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Meeting Minutes Transmittal/Approval
Unit Managers' Meeting
Remedial Action and Waste Disposal Unit/Source Operable Unit
3350 George Washington Way, Richland, Washington
December 1999

APPROVAL: _____ Date 4-18-00
Glenn Goldberg/Chris Smith, 100 Area Unit Managers, RL (H0-12)

APPROVAL: _____ Date 4-20-00
Wayne Soper, 100 Aggregated Area Unit Manager, Ecology (B5-18)

APPROVAL: _____ Date 4-20-00
Dennis Faulk, 100 Aggregate Area Unit Manager, EPA (B5-01)

APPROVAL: _____ Date 4-20-00
Rick Bond, 100-N Area Unit Manager, Ecology (H0-18)

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APR 26 2000
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Meeting minutes are attached. Minutes are comprised of the following:

Attachment 1	–	Agenda
Attachment 2	–	100 Area UMM Minutes - December 1999
Attachment 3	–	Regulator Review Schedule
Attachment 4	–	100 Area CVP Status
Attachment 5	–	100-BC, -D, -H, -F, and -K Operable Unit Maps
Attachment 6	–	116-DR-1 site Characterization Borehole Results
Attachment 7	–	100-DR-1/2 Liquid Waste Sites GR/Test Trench Data

Prepared by: Amy J. Jones Date 3/30/00
Amy J. Jones (H0-10)/Tamen Rodriguez

Concurrence by: Vernon R. Dronen Date 4/20/00
Vern Dronen, BHI Remedial Action and Waste Disposal Project Manager (H0-17)

UNIT MANAGERS' MEETING AGENDA

3350 George Washington Way
December 8, 1999

1:00 – 3:00 p.m. 100 Area 1A14

100 N Activities

- 100 NR-1 TSD Sites Bid Package / Remedial Action RFP
- ROD
- RDR/SAP

General

- Status of Close Out Verification Packages for Regulator Review
- Status of RDR/RAWP and SAP Revisions
- Regulatory Document Review Planning
- Remedial Design Activities Outfall Remediation - 100 BC, D, H, F and K Operable Units
- Resolution of D&D/RA Cleanup Values
- Five year CERCLA Review for the RODs
- 100 Area Burial Ground FFS/PP Status
- Final Resolution of D&D/RA Cleanup Values
- Other, Assessments, etc.

100 BC/D Remedial Action

- 116-DR-1/2 Vadose Zone Characterization - Status of Summary Results and Reporting
- Status of Ecology Review of Cr6+ Kd-Leachability Test Results Report/Associated 116-D7 RESRAD Modeling
- Other - 116 D3/DR3 sites, etc.

100 H, F and K Remedial Action

- Status of Vadose Zone Characterization at 100 H
- Status of 126-F1 Ash Pit Characterization
- Update on 116-H-7 Grout Sampling
- 100 H Area Plume up date
- Discussion of change packages for TPA Milestones M-16-13A and M-16-26C.
- Discuss the 100-H-24 concrete removal (just an update)
- 1607-H2 & H4 Septic Sites - First CVP sites for "Group 4" RAWD Project

MEETING MINUTES
REMEDIAL ACTION AND WASTE DISPOSAL
UNIT MANAGERS' MEETING -- 100 AREA
December 21, 1999

Attendees: Not Provided

Agenda: See Attachment #1

Topics of Discussion:

100 N Activities

1. 100 NR-1 TSD Sites Bid Package / Remedial Action RFP – A copy of the 100 NR-1 TSD Sites Bid Package was provided to Rick Bond of Ecology.

2. ROD – EPA and Ecology concurred that the ROD should be finalized and signed by mid-January, 2000. EPA commented that the Remaining Sites ROD identified 3/30/00 as the due date for the Institutional Controls Report for the 100 Areas. The 100-NR-1 and 100-NR-2 ROD identifies 7/30/00 as the due date for the Institutional Controls Report. EPA suggested that RL determine which date they prefer and inform EPA by formal letter. RL agreed and a letter identifying 7/30/00 as the due date for the Institutional Controls Report will be sent.

3. RDR/SAP – An overall Regulator Document Review Schedule, including the 100N RDR/SAP, was handed out (Attachment 3). This schedule shows the target date as 2/01/00 for transmittal of the N RDR and SAP to Ecology for review and comment. Ecology elected for EPA to provide formal review comments on the documents. When Ecology transmits the documents to RL, they will also transmit a copy to EPA.

General

4. Cleanup Verification Packages – the following topics were discussed:

   - CVP Status - ERC reviewed the current status of the packages (Attachment 4). EPA provided signed WIDS Waste Site Reclassification Forms for the 116-B-1, 116-B-11, and 116-C-5 Waste Sites at the UMM. These documents will now be formally issued as Rev. 0.

   - General Ecology/EPA Comments and Requests regarding CVPs - EPA provided the following comments and requests on this subject: (1) EPA asked that the footnote in Appendix A be revised so that reader does not have to go into subsequent Appendices for information. (2) EPA indicated that they would like to see the radiological risk discussion and graph added back into the CVPs. This information does not need to be added to the CVPs currently in EPA review nor for the CVPs shown in Attachment 2 as being "in process." (3) Dennis Faulk of EPA needs only one copy of Draft A documents in future. (4) EPA asked that the ERC make sure that the regulator split sample data is included in the appropriate CVPs. (5) EPA asked that DOE prepare a brief "white paper" that explains how the qualitative risk assessments (QRAs) were performed. Its purpose is not to explain risk evaluations in the context of the CVPs. Wayne

Soper, Ecology asked that this effort be coordinated with Phil Staats, Ecology. Glenn Goldberg, DOE asked the ERC to coordinate this task. (6) EPA asked that any letter requesting permission to excavate a "proximity site" that is not in a ROD needs to include an explanation of why the site was omitted.

- Institutional Controls Discussion - The RDR/RAWP requires that CVPs include a statement that institutional controls are needed if wastes are left in place below 15 feet (referred to in Attachment 3). To date, the CVPs have not included such text; DOE will add such statements in the future to follow the intent RDR/RAWP. EPA concurred that this was appropriate; such text will be added to the Draft A CVPs currently at EPA for review as well as to the CVPs in process. Ecology suggested that perhaps this requirement should be deleted from the RDR/RAWP; the opportunity to discuss this possibility further will come in connection with the current update to the RDR/RAWP.

- 116-DR-9 CVP & Split Sample Issue - Ecology briefly summarized the issue involving a relatively high Cr^{+6} value in a deep zone split sample. No conclusions or agreements were made during this meeting. This issue will be discussed further at a separate meeting scheduled for 12/13/99.

- RESRAD - Argonne National Laboratory has released a new version of RESRAD (i.e., Version 5.91). Steve Clark circulated a summary of the changes relative to the version currently in use to support CVPs. RL, EPA and Ecology all agreed that, upon completion of test runs to verify that the current and new versions yield the same results for same input files, RL should adopt RESRAD 5.91 for CVP-related RESRAD runs.

- Status of RDR/RAWP and SAP Revisions – The status of the RDR/RAWP and SAP updates was reviewed. Regulator review copies will be delivered to EPA and Ecology in January.

- Regulatory Document Review Planning – An overall Regulator Document Review Schedule (previously noted as Attachment 2) was provided to the regulators, identifying all the documents that will require their review and approval.

- Remedial Design Activities Outfall Remediation - 100 BC, D, H, F and K Operable Units – A handout of five drawings (Attachment 5) was provided showing the outfall structures in each Operable Unit. The figures indicate that short-term outfall remedial actions, if any, will be limited to removal of the outfall buildings (1904 and 1908 structures) and will remain above the high water mark. Removal of the outfall buildings is contingent upon approval of funding and scope by DOE. Regulators emphasized that outfall removal activities should not preclude future river pipeline and spillway remedial action efforts. EPA and Ecology also emphasized that ERC need only notify the Washington Department of Fish & Wildlife (WDFW), National Marine Fisheries Service (NMFS), The Corps of Engineers (USCOE), and other local agencies of the planned activities, and the cleanup authority would be granted by EPA and Ecology (the lead agencies for the 100 Areas Remedial Action). River discharge pipes and spillways will be stabilized and sealed to prevent intrusion by backfill material, rainwater, and groundwater (where applicable), concurrent with removal of the outfall structure (1904/1908 buildings).

- Resolution of D&D/RA Cleanup Values – EPA stated that, as a result of their review, they are satisfied that there is general agreement between D&D and RA cleanup values and evaluation processes. EPA views each project's practices regarding the use of a drilling scenario as appropriate.

- Five Year CERCLA Review for the RODs – EPA requested that this item be placed on the January, 2000 UMM Agenda, and that Dave Einan, EPA would provide a presentation as to EPA's expectations on the process. The Five Year CERCLA ROD review is tentatively scheduled for March through June.

- 100 Area Burial Ground FFS/PP Status – This document has been transmitted to RL, and RL is in process of formally transmitting to EPA.

- Other, Assessments, etc. – no items discussed.

100 BC/D Remedial Action

5. 116-DR-1/2 Vadose Zone Characterization - Status of Summary Results and Reporting – a summary of analytical data from the vadose zone drilling was provided to the regulators for review (Attachment 6).

6. Status of Ecology Review of Cr6+ Kd-Leachability Test Results Report/Associated 116-D7 RESRAD Modeling - Ecology requested a meeting with the report author, Jeff Serne of PNNL to be held on December 13. The meeting is for clarification of report details. No significant issues are expected.

7. Other - 116 D3/DR3 sites, etc. - During remedial action for the 100 D Group 3 small sites, initial excavation at coordinates specified for 116-D-3 and 116-DR-3 failed to conclusively confirm the presence of waste sites. After further review of historical documents it was determined that possible alternative locations exist for both sites. Following a walkdown with Ecology, the ERC has developed a strategy for potholing and trenching to determine whether the alternative locations may in fact be the waste sites (Attachment 7).

   Ecology was advised that the 100 DR north pipelines CVP will be developed in three parts in order to facilitate timely closeout and backfill of clean trenches by de-coupling them from the areas where contamination plumes still exist. Ecology indicated that they would not be collecting as many splits for pipeline verification samples as they have for other waste sites. EPA requested that a proposed milestone for B/C pipelines be included with the package of H, F and K milestone revisions.

100 H, F and K Remedial Action

8. Status of Vadose Zone Characterization at 100 H - ERC provided a status of the deep vadose characterization activities to be completed for 100 H/F/K Areas. A draft Data Quality Objectives workbook and Description of Work have been completed. Regulator interviews have been initiated. The three areas are being combined to streamline the Data Quality Objectives process and reduce cost.

9. Status of 126-F1 Ash Pit Characterization – ERC provided a status of the small tube geophysical work at the 126-F-1 Ash Pit. Data collection activities have been completed. Preliminary information indicates the majority of the ash pit (southern 2/3) is not contaminated. Data indicates natural occurring radioactivity. Additional results and recommendations will be presented at subsequent Unit Manager Meetings.

10. Update on 116-H-7 Grout Sampling – Three additional samples will be collected beneath the grout material to assure contamination has not accumulated. A Baseline Change Proposal has been prepared for the additional scope. Work will begin once the Baseline Change Proposal is approved.

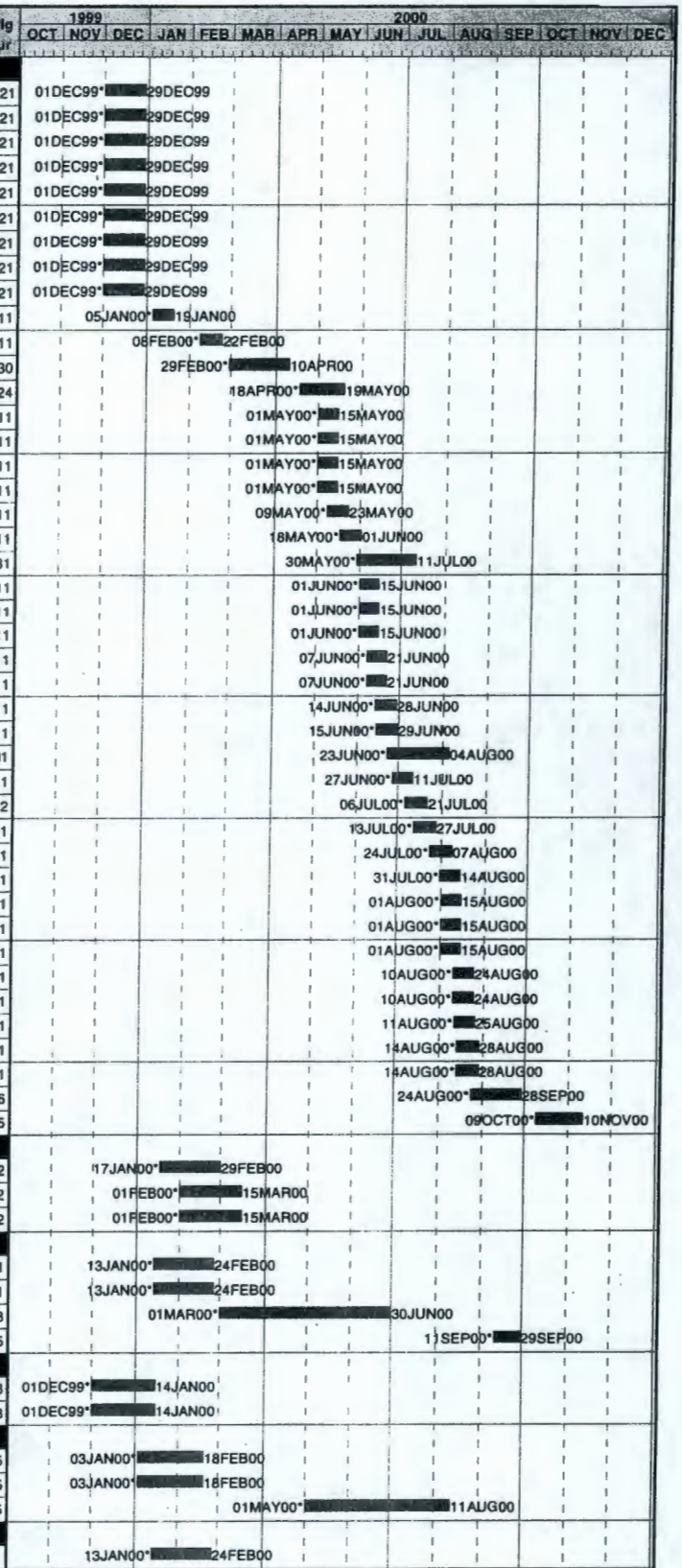
11. 100 H Area Plume Update – Additional plumes have been identified in the 116-H-1 waste site along the southwest corner.

12. Discussion of change packages for TPA Milestones M-16-13A and M-16-26C – A draft Tri-Party Agreement change package was presented along with the logic associated with the schedule extension. EPA and Ecology provided no comments at the meeting. DOE will transmit the formal change request to EPA and Ecology by the end of December.

13. Discuss the 100-H-24 concrete removal (just an update) - Excavation of contaminated soils at the substation was initiated in November. Concrete support structures associated with the substation are more extensive than indicated on design drawings resulting in additional material to be removed.

14. 1607-H2 & 1607-H4 Septic Sites - First CVP sites for Group 4 RAWD Project - Excavation of the two septic tanks has been completed along with variance sampling. Sample data shall be available within the next two weeks. The two waste sites are nonradiologically contaminated. Variance samples are being analyzed for ICP metals instead of GEA.

Activity ID	Activity Description	Orig Dur	Start	Finish
CVP's				
101040	116-DR-9Retention Basin	21	01DEC99*	29DEC99
101240	116-B-1 Trench	21	01DEC99*	29DEC99
101250	116-B-4French Drain	21	01DEC99*	29DEC99
101260	116-B-9French Drain	21	01DEC99*	29DEC99
101270	116-B-10Dry Well	21	01DEC99*	29DEC99
101280	116-B-3Crib	21	01DEC99*	29DEC99
101290	116-B-2Fuel Storage Basin	21	01DEC99*	29DEC99
101310	116-B-6BCrib	21	01DEC99*	29DEC99
101320	116-B-12Crib	21	01DEC99*	29DEC99
101330	116-C-2A/BCCrib, 2B Pump Stn, and 2C	11	05JAN00*	19JAN00
101300	116-B-6A/B-16Crib & Storage Tanks	11	08FEB00*	22FEB00
101030	116-D-7Retention Basin	30	29FEB00*	10APR00
101400	100-H-24151-H Substation	24	18APR00*	19MAY00
101010	107-D5(100-D-04) Sludge Disposal Tre	11	01MAY00*	15MAY00
101070	East Pipelines - D Area	11	01MAY00*	15MAY00
101080	West Pipelines - D Area	11	01MAY00*	15MAY00
101090	2 P/L O/B Piles - D Area	11	01MAY00*	15MAY00
101340	1607-H-2Septic Tank	11	09MAY00*	23MAY00
101350	1607-H-4Septic Tank	11	18MAY00*	01JUN00
101020	116-DR-1&2Site Trench	31	30MAY00*	11JUL00
101060	Sanitary Pipelines	11	01JUN00*	15JUN00
101370	116-H-7Retention Basin	11	01JUN00*	15JUN00
101410	116-H-2Trench	11	01JUN00*	15JUN00
101150	116-D-2Crib	11	07JUN00*	21JUN00
101190	116-D-9Crib	11	07JUN00*	21JUN00
101110	116-D-4French Drain	11	14JUN00*	28JUN00
101170	100-D-12NaCr2 Station	11	15JUN00*	29JUN00
101160	116-D-3French Drain	31	23JUN00*	04AUG00
101230	116-DR-7Inkwell Crib	11	27JUN00*	11JUL00
101390	100-H-17Thimble Burial	12	06JUL00*	21JUL00
101200	116-DR-3Storage Basin Trenches	11	13JUL00*	27JUL00
101140	116-D-6French Drain	11	24JUL00*	07AUG00
101220	116-DR-6Liquid Disposal Trench	11	31JUL00*	14AUG00
101050	North Effluent Pipelines	11	01AUG00*	15AUG00
101100	100-D-PL Group 3 Pipelines	11	01AUG00*	15AUG00
101380	116-H-5Sludge Disposal Trench	11	01AUG00*	15AUG00
101130	116-D-1BStorage Basin Trenches	11	10AUG00*	24AUG00
101210	116-DR-4Pluto Crib	11	10AUG00*	24AUG00
101180	100-D-52Drywell	11	11AUG00*	25AUG00
101120	116-D-1AStorage Basin Trenches	11	14AUG00*	28AUG00
101420	116-H-3French Drain	11	14AUG00*	28AUG00
101360	116-H-1107-H LW Disposal Trench	26	24AUG00*	28SEP00
101430	H Pipelines	25	09OCT00*	10NOV00
100-N				
201010	100-NR-1 TSD DQO Workbook Review	32	17JAN00*	29FEB00
201020	100-NR-1 TSD SAP Draft A Review	32	01FEB00*	15MAR00
201030	100-NR-1 TSD RDR Draft A Review	32	01FEB00*	15MAR00
100 Area Common				
301010	100 Area SAP Regulator Review (C/O)	31	13JAN00*	24FEB00
301020	100 Area RDR Regulator Review (C/O)	31	13JAN00*	24FEB00
301040	5- Year ROD Review (Regulator Task)	88	01MAR00*	30JUN00
301030	100 Area Long Range Remediation Schedule	15	11SEP00*	29SEP00
300-FF-2				
401010	Regulator Review Draft A FFS 300-FF-2	33	01DEC99*	14JAN00
401020	Regulator Review Draft A PP 300-FF-2	33	01DEC99*	14JAN00
100 Area Burial Grounds				
501010	Regulator Review Draft C FFS 100 Area BG	35	03JAN00*	18FEB00
501020	Regulator Review Draft A PP 100 Area BG	35	03JAN00*	18FEB00
501030	ROD Preparation	75	01MAY00*	11AUG00
Remaining Sites				
801010	Remaining Sites SAP Regulator Review (C/O)	31	13JAN00*	24FEB00



Project Start 01OCT99
Project Finish 10NOV00
Data Date 01OCT99
Run Date 16JAN00

Early Bar
Progress Bar
Critical Activity

REGR

Sheet 1 of 1

Regulator Review Schedule

Organized by Area

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100 Area CVP Status
(UMM 12/8/99)

Rev. 0 CVPs Signed Off

B/C Area	D Area
116-C-1	100-D-4
116-B-13	100-D-20
116-B-14	100-D-21
	100-D-22
	1607-D2:1
	1607-D2

Rev. 0 CVPs with EPA/Ecology for Final Check and Signoff

B/C Area	D Area
116-B-1	100-DR-9
116-B-11	
116-C-5	

Draft A with EPA/Ecology for Review

B/C Area	D Area
116-B-2	None
116-B-3	
116-B-4	
116-B-6B	
116-B-9	
116-B-10	
116-B-12	

CVPs in Process

B/C Area	D Area
116-C-2ABC	116-D-7

General CVP Discussion Topics
(UMM 12/8/99)

116-DR-9 CVP Deep Zone Split Sample

Issue/Question: What additional actions are necessary to address the relatively high deep zone split sample result for Cr^{+6}?

