AR TARGET SHEET

The following document was too large to scan as one unit, therefore, it has been divided into sections.

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SECTION: 2 OF 2

DOCUMENT #: 08-AMCP-0047

TITLE: Supplemental Remedial Investigation/Feasibility Study Work Plan for 200 Areas Central Plateau OU, Volumes I and II, DOE/RL-2007-02 Rev 0

Table C-2. Supplemental Data Collection Activities by Operable Unit - Model Groups 2 through 7. (26 Pages)

Waste Site	Operable Unit	Model #	Existing Data							Proposed Supplemental Data Collection Activities						Rationale for Proposed Supplemental Data Collection Activities
			Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Surface Sampling	Geophysical Resistivity Characterization	Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Geophysical Resistivity Characterization	
216-S-10P	200-CS-1	5	1			4									No	Existing data are sufficient for decision making.
200-CS-1 Total			**1**			**4**				**0**	**0**	**0**	**0**	**0**	**0**	
216-A-25	200-CW-1	5	1			16	3					2			No	Existing data are sufficient for decision making; however, Ecology indicated stakeholder concern for the overflow area on the northwest edge of the pond; these data would respond to these stakeholder concerns.
216-B-3	200-CW-1	5	1			5						6+			No	These data would augment existing data and support a more detailed evaluation of a partial removal of the hotspot area around test pit location BP-1; these data may influence the remedy selection.
216-B-3A RAD	200-CW-1	5		1				30							No	Existing data are sufficient for decision making.
216-B-3B RAD	200-CW-1	5		1				26							No	Existing data are sufficient for decision making.
216-B-3C RAD	200-CW-1	5		1				21							No	Existing data are sufficient for decision making.
216-S-16P	200-CW-1 (formerly in 200-CW-2)	5						50				21			No	These activities would provide site-specific data and would allow a more definitive evaluation of partial removal alternative; these data may influence the remedy selection from the current alternative identified in the draft 200-CW-5/2/4/200-SC-1 FS.
216-S-17	200-CW-1 (formerly in 200-CW-2)	5										15			No	These activities would provide site-specific data and would allow a more definitive evaluation of partial removal alternative; these data may influence the remedy selection from the current alternative identified in the draft 200-CW-5/2/4/200-SC-1 FS.
UPR-200-W-124	200-CW-1 (formerly in 200-CW-2)	5										3			No	These activities would be contingent on finding contamination at the drive point location near the west end of 216-S-17.

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216-T-4A	200-CW-1 (formerly in 200-CW-4)	5													No	The pond bottom was scraped and placed in Trench 27 of Burial Ground 218-W-2A; this would represent the majority of the small inventory received by the pond; remaining contamination is expected to be minimal and could be addressed through the action at the burial ground; no data collection activities are recommended or considered required for decision making; the waste site will be moved to Model Group 1.
216-T-4B	200-CW-1 (formerly in 200-CW-4)	5										4			No	The pond and trench leading to the pond (within the area of the 218-W3-AE Burial Ground) are expected to have minimal contamination; these activities would provide site-specific data that could be used to support a CERCLA decision for the pond separate from the RCRA decision for the burial ground TSD.
216-U-10	200-CW-1 (formerly in 200-CW-5)	5		1	10	1	3	5			1 (140 ft)	8	3		No	The borehole would help resolve data quality issues associated with the previous borehole; the test pits would permit a visual inspection and sampling of the organic layer associated with the bottom of the pond that tends to concentrate the contamination; the direct pushes would provide data on the rest of the pond to give a pond-wide data set that could be used to address stakeholder concerns and uncertainties on inventory.
216-U-11	200-CW-1 (formerly in 200-CW-5)	5						2				14			No	These data would augment existing data and support a more detailed evaluation of a partial removal alternative; the data may influence the remedy selection from the current alternative identified in the draft 200-CW-5/2/4/200-SC-1 FS
200-CW-1 Total (M-015-38B, 05/31/2009)			**2**	**4**	**10**	**22**	**6**	**134**		**0**	**1**	**73**	**3**	**0**	**0**	
216-Z-11	200-CW-5	3	1		20		2								No	Early agreement was reached that supplemental data are not required.
216-Z-19	200-CW-5	3						272							No	Early agreement was reached that supplemental data are not required.
216-Z-1D	200-CW-5	3						90							No	Early agreement was reached that supplemental data are not required.

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216-Z-20	200-CW-5	3													No	Early agreement was reached that supplemental data are not required.
200-CW-5 Total (M-015-40D, 4/30/2008)			1		20		2	363								
216-A-30	200-SC-1	6								1					Yes	The analogous relationship with 216-U-10 is somewhat uncertain. Inventory information would suggest potential for groundwater impacts associated with chromium, fluoride, and/or nitrate. Geophysical resistivity characterization would support evaluation of the lateral extent of potential elevated conductivity and a deep borehole would provide site-specific data on nature and vertical extent and correlation data for the geophysical resistivity characterization results. The data from the 216-A-30 borehole would be used as analogous for 216-A-37-2 and 216 A-6 and associated unplanned releases because 216-A-37-2 and 216-A-6 received the same waste as 216-A-30. 216-A-6 was ultimately replaced by 216-A-30 and 216-A-37-2 replaced 216-A-30.
216-A-37-2	200-SC-1	6												299-E25-21, 299-E25-23, 299-E25-24	Yes	Data collected from 216-A-30 will be used to evaluate this trench; logging of existing wells will provide opportunistic site-specific information on contaminant nature and distribution
216-A-6	200-SC-1	6													Yes (opportunistic)	Existing data and data from 216-A-30 will be used to evaluate this site

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216-B-55	200-SC-1	6										6		299-E28-13	No	This crib was assigned to 216-U-10 in the Draft A FS for 200-CW-5/2/4/200SC-1. 216-U-10 has a larger inventory of several constituents than does 216-B-55. While the analogous relationship with 216-U-10 would bound the decision process, supplemental data at 216-B-55 may permit a stronger analysis of no action and MESC/MNA/IC alternatives and may permit lesser alternative than the analogous evaluation. Supplemental data would provide information on the nature and extent of contamination; because the crib is large, the supplemental data would allow assessment of partial removal alternative and permit a more accurate evaluation of contaminant volume and cost.
216-S-5	200-SC-1	6					1								Yes	Existing information is sufficient for decision making for the shallow zone; geophysical resistivity characterization would provide information on elevated conductivity that may be associated with deeper contamination; the borehole at 216-S-6 would provide information to validate the geophysical resistivity characterization and to evaluate protection of groundwater at 216-S-5 as well.

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			Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Surface Sampling	Geophysical Resistivity Characterization	Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Geophysical Resistivity Characterization	
216-S-6	200-SC-1	6									1				Yes	The analogous relationship identified in the Draft A 200-CW-5/2/4/200-SC-1 FS between 216-U-10 (representative site) and 216-S-6 is somewhat uncertain; while inventory, geophysical logs, and analogous relationships may support shallow vadose zone decision making, geophyscial resistivity characterization surveys would provide indication of deeper zones of elevated conductivity that may be associated with contamination. A shallow borehole would help correlate with the geophysical resistivity characterization, would provide information on pore water contamination, and would support the protection of groundwater evaluation for both the 216-S-6 and 216-S-5 Cribs. Supplemental data would provide site-specific information on remaining inventory of uranium and nitrate in the soil column that may impact groundwater.
216-T-36	200-SC-1	6							Yes	1*	TBD				Complete	Data from a borehole planned for the characterization of the 200-ZP-1 groundwater OU in this area will be used to help evaluate the potential for this crib to be contributing to groundwater contamination. If the groundwater well shows the indication of contaminant contribution from this site, then a shallow borehole will be drilled to acquire site-specific Information on nature and vertical extent within the crib. These data, along with the data from the groundwater well, would be used to better understand the current groundwater plume in the area and the protection of groundwater from contaminants remaining in the vadose zone
UPR-200-E-19	200-SC-1	6													Yes (opportunistic)	See 216-A-6; this unplanned release site is associated with and will be addressed with 216-A-6
UPR-200-E-21	200-SC-1	6													Yes (opportunistic)	See 216-A-6; this unplanned release site is associated with and will be addressed with 216-A-6.

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			Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Surface Sampling	Geophysical Resistivity Characterization	Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Geophysical Resistivity Characterization	
UPR-200-E-29	200-SC-1	6													Yes (opportunistic)	See 216-A-6; this unplanned release site is associated with and will be addressed with 216-A-6.
200-SC-1 Total (M-015-40E, 12/31/2010)							**1**		**1**	**2**	**2**	**6**	**0**	**4**	**8**	
216-T-27	200-LW-1	2					1							299-W14-53	Yes	Newer log in well 299-W14-53 would provide information on contaminant movement; geophysical resistivity characterization would provide information on deeper contaminants that may be associated with groundwater plume in area and would help resolve modeling issues for the area; analogous relationship with 216-T-26 and 216-T-28 is sufficient for decision making.
216-T-28	200-LW-1	2	1				5								Yes	See 216-T-27.
216-T-34	200-LW-1	6									1				Yes	Existing data and inventory support decision making; however, the representative site (216-Z-7) for the 216-T-34 Crib has greater Cs-137, plutonium, and uranium inventory. Geophysical resistivity characterization would provide information to address uncertainty on groundwater protection due to nitrate inventory; shallow borehole would provide information on nature of contamination, including plutonium, in the shallow zone to support risk assessment; data also would support evaluation at 216-T-35 as an analogous site to 216-T-34.
216-T-35	200-LW-1	6												299-W11-18	Yes	Existing geophysical logging data and supplemental data collected from 216-T-34 will be used to support decision making at 216-T-35.
216-A-15	200-LW-2	2							Yes					Vent riser, if possible	Complete	Low volume and inventory; geophysical logging is opportunistic method to gain site-specific data; decision can be made on analogous relationships and inventory.
216-B-10A	200-LW-2	2										1			Yes (opportunistic)	The 216-B-10A site received a lot of effluent with a small inventory; however, site-specific data may help support evaluation and selection of a lesser alternative, such as MESC/MNA/IC, and would provide better data for balancing the decision making between leave in place and remove alternatives.

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216-B-10B	200-LW-2	2													Yes (opportunistic)	Received only 28,000 L; analogous to 216-B-10A; so data from 216-B-10A would support decision making at 216-B-10B
216-B-6	200-LW-2	2								1*					Yes	Uncertainty associated with the current groundwater contamination and the potential for groundwater impacts due to vadose zone contamination are not adequately addressed by the analogous relationship, because the assigned representative site does not have a similar chromium inventory. A monitoring well is needed near this site for the 200-BP-5 groundwater OU; this well will be a combined groundwater and vadose zone well. It will provide vadose zone data that can be used to support the groundwater protection evaluation in the FS. Geophysical resistivity characterization will help locate the well and will provide information on the lateral extent.
216-S-20	200-LW-2	2	1				4								No	Existing data are sufficient to support decision making.
216-S-26	200-LW-2	6													No	Site is identified in draft FS as an RTD site; no supplemental data are required to support RTD determination.
216-T-2	200-LW-2	2													No	Analogous relationship is sufficient for decision making; received 6,000 m^3 of waste and a small inventory.
216-T-8	200-LW-2	6										2			No	This crib is preliminarily assigned to 216-T-28, which has a larger inventory of several constituents. While the analogous relationship with 216-T-26 would bound the decision process, supplemental data at 216-T-8 may permit a stronger analysis of no action and MESC/MNA/IC alternatives and may permit lesser alternative than the analogous evaluation.

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			Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Surface Sampling	Geophysical Resistivity Characterization	Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Geophysical Resistivity Characterization	
216-Z-16	200-LW-2	6					1			1					Yes	SIM inventory indicates a large volume of fluoride went to this crib; the impacts to groundwater associated with fluoride are uncertain; geophysical resistivity characterization would provide an indication of potential elevated conductivity that may be associated with vadose zone contamination and elevated moisture; based on the geophysical resistivity characterization, additional data collection activities may be required to assess the impacts.
216-Z-17	200-LW-2	6												299-W15-204 moisture log	No	This site will be evaluated based on data collected at 216-Z-16, which received a similar inventory of fluoride.
216-Z-7	200-LW-2	4	1		6		7							Neutron in W15-62, -63, -64, -76, -77, and -78	Yes	Existing data are sufficient for decision making; supplemental data further define extent and help refine cost estimates related to high plutonium removal and disposal.
200-LW-1/200-LW-2 Total (M-015-46B,			**3**		**6**		**18**			**2**	**1**	**3**	**0**	**9**	**9**	
200-E-102	200-MW-1	4							Yes			1			Complete	200-E-102 is analogous to 216-A-4 in terms of contaminants because it was used to dispose of soils contaminated when 216-A-4 plugged. Groundwater impacts are not expected to be significant because the waste discharged was soils. Therefore, the analogous relationship is sufficient for decision making; supplemental data support evaluation of geophysical resistivity characterization in area south of PUREX and provide information on the use and depth of investigation of hydraulic hammer south of PUREX.

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216-A-2	200-MW-1 (formerly in 200-PW-3)	4					1		Yes	1		1			Complete	216-A-2 Crib is very near to and was constructed around the same time as 216-A-4. Investigation activities initiated at 216 A-4 identified uncertainty associated with unexpectedly high contamination that was not in line with the inventory information. Based on the uncertainty in the contamination at 216-A-4 and its proximity to 216-A-2, site-specific supplemental data from 216-A-2 will help reduce potential uncertainty at that site associated with the nature of contamination and will provide a better understanding of crib risks than the analogous relationship to either 216-A-4 or 216-A-8 (analogous assignment has not been made for 216-A-2, but 216-A-4 and 216-A-8 are likely representative sites for 216-A-2); supplemental data would be considered acceleration of confirmatory sampling. Geophysical resistivity characterizaton and data from 216-A-4 will provide additional information on extent of contamination for the area south of PUREX and will be used to help evaluate alternatives at 216-A-2 as well as 216-A-4.
216-A-21	200-MW-1	6					1		Yes			1			Complete	Analogous relationship with 216-A-4 is bounding for 216-A-21, which was built to replace 216-A-4. Because of the uncertainty at 216-A-4, a direct push at 216-A-21 will provide site-specific information to better define the relationship with 216-A-4.
216-A-27	200-MW-1	6					2		Yes						Complete	Existing information and analogous relationship are sufficient to support decision making; this site is the replacement crib for 216-A-21, which replaced 216-A-4.

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216-A-4	200-MW-1	4		1	1		1		Yes	1					Complete	Data are needed with depth to meet requirements of existing work plan. Samples have been collected in the 0 to 15-ft zone; these data are augmented with geophysical logging data. No additional data are needed for this zone. The SAP for the step-off borehole at 216-A-4 specifies additional data collection down the borehole that will support future modeling efforts and provide detailed assessment of contamination in pore water with depth and its potential impact on groundwater. The need for additional data beyond the 216-A-4 borehole will be assessed once the data are available for review. Data on plutonium extent exist from the sampling and logging already conducted at the site. Additional information will be gained from the step-off borehole and passive neutron logging will be attempted in the 299-E24-54 borehole in the northeast corner of the crib. These data will provide an understanding of the distribution of the plutonium. Additional needs will be assessed once these data are collected.
216-B-4	200-MW-1	2												Log reverse well if possible	Yes (opportunistic)	Low volume and inventory; opportunistic method to gain site-specific data; decision can be made on analogous relationships and inventory
216-C-2	200-MW-1	2		1 (sediment sample from reverse well											Yes (opportunistic)	Existing data are sufficient to support decision making
200-MW-1 Total (M-015-44B,				**2**	**1**		**4**		**4**	**2**	**0**	**2**	**0**	**1**	**2**	
216-Z-1&2	200-PW-1	4													No	Existing data sufficient for decision making.
216-Z-12	200-PW-1	4	3				9								No	Existing data sufficient for decision making
216-Z-18	200-PW-1	4					4								No	Existing data sufficient for decision making.
216-Z-1A	200-PW-1	4	2	14	15+		3								No	Existing data sufficient for decision making.
216-Z-3	200-PW-1	4					2								No	Existing data sufficient for decision making.

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216-Z-9	200-PW-1	4	7	2	15+		3								No	Existing data sufficient for decision making.
241-Z-361	200-PW-1	4						Sludge							No	Sludge has been sampled; minimal likelihood of leaks; no supplemental data needed.
UPR-200-W-110	200-PW-1	3													No	Early agreement that supplemental data are not required.
216-A-24	200-PW-3	6					23								Yes	The relationship with 216-A-8, a representative site for this OU group, is strong enough to support decision making at 216-A-24. Inventories and types of contaminants are similar and the 216-A-24 Crib was used to replace the 216-A-8 Crib. Information on nature and extent of contamination can be assessed using the information from the 216-A-8 Crib. To augment the understanding of deeper contamination at 216-A-8 and 216-A-24, along with other sites in the same area, geophysical resistivity characterization is proposed for evaluating the presence of potential deeper zones of elevated conductivity.
216-A-31	200-PW-3	2							Yes						Complete	Very low volume and inventory received.
216-A-7	200-PW-3	6												299-E25-54	Yes	Uncertainty exists in the organic inventory, the current concentration, and potential impact on groundwater. This site has a large Cs-137 inventory as well as the organic, which is a unique combination. This site is similar to 216-A-8 in inventory, but did receive a different waste stream. The impacts on contaminant distribution should be investigated to support the remedial decision making. Because well 299-E25-54 is located within the site boundaries, logging this well would provide site-specific spectral gamma data in the shallow zone.

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216-A-8	200-PW-3	6	1		5		6								Yes	Existing data are sufficient to support decision making. Data on the nature of contamination were collected during the RI from the borehole; information on the extent of organics was evaluated through vapor sampling from new and existing holes. Information on the extent of Cs-137 and other gamma emitters also was collected through geophysical logging activities. Geophysical resistivity characterization surveys are being proposed by both groundwater and waste sites for this area. Geophysical resistivity characterization surveys will provide information on zones of elevated conductivity, if present, that may be indicative of potential impacts to groundwater. The geophysical resistivity characterization can be evaluated using the existing data from the borehole at 216-A-8.
UPR-200-E-56	200-PW-3	6													No	See 216-A-24; site is associated with and will be addressed by 216-A-24
216-Z-10	200-PW-6	7													No	Inventory and analogous data could be used to support decision making. Plutonium and americium are not expected to impact groundwater and the contamination is too deep for surface exposure by humans or biota. Because of low inventory and site type (i.e., reverse well with 6-in. diameter), potential for intrusion is very low.

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216-Z-5	200-PW-6	2					6								No	The analogous site relationship with 216-Z-7 is strong because the waste stream that went to 216-Z-5 was diverted to 216-Z-7; therefore, the analogous site relationship supports decision making. According to SIM, 216-Z-7 received 504.8 g of Pu-239 and 39.97 g Pu-240 versus the 29.63 g Pu-239 and 1.999 g Pu-240 for 216-Z-5. The maximum concentration found at 216-Z-7 was 470,000 pCi/g Pu-239/240. Based on these ratios, Pu concentrations at 216-Z-5 should be an order of magnitude less than 216-Z-7; therefore, concentrations may be below 100 nCi/g, which can strongly influence decision making.
216-Z-8	200-PW-6	4	3				7								No	Small site; contaminants to ~30 ft; no supplemental data needed for decision making
241-Z-8	200-PW-6	4						Sludge							No	Sludge has been sampled; minimal likelihood of leaks; no supplemental data needed
200-PW-1 Total (M-015-45B, 9/30/2007)			**16**	**16**	**35**		**63**	**2**	**2**	**0**	**0**	**0**	**0**	**1**	**3**	
216-A-10	200-PW-2	2	1		5		4		Partial						Yes	Existing data from remedial investigation is sufficient for decision making for the upper vadose zone; however, the geophysical resistivity characterization south of PUREX indicates potentially high conductivity in the area of the 216-A-10 Crib; geophysical resistivity characterization over the rest of the crib would provide better understanding of the distribution of the conductivity plume; data from 216-A-4 and A-5 Cribs would be used in conjunction with the 216-A-10 Crib data to better understand potential for deep contamination and associated risks to groundwater.

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216-A-19	200-PW-2	6	1												Yes	Existing information are sufficient to support decision making. Geophysical resistivity characterization surveys are proposed for the 216-A-8 and 216-A-24 sites; these surveys would cover 216-A-19 and would help reduce uncertainty associated with deeper vadose zone contamination. Based on the preferred alternative of RTD as identified in the draft FS for 200-PW-2/4, lateral extent can be determined during design or through the observational approach. Supplemental data would not likely change the preferred alternative.
216-A-36A	200-PW-2	2							Yes						Complete	Geophysical resistivity characterization has already been conducted over the northern part of the 216-B-36A&B Cribs; geophysical resistivity characterization would be completed over the entire crib area to define the outer limit of the conductivity plume south of PUREX; the need for additional data will be assessed following completion of the 216-A-4 and 216-A-2 boreholes.
216-A-36B	200-PW-2	2	1				3		Partial						Yes	Existing data from remedial investigation are sufficient for decision making for the upper vadose zone; however, the geophysical resistivity characterization south of PUREX indicates potentially high conductivity in the area of the A-36A&B Cribs; geophysical resistivity characterization has been run over a portion of the 216-A-36A&B cribs; geophysical resistivity characterization over the rest of the crib area would provide better understanding of the distribution of the conductivity plume; see 216-A-36A

Table C-2. Supplemental Data Collection Activities by Operable Unit - Model Groups 2 through 7. (26 Pages)

Waste Site	Operable Unit	Model #	Existing Data							Proposed Supplemental Data Collection Activities						Rationale for Proposed Supplemental Data Collection Activities
			Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Surface Sampling	Geophysical Resistivity Characterization	Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Geophysical Resistivity Characterization	
216-A-5	200-PW-2	2					4		Yes	1		1			Complete	Because of the contamination uncertainties identified at the 216-A-4 Crib and the apparent contribution by 216-A-5 to the elevated conductivity plume identified by geophysical resistivity characterization surveys on the western side of the south of PUREX area, supplemental data would help provide a better understanding of deep zone contaminants and potential to impact groundwater. These data also would support validation of the geophysical resistivity characterization results and development of a south of PUREX conceptual site model to support all the FS efforts in this area. A drive point will be installed before the borehole to obtain spectral gamma information to support health and safety and radiological control planning, and to provide some additional data on extent.
216-B-12	200-PW-2	2	1				3			1*					Yes	The reported inventory for total uranium is 15,112 kg and for nitrate is 2.8 million kg. This inventory could present a substantial risk to groundwater; however, few groundwater monitoring wells are available for analysis. The data collected during the initial remedial investigation are not reflective of the inventory, so an uncertainty exists between inventory and sampling data. The need for a groundwater monitoring well in the area has been identified through the 200-BP-5 OU DQO efforts. Opportunistic data collection for vadose zone samples associated with a planned groundwater monitoring well, including assessment of pore water contamination in the vadose zone, will be used to augment the FS evaluation of protection of groundwater. Geophysical resistivity surveys will be used to evaluate extent and to help locate the monitoring well. The results from the borehole will help resolve the inconsistencies between the existing borehole data and the inventory information.

