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Appendix D

Waste Site Summaries

200-BC-1, 200-WA-1

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Terms

bgs	below ground surface
CA	Contamination Area
CCU	Cold Creek Unit
CTET	carbon tetrachloride
DPT	direct push technology
EMI	electromagnetic interference
ERDF	Environmental Restoration Disposal Facility
EO	Engineering Order
GPL	geophysical log
GPS	Global Positioning System
HEIS	Hanford Environmental Information System
HGLS	high rate logging
HPGe	High Purity Germanium
HRLS	high rate logging system
IMUST	Inactive Miscellaneous Underground Storage Tank
LFI	limited field investigation
MIBK	methyl isobutyl ketone
MSA	Mission Support Alliance
nd	nondetect
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PBS	polymeric barrier system
PCB	polychlorinated biphenyl
PRG	Preliminary Remediation Goal
PRTR	Plutonium Recycle Test Reactor
PUREX	Plutonium Uranium Extraction (Plant)
PVC	polyvinyl chloride
REDOX	Reduction-Oxidation

RI/FS	remedial investigation/feasibility study
RLS	Radiologic Logging System
SAP	sampling and analysis plan
SCA	Soil Contamination Area
SGLS	spectral gamma
SVOC	semi-volatile organic compound
TCE	trichloroethene
TDEM	200-W-71 (U Plant)
TRCA	time-critical removal action
URMA	Underground Radioactive Materials Area
UNH	uranyl nitrate hexahydrate
UPR	unplanned release
VCP	vitrified clay pipeline
VOC	volatile organic compound
WAC	*Washington Administrative Code*
WDOH	Washington State Department of Health
WIDS	Waste Information Data System
WSCF	Waste Sampling and Characterization Facility

D1 Introduction

This appendix provides extensive information on each waste site, including process history, potential contaminants, maps, drawings, previous investigations near the site, and nature and extent of contamination.

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Site: 200-E-14	Area: BC Cribs	Category: Intermediate

Site Description

Site Type: Siphon Tank
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-BC-1
Service Dates: January 1956 to October 1957

Waste Site Location and Physical Description: The 200-E-14 Siphon Tank is located south of Route 4S, south of the 200 East Area (Figure 1). The tank is 18 m (60 ft) north of the center line between the 216-B-14 and 216-B-15 Cribs. The siphon tank was designed to receive liquid waste from the 200-E-114-PL (pipeline) and release the waste into the 216-B-14 through 216-B-19 Cribs. The siphon tank was designed to hold the waste until the liquid level reached 1.6 m (5.5 ft). When the level was reached, the siphon action would begin and the tank contents would discharge to the designated crib. The siphon action would stop when the tank level receded to 0.07 m (6 in.). The siphon action was intended to flood the crib area with a significant amount of liquid, resulting in a uniform spread of contaminants throughout the crib, instead of a large amount of contaminants concentrating near the discharge point.

Waste Site Coordinates:
E-573639.15478 N-134439.31401

Site Dimensions:
Site Length: 8.2 m (27 ft)
Site Depth: 6.6 m (21.5 ft) (estimated per drawing H-2-2770, *Siphon Tank 1st Cycle & T.B.P. Waste Scavenging*)
Site Width: 3.9 m (12.8 ft)
Cover Thickness: 0.6 m (2 ft) over 2.1 m (7 ft) of overburden
Site Area: 32 m^2 (344.4 ft^2)

Related Site Structure(s): The siphon tank is associated with the 200-E-114-PL, the 216-B-14, 216-B-15, 216-B-16, 216-B-17, 216-B-18, and 216-B-19 Cribs, 241-BY Tank Farm, and 221-U Building.

Site Posting: The area was covered with a minimum of 0.6 m (2 ft) of top soil and posted as an Underground Radioactive Material Area.

Site History

Release Summary: Estimated release volume from the siphon tank into the BC Cribs is 38.9E+6 L (10.3E+6 gal). The waste received by the siphon tank from the 200-E-114-PL was scavenged uranium recovery process (tributyl phosphate solvent extraction) liquid waste from the 241-BY Tank Farm and 241-C Tank Farm.

Site: 200-E-14	Area: BC Cribs	Category: Intermediate

A 1998 evaluation of the Inactive Miscellaneous Underground Storage Tank contents based on crib inventory data concluded the potential from hydrogen generation, ferrocyanide induced reaction, organic chemical reactions, heat generation, criticality, flammability, noxious vapor emissions, leakage, and radiation exposure were all ranked as low.

Volume Discharged: The approximate effluent discharged from the siphon tank into the BC Cribs was 38.9E+6 L (10.3E+6 gal). An unknown volume may have leaked from the tank.

Pore Volume Discharged: (unknown) L/ (325 ft x 345.6 ft^2 / 35.3 m^3/ft^3 * 1000 L/m^3 * 0.3) = Unknown

Previous Site Characterization

Site Characterization Summary: The BC Cribs area was surface-stabilized in 1981. Prior to stabilization, a radiological survey found vent hoods and liquid level risers on the cribs and siphon tank were contaminated with levels ranging from 200 to 30,000 cpm. The vent hoods and risers were removed, wrapped in plastic and transported to the burial grounds.

A surface radiological survey of the BC Crib area is done annually. The surface above the siphon tank is also covered in the survey.

Nature and Extent of Contamination:

No data are available to evaluate the shallow or deep soil contamination.

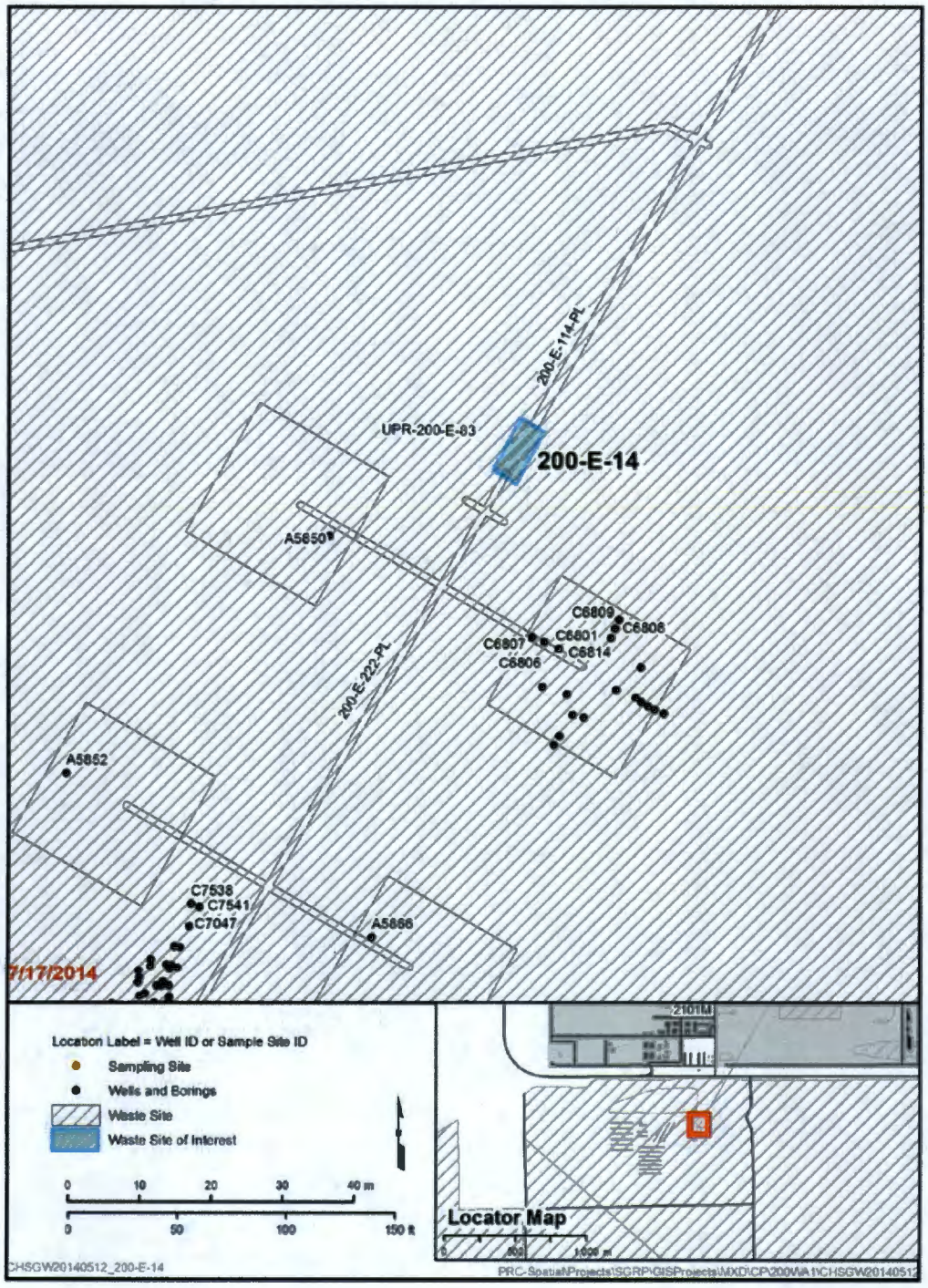
References:

DOE-EM/GJ887-2005, *299-E13-01 (A5849) Log Data Report*, Stoller Hanford Office, Richland, Washington.

H-2-2770 (drawing), 1982, *Siphon Tank 1st Cycle & T.B.P. Waste Scavenging*, Sh. 1, Rev. 1, General Electric Company, Richland, Washington.

Waste Information Data System General Summary Report for the 200-E-14 Waste Site.

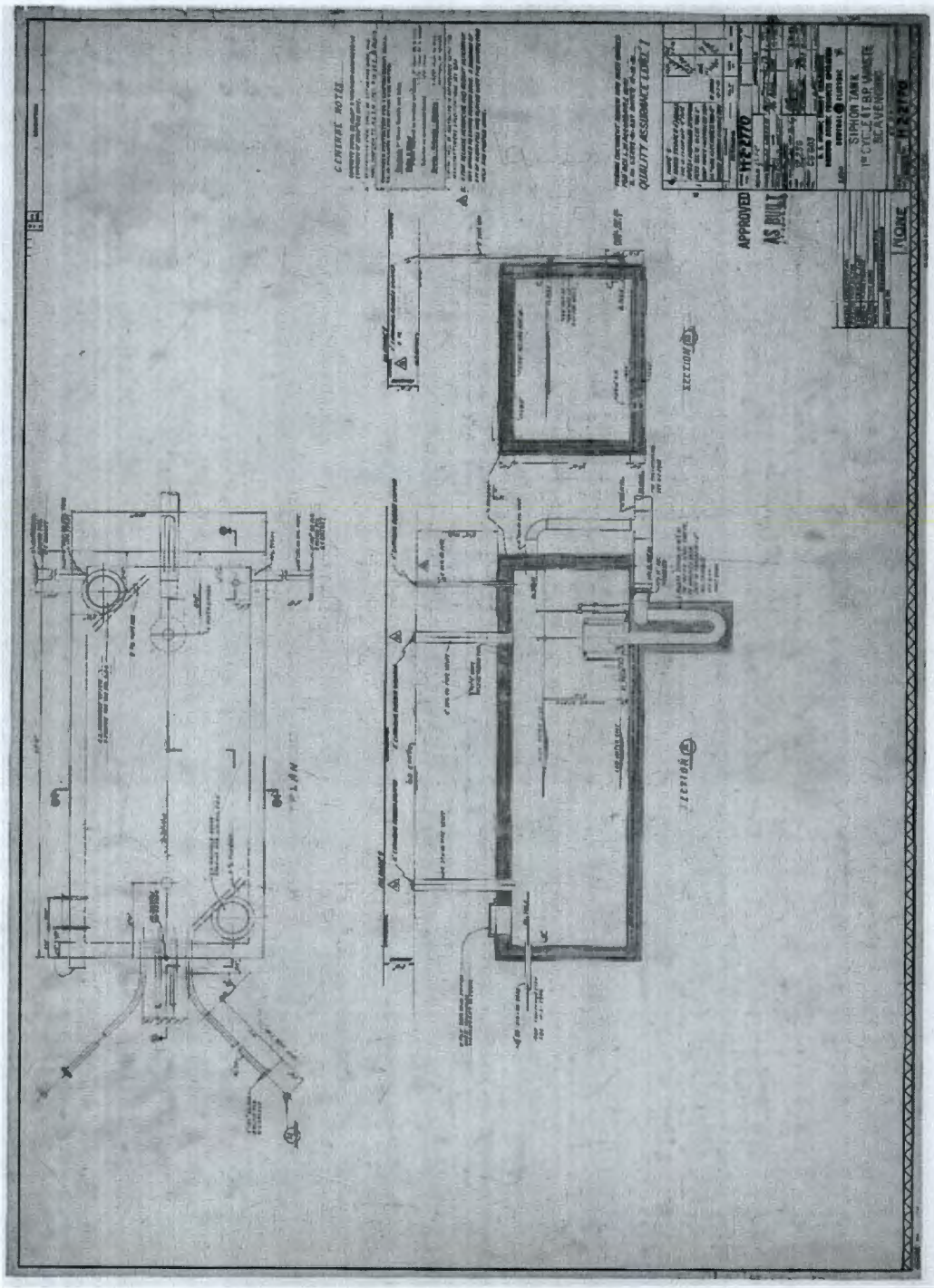
Site: 200-E-14	Area: BC Cribs	Category: Intermediate



ID = identification

Figure 1. 216-E-14 Waste Site Map

Site: 200-E-14	Area: BC Cribs	Category: Intermediate



Source: H-2-2770, *Siphon Tank 1st Cycle & T.B.P. Waste Scavenging,* Sheet 1.

Note: Produced from the best available copy.

Figure 2. Plan and Section Views

Site: 216-B-14	Area: BC	Category: Deep (Representative Site)

Site Description

Site Type: Crib
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: January and February 1956

Waste Site Location and Physical Description: The 216-B-14 Crib is located south of the 200 East Area (across Route 4S) in the BC Crib Area (Figure 1). The BC Cribs and Trenches are located inside the BC Controlled Area (see Figure 1). The crib is a dispersion structure 3.0 by 3.0 by 0.9 m (10 by 10 by 3 ft) high, made of wood, cinderblock, and steel, over a 1.5 m (5 ft) bed of 7.6 cm (3 in.) gravel, with a 35.6 cm (14 in.) inlet pipe located 1.8 m (6 ft) below grade. The bottom dimensions of the excavation are 12.2 m^2 (40 ft^2) and 3.9 m (13 ft) deep. The side slope is 2:1. The excavated area surrounding the crib at the surface is 24.4 m^2 (80 ft^2) (see Figure 2).

Waste Site Coordinates:
E-573648.95762 N-134407.55730

Site Dimensions:
Site Length: 12.2 m (40 ft)
Site Width: 12.2 m (40 ft)
Site Area: 148.7 m^2 (1,600 ft^2)
Site Depth: 4.0 m (13 ft) to bottom of structure
Cover Thickness: 0.6 m (2 ft)
Depth to groundwater from bottom of structure: 99.7 m (327 ft)

Related Site Structure(s): The site is associated with the 200-E-14 Siphon Tank, 200-E-114-PL Pipeline, and UPR-200-E-83.

Site Posting: The area has been covered with clean soil and posted as an Underground Radioactive Material Area.

Site History

Release Summary: The 216-B-14 Crib received 8.71E+6 L (2.30E+6 gal) tributyl phosphate supernatant waste from the U-Plant Uranium Recovery operations and scavenged tank farm waste via underground pipelines. From 1952 to 1958, waste containing uranium and fission products, produced by the bismuth phosphate separations process, were removed from underground storage tanks and reprocessed at 221-U Plant to recover the uranium from the waste. After the uranium was removed, the cesium and strontium content of the effluent was precipitated by adding ferrocyanide. The addition of ferrocyanide to the waste was called "scavenging." The supernate liquor was released to the ground in the BC Cribs and Trenches via the 200-E-114-PL (pipeline). The waste is liquid process effluent, high in salt, and

Site: 216-B-14	Area: BC	Category: Deep (Representative Site)

neutral to basic. The waste contained inorganic compounds such as ferrocyanide, nitrate, and phosphate.

The crib is assumed to exhibit deep vadose effects.

Volume Discharged: 8.71E+6 L (2.30E+6 gal)

Pore Volume Discharged: 8.71E+6 L/ (99.7 m x 148.7 m^2 * 1,000 L/m^3 * 0.3) = 2.0

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-14 Waste Site

Contaminant	Mass Discharged
Pu	25 g
Sr-90	400 Ci
Cs-137	250 Ci
U	220 kg
Ru-106	5.9E+04 Ci
Beta	1.4E+05 Ci
Co-60	5 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: The crib was characterized in 2008 with 19 direct push technology (DPT) boreholes to a depth of approximately 7.6 m (25 ft) below ground surface (bgs). All 19 boreholes were geophysical logged. Distribution of cesium-137 from these DPT boreholes is presented in Figures 3 and 4. Well-E13-01 (A5849) was geophysical logged in 2005 and the results are shown in Figure 5.

A field test using desiccation technology was initiated in 2011 south of the 216-B-17 Crib and soil moisture is being monitored for 5 years. Water was removed from a portion of the subsurface, creating low moisture conditions that inhibit downward movement of water and dissolved contaminants. The treatability test will provide information about desiccation that can be used to evaluate this technology in feasibility studies of contaminants in the deep vadose zone.

The BC Cribs and Trenches area was interim stabilized as a single unit in 1981. During stabilization, the valve to the crib from Pipeline 200-E-114-PL was closed. The BC Cribs area was revegetated and weed

Site: 216-B-14	Area: BC	Category: Deep (Representative Site)

growth was controlled with selective herbicide. The stabilization cover has been badly damaged over time by wind erosion.

In May 1958, smearable contamination was detected on the Crib vent risers measuring 40,000 counts per minute (cpm) and 10,000 cpm on the ground under a flange that was part of the over ground pipeline. Contaminated rabbit droppings reading 5,000 to 10,000 cpm were identified. The maximum value detected was 200 millirem per hour. In August 2005, mobile surface contamination monitor (MSCM) tractor surveys found extensive wind damage on the stabilization cover. Surface contamination was found at several locations. Contamination levels up to 25 millirem per hour were found. An annual surface radiation survey is performed.

Borehole and data summaries are presented in Tables 2 and 3. Borehole locations are shown on Figure 1.

Groundwater contaminants of potential concern (COPCs) associated with BC Crib Waste Sites 216-B-14 through 216-B-19 include strontium-90 and cesium-137. Strontium-90 concentrations ranged between non-detect and 18 pCi/L from 1960 to 2014, with one detection above the drinking water standard of 8 pCi/L. The maximum concentration was detected in 1960. Cesium-137 results (non-detect to 12.9 pCi/L) were below the drinking water standard of 200 pCi/L between 1987 and 2014.

Table 2. Borehole Summary for the 216-B-14 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
1957	A5849/299-E13-1	Within crib floor footprint	50 (GPL)
2008	C6796 through C6803	Within crib floor footprint	26 (GPL)
2008	C6804 through C6814	Within crib sidewall footprint	26 (GPL)

GPL = geophysical log
ID = identification

Table 3. Geophysical Log Summary for the 216-B-14 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137		
		Maximum Detected Concentration	Units	Sample Depth (ft)
C6796	0 – 5	91.6	pCi/g	0.0
	5 – 10	–	pCi/g	–
	10 – 15	2,240,000	pCi/g	15
	>15	1,220,000	pCi/g	15.5

Site: 216-B-14	Area: BC	Category: Deep (Representative Site)

Table 3. Geophysical Log Summary for the 216-B-14 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137		
		Maximum Detected Concentration	Units	Sample Depth (ft)
C6797	0 – 5	–	pCi/g	–
	5 – 10	–	pCi/g	–
	10 – 15	1,040,000	pCi/g	15
	>15	2,100,000	pCi/g	15.5
C6798	0 – 5	2,380	pCi/g	0.0
	5 – 10	–	pCi/g	–
	10 – 15	663,000	pCi/g	15
	>15	409,000	pCi/g	15.5
C6799	0 – 5	–	pCi/g	–
	5 – 10	–	pCi/g	–
	10 – 15	228,000	pCi/g	15
	>15	849,000	pCi/g	16
C6800	0 – 5	–	pCi/g	–
	5 – 10	–	pCi/g	–
	10 – 15	809,000	pCi/g	15
	>15	895,000	pCi/g	15.5
C6801	0 – 5	–	pCi/g	–
	5 – 10	–	pCi/g	–
	10 – 15	173,000	pCi/g	15
	>15	1,080,000	pCi/g	16.5
C6802	0 – 5	–	pCi/g	–
	5 – 10	–	pCi/g	–
	10 – 15	342,000	pCi/g	15
	>15	1,090,000	pCi/g	15.5
C6803	0 – 5	–	pCi/g	–
	5 – 10	–	pCi/g	–
	10 – 15	302,000	pCi/g	14.5
	>15	4,350,000	pCi/g	18
C6804	0 – 5	–	pCi/g	–
	5 – 10	–	pCi/g	–
	10 – 15	4,440	pCi/g	13
	>15	284,000	pCi/g	17
C6805	0 – 5	–	pCi/g	–
	5 – 10	–	pCi/g	–
	10 – 15	242,000	pCi/g	15
	>15	1,270,000	pCi/g	16.5
C6806	0 – 5	–	pCi/g	–
	5 – 10	–	pCi/g	–
	10 – 15	2,080	pCi/g	15
	>15	17,400	pCi/g	20

Site: 216-B-14	Area: BC	Category: Deep (Representative Site)

Table 3. Geophysical Log Summary for the 216-B-14 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137		
		Maximum Detected Concentration	Units	Sample Depth (ft)
C6807	0 – 5	–	pCi/g	–
	5 – 10	53.4	pCi/g	9.5
	10 – 15	171	pCi/g	10.5
	>15	16,000	pCi/g	20.5
C6808	0 – 5	–	pCi/g	–
	5 – 10	–	pCi/g	–
	10 – 15	141	pCi/g	15
	>15	24,400	pCi/g	19.5
C6809	0 – 5	–	pCi/g	–
	5 – 10	–	pCi/g	–
	10 – 15	–	pCi/g	–
	>15	15,100	pCi/g	20
C6810	0 – 5	–	pCi/g	–
	5 – 10	–	pCi/g	–
	10 – 15	26.6	pCi/g	15
	>15	6,080	pCi/g	17
C6811	0 – 5	–	pCi/g	–
	5 – 10	–	pCi/g	–
	10 – 15	19.7	pCi/g	15
	>15	1170	pCi/g	16.5
C6812	0 – 5	–	pCi/g	–
	5 – 10	–	pCi/g	–
	10 – 15	134	pCi/g	15
	>15	46,000	pCi/g	17.5
C6813	0 – 5	29.8	pCi/g	3.5
	5 – 10	–	pCi/g	–
	10 – 15	63.2	pCi/g	15
	>15	23,700	pCi/g	17
C4614	0 – 5	–	pCi/g	–
	5 – 10	–	pCi/g	–
	10 – 15	151,000	pCi/g	15
	>15	724,000	pCi/g	16
A5849	0 – 5	20.8	pCi/g	2.0
	5 – 10	107	pCi/g	10.0
	10 – 15	321,000	pCi/g	14
	>15	2,110,000	pCi/g	40.5

bgs = below ground surface ID = identification

Site: 216-B-14	Area: BC	Category: Deep (Representative Site)

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] bgs): The average depth of the maximum cesium-137 concentration in the eight boreholes within the 216-13-14 Crib floor footprint is 4.9 m (16 ft), which is 1 m (3 ft) below the base of the crib. The zone of relatively high cesium-137 concentrations (greater than 1,000 pCi/g) tends to be 2.1 to *3.5* m (7 to 12 ft) thick within the area of the crib floor.

In the upper 4.6 m (15 ft) of the soil column, the maximum equivalent cesium-137 concentration was greater than 750 pCi/g in all eight initial boreholes drilled through the crib floor footprint; however, the addition of the step-out boreholes was successful in delineating the lateral extent of the cesium-137 contamination greater than 750 pCi/g within this upper 4.6 m (15-ft) thick zone. Log data indicate that little or no contamination was encountered in the top 2.7 m (9 ft) bgs, which corresponds with the backfill placed on top of the gravel layer on which the crib is constructed.

Deep (>4.6 m [>15 ft] bgs): The average depth of the maximum cesium-137 concentration in the 11 boreholes below the 216-B-14 Crib floor footprint is 5.5 m (18 ft). The zone of relatively high cesium-137 concentrations (greater than 1,000 pCi/g) tends to be 0.2 to 3.0 m (1 to 10 ft) thick below the area of the Crib floor. Logging of Well 299-E13-1 (A5849) shows a maximum cesium-137 concentration at 12.3 m (40.5 ft) bgs and indicates that contamination may extend much deeper.

References:

DOE/RL-2004-66, 2005, *Focused Feasibility Study for the BC Cribs and Trenches Area Waste Sites*, Draft A, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA170624. http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA170919. http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA171165. http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA171467.

DOE/RL-2009-36, 2010, *BC Cribs and Trenches Excavation-Based Treatability Test Report*, Rev. 1 (reissue), U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0084533.

DOE-EM/GJ887-2005, *299-E13-01 (A5849) Log Data Report*, Stoller Hanford Office, Richland, Washington.

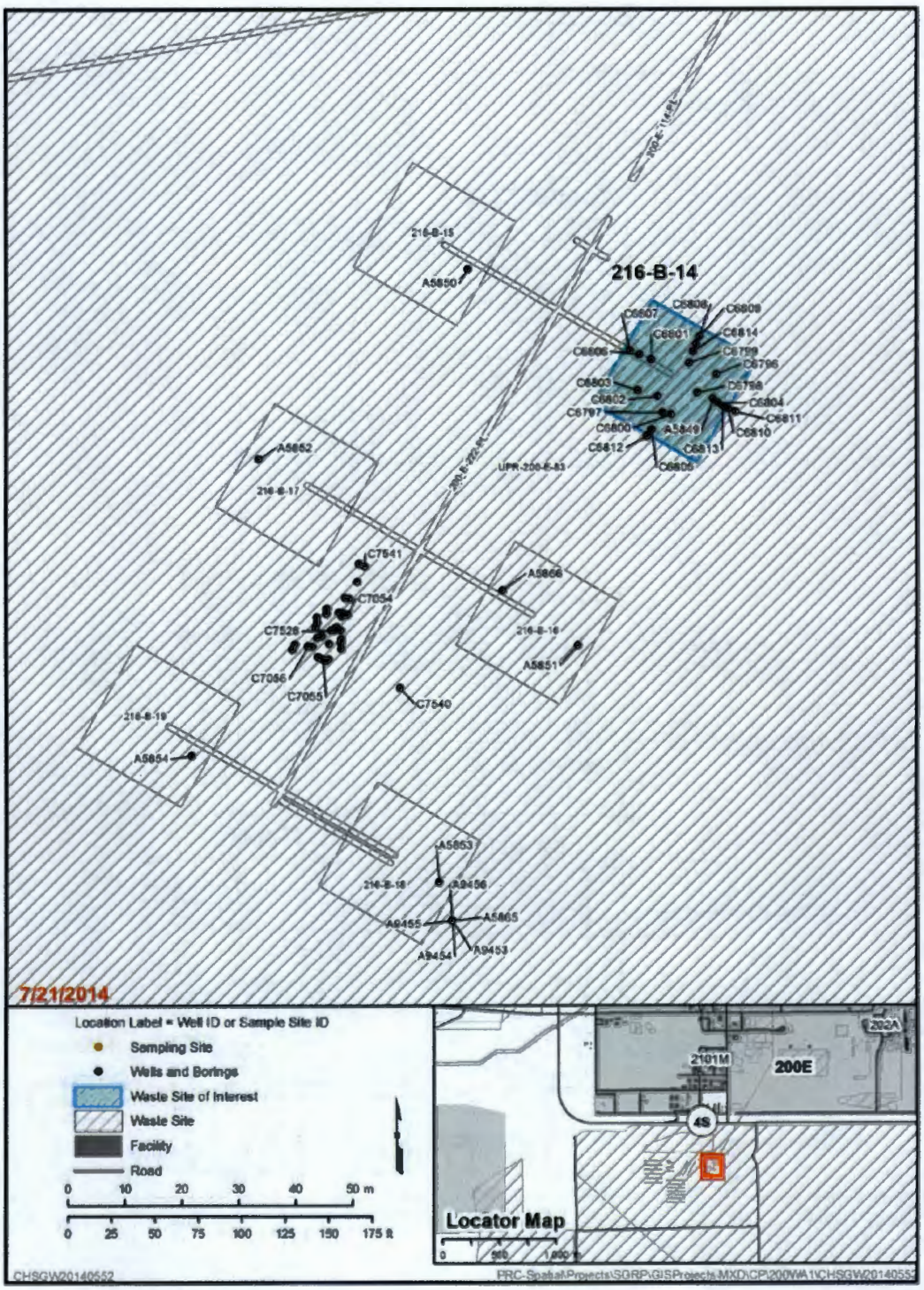
HW-55176, 1958 (public release 2001), Part VI Appendix C-24, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, General Electric Company, Richland, Washington.

PNNL-22826, 2013, *Deep Vadose Zone Treatability Test for the Hanford Central Plateau: Interim Post-Desiccation Monitoring Results*, Pacific Northwest National Laboratory, Richland, Washington. Available at: http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-22826.pdf.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029

Waste Information Data System General Summary Report for the 216-B-14 Waste Site.

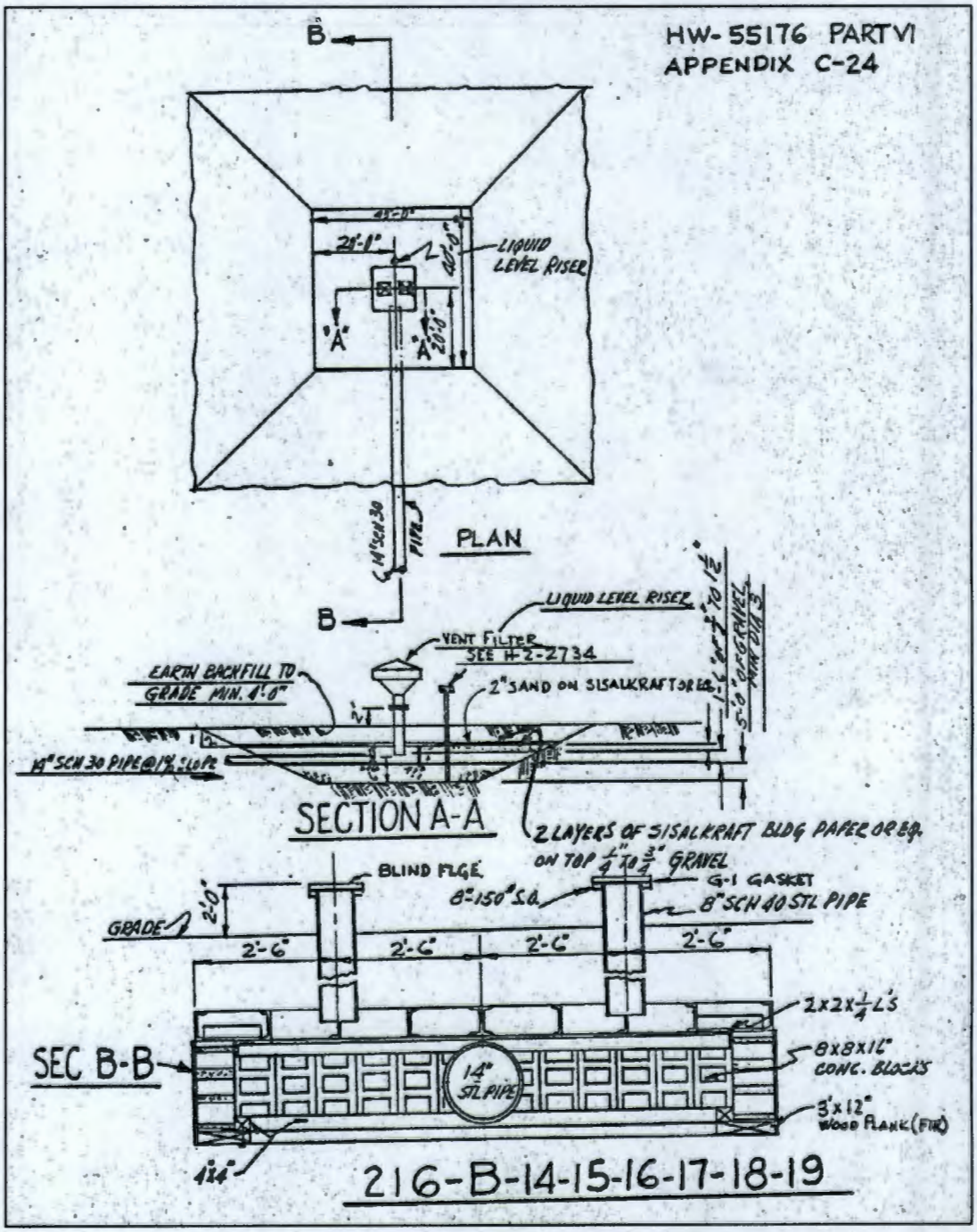
Site: 216-B-14	Area: BC	Category: Deep (Representative Site)



ID = Identification

Figure 1. 216-B-14 Waste Site Map

Site: 216-B-14	Area: BC	Category: Deep (Representative Site)

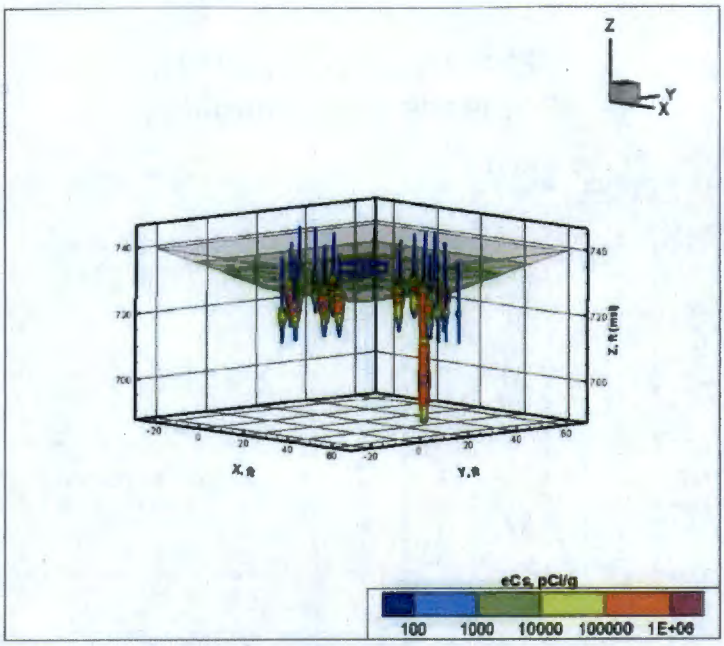


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI Appendix C-24.

Note: Produced from the best available copy.

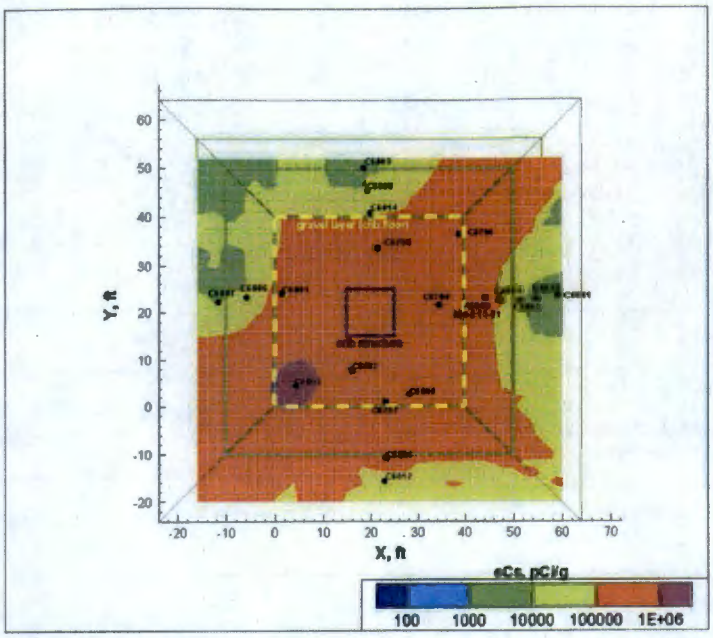
Figure 2. Plan and Section Views

Site: 216-B-14	Area: BC	Category: Deep (Representative Site)



Source: DOE/RL-2009-36, *BC Cribs and Trenches Excavation-Based Treatability Test Report.*

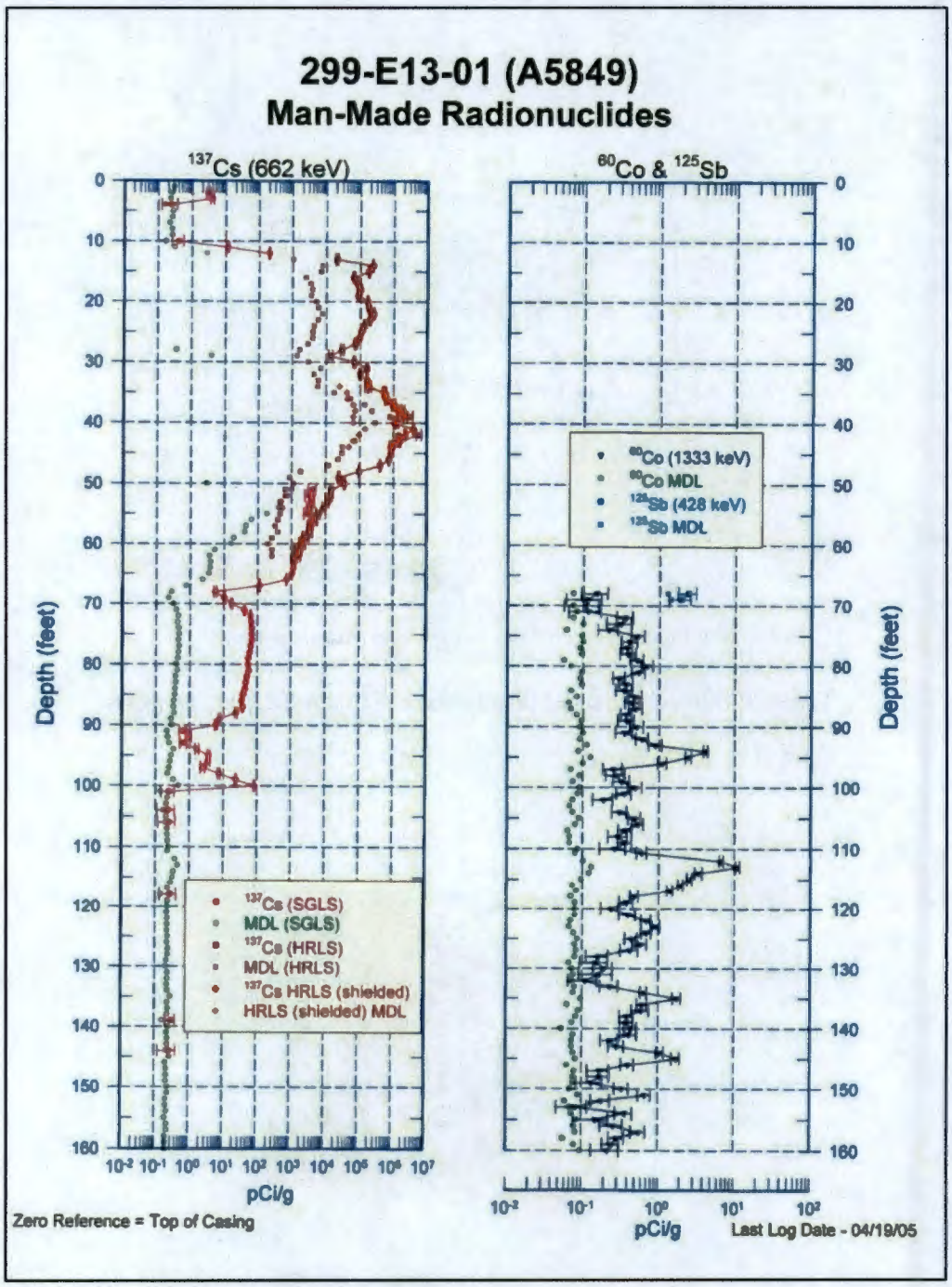
Figure 3. Three-dimensional Distribution of Cesium-137 Contamination



Source: DOE/RL-2009-36, *BC Cribs and Trenches Excavation-Based Treatability Test Report.*

Figure 4. Plan View of Distribution of Cesium-137 Contamination

Site: 216-B-14	Area: BC	Category: Deep (Representative Site)



Source: DOE-EM/GJ887-2005, *299-E13-01 (A5849) Log Data Report.*

MDL = minimum detectable level
HRLS = high rate logging system SGLS = spectral gamma logging system

Figure 5. Geophysical Log

Site: 216-B-15	Area: BC Cribs	Category: Deep (similar to 216-B-14)

Site Description

Site Type: Crib
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: April 1956 to December 1957

Waste Site Location and Physical Description: The 216-B-15 Crib is located south of the 200 East Area (across Route 4S) in the BC Crib Area (Figure 1). The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The crib is a dispersion structure 3.0 by 3.0 by 0.9 m (10 by 10 by 3 ft) high, made of wood, cinderblock, and steel, over a 1.5 m (5 ft) bed of 7.6 cm (3 in.) gravel, with a 35.6 cm (14 in.) inlet pipe located 1.8 m (6 ft) below grade.

The bottom dimensions of the excavation are 12.2 by 12.2 m (40 by 40 ft) and 4.0 m (13 ft) deep. The side slope is 2:1. The excavated area surrounding the crib at the surface is 24.4 by 24.4 m (80 by 80 ft) (Figure 2).

Waste Site Coordinates:
E-573606.64511 N-134431.82295

Site Dimensions:
Site Length: 12.2 m (40 ft) Site Depth: 4.0 m (13 ft)
Site Width: 12.2m (40 ft) Cover Thickness: 0.6 m (2 ft)
Site Area: 149 m^2 (1,600 ft^2)

Related Site Structure(s): The site is associated with the 200-E-14 Siphon Tank, 200-E-114-PL Pipeline, and UPR-200-E-83.

Site Posting: The area has been covered with clean soil and posted as an Underground Radioactive Material Area.

Site History

Release Summary: The Crib received 6.3E6 L (1.7E6 gal) tributyl phosphate supernatant waste from the U-Plant Uranium Recovery operations and scavenged tank farm waste via underground pipelines. From 1952 to 1958, waste containing uranium and fission products, produced by the bismuth phosphate separations process, were removed from underground storage tanks and reprocessed at 221-U Plant to recover the uranium from the waste. After the uranium was removed, the cesium and strontium content of the effluent was precipitated by adding ferrocyanide. The addition of ferrocyanide to the waste was called "scavenging." The supernate liquor was released to the ground in the BC Cribs and

Site: 216-B-15	Area: BC Cribs	Category: Deep (similar to 216-B-14)

Trenches via the 200-E-114-PL Pipeline. The waste is liquid process effluent, high in salt, and neutral to basic. The waste contained inorganic compounds such as ferrocyanide, nitrate, and phosphate.

Volume/Mass Discharged: 6.3E+06 L (1.7E6 gal)

Pore Volume Discharged: 6.3E+06 L/ (327 ft x 1,600 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 1.4

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-15 Waste Site

Contaminant	Mass Discharged
Pu	5 g
Sr-90	200 Ci
Cs-137	200 Ci
U	100 kg
Ru-106	2.2E+04 Ci
Beta	6.9E+04 Ci
Co-60	5 Ci

Source: RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, smearable contamination was detected on the crib vent risers measuring 40,000 counts per minute (cpm) and 10,000 cpm on the ground under a flange that was part of the over ground pipeline. Contaminated rabbit droppings reading 5,000 to 10,000 cpm were identified. The maximum value detected was 200 millirem per hour.

In August 2005, mobile surface contamination monitor tractor surveys found extensive wind damage on the stabilization cover. Surface contamination was found at several locations. Contamination levels up to 25 millirem per hour were found.

The BC Cribs and Trenches area was interim stabilized as a single unit in 1981. During stabilization, 200-E-114-PL to the cribs was valved out. The BC Cribs area was revegetated and weed growth was controlled with selective herbicide. The stabilization cover has been badly damaged over time by wind erosion.

An annual surface radiation survey is performed.

Site: 216-B-15	Area: BC Cribs	Category: Deep (similar to 216-B-14)

Borehole and data summaries are presented in Tables 2 and 3. Borehole locations are shown on Figure 1.

Groundwater contaminants of potential concern (COPCs) associated with BC Crib waste sites 216-B-14 through 216-B-19 include strontium-90 and cesium-137. Strontium-90 concentrations ranged between non-detect and 18 pCi/L from 1960 to 2014, with one detection above the drinking water standard of 8 pCi/L. The maximum concentration was detected in 1960. Cesium-137 results (non-detect to 12.9 pCi/L) were below the drinking water standard of 200 pCi/L between 1987 and 2014.

Table 2. Borehole Summary for the 216-B-15 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2005	A5850	Within crib floor footprint	346 (GPL)

GPL = geophysical log
ID = identification

Table 3. Geophysical Log Summary for the 216-B-15 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A5850	0 – 5	0.45	pCi/g	3.0	19,217	cpm	5
	5 – 10	0.19	pCi/g	10.0	32,303	cpm	10
	10 – 15	492.8	pCi/g	15	3,109,750	cpm	15
	>15	509,071.2	pCi/g	19	36,120,700	cpm	17

bgs = below ground surface

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): The depth of the maximum cesium-137 concentration in the one borehole within the 216-13-15 Crib floor footprint is 4.57 m (15 ft), which is 0.6 m (2 ft) below the base of the crib.

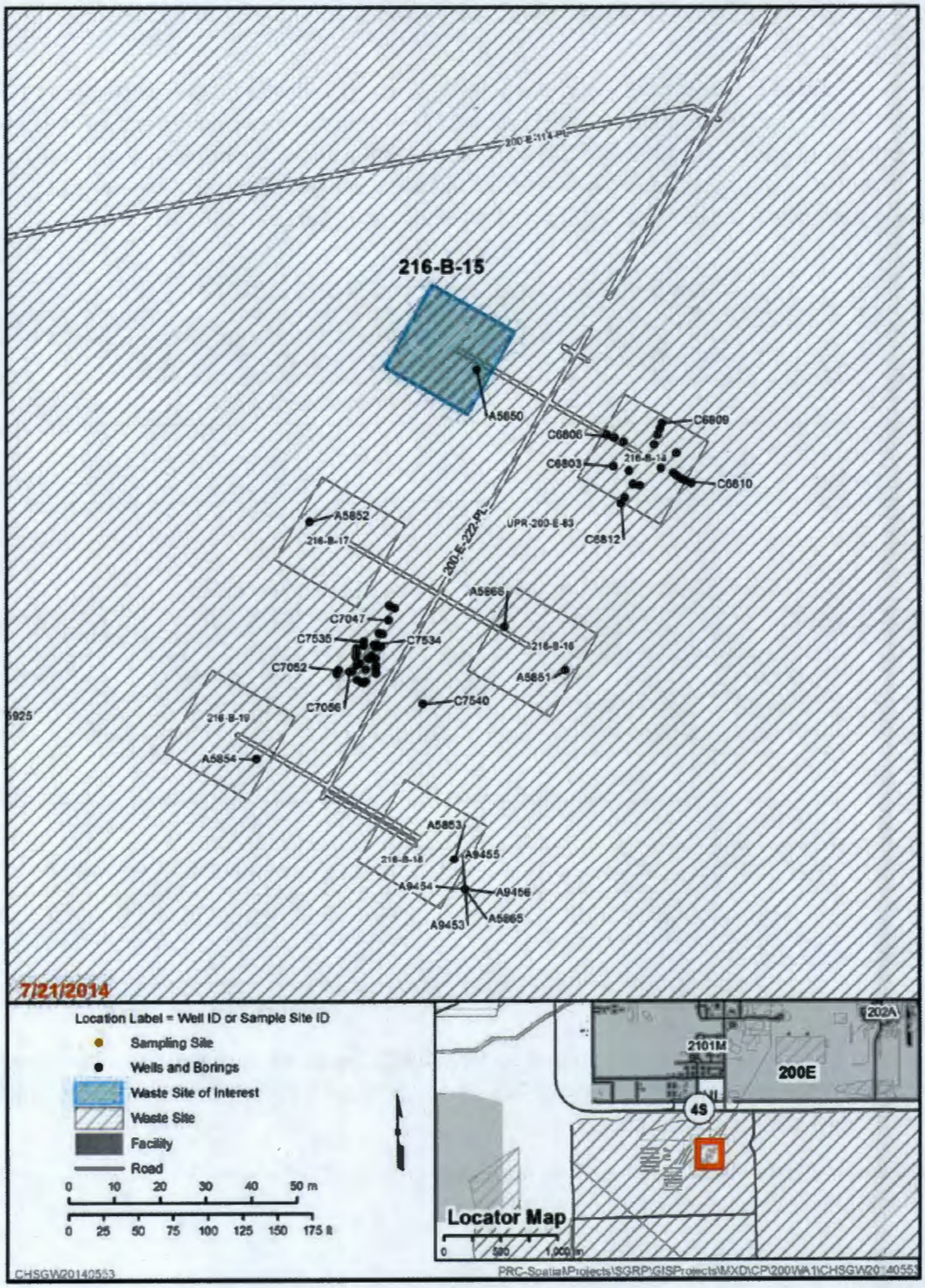
Deep (>4.6 m [>15 ft] bgs): The depth of the maximum cesium-137 concentration in the one borehole within the 216-B-15 Crib floor footprint is 5.8 m (19 ft).

References:

HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI Appendix C-24, General Electric, Richland Company, Richland, Washington.

Waste Information Data System General Summary Report for the 216-B-15 Waste Site.

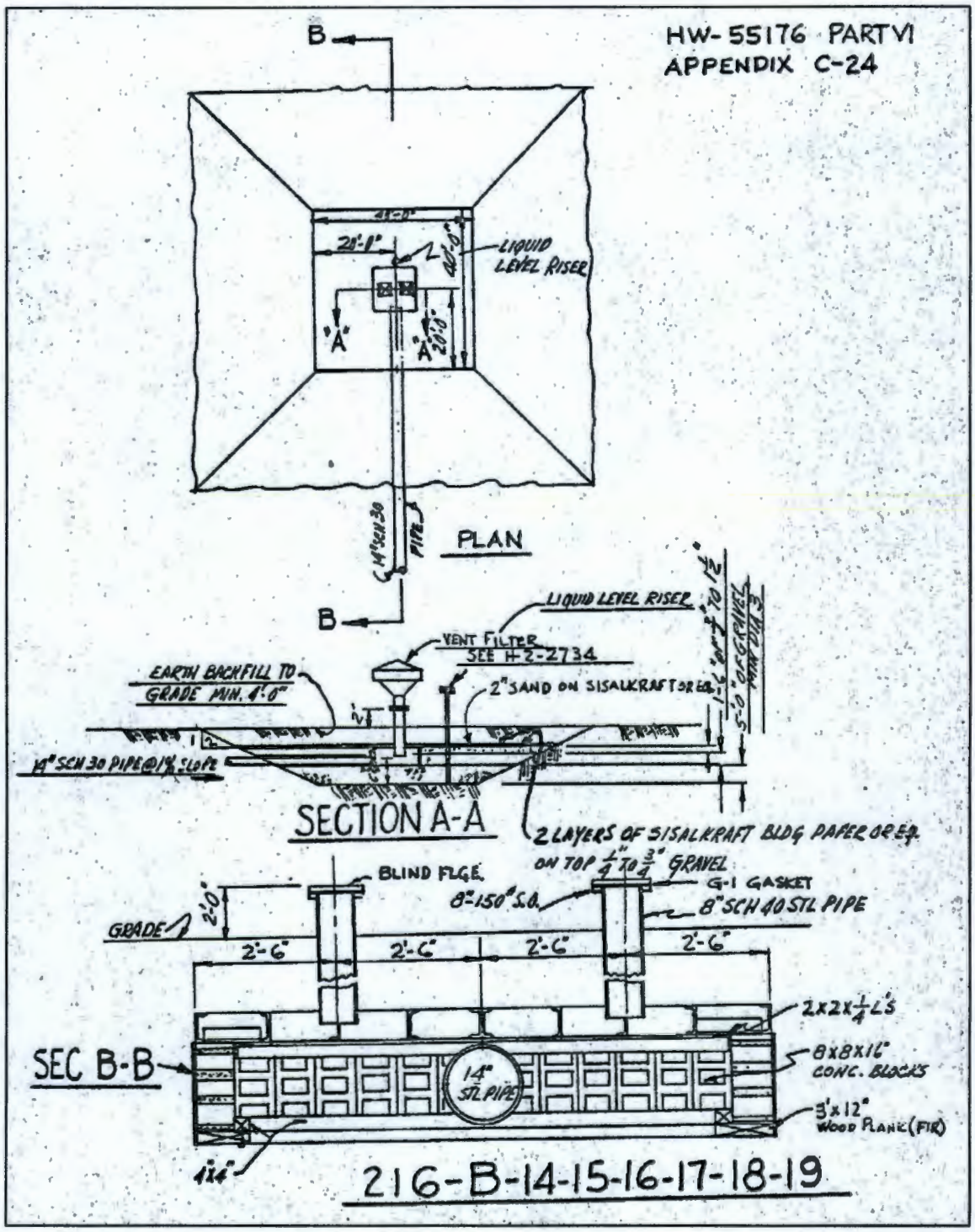
Site: 216-B-15	Area: BC Cribs	Category: Deep (similar to 216-B-14)



ID = identification

Figure 1. 216-B-15 Waste Site Map

Site: 216-B-15	Area: BC Cribs	Category: Deep (similar to 216-B-14)



Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-24.

Note: Produced from the best available copy.

Figure 2. Plan and Section Views

Site: 216-B-15	Area: BC Cribs	Category: Deep (similar to 216-B-14)

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Site: 216-B-16	Area: BC	Category: Deep (similar to 216-B-14)

Site Description

Alternate Site Identification: 216-B-16 Crib
Site Type: Crib
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: April to August 1956

Waste Site Location and Physical Description: The 216-B-16 Crib is located south of the 200 East Area (across Route 4S) in the BC Crib Area. The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The crib is a dispersion structure 3.0 by 3.0 by 0.9 m (10 by 10 by 3 ft) high, made of wood, cinderblock, and steel, over a 1.5 m (5 ft) bed of 7.6 cm (3 in.) gravel, with a 35.6 cm (14 in.) inlet pipe located 1.8 m (6 ft) below grade. The bottom dimensions of the excavation are 12.2 m^2 (40 ft^2) and 4.0 m (13 ft) deep. The side slope is 2:1. The excavated area surrounding the crib at the surface is 24.4 m^2 (80 ft^2) (see Figure 2).

Waste Site Coordinates:
E-573624.68821 N-134365.24498

Site Dimensions:
Site Length: 12 m (40 ft) (bottom dimension)
Site Width: 12 m (40 ft) (bottom dimension)
Site Area: 149 m^2 (1,600 ft^2)
Site Depth: 4.0 m (13 ft) to bottom of structure
Cover Thickness: 0.6 m (2 ft)

Related Site Structure(s): The site is associated with the 200-E-14 Siphon Tank, 200-E-114-PL (Pipeline), and UPR-200-E-83.

Site Posting:
The area has been covered with clean soil and posted as an Underground Radioactive Material Area.

Site History

Release Summary: The crib received 5.6E6 L (1.5E6 gal) tributyl phosphate supernatant waste from the U-Plant Uranium Recovery operations and scavenged tank farm waste via underground pipelines. From 1952 to 1958, waste containing uranium and fission products, produced by the bismuth phosphate separations process, were removed from underground storage tanks and reprocessed at 221-U Plant to recover the uranium from the waste. After the uranium was removed, the cesium and strontium content of the effluent was precipitated by adding ferrocyanide. The addition of ferrocyanide to the waste was called "scavenging." The supernate liquor was released to the ground in the BC Cribs and

Site: 216-B-16	Area: BC	Category: Deep (similar to 216-B-14)

Trenches via the 200-E-114-PL. The waste is liquid process effluent, high in salt, and neutral to basic. The waste contained inorganic compounds such as ferrocyanide, nitrate, and phosphate.

Volume/Mass Discharged: 5.6E+06 L (1.5E+06 gal)

Pore Volume Discharged: 5.6E+06 L/ (327 ft x 1,600 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 1.3

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-16 Waste Site

Contaminant	Mass Discharged
Pu	10 g
Sr-90	700 Ci
Cs-137	650 Ci
U	320 kg
Ru-106	1.3E+04 Ci
Beta	5.4E+04 Ci
Co-60	5 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary:
In May 1958, smearable contamination was detected on the crib vent risers measuring 40,000 cpm and 10,000 cpm on the ground under a flange that was part of the over ground pipeline. Contaminated rabbit droppings reading 5,000 to 10,000 cpm were identified. The maximum value detected was 200 millirem per hour.

In August 2005, mobile surface contamination monitor tractor surveys found extensive wind damage on the stabilization cover. Surface contamination was found at several locations. Contamination levels up to 25 millirem per hour were found.

The BC Cribs and Trenches area was interim stabilized as a single unit in 1981. During stabilization, 200-E-114-PL to the cribs was valved out. The BC Cribs area was revegetated and weed growth was controlled with selective herbicide. The stabilization cover has been badly damaged over time by wind erosion. An annual surface radiation survey is performed.

Site: 216-B-16	Area: BC	Category: Deep (similar to 216-B-14)

Borehole and data summaries are presented in Tables 2 and 3. Borehole locations are shown on Figure 1.

Groundwater contaminants of potential concern associated with BC Crib waste sites 216-B-14 through 216-B-19 include strontium-90 and cesium-137. Strontium-90 concentrations ranged between non-detect and 18 pCi/L from 1960 to 2014, with one detection above the drinking water standard of 8 pCi/L. The maximum concentration was detected in 1960. Cesium-137 results (non-detect to 12.9 pCi/L) were below the drinking water standard of 200 pCi/L between 1987 and 2014.

Table 2. Borehole Summary for the 216-B-16 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2005	A5866	Within crib floor footprint	345 (GPL)

GPL = geophysical log
ID = identification

Table 3. Geophysical Log Summary 216-B-16

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A5866	0 – 5	0.34	pCi/g	4.0	10,901	cpm	4
	5 – 10	0.4	pCi/g	8.0	12,164.1	cpm	10
	10 – 15	2719.4	pCi/g	14	15,924,100	cpm	14
	>15	31447.3	pCi/g	16.5	79,747,800	cpm	21

bgs = below ground surface
ID = identification

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): The depth of the maximum cesium-137 concentration in the one borehole within the 216-13-16 Crib floor footprint is 4.3 m (14 ft), which is 0.3 m (1 ft) below the base of the crib.

Deep (>4.6 m [>15 ft] bgs): The depth of the maximum cesium-137 concentration in the one borehole within the 216-B-16 Crib floor footprint is 5 m (16.5 ft).

Site: 216-B-16	Area: BC	Category: Deep (similar to 216-B-14)

References:

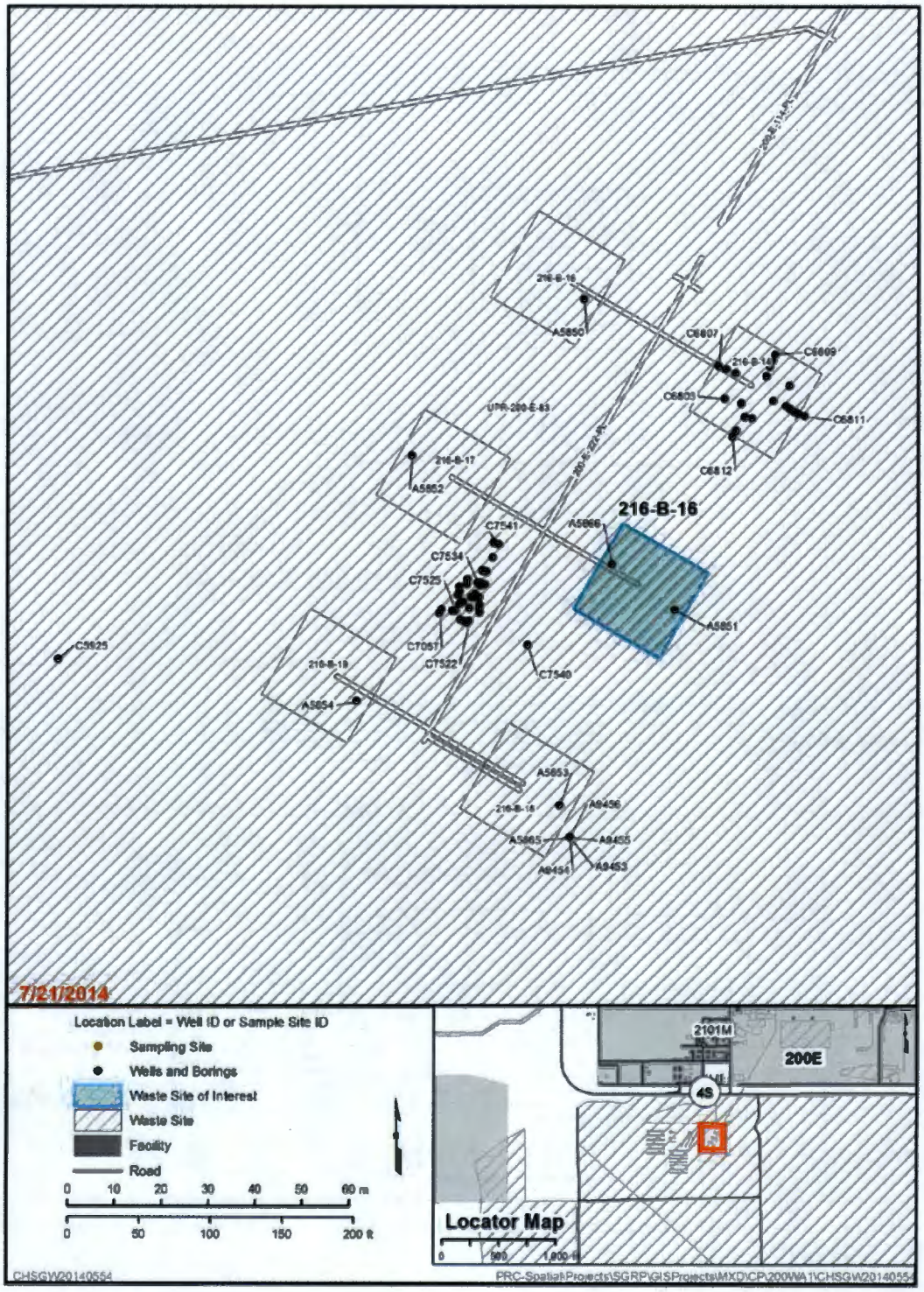
ArcMap

HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI Appendix C-24, General Electric, Richland Company, Richland, Washington.

Waste Information Data System General Summary Report for the 216-B-16 Waste Site.

QMap

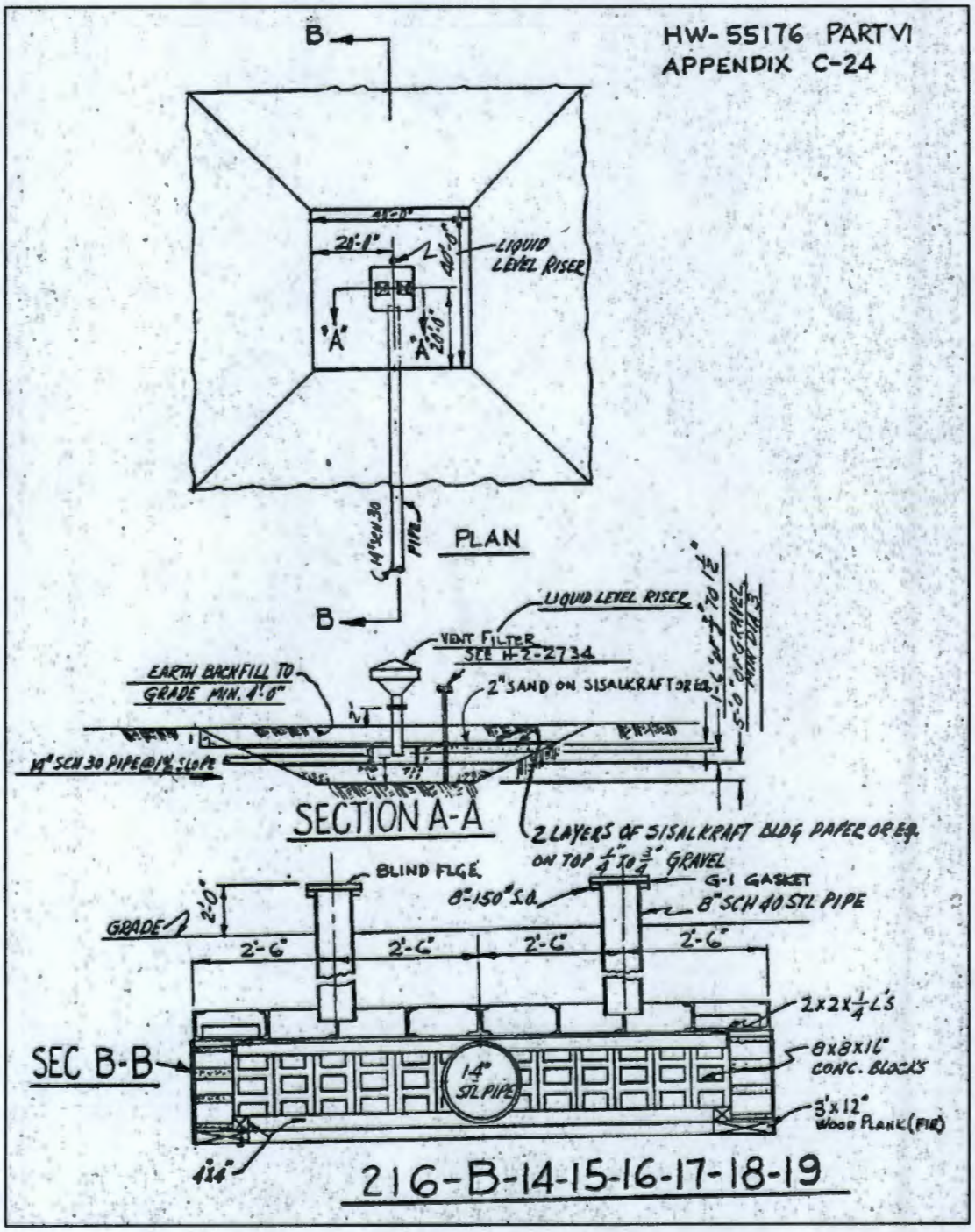
Site: 216-B-16	Area: BC	Category: Deep (similar to 216-B-14)



ID = identification

Figure 1. 216-B-16 Waste Site Map

Site: 216-B-16	Area: BC	Category: Deep (similar to 216-B-14)



Source: H-2-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI Appendix C-24.

Note: Produced from the best available copy.

Figure 2. Plan and Section Views

Site: 216-B-17	Area: BC Cribs	Category: Deep (similar to 216-B-14)

Site Description

Alternate Site Identification: 216-B-17 Crib
Site Type: Crib
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: January 1956

Waste Site Location and Physical Description: The 216-B-17 Crib is located south of the 200 East Area (across Route 4S) in the BC Crib Area. The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The crib is a dispersion structure 3.0 by 3.0 by 0.9 m (10 by 10 by 3 ft) high, made of wood, cinderblock, and steel, over a 1.5 m (5 ft) bed of 7.6 cm (3 in.) gravel, with a 35.6 cm (14 in.) inlet pipe located 1.8 m (6 ft) below grade. The bottom dimensions of the excavation are 12.2 m^2 (40 ft^2) and 4.0 m (13 ft) deep. The side slope is 2:1. The excavated area surrounding the crib at the surface is 24.4 m^2 (80 ft^2) (see Figure 2).

Waste Site Coordinates:
E-573582.39515 N-134389.51043

Site Dimensions:
Site Length: 12 m (40 ft) (bottom dimension)
Site Width: 12 m (40 ft) (bottom dimension)
Site Area: 149 m^2 (1,600 ft^2)
Site Depth: 4.0 m (13 ft) to bottom of structure
Cover Thickness: 0.6 m (2 ft)
Depth to groundwater from bottom of structure: 99.7 m (327 ft)

Related Site Structure(s): The site is associated with the 200-E-14 Siphon Tank, 200-E-114-PL (Pipeline), and UPR-200-E-83.

Site Posting: The area has been covered with clean soil and posted as an Underground Radioactive Material Area.

Site History

Release Summary: The 216-B-17 Crib received 3.4E6 L (0.9E6 gal) tributyl phosphate supernatant waste from the U Plant Uranium Recovery operations and scavenged tank farm waste via underground pipelines. From 1952 to 1958, waste containing uranium and fission products, produced by the bismuth phosphate separations process, were removed from underground storage tanks and reprocessed at 221-U Plant to recover the uranium from the waste. After the uranium was removed, the cesium and strontium content of the effluent was precipitated by adding ferrocyanide. The addition of ferrocyanide to the waste was called "scavenging." The supernate liquor was released to the ground in the BC Cribs

Site: 216-B-17	Area: BC Cribs	Category: Deep (similar to 216-B-14)

and Trenches via the 200-E-114-PL. The waste is liquid process effluent, high in salt, and neutral to basic. The waste contained inorganic compounds such as ferrocyanide, nitrate, and phosphate.

Volume/Mass Discharged: 3.4E+06 L (0.9E+06 gal)

Pore Volume Discharged: 3.4E+06 L/ (327 ft x 1,600 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.8

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-17 Waste Site

Contaminant	Mass Discharged
Pu	10 g
Sr-90	160 Ci
Cs-137	220 Ci
U	350 kg
Ru-106	250 Ci
Beta	2000 Ci
Co-60	1 Ci

RHO-CD-679, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, smearable contamination was detected on the crib vent risers measuring 40,000 cpm and 10,000 cpm on the ground under a flange that was part of the over ground pipeline. Contaminated rabbit droppings reading 5,000 to 10,000 cpm were identified. The maximum value detected was 200 millirem per hour.

In August 2005, mobile surface contamination monitor tractor surveys found extensive wind damage on the stabilization cover. Surface contamination was found at several locations. Contamination levels up to 25 millirem per hour were found.

The BC Cribs and Trenches area was interim stabilized as a single unit in 1981. During stabilization 200-E-114-PL to the cribs was valved out. The BC Cribs area was revegetated and weed growth was controlled with selective herbicide. The stabilization cover has been badly damaged over time by wind erosion. An annual surface radiation survey is performed.

Site: 216-B-17	Area: BC Cribs	Category: Deep (similar to 216-B-14)

Borehole and data summaries are presented in Tables 2, 3, and 4. Borehole locations are shown on Figure 1.

Groundwater contaminants of potential concern associated with BC Crib waste sites 216-B-14 through 216-B-19 include strontium-90 and cesium-137. Strontium-90 concentrations ranged between non-detect and 18 pCi/L from 1960 to 2014, with one detection above the drinking water standard of 8 pCi/L. The maximum concentration was detected in 1960. Cesium-137 results (non-detect to 12.9 pCi/L) were below the drinking water standard of 200 pCi/L between 1987 and 2014.