- 12 deep zone regular samples: 0.03U to 0.604 mg/kg

- At A1 Sampling Area:
  Regular sample: 0.03U mg/kg
  Duplicate sample: 0.607 mg/kg
  Split sample: 7.8 mg/kg

- 95% UCL (based on regular samples): 0.55mg/kg
- 95% UCL (including split as 13th sample): 1.82 mg/kg

- Comparison standard: 2.2 mg/kg (groundwater protection)

Section 5: "Statement of Protectiveness" & Statement re Institutional Controls

Issue/Question: RDR/RAWP says we should document need for institutional controls in CVPs. (See excerpts below and attached.) If the addition is appropriate, the recommendation is to do it in Section 5, "Statement of Protectiveness." Discussion.

> RDR/RAWP p.2-10: *"In the event that DOE relinquishes full control of the site, deed restrictions will be applied as necessary to prohibit excavation and drilling below the 4.6M (15 ft) level in those cases where contaminants meet the required groundwater/river protection cleanup goals but exceed concentrations that are protective for direct exposure."*
>
> RDR/RAWP p.3-13: *"Wastes left in place at depths greater than 4.6m (15ft) and that are protective of groundwater and the Columbia River will have institutional controls applied (e.g., deed restrictions for well drilling and deep excavation)."*
>
> RDR/RAWP p.2-10: *"The requirement for deed/lease restrictions will be documented in the site close-out verification package (see section 3.7, CERCLA Cleanup Documentation) and executed in accordance with DOE land release policy (see section 3.8, Site Release). Public comment would not be sought for deed/lease restrictions deemed necessary to prevent interference with the integrity of the cleanup action."* (Underline added.)

DOE/RL-96-17

Attachment 4 Rev. 1

Remedial Design Report/Remedial Action Work Plan for the 100 Area

Date Published
May 1998

United States
Department of Energy
P.O. Box 550
Richland, Washington 99352

- To identify target volumes in soil that require remediation for purposes of remedial design

- To identify minimum quantitation limits for contaminants in soil that must be achieved by analytical systems used during remedial action

- To provide "look-up" values for use in the field to rapidly evaluate analytical data collected during remedial action.

These contaminant-specific concentrations correspond to the RAGs but are not intended for use in verifying that remedial action is complete at a site. The concentrations represent values that individually equate to MTCA values or 15 mrem/yr dose rate. For radionuclides, the expectation is that most sites will have multiple radionuclides driving the cleanup; therefore, a cumulative dose of 15 mrem/yr would potentially result in individual radionuclide concentrations that are lower than these "look-up" values. The process for developing and using these contaminant-specific concentrations is presented in Figure 2-1. The verification process is further defined in Section 3.6. A summary of all representative look-up values can be found in Table 2-7.

2.1.5 Balancing Factors

Based on existing knowledge, it is possible that residual wastes may remain in place at sites where (1) contamination begins at depths below 4.6 m (15 ft), (2) residual soil contamination is present below 4.6 m (15 ft) or the engineered structure, or (3) marginally contaminated material is present. The ROD provides a decision framework to evaluate leaving some contamination in place:

> *"The decision to leave wastes in place at such sites will be a site-specific determination made during remedial design and remedial action activities that will balance the extent of remediation with protection of human health and the environment, disturbance of ecological and cultural resources, worker health and safety, remediation costs, operation and maintenance costs, and radioactive decay of short-lived (half life less than 30.2 years [e.g., ^{137}Cs] radionuclides). The application of the criteria for the balancing factors, the process for determining the extent of remediation at deep sites, and the public involvement process during such determinations shall be specified further in the Remedial Design Report"* (EPA 1995).

In addition to the seven balancing factors identified above, the section of the ROD entitled "Scope and Role of Response Action Within Site Strategy" identifies three additional factors: sizing of the ERDF, the use of institutional controls, and long-term monitoring costs.

The balancing factors can be divided into two categories: (1) factors effecting the size of the excavation, and (2) factors associated with cost. Three of the balancing factors - minimizing disturbance of cultural or ecological resources, minimizing the size of the ERDF (minimize waste volume), and protecting worker health and safety - weigh in favor of minimizing excavation size. The other balancing factors suggest that the extent of remediation and associated costs be weighed against the reliability and cost of institutional controls. The two

categories, when weighed with protection of human health and the environment, lead to the following conclusions:

- Contaminant concentrations below 4.6 m (15 ft) or below the engineered structure will be required to meet the criteria for protection of the groundwater and the Columbia River, as stated in RAO number 2 in Section 2.1. For residual contamination below 4.6 m (15 ft) or below the engineered structure shown to impact groundwater or the Columbia River, the balancing factors may be invoked.

- Radioactive contaminants present below the 4.6 m (15 ft) level will be required to be equal to or below concentrations so that the external radiation to a potential receptor in a basement 3.7 m (12 ft) below ground (in combination with radiation exposure from other contaminant pathways) is below 15 mrem/yr.

- In the event that DOE relinquishes full control of the site, deed restrictions will be applied as necessary to prohibit excavation and drilling below the 4.6 m (15 ft) level in those cases where contaminants meet the required groundwater/river protection cleanup goals but exceed concentrations that are protective for direct exposure.

- For areas where lateral movement of contaminants, low radionuclide levels, or small quantities of disposed waste would generate marginally contaminated material to be disposed at the ERDF, or where it can be demonstrated that radionuclide concentrations will result in achieving an acceptable risk range within a reasonable period of time, the balancing factors may be invoked.

In the event that the consideration of balancing factors results in a recommendation to leave contaminated soils or debris in place at a waste site at levels that exceed the RAOs, the ROD states that the Tri-Parties will initiate public involvement prior to making a decision to leave contamination in place. The process will be as described for an explanation of significant difference (ESD) in the Public Involvement Plan.

Deed/lease restrictions or other institutional controls and long-term monitoring may be required to prevent human exposure to groundwater and/or contaminated soils or interference with the integrity of the cleanup action for any site. Potential deed restrictions could prohibit the drilling of any well to groundwater or any activity that would result in soil disturbance greater than 12 feet below the surface. The requirement for deed/lease restrictions will be documented in the site close-out verification package (see section 3.7, CERCLA Cleanup Documentation) and executed in accordance with DOE land release policy (see section 3.8, Site Release). Public comment would not be sought for deed/lease restrictions deemed necessary to prevent interference with the integrity of the cleanup action.

2.1.6 Applicable or Relevant and Appropriate Requirements

The National Contingency Plan (NCP) and the ROD require that the remedial actions described in this document comply with the ARARs established in the ROD. The purpose of this section is to discuss how each of the ARARs identified in the ROD will be met during remedial action.

A fundamental change is a change that does not meet the requirements set forth in the ROD or that incorporates remedial activities not defined in the scope of the ROD. In few cases are there fundamental changes to a ROD. Should the situation arise, the ROD must be amended. Examples of significant changes that fundamentally alter the remedy occur when:

- Waste remains in place above cleanup objectives due to cultural resources,
- A final land use is defined that is not compatible with the ROD,
- Stabilization of waste remaining in place in the 100 Area rather than excavating and disposing the soil at the ERDF.

The project manager is responsible for tracking all changes and obtaining appropriate reviews by ERC staff. The project manager will discuss the change with DOE, and DOE will then discuss the type of change that is necessary with the EPA and Ecology. The lead regulatory agency's responsibility is to determine the significance of the change. Appropriate documentation will follow based on the type of change.

3.6 GOAL ATTAINMENT

This section describes the approach for verifying attainment of cleanup of soils in accordance with the RAOs identified in the ROD and presents the supporting calculations. The general approach for verifying attainment of RAGs is presented in Figure 3-3 and involves the following steps.

- Identify the unit(s) within a site for cleanup verification
- Calculate the summary statistics for the identified unit(s)
- Identify the appropriate RAGs to be applied to the unit(s)
- Evaluate the summary statistics for the identified unit(s) against the decision rules for achieving the appropriate RAGs
- Verify the attainment of the radionuclide soil concentrations corresponding to the 15 mrem/yr radionuclide soil cleanup standard for direct exposure
- Verify the attainment of the nonradionuclide soil concentrations corresponding to MTCA Method B soil cleanup standards for direct contact
- Verify the attainment of the radionuclide contaminant concentrations in soil less than or equal to the RESRAD-calculated values that meet the groundwater RAGs for protection of groundwater
- Verify the attainment of the nonradionuclide contaminant concentrations in soil less than or

equal to 100 times the groundwater RAGs for protection of groundwater

- Verify the attainment of the radionuclide contaminant concentrations in soil less than or equal to the RESRAD-calculated values that meet the RAGs after the DAF has been applied for protection of the Columbia River

- Verify the attainment of the nonradionuclide contaminant concentrations in soil less than or equal to 100 times the RAGs for protection of the Columbia River after the DAF has been applied.

Details regarding verification sampling and analysis may be found in the SAP (DOE-RL 1996b).

3.6.1 Identify the Unit(s) Within a Site for Cleanup Verification

In this step, the site is divided into units for purposes of collecting verification samples. Summary statistics (e.g., arithmetic mean and 95 percent upper confidence limit [UCL]) are calculated for verification samples from a particular unit. Verification sampling and analysis data will be evaluated against the decision rules (see Section 3.6.4) on a unit-by-unit basis. Generally, a site will be divided into the following units: (1) stockpiled "clean" soil that will be returned to the excavation, (2) soil from the bottom of the excavation when excavation is from 0 to 4.6 m (0 to 15 ft) below ground surface, and (3) soil from the bottom of the excavation when excavation is greater than 4.6 m (15 ft) below ground surface. Additional units may be defined as needed for large sites or other specific needs. These units will be identified in site-specific instructions prepared for confirmation sampling. Details regarding verification sampling and analysis can be found in the SAP (DOE-RL 1996b).

3.6.2 Calculate the Summary Statistics for the Identified Unit(s)

The summary statistics needed for each unit (Section 3.6.1) are arithmetic mean, standard deviation, one-sided 95 percent UCL, and the total number of samples collected from the unit. The number of samples with concentrations exceeding the MTCA cleanup level and two times the MTCA cleanup level must also be determined from the sampling and analytical data.

3.6.3 Identify the Appropriate Remedial Action Goals to be Applied to the Unit(s)

The RAG or RAGs that apply to a site must be identified to verify that remedial action has attained the RAOs. A review of Section 2.1.2 provides the information necessary to identify the appropriate RAGs. One or more of these goals may apply to any particular unit.

3.6.4 Evaluate the Summary Statistics Against the Decision Rules for Achieving the Appropriate Remedial Action Goals

For the RAGs identified in the previous step, decision rules are defined that will be used to test verification sampling and analysis data. These decision rules follow:

- MTCA standards are achieved under the following conditions (WAC 173-340-740[7][e]):

- The 95 percent UCL on the arithmetic mean from verification samples collected is less than the cleanup standard for each contaminant of concern.

- No single sample concentration is greater than two times the cleanup standard.

- Less than 10 percent of the sample concentrations exceed the cleanup standard.

- Radionuclide soil cleanup standards are achieved under the following conditions:

  - The dose calculated from the 95 percent UCL on the arithmetic mean for the sum of all radioactive contaminants of concern from verification samples collected from the sides of the excavation and from soil 0 to 4.6 m (0 to 15 ft) below grade is less than 15 mrem/yr. The dose is calculated assuming exposure through inhalation, soil ingestion, crop ingestion, meat and milk ingestion, aquatic foods ingestion, drinking water ingestion, and external gamma exposure pathways using residential exposure assumptions (specific assumptions for dose calculations are presented in Appendix B). Figure 3-4 illustrates this conceptual model.

  - The dose calculated from the 95 percent UCL on the arithmetic mean for the sum of all radioactive contaminants of concern from verification samples collected from soil from the bottom of the excavation is less than 15 mrem/yr. The dose is calculated assuming external gamma exposure during the portion of an individual's lifetime spent in the basement of a residence, and assuming that the total depth of the basement is 3.7 m (12 ft) below grade (specific assumptions for dose calculations are presented in Appendix B). See Figure 3-4 for a depiction of this conceptual model.

- For nonradioactive contaminants, cleanup of soils for groundwater protection will have been achieved when the 95 percent UCL on the arithmetic mean concentration in soil of each contaminant of concern is less than 100 times the groundwater RAG as presented in Table 2-5.

- For radionuclide contaminants, cleanup of soils for groundwater protection will have been achieved when the 95 percent UCL on the arithmetic mean concentration in soil of each contaminant of concern is less than the value, as calculated by RESRAD, that meets the groundwater RAG as presented in Table 2-5.

- For nonradioactive contaminants, cleanup of soils for protection of the Columbia River will have been achieved when the 95 percent UCL on the arithmetic mean concentration in soil of each contaminant of concern is less than 100 times the RAG after the DAF has been applied as presented in Table 2-6.

- For radionuclide contaminants, cleanup of soils for protection of the Columbia River will have been achieved when the 95 percent UCL on the arithmetic mean concentration in soil of each contaminant of concern is less than the value, as calculated by RESRAD, that meets the RAG after the DAF has been applied as presented in Table 2-6.

3.6.5 Verify the Attainment of the Radionuclide Soil Cleanup Standard

Determining when a remedial action has achieved the cleanup level (15 mrem/yr) involves converting radionuclide concentrations (in pCi/g) in soil into dose rates (in mrem/yr) using a dose assessment model. Use of a model requires an exposure scenario that specifies (1) a hypothetical receptor, (2) pathways of exposure from radionuclides in soil to the receptor, and (3) assumptions and parameters for estimating exposures and doses to the receptor from radionuclides in soil.

Unrestricted future use in the 100 Area is represented by an individual resident in a rural-residential setting. This resident is assumed to consume crops raised in a backyard garden, meat and milk from locally raised livestock, and meat from game animals and fish, and to live in a residence with a basement 3.7 m (12 ft) below grade. The following exposure pathways are considered when estimating doses from radionuclides in soil: inhalation; soil ingestion; ingestion of crops, meat, fish, drinking water, and milk; and external gamma exposure. External gamma exposure is assumed to be the only exposure pathway from contaminants at the bottom of the excavation and is assumed to occur only when an individual is in the basement. (Wastes left in place at depths greater than 4.6 m [15 ft] and that are protective of groundwater and the Columbia River will have institutional controls applied [e.g., deed restrictions for well drilling and deep excavation].) This individual is conservatively assumed to spend 25 percent of his/her lifetime in the basement. Therefore, doses are calculated separately in fill soil from 0 to 4.6 m (0 to 15 ft) below grade and for residual contaminants at the bottom of the excavation. These doses are then summed to obtain the total dose associated with radionuclides in soil. A list of the assumptions and model parameters used in RESRAD is presented in Appendix B.

3.6.6 Verify the Attainment of the MTCA Cleanup Standards

Verifying the attainment of MTCA Method B cleanup standards involves comparing the appropriate summary statistics with the RAG presented in Table 2-1. The decision rules for MTCA standards presented in Section 3.6.4 are also used for this verification.

3.6.7 Verify the Attainment of the Contaminant Concentrations in Soil for Protection of the Groundwater

Verifying the attainment of groundwater RAGs involves two steps. First, the RESRAD model will be used with site-specific input parameters to determine if contaminants (in addition to those contaminants predicted by RESRAD using the input parameters applicable to the generic site model [input parameters for the generic site model are listed in Appendix B] and listed in Table 2-5 and 2-6) reach groundwater. For nonradioactive contaminants, if additional contaminants are predicted to reach groundwater, then the 100 times rule will be used to determine contaminant-specific concentrations in soil protective of groundwater, as was done in Section 2. For radionuclide contaminants, if additional contaminants are predicted to reach groundwater, then the RESRAD model will be used to determine contaminant-specific concentrations in soil protective of groundwater. The second step involves comparing the appropriate summary statistics to the contaminant-specific concentrations in soil that meet the groundwater RAGs

presented in Table 2-5 and any new RAGs resulting from the previous step.

3.6.8 Verify the Attainment of the Contaminant Concentrations in Soil for Protection of the Columbia River

Similar to the procedure presented in Section 3.6.7, verifying the attainment of RAGs protective of the Columbia River involves two steps. First, the RESRAD model will be used with site-specific input parameters to determine if contaminants (in addition to those contaminants predicted by RESRAD using the input parameters applicable to the generic site model [input parameters for the generic site model are listed in Appendix B] and listed in Table 2-5 and 2-6) reach groundwater. For nonradioactive contaminants, if additional contaminants are predicted to reach groundwater, then the 100 times rule will be used to determine contaminant-specific concentrations in soil protective of the Columbia River, as was done in Section 2. For radionuclide contaminants, if additional contaminants are predicted to reach groundwater, then the RESRAD model will be used to determine contaminant-specific concentrations in soil protective of the Columbia River. The second step involves comparing the appropriate summary statistics to the contaminant-specific concentrations in soil that meet the RAGs after the DAF has been applied as presented in Table 2-6 and any new RAGs resulting from the previous step.

3.7 CERCLA CLEANUP DOCUMENTATION

Cleanup verification reports will be prepared after RAG attainment has been verified, as discussed in Section 3.6.1. The reports will provide the needed documentation for verification of interim remedial action at a site and to support the eventual deletion of the OU from the NPL. Cleanup verification reports using the following outline will be prepared for groups of sites or individual sites as needed:

- 1.0 Introduction
- 2.0 Site Description (site history, site description, remedial action description)
- 3.0 Remedial Action Objectives and Goals
- 4.0 Sampling and Analytical Results: Summary of Field Analytical/Field Screening Activities, Data Evaluation, Data Validation, and Data Interpretation
- 5.0 Statement of Protectiveness
- 6.0 References
- Appendices (analytical data tables, field reports, and documentation of calculations as needed to support the information presented in the body of the report).

3.8 SITE RELEASE

The DOE will continue to manage the land in the 100 Area of the Hanford Site as long as necessary to support remedial actions and other missions. The release of land areas for other uses will depend on the following: (1) release of the individual waste sites and (2) the completion of other work in the OU such as decontamination and decommissioning of facilities, as well as final cleanup verification under CERCLA.

It is unknown at this time when a final ROD will be recorded for the 100 Area NPL site, but the final ROD will contain operation and maintenance requirements. The DOE will provide institutional controls (e.g., site monitoring and access restrictions) to meet all project missions until such time that they are deemed unnecessary.

Where deed restrictions or other institutional controls are utilized in accordance with this RDR/RAWP and the ROD, the DOE will not allow any activities that would interfere with the remedial action prior to EPA and Ecology approval. Additionally, DOE will take necessary measures, such as filing the deed restrictions in appropriate county offices, to ensure the continuation of these restrictions prior to any transfer or lease of the property. A copy of a notification of any restrictions will be given to any prospective purchaser/transferee before any transfer or lease by DOE. The DOE will provide EPA and Ecology with written verification that these restrictions have been put in place.