Table C-2. Supplemental Data Collection Activities by Operable Unit - Model Groups 2 through 7. (26 Pages)

Waste Site	Operable Unit	Model #	Existing Data							Proposed Supplemental Data Collection Activities						Rationale for Proposed Supplemental Data Collection Activities
			Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Surface Sampling	Geophysical Resistivity Characterization	Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Geophysical Resistivity Characterization	
216-C-1	200-PW-2	6								1*					Yes	This site has one of the largest identified chromium inventories; the 216-C-1 chromium inventory is an order of magnitude higher than the chromium inventory of its representative site (216-A-10). Additional data on nature and extent of potential vadose plumes of mobile contaminants is needed to assess protection of groundwater in this area. The combination of geophysical resistivity characterization and a deep borehole will provide information on nature and on vertical and lateral extent, which will support a stronger modeling effort and risk assessment in the RI/FS documents. The borehole will be a combined groundwater and vadose zone data collection activity to support both the groundwater and source OUs. Analogous relationships and inventory are sufficient to support decision making on the shallow contamination.
216-S-1&2	200-PW-2	4		11			1			1		2		W22-67	Yes	A large inventory of mobile contaminants was discharged to these cribs. An assessment of the extent of deeper contaminants is needed to support protection of groundwater evaluation. Geophysical resisitivity characterization will give an indication of the presence of a conductivity plume that likely could be associated with the nitrate and other mobile constituents. A follow-on DQO process to evaluate the need for further characterization needs based on the results of the geophysical resistivity characterization will be conducted as needed. The inventory of plutonium discharged to these cribs may result in concentrations above 100 nCi/g. This is an uncertainty that can influence the evaluation of alternatives. Determining the extent of the plutonium contamination will support a better evaluation of protectiveness, disposal options, and costs. Two direct pushes are proposed to evaluate the extent of plutonium at these cribs.

Table C-2. Supplemental Data Collection Activities by Operable Unit - Model Groups 2 through 7. (26 Pages)

Waste Site	Operable Unit	Model #	Existing Data							Proposed Supplemental Data Collection Activities						Rationale for Proposed Supplemental Data Collection Activities
			Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Surface Sampling	Geophysical Resistivity Characterization	Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Geophysical Resistivity Characterization	
216-S-7	200-PW-2	2	1				5								No	Existing data are sufficient to support decision making.
UPR-200-W-36	200-PW-2	2													Yes (opportunistic)	Included with 216-S-1&2 in Model Group 4.
216-A-37-1	200-PW-4	6	1				3								Yes	Existing data are sufficient for decision making.
216-A-45	200-PW-4	2					3							299-E17-12, -13, -53, and -54	Yes	Very low volume and inventory received; logs would provide site-specific information for remedial alternative evaluation.
216-S-23	200-PW-4	2					4								No	Site received large volume with very low inventory;
200-PW-2/200-PW-4 Total (M-015-43D,			**6**	**11**	**5**		**30**		**1**	**4**	**0**	**3**	**0**	**5**	**9**	
216-B-11A&B	200-PW-5	6					2								Yes*	Existing data are sufficient for decision making. Geophysical resistivity characterization is being conducted as part of the 200-BP-5 OU RI/FS; the source OUs in the area will also use the data.
216-B-50	200-PW-5	2		3											Yes*	Part of BY Cribs; see 216-B-43.
216-B-57	200-PW-5	2	1	2											Yes*	Site is covered with Hanford Barrier; data collected under 200-BP-1 and as part of barrier monitoring are sufficient for decision making. Geophysical resistivity characterization is being conducted as part of the 200-BP-5 OU RI/FS; the source OUs in the area will also use the data.
216-B-62	200-PW-5	6					8							299-E28-85, 299-E28-86, 299-E28-87, 299-E28-88, 299-E28-90; 299-E28-18 and 299-E28-21, if possible	No	Existing information in concert with logging of existing wells provides sufficient data for decision making as Cs-137 is the major contaminant at this site; this site is directly analogous to 216-B-12, which was characterized under 200-PW-2/4 Work Plan.

Table C-2. Supplemental Data Collection Activities by Operable Unit - Model Groups 2 through 7. (26 Pages)

Waste Site	Operable Unit	Model #	Existing Data							Proposed Supplemental Data Collection Activities						Rationale for Proposed Supplemental Data Collection Activities
			Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Surface Sampling	Geophysical Resistivity Characterization	Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Geophysical Resistivity Characterization	
216-S-13	200-PW-5 (formerly in 200-PW-3)	2								1				299-W22-21	Yes	Analogous relationships with other sites (such as 216-S-7 or other 200-PW-1/3/6 sites) and inventory data would support decision making; however, uncertainty exists in the chromium data between current SIM inventory and inventory data from past estimates. Supplemental data could help alleviate the uncertainty and would be used to support a better evaluation of protection of groundwater, especially for the chromium. As part of the Supplemental Work Plan DQO, this site was identified to be reassigned to the 200-PW-5 OU to allow additional time for completing the borehole.
216-S-14	200-PW-5 (formerly in 200-PW-3)	6													No	Existing information and data from 216-S-13 borehole will be used to evaluate waste site; hexone was the main contaminant and is not expected to remain in the soils; 216-S-13 also received hexone along with other contaminants.
216-S-21	200-PW-5	2										1		299-W23-63	No	The analogous relationship and inventory data are sufficient to support decision making; however, supplemental data may support a lesser alternative (such as MESC/MNA/IC). Inventory data do not suggest groundwater protection issue. Cesium-137 is the main contaminant identified in the SIM inventory. Nearby borehole logging indicates background levels for gamma emitters. Logging the existing borehole in the crib and sampling at the crib bottom would provide confirmatory data that may support stronger evaluation and potential selection of a lesser remedy.
216-S-9	200-PW-5	6												299-W22-25, 299-W22-26	Yes	Existing information is sufficient for decision making for the shallow zone; geophysical resistivity characterization would provide information on elevated conductivity in the deeper vadose zone that may be associated with nitrate contamination; geophysical logging of existing boreholes would provide additional data on extent of contamination.

Table C-2. Supplemental Data Collection Activities by Operable Unit - Model Groups 2 through 7. (26 Pages)

Waste Site	Operable Unit	Model #	Existing Data							Proposed Supplemental Data Collection Activities						Rationale for Proposed Supplemental Data Collection Activities
			Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Surface Sampling	Geophysical Resistivity Characterization	Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Geophysical Resistivity Characterization	
216-B-42	200-TW-1	6					1			1					Yes*	A borehole at this site would reduce uncertainty associated with differences in waste streams between 216-B-42 and 216-B-38; depth of borehole to be dependent on geophysical resistivity characterization results. Geophysical resistivity characterization is being conducted as part of the 200-BP-5 OU RI/FS; the source OUs in the area will also use the data.
216-B-43	200-TW-1	2	1	2			1			2*					Yes*	The upper vadose zone was extensively investigated; data on the deeper vadose zone were collected but were not as extensive. Existing data are likely sufficient to support decision making for the waste sites; however, the groundwater in the area has some uncertainties associated with increasing contamination levels. To obtain a better understanding of the deep vadose zone and the groundwater, supplemental information on deep vadose zone nature and extent would reduce uncertainty. Geophysical resistivity characterization will supply additional extent information and will help support placement of boreholes that will be used to obtain deep vadose zone information on nature and extent and provide groundwater monitoring points. Geophysical resistivity characterization is being conducted as part of the 200-BP-5 OU RI/FS; the source OUs in the area will also use the data. The geophysical resistivity characterization activities were initiated in the fall of 2006. The data from these activities will be used to augment the evaluation of this set of cribs in the FS process. These data would constitute an acceleration of confirmatory sampling for the BY Cribs. This proposed boreholes will be drilled around the B-43 through B-50 as combined groundwater and source data collection activities.
216-B-44	200-TW-1	2		3			2								Yes*	Part of BY Cribs; see 216-B-43.
216-B-45	200-TW-1	2		3			2								Yes*	Part of BY Cribs; see 216-B-43.
216-B-46	200-TW-1	2		3			2								Yes*	Part of BY Cribs; see 216-B-43.

Table C-2. Supplemental Data Collection Activities by Operable Unit - Model Groups 2 through 7. (26 Pages)

Waste Site	Operable Unit	Model #	Existing Data							Proposed Supplemental Data Collection Activities						Rationale for Proposed Supplemental Data Collection Activities
			Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Surface Sampling	Geophysical Resistivity Characterization	Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Geophysical Resistivity Characterization	
216-B-47	200-TW-1	2		3			1								Yes*	Part of BY Cribs; see 216-B-43.
216-B-48	200-TW-1	2		3			1								Yes*	Part of BY Cribs; see 216-B-43.
216-B-49	200-TW-1	2	1	2											Yes*	Part of BY Cribs; see 216-B-43.
216-BY-201	200-TW-1	7													Yes*	Existing data are sufficient to support decision making.
216-T-18	200-TW-1	4					1					4			Yes	The analogous relationship with 216-T-26 is sufficient to support decision making. Inventory does not imply significant groundwater risks; however, opportunity exists to extend the geophysical resistivity characterization proposed for 216-T-26, 216-T-27, and 216-T-28 to cover 216-T-18. This would provide confirmatory information on the deeper vadose zone for 216-T-18. In addition, 216-T-18 only received a small volume, which would not indicate a substantial threat to groundwater. Supplemental information on the nature and extent of plutonium may provide a stronger evaluation of protectiveness, disposal options, and cost. The direct pushes would help establish the extent of plutonium at the crib. These data also may permit selection of a lesser or different alternative. These data collection activities would constitute accelerated confirmatory sampling activities.
216-T-19	200-TW-1 (formerly in 200-PW-1)	6					1			1					Yes	Supplemental data on the nature and extent of contamination are needed to address uncertainties associated with protection of groundwater and with unexpected contamination from a nearby borehole (found during drilling); geophysical resistivity characterization will provide extent of elevated conductivity and borehole will provide information on nature of contamination in the crib and in the pore water.

Table C-2. Supplemental Data Collection Activities by Operable Unit - Model Groups 2 through 7. (26 Pages)

Waste Site	Operable Unit	Model #	Existing Data							Proposed Supplemental Data Collection Activities						Rationale for Proposed Supplemental Data Collection Activities
			Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Surface Sampling	Geophysical Resistivity Characterization	Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Geophysical Resistivity Characterization	
216-T-26	200-TW-1	2	1				2								Yes	Existing data are sufficient for decision making; however, supplemental data may provide information on lateral extent and support a stronger basis for protection of groundwater evaluation. Geophysical resistivity characterization surveys would provide information on lateral extent of potential elevated conductivity plume. The nature of the conductivity plume would be assessed based on the existing borehole data. Because well 299-W14-53 was logged before waste discharge, a new geophysical log would provide information on the impacts of the waste discharge on vadose contaminant concentrations.
UPR-200-E-9	200-TW-1	6													Yes* (Opportunistic)	Regulators agreed no supplemental data needed to support decision making; requested site be moved to 200-MG-2.
200-TW-1/200-PW-5 Total (M-015-42D,			**4**	**24**			**24**		**2**	**5**	**0**	**5**	**0**	**11**	**18**	
200-E-45	200-TW-2	7													Yes*	Site is associated with 216-B-8 and will be addressed with 216-B-8; no supplemental data are needed for 200-E-45.
200-W-52	200-TW-2	4							Yes						Complete	Site is associated with 216-T-7; supplemental activities are identified under 216-T-7.
216-B-35	200-TW-2	6					1								Yes*	See 216-B-38; existing information and geophysical resistivity characterization would provide sufficient information on nature and extent of contamination.
216-B-36	200-TW-2	6					2								Yes*	See 216-B-38; existing information and geophysical resistivity characterization would provide sufficient information on nature and extent of contamination.
216-B-37	200-TW-2	6					3								Yes*	See 216-B-38; existing information and geophysical resistivity characterization would provide sufficient information on nature and extent of contamination.

Table C-2. Supplemental Data Collection Activities by Operable Unit - Model Groups 2 through 7. (26 Pages)

Waste Site	Operable Unit	Model #	Existing Data							Proposed Supplemental Data Collection Activities						Rationale for Proposed Supplemental Data Collection Activities
			Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Surface Sampling	Geophysical Resistivity Characterization	Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Geophysical Resistivity Characterization	
216-B-38	200-TW-2	6	1		5		2								Yes*	Site was characterized under the 200-TW-1/2/200-PW-5 Work Plan; existing information and geophysical resistivity characterization would provide sufficient information on nature and extent of contamination. Geophysical resistivity characterization is being conducted as part of the 200-BP-5 OU RI/FS; the source OUs in the area will also use the data.
216-B-39	200-TW-2	6													Yes*	See 216-B-38; existing information and geophysical resistivity characterization would provide sufficient information on nature and extent of contamination.
216-B-40	200-TW-2	6													Yes*	See 216-B-38; existing information and geophysical resistivity characterization would provide sufficient information on nature and extent of contamination.
216-B-41	200-TW-2	6					1								Yes*	See 216-B-38; existing information and geophysical resistivity characterization would provide sufficient information on nature and extent of contamination.
216-B-5	200-TW-2	7													No	Existing data are sufficient to support decision making.

Table C-2. Supplemental Data Collection Activities by Operable Unit - Model Groups 2 through 7. (26 Pages)

Waste Site	Operable Unit	Model #	Existing Data							Proposed Supplemental Data Collection Activities						Rationale for Proposed Supplemental Data Collection Activities
			Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Surface Sampling	Geophysical Resistivity Characterization	Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Geophysical Resistivity Characterization	
216-B-7A&B	200-TW-2	4	1				5					3		E33-18	Yes*	The extent of plutonium at concentrations above 100 nCi/g is significant to the decision process in terms of balancing costs for removal and disposal against costs for capping and long-term maintenance and for balancing worker risk against long-term risks. Logs in nearby existing wells show Cs-137 has spread beyond the waste-site boundaries. Supplemental data collection activities would define the extent of plutonium movement and provide a better understanding of plutonium distribution and volume, especially in relation to concentrations above 100 nCi/g. geophysical resistivity characterization would provide information on potential elevated conductivity, which may be indicative of elevated moisture and associated contamination. This information would support an understanding of the extent of deeper constituents. Geophysical resistivity characterization is being conducted as part of the 200-BP-5 OU RI/FS; the source OUs in the area will also use the data.
216-B-8	200-TW-2	6					7			2*		1			Yes*	Groundwater wells being planned near 216-B-8 will be sampled to obtain vadose zone information; a direct push will provide information on the extent of contamination; the geophysical resistivity characterization information will help locate both the groundwater wells and the direct push. Geophysical resistivity characterization is being conducted as part of the 200-BP-5 OU RI/FS; the source OUs in the area will also use the data.
216-B-9	200-TW-2	6					12								No	Existing data are sufficient for decision making.
216-T-14	200-TW-2	6					1		Yes						Complete	See 216-T-15.

Table C-2. Supplemental Data Collection Activities by Operable Unit - Model Groups 2 through 7. (26 Pages)

Waste Site	Operable Unit	Model #	Existing Data							Proposed Supplemental Data Collection Activities						Rationale for Proposed Supplemental Data Collection Activities
			Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Surface Sampling	Geophysical Resistivity Characterization	Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Geophysical Resistivity Characterization	
216-T-15	200-TW-2	6							Yes			4			Complete	Existing logging data provide some information on the extent of the shallow contamination. Direct pushes in the 216-T-15 Trench would augment the existing information and provide a stronger analysis of the partial removal alternative. Recently drilled groundwater wells will provide information on the deeper contamination; existing geophysical resistivity characterization surveys will be used in coordination with other data sources to enhance the understanding of the contamination problem at the 216-T-14 through 216-T-17 trenches.
216-T-16	200-TW-2	6							Yes						Complete	See 216-T-15.
216-T-17	200-TW-2	6							Yes						Complete	See 216-T-15.
216-T-21	200-TW-2	6					1								Yes	Existing logging data provide information on the extent of the shallow contamination. The analogous relationship to the 216-T-15 and 216-B-38 waste sites would be used in combination with the geophysical resistivity characterization to evaluate the 216-T-21 through 216-T-25 trenches.
216-T-22	200-TW-2	6					2								Yes	See 216-T-21.
216-T-23	200-TW-2	6					1								Yes	See 216-T-21.
216-T-24	200-TW-2	6					2								Yes	See 216-T-21.
216-T-25	200-TW-2	6					1								Yes	See 216-T-21.
216-T-3	200-TW-2	7								1					Yes (opportunistic)	Existing data for this site are limited; a deep borehole would provide information on the plutonium concentrations and would support a better risk assessment and evaluation of protectiveness.

Table C-2. Supplemental Data Collection Activities by Operable Unit - Model Groups 2 through 7. (26 Pages)

Waste Site	Operable Unit	Model #	Existing Data							Proposed Supplemental Data Collection Activities						Rationale for Proposed Supplemental Data Collection Activities
			Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Surface Sampling	Geophysical Resistivity Characterization	Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Geophysical Resistivity Characterization	
216-T-32	200-TW-2	4					1		Yes			4			Complete	The uncertainty associated with the plutonium inventory and resulting soil concentrations could impact the remedial alternative and should be resolved through supplemental data collection. The presence of high plutonium may influence the evaluation of remedial alternatives, especially in terms of protectiveness, disposal options, and cost. Identifying the plutonium concentrations also may permit assessment and use of a lesser alternative if concentrations are lower than the associated representative site. The uncertainty associated with the elevated conductivity plume in this area will be addressed through a borehole at 216-T-7; data collected at 216-T-7 will include an assessment of pore water contamination to support the protection of groundwater evaluation. Based on the results of that borehole, a follow-on DQO process may be conducted if uncertainties remain.

Table C-2. Supplemental Data Collection Activities by Operable Unit - Model Groups 2 through 7. (26 Pages)

Waste Site	Operable Unit	Model #	Existing Data							Proposed Supplemental Data Collection Activities						Rationale for Proposed Supplemental Data Collection Activities
			Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Surface Sampling	Geophysical Resistivity Characterization	Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Geophysical Resistivity Characterization	
216-T-5	200-TW-2	4					2		Yes			4			Complete	Supplemental data will help resolve uncertainties associated with the nature of the plutonium contamination near the bottom of the crib structure and below, and will support evaluation of a broader range of alternatives, including disposal options. Geophysical resistivity characterization data do not indicate a conductivity plume beneath this site. No supplemental data collection activities are required at this time for this crib. Data with depth in the area will be collected through a boring at 216-T-7, which will provide data for use in assessing the deep vadose zone in the area, including at 216-T-5. The 216-T-7 data will be evaluated and if needed, a follow-on DQO for the area will be conducted. The extent of contamination at the crib is defined well enough by the analogous site approach, by the small size of the crib, by geophysical logging of nearby wells, and by the proposed boring. No supplemental data on extent are required to support decision making.
216-T-6	200-TW-2	4					15					4			Yes	Analogous relationships and inventory can be used for decision making. However, more refined data on plutonium concentrations could reduce uncertainty in evaluation of disposal options and associated costs. Because of the large nitrate inventory, geophysical resistivity characterization would help resolve extent of deeper mobile contaminants.

Table C-2. Supplemental Data Collection Activities by Operable Unit - Model Groups 2 through 7. (26 Pages)

Waste Site	Operable Unit	Model #	Existing Data							Proposed Supplemental Data Collection Activities						Rationale for Proposed Supplemental Data Collection Activities
			Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Surface Sampling	Geophysical Resistivity Characterization	Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Geophysical Resistivity Characterization	
216-T-7	200-TW-2	4					1		Yes	1*	1	1			Complete	The plutonium concentration is uncertain and should be resolved to support a stronger evaluation of protectiveness, disposal options, and cost. Eight borings in 216-T-7 and 200-W-52 have recently been geophysically logged; however, the data from these logs were not available for this review. Analysis of these logging results should be conducted before further activities at the crib and tile field and to locate supplemental data collection activities. A borehole to groundwater would provide site-specific information for the waste sites and would provide additional information on the nature of the conductivity plume. A combined borehole to address waste site and groundwater needs may be an opportunity but would need to be drilled adjacent to the waste sites. If so, a shallow borehole through the waste site (located based on the results of the geophysical logging of the eight borings) would provide site-specific information on the plutonium concentrations.
241-B-361	200-TW-2	4					2	Sludge							No	Sludge has been sampled; minimal likelihood of leaks; no supplemental data needed.
241-T-361	200-TW-2	4					1	Sludge							Complete	Sludge has been sampled; minimal likelihood of leaks; no supplemental data needed.
200-TW-2 Total (M-015-42E, 12/31/2011)			**2**		**5**		**63**	**2**	**15**	**4**	**1**	**21**	**0**	**1**	**17**	
UPR-200-E-144	200-UR-1	4					8			(See 216-B-7A&B)					No	Consolidated material over 216-B-7A and other nearby sites; only minor contamination; no supplemental data required.
UPR-200-W-166	200-UR-1	6													No	Unplanned release associated with the 216-T-14 through 216-T-17 Cribs; UPR will be addressed with the cribs, so no supplemental data required.
200-UR-1 Total							**8**			**0**	**0**	**0**	**0**	**0**	**0**	
Supplemental Work Plan Total			**34**	**57**	**62**	**26**	**217**	**138**	**25**	**19**	**5**	**113**	**3**	**32**	**66**	

*** Denotes work planned by Groundwater Project. For wells, data will be collected in the vadose zone to support evaluation of waste sites.**

CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act of 1980.*

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Waste Site	Operable Unit	Model #	Existing Data							Proposed Supplemental Data Collection Activities						Rationale for Proposed Supplemental Data Collection Activities
			Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Surface Sampling	Geophysical Resistivity Characterization	Deep Boreholes	Shallow Boreholes	Drive Points	Test Pits	Geophysical Logging of Existing Boreholes	Geophysical Resistivity Characterization	

DQO = data quality objective.
Ecology = Washington State Department of Ecology.
FS = feasibility study.
HRR = high-resolution resistivity.
MESC/MNA/IC = Maintain Existing Soil Cover, Monitored Natural Attenuation, and Institutional Controls.
OU = operable unit.
PUREX = Plutonium-Uranium Extraction (Plant or process).
RCRA = *Resource Conservation and Recovery Act of 1976*.
RI = remedial investigation.
RTD = removal, treatment, and disposal.
SAP = sampling and analysis plan.
SIM = Soil Inventory Model.
TSD = treatment, storage, and/or disposal (unit).

