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ENGINEERING DATA TRANSMITTAL

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15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Impact Level	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	WHC-SD-EN-AP-126		0	Description of Work for the 100-BC-2 Vadose Boreholes: 116-C-2A Crib and 116-C-2C Sand Filter	3Q	1/2	1	

16. KEY

Impact Level (F)	Reason for Transmittal (G)	Disposition (H) & (I)
1, 2, 3, or 4 (see MRP 5.43)	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

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(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.
1/2	1	Cog.Eng. K.O. Kytola	[signature]	5-25-93	H6-02	EDMC (2)			H6-08	3	
1/2	1	Cog. Mgr. R.P. Henckel	[signature]	5-25-93	H6-02	Central Files (2)			L8-04	3	
1/2	1	QA G.S. Corrigan	[signature]	5-25-93	H4-16	ERC			H6-07	3	

18. K.O. Kytola [signature] 5-25-93 Signature of EDT Originator / Date	19. Authorized Representative for Receiving Organization / Date	20. R.P. Henckel [signature] 5-25-93 Cognizant/Project Engineer's Manager / Date	21. DOE APPROVAL (if required) Ltr. No. [] Approved [] Approved w/comments [] Disapproved w/comments

BD-7400-172-2 (07/91) GEF097

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SUPPORTING DOCUMENT

SUPPORTING DOCUMENT	1. Total Pages 17

2. Title	3. Number	4. Rev No.
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5. Key Words	6. Author
Borehole, analytical sampling	Name: K.O. Kytola
APPROVED FOR PUBLIC RELEASE 5/26/93 D. [signature]	Signature [signature] Organization/Charge Code 81310/P711A

7. Abstract

Kytola, K.O., 1993, *Description of Work for the 100-BC-2 Vadose Boreholes: 116-C-2A Crib and 116-C-2C Sand Filter*, WHC-SD-EN-AP-126, Rev.0, Westinghouse Hanford Company, Richland, Washington.

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9. Impact Level 3Q

10. RELEASE STAMP

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FIGURES:

TABLES:

1.0 SCOPE OF WORK

This description of work details the field activities associated with the cable-tool drilling of two vadose boreholes (Task 5) in the 100-BC-2 Operable Unit (Figure 1) and will serve as a field guide for those performing the work. It should be used in conjunction with the *Remedial Investigation/ Feasibility Study Work Plan for the 100-BC-2 Operable Unit, Hanford Site, Richland, Washington* (DOE-RL 1993) for general investigation strategy and *Environmental Investigations and Site Characterization Manual* (WHC 1988a) for specific procedures.

The boreholes will be drilled at the 116-C-2A and 116-C-2C waste sites. These sites are part of a three-site system consisting of a sump pump, sand filter, and pluto crib (Figures 2 and 3).

The pluto crib (116-C-2A) received liquid waste from reactor operations primarily associated with fuel cladding failures as well as other liquid wastes such as spent decontamination solutions. This site is 23 by 16 by 6 ft deep. The top of the crib was approximately 21 ft below grade at time of construction and is probably 25 to 30 ft below grade with subsequent overburden. The crib structure and location of the borehole are detailed in Figure 4.

The waste that went to the crib was first filtered through a sand filter (116-C-2C), which is a 38- by 18- by 18-ft-deep concrete box filled with basalt sand. The top of the filter consists of concrete slabs that are visible from the surface. The location of the borehole is indicated in Figure 5.

2.0 GENERAL REQUIREMENTS

2.1 HEALTH AND SAFETY

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

- WHC-EP-0383, *Environmental Engineering, Technology, and Permitting Function Quality Assurance Program Plan* (WHC 1990)
- WHC-CM-4-10, *Radiation Protection* (WHC 1988b)
- WHC-CM-4-11, *ALARA Program* (WHC 1988c)
- WHC-CM-4-3, *Industrial Safety Manual*, Vol. 1 through 3 (WHC 1987)
- WHC-CM-7-5, *Environmental Compliance Manual* (WHC 1988d)
- WHC-CM-7-7, *Environmental Investigations and Site Characterization Manual* (WHC 1988a)