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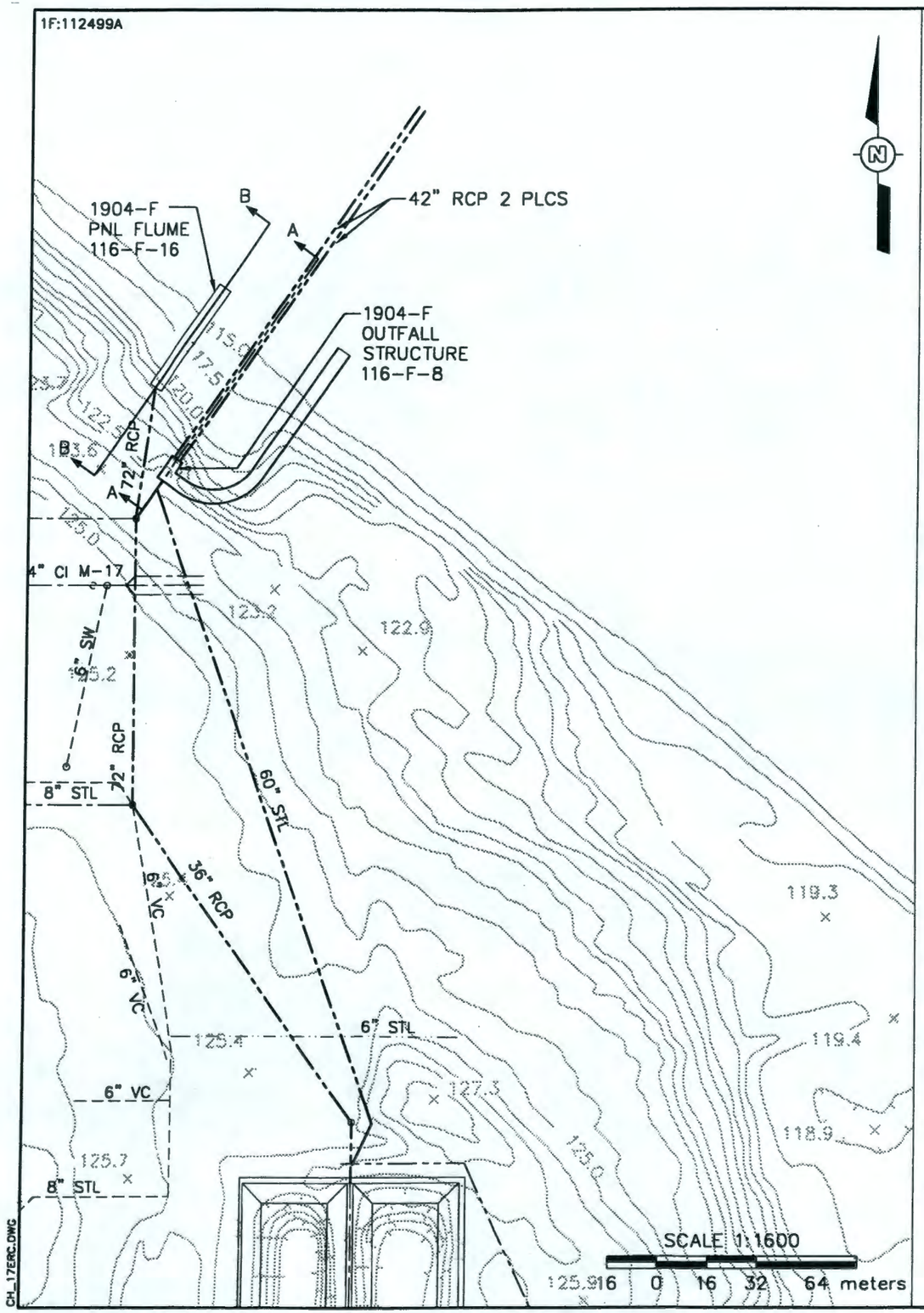
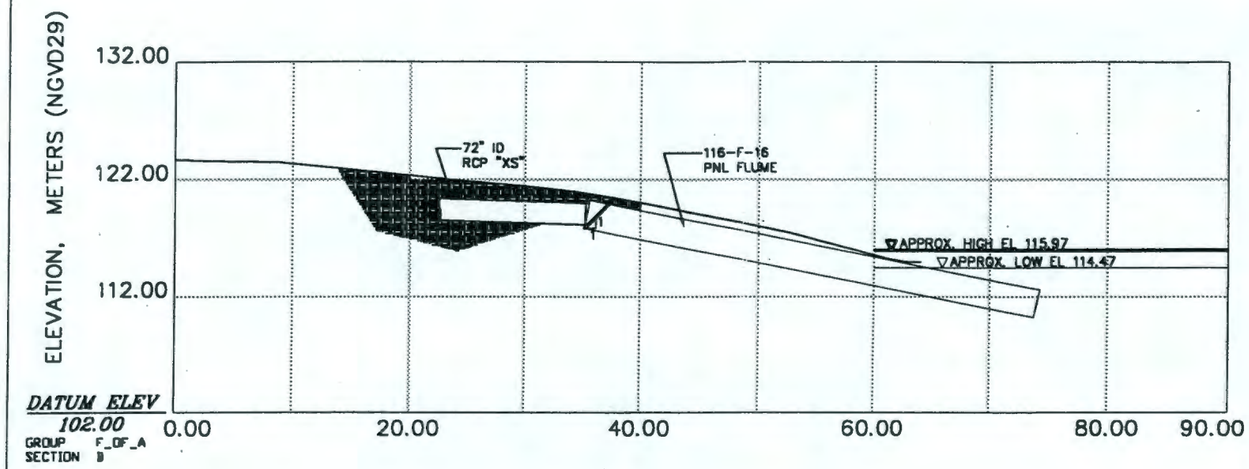
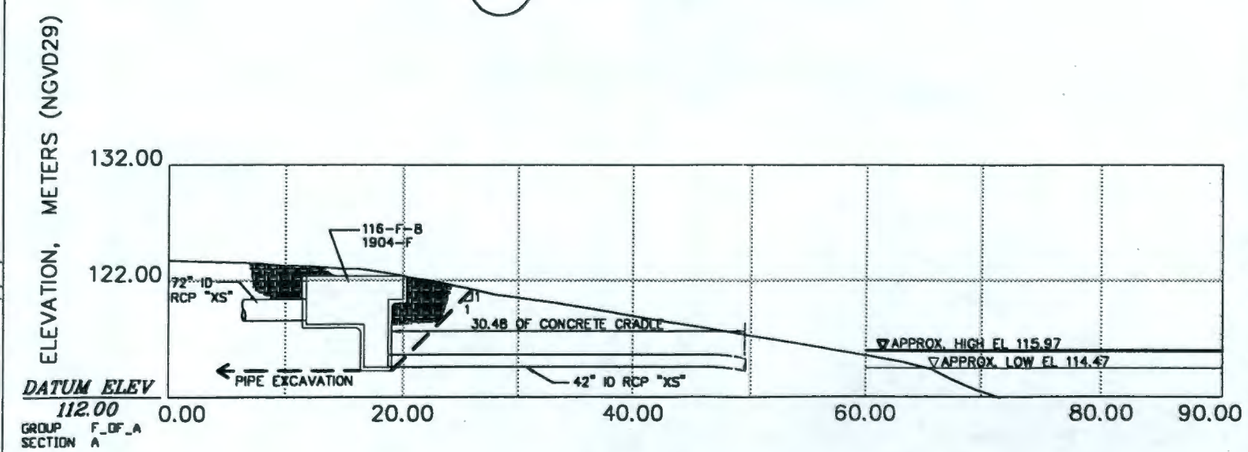




B SECTION VIEW



A SECTION VIEW

SCALE 1:500

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NOTE: VERTICAL DATUM IS NVGD29

U.S DEPARTMENT OF ENERGY DOE FIELD OFFICE, RICHLAND HANFORD ENVIRONMENTAL RESTORATION PROGRAM	100-F AREA 100 AREA REMEDIAL DESIGN OUTFALL STRUCTURES 1904F & FLUME

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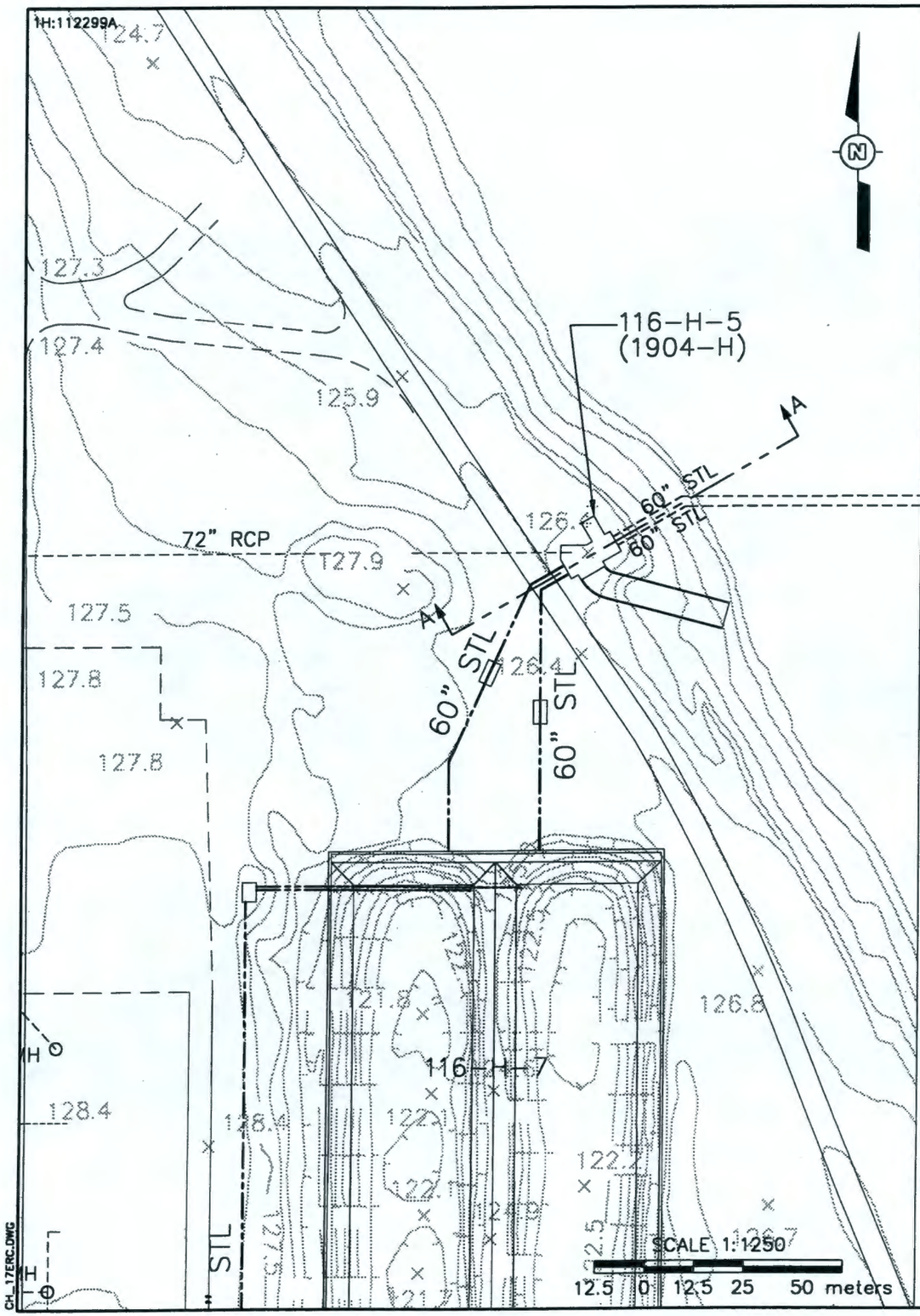

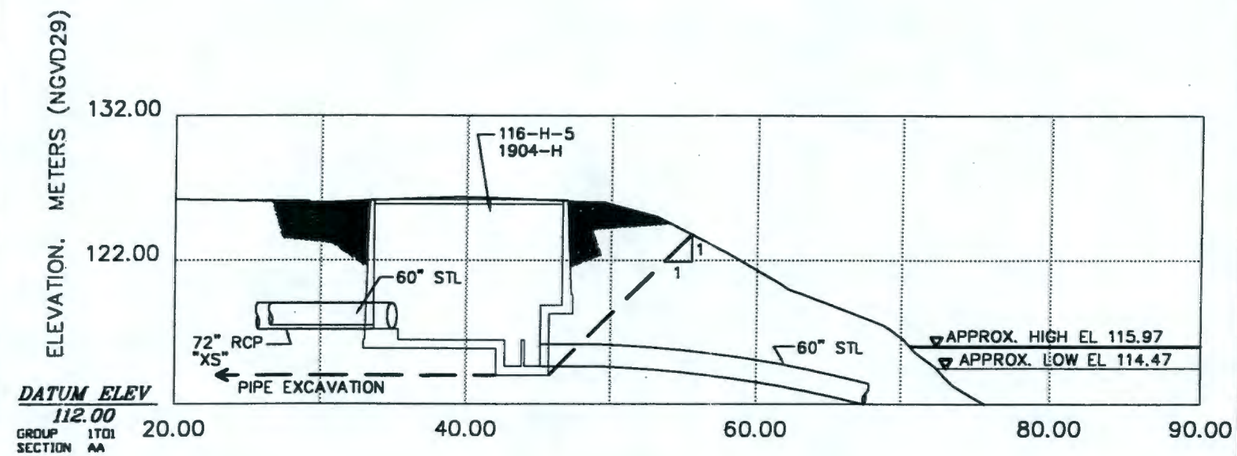

A SECTION VIEW

SCALE 1:400

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NOTE: VERTICAL DATUM IS NGVD29

U.S DEPARTMENT OF ENERGY DOE FIELD OFFICE, RICHLAND HANFORD ENVIRONMENTAL RESTORATION PROGRAM	100-H AREA 100 AREA REMEDIAL DESIGN OUTFALL STRUCTURE 116-H-5

CH_17ERC.DWG

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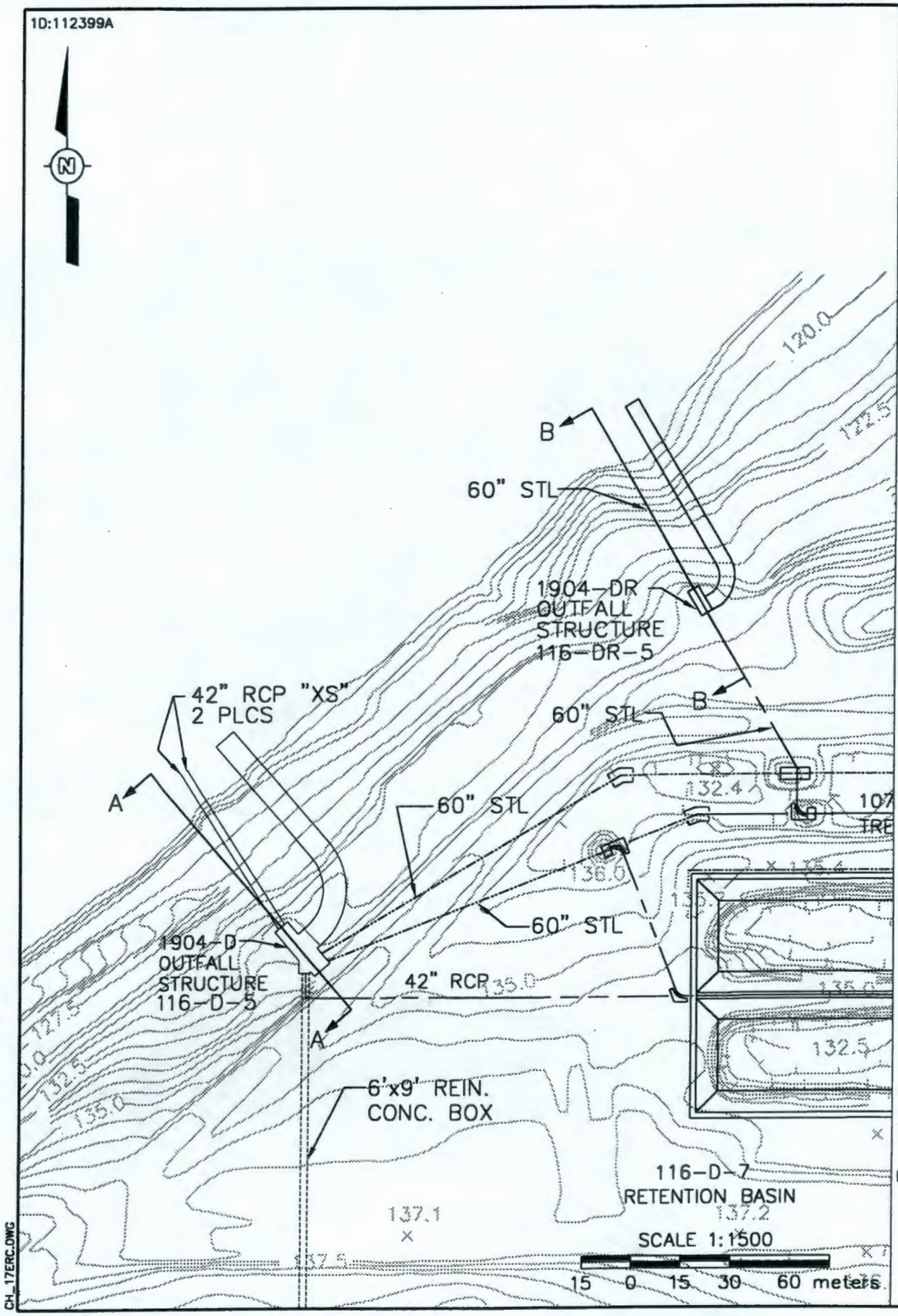

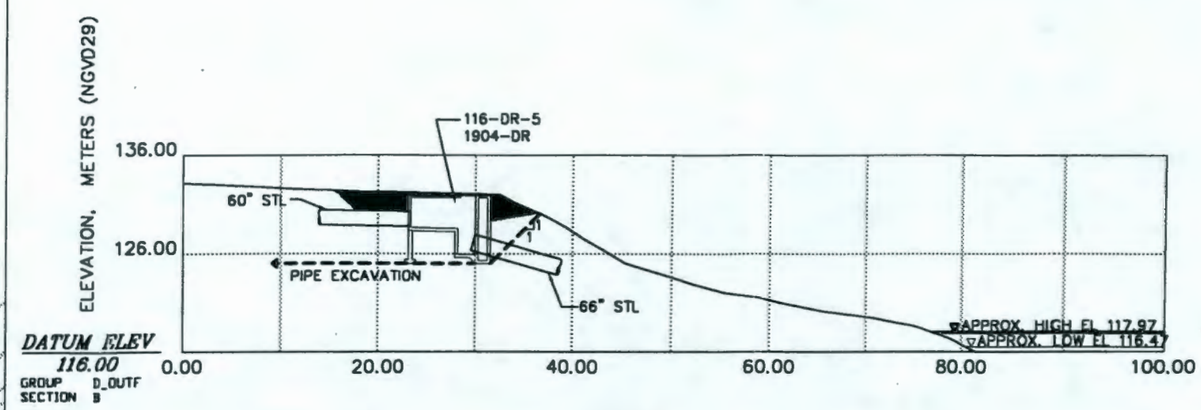

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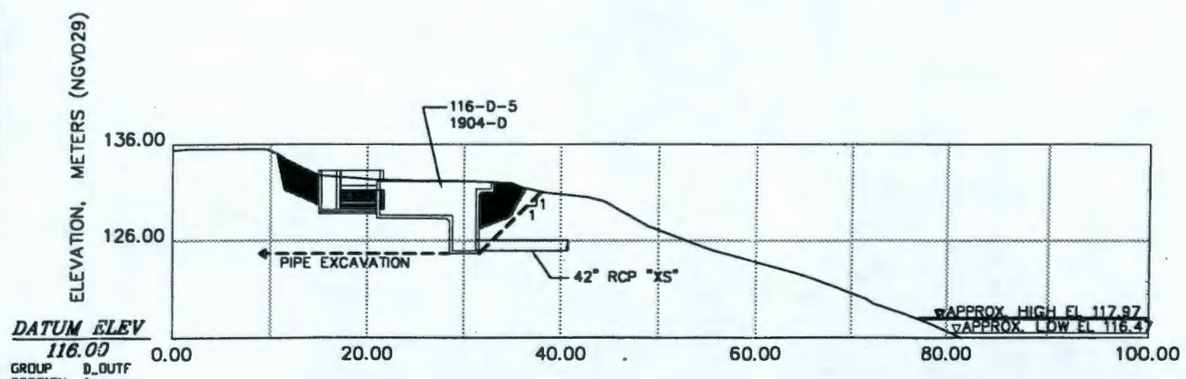

A SECTION VIEW

NOTE: VERTICAL DATUM IS NVGD29

SCALE 1:600
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U.S DEPARTMENT OF ENERGY
DOE FIELD OFFICE, RICHLAND
HANFORD ENVIRONMENTAL RESTORATION PROGRAM