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Volume II

Supplemental Remedial Investigation/Feasibility Study Work Plan for the 200 Areas Central Plateau Operable Units

Volume II: Site-Specific Field-Sampling Plan Addenda

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

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

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H. E. Randall 11/09/2007
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VOLUME II ADDENDA

(Each addendum consists of one or more site-specific field-sampling plans)

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ADDENDUM 1

SITE-SPECIFIC FIELD-SAMPLING PLANS FOR THE 216-S-5, 216-S-6, 216-T-36, 216-B-55, 216-A-37-2, AND 216-A-30 CRIBS IN THE 200-SC-1 OPERABLE UNIT

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APPROVAL PAGE

Title: Supplemental Remedial Investigation Work Plan for the 200 Areas Central Plateau Operable Units, Volume II, Addenda

Addendum 1 – Site-Specific Field Sampling Plans for the 216-S-5, 216-S-6, 216-T-36, 216-B-55, 216-A-37-2, and 216-A-30 Cribs in the 200-SC-1 Operable Unit

Approval: U.S. Department of Energy, Richland Operations Office

David A Bradburn 11/30/07

Signature Date

Lead Regulatory Agency:

☒ U.S. Environmental Protection Agency

☐ Washington State Department of Ecology

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Signature Date

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_____ _____

Signature Date

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CONTENTS

FIGURES

TABLES

TERMS

bgs	below ground surface
DG	downhole geophysics
GL	geologic log
MESC/MNA/IC	Maintain Existing Soil Cover, Monitored Natural Attenuation, Institutional Controls
N/A	not applicable
OU	operable unit
PH	process history
PUREX	Plutonium-Uranium Extraction (Plant or process)
REDOX	Reduction-Oxidation (Plant or process)
RS	representative site
SIM	Soil Inventory Model
TBD	to be determined
TD	total depth
WIDS	*Waste Information Data System* database

METRIC CONVERSION CHART

Into Metric Units			Out of Metric Units		
If you know	*Multiply by*	*To get*	*If you know*	*Multiply by*	*To get*
Length			**Length**		
Inches	25.40	Millimeters	millimeters	0.0394	inches
Inches	2.54	Centimeters	centimeters	0.394	inches
Feet	0.305	Meters	meters	3.281	feet
Yards	0.914	Meters	meters	1.094	yards
miles (statute)	1.609	Kilometers	kilometers	0.621	miles (statute)
Area			**Area**		
sq. inches	6.452	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.0929	sq. meters	sq. meters	10.764	sq. feet
sq. yards	0.836	sq. meters	sq. meters	1.196	sq. yards
sq. miles	2.591	sq. kilometers	sq. kilometers	0.386	sq. miles
Acres	0.405	Hectares	hectares	2.471	acres
Mass (weight)			**Mass (weight)**		
ounces (avoir)	28.349	Grams	grams	0.0353	ounces (avoir)
Pounds	0.454	Kilograms	kilograms	2.205	pounds (avoir)
tons (short)	0.907	Ton (metric)	ton (metric)	1.102	tons (short)
Volume			**Volume**		
Teaspoons	5	Milliliters	milliliters	0.034	ounces (U.S., liquid)
Tablespoons	15	Milliliters	liters	2.113	pints
ounces (U.S., liquid)	29.573	Milliliters	liters	1.057	quarts (U.S., liquid)
Cups	0.24	Liters	liters	0.264	gallons (U.S., liquid)
Pints	0.473	Liters	cubic meters	35.315	cubic feet
quarts (U.S., liquid)	0.946	Liters	cubic meters	1.308	cubic yards
gallons (U.S., liquid)	3.785	Liters			
cubic feet	0.0283	cubic meters			
cubic yards	0.764	cubic meters			
Temperature			**Temperature**		
Fahrenheit	(°F-32)*5/9	Centigrade	Centigrade	(°C*9/5)+32	Fahrenheit
Radioactivity			**Radioactivity**		
Picocurie	37	millibecquerel	millibecquerel	0.027	picocurie

AD1-1.0 INTRODUCTION

Addendum 1 of Work Plan Volume II contains the site-specific field sampling plans for the 216-S-5, 216-S-6, 216-T-36, 216-B-55, 216-A-37-2, and 216-A-30 Cribs in the 200-SC-1 Operable Unit. The site-specific field sampling plans in this addendum provide site-specific information regarding the waste sites conceptual model, data needs, data collection strategy, and associated analytical and quality control requirements arrived at during the agency data quality objectives process as documented in the data-needs priority summary tables (Volume I, Appendix C). Together with the elements of the overall sampling and analysis plan (Volume I, Appendix A), the site-specific field sampling plans presented in Chapters 2.0 through 6.0 of this addendum complete the sampling and analysis plan for these waste sites. This addendum is part of the supplemental work plan and is considered a component of that primary document under the *Hanford Federal Facility Agreement and Consent Order*.[1]

[1] Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*, 2 vols., Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington, as amended.

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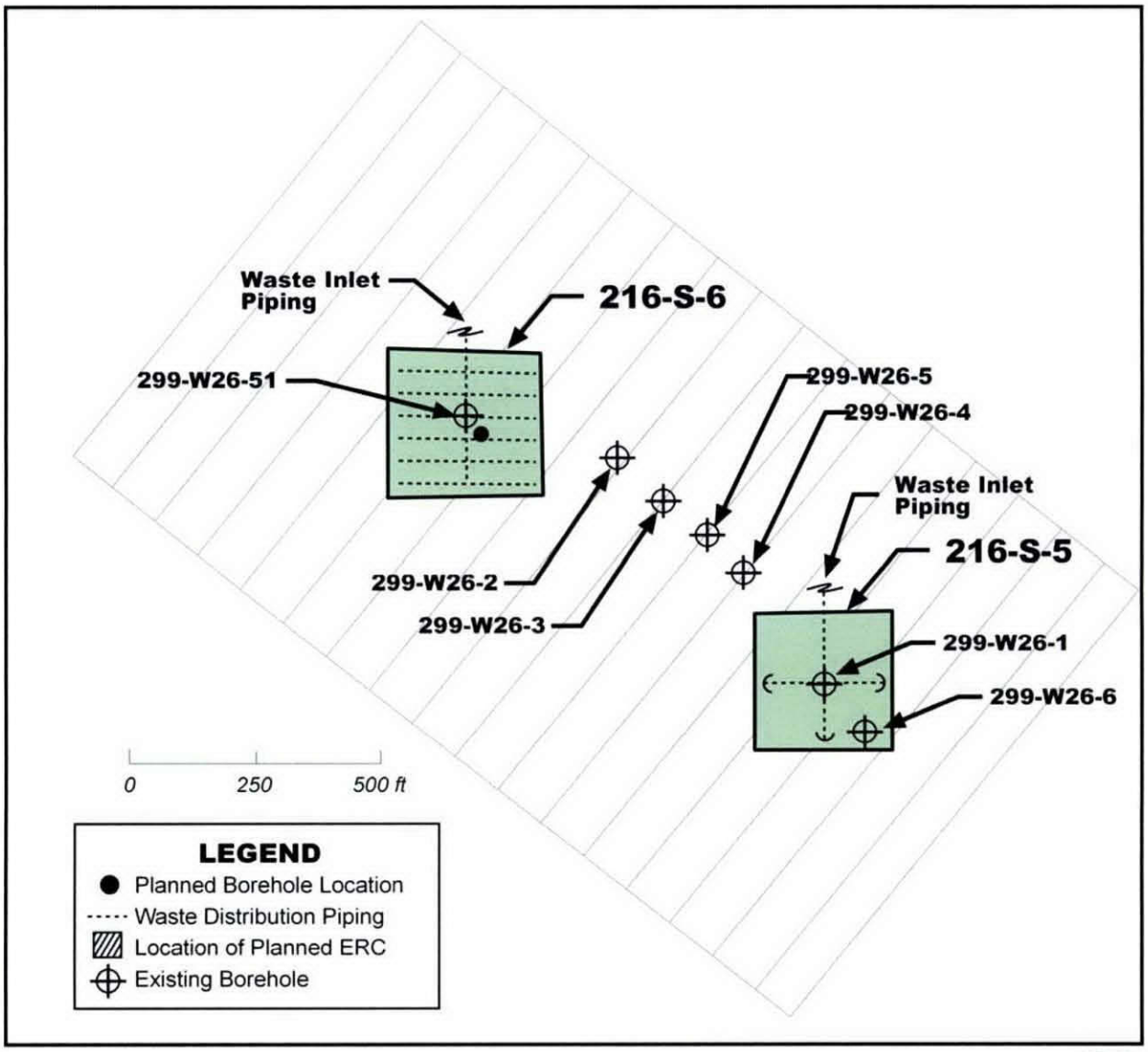
AD1-2.0 216-S-5 AND 216-S-6 CRIBS SITE-SPECIFIC FIELD-SAMPLING PLAN

The following figures and tables provide the site-specific field-sampling plan for the 216-S-5 and 216-S-6 Cribs.

Figure AD1-1. 216-S-5 and 216-S-6 Cribs Data-Collection Locations.



ERC = electrical resistivity characterization.

Figure AD1-2. 216-S-6 Crib Stratigraphy and Sample-Collection Intervals.

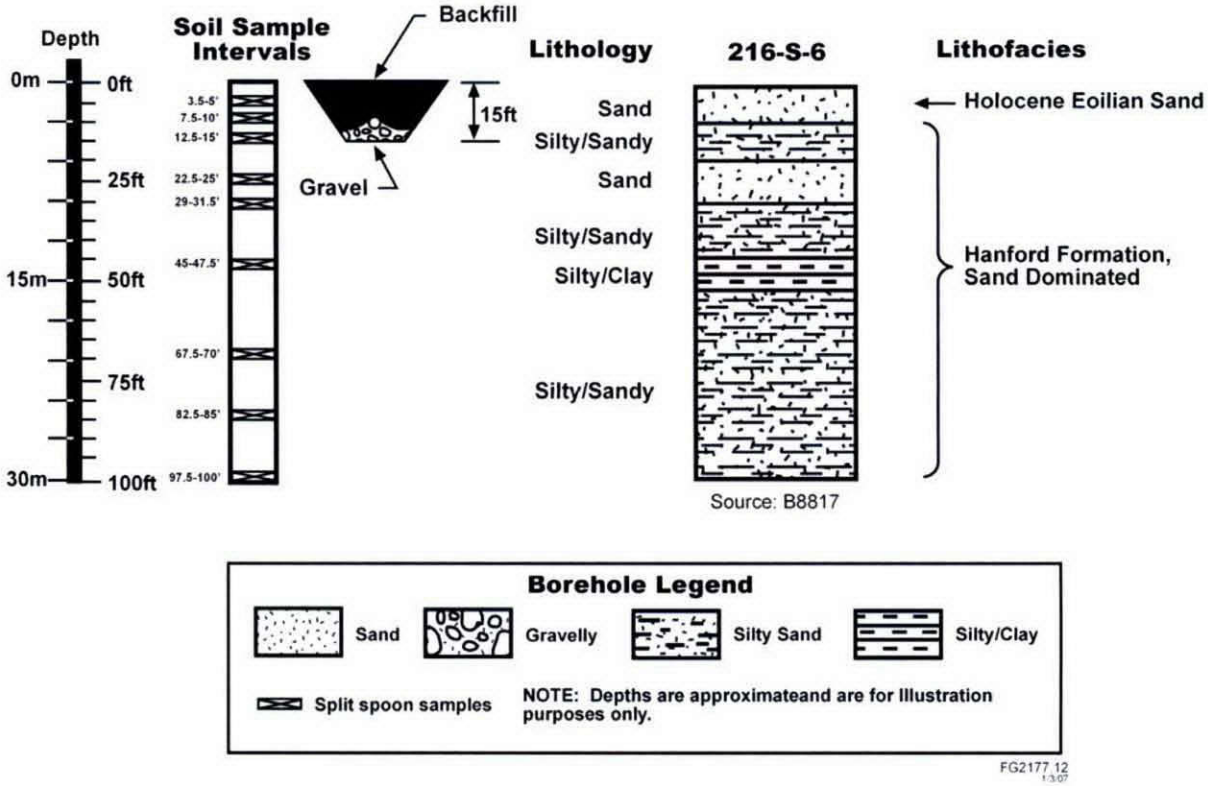


Table AD1-1. 216-S-6 Crib Sampling Plan.

Sample Collection Methodology	Sample Location	Maximum Depth of Investi-gation	Sample Interval Depth (ft bgs) [a]	Analyte List [b]	Physical Properties	
					Sample Interval	Parameters
Shallow borehole and sampling	One shallow borehole to evaluate ERC	100 ft bgs	Sample at depths of: 3.5 – 5 ft bgs 7.5 – 10 ft bgs 12.5 – 15 ft bgs 22.5 – 25 ft bgs 29 – 31.5 ft bgs 45 – 47.5 ft bgs 67.5 – 70 ft bgs 82.5 – 85 ft bgs 97.5 – 100 ft bgs	Analytes are presented in Volume I, Tables A2-3, the 200-CW-5, 200-CW-2, 200-CW-4, and 200-SC-1 columns.	One sample at each change in stratigraphy. Sample interval at Hanford formation, sand dominated. Other samples taken at fine-grained intervals.	pH, specific conductance, bulk density, moisture, particle size distribution

Number of split-spoon samples	9
Approximate number of field quality-control samples [c]	3
Approximate number of physical-property samples	2
Approximate total number of soil samples collected	14
Approximate total number of soil samples analyzed	14

Non-Sample Data Collection	Maximum Depth of Investigation
Electrical resistivity characterization	Not defined (ERC survey of area continuous with the 216-S-5 Crib)

[a] Actual sampling depths may vary depending on the amount of backfill/overburden used in interim-stabilization activities at the waste site, field screening results, and varying subsurface conditions.

[b] See Volume 1, Appendix A, Tables A2-1, A2-2, A2-3, A2-5, and A3-2 for detection limits and other analytical parameters.

[c] One duplicate, one split, and one equipment blank. Field blanks also will be collected for volatile organic analysis, but are not included here.

bgs = below ground surface.
ERC = electrical resistivity characterization.

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Figure AD1-3. 216-S-5 Crib
Conceptual Model and Data Summary.

216-S-5 Crib

200-SC-1 Operable Unit
Waste Type: Steam Condensate

Model Group 6
200-W Ponds Zone

History

216-S-5 Crib is a liquid waste disposal site that received process cooling water and REDOX steam condensate from the 202-S Building. The waste water was acidic. The structure was allowed to overflow for some months in 1956 and surrounding contamination ranged from 100 millirad/hr to 17 rad/hr.

CONSTRUCTION: A square pit 210 ft by 210 ft by 15 ft deep, filled with gravel and two corrugated perforated metal pipes that form a cross in the center of the structure.

WASTE VOLUME: 4,100,000,000 liters

DURATION: 1954 to 1957.

ESTIMATED INVENTORY OF SELECTED HIGH-MOBILITY CONSTITUENTS

	WIDS	SIM
Uranium	270 Kg	1098 Kg
Tritium	0 Ci	3.3 Ci
Nitrate	100 Kg	232,600 Kg
Nitrite	--	203,400 Kg
Fluoride	--	5.15 Kg

ESTIMATED INVENTORY OF SELECTED MEDIUM/LOW MOBILITY CONSTITUENTS

	WIDS	SIM
Co-60	0.002 Ci	0.002 Ci
Cs-137	28.8 Ci	56.2 Ci
Sr-90	59.4 Ci	31.4 Ci
Pu-239/240	42 Ci	0.018 Ci
Plutonium (total)	580 g	0.014 Ci
Total Beta Emitters	174 Ci	--

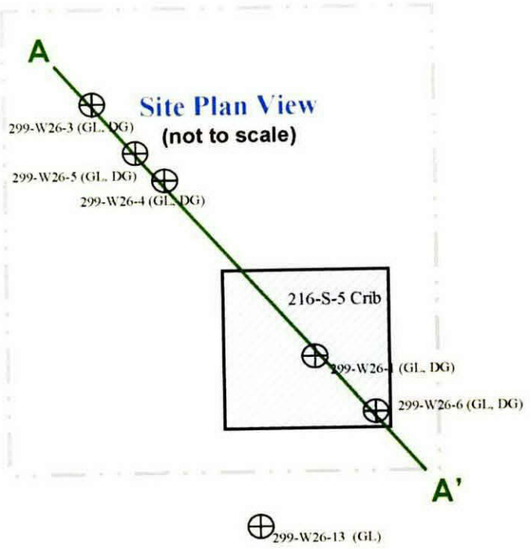
Note: "--" indicates inventory not estimated.

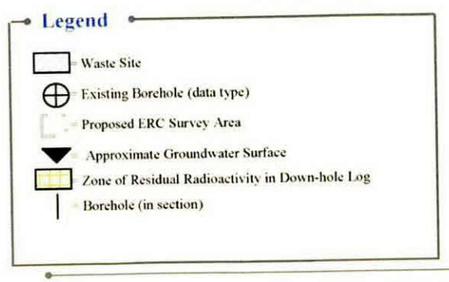
REFERENCES:

WIDS general summary reports
Hanford Soil Inventory Model, Rev 1 (RPP-26744)

Basis of Knowledge

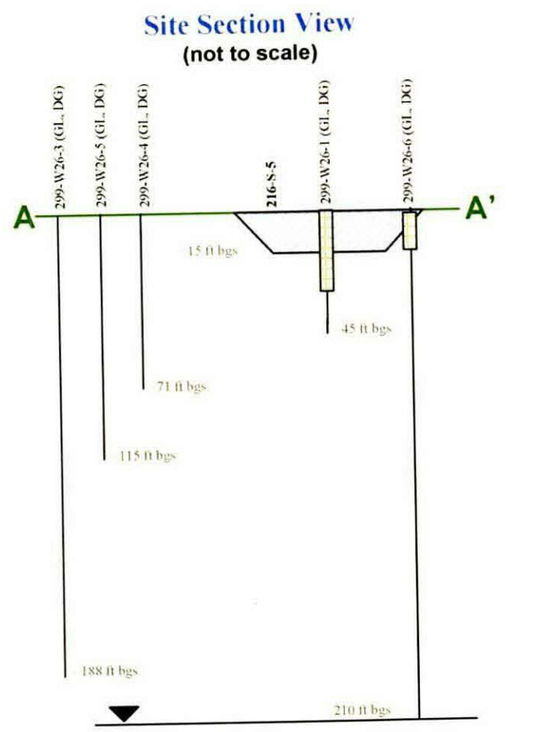
- Process History (PH)
- Interpretation of Downhole Geophysics (DG)
- Geologic Logs (GL)
- Extrapolation from Representative Site (RS)





Characterization Summary

- Scintillation probe and spectral gamma profiles from wells 299-W26-1, -3, -4, -5, and -6 indicate residual gamma emitters to about 30 feet bgs within the crib footprint.
- Process history including data from discharge stream.
- Assigned to representative site 216-U-10.



Data Needs, Rationale, and Investigation Approach

No additional data are needed for 216-S-5. Decisions will be made using the following information:

- Existing site-specific information
- Information to be collected from 216-S-6 Crib
- Electrical Resistivity Characterization (ERC) survey of 216-S-5 and 216-S-6 combined area to identify potential conductivity plume that may be associated with contamination.

Potential Viable Alternatives

- REMOVE/TREAT/DISPOSE
- PARTIAL REMOVAL/TREATMENT/BARRIER
- MESC/MNA/IC
- BARRIER

Table AD1-2. Data-Needs Priority
Summary – Model Group 6 – 216-S-5 Crib
(200-CW-5/2/4/200-SC-1) (RL/FH) (CPP) (EPA). (2 Pages)

Background	
Site Identification	216-S-5
Site Location	200 West Area; 200 West Ponds Zone, southwest of 207-S Retention Basin west of the 216-S-10 Ditch
Type of Site	Crib
Operating History	The site consists of a gravel-filled crib containing two lengths of corrugated, perforated metal pipe that form a cross. The crib has been surface stabilized. It is marked and posted with Underground Radioactive Material signs. This unit received subsurface liquid disposal for the 202-S Building process vessel cooling water and steam condensate via an underground clay pipeline. The crib was built to replace the 216-S-17 Pond. The site is associated with the 202-S Building, the 207-S Retention Basin, and 216-S-6 Crib. The unit (originally called an underground swamp) was built as a temporary replacement for the grossly contaminated 216-S-17 Pond. In November 1954, the 216-S-6 Crib was built to receive condensate and cooling water with a high potential for contamination. Effluent with a low potential for contamination was sent to the 216-S-5 Crib. In 1957, the site was deactivated by valving out and locking the pipeline to the unit. The effluent was rerouted to the 216-S-16 Pond. The 207-S Retention Basin was bypassed in April 1954 due to being grossly contaminated. The basin later was backfilled with soil to prevent contamination migration. In 1956, the large cooling water discharge volumes made it necessary to cut a hole along the top edge of the crib to discharge overflow cooling water to a trench immediately southwest of the crib structure rather than allowing the crib to flood. The overflow of 50 to 100 gal/min represented approximately 5% of the total flow to the 216-S-5 Crib. The emergency overflow continued throughout the summer of 1956. In September 1956, the REDOX A-2 dissolver and H-4 coils failed. The dose rates along the edge of the crib overflow area increased from 100 millirad/h to 350 millirad/h with some spots reading up to 17 rad/h. The emergency crib overflow pond was used until the 216-S-16 Pond was completed in September 1957. In 1974, action was taken to fill in four cave-in depressions at the 216-S-5 Crib. This site is monitored by groundwater wells 299-W26-1, 299-W26-3, 299-W26-4, 299-W26-5, and 299-W26-6. Visual and radiological surveys are performed at the site. (WIDS) The crib is 64 by 64 m (210 by 210 ft) and 4.6 m (15 ft) deep. The crib operated from 1954 to 1957. (WIDS) Site Inventory Model – 216-S-5 (RPP-26744) (some constituents of interest are highlighted)