Table 2. Borehole Summary the 216-B-17 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2005	A5852	Within crib floor footprint	346 (GPL)
2008	C5923	Southeast of crib boundary	342 (GPL and soil samples)
2009	C7047	Southeast of crib boundary	71 (GPL)
2010-2011	C7523, C7525, C7529, C7531, C7533, C7535, C7537, C7539, C7541	Southeast of crib boundary	70 (GPL)
2011	C8387 and C8388	Southeast of crib boundary	64 (GPL)

GPL = geophysical log
ID = identification

Site: 216-B-17	Area: BC Cribs	Category: Deep (similar to 216-B-14)

Table 3. Geophysical Log Summary for the 216-B-17 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A5852	0 – 5	0.7	pCi/g	4.0	13,784	cpm	4
	5 – 10	–	pCi/g	–	12,380.6	cpm	8
	10 – 15	109	pCi/g	15	393,235	cpm	15
	>15	853.3	pCi/g	19	2,566,100	cpm	17
C5923	0 – 5	0.29	pCi/g	2.0	14,781.8	cpm	4
	5 – 10	–	pCi/g	–	14,094.3	cpm	6
	10 – 15	–	pCi/g	–	11,590.3	cpm	15
	>15	0.56	pCi/g	46	28,585.6	cpm	70
C7047	0 – 5	–	pCi/g	–	10,601.2	cpm	5
	5 – 10	–	pCi/g	–	10,241.9	cpm	6
	10 – 15	–	pCi/g	–	8,186.5	cpm	–
	>15	0.29	pCi/g	46	17,125.5	cpm	71
C7523	0 – 5	0.24	pCi/g	2.0	15,846.9	cpm	5
	5 – 10	–	pCi/g	–	13,216	cpm	7
	10 – 15	–	pCi/g	–	10,740.3	cpm	15
	>15	0.33	pCi/g	47	17,643.8	cpm	49
C7525	0 – 5	0.16	pCi/g	3.0	15,908.2	cpm	5
	5 – 10	–	pCi/g	–	14,625.8	cpm	6
	10 – 15	–	pCi/g	–	11430.1	cpm	12
	>15	0.36	pCi/g	47	17,961.1	cpm	62
C7529	0 – 5	0.19	pCi/g	3.0	15,507.3	cpm	5
	5 – 10	–	pCi/g	–	15,002	cpm	6
	10 – 15	–	pCi/g	–	11,041.1	cpm	15
	>15	0.4	pCi/g	46	18,337.4	cpm	49

Site: 216-B-17	Area: BC Cribs	Category: Deep (similar to 216-B-14)

Table 3. Geophysical Log Summary for the 216-B-17 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
C7531	0 – 5	–	pCi/g	–	15,912.8	cpm	5
	5 – 10	0.36	pCi/g	7.0	14,948.2	cpm	6
	10 – 15	–	pCi/g	–	11,112.9	cpm	15
	>15	0.63	pCi/g	46	18,357.5	cpm	48
C7533	0 – 5	–	pCi/g	–	16,480	cpm	4
	5 – 10	–	pCi/g	–	15,427.4	cpm	6
	10 – 15	–	pCi/g	–	11,661.2	cpm	15
	>15	0.67	pCi/g	45	24,559.4	cpm	70
C7535	0 – 5	0.6	pCi/g	3.0	15,981.8	cpm	5
	5 – 10	–	pCi/g	–	14,636.6	cpm	6
	10 – 15	–	pCi/g	–	10,470.1	cpm	14
	>15	0.65	pCi/g	46	21,816.3	cpm	70
C7537	0 – 5	0.5	pCi/g	3.0	15,535.6	cpm	5
	5 – 10	–	pCi/g	–	14,423	cpm	6
	10 – 15	–	pCi/g	–	10,734.1	cpm	11
	>15	0.43	pCi/g	46	17,619.2	cpm	49
C7539	0 – 5	0.16	pCi/g	3.0	15,897.2	cpm	5
	5 – 10	–	pCi/g	–	15,148.1	cpm	6
	10 – 15	–	pCi/g	–	11,032	cpm	15
	>15	0.42	pCi/g	46	17,582.1	cpm	62
C7541	0 – 5	–	pCi/g	–	16,033.4	cpm	4
	5 – 10	–	pCi/g	–	14,909.5	cpm	6
	10 – 15	–	pCi/g	–	11,902.4	cpm	14
	>15	1.4	pCi/g	41	17,578.3	cpm	41

Site: 216-B-17	Area: BC Cribs	Category: Deep (similar to 216-B-14)

Table 3. Geophysical Log Summary for the 216-B-17 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
C8387	0 – 5	0.87	pCi/g	3.0	14,062	cpm	4
	5 – 10	–	pCi/g	–	13,373.9	cpm	6
	10 – 15	–	pCi/g	–	9,681.8	cpm	11
	>15	0.84	pCi/g	46	15,698.6	cpm	63
C8388	0 – 5	0.35	pCi/g	3.0	13,243.1	cpm	3
	5 – 10	–	pCi/g	–	13,045.6	cpm	6
	10 – 15	–	pCi/g	–	9,683.28	cpm	11
	>15	0.39	pCi/g	52	16,428.8	cpm	64

bgs = below ground surface
ID = identification

Table 4. Soil Maximum Detection Summary 216-B-17 (Soil Borehole C5923)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Aluminum	1,340	µg/kg	13.5	7,630,000	µg/kg	26
Calcium	6,980	µg/kg	6	14,600,000	µg/kg	37
Chromium	–	–	–	13,400	µg/kg	–
Copper	–	–	–	9,820	µg/kg	–
Fluoride	1,270	µg/kg	8.5	1,240	µg/kg	16
Iron	2,840	µg/kg	13.5	21,400,000	µg/kg	26
Magnesium	1,740	µg/kg	6	4,890,000	µg/kg	26
Manganese	43.5	µg/kg	13.5	477,000	µg/kg	26
Mercury	–	–	–	66.3	µg/kg	46
Nitrate	6,990	µg/kg	8.5	16,800,000	µg/kg	46
Phosphate	9,430	µg/kg	6	–	–	–

Site: 216-B-17	Area: BC Cribs	Category: Deep (similar to 216-B-14)

Table 4. Soil Maximum Detection Summary 216-B-17 (Soil Borehole C5923)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Potassium	5,620	µg/kg	6	1,810,000	µg/kg	135
Sodium	44,300	µg/kg	8.5	5400000	µg/kg	46
Sulfate	31,900	µg/kg	13.5	2570000	µg/kg	46
Technetium-99	–	–	–	141	pCi/g	216
Uranium-238	0.000975	pCi/g	8.5	0.198	pCi/g	263.5

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): The depth of the maximum cesium-137 concentration in the one borehole within the 216-B-17 Crib floor footprint is 4.57 m (15 ft), which is 0.6 m (2 ft) below the base of the crib. The crib is above site background levels for phosphate (9.43 mg/kg) at 1.83 m (6 ft).

Deep (>4.6 m [>15 ft] bgs): The depth of the maximum cesium-137 concentration (853.3 pCi/g) in the one borehole within the 216-B-17 Crib floor footprint is 5.8 m (19 ft). The crib is above site background levels for nitrate (1680 mg/kg), sodium (5400 mg/kg), and sulfate (2570 mg/kg) below 4.57 m (15 ft).

References:

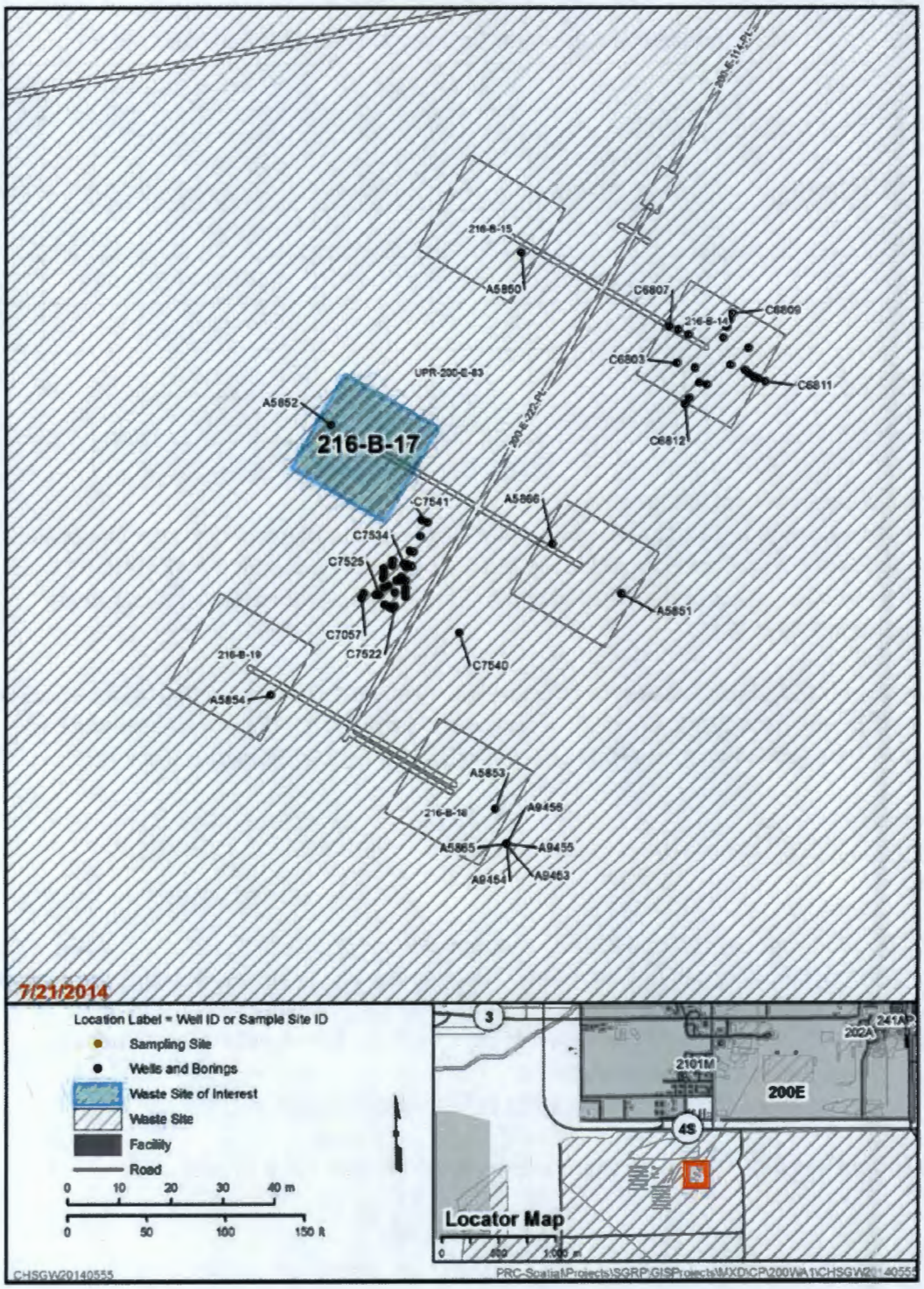
ArcMap

HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI Appendix C-24, General Electric, Richland Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029.

Waste Information Data System General Summary Report for the 216-B-17 Waste Site.

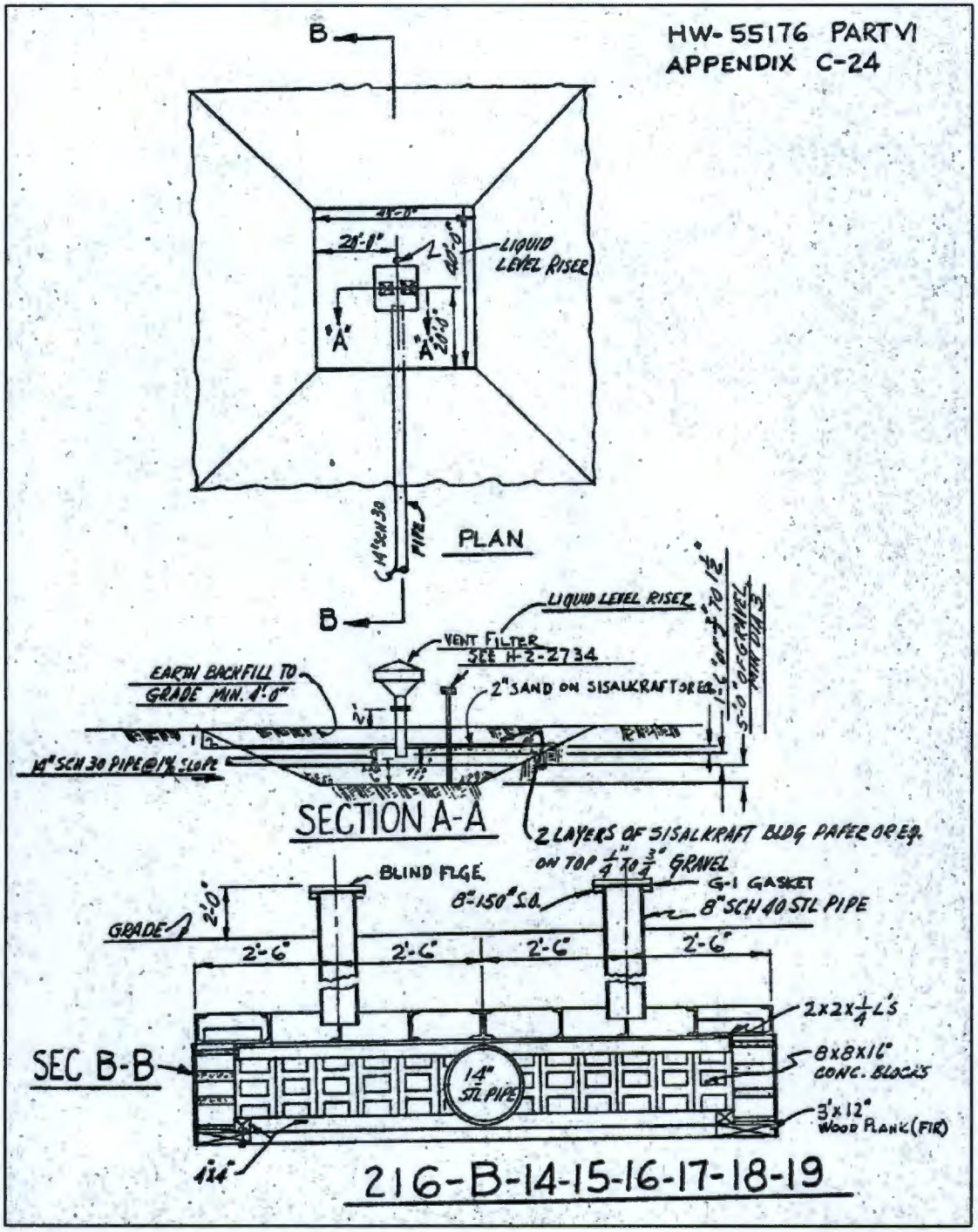
Site: 216-B-17	Area: BC Cribs	Category: Deep (similar to 216-B-14)



ID = identification

Figure 1. 216-B-17 Waste Site Map

Site: 216-B-17	Area: BC Cribs	Category: Deep (similar to 216-B-14)



Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-24.

Note: Produced from the best available copy.

Figure 2. Plan and Section Views

Site: 216-B-17	Area: BC Cribs	Category: Deep (similar to 216-B-14)

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Site: 216-B-18	Area: BC Cribs	Category: Deep (similar to 216-B-14)

Site Description

Alternate Site Identification: 216-B-18 Crib
Site Type: Crib
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: March to April 1956

Waste Site Location and Physical Description: The 216-B-18 Crib is located south of the 200 East Area (across Route 4S) in the BC Crib Area. The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The crib is a dispersion structure 3.0 by 3.0 by 0.9 m (10 by 10 by 3 ft) high, made of wood, cinderblock, and steel, over a 1.5 m (5 ft) bed of 7.6 cm (3 in.) gravel, with a 35.6 cm (14 in.) inlet pipe located 1.8 m (6 ft) below grade. The bottom dimensions of the excavation are 12.2 m^2 (40 ft^2) and 4.0 m (13 ft) deep. The side slope is 2:1. The excavated area surrounding the crib at the surface is 24.4 m^2 (80 ft^2) (Figure 2).

Waste Site Coordinates:
E-573600.41741 N-134322.93487

Site Dimensions:
Site Length: 12 m (40 ft) (bottom dimension)
Site Width: 12 m (40 ft) (bottom dimension)
Site Area: 149 m^2 (1,600 ft^2)
Site Depth: 4.0 m (13 ft) to bottom of structure
Cover Thickness: 0.6 m (2 ft)

Related Site Structure(s): The site is associated with the 200-E-14 Siphon Tank, 200-E-114-PL (Pipeline), and UPR-200-E-83.

Site Posting: The area has been covered with clean soil and posted as an Underground Radioactive Material Area.

Site History

Release Summary: The Crib received 8.5E6 L (2.3E6 Gal) tributyl phosphate supernatant waste from the U-Plant Uranium Recovery operations and scavenged tank farm waste via underground pipelines. From 1952 to 1958, waste containing uranium and fission products, produced by the bismuth phosphate separations process, were removed from underground storage tanks and reprocessed at 221-U Plant to recover the uranium from the waste. After the uranium was removed, the cesium and strontium content of the effluent was precipitated by adding ferrocyanide. The addition of ferrocyanide to the waste was called "scavenging." The supernate liquor was released to the ground in the BC Cribs and Trenches via the 200-E-114-PL (Pipeline). The waste is liquid process effluent, high in salt, and neutral to basic. The waste contained inorganic compounds such as ferrocyanide, nitrate, and phosphate.

Site: 216-B-18	Area: BC Cribs	Category: Deep (similar to 216-B-14)

Volume/Mass Discharged: 8.5E+06 L (2.3E+06 gal)

Pore Volume Discharged: 8.5E+06 L/ (327 ft x 1,600 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 1.9

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-18 Waste Site

Contaminant	Mass Discharged
Pu	10 g
Sr-90	190 Ci
Cs-137	250 Ci
U	240 kg
Ru-106	1.9E+04 Ci
Beta	5.1E+04 Ci
Co-60	5 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, smearable contamination was detected on the crib vent risers measuring 40,000 and 10,000 cpm on the ground under a flange that was part of the over ground pipeline. Contaminated rabbit droppings reading 5,000 to 10,000 cpm were identified. The maximum value detected was 200 millirem per hour.

In August 2005, mobile surface contamination monitor (MSCM) tractor surveys found extensive wind damage on the stabilization cover. Surface contamination was found at several locations. Contamination levels up to 25 millirem per hour were found.

The BC Cribs and Trenches area was interim stabilized as a single unit in 1981. During stabilization, 200-E-114-PL to the cribs was valved out. The BC Cribs area was revegetated and weed growth was controlled with selective herbicide. The stabilization cover has been badly damaged over time by wind erosion.

An annual surface radiation survey is performed.

Site: 216-B-18	Area: BC Cribs	Category: Deep (similar to 216-B-14)

Borehole and data summaries are presented in Tables 2 and 3. Borehole locations are shown on Figure 1.

Groundwater contaminants of potential concern associated with BC Crib waste sites 216-B-14 through 216-B-19 include strontium-90 and cesium-137. Strontium-90 concentrations ranged between non-detect and 18 pCi/L from 1960 to 2014, with one detection above the drinking water standard of 8 pCi/L. The maximum concentration was detected in 1960. Cesium-137 results (non-detect to 12.9 pCi/L) were below the drinking water standard of 200 pCi/L between 1987 and 2014.

Table 2. Borehole Summary for the 216-B-18 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
1985 & 1987	A5865	Southeast of crib boundary	360 (GPL)
2005	A5853	Within crib floor footprint	346 (GPL)
1968	A9454	Southeast of crib boundary	Unknown (GPL)

GPL = geophysical logging
ID = identification

Table 3. Geophysical Log Summary 216-B-18

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A5853	0 – 5	0.41	pCi/g	4.0	15,116.5	cpm	4
	5 – 10	–	pCi/g	–	38,347	cpm	10
	10 – 15	42,362.5	pCi/g	15	16,216,000	cpm	14
	>15	536,865.6	pCi/g	16.5	46,111,600	cpm	19

ID = identification

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): The depth of the maximum cesium-137 concentration in the one borehole within the 216-13-18 Crib floor footprint is 4.57 m (15 ft), which is 0.6 m (2 ft) below the base of the crib.

Deep (>4.6 m [>15 ft] bgs): The depth of the maximum cesium-137 concentration in the one borehole within the 216-B-18 Crib floor footprint is 5.0 m (16.5 ft).

Site: 216-B-18	Area: BC Cribs	Category: Deep (similar to 216-B-14)

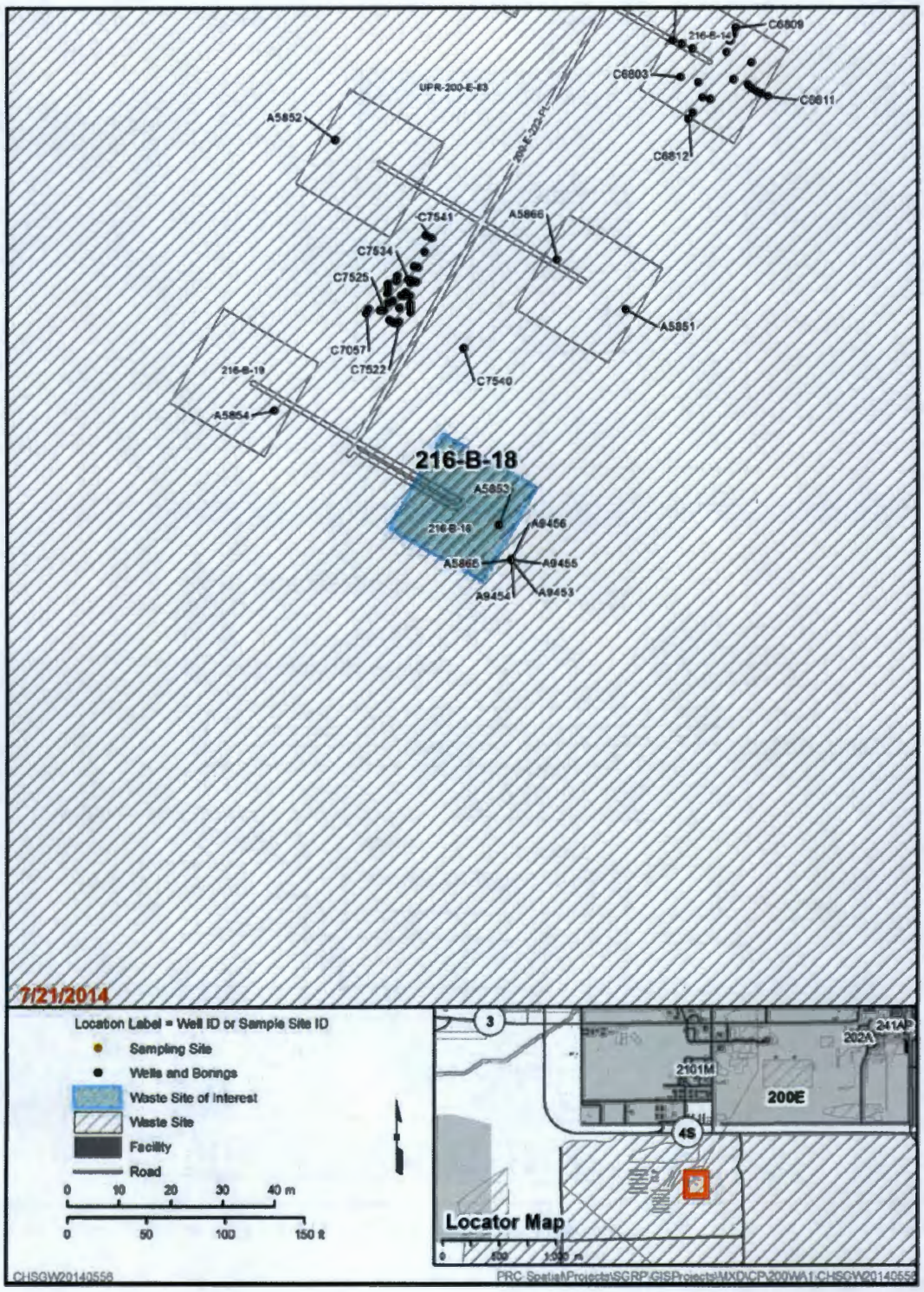
References:

HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-24, General Electric, Richland Company, Richland, Washington

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029.

Waste Information Data System General Summary Report for the 216-B-18 Waste Site.

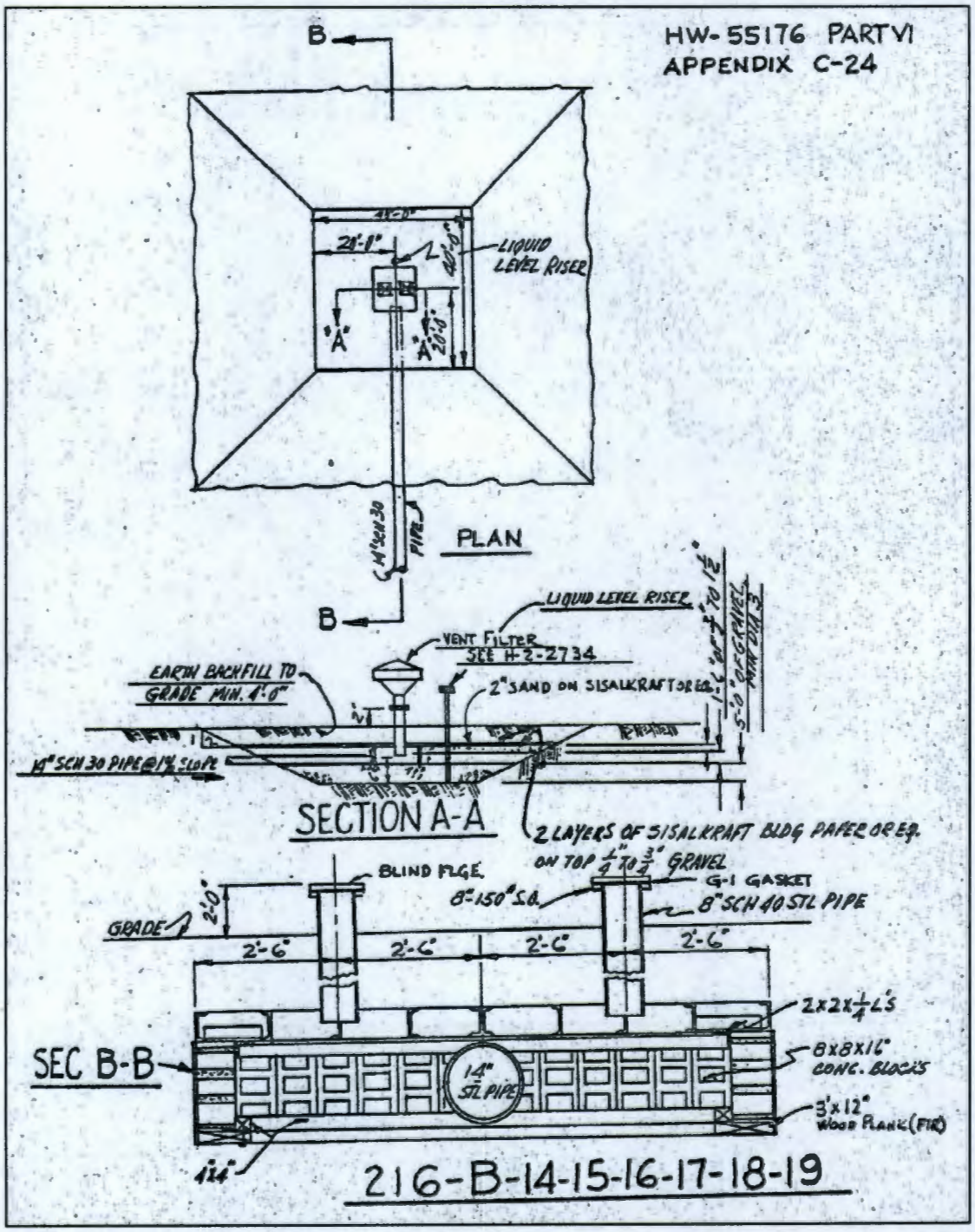
Site: 216-B-18	Area: BC Cribs	Category: Deep (similar to 216-B-14)



ID = identification

Figure 1. 216-B-18 Waste Site Map

Site: 216-B-18	Area: BC Cribs	Category: Deep (similar to 216-B-14)



Source: H2-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-24.

Note: Produced from the best available copy.

Figure 2. Plan and Section Views

Site: 216-B-19	Area: BC Cribs	Category: Deep (similar to 216-B-14)

Site Description

Alternate Site Identification: 216-B-19 Crib
Site Type: Crib
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: February to October 1957

Waste Site Location and Physical Description: The 216-B-19 Crib is located south of the 200 East Area (across Route 4S) in the BC Crib Area. The BC Cribs and Trenches are located inside the BC Controlled Area (see Figure 1). The crib is a dispersion structure 3.0 by 3.0 by 0.9 m (10 by 10 by 3 ft) high, made of wood, cinderblock, and steel, over a 1.5 m (5 ft) bed of 7.6 cm (3 in.) gravel, with a 35.6 cm (14 in.) inlet pipe located 1.8 m (6 ft) below grade. The bottom dimensions of the excavation are 12.2 m^2 (40 ft^2) and 4.0 m (13 ft) deep. The side slope is 2:1. The excavated area surrounding the crib at the surface is 24.4 m^2 (80 ft^2) (see Figure 2).

Waste Site Coordinates:
E-573558.12501 N-134347.19534

Site Dimensions:
Site Length: 12 m (40 ft) (bottom dimension)
Site Width: 12 m (40 ft) (bottom dimension)
Site Area: 149 m^2 (1,600 ft^2)
Site Depth: 4.0 m (13 ft) to bottom of structure
Cover Thickness: 0.6 m (2 ft)

Related Site Structure(s): The site is associated with the 200-E-14 Siphon Tank, 200-E-114-PL (Pipeline), and UPR-200-E-83.

Site Posting: The area has been covered with clean soil and posted as an Underground Radioactive Material Area (URMA).

Site History

Release Summary: The Crib received 6.4E6 L (1.7E6 gal) tributyl phosphate supernatant waste from the U Plant Uranium Recovery operations and scavenged tank farm waste via underground pipelines. From 1952 to 1958, waste containing uranium and fission products, produced by the bismuth phosphate separations process, were removed from underground storage tanks and reprocessed at 221-U Plant to recover the uranium from the waste. After the uranium was removed, the cesium and strontium content of the effluent was precipitated by adding ferrocyanide. The addition of ferrocyanide to the waste was called "scavenging." The supernate liquor was released to the ground in the BC Cribs and

Site: 216-B-19	Area: BC Cribs	Category: Deep (similar to 216-B-14)

Trenches via the 200-E-114-PL (Pipeline). The waste is liquid process effluent, high in salt, and neutral to basic. The waste contained inorganic compounds such as ferrocyanide, nitrate, and phosphate.

Volume/Mass Discharged: 6.4E+06 L (1.7E+06 Gal)

Pore Volume Discharged: 6.4E+06 L/ (327 ft x 1,600 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 1.4

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-19 Waste Site

Contaminant	Mass Discharged
Pu	10 g
Sr-90	200 Ci
Cs-137	270 Ci
U	180 kg
Ru-106	5100 Ci
Beta	1.1E+04 Ci
Co-60	5 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, smearable contamination was detected on the Crib vent risers measuring 40,000 and 10,000 cpm on the ground under a flange that was part of the over ground pipeline. Contaminated rabbit droppings reading 5,000 to 10,000 cpm were identified. The maximum value detected was 200 millirem per hour.

In August 2005, mobile surface contamination monitor tractor surveys found extensive wind damage on the stabilization cover. Surface contamination was found at several locations. Contamination levels up to 25 millirem per hour were found.

The BC Cribs and Trenches area was interim stabilized as a single unit in 1981. During stabilization, 200-E-114-PL to the cribs was valved out. The BC Cribs area was revegetated and weed growth was controlled with selective herbicide. The stabilization cover has been badly damaged over time by wind erosion.

An annual surface radiation survey is performed.

Site: 216-B-19	Area: BC Cribs	Category: Deep (similar to 216-B-14)

Borehole and data summaries are presented in Tables 2 and 3. Borehole locations are shown on Figure 1.

Groundwater contaminants of potential concern associated with BC Crib waste sites 216-B-14 through 216-B-19 include strontium-90 and cesium-137. Strontium-90 concentrations ranged between non-detect and 18 pCi/L from 1960 to 2014, with one detection above the drinking water standard of 8 pCi/L. The maximum concentration was detected in 1960. Cesium-137 results (non-detect to 12.9 pCi/L) were below the drinking water standard of 200 pCi/L between 1987 and 2014.

Table 2. Borehole Summary for the 216-B-19 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2005	A5854/299-E13-6	Within crib floor footprint	345 (GPL)

GPL = geophysical log
ID = Identification

Table 3. Geophysical Log Summary for the 216-B-19 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A5854	0 – 5	0.25	pCi/g	4.0	12,495.4	cpm	4
	5 – 10	–	pCi/g	–	29,320	cpm	10
	10 – 15	113,266.4	pCi/g	15	5,680,610	cpm	13
	>15	199,079.8	pCi/g	16	1,181,260	cpm	20

bgs = below ground surface
ID = identification

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): The depth of the maximum cesium-137 concentration in the one borehole within the 216-13-19 Crib floor footprint is 4.57 m (15 ft), which is 0.6 m (2 ft) below the base of the rib.

Deep (>4,6 m [>15 ft] bgs): The depth of the maximum cesium-137 concentration in the one borehole within the 216-B-19 Crib floor footprint is 4.9 m (16 ft).

Site: 216-B-19	Area: BC Cribs	Category: Deep (similar to 216-B-14)

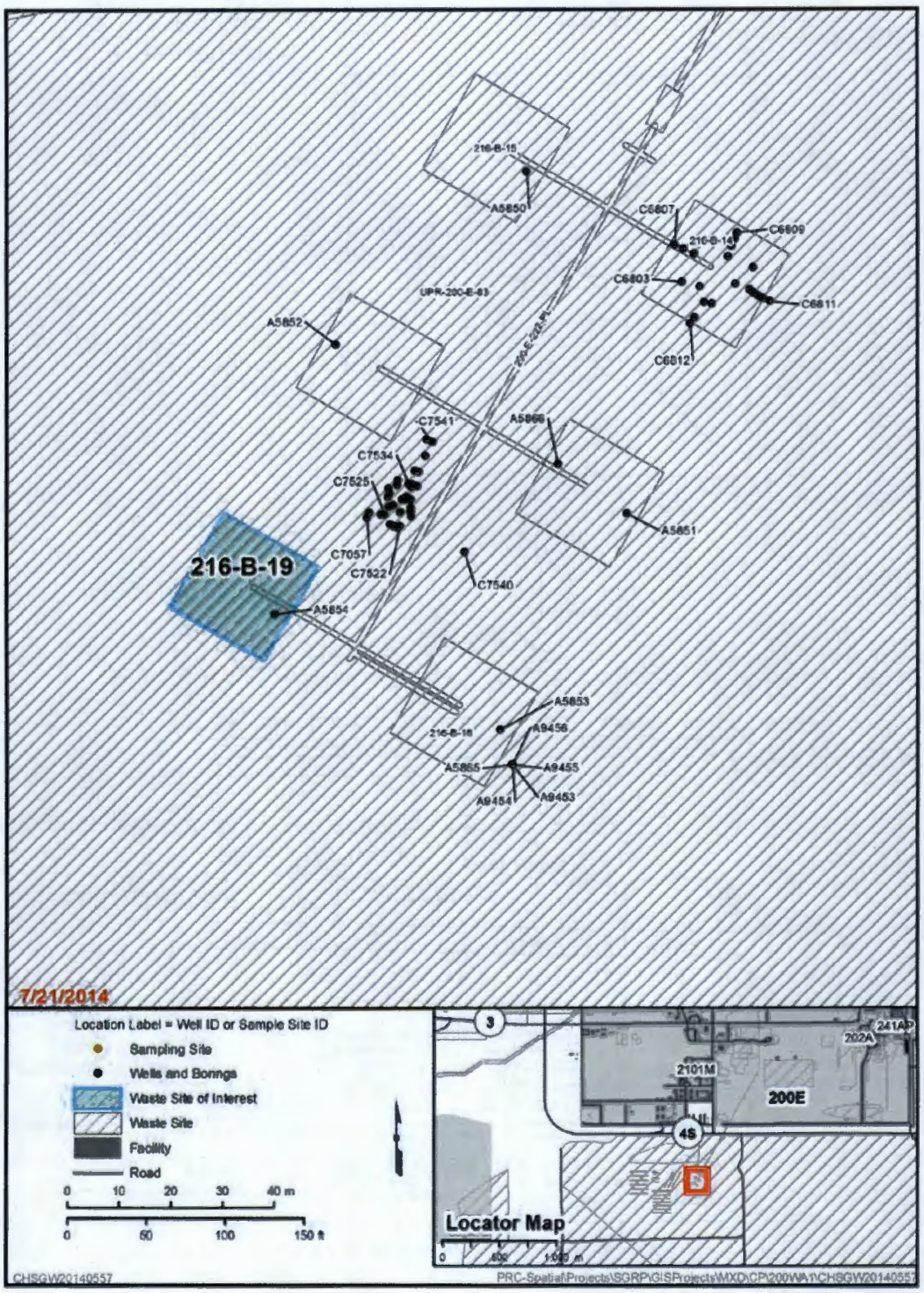
References:

HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites,* Part VI Appendix C-24, General Electric, Richland Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029.

Waste Information Data System General Summary Report for the 216-B-19 Waste Site.

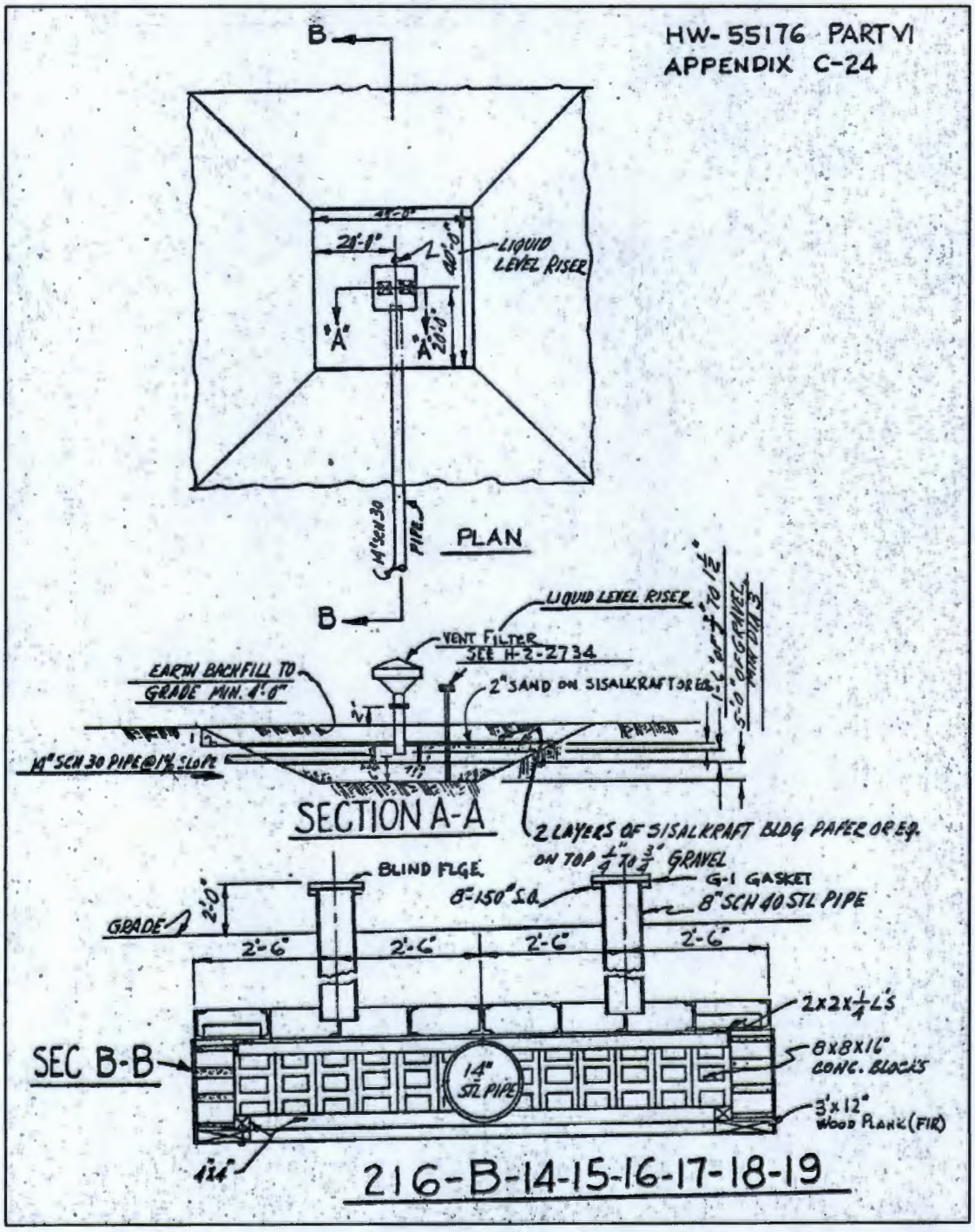
Site: 216-B-19	Area: BC Cribs	Category: Deep (similar to 216-B-14)



ID = identification

Figure 1. 216-B-19 Waste Site Map

Site: 216-B-19	Area: BC Cribs	Category: Deep (similar to 216-B-14)



Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-24.

Note: Produced from the best available copy.

Figure 2. Plan and Section Views

Site: 216-B-20	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Site Description

Alternate Site Identification: 216-B-20 Trench
Site Type: Trench
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: August to September 1956

Waste Site Location and Physical Description: 216-B-20 Trench is located south of the 200 East Area (across Route 4S) in the BC Cribs and Trenches area. The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The trench was divided into 19 m (62.5 ft) sections by 0.6 m (2 ft) high earthen dams. The side slope is 1:1.5. The depth was designated to be 3 m (10 ft) but is often documented as 1.8 m (6 ft). A sisalkraft cover with wooden frame was constructed over the trench (Figures 2, 3, and 4).

Waste Site Coordinates:
E-573418.77445 N-134376.14761

Site Dimensions:
Site Length: 152.4 m (500 ft) Site Depth: 3.1 m (10 ft)
Site Width: 3.1 m (10 ft) Cover Thickness: 15.2 cm (6 in.) (in 1969)
Site Area: 464.8 m^2 (5,000 ft^2)

Related Site Structure(s): The trench is associated with U Plant uranium recovery process and UPR-200-E-83.

Site Posting: The trench has been backfilled with clean soil and posted Underground Radioactive Material Area. Concrete AC 540 markers outline the area where the trenches are located, but do not identify specific trench locations.

Site History

Release Summary: 216-B-20 Trench received 4.7E6 L (1.2E6 gal) of scavenged tributyl phosphate supernate liquid waste from the 221-U Building during uranium recovery operations. After the uranium was removed, the cesium and strontium content of the effluent was reduced through precipitation by adding ferrocyanide. The waste was received into the trench via an aboveground transfer line extending from the 200-E-114-PL pipeline. The waste is liquid process effluent, high in salt, and neutral to basic. The waste contained inorganic compounds such as ferrocyanide, nitrate, and phosphate.

The 216-B-20 Trench was backfilled after it reached its specific retention capacity. In 1969, Trenches 216-B-20, 21, 22, and 28 were covered with 15 cm (6 in.) of gravel. The area was further

Site: 216-B-20	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

stabilized and revegetated in September 1981 and 1982. The stabilization cover has been badly damaged over time by wind erosion.

Volume/Mass Discharged: 4.7E+06 L (1.2E+06 gal)

Pore Volume Discharged: 4.7E+06 L/ (330 ft x 5,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.34

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-20 Waste Site

Contaminant	Mass Discharged
Pu	1.3 g
Sr-90	790 Ci
Cs-137	1500 Ci
U	350 kg
Ru-106	10,000 Ci
Beta	3.2E+04 Ci
Co-60	4.4 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, an unplanned release (UPR-200-E-83) occurred when a large area was found to be contaminated with radioactive rabbit feces reading 5,000 to 10,000 cpm. A burrow in Trench 216-B-28, containing contaminated salt, was believed to be the source of the material ingested by the rabbits. Also detected was smearable contamination on the crib vent risers of 40,000 cpm and 10,000 cpm on the ground under a flange that was part of the aboveground pipeline.

In 1969, contaminated Russian thistle was identified growing on some of the BC Trenches. To inhibit weed growth, 45,870 m^3 (60,000 yd^3) of sand and gravel was placed on top of the trenches. In 1981, the area was covered with additional top soil, time release herbicides and rodent deterrent. The area was surface stabilized again in 1982.

In March 1981, radiological surveys detected an area east of the 216-B-20 Trench with a dose rate of 500 millirem per hour. Buried contaminated equipment related to the aboveground transfer line was identified as the source. After the equipment and surrounding soil were removed, a follow-up survey

Site: 216-B-20	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

detected a plume of contamination measuring approximately 4.6 m (15 ft) long extending to the dirt road east of the trenches. The plume readings detected up to 3,000 cpm.

In August 2005, a mobile surface contamination monitor (MCSM) tractor survey found extensive wind damage on the stabilization cover at the BC Cribs and Trenches. Surface contamination with levels up to 25 millirem per hour was detected.

A surface radiation survey is performed annually.

Borehole and data summaries are presented in Tables 2 and 3. Borehole locations are shown on Figure 1.

Table 2. Borehole Summary for the 216-B-20 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2007	A5867/299-E13-51	South of site boundary	76 (GPL)
2004	A5855/299-E13-7	East of site boundary	345 (GPL)

GPL = geophysical log
ID = identification

Table 3. Geophysical Log Summary for the 216-B-20 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A5855	0 – 5	18.1	pCi/g	5.0	40,413.7	cpm	5
	5 – 10	0.34	pCi/g	6.0	14,269.3	cpm	6
	10 – 15	–	pCi/g	–	12,244.4	cpm	11
	>15	6.5	pCi/g	20	1,756,560	cpm	22
A5867	0 – 5	2.9	pCi/g	5.0	12,552.1	cpm	5
	5 – 10	15.4	pCi/g	8.0	25,008.7	cpm	8
	10 – 15	5.6	pCi/g	11	13,377.4	cpm	11
	>15	90.6	pCi/g	18	158,630	cpm	18

bgs = below ground surface
ID = identification

Site: 216-B-20	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): The depth of the maximum cesium-137 concentration in the closest borehole to the 216-B-20 Trench floor footprint is 1.5 m (5 ft).

Deep (>4.6 m [>15 ft] bgs): The depth of the maximum cesium-137 concentration in the closest borehole within the 216-B-20 Trench floor footprint is 5.5 m (18 ft).

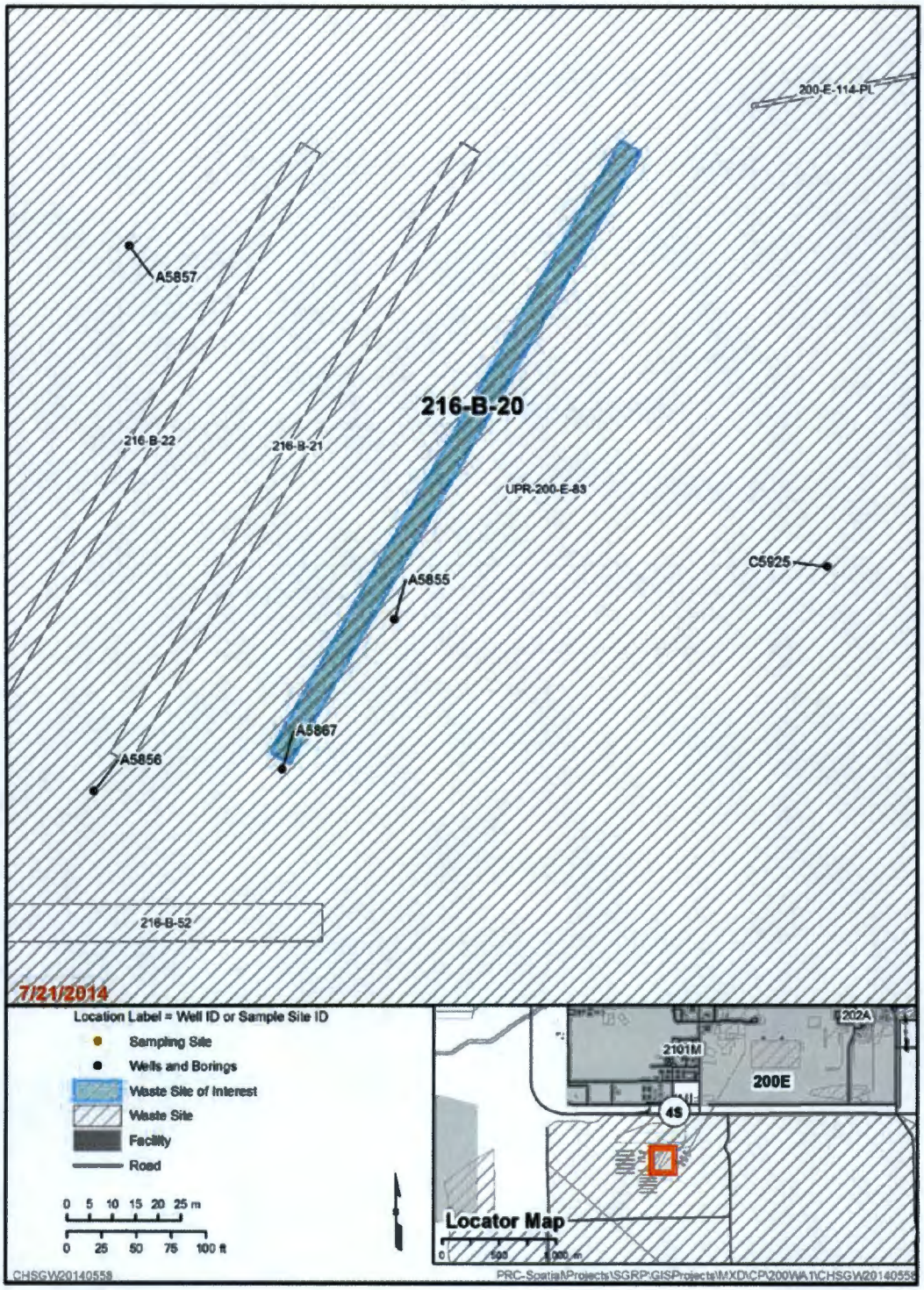
References:

HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI Appendix C-25, C-26, and C-26A, General Electric, Richland Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029.

Waste Information Data System General Summary Report for the 216-B-20 Waste Site.

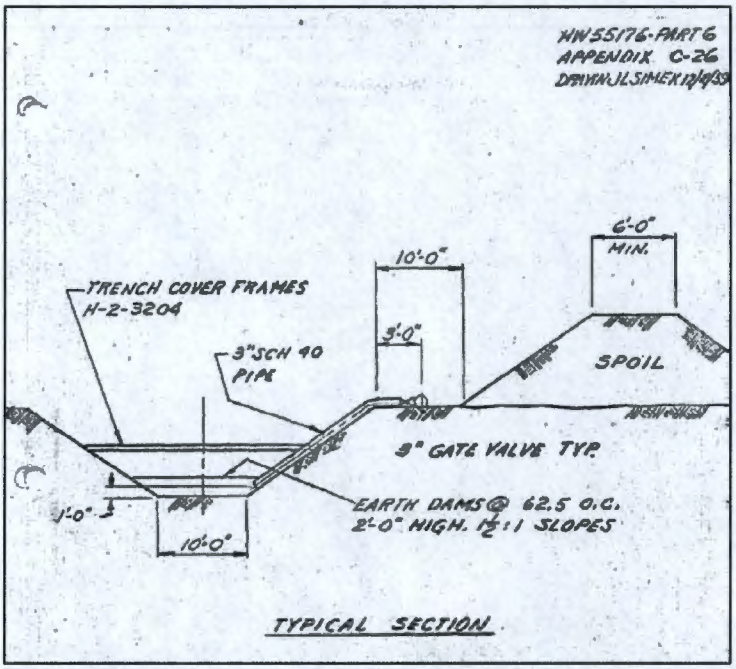
Site: 216-B-20	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



ID = identification

Figure 1. 216-B-20 Waste Site Map

Site: 216-B-20	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

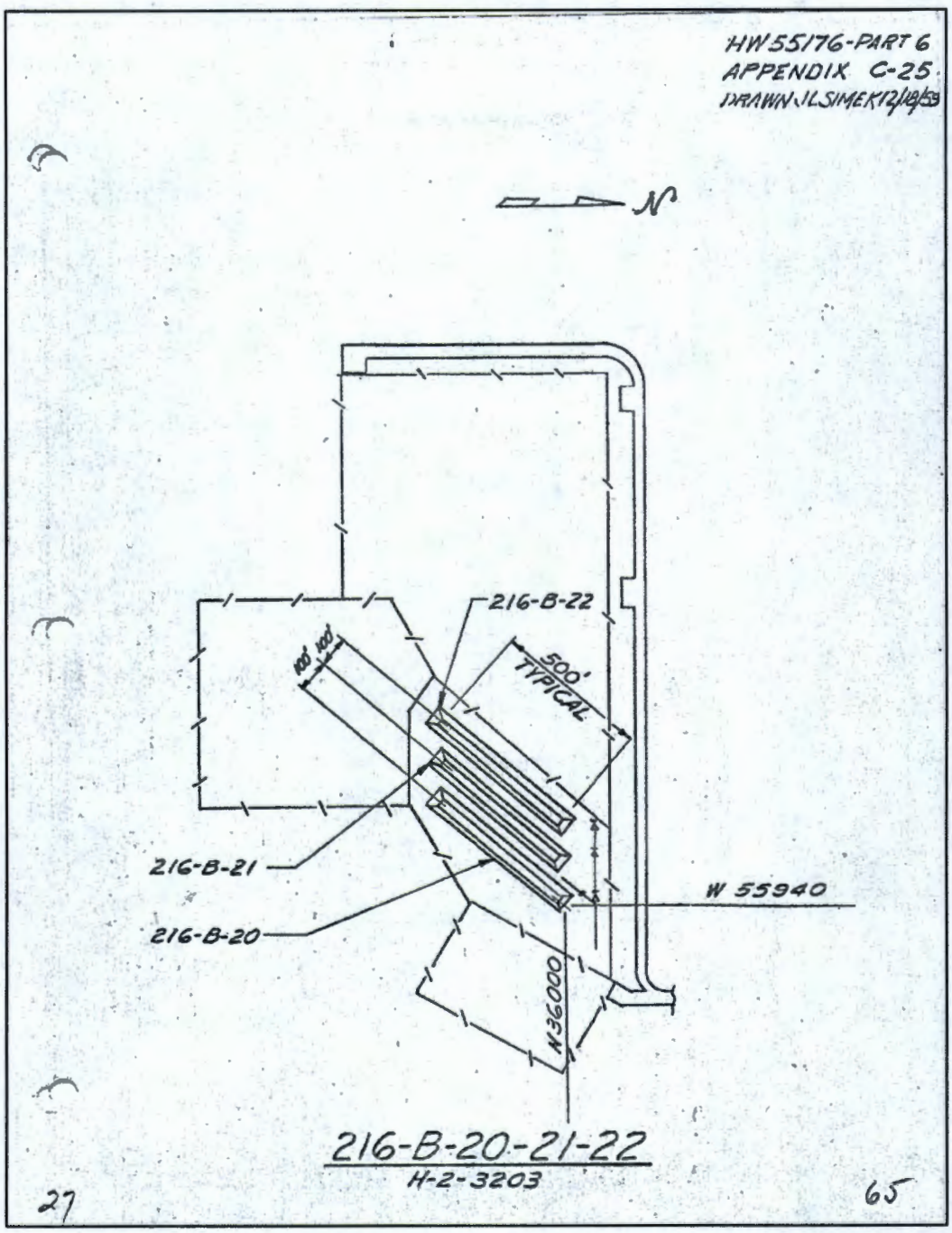


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-26.

Note: Produced from the best available copy.

Figure 2. Trench Elevation

Site: 216-B-20	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

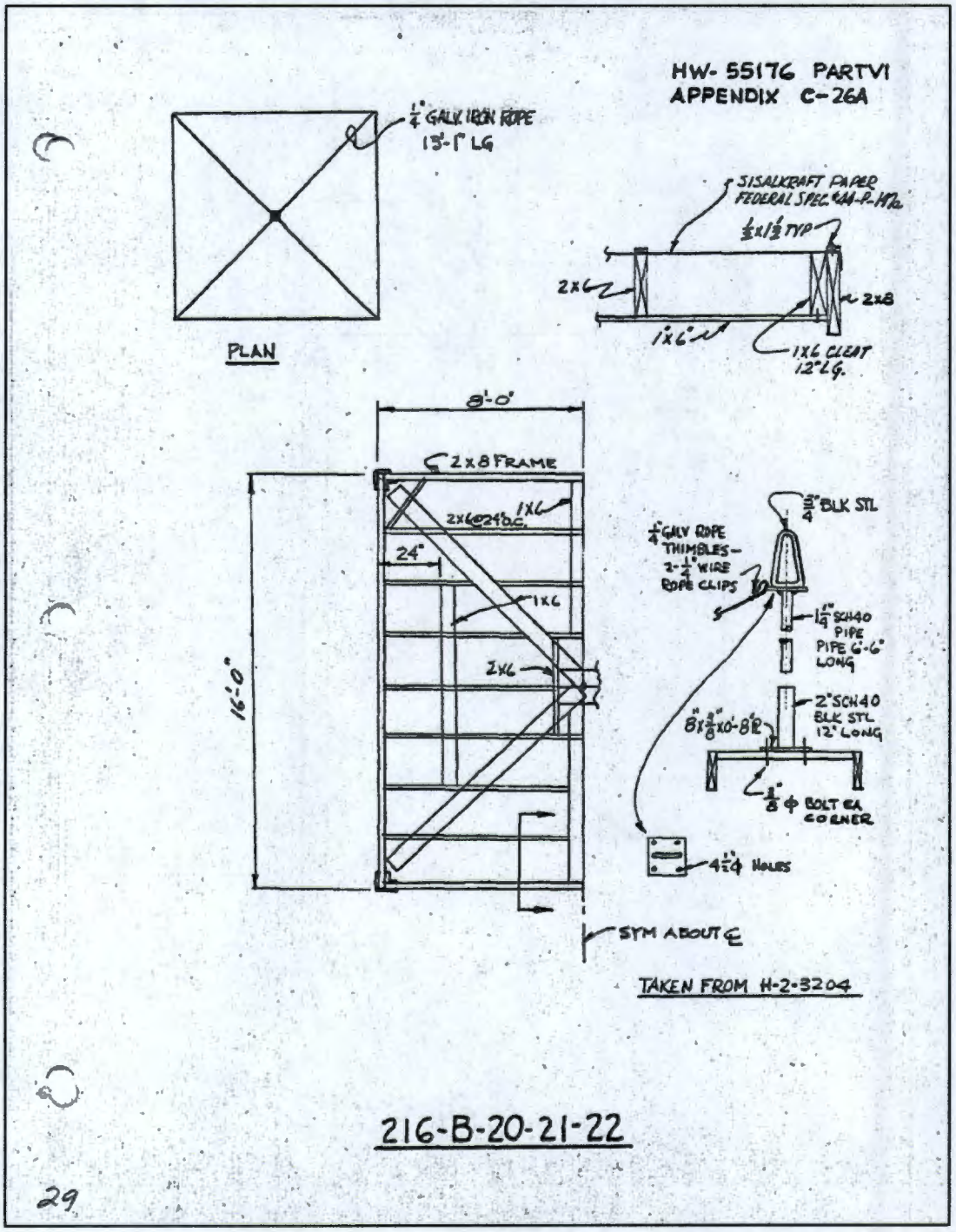


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-25.

Note: Produced from the best available copy.

Figure 3. Trench Plan View

Site: 216-B-20	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-26.

Note: Produced from the best available copy.

Figure 4. Trench Cover

Site: 216-B-21	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Site Description

Alternate Site Identification: 216-B-21 Trench
Site Type: Trench
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: September to October 1956

Waste Site Location and Physical Description: 216-B-21 Trench is located south of the 200 East Area (across Route 4S) in the BC Cribs and Trenches area. The BC Cribs and Trenches are located inside the BC Controlled Area (see Figure 1). The trench was divided into 19 m (62.5 ft) sections by 0.6 m (2 ft) high earthen dams. The side slope is 1:1.5. The depth was designated to be 3 m (10 ft) but is often documented as 1.8 m (6 ft). A sisalkraft cover with wooden frame was constructed over the trench (see Figures 2, 3, and 4).

Waste Site Coordinates:
E-573383.51025 N-134375.94369

Site Dimensions:
Site Length: 152.4 m (500 ft)
Site Width: 3.1 m (10 ft)
Site Area: 464.8 m^2 (5,000 ft^2)
Note: These are bottom dimensions.

Site Depth: 3.1 m (10 ft)
Cover Thickness: 15.2 cm (6 in.) (in 1969)

Related Site Structure(s): The trench is associated with U Plant uranium recovery process and UPR-200-E-83.

Site Posting: The trench has been backfilled with clean soil and posted Underground Radioactive Material Area. Concrete AC 540 markers outline the area where the trenches are located, but do not identify specific trench locations.

Site History

Release Summary: 216-B-21 Trench received 4.7E6 L (1.2E6 gal) of scavenged tributyl phosphate supernate liquid waste from the 221-U Building during uranium recovery operations. After the uranium was removed, the cesium and strontium content of the effluent was reduced through precipitation by adding ferrocyanide. The waste was received into the trench via an aboveground transfer line extending from the 200-E-114-PL (Pipeline). The waste is liquid process effluent, high in salt, and neutral to basic. The waste contained inorganic compounds such as ferrocyanide, nitrate, and phosphate.

Site: 216-B-21	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

The Trench was backfilled after it reached its specific retention capacity. In 1969, Trenches 216-B-20, 21, 22, and 28 were covered with 15 cm (6 in.) of gravel. The area was further stabilized and revegetated in September 1981, the stabilization cover has been badly damaged over time by wind erosion.

Volume/Mass Discharged: 4.7E+06 L (1.2E+06 gal)

Pore Volume Discharged: 4.7E+06 L/ (330 ft x 5,000 ft^2 / 35.3 m^3/ft^3 * 1000 L/m^3 * 0.3) = 0.34

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-21 Waste Site

Contaminant	Mass Discharged
Pu	10 g
Sr-90	740 Ci
Cs-137	370 Ci
U	680 kg
Ru-106	1.5E+04 Ci
Beta	4.7E+04 Ci
Co-60	6.5 Ci

Source: RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, an Unplanned Release (UPR-200-E-83) occurred when a large area was found to be contaminated with radioactive rabbit feces reading 5,000 to 10,000 cpm. A burrow in Trench 216-B-28, containing contaminated salt, was believed to be the source of the material ingested by the rabbits. Also detected was smearable contamination on the crib vent risers of 40,000 cpm and 10,000 cpm on the ground under a flange that was part of the aboveground pipe.

In 1969, contaminated Russian thistle was identified growing on some of the BC Trenches. To inhibit weed growth, 45,870 m^3 (60,000 yd^3) of sand and gravel was placed on top of the trenches. In 1981, the area was covered with additional top soil, time release herbicides, and rodent deterrent. The area was surface stabilized again in 1982.

Site: 216-B-21	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

In March 1981, radiological surveys detected an area east of the 216-B-20 Trench with a dose rate of 500 millirem per hour. Buried contaminated equipment related to the aboveground transfer line was identified as the source. After the equipment and surrounding soil were removed, a follow-up survey detected a plume of contamination measuring approximately 4.6 m (15 ft) long extending to the dirt road east of the trenches. The plume readings detected up to 3,000 cpm.

In August 2005, a mobile surface contamination monitor tractor survey found extensive wind damage on the stabilization cover at the BC Cribs and Trenches. Surface contamination with levels up to 25 millirem per hour was detected.

The trench is monitored by groundwater well 299-E13-8. A surface radiation survey is performed annually.

Borehole and data summaries are presented in Tables 2 and 3. Borehole locations are shown on Figure 1.

Table 2. Borehole Summary for the 216-B-21 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2004	A5856/299-E13-8	North of site boundary	345 (GPL)

GPL = geophysical log
ID = identification

Table 3. Geophysical Log Summary for the 216-B-21 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A5856	0 – 5	–	pCi/g	–	12,759.7	cpm	5
	5 – 10	0.42	pCi/g	6.0	12,869	cpm	6
	10 – 15	–	pCi/g	–	11,987.9	cpm	13
	>15	0.99	pCi/g	50	21,687.3	cpm	145

bgs = below ground surface
ID = identification

Site: 216-B-21	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Nature Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): The depth of the maximum cesium-137 concentration in the closest borehole to the 216-B-21 Trench floor footprint is 1.8 m (6 ft).

Deep (>0 to 4.6 m [>15 ft) bgs): The depth of the maximum cesium-137 concentration in the closest borehole within the 216-B-21 Trench floor footprint is 15.2 m (50 ft).

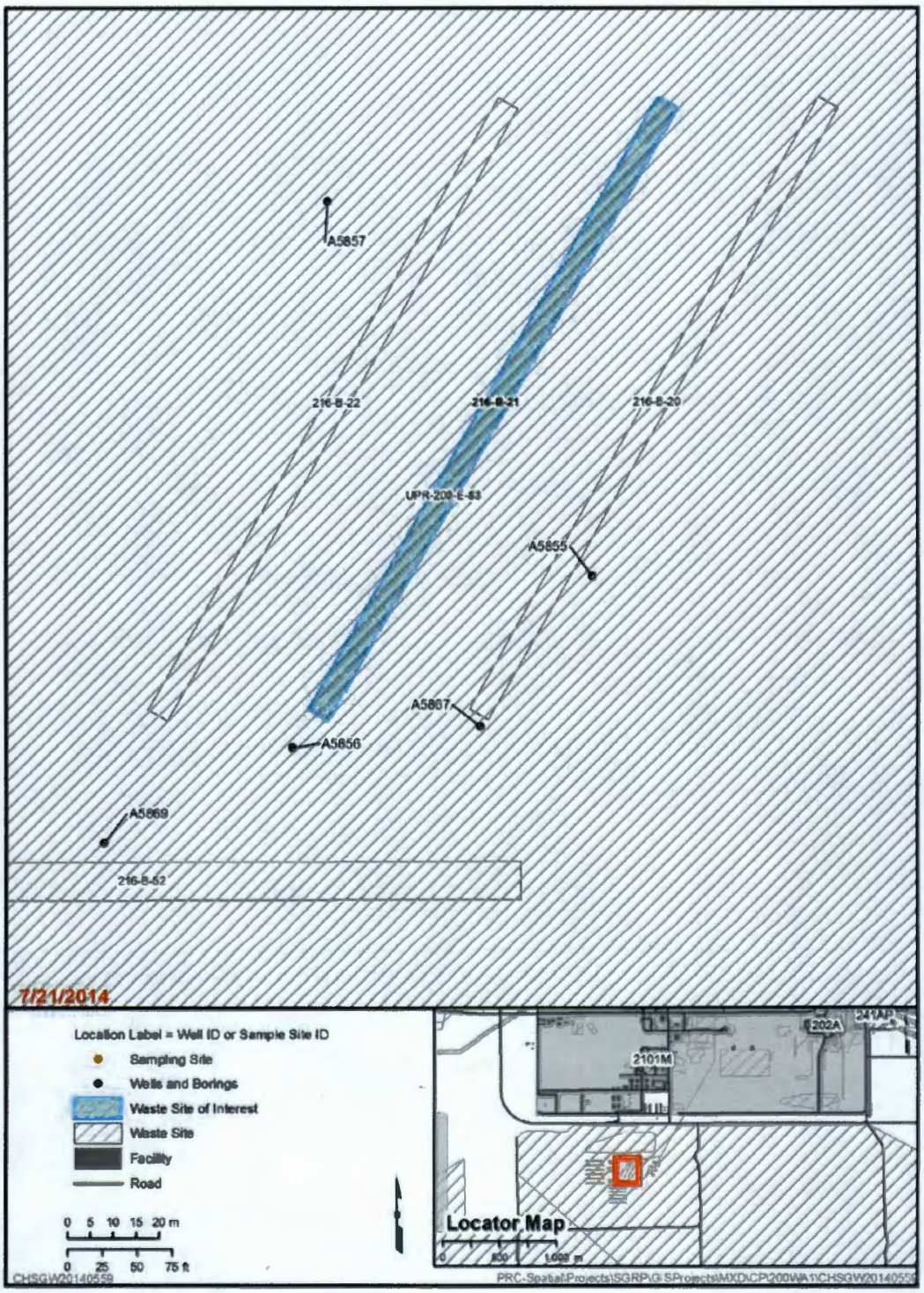
References:

HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI Appendix C-25, C-26 and C-26A, General Electric, Richland Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029.

Waste Information Data System General Summary Report the site 216-B-21 Waste Site.