100-D AREA
100 AREA REMEDIAL DESIGN
OUTFALL STRUCTURES 1904D & 1904DR

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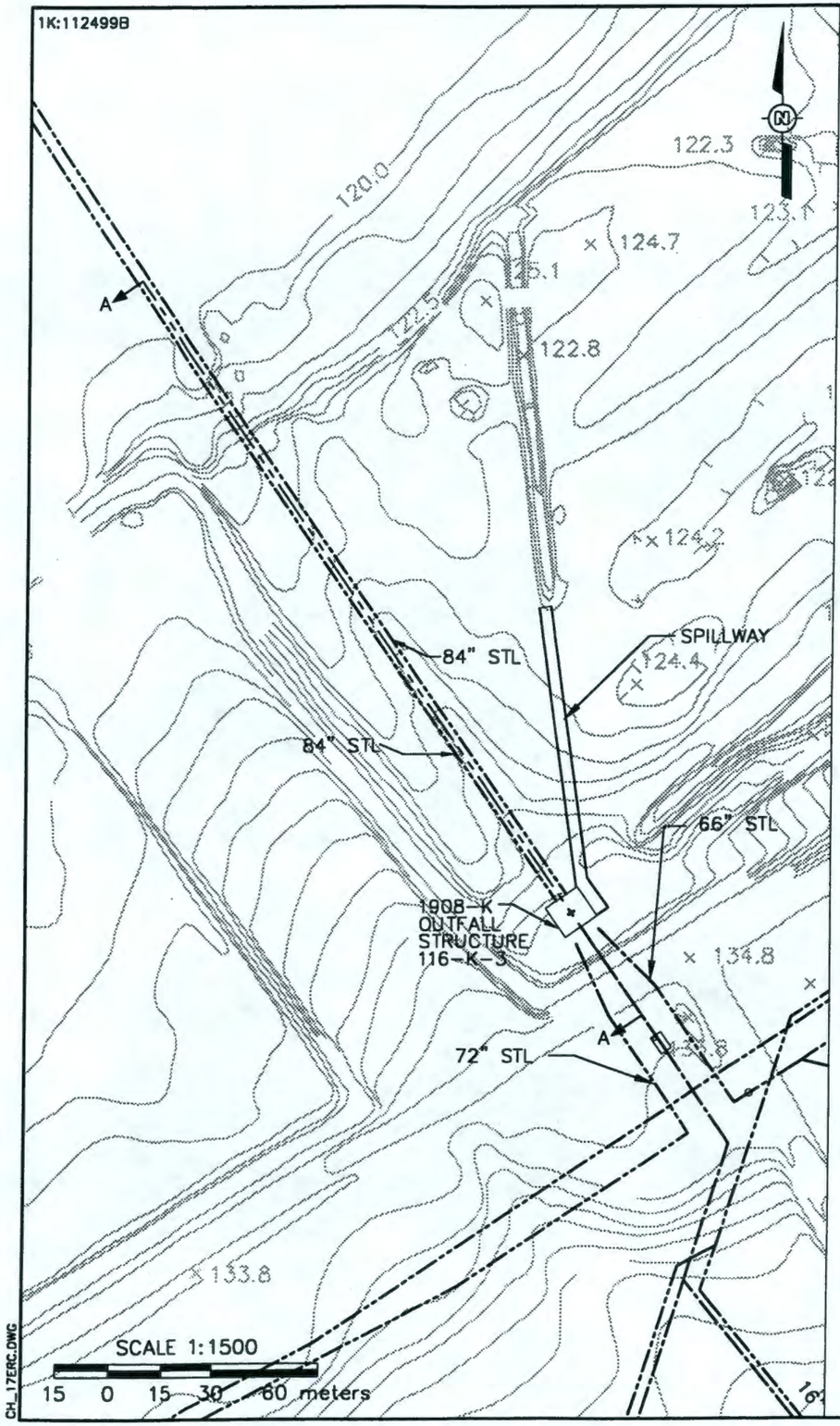

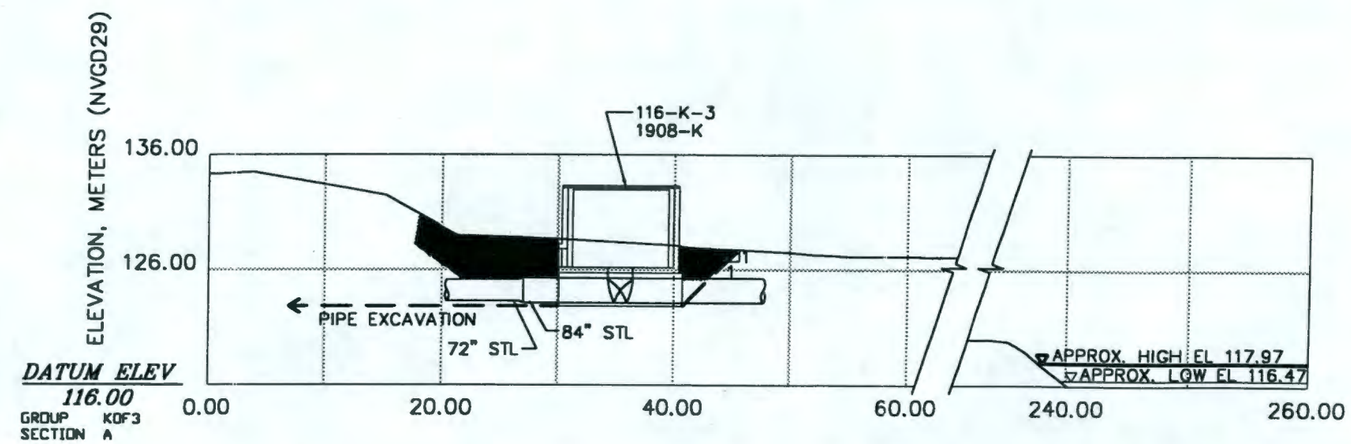

(A) SECTION VIEW

NOTE: VERTICAL DATUM IS NVGD29

SCALE 1:500

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U.S DEPARTMENT OF ENERGY DOE FIELD OFFICE, RICHLAND HANFORD ENVIRONMENTAL RESTORATION PROGRAM	100-K AREA 100 AREA REMEDIAL DESIGN OUTFALL STRUCTURES 1908K

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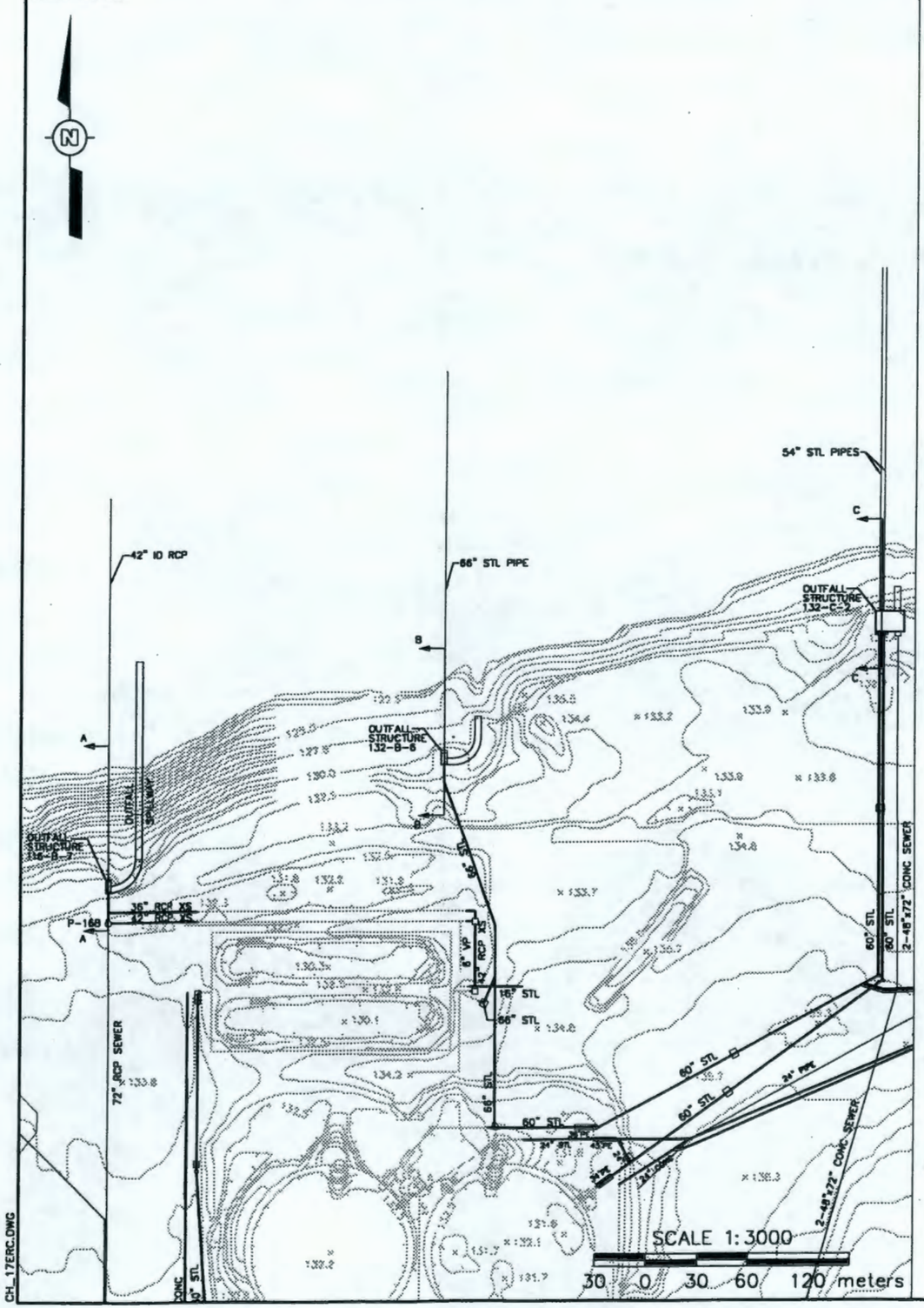
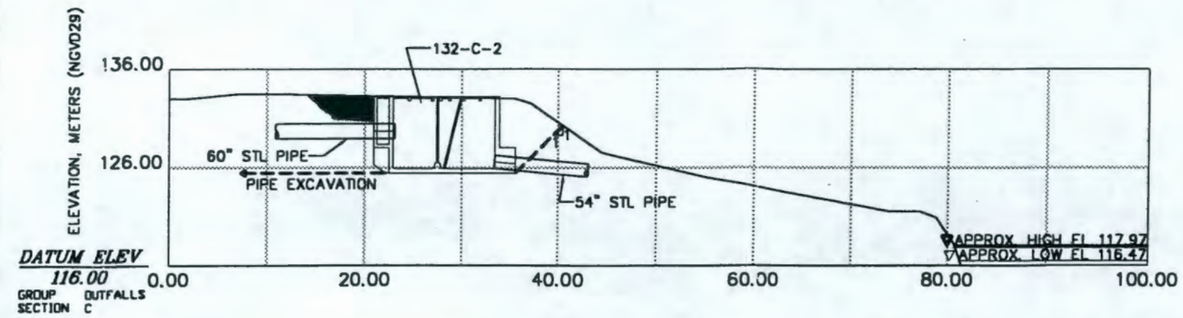
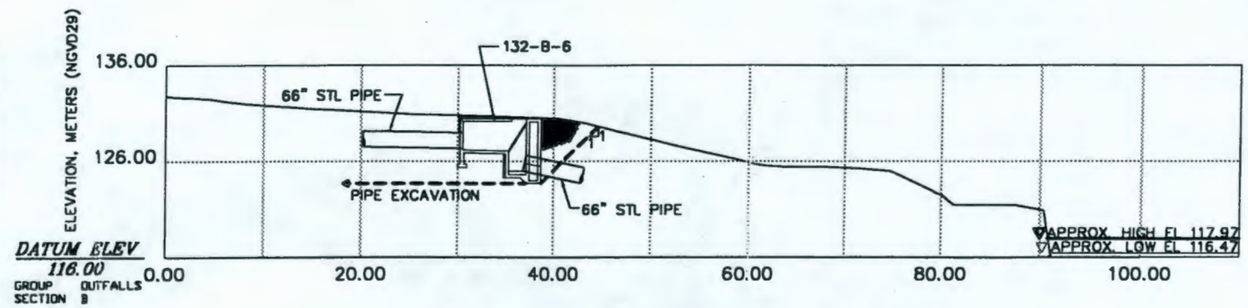




C SECTION VIEW



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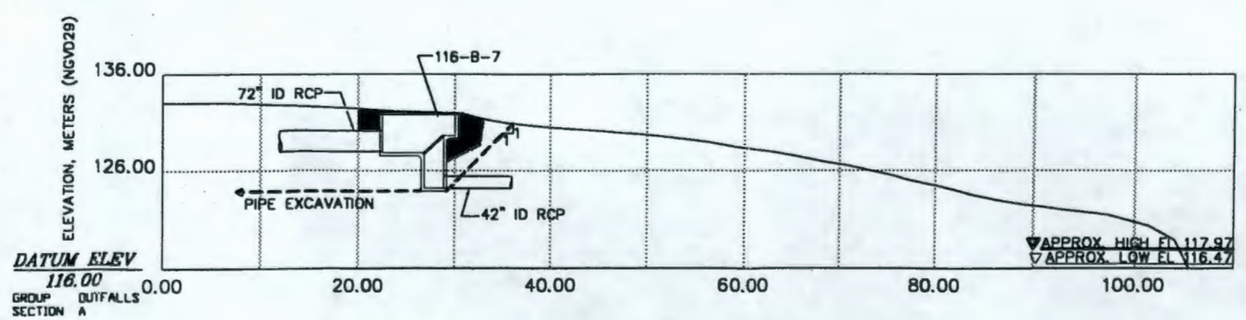

A SECTION VIEW

SCALE 1:600

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NOTE: VERTICAL DATUM IS NVGD29

U.S DEPARTMENT OF ENERGY DOE FIELD OFFICE, RICHLAND HANFORD ENVIRONMENTAL RESTORATION PROGRAM	100-BC AREA 100 AREA REMEDIAL DESIGN OUTFALLS 132-C-2,132-B-6, AND 116-B-7

CH_17ERC.DWG

076402 Attachment 6

Job No. 22192
Written Response Required: NO
Due Date: N/A
Actionee: N/A
Closes CCN: N/A
OU: 100-DR-1
TSD: N/A
ERA: N/A
Subject Code: 8280

Environmental Restoration Contractor **ERC Team**

Interoffice Memorandum

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DATE: January 25, 2000

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FROM: D. B. Blumenkranz DBB
100-D/DR Remedial Action
H9-02/ 372-9658

SUBJECT: **116-DR-1 SITE CHARACTERIZATION BOREHOLE RESULTS**

The attached technical memorandum summarizes the 116-DR-1 Site Characterization Borehole Results. This is an update to and supersedes the document that was distributed on December 8, 1999 (CCN 074598).

DDB:mrc

Attached: Technical Memorandum for 116-DR-Site Characterization Borehole Results

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TECHNICAL MEMORANDUM

FOR THE

116-DR-1 SITE CHARACTERIZATION BOREHOLE RESULTS

1999

D. B. Blumenkranz

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1.0 INTRODUCTION

Borehole B8786 was drilled near the influent end of the 116-DR-1 liquid waste disposal trench (Figure 1). The primary purpose of the 116-DR-1 Trench was to receive contaminated water that had been diverted from the retention basins after the liquid effluent was contaminated by ruptured fuel elements. The trenches were used between 1950 and 1967, with each trench receiving 40 million L (10.6 million gal) of waste. In addition, the trenches received liquid coolant effluent that was intentionally diverted to the trenches to test infiltration rates. During testing, 388,512,000 L/day (102,240,000 gal/day) of effluent were discharged into the two trenches during a 4-month period. This site was selected as the worst-case scenario based upon sampling at the bottom of the excavation and process knowledge. The site, at the time of drilling, was an open excavation. During remediation, contaminated soil was removed from the site to a depth of 4.6 m (15 ft) and was disposed at the Environmental Restoration Disposal Facility.

The borehole was drilled to a depth of approximately 14 m (45.5 ft), which is the estimated depth to the saturated zone. The drilling began on June 17, 1999, at the bottom of the 116-DR-1 site excavation, which is roughly 4.6 m (15 ft) below the original surface before remediation began. The drilling concluded on June 24, 1999. Eighteen samples (including a duplicate) were collected at 0.85-m (±0.28 m) 2.8-ft [±0.9 ft]) intervals.

2.0 PROJECT OBJECTIVES

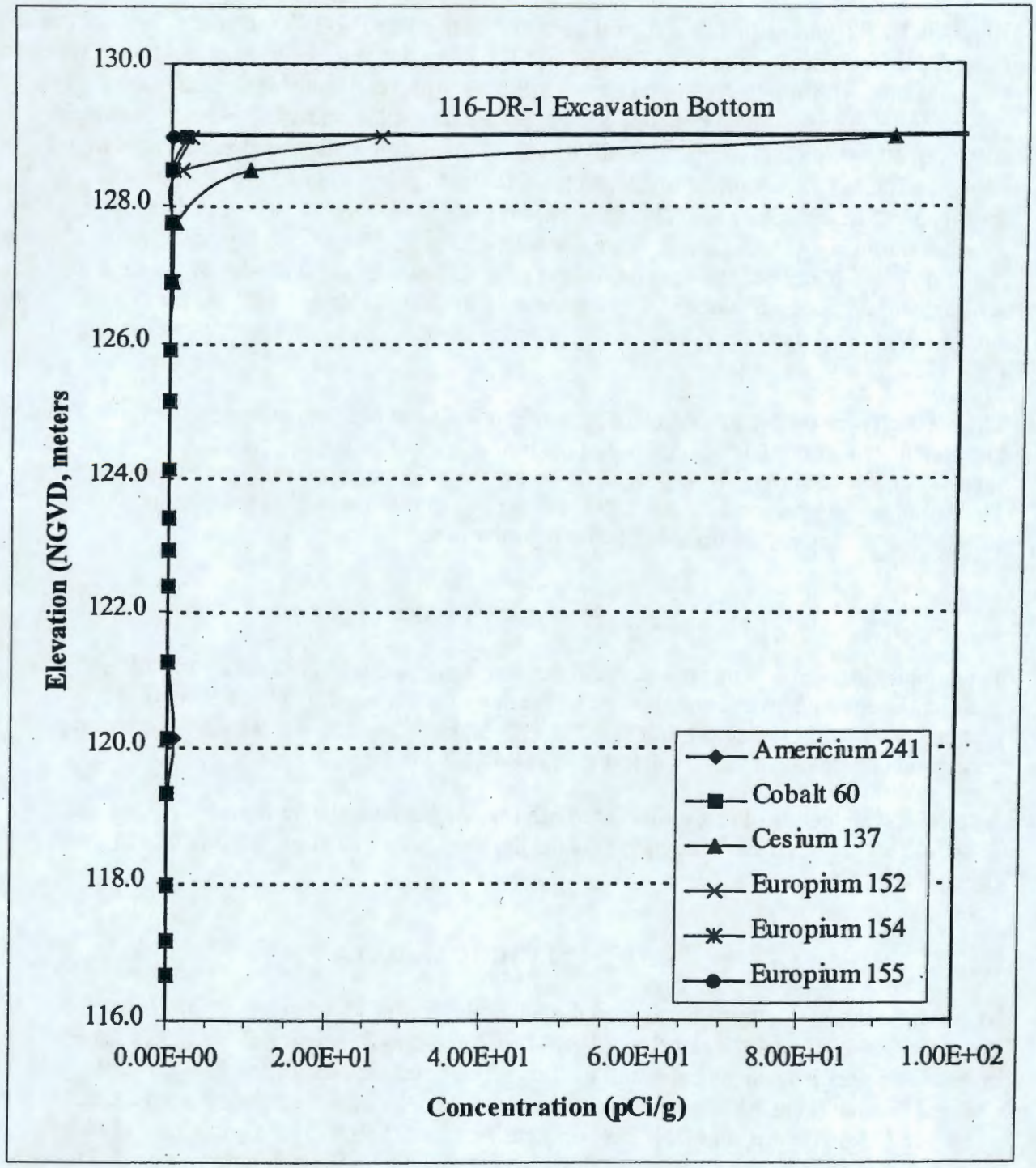
The primary objective of this project is to develop a vertical profile of the distribution of chemical and radioactive contamination in the deep zone (i.e. >4.6 m [>15 ft] to the groundwater) of the 116-DR-1 and 116-DR-2 Trenches. The data will be used for cleanup verification modeling of the 116-DR-1 and 116-DR-2 Trenches.

A secondary objective of this project is to use the deep zone soil data from 116-DR-1 and 116-DR-2 as the worst-case baseline data for the deep zone modeling of other Group 2 and Group 3 sites.

3.0 TECHNICAL DATA

ResonantSonic International performed the borehole drilling in accordance with *Description of Work for Borehole Sampling at the 116-DR-1 and 116-DR-2 Trenches* (BHI 1999). The borehole was drilled using a cable-toll drill rig. The borehole was drilled with DN250 (10-in. nominal diameter) casing to a depth of 5.0 m (16.4 ft), DN200 (8-in.) casing from 5.0 m (16.4 ft) to 10.9-m (35.8-ft) deep, and DN175 (7-in.) casing from 10.9-m (35.8-ft) to 13.5-m (44.0-ft) deep. All casings were constructed of threaded carbon-steel. The borehole was drilled to a depth of approximately 14 m (45.5 ft), with the final 0.5 m (1.5 ft) of depth achieved by use of a DN125 (5-in.) split-spoon sampler. At the conclusion of borehole installation, the borehole was grouted with Portland cement and bentonite clay. All casings and equipment were then removed. Groundwater was discovered at 12.78 m (41.95 ft) below the 116-DR-1 excavation bottom. All depths specified above are relative to the 116-DR-1 excavation bottom.