Na (kg) 5.331E+04	Al (kg) 2.053E+01	Fe (kg) 1.366E+00	Cr (kg) 3.583E+00	Bi (kg) 0.000E+00	La (kg) 0.000E+00	Hg (kg) 3.987E+00	Zr (kg) 0.000E+00	Pb (kg) 1.160E-03
Ni (kg) 1.526E-01	Ag (kg) 3.107E-03	Mn (kg) 1.682E-01	Ca (kg) 2.116E+02	K (kg) 4.642E+03	NO3 (kg) 2.326E+05	NO2 (kg) 2.034E+05	CO3 (kg) 6.028E-01	PO4 (kg) 5.550E+01
SO4 (kg) 1.342E+00	Si (kg) 9.037E+02	F (kg) 5.154E+00	Cl (kg) 2.419E+00	CCl4 (kg) 0.000E+00	Butanol (kg) 1.043E-03	TBP (kg) 0.000E+00	NPH (kg) 0.000E+00	NH3 (kg) 1.859E-01
Fe(CN)6 (kg) 0.000E+00	H-3 (Ci) 3.297E+00	C-14 (Ci) 1.075E-03	Ni-59 (Ci) 2.888E-04	Ni-63 (Ci) 2.627E-02	Co-60 (Ci) 1.751E-03	Se-79 (Ci) 5.187E-05	Sr-90 (Ci) 3.142E+01	Y-90 (Ci) 3.166E+01
Zr-93 (Ci) 3.109E-03	Nb-93m (Ci) 2.671E-03	Tc-99 (Ci) 2.585E-02	Ru-106 (Ci) 6.351E-10	Cd-113m (Ci) 2.224E-03	Sb-125 (Ci) 1.767E-04	Sn-126 (Ci) 2.103E-04	I-129 (Ci) 3.151E-05	Cs-134 (Ci) 7.226E-06
Cs-137 (Ci) 5.625E+01	Ba-137m (Ci) 5.328E+01	Sm-151 (Ci) 2.086E+00	Eu-152 (Ci) 2.187E-04	Eu-154 (Ci) 1.465E-02	Eu-155 (Ci) 6.065E-03	Ra-226 (Ci) 3.007E-09	Ra-228 (Ci) 1.754E-14	Ac-227 (Ci) 1.285E-08
Pa-231 (Ci) 1.909E-08	Th-229 (Ci) 6.025E-11	Th-232 (Ci) 1.891E-14	U-232 (Ci) 5.476E-06	U-233 (Ci) 4.488E-07	U-234 (Ci) 3.591E-01	U-235 (Ci) 1.589E-02	U-236 (Ci) 4.885E-03	U-238 (Ci) 3.665E-01
U-Total (kg) 1.098E+03	Np-237 (Ci) 1.367E-04	Pu-238 (Ci) 2.783E-04	Pu-239 (Ci) 1.450E-02	Pu-240 (Ci) 2.851E-03	Pu-241 (Ci) 9.832E-03	Pu-242 (Ci) 8.463E-08	Am-241 (Ci) 1.022E-02	Am-243 (Ci) 3.791E-06
Cm-242 (Ci) 7.791E-06	Cm-243 (Ci) 1.503E-07	Cm-244 (Ci) 3.605E-06						

Table AD1-2. Data-Needs Priority
Summary – Model Group 6 – 216-S-5 Crib
(200-CW-5/2/4/200-SC-1) (RL/FH) (CPP) (EPA). (2 Pages)

Vicinity Waste Sites	216-S-6, 216-S-11, and 216-S-17						
Potential Remedial Alternatives							
X for Viable Alternatives	No Action	MESC/MNA/IC	Removal/Disposal	Barrier	Partial Removal/Barrier	In Situ Treatment	Other
		X	X	X	X		

Data Evaluation and Gaps Analysis			
Data	Knowns	Data Uncertainties	Are supplemental data required to support decision making?
Geophysical Logging 299-W26-06 (209.65 ft) (spectral gamma log 2003) 299-W26-3 (188 ft) (scintillation log 1976) 299-W26-4 (71 ft) (scintillation log 1976) 299-W26-1 (87 ft) (scintillation log 1976) (spectral gamma log 2006) 299-W26-5 (115 ft) (scintillation log 1976)	Located in the southeast corner of the crib. Cesium-137 detected from 3 to 16 ft in concentrations ranging from 0.4 to 2.5 pCi/g. The maximum concentration of Cs-137 was at 8 ft. Cesium-137 also was detected at 53 and 62 ft, with concentrations ~0.4 pCi/g. Located 378 ft northwest of the center of the crib. Scintillation probe profiles show background level radiation. Located 287 ft northwest of the center of the crib. Scintillation probe profiles show background-level radiation. Located in the center of the crib area. Scintillation probe profiles indicate radioactive contaminants from 1.5 to 12.8 m (5 to 42 ft) bgs. The spectral gamma log identified Cs-137 in the same depth range as the scintillation log with a maximum concentration of 12,000 pCi/g at 5.8 m (19 ft) bgs. Located northwest of the center of the crib area between 299-W26-3 and 299-W26-4; scintillation probe profiles show background-level radiation.	Potential for impacts to groundwater	No. Existing information is sufficient for decision making for the shallow zone; ERC would provide information on elevated conductivity that may be associated with deeper contamination; the shallow borehole sampling at 216-S-6 would provide information to correlate the ERC and to evaluate protection of groundwater at 216-S-5 as well.

Proposed Activities and Path Forward:

Conduct ERC surveys to evaluate potential for elevated conductivity plume that may be associated with contamination; use to help evaluate extent of contamination with depth.

Use existing information and information from data collection activities at 216-S-6 to support remedial decision making for 216-S-5.

The following provides a list of the references/bibliography used during this evaluation:

DOE/RL-2004-24, *Feasibility Study for the 200-CW-5 (U Pond/Z Ditches Cooling Water Waste Group), 200-CW-2 (S Pond and Ditches Cooling Water Waste Group), 200-CW-4 (T Pond and Ditches Cooling Water Waste Group), and 200-SC-1 (Steam Condensate Waste Group) Operable Units.*
RHO-CD-673, *Handbook 200 Areas Waste Sites.*
RPP-26744, *Hanford Soil Inventory Model, Rev. 1.*
Waste Information Data System Report, Hanford Site database.

bgs = below ground surface.
ERC = electrical resistivity characterization.
MESC/MNA/IC = Maintain Existing Soil Cover, Monitored Natural Attenuation, Institutional Controls.
NPH = normal paraffin hydrocarbon.
TBP = tributyl phosphate.
WIDS = *Waste Information Data System* database.

Figure AD1-4. 216-S-6 Crib
Conceptual Model and Data Summary.

216-S-6 Crib

200-SC-1 Operable Unit
Waste Type: Steam Condensate

Model Group 6
200-W Ponds Zone

History

216-S-6 Crib is a liquid waste disposal site that received process cooling water and REDOX steam condensate from the 202-S Building. The waste stream was neutral to basic.

CONSTRUCTION: A square pit 210 ft by 210 ft by 15 ft deep, filled with gravel and a corrugated perforated metal pipe down the center with six pipes branching off perpendicular to the main pipe at 7 ft below the surface. The site is backfilled with 116,333 cu yd of gravel, 12,000 cu m contaminated soil and 13,000 cu m of "overburden" soils.

WASTE VOLUME: 4,470,000,000 liters

DURATION: 1954 to 1972

ESTIMATED INVENTORY OF SELECTED HIGH-MOBILITY CONSTITUENTS

	WIDS	SIM
Uranium	272 Kg	853 Kg
Tritium	0.00 Ci	3.549 Ci
Nitrate	140 Kg	253,500 Kg
Nitrite	--	221,100 Kg
Fluoride	--	3.9 Kg

ESTIMATED INVENTORY OF SELECTED MEDIUM/LOW MOBILITY CONSTITUENTS

	WIDS	SIM
Co-60	0.258 Ci	0.0008 Ci
Cs-137	125.0 Ci	11.3 Ci
Sr-90	224.0 Ci	5.8 Ci
Pu-239/240	34.3 Ci	0.3 Ci
Plutonium	473 g	--
Total Beta Emitters	901 Ci	--

Note: "--" indicates inventory not estimated

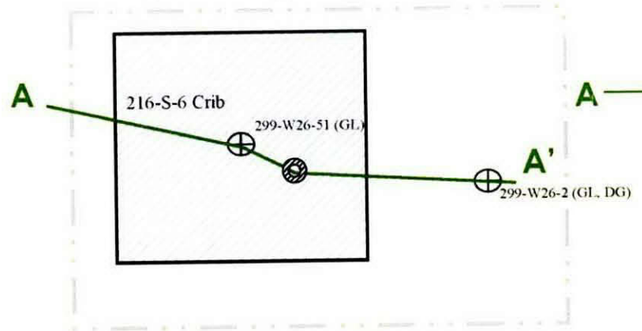
REFERENCES:

WIDS general summary reports
Hanford Soil Inventory Model, Rev 1 (RPP-26744)

Basis of Knowledge

- Process History (PH)
- Interpretation of Downhole Geophysics (DG)
- Interpretation of Surface Geophysics (SG)
- Geologic Logs (GL)
- Extrapolation from Representative Site (RS)

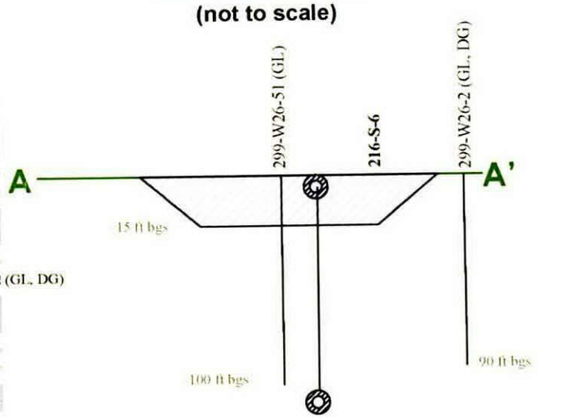
Site Plan View
(not to scale)

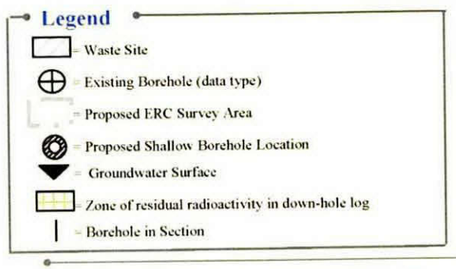


Characterization Summary

- One scintillation probe profile from well 299-W26-2 to approximately 90 ft bgs indicates no detectable gamma emitters.
- Process history including data from discharge stream.
- Surface scans identified contaminated plants growing on the site.
- Assigned to representative site 216-U-10.

Site Section View
(not to scale)





Potential Viable Alternatives

- REMOVE/TREAT/DISPOSE
- PARTIAL REMOVAL/TREATMENT/BARRIER
- MESC/MNA/IC
- BARRIER

Data Needs, Rationale, and Investigation Approach

Additional information is required for the following reasons:

- The analogous relationship to 216-U-10 is uncertain.
- The potential exists for deeper contamination associated with mobile contaminants that may impact groundwater (e.g., nitrate, uranium).

The supplemental investigation strategy incorporates the following elements:

- Electrical Resistivity Characterization (ERC) survey to identify the presence of subsurface conductivity plumes that may indicate subsurface contaminants.
- Install one shallow borehole to a depth of about 100 feet bgs. Collect subsurface soil samples and analyze them as specified.
- Correlate the soil sample analyses to results of ERC survey to obtain site-specific data to reduce the uncertainty between 216-S-6 and the representative site.
- Data collected at 216-S-6 will also be used to support decision making for 216-S-5.

Table AD1-3. Data-Needs Priority
Summary – Model Group 6 – 216-S-6 Crib
(200-CW-5/2/4/ 200-SC-1) (RL/FH) CPP) (EPA). (2 Pages)

Background	
Site Identification	216-S-6
Site Location	200 West Area, 200-W Ponds, northwest of the 216-S-5 Crib and north of 216-S-17 Pond.
Type of Site	Crib
Operating History	This unit consists of a square pit filled with gravel with corrugated, perforated metal pipe running down the center, and six pipes branching off perpendicular to the main pipe. The site is backfilled and marked with Underground Radioactive Material signs. This unit received subsurface process cooling water and steam condensate from the 202-S Building waste via an underground pipeline. The site is associated with the 202-S Building, the 207-S Retention Basin, the 2904-S-171 Control Structure, and the 215-S-5 Crib. This site operated from November 1954 to July 1972. The crib was constructed as part of the Segregation Project. REDOX effluent with a high potential for contamination was diverted to the 216-S-6 Crib. Effluent with a low potential for contamination was sent to the 216-S-5 Crib. After July 1967, the site received the steam condensate from the D-12 and D-14 Waste Concentrators in the 202-S Building. The waste is low salt, neutral to basic and contains nitrates. In September 1955, both the 216-S-5 and 216-S-6 Cribs were operated at greater-than-capacity levels. Temporary relief was provided by blading off the corner of the 216-S-6 Crib and cutting a run off ditch. The overflow was considered a better option than allowing the crib to flood and damage the roof seal. No contamination problems were noted in the overflow area in 1955. (WIDS) The crib is 64 by 64 m (210 by 210 ft) and 4.6 m (15 ft) deep. The crib operated from 1954 to 1972. (WIDS) Soil Inventory Model – 216-S-6 (RPP-26744) (some constituents of interest are highlighted)

Na (kg) 5.789E+04	Al (kg) 1.346E+01	Fe (kg) 2.525E-02	Cr (kg) 1.837E-01	Bi (kg) 0.000E+00	La (kg) 0.000E+00	Hg (kg) 4.332E+00	Zr (kg) 0.000E+00	Pb (kg) 1.261E-03
Ni (kg) 1.568E-02	Ag (kg) 3.273E-06	Mn (kg) 2.657E-03	Ca (kg) 2.283E+02	K (kg) 4.223E+03	NO3 (kg) 2.535E+05	NO2 (kg) 2.211E+05	CO3 (kg) 1.481E-02	PO4 (kg) 4.242E+01
SO4 (kg) 1.312E-01	Si (kg) 9.821E+02	F (kg) 3.939E+00	Cl (kg) 1.967E-01	CCl4 (kg) 0.000E+00	Butanol (kg) 7.973E-04	TBP (kg) 0.000E+00	NPH (kg) 0.000E+00	NH3 (kg) 1.814E-02
Fe(CN)6 (kg) 0.000E+00	H-3 (Ci) 3.549E+00	C-14 (Ci) 9.230E-05	Ni-59 (Ci) 7.043E-05	Ni-63 (Ci) 6.715E-03	Co-60 (Ci) 8.266E-04	Se-79 (Ci) 1.600E-04	Sr-90 (Ci) 5.831E+00	Y-90 (Ci) 5.838E+00
Zr-93 (Ci) 2.373E-03	Nb-93m (Ci) 3.198E-04	Tc-99 (Ci) 1.600E-02	Ru-106 (Ci) 6.588E-10	Cd-113m (Ci) 3.538E-04	Sb-125 (Ci) 6.437E-05	Sn-126 (Ci) 2.609E-05	I-129 (Ci) 2.804E-03	Cs-134 (Ci) 5.945E-06
Cs-137 (Ci) 1.130E+01	Ba-137m (Ci) 1.067E+01	Sm-151 (Ci) 5.880E-01	Eu-152 (Ci) 1.037E-04	Eu-154 (Ci) 1.175E-02	Eu-155 (Ci) 6.839E-04	Ra-226 (Ci) 3.789E-07	Ra-228 (Ci) 3.186E-12	Ac-227 (Ci) 1.579E-06
Pa-231 (Ci) 2.311E-06	Th-229 (Ci) 2.585E-09	Th-232 (Ci) 3.264E-12	U-232 (Ci) 4.552E-06	U-233 (Ci) 1.508E-06	U-234 (Ci) 2.803E-01	U-235 (Ci) 1.237E-02	U-236 (Ci) 3.877E-03	U-238 (Ci) 2.848E-01
U-Total (kg) 8.529E+02	Np-237 (Ci) 1.740E-03	Pu-238 (Ci) 9.023E-03	Pu-239 (Ci) 2.467E-01	Pu-240 (Ci) 5.135E-02	Pu-241 (Ci) 2.629E-01	Pu-242 (Ci) 2.124E-06	Am-241 (Ci) 5.488E-02	Am-243 (Ci) 2.067E-05
Cm-242 (Ci) 3.471E-05	Cm-243 (Ci) 7.276E-07	Cm-244 (Ci) 1.756E-05						

Table AD1-3. Data-Needs Priority
Summary – Model Group 6 – 216-S-6 Crib
(200-CW-5/2/4/ 200-SC-1) (RL/FH) CPP) (EPA). (2 Pages)

Vicinity Waste Sites	216-S-17; 216-S-16D; 216-S-5						
Potential Remedial Alternatives							
X for Viable Alternatives	No Action	MESC/MNA/IC	Removal/Disposal	Barrier	Partial Removal/Barrier	In Situ Treatment	Other
		X	X	X	X		

Data Evaluation and Gaps Analysis			
Data	Knowns	Data Uncertainties	Are supplemental data required to support decision making?
Geophysical logging 299-W26-2 (230 ft) (scintillation log 1976) 299-W26-51 (106 ft) (spectral gamma log 2006) (moisture log 2006)	Located east of and outside of the crib. Scintillation probe profiles indicate background radiation levels. Located in center of crib. Cs-137 was detected from 2.1 to 18.9 m (7 to 62 ft) bgs with a maximum concentration of 3,800 pCi/g at 13.7 m (45 ft) bgs. The moisture detected in the well was variable due to the presence of a grout seal from the surface to 6 m (20 ft) bgs. Below this depth, moisture appears to increase at about 11.9, 14, 18, 20.7, 23.8 m (39, 46, 59, 68, 78 ft), and from 28 m (92 ft) to the bottom of the borehole at 32.3 m (106 ft).	Potential for impacts to groundwater from mobile contaminants such as nitrate and uranium	Yes. The analogous relationship between 216-U-10 (representative site) and 216-S-6 is somewhat uncertain. While inventory, geophysical logs, and analogous relationships may support shallow vadose zone decision making, ERC surveys would provide indication of deeper zones of elevated conductivity that may be associated with contamination. A shallow borehole would help correlate with the ERC by providing samples that can be evaluated for pore water contamination (similar to the 216-B-26 borehole drilled in the BC Cribs and Trenches area). These analyses would support the protection of groundwater evaluation for both the 216-S-6 and 216-S-5 Cribs. Supplemental data would provide site-specific information on remaining inventory of mobile contaminants, such as uranium and nitrate, in the soil column that may impact groundwater.

Proposed Activities and Path Forward:

Conduct ERC surveys to evaluate the presence of subsurface conductivity that may be associated with mobile contaminants that could impact groundwater.

Install shallow borehole to correlate results of ERC and to obtain site-specific data needed because of differences between the representative site and 216-S-6.

Data collected at 216-S-6 also would be used to support 216-S-5 decision making because these two sites received similar waste streams, with the higher concentration effluent going to 216-S-6. 216-S-6 is bounding for 216-S-5 decision making.

Additional Notes: Soil Inventory Model inventory identifies >800 kg uranium and >200,000 kg each of nitrate and nitrite.

References: The following provides a list of the references/bibliography used during this evaluation:

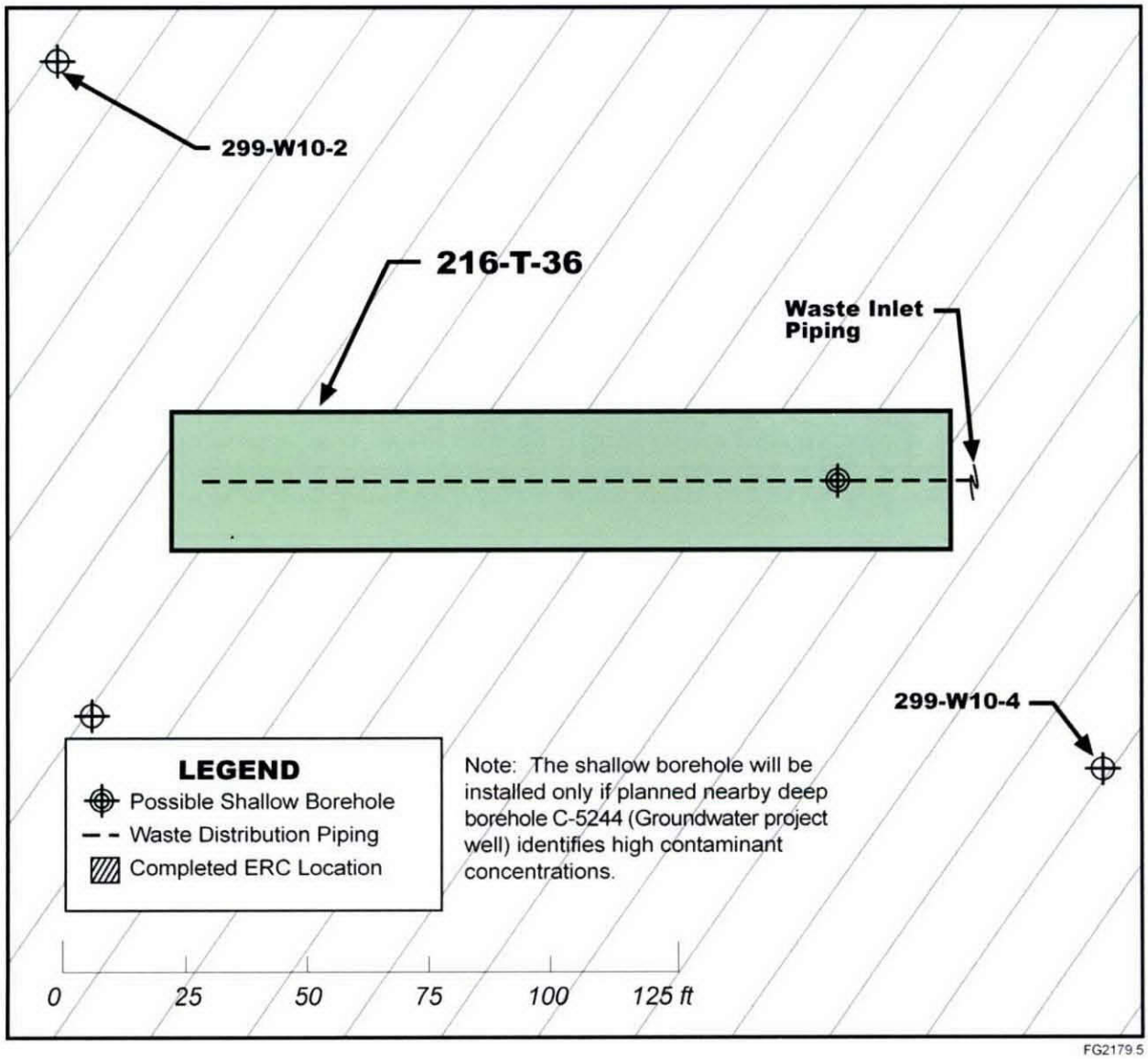
DOE/RL-2004-24, *Feasibility Study for the 200-CW-5 (U Pond/Z Ditches Cooling Water Waste Group), 200-CW-2 (S Pond and Ditches Cooling Water Waste Group), 200-CW-4 (T Pond and Ditches Cooling Water Waste Group), and 200-SC-1 (Steam Condensate Waste Group) Operable Units.*
RHO-CD-673, *Handbook 200 Areas Waste Sites.*
RPP-26744, *Hanford Soil Inventory Model, Rev. 1.*
Waste Information Data System Report, Hanford Site database.