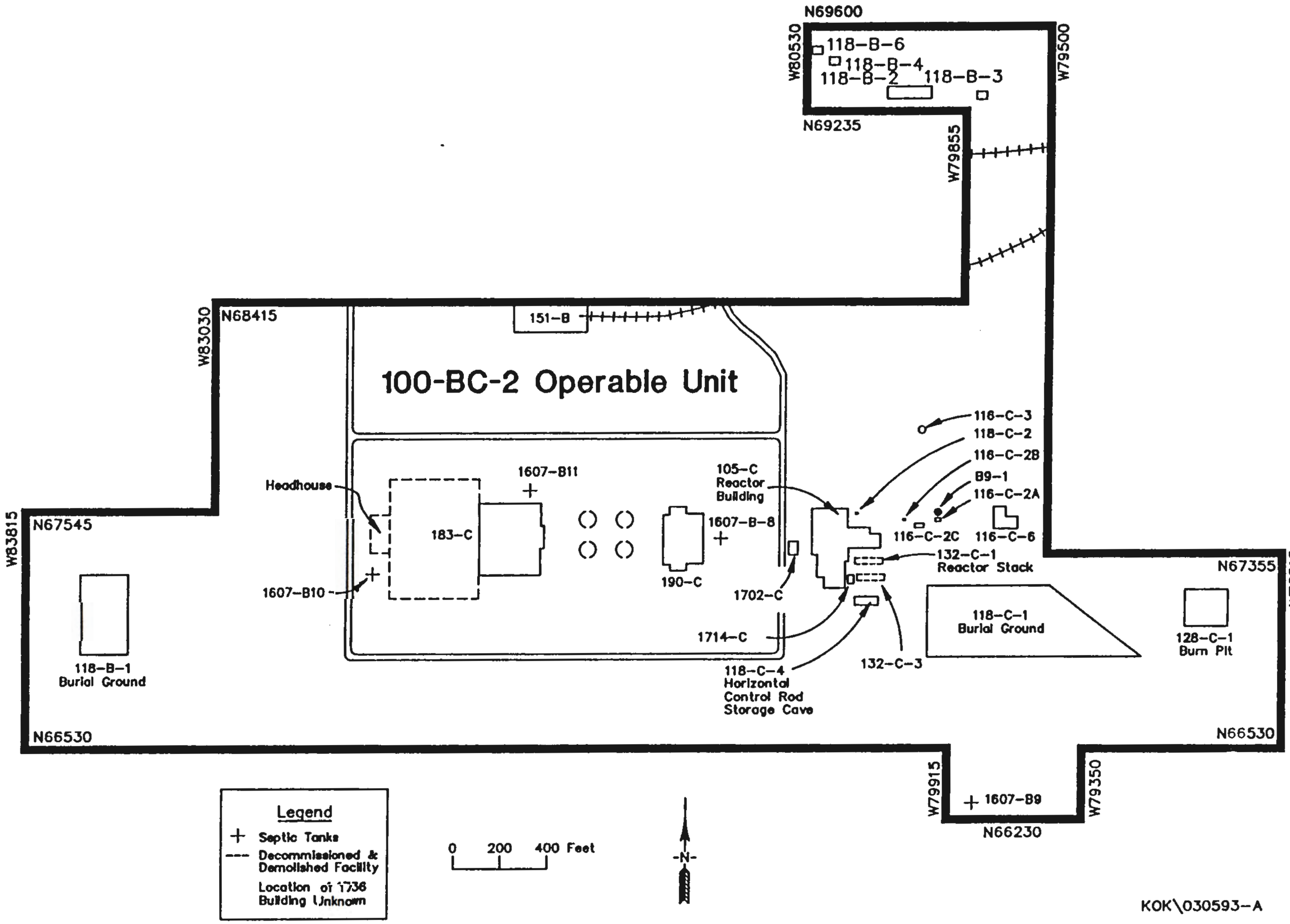

Figure 1. Map of the 100-BC-2 Operable Unit.