Figure 1. 116-DR-1 Vadose Zone Characterization Borehole Data: Am-241, Co-60, Cs-137, Eu-152, Eu-154, and Eu-155.



4.0 SUBSURFACE GEOLOGY

The Hanford formation is at least 13.7-m (45-ft) thick at borehole B8786, as measured from the 116-DR-1 excavation bottom. The Hanford formation consists of unconsolidated sandy gravel, silty sandy gravel, gravelly sand, and sand. Sand lenses and silt stringers are intercalated with the gravel deposits of the Hanford formation. The formation is moderately to very poorly sorted. Coarser sediment such as pebbles, gravel, and cobbles are approximately 40% to 90% basalt; the remaining percentage consists of granites, felsics, and various metamorphics. The sand fractions are high in basalt, with the remaining comprised of feldspar, quartzite, and traces of formica. There was not enough penetration below 13.7 m (45 ft) to truly determine if the Hanford formation discontinues at that point and if the Ringold Unit begins, although, it is suspected that this is the case (see Appendix A).

5.0 SAMPLING DESCRIPTION

Eighteen samples (including a duplicate, B0VNH4) were collected at 0.85-m (±0.28 m) (2.8-ft [±0.9 ft]) intervals. Appendix B provides the raw data for the samples. Table 1 summarizes the results for the contaminants of concern and the depth (elevation in National Geodetic Vertical Datum) for each corresponding sample.

Field screening measurements of gross beta/gamma activity were taken during the sampling effort. The highest reading (24,000 disintegrations per minute [dpm]) was measured at 1.2 m (4 ft) below the 116-DR-1 Trench bottom; however, no corresponding sample was taken due to poor split-pool recovery. The field readings tapered off below that level but varied between less-than-detectable to as high as 3,400 dpm as deep at 7.9 m (26 ft).

Figures 1 through 3 provide an illustration of contaminant of concern levels with borehole depth. To provide a meaningful interpretation of the data, the values reported for radiological constituents present below background (i.e., negative value reported), or at undetectable quantities, have been adjusted to the minimal detectable activity for illustrative purposes. Metal results qualified as below analytical detection limits have been adjusted to half their associated detection limit in Figure 3.

6.0 CONCLUSIONS

The data indicate that contaminant levels drop off significantly at 128.5 m (421.6 ft), approximately 1.5 m (4.9 ft) below the 116-DR-1 and the 116-DR-2 excavation bottom.

7.0 REFERENCE

BHI, 1999, *Description of Work for Borehole Sampling at 116-DR-1 and 116-DR-2 Trenches*, BHI-01285, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

Table 1. Summary of COC Results. (3 pages)

HEIS Number	Elevation (m)	Americium 241 (pCi/g)		Cobalt 60 (pCi/g)	Cesium 137 (pCi/g)	Europium 152 (pCi/g)		Europium 154 (pCi/g)	Europium 155 (pCi/g)
B0VNH9	Field Blank	1.50E-02	U	U	U	U		U	U
B0VNH1	129.0	1.00E-02	U	1.88E+00	9.13E+01	2.65E+01		2.46E+00	U
B0VNH2	128.5	1.10E-02	U	7.40E-02	9.86E+00	1.51E+00		1.60E-01	U
B0VNH3	127.7	5.00E-03	U	U	4.92E-01	2.43E-01		U	U
B0VNH4	Duplicate of B0VNH3	1.50E-02	U	U	3.64E-01	2.54E-01		U	U
B0VNH5	126.9	1.20E-02	U	U	1.61E-01	1.90E-01		U	U
B0VNH6	125.9	0.00E+00	U	U	U	9.70E-02	J	U	U
B0VNH7	125.1	3.00E-03	U	U	U	1.07E-01		U	U
B0VNH8	124.1	6.00E-03	U	U	U	U		U	U
B0VNJ0	123.4	6.00E-03	U	U	U	U		U	U
B0VNJ1	122.9	1.40E-02	U	U	U	U		U	U
B0VNJ2	122.4	-7.00E-03	U	U	U	U		U	U
B0VNJ3	121.3	1.70E-02	U	U	U	U		U	U
B0VNJ4	120.1	8.33E-01	J	U	U	U		U	U
B0VNJ5	119.3	0.00E+00	U	U	U	U		U	U
B0VNJ6	118.0	-1.10E-02	U	U	U	U		U	U
B0VNJ7	117.1	-3.00E-03	U	U	U	U		U	U
B0VNJ8	116.7	8.00E-03	U	U	3.80E-02	U		U	U

Table 1. Summary of COC Results. (3 pages)

HEIS Number	Elevation (m)	Uranium 233/234 (pCi/g)		Uranium 238 (pCi/g)		Plutonium 238 (pCi/g)		Plutonium 239/240 (pCi/g)		Nickel 63 (pCi/g)		Total Strontium (pCi/g)	
B0VNH9	Field Blank	1.62E-01	J	2.43E-01	J	8.00E-03	U	4.00E-03	U	-7.28E-01	U	-3.00E-02	U
B0VNH1	129.0	4.39E-01	J	4.07E-01	J	1.00E-02	U	1.37E-01	J	1.29E+02		5.69E+00	
B0VNH2	128.5	3.58E-01	J	3.25E-01	J	0.00E+00	U	5.00E-03	U	1.09E+01	J	1.20E+00	
B0VNH3	127.7	3.51E-01	J	3.45E-01	J	0.00E+00	U	1.10E-02	U	6.67E-01	U	6.00E-01	J
B0VNH4	Duplicate of B0VNH3	3.08E-01	J	2.18E-01	J	8.00E-03	U	1.60E-02	U	6.23E-01	U	5.96E-01	J
B0VNH5	126.9	4.73E-01	J	3.34E-01	J	-7.00E-03	U	-7.00E-03	U	4.70E-02	U	6.24E-01	J
B0VNH6	125.9	4.11E-01	J	3.02E-01	J	-4.00E-03	U	-4.00E-03	U	-1.24E+00	U	7.23E-01	J
B0VNH7	125.1	3.86E-01	J	2.37E-01	J	-5.00E-03	U	0.00E+00	U	-5.79E-01	U	5.34E-01	J
B0VNH8	124.1	3.34E-01	J	3.51E-01	J	5.00E-03	U	-5.00E-03	U	-5.45E-01	U	8.81E-01	J
B0VNJ0	123.4	3.28E-01	J	4.41E-01	J	6.00E-03	U	1.10E-02	U	-8.43E-01	U	2.58E-01	U
B0VNJ1	122.9	3.40E-01	J	3.02E-01	J	-6.00E-03	U	4.40E-02	U	-1.04E+00	U	7.59E-01	J
B0VNJ2	122.4	5.72E-01	J	5.02E-01	J	-1.20E-02	U	0.00E+00	U	-6.41E-01	U	4.86E-01	J
B0VNJ3	121.3	4.77E-01	J	3.30E-01	J	1.30E-02	U	2.00E-02	U	-6.94E-01	U	5.70E-01	J
B0VNJ4	120.1	3.46E-01	J	2.77E-01	J	-1.80E-02	U	-1.20E-02	U	3.22E-01	U	8.13E-01	J
B0VNJ5	119.3	3.36E-01	J	5.04E-01	J	6.70E-02	U	1.30E-02	U	-4.80E-02	U	1.24E+00	
B0VNJ6	118.0	5.25E-01	J	3.15E-01	J	0.00E+00	U	-6.00E-03	U	-6.14E-01	U	8.25E-01	J
B0VNJ7	117.1	4.95E-01	J	5.34E-01	J	-2.30E-02	U	-2.30E-02	U	-7.07E-01	U	3.29E-01	J
B0VNJ8	116.7	2.91E-01	J	2.91E-01	J	-1.40E-02	U	5.00E-03	U	-5.90E-01	U	2.58E-01	J

Table 1. Summary of COC Results. (3 pages)

HEIS Number	Elevation (m)	Field Readings (Portable Beta/Gamma Monitor) (dpm)	Arsenic (mg/kg)		Total Chromium (mg/kg)	Hexavalent Chromium (mg/kg)		Mercury (mg/kg)		Lead (mg/kg)
B0VNH9	Field Blank	NA	0.22	U	0.15	0.4	U	0.02	U	0.75
B0VNH1	129.0	8000	2.6		102	0.41	U	0.08		5.6
B0VNH2	128.5	less than detect	1.6		23.3	2.3		0.02		1.9
B0VNH3	127.7	less than detect	1.3		14.4	0.42	U	0.02	U	2.1
B0VNH4	Duplicate of B0VNH3	less than detect	1.6		16.6	0.41	U	0.02	U	1.7
B0VNH5	126.9	3500	1.6		11.6	0.66		0.02	U	2.1
B0VNH6	125.9	3500	1.6		12.5	0.96		0.02	U	2.2
B0VNH7	125.1	3500	1.9		10.6	0.42	U	0.01	U	2
B0VNH8	124.1	<600	1.5		5.8	0.42	U	0.02	U	2
B0VNJ0	123.4	<600	2.3		13.5	0.43	U	0.02	U	3
B0VNJ1	122.9	900	1.0		6.8	0.42	U	0.02	U	2.8
B0VNJ2	122.4	3400	1.4		11.5	0.42	U	0.02	U	2.9
B0VNJ3	121.3	<600	1.5		10.7	0.41	U	0.02	U	2.2
B0VNJ4	120.1	<600	1.2		9.6	0.41	U	0.02	U	1.9
B0VNJ5	119.3	<600	1.4		6.9	0.41	U	0.02	U	1.9
B0VNJ6	118.0	<600	1.1		6.9	0.41	U	0.02	U	2.6
B0VNJ7	117.1	<600	0.62		4.7	0.44	U	0.01	U	1.5
B0VNJ8	116.7	<600	0.74		7.3	0.43	U	0.02	U	1.8

U = nondetect
J = estimated value
NA = not available
Field readings in counts/minute converted to disintegrations/minute by multiplying by a factor of 10.

Figure 2. 116-DR-1 Vadose Zone Characterization Borehole Data: U-233/234, U-238, Pu-238, Pu-239, Ni-63, and Total Sr.

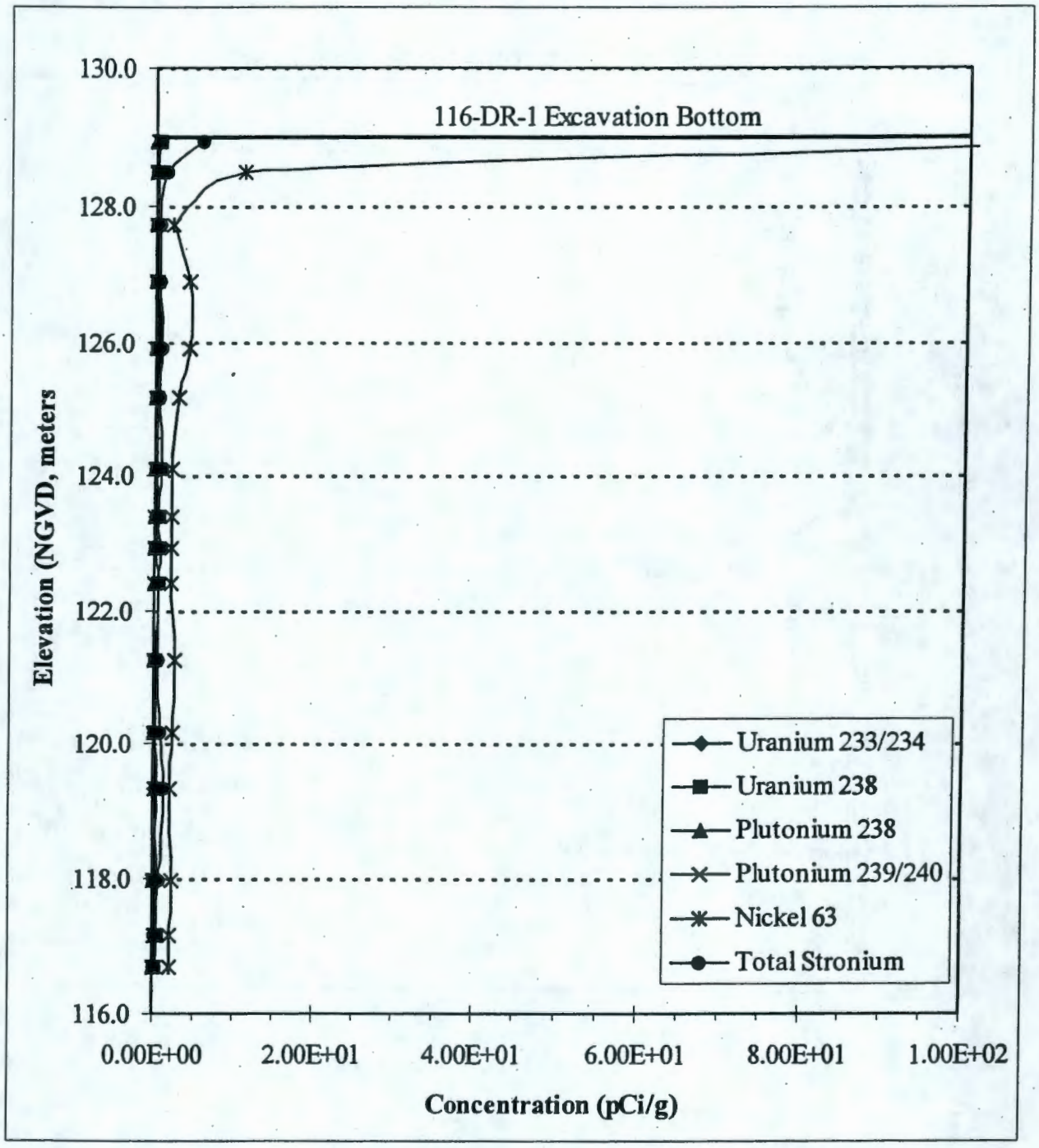
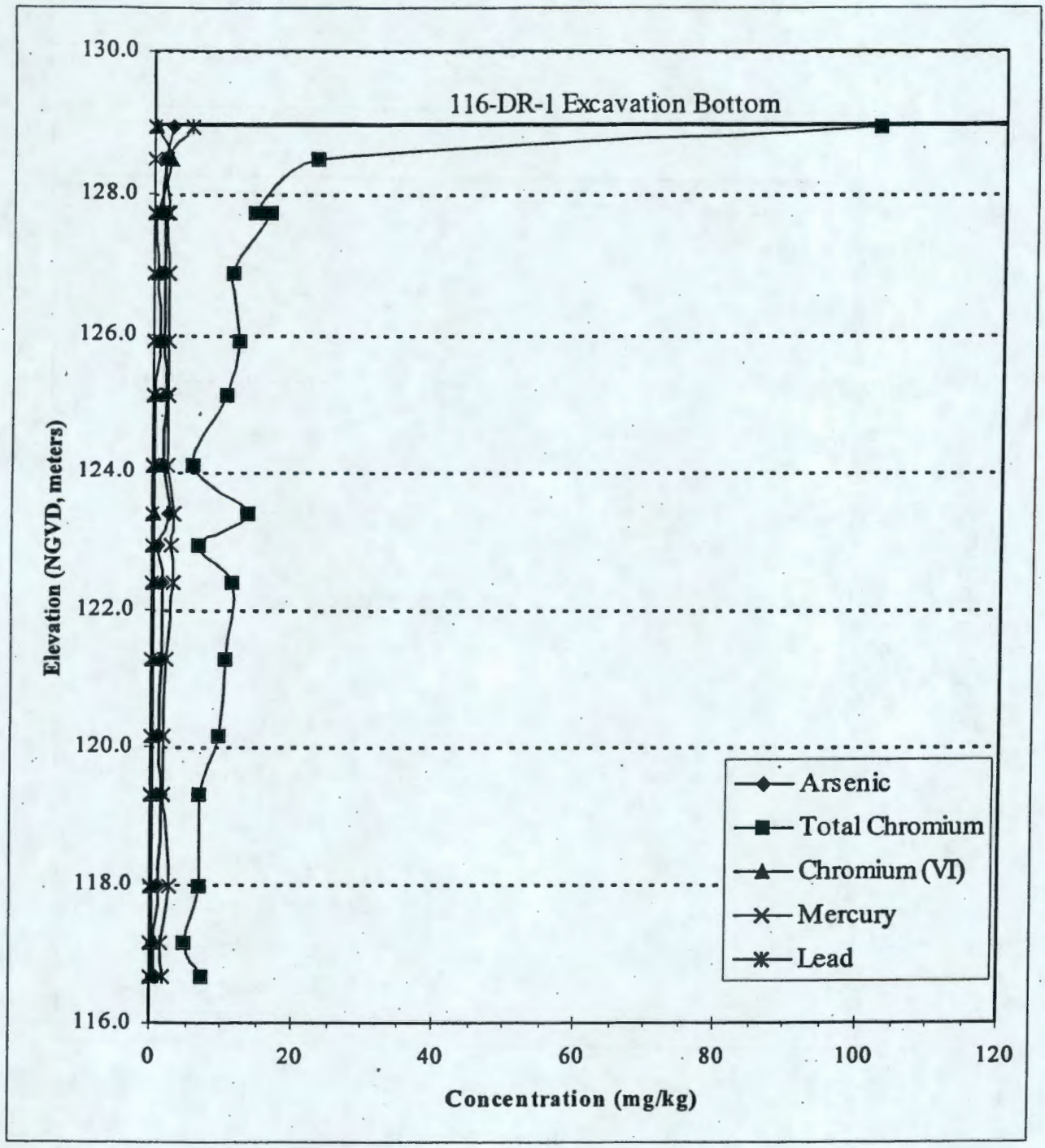


Figure 3. 116-DR-1 Vadose Zone Characterization Borehole Data: Ar, Cr (Total), $Cr^{+}6$, Hg, and Pb.