ERC = electrical resistivity characterization.
MESC/MNA/IC = Maintain Existing Soil Cover, Monitored Natural Attenuation, Institutional Controls.
WIDS = *Waste Information Data System* database.

AD1-3.0 216-T-36 CRIB SITE-SPECIFIC FIELD-SAMPLING PLAN

The following figures and tables provide the site-specific field-sampling plan for the 216-T-36 Crib.

Figure AD1-5. 216-T-36 Crib Data-Collection Locations.



ERC = electrical resistivity characterization.

Figure AD1-6. 216-T-36 Crib Stratigraphy and Sample-Collection Intervals.

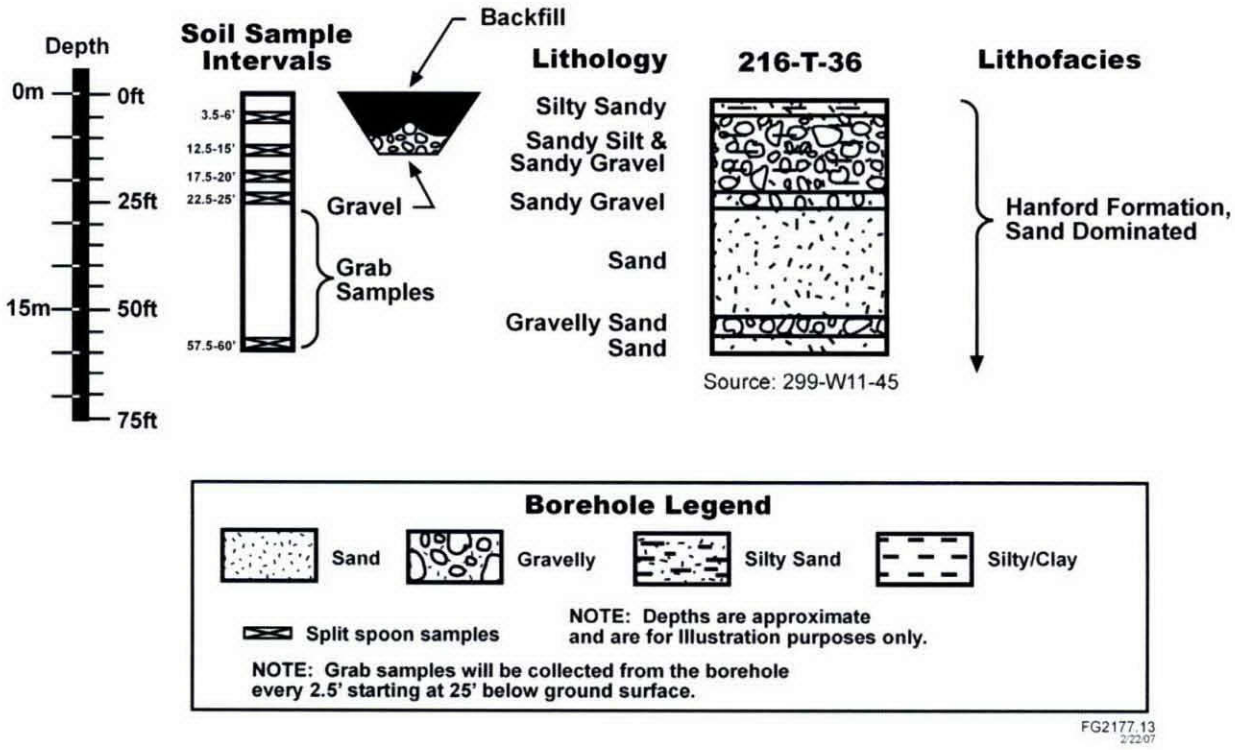


Table AD1-4. 216-T-36 Crib Data Collection Plan.

Sample Collection Methodology	Sample Location	Maximum Depth of Investi-gation	Sample Interval Depth (ft bgs) [a]	Analyte List [b]	Physical Properties	
					Sample Interval	Parameters
Borehole drilling and sampling	One shallow borehole if indicated by monitoring well data	60 ft bgs	Sample at depths of: 3.5 – 6 ft bgs 12.5 – 15 ft bgs 17.5 – 20 ft bgs 22.5 – 25 ft bgs 57.5 – 60 ft bgs	Analytes are presented in Volume I, Table A2-3, the 200-CW-5, 200-CW-2, 200-CW-4, and 200-SC-1 columns.	One sample at each change in stratigraphy. Sample interval at Hanford formation, sand dominated. Other samples taken at fine-grained interval(s).	pH, specific conductance, bulk density, moisture, particle size distribution
			Grab sample collected every 2.5 ft starting at 25 ft bgs to TD; initial analysis on 5-ft samples.	See Volume I, Table A2-3.		

Number of split-spoon samples	5
Approximate number of field quality-control samples [c]	3
Approximate number of physical-property samples	2
Approximate number of grab samples	15
Approximate total number of soil samples collected	25
Approximate total number of soil samples initially analyzed [d]	18

[a] Actual sampling depths may vary depending on the amount of backfill/overburden used in interim-stabilization activities at the waste site, field screening results, and varying subsurface conditions.

[b] See Volume I, Appendix A, Tables A2-1, A2-2, A2-3, A2-5, and A3-2 for detection limits and other analytical parameters.

[c] One duplicate, one split, and one equipment blank. Field blanks also will be collected for volatile organic analysis, but are not included here.

[d] Number of samples analyzed includes five split-spoon samples, three field quality-control samples, two physical-property samples, and eight grab samples.

bgs = below ground surface.
TD = total depth.

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Figure AD1-7. 216-T-36 Conceptual Model and Data Summary.

216-T-36 Crib

200-SC-1 Operable Unit
Waste Type: Steam Condensate

Model Group 6
T Farm Zone

History

216-T-36 Crib is a liquid waste disposal site that received process steam condensate, equipment decontamination waste and miscellaneous radioactive waste from 221-T and 221-U buildings and decontamination waste from 2706-T building. The waste stream was an alkaline aqueous waste.

CONSTRUCTION: The 216-T-36 crib consists of a clay distribution pipe placed in a rectangular trench with bottom dimensions of 160 ft by 10 ft by 15 ft deep, filled with gravel and soil.

WASTE VOLUME: 522,000 liters

DURATION: 1967 to 1969 (end of use not clearly identified).

ESTIMATED INVENTORY OF SELECTED HIGH-MOBILITY CONSTITUENTS

	WIDS	SIM
Uranium	1.18 Kg	172 Kg
Tritium	0.00 Ci	0.001 Ci
Nitrate	0.00 Kg	4,950 Kg
Nitrite	0.00 Kg	563 Kg
Fluoride	0.0 Kg	0.0 Kg
Chromium	--	212 Kg

ESTIMATED INVENTORY OF SELECTED MEDIUM/LOW MOBILITY CONSTITUENTS

	WIDS	SIM
Co-60	--	0.00008 Ci
Cs-137	0.06 Ci	0.07 Ci
Sr-90	0.05 Ci	0.6 Ci
Pu-239/240	0.0 Ci	22.8 Ci
Pu-241	0.0 Ci	111 Ci
Plutonium	0.24 Ci	--
Total Beta Emitters	0.72 Ci	--
Total Alpha Emitters	22.7 Ci	--

Note: "--" indicates inventory not estimated.

REFERENCES:

WIDS general summary reports
Hanford Soil Inventory Model, Rev 1 (RPP-26744)

Basis of Knowledge

- Process History (PH)

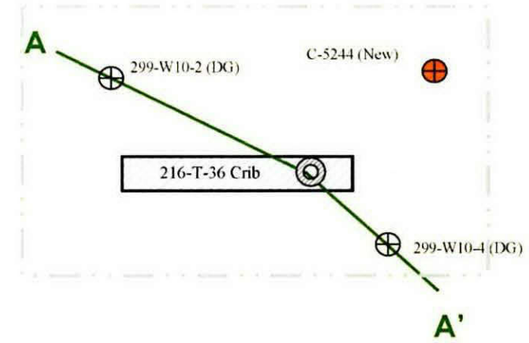
Interpretation of Downhole Geophysics (DG)

- Extrapolation from Representative Site (RS)

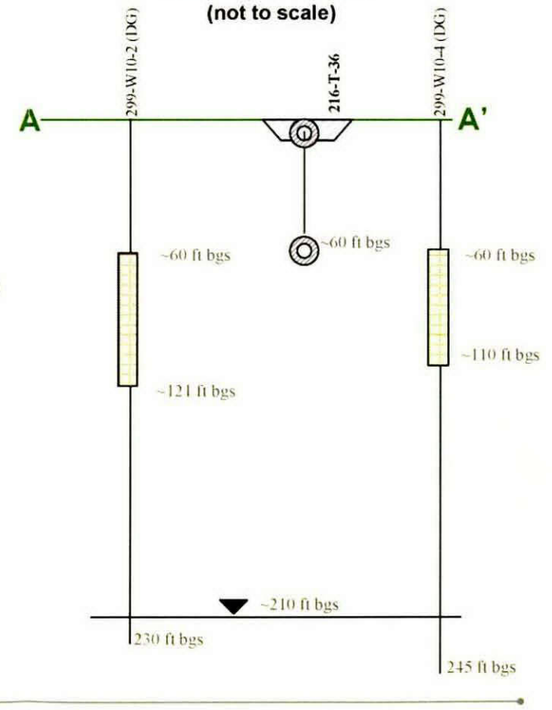
Characterization Summary

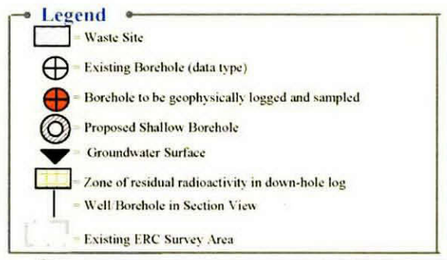
- No site-specific measurements. Process history only.
- Assigned as analogous to representative site 216-T-26.
- Downhole geophysics from two nearby wells (299-W10-2 and 299-W10-4) indicate subsurface contamination by gamma emitting nuclides pre-dating 216-T-36. Tc-99 groundwater plume in this area.
- ERC survey indicates areas of elevated conductivity near the east side of the crib and limited conductivity directly below the crib.

Site Plan View
(not to scale)



Site Section View
(not to scale)





Potential Viable Alternatives

- REMOVE/TREAT/DISPOSE
- PARTIAL REMOVAL/TREATMENT/BARRIER
- MESC/MNA/IC
- BARRIER

Data Needs, Rationale, and Investigation Approach

Additional Information may be required for the following reasons:

- Based on current groundwater conditions (e.g., Tc-99) in the vicinity of this site, the inventory for 216-T-36 may be uncertain.

The supplemental investigation incorporates the following elements:

- A new deep borehole (to be installed by the groundwater program) will be installed and sampled.
- Sampling and analysis results and downhole geophysics from the new borehole will be evaluated.
- If the new borehole indicates soil contamination that suggests contribution from 216-T-36, then a shallow borehole (to about 60 feet bgs) will be placed within the crib footprint and subsurface soil samples will be collected and analyzed as specified.
- The sampling and analysis results from the new borehole(s) will be correlated to existing ERC survey data.

Table AD1-5. Data-Needs Priority
Summary – Model Group 6 – 216-T-36 Crib
(200-SC-1) (RL/FH) (CPP) (EPA). (2 Pages)

Background	
Site Identification	216-T-36 Crib
Site Location	200 West Area, T Farm Zone, south of 241-T Tank Farm; north of 241-TY Tank Farm
Type of Site	Crib
Operating History	The site consists of an interim stabilized crib posted as Underground Radioactive Material. The site consists of a single vitreous clay distribution pipe resting in a gravel layer that is in a rectangular trench. Backfill covers the pipe and gravel. The crib also has a gage well riser and a filter riser. This site provided subsurface liquid disposal for steam condensate, equipment decontamination waste, and miscellaneous waste from the 221-T and 221-U Buildings. The site also received decontamination waste from the 2706-T Building. Associated structures are the 221-T, 221-U, and 2706-T Buildings and the 200-W-79 Pipeline. The site started operation in May 1967. The end date is unclear. However, a shutdown date between 1970 and 1973 is likely based on available documentation. One WIDS source indicates the 216-T-36 Crib was built to replace the 216-T-28 Crib. (WIDS)

Soil Inventory Model – 216-T-36 (RPP-26744) (some constituents of interest are highlighted)

Na (kg) 2.29E+03	Al (kg) 0.00E+00	Fe (kg) 5.33E+01	Cr (kg) 2.12E+02	Bi (kg) 0.00E+00	La (kg) 0.00E+00	Hg (kg) 0.00E+00	Zr (kg) 0.00E+00	Pb (kg) 0.00E+00
Ni (kg) 9.44E+01	Ag (kg) 0.00E+00	Mn (kg) 0.00E+00	Ca (kg) 2.45E+02	K (kg) 1.38E+01	NO3 (kg) 4.95E+03	NO2 (kg) 5.63E+02	CO3 (kg) 1.52E+02	PO4 (kg) 0.00E+00
SO4 (kg) 2.00E+02	Si (kg) 0.00E+00	F (kg) 0.00E+00	Cl (kg) 5.73E+01	CCl4 (kg) 0.00E+00	Butanol (kg) 0.00E+00	TBP (kg) 0.00E+00	NPH (kg) 0.00E+00	NH3 (kg) 0.00E+00
Fe(CN)6 (kg) 0.00E+00	H-3 (Ci) 1.24E-03	C-14 (Ci) 1.19E-05	Ni-59 (Ci) 1.12E-04	Ni-63 (Ci) 1.08E-02	Co-60 (Ci) 8.02E-05	Se-79 (Ci) 5.04E-07	Sr-90 (Ci) 6.16E-01	Y-90 (Ci) 6.16E-01
Zr-93 (Ci) 2.96E-05	Nb-93m (Ci) 2.23E-05	Tc-99 (Ci) 2.15E-04	Ru-106 (Ci) 2.25E-08	Cd-113m (Ci) 4.41E-05	Sb-125 (Ci) 3.92E-05	Sn-126 (Ci) 2.16E-06	I-129 (Ci) 2.98E-04	Cs-134 (Ci) 5.70E-06
Cs-137 (Ci) 7.26E-01	Ba-137m (Ci) 6.87E-01	Sm-151 (Ci) 1.95E-02	Eu-152 (Ci) 1.24E-05	Eu-154 (Ci) 9.02E-04	Eu-155 (Ci) 3.32E-04	Ra-226 (Ci) 4.31E-11	Ra-228 (Ci) 4.39E-08	Ac-227 (Ci) 1.15E-07
Pa-231 (Ci) 1.78E-07	Th-229 (Ci) 2.69E-08	Th-232 (Ci) 3.46E-08	U-232 (Ci) 1.95E-02	U-233 (Ci) 1.17E+00	U-234 (Ci) 8.54E-02	U-235 (Ci) 3.26E-03	U-236 (Ci) 3.70E-03	U-238 (Ci) 5.73E-02
U-Total (kg) 1.72E+02	Np-237 (Ci) 4.52E-07	Pu-238 (Ci) 1.92E+00	Pu-239 (Ci) 1.69E+01	Pu-240 (Ci) 5.91E+00	Pu-241 (Ci) 1.11E+02	Pu-242 (Ci) 1.03E-03	Am-241 (Ci) 7.96E-04	Am-243 (Ci) 7.59E-07
Cm-242 (Ci) 1.27E-06	Cm-243 (Ci) 1.36E-07	Cm-244 (Ci) 3.41E-06						

Table AD1-5. Data-Needs Priority Summary – Model Group 6 – 216-T-36 Crib (200-SC-1) (RL/FH) (CPP) (EPA). (2 Pages)

Vicinity Waste Sites	200-W-79; 216-T-13; 241-T Tank Farm						
Potential Remedial Alternatives							
X for Viable Alternatives	No Action	MESC/MNA/IC	Removal/Disposal	Barrier	Partial Removal/Barrier	In Situ Treatment	Other
		X	X	X	X		

Data Evaluation and Gaps Analysis			
Data	Knowns	Data Uncertainties	Are supplemental data required to support decision making?
Scintillation Logs (ARH-ST-156): 299-W10-2 (230 ft) (1976) 299-W10-4 (245 ft) (1976) ERC surveys (2006)	Located 10 m (33 ft) north of the northwest corner of the 216-T-36 Crib. Scintillation log from 1976 indicates minor (10^4 cpm) at ~30 m (100 ft) bgs. ARH-ST-156 implies this contamination is associated with 216-T-7 rather than 216-T-36. Located 10 m (33 ft) south of the southeast corner of the 216-T-36 Crib. Scintillation logs from 1959, 1963, and 1976 indicate minor (10^3 to 10^4 cpm) at ~30 m (100 ft) bgs. ARH-ST-156 implies this contamination is associated with 216-T-7 rather than 216-T-36. The 216-T-36 Crib is located in an area of increasing Tc-99 concentrations in the groundwater. ERC surveys show some areas of higher conductivity near the east side of this crib. The area directly below the crib shows limited conductivity to a depth of >40 m (130 ft) bgs (RPP-RPT-28955)	Based on current groundwater conditions, the inventory for this site may be uncertain.	Potentially. A deep borehole is planned for fiscal year 2007 to evaluate the Tc-99 plume in the groundwater in this area. The borehole will be located to the northeast of the 216-T-36 Crib. Based on the information from the groundwater borehole, a shallow borehole may be needed in the 216-T-36 Crib to resolve uncertainties in the inventory and resulting contaminant concentrations. If the groundwater borehole indicates substantial vadose zone contamination, then a shallow borehole will be drilled in the 216-B-36 Crib to obtain site-specific information to correlate with ERC and to support site-specific risk assessment and the decision making for the 216-T-36 Crib.

Proposed Activities and Path Forward:

Evaluate data from the groundwater borehole to be drilled to the northeast of the 216-T-36 Crib in fiscal year 2007.

Install a contingent shallow borehole if the vadose information from the groundwater well indicates substantial contamination.

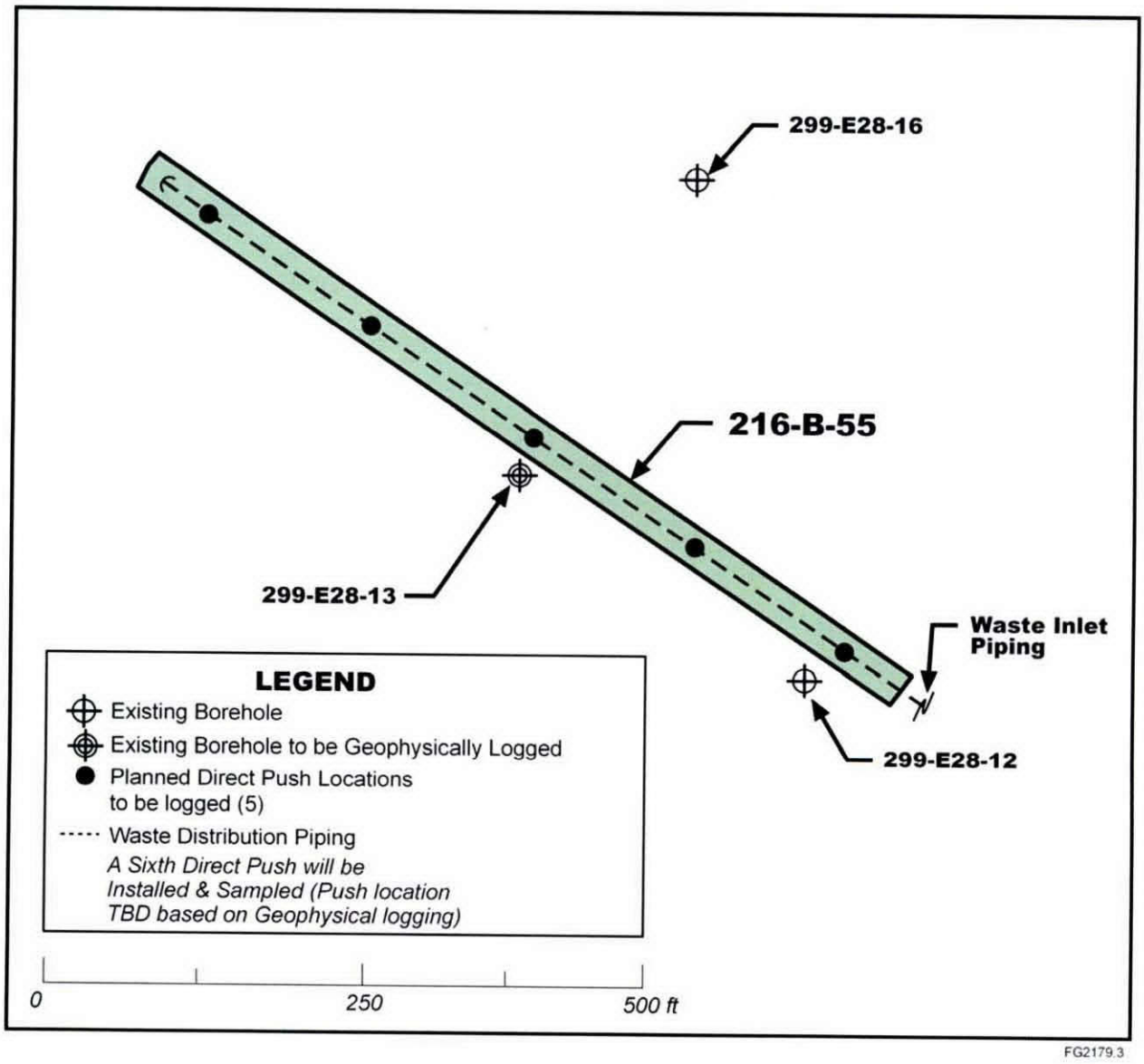
Additional Notes:
The following provides a list of the references/bibliography used during this evaluation:
ARH-ST-156, *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells.*
DOE/RL-2004-24, *Feasibility Study for the 200-CW-5 (U Pond/Z Ditches Cooling Water Waste Group), 200-CW-2 (S Pond and Ditches Cooling Water Waste Group), 200-CW-4 (T Pond and Ditches Cooling Water Waste Group), and 200-SC-1 (Steam Condensate Waste Group) Operable Units.*
DOE/RL-2006-46, *Sampling and Analysis Plan for Deep Groundwater Wells 299-W11-48 (C5243) and 299-W10-32 (C5244) Near Waste Management Area T in the 200-ZP-1 Operable Unit, Fiscal Year 2006.*
RPP-26744, *Hanford Soil Inventory Model, Rev. 1.*
RPP-RPT-28955, *Surface Geophysical Exploration of T Tank Farm at the Hanford Site.*
Waste Information Data System Report, Hanford Site database.

bgs = below ground surface.
ERC = electrical resistivity characterization.
MESC/MNA/IC = Maintain Existing Soil Cover, Monitored Natural Attenuation, Institutional Controls.
WIDS = *Waste Information Data System* database.