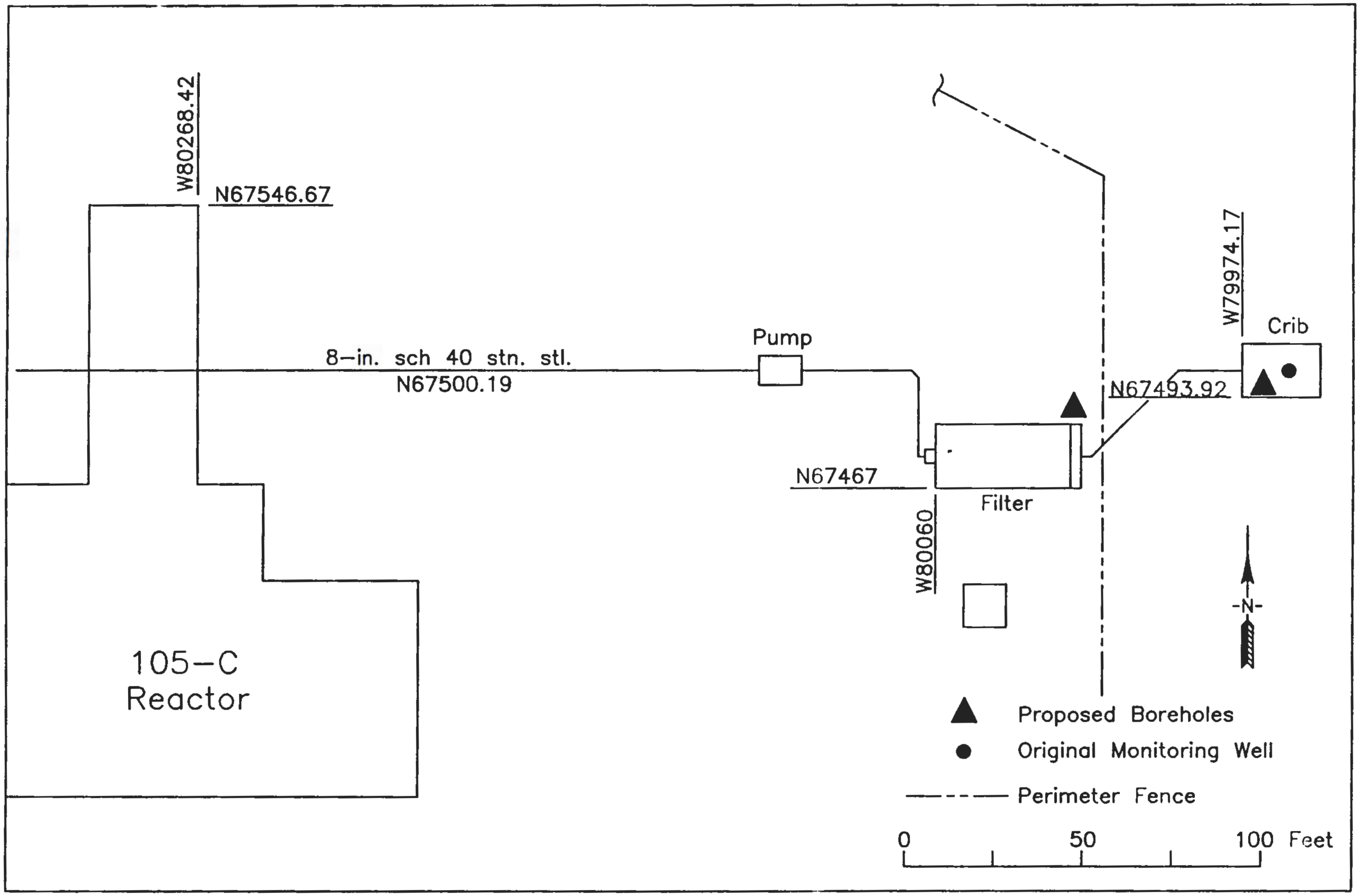

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Figure 2. Top View of the 116-C-2 Pluto Crib System.

Figure 3. Side View of the 116-C-2 Pluto Crib System.