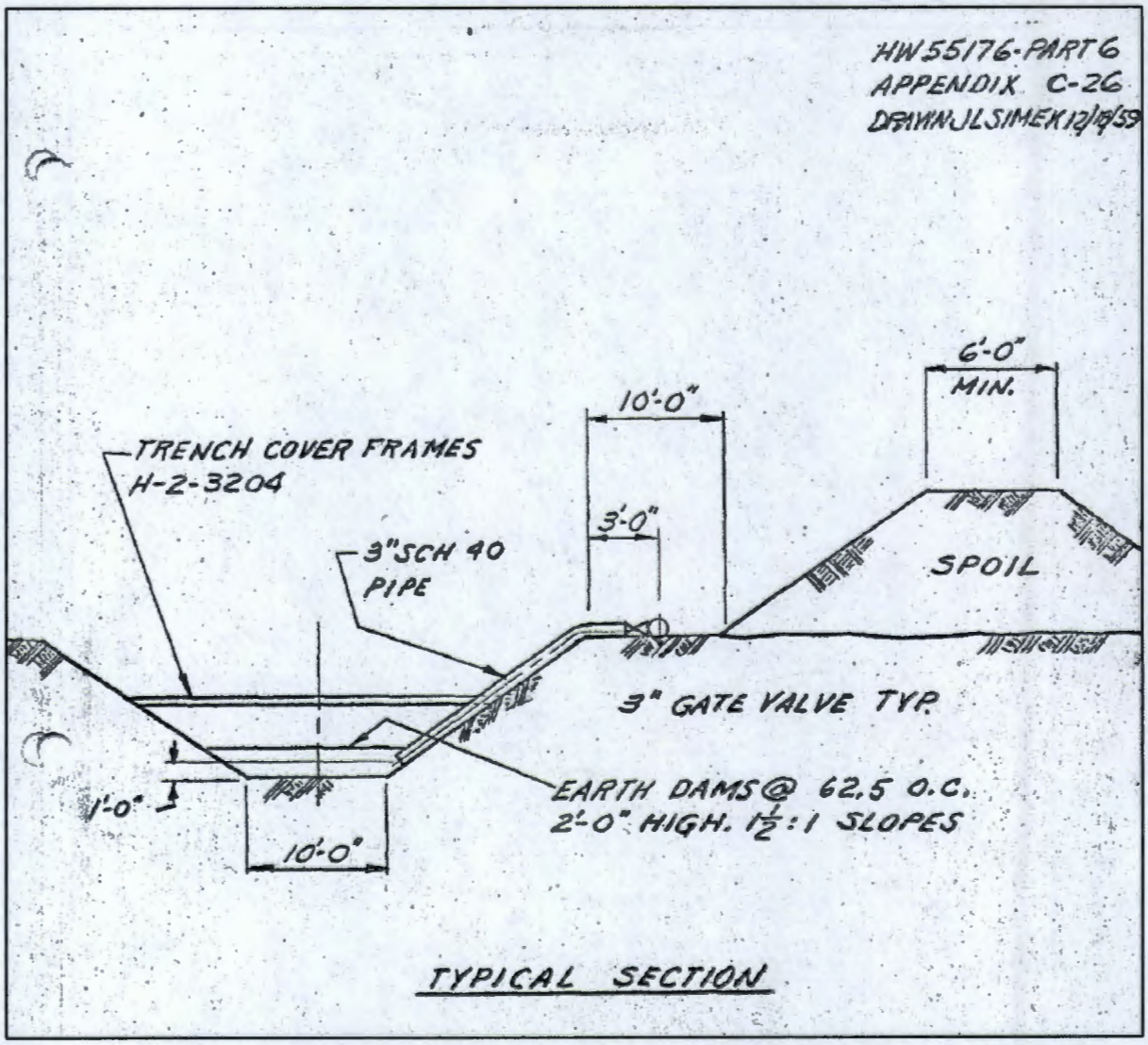
Site: 216-B-21	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



ID = identification

Figure 1. 216-B-21 Waste Site Map

Site: 216-B-21	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

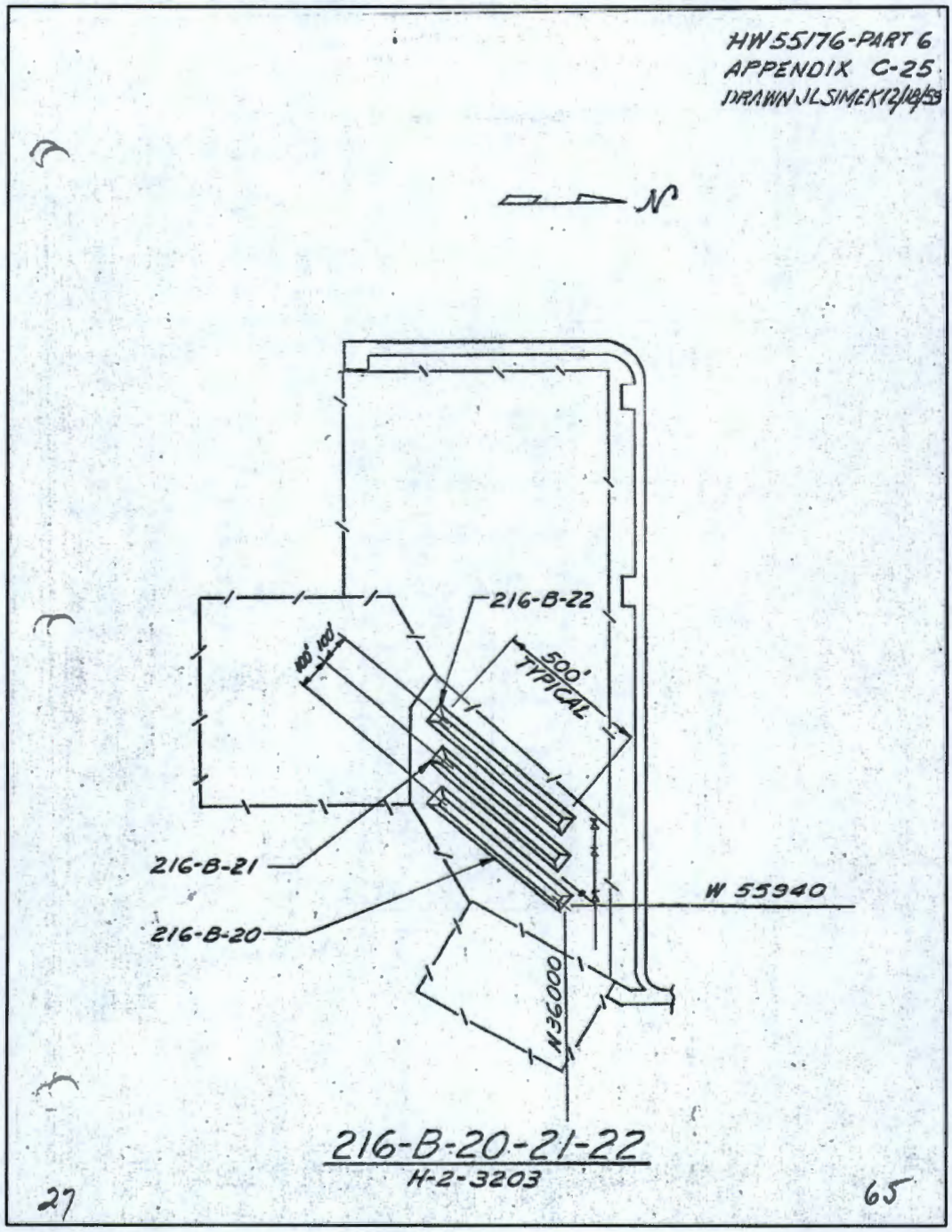


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-26.

Note: Produced from the best available copy.

Figure 2. Trench Elevation

Site: 216-B-21	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

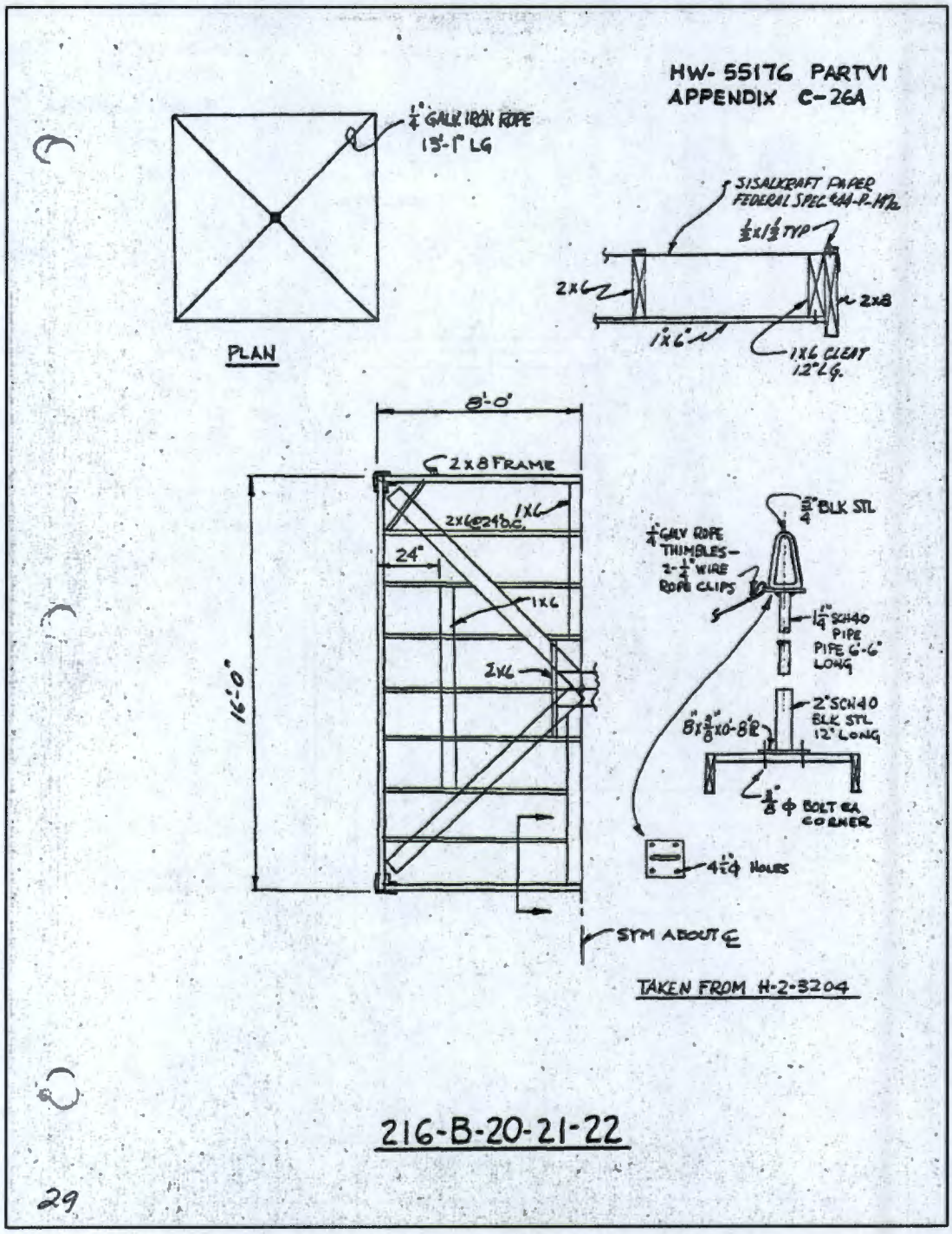


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-26.

Note: Produced from the best available copy.

Figure 3. Trench Plan View

Site: 216-B-21	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-26.

Note: Produced from the best available copy.

Figure 4. Trench Cover

Site: 216-B-22	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Site Description

Alternate Site Identification: 216-B-22 Trench
Site Type: Trench
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: October 1956

Waste Site Location and Physical Description: The 216-B-22 Trench is located south of the 200 East Area (across Route 4S) in the BC Cribs and Trenches area. The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The trench was divided into 19 m (62.5 ft) sections by 0.6 m (2 ft) high earthen dams. The side slope is 1:1.5. The depth was designated to be 3 m (10 ft) but is often documented as 1.8 m (6 ft). A sisalkraft cover with wooden frame was constructed over the trench (Figures 2, 3, and 4).

Waste Site Coordinates:
E-573348.30230 N-134375.80626

Site Dimensions:
Site Length: 152.4 m (500 ft)
Site Width: 3.1 m (10 ft)
Site Area: 464.8 m^2 (5,000 ft^2)
Note: These are bottom dimensions.
Site Depth: 3.1 m (10 ft)
Cover Thickness: 15.2 cm (6 in.) (in 1969)

Related Site Structure(s): The trench is associated with U Plant uranium recovery process and UPR-200-E-83.

Site Posting: The trench has been backfilled with clean soil and posted Underground Radioactive Material Area. Concrete AC 540 markers outline the area where the trenches are located, but do not identify specific trench locations.

Site History

Release Summary: The 216-B-22 Trench received 4.7E6 L (1.3E6 gal) of scavenged tributyl phosphate (TBP) supernate liquid waste from the 221-U Building during uranium recovery operations. After the uranium was removed, the cesium and strontium content of the effluent was reduced through precipitation by adding ferrocyanide. The waste was received into the trench via an aboveground transfer line extending from the 200-E-114-PL pipeline. The waste is liquid process effluent, high in salt, and neutral to basic. The waste contained inorganic compounds such as ferrocyanide, nitrate, and phosphate.

Site: 216-B-22	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

The trench was backfilled after it reached its specific retention capacity. In 1969, Trenches 216-B-20, 21, 22, and 28 were covered with 15 cm (6 in.) of gravel. The area was further stabilized and revegetated in September 1981, the stabilization cover has been badly damaged over time by wind erosion.

Volume/Mass Discharged: 4.7E+06 L (1.3E+06 gal)

Pore Volume Discharged: 4.7E+06 L/ (330 ft x 5,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.34

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-22 Waste Site

Contaminant	Mass Discharged
Pu	2.6 g
Sr-90	410 Ci
Cs-137	45 Ci
U	420 kg
Ru-106	3.0E+04 Ci
Beta	9.5E+04 Ci
Co-60	13 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, an Unplanned Release (UPR-200-E-83) occurred when a large area was found to be contaminated with radioactive rabbit feces reading 5,000 to 10,000 cpm. A burrow in Trench 216-B-28, containing contaminated salt, was believed to be the source of the material ingested by the rabbits. Also detected was smearable contamination on the crib vent risers of 40,000 cpm and 10,000 cpm on the ground under a flange that was part of the aboveground pipe.

In 1969, contaminated Russian thistle was identified growing on some of the BC Trenches. To inhibit weed growth, 45,870 m^3 (60,000 yd^3) of sand and gravel was placed on top of the trenches. In 1981, the area was covered with additional top soil, time release herbicides, and rodent deterrent. The area was surface stabilized again in 1982.

In March 1981, radiological surveys detected an area east of the 216-B-20 Trench with a dose rate of 500 millirem per hour. Buried contaminated equipment related to the aboveground transfer line was identified as the source. After the equipment and surrounding soil were removed, a follow-up survey

Site: 216-B-22	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

detected a plume of contamination measuring approximately 4.6 m (15 ft) long extending to the dirt road east of the trenches. The plume readings detected up to 3,000 cpm.

In August 2005, a mobile surface contamination monitor tractor survey found extensive wind damage on the stabilization cover at the BC Cribs and Trenches. Surface contamination with levels up to 25 millirem per hour was detected.

The trench is monitored by groundwater well 299-E13-9. A surface radiation survey is performed annually.

Borehole and data summaries are presented in Tables 2 and 3. Boring locations are shown on Figure 1.

Table 2. Borehole Summary for the 216-B-22 Waste Site

Year	Boring/Well ID	Location with Respect to Site	Depth (ft)
2004	A5856/299-E13-8	Northwest of site boundary	345 (GPL)
2003	A5857/299-E13-9	Southeast of site boundary	345 (GPL)

GPL = geophysical log
ID = identification

Table 3. Geophysical Log Summary for the 216-B-22 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A5856	0 – 5	–	pCi/g	–	12,759.7	cpm	5
	5 – 10	0.42	pCi/g	6.0	12,869	cpm	6
	10 – 15	–	pCi/g	–	11,987.9	cpm	13
	>15	0.99	pCi/g	50	21,687.3	cpm	145
A5857	0 – 5	0.15	pCi/g	5.0	12,007.3	cpm	4
	5 – 10	0.55	pCi/g	6.0	11,789.2	cpm	6
	10 – 15	–	pCi/g	–	11,818.7	cpm	11
	>15	0.23	pCi/g	75	23,180.9	cpm	274

bgs = below ground surface
ID = identification

Site: 216-B-22	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Nature and Extent of Contamination:

Shallow (0 to 4.5 m [0 to 15 ft] below ground surface [bgs]): The depth of the maximum cesium-137 concentration in the closest borehole to the 216-B-22 Trench floor footprint is 1.8 m (6 ft).

Deep (>4.5 m [>15 ft] bgs): The depth of the maximum cesium-137 concentration in the closest borehole within the 216-B-22 Trench floor footprint is 15.2 m (50 ft).

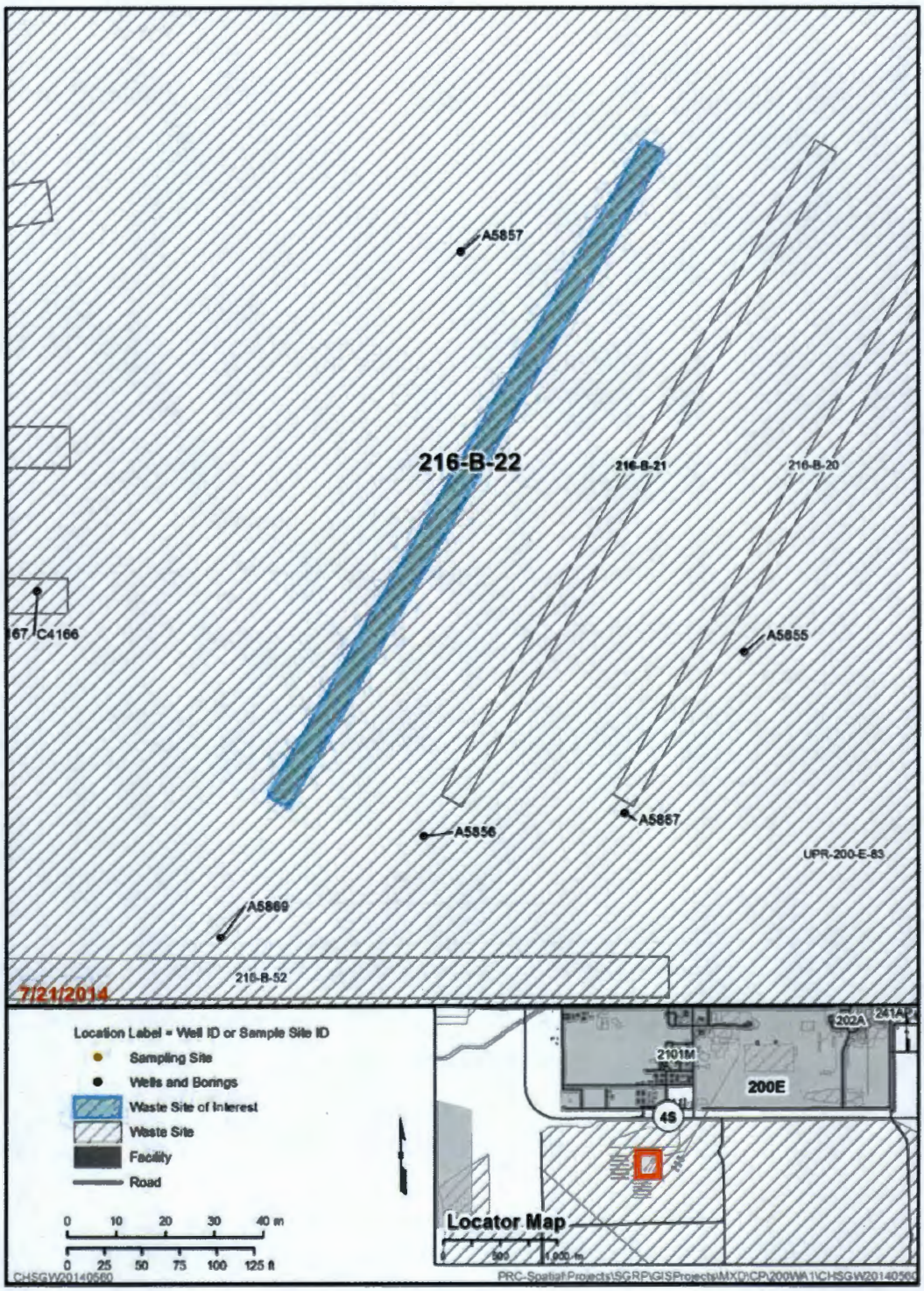
References:

HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites,* Part VI Appendix C-25, C-26 and C-26A, General Electric, Richland Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029.

Waste Information Data System General Summary Report for the 216-B-22 Waste Site.

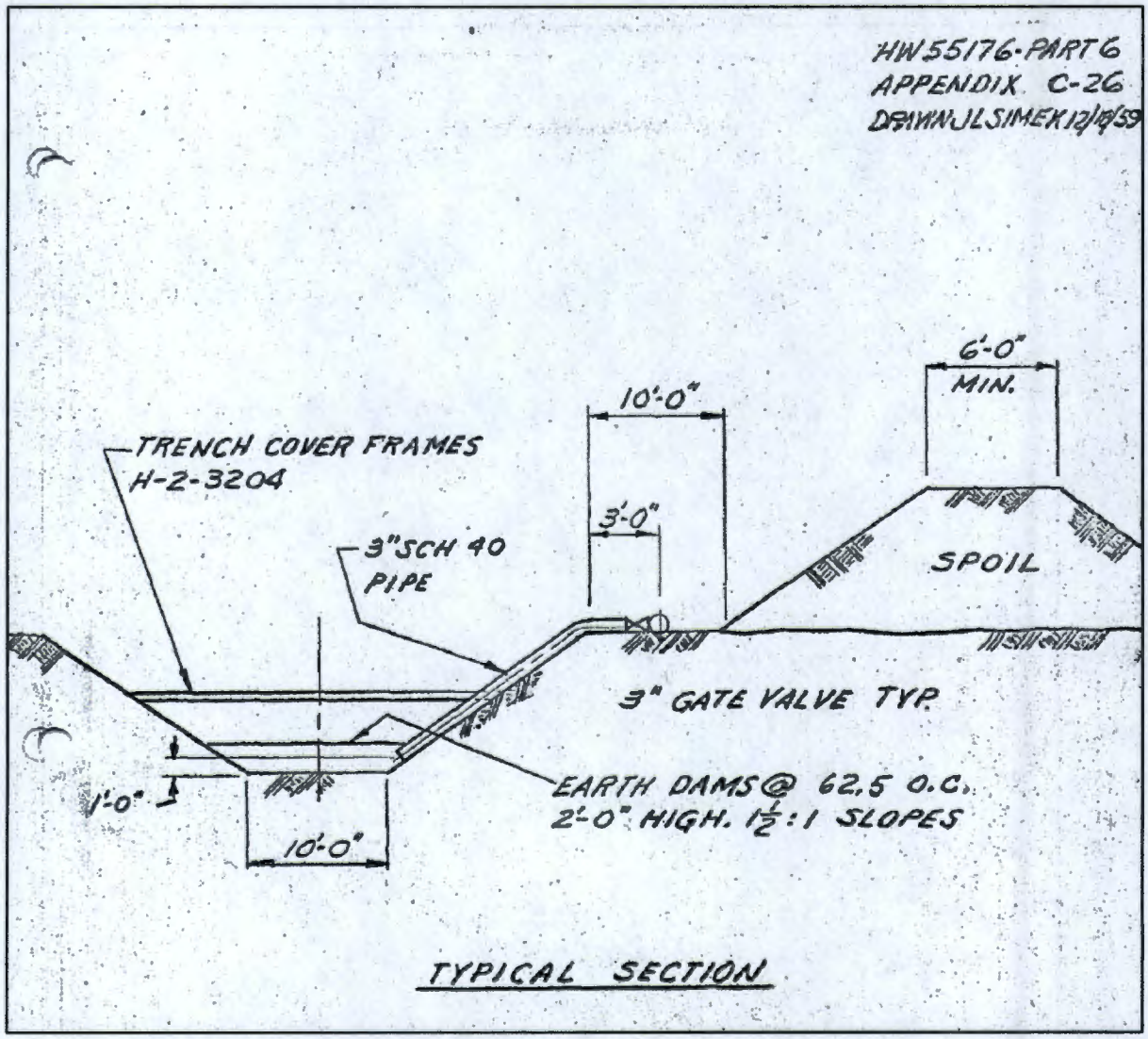
Site: 216-B-22	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



ID = identification

Figure 1. 216-B-22 Waste Site Map

Site: 216-B-22	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

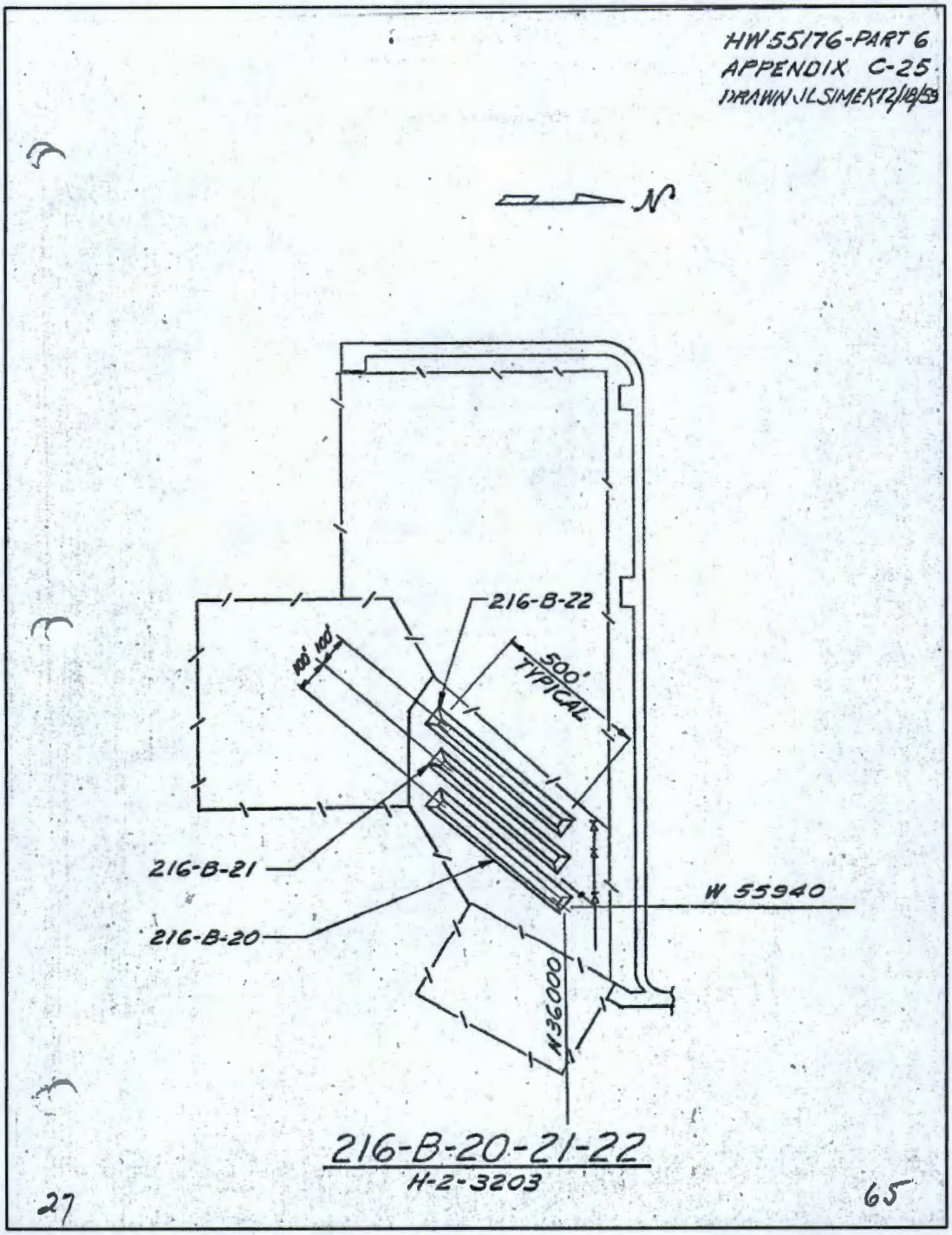


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-26.

Note: Produced from the best available copy.

Figure 2. Trench Elevation

Site: 216-B-22	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

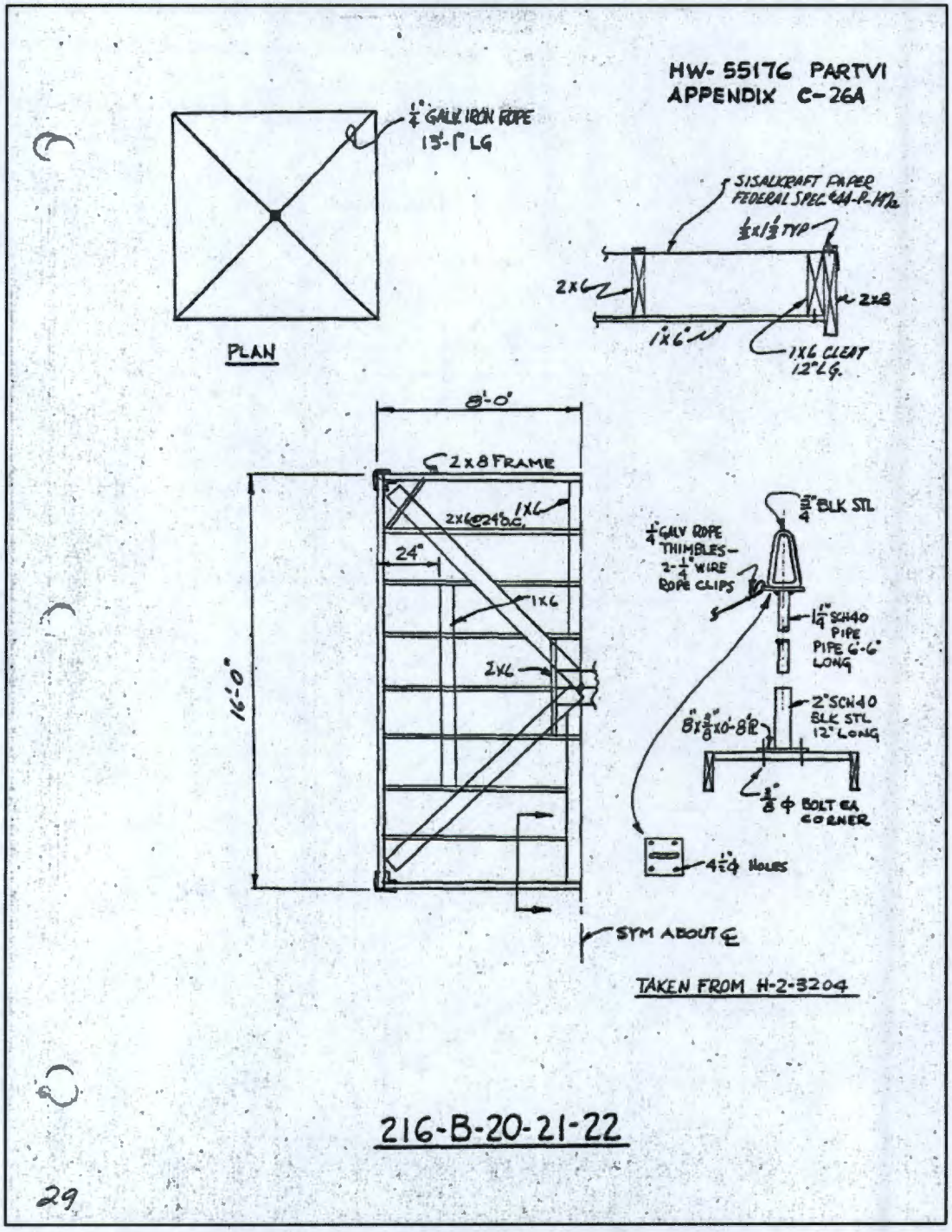


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-25.

Note: Produced from the best available copy.

Figure 3. Trench Plan View

Site: 216-B-22	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-26A.

Note: Produced from the best available copy.

Figure 4. Trench Cover

Site: 216-B-23	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Site Description

Alternate Site Identification: 216-B-23 Trench
Site Type: Trench
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: October 1956

Waste Site Location and Physical Description: The 216-B-23 Trench is located south of the 200 East Area (across Route 4S) in the BC Cribs and Trenches area. The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The trench was divided into eight 19 m (62.5 ft) sections by 1.2 m (4 ft) high earthen dams. The side slope is 1:1.5. The depth was 3 m (10 ft). A wooden frame cover was constructed over the trench (see Figures 2, 3, and 4).

Waste Site Coordinates:
E-573288.35929 N-134237.46889

Site Dimensions:
Site Length: 152.4 m (500 ft) Site Depth: 3.1 m (10 ft)
Site Width: 3.1 m (10 ft) Cover Thickness: 2.4 m (8 ft)
Site Area: 464.8 m^2 (5,000 ft^2)
Note: These are bottom dimensions.

Related Site Structure(s): The 216-B-23 Trench is associated with U Plant uranium recovery process and UPR-200-E-83.

Site Posting: The Trench has been backfilled with clean soil and posted Underground Radioactive Material Area. Concrete AC 540 markers outline the area where the trenches are located, but do not identify specific trench locations.

Site History

Release Summary: The 216-B-23 Trench received 4.5E6 L (1.2E6 gal) of scavenged tributyl phosphate supernate liquid waste from the 221-U Building during uranium recovery operations. After the uranium was removed, the cesium and strontium content of the effluent was reduced through precipitation by adding ferrocyanide. The waste was received into the trench via an aboveground transfer line extending from the 200-E-114-PL pipeline. The waste is liquid process effluent, high in salt, and neutral to basic. The waste contained inorganic compounds such as ferrocyanide, nitrate, and phosphate.

The Trench was backfilled after it reached its specific retention capacity.

Site: 216-B-23	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Volume/Mass Discharged: 4.5E+06 L (1.2E6 gal)

Pore Volume Discharged: 4.5E+06 L/ (330 ft x 5,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.32

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-23 Waste Site

Contaminant	Mass Discharged
Pu	1.8 g
Sr-90	150 Ci
Cs-137	110 Ci
U	160 kg
Ru-106	1.5E+04 Ci
Beta	4.7E+04 Ci
Co-60	6.7 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, an Unplanned Release (UPR-200-E-83) occurred when a large area was found to be contaminated with radioactive rabbit feces reading 5,000 to 10,000 cpm. A burrow in Trench 216-B-28, containing contaminated salt, was believed to be the source of the material ingested by the rabbits.

In 1969, contaminated tumbleweeds were identified growing on some of the BC Trenches. To inhibit weed growth, 45,870 m^3 (60,000 yd^3), approximately 15.2 cm (6 in.) of sand and gravel, was placed on top of the Trenches. In 1981, the area was covered with additional top soil, time release herbicides, and rodent deterrent. The area was surface stabilized again in 1982.

A surface radiation survey is performed annually.

Borehole and data summaries are presented in Tables 2 and 3. Borehole locations are shown on Figure 1.

Site: 216-B-23	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Table 2. Borehole Summary the 216-B-23 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2003	A4724/299-E13-10	Unknown	339 (GPL)

GPL = geophysical log
ID = identification

Table 3. Geophysical Log Summary 216-B-23

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A4724	0 – 5	–	pCi/g	–	6,408.3	cpm	3
	5 – 10	0.28	pCi/g	6.0	6,204.8	cpm	8
	10 – 15	–	pCi/g	–	5,424.3	cpm	11
	>15	0.38	pCi/g	330	14,336.2	cpm	243

bgs = below ground surface
ID = identification

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): The depth of the maximum cesium-137 concentration in the closest borehole to the 216-B-23 Trench floor footprint is 1.8 m (6 ft).

Deep (>4.6 m [>15 ft] bgs): The depth of the maximum cesium-137 concentration in the closest borehole within the 216-B-23 Trench floor footprint is 100.6 m (330 ft).

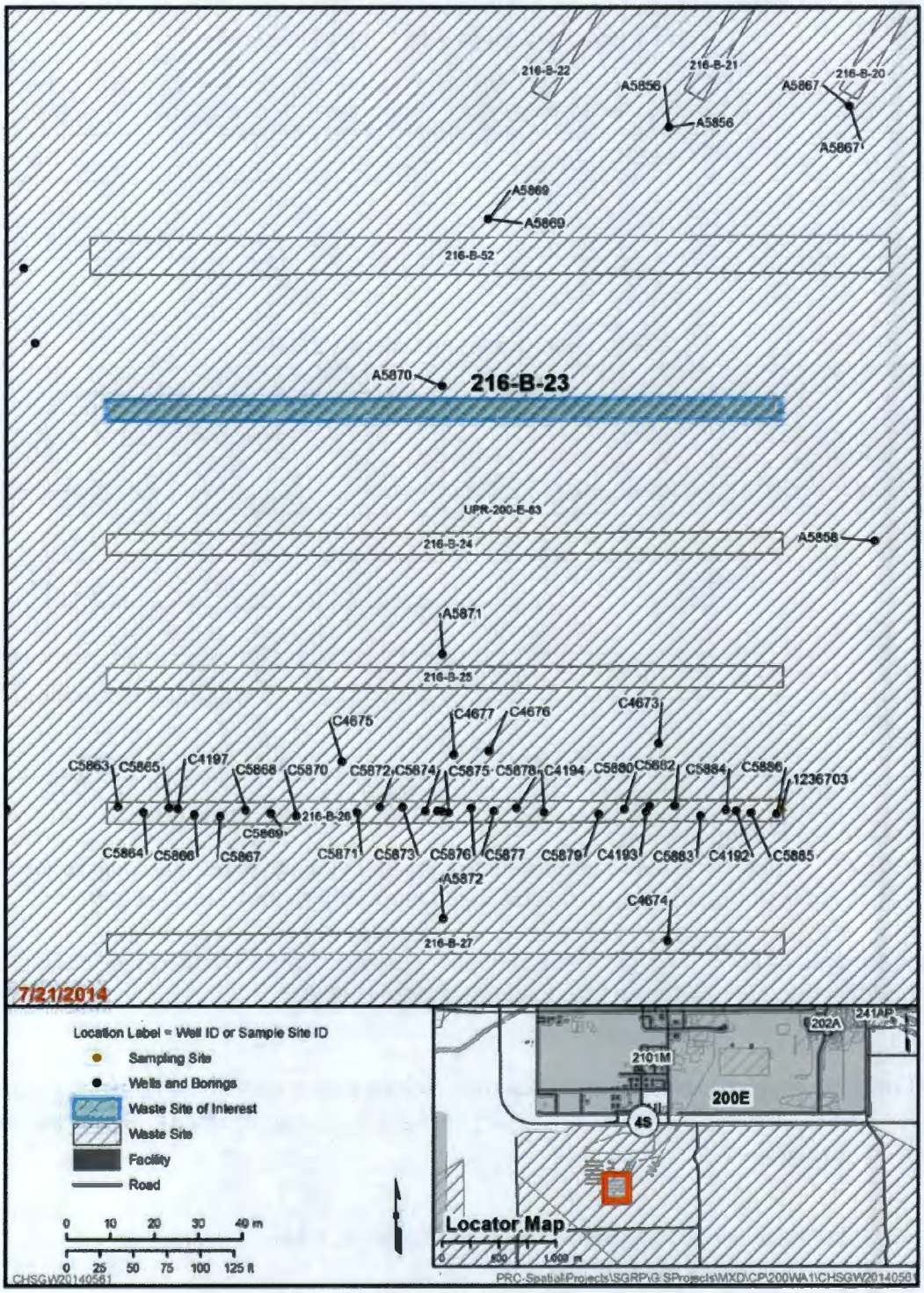
References:

HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI Appendix C-26, C-27 and C-28, General Electric, Richland Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029.

Waste Information Data System General Summary Report for the 216-B-23 Waste Site.

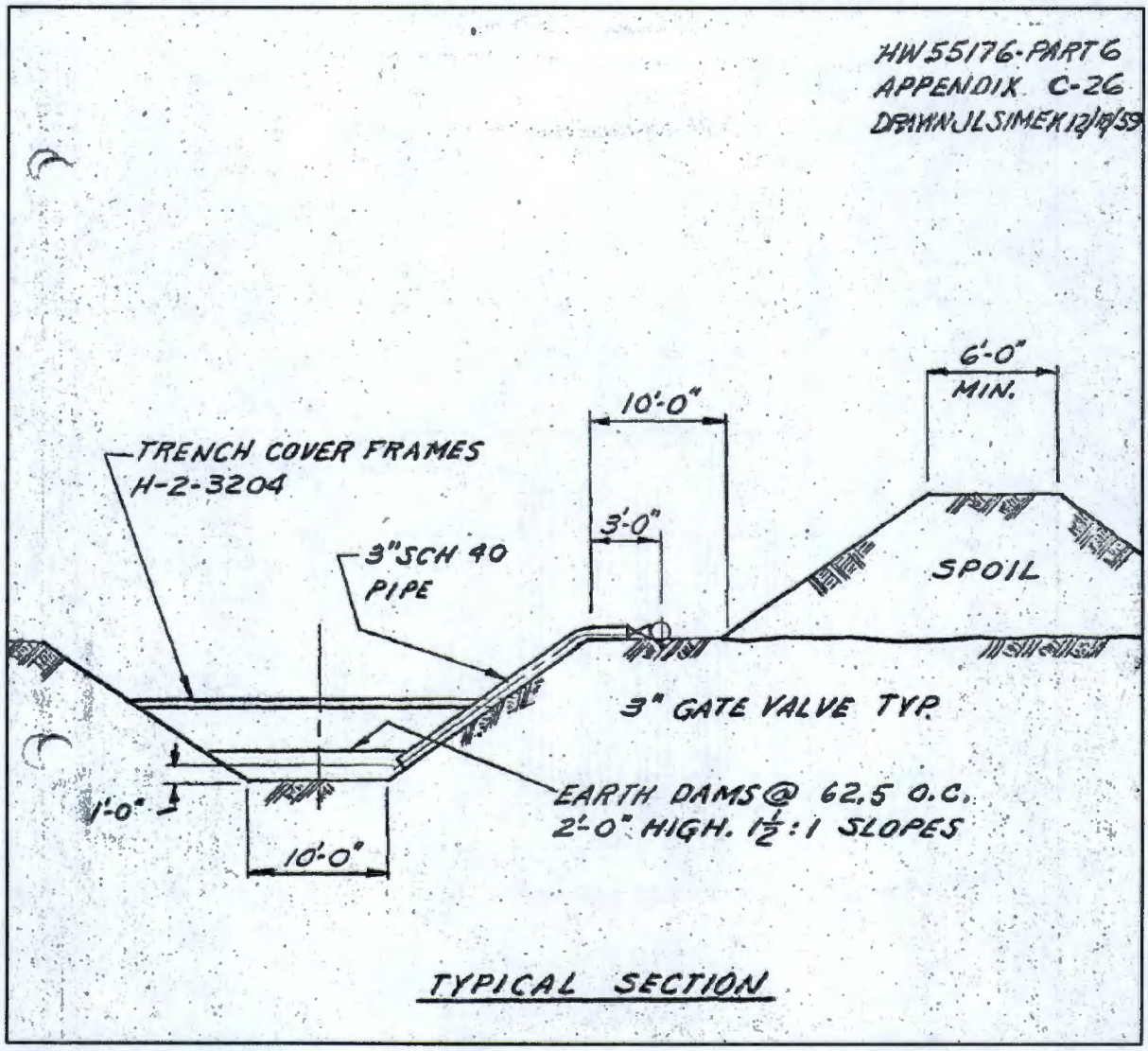
Site: 216-B-23	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



ID = identification

Figure 1. 216-B-23 Waste Site Map

Site: 216-B-23	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

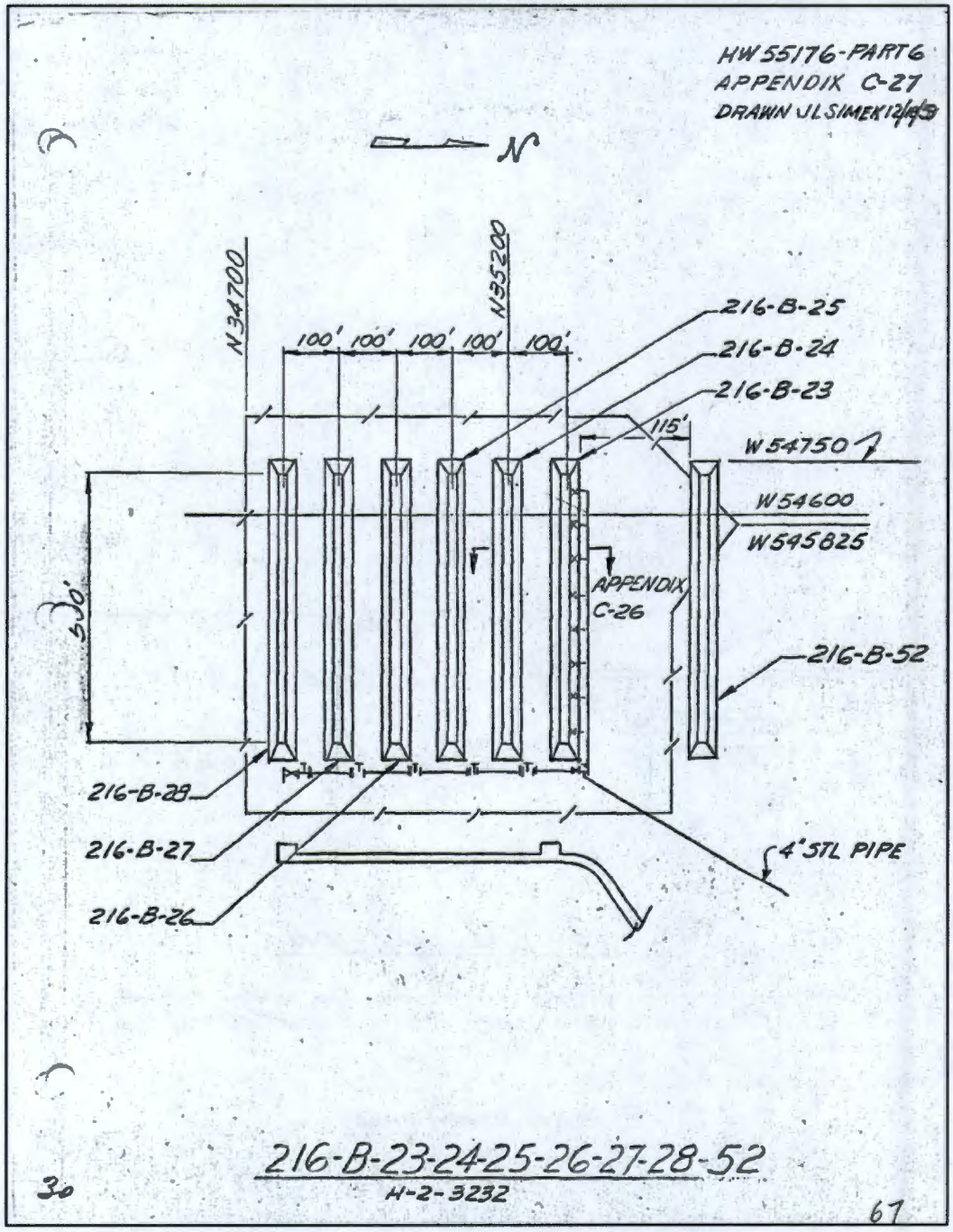


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-26.

Note: Produced from the best available copy.

Figure 2. Trench Elevation

Site: 216-B-23	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

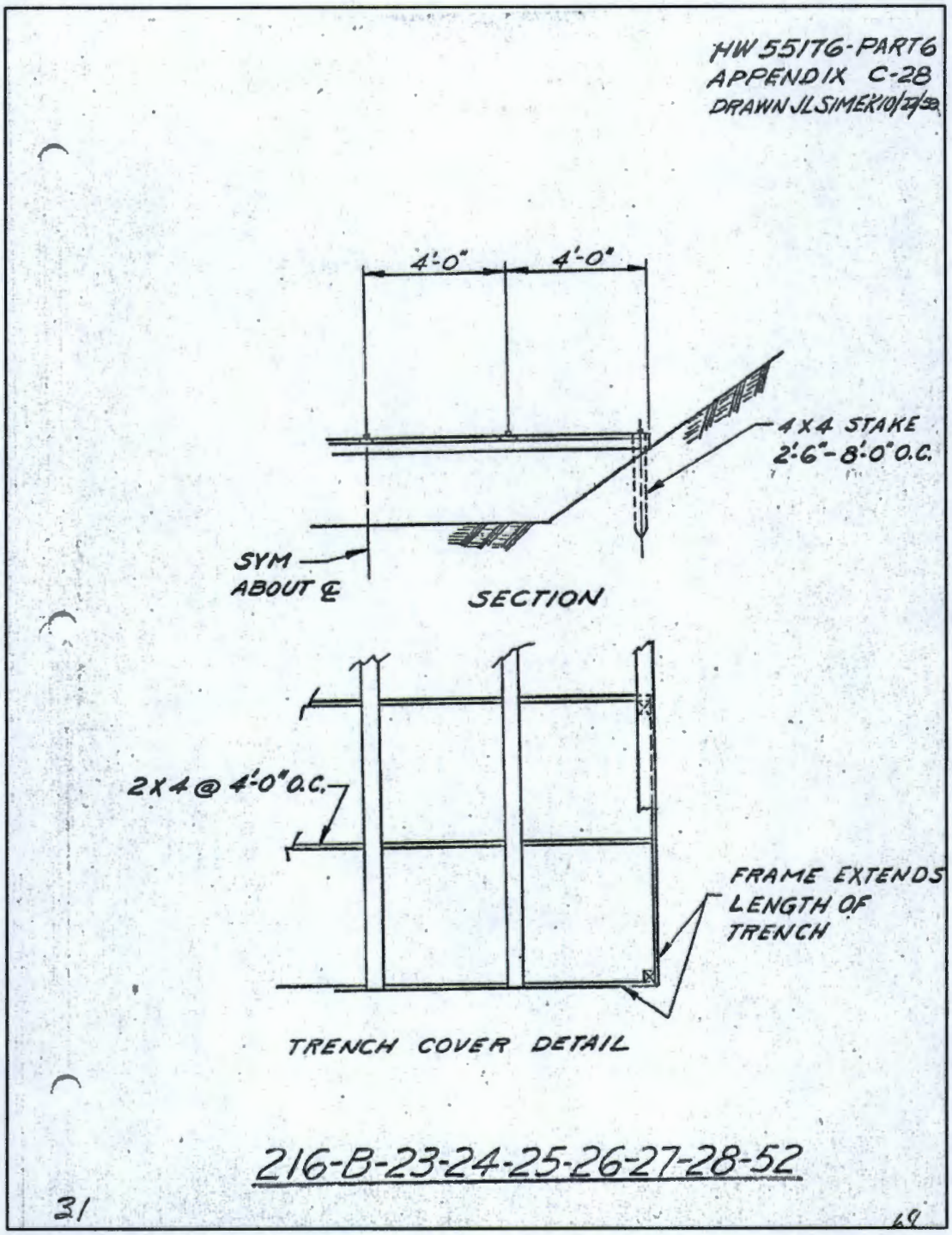


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-26.

Note: Produced from the best available copy.

Figure 3. Trench Plan View

Site: 216-B-23	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-28.

Note: Produced from the best available copy.

Figure 4. Trench Cover

Site: 216-B-23	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

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Site: 216-B-24	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Site Description

Alternate Site Identification: 216-B-24 Trench
Site Type: Trench
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: October and November 1956

Waste Site Location and Physical Description: The 216-B-24 Trench is located south of the 200 East Area (across Route 4S) in the BC Cribs and Trenches area. The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The Trench was divided into eight 19 m (62.5 ft) sections by 1.2 m (4 ft) high earthen dams. The side slope is 1.5:1. The depth was 3 m (10 ft). A wooden frame cover was constructed over the trench (Figures 2, 3, and 4).

Waste Site Coordinates:
E-573288.46875 N-134206.99215

Site Dimensions:
Site Length: 152.4 m (500 ft) Site Depth: 3.1 m (10 ft)
Site Width: 3.1 m (10 ft) Cover Thickness: 2.4 m (8 ft)
Site Area: 464.8 m^2 (5,000 ft^2)
Note: These are bottom dimensions.

Related Site Structure(s): The trench is associated with U Plant uranium recovery process and UPR-200-E-83.

Site Posting: The trench has been backfilled with clean soil and posted Underground Radioactive Material Area. Concrete AC 540 markers outline the area where the trenches are located, but do not identify specific trench locations.

Site History

Release Summary: 216-B-24 Trench received 4.7E6 L (1.2E6 gal) of scavenged tributyl phosphate supernate liquid waste from the 221-U Building during uranium recovery operations. After the uranium was removed, the cesium and strontium content of the effluent was reduced through precipitation by adding ferrocyanide. The waste was received into the trench via an aboveground transfer line extending from the 200-E-114-PL pipeline. The waste is liquid process effluent, high in salt, and neutral to basic. The waste contained inorganic compounds such as ferrocyanide, nitrate, and phosphate.

The trench was backfilled after it reached its specific retention capacity.

Site: 216-B-24	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Volume/Mass Discharged: 4.7E+06 L (1.2E+06 gal)

Pore Volume Discharged: 4.7E+06 L/ (330 ft x 5,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.34

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-24 Waste Site

Contaminant	Mass Discharged
Pu	7.7 g
Sr-90	180 Ci
Cs-137	130 Ci
U	250 kg
Ru-106	2.3E+04 Ci
Beta	7.3E+04 Ci
Co-60	10 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, an Unplanned Release (UPR-200-E-83) occurred when a large area was found to be contaminated with radioactive rabbit feces reading 5,000 to 10,000 cpm. A burrow in Trench 216-B-28, containing contaminated salt, was believed to be the source of the material ingested by the rabbits.

In 1969, contaminated tumbleweeds were identified growing on some of the BC Trenches. To inhibit weed growth, 45,870 m^3 (60,000 yd^3) of sand and gravel was put on top of the trenches. Approximately 15.2 cm (6 in.) of sand and gravel were placed on top of each trench. In 1981, the area was covered with additional top soil, time release herbicides, and rodent deterrent. The area was surface stabilized again in 1982.

The trench is monitored by groundwater well 299-E13-11. A surface radiation survey is performed annually.

Borehole and data summaries are presented in Tables 2 and 3. Well and borehole locations are shown on Figure 1.

Site: 216-B-24	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Table 2. Borehole Summary for the 216-B-24 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2004	A5858/299-E13-11	East of site boundary	338 (GPL)

GPL = geophysical logging
ID = identification

Table 3. Geophysical Log Summary for the 216-B-24 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A5858	0 – 5	1.47	pCi/g	5.0	16,397.6	cpm	5
	5 – 10	5.6	pCi/g	6.0	21,446	cpm	6
	10 – 15	–	pCi/g	–	11,701	cpm	11
	>15	0.33	pCi/g	315	21,157.7	cpm	143

bgs = below ground surface
ID = identification

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): The depth of the maximum cesium-137 concentration in the closest borehole to the 216-B-24 Trench floor footprint is 1.8 m (6 ft).

Deep (>4.6 m [>15 ft] bgs): The depth of the maximum cesium-137 concentration in the closest borehole within the 216-B-24 Trench floor footprint is 96 m (315 ft).

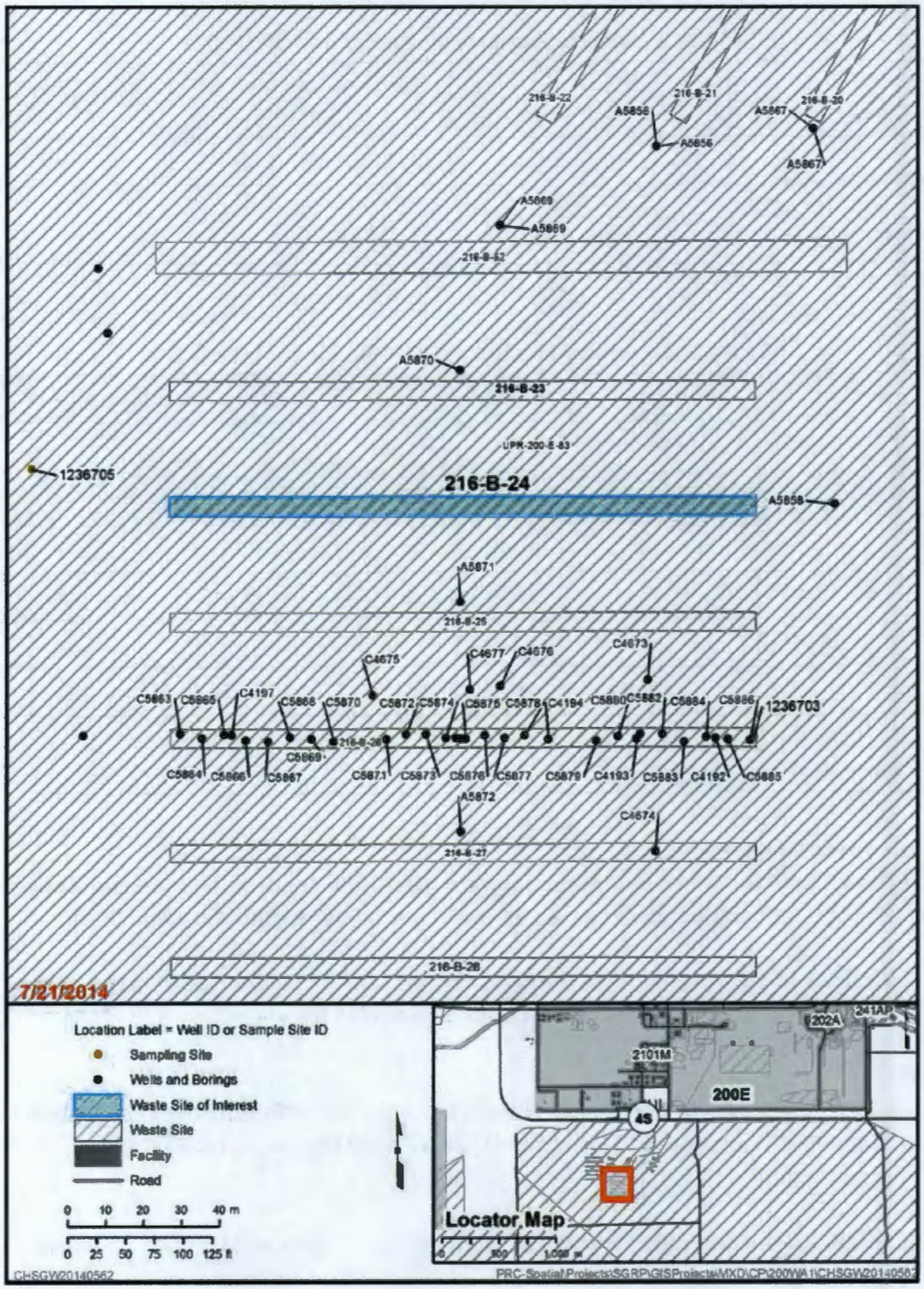
References:

HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI Appendix C-26, C-27 and C-28, General Electric, Richland Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029.

Waste Information Data System General Summary Report for the 216-B-24 Waste Site.

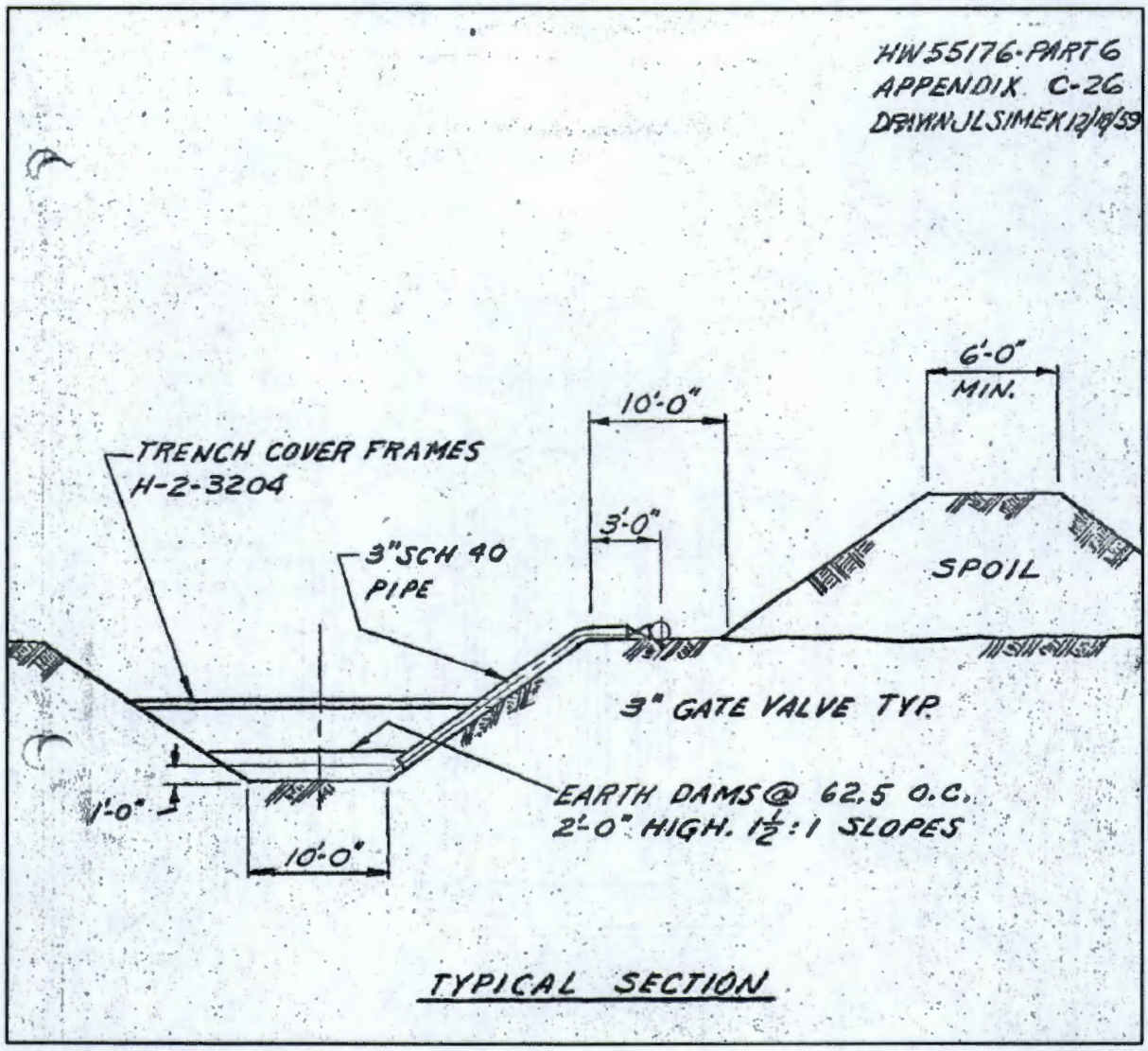
Site: 216-B-24	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



ID = identification

Figure 1. 216-B-24 Waste Site Map

Site: 216-B-24	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

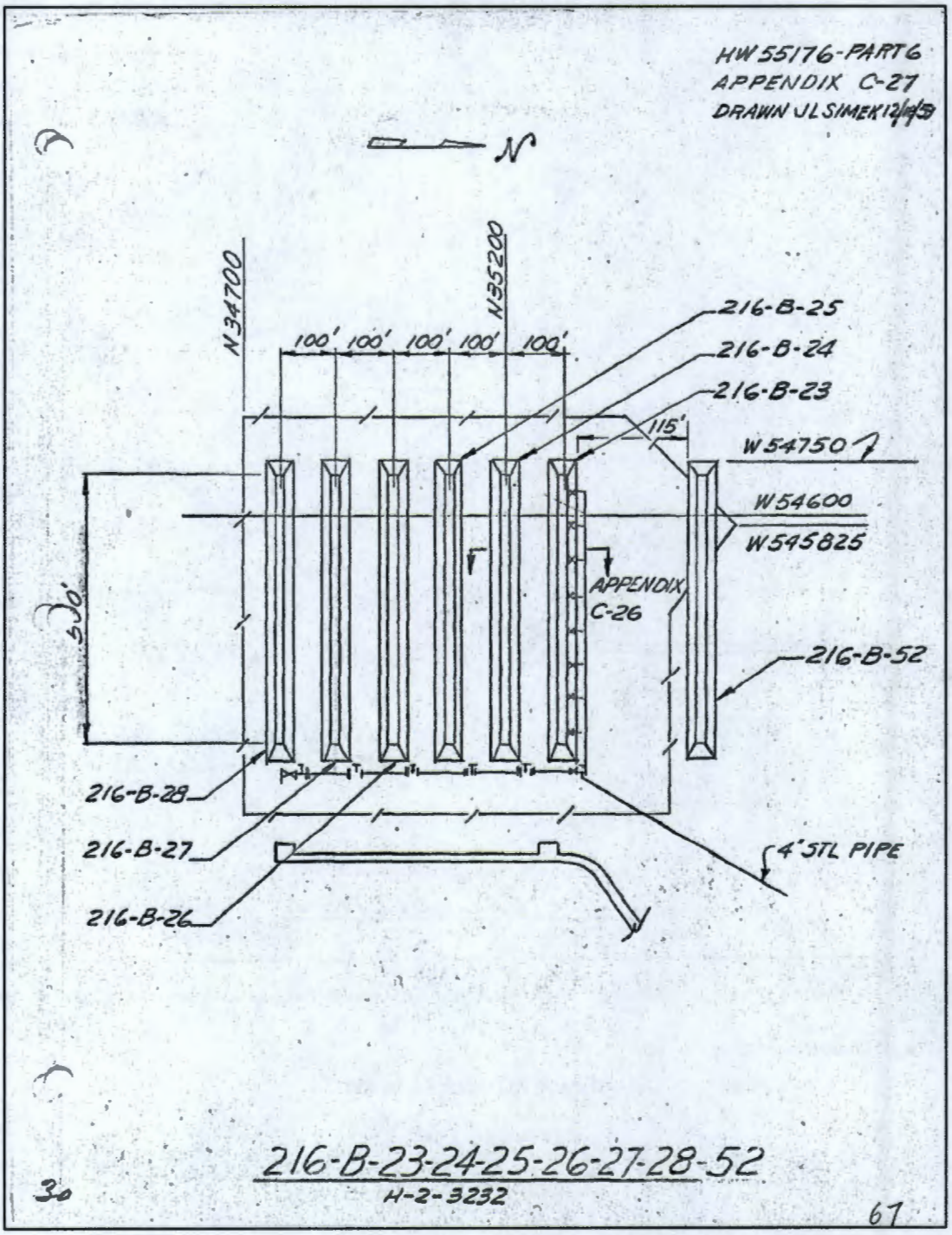


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-26.

Note: Produced from the best available copy.

Figure 2. Trench Elevation

Site: 216-B-24	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

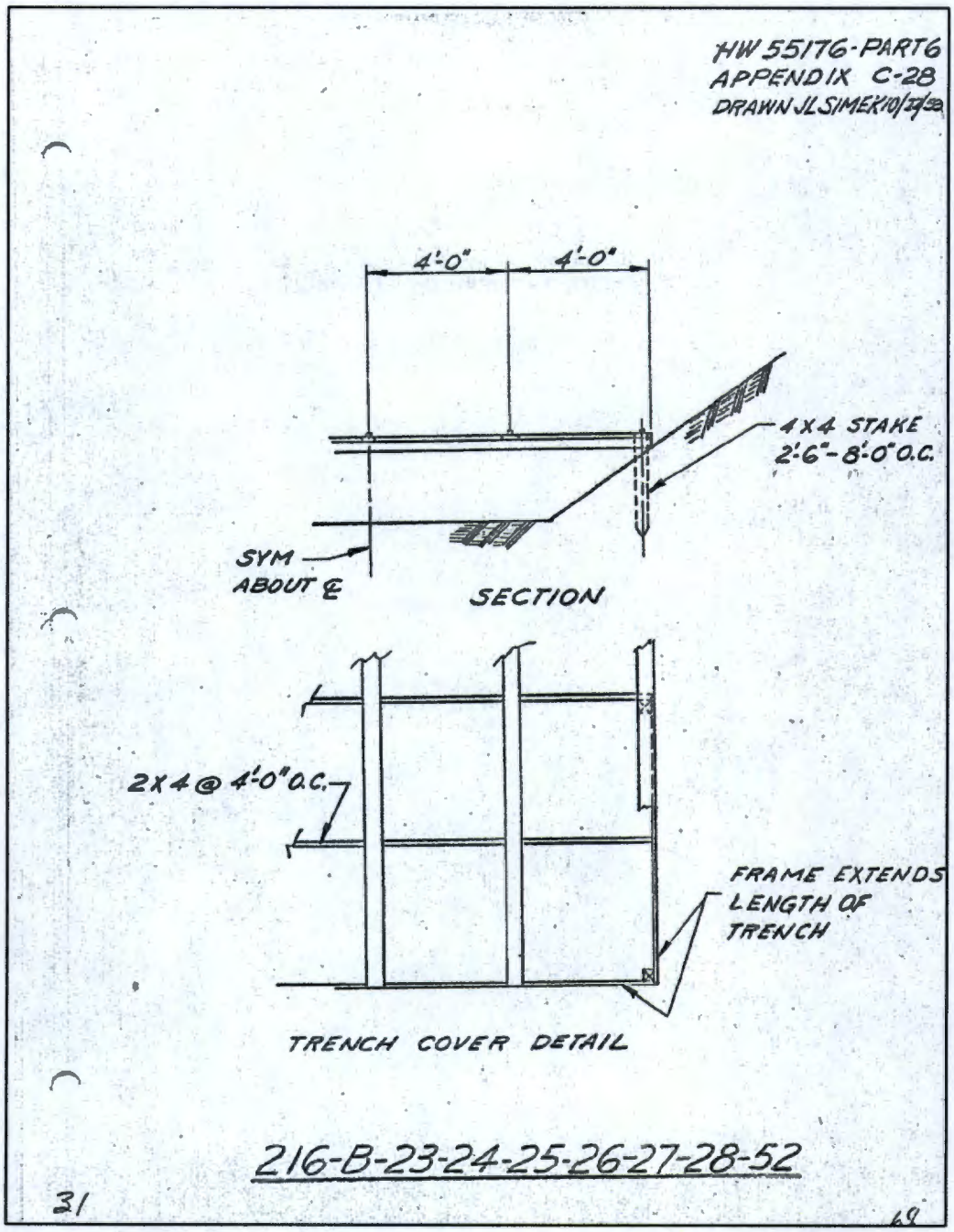


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-26.

Note: Produced from the best available copy.

Figure 3. Trench Plan View

Site: 216-B-24	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-26.

Note: Produced from the best available copy.

Figure 4. Trench Cover

Site: 216-B-24	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

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Site: 216-B-25	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Site Description

Alternate Site Identification: 216-B-25 Trench
Site Type: Trench
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: November and December 1956

Waste Site Location and Physical Description: The 216-B-25 Trench is located south of the 200 East Area (across Route 4S) in the BC Cribs and Trenches area. The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The Trench was divided into eight 19 m (62.5 ft) sections by 1.2 m (4 ft) high earthen dams. The side slope is 1.5:1. The depth was 3 m (10 ft). A wooden frame cover was constructed over the trench (Figures 2, 3, and 4).

Waste Site Coordinates:
E-573288.53130 N-134176.51560

Site Dimensions:
Site Length: 152.4 m (500 ft)
Site Width: 3.1 m (10 ft)
Site Area: 464.8 m^2 (5,000 ft^2)
Note: These are bottom dimensions.
Site Depth: 3.1 m (10 ft)
Cover Thickness: 2.4 m (8 ft)

Related Site Structure(s): The 216-B-25 Trench is associated with the U Plant uranium recovery process and UPR-200-E-83.

Site Posting: The Trench has been backfilled with clean soil and posted Underground Radioactive Material Area. Concrete AC 540 markers outline the area where the trenches are located, but do not identify specific trench locations.

Site History

Release Summary: 216-B-25 Trench received 3.8E6 L (0.9E6 gal) of scavenged tributyl phosphate supernate liquid waste from the 221-U Building during uranium recovery operations. After the uranium was removed, the cesium and strontium content of the effluent was reduced through precipitation by adding ferrocyanide. The waste was received into the trench via an aboveground transfer line extending from the 200-E-114-PL pipeline. The waste is liquid process effluent, high in salt, and neutral to basic. The waste contained inorganic compounds such as ferrocyanide, nitrate, and phosphate.

The Trench was backfilled after it reached its specific retention capacity.

Site: 216-B-25	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Volume/Mass Discharged: 3.8E+06 L (0.9E6 gal)

Pore Volume Discharged: 3.8E+06 L/ (330 ft x 5,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.27

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-25 Waste Site

Contaminant	Mass Discharged
Pu	2 g
Sr-90	210 Ci
Cs-137	56 Ci
U	150 kg
Ru-106	1.6E+04 Ci
Beta	4.9E+04 Ci
Co-60	6.9 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, an unplanned release (UPR-200-E-83) occurred when a large area was found to be contaminated with radioactive rabbit feces reading 5,000 to 10,000 cpm. A burrow in the 216-B-28 Trench, containing contaminated salt, was believed to be the source of the material ingested by the rabbits.

In 1969, contaminated Russian thistle was identified growing on some of the BC Trenches. To inhibit weed growth, 45,870 m^3 (60,000 yd^3), approximately 15.2 cm (6 in.) of sand and gravel on each, was placed on top of the Trenches. In 1981, the area was covered with additional top soil, time release herbicides, and rodent deterrent. The area was surface stabilized again in 1982. A surface radiation survey is performed annually.

The borehole summary is presented in Table 2. The borehole location is shown on Figure 1.

Site: 216-B-25	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Table 2. Borehole Summary for the 216-B-25 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2005	299-E13-56 (A5871)	North of the trench footprint	50 (GPL)

GPL = geophysical logging
ID = identification

Nature and Extent of Contamination:

Insufficient data are available to evaluate for the presence or absence of shallow or deep soil contamination. Shallow soil within the basin is likely contaminated from historical discharges to the basin, starting at the bottom of the trench (3.1 m [10 ft] below ground surface [bgs]). Due to the volume of waste received in the trench, deep (>4.6 m [>15 ft] bgs) contamination is likely and may extend to groundwater (100.6 m [330 ft] bgs).