AD1-4.0 216-B-55 CRIB SITE-SPECIFIC FIELD-SAMPLING PLAN

The following figures and tables provide the site-specific field-sampling plan for the 216-B-55 Crib.

Figure AD1-8. 216-B-55 Crib Data-Collection Locations.



TBD = to be determined.

Figure AD1-9. 216-B-55 Crib Stratigraphy and Sample-Collection Intervals.

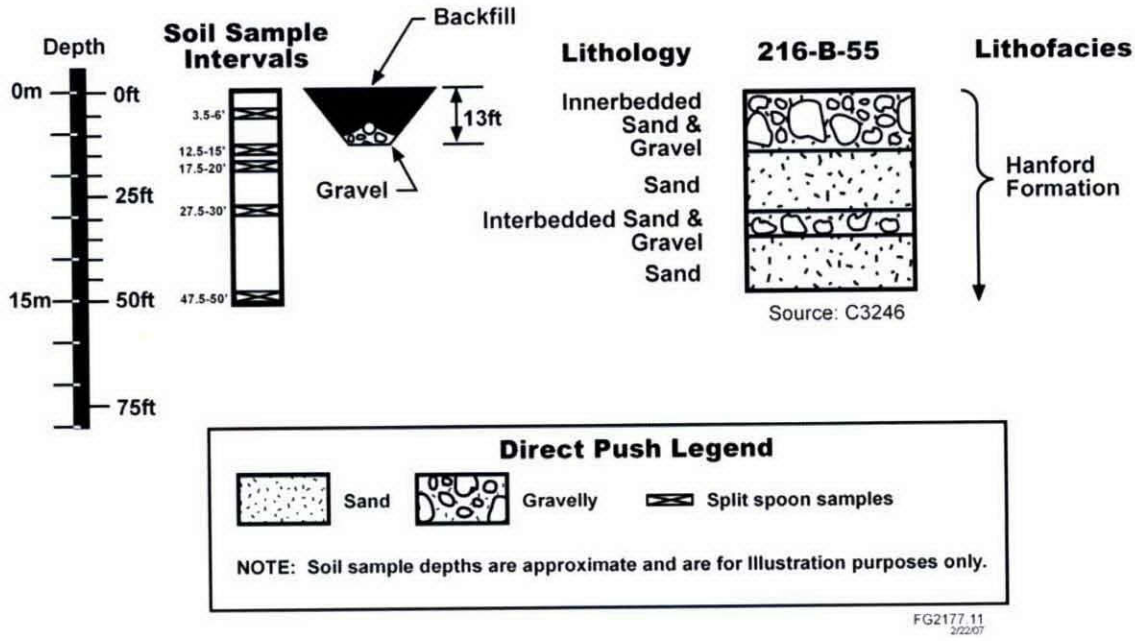


Table AD1-6. 216-B-55 Crib Sampling Plan.

Sample Collection Methodology	Sample Location	Maximum Depth of Investigation	Sample Interval Depth (ft bgs) [a]	Analyte List [b]	Physical Properties	
					Sample Interval	Parameters
Direct push with sampling	Five direct-push holes [e]	50 ft bgs	12.5 – 15 ft bgs	Analytes are presented in Volume I, Table A2-3, the 200-CW-5, 200-CW-2, 200-CW-4, and 200-SC-1 columns.	N/A	N/A
	One direct-push hole [f]	50 ft bgs	Sample at depths of: 3.5 – 6 ft bgs 12.5 – 15 ft bgs 17.5 – 20 ft bgs 27.5 – 30 ft bgs 47.5 – 50 ft bgs	Analytes are presented in Volume I, Table A2-3, the 200-CW-5, 200-CW-2, 200-CW-4, and 200-SC-1 columns.	N/A	N/A

Number of split-spoon samples	10
Approximate number of field quality-control samples [c]	3
Approximate total number of soil samples collected	13
Approximate total number of soil samples initially analyzed [d]	8

Non-Sample Data Collection	Maximum Depth of Investigation
Downhole gamma-spectroscopy log, neutron moisture, passive neutrons	Surface to total depth in five direct-push holes to 50 ft bgs and one existing well E28-13 to 230 ft bgs

[a] Actual sampling depths may vary depending on the amount of backfill/overburden used in interim stabilization activities at the waste site, field screening results, and varying subsurface conditions.
[b] See Volume I, Appendix A, Tables A2-1, A2-2, A2-3, A2-5, and A3-2 for detection limits and other analytical parameters.
[c] One duplicate, one split, and one equipment blank. Field blanks also will be collected for volatile organic analysis, but are not included here.
[d] Number of samples analyzed includes five split-spoon samples and three field quality-control samples. Five additional split spoons associated with five direct pushes will be analyzed in accordance with footnote e.
[e] Analyze these samples only if geophysical logging shows no contamination.
[f] Install sixth direct push at location of highest contamination from the initial five pushes, to collect and analyze soil samples. If the logging results of the first five pushes do not indicate contamination, install sixth direct push at the head end of the ditch and sample throughout the push to obtain vertical distribution of contaminants.
bgs = below ground surface. N/A = not applicable.

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Figure AD1-10. 216-B-55 Crib
Conceptual Model and Data Summary.

216-B-55 Crib

200-SC-1 Operable Unit
Waste Type: Steam Condensate

Model Group 6
B Plant Zone

History

216-B-55 Crib is a liquid waste disposal site that received contaminated steam condensate from the 221-B Building.

CONSTRUCTION: A covered, gravel-filled trench with bottom dimensions of 750 feet long by 10 feet wide and about 13 feet deep. A perforated 30-inch diameter galvanized pipe runs the length of the unit.

WASTE VOLUME: 1,230,000,000 liters

DURATION: 1967 to 1991.

ESTIMATED INVENTORY OF SELECTED HIGH-MOBILITY CONSTITUENTS

	WIDS	SIM
Uranium	<0.54 Kg	0.0003 Kg
Tritium	3.74 Ci	0.0002 Ci
Nitrate	--	604 Kg
Fluoride	--	159 Kg

ESTIMATED INVENTORY OF SELECTED MEDIUM/LOW MOBILITY CONSTITUENTS

	WIDS	SIM
Co-60	0.38 Ci	0.0004 Ci
Cs-137	21.1 Ci	0.14 Ci
Sr-90	<11.1 Ci	0.0002 Ci
Plutonium	<0.46 g	0.00014 Ci
Total Beta Emitters	150 Ci	--

Note: "--" indicates inventory not estimated

REFERENCES:

WIDS general summary reports
Hanford Soil Inventory Model, Rev 1 (RPP-26744)

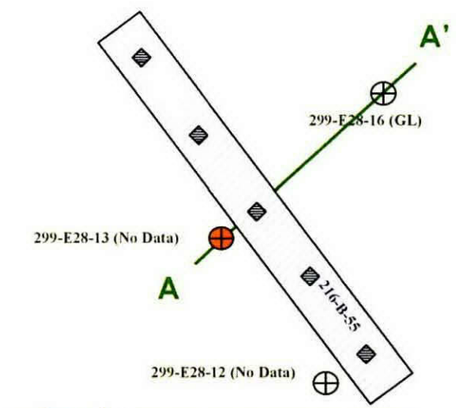
Basis of Knowledge

- Process History (PH)
- Geologic Logs (GL)
- Extrapolation from Representative Site (RS)

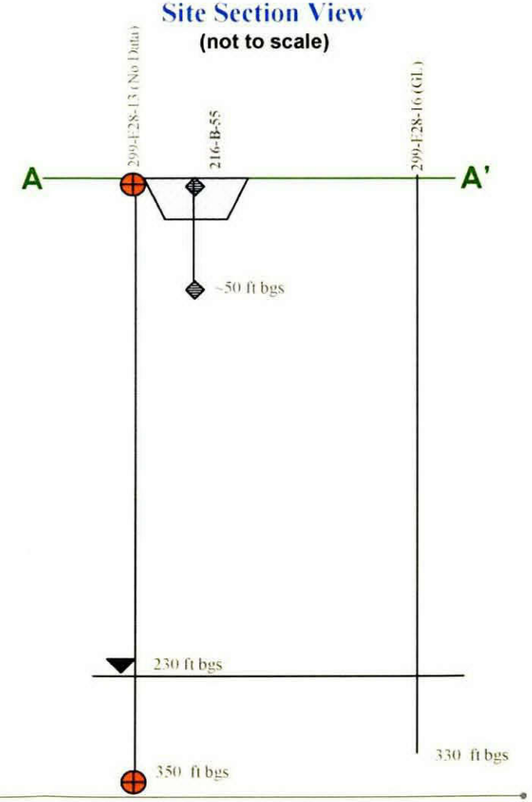
Characterization Summary

- One geologic log from well 299-E28-16
- Process history including data from discharge stream
- Assigned to representative site 216-U-10.

Site Plan View
(not to scale)



Site Section View
(not to scale)



Potential Viable Alternatives

- NO ACTION
- REMOVE/TREAT/DISPOSE
- PARTIAL REMOVAL/TREATMENT/BARRIER
- MESC/MNA/IC
- BARRIER

Data Needs, Rationale, and Investigation Approach

No additional data are required to support a decision based on the analogous relationship; however additional information is useful for the following reasons:

- The analogous relationship with 216-U-10 is expected to be bounding; however, the actual inventory at this facility may be substantially lower, providing the opportunity to support a no action alternative, or other non-intrusive alternatives.
- Supplemental information may also support reducing the scope of intrusive remediation (e.g., partial removal/treatment/barrier).

The supplemental investigation strategy incorporates the following elements:

- Geophysically log existing well 299-E28-13, using gamma spectroscopy, neutron moisture, and passive neutron logging techniques.
- Install 5 direct push holes along the axis of the crib and geophysically-log the holes and collect soil samples at the elevation of the crib bottom. Identify locations of elevated gamma activity.
- Collect subsurface soil samples from one direct push hole located at the point of highest gamma activity identified in the five logged holes. If no gamma response is found in the first five holes, then locate the sixth hole near the head end of the trench, collect soil samples and analyze as specified.

Table AD1-7. Data-Needs Priority
Summary – Model Group 6 – 216-B-55 Crib
(200-CW-5/2/4/200-SC-1) (RL/FH) (CPP) (EPA). (2 Pages)

Background	
Site Identification	216-B-55 Crib
Site Location	200 East Area; B Plant Zone; west of 225-B and north of 7th Street
Type of Site	Crib
Operating History	The site is marked with concrete AC-540 markers and posted with Underground Radioactive Material signs. The unit is filled with approximately 1380 m^3 (1,800 yd^3) of gravel. A perforated 30 cm (30-in.) diameter galvanized pipe runs the length of the unit, 0.9 m (3 ft) above the bottom. The site had two gage wells of 20 cm (8-in.) steel pipe with a galvanized sheet metal cap. Each well extended from the crib bottom to approximately 0.9 m (3 ft) above grade. The crib was constructed with 19,500 ft^2 of membrane barrier. The site received 1.23 billion liters of steam condensate from 221-B. The crib is adjacent to an area of reoccurring, spreading contamination known as UPR-200-E-64. (WIDS) The crib is 228 m long by 3.1 m wide (750 ft by 10 ft) (WIDS). The depth is uncertain, but appears to be approximately 13 ft deep (H-2-60330). The crib operated from 1967 to 1991 (WIDS). Soil Inventory Model – 216-B-55 (RPP-26744).

Na (kg) 2.490E+03	Al (kg) 9.318E-02	Fe (kg) 4.231E+01	Cr (kg) 1.474E-02	Bi (kg) 9.513E-06	La (kg) 0.000E+00	Hg (kg) 2.936E-06	Zr (kg) 1.259E-06	Pb (kg) 6.649E+00
Ni (kg) 9.903E-04	Ag (kg) 0.000E+00	Mn (kg) 6.044E+00	Ca (kg) 2.273E+04	K (kg) 8.958E+02	NO3 (kg) 6.045E+02	NO2 (kg) 3.579E-01	CO3 (kg) 9.067E+04	PO4 (kg) 5.572E-03
SO4 (kg) 1.245E+04	Si (kg) 2.974E+03	F (kg) 1.596E+02	Cl (kg) 1.058E+03	CCl4 (kg) 0.000E+00	Butanol (kg) 1.754E-08	TBP (kg) 0.000E+00	NPH (kg) 0.000E+00	NH3 (kg) 3.772E-03
Fe(CN)6 (kg) 0.000E+00	H-3 (Ci) 1.770E-04	C-14 (Ci) 3.399E-05	Ni-59 (Ci) 6.417E-06	Ni-63 (Ci) 6.098E-04	Co-60 (Ci) 3.926E-04	Se-79 (Ci) 4.049E-06	Sr-90 (Ci) 2.197E-04	Y-90 (Ci) 2.197E-04
Zr-93 (Ci) 2.412E-04	Nb-93m (Ci) 1.947E-04	Tc-99 (Ci) 1.291E-03	Ru-106 (Ci) 3.687E-10	Cd-113m (Ci) 2.523E-04	Sb-125 (Ci) 5.996E-05	Sn-126 (Ci) 1.683E-05	I-129 (Ci) 7.634E-07	Cs-134 (Ci) 1.353E-07
Cs-137 (Ci) 1.433E-01	Ba-137m (Ci) 1.354E-01	Sm-151 (Ci) 5.316E-02	Eu-152 (Ci) 9.925E-06	Eu-154 (Ci) 7.391E-04	Eu-155 (Ci) 3.411E-04	Ra-226 (Ci) 1.890E-10	Ra-228 (Ci) 8.757E-09	Ac-227 (Ci) 1.119E-09
Pa-231 (Ci) 3.058E-09	Th-229 (Ci) 4.858E-11	Th-232 (Ci) 1.353E-10	U-232 (Ci) 2.324E-09	U-233 (Ci) 1.434E-07	U-234 (Ci) 9.993E-08	U-235 (Ci) 4.173E-09	U-236 (Ci) 2.723E-09	U-238 (Ci) 9.357E-08
U-Total (kg) 2.805E-04	Np-237 (Ci) 4.206E-06	Pu-238 (Ci) 1.969E-06	Pu-239 (Ci) 4.575E-05	Pu-240 (Ci) 1.061E-05	Pu-241 (Ci) 8.933E-05	Pu-242 (Ci) 7.363E-10	Am-241 (Ci) 6.433E-05	Am-243 (Ci) 3.694E-08
Cm-242 (Ci) 2.269E-07	Cm-243 (Ci) 6.970E-09	Cm-244 (Ci) 1.739E-07						

Table AD1-7. Data-Needs Priority
Summary – Model Group 6 – 216-B-55 Crib
(200-CW-5/2/4/200-SC-1) (RL/FH) (CPP) (EPA). (2 Pages)

Vicinity Waste Sites	216-B-12, UPR-200-E-64						
Potential Remedial Alternatives							
X for Viable Alternatives	No Action	MESC/MNA/IC	Removal/Disposal	Barrier	Partial Removal/Barrier	In Situ Treatment	Other
	X	X	X	X	X		

Data Evaluation and Gaps Analysis			
Data	Knowns	Data Uncertainties	Are supplemental data required to support decision making?
Well 299-E28-12 (349 ft) (scintillation logs 1968, 1970, and 1976)	Located 4 m (13 ft) from the crib edge on the southeast end. Only background radioactivity was detected	Nature and extent of contamination is uncertain; however, contaminant concentrations are expected to be low based on Soil Inventory Model inventory estimate. Analogous relationship with representative site is a bounding relationship. Site-specific data may indicate no action or MESC/IC/MNA are more appropriate.	No. Analogous relationship and inventory data could be used to support decision making. However, this crib is assigned to 216-U-10, which has a larger inventory of several constituents. While the analogous relationship with 216-U-10 would bound the decision process, supplemental data at 216-B-55 may permit a stronger analysis of the no action and MESC/IC/MNA alternatives and may permit a lesser alternative than the analogous evaluation. Supplemental data would provide site-specific confirmatory information on the nature and extent of contamination; because the crib is large, the supplemental data would allow assessment of partial removal alternative and permit a more accurate evaluation of contaminant volume and cost.

Proposed Activities and Path Forward:

Geophysically log well 299-E28-13.

Install five direct pushes along length of crib; geophysically log the holes; collect soil samples at bottom of crib.

Install sixth direct push at location of highest contamination from the initial five pushes to collect and analyze soil samples. If the logging results of the first five pushes do not indicate contamination, install sixth direct push at the head end of the ditch and sample throughout the push to obtain vertical distribution of contaminants.

Additional Notes:
The following provides a list of the references/bibliography used during this evaluation:

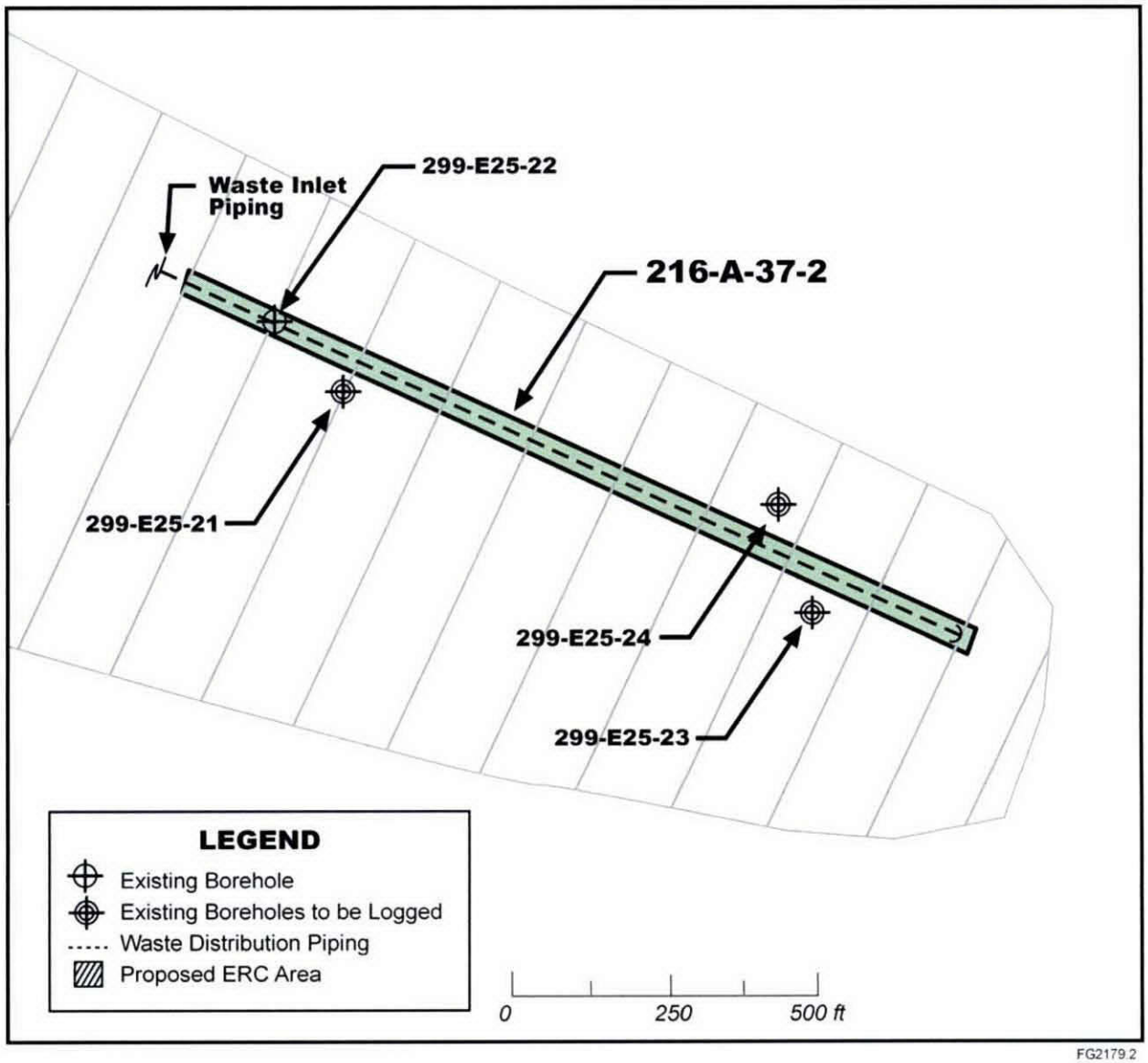
ARH-947, *200 Areas Disposal Sites for Radioactive Liquid Waste.*
ARH-ST-156, *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells.*
BHI-00179, *B Plant Aggregate Area Management Study Technical Baseline Report.*
DOE/RL-2004-24, *Feasibility Study for the 200-CW-5 (U Pond/Z Ditches Cooling Water Waste Group), 200-CW-2 (S Pond and Ditches Cooling Water Waste Group), 200-CW-4 (T Pond and Ditches Cooling Water Waste Group), and 200-SC-1 (Steam Condensate Waste Group) Operable Units.*
H-2-60330, *Trench 216-B-55 Cond Waste Lines 221-B to Trench 216-B-55 & B-12 Crib Plan & Profile.*
RHO-CD-673, *Handbook 200 Areas Waste Sites.*
RHO-RE-SR-84-24 P, *Results of the Separations Area Groundwater Monitoring Network for 1983.*
RPP-26744, *Hanford Soil Inventory Model,* Rev. 1.
Waste Information Data System Report, Hanford Site database.

MESC/MNA/IC = Maintain Existing Soil Cover, Monitored Natural Attenuation, Institutional Controls.
WIDS = *Waste Information Data System* database.

AD1-5.0 216-A-37-2 CRIB SITE-SPECIFIC FIELD-SAMPLING PLAN

The following figures and tables provide the site-specific field-sampling plan for the 216-A-37-2 Crib.