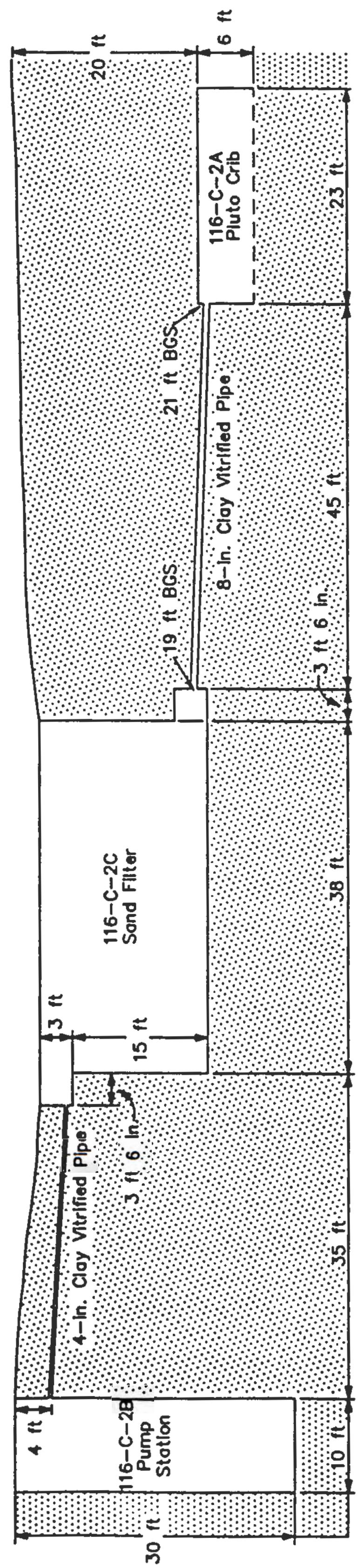

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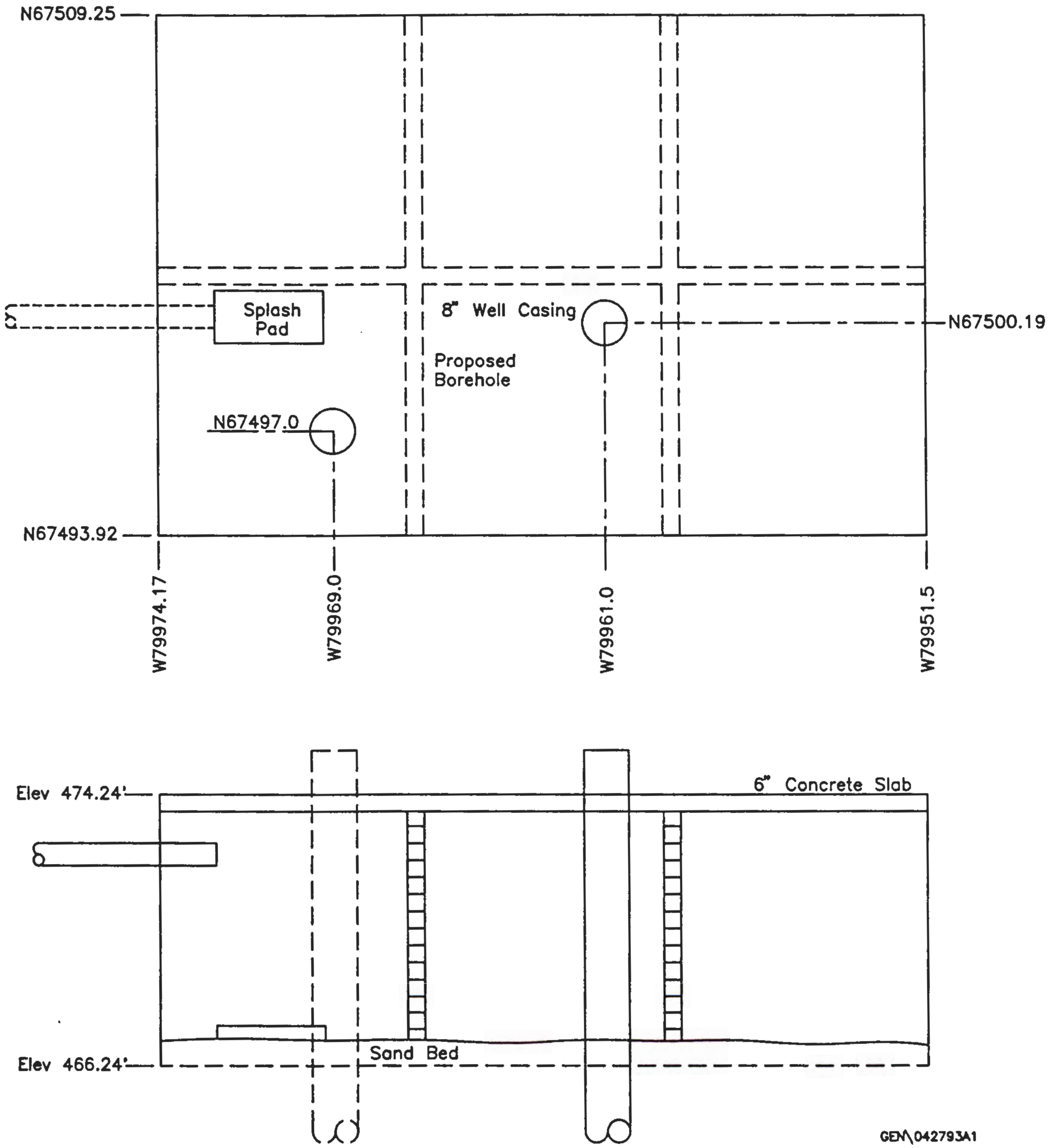
Figure 4. Schematic of the 116-C-2A Pluto Crib.