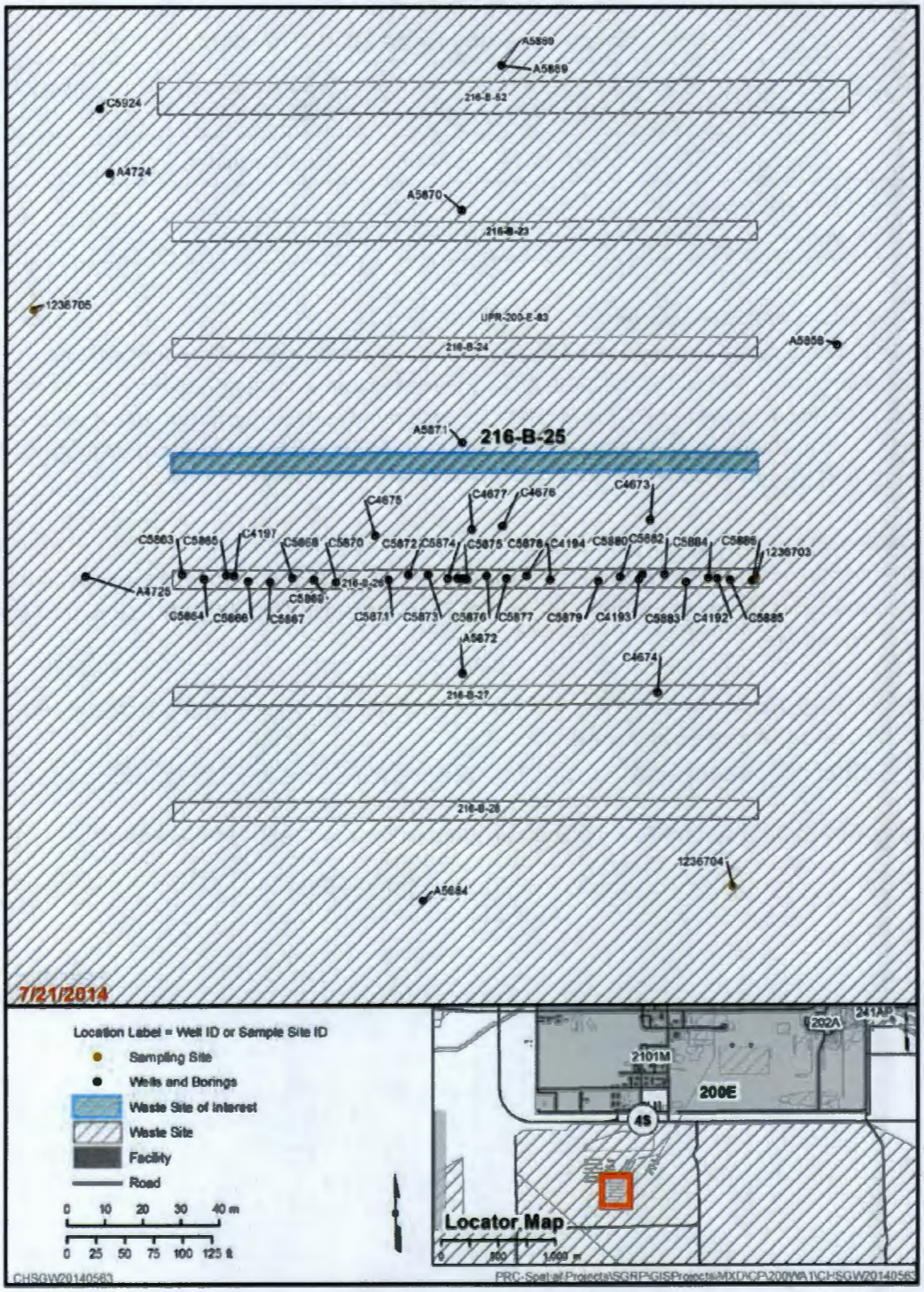
References:

HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites,* Part VI, Appendix C-26, C-27 and C-28, General Electric, Richland Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029.

Waste Information Data System General Summary Report for the 216-B-25 Waste Site.

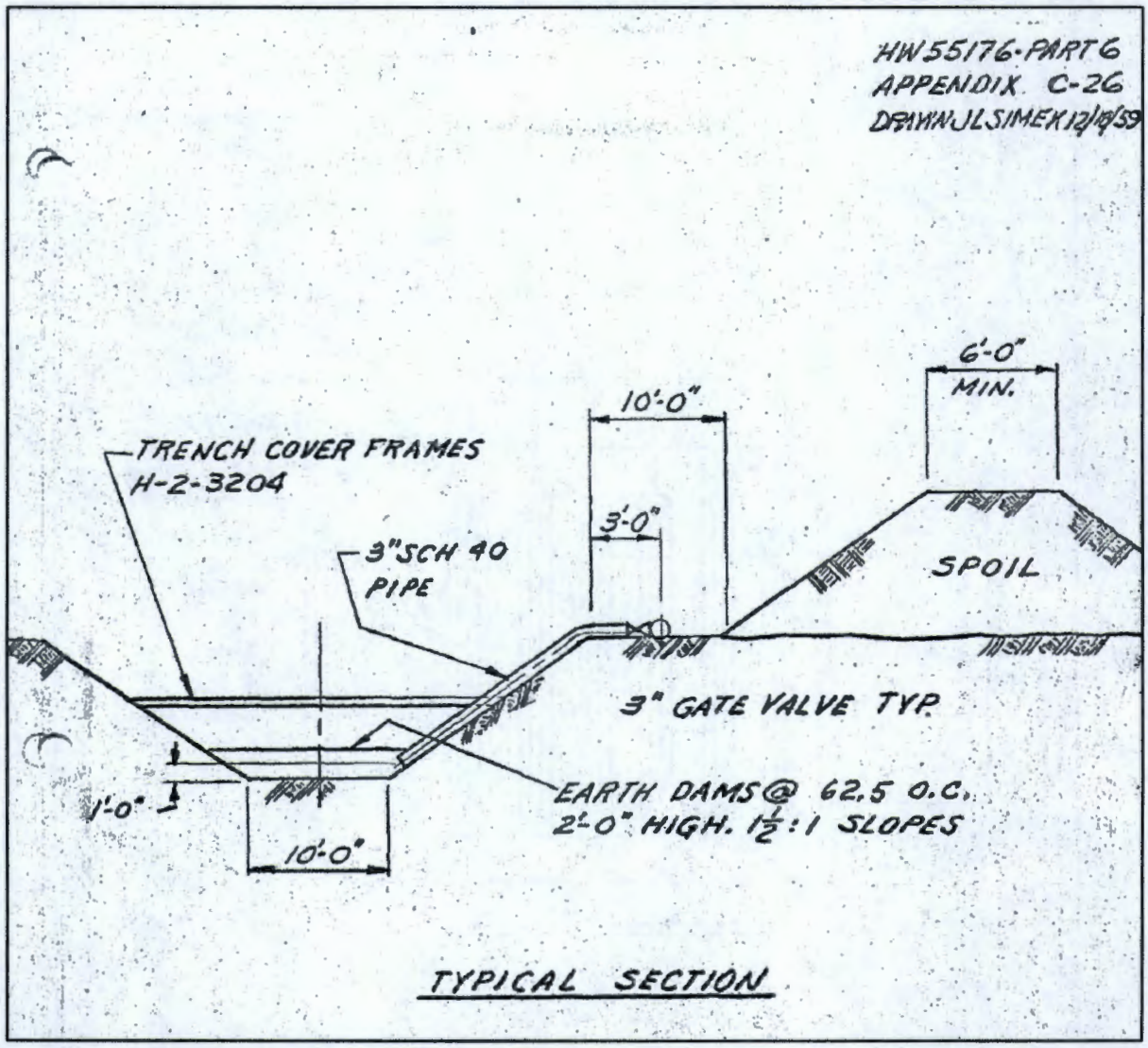
Site: 216-B-25	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



ID = identification

Figure 1. 216-B-25 Waste Site Map and Borehole Location

Site: 216-B-25	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

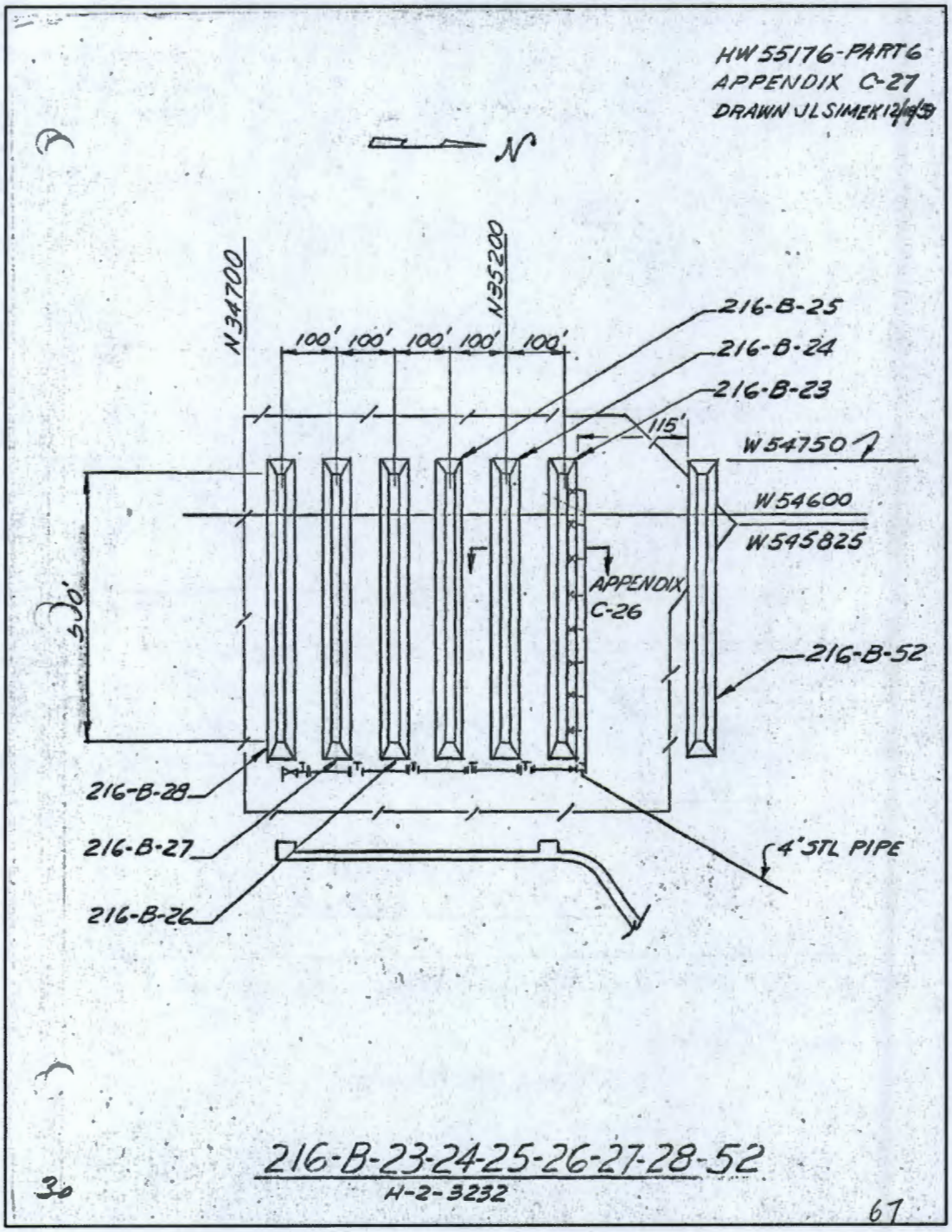


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-26.

Note: Produced from the best available copy.

Figure 2. Trench Elevation

Site: 216-B-25	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

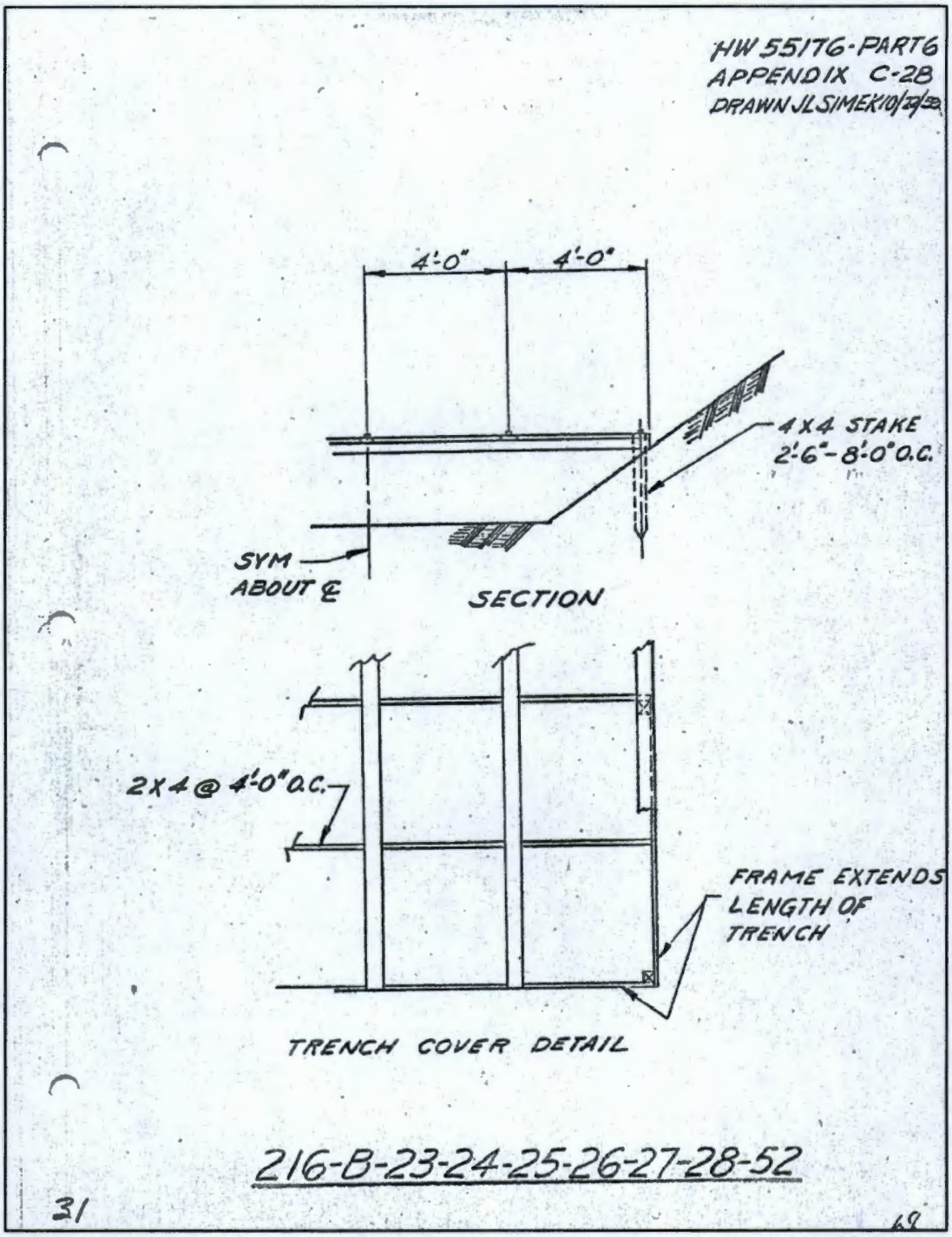


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-27.

Note: Produced from the best available copy.

Figure 3. Trench Plan View

Site: 216-B-25	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-28.

Note: Produced from the best available copy.

Figure 4. Trench Cover

Site: 216-B-25	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

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Site: 216-B-26	Area: BC Cribs	Category: Intermediate (Representative Site)

Site Description

Alternate Site Identification: 216-B-26 Trench
Site Type: Trench
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: December 1956 to February 1957

Waste Site Location and Physical Description: The 216-B-26 Trench is located south of the 200 East Area (across Route 4S) in the BC Cribs and Trenches area. The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The Trench was divided into eight 19 m (62.5 ft) sections by 1.2 m (4 ft) high earthen dams. The side slope is 1.5:1. The depth was 3 m (10 ft). A wooden frame cover was constructed over the trench (Figures 2, 3, and 4).

Waste Site Coordinates:
E-573288.64104 N-134146.03889

Site Dimensions:
Site Length: 152.4 m (500 ft)
Site Width: 3.1 m (10 ft)
Site Area: 464.8 square m (5,000 ft^2)
Note: These are bottom dimensions.
Site Depth: 3.1 m (10 ft)
Cover Thickness: 2.4 m (8 ft)

Related Site Structure(s): The 216-B-26 Trench is associated with U Plant uranium recovery process and UPR-200-E-83.

Site Posting: The Trench has been backfilled with clean soil and posted Underground Radioactive Material Area. Concrete AC 540 markers outline the area where the trenches are located, but do not identify specific trench locations.

Site History

Release Summary: 216-B-26 Trench received 5.9E6 L (1.6E6 gal) of scavenged tributyl phosphate supernate liquid waste from the 221-U Building during uranium recovery operations. After the uranium was removed, the cesium and strontium content of the effluent was reduced through precipitation by adding ferrocyanide. The waste was received into the trench via an aboveground transfer line extending from the 200-E-114-PL pipeline. The waste is liquid process effluent, high in salt, and neutral to basic. The waste contained inorganic compounds such as ferrocyanide, nitrate, and phosphate. The trench was backfilled after it reached its specific retention capacity.

Volume Discharged: 5.9E+06 L (1.6E+06 gal)

Site: 216-B-26	Area: BC Cribs	Category: Intermediate (Representative Site)

Pore Volume Discharged: 5.9E+06 L L/ (330 ft x 5,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.42

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-26 Waste Site

Contaminant	Mass Discharged
Pu	2.5 g
Sr-90	1100 Ci
Cs-137	950 Ci
U	590 kg
Ru-106	2.4E+04 Ci
Beta	7.7E+04 Ci
Co-60	11 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, an unplanned release (UPR-200-E-83) occurred when a large area was found to be contaminated with radioactive rabbit feces reading 5,000 to 10,000 cpm. A burrow in Trench 216-B-28, containing contaminated salt, was believed to be the source of the material ingested by the rabbits.

In 1969, contaminated tumbleweeds were identified growing on some of the BC Trenches. To inhibit weed growth, 45,870 m^3 (60,000 yd^3), approximately 15.2 cm (6 in.) of sand and gravel, were placed on top of the trenches. In 1981, the area was covered with additional top soil, time release herbicides, and rodent deterrent. The area was surface stabilized again in 1982.

In December 2004 and January 2005, characterization borehole C4191 and six direct push technology (DPT) boreholes were placed through the trench. A Trench Excavation Treatability Test was done in 2008. Sixty-three shallow (7.6 m [25 ft] deep) DPT boreholes were installed within the footprint and to the side of the trench to assess lateral extent of contamination. Fifty-five of the DPT holes were logged. Eight of these DPT holes were selected to become boreholes. Approximately one-third of the trench was excavated in July 2008. The excavated contaminated soil was taken to the Environmental Restoration Disposal Landfill. A surface radiation survey is performed annually.

Site: 216-B-26	Area: BC Cribs	Category: Intermediate (Representative Site)

Borehole summaries and data are presented in Tables 2, 3, 4, and 5. Well and borehole locations are shown on Figure 1.

Table 2. Borehole Summary for the 216-B-26 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Well Depth (ft)
2003	C4191	Within trench footprint	340 (GPL and soil samples)
2007	C5915 to C5922	Within trench footprint	25 (sampled 8 to 17 ft bgs)

bgs = below ground surface
GPL = geophysical log
ID = identification

Table 3. Geophysical Log Summary for the 216-B-26 Waste Site

Borehole ID	Depth Interval (ft bgs)	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
C4191	0 – 5	1.3	pCi/g	2.0	147,157	cpm	5
	5 – 10	582.7	pCi/g	10.0	520,106	cpm	7
	10 – 15	3,598,264	pCi/g	13	4,137,100	cpm	13
	>15	1,46,112.7	pCi/g	16	1,001,740	cpm	21

bgs = below ground surface
ID = identification

Table 4. Soil Maximum Detection Summary (Soil Borehole C4191)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Aluminum	–	–	–	7,680,000	µg/kg	30
Americium-241	–	–	–	0.21	pCi/g	25
Antimony-125	–	–	–	2.28	pCi/g	20
Bis(2-ethylhexyl) adipate	–	–	–	220	µg/kg	25
Bismuth	–	–	–	233,000	µg/kg	15.5

Site: 216-B-26	Area: BC Cribs	Category: Intermediate (Representative Site)

Table 4. Soil Maximum Detection Summary (Soil Borehole C4191)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Calcium	–	–	–	10,900,000	µg/kg	30
Carbon-14	–	–	–	3.09	pCi/g	30
Cesium-134	–	–	–	0.039	pCi/g	250
Cesium-137	–	–	–	529,000	pCi/g	15.5
Chloride	–	–	–	24,400	µg/kg	100
Chromium	–	–	–	8,890	µg/kg	340.5
Cobalt-60	–	–	–	0.069	pCi/g	100
Copper	–	–	–	19,600	µg/kg	15.5
Cyanide	–	–	–	2140	µg/kg	100
Diethylphthalate	–	–	–	620	µg/kg	55
Europium-155	–	–	–	0.096	pCi/g	30
Heneicosane	–	–	–	2,100	µg/kg	150
Hexavalent Chromium	–	–	–	700	µg/kg	30
Iron	–	–	–	37,900,000	µg/kg	15.5
Lead	–	–	–	5,100	µg/kg	30
Magnesium	–	–	–	6,080,000	µg/kg	15.5
Manganese	–	–	–	641,000	µg/kg	15.5
Mercury	–	–	–	1,420	µg/kg	30
Neptunium-237	–	–	–	0.023	pCi/g	100
Nickel	–	–	–	17,800	µg/kg	295
Nickel-63	–	–	–	2,110	pCi/g	15.5
Nitrate	–	–	–	4,090,000	µg/kg	100
Nitrogen in nitrite and nitrate	–	–	–	1,080,000	µg/kg	100
Phosphate	–	–	–	180,000	µg/kg	20

Site: 216-B-26	Area: BC Cribs	Category: Intermediate (Representative Site)

Table 4. Soil Maximum Detection Summary (Soil Borehole C4191)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Phosphine oxide, triphenyl-	–	–	–	370	µg/kg	30
Plutonium-238	–	–	–	0.041	pCi/g	340.5
Plutonium-239/240	–	–	–	195	pCi/g	15.5
Potassium	–	–	–	1,430,000	µg/kg	30
Potassium-40	–	–	–	22.2	pCi/g	100
Radium-226	–	–	–	0.935	pCi/g	20
Radium-228	–	–	–	1.62	pCi/g	340.5
Sodium	–	–	–	3,590,000	µg/kg	30
Sulfate	–	–	–	142,000	µg/kg	55
Technetium-99	–	–	–	92	pCi/g	100
Thorium-228	–	–	–	3.01	pCi/g	340.5
Thorium-230	–	–	–	0.728	pCi/g	30
Thorium-232	–	–	–	3.04	pCi/g	340.5
Tin-126	–	–	–	0.179	pCi/g	30
Total beta radiostrontium	–	–	–	974,000	pCi/g	15.5
Tritium	–	–	–	42.9	pCi/g	100
Uranium	–	–	–	569,00	µg/kg	15.5
Uranium-233/234	–	–	–	7.8	pCi/g	20
Uranium-234	–	–	–	2.63	pCi/g	30
Uranium-235	–	–	–	0.48	pCi/g	20
Uranium-238	–	–	–	8.2	pCi/g	20
Vanadium	–	–	–	10,100	µg/kg	15.5
Zinc	–	–	–	64,600	µg/kg	15.5

Table 5. Soil Maximum Detection Summary (Soil Boreholes C5915 through C5922)

Chemical	Units	C5915				C5916			
		Sample Interval: 0 – 15 ft		Sample Interval: >15 ft		Sample Interval: 0 – 15 ft		Sample Interval: >15 ft	
		Maximum Detected Concentration	Sample Depth (ft)	Maximum Detected Concentration	Sample Depth (ft)	Maximum Detected Concentration	Sample Depth (ft)	Maximum Detected Concentration	Sample Depth (ft)
Cesium-137	pCi/g	27,600	14	194	16.5	336	15	3.6	17.5
Gross alpha	pCi/g	160	14	8.41	16.5	20	15	45.7	17.5
Gross beta	pCi/g	202,000	14	1,440	16.5	6,590	15	87.2	17.5
Potassium-40	pCi/g	111	14	44.2	16.5	136	15	49	17.5
Radium-226	pCi/g	2.78	11.5	1.39	16.5	3.29	15	1.48	17.5
Radium-228	pCi/g	3	11.5	–	–	–	–	–	–
Thorium-228	pCi/g	2.25	11.5	–	–	2.4	15	1.21	17.5
Thorium-232	pCi/g	3	11.5	–	–	–	–	–	–
Total beta radiostrontium	pCi/g	77,300	14	445	16.5	3,050	15	21.4	17.5

Table 5. Soil Maximum Detection Summary (Soil Boreholes C5915 through C5922)

Chemical	Units	C5917				C5918			
		Sample Interval: 0 – 15 ft		Sample Interval: >15 ft		Sample Interval: 0 – 15 ft		Sample Interval: >15 ft	
		Maximum Detected Concentration	Sample Depth (ft)	Maximum Detected Concentration	Sample Depth (ft)	Maximum Detected Concentration	Sample Depth (ft)	Maximum Detected Concentration	Sample Depth (ft)
Cesium-137	pCi/g	5,740	14.5	6,020	17	692,000	12	–	–
Gross alpha	pCi/g	18.3	14.5	12.7	17	125	12	–	–
Gross beta	pCi/g	15,600	14.5	4,120	17	2,230,000	12	–	–
Potassium-40	pCi/g	68.6	12	146	17	131	8.5	–	–
Radium-226	pCi/g	2.52	12	–	–	5.34	8.5	–	–
Radium-228	pCi/g	2.5	12	–	–	5.94	8.5	–	–
Thorium-228	pCi/g	2.64	12	–	–	3.22	8.5	–	–
Thorium-232	pCi/g	2.5	12	–	–	5.94	8.5	–	–
Total beta radiostrontium	pCi/g	3,970	14.5	1580	17	646,000	12	–	–

Table 5. Soil Maximum Detection Summary (Soil Boreholes C5915 through C5922)

Chemical	Units	C5919				C5920			
		Sample Interval: 0 – 15 ft		Sample Interval: >15 ft		Sample Interval: 0 – 15 ft		Sample Interval: >15 ft	
		Maximum Detected Concentration	Sample Depth (ft)	Maximum Detected Concentration	Sample Depth (ft)	Maximum Detected Concentration	Sample Depth (ft)	Maximum Detected Concentration	Sample Depth (ft)
Cesium-137	pCi/g	2,630	14.5	198	17	22.6	13	172	15.5
Gross alpha	pCi/g	31.9	14.5	11.4	17	29.7	13	15.2	15.5
Gross beta	pCi/g	12,700	14.5	1,490	17	187,000	13	4550	15.5
Potassium-40	pCi/g	140	14.5	60.3	17	148	13	51.6	15.5
Radium-226	pCi/g	1.37	12	2.3	17	6.24	13	1.37	15.5
Radium-228	pCi/g	2.22	12	2.48	17	–	–	2.46	15.5
Thorium-228	pCi/g	1.8	12	1.74	17	1.34	10.5	1.46	15.5
Thorium-232	pCi/g	2.22	12	2.48	17	–	–	2.46	15.5
Total beta radiostrontium	pCi/g	6,960	14.5	512	17	91200	13	2310	15.5

Table 5. Soil Maximum Detection Summary (Soil Boreholes C5915 through C5922)

Chemical	Units	C5921				C5922			
		Sample Interval: 0 – 15 ft		Sample Interval: >15 ft		Sample Interval: 0 – 15 ft		Sample Interval: >15 ft	
		Maximum Detected Concentration	Sample Depth (ft)	Maximum Detected Concentration	Sample Depth (ft)	Maximum Detected Concentration	Sample Depth (ft)	Maximum Detected Concentration	Sample Depth (ft)
Cesium-137	pCi/g	1,420,000	12.4	–	–	692,000	12	–	–
Gross alpha	pCi/g	185	12.4	–	–	125	12	–	–
Gross beta	pCi/g	1,650,000	12.4	–	–	2,230,000	12	–	–
Potassium-40	pCi/g	150	10	–	–	131	8.5	–	–
Radium-226	pCi/g	5.56	10	–	–	5.34	8.5	–	–
Radium-228	pCi/g	5.21	10	–	–	5.94	8.5	–	–
Thorium-228	pCi/g	3.32	10	–	–	3.22	8.5	–	–
Thorium-232	pCi/g	5.21	10	–	–	5.94	8.5	–	–
Total beta radiostrontium	pCi/g	561,000	12.4	–	–	646,000	12	–	–

Site: 216-B-26	Area: BC	Category: Intermediate (Representative Site)

Nature and Extent of Contamination:

Shallow (0 to 15 ft below ground surface [bgs]): According to DOE/RL-2009-36, *BC Cribs and Trenches Excavation-Based Treatability Test Report*, a highly contaminated region was found approximately 3.3 to 3.6 m (11 to 12 ft) deep that corresponds with the bottom of the trench during its operational period. This region is approximately 0.3 m (1 ft) thick and contains peak equivalent cesium-137 concentrations greater than 1 million pCi/g. Equivalent cesium-137 concentrations varied considerably along the length of the trench, with a maximum of approximately 2.9 million pCi/g near the west end of the center section of the trench. The estimated volume of soil contaminated with greater than 750 pCi/g of cesium-137 (less than 4.6 m [15 ft] bgs) is 1,481 m^3 (1,937 yd^3). Contaminant distribution varied by an order of magnitude among the three sections of the trench that are separated by berms. Equivalent cesium-137 inventories derived from logging data for the western, middle, and eastern sections of the trench are estimated at 28 Ci, 267 Ci, and 374 Ci, respectively, for a total inventory of 669 Ci. When soil sampling data are considered, the cesium-137 inventory is estimated at 569 Ci. The strontium-90 inventory, based on soil sampling data, is between 389 and 498 Ci, and these values are in agreement with RPP-26744, *Hanford Soil Inventory Model, Rev. 1*.

Deep (>4.6 m [>15 ft] bgs): According to DOE/RL-2004-66, *Focused Feasibility Study for the BC Cribs and Trenches Area Waste Sites*, cesium-137 was detected with the Radiologic Logging System to a depth of 12.1 m (40 ft) bgs, with significantly elevated levels from 3.7 to 7.6 m (12 to 25 ft) bgs. Technitium-99, at concentrations up to 92 pCi/g, is the dominant radionuclide present in the zone from 14.9 m to 49.7 m (36 to 150 ft) bgs, with the maximum concentration observed at 30 m (100 ft) bgs. A maximum uranium concentration of 56.9 mg/kg was observed at 4.3 (14 ft) bgs; no uranium was observed below 9.1 m (30 ft) bgs.

References:

DOE/RL-2009-36, 2010, *BC Cribs and Trenches Excavation-Based Treatability Test Report*, Rev. 1, (reissue), U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0084533.

DOE/RL-2004-66, 2005, *Focused Feasibility Study for the BC Cribs and Trenches Area Waste Sites*, Draft A, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA170624. http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA170919. http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA171165. http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA171467.

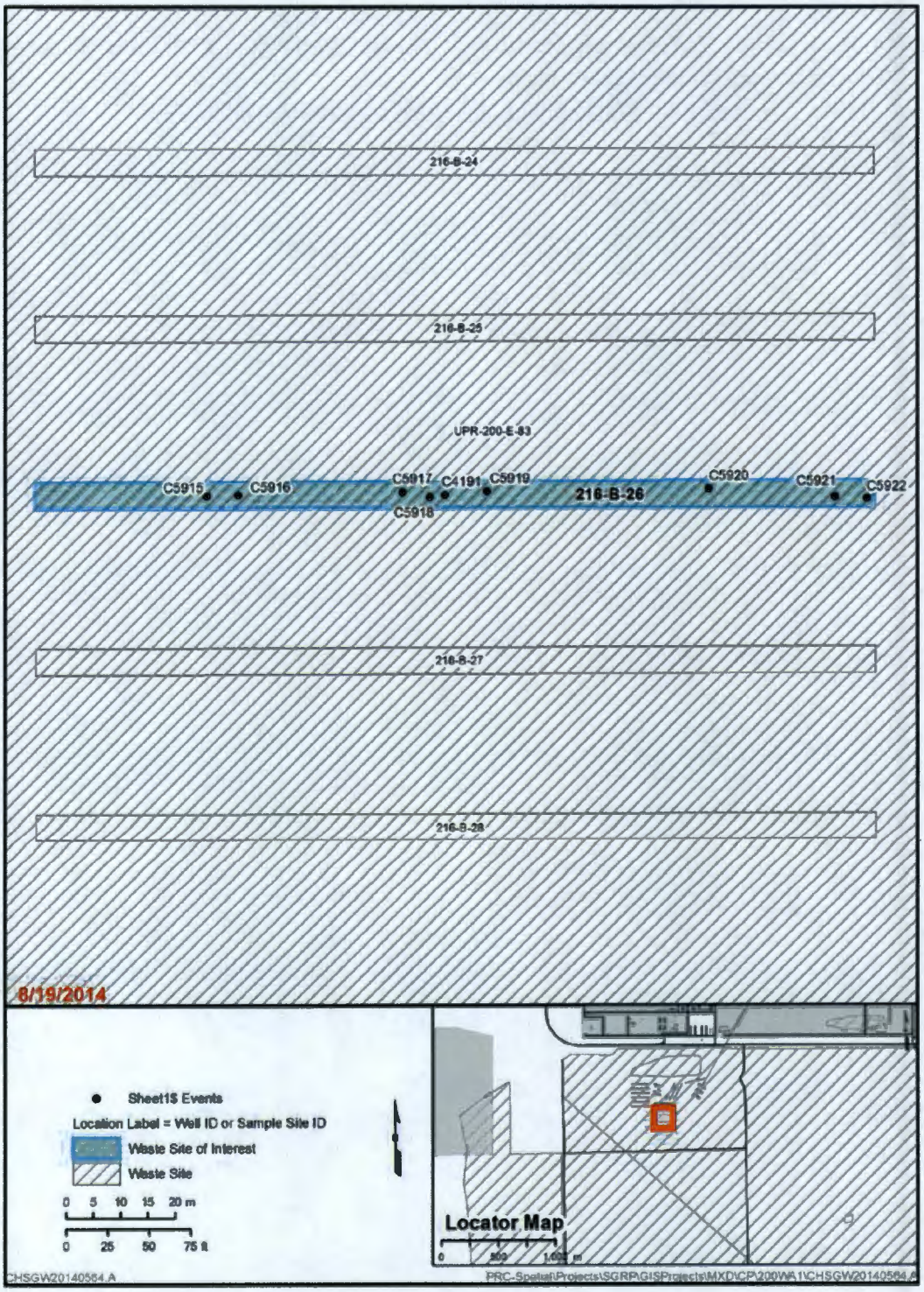
HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI Appendices C-26, C-27 and C-28, General Electric, Richland Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029.

Site: 216-B-26	Area: BC	Category: Intermediate (Representative Site)

RPP-26744, 2005, *Hanford Soil Inventory Model, Rev. 1*, Rev. 0, Washington. CH2M HILL Hanford Group, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0081114H.

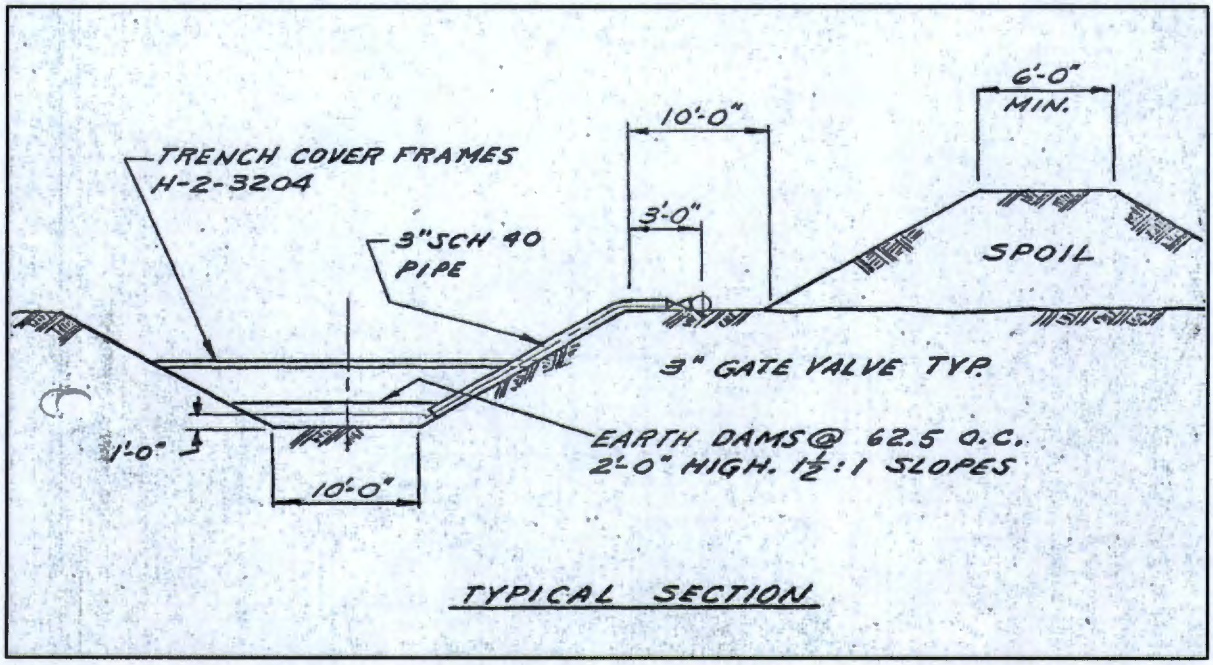
Site: 216-B-26	Area: BC	Category: Intermediate (Representative Site)



ID = identification

Figure 1. 216-B-26 Waste Site Map and Borehole Locations

Site: 216-B-26	Area: BC	Category: Intermediate (Representative Site)

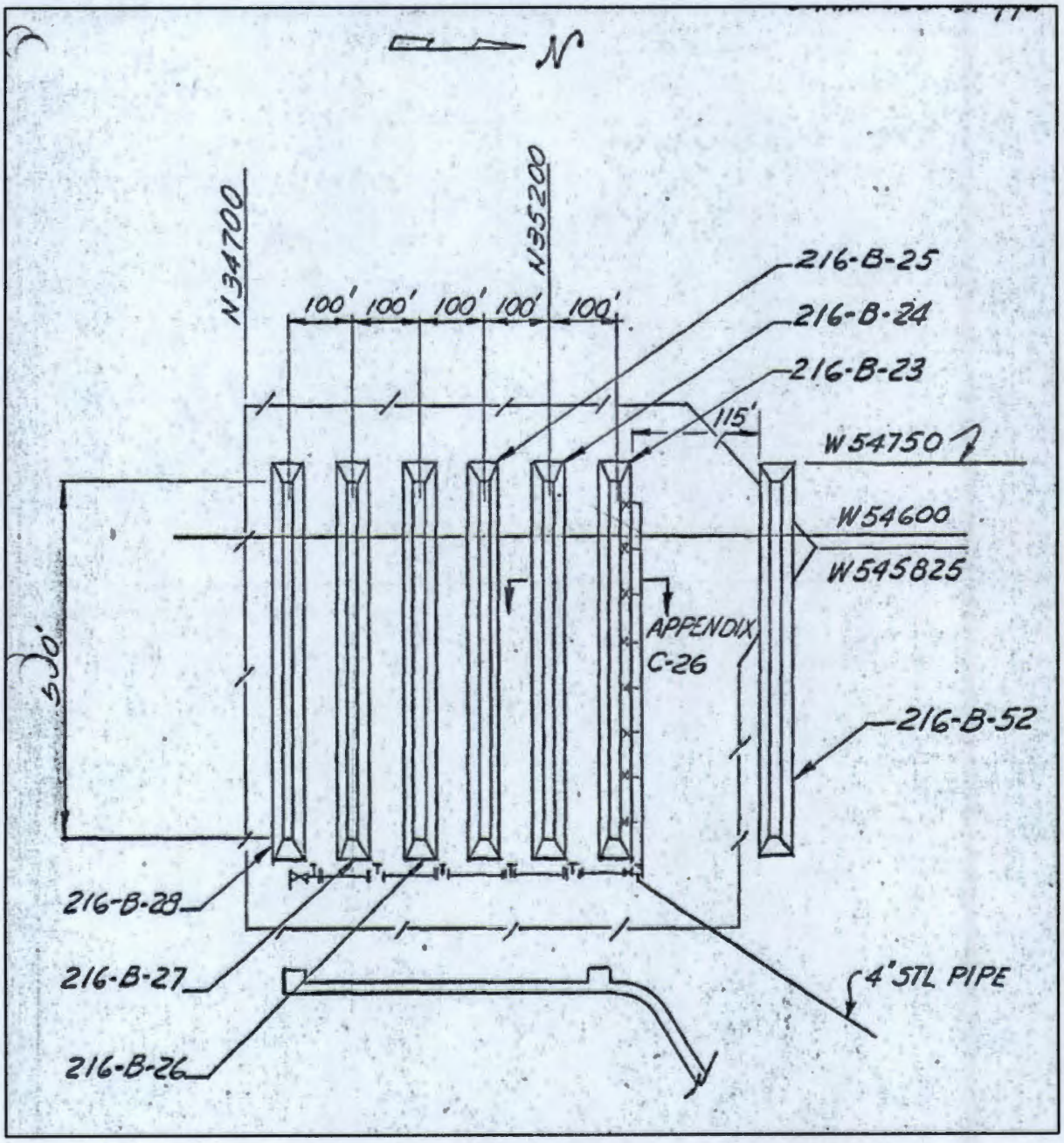


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-26.

Note: Produced from the best available copy.

Figure 2. Trench Elevation

Site: 216-B-26	Area: BC	Category: Intermediate (Representative Site)

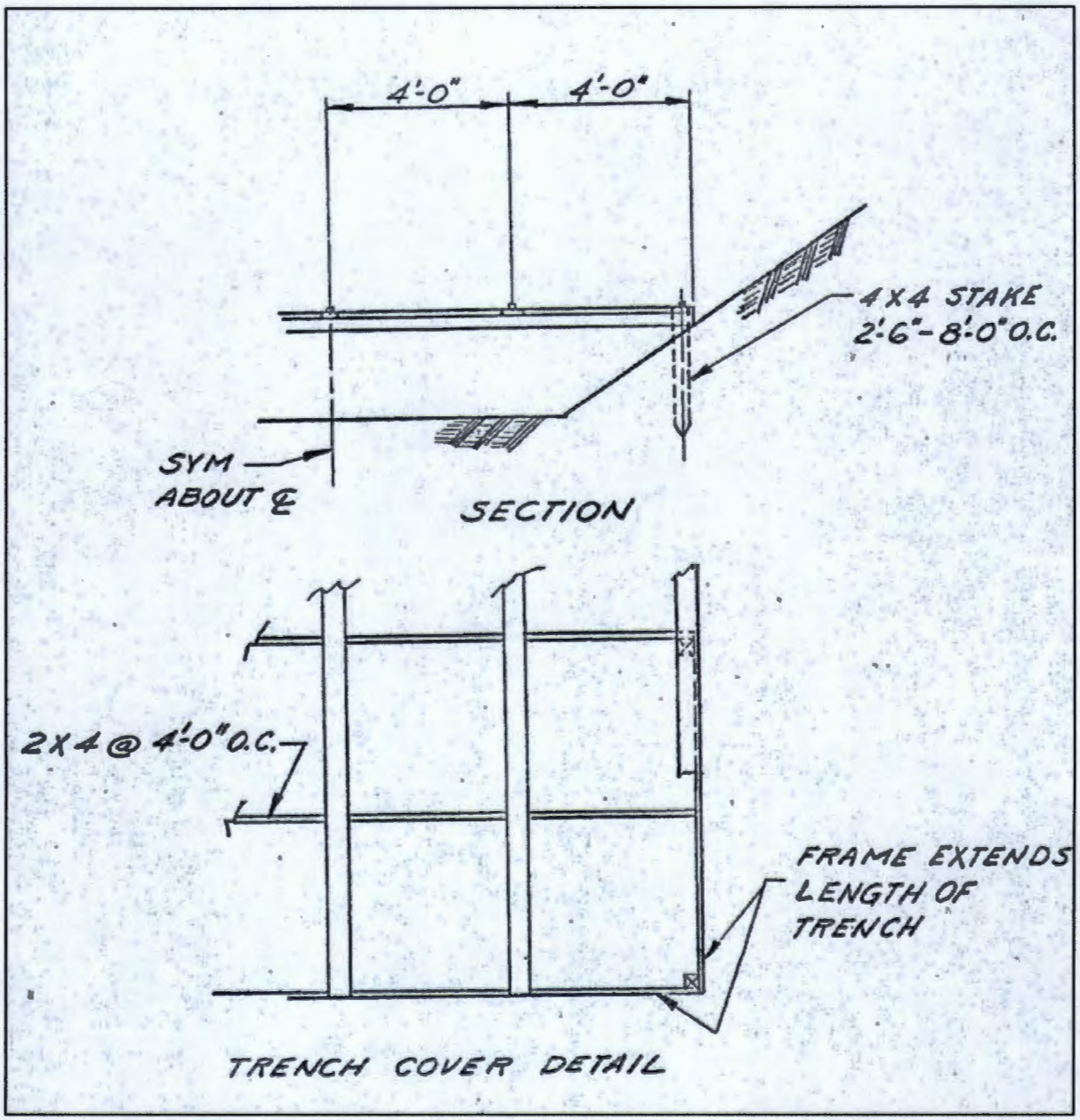


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-27.

Note: Produced from the best available copy.

Figure 3. Trench Plan View

Site: 216-B-26	Area: BC	Category: Intermediate (Representative Site)



Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-28.

Note: Produced from the best available copy.

Figure 4. Trench Cover

Site: 216-B-26	Area: BC	Category: Intermediate (Representative Site)

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Site: 216-B-27	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Site Description

Alternate Site Identification: 216-B-27 Trench
Site Type: Trench
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: February to April 1957

Waste Site Location and Physical Description: The 216-B-27 Trench is located south of the 200 East Area (across Route 4S) in the BC Cribs and Trenches area. The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The trench was divided into eight 19 m (62.5 ft) sections by 1.2 m (4 ft) high earthen dams. The side slope is 1.5:1. The depth was 3 m (10 ft). A wooden frame cover was constructed over the trench (Figures 2 and 3).

Waste Site Coordinates:
E-573288.71901 N-134115.56253

Site Dimensions:
Site Length: 152.4 m (500 ft) Site Depth: 3.1 m (10 ft)
Site Width: 3.1 m (10 ft) Cover Thickness: 2.4 m (8 ft)
Site Area: 464.8 m^2 (5,000 ft^2)
Note: These are bottom dimensions.

Related Site Structure(s): The trench is associated with U Plant uranium recovery process and UPR-200-E-83.

Site Posting: The Trench has been backfilled with clean soil and posted Underground Radioactive Material Area. Concrete AC 540 markers outline the area where the trenches are located, but do not identify specific trench locations.

Site History

Release Summary: 216-B-27 Trench received 4.4E6 L (1.2E6 gal) of scavenged tributyl phosphate supernate liquid waste from the 221-U Building during uranium recovery operations. After the uranium was removed, the cesium and strontium content of the effluent was reduced through precipitation by adding ferrocyanide. The waste was received into the trench via an aboveground transfer line extending from the 200-E-114-PL pipeline. The waste is liquid process effluent, high in salt, and neutral to basic. The waste contained inorganic compounds such as ferrocyanide, nitrate, and phosphate.

The trench was backfilled after it reached its specific retention capacity.

Site: 216-B-27	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Volume/Mass Discharged: 4.4E+06 L (1.2E+06 gal)

Pore Volume Discharged: 4.4E+06 L/ (330 ft x 5,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.31

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-27 Waste Site

Contaminant	Mass Discharged
Pu	0.7 g
Sr-90	600 Ci
Cs-137	34 Ci
U	340 kg
Ru-106	1.7E+04 Ci
Beta	5.5E+04 Ci
Co-60	7.6 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, an Unplanned Release (UPR-200-E-83) occurred when a large area was found to be contaminated with radioactive rabbit feces reading 5,000 to 10,000 cpm. A burrow in Trench 216-B-28, containing contaminated salt, was believed to be the source of the material ingested by the rabbits.

In 1969, contaminated tumbleweeds were identified growing on some of the BC Trenches. To inhibit weed growth, 45,870 m^3 (60,000 yd^3), approximately 15.2 cm (6 in.) of sand and gravel were placed on top of the trenches. In 1981, the area was covered with additional top soil, time release herbicides, and rodent deterrent. The area was surface stabilized again in 1982. A surface radiation survey is performed annually.

A borehole summary is presented in Table 2. Geophysical log results are presented on Figure 5. Borehole locations are shown on Figure 1.

Site: 216-B-27	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Table 2. Borehole Summary for the 216-B-27 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2005	A5872/299-E13-57	North of site boundary	2 - 48 (GPL)

GPL = geophysical log
ID = identification

Nature and Extent of Contamination: As shown on Figure 5, Cs-137 and Co-60 were the man-made radionuclides detected in borehole A5872. Cs-137 was detected throughout the borehole. Concentrations were measured that ranged between approximately 0.2 and 2,300 pCi/g. The maximum concentration was measured at approximately 2.1 m (7 ft) below ground surface (bgs). Co-60 was detected at a few depths; the maximum concentration was measured at approximately 0.08 pCi/g at 14.6 m (48 ft).

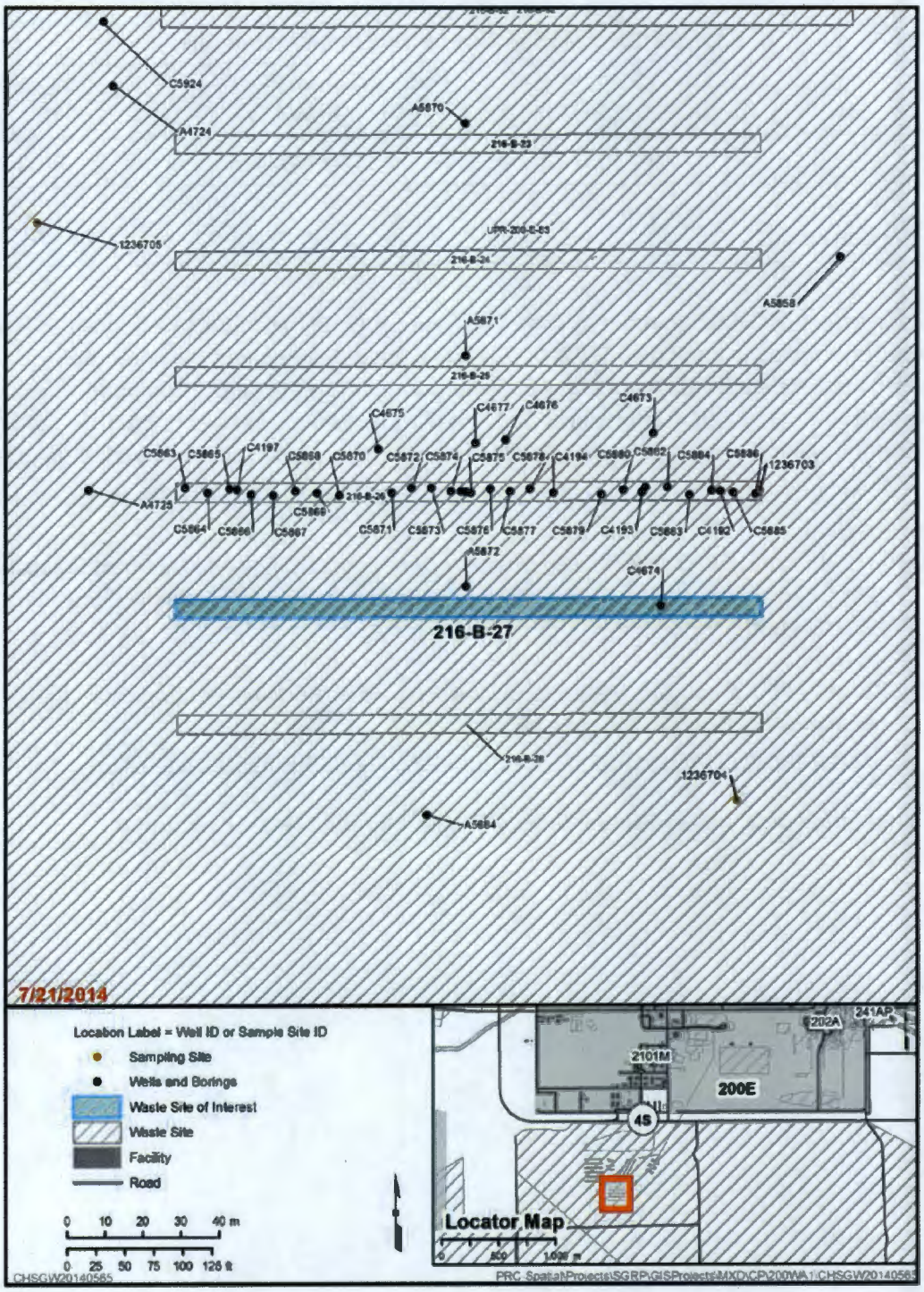
References:

HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendices C-26, C-27, and C-28, General Electric, Richland Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029.

Waste Information Data System General Summary Report for the 216-B-27 Waste Site.

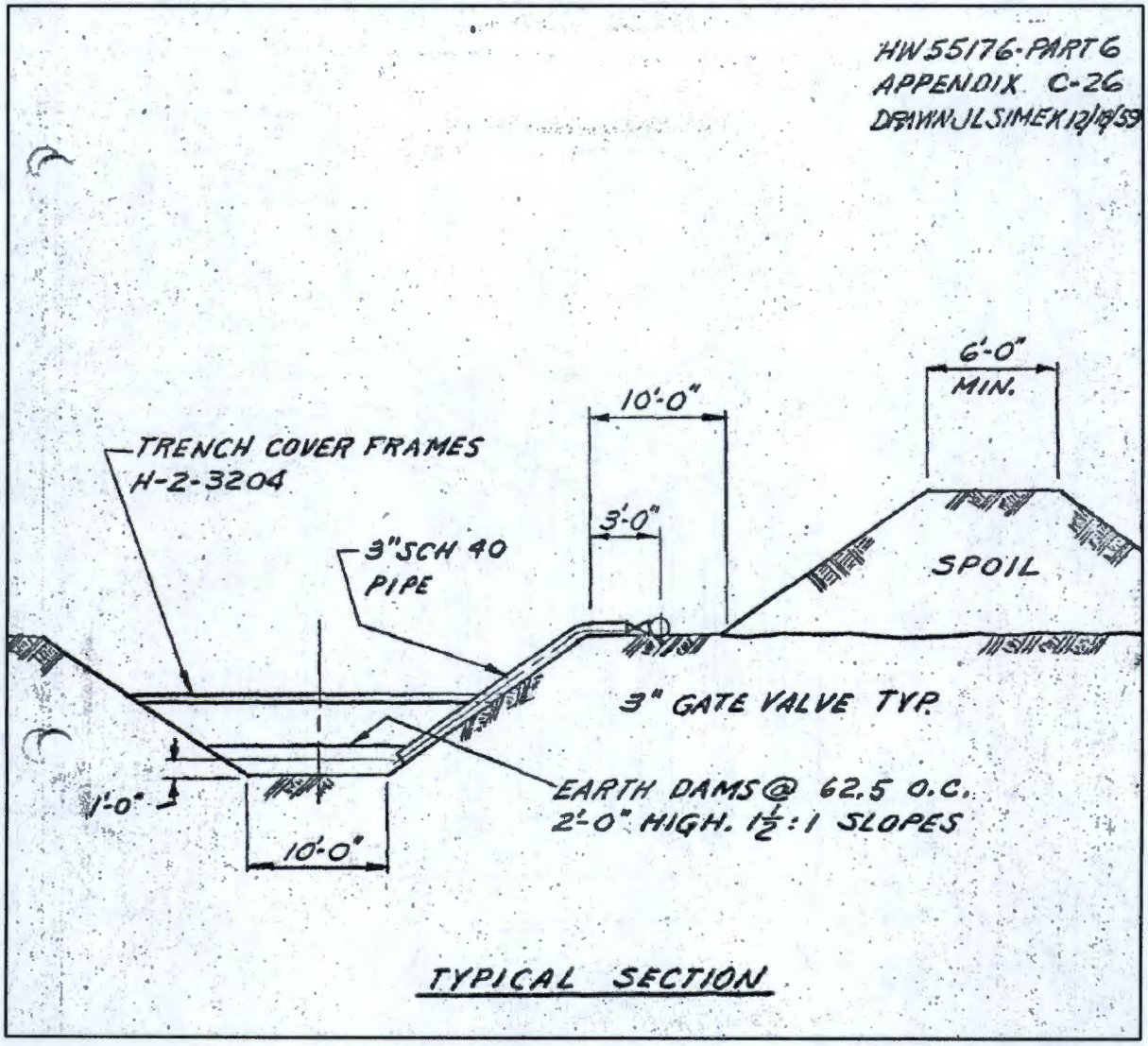
Site: 216-B-27	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



ID = identification

Figure 1. 216-B-27 Waste Site Map

Site: 216-B-27	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

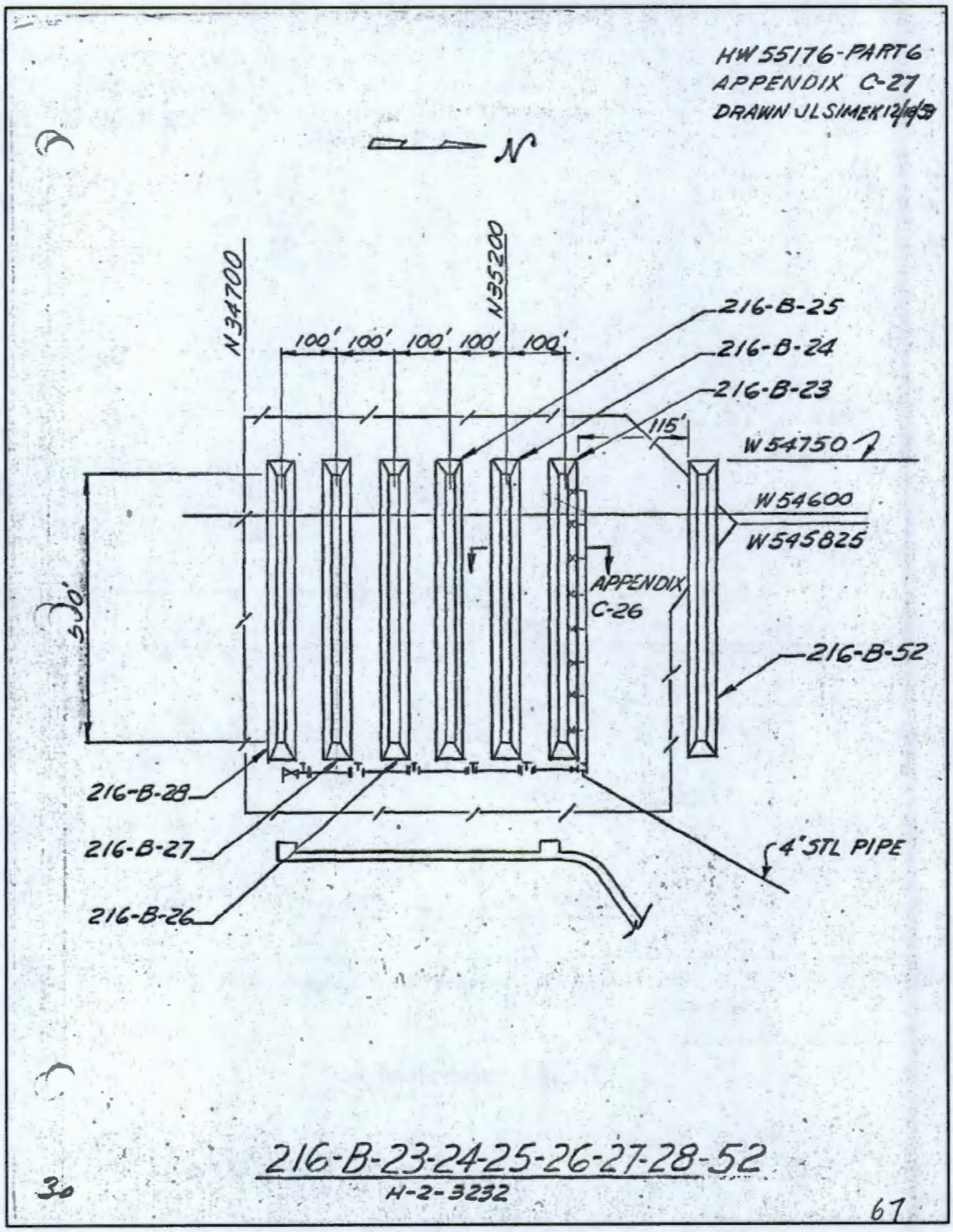


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-26.

Note: Produced from the best available copy.

Figure 2. Trench Elevation

Site: 216-B-27	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

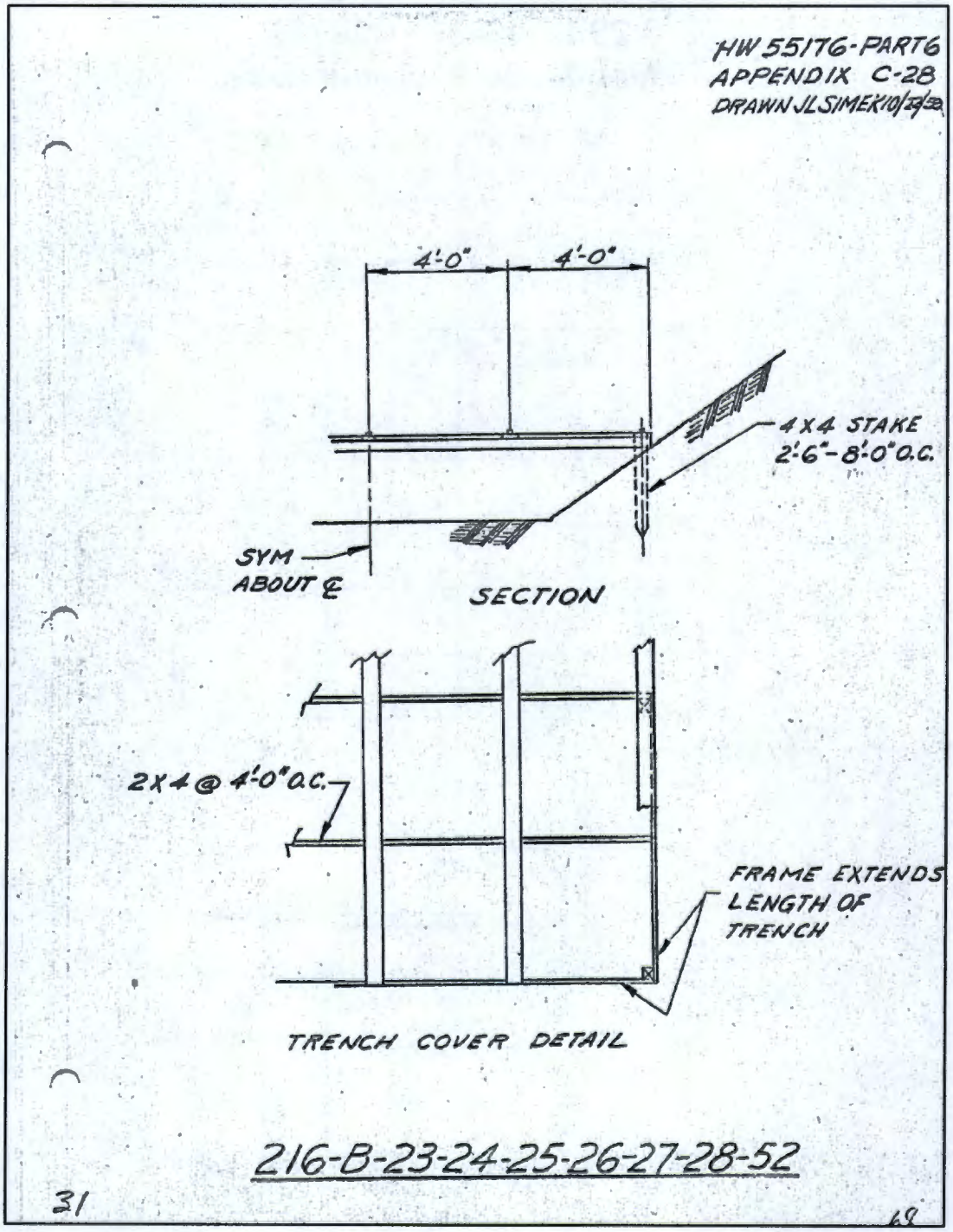


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-27.

Note: Produced from the best available copy.

Figure 3. Trench Plan View

Site: 216-B-27	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

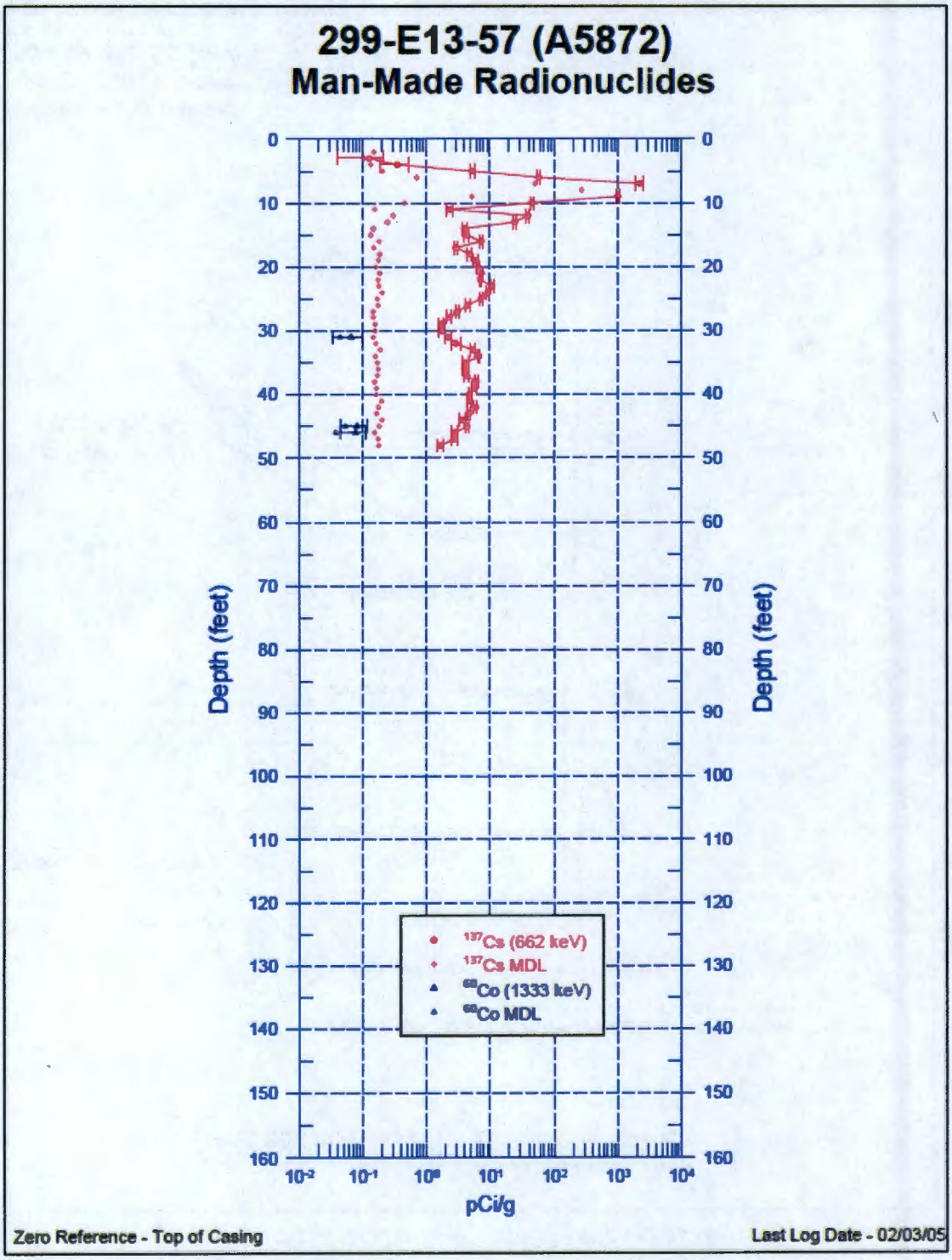


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-26.

Note: Produced from the best available copy.

Figure 4. Trench Cover

Site: 216-B-27	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



MDL = minimum detectable level

Figure 5. Geophysical Logging Results for Borehole A5872

Site: 216-B-28	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Site Description

Alternate Site Identification: 216-B-28 Trench
Site Type: Trench
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: April to June 1957

Waste Site Location and Physical Description: The 216-B-28 Trench is located south of the 200 East Area (across Route 4S) in the BC Cribs and Trenches area. The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The trench was divided into eight 19 m (62.5 ft) sections by 1.2 m (4 ft) high earthen dams. The side slope is 1.5:1. The depth was 3 m (10 ft). A wooden frame cover was constructed over the trench (Figures 2, 3, and 4).

Waste Site Coordinates:
E-573288.79614 N-134085.08614

Site Dimensions:
Site Length: 152.4 m (500 ft) Site Depth: 3.1 m (10 ft)
Site Width: 3.1 m (10 ft) Cover Thickness: 2.4 m (8 ft)
Site Area: 464.8 m^2 (5,000 ft^2)
Note: These are bottom dimensions.

Related Site Structure(s): The trench is associated with U Plant uranium recovery process and UPR-200-E-83.

Site Posting: The trench has been backfilled with clean soil and posted Underground Radioactive Material Area. Concrete AC 540 markers outline the area where the trenches are located, but do not identify specific trench locations.

Site History

Release Summary: 216-B-28 Trench received 5.1E6 L (1.3E6 gal) of scavenged tributyl phosphate supernate liquid waste from the 221-U Building during uranium recovery operations. After the uranium was removed, the cesium and strontium content of the effluent was reduced through precipitation by adding ferrocyanide. The waste was received into the trench via an aboveground transfer line extending from the 200-E-114-PL pipeline. The waste is liquid process effluent, high in salt, and neutral to basic. The waste contained inorganic compounds such as ferrocyanide, nitrate, and phosphate.

The trench was backfilled after it reached its specific retention capacity.

Site: 216-B-28	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Volume/Mass Discharged: 5.1E+06 L (1.3E+06 gal)

Pore Volume Discharged: 5.1E+06 L/ (330 ft x 5,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.36

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-28 Waste Site

Contaminant	Mass Discharged
Pu	5.6 g
Sr-90	110 Ci
Cs-137	23 Ci
U	300 kg
Ru-106	5200 Ci
Beta	1.7E+04 Ci
Co-60	2.3 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, an Unplanned Release (UPR-200-E-83) occurred when a large area was found to be contaminated with radioactive rabbit feces reading 5,000 to 10,000 cpm. A burrow in Trench 216-B-28, containing contaminated salt, was believed to be the source of the material ingested by the rabbits.

In 1969, contaminated Russian thistle was identified growing on some of the BC Trenches. To inhibit weed growth, 45,870 m^3 (60,000 yd^3), approximately 15.2 cm (6 in.) of sand and gravel, was placed on top of the trenches. In 1981, the area was covered with additional top soil, time release herbicides, and rodent deterrent. The area was surface stabilized again in 1982.

The trench is monitored by groundwater wells 299-E13-13 and 299-E13-19. Data indicate a breakthrough to the groundwater had not occurred at the trench as of June 1977. A surface radiation survey is performed annually.

Borehole and data summaries are presented in Tables 2 and 3. Borehole locations are shown on Figure 1.

Site: 216-B-28	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Table 2. Borehole Summary for the 216-B-28 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2005	A5864/299-E13-19	South of site boundary	330 (GPL)

GPL = geophysical logging
ID = identification

Table 3. Geophysical Log Summary for the 216-B-28 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A5864	0 – 5	3.18	pCi/g	5.0	20,405	cpm	5
	5 – 10	0.15	pCi/g	6.0	14,633.3	cpm	6
	10 – 15	–	pCi/g	–	12,808.9	cpm	12
	>15	0.24	pCi/g	127	21,893.6	cpm	123

bgs = below ground surface
ID = identification

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): The depth of the maximum cesium-137 concentration in the closest borehole to the 216-B-28 Trench floor footprint is 1.8 m (6 ft).