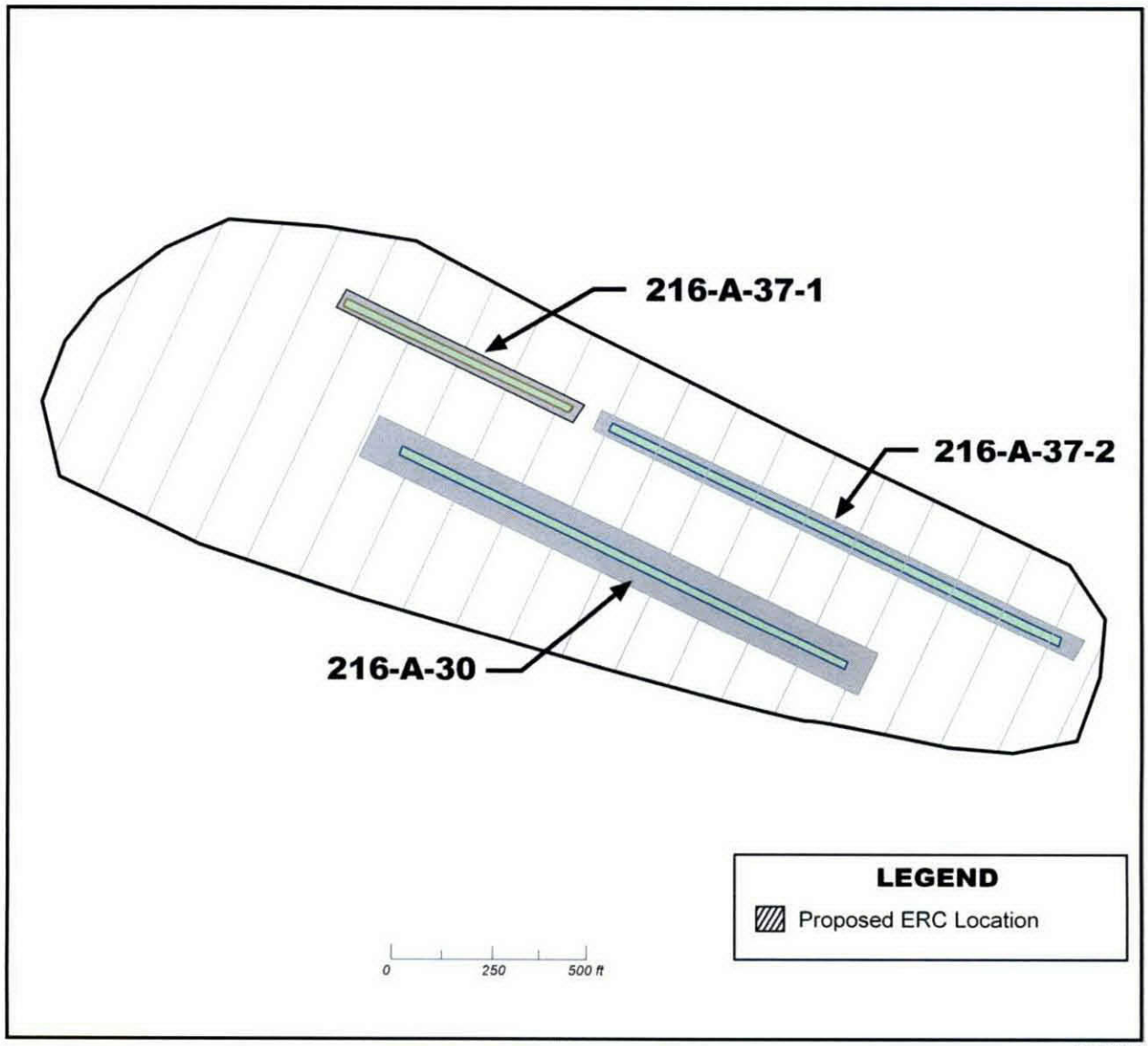
Figure AD1-11. 216-A-37-2 Crib Data-Collection Locations.



ERC=electrical resistivity characterization.

NOTE: Downhole logging from surface to total depth of existing boreholes. Downhole logging includes gamma spectroscopy, neutron moisture, and passive neutron.

Figure AD1-12. East Plutonium-Uranium Extraction Plant Electrical Resistivity Characterization Data-Collection Study Area (including the 216-A-37-2 Crib).



ERC = electrical resistivity characterization.

Figure AD1-13. 216-A-37-2 Crib
Conceptual Model and Data Summary.

216-A-37-2 Crib

200-SC-1 Operable Unit
Waste Type: Steam Condensate

Model Group 6
PUREX Zone

History

216-A-37-2 Crib is a liquid waste disposal site constructed as a replacement for 216-A-30 Crib and received contaminated steam condensate, equipment disposal tunnel floor and water-filled door drainage, and fuel slug storage basin overflow from the 202-A Building (PUREX).

CONSTRUCTION: A covered, gravel-filled trench with bottom dimensions of 1,400 feet long by 10 feet wide and about 16 feet deep. Two perforated galvanized pipes run the length of the unit.

WASTE VOLUME: 1,290,000,000 liters

DURATION: 1983 to 1995.

ESTIMATED INVENTORY OF SELECTED HIGH-MOBILITY CONSTITUENTS

	WIDS	SIM
Uranium	0.005 Ci	47.6 Kg
U-234	--	0.02 Ci
Tritium	5.08 Ci	9.5 Ci
Nitrate	--	617 Kg
Fluoride	--	149 Kg

INVENTORY OF MEDIUM/LOW MOBILITY CONSTITUENTS

	WIDS	SIM
Cs-137	0.102 Ci	--
Sr-90	0.132 Ci	0.06 Ci
Plutonium	--	1.34 Ci
Total Beta Emitters	0.672 Ci	--

Note: "--" indicates inventory not estimated.

REFERENCES:

WIDS general summary reports
Hanford Soil Inventory Model, Rev 1 (RPP-26744)

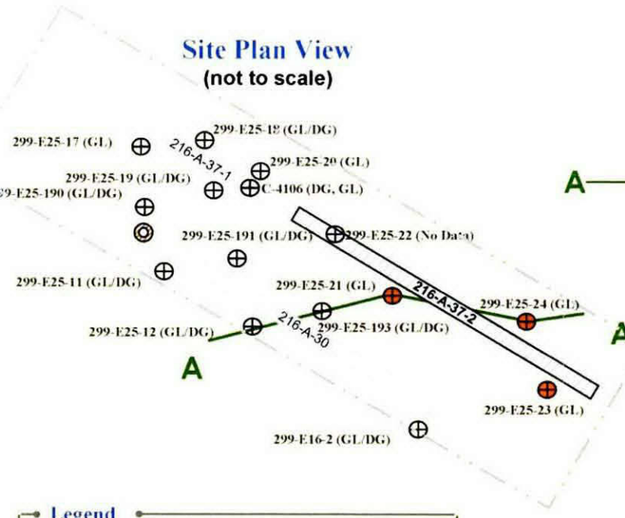
Basis of Knowledge

- Process History (PH)
- Interpretation of Downhole Geophysics (DG)
- Geologic Logs (GL)
- Extrapolation from Representative Site (RS)

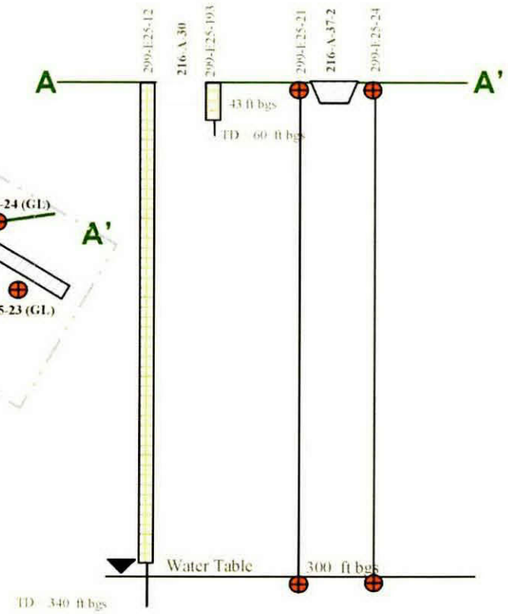
Characterization Summary

- Operating history and scintillation log of well 299-E25-12 (adjacent to 216-A-30) suggests potential for deep contamination at relatively low concentrations under 216-A-30.
- Assigned to representative site 216-U-10.

Site Plan View
(not to scale)



Site Section View
(not to scale)



Legend

- Waste Site
- Existing Borehole (data type)
- Existing borehole to be geophysically logged
- Proposed New Borehole to be Sampled
- Groundwater Surface
- Zone of residual radioactivity in down-hole log.
- Footprint of ERC Survey

Data Needs, Rationale, and Investigation Approach

No additional data are needed for 216-A-37-2. Decisions at this site will be made using the following information:

- The estimated inventory for the site is relatively low.
- The site received the same waste stream as 216-A-30 Crib and the information derived from that site can be used to describe conditions at 216-A-37-2. 216-A-30 should provide bounding conditions for 216-A-37-2.
- 216-A-37-2 will be included in the conductivity survey to be conducted at 216-A-30.
- Conduct downhole geophysical logging (gamma spectroscopy, neutron moisture, and passive neutron) at three nearby existing wells to supplement information.
- Results of sampling and analysis of subsurface soil from a new deep borehole to be placed within 216-A-30 Crib will be evaluated in association with 216-A-37-2.

Potential Viable Alternatives

- NO ACTION
- REMOVE/TREAT/DISPOSE
- PARTIAL REMOVAL/TREATMENT/BARRIER
- MESC/MNA/IC
- BARRIER

Table AD1-8. Data-Needs Priority
Summary – Model Group 6 – 216-A-37-2 Crib
(200-CW-5/2/4/200-SC-1) (RL/FH) (CPP) (EPA). (2 Pages)

Background	
Site Identification	216-A-37-2 Crib
Site Location	200 East Area; PUREX Zone; outside 200 East Area perimeter fence, east of the 202-A Building
Type of Site	Crib
Operating History	The crib is marked with concrete AC-540 posts and Underground Radioactive Material signs. The crib was built as a replacement for the 216-A-30 crib. The crib received PUREX steam condensate waste. There are two steel drain pipes. One is perforated and runs the length of the unit, and the other is unperforated and runs from west to east only to the center of the unit, 1.5 m (5 ft) above the bottom. Two vents are located at the center and at the east end. Two liquid-level gage wells are located 106 m (350 ft) from the ends of the unit. A bed of gravel on the bottom has been covered with a 20-mil polyvinyl chloride barrier cover. The crib is 1,400 ft long, 10 ft wide at the bottom, and 16 ft deep. The waste site received 1,090,033 m^3 of liquid effluent and operated from 1983 to 1995. Site Inventory Model – 216-A-37-2 Crib (RPP-26744) (some constituents of interest are highlighted)

Na (kg) 2.366E+03	Al (kg) 0.000E+00	Fe (kg) 5.664E+01	Cr (kg) 0.000E+00	Bi (kg) 0.000E+00	La (kg) 0.000E+00	Hg (kg) 1.155E-02	Zr (kg) 0.000E+00	Pb (kg) 5.555E-01
Ni (kg) 0.000E+00	Ag (kg) 0.000E+00	Mn (kg) 7.728E+00	Ca (kg) 1.181E+04	K (kg) 8.178E+02	NO3 (kg) 6.177E+02	NO2 (kg) 0.000E+00	CO3 (kg) 7.469E+04	PO4 (kg) 0.000E+00
SO4 (kg) 1.163E+04	Si (kg) 2.757E+03	F (kg) 1.487E+02	Cl (kg) 1.168E+03	CCl4 (kg) 0.000E+00	Butanol (kg) 1.389E+02	TBP (kg) 0.000E+00	NPH (kg) 0.000E+00	NH3 (kg) 0.000E+00
Fe(CN)6 (kg) 0.000E+00	H-3 (Ci) 9.505E+00	C-14 (Ci) 4.528E-01	Ni-59 (Ci) 0.000E+00	Ni-63 (Ci) 0.000E+00	Co-60 (Ci) 0.000E+00	Se-79 (Ci) 0.000E+00	Sr-90 (Ci) 5.556E-02	Y-90 (Ci) 5.560E-02
Zr-93 (Ci) 0.000E+00	Nb-93m (Ci) 0.000E+00	Tc-99 (Ci) 0.000E+00	Ru-106 (Ci) 0.000E+00	Cd-113m (Ci) 0.000E+00	Sb-125 (Ci) 0.000E+00	Sn-126 (Ci) 0.000E+00	I-129 (Ci) 5.437E-05	Cs-134 (Ci) 0.000E+00
Cs-137 (Ci) 0.000E+00	Ba-137m (Ci) 0.000E+00	Sm-151 (Ci) 0.000E+00	Eu-152 (Ci) 0.000E+00	Eu-154 (Ci) 0.000E+00	Eu-155 (Ci) 0.000E+00	Ra-226 (Ci) 5.406E-07	Ra-228 (Ci) 3.249E-11	Ac-227 (Ci) 2.712E-06
Pa-231 (Ci) 6.243E-06	Th-229 (Ci) 3.566E-09	Th-232 (Ci) 3.729E-11	U-232 (Ci) 7.605E-06	U-233 (Ci) 2.411E-06	U-234 (Ci) 2.300E-02	U-235 (Ci) 8.816E-04	U-236 (Ci) 2.222E-03	U-238 (Ci) 1.586E-02
U-Total (kg) 4.764E+01	Np-237 (Ci) 5.757E-04	Pu-238 (Ci) 1.435E-02	Pu-239 (Ci) 1.386E-01	Pu-240 (Ci) 3.908E-02	Pu-241 (Ci) 1.158E+00	Pu-242 (Ci) 4.931E-06	Am-241 (Ci) 3.599E-02	Am-243 (Ci) 9.959E-06
Cm-242 (Ci) 1.838E-05	Cm-243 (Ci) 2.780E-06	Cm-244 (Ci) 7.111E-05						

Table AD1-8. Data-Needs Priority
Summary – Model Group 6 – 216-A-37-2 Crib
(200-CW-5/2/4/200-SC-1) (RL/FH) (CPP) (EPA). (2 Pages)

Vicinity Waste Sites	216-A-30, 216-A-37-1						
Potential Remedial Alternatives							
X for Viable Alternatives	No Action	MESC/MNA/IC	Removal/Disposal	Barrier	Partial Removal/Barrier	In Situ Treatment	Other
	X	X	X	X	X		
Data Evaluation and Gaps Analysis							
Data	Knowns	Data Uncertainties	Are supplemental data required to support decision making?				
No site-specific sampling or geophysical logging information Borehole C4106 at 216-A-37-1 was drilled to the water table and provides information on deeper contamination in the area of the 216-A-37-1 and 216-A-37-2 Cribs.		Nature and extent of contamination at 216-A-37-2; inventory indicates minor contamination.	No. Inventory data and data from supplemental investigation activities at 216-A-30 (proposed) will support decision making at the 216-A-37-2 Crib (216-A-37-2 replaced the 216-A-30 Crib). Because existing wells are located within the waste site, geophysical logging is an opportunistic method of collecting site-specific data to help confirm inventory knowledge for gamma-emitting radionuclides and to support decision making. ERC surveys in this area also will provide information on the potential for deeper mobile contaminants.				
Proposed Activities and Path Forward: No supplemental data collection activities are required. Data collected from 216-A-30 will be used to support evaluation of 216-A-37-2. Geophysically log 299-E25-21, -23, and -24 to obtain opportunistic site-specific information. Reevaluate data needs following assessment of the 216-A-30 supplemental investigation data and any additional information collected for 216-A-37-1 (a Washington State Department of Ecology treatment, storage, and/or disposal site).							

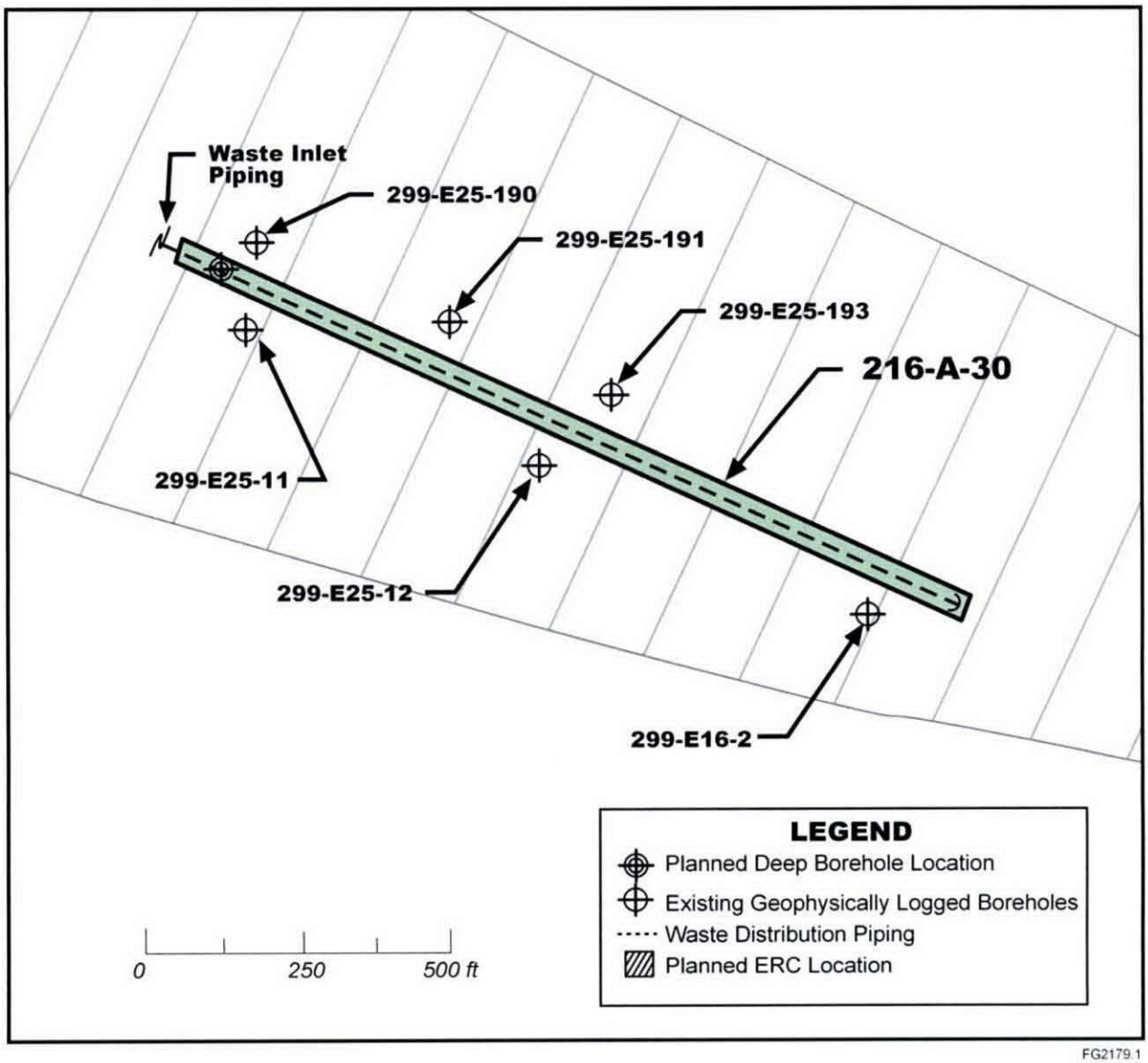
Additional Notes:
The following provides a list of the references/bibliography used during this evaluation:
DOE/RL-2003-11, *Remedial Investigation for the 200-CW-5 U Pond/ Z Ditches Cooling Water Group, the 200-CW-2 S Pond and Ditches Cooling Water Group, the 200-CW-4 T Pond and Ditches Cooling Water Group, and the 200-CS-1 Steam Condensate Group Operable Units.*
DOE/RL-2004-24, *Feasibility Study for the 200-CW-5 (U Pond/Z Ditches Cooling Water Waste Group), 200-CW-2 (S Pond and Ditches Cooling Water Waste Group), 200-CW-4 (T Pond and Ditches Cooling Water Waste Group), and 200-SC-1 (Steam Condensate Waste Group) Operable Units.*
HNF-1744, *Radioactive Inventories of Liquid Waste Disposal Sites on the Hanford Site.*
RHO-CD-673, *Handbook 200 Areas Waste Sites.*
RHO-RE-SR-84-24 P, *Results of the Separation Area Groundwater Monitoring Network for 1983.*
RPP-26744, *Hanford Soil Inventory Model, Rev. 1.*
Waste Information Data System Report, Hanford Site database.

MESC/MNA/IC = Maintain Existing Soil Cover, Monitored Natural Attenuation, Institutional Controls..
PUREX = Plutonium-Uranium Extraction (Plant or process).
WIDS = *Waste Information Data System* database.

AD1-6.0 216-A-30 CRIB SITE-SPECIFIC FIELD-SAMPLING PLAN

The following figures and tables provide the site-specific field-sampling plan for the 216-A-30 Crib.

Figure AD1-14. 216-A-30 Crib Data-Collection Locations.



NOTE: Full extent of electrical resistivity characterization (ERC) shown on Figure AD1-12.

Figure AD1-15. 216-A-30 Crib Stratigraphy and Sample-Collection Intervals.

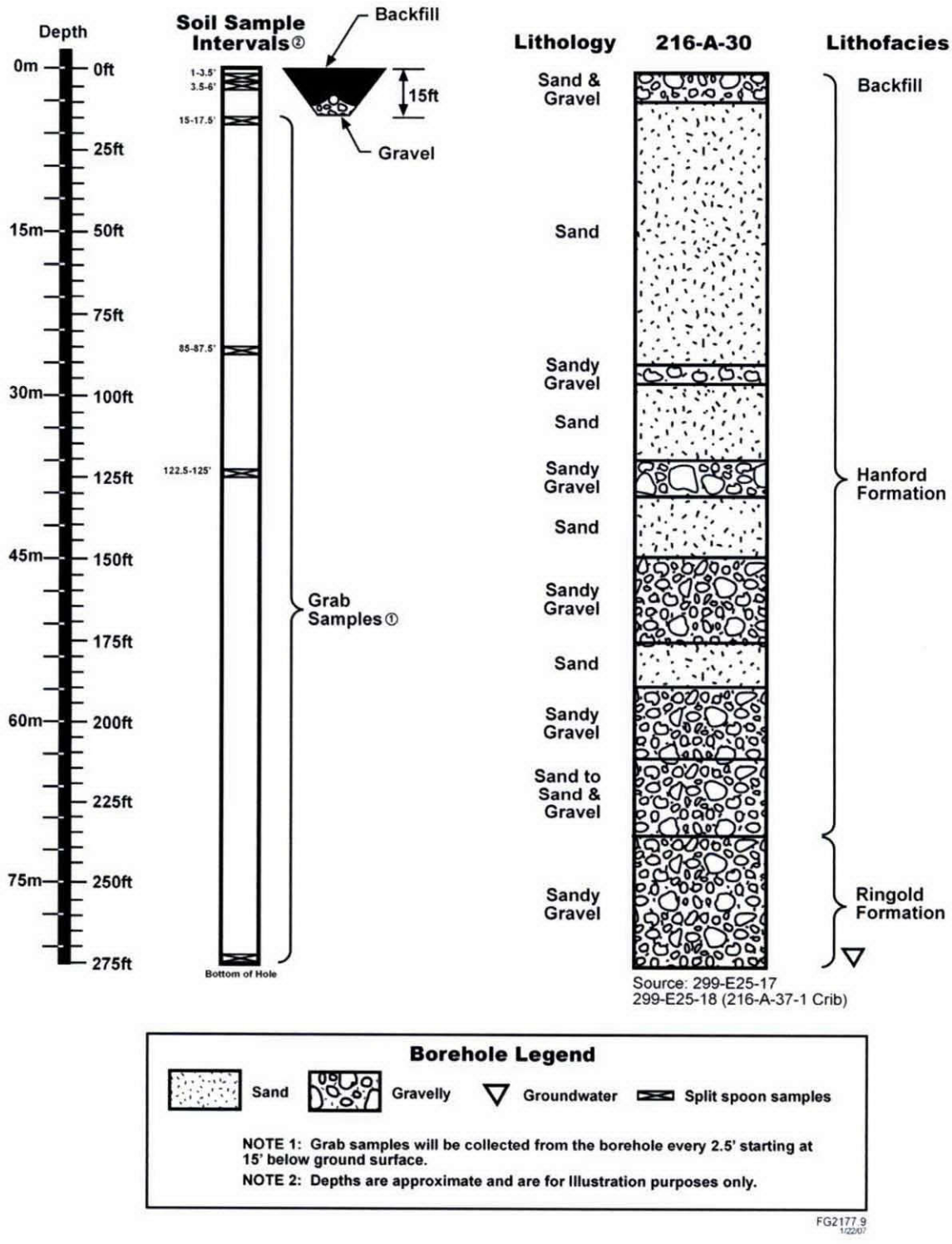


Table AD1-9. 216-A-30 Crib Sampling Plan.