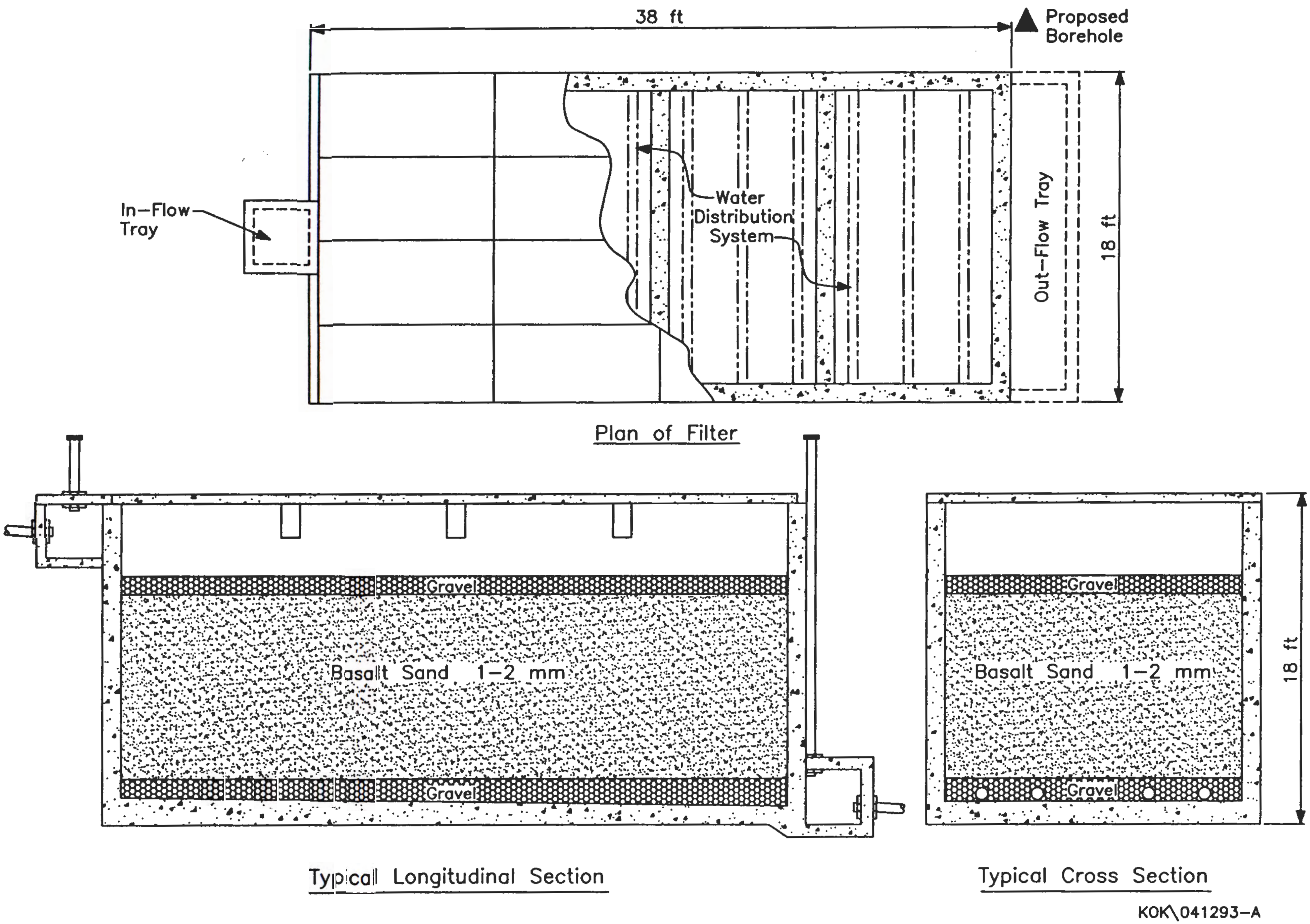


Figure 5. Schematic of the 116-C-2C Sand Filter.