Deep (>4.6 m [>15 ft] bgs): The depth of the maximum cesium-137 concentration in the closest borehole within the 216-B-28 Trench floor footprint is 38.7 m (127 ft).

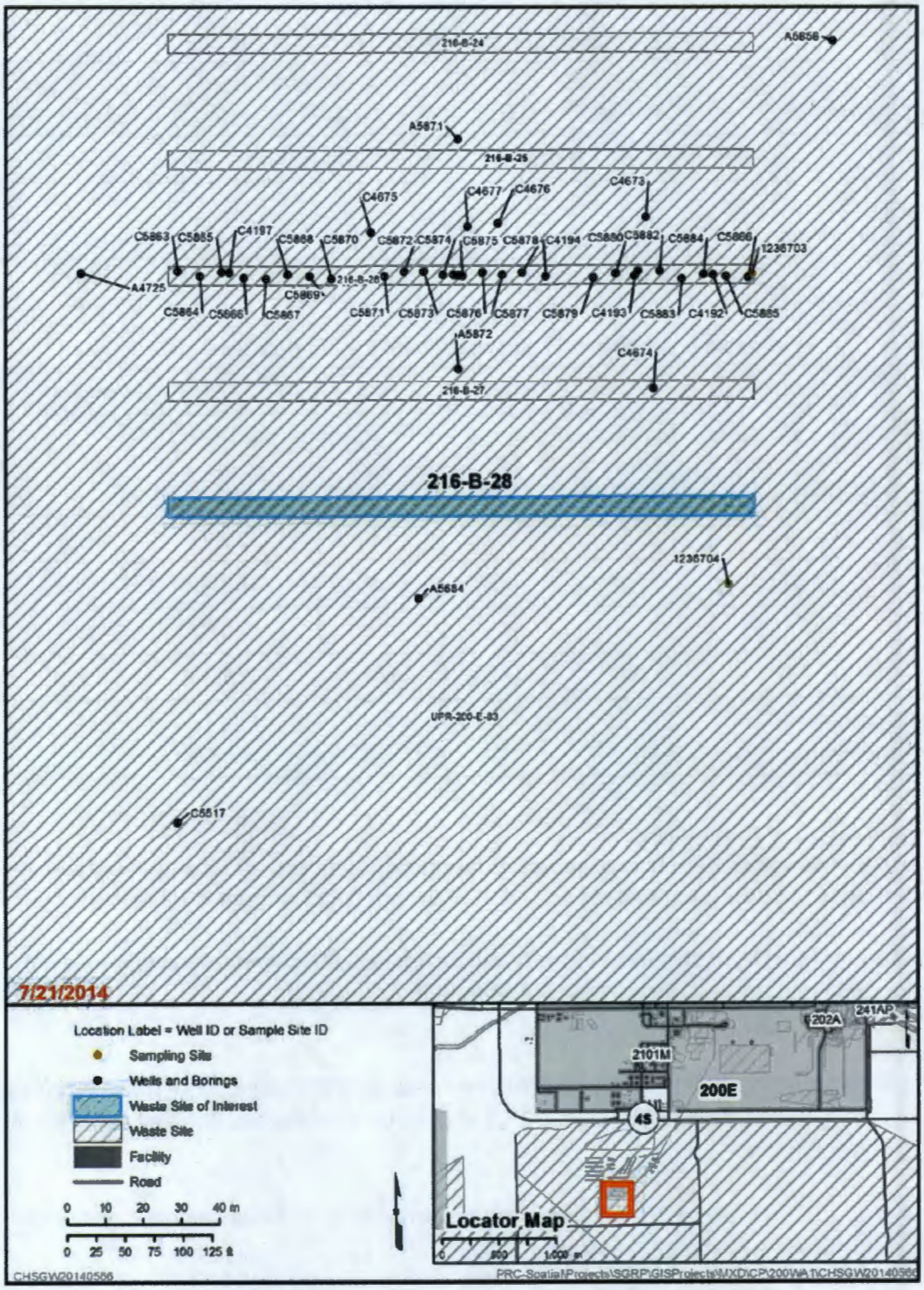
References:

HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendices C-26, C-27, and C-28, General Electric, Richland Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029.

Waste Information Data System General Summary Report for the 216-B-28 Waste Site.

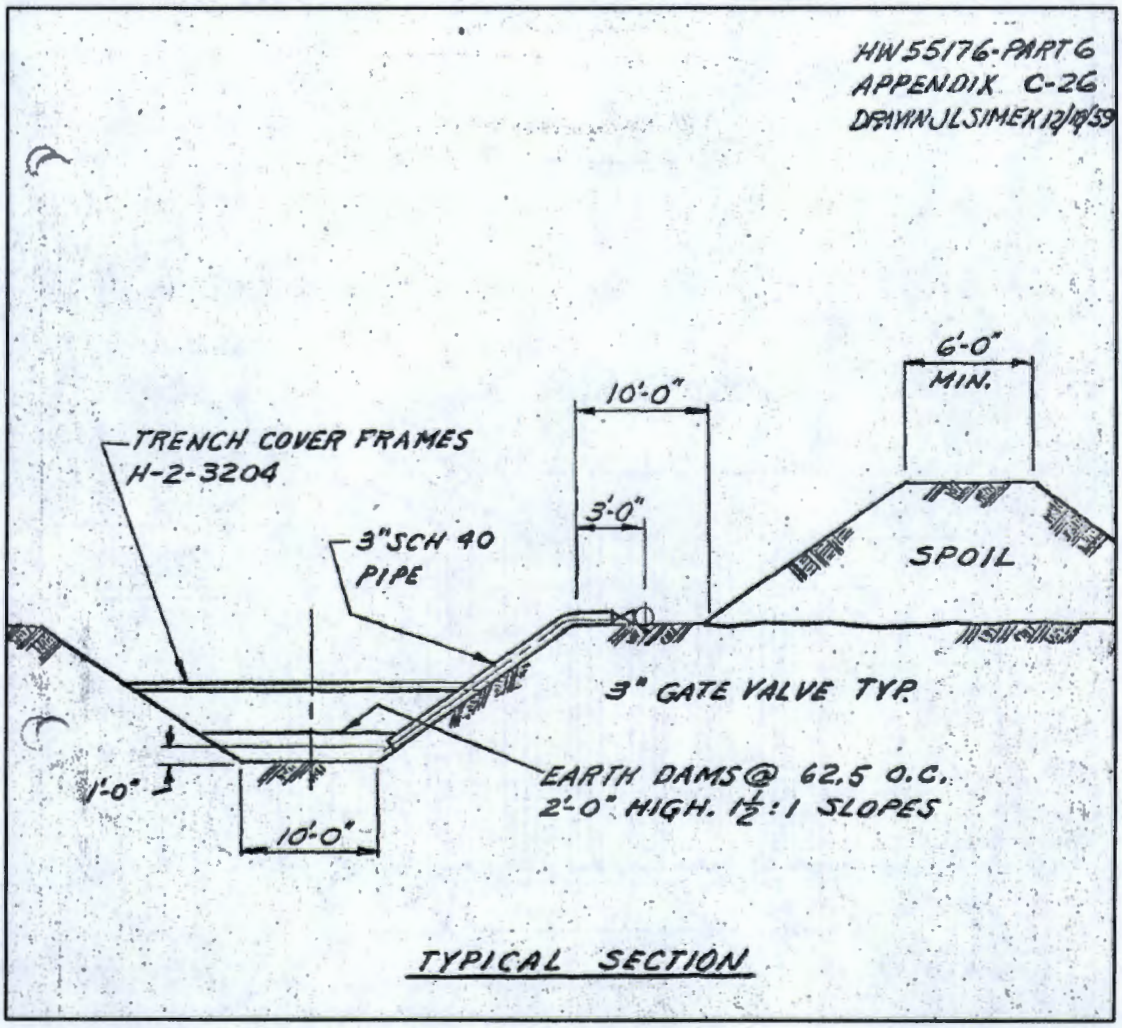
Site: 216-B-28	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



ID = identification

Figure 1. 216-B-28 Waste Site Map

Site: 216-B-28	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

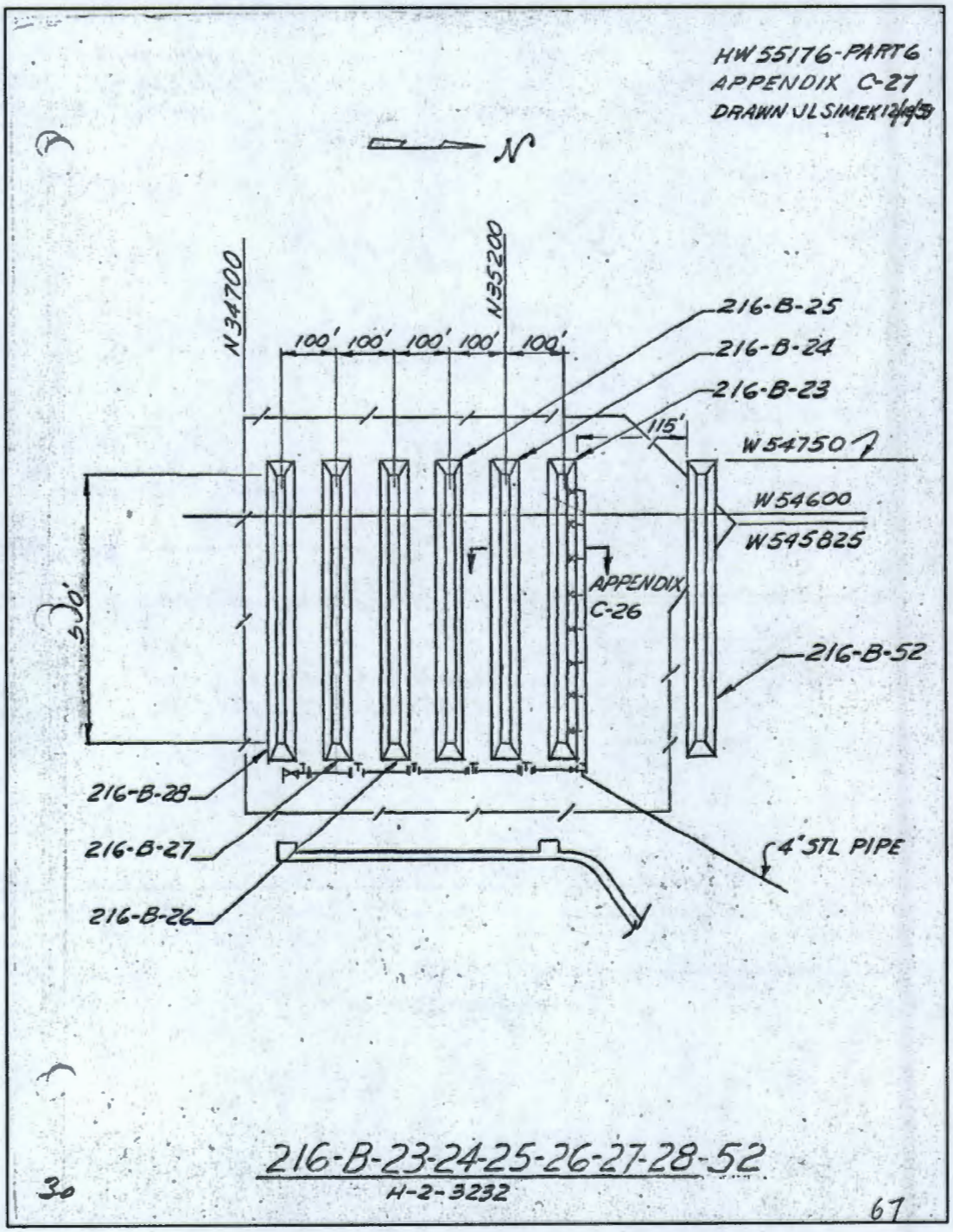


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-26.

Note: Produced from the best available copy.

Figure 2. Trench Elevation

Site: 216-B-28	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

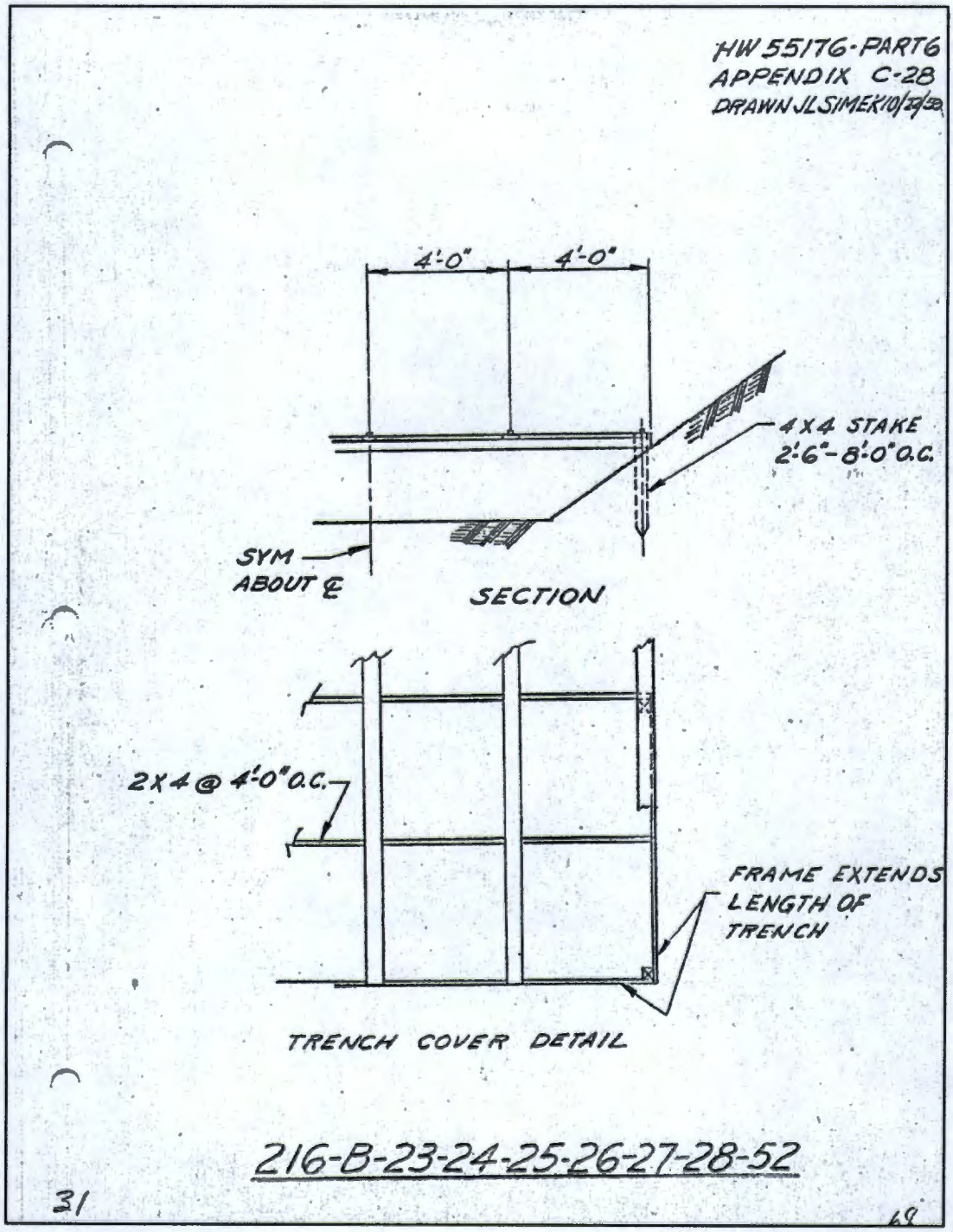


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-27.

Note: Produced from the best available copy.

Figure 3. Trench Plan View

Site: 216-B-28	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-28.

Note: Produced from the best available copy.

Figure 4. Trench Cover

Site: 216-B-28	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

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Site: 216-B-29	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Site Description

Alternate Site Identification: 216-B-29 Trench
Site Type: Trench
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: June to July 1957

Waste Site Location and Physical Description: The 216-B-29 Trench is located south of the 200 East Area (across Route 4S) in the BC Cribs and Trenches area. The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The trench was divided into two equal sections by an earthen dam 1.5 m (5 ft) high and 1.5 m (5 ft) wide at the top. The trench had side slopes of 1:1.75. Liquid was discharged into the trench via four 7.6 cm (3 in.) Schedule 40 pipes extending laterally from a 10.2 cm (4 in.) pipe that ran along the top edge of the trench. Liquid discharge was controlled by gate valves located at the top of the lateral lines. A cover constructed of 2.5 by 15.2 cm (1 by 6 in.) and 5 by 10.2 cm (2 by 4 in.) wood framing and sisalkraft paper extended the length of the trench. The vertical distance from the cover to the trench bottom was a minimum of 1.5 m (5 ft) (Figures 2 and 3). When the trench reached its specific retention capacity, the aboveground pipeline to the trench was removed and the trench was backfilled. The wood frame cover was left in place and probably collapsed under the weight of the overlying soil during the backfilling activities. The removed pipeline was buried in a shallow trench between 216-B-29 and 216-B-53A.

Waste Site Coordinates:
The centerline coordinates of the trench are N-36000 and W-54800.

Site Dimensions:
Site Length: 152.4 m (500 ft) (bottom dimension) Site Depth: 2.4 m (8 ft) minimum
Site Width: 3.1 m (10 ft) (bottom dimension) Cover Thickness: 3.0 m (10 ft) minimum
Site Area: 464.8 m^2 (5,000 ft^2) including backfill and stabilization cover

Related Site Structure(s): The 216-B-29 Trench is associated with U Plant uranium recovery process and UPR-200-E-83.

Site Posting: The trench has been backfilled with clean soil and posted Underground Radioactive Material Area. Concrete AC 540 markers outline the area where the trenches are located, but do not identify the specific trench location.

Site: 216-B-29	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Site History

Release Summary: 216-B-29 Trench received 4.8E6 L (1.3E6 gal) of scavenged tributyl phosphate supernate liquid waste from the 221-U Building during uranium recovery operations. After the uranium was removed, the cesium and strontium content of the effluent was reduced through precipitation by adding ferrocyanide. The waste was received into the trench via aboveground transfer lines extending from the 200-E-114-PL pipeline. The waste is liquid process effluent, high in salt, and neutral to basic. The waste contained inorganic compounds such as ferrocyanide, nitrate, and phosphate.

Volume/Mass Discharged: 4.8E+06 L (1.3E+06 gal)

Pore Volume Discharged: 4.8E+06 L/ (332 ft x 5,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.34

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-29 Waste Site

Contaminant	Mass Discharged
Pu	1.1 g
Sr-90	190 Ci
Cs-137	59 Ci
U	340 kg
Ru-106	1.6E+04 Ci
Beta	5.1E+04 Ci
Co-60	7.1 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, an Unplanned Release (UPR-200-E-83) occurred when a large area was found to be contaminated with radioactive rabbit feces reading 5,000 to 10,000 cpm. A burrow in Trench 216-B-28, containing contaminated salt, was believed to be the source of the material ingested by the rabbits.

In 1969, contaminated Russian thistle was identified growing on some of the BC Trenches. To inhibit weed growth, 45,870 m^3 (60,000 yd^3), approximately 15.2 cm (6 in.) of sand and gravel, was placed on

Site: 216-B-29	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

top of the trenches. In 1981, the area was covered with additional top soil, time release herbicides, and rodent deterrent. The area was surface stabilized again in 1982.

A radiation survey performed in January 2006 detected a 1.2 m^2 (4 ft^2) area of contamination with a maximum direct reading of 5,000 cpm.

The trench is monitored by groundwater well 299-E13-14. Data indicate a breakthrough to the groundwater had not occurred at the trench as of June 1977. A surface radiation survey is performed annually.

Borehole and data summaries are presented in Tables 2 and 3. Borehole locations are shown on Figure 1.

Table 2. Borehole Summary for the 216-B-29 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2003	A4726/299-E13-14	North of site boundary	100 (GPL)

GPL = geophysical log
ID = identification

Table 3. Geophysical Log Summary for the 216-B-29 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A4726	0 – 5	–	pCi/g	–	8,099.7	cpm	5
	5 – 10	–	pCi/g	–	8,346.8	cpm	8
	10 – 15	–	pCi/g	–	8,323.8	cpm	11
	>15	0.28	pCi/g	27	11,185.4	cpm	93

bgs = below ground surface
ID = identification

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): The depth of the maximum cesium-137 concentration in the closest borehole to the 216-B-29 Trench floor footprint is unknown.

Deep (>4.6 m [>15 ft] bgs): The depth of the maximum cesium-137 concentration in the closest borehole to the 216-B-29 Trench floor footprint is 8.2 m (27 ft).

Site: 216-B-29	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

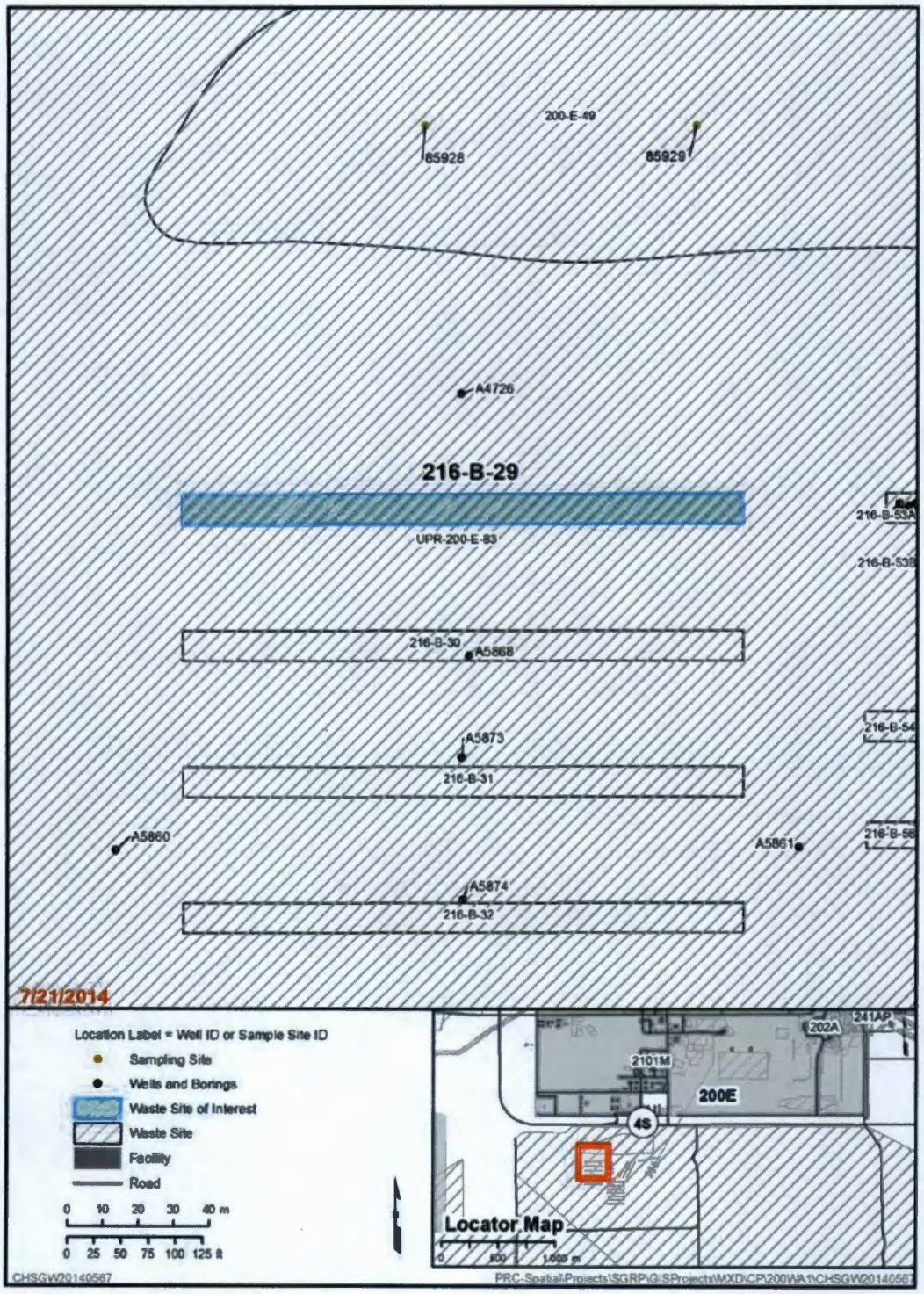
References:

HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendices C-29 and C-30, General Electric, Richland Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029.

Waste Information Data System General Summary Report for the 216-B-29 Waste Site.

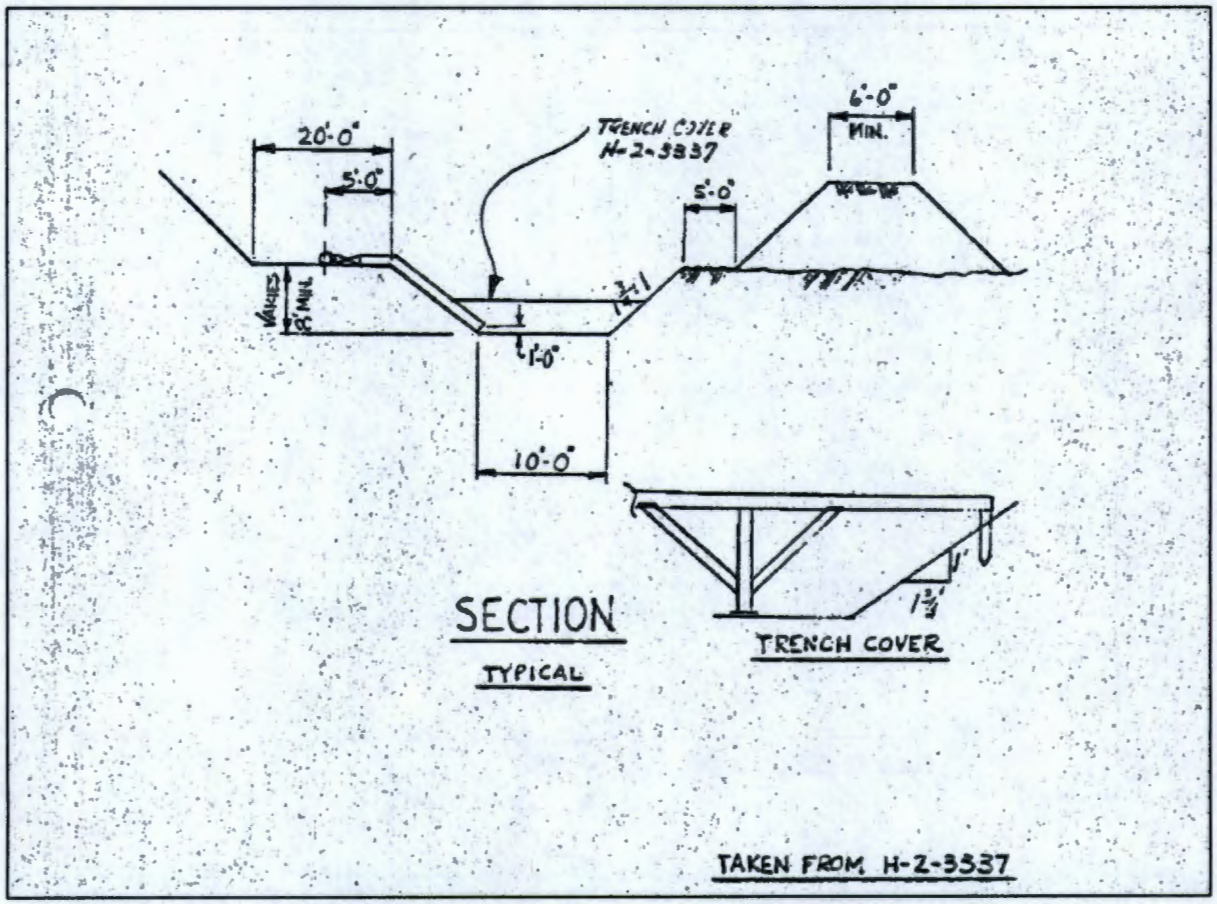
Site: 216-B-29	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



ID = identification

Figure 1. 216-B-29 Waste Site Map

Site: 216-B-29	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

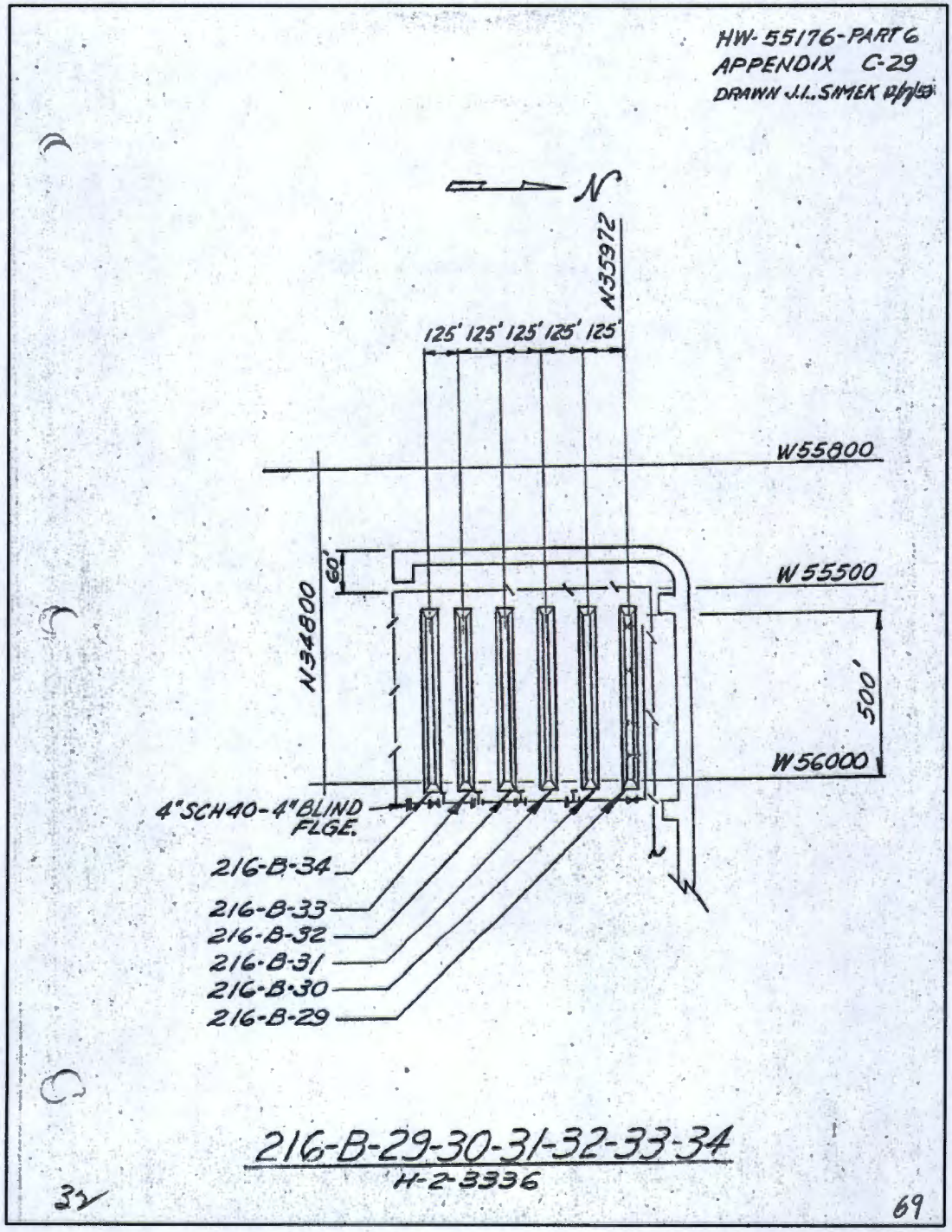


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-30.

Note: Produced from the best available copy.

Figure 2. Trench Elevation

Site: 216-B-29	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-29.

Note: Produced from the best available copy.

Figure 3. Trench Plan View

Site: 216-B-29	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

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Site: 216-B-30	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Site Description

Alternate Site Identification: 216-B-30 Trench
Site Type: Trench
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: July 1957 (RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III)

Waste Site Location and Physical Description: The 216-B-30 Trench is located south of the 216-B-29 Trench, directly south of the 200 East Area (across Route 4S) in the BC Cribs and Trenches area. The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The trench was divided into two equal sections by an earthen dam 1.5 m (5 ft) high and 1.5 m (5 ft) wide at the top. The trench had side slopes of 1:1.75. Liquid was discharged into the trench via four 7.6 cm (3 in.) Schedule 40 pipes extending laterally from a 10.2 cm (4 in.) pipe that ran along the top edge of the trench. Liquid discharge was controlled by gate valves located at the top of the lateral lines. A cover constructed of 2.5 by 15.2 cm (1 by 6 in.) and 5 by 10.2 cm (2 by 4 in.) wood framing and sisalkraft paper extended the length of the trench. The vertical distance from the cover to the trench bottom was a minimum of 1.5 m (5 ft) (Figures 2 and 3). When the trench reached its specific retention capacity, the aboveground pipeline to the trench was removed and the trench was backfilled. The wood frame cover was left in place and probably collapsed under the weight of the overlying soil during the backfilling activities. The removed pipeline was buried in a shallow trench between 216-B-29 and 216-B-53A.

Waste Site Coordinates:
W-573087.96035 N-134403.77703

Site Dimensions:
Site Length: 152.4 m (500 ft) (bottom dimension) Site Depth: 2.4 m (8 ft) minimum
Site Width: 3.1 m (10 ft) (bottom dimension) Cover Thickness: 3.0 m (10 ft) minimum
Site Area: 464.8 m^2 (5,000 ft^2) including backfill and stabilization cover

Related Site Structure(s): The 216-B-30 Trench is associated with U Plant uranium recovery process and UPR-200-E-83.

Site Posting: The trench has been backfilled with clean soil and posted Underground Radioactive Material Area. Concrete AC 540 markers outline the area where the trenches are located, but do not identify the specific trench location.

Site: 216-B-30	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Site History

Release Summary: The 216-B-30 Trench received 4.8E6 L (1.3E6 gal) of scavenged tributyl phosphate (TBP) supernate liquid waste from the 221-U Building during uranium recovery operations. After the uranium was removed, the cesium and strontium content of the effluent was reduced through precipitation by adding ferrocyanide. The waste was received into the trench via aboveground transfer lines extending from the 200-E-114-PL pipeline. The waste is liquid process effluent, high in salt, and neutral to basic. The waste contained inorganic compounds such as ferrocyanide, nitrate, and phosphate.

Volume/Mass Discharged: 4.8E+06 L (1.3E+06 gal)

Pore Volume Discharged: 4.8E+06 L/ (332 ft x 5,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.34

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-30 Waste Site

Contaminant	Mass Discharged
Pu	2.1 g
Sr-90	600 Ci
Cs-137	3400 Ci
U	88 kg
Ru-106	3900 Ci
Beta	1.6E+04 Ci
Co-60	1.7 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, an unplanned release (UPR-200-E-83) occurred when a large area was found to be contaminated with radioactive rabbit feces reading 5,000 to 10,000 cpm. A burrow in the 216-B-28 Trench, containing contaminated salt, was believed to be the source of the material ingested by the rabbits.

Site: 216-B-30	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

In 1969, contaminated tumbleweeds were identified growing on some of the BC Trenches. To inhibit weed growth, 45,870 m^3 (60,000 yd^3), approximately 15.2 cm (6 in.) of sand and gravel, was placed on top of the trenches. In 1981, the area was covered with additional top soil, time release herbicides, and rodent deterrent. The area was surface stabilized again in 1982. A surface radiation survey is performed annually.

Borehole and data summaries are presented in Tables 2 and 3. Borehole locations are shown on Figure 1.

Table 2. Borehole Summary for the 216-B-30 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2007	A5868/299-E13-52	Within crib floor footprint	94 (GPL)

GPL = geophysical log
ID = identification

Table 3. Geophysical Log Summary for the 216-B-30 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A5868	0 – 5	1.45	pCi/g	5.0	24,753.8	cpm	5
	5 – 10	188.87	pCi/g	10.0	2,010,080	cpm	10
	10 – 15	197,934.7	pCi/g	12.5	793,890	cpm	12.5
	>15	8,130.8	pCi/g	17	3,749,810	cpm	23

bgs = below ground surface
ID = identification

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): The depth of the maximum cesium-137 concentration in the one borehole within to the 216-B-30 Trench floor footprint is 3.8 m (12.5 ft), which is 1.4 m (4.5 ft) below the bottom of the crib.

Deep (>4.6 m [>15 ft] bgs): The depth of the maximum cesium-137 concentration in the one borehole within the 216-B-30 Trench floor footprint is 5.2 m (17 ft).

Site: 216-B-30	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

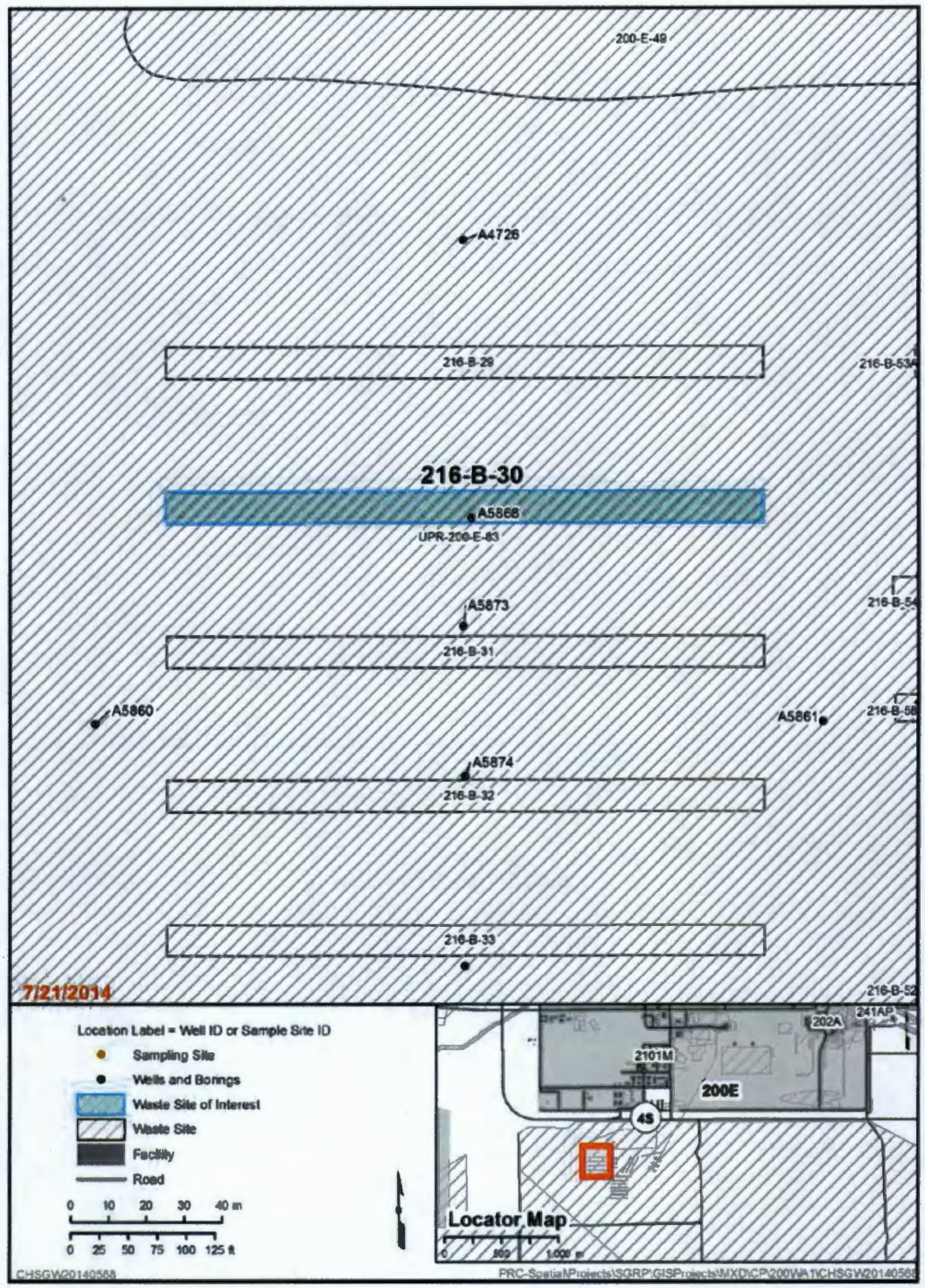
References:

HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendices C-29 and C-30, General Electric, Richland Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029.

Waste Information Data System General Summary Report for the 216-B-30 Waste Site.

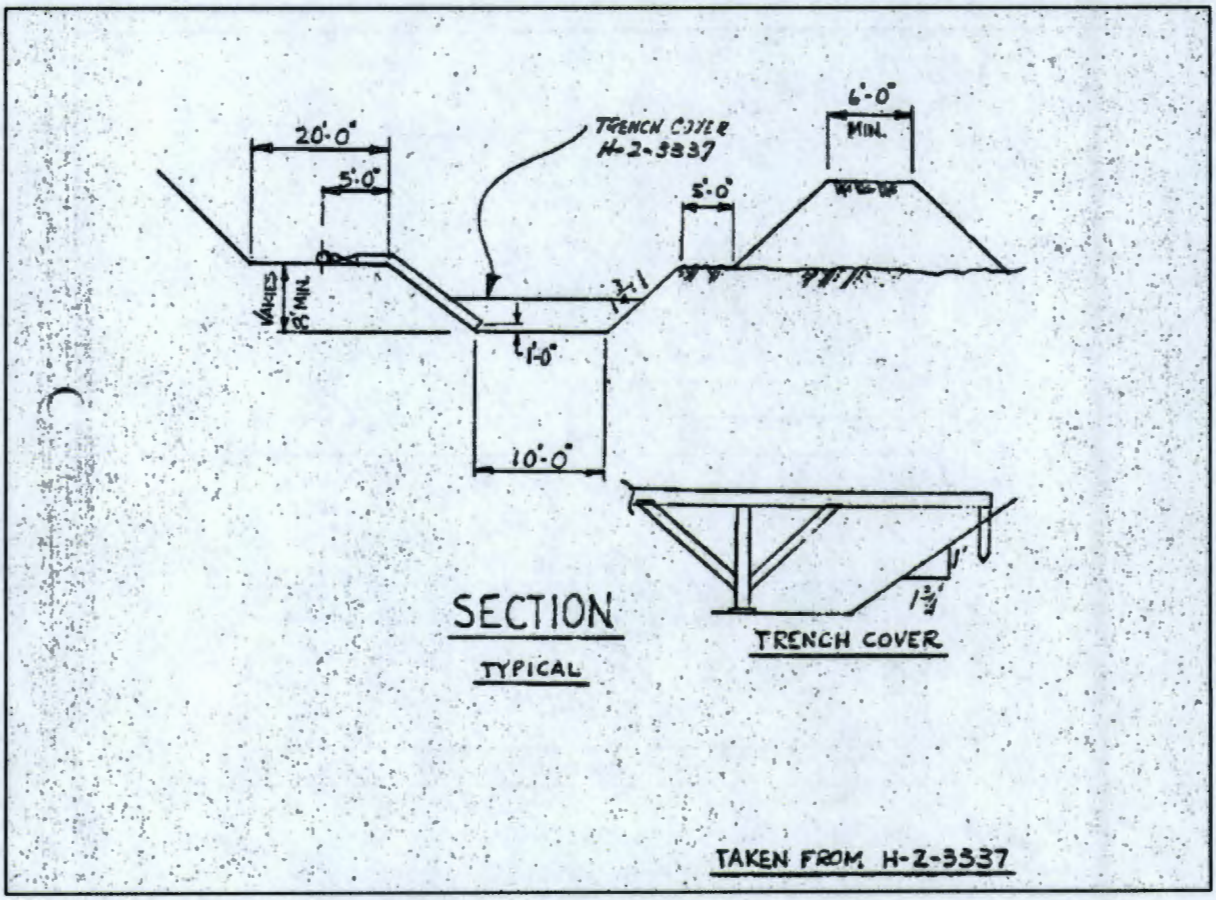
Site: 216-B-30	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



ID = identification

Figure 1. 216-B-30 Waste Site Map

Site: 216-B-30	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

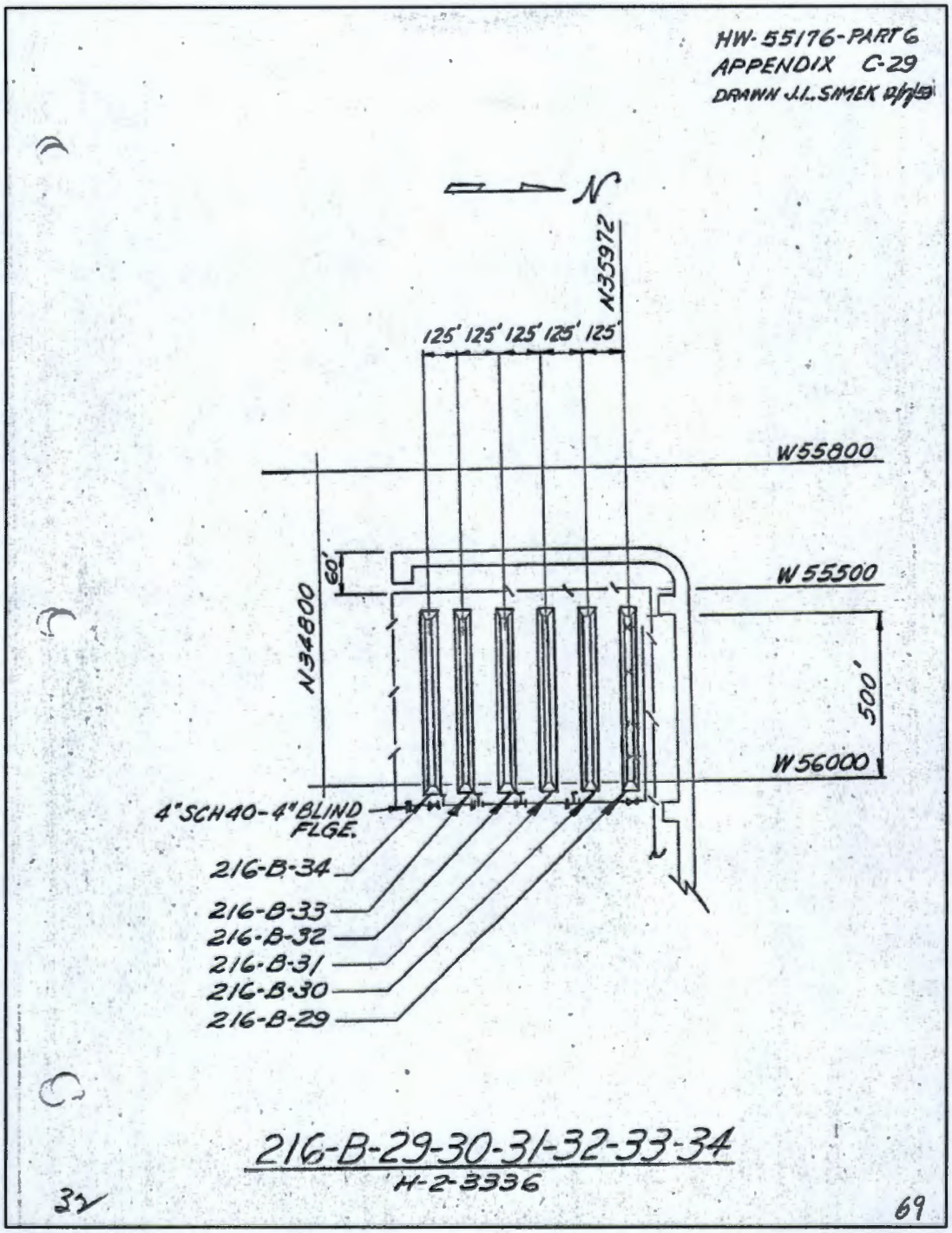


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-30.

Note: Produced from the best available copy.

Figure 2. Trench Elevation

Site: 216-B-30	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-29.

Note: Produced from the best available copy.

Figure 3. Trench Plan View

Site: 216-B-30	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

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Site: 216-B-31	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Site Description

Alternate Site Identification: 216-B-31 Trench
Site Type: Trench
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: July to August 1957 (RHO-CD-673)

Waste Site Location and Physical Description: The 216-B-31 Trench is located directly south of the 216-B-30 Trench, south of the 200 East Area (across Route 4S) in the BC Cribs and Trenches area. The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The trench was divided into two equal sections by an earthen dam 1.5 m (5 ft) high and 1.5 m (5 ft) wide at the top. The trench had side slopes of 1:1.75. Liquid was discharged into the trench via four 7.6 cm (3 in.) Schedule 40 pipes extending laterally from a 10.2 cm (4 in.) pipe that ran along the top edge of the trench. Liquid discharge was controlled by gate valves located at the top of the lateral lines. A cover constructed of 2.5 by 15.2 cm (1 by 6 in.) and 5 by 10.2 cm (2 by 4 in.) wood framing and sisalkraft paper extended the length of the trench. The vertical distance from the cover to the trench bottom was a minimum of 1.5 m (5 ft) (Figures 2 and 3). When the trench reached its specific retention capacity, the aboveground pipeline to the trench was removed and the trench was backfilled. The wood frame cover was left in place and probably collapsed under the weight of the overlying soil during the backfilling activities. The removed pipeline was buried in a shallow trench between 216-B-29 and 216-B-53A.

Waste Site Coordinates:
Lon-573088.06930 Lat-134365.68348

Site Dimensions:
Site Length: 152.4 m (500 ft) (bottom dimension) Site Depth: 2.4 m (8 ft) minimum
Site Width: 3.1 m (10 ft) (bottom dimension) Cover Thickness: 3.0 m (10 ft) minimum,
Site Area: 464.8 m^2 (5,000 ft^2) including backfill and stabilization cover

Related Site Structure(s): The 216-B-31 Trench is associated with U Plant uranium recovery process and UPR-200-E-83.

Site Posting: The trench has been backfilled with clean soil and posted Underground Radioactive Material Area. Concrete AC 540 markers outline the area where the trenches are located, but do not identify the specific trench location.

Site: 216-B-31	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Site History

Release Summary: The 216-B-31 Trench received 4.7E6 L (1.3E6 gal) of scavenged tributyl phosphate supernate liquid waste from the 221-U Building during uranium recovery operations. After the uranium was removed, the cesium and strontium content of the effluent was reduced through precipitation by adding ferrocyanide. The waste was received into the trench via aboveground transfer lines extending from the 200-E-114-PL pipeline. The waste is liquid process effluent, high in salt, and neutral to basic. The waste contained inorganic compounds such as ferrocyanide, nitrate, and phosphate.

Volume/Mass Discharged: 4.7E+06 L (1.3E+06 gal)

Pore Volume Discharged: 4.7E+06 L/ (332 ft x 5,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.33

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-31 Waste Site

Contaminant	Mass Discharged
Pu	5.2 g
Sr-90	210 Ci
Cs-137	28 Ci
U	120 kg
Ru-106	6100 Ci
Beta	1.9E+04 Ci
Co-60	2.7 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, an unplanned release (UPR-200-E-83) occurred when a large area was found to be contaminated with radioactive rabbit feces reading 5,000 to 10,000 cpm. A burrow in the 216-B-28 Trench, containing contaminated salt, was believed to be the source of the material ingested by the rabbits.

In 1969, contaminated tumbleweeds were identified growing on some of the BC Trenches. To inhibit weed growth, 45,870 m^3 (60,000 yd^3), approximately 15.2 cm (6 in.) of sand and gravel was placed on

Site: 216-B-31	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

top of the trenches. In 1981, the area was covered with additional top soil, time release herbicides, and rodent deterrent. The area was surface stabilized again in 1982.

A surface radiation survey performed in August 2005 found soil erosion and surface contamination on the trench with a maximum reading of 25 millirad per hour.

The trench is monitored by groundwater wells 299-E13-15 and 299-E13-16. Data indicate a breakthrough to the groundwater had not occurred at the trench as of June 1977. A surface radiation survey is performed annually.

Borehole and data summaries are presented in Tables 2 and 3. Borehole locations are shown on Figure 1.

Table 2. Borehole Summary for the 216-B-31 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2003	A5860/299-E13-15	West of site boundary	339 (GPL)
2003	A5861/299-E13-16	East of site boundary	348 (GPL)

GPL = geophysical log
ID = identification

Table 3. Geophysical Log Summary for the 216-B-31 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A5860	0 – 5	0.17	pCi/g	5.0	11,569.9	cpm	3
	5 – 10	–	pCi/g	–	11,078.1	cpm	6
	10 – 15	–	pCi/g	–	10,519	cpm	15
	>15	0.24	pCi/g	263	22,491	cpm	144
A5861	0 – 5	–	pCi/g	–	5,955.3	cpm	4
	5 – 10	2.35	pCi/g	9.0	8,048.2	cpm	9
	10 – 15	0.68	pCi/g	10	6,894.6	cpm	10
	>15	0.28	pCi/g	25	14,697.2	cpm	108

ID = identification

Site: 216-B-31	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): The depth of the maximum cesium-137 concentration in the closest borehole to the 216-B-31 Trench floor footprint is 2.7 m (9 ft).

Deep (>4.6 m [>15 ft] bgs): The depth of the maximum cesium-137 concentration in the closest borehole to the 216-B-31 Trench floor footprint is 7.6 m (25 ft).

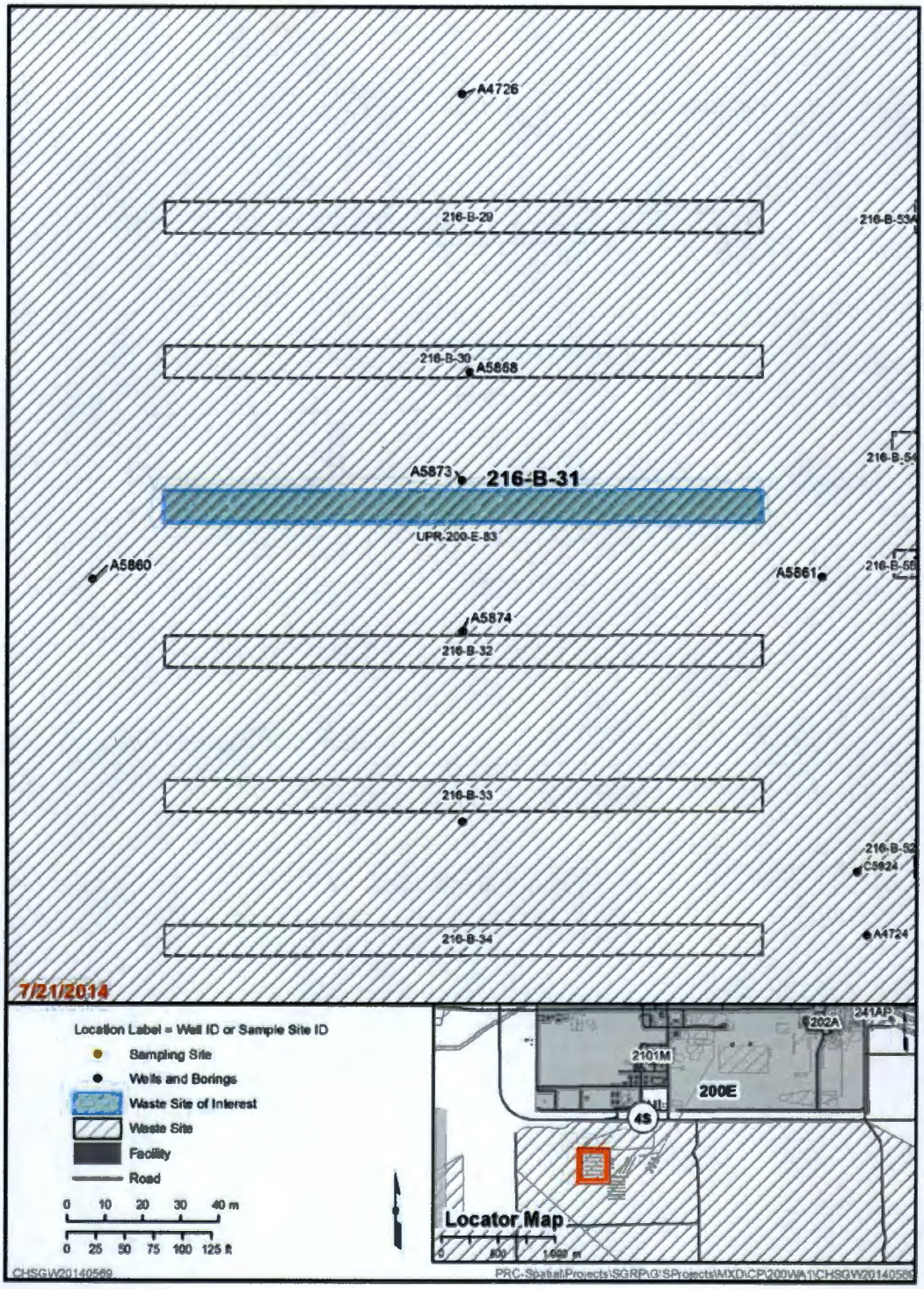
References:

HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendices C-29 and C-30, General Electric, Richland Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029.

Waste Information Data System General Summary Report for the 216-B-31 Waste Site.

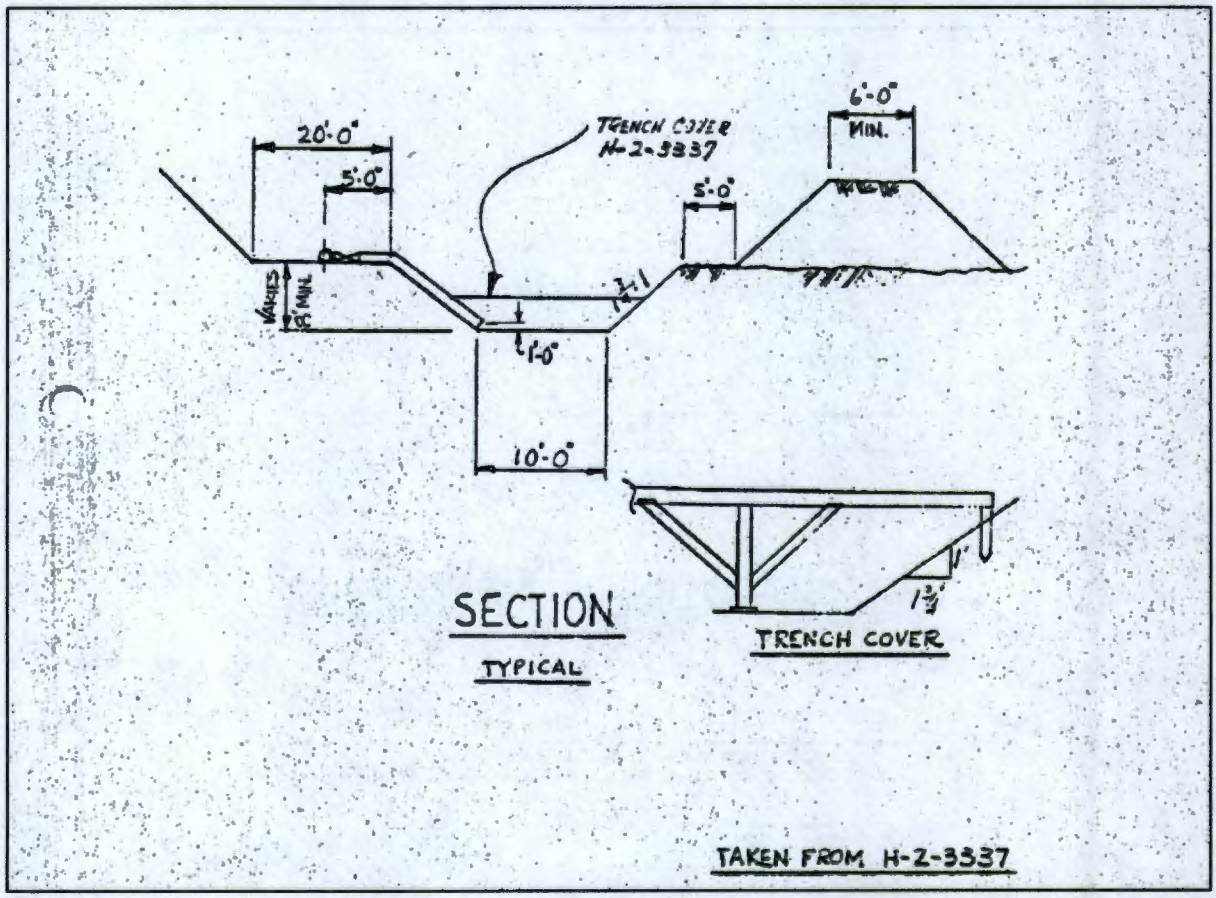
Site: 216-B-31	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



ID = identification

Figure 1. 216-B-31 Waste Site Map

Site: 216-B-31	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

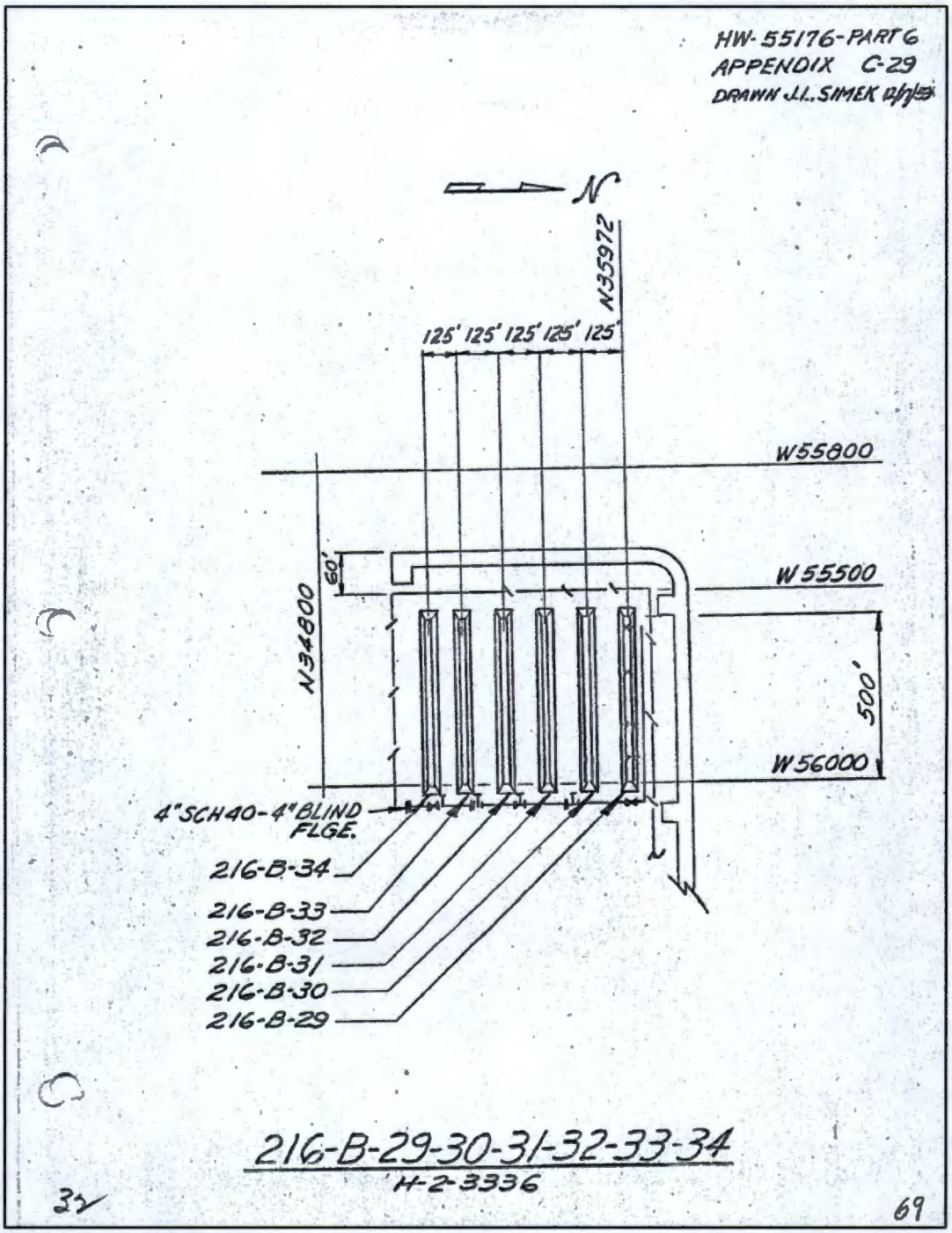


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix 30.

Note: Produced from the best available copy.

Figure 2. Trench Elevation

Site: 216-B-31	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix 29.

Note: Produced from the best available copy.

Figure 3. Trench Plan View

Site: 216-B-31	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

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Site: 216-B-32	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Site Description

Site Identification: 216-B-32 Trench
Site Type: Trench
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: August to September 1957

Waste Site Location and Physical Description: The 216-B-32 Trench is located directly south of the 216-B-31 Trench, south of the 200 East Area (across Route 4S) in the BC Cribs and Trenches area. The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The trench was divided into two equal sections by an earthen dam 1.5 m (5 ft) high and 1.5 m (5 ft) wide at the top. The trench had side slopes of 1:1.75. Liquid was discharged into the trench via four 7.6 cm (3 in.) Schedule 40 pipes extending laterally from a 10.2 cm (4 in.) pipe that ran along the top edge of the trench. Liquid discharge was controlled by gate valves located at the top of the lateral lines. A cover constructed of 2.5 by 15.2 cm (1 by 6 in.) and 5 by 10.2 cm (2 by 4 in.) wood framing and sisalkraft paper extended the length of the trench. The vertical distance from the cover to the trench bottom was a minimum of 1.5 m (5 ft) (Figures 2 and 3). When the trench reached its specific retention capacity, the aboveground pipeline to the trench was removed and the trench was backfilled. The wood frame cover was left in place and probably collapsed under the weight of the overlying soil during the backfilling activities. The removed pipeline was buried in a shallow trench between 216-B-29 and 216-B-53A.

Waste Site Coordinates:
Lon-573088.17839 Lat-134327.59006

Site Dimensions:
Site Length: 152.4 m (500 ft) (bottom dimension) Site Depth: 2.4 m (8 ft) minimum
Site Width: 3.1 m (10 ft) (bottom dimension) Cover Thickness: 3.0 m (10 ft) minimum
Site Area: 464.8 m^2 (5,000 ft^2) including backfill and stabilization cover

Related Site Structure(s): The trench is associated with U Plant uranium recovery process and UPR-200-E-83.

Site Posting: The trench has been backfilled with clean soil and posted Underground Radioactive Material Area. Concrete AC 540 markers outline the area where the trenches are located, but do not identify the specific trench location.

Site: 216-B-32	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Site History

Release Summary: The 216-B-32 Trench received 4.8E6 L (1.3E6 gal) of scavenged tributyl phosphate supernate liquid waste from the 221-U Building during uranium recovery operations. After the uranium was removed, the cesium and strontium content of the effluent was reduced through precipitation by adding ferrocyanide. The waste was received into the trench via aboveground transfer lines extending from the 200-E-114-PL pipeline. The waste is liquid process effluent, high in salt, and neutral to basic. The waste contained inorganic compounds such as ferrocyanide, nitrate, and phosphate.

Volume/Mass Discharged: 4.8E+06 L (1.3E+06 gal)

Pore Volume Discharged: 4.8E+06 L/ (332 ft x 5,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.34

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-32 Waste Site

Contaminant	Mass Discharged
Pu	2.6 g
Sr-90	260 Ci
Cs-137	130 Ci
U	11 kg
Ru-106	3800 Ci
Beta	1.2E+04 Ci
Co-60	1.7 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, an Unplanned Release (UPR-200-E-83) occurred when a large area was found to be contaminated with radioactive rabbit feces reading 5,000 to 10,000 cpm. A burrow in Trench 216-B-28, containing contaminated salt, was believed to be the source of the material ingested by the rabbits.

In 1969, contaminated Russian thistle was identified growing on some of the BC Trenches. To inhibit weed growth, 45,870 m^3 (60,000 yd^3), approximately 15.2 cm (6 in.) of sand and gravel, was placed on

Site: 216-B-32	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

top of the trenches. In 1981, the area was covered with additional top soil, time release herbicides, and rodent deterrent. The area was surface stabilized again in 1982.

A surface radiation survey is performed annually.

A borehole summary is presented in Table 2. The geophysical log for borehole A5874 is shown on Figure 4. Borehole locations are shown on Figure 1.

Table 2. Borehole Summary for the 216-B-32 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2003	A5874/299-E13-59	North of site boundary	46 (GPL)

GPL = geophysical log
ID = identification

Nature and Extent of Contamination:

As shown on Figure 4, Cs-137 and Co-60 were the only man-made radionuclides detected in borehole A5874. Cs-137 was detected at a few depths throughout the borehole with a maximum concentration of approximately 1 pCi/g. Co-60 was detected near its minimum detectable level (MDL) of approximately 0.07 pCi/g between 10.7 and 14 m (35 and 46 ft). The borehole apparently was not drilled deep enough to penetrate all the contamination.

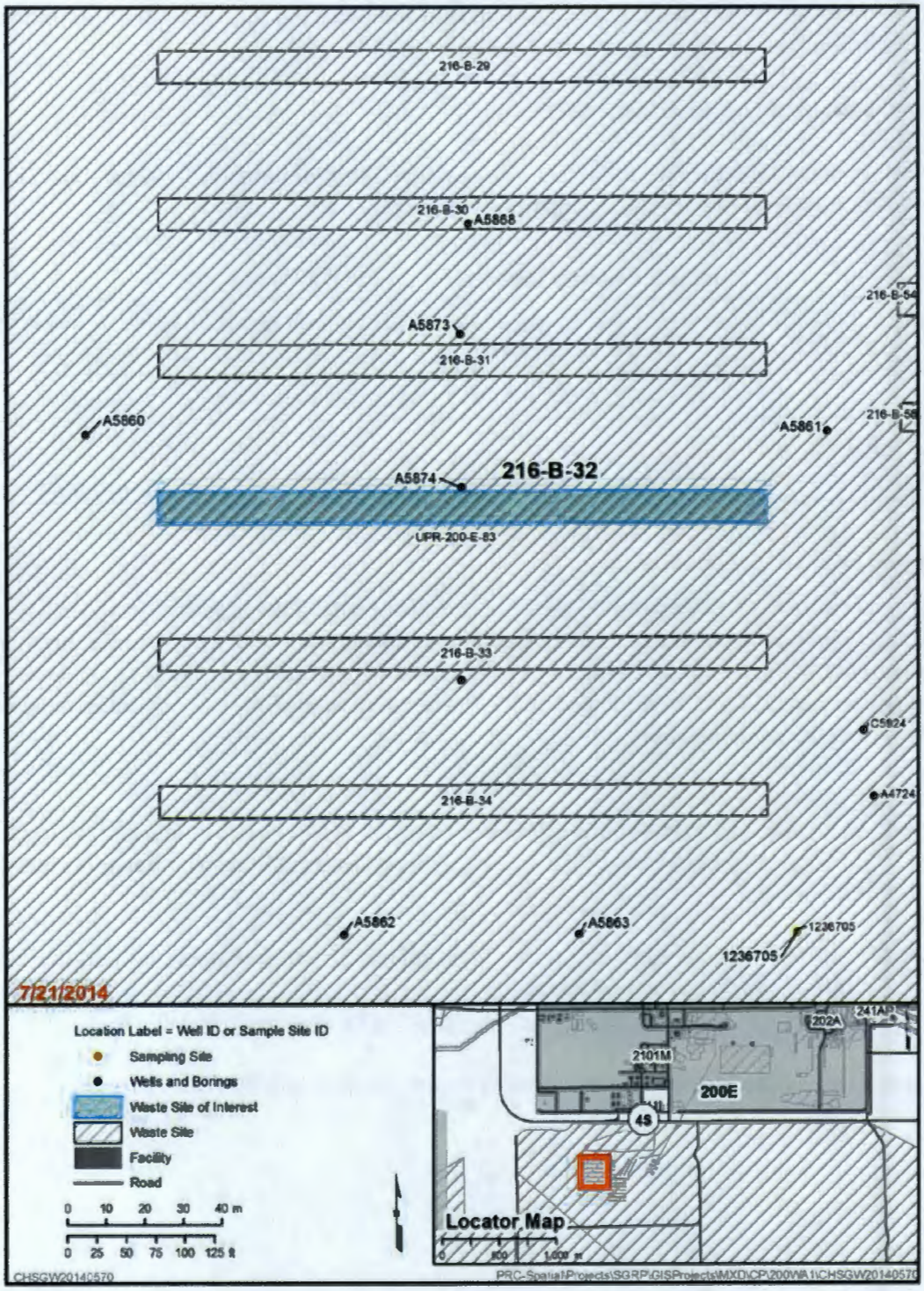
References:

HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendices C-29 and C-30, General Electric, Richland Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029.