APPENDIX A

SAMPLE DATA

Table A-1. Raw Sample Data. (4 pages)

HEIS Number	Elevation (m)	Gamma Energy Analysis								
		Americium-241			Cobalt-60			Cesium-137		
		Result (pCi/g)	Q	MDA (pCi/g)	Result (pCi/g)	Q	MDA (pCi/g)	Result (pCi/g)	Q	MDA (pCi/g)
B0VNH1	129.0	U	U	2.20E-01	1.88E+00		3.90E-02	9.13E+01		9.30E-02
B0VNH2	128.5	U	U	6.20E-02	7.40E-02		1.40E-02	9.86E+00		2.50E-02
B0VNH3	127.7	U	U	3.70E-02	U	U	1.20E-02	4.92E-01		1.40E-02
B0VNH4	127.7	U	U	7.30E-02	U	U	2.10E-02	3.64E-01		1.70E-02
B0VNH5	126.9	U	U	2.60E-02	U	U	2.20E-02	1.61E-01		2.40E-02
B0VNH6	125.9	U	U	2.70E-02	U	U	2.40E-02	U	U	2.10E-02
B0VNH7	125.1	U	U	7.70E-02	U	U	2.10E-02	U	U	2.00E-02
B0VNH8	124.1	U	U	3.40E-02	U	U	1.10E-02	U	U	9.00E-03
B0VNH9	130.3	U	U	1.80E-02	U	U	1.90E-02	U	U	1.40E-02
B0VNJ0	123.4	U	U	1.00E-01	U	U	2.70E-02	U	U	2.40E-02
B0VNJ1	122.9	U	U	3.70E-02	U	U	1.10E-02	U	U	1.00E-02
B0VNJ2	122.4	U	U	7.80E-02	U	U	2.30E-02	U	U	1.90E-02
B0VNJ3	121.3	U	U	3.20E-02	U	U	1.00E-02	U	U	9.00E-03
B0VNJ4	120.1	U	U	2.50E-02	U	U	2.20E-02	U	U	1.90E-02
B0VNJ5	119.3	U	U	7.10E-02	U	U	1.90E-02	U	U	1.60E-02
B0VNJ6	118.0	U	U	3.60E-02	U	U	1.80E-02	U	U	1.00E-02
B0VNJ7	117.1	U	U	2.50E-02	U	U	2.30E-02	U	U	2.00E-02
B0VNJ8	116.7	U	U	8.20E-02	U	U	2.30E-02	3.80E-02	J	2.10E-02

HEIS Number	Elevation (m)	Gamma Energy Analysis (cont.)								
		Europium-152			Europium-154			Europium-155		
		Result (pCi/g)	Q	MDA (pCi/g)	Result (pCi/g)	Q	MDA (pCi/g)	Result (pCi/g)	Q	MDA (pCi/g)
B0VNH1	129.0	2.65E+01		3.30E-01	2.46E+00		1.40E-01	U	U	2.20E-01
B0VNH2	128.5	1.51E+00		6.20E-02	1.60E-01		5.60E-02	U	U	5.70E-02
B0VNH3	127.7	2.43E-01		2.90E-02	U	U	4.20E-02	U	U	3.10E-02
B0VNH4	127.7	2.54E-01		4.90E-02	U	U	6.90E-02	U	U	5.80E-02
B0VNH5	126.9	1.90E-01		4.50E-02	U	U	8.20E-02	U	U	4.30E-02
B0VNH6	125.9	9.70E-02	J	4.90E-02	U	U	8.50E-02	U	U	7.70E-02
B0VNH7	125.1	1.07E-01		5.30E-02	U	U	7.30E-02	U	U	5.70E-02
B0VNH8	124.1	U	U	2.80E-02	U	U	3.70E-02	U	U	3.10E-02
B0VNH9	130.3	U	U	3.30E-02	U	U	5.70E-02	U	U	2.90E-02
B0VNJ0	123.4	U	U	6.90E-02	U	U	9.00E-02	U	U	7.30E-02
B0VNJ1	122.9	U	U	3.00E-02	U	U	4.20E-02	U	U	3.10E-02
B0VNJ2	122.4	U	U	5.40E-02	U	U	7.30E-02	U	U	5.90E-02
B0VNJ3	121.3	U	U	2.40E-02	U	U	3.50E-02	U	U	3.80E-02
B0VNJ4	120.1	U	U	4.20E-02	U	U	7.50E-02	U	U	6.30E-02
B0VNJ5	119.3	U	U	4.70E-02	U	U	6.20E-02	U	U	6.00E-02
B0VNJ6	118.0	U	U	2.80E-02	U	U	3.80E-02	U	U	4.20E-02
B0VNJ7	117.1	U	U	4.20E-02	U	U	7.10E-02	U	U	5.00E-02
B0VNJ8	116.7	U	U	5.40E-02	U	U	7.90E-02	U	U	6.10E-02

Table A-1. Raw Sample Data. (4 pages)

HEIS Number	Elevation (m)	Gamma Energy Analysis (cont.)								
		Potassium-40			Radium-226			Radium-228		
		Result (pCi/g)	Q	MDA (pCi/g)	Result (pCi/g)	Q	MDA (pCi/g)	Result (pCi/g)	Q	MDA (pCi/g)
B0VNH1	129.0	1.18E+01		2.20E-01	3.92E-01		1.30E-01	4.87E-01		2.10E-01
B0VNH2	128.5	1.03E+01		1.10E-01	3.41E-01		3.90E-02	5.18E-01		6.30E-02
B0VNH3	127.7	1.11E+01		1.00E-01	3.62E-01		2.30E-02	5.14E-01		4.80E-02
B0VNH4	127.7	1.03E+01		2.20E-01	3.50E-01		4.20E-02	5.66E-01		8.70E-02
B0VNH5	126.9	1.11E+01		1.90E-01	4.34E-01		4.00E-02	5.37E-01		1.10E-01
B0VNH6	125.9	1.19E+01		2.20E-01	4.11E-01		3.80E-02	7.28E-01		1.00E-01
B0VNH7	125.1	1.19E+01		2.40E-01	4.11E-01		3.60E-02	6.10E-01		1.00E-01
B0VNH8	124.1	9.62E+00		1.10E-01	3.50E-01		2.10E-02	4.97E-01		5.10E-02
B0VNH9	130.3	5.53E+00		1.80E-01	1.65E-01		3.00E-02	2.03E-01		7.10E-02
B0VNJ0	123.4	1.50E+01		2.80E-01	5.52E-01		5.20E-02	8.40E-01		9.80E-02
B0VNJ1	122.9	1.07E+01		1.10E-01	3.52E-01		2.20E-02	5.63E-01		5.10E-02
B0VNJ2	122.4	1.28E+01		2.50E-01	4.65E-01		3.50E-02	6.60E-01		9.00E-02
B0VNJ3	121.3	1.18E+01		9.80E-02	3.72E-01		1.80E-02	5.05E-01		4.10E-02
B0VNJ4	120.1	9.85E+00		2.30E-01	4.02E-01		3.40E-02	5.42E-01		1.00E-01
B0VNJ5	119.3	9.54E+00		2.20E-01	3.40E-01		3.60E-02	4.81E-01		8.60E-02
B0VNJ6	118.0	9.20E+00		1.10E-01	4.34E-01		2.10E-02	6.11E-01		5.20E-02
B0VNJ7	117.1	8.95E+00		2.20E-01	3.78E-01		4.10E-02	5.48E-01		9.70E-02
B0VNJ8	116.7	1.16E+01		2.30E-01	3.87E-01		4.60E-02	5.76E-01		9.60E-02

HEIS Number	Elevation (m)	Gamma Energy Analysis (cont.)								
		Thorium-228			Thorium-232			Nickel-63		
		Result (pCi/g)	Q	MDA (pCi/g)	Result (pCi/g)	Q	MDA (pCi/g)	Result (pCi/g)	Q	MDA (pCi/g)
B0VNH1	129.0	4.57E-01		1.20E-01	4.87E-01		2.10E-01	1.29E+02		4.80E+00
B0VNH2	128.5	4.84E-01		3.30E-02	5.18E-01		6.30E-02	1.09E+01	J	3.40E+00
B0VNH3	127.7	4.65E-01		1.50E-02	5.14E-01		4.80E-02	6.67E-01	U	2.00E+00
B0VNH4	127.7	4.68E-01		2.40E-02	5.66E-01		8.70E-02	6.23E-01	U	2.10E+00
B0VNH5	126.9	5.03E-01		2.30E-02	5.37E-01		1.10E-01	4.70E-02	U	4.30E+00
B0VNH6	125.9	4.75E-01		2.40E-01	7.28E-01		1.00E-01	-1.24E+00	U	4.20E+00
B0VNH7	125.1	5.56E-01		2.50E-02	6.10E-01		1.00E-01	-5.79E-01	U	2.80E+00
B0VNH8	124.1	4.80E-01		1.30E-02	4.97E-01		5.10E-02	-5.45E-01	U	2.00E+00
B0VNH9	130.3	2.23E-01		2.50E-02	2.03E-01		7.10E-02	-7.28E-01	U	2.00E+00
B0VNJ0	123.4	7.56E-01		3.20E-02	8.40E-01		9.80E-02	-8.43E-01	U	2.10E+00
B0VNJ1	122.9	4.71E-01		1.50E-02	5.63E-01		5.10E-02	-1.04E+00	U	2.10E+00
B0VNJ2	122.4	5.77E-01		2.50E-02	6.60E-01		9.00E-02	-6.41E-01	U	2.20E+00
B0VNJ3	121.3	4.83E-01		1.30E-02	5.05E-01		4.10E-02	-6.94E-01	U	2.70E+00
B0VNJ4	120.1	6.44E-01		3.20E-02	5.42E-01		1.00E-01	3.22E-01	U	2.40E+00
B0VNJ5	119.3	4.49E-01		2.20E-02	4.81E-01		8.60E-02	-4.80E-02	U	2.20E+00
B0VNJ6	118.0	5.51E-01		1.50E-02	6.11E-01		5.20E-02	-6.14E-01	U	2.30E+00
B0VNJ7	117.1	5.12E-01		2.40E-02	5.48E-01		9.70E-02	-7.07E-01	U	2.10E+00
B0VNJ8	116.7	5.64E-01		2.70E-02	5.76E-01		9.60E-02	-5.90E-01	U	2.00E+00

Table A-1. Raw Sample Data. (4 pages)

HEIS Number	Elevation (m)	Gamma Energy Analysis (cont.)						Strontium Analysis		
		Uranium-238			Uranium-235			Total Strontium		
		Result (pCi/g)	Q	MDA (pCi/g)	Result (pCi/g)	Q	MDA (pCi/g)	Result (pCi/g)	Q	MDA (pCi/g)
B0VNH1	129.0	U	U	6.90E+00	U	U	3.30E-01	5.69E+00		2.70E-01
B0VNH2	128.5	U	U	1.80E+00	U	U	9.00E-02	1.20E+00		1.50E-01
B0VNH3	127.7	U	U	1.30E+00	U	U	4.90E-02	6.00E-01	J	1.50E-01
B0VNH4	127.7	U	U	2.40E+00	U	U	7.50E-02	5.96E-01	J	1.60E-01
B0VNH5	126.9	U	U	2.90E+00	U	U	7.20E-02	6.24E-01	J	1.70E-01
B0VNH6	125.9	U	U	2.70E+00	U	U	7.10E-02	7.23E-01	J	1.40E-01
B0VNH7	125.1	U	U	2.60E+00	U	U	7.50E-02	5.34E-01	J	1.70E-01
B0VNH8	124.1	U	U	1.30E+00	U	U	8.40E-02	8.81E-01	J	1.40E-01
B0VNH9	130.3	U	U	2.20E+00	U	U	4.80E-02	-3.00E-02	U	2.00E-01
B0VNJ0	123.4	U	U	3.10E+00	U	U	9.70E-02	2.58E-01	U	2.60E-01
B0VNJ1	122.9	U	U	1.30E+00	U	U	6.80E-02	7.59E-01	J	1.30E-01
B0VNJ2	122.4	U	U	2.60E+00	U	U	7.80E-02	4.86E-01	J	1.30E-01
B0VNJ3	121.3	U	U	1.20E+00	U	U	4.20E-02	5.70E-01	J	1.60E-01
B0VNJ4	120.1	U	U	2.60E+00	U	U	6.80E-02	8.13E-01	J	1.70E-01
B0VNJ5	119.3	U	U	2.70E+00	U	U	7.30E-02	1.24E+00		1.60E-01
B0VNJ6	118.0	U	U	1.30E+00	U	U	4.80E-02	8.25E-01	J	1.10E-01
B0VNJ7	117.1	U	U	2.60E+00	U	U	6.80E-02	3.29E-01	J	1.10E-01
B0VNJ8	116.7	U	U	2.50E+00	U	U	8.20E-02	2.58E-01	J	8.80E-02

HEIS Number	Elevation (m)	Isotopic Analysis								
		Uranium-233/234			Uranium-235			Uranium-238		
		Result (pCi/g)	Q	MDA (pCi/g)	Result (pCi/g)	Q	MDA (pCi/g)	Result (pCi/g)	Q	MDA (pCi/g)
B0VNH1	129.0	4.39E-01	J	7.00E-02	5.40E-02	U	5.90E-02	4.07E-01	J	6.10E-02
B0VNH2	128.5	3.58E-01	J	5.10E-02	3.20E-02	U	6.10E-02	3.25E-01	J	5.10E-02
B0VNH3	127.7	3.51E-01	J	3.70E-02	4.40E-02	J	2.80E-02	3.45E-01	J	2.30E-02
B0VNH4	127.7	3.08E-01	J	5.80E-02	1.80E-02	U	7.00E-02	2.18E-01	J	5.80E-02
B0VNH5	126.9	4.73E-01	J	8.90E-02	3.40E-02	U	8.60E-02	3.34E-01	J	7.10E-02
B0VNH6	125.9	4.11E-01	J	9.20E-02	5.80E-02	U	1.10E-01	3.02E-01	J	9.20E-02
B0VNH7	125.1	3.86E-01	J	9.70E-02	7.40E-02	U	8.10E-02	2.37E-01	J	6.70E-02
B0VNH8	124.1	3.34E-01	J	6.50E-02	2.10E-02	U	7.90E-02	3.51E-01	J	6.50E-02
B0VNH9	130.3	1.62E-01	J	8.60E-02	1.10E-02	U	8.30E-02	2.43E-01	J	6.90E-02
B0VNJ0	123.4	3.28E-01	J	9.00E-02	5.70E-02	U	8.70E-02	4.41E-01	J	7.20E-02
B0VNJ1	122.9	3.40E-01	J	7.20E-02	0.00E+00	U	8.70E-02	3.02E-01	J	7.20E-02
B0VNJ2	122.4	5.72E-01	J	6.70E-02	6.40E-02	U	8.20E-02	5.02E-01	J	6.70E-02
B0VNJ3	121.3	4.77E-01	J	6.60E-02	2.10E-02	U	8.00E-02	3.30E-01	J	6.60E-02
B0VNJ4	120.1	3.46E-01	J	7.60E-02	0.00E+00	U	9.20E-02	2.77E-01	J	7.60E-02
B0VNJ5	119.3	3.36E-01	J	7.60E-02	2.40E-02	U	9.20E-02	5.04E-01	J	7.60E-02
B0VNJ6	118.0	5.25E-01	J	7.30E-02	1.20E-02	U	8.80E-02	3.15E-01	J	7.30E-02
B0VNJ7	117.1	4.95E-01	J	8.70E-02	5.70E-02	U	7.30E-02	5.34E-01	J	6.00E-02
B0VNJ8	116.7	2.91E-01	J	8.60E-02	4.10E-02	U	1.00E-01	2.91E-01	J	8.60E-02

Table A-1. Raw Sample Data. (4 pages)

HEIS Number	Elevation (m)	Isotopic Analysis						Alpha Energy Analysis		
		Plutonium-238			Plutonium-239/240			Americium-241		
		Result (pCi/g)	Q	MDA (pCi/g)	Result (pCi/g)	Q	MDA (pCi/g)	Result (pCi/g)	Q	MDA (pCi/g)
B0VNH1	129.0	1.00E-02	U	4.90E-02	1.37E-01	J	5.60E-02	1.00E-02	U	1.20E-01
B0VNH2	128.5	0.00E+00	U	5.80E-02	5.00E-03	U	6.50E-02	1.10E-02	U	6.10E-02
B0VNH3	127.7	0.00E+00	U	1.00E-01	1.10E-02	U	8.30E-02	5.00E-03	U	2.50E-02
B0VNH4	127.7	8.00E-03	U	3.10E-02	1.60E-02	U	3.90E-02	1.50E-02	U	3.60E-02
B0VNH5	126.9	-7.00E-03	U	1.00E-01	-7.00E-03	U	7.20E-02	1.20E-02	U	1.80E-02
B0VNH6	125.9	-4.00E-03	U	3.80E-02	-4.00E-03	U	3.80E-02	0.00E+00	U	2.90E-02
B0VNH7	125.1	-5.00E-03	U	6.30E-02	0.00E+00	U	6.80E-02	3.00E-03	U	4.50E-02
B0VNH8	124.1	5.00E-03	U	5.60E-02	-5.00E-03	U	5.60E-02	6.00E-03	U	4.70E-02
B0VNH9	130.3	8.00E-03	U	3.70E-02	4.00E-03	U	2.90E-02	1.50E-02	U	2.80E-02
B0VNJ0	123.4	6.00E-03	U	6.10E-02	1.10E-02	U	5.30E-02	6.00E-03	U	3.40E-02
B0VNJ1	122.9	-6.00E-03	U	7.70E-02	4.40E-02	U	6.00E-02	1.40E-02	U	3.50E-02
B0VNJ2	122.4	-1.20E-02	U	8.00E-02	0.00E+00	U	8.60E-02	-7.00E-03	U	4.00E-02
B0VNJ3	121.3	1.30E-02	U	6.40E-02	2.00E-02	U	5.10E-02	1.70E-02	U	4.10E-02
B0VNJ4	120.1	-1.80E-02	U	7.60E-02	-1.20E-02	U	7.60E-02	8.33E-01	J	4.20E-02
B0VNJ5	119.3	6.70E-02	U	2.30E-01	1.30E-02	U	1.70E-01	0.00E+00	U	2.50E-02
B0VNJ6	118.0	0.00E+00	U	7.60E-02	-6.00E-03	U	5.90E-02	-1.10E-02	U	3.90E-02
B0VNJ7	117.1	-2.30E-02	U	1.50E-01	-2.30E-02	U	1.60E-01	-3.00E-03	U	3.90E-02
B0VNJ8	116.7	-1.40E-02	U	5.60E-02	5.00E-03	U	7.00E-02	8.00E-03	U	2.20E-02

HEIS Number	Elevation (m)	ICP Metals								Hex Chromium	
		Arsenic		Total Chromium		Mercury		Lead		Chromium (VI)	
		Result (mg/kg)	Q	Result (mg/kg)	Q	Result (mg/kg)	Q	Result (mg/kg)	Q	Result (mg/kg)	Q
B0VNH1	129.0	2.6		102		0.08		5.6		0.41	U
B0VNH2	128.5	1.6		23.3		0.02		1.9		2.30	
B0VNH3	127.7	1.3		14.4		0.02	U	2.1		0.42	U
B0VNH4	127.7	1.6		16.6		0.02	U	1.7		0.41	U
B0VNH5	126.9	1.6		11.6		0.02	U	2.1		0.66	
B0VNH6	125.9	1.6		12.5		0.02	U	2.2		0.96	
B0VNH7	125.1	1.9		10.6		0.01	U	2.0		0.42	U
B0VNH8	124.1	1.5		5.8		0.02	U	2.0		0.42	U
B0VNH9	130.3	0.22	U	0.15		0.02	U	0.75		0.40	U
B0VNJ0	123.4	2.3		13.5		0.02	U	3.0		0.43	U
B0VNJ1	122.9	1.0		6.8		0.02	U	2.8		0.42	U
B0VNJ2	122.4	1.4		11.5		0.02	U	2.9		0.42	U
B0VNJ3	121.3	1.5		10.7		0.02	U	2.2		0.41	U
B0VNJ4	120.1	1.2		9.6		0.02	U	1.9		0.41	U
B0VNJ5	119.3	1.4		6.9		0.02	U	1.9		0.41	U
B0VNJ6	118.0	1.1		6.9		0.02	U	2.6		0.41	U
B0VNJ7	117.1	0.62		4.7		0.01	U	1.5		0.44	U
B0VNJ8	116.7	0.74		7.3		0.02	U	1.8		0.43	U

HEIS = Hanford Environmental Information System
Q = qualifier
MDA = minimum detectable activity
ICP = inductively coupled plasma

APPENDIX B

BOREHOLE LOGS

Figure B-1. Borehole Log, Borehole B8786, Page 1

BOREHOLE LOG

Page 1 of 2 (Page 1 of 2 / Date: 6/17/99)

Well ID: B8786 | Well Name: NA | Location: 116-DR-1 Trench

Project: 116-DR-1 Trench | Reference Measuring Point: Ground surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	DB	NA		0'-1'(?): Fill - mostly gravelly sand, light brown	Drilling with 9" bit. <d BZ at surface
	↓	↓		dry, moderately sorted, weak to strong rxn to HCl	1'-3' 20,000 ppm BY
	5" SS with stainless steel liners	1.5'-4.0' RCVD 0.5 (<9%) SS-1		1'-4.5' Sandy GRAVEL: 30% grav, 60% sand, 10% silt, brown, dry to moist, moderately sorted, basalt-rich	No samples collected due to v. poor recovery
				4.5'-7' Gravelly SAND: 10% gray 80% sand, 10% silt, brown, moist, moderate to well sorted, SA, mostly basalt, c-m sand	4'-4½' [redacted] (monitoring) [redacted] 08YS 5'-6½' [redacted] BOVNK2 08S 4'-4½' 3,000-6,000 dpm BY 5'-6½' <d BY (Background)
5	5" SS w/ SS liners	4'-6.5' RCVD 100% SS-2			
	5" SS w/SS liners	7'-9.5' RCVD 100% SS-3		7'-23.5' SAND: 5% grav, 85% sand, 10% silt, black-brown, moist, well sorted, basalt-rich, mostly c-m sand	7'-9.5' BOVNK3 Main 7'-9.5' [redacted] BOVNK4 Dup 7'-9.5' BOVNK6, BOVNK10 Between BOVNK Split <d BY (7'-9.5')
10	5" SS w/SS liners	9.5'-12.5' RCVD 100% SS-4			9.5'-12.5' [redacted] BOVNK5 350 ppm BY 13'-15.5' BOVNK6 350 ppm BY
	DB	NA			
	5" SS w/SS liners	13'-15.5' RCVD 100%			
15	DB	SS-5			15.5'-16¾' 350 ppm 16¾'-17' BY
	5" SS w/SS liners	15.5'-18' RCVD 100% SS-6		17¼'-18' <d BY	15.5'-18' [redacted] BOVNK7 <d BY Between 16½-17' Basalt Sand 15.5'-16¾' light brown fine sand & BG mix
	DB	NA			End of Shift 6/16/99
	5" SS w/SS liners	18.8'-21.5' RCVD 100% SS-7			18.8'-21.5' <600 ppm BY [redacted] BOVNK8
20	DB	NA			22'-23.5' <600 ppm BY
	5" SS w/SS liners	22'-24.6' RCVD 100% SS-8		23.5'-26.3' SAND: 90% sand, 10% silt, @25' vf sand, brown, fining downward, well sorted	22'-23' BOVNS0 <600 ppm BY BOVNN0 sharp contact @23.5' 23.5'-24.6' 900 ppm BY 23.5'-24.6' BOVNN1; BOVNL1
25	5" SS w/SS liners	24.6'-27' RCVD 100% SS-9		26.3'-31.8' Sandy GRAVEL: 50% grav, 40% sand, 10% silt, brown/black, moist, poorly sorted, gravel SR-R, 50% bas, 50% other, basalt-rich sand	24.6'-27' BOVNL2, BOVNL2 mostly blowout of sand except ~24.6'-25' 340 ppm BY
	DB	NA			
	5" SS w/SS liners	28.2'-30.8			28.2'-30.8 <600 ppm BY <background