- WHC-SD-EN-SAD-002, Rev. 0, *100 Area Low Hazard Characterization Activities Safety Assessment* (Taylor 1991)
- Site-specific health and safety plan/job safety analysis.

2.2 PREREQUISITES

Each item on the Drilling Planning form for tasks that require no readiness review (EII 1.13, "Environmental Readiness Review") will be signed and dated by the cognizant engineer or field team leader (FTL) prior to the start of work.

3.0 SAMPLING AND FIELD ACTIVITIES

3.1 SOIL SCREENING

All samples and cuttings will be field screened for evidence of volatile organics and radionuclides (DOE-RL 1993, Section 5.1.5.2). Volatiles will be screened by the field geologist using an organic vapor monitor (OVM) that will be used, maintained, and calibrated consistent with EII 3.2, "Health and Safety Monitoring Instruments," and EII 3.4, "Characterization Instruments" (WHC 1988a). Radionuclides will be screened per EII 3.4 also. Radionuclide screening for gross gamma will be performed by the field geologist using a Ludlum (a tradename of Ludlum Measurements Inc.) 14c detector. The field geologist will record screening results in the borehole log per EII 9.1, "Geologic Logging" (WHC 1988a).

The action level from radionuclide screening is local background plus reading from the background site in Figure 6 and for volatile organic screening, 5 ppm above background. Prior to initiating drilling, determine a one-time instrument background reading using the OVM instrument at the background site located in Figure 6. Instrument background will be measured on freshly disturbed surface soil, holding the instruments <1 in. from the soil. Background for radionuclide screening will be determined by taking a reading at the drill site with a Ludlum prior to drilling. The field geologist will record the background levels in the borehole log per EII 9.1, "Geologic Logging" (WHC 1988a), prior to the start of drilling.

Chromium screening will take place only on the last sample interval using a portable hexavalent chromium test kit per EII 3.4, "Field Screening" (WHC 1988a). The field geologist will record the screening results in the borehole log per EII 9.1, "Geologic Logging" (WHC 1988a). The chromium screening shall be done for informational purposes only; therefore, an action level is not required.

Figure 6. Location of Background Site.

9 3 1 2 9 7 9 1 4 9 6

3.2 GEOLOGIC SAMPLING

Geologic samples will be taken at 5-ft intervals and at major stratigraphic changes for the preparation of borehole logs (DOE-RL 1993, Section 5.1.5.2, and EII 9.1, "Geologic Logging" [WHC 1988a]). The field geologist shall archive the nonradioactive geologic samples per EII 5.7A, "Hanford Geotechnical Sample Library Control" (WHC 1988a). Archive samples are collected and placed into a 1-pint mason jar. The jar will be sealed and labeled with the boring number, depth of sample, date, and intitials of the sampler.

All waste generated during drilling activities will be handled per EII 4.3, "Control of CERCLA and Other Past-Practice Investigation Derived Waste" (WHC 1988a).

3.3 ANALYTICAL SAMPLING

Analytical sampling will be based on the following:

1. If drill cuttings fail the screening criteria (i.e., contain greater than or equal to the action level), begin sampling at that point and continue sampling at 5-ft intervals. Send samples out for analysis. Stop sampling (and analysis) 5 ft below the groundwater table or when two consecutive samples, from below the expected waste depth, pass screening criteria.

2. If drill cuttings pass (are less than) the screening criteria, continue screening. Collect and analyze one sample at maximum expected waste depth and continue sampling as close to 5-ft intervals as field conditions will allow until two consecutive samples pass the screening criteria. If any cuttings or exposed material fail the screening criteria, proceed as in item 1 above.

Analytical sampling will be conducted using a split-spoon sampler per the 100-BC-2 Operable Unit work plan (DOE-RL 1993, Section 5.1.5.2) and EII 5.2, "Soil and Sediment Sampling," Appendix B (WHC 1988a). Soil cuttings will be continuously screened per the criteria stated in Section 3.1, from the surface to the final depth. The boreholes, expected waste depths, and anticipated depth are shown in Table 1.

Table 1. Borehole Expected Waste Depths.

Borehole	Expected waste depth (ft)	Anticipated depth of borehole (ft)[a]
116-C-2A	30	50
116-C-2C	25	50

[a]Based on previous sampling and characteristics of waste sites.