Waste Information Data System General Summary Report for the 216-B-32 Waste Site.

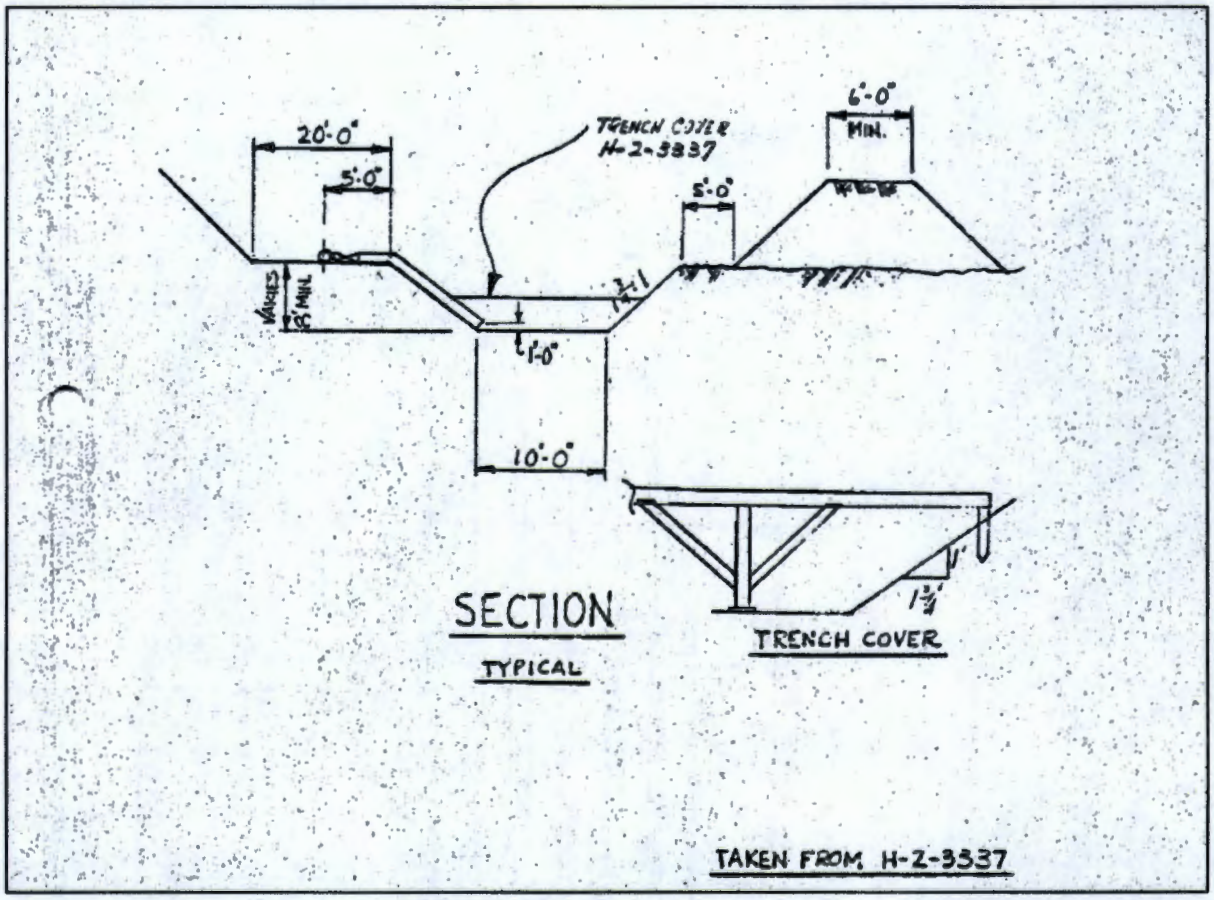
Site: 216-B-32	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



ID = identification

Figure 1. 216-B-32 Waste Site Map

Site: 216-B-32	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

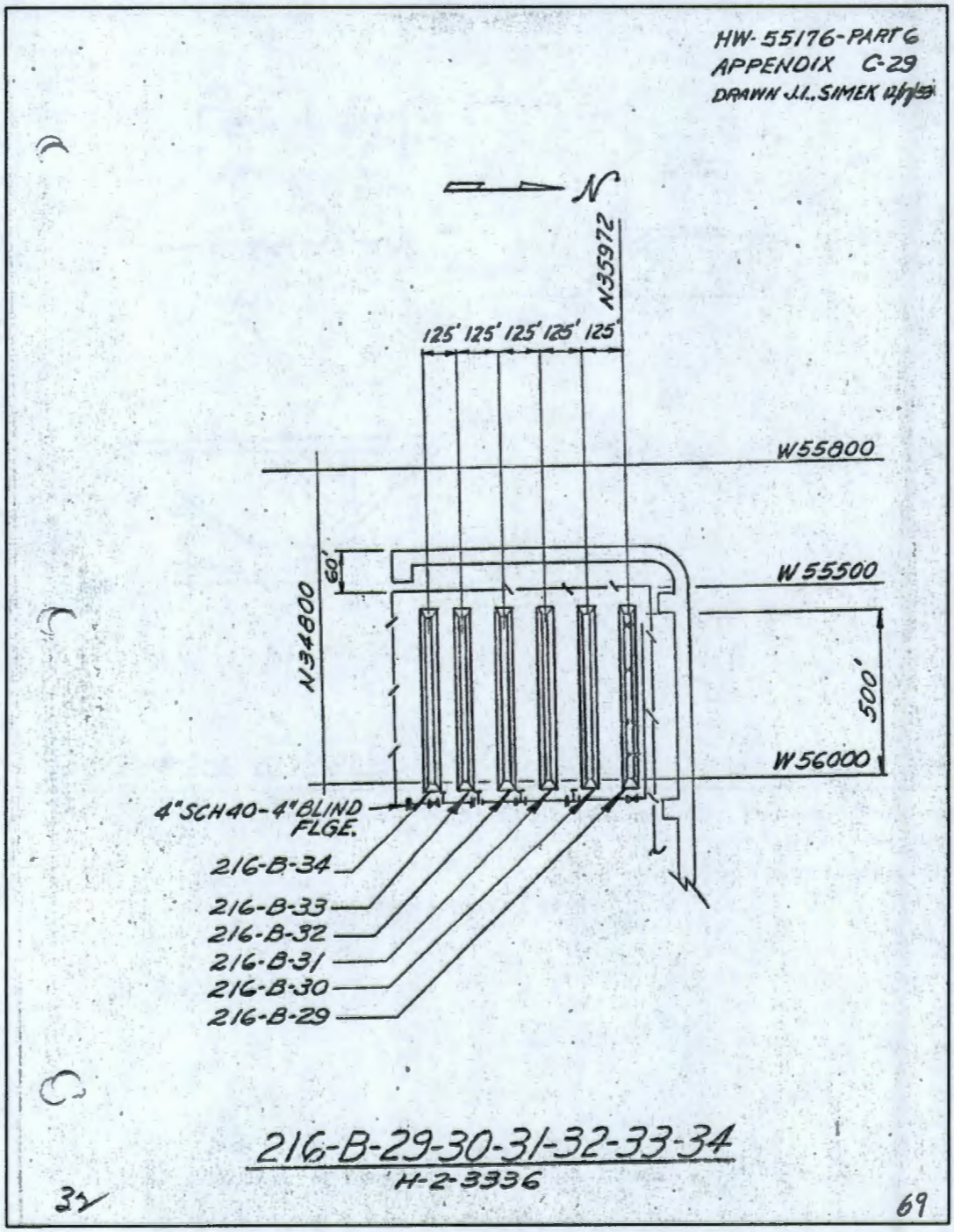


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-30.

Note: Produced from the best available copy.

Figure 2. Trench Elevation

Site: 216-B-32	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

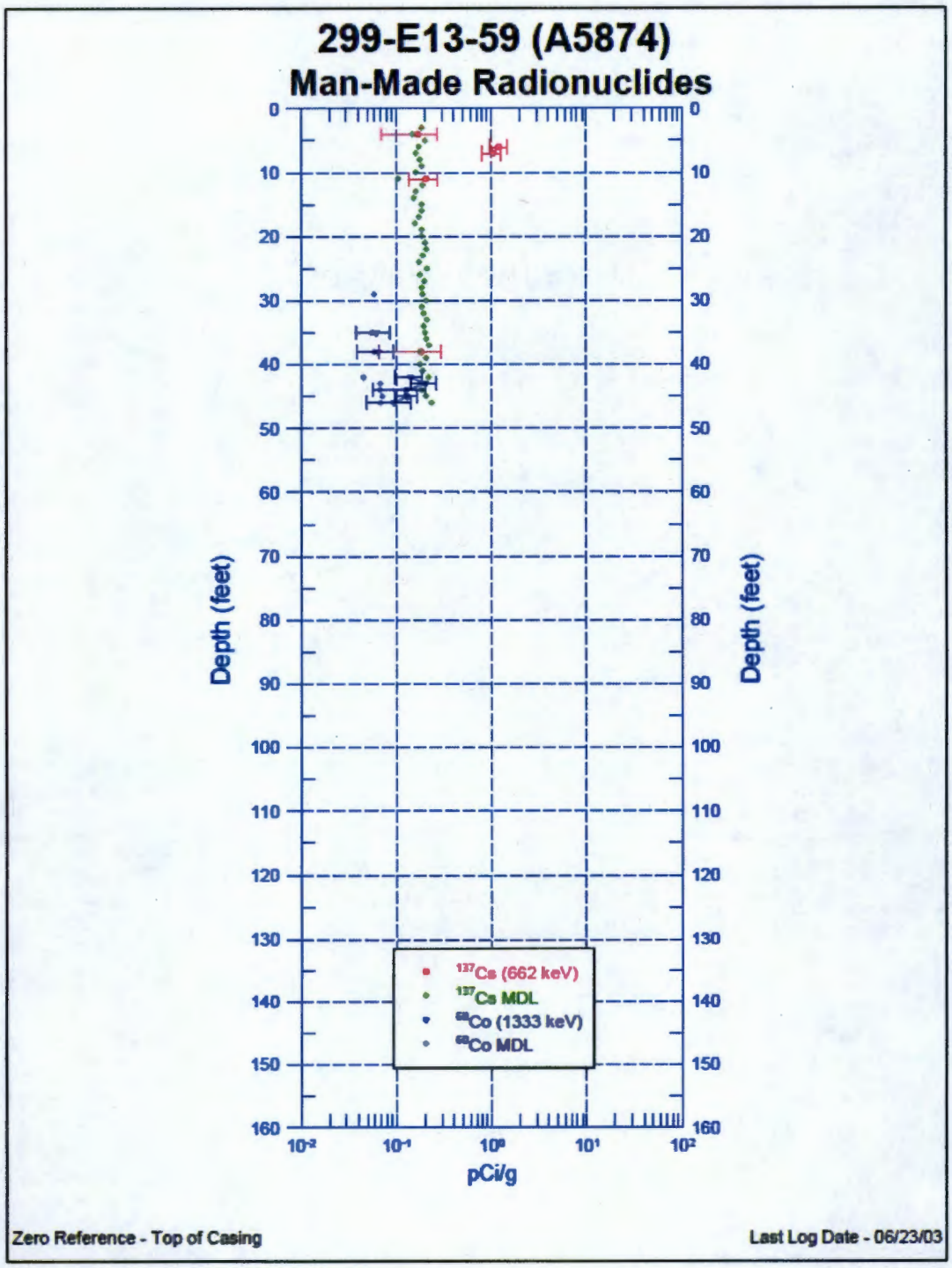


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-29.

Note: Produced from the best available copy.

Figure 3. Trench Plan View

Site: 216-B-32	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



MDL = minimum detectable level

Figure 4. Geophysical Log for Borehole A5874

Site: 216-B-32	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

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Site: 216-B-33	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Site Description

Alternate Site Identification: 216-B-33 Trench
Site Type: Trench
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: September to October 1957

Waste Site Location and Physical Description: The 216-B-33 Trench is located directly south of the 216-B-32 Trench, south of the 200 East Area (across Route 4S) in the BC Cribs and Trenches area. The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The trench was divided into two equal sections by an earthen dam 1.5 m (5 ft) high and 1.5 m (5 ft) wide at the top. The trench had side slopes of 1:1.75. Liquid was discharged into the trench via four 7.6 cm (3 in.) Schedule 40 pipes extending laterally from a 10.2 cm (4 in.) pipe that ran along the top edge of the trench. Liquid discharge was controlled by gate valves located at the top of the lateral lines. A cover constructed of 2.5 by 15.2 cm (1 by 6 in.) and 5 by 10.2 cm (2 by 4 in.) wood framing and sisalkraft paper extended the length of the trench. The vertical distance from the cover to the trench bottom was a minimum of 1.5 m (5 ft) (Figures 2 and 3). When the trench reached its specific retention capacity, the aboveground pipeline to the trench was removed and the trench was backfilled. The wood frame cover was left in place and probably collapsed under the weight of the overlying soil during the backfilling activities. The removed pipeline was buried in a shallow trench between 216-B-29 and 216-B-53A.

Waste Site Coordinates:
Lon-573088.31255 Lat-134289.49220

Site Dimensions:
Site Length: 152.4 m (500 ft) (bottom dimension) Site Depth: 2.4 m (8 ft) minimum
Site Width: 3.1 m (10 ft) (bottom dimension) Cover Thickness: 3.1 m (10 ft) minimum
Site Area: 464.8 m^2 (5,000 ft^2) including backfill and stabilization cover

Related Site Structure(s): The 216-B-33 Trench is associated with U Plant uranium recovery process and UPR-200-E-83.

Site Posting: The trench has been backfilled with clean soil and posted Underground Radioactive Material Area. Concrete AC 540 markers outline the area where the trenches are located, but do not identify the specific trench location.

Site: 216-B-33	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Site History

Release Summary: The 216-B-33 Trench received 4.7E+06 L (1.3E+06 gal) of scavenged tributyl phosphate supernate liquid waste from the 221-U Building during uranium recovery operations. After the uranium was removed, the cesium and strontium content of the effluent was reduced through precipitation by adding ferrocyanide. The waste was received into the trench via aboveground transfer lines extending from the 200-E-114-PL pipeline. The waste is liquid process effluent, high in salt, and neutral to basic. The waste contained inorganic compounds such as ferrocyanide, nitrate, and phosphate.

Volume/Mass Discharged: 4.7E+06 L (1.3E+06 gal)

Pore Volume Discharged: 4.7E+06 L/ (332 ft x 5,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.33

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-33 Waste Site

Contaminant	Mass Discharged
Pu	12 g
Sr-90	41 Ci
Cs-137	270 Ci
U	20 kg
Ru-106	3200 Ci
Beta	1.0E+04 Ci
Co-60	1.4 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, an unplanned release (UPR-200-E-83) occurred when a large area was found to be contaminated with radioactive rabbit feces reading 5,000 to 10,000 cpm. A burrow in the 216-B-28 Trench, containing contaminated salt, was believed to be the source of the material ingested by the rabbits.

Site: 216-B-33	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

In 1969, contaminated tumbleweeds were identified growing on some of the BC Trenches. To inhibit weed growth, 45,870 m^3 (60,000 yd^3), approximately 15.2 cm (6 in.) of sand and gravel, was placed on top of the trenches. In 1981, the area was covered with additional top soil, time release herbicides, and rodent deterrent. The area was surface stabilized again in 1982.

A surface radiation survey is performed annually.

Nature and Extent of Contamination:

Insufficient data are available to evaluate for the presence or absence of shallow or deep soil contamination. Shallow soil within the basin is likely contaminated from historical discharges to the basin, starting at the bottom of the trench (2.4 m [8 ft] below ground surface [bgs]). Due to the volume of waste received in the trench, deep (>4.6 m [>15 ft] bgs) contamination is likely and may extend to groundwater (101 m [332 ft] bgs).

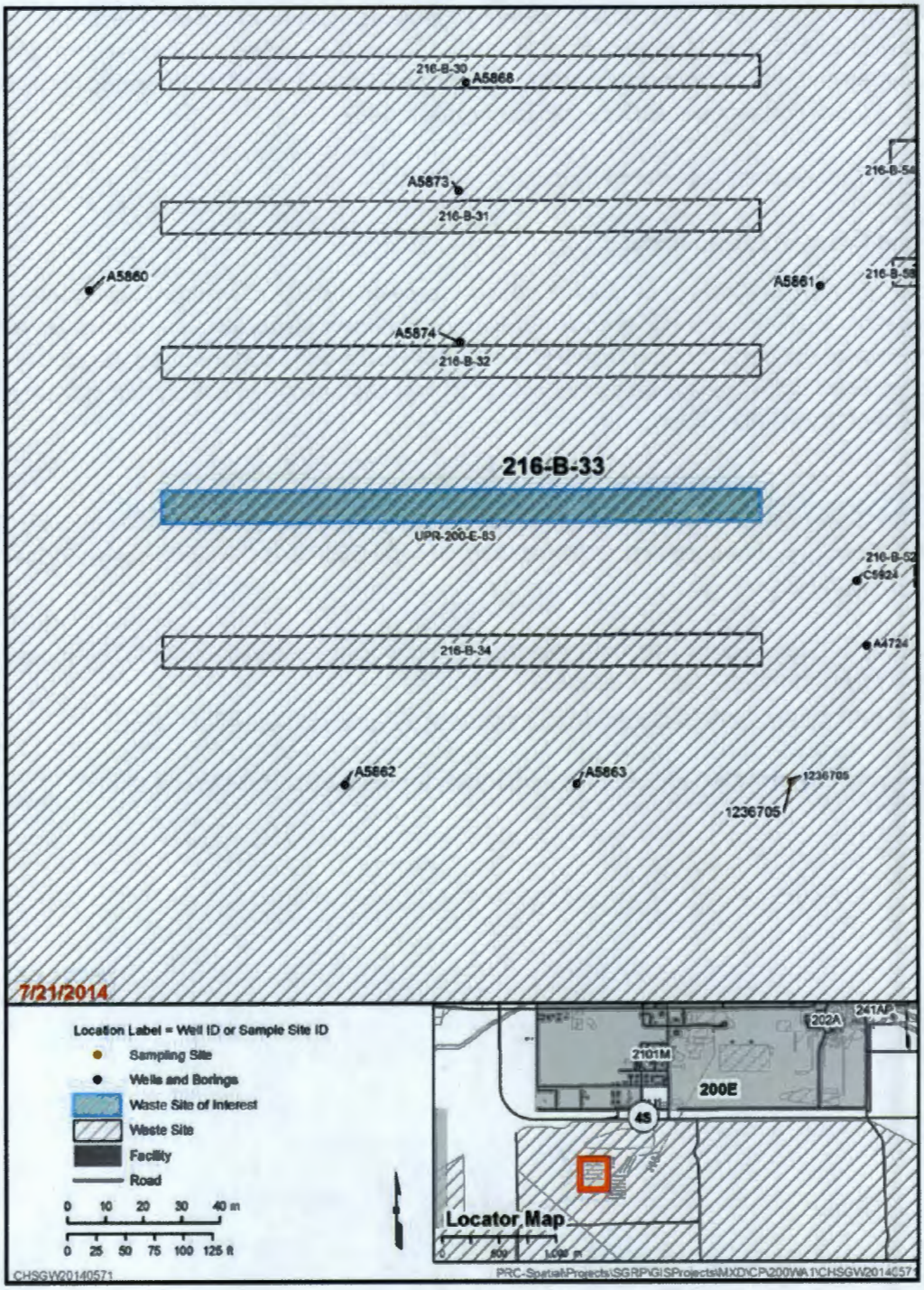
References:

HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendices C-29 and C-30, General Electric, Richland Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029.

Waste Information Data System General Summary Report for the 216-B-33 Waste Site.

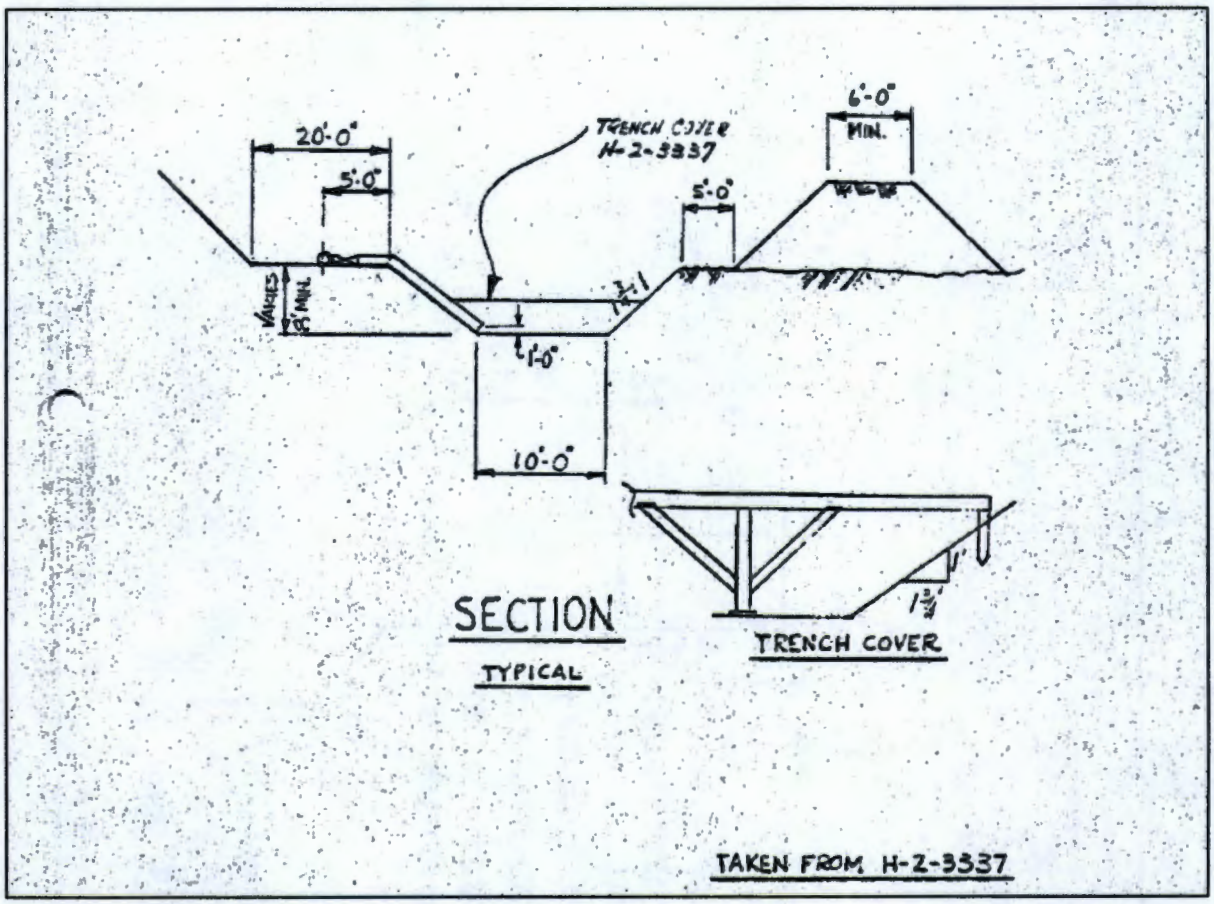
Site: 216-B-33	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



ID = identification

Figure 1. 216-B-33 Waste Site Map

Site: 216-B-33	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

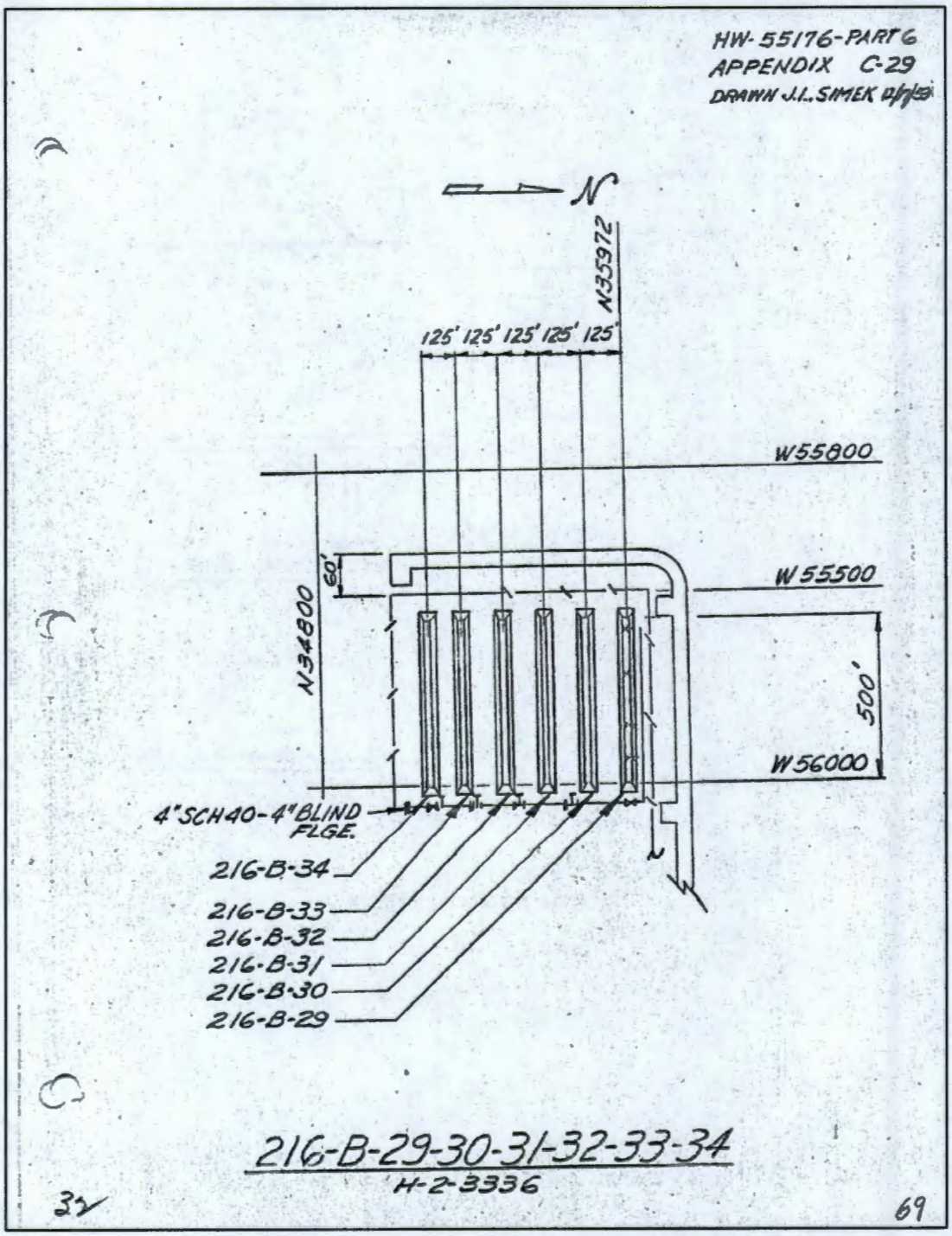


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-30.

Note: Produced from the best available copy.

Figure 2. Trench Elevation

Site: 216-B-33	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-29.

Note: Produced from the best available copy.

Figure 3. Trench Plan View

Site: 216-B-34	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Site Description

Site Identification: 216-B-34 Trench
Site Type: Trench
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: October 1957

Waste Site Location and Physical Description: The 216-B-34 Trench is located directly south of the 216-B-33 Trench, south of the 200 East Area (across Route 4S) in the BC Cribs and Trenches area. The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The trench was divided into two equal sections by an earthen dam 1.5 m (5 ft) high and 1.5 m (5 ft) wide at the top. The trench had side slopes of 1:1.75. Liquid was discharged into the trench via four 7.6 cm (3 in.) Schedule 40 pipes extending laterally from a 10.2 cm (4 in.) pipe that ran along the top edge of the trench. Liquid discharge was controlled by gate valves located at the top of the lateral lines. A cover constructed of 2.5 by 15.2 cm (1 by 6 in.) and 5 by 10.2 cm (2 by 4 in.) wood framing and sisalkraft paper extended the length of the trench. The vertical distance from the cover to the trench bottom was a minimum of 1.5 m (5 ft) (Figures 2 and 3). When the trench reached its specific retention capacity, the aboveground pipeline to the trench was removed and the trench was backfilled. The wood frame cover was left in place and probably collapsed under the weight of the overlying soil during the backfilling activities. The removed pipeline was buried in a shallow trench between 216-B-29 and 216-B-53A.

Waste Site Coordinates:
Lon-573088.42216 Lat-134251.39817

Site Dimensions:
Site Length: 152.4 m (500 ft) (bottom dimension) Site Depth: 2.4 m (8 ft) minimum
Site Width: 3.1 m (10 ft) (bottom dimension) Cover Thickness: 3.1 m (10 ft) minimum
Site Area: 464.8 m^2 (5,000 ft^2) including backfill and stabilization cover

Related Site Structure(s): The trench is associated with U Plant uranium recovery process and UPR-200-E-83.

Site Posting: The trench has been backfilled with clean soil and posted Underground Radioactive Material Area. Concrete AC 540 markers outline the area where the trenches are located, but do not identify the specific trench location.

Site: 216-B-34	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Site History

Release Summary: 216-B-34 Trench received 4.9E6 L (1.3E6 gal) of scavenged tributyl phosphate supernate liquid waste from the 221-U Building during uranium recovery operations. After the uranium was removed, the cesium and strontium content of the effluent was reduced through precipitation by adding ferrocyanide. The waste was received into the trench via aboveground transfer lines extending from the 200-E-114-PL pipeline. The waste is liquid process effluent, high in salt, and neutral to basic. The waste contained inorganic compounds such as ferrocyanide, nitrate, and phosphate.

Volume/Mass Discharged: 4.9E+06 L (1.3E+06 gal)

Pore Volume Discharged: 4.9E+06 L/ (332 ft x 5,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.35

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-34 Waste Site

Contaminant	Mass Discharged
Pu	5.7 g
Sr-90	41 Ci
Cs-137	17 Ci
U	85 kg
Ru-106	1,400 Ci
Beta	4,400 Ci
Co-60	0.60 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, an unplanned release (UPR-200-E-83) occurred when a large area was found to be contaminated with radioactive rabbit feces reading 5,000 to 10,000 cpm. A burrow in Trench 216-B-28, containing contaminated salt, was believed to be the source of the material ingested by the rabbits.

In 1969, contaminated tumbleweeds were identified growing on some of the BC Trenches. To inhibit weed growth, 45,870 m^3 (60,000 yd^3), approximately 15.2 cm (6 in.) of sand and gravel was placed on

Site: 216-B-34	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

top of the trenches. In 1981, the area was covered with additional top soil, time release herbicides, and rodent deterrent. The area was surface stabilized again in 1982.

A radiation survey conducted in January 2006 detected contaminated rabbit feces, reading 8,000 cpm. Evidence of severe wind erosion was also noted.

The trench is monitored by groundwater wells 299-E13-10, 299-E13-17, and 299-E13-18. Data indicate a breakthrough to the groundwater had not occurred at the trench as of June 1977. A surface radiation survey is performed annually.

Borehole and data summaries are presented in Tables 2 and 3. Borehole locations are shown on Figure 1.

Table 2. Borehole Summary for the 216-B-34 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
1965-1968	A5862/299-E13-17	South of site boundary	339 (GPL)
1972-2003	A5863/299-E13-18	South of site boundary	381 (GPL)

GPL = geophysical log
ID = identification

Table 3. Geophysical Log Summary for the 216-B-34 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A5862	0 – 5	–	pCi/g	–	11,246	cpm	5
	5 – 10	–	pCi/g	–	11,414	cpm	6
	10 – 15	–	pCi/g	–	10,715	cpm	15
	>15	0.23	pCi/g	154	21,247	cpm	145
A5863	0 – 5	0.37	pCi/g	5.0	8,152.8	cpm	3
	5 – 10	–	pCi/g	–	8,018.9	cpm	6
	10 – 15	–	pCi/g	–	7,237.7	cpm	15
	>15	0.36	pCi/g	70	16,339.5	cpm	333

bgs = below ground surface
ID = identification

Site: 216-B-34	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): The depth of the maximum cesium-137 concentration in the closest borehole to the 216-B-34 Trench floor footprint is 1.5 m (5 ft).

Deep (>4.6 m [>15 ft] bgs): The depth of the maximum cesium-137 concentration in the closest borehole to the 216-B-34 Trench floor footprint is 21.3 m (70 ft).

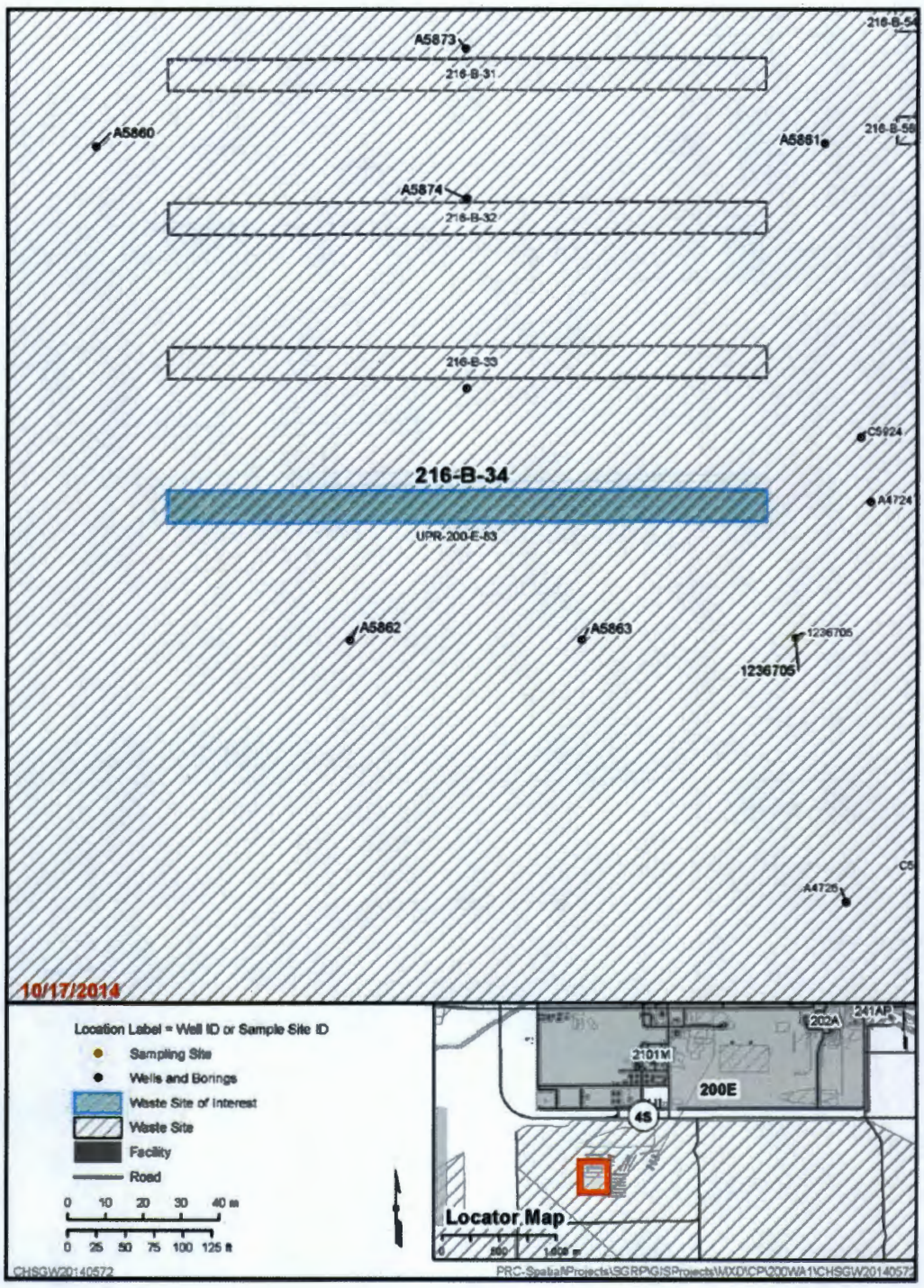
References:

HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendices C-29 and C-30, General Electric, Richland Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029.

Waste Information Data System General Summary Report for the 216-B-34 Waste Site.

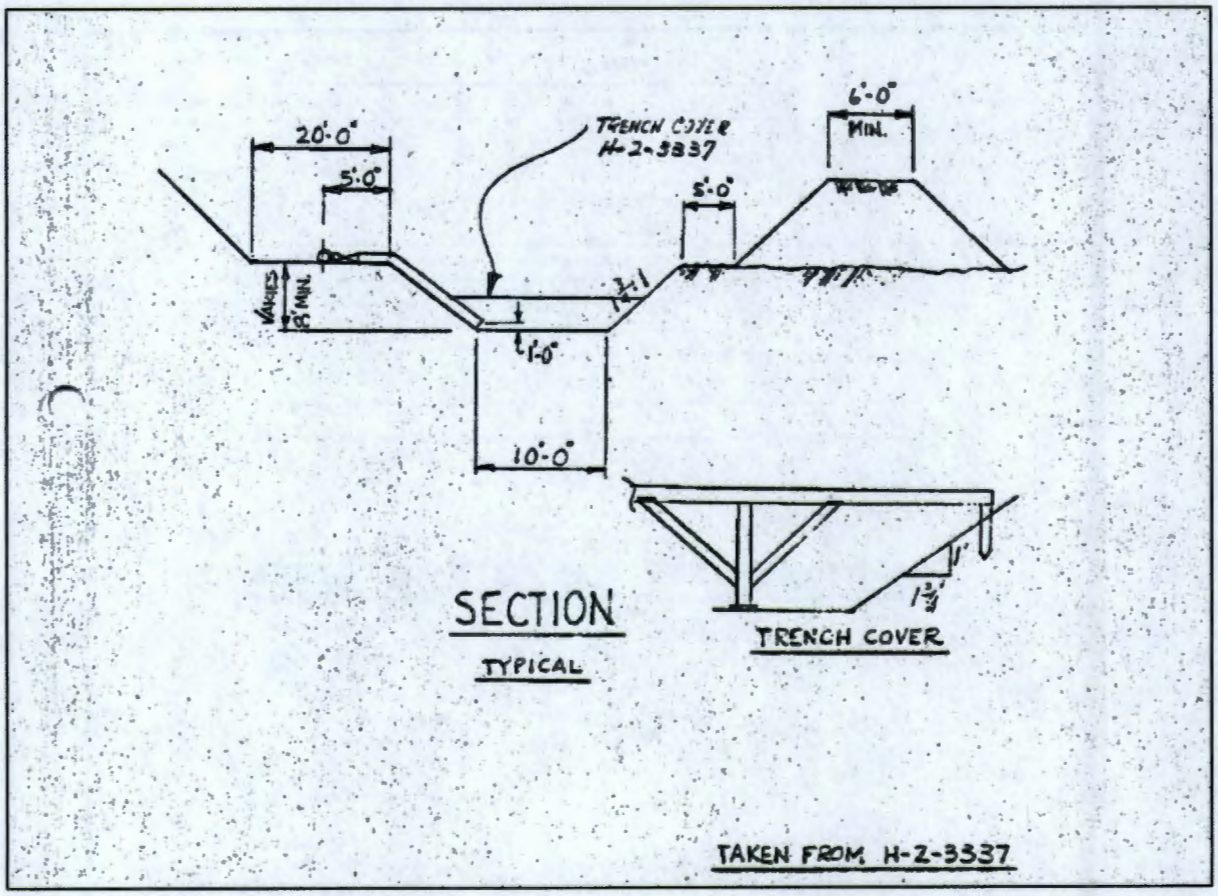
Site: 216-B-34	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



ID = identification

Figure 1. 216-B-34 Waste Site Map

Site: 216-B-34	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

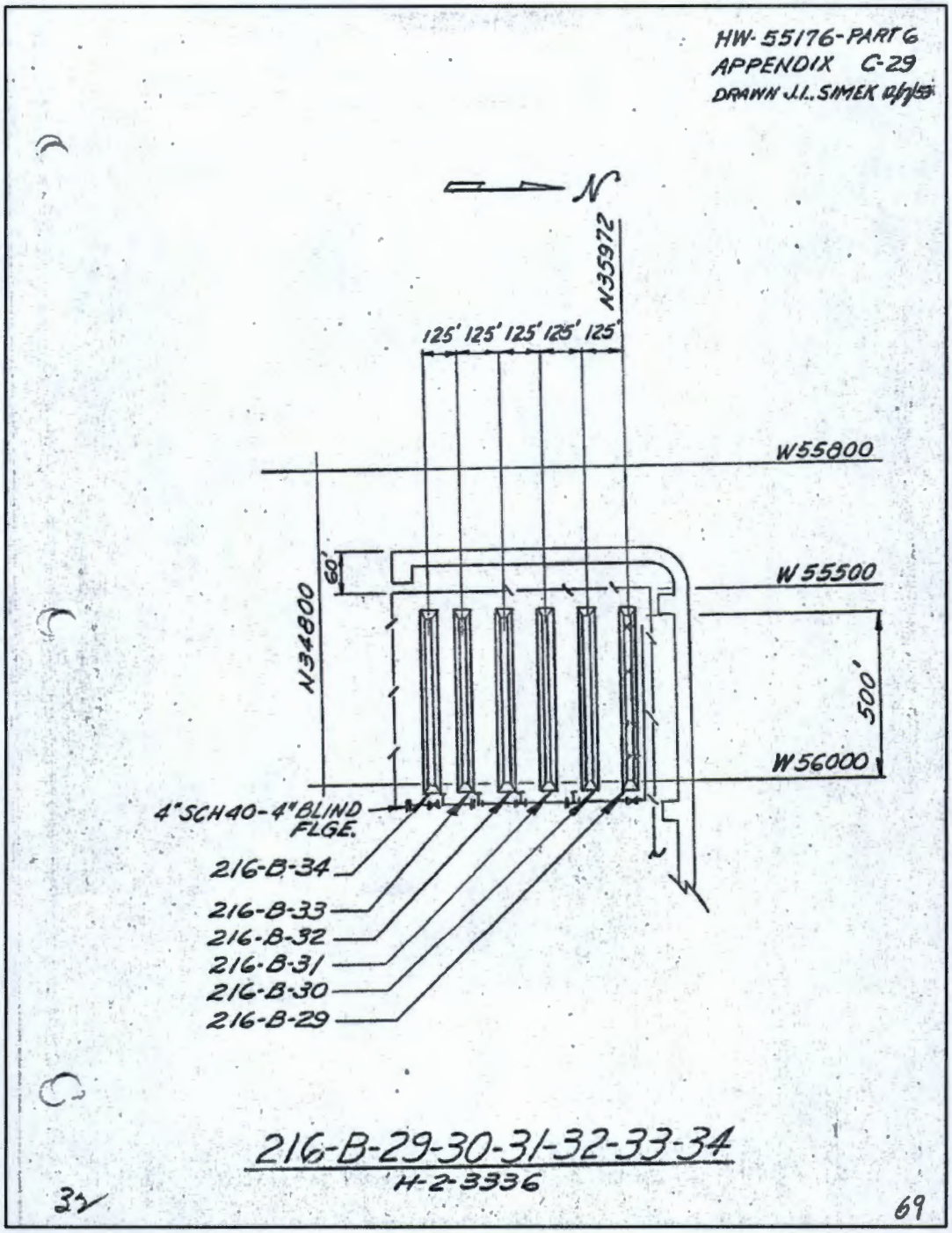


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-30.

Note: Produced from the best available copy.

Figure 2. Trench Elevation

Site: 216-B-34	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-29.

Note: Produced from the best available copy.

Figure 3. Trench Plan View

Site: 216-B-34	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

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Site: 216-B-52	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Site Description

Alternate Site Identification: 216-B-52 Trench
Site Type: Trench
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: December 1957 and January 1958

Waste Site Location and Physical Description: The 216-B-52 Trench is located immediately north of the 216-B-32 Trench, south of the 200 East Area (across Route 4S) in the BC Cribs and Trenches area. The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The Trench was divided into two equal sections by an earthen dam 1.5 m (5 ft) high and 1.5 m (5 ft) wide at the top. The trench had side slopes of 1.25:1. A wood framed and sisalkraft paper cover extended the length of the trench (Figures 2 and 3). When the trench reached its specific retention capacity, the aboveground pipeline to the trench was removed and the trench was backfilled.

Waste Site Coordinates:
Lon-573298.62500 Lat-134272.54685

Site Dimensions:
Site Length: 176.8 m (580 ft) (bottom dimension) Site Depth: 2.4 m (8 ft) minimum
Site Width: 3.1 m (10 ft) (bottom dimension) Cover Thickness: 3.0 m (10 ft) minimum
Site Area: 548.1 m^2 (5,800 ft^2) including backfill and stabilization cover

Related Site Structure(s): The trench is associated with U Plant uranium recovery process and UPR-200-E-83.

Site Posting: The trench has been backfilled with clean soil and posted Underground Radioactive Material Area. Concrete AC 540 markers outline the area where the trenches are located, but do not identify the specific trench location.

Site History

Release Summary: The 216-B-52 Trench received 8.5E6 L (2.3E6 gal) of scavenged tributyl phosphate supernate liquid waste from the 221-U Building during uranium recovery operations. After the uranium was removed, the cesium and strontium content of the effluent was reduced through precipitation by adding ferrocyanide. The waste was received into the trench via aboveground transfer lines extending from the 200-E-114-PL pipeline. The waste is liquid process effluent, high in salt, and neutral to basic. The waste contained inorganic compounds such as ferrocyanide, nitrate, and phosphate.

Site: 216-B-52	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Volume Discharged: 8.5E+06 L (2.3E+06 gal)

Pore Volume Discharged: 8.5E+06 L/ (323 ft x 5,800 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.53

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-52 Waste Site

Contaminant	Mass Discharged
Pu	19 g
Sr-90	11 Ci
Cs-137	340 Ci
U	30 kg
Ru-106	8,600 Ci
Beta	1.8E+04 Ci
Co-60	4.5 Ci

RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, an Unplanned Release (UPR-200-E-83) occurred when a large area was found to be contaminated with radioactive rabbit feces reading 5,000 to 10,000 cpm. A burrow in Trench 216-B-28, containing contaminated salt, was believed to be the source of the material ingested by the rabbits.

In 1969, contaminated tumbleweeds were identified growing on some of the BC Trenches. To inhibit weed growth, 45,870 m^3 (60,000 yd^3), approximately 15.2 cm (6 in.) of sand and gravel, was placed on top of the trenches. In 1981, the area was covered with additional top soil, time release herbicides, and rodent deterrent. The area was surface stabilized again in 1982.

A surface radiation survey is performed annually.

Borehole and data summaries are presented in Tables 2 and 3. Borehole locations are shown on Figure 1.

Site: 216-B-52	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Table 2. Borehole Summary for the 216-B-52 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2003	A4724/299-E13-10	West of site boundary	3 - 339 (GPL)
2008	C5924/299-E13-63	West of site boundary	0 - 245 (GPL) 5 – 245.5 (50 soil samples)

GPL = geophysical log
ID = identification

Table 3. Geophysical Log Summary 216-B-52

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A4724	0 – 5	–	pCi/g	–	6,408.3	cpm	3
	5 – 10	0.28	pCi/g	6.0	6,204.8	cpm	8
	10 – 15	–	pCi/g	–	5,424.3	cpm	11
	>15	0.38	pCi/g	330	14,336.2	cpm	243
C5924	0 – 5	2.5	pCi/g	3.0	17,043.1	cpm	2.7
	5 – 10	4.8	pCi/g	6.0	20,513.6	cpm	6
	10 – 15	–	pCi/g	–	12,363.9	cpm	15
	>15	0.23	pCi/g	83	17,178.2	cpm	129

bgs = below ground surface
ID = identification

Site: 216-B-52	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

Table 4. Soil Maximum Detection Summary for the 216-B-52 Waste Site (Soil Borehole C5924)

Chemical	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Aluminum	92.6	µg/kg	12.5	5,270,000	µg/kg	36
Calcium	13,400	µg/kg	5.5	9,520,000	µg/kg	36
Cesium-137	0.721	pCi/g	5.5	–	–	–
Fluoride	707	µg/kg	12.5	2,060	µg/kg	20
Iron	146	µg/kg	12.5	15,700,000	µg/kg	20
Magnesium	4,280	µg/kg	12.5	4,260,000	µg/kg	20
Manganese	–	–	–	337,000	µg/kg	36
Nitrate	15,300	µg/kg	12.5	2,520,000	µg/kg	118
Potassium	5,370	µg/kg	5.5	1,480,000	µg/kg	178.5
Sodium	12,800	µg/kg	12.5	30,200	µg/kg	56
Sulfate	9,720	µg/kg	12.5	129,000	µg/kg	105.5
Technetium-99	–	–	–	98.7	pCi/g	118
Uranium-238	0.000188	pCi/g	5.5	0.157	pCi/g	36

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): The depth of the maximum cesium-137 concentration in the nearest borehole to the 216-B-52 Trench floor footprint is 1.8 m (6 ft).

Deep (>4.6 m [>15 ft] bgs): The depth of the maximum cesium-137 concentration in the nearest borehole to the 216-B-52 Trench floor footprint is 100.6 m (330 ft). The trench is above site background levels for nitrate (2520 mg/k) below 4.6 m (15 ft).

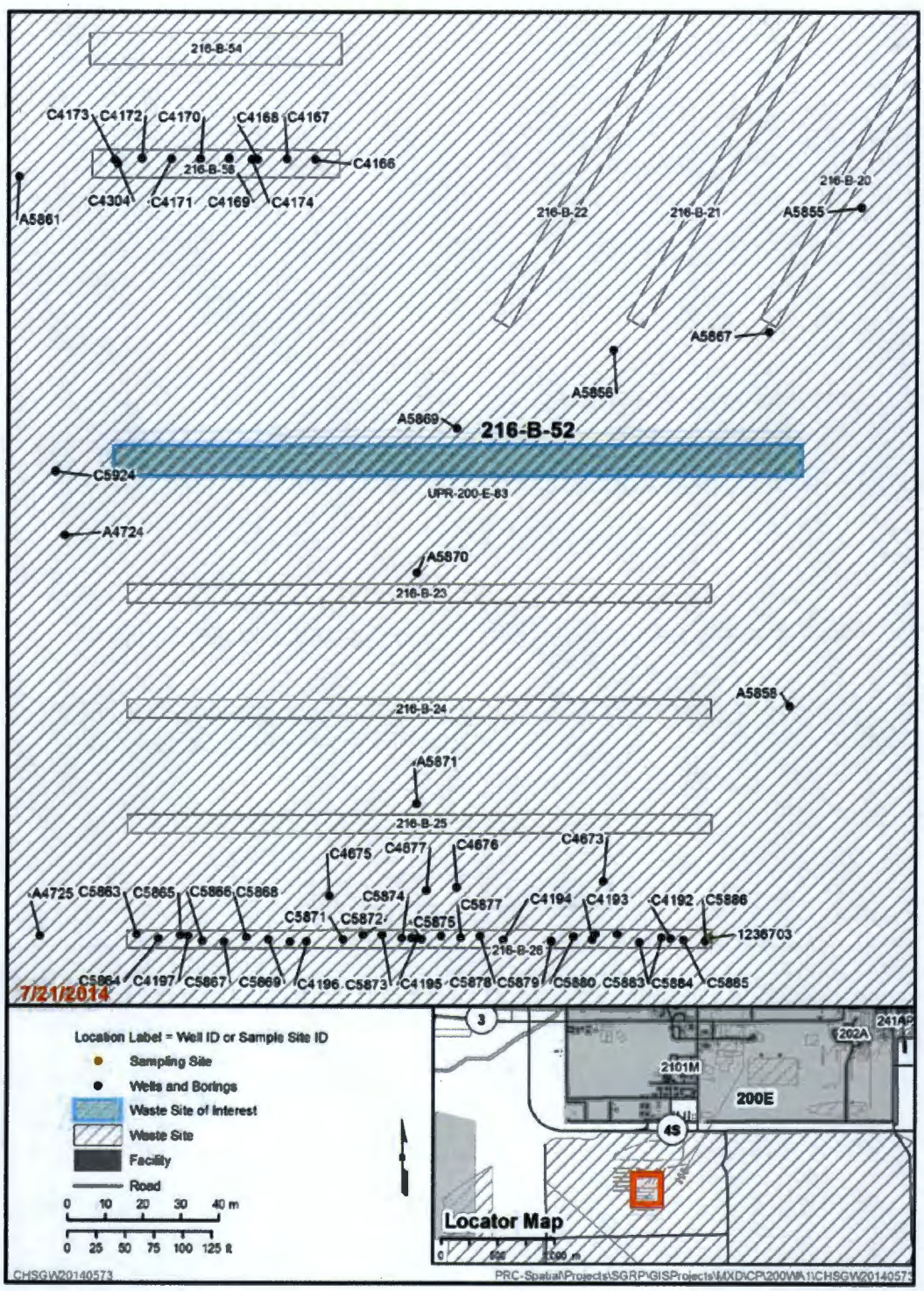
References:

HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendices C-28, C-29, and C-30, General Electric, Richland Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029.

Waste Information Data System General Summary Report for the 216-B-52 Waste Site.

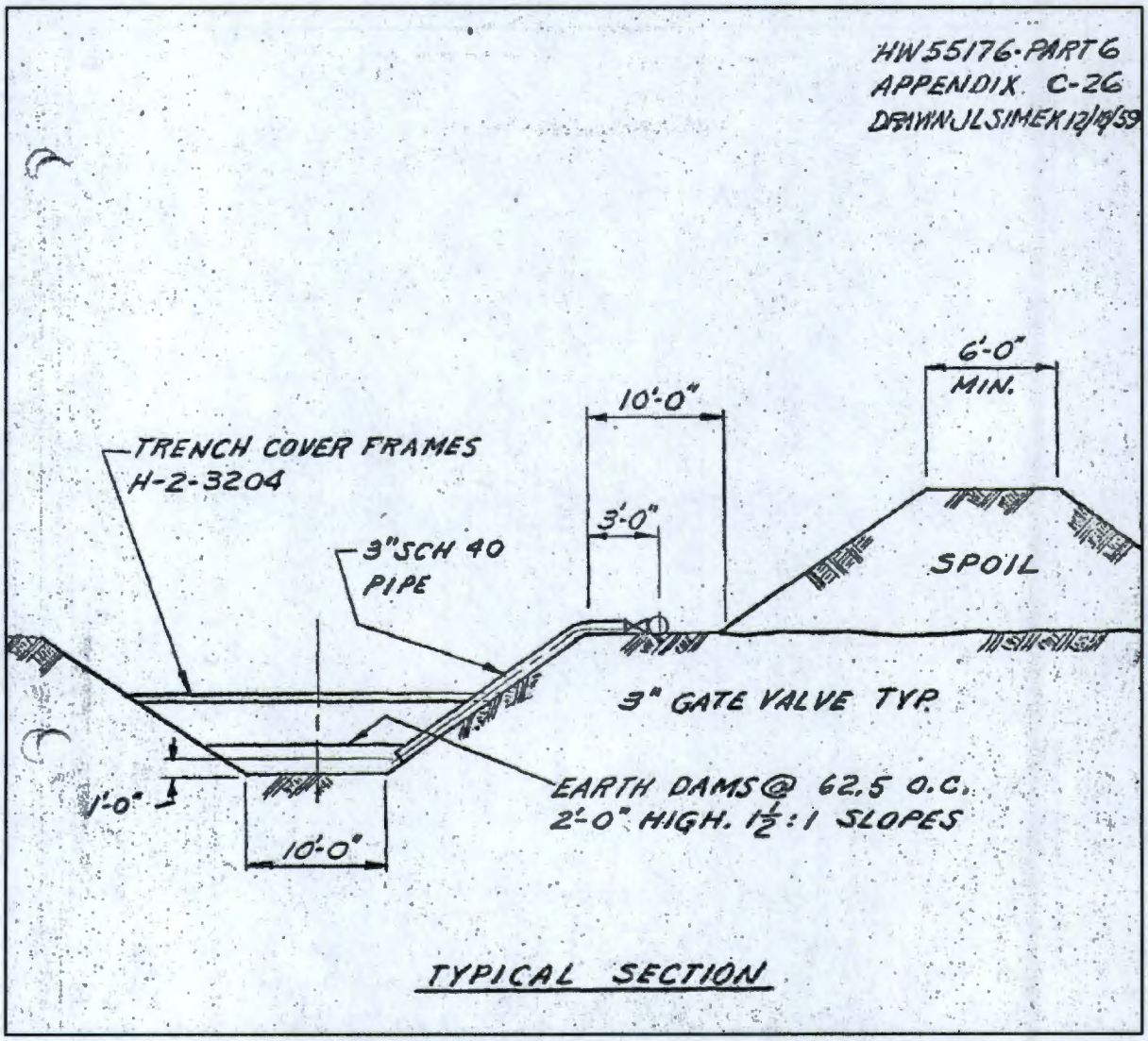
Site: 216-B-52	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



ID = identification

Figure 1. 216-B-52 Waste Site Map

Site: 216-B-52	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

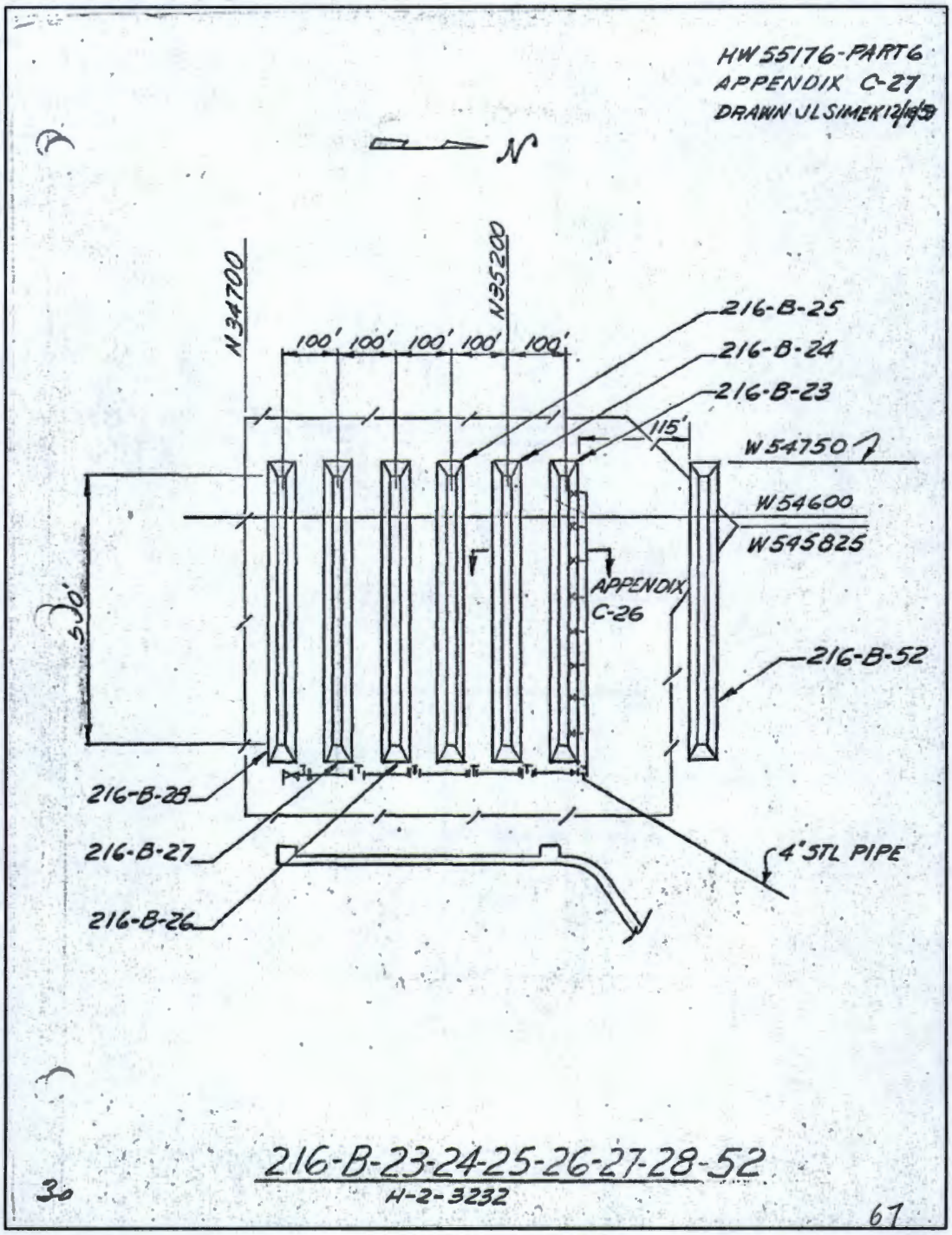


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-26.

Note: Produced from the best available copy.

Figure 2. Trench Elevation

Site: 216-B-52	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)

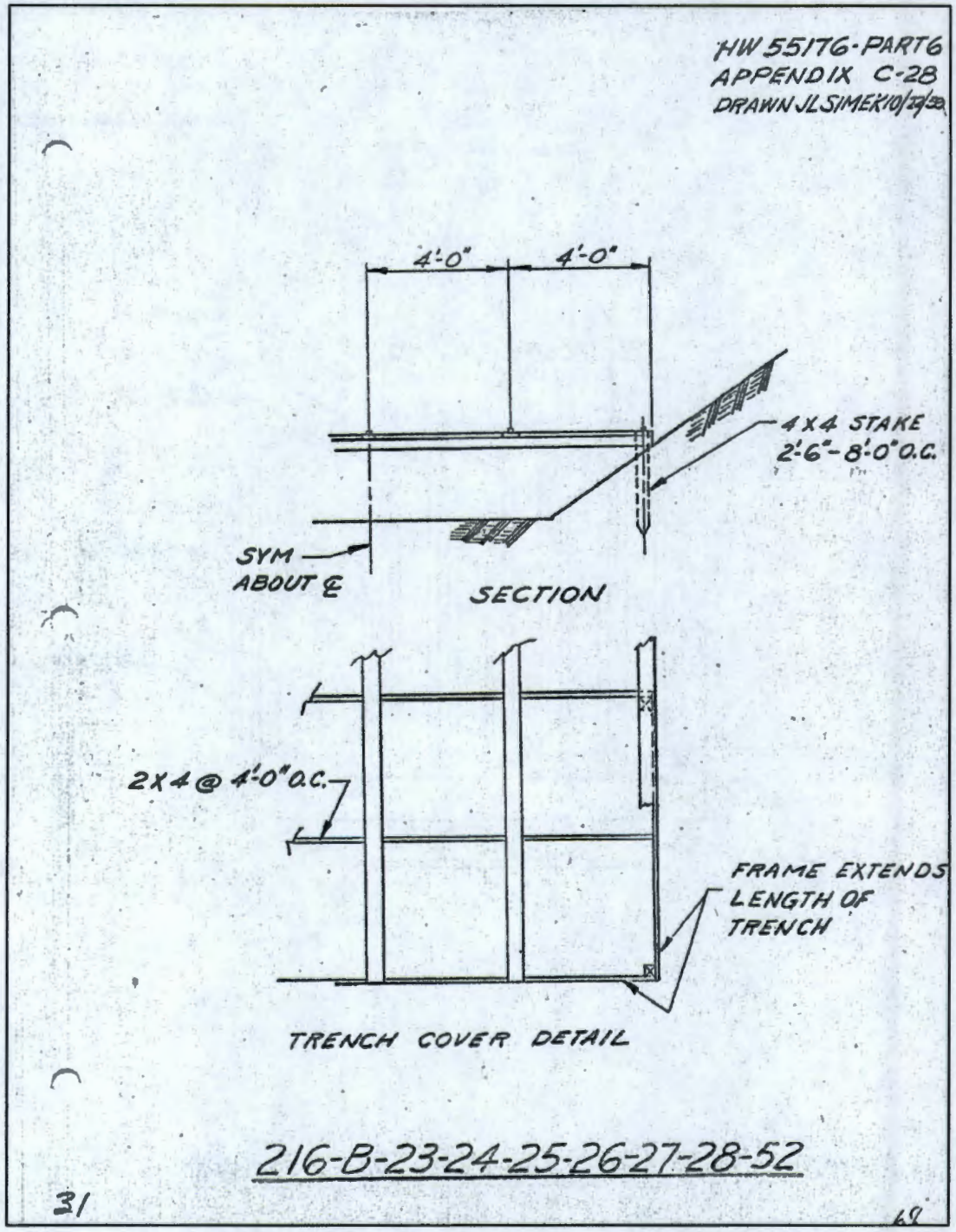


Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-27.

Note: Produced from the best available copy.

Figure 3. Trench Plan View

Site: 216-B-52	Area: BC Cribs	Category: Intermediate (Similar to 216-B-26)



Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part VI, Appendix C-28.

Note: Produced from the best available copy.

Figure 4. Trench Cover

Site: 216-B-53A	Area: BC Cribs	Category: Intermediate

Site Description

Alternate Site Identification: 216-B-53A Trench
Site Type: Trench
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: October and November 1965 (RHO-CD-673)

Waste Site Location and Physical Description: The 216-B-53A Trench is located south of the 200 East Area (across Route 4S) in the BC Cribs and Trenches area. The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The trench was an open excavation divided into two sections by an earthen dam at the center (Figure 2). The dam was 1.5 m (5 ft) high and 13 cm (5 in.) wide at the top. The trench had side slopes of 1.75:1. Use of the trench was discontinued when specific retention capacity was reached.

Waste Site Coordinates:
E-73218.87502 N-134442.20313

Site Dimensions:
Site Length: 18.3 m (60 ft) (bottom dimension)
Site Width: 3.1 m (10 ft) (bottom dimension)
Site Area: 56.7 m^2 (600 ft^2)
Site Depth: 3.1 m (10 ft) minimum
Cover Thickness: 1.5 m (5 ft) overburden depth

Related Site Structure(s): The trench is associated with the 309 Building, the 340 Facility, and an incident that occurred in the 309 Building ion exchange column (309-W S-2).

Site Posting: The trench has been backfilled and covered with clean soil and posted Underground Radioactive Material Area. Concrete AC 540 markers outline the area where the trenches are located, but do not identify the specific trench location.

Site History

Release Summary: 216-B-53A Trench received 5.49E+5 L (1.45E+5 gal) of neutral to basic liquid waste from a liquid release at the Plutonium Recycle Test Reactor (PRTR) in the 300 Area. Contaminated liquid was transported to the 200 Area via tanker trucks. Of all the specific retention trenches at this location, only 216-B-53A is considered to be a Transuranic waste site, containing 100 g of plutonium. On September 29, 1965, an accident occurred in the 300 Area when test fuel at the PRTR in the 309 Building failed, causing failure of the process tube, which contaminated the 309 reactor's moderator coolant system. The Rupture Loop Ion Exchange test loop and the PRTR main cleanup system were both contaminated with residual plutonium fuel and fission products. Nearly 3.8E+6 L (1.0 E+6 gal) of light water

Site: 216-B-53A	Area: BC Cribs	Category: Intermediate

was initially contaminated. However, additional cooling water was added over many days following the accident and the contaminated water volume rose to nearly 53E+6 L (14E+6 gal). The contaminated effluent was transferred to the 340 Facility and then transported by tanker trucks to the 200 Area. It is not known if the PRTR waste was trucked to a 200 Area tank farm and transported to the trench through underground pipeline to the BC Area or if the trucks emptied the waste directly into the trench. It is possible that additional piping was used to unload liquid waste from tanker trucks to the trench.

Volume/Mass Discharged: 5.49E+05 L (1.45E+05 gal)

Pore Volume Discharged: 5.49E+05 L/ (333 ft x 600 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.32

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-53A Waste Site

Contaminant	Mass Discharged
Pu	100 g
Beta	50 Ci
Sr-90	<0.10 Ci
Ru-106	5.0 Ci
Cs-137	<0.10 Ci
Co-60	0.50 Ci
U	23 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: The trench was characterized in 2008 with 16 direct push technology boreholes to a depth of approximately 7.6 m (25 ft) below ground surface (bgs). All 16 boreholes were geophysical logged.

In May 1958, an unplanned release (UPR-200-E-83) occurred when a large area was found to be contaminated with radioactive rabbit feces reading 5,000 to 10,000 cpm. A burrow in Trench 216-B-28, containing contaminated salt, was believed to be the source of the material ingested by the rabbits.

In 1969, contaminated Russian thistle was identified growing on Trenches 216-B-53A, 216-B-53B, and 216-B-54. The maximum dose rate was 1,500 millirem per hour. To inhibit weed growth, 45,870 m^3 (60,000 yd^3), approximately 15.2 cm (6 in.) of sand and gravel, was placed on top of the trenches. In

Site: 216-B-53A	Area: BC Cribs	Category: Intermediate

1981, the area was covered with additional top soil, time release herbicides, and rodent deterrent. A surface radiation survey is performed annually.

Borehole and data summaries are presented in Tables 2 and 3. Borehole locations are shown on Figure 1.