Reported By: DC Weekes | Reviewed By: Pat Moore

Title: Geologist | Title: Geologist

Signature: DC Weekes | Date: 6/21/99 | Signature: Pat Moore | Date: 6/21/99

BHI-EE-183 (12/97)

Figure B-2. Borehole Log, Borehole B8786, Page 2

BOREHOLE LOG

Page 2 of 2
Date: 6/21/99

Well ID: B8786 | Well Name: NA | Location: 116-DR-1 Trench

Project: 116-DR-1 Trench | Reference Measuring Point: Ground surface

Depth (FL)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HC1	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
30		SS-10			28.2-30.8' background BY BOVNN3, BOVNL3
	DB	NA		~~30.0~~ 31.8'-32.5' Silty Sandy GRAVEL: as above	
	5" ss w/ss liners	31.8'-34.5 RCVD 100% SS-11		50% gravel, 20% silt, 30% sand, somewhat cemented	31.8'-34.5' <600 dpm BY background BOVNN4, BOVNL4
35	5" ss w/ss liners	34.5'-37.3' RCVD 60% SS-12		32.5'-41.5' Sandy GRAVEL: as 26.3'-31.8'	End of shift 6/21/99
					34.5'-37.3' background BY BOVNN5, BOVNL5
	DB	NA			39'-41.6' background BY BOVNN6, BOVNL6
40	5" ss w/ss liners	39'-41.6' RCVD 75% SS-13			End of shift 6/22/99
	5" ss w/ss liners	41.5'-44.5' RCVD 100% SS-14		41.5'-44.5' Sandy GRAVEL: 50% gravel, 40% sand, 10% silt, black, wet, poorly sorted; gravel is R-WR, 30% bas, 70% other; sand is mostly m-c, 40% bas, 60% other, SA-R; poss. Ringold although the basalt content is fairly high,	WL@ ~~40.1~~ 41.4' bgs 41.5'-44.5' background BY BOVNN7, BOVNL7 43.6'-45.5' background BY BOVNN8, BOVNL8 Hanford/Ringold contact ~44.5 ft
45	5" ss w/ss liners 100% rcvd	43.6'-45.5 SS-15		44.5'-45.5' Silty Sandy GRAVEL: 60% gravel, 25% sand, 15% silt, 2.5Y 7/2 (dry) light gray, wet, v poorly sorted; GRavel is R-WR, 30% bas, 70% other; sand is mostly m-c, SA-GR, 25% bas, 75% other, 50 mm max size, no rxn to HCl	TD@ 45.5 ft on 6/23/99 @TD bottom of 6" nom casing is 44 ft bgs and water level is 41.61' bgs water level is 41.57' bgs just before abandonment.
50					Water sample collected by bailer @ 0835 hr 6/23/99 [redacted]

Reported By: DC Weekes | Reviewed By: Pat Moore

Title: Geologist | Title: Geologist

Signature: DC Weekes | Date: 6/23/99 | Signature: Pat Moore | Date: 6/29/99

BHI-EE-183 (12/97)

APPENDIX C

FIELD LOG NOTES

PROJECT 116 DR drilling B99-072/73 6-17-99 Notebook No. EFL 1133-7 6

Continued From Page N/A

WD 6-17-99

6-17

Pre job set up for drilling job at 1000 hrs. Doug Bowers/

0915 Ed Rafuse calls and moves pre job back to 1130 hrs.

1130 Arrive 116D for pre job. Work package # 1999 03 02 001, the contract # is 0000X-SC-G0176, RWP # GW121 rev. 0, the # on the borehole is B8786. Work to be preformed is split spoon sampling of the borehole per work package.

1230 Drill rig not in place yet. Will wait until drillers are back from retrieving regulated tools from 100N.

1330 Pre job held attending are:

Doug Bowers	Reene Neilson	Dave Weeks
Mo Wrasdic	Russ Vellines	
Ed Rafuse	Mike Kohler	

1400 Dress out and inter zone. While drillers are setting up cable tool drill rig we will be organizing sampling equipment. Set up two 35 gallon barrels for field deconning sample equipment. Drum #'s are 100D 99-0043 and 100D 99-0041

1500 Drillers have set rig and split spoons are ready, due to the late hr. Joe Jeminez has decided to not sample today but to let drillers make their initial drive into the ground and leave the drive barrel in place. Prepared split spoons are bagged and secured to maintain cleanliness.

1530 Exit zone.

WD 6-17-99

Continued on Page N/A

Read and Understood By

Doug Bowers / Doug Bowers 6-17-99

Signed Date Signed Date

PROJECT 116 DR drilling B99-072/73 6-18-99 Notebook No. EFL 1137-4

Continued From Page 66

6-18-99

O900 B0VNH3 (TMA) B0VNK3 (RCF) is the main sample.
B0VNH4 (TMA) B0VNK4 (RCF) is the duplicate sample.
B0VNK0 (Quant) B0VNM0 (RCF) is the split sample.

O930 The HPT is concerned about rising winds (~10 to 15 mph gusts) so we will exit for morning break and allow the area to be sprayed down by the water truck.

1010 Area has been sprayed down around the drill rig.

1017 Back in to dress out.

1040 Entry made back into zone.

1055 B0VNH5 (TMA) B0VNK5 (RCF) is the next sample and is taken from the ~9.5' to 12.5' depth, driller is trying to compact material in split spoon. Recovery is 100% and material is a very clean basalt sand and is <5% gravel, reading 350 cpm Beta Gamma by HPT.

1140 B0VNH6 (TMA) B0VNK6 (RCF) is taken from the ~13' to 15.5" depth. The casing being set caused a slight off set in the running depth of the sampling Material is a very clean basalt sand <5% gravel and there is 100% recovery. Upon review of field notes show nothing was written down for a survey count on cpm beta gamma. From memory only I believe the counts were 350-cpm beta gamma.

1159 Drillers have to clean out hole some of the material from the last drive barrel seem to have fallen in when the were pulling it out.

1218 B0VNH7 (TMA) B0VNK7 (RCF) is taken from the ~15.5' to ~18' depth. As sample is retrieved from split spoon into SS bowl it is noticed there is a slight difference in the lithologies of the material that is not apparent until they are laying side by side in the bowl. There is a very small amount of fine light brown sand in the upper ~15" of the split spoon and it reads 350-cpm beta gamma. The bottom ~9" of the split spoon reads = back ground, and is a clean basalt sand with no gravel. Due to the very slight difference in visual appearance the two materials were placed into bowl, upon seeing the difference when they were in the bowl it was to late to take separate samples because the material had already come into contact with each other to much.

1240 Exit for lunch. Drillers will be setting up to down size drill casing and drilling will cease for today.

1330 Enter back into zone to secure area, sample equipment, and finish field deconning used equipment for return to WSCF. Final sample securing is done at this time also. Samples have been place on ice immediately after sampling in zone and are cleared out of zone now by HPT.

1555 Exit site and transport all samples on blue card to 3728 facility.

6-18-99

Continued on Page N/A

Read and Understood By

Doug Bowers / Doug Bowers 6-18-99
Signed Date

Signed Date

66

PROJECT 116 DR Drilling 099-072/73, 6-18-99

Notebook No. EEL 1133-7

Continued From Page 64

0500 Arrive 3728 to load up supplies for drill job. Doug Bowers/ Doug Bowers. Lot #'s on bottles used in sampling for the entire job are, 1 liter aG L 302288,250 ml aG F 8127030, 20 ml Poly N/A. All surveys taken by HPT will be included at the end of the log entries for this job there is a one to two day lag with processing them.

0600 Arrive 116 D for pre job same guidance documents as yesterday. Same personal also the work to be preformed is per work package 1999 03 02 001. Weather is sunny slight breeze expected to pick up this afternoon.

0700 Samples will be taken every one-meter as much as the drilling methodology will allow. Drillers will install a 10 inch casing, clean it out to the required depth the take a split spoon that has been prepared by the samplers with WSCF deconed parts, all split spoon equipment and sampling equipment will be WSCF deconed unless otherwise noted. Material will be placed into a stainless steel bowl thoroughly homogenized and placed into sample bottles with stainless steel spoon. This methodology will be the same through out the job unless otherwise noted.

DB 6-18-99

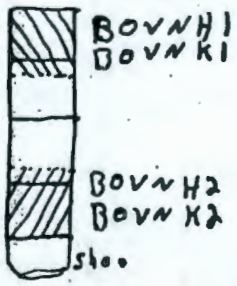
0720 First drive barrel is emptied and casing set due to the dry nature of the soil driller has to go to 2' to get hold in drive barrel. All drill spoils will be encased in plastic sleeving and placed into ERDF container on drill site.

0755 First attempt at split spoon is made from the 2' to 4' depth, only an ~5% recovery is made a large rock has hung up in the throat of the spoon.

0810 Drive barrel is now taken down the 4' depth and emptied.

0820 Split spoon sample is taken from the 4' to 6.5' depth. In taking the spoon apart it has 100 % recovery and there two very distinct layers each will be sampled.

The top 8" of the spoon have dry sandy silt reading 700 to 800 cpm Beta Gamma (back ground is ~ 200 cpm)



DB 6-18-99

The bottom ~16" of the spoon contain a very clean basalt sand <5% gravel and nothing above back ground upon survey by HPT.

0845 B0VNH1 (TMA) B0VNK1(RCF) Taken from the above-mentioned material from ~4' to 4' 8". Material is separated by visual differences in the lithology.

0850 B0VNH2 (TMA) B0VNK2 (RCF) Taken from the above-mentioned material from the ~4' 8" to the ~6.5' depth.

0855 The next sample is taken from the ~7' to ~9.5' depth, material is a very clean basalt sand <5% gravel and reads less than back ground by HPT survey, recovery is 100%. This sample will be the QA/QC sample and will have a main, duplicate, and a split sample taken from it.

DB 6-18-99

Continued on Page 67

Read and Understood By

Signed	Date	Signed	Date
Doug Bowers/Doug Bowers	6-18-99		

PROJECT 116-DR drilling B99-072/73 6-18-99 Notebook No. EFL 1137-7

Continued From Page 66

6-18-99

O900 B0VNH3 (TMA) B0VNK3 (RCF) is the main sample.
B0VNH4 (TMA) B0VNK4 (RCF) is the duplicate sample.
B0VNK0 (Quant) B0VNM0 (RCF) is the split sample.

O930 The HPT is concerned about rising winds (~10 to 15 mph gusts) so we will exit for morning break and allow the area to be sprayed down by the water truck.

1010 Area has been sprayed down around the drill rig.

1017 Back in to dress out.

1040 Entry made back into zone.

1055 B0VNH5 (TMA) B0VNK5 (RCF) is the next sample and is taken from the ~9.5' to 12.5' depth, driller is trying to compact material in split spoon. Recovery is 100% and material is a very clean basalt sand and is <5% gravel, reading 350 cpm Beta Gamma by HPT.

1140 B0VNH6 (TMA) B0VNK6 (RCF) is taken from the ~13' to 15.5" depth. The casing being set caused a slight off set in the running depth of the sampling Material is a very clean basalt sand <5% gravel and there is 100% recovery. Upon review of field notes show nothing was written down for a survey count on cpm beta gamma. From memory only I believe the counts were 350-cpm beta gamma.

1159 Drillers have to clean out hole some of the material from the last drive barrel seem to have fallen in when the were pulling it out.

1218 B0VNH7 (TMA) B0VNK7 (RCF) is taken from the ~15.5' to ~18' depth. As sample is retrieved from split spoon into SS bowl it is noticed there is a slight difference in the lithologies of the material that is not apparent until they are laying side by side in the bowl. There is a very small amount of fine light brown sand in the upper ~15" of the split spoon and it reads 350-cpm beta gamma. The bottom ~9" of the split spoon reads = back ground, and is a clean basalt sand with no gravel. Due to the very slight difference in visual appearance the two materials were placed into bowl, upon seeing the difference when they were in the bowl it was to late to take separate samples because the material had already come into contact with each other to much.

1240 Exit for lunch. Drillers will be setting up to down size drill casing and drilling will cease for today.

1330 Enter back into zone to secure area, sample equipment, and finish field deconning used equipment for return to WSCF. Final sample securing is done at this time also. Samples have been place on ice immediately after sampling in zone and are cleared out of zone now by HPT.

1555 Exit site and transport all samples on blue card to 3728 facility.

6-18-99

Continued on Page N/A

Read and Understood By

Doug Bowen / Doug Bowen 6-18-99

Signed Date Signed Date

68

PROJECT 116 DR drilling D99-072/73 6-21-99 Notebook No. EEL 1133-7

Continued From Page N/A

0500 Arrive 3728 to load supplies and ice. Doug Bowers/ Doug Bowers

0600 Arrive 100D for POD. Work to be preformed today will be a continuation of the split spoon sampling of the B8786 bore hole. Drillers will start out by down sizing the casing to 8",while they are doing that samplers will make a run to WSCF to pick up some more liners for split spoons. Ed Rafuse has also asked us to pick up some rad sleeving from 233-S in 200 area while we are over there. Personal at POD:

Ed Rafuse	Renee Neilson
Mike Kohler	Dave Weeks
Doug Bowers	Mo Wrasdic
Russ Velline	

DB 6-21-99

0830 Arrive back at 100D to enter zone, drillers are just finishing up on there work. They have set the 8" casing and are cleaning out the bentonite they put in the hole and had hydrated earlier this morning.

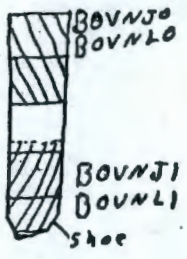
0928 Driving split spoon 18.8' to 21.5'. Back ground readings by HPT are 240 cpm beta gamma

0935 B0VNH8 (TMA) B0VNK8 (RCF) taken from 18.8' to 21.5', material is a clean basalt sand, there is a slight silty build up on the walls of the liners that easily mixes and falls apart when homogenized. This sample is a composite of all the liners; there is a 100% recovery

0950 B0VNH9 (TMA) This sample is an equipment blank and is tied to the sample equipment used on the next split spoon. Silica sand from 3728 bldg. is poured through the split spoon after it is assembled into the S.S. bowl and homogenized with S.S. spoon and placed into sample containers. Equipment is recovered with same foil and placed aside to be used on following sample.

1006 Driving next split spoon from 22' to 24.6'.

1018 B0VNJ0 (TMA) B0VNL0 (RCF) is taken from the top 2 liners of the split spoon.



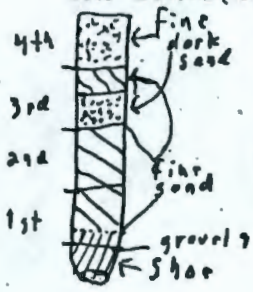
Material is a clean basalt sand with no cpm above background. There are two very distinct and different materials in spoon both will be sampled individually. There is a 100% recovery on the split spoon.

B0VNJ1 (TMA) B0VNL1 (RCF) is taken from the mouth of the shoe (note this part of the split spoon in the shoe is not normally used) to ~1" into the second liner of the spoon. This seems to be the cut of point for the very distinct visual difference of the two materials. This material is a very fine brown sand that is packed extremely tight in the spoon and there seems to be a lot of silt in it. Reading by the HPT is 340 cpm.

The other ~5" of the 2nd liner are mixed between the two materials and is discarded

1028 Driving next split spoon 24.6' to 27'.

1041 B0VNJ2 (TMA) B0VNL2 (RCF) taken from composite of all 4 liners, there is a mix of layers of material, recovery is 100%. The shoe and the first ~2" of the first liner are ~50% gravel and 50% sand material in shoe is used in this sample, this is the first time this gravely material has appeared cpm is = to background. The next ~4' of the first liner and the entire 2nd liner are the tightly packed fine sand similar to the type found in the previous spoon at 1018 hrs and cpm is = to background. ~ 3" of the 3rd liner and all of the 4th liner are a fine dark (not basalt) sand with a lot of silt and reads 340



DB 6-21-99

Continued on Page 69

Read and Understood By

Doug Bowers/Doug Bowers 6-21-99

Signed Date Signed Date

PROJECT 716DR drilling B99-072/73 6-21-99 Notebook No. EFL 1133-7

Continued From Page 68

A TB 6-21-99

cpm. The top ~3" of the third liner are like the fine sand in the 2nd liner and cpm = back ground.

1130 Out of Zone for lunch
1235 Back in zone drilling again.
1257 Driving split spoon 28' to 30.8'
1301 B0VNJ3 (TMA) B0VNL3 (RCF) taken from a composite of all 4 liners material is uniform in all liners and is ~50% gravel and 50% sand all cpm are = to background. Recovery is 100%, sample has a lot of large rocks so they are "panned out" prior to sampling
1348 Driving spoon 31.8' to 34.5.
1351 B0VNJ4 (TMA) B0VNL4 (RCF) taken from composite of all 4 liners, there two materials in spoon. From the shoe to ~5" into the 3rd liner there is a coarse dark sand and gravel ~50/50 mix. The top ~1" of the 3rd and all of the 4th liner are a fine dry sandy silt with ~ 50% gravel. There seems to be some type of binder in the silt/sand in this layer. All readings by HPT are = to background.
1356 Exit for afternoon break.
1443 Back into zone, drillers drive casing to 34.5' and clean out hole. They are going to be downsizing casing in the morning so this is where we will stop for today. Samples have been on ice as they have been taken and are secured for transport and will be moved to 3728 bldg. on a blue card
1540 Exit zone, and begin to remove field deconed sampling equipment.
1630 Exit site for 3728.

A TB 6-21-99

A TB 6-21-99

Continued on Page 6/4

Read and Understood By

Doug Bowers/Doug Bowers 6-21-99

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PROJECT 116DR drilling 099-072/73 6-22-99 Notebook No. EFL 1133.7

Continued From Page #A

DAB 6-22-99

0500 Arrive 3728 for supplies and ice. Doug Bowers/ Doug Bowers

0600 Arrive 116 DR for prejob;

Doug Bowers	Renee Neilson
Mo Wrasdie	Dave Weeks
Ed Rafuse	Mike Kohler
Jimmy Miles	

DAB 6-22-99

0630 Area is being down posted to an RBA and the drillers are down sizing the drill casing again today. HPT measures background @ 200 cpm. Weather is partly cloudy expected high ~85 F with mild winds.

1024 In zone (RBA) and hooking up split spoon. Now using 35 gal. Drum # 100D 99-0042 for decon water.

1028 Driving split spoon 34.5' to 37.3'.

1033 B0VNJ5 (TMA) B0VNL5 (RCF) material is a silty sand and ~40% gravel, with an ~ 2" layer of brown sand layer in the ~ middle of the 1st linner. All material is = to background of 200 cpm.

1045 Drillers have to retool for downsizing casing

1335 Out of zone drillers have to run to 100N to lay down yard.

1412 Back into zone to set 6" casing.

1509 Cleaning hole with 6" drive barrel, repeat several times to clear bentonite pellets.

1557 Drive to 39.5' and still have some bentonite in barrel that appears to be sluff that fell in.

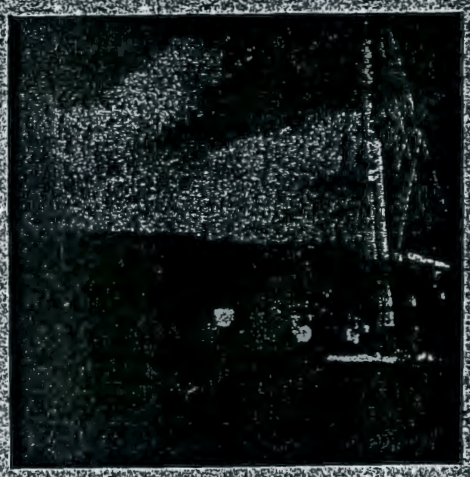
1605 Driving split spoon 39' to 41.6'

1610 B0VNJ6 (TMA) B0VNL6 (RCF) Material is a dark silty sand with ~ 50% gravel, recovery is ~75%. The shoe and ~ the first 2' of the 1st linner are wet, this is apparently the water table.