Sample Collection Methodology	Sample Location	Maximum Depth of Investi-gation	Sample Interval Depth (ft bgs) [a]	Analyte List [b]	Physical Properties	
					Sample Interval	Parameters
Borehole drilling and sampling	One new borehole near the inlet end of crib	To water table (~275 ft bgs)	Split-spoon sample intervals: 1 – 3.5 ft bgs 3.5 – 6 ft bgs 15 – 17.5 ft bgs 85 – 87.5 ft bgs 122.5 – 125 ft bgs TD (~272.5 – 275 ft bgs)	Analytes are presented in Volume I, Table A2-3, the 200-CW-5, 200-CW-2, 200-CW-4, and 200-SC-1 columns.	All split-spoon samples	pH, specific conductance, bulk density, moisture, particle-size distribution
			Collect grab samples every 2.5 ft from depth 15 ft bgs to TD. Perform extraction analysis on grab samples, starting with samples every 10 ft.	See Volume I, Table A2-3	N/A	N/A
Number of split-spoon samples		6				
Approximate number of field quality-control samples [c]		3				
Approximate number of grab samples		105				
Approximate total number of soil samples collected		113				
Approximate total number of soil samples initially analyzed [d]		36				
Non-Sample Data Collection		**Maximum Depth of Investigation**				
Electrical resistivity characterization		Not defined				
Downhole gamma-spectroscopy log, neutron moisture, and passive neutron logs		Surface to TD in new borehole at ~275 ft bgs				

[a] Actual sampling depths may vary depending on the amount of backfill/overburden used in interim-stabilization activities at the waste site, field screening results, and varying subsurface conditions.
[b] See Volume I, Appendix A, Tables A2-1, A2-2, A2-3, and A3-2 for detection limits and other analytical parameters.
[c] One duplicate, one split, and one equipment blank. Field blanks also will be collected for volatile organic analysis, but are not included here.
[d] Samples analyzed include 6 split spoon samples, 27 grab samples, and 3 quality-control samples.
bgs = below ground surface. N/A = not applicable. TD = total depth.

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Figure AD1-16. 216-A-30 Crib
Conceptual Model and Data Summary.

216-A-30 Crib

200-SC-1 Operable Unit
Waste Type: Steam Condensate

Model Group 6
PUREX Plant Zone

History

216-A-30 Crib is a liquid waste disposal site that received contaminated steam condensate, equipment disposal tunnel floor and water-filled door drainage, and fuel slug storage basin overflow from the 202-A Building (PUREX). In 1972, contaminated salt crust formed on the surface of the crib. Contaminated tumbleweeds were subsequently found growing on the crib.

CONSTRUCTION: A covered, gravel-filled trench with bottom dimensions of 1,400 feet long by 10 feet wide and about 15 feet deep. Two perforated galvanized pipes run the length of the unit.

WASTE VOLUME: 7,500,000,000 liters

DURATION: 1961 to 1992.

ESTIMATED INVENTORY OF SELECTED HIGH-MOBILITY CONSTITUENTS

	WIDS	SIM
Uranium	<41 Kg	656 Kg
U-233	<7.48 g	2.05 Ci
Tritium	10.7 Ci	0.02 Ci
Nitrate	--	208,200 Kg
Chromium	--	6,045 Kg
Fluoride	--	1,128 Kg

ESTIMATED INVENTORY OF SELECTED MEDIUM/LOW MOBILITY CONSTITUENTS

	WIDS	SIM
Co-60	16.6 Ci	0.0002 Ci
Cs-137	220 Ci	2.79 Ci
Sr-90	<11.1 Ci	1.10 Ci
Plutonium	<72 g	247.8 Ci
Pu-239/-240	--	41.45 Ci
Pu-241	--	202.7 Ci
Total Beta Emitters	5,440 Ci	--

Note: "--" indicates inventory not estimated.

REFERENCES:

WIDS general summary reports
Hanford Soil Inventory Model, Rev 1 (RPP-26744)

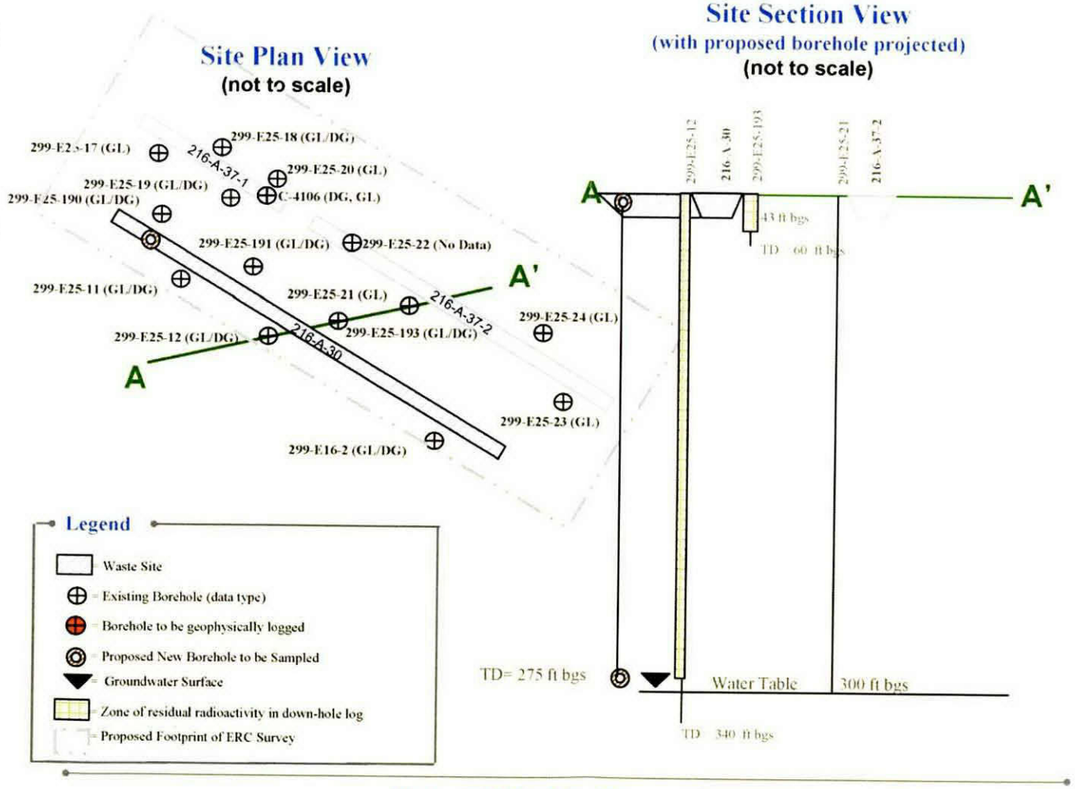
Basis of Knowledge

- Process History (PH)
- Interpretation of Downhole Geophysics (DG)
- Geologic Logs (GL)
- Extrapolation from Representative Site (RS)

Characterization Summary

- Operating history and scintillation log of well 299-E25-12 (adjacent to 216-A-30) suggests potential for deep contamination at relatively low concentrations under 216-A-30.
- Operating history indicates surface contamination along full length of crib.
- Assigned to representative site 216-U-10.

Site Plan View
(not to scale)



Site Section View
(with proposed borehole projected)
(not to scale)

Potential Viable Alternatives

- REMOVE/TREAT/DISPOSE
- PARTIAL REMOVAL/TREATMENT/BARRIER
- MESC/MNA/IC
- BARRIER

Data Needs, Rationale, and Investigation Approach

Additional information is required for the following reasons:

- There are uncertainties in the relationship to the representative site (216-U-10) based on geology and inventory.
- Groundwater protection could be a concern based on the site-specific inventory; the full nature and extent of contaminants that may impact groundwater are uncertain (e.g., chromium, fluoride, nitrate).

The supplemental investigation strategy incorporates the following elements:

- An Electrical Resistivity Characterization (ERC) survey will support identification of areas of elevated conductivity that may be associated with mobile contaminants.
- One deep borehole will be installed near the head end of the 216-A-30 Crib to collect subsurface soil samples for analysis as specified.
- Data collected from this site will be used to describe expected conditions at 216-A-37-2 and 216-A-6. This is appropriate because these sites all received the same waste; 216-A-6 was replaced by 216-A-30, which was subsequently replaced by 216-A-37-2.

Table AD1-10. Data-Needs Priority
Summary – Model Group 6 – 216-A-30 Crib
(200-CW-5/2/4/200-SC-1) (RL/FH) (CPP) (EPA). (2 Pages)

Background	
Site Identification	216-A-30 Crib
Site Location	200 East; PUREX Zone; south of 202-A Building inside the PUREX Exclusion Fence, immediately east of 216-Z-6 Crib and adjacent to 216-A-37-1 and 216-A-37-2.
Type of Site	Crib
Operating History	The crib is surrounded with concrete AC-540 markers and posted with Underground Radioactive Material signs. The unit includes two distribution pipes: one 15-in (38 cm) corrugated perforated pipe running approximately 4 ft (1.2 m) below grade to the center of the unit, the other a 16-in (41 cm) steel pipe running parallel to the other, 4 ft (1.2 m) below grade to the center of the unit, then angling 45 degrees and changing to a 15-in (38 cm) corrugated, perforated pipe running 7 to 8 ft (2.1 to 2.4 m) below grade to the end of the unit. It is filled with 5 ft (1.5 m) or a total of 123,000 cu ft (3,480 m^3) of gravel, and the site has been backfilled. The side slope is 1.5:1. The crib is associated with PUREX operations. Two 8-inch (20 cm) carbon steel gage wells extending from the bottom to 3 ft (0.9 m) above grade. A 15-inch (38 cm) diameter vent riser extends from the distribution pipe to 3 ft (0.9 m) above grade. Two 16-in. (41 cm) by 16-inch (41 cm) by 8-inch (20 cm) concrete pads support the gage wells. 47,720 square feet (4430 square meters) of polyethylene sheets were added. The site is associated with the 216-A-6 Crib. The site received waste between 1961 and 1992. From 1961 to 1966, the 216-A-6 and 216-A-30 Cribs were used in parallel; in 1970, the 216-A-6 Crib was abandoned and the effluent was routed to the 216-A-30 Crib. The 216-A-37-2 Crib subsequently was constructed to replace 216-A-30. During the winter of 1971 and early 1972, an alkaline deposit formed over the surface of the 216-A-30 Crib. A radiation survey found the residue to have between 4000 to 6000 disintegrations per minute beta/gamma on the surface. A few tumbleweeds were found measuring 12,000 disintegrations per minute beta/gamma. An exploratory excavation was made into the crib in 1972. Dose rates up to 800 mrad/h were encountered at a depth of 1.2 m (4 ft). It appeared to be a salt deposit condensing out of vapors being emitted from the unit through the porous soil. Corrective actions were taken in June 1972, including covering the ground with layers of sand and plastic. This crib has a history of tumbleweed growing on it and becoming contaminated by absorbing the radionuclides from the crib through their roots. In November 2002, an area measuring approximately 12 by 12 m (40 by 40 ft) was found to have growing contaminated tumbleweeds reading up to 120,000 disintegrations per minute. (WIDS) The crib is 1,400 ft long, and 10 ft wide at the bottom. Construction and historical information would suggest contamination as shallow as 4 to 5 ft bgs. The waste site received approximately 7.5 million m^3 of liquid effluent. (WIDS) Soil Inventory Model – 216-A-30 (RPP-26744) – 216-A-30 (some constituents of interest are highlighted).

Na (kg) 8.123E+04	Al (kg) 1.521E+01	Fe (kg) 1.894E+03	Cr (kg) 6.045E+03	Bi (kg) 0.000E+00	La (kg) 0.000E+00	Hg (kg) 7.350E-03	Zr (kg) 1.704E-05	Pb (kg) 3.680E-01
Ni (kg) 1.628E+03	Ag (kg) 2.081E-07	Mn (kg) 4.681E+01	Ca (kg) 8.274E+04	K (kg) 8.285E+04	NO3 (kg) 2.082E+05	NO2 (kg) 1.603E+04	CO3 (kg) 5.583E+05	PO4 (kg) 2.981E+04
SO4 (kg) 9.867E+04	Si (kg) 1.865E+04	F (kg) 1.128E+03	Cl (kg) 9.680E+03	CCl4 (kg) 0.000E+00	Butanol (kg) 2.292E-03	TBP (kg) 0.000E+00	NPH (kg) 0.000E+00	NH3 (kg) 9.615E-03
Fe(CN)6 (kg) 0.000E+00	H-3 (Ci) 1.809E-02	C-14 (Ci) 2.889E-02	Ni-59 (Ci) 2.208E-04	Ni-63 (Ci) 2.124E-02	Co-60 (Ci) 2.517E-04	Se-79 (Ci) 2.044E-06	Sr-90 (Ci) 1.101E+00	Y-90 (Ci) 1.102E+00
Zr-93 (Ci) 1.213E-04	Nb-93m (Ci) 9.425E-05	Tc-99 (Ci) 7.391E-04	Ru-106 (Ci) 1.235E-05	Cd-113m (Ci) 1.528E-04	Sb-125 (Ci) 1.709E-04	Sn-126 (Ci) 8.631E-06	I-129 (Ci) 8.912E-03	Cs-134 (Ci) 1.240E-04
Cs-137 (Ci) 2.795E+00	Ba-137m (Ci) 2.638E+00	Sm-151 (Ci) 5.697E-02	Eu-152 (Ci) 2.628E-05	Eu-154 (Ci) 1.925E-03	Eu-155 (Ci) 7.655E-04	Ra-226 (Ci) 5.643E-06	Ra-228 (Ci) 1.392E-07	Ac-227 (Ci) 2.723E-05
Pa-231 (Ci) 4.887E-05	Th-229 (Ci) 8.803E-08	Th-232 (Ci) 6.180E-08	U-232 (Ci) 3.467E-02	U-233 (Ci) 2.052E+00	U-234 (Ci) 2.997E-01	U-235 (Ci) 1.186E-02	U-236 (Ci) 1.633E-02	U-238 (Ci) 2.185E-01
U-Total (kg) 6.564E+02	Np-237 (Ci) 3.315E-03	Pu-238 (Ci) 3.444E+00	Pu-239 (Ci) 3.072E+01	Pu-240 (Ci) 1.073E+01	Pu-241 (Ci) 2.027E+02	Pu-242 (Ci) 1.812E-03	Am-241 (Ci) 1.469E-03	Am-243 (Ci) 1.359E-06
Cm-242 (Ci) 2.373E-06	Cm-243 (Ci) 2.477E-07	Cm-244 (Ci) 6.057E-06						

Table AD1-10. Data-Needs Priority Summary – Model Group 6 – 216-A-30 Crib (200-CW-5/2/4/200-SC-1) (RL/FH) (CPP) (EPA). (2 Pages)

Vicinity Waste Sites	216-A-6 Crib; 216-A-37-1 and 216-A-37-2 Cribs						
Potential Remedial Alternatives							
X for Viable Alternatives	No Action	MESC/MNA/IC	Removal/Disposal	Barrier	Partial Removal/Barrier	In Situ Treatment	Other
	No (inventory suggests contamination that could exceed the no action criteria)	X	X	X	X		

Data Evaluation and Gaps Analysis			
Data	Knowns	Data Uncertainties	Are supplemental data required to support decision making?
Scintillation Logs for Wells: 299-E16-2 (340 ft) (1963, 1968, and 1976) 299-E25-11 (340 ft) (1963, 1968, and 1976) 299-E25-12 (340 ft) (1963, 1976)	All three wells are located along the southern edge of the crib. Low-level radioactive contaminants were detected in wells E25-11 and E25-12 in 1963. In 1976, the scintillation probe profiles showed minor activity in all three wells. (ARH-ST-156)	Relationship with representative site has some uncertainties related to geology and inventory. Protection of groundwater could be a concern based on the inventory; site-specific nature and extent of contaminants that may impact groundwater are uncertain.	Yes. The analogous relationship with 216-U-10 is somewhat uncertain. Inventory information would suggest potential for groundwater impacts associated with chromium, fluoride, and/or nitrate. ERC would support evaluation of the lateral extent of potential elevated conductivity that may be associated with mobile contaminants that could impact groundwater. A deep borehole would provide site-specific data on nature and vertical extent and correlation data for the ERC survey results. The data from the 216-A-30 borehole would be used as analogous for 216-A-37-2 and 216-A-6 and associated unplanned releases (these unplanned releases are associated with spills or overflows at the 216-A-6 Crib) because 216-A-37-2 and 216-A-6 received the same waste as 216-A-30. 216-A-6 ultimately was replaced by 216-A-30 and 216-A-37-2 replaced 216-A-30.
Spectral Gamma Logs for Wells: 299-E25-190 (50 ft) (2006) 299-E25-191 (50 ft) (2006) 299-E25-193 (60 ft) (2006)	All three wells are located along the northern edge of the crib. All three wells had minor amounts of Cs-137, mostly above 20 ft. Each well had total gamma anomalies beginning ~15 ft deep, which do not correlate with the observed Cs-137 concentrations. Assessment of the logging results indicated the potential for Sr-90 concentrations in excess of 500 pCi/g in these wells. Elevated concentrations extended to a maximum depth of ~43 ft bgs. A moisture log in 299-E25-191 shows elevated moisture content associated with the lower interval of Sr-90 contamination in that well. (Stoller 2006)		

Proposed Activities and Path Forward:

- Conduct ERC surveys to evaluate potential for elevated conductivity that may be associated with mobile contaminants and lateral extent of contamination.
- Install deep borehole to obtain site-specific data that will be used to define nature and vertical extent of contamination and to correlate ERC data.
- Use data as analogous for 216-A-37-2 and 216-A-6 and associated unplanned releases at 216-A-6 because 216-A-37-2 and 216-A-6 received the same waste as 216-A-30. 216-A-6 ultimately was replaced by 216-A-30 and 216-A-37-2 replaced 216-A-30.

Additional Notes:

The following provides a list of the references/bibliography used during this evaluation:

ARH-ST-156, *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells.*
BHI-00178, *PUREX Plant Aggregate Area Management Study Technical Baseline Report.*
DOE/RL-99-66, *Steam Condensate/Cooling Water Waste Group Operable Units RI/FS Work Plan; Includes: 200-CW-5, 200-CW-2, 200-CW-4, and 200-SC-1 Operable Units.*
DOE/RL-2003-11, *Remedial Investigation for the 200-CW-5 U Pond/ Z Ditches Cooling Water Group, the 200-CW-2 S Pond and Ditches Cooling Water Group, the 200-CW-4 T Pond and Ditches Cooling Water Group, and the 200-CS-1 Steam Condensate Group Operable Units.*
DOE/RL-2004-24, *Feasibility Study for the 200-CW-5 (U Pond/Z Ditches Cooling Water Waste Group), 200-CW-2 (S Pond and Ditches Cooling Water Waste Group), 200-CW-4 (T Pond and Ditches Cooling Water Waste Group), and 200-SC-1 (Steam Condensate Waste Group) Operable Units.*
RHO-CD-673, *Handbook 200 Areas Waste Sites.*
RHO-RE-SR-84-24 P, *Results of the Separations Area Groundwater Monitoring Network for 1983.*
RPP-26744, *Hanford Soil Inventory Model,* Rev 1.
Stoller, 2006, "Contract No. 30475-1, Stoller Geophysical Log Results in the 216-A-30 Trench."
Waste Information Data System Report, Hanford Site database.

bgs = below ground surface.
ERC = electrical resistivity characterization.
MESC/MNA/IC = Maintain Existing Soil Cover, Monitored Natural Attenuation, Institutional Controls.
PUREX = Plutonium-Uranium Extraction (Plant or process).
WIDS = Waste Information Data System database.

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DOE/RL-2004-24, 2004, *Feasibility Study for the 200-CW-5 (U Pond/Z Ditches Cooling Water Waste Group), 200-CW-2 (S Pond and Ditches Cooling Water Waste Group), 200-CW-4 (T Pond and Ditches Cooling Water Waste Group), and 200-SC-1 (Steam Condensate Waste Group) Operable Units*, Draft A, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*, 2 vols., Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington, as amended.

H-2-60330, *Trench 216-B-55 Cond Waste Lines 221-B to Trench 216-B-55 & B-12 Crib Plan & Profile*, Hanford Site Drawing.

HNF-1744, 1999, *Radionuclide Inventories of Liquid Waste Disposal Sites on the Hanford Site*, Fluor Daniel Hanford, Inc., Richland, Washington.

RH-CD-673, 1979, *Handbook 200 Areas Waste Sites*, 3 vols., Rockwell Hanford Operations, Richland, Washington.

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RPP-RPT-28955, 2006, *Surface Geophysical Exploration of T Tank Farm at the Hanford Site*, Rev. 0, CH2M HILL Hanford Group, Inc., Richland, Washington.

Stoller, 2006, "Contract No. 30475-1, Stoller Geophysical Log Results in the 216-A-30 Trench," (letter to Chris Wright, Fluor Hanford, from Brian W. Mathis), Stoller Hanford Office, Richland, Washington, November 15.

Waste Information Data System Report, Hanford Site database.

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