Table 2. Borehole Summary for the 216-B-53A Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2008	C6754 thru C6761	Western section of trench	25 (GPL)
	C6762 thru C7669	Eastern section of trench	25 (GPL)

GPL = geophysical log
ID = identification

Table 3. Geophysical Log Data Summary for the 216-B-53A Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
C6754	0 – 5	4.24	pCi/g	4.0	16,957.1	cpm	4
	5 – 10	0.4	pCi/g	5.5	12,058.6	cpm	5.5
	10 – 15	252.5	pCi/g	15	446,033	cpm	15
	>15	264.6	pCi/g	15.5	54,376.9	cpm	16.5
C6755	0 – 5	1.72	pCi/g	3.5	13,510.3	cpm	3.5
	5 – 10	0.6	pCi/g	5.5	11,703.1	cpm	10
	10 – 15	396.8	pCi/g	15	76,075.8	cpm	14
	>15	187.3	pCi/g	15.5	43,119.3	cpm	16.5
C6756	0 – 5	9.24	pCi/g	4.0	24,431.6	cpm	4
	5 – 10	0.74	pCi/g	5.5	11,919.8	cpm	5.5
	10 – 15	1.2	pCi/g	14	12,887	cpm	14
	>15	3.9	pCi/g	18.5	15,394	cpm	18.5

Site: 216-B-53A	Area: BC Cribs	Category: Intermediate

Table 3. Geophysical Log Data Summary for the 216-B-53A Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
C6757	0 – 5	1.56	pCi/g	4.0	13,447.1	cpm	4
	5 – 10	0.68	pCi/g	5.5	12,381.1	cpm	5.5
	10 – 15	0.29	pCi/g	13.5	11,612	cpm	14
	>15	19.8	pCi/g	18.5	53,286.8	cpm	18.5
C6758	0 – 5	2.2	pCi/g	4.5	13,952.9	cpm	4.5
	5 – 10	1.3	pCi/g	5.5	12,712.1	cpm	5.5
	10 – 15	73.6	pCi/g	15	147,568	cpm	15
	>15	101.7	pCi/g	15.5	177,977	cpm	15.5
C6759	0 – 5	2.58	pCi/g	4.0	14,928.1	cpm	4.5
	5 – 10	1.12	pCi/g	5.5	12,482	cpm	5.5
	10 – 15	709.9	pCi/g	15	1,293,260	cpm	15
	>15	567.4	pCi/g	15.5	1,002,410	cpm	15.5
C6760	0 – 5	2.69	pCi/g	5.0	15,982.1	cpm	5
	5 – 10	1.8	pCi/g	5.5	14,481.5	cpm	5.5
	10 – 15	120.3	pCi/g	15	397,996	cpm	15
	>15	2355	pCi/g	16	4,407,410	cpm	16
C6761	0 – 5	4.6	pCi/g	5.0	19,388	cpm	5
	5 – 10	3.3	pCi/g	5.5	17,318.6	cpm	5.5
	10 – 15	73.8	pCi/g	15	300,437	cpm	15
	>15	2764.1	pCi/g	16	6,069,900	cpm	16
C6762	0 – 5	1.05	pCi/g	4.0	12,159.9	cpm	5
	5 – 10	0.98	pCi/g	6.5	12,952.7	cpm	8
	10 – 15	121.9	pCi/g	15	350771	cpm	15
	>15	1076.8	pCi/g	16	1639550	cpm	16

Site: 216-B-53A	Area: BC Cribs	Category: Intermediate

Table 3. Geophysical Log Data Summary for the 216-B-53A Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
C6763	0 – 5	1.17	pCi/g	5.0	13,095.3	cpm	4.5
	5 – 10	1.14	pCi/g	6.5	12,897.5	cpm	6.5
	10 – 15	50.5	pCi/g	15	200,000	cpm	15
	>15	1002.5	pCi/g	16	1,716,170	cpm	16
C6764	0 – 5	2.5	pCi/g	5.0	15,460.1	cpm	5
	5 – 10	4.6	pCi/g	5.5	16,820.2	cpm	5.5
	10 – 15	29.8	pCi/g	15	129,774	cpm	15
	>15	1180	pCi/g	16	1,873,940	cpm	16
C6765	0 – 5	4.57	pCi/g	5.0	18,737.5	cpm	5
	5 – 10	2.88	pCi/g	5.5	16,684.1	cpm	5.5
	10 – 15	26.8	pCi/g	15	150,400	cpm	15
	>15	2707.2	pCi/g	16.5	5,391,080	cpm	16.5
C6766	0 – 5	7.4	pCi/g	5.0	21,683.6	cpm	5
	5 – 10	14.4	pCi/g	7.5	24,136.1	cpm	7.5
	10 – 15	55.5	pCi/g	15	190,387	cpm	15
	>15	800.3	pCi/g	16	1,353,930	cpm	16
C6767	0 – 5	7.5	pCi/g	5.0	21,004	cpm	5
	5 – 10	3.1	pCi/g	5.5	15,782	cpm	5.5
	10 – 15	45.2	pCi/g	15	195,194	cpm	15
	>15	1535	pCi/g	16	2,774,030	cpm	16
C6768	0 – 5	5.07	pCi/g	3.0	16,208.3	cpm	3
	5 – 10	2.07	pCi/g	6.0	13,906.7	cpm	6
	10 – 15	86.9	pCi/g	15	320,770	cpm	15
	>15	1927.8	pCi/g	16	3,207,800	cpm	16

bgs = below ground surface ID = identification

Site: 216-B-53A	Area: BC Cribs	Category: Intermediate

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] bgs): The depth of the maximum cesium-137 concentration in the boreholes within the 216-B-53A trench floor footprint is 4.57 m (15 ft), which is 1.5 (5 ft) below the bottom of the crib.

Deep (>4.6 m [>15 ft] bgs): The depth of the maximum cesium-137 concentration in the boreholes within the 216-B-53A trench floor footprint is 4.9 m (16 ft).

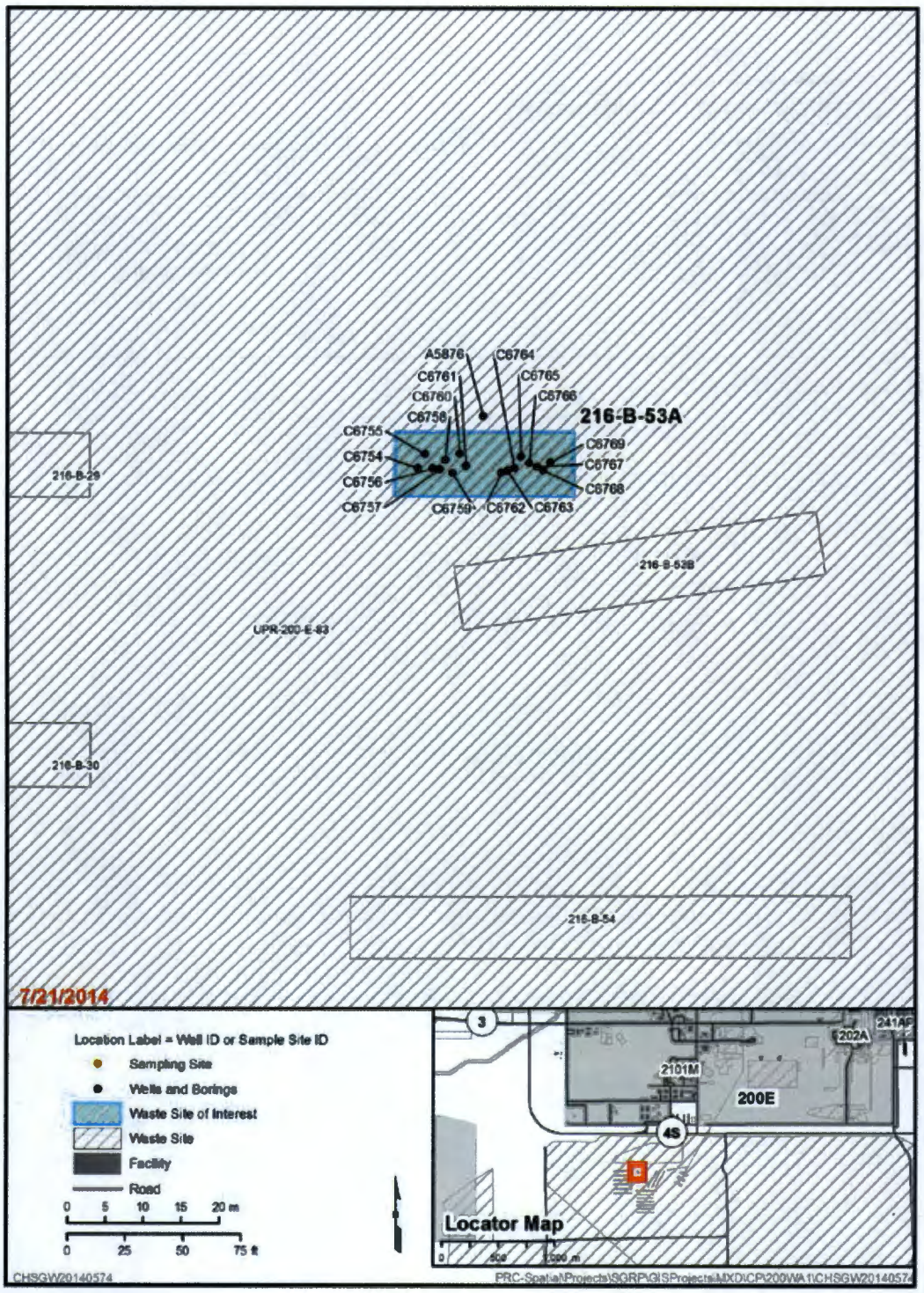
References:

DOE/RL-2009-36, 2010, *BC Cribs and Trenches Excavation-Based Treatability Test Report*, Rev. 1 (reissue), U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0084533.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, 3 vols., Rockwell Hanford Operations, Richland, Washington. Available at:
http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039027.
http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.
http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029.

Waste Information Data System General Summary Report for the 216-B-53A Waste Site.

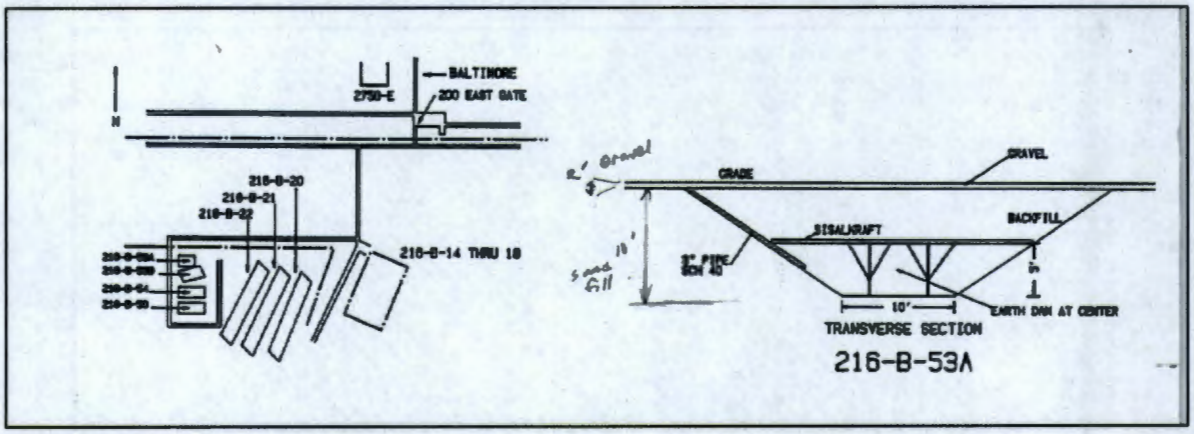
Site: 216-B-53A	Area: BC Cribs	Category: Intermediate



ID = identification

Figure 1. 216-B-53A Waste Site Map

Site: 216-B-53A	Area: BC Cribs	Category: Intermediate



Note: Produced from the best available copy.

Figure 2. Plan and Elevation View

Site: 216-B-53B	Area: BC Cribs	Category: Intermediate (Similar to 216-B-58)

Site Description

Alternate Site Identification: 216-B-53B Trench
Site Type: Trench
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: November 1962 to March 1963 (RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III)

Waste Site Location and Physical Description: The 216-B-53B Trench is located south of the 200 East Area (across Route 4S) in the BC Cribs and Trenches area. The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The trench was an open excavation divided into two sections by an earthen dam at the center (Figure 2). The dam was 1.5 m (5 ft) high and 13 cm (5 in.) wide at the top. The trench had side slopes of 1.75:1. Use of the trench was discontinued when specific retention capacity was reached.

Waste Site Coordinates:
Lon-573239.34367 Lat-134428.24222

Site Dimensions:
Site Length: 45.7 m (150 ft) (bottom dimension)
Site Width: 2.4 m (8 ft) (bottom dimension)
Site Area: 112 m^2 (1,200 ft^2)
Site Depth: 3.1 m (10 ft) minimum
Cover Thickness: 1.5 m (5 ft) overburden depth

Related Site Structure(s): The trench is associated with the 300 Area laboratory waste and the 340 Facility.

Site Posting: The trench has been backfilled and covered with clean soil and posted as an Underground Radioactive Material Area. Concrete AC 540 markers outline the area where the trenches are located, but do not identify the specific trench location.

Site History

Release Summary: 216-B-53B Trench received 15.1E3 L (4.0E3 gal) of liquid waste from the 300 Area Hanford Laboratory Operations. The waste was low salt and neutral to basic. The liquid waste was sent to the 340 Facility via the process sewer. Waste that was above the release limits for the 300 Area Process Ponds was sent by tanker truck to the 200 Area for disposal. It is not known if the 300 Area waste was trucked to a 200 Area tank farm and transported to this trench through the underground pipeline to the BC Area or if the trucks emptied the waste directly into the trench. It is possible additional piping was used to unload liquid waste from tanker trucks to the trench.

Site: 216-B-53B	Area: BC Cribs	Category: Intermediate (Similar to 216-B-58)

Volume/Mass Discharged: 15.1E+03 L (4.0E+03 gal)

Pore Volume Discharged: 15.1E+03 L/ (324 ft x 1,200 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.005

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-53B

Contaminant	Mass Discharged
Pu	5.0 g
Beta	44 Ci
Sr-90	10 Ci
Ru-106	4.0 Ci
Cs-137	7.0 Ci
Co-60	1.0 Ci
U	9.1 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, an unplanned release (UPR-200-E-83) occurred when a large area was found to be contaminated with radioactive rabbit feces reading 5,000 to 10,000 cpm. A burrow in Trench 216-B-28, containing contaminated salt, was believed to be the source of the material ingested by the rabbits.

In 1969, contaminated Russian thistle was identified growing on Trenches 216-B-53A, 216-B-53B, and 216-B-54. The maximum dose rate was 1,500 millirem per hour. To inhibit weed growth, 45,870 m^3 (60,000 yd^3), approximately 15.2 cm (6 in.) of sand and gravel, was placed on top of the trenches. In 1981, the area was covered with additional top soil, time release herbicides, and rodent deterrent. A surface radiation survey is performed annually.

Nature and Extent of Contamination:

No data are available to evaluate the shallow or deep soil contamination.

Site: 216-B-53B	Area: BC Cribs	Category: Intermediate (Similar to 216-B-58)

References:

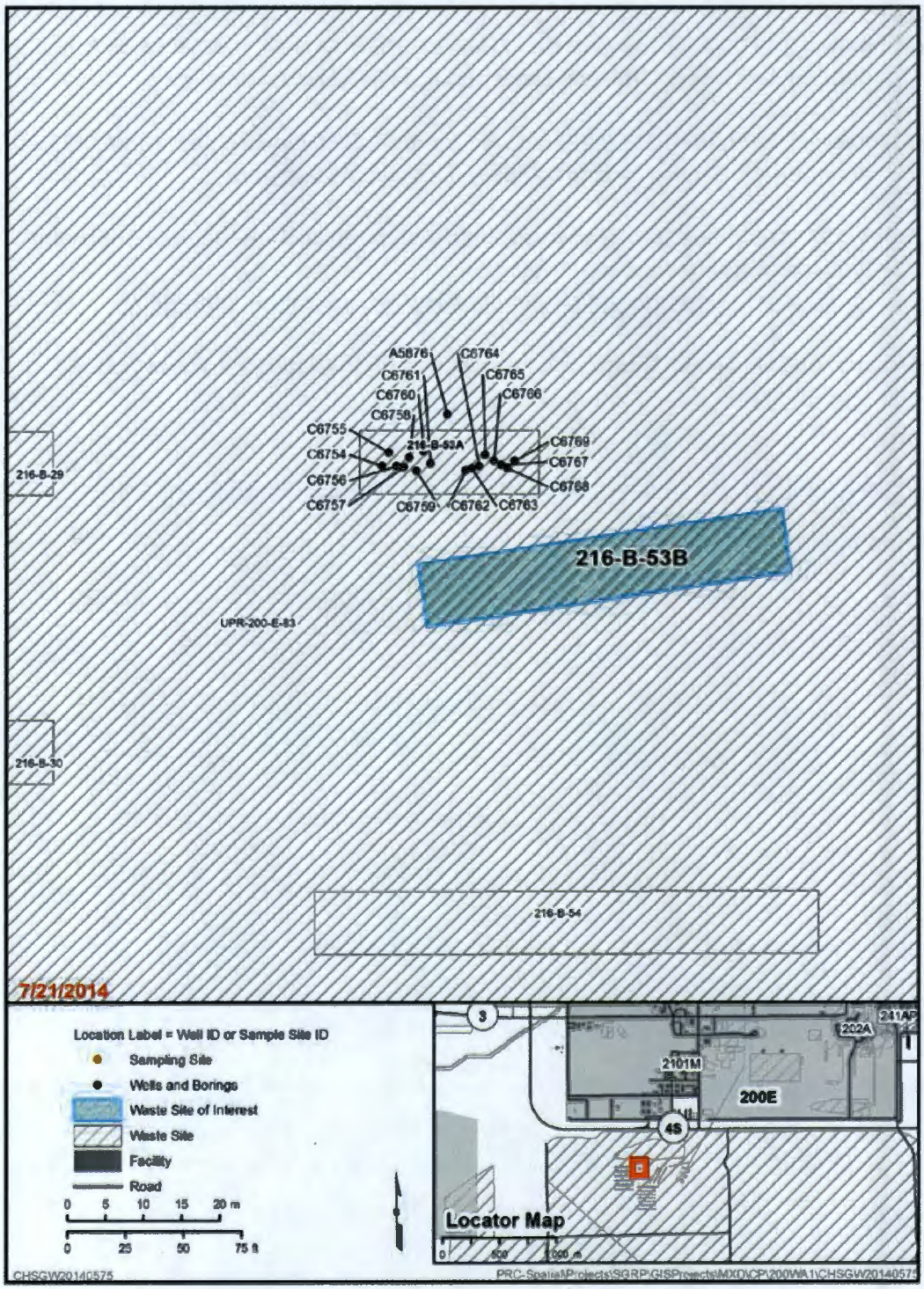
H-2-3336 (drawing), 1973, *Cribs 216-B-29 thru 216-B-34, 216-B-52, B-54, B-58 Plot Plan Phase Three "BC Crib Area,"* Rev. 8, General Electric Company, Richland, Washington.

H-2-3337 (drawing), 1973, *Cribs 216-B-29 thru 34, 52 thru 54, & 58 Profile & Dets Phase III "BC Crib Area,"* Rev. 2, General Electric Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029.

Waste Information Data System General Summary Report for the 216-B-53B Waste Site.

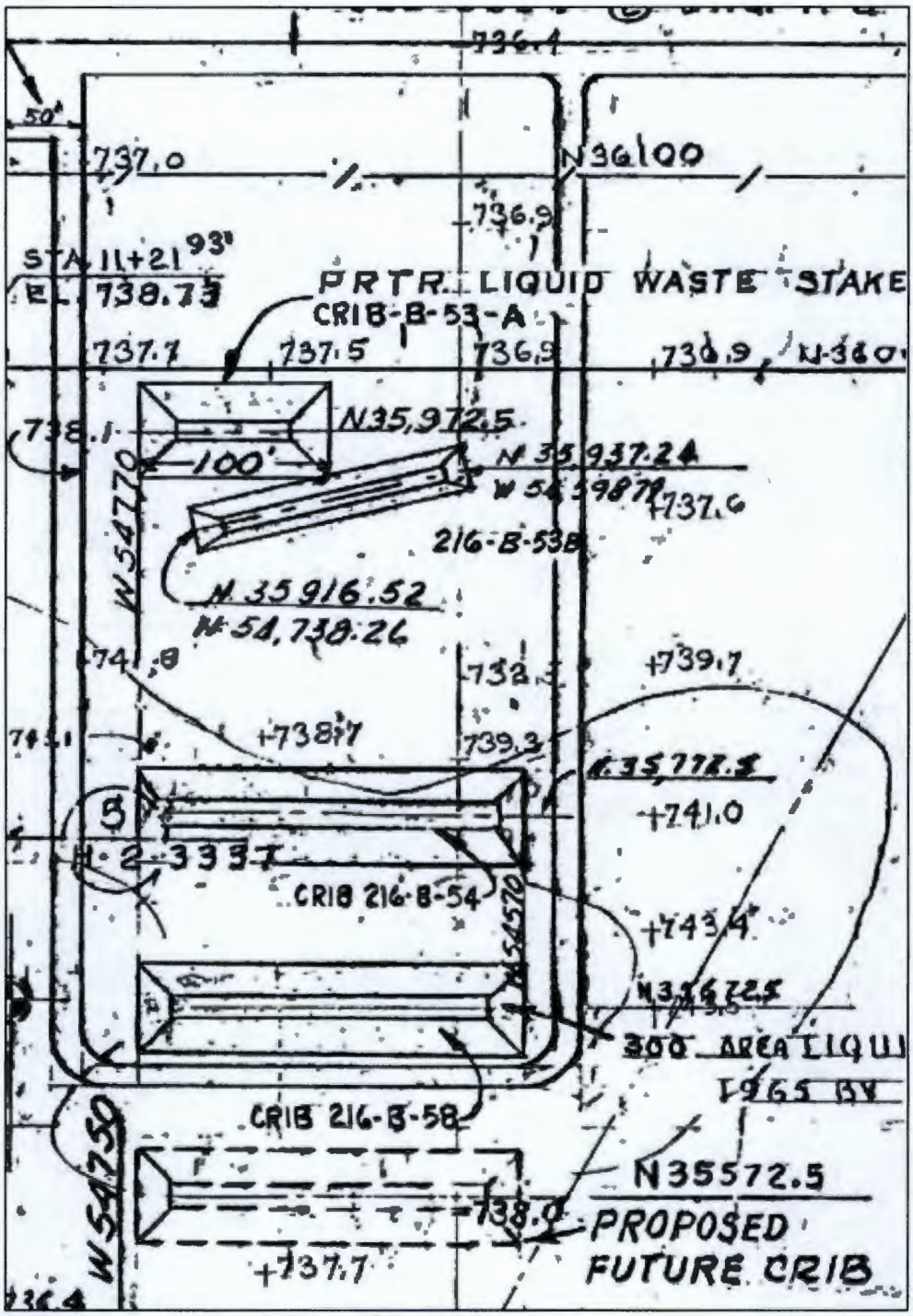
Site: 216-B-53B	Area: BC Cribs	Category: Intermediate (Similar to 216-B-58)



ID = Identification

Figure 1. 216-B-53B Site Map

Site: 216-B-53B	Area: BC Cribs	Category: Intermediate (Similar to 216-B-58)

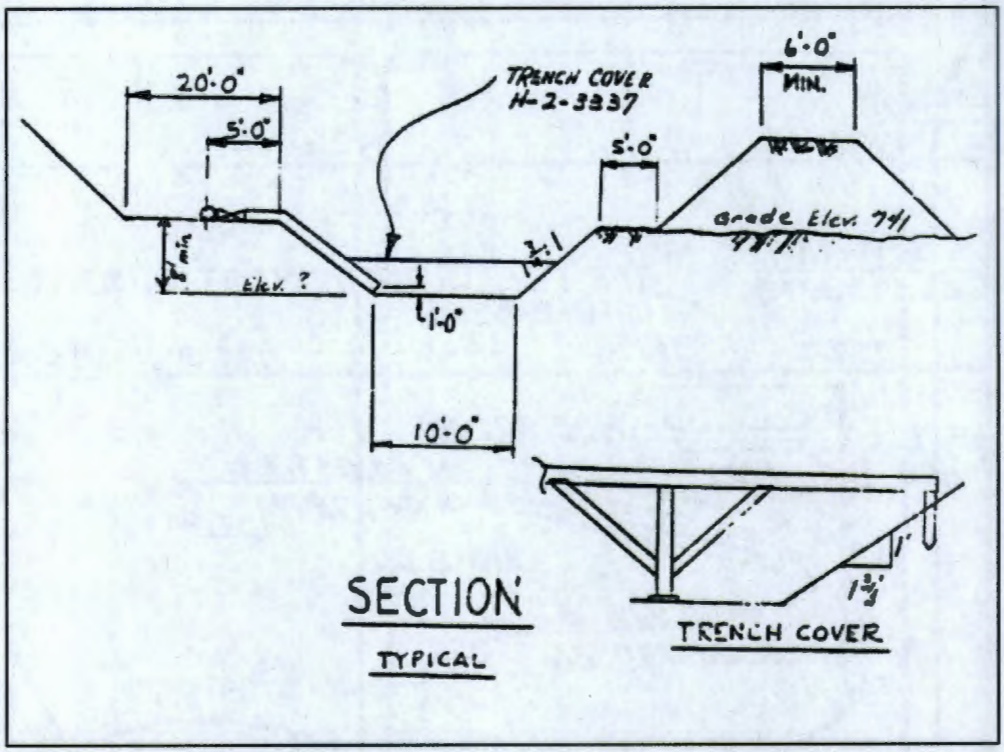


Source: H-2-3336, *Cribs 216-B-29 thru 216-B-34, 216-B-52, B-54, B-58 Plot Plan Phase Three "BC Crib Area."*

Note: Produced from the best available copy.

Figure 2. Plan View

Site: 216-B-53B	Area: BC Cribs	Category: Intermediate (Similar to 216-B-58)



Source: H-2-3337, *Cribs 216-B-29 thru 34, 52 thru 54, & 58 Profile & Dets Phase III "BC Crib Area."*

Note: Produced from the best available copy.

Figure 3. Section and Trench Cover

Site: 216-B-54	Area: BC Cribs	Category: Intermediate (Similar to 216-B-58)

Site Description

Alternate Site Identification: 216-B-54 Trench
Site Type: Trench
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: March 1963 to October 1963

Waste Site Location and Physical Description: The 216-B-54 Trench is located south of the 200 East Area (across Route 4S) in the BC Cribs and Trenches area. The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The trench was an open excavation divided into two sections by an earthen dam at the center (Figure 2). The dam was 1.5 m (5 ft) high and 13 cm (5 in.) wide at the top. The trench had side slopes of 1.75:1. Use of the trench was discontinued when specific retention capacity was reached.

Waste Site Coordinates:
E-573234.32771 N-134381.30149

Site Dimensions:
Site Length: 61 m (200 ft) (bottom dimension)
Site Width: 3.1 m (10 ft) (bottom dimension)
Site Area: 189.1 m^2 (2,000 ft^2)
Site Depth: 2.4 m (8 ft)
Cover Thickness: 2.4 m (8 ft) overburden depth

Related Site Structure(s): The trench is associated with the 300 Area laboratory facilities and the 340 Facility.

Site Posting: The trench has been backfilled and covered with clean soil and posted as an Underground Radioactive Material Area. Concrete AC 540 markers outline the area where the trenches are located, but do not identify the specific trench location.

Site History

Release Summary: The 216-B-54 Trench received 9.99E+5 L (26.4E+4 gal) of liquid waste from the 300 Area Hanford Laboratory Operations. The waste was low salt and neutral to basic. The liquid waste was sent to the 340 Facility via the process sewer. Waste that was above the release limits for the 300 Area Process Ponds was sent by tanker truck to the 200 Area for disposal. It is not known if the 300 Area waste was trucked to a 200 Area tank farm and transported to this trench through the underground pipeline to the BC area or if the trucks emptied the waste directly into the trench. It is possible additional piping was used to unload liquid waste from tanker trucks to the trench.

Site: 216-B-54	Area: BC Cribs	Category: Intermediate (Similar to 216-B-58)

Volume/Mass Discharged: 9.99E+05 L (26.4E+04 gal)

Pore Volume Discharged: 9.99E+05 L/ (326 ft x 2,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.18

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-54 Waste Site

Contaminant	Mass Discharged
Pu	5.0 g
Beta	2,400 Ci
Sr-90	0.1 Ci
Ru-106	10 Ci
Cs-137	0.1 Ci
Co-60	0.1 Ci
U	9.1 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, an unplanned release (UPR-200-E-83) occurred when a large area was found to be contaminated with radioactive rabbit feces reading 5,000 to 10,000 cpm. A burrow in Trench 216-B-28, containing contaminated salt, was believed to be the source of the material ingested by the rabbits.

In 1969, contaminated Russian thistle was identified growing on Trenches 216-B-53A, 216-B53B, and 216-B-54. The maximum dose rate was 1,500 millirem per hour. To inhibit weed growth, 45,870 m^3 (60,000 yd^3), approximately 15.2 cm (6 in.) of sand and gravel, was placed on top of the trenches. In 1981, the area was covered with additional top soil, time release herbicides, and rodent deterrent. A surface radiation survey is performed annually.

There are no well or boreholes within or adjacent to this site.

Nature and Extent of Contamination:
No data are available to evaluate the shallow or deep soil contamination.

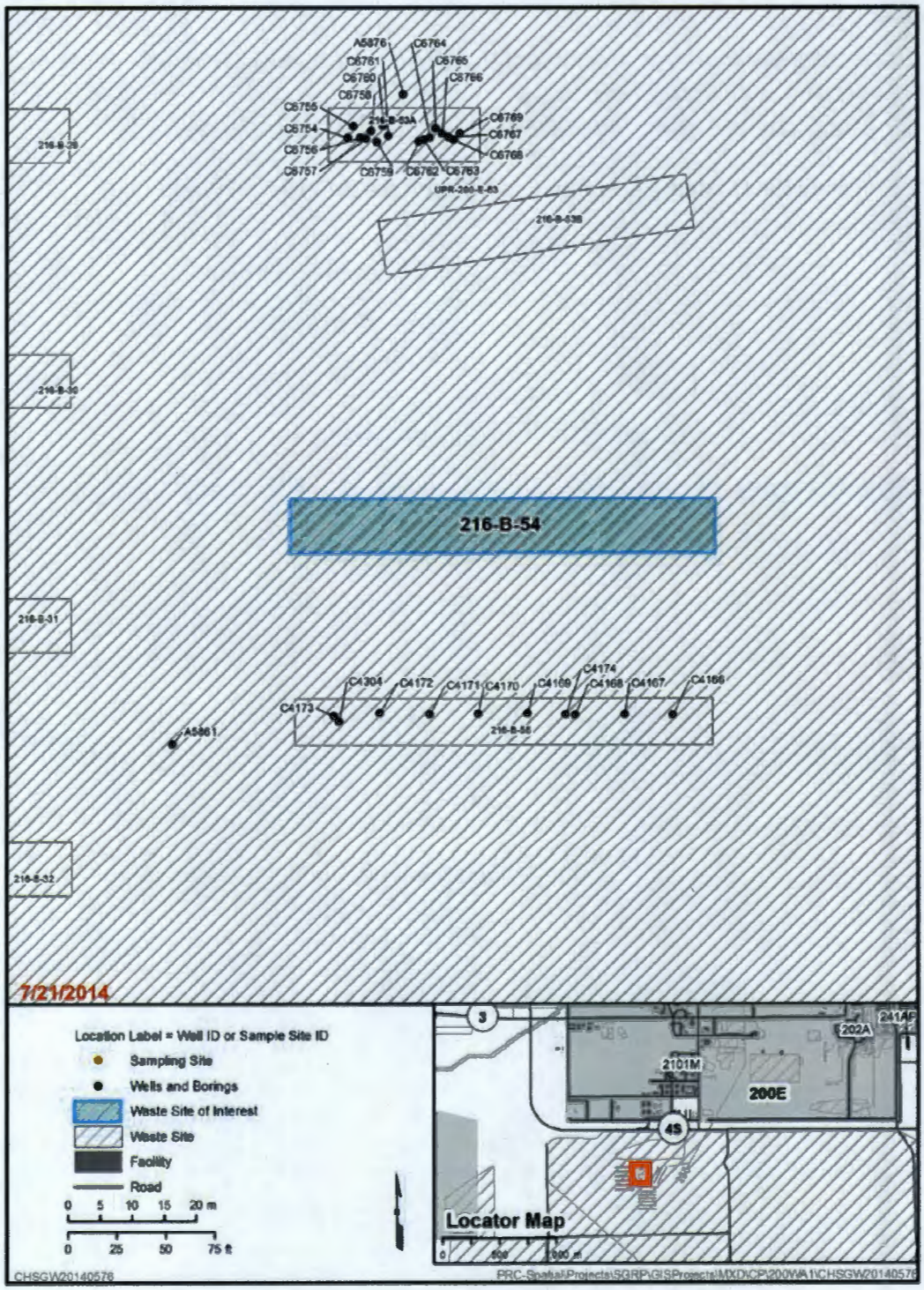
Site: 216-B-54	Area: BC Cribs	Category: Intermediate (Similar to 216-B-58)

References:

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029

Waste Information Data System General Summary Report for the 216-B-54 Waste Site.

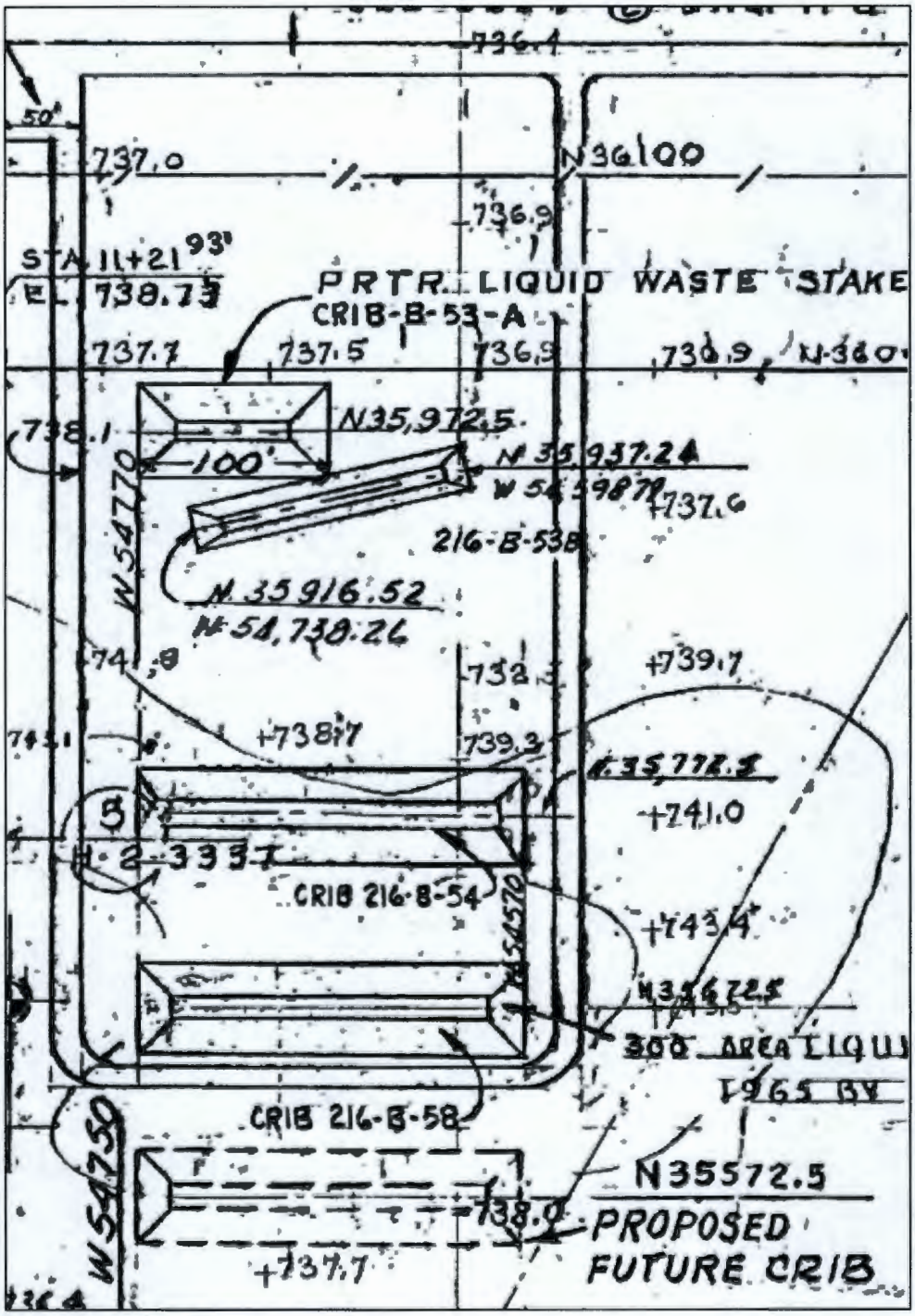
Site: 216-B-54	Area: BC Cribs	Category: Intermediate (Similar to 216-B-58)



ID = identification

Figure 1. 216-B-54 Waste Site Map

Site: 216-B-54	Area: BC Cribs	Category: Intermediate (Similar to 216-B-58)

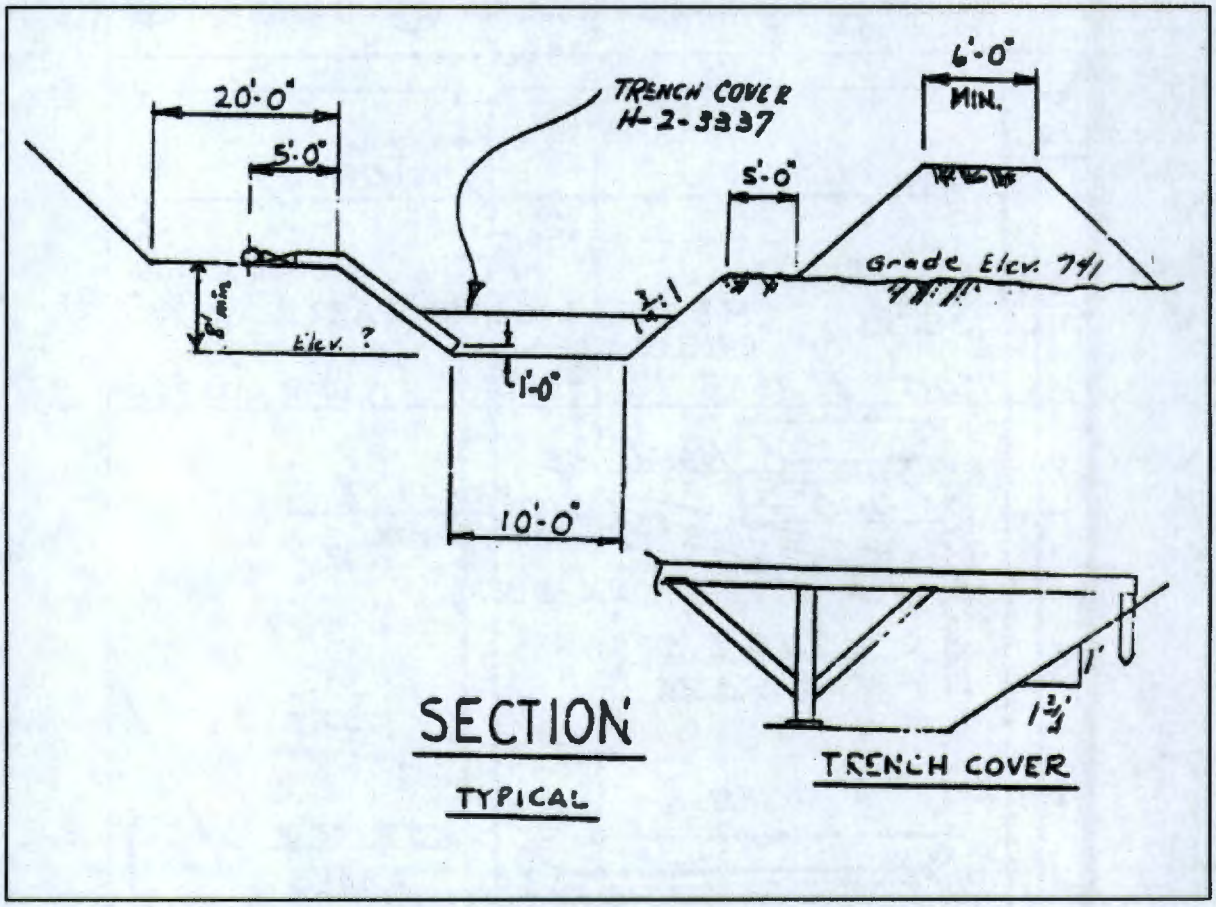


Source: H-2-3336, *Cribs 216-B-29 thru 216-B-34, 216-B-52, B-54, B-58 Plot Plan Phase Three "BC Crib Area."*

Note: Produced from the best available copy.

Figure 2. Plan View

Site: 216-B-54	Area: BC Cribs	Category: Intermediate (Similar to 216-B-58)



Source: H-2-3337,*Cribs 216-B-29 thru 34, 52 thru 54, & 58 Profile & Dets Phase III "BC Crib Area.*"

Note: Produced from the best available copy.

Figure 3. Section and Trench Cover

Site: 216-B-58	Area: BC Cribs	Category: Intermediate (Representative Site)

Site Description

Alternate Site Identification: 216-B-58 Trench
Site Type: Trench
Facility/Geographic Area: BC Cribs and Trenches
Current Operable Unit (OU) Assignment: 200-BC-1
Former OU Assignment: 200-TW-1
Service Dates: November 1965 to June 1967 (RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III)

Waste Site Location and Physical Description: The 216-B-58 Trench is located south of the 200 East Area (across Route 4S) in the BC Cribs and Trenches area. The BC Cribs and Trenches are located inside the BC Controlled Area (Figure 1). The trench construction is shown on Figures 2 and 3. The trench was an open excavation divided into eight 7.6 m (25 ft) sections divided by 1.2 m (4 ft) high earthen dams. A 1.2 m (4 ft) diameter pipe was placed along the bottom of the trench. The pipe was corrugated with five 10 cm (4 in.) diameter holes around the bottom half. The trench was covered with 8 wooden cover frames, 5.5 m (18 ft) wide by 8.5 m (28 ft) long. A 7.6 cm (3 in.) Schedule 40, carbon steel pipe, approximately 7 m (23 ft) long was placed along the side of the structure.

Waste Site Coordinates:
E-573234.40630 N-134350.83595

Site Dimensions:
Site Length: 61 m (200 ft) (bottom dimension)
Site Depth: 3.1 m (10 ft) (DOE/RL-2004-66, *Focused Feasibility Study for the BC Cribs and Trenches Area Waste Sites*)
Site Width: 3.1 m (10 ft) (bottom dimension)
Cover Thickness: 2.4 m (10 ft) overburden depth
Site Area: 189.1 m^2 (2,000 ft^2)

Related Site Structure(s): The trench is associated with the 300 Area laboratory facilities and the 340 Facility.

Site Posting: The trench has been backfilled and covered with clean soil and posted Underground Radioactive Material Area. Concrete AC 540 markers outline the area where the trenches are located, but do not identify the specific trench location.

Site History

Release Summary: 216-B-58 Trench received 4.13E+05 L (1.09E+05 gal) of liquid waste from the 300 Area Hanford Laboratory Operations. The waste was low salt and neutral to basic. The liquid waste was sent to the 340 Facility via the process sewer. Waste that was above the release limits for the

Site: 216-B-58	Area: BC Cribs	Category: Intermediate (Representative Site)

300 Area Process Ponds was sent by tanker truck to the 200 Area for disposal. It is not known if the 300 Area waste was trucked to a 200 Area tank farm and transported to this trench through the underground pipeline to the BC area or if the trucks emptied the waste directly into the trench. It is possible additional piping was used to unload liquid waste from tanker trucks to the trench.

Volume/Mass Discharged: 4.13E+5 L (1.09E+05 gal)

Pore Volume Discharged: 4.13E+05 L/ (99 m x 189 m^2 * 1,000 L/m^3 * 0.3) = 0.07

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-B-58 Waste Site

Contaminant	Mass Discharged
Pu	6.7 g
Beta	59 Ci
Sr-90	10 Ci
Ru-106	7 Ci
Cs-137	7.7 Ci
Co-60	2.4 Ci
U	9.1 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume III.

Previous Site Characterization

Site Characterization Summary: In May 1958, an unplanned release (UPR-200-E-83) occurred when a large area was found to be contaminated with radioactive rabbit feces reading 5,000 to 10,000 cpm. A burrow in Trench 216-B-28, containing contaminated salt, was believed to be the source of the material ingested by the rabbits.

In 1969, contaminated Russian thistle was identified growing on Trenches 216-B-53A, 216-B-53B, and 216-B-54. The maximum dose rate was 1,500 millirem per hour. To inhibit weed growth, 45,870 m^3 (60,000 yd^3), approximately 15.2 cm (6 in.) of sand and gravel, was placed on top of the trenches. In 1981, the area was covered with additional top soil, time release herbicides, and rodent deterrent. A surface radiation survey is performed annually.

Site: 216-B-58	Area: BC Cribs	Category: Intermediate (Representative Site)

Eight direct push technology holes were placed through the trench. The highest concentration of radionuclides was found 4.1 m to 6.1 m (13.5 ft to 20 ft) below ground surface. The maximum cesium-137, strontium-90, americium, and plutonium concentrations were 14.6E+3 pCi/g, 18.4E+3 pCi/g, 412 pCi/g, and 310 pCi/g, respectively.

Contamination is present primarily in the shallow portion of the vadose zone beneath the 216-B-58 Trench. The majority of contaminants and the highest concentrations were detected from 4.1 m to 6.1 m (13.5 to 20 ft) below ground surface (bgs). Radionuclide contaminants in this zone include Am-241, Cs-137, Co-60, Pu-239/240, Sr-90, and tritium. The maximum concentration of many of the contaminants were associated with the soil just below the bottom of the crib at a depth of about 4.6 m (15 ft) bgs. Cs-137 and Sr-90 were the dominant radionuclides present, with maximum concentration of 14,600 and 18,400 pCi/g, respectively. Samples from the borehole at the west end of the trench revealed Co-60 to 1,700 pCi/g. The transuranic constituents Am-241 and Pu-239/240 were observed at the 4.6 m (15-ft) level at concentration of 412 pCi/g and 310 pCi/g, respectively.

Tritium was distributed more widely across the vadose zone and was detected to a depth of 16.8 m (55 ft) bgs. Nitrate concentration exceeded the screening level at depths corresponding to near the bottom of the trench (40.1 mg/kg as nitrate) and from 8.3 to 10.6 m (27.5 to 35 ft) bgs. At the borehole in the middle of the trench, neutron moisture logging showed higher moisture concentrations at the 9.1 m, 13.7 m, 15.2 m, 16.1 m, 20.4 m, and ~30.5 m (30 ft, 45 ft, 50 ft, 53 ft, 67 ft, and near 100 ft) levels bgs. From the west-end borehole, higher moisture concentrations were indicated at the 9.1 m, 10.6 m, 12.9 m, 13.4 m, 16.1 m, 20.4 m, 25.9 m, and ~30.5 m (30 ft, 35 ft, 40 ft, 44 ft, 53 ft, 67 ft, 85 ft, and near 100 ft) levels bgs.

Borehole and data summaries are presented in Tables 2 through 5. Borehole locations are shown on Figure 1.

Table 2. Borehole Summary for the 216-B-58 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
1957	A5861/299-E-13-16	60 ft west of trench	3 to 348 (GPL)
2003	C4166 to C4173	Trench footprint	35 (GPL)
2003	C4174	Trench footprint	11 to 100 (8 soil samples)
2003	C4304	Trench footprint	0 to 99 (GPL) 12.5 to 100 (7 soil samples)

GPL = geophysical log
ID = identification

Site: 216-B-58	Area: BC Cribs	Category: Intermediate (Representative Site)

Table 3. Geophysical Log Summary for the 216-B-58 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
C4174	0 – 5	0.4	pCi/g	4	–	–	–
	5 – 10	1,700	pCi/g	10	–	–	–
	10 – 15	32,000	pCi/g	12	–	–	–
	>15	3,000	pCi/g	16	–	–	–
C4304	0 – 5	0.43	pCi/g	3	7,707.9	cpm	5
	5 – 10	943.3	pCi/g	10	5,728,570	cpm	10
	10 – 15	569.4	pCi/g	11	10,610,000	cpm	11
	>15	–	pCi/g	–	57,417.2	cpm	28
A5861	0 – 5	–	pCi/g	–	5,955.3	cpm	4
	5 – 10	2.35	pCi/g	9	8,048.2	cpm	9
	10 – 15	0.68	pCi/g	10	6,894.6	cpm	10
	>15	0.28	pCi/g	25	14,697.2	cpm	108

bgs = below ground surface

Site: 216-B-58	Area: BC Cribs	Category: Intermediate (Representative Site)

Table 4. Soil Maximum Detections (Soil Borehole C4174)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
2',3,4,5,5'-Pentachlorobiphenyl		–	–	1,200	µg/kg	16
Actinium-228	–	–	–	0.695	pCi/g	20
Americium-241	0.079	pCi/g	13.5	412	pCi/g	16
Aroclor-1254	–	–	–	930	µg/kg	16
Arsenic	–	–	–	16,000	µg/kg	20
Barium	66,800	µg/kg	13.5	100,000	µg/kg	25
Beryllium	–	–	–	500	µg/kg	25
Bismuth	–	–	–	9,870	µg/kg	16
Bismuth-212	–	–	–	0.392	pCi/g	20
Bismuth-214	–	–	–	0.328	pCi/g	20
Cadmium	–	–	–	170	µg/kg	25
Cesium-134	–	–	–	0.034	pCi/g	20
Cesium-137	0.343	pCi/g	13.5	14,600	pCi/g	16
Chloride	–	–	–	14,100	µg/kg	55
Chromium	4,130	µg/kg	13.5	9,400	µg/kg	25
Cobalt-60	–	–	–	9.96	pCi/g	16
Copper	–	–	–	14,400	µg/kg	25
Europium-154	–	–	–	8.09	pCi/g	16
Europium-155	–	–	–	0.062	pCi/g	37.5
Hexavalent Chromium	–	–	–	470	µg/kg	25
Lead	–	–	–	12,500	µg/kg	25
Lead-212	–	–	–	0.612	pCi/g	20
Lead-214	–	–	–	0.324	pCi/g	20
Mesityl oxide	–	–	–	800	µg/kg	25
Neptunium-237	–	–	–	0.032	pCi/g	16

Site: 216-B-58	Area: BC Cribs	Category: Intermediate (Representative Site)

Table 4. Soil Maximum Detections (Soil Borehole C4174)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
n-Hexatriacontane	–	–	–	840	µg/kg	16
Nickel	7,760	µg/kg	13.5	10,100	µg/kg	100
Nickel-63	–	–	–	36.1	pCi/g	16
Nitrate	–	–	–	3,570	µg/kg	25
Nitrogen in nitrite and nitrate	1,100	µg/kg	13.5	5,100	µg/kg	25
Plutonium-238	0.13	pCi/g	13.5	31	pCi/g	16
Plutonium-239/240	2	pCi/g	13.5	310	pCi/g	16
Potassium-40	16.4	pCi/g	13.5	18.3	pCi/g	16
Radium-226	0.575	pCi/g	13.5	0.604	pCi/g	55
Radium-228	1.2	pCi/g	13.5	4.42	pCi/g	16
Selenium	4,700	µg/kg	13.5	1,300	µg/kg	20
Silver	–	–	–	80	µg/kg	25
Sulfate	–	–	–	19,700	µg/kg	25
Thallium-208	–	–	–	0.24	pCi/g	20
Thorium-228	1.24	pCi/g	13.5	6.89	pCi/g	16
Thorium-230	0.397	pCi/g	13.5	1.05	pCi/g	25
Thorium-232	1.2	pCi/g	13.5	4.42	pCi/g	16
Total beta radiostrontium	0.281	pCi/g	13.5	18,400	pCi/g	16
Tritium	–	–	–	89.4	pCi/g	30
Uranium	–	–	–	1,150	µg/kg	25
Uranium-233/234	0.12	pCi/g	13.5	0.31	pCi/g	16
Uranium-235	0.02	pCi/g	13.5	0.024	pCi/g	25
Uranium-238	0.14	pCi/g	13.5	0.362	pCi/g	25

Site: 216-B-58	Area: BC Cribs	Category: Intermediate (Representative Site)

Table 5. Soil Maximum Detections (Soil Borehole C4304)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Acetone	52	µg/kg	15	–	–	–
Americium-241	297	pCi/g	15	150	pCi/g	20
Arsenic	8,810	µg/kg	15	12,600	µg/kg	30
Barium	86,600	µg/kg	15	150,000	µg/kg	30
Cesium-137	14.2	pCi/g	15	0.053	pCi/g	25
Chloride	–	–	–	36,300	µg/kg	37.5
Chromium	4,810	µg/kg	15	7,700	µg/kg	55
Cobalt-60	1,700	pCi/g	15	10.4	pCi/g	30
Copper	–	–	–	11,900	µg/kg	55
Cyanide	–	–	–	360	µg/kg	55
Europium-155	–	–	–	0.067	pCi/g	37.5
Neptunium-237	0.006	pCi/g	15	0.004	pCi/g	55
Nickel	10,800	µg/kg	15	10,700	µg/kg	30
Nickel-63	165	pCi/g	15	–	–	–
Nitrate	40,100	µg/kg	15	255,000	µg/kg	30
Nitrogen in nitrite and nitrate	12,100	µg/kg	15	82,500	µg/kg	30
Plutonium-238	20	pCi/g	15	0.078	pCi/g	100
Plutonium-239/240	240	pCi/g	15	0.24	pCi/g	37.5
Potassium-40	15.6	pCi/g	15	16.7	pCi/g	55
Radium-226	–	–	–	0.892	pCi/g	30
Radium-228	–	–	–	1.36	pCi/g	30
Selenium	4,360	µg/kg	15	6,540	µg/kg	20
Sulfate	–	–	–	61,900	µg/kg	30
Sulfide	33,000	µg/kg	15	25,800	µg/kg	20
Thorium-228	1.51	pCi/g	15	1	pCi/g	100
Thorium-230	0.372	pCi/g	15	0.52	pCi/g	30
Thorium-232	0.894	pCi/g	15	1.36	pCi/g	30
Total beta radiostrontium	0.412	pCi/g	15	1.01	pCi/g	25

Site: 216-B-58	Area: BC Cribs	Category: Intermediate (Representative Site)

Table 5. Soil Maximum Detections (Soil Borehole C4304)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Tritium	10.2	pCi/g	15	798	pCi/g	30
Uranium-233/234	0.74	pCi/g	15	0.19	pCi/g	37.5
Uranium-235	0.13	pCi/g	15	0.024	pCi/g	30
Uranium-238	0.58	pCi/g	15	0.19	pCi/g	37.5

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] bgs): Contamination is present primarily in the shallow portion of the vadose zone beneath the 216-B-58 Trench. The majority of contaminants and the highest concentrations were detected from 4.1 to 6.1 m (13.5 to 20 ft) bgs. Radionuclide contaminants in this zone include Am-241, Cs-137, Co-60, Pu-239/240, Sr-90, and tritium. The maximum concentration of many of the contaminants were associated with the soil just below the bottom of the crib at a depth of about 4.6 m (15 ft) bgs. Cs-137 and Sr-90 were the dominant radionuclides present.

Deep (>4.6 m [>15 ft) bgs): Tritium was distributed more widely across the vadose zone and was detected to a depth of 16.8 m (55 ft) bgs. Nitrate concentration exceeded the screening level at depths corresponding to near the bottom of the trench and from 8.3 to 10.6 m (27.5 to 35 ft) bgs. Higher moisture concentration we detected throughout the vadose zone down to the bottom of the boreholes at 30.5 m (100 ft) bgs.

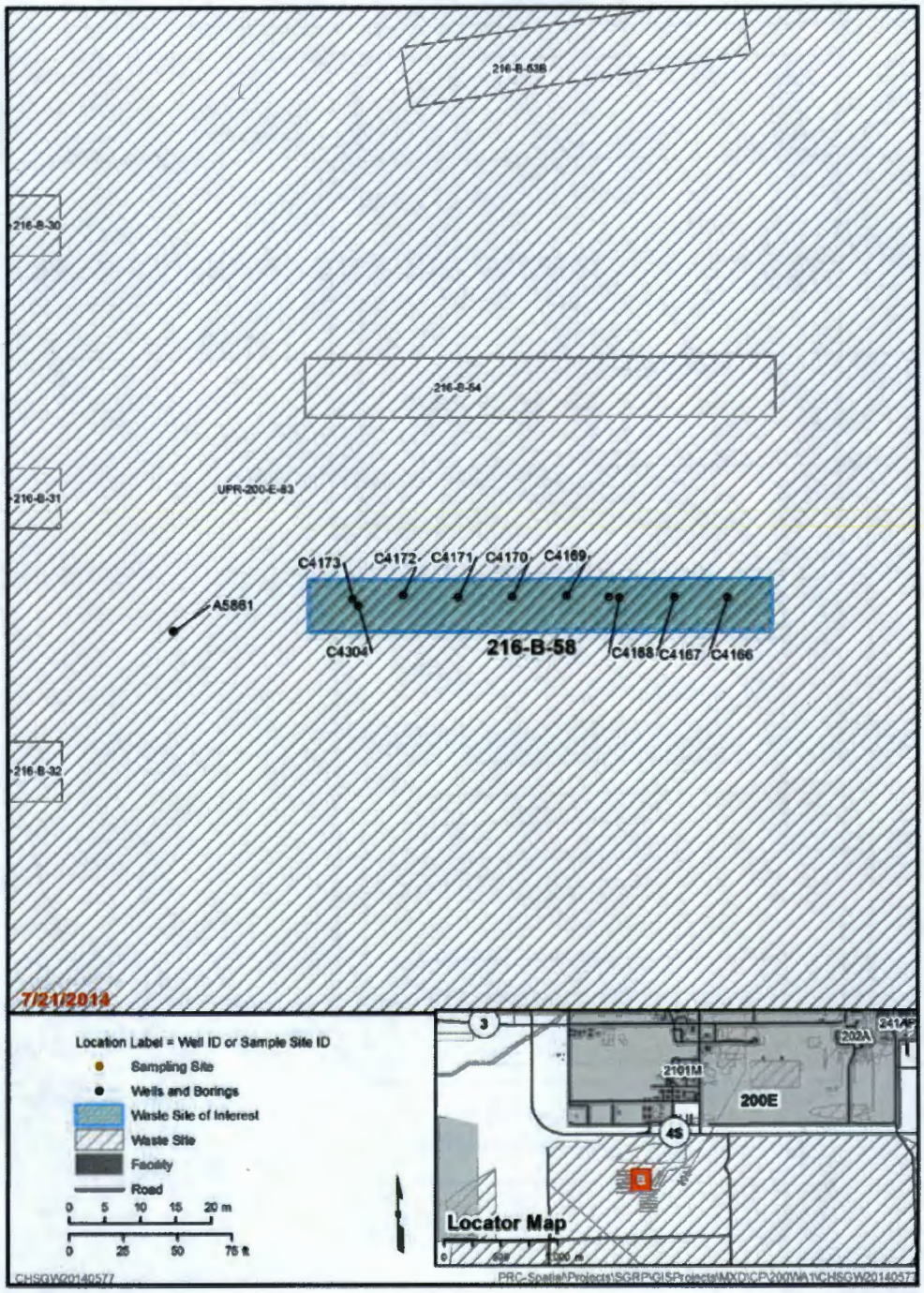
References:

DOE/RL-2004-66, 2005, *Focused Feasibility Study for the BC Cribs and Trenches Area Waste Sites*, Draft A, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA170624. http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA170919. http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA171165. http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA171467.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume III, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029

Waste Information Data System General Summary Report for the 216-B-58 Waste Site.

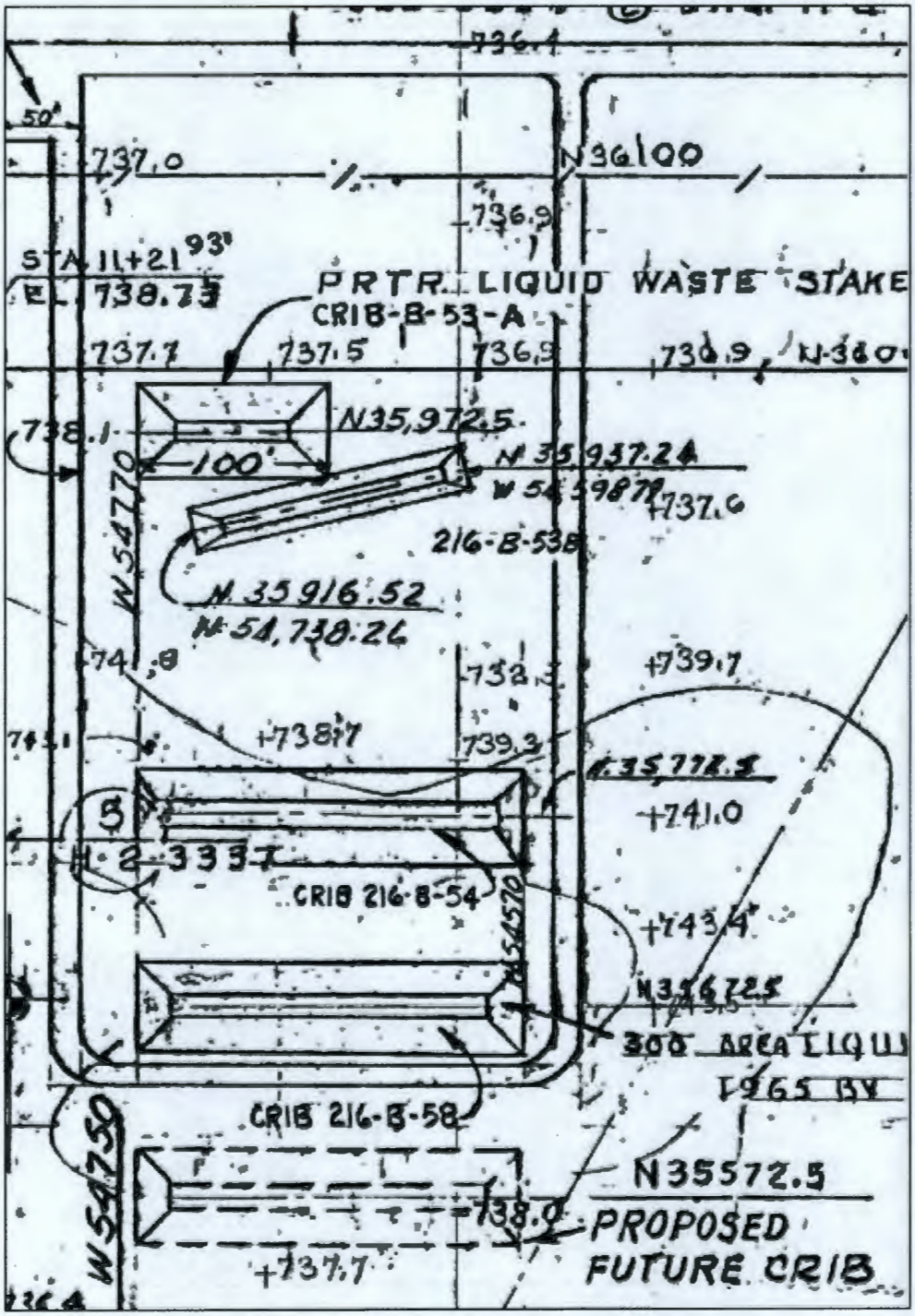
Site: 216-B-58	Area: BC Cribs	Category: Intermediate (Representative Site)



ID = identification

Figure 1. 216-B-58 Waste Site Map

Site: 216-B-58	Area: BC Cribs	Category: Intermediate (Representative Site)

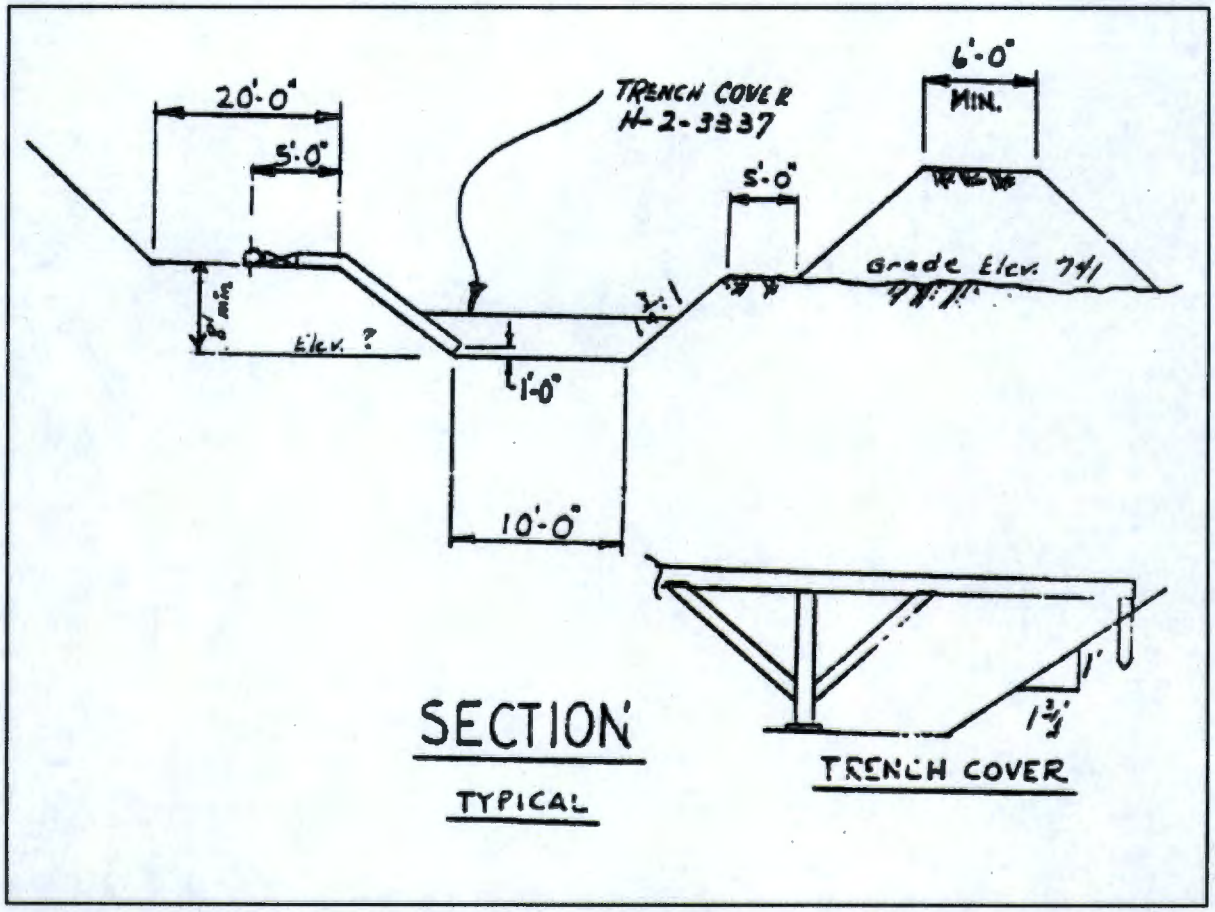


Source: H-2-3336, *Cribs 216-B-29 thru 216-B-34, 216-B-52, B-54, B-58 Plot Plan Phase Three "BC Crib Area."*

Note: Produced from the best available copy.

Figure 2. 216-B-58 Plan View

Site: 216-B-58	Area: BC Cribs	Category: Intermediate (Representative Site)



Source: H-2-3337, *Cribs 216-B-29 thru 34, 52 thru 54, & 58 Profile & Dets Phase III "BC Crib Area."*

Note: Produced from the best available copy.

Figure 3. Section and Trench Cover

Site: 216-B-58	Area: BC Cribs	Category: Intermediate (Representative Site)

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Site: 200-W-1	Area: S Plant	Category: Intermediate

Site Description

Alternate Site Identification: Reduction-Oxidation (REDOX) Mud Pit West
Site Type: Mud Pit
Facility/Geographic Area: S-Plant (REDOX) Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1, 200-SW-1
Service Dates: Unspecified

Waste Site Location and Physical Description: The 200-W-1 waste site is located west of the REDOX Facility, outside of the REDOX exclusion fence, and north of 10th Street (Figure 1). Originally described as a pit with a surface area resembling drilling mud, the 200-W-1 mud pit is a shallow depression with no vegetation. The pit has the surface characteristics of a site that has had liquid evaporate or percolate through.

In 1999, two waste sites were surveyed to determine which one was the correct location for 200-W-1, as the site location and description were vague. The exact boundaries of the site are difficult to determine, as the pit and surrounding area appears to have been disturbed by heavy machinery. The vegetation cover primarily consisted of cheat grass and tumbleweeds, with some bunchgrass and rabbit brush. The vegetative cover varied in density from sparse to moderate. The soil consisted of greater than 50 percent sand, with some surface soil discoloration visible. Other features found within the site include a 2.5 cm (1 in.) diameter rubber hose near the west edge of the site, and discarded lumber and a wooden stake within the un-vegetated area.

Waste Site Coordinates:
Lon-567176.56254 Lat-133977.62499

Site Dimensions:
Site Length: 23.0 m (75.5 ft) Site Depth: Not specified
Site Width: 20.0 m (65.6 ft) Cover Thickness: None
Site Area: 477 m^2 (5,134 ft^2)

Related Site Structure(s): During trench excavation for Project W-987 on August 9, 1995, two nearby areas of aluminum silicate (200-W-17) and aluminum oxide (200-W-18) were discovered. It is assumed that 200-W-1 is related to these two sites.

Site Posting: Not specified.

Site History

Release Summary: No estimated release volume is presented for this waste site. The 200-W-1 mud pit received liquid waste generated during equipment decontamination. Interviews with former employees

Site: 200-W-1	Area: S Plant	Category: Intermediate

revealed that plutonium contaminated ventilation equipment was rinsed at an unspecified location near this site.

Volume/Mass Discharged: Unspecified volume of liquid from equipment decontamination.

Pore Volume Discharged: L/ (vadose zone thickness ft x area ft^2 / 35.3 m^3/ft^3 * 1000 L/m^3 * 0.3) = Unknown

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: A site characterization is needed for this site. No radiological surveys have been conducted at this location. No soil samples have been collected.

A field visit to determine the exact location of the 200-W-1 mud pit occurred on August 18, 1999. Two potential waste sites matched the vague location and site description of the mud pit. The site's location was verified and the boundary mapped with Global Positioning System (GPS) survey equipment on August 26, 1999 (Table 1). Originally, field estimates from 1993 placed the site dimensions at 30.5 m (100.0 ft) long by 15.2 m (50.0 ft) wide, with a site area of 464.5 m^2 (5,000 ft^2).

Table 1. GPS Coordinates from 1999 Survey

Easting	Northing
567151.1	133951.3
567149.9	133970.4
567173.8	133972.3
567173.5	133950.1

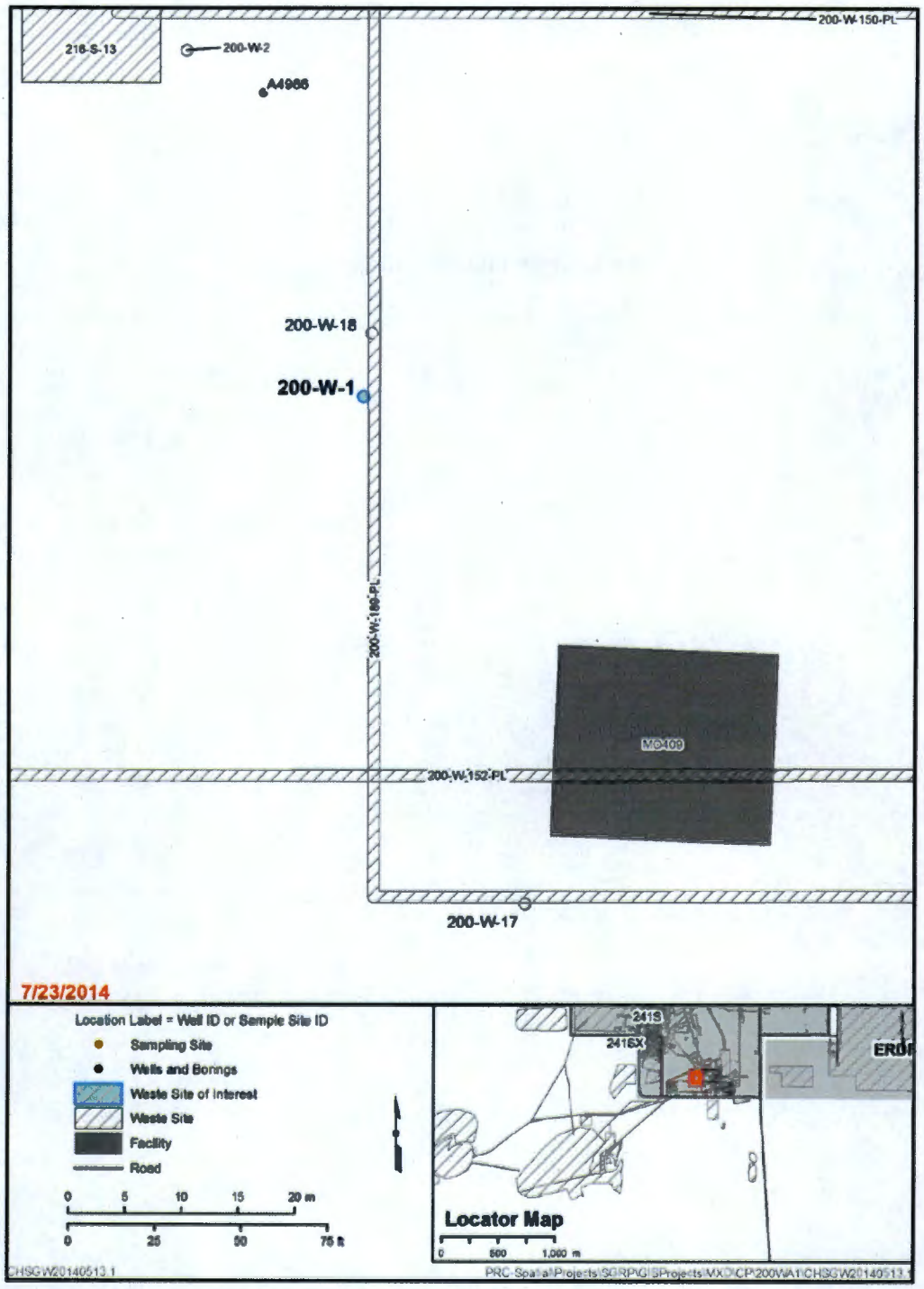
GPS = Global Positioning System

Nature and Extent of Contamination: No data are available to evaluate shallow or intermediate soil contamination. The type and volume of waste and depth are unknown. The approximate depth to groundwater is 70.4 m (231 ft) below ground surface (bgs).