3.4 GEOPHYSICAL LOGGING

Log all boreholes using a spectral gamma logging tool per EII 11.1, "Geophysical Logging" (WHC 1988a). Spectral gamma logging is preferred but, if the spectral gamma logging tool is not available, the gross gamma logging tool will be used.

4.0 ANALYSES

Samples collected for chemical analysis will be analyzed for the target analytes listed in Tables 2 and 3 using Level III SW-846 (EPA 1986) methods for all analytes except radionuclides, which will be analyzed by standard methods as defined in the laboratory statement of work. Estimated quantity of material needed for analyses is shown in Table 4. The laboratory will use existing Level IV methods approved under its contract for radiological analyses. Sample custody will follow the procedures as specified in the 100-BC-2 Operable Unit work plan (DOE-RL 1993, Appendix A, Section 5.1) and EII 5.1, "Chain of Custody" (WHC 1988a).

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

1. Total Activity
2. Radioisotopes
3. TAL
4. Anions
5. Semivolatiles/PCB/Pest.
6. Volatiles.

5.0 QA/QC REQUIREMENTS

Internal quality control samples shall be collected by the sampling scientist as specified in Appendix A, "Quality Assurance Project Plan" (DOE-RL 1993) with the revisions as outlined below. The sampling shall be documented in the sampling logbook per EII 1.5, "Field Logbooks" (WHC 1988a).

1. Collect one duplicate for every 20 soil samples.

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

3. Field blanks and trip blanks are not required.

4. Collect one sample each month from any source of water introduced into the hole during drilling. Only one sample is required for both groundwater and vadose borings. Analyze for the full suite of water parameters (see the 100-BC-5 Operable Unit description of work [WHC 1992] for parameters and volume requirements).

Table 2. Data Quality Objectives for 116-C-2A.

Objectives	Determine nature and vertical extent of contamination.							
Prioritized Data Uses	Determine maximum contaminant concentration to support qualitative risk assessment. Define vertical distribution of contaminants in soil. Determine IRM action.							
Appropriate Analytical Level	Level II Field Screening. Level III EPA methods (1986).							
Target Anlytes (Level II Screen)	Chromium, lead, gross beta, and gross gamma.							
Level of Concern	Two times background[a].							
Required Detection Limit	Two times background.							
Target Analytes (Level III)	Cr[b]	Pb[b]	Co-60[c]	Cs-137[c]	Eu-152[c]	Eu-154[c]	H-3[c]	Sr-90[c]
Level of Concern[d]	400	15[e]	51	27	360	250	14,000	21
Minimum Detection Level[f,g]	40	1.5	5.1	2.7	36	25	1,400	2.1
Critical Samples	One sample at expected waste depth. Two clean samples below lowest contamination. One sample at highest level detected during value screening.							

[a]Background is from uncontaminated area near site.
[b]mg/kg.
[c]pCi/g.
[d]Based on 10^{-6}.
[e]No health-based risk can be calculated; therefore, background threshold value is used.
[f]Method-specific detection limit is specified in Table QAPjP-1 (DOE-RL 1993, Appendix A).
[g]0.1 of level of concern value.

Table 3. Data Quality Objectives for 116-C-2C.

Objectives	Determine nature and vertical extent of contamination.									
Prioritized Data Uses	Determine maximum contaminant concentration to support qualitative risk assessment. Define vertical distribution of contaminants in soil. Determine IRM action.									
Appropriate Analytical Level	Level II Field Screening. Level III EPA methods (1986).									
Target Anlytes (Level II Screen)	Chromium, lead, gross beta, and gross gamma.									
Level of Concern	Two times background.[a]									
Required Detection Limit	Two times background.									
Target Analytes (Level III)	Cr[b]	Pb[b]	Co-60[c]	Cs-137[c]	Eu-152[c]	Eu-154[c]	H-3[c]	Sr-90[c]	Pu-238[c]	Pu-239/240[c]
Level of Concern[d]	400	15[e]	51	27	360	250	14,000	21	3.5	3.5
Minimum Detection Level[f,g]	40	1.5	5.1	2.7	36	25	1,400	2.1	1.0[h]	1.0[h]
Critical Samples	One sample at expected waste depth. Two clean samples below lowest contamination. One sample at highest level detected during value screening.									