1627 All samples have been on ice after being taken and are now secured for transport to the 3728 bldg. on a blue card.

Forgot to include picture earlier

DAB 6-22-99



6-22-99 0700 116 DR 42 B setup DAB

DAB 6-22-99

Continued on Page #/4

Doug Bowers/Doug Bowers 6-22-99

Signed Date Signed Date

PROJECT 116 DR drilling B99-072/73 6-23-99 Notebook No. EF2 1133-7

Continued From Page N/A

6-23-99 DB

O500 Arrive 3728 for ice and supplies. Doug Bowers/ Doug Bowers

O600 Arrive 116 DR for pre job; same personal as 6-22-99. Weather is sunny and expected high of 85 F, no wind now but gusts expected to 10 to 15 mph.

O650 Drive barrel down to 42' then tagged with tape and hole was at 41.5, there has been 6" of sluff fall into hole.

O700 Split spoon driven 41.5' to 44.5', recovery is 100%, 4th liner will not be used in composite.

O706 B0VNJ7 (TMA) B0VNL7 (RCF) Material is a basalt sand and ~50 to 60% gravel, with rad readings = to background. Only the first 3 liners of the spoon were used.

O752 Water level is tagged at 41.95 from ground surface, the bottom of the hole is tagged at 43.5' ~12" of sluff has fallen in.

O803 Driving split spoon again 43.5' to 45.5'.

O810 B0VNJ8 (TMA) B0VNL8 (RCF) material is a medium, brown sand and ~60% gravel, geologist Dave Weeks is calling it Ringold formation. Due to the ~12" of sluff measured in the hole only the 1st and 2nd liner of the split spoon will be used in the sample composite.

O835 B0VNF2 (TMA) B0VNF3 (Q) B0VNF4 (RCF) Material is water collected from the borehole with a disposable plastic bailer put into a 2.5 gal. cubitainer. The water is very dirty and will need to be filtered. No preservatives are added to samples per Rich Weiss, the lab will filter sample then preserve it. Lot #'s on bottles are:

250 ml poly L/2 8048010
500 ml poly L 8037010
500 ml aG Y 8093040
1 L poly C 8065020

O915 Depth to water from ground surface is 41.61', total depth of hole is 45.5' from ground surface.

O930 All samples have been on ice after being taken and are secured for transport. Quanterra and RCF samples will be delivered to respective labs and TMA/RECRA samples will be delivered to 3728 bldg. all samples delivered on blue cards.

1300 The decon liquids from the three 35 gal drums used are transferred into one 35 gallon bung top drum # 100D 99-0037.

DB 6-23-99

Continued on Page N/A

Read and Understood By

Doug Bowers/Doug Bowers _____ Signed _____ Date _____ Signed _____ Date

Notebook No. EEL 113-7
Continued From Page N/A

PROJECT 116 DR drilling 099-072/73 6-24-99

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RADIOLOGICAL SURVEY RECORD
Contamination

Type of Survey (check one only): ☐ *Release ☐ Routine ☒ Work Progress ☐ Shipment
* The potential for internal contamination was evaluated.

Survey # RSR-GW99-0058

RWP #/Rev. #	Date	Time	Location Code/Description
GW-121/REV0	6-18-99	1230	DR1

SURVEYED SLEEVING FULL OF DIRT AT BOREHOLE #B8786 WHILE DRILLING SEE PAGE 2 FOR SAMPLE TIMES AND DEPTHS.

Technical Assessment Number T4-99-SR-20

QS Sensitive Area | HCA High Contamination Area | RBA Radiological Buffer Area | ARA Airborne Radioactivity Area | RMA Radiation Monitored Area | RA Radiation Area | HRA High Radiation Area

Q Radiological Survey | S Swab | M Large Area Wipe | (AS) Air Sample Location | Radiological Boundary | SCA Soil Contamination Area | VHRA Very High Radiation Area

Instruments

Model	Serial #	Source # (Initial)	CF	Cal Due Date	Model	Serial #	Source # (Initial)	CF	Cal Due Date
E-600	1069			5-30-00	N	N			N
SHP 380AB	1497	BAK	0.10 / 0.6	6-3-00					
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		N/A

RCT Name/Signature/Date: J. KOEHLER / [signature] / 6-18-99

RCT Supervisor Name/Signature/Date: B.A. [illegible] / [signature] / 6/21/99

COPY

Contamination Measurement Information
Circled values indicate removable β contamination in excess of β

No.	Description of Item or Location: TIME	DEPTH	Removable (dpm/100 cm²) α	α C-F	β-γ	β-γ C-F	Total (dpm/100 cm²) α	α C-F	β-γ	β-γ C-F
1	0720	0-2'							<600	6
2	0735	1-3'							20000	6
3	0810	4'							24000	6
4	0830	5'							7200	6
5	0845	7'			N		N		6000	6
6	0900	9½'							600	6
7	1100	11½'			A		A		4900	6
8	1130	13'							<600	6
9	1145	14'							1200	6
10	1200	15½'							1800	6
11	1230	17½'							900	6
					N					
					A					

Continued on Page 73

Read and Understood By

Signed: [signature] Date: 6-24-99

Signed: _____ Date: _____

Notebook No. EE 1105-1

Continued From Page 73

PROJECT 116DR drilling 099-072173 6-24-99

Type of Survey (check one only): ☐ Release ☐ Routine ☐ Work Progress ☐ Shipment

* The potential for internal contamination was evaluated.

Survey # RSR-GW-99-0476

RWP #/Rev. #	Date	Time	Location Code/Description
GW-121/REV0	6-24-99	1530	DR1

SLEEVING FILLED WITH DRILLING SPOILS

SURVEYED ALL MATERIALS REMOVED FROM BOREHOLE #B1786. FOR TIMES + SURVEY DEPTHS SEE PAGE 2 of 2.

Technical Assessment Number: TA-98-SR-20

CA	HCA	RBA	ARA	RMA	RA	HRA
Contamination Area	High Contamination Area	Radiological Buffer Area	Airborne Radioactivity Area	Radioactive Materials Area	Radiation Area	High Radiation Area

O	S	M	L	AS	RB	SCA	VHRA
Exclusion Area	Small	Medium	Large Area Wipe	Air Sample Location	Radiological Boundary	Soil Contamination Area	Very High Radiation Area

Instruments

Model	Serial #	Source ✓ (Initial)	CF	Cal Due Date	Model	Serial #	Source ✓ (Initial)	CF	Cal Due Date
E-600	1044	MK	0-6	5-25-00	~	~			
3H3 HP AP	1297	~	n-9	5-22-00					
~	~	~		~					
A	A	A	A	A	A	A	A	A	A

COPY

RCT Name/Signature/Date: J. KOEHLER / 6-24-99

RCT Supervisor Name/Signature/Date: 6/23/99 GAILTUN

Contamination Measurement Information

Circled values indicate removable contamination in excess of

No.	Description of Item or Location: TIME	DEPTH	Removable (dpm/100 cm²): a	a CF	βγ	βγ CF	Total (dpm/100 cm²): a	a CF	βγ	βγ CF
1	0920	19'9"							900	6
2	0950	20'6"							<600	6
3	1000	22'0"							1200	6
4	1030	24'5"			N				900	6
5	1055	26'0"							1200	6
6	1255	28'3"			A				4900	6
7	1329	30'0"							<600	6
8	1347	31'9"							<600	6
9	1505	33'6"							<600	6
10	1529	34'6"							<600	6
					N					
					A					

Continued on Page 74

Read and Understood By

Signed: Larry Bowers / Doug Bowers Date: 6-24-99

Signed _____ Date _____

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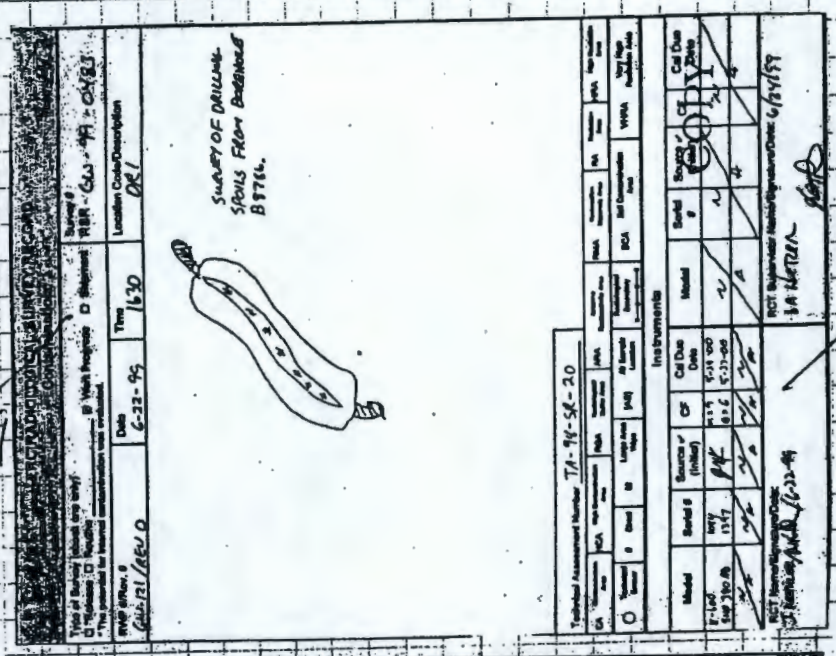
PROJECT 116 DR drilling B99-072/73 6-24-99

Notebook No. EFL 1133-7

Continued From Page 73



Continued on Page 75

Read and Understood By

Signed: Doug Bowers/Doug Bowers Date: 6-24-99

Signed: _____ Date: _____

PROJECT 116 DR drilling B99-072/73 6-24-99

Notebook No. EFL 1139-7

Continued From Page 74

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Survey # RSR-GCJ-99-0492

Location Code/Description DR

Date 6-23-99

Time 0740

SURVEY TAKEN ON DRILLING SPOILS FROM BORE HOLE # B9756. SEE BACK FOR TIMES + DEPTHS.

Instruments

Model	Serial #	Source # (Initial)	CF	Cal Due Date
[illegible]	1094	[illegible]	[illegible]	[illegible]
[illegible]	1397	[illegible]	[illegible]	[illegible]
N/A	N/A	N/A	N/A	N/A

Contamination Measurement Information

No.	Description of Item or Location: TIME	DEPTH	Removable (dpm/100 cm²) α	CF	Bt	Bt CF	Total (dpm/100 cm²) α	CF	Bt	Bt CF
1	0655	42'	N/A	N/A	N/A	N/A	N/A	N/A	<600	6
2	0730	46'4"	N/A	N/A	N/A	N/A	N/A	N/A	<600	6

N/A

COPY

6-24-99

Continued on Page N/A

Read and Understood By

Signed: [illegible] Bowers / Doug Bowers — Date: 6-24-99

Signed: _____ Date: _____

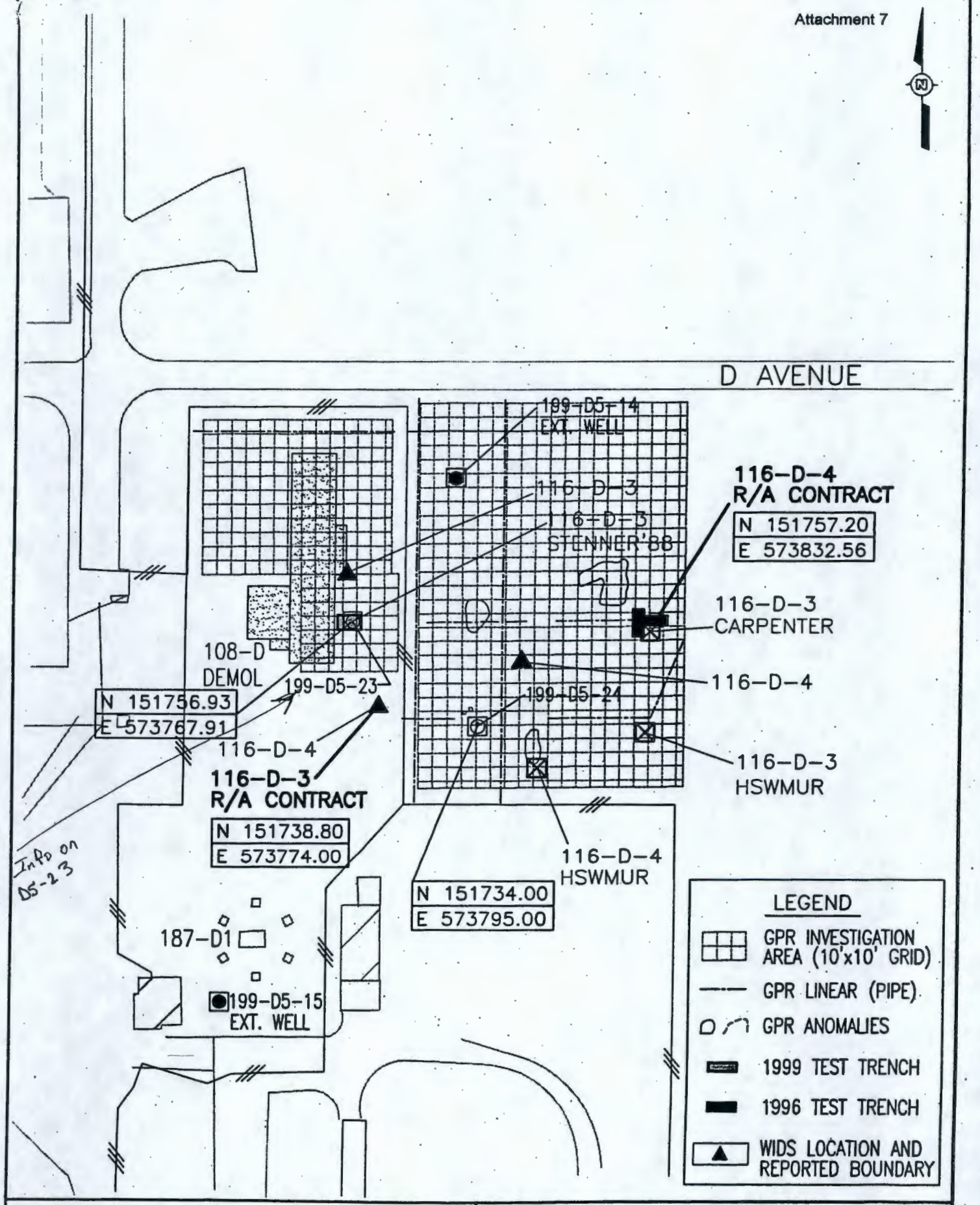

FIGURE 2
100-DR-1 LIQUID WASTE SITES
GPR/TEST TRENCH DATA

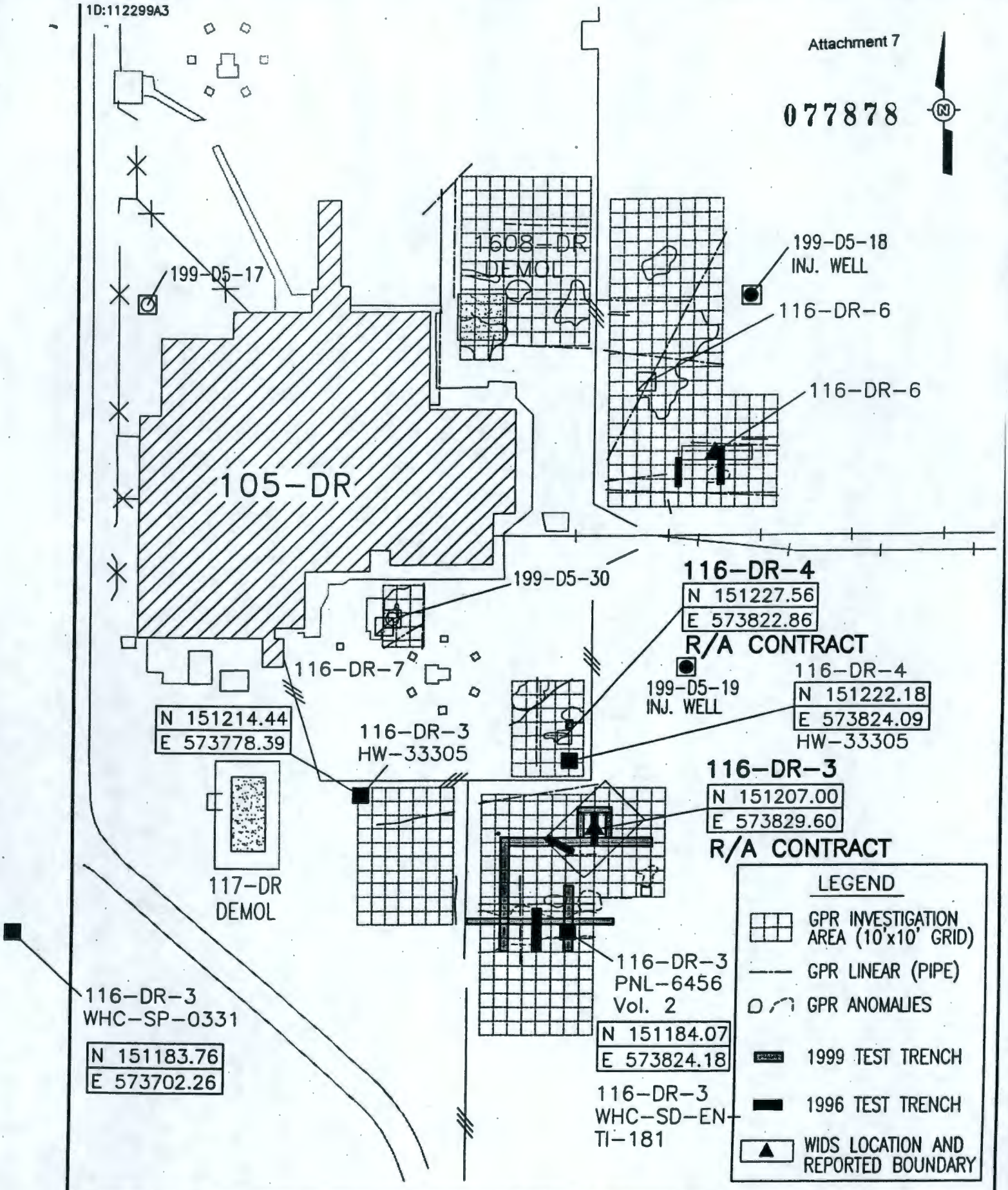

FIGURE 1
100-DR-2 LIQUID WASTE SITES
GPR/TEST TRENCH DATA

077878

Distribution

Unit Managers' Meeting: 100 Area Remedial Action Unit/Source Operable Units

Glenn Goldberg ..... DOE-RL, RP (H0-12)
Owen Robertson ..... DOE-RL, RP (H0-12)
Chris Smith ..... DOE-RL, RP (H0-12)
Eileen Murphy-Fitch ..... DOE-RL (H0-12)

Lisa Treichel ..... DOE-HQ (EM-442)

Wayne Soper ..... WDOE (Kennewick) (B5-18)
Rick Bond ..... WDOE (Kennewick) (B5-18)

Dennis Faulk ..... EPA (B5-01)

Lynn Albin ..... Washington Dept. of Health
Richard Jaquish ..... Washington Dept. of Health

John April ..... BHI (H0-17)
Ella Coenenburg ..... BHI (H9-03)
Frank Corpuz ..... BHI (X9-06)
Rick Donahoe ..... BHI (H0-17)
Jon Fancher ..... CHI (H9-02)
Alvina Goforth ..... BHI (H0-09)
Chris Kemp ..... BHI (S3-20)
Tom Kisenwether ..... BHI (X9-10)
Alvin Langstaff ..... BHI (X3-40)
Tamen Rodriguez ..... BHI (H0-17)
Fred Roeck ..... BHI (H0-17)
Mark Sturges ..... CHI (X3-40)
Joan Woolard ..... BHI (H0-02)
Administrative Record ..... BHI (H0-09)

Please inform Tamen Rodriguez (372-9562) – BHI (H0-17)
of deletions or additions to the distribution list.