[a]Background is from uncontaminated area near site.
[b]mg/kg.
[c]pCi/g.
[d]Based on 10^{-6}.
[e]No health-based risk can be calculated; therefore, background threshold value is used.
[f]Method-specific detection limit is specified in Table QAPjP-1 (DOE-RL 1993, Appendix A).
[g]0.1 of level of concern value.
[h]Maximum achievable detection limit even though not .1 of level of concern value.

Table 4. Potential Analytes.

Analyte	Method	Holding Time	Container/Volume
ICP/AA Metals Mercury Cyanide	SW-846[a] SW-846[a] SW-846[a]	6 mo 23 d 14 d	Glass, 250 mL
Volatiles	SW-846[a]	14 d	Glass, 125 mL
Semivolatiles PCB/pesticides Anions: Sulfate Fluoride Nitrate/nitrite	SW-846[a] SW-846[a] EPA 300[c] EPA 300[c] EPA 353.2	7 d[b] 7 d[b] 28 d 28 d 28 d	Amber glass, 950 mL
Radionuclides: ^{14}C ^{90}Sr Gross alpha Gross beta Gamma spec Alpha spec $^{235,238}U$ $^{239/240}Pu$ ^{241}Am ^{99}Tc	Lab SOP	6 mo	Glass or plastic, 1,000 mL
Total activity (222-S Lab)	Lab SOP	6 mo	Glass or plastic small vial (at least 1 g)

[a]EPA (1986).
[b]For extraction, 40 d after analysis for extraction.
[c]EPA 300/modified per work plan quality assurance project plan.
AA = atomic absorption
ICP = inductively coupled plasma
PCB = polychlorinated biphenyl
SOP = standard operating procedure.

5. Collect equipment blanks at the same frequency as duplicates and analyze for the same constituents as the soil samples. The media shall be silica sand.

6. Collect two background samples within the background site located in Figure 6 and analyze for the constituents identified by the field screening. Analytes of concern are listed in Tables 2 and 3.

6.0 SCHEDULE

The following schedule is for vadose drilling in the 100-BC-2 Operable Unit in 1993. This schedule is subject to change, and the U.S. Department of Energy, Richland Operations Office operable unit manager should be contacted for current status. An Agreement Activity Notification form will be issued at least 5 days prior to the start of field work.

Activity location	Activity dates
116-C-2A Pluto Crib	July 1-14, 1993
116-C-2C Sand Filter	July 15-28, 1993

7.0 CHANGES TO DESCRIPTION OF WORK

Unforseeable major changes to this description of work, such as analyzing different parameters, using different analytical methods, or changing the sampling interval, will be submitted using the Engineering Change Notice form. Copies will be submitted to the lead regulatory agency and appropriate field personnel within 10 working days of the change. Forseeable changes will be submitted to the lead regulatory agency for approval or review prior to deviating from the description of work.

8.0 REFERENCES

DOE-RL, 1993, *Remedial Investigation/Feasibility Study Work Plan for the 100-BC-2 Operable Unit, Hanford Site, Richland, Washington*, DOE/RL-91-07, Decisional Draft, U.S. Department of Energy, Richland, Field Office, Richland Washington.

EPA, 1986, *Test Methods for Evaluating Solid Waste (SW-846)*, Third Edition, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

Taylor, W. E., 1991, *100 Area Low Hazard Characterization Activities Safety Assessment*, WHC-SD-EN-SAD-002, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

WHC, 1987, *Industrial Safety Manual*, WHC-CM-4-3, Vol. 1-3, Westinghouse Hanford Company, Richland, Washington.

WHC, 1988a, *Environmental Investigations and Site Characterization Manual*, WHC-CM-7-7, Westinghouse Hanford Company, Richland, Washington.

WHC, 1988b, *Radiation Protection*, WHC-CM-4-10, Westinghouse Hanford Company, Richland, Washington.

WHC, 1988c, *ALARA Program*, WHC-CM-4-11, Westinghouse Hanford Company, Richland, Washington.

WHC, 1988d, *Environmental Compliance Manual*, WHC-CM-7-5, Westinghouse Hanford Company, Richland, Washington.

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

WHC, 1992, *Description of Work for the 100-BC-5 Groundwater Operable Unit*, WHC-SD-EN-AP-070, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

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Title Description of Work for the 100-BC-2 Vadose Boreholes: 116-C-2A Crib and 116-C-2C Sand Filter

Unclassified Category UC-NA

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