References:

Waste Information Data System General Summary Report for the 200-W-1 Waste Site.

Site: 200-W-1	Area: S Plant	Category: Intermediate



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 200-W-1 Waste Site Map

Site: 200-W-1	Area: S Plant	Category: Intermediate

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Site: 200-W-2	Area: S Plant	Category: Shallow-Subsurface

Site Description

Alternate Site Identification: Reduction-Oxidation (REDOX) Berms West
Site Type: Spoils Pile/Berm
Facility/Geographic Area: S-Plant (REDOX) Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1, 200-SW-1
Service Dates: Unspecified

Waste Site Location and Physical Description: The 200-W-2 waste site is located northwest of the 202-S Facility, and is outside the REDOX exclusion fence line (Figure 1). The site consists of mostly flat, level, land with several acres of disturbed soil, and two unmarked and unposted bermed areas. One berm is approximately 1.5 m (5 ft) high and 9.2m (30 ft) wide. The second berm is approximately 3.1 m (10 ft) high and 15.3 m (50 ft) wide.

Waste Site Coordinates:
Lon-567160.93748 Lat-134008.03128

Site Dimensions:
Site Length: Irregular m (Irregular ft) Site Depth: Not specified
Site Width: Irregular m (Irregular ft) Cover Thickness: None
Site Area: 248 m^2 (2,670 ft^2)

Related Site Structure(s): Not specified.

Site Posting: Not specified.

Site History

Release Summary: The wastes contained at this site are unspecified, and no release volume is presented for the 200-W-2 waste site. However, the berms may cover contaminated soil or debris. It has been reported that ventilation equipment had been cleaned in the area, but the exact location cannot be verified.

Volume/Mass Discharged: Unspecified.

Pore Volume Discharged: Unknown.

Waste Inventory: Data not available.

Site: 200-W-2	Area: S Plant	Category: Shallow-Subsurface

Previous Site Characterization

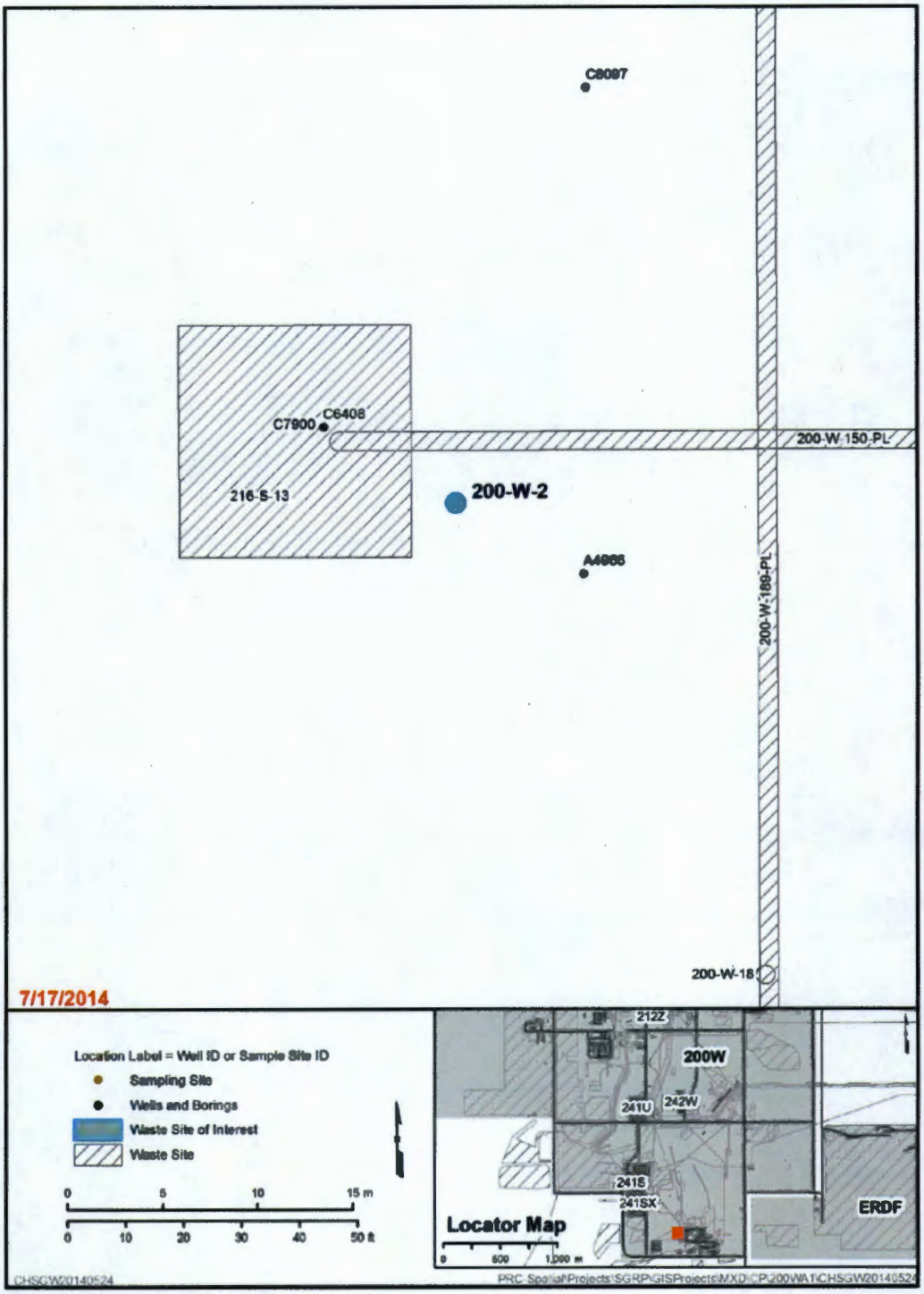
Site Characterization Summary: No radiological surveys have been conducted at this location.

A site walkdown and Global Positioning System survey occurred on August 18, 1999 to verify the site location and extent, and to map the site boundary. Staff did not find any markings or postings related to the site indicating waste was buried at the location.

Nature and Extent of Contamination: Unconfirmed release. No data are available for this site. Berms may cover contaminated soil or debris. Release history and site boundaries are poorly defined.

References:
Waste Information Data System General Summary Report for the 200-W-2 Waste Site.

Site: 200-W-2	Area: S Plant	Category: Shallow-Subsurface



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 200-W-2 Waste Site Map

Site: 200-W-2	Area: S Plant	Category: Shallow-Subsurface

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Site: 200-W-11	Area: S Plant	Category: Shallow-Subsurface

Site Description

Alternate Site Identification: Concrete Foundation South of 241-S, S-Farm Foundation and Dump Site
Site Type: Dump Site
Facility/Geographic Area: S Plant (Reduction-Oxidation) Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1, 200-SW-1
Service Dates: Unspecified

Waste Site Location and Physical Description: The 200-W-11 waste site is located south of the 241-S Tank Farm, north of 10th Street, and west of Camden Avenue (Figure 1). The site includes a concrete foundation, small burn areas, bare areas, and scattered debris. The debris includes barbed wire, welding rods, oil cans, paint cans, solvent cans, glass, cable, melted roofing material, wood, pipe, rubber brick, metal, concrete, and vehicle parts. No drawings related to the foundation have been identified.

Waste Site Coordinates:
Lon-566811.47855 Lat-133980.57857

Site Dimensions:
Site Length: Irregular m (Irregular ft) Site Depth: Not specified
Site Width: Irregular m (Irregular ft) Cover Thickness: None
Site Area: 11,505 m^2 (123,840 ft^2)

Related Site Structure(s): The site is possibly associated with the construction of the 241-SX, 241-SY, 241-S Tank Farms.

Site Posting: Not specified.

Site History

Release Summary: The wastes contained at the 200-W-11 waste site are unspecified and no release volume is presented. The release type is believed to be a mix of solid and liquid materials. The exact purpose or use the site fulfilled is not specified. It may have been used as a laydown yard, support fabrication area, or used for vehicle maintenance. It is possible the site supported the construction for the 241-S Tank Farm.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Site: 200-W-11	Area: S Plant	Category: Shallow-Subsurface

Previous Site Characterization

Site Characterization Summary: No radiological surveys have been conducted at this location.

The site was identified on April 19, 1995, during a *Resource Conservation and Recovery Act of 1976* General Inspection. On April 4, 1995, the site was visited to document the various types of debris present and a site walkdown for initial review purposes began. Figure 2 shows photographs of the site taken during a site walkdown on August 7, 1995 (WHC-N-1223 1). The initial review was completed on September 11, 1995. Following the initial review, the site was mapped using Global Positioning System survey equipment from October 25 to November 14, 1995.

Soil borehole C7664 was installed in 2010, approximately 30.5 (100 ft) northeast of the site, data are summarized below in Tables 1 and 2 below. Borehole locations are shown on Figure 1.

Table 1. 200-W-11 Waste Site Previous Geophysical Logs

Year	Boring / Well ID	Location with Respect to Site	Depth (ft)
2010	C7664 / 299-W22-89	Outside (northeast of site boundary)	0 – 323

ID = identification

Table 2. 200-W-11 Waste Site Geophysical Log Summary

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
C7664	0 – 5	0.593	pCi/g	1.0	12845.3	cpm	5
	5 – 10		pCi/g		14373.2	cpm	9
	10 – 15		pCi/g		12845.1	cpm	13
	> 15		pCi/g		16414.7	cpm	139

bgs = below ground surface

ID = identification

Nature and Extent of Contamination: No data are available to evaluate shallow soil contamination within the site boundaries (Figure 1).

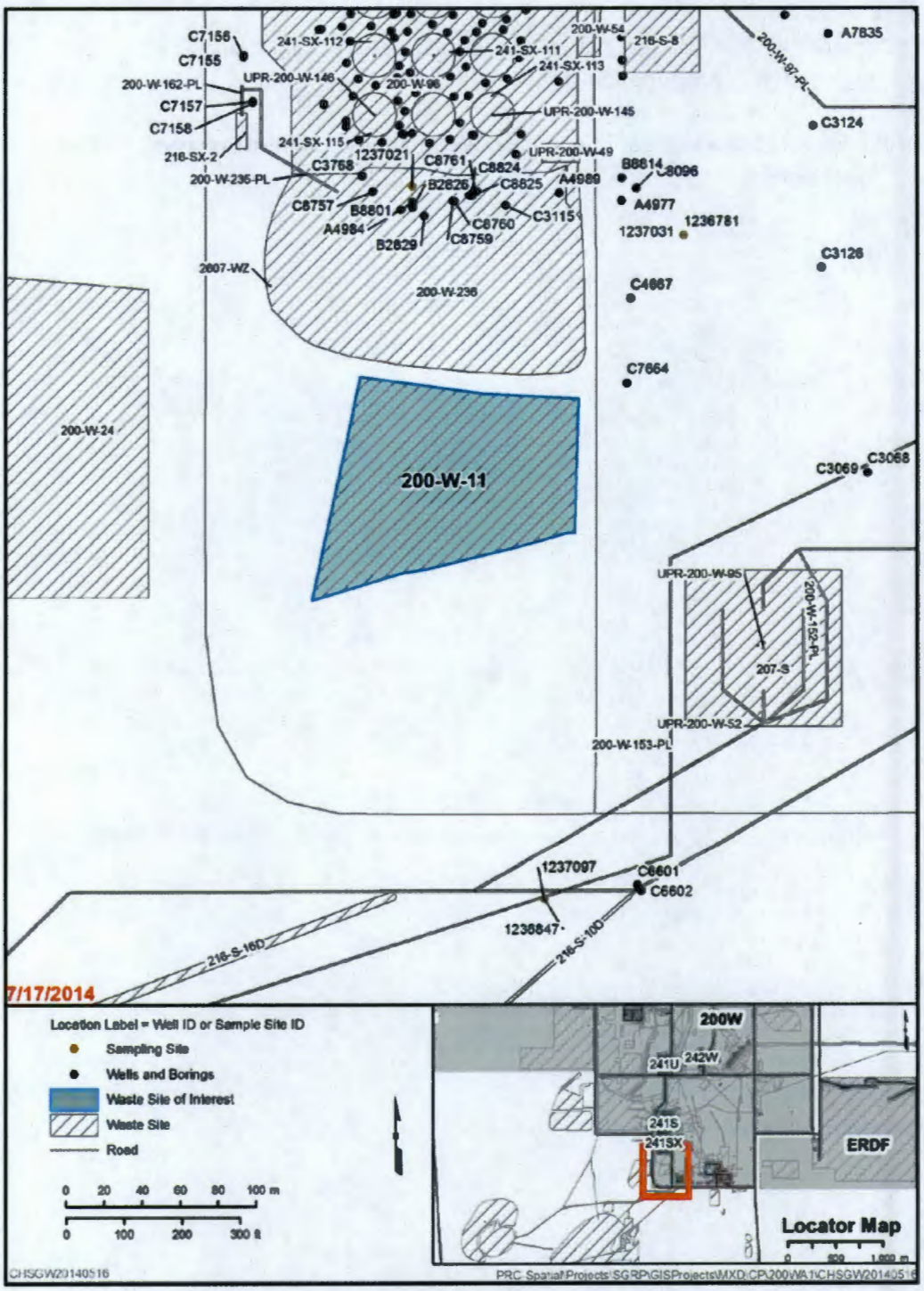
Site: 200-W-11	Area: S Plant	Category: Shallow-Subsurface

References:

Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq. Available at: http://www.epa.gov/rcraonline/.

WHC-N-1223 1, 1995, *Site Investigation Logbook*, Westinghouse Hanford Company, Richland, Washington.

Site: 200-W-11	Area: S Plant	Category: Shallow-Subsurface



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 200-W-11 Waste Site Map

Site: 200-W-11	Area: S Plant	Category: Shallow-Subsurface

8-7-95 KJ Moss 200 West
S-Farm Foundation and Dump Site
Rattlesnake Mountain in
Background, Foundation in
Foreground

8-7-95 KJ Moss 200 West
241-SX/SY Farm in Background
S-Farm and Dump Site in Foreground

Source: WHC-N-1223 1, *Site Investigation Logbook*.

Note: Produced from the best available copy.

Figure 2. 200-W-11 Waste Site Photos

Site: 200-W-11	Area: S Plant	Category: Shallow-Subsurface

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Site: 200-W-15	Area: S Plant	Category: Intermediate

Site Description

Alternate Site Identification: S Plant Project W-087 Hexone Discovery
Site Type: Unplanned Release
Facility/Geographic Area: S Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UR-1
Service Dates: Not applicable

Waste Site Location and Physical Description: The site is located approximately 18 m (59 ft) southwest of the southwest corner of the Reduction-Oxidation (REDOX) Facility (Building 202-S) (Figure 1). Original photos are shown in Figure 2. The pipe trench where the hexone (methyl isobutyl ketone or MIBK) contaminated soil was found has been backfilled to grade with soil originally removed from the excavation. Hexone contaminated soil was also put back into the excavation. There is currently no visual evidence of this excavation on the surface. The area is now under asphalt.

Waste Site Coordinates:
E-567306 (m) N-133934 (m)

Site Dimensions:
Site Length: 12.19 m (40 ft)
Site Width: 2.44 m (8 ft)
Site Area: 29.73 m^2 (320 ft^2)
Site Depth: 0.69 m (2 ft)
Cover Thickness: 0.69 m (2 ft)

Related Site Structure(s): The site is associated with 202-S, 222-S, and 244-S.

Site Posting: The site is not marked or posted.

Site History

Release Summary: In June 1995, while excavating pipe trench for Project W-087 (new transfer lines from 222-S to 244-S), a dark 7.6 cm (3-in.) thick discolored soil layer was observed at a depth about 0.6 m (2 ft) (Figure 2). It was determined to be hexone and surfactants. The hexone contaminated soil was stockpiled and returned to the excavation after the pipe was installed in the trench. The estimated total volume of contaminated soil is approximately 80 ft^3 (2.27 m^3).

Volume/Mass Discharged: Unknown

Pore Volume Discharged: Unknown

Waste Inventory: Not available

Site: 200-W-15	Area: S Plant	Category: Intermediate

Previous Site Characterization

Site Characterization Summary: Global Positioning System surveys were conducted for the site on November 8 and 14, 1995. Site inspections were performed on August 11, 1995 and August 18, 1999. In August 1999, the site was covered by asphalt and there was no evidence on the surface of where the excavation was located.

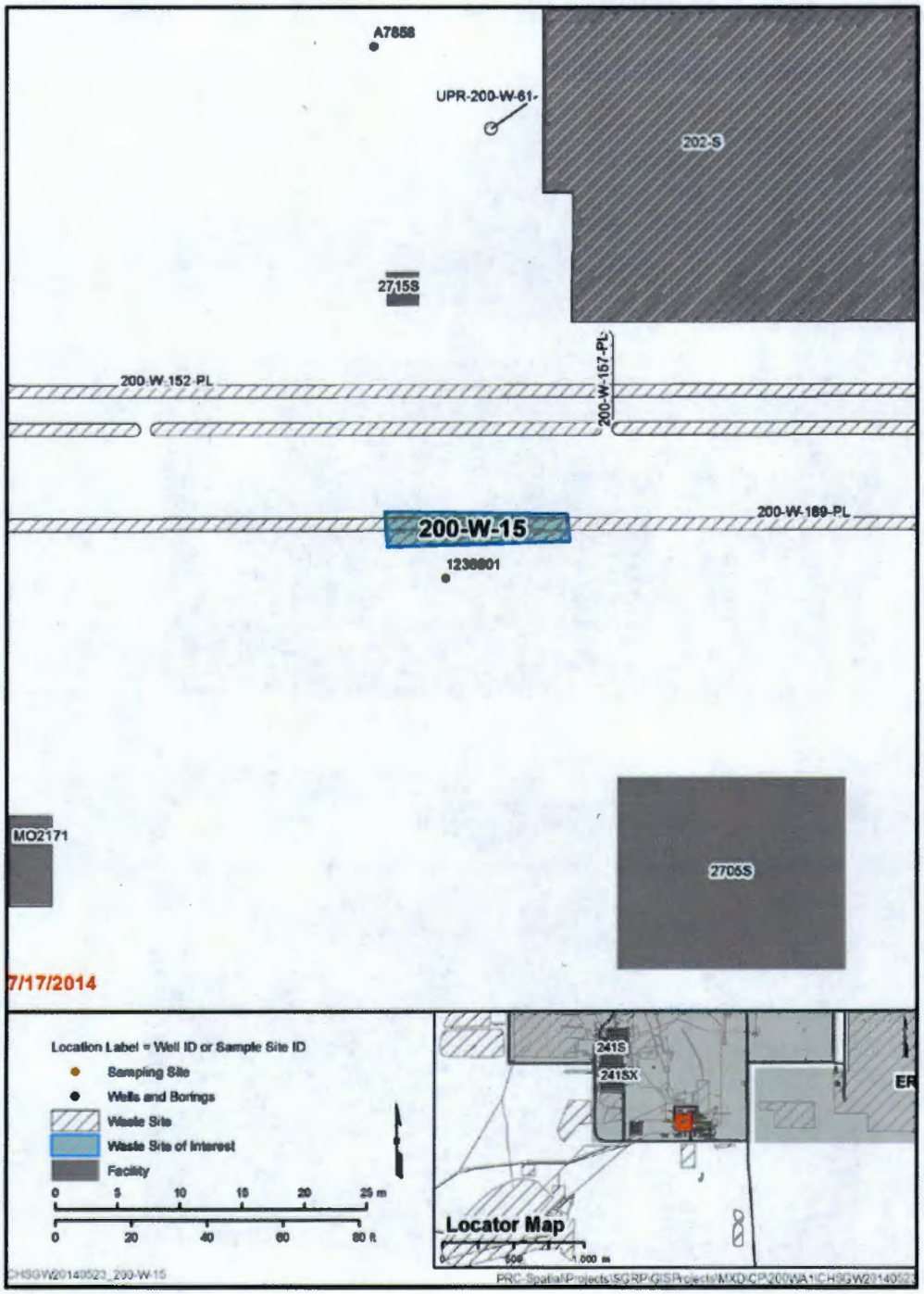
Nature and Extent of Contamination:

No data are available to evaluate shallow or intermediate depth soil contamination. MIBK and surfactant-contaminated soil was mixed with soil, backfilled, and covered with asphalt. It is likely that some degradation of organics in the backfilled soil has occurred in 20 years. The approximate depth to groundwater is 71 m (233 ft) below ground surface (bgs).

References:

Waste Information Data System General Summary Report for the 200-W-15 Waste Site.

Site: 200-W-15	Area: S Plant	Category: Intermediate



ID = identification

Figure 1. 200-W-15 Waste Site Map

Site: 200-W-15	Area: S Plant	Category: Intermediate

Pipe Trench Construction Photos

200-W-15

Note: Produced from the best available copy.

Figure 2. 200-W-15 Waste Site Pipe Trench Construction Photos

Site: 200-W-22	Area: S Plant	Category: Intermediate

Site Description

Alternate Site Identification: 200-W-22, 203-S/204-S/205-S Stabilized Area
Site Type: Unplanned Release
Facility/Geographic Area: S-Plant (Reduction-Oxidization [REDOX]) Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-PW-2, 200-MG-1
Service Dates: Early 1950s to 1981

Waste Site Location and Physical Description: The 200-W-22 waste site consists of multiple unplanned releases (UPRs) and areas contaminated during processes associated with REDOX Plant operations. The site includes the 203-S, 204-S and 205-S Facilities and associated unloading platforms, and is located northwest of the 202-S Facility (Figures 1 and 2). In 1983, the site was decommissioned and all aboveground surface features were removed. However, the cement basins and buried piping are still present at the site.

The 203-S and 205-S Facilities were constructed in the early 1950s to process and decontaminate the uranyl nitrate hexahydrate (UNH) produced by REDOX operations. The primary process unit consisted of a column filled with silica gel that removed traces of fission products from the UNH. The silica gel column (SG-1) was located in the underground 205-S Vault. The vault also contained a waste neutralization tank. The 205-S Facility was a two-story, aboveground, chemical make-up building. It contained two chemical make-up tanks, a UNH sample room, and extensive piping connected to the REDOX Facility and the underground vault.

The 203-S Facility was an aboveground UNH storage facility that consisted of two 19,000 L (5,000 gal) stainless steel tanks that were set in an open concrete basin. There was also a 204-S Tank Farm, that consisted of four 190,000 L (50,000 gal) aboveground tanks set in two open concrete basins.

A UNH unloading facility was located at the adjacent railroad siding. UNH from the Plutonium-Uranium Extraction (PUREX) Plant were transported by truck to the unloading station and placed in the 204-S tanks. The PUREX solutions were then processed through the silica gel column. An aboveground UNH pipeline connected the 203-S, 204-S, 205-S areas to the 224-U Facility.

After REDOX was shut down in 1965, the 203-S and 205-S Facilities were placed on standby. The unloading station was converted to a railcar unloading station, and Tank 204-S-4 was connected to the 240-S-151 diversion box so that waste could be transferred to the tank farms.

Waste Site Coordinates:
E-567285.86635 N-134098.40974

Site Dimensions:
Site Length: 84.0 m (276.0 ft)
Site Width: 68.0 m (223.0 ft)
Site Area: 5,712.0 m^2 (61,548.0 ft^2)
Site Depth: 3.0 m (10.0 ft)
Cover Thickness: 0.6 m (2.0 ft)

Site: 200-W-22	Area: S Plant	Category: Intermediate

Related Site Structure(s): The site is associated with the 203-S and 205-S UNH processing facilities, the REDOX UNH unloading facility, and UPR-200-W-32, UPR-200-83, UPR-200-W-10, UPR-200-W-69, UPR-200-W-86, UPR-200-W-116, UPR-200-W-123.

Site Posting: The site is currently posted as an Underground Radioactive Materials Area (URMA). In addition, there are also two small, posted URMAs located under the abandoned steam line, on the south end of this site.

Site History

Release Summary: Releases at the 200-W-22 waste site are associated with the unloading, transportation, and processing of UNH, and the long-term storage of contaminated waste.

Waste processed and stored in this area included contaminated UNH from REDOX and PUREX, thorium nitrate from PUREX, 100-N Reactor decontamination waste, and 300 Area Laboratory wastes. After 1965, Tanks 204-S-1, S-2, and S-3 continued to store shipments of these wastes from the unloading station. Radiological contaminants may still be present in and around the remaining contaminated structures (cement basins and piping) that were not removed in the 1983 stabilization effort.

In addition to waste stored at the associated facilities, several UPRs occurred over the years at the site. In 1952, the ground around the 203-S uranium nitrate hexahydrate storage tanks was contaminated with uranium. A maximum of 10,000 cpm at 2.5 cm (1 in.) was found in this area.

Another two UPRs, UPR-200-W-116 and UPR-200-W-123, involve spills or speck contamination associated with the unloading station. UPR-200-W-116 consists of contaminated soil specks located east of the railcar unloading station. UPR-200-W-123 occurred on January 18, 1979, when a railroad tank car spilled a small amount of radioactive liquid waste from the 300 Area onto the ground at the 204-S unloading station.

Volume/Mass Discharged: Unspecified.

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: The soil in the area that was contaminated with uranium in 1952 was covered with blacktop and enclosed within a wooden rail fence. The fence was posted with Radiation Zone signs.

Site decommissioning activities in 1983 removed all aboveground features, including equipment, structures, utilities, and tanks. In addition, most of the radioactive structures and equipment were removed and buried. Structures were removed to a level equal to 0.6 m (2 ft) below the railroad grade level. No attempt was made to remove the concrete structures or buried piping. The radioactive structures that were covered in place are the 203-S Basin, the 204-S Basin, the 205-S Vault,

Site: 200-W-22	Area: S Plant	Category: Intermediate

the 205-S Building base pad, various isolated utility lines, the railcar unloading area, the concrete encased pipeline from the REDOX Facility to the tank farm, and the REDOX chemical sewer. Once structures were removed or buried, the site was graded and leveled with clean backfill material. The final closure activities included placing signs and concrete monuments.

The site is radiologically and visually inspected once a year.

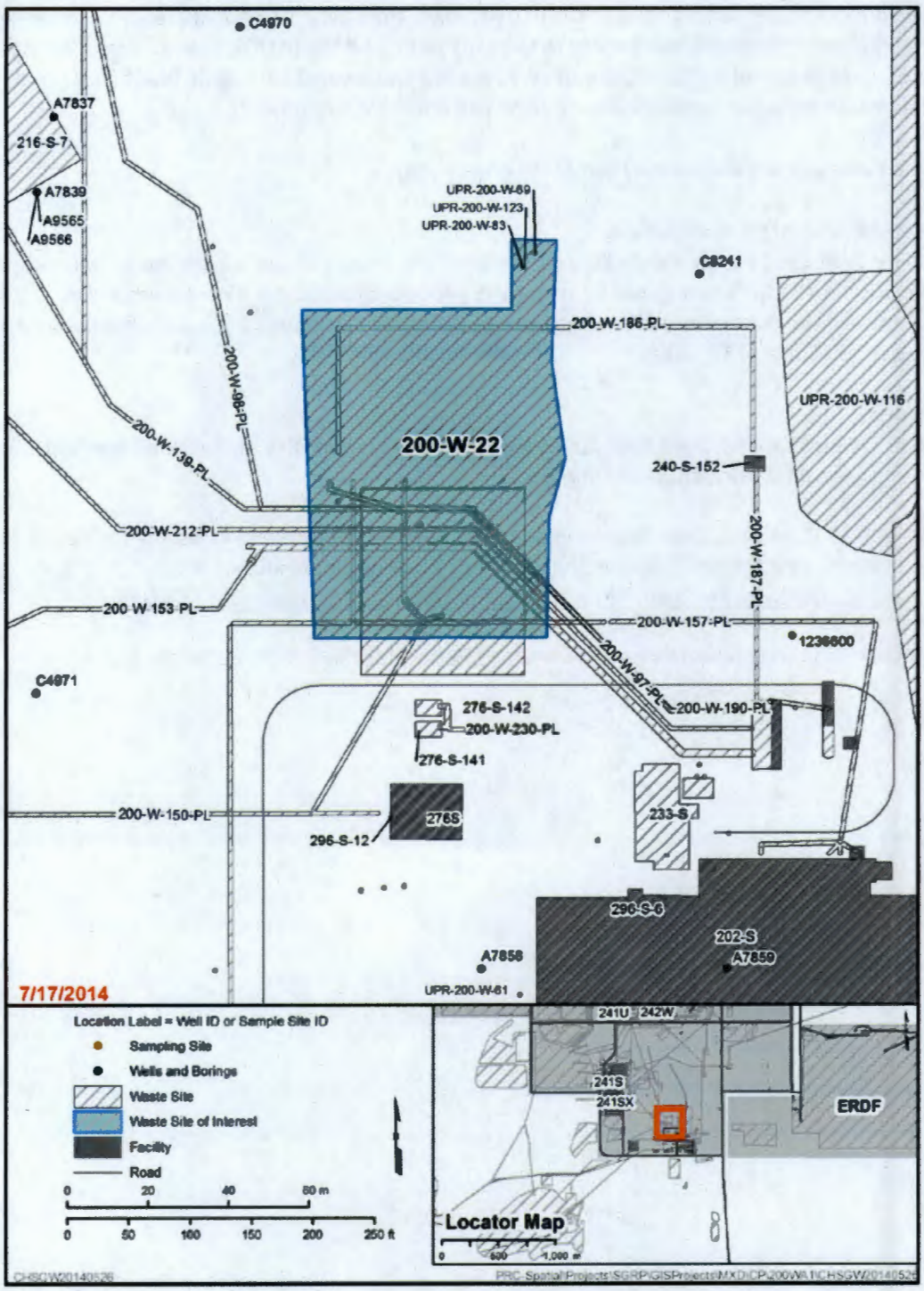
Nature and Extent of Contamination:
No data are available to evaluate shallow or intermediate depth soil contamination or foundation contamination. UNH spills associated with storage, processing transportation occurred across 1.4 acres. At least some of the contaminated soil has been covered with blacktop. The approximate depth to groundwater is 70.8 m (232 ft) bgs.

References:
H-2-44511, 1984, Sheet 29, *Area Map 200 West "S" Plant Facilities*, Rev. 3, Rockwell Hanford Operations, Richland, Washington.

PNNL-14702, 2006, *Vadose Zone Hydrogeology Data Package for Hanford Assessments*, Rev. 1, Pacific Northwest National Laboratory, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0911300343.

Waste Information Data System General Summary Report for the 200-W-22 Waste Site.

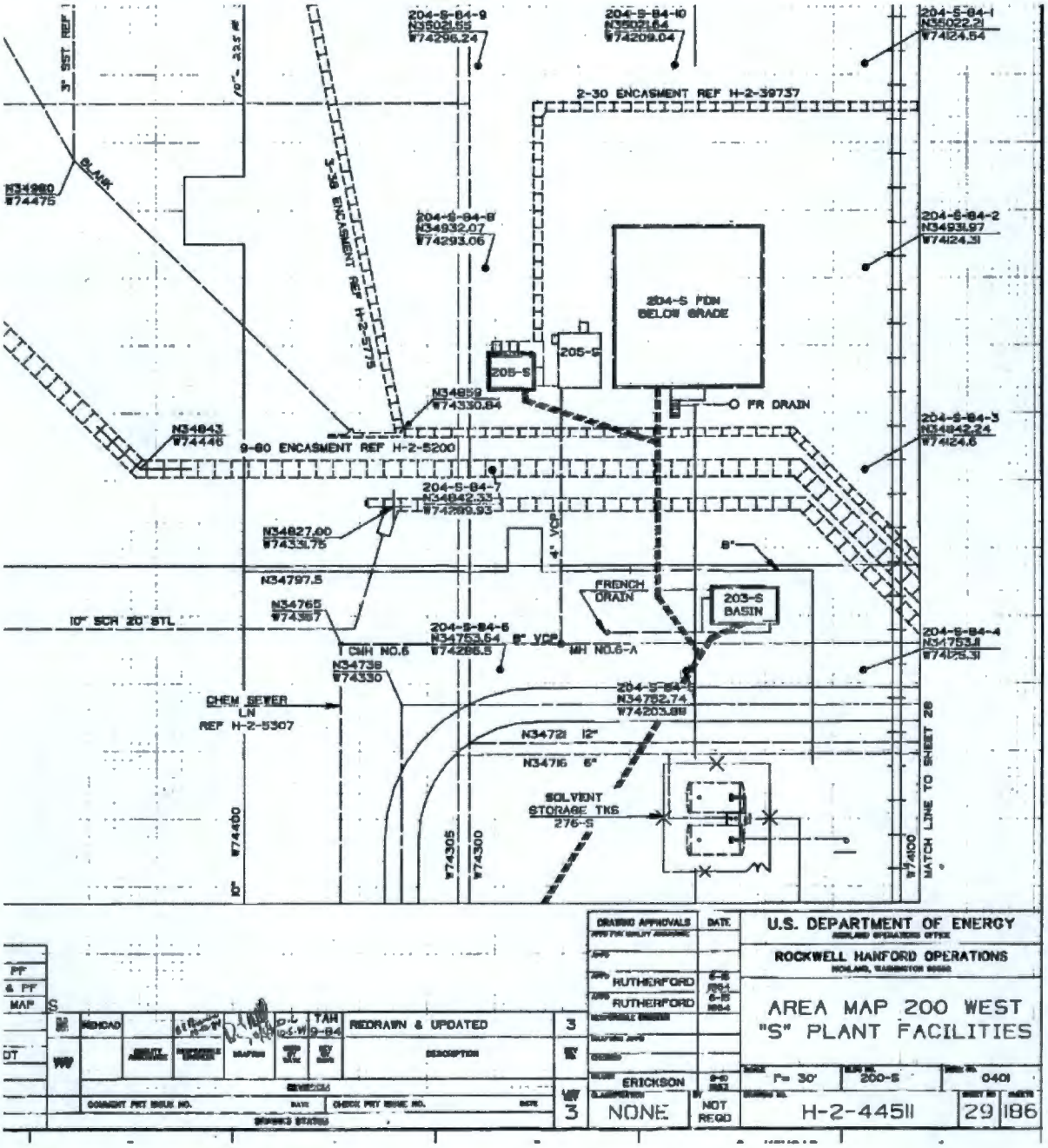
Site: 200-W-22	Area: S Plant	Category: Intermediate



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 200-W-22 Waste Site Map

Site: 200-W-22	Area: S Plant	Category: Intermediate



Source: H-2-44511, *Area Map 200 West "S" Plant Facilities.*

Note: Produced from best available copy.

Figure 2. 200-W-22 Waste Site Area Map

Site: 200-W-22	Area: S Plant	Category: Intermediate

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Site: 200-W-51	Area: S Plant	Category: Intermediate

Site Description

Alternate Site Identification: 200-W-51
Site Type: Septic Tank (Abandoned)
Facility/Geographic Area: S Plant (241-SY Tank Farm Area)
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Service Dates: Unknown

Waste Site Location and Physical Description: The 200-W-51 waste site is a decommissioned septic tank located north (and slightly east) of Tank 241-SY-101, north of the 241-SY Tank Farm fence (Figure 1). Engineering Change Notice ECN-637974 (December 1996) identifies the location of an abandoned septic tank found during the construction activities associated with the new SY Exhauster (Figure 2). Work package 2W-94-1004 Work Change Notice #4 describes the activities associated with filling and covering the abandoned tank. The tank is not shown on any known drawings. No construction information was found for the septic tank. The presence of an associated drain field is unknown.

The site is marked with a sign (Figure 3).

Waste Site Coordinates:
Lon-566915.55 Lat-134633.07

Site Dimensions:
Site Length: Not specified
Site Width: Not specified
Site Area: Not specified
Site Depth: Not specified
Cover Thickness: Not specified
Capacity: Not specified

Related Site Structure(s): Not specified.

Site Posting: No site posting is specified for 200-W-51.

Site History

Release Summary: The operational history of the 200-W-51 Septic Tank is unknown.

The tank was decommissioned in 1994 in accordance with *Washington Administrative Code* (WAC) guidelines available at the time (WAC 246-272-18501). The tank was exposed and opened at the top and the existing heel stabilized with grout or absorbent material. The tank walls were collapsed to the extent practicable and the site was backfilled and compacted with clean fill.

Volume/Mass Discharged: Unspecified volume of liquid (assumed to be sanitary sewage) from unknown building.

Site: 200-W-51	Area: S Plant	Category: Intermediate

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: The septic system was deactivated following established *Washington Administrative Code* guidelines in 1994. No sampling records from the deactivation are available.

No site characterization information is available for the 200-W-51 waste site. The site is not routinely surveyed or monitored.

Nature and Extent of Contamination: Insufficient data are available to evaluate shallow or intermediate depth soil contamination.

References:

Engineering Change Notice 624622 (June 1995).

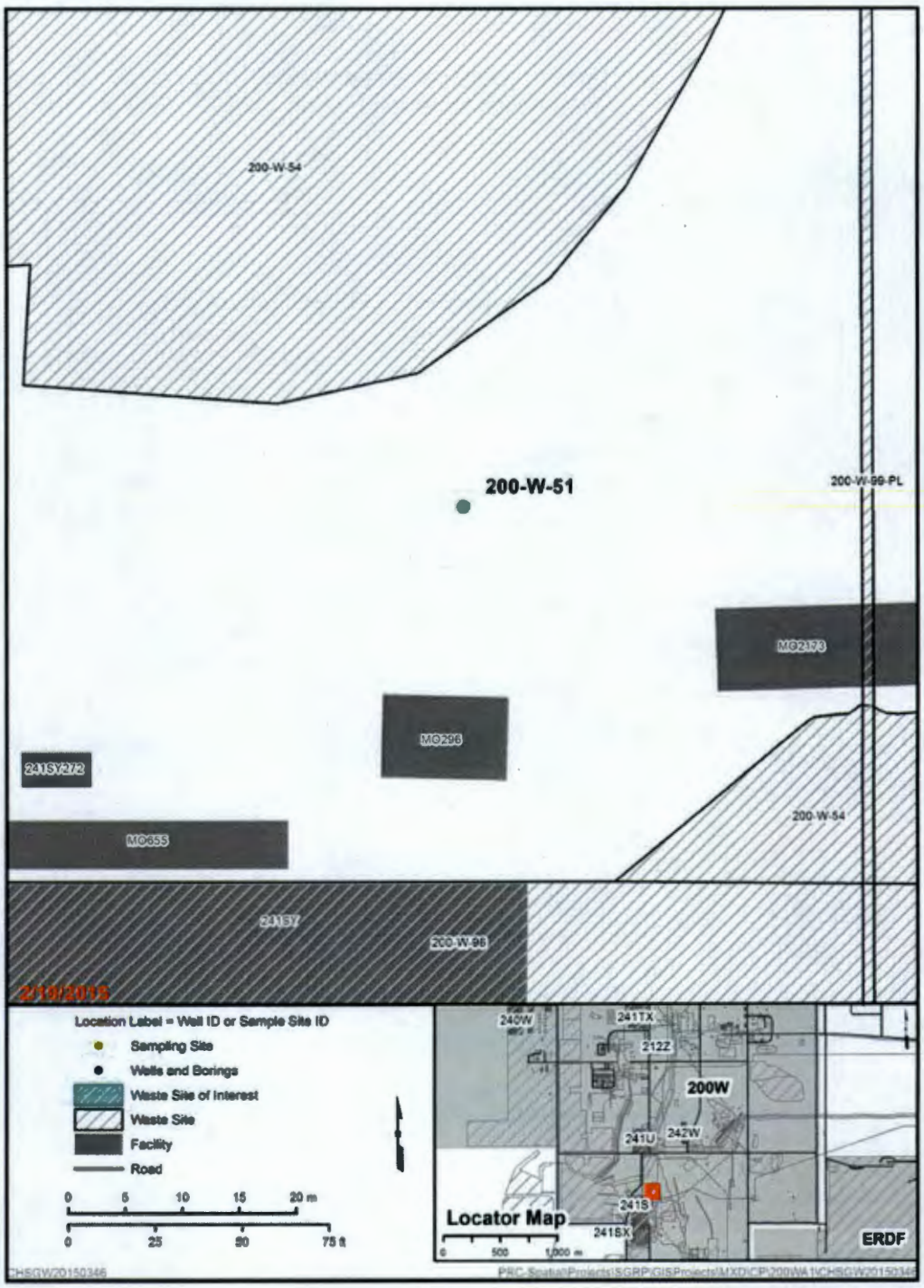
Engineering Change Notice 637974 (December 1996).

WAC 246-272-18501, "Abandonment," *Washington Administrative Code*. Olympia Washington, Repealed.

Waste Information Data System General Summary Report for the 200-W-51 Waste Site.

Work Change Notice 2W-94-01004/M.

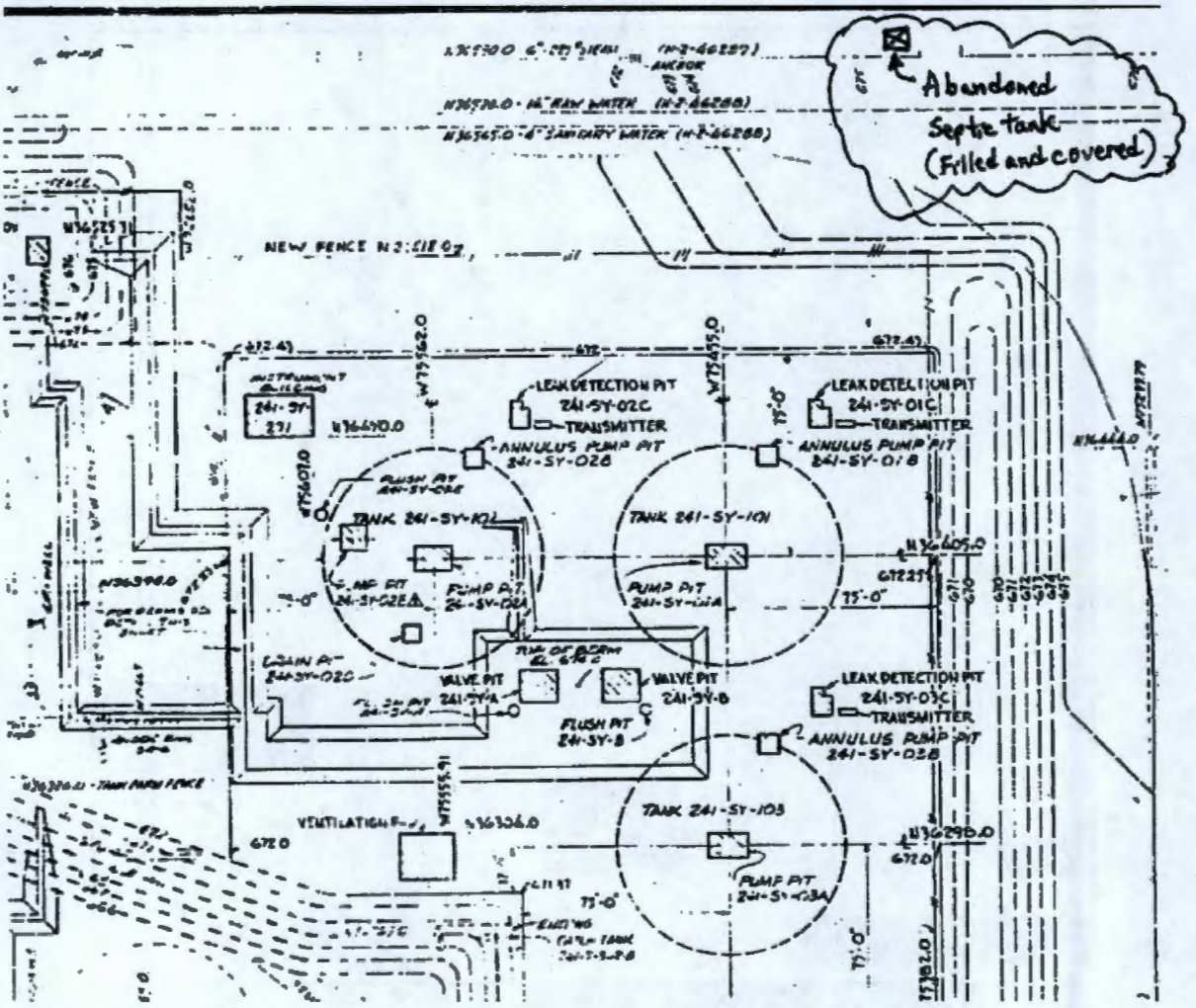
Site: 200-W-51	Area: S Plant	Category: Intermediate



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 200-W-51 Waste Site Map

Site: 200-W-51	Area: S Plant	Category: Intermediate



Source: Engineering Change Notice 6374974.

Note: Produced from best available copy.

Figure 2. Location of 200-W-51 Septic Tank

Site: 200-W-51	Area: S Plant	Category: Intermediate

Figure 3. Sign at the 200-W-51 Septic Tank

Site: 200-W-51	Area: S Plant	Category: Intermediate

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Site: 200-W-54	Area: S Plant	Category: Shallow – Surface

Site Description

Alternate Site Identification: Contamination Migration from 241-SX Tank Farm
Site Type: Unplanned Release
Facility/Geographic Area: S Plant (Reduction-Oxidation [REDOX]) Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UR-1, 200-MG-1
Service Dates: Unspecified

Waste Site Location and Physical Description: The 200-W-54 waste site consists of an expanding area of migrating contamination located east and north of the 241-S, SX, SY Tank Farm fence (Figure 1). The site extends eastward to the west edge of the 216-S-9 Crib. The original unplanned release was defined in 1997 as a large, irregular shaped Soil Contamination Area (SCA) located on the east side of 241-S/SX Tank Farms. In 1997, the site measured approximately 175 m (575 ft) by 100 m (330 ft). A second Global Positioning System (GPS) survey was conducted in 1998, which expanded the posted SCA approximately 50 m (165 ft) to the west, up to the 241-S, SX, SY Tank Farm fence, and approximately 200 m (660 ft) in the north-south direction. The 200-W-54 waste site is moderately vegetated with bunchgrasses, with no soil discoloration or debris visible. There are multiple chained areas with various radiological postings located on the east and north side of the 241-SY Tank Farm. These are discussed further in the following sections.

Waste Site Coordinates:
E-566995.55532 N-134485.02175

Site Dimensions:
Original site dimensions taken in 1997.
Site Length: 175.0 m (574.2 ft) Site Depth: Unspecified
Site Width: 100.6 m (330.0 ft) Cover Thickness: 0.0 m (0.0 ft)
Site Area: 17,601.5 m^2 (189,469.5 ft^2)

Site dimensions of the expanded area mapped in 1998.
Site Length: 225.0 m (738.2 ft) Site Depth: Unspecified
Site Width: 300.0 m (984.3 ft) Cover Thickness: 0.0 m (0.0 ft)
Site Area: Unspecified

Related Site Structure(s): The site is associated with activity in the 241-S, SX and SY Tank Farms. There is also one separately posted Contamination Area located north of 241-SY Tank Farm, across a gravel road. In 2002, the 200-W-54 waste site was consolidated with the 241-S, SX, SY Soil Site (200-W-96), but because of the increasing size of 200-W-54, it was un-consolidated from 200-W-96 in December 2004.

Site Posting: The site is posted as an SCA.

Site: 200-W-54	Area: S Plant	Category: Shallow – Surface

Site History

Release Summary: All of the contamination in the area is assumed to originate from Tank Farm activities or contamination migration from the adjacent posted contamination areas, as they are the only apparent contamination sources. It is assumed contamination spread from the Tank Farms and through Site 200-W-54 via windblown particulates.

Contaminated tumbleweed fragments, rabbit and mouse feces, and soil specks are frequently identified along the outside of the Tank Farm fence. Attempts to remove the contamination usually eliminate the need to post the contamination with radiological boundaries. In 2009, many contaminated animal droppings were found outside the posted areas. Some of these rabbit feces and speck patches were delineated and posted as a Contaminated Area.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: A GPS survey occurred on March 25, 1997, to document the size and shape of the SCA. Site walkdowns for mapping and verification purposes occurred in 1997 and 2000, and additional GPS surveys of posted contaminated areas near the Tank Farms occurred in 1998 and 1999. The posted size and shape of 200-W-54 changed with each additional radiological survey, due to contamination migration.

For instance, the site dimensions defined in 1998 were highly irregular, as a narrow area was found to extend along the entire length of the eastern 241-S, SX, SY Tank Farm fence. A wider area, located midway of the Tank Farm fence line extends significantly eastward.

Radiological surveys taken on November 17, 1998, discovered three additional areas of contamination east of 241-SX Tank Farm. Contaminated media included rabbit feces, tumbleweed fragments, and ant hills. Another 15 individual contaminated areas were discovered on November 22, 1998. Several of the areas consisted of small contamination specks, which were picked up and disposed of as Radioactive Material. The sites that were not picked up were posted and left in place. Maximum readings from November 17, 1998, were 5,000 cpm on tumbleweed fragments, while the highest readings from November 22, 1998, were 650 cpm in an area of contaminated dirt and gravel.

A site visit in August 2000 found a number of additional radiologically chained and posted areas in this vicinity. In September, October, and November 2000, several individual radiologically posted areas in the vicinity of 200-W-54 and the Tank Farm fence were submitted to the Waste Information Data

Site: 200-W-54	Area: S Plant	Category: Shallow – Surface

System (WIDS) as Discovery Sites. All the radiologically posted areas north and east of the Tank Farm fence are incorporated into the 200-W-54 waste site description as it is believed all the sites share the Tank Farms as their contamination source.

Geophysical and analytical soil data are available from two boreholes (C3398 and C8095) located within the waste site area. Borehole and data summaries are presented in Tables 1 through 3. Borehole locations are shown on Figure 1. However, besides the radiological surveys, no data representative of the top foot of soil is available.

Table 1. Borehole Summary for the 200-W-54 Waste Site

Year	Well / Borehole ID	Location with Respect to Site	Depth (ft)
1999	299-W22-48 / B8812	Outside – 30 ft east	205 – 236 (2 soil samples)
2001	299-W22-81 / C3123	Outside – 20 ft east	Not reported*
2001, 2002	200-W22-84 / C3398	Inside – north	0 – 274 (GPL) 0 – 6, 234 – 239 (2 soil samples)
2001, 2002	200-W22-85 / C3399	Outside – 20 ft southeast	2 – 260 (GPL) 219 – 224 (1 soil sample)
2011	200-W22-90 / C8095	Inside - north	0 – 317 (GPL) 237 – 242 (1 soil sample)

*Waste management sample.

GPL = geophysical log

ID = identification

Site: 200-W-54	Area: S Plant	Category: Shallow – Surface

Table 2. Geophysical Logs 200-W-54

Borehole	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
C3398	0 – 5	–	pCi/g	–	10,394.1	cpm	3
	5 – 10	–	pCi/g	–	8,821.8	cpm	10
	10 – 15	–	pCi/g	–	10,483	cpm	15
	> 15	–	pCi/g	–	17,068.9	cpm	153
C8095	0 – 5	0.67	pCi/g	1.0	14,003.8	cpm	4
	5 – 10	–	pCi/g	–	13,979.9	cpm	10
	10 – 15	–	pCi/g	–	15,656.2	cpm	15
	> 15	–	pCi/g	–	18,091.1	cpm	171

bgs = below ground surface

Site: 200-W-54	Area: S Plant	Category: Shallow – Surface

Table 3. Soil Maximum Detection Summary for the 200-S-54 Waste Site (Soil Boreholes C3398 and C8095)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Acetone	44	µg/kg	6	–	–	–
Aluminum	8,150,000	µg/kg	6	7,030,000	µg/kg	239
Ammonia	18,400	µg/kg	6	–	–	–
Arsenic	61	µg/L	6	–	–	–
Barium	508	µg/L	6	97,700*	µg/kg	242
Beryllium	0.43	µg/L	6	0.69	µg/L	239
Cadmium	5.7	µg/L	6	–	–	–
Calcium	7,610,000	µg/kg	6	3,880,000	µg/kg	239
Cs-137	0.072	pCi/g	6	–	–	–
Chromium	–	–	–	23,100*	µg/kg	242
Copper	15,700	µg/kg	6	12,000	µg/kg	239
Gross alpha	–	–	–	1.8*	pCi/g	242
Gross beta	–	–	–	5.7*	pCi/g	242
Hexavalent chromium	490	µg/kg	6	1,500	µg/kg	239
Iron	28,100,000	µg/kg	6	18,600,000	µg/kg	239
Lead	–	–	–	7,210*	µg/kg	242
Magnesium	5,010,000	µg/kg	6	3,350,000	µg/kg	239
Manganese	438,000	µg/kg	6	346,000*	µg/kg	242
Molybdenum	530	µg/kg	6	3,100	µg/kg	239
Nickel	31.5	µg/L	6	35.3	µg/L	239
Nitrate	5,680	µg/kg	6	–	–	–
Potassium	1,510,000	µg/kg	6	1,130,000	µg/kg	239
K-40	–	–	–	13.7*	pCi/g	242
Pu-238	–	–	–	0.018*	pCi/g	242
Ra-226	0.505	pCi/g	6	0.343*	pCi/g	242

Site: 200-W-54	Area: S Plant	Category: Shallow – Surface

Table 3. Soil Maximum Detection Summary for the 200-S-54 Waste Site (Soil Boreholes C3398 and C8095)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Ra-228	0.62	pCi/g	6	1.22*	pCi/g	242
Sodium	478,000	µg/kg	6	653,000	µg/kg	239
Tc-99	–	–	–	1.1*	pCi/g	242
Th-228	1.11	pCi/g	6	0.663	pCi/g	239
Th-230	0.48	pCi/g	6	–	–	–
Th-232	0.62	pCi/g	6	0.958*	pCi/g	242
Tin	1,900	µg/kg	6	3,700	µg/kg	239
U-233/234	0.662	pCi/g	6	0.14*	pCi/g	242
U-238	0.508	pCi/g	6	0.16*	pCi/g	242
Zinc	58.1	µg/L	6	32.1	µg/L	239

*Data are from borehole C8095. All other data are from borehole C3398.

Nature and Extent of Contamination:

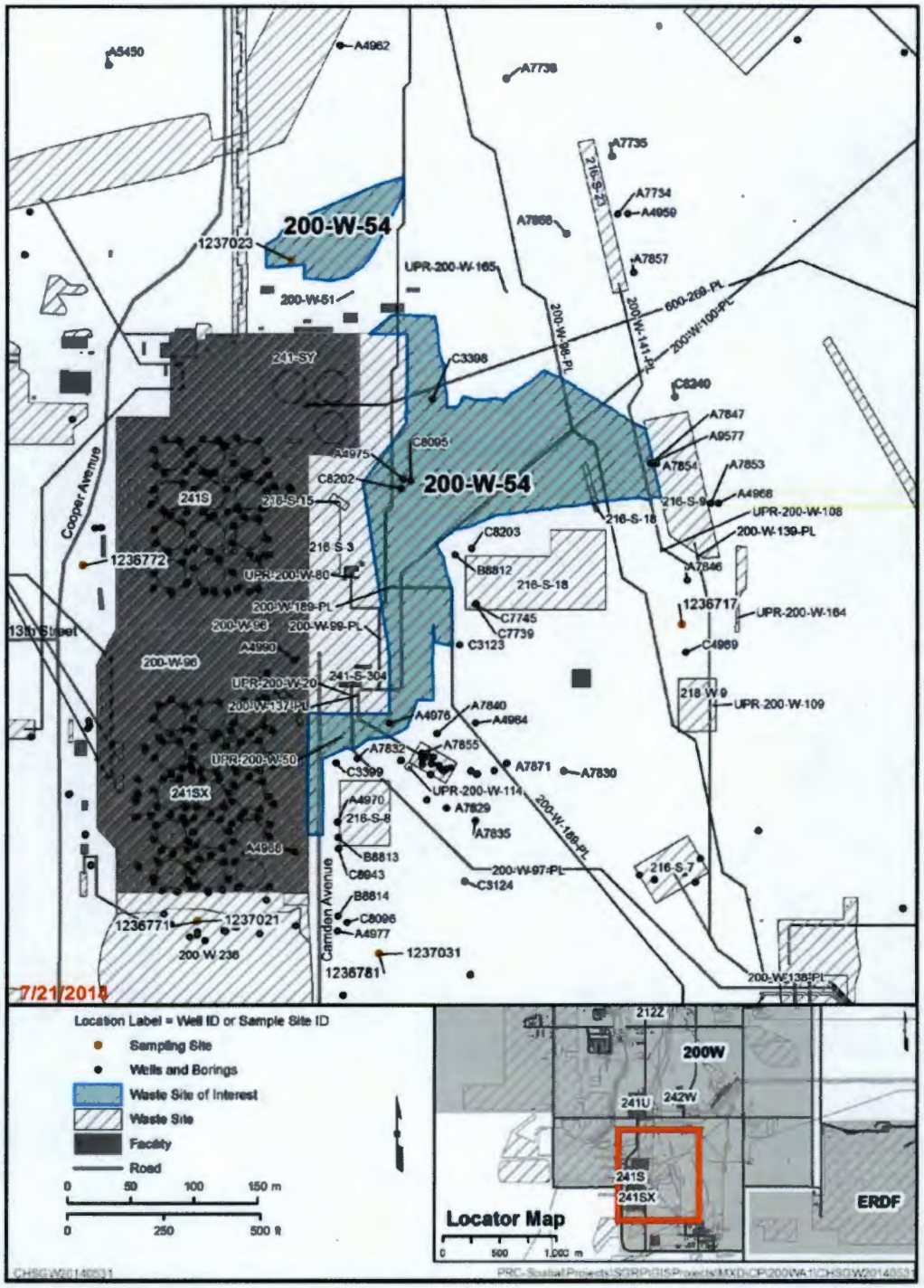
Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Soil sample results 0 – 1.8 m (0 – 6 ft) bgs indicate radionuclides are at background levels. Radiological surveys have detected significant contamination at soil surface; and potential exists for migration of contaminated specks, vegetation, and feces.

Deep (>4.6 m [>15 ft]) bgs: Soil sample results indicate radionuclides are at background levels.

References:

Waste Information Data System General Summary Report for the 200-W-54 Waste Site.

Site: 200-W-54	Area: S Plant	Category: Shallow – Surface



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 200-W-54 Waste Site Map

Site: 200-W-54	Area: S Plant	Category: Shallow – Surface

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Site: 200-W-75	Area: S Plant	Category: Shallow-Subsurface

Site Description

Alternate Site Identification: 200-W-75, Radiological Logging System (RLS) Calibration Silos
Site Type: Experiment/Test Site
Facility/Geographic Area: S Plant (Reduction-Oxidation) Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-SW-2, 200-MG-1
Service Dates: Site became operational in 1978

Waste Site Location and Physical Description: The 200-W-75 waste site consists of four buried RLS equipment calibration silos. Three silos are located west of the 202-S Building, south of the 276-S Building, and north of the 211-S Tanks (Figure 1). The fourth calibration silo is located west of the 211-S Tanks, across an asphalt access road. The silos are galvanized steel containers with metal lids bolted on top (Figure 2). The silos have somewhat different design constructions for calibrating different types of equipment. One type consisted of a 15.2 cm (6-in.) capped well casing inserted through the centers of the silos. There are two risers with bolted lids adjacent to the well casing (see Figure 2).

Three of the silos were located within the 211-S posted contamination area. This area was covered with a minimum of 15.24 cm (6 in.) of clean gravel in November 2002. The three silos are now beneath the clean backfill and are no longer visible. The area was downposted to an Underground Radioactive Material Area (URMA) following surface stabilization work.

Waste Site Coordinates:
E-567262.62201 N-133987.43463

Site Dimensions:
Site Length: Not specified
Site Width: 1.2 m (4.0 ft)
Site Area: 1.13 m^2 (12.16 ft^2)
Site Depth: 2.4 m (8.0 ft)
Cover Thickness: 0.15 m (0.5 ft)

Related Site Structure(s): None.

Site Posting: The site is posted as an URMA.

Site History

Release Summary: The site consists of several contaminated calibration silos used to store solid radioactive material. The calibration silos contained radioactive sources consisting of known quantities of cobalt-60, strontium-90, ruethenium-106, and cerium-144 in sealed capsules. Since the silo covers are posted with URMA signs, it is assumed the sources are still inside the silos.

Site: 200-W-75	Area: S Plant	Category: Shallow-Subsurface

In the late 1970s, test well mockups were used to calibrate in-well radionuclide detectors. The calibration mockups were constructed of a steel container approximately 2.4 m (8 ft) deep filled with soil. Tubes containing radioactive sources were inserted into the soil at distances of 2.5, 7.6, 15, 30, 46, and 61 cm (1, 3, 5.9, 11.8, 18.1, 24 in.) from the well casing that was located in the center of the mockup. The mockup silo was buried so that a RLS vehicle could drive up to the calibration silo and drop its logging probe in the center well casing.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

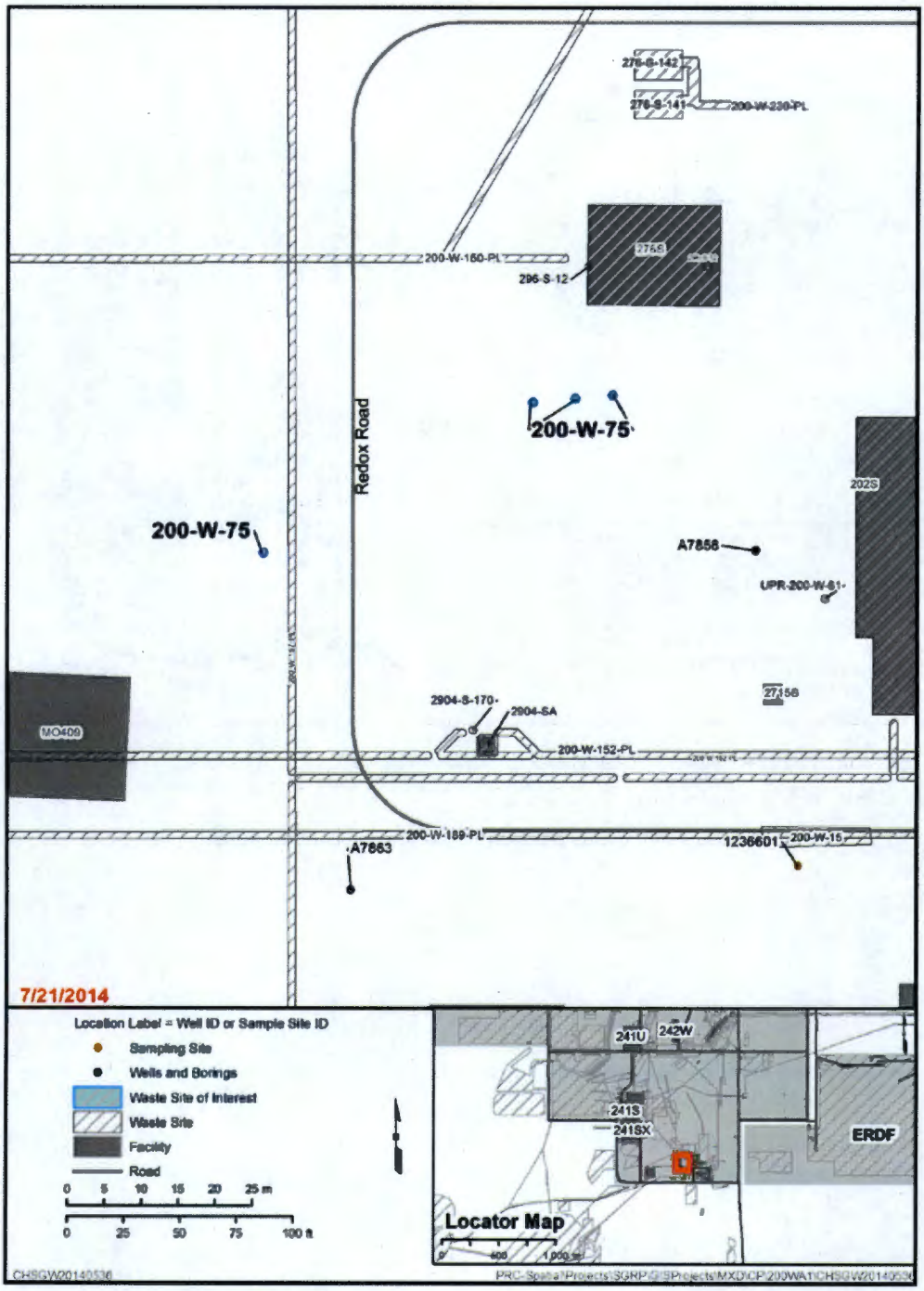
Site Characterization Summary: It is assumed that the silos still contain solid radioactive source material. Silos are covered with 15.2 (6 in.) clean backfill and not visible. However, a Global Positioning System survey on February 20, 2001, mapped the boundaries of the site.

Nature and Extent of Contamination:

Shallow 0 – 4.6 m (0 – 15 ft) below ground surface (bgs): Original silo depth was 2.4 m (8 ft) bgs. Likely contaminated source material inside each silo, potential radiological contamination in the subsurface soil surrounding the silos.

References:
Waste Information Data System General Summary Report for the 200-W-75 Waste Site.

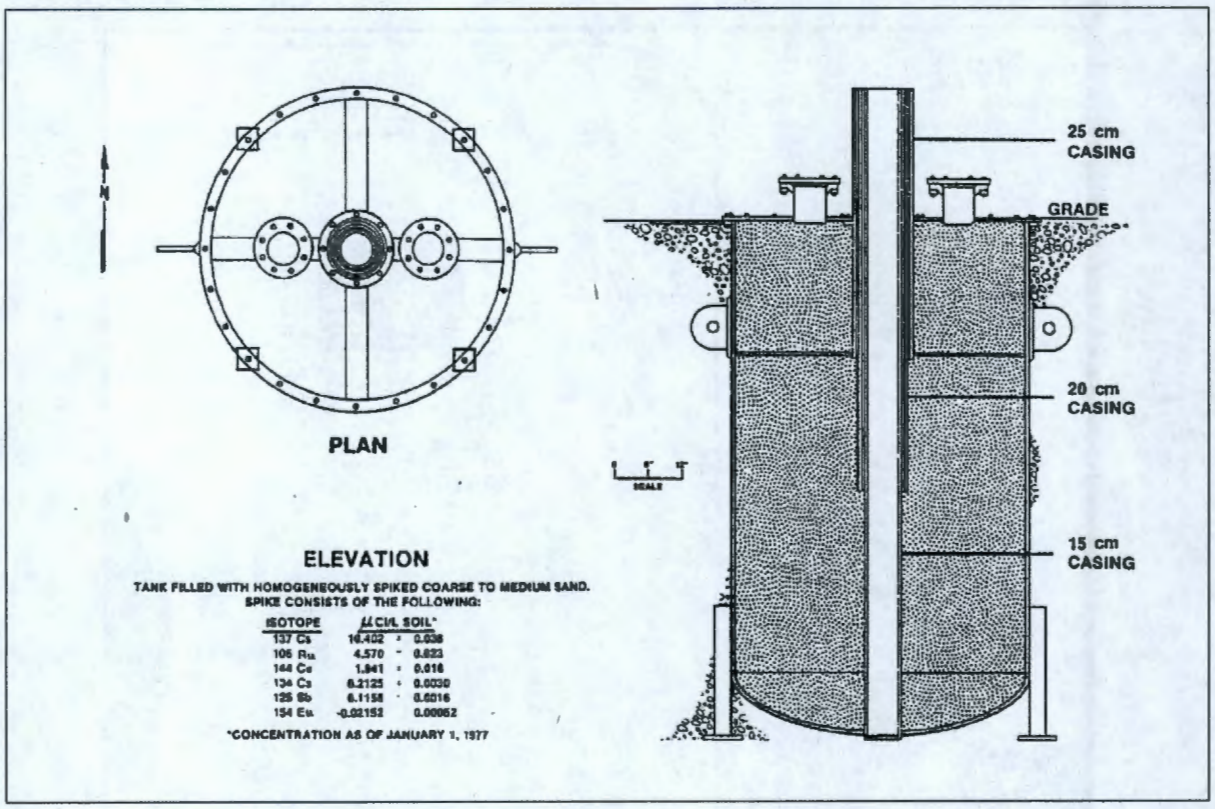
Site: 200-W-75	Area: S Plant	Category: Shallow-Subsurface



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 200-W-75 Waste Site Map

Site: 200-W-75	Area: S Plant	Category: Shallow-Subsurface



Source: RHO-ST-14, *High-Level Waste Leakage from the 241-T-106 Tank at Hanford*, Figure J-6.

Note: Produced from the best available copy.

Figure 2. Cross Section of In-Well Calibration Facility

Site: 200-W-240	Plant: S Plant	Category: Shallow – Surface Only

Site Description

Alternate Site Identification: Contaminated Rabbit Feces Area South and West of 272S
Site Type: Contamination Migration
Facility/Geographic Area: 200W
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: Not applicable
Service Dates: Not applicable

Waste Site Location and Physical Description: The 200-W-240 waste site is a large area posted with contamination area signs. Contaminated rabbit feces have been found in this area since at least 2009. The waste site is located on the south and west sides of the 272-S Building, on the west side of Cooper Ave. in the 200 West area (Figure 1).

Waste Site Coordinates:
Lon-5666647.86 Lat-134534.15

Site Dimensions:
Site Length: 86.9 m (285.1 ft) Site Width: 79.3 m (260.1 ft)
These are the dimensions of the largest extents of the irregularly-shaped waste site.

Site Posting: The waste site is a large area posted with Contamination Area signs.

Site History

Release Summary: In 2011, the area was recognized as an area that was often re-contaminated from biological vectors. Contaminated rabbit feces and tumble weed fragments have often been identified in this area, possibly due to the Tank 241-S-102 spill.

The type of waste and the volume of waste released at the 200-W-240 waste site are not specified. Therefore, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Site: 200-W-240	Plant: S Plant	Category: Shallow – Surface Only

Previous Site Characterization

Site Characterization Summary: Global Positioning System surveys were performed in September 2011 to define the boundaries of the 200-W-240 and 200-W-241 waste sites. In 1994, a surface soil sample (Sampling Site 2380) was collected west of 200-W-240 and analyzed for semi-volatile organics, metals, anions, total petroleum hydrocarbons, and radionuclides. A borehole summary is provided in Table 1. Borehole and sample locations are shown on Figure 1.

Table 1. Sampling Site and Well Location Summary for the 200-W-240 Waste Site

Year	Identification	Location with Respect to Site	Depth (ft)
1994	Sampling Site 2380	Outside, approximately 75 ft west	0
Unknown	A8045 (299-W23-210)	Within site boundary	100

Note: Sampling Site 2380 is associated with 216-U-10 and results are not included since they are not representative of the 200-W-240 waste site.

Nature and Extent of Contamination: A survey performed in 2009 identified contaminated rabbit feces that read approximately 20 rad/hour on contact (corrected rad dose). In January 2013, a survey of the perimeter of this waste site identified contaminated mouse feces with a maximum of 4 mr/hr (beta/gamma) and 0.5 mr/hr (gamma). The feces, located outside the boundary, were properly removed the same day they were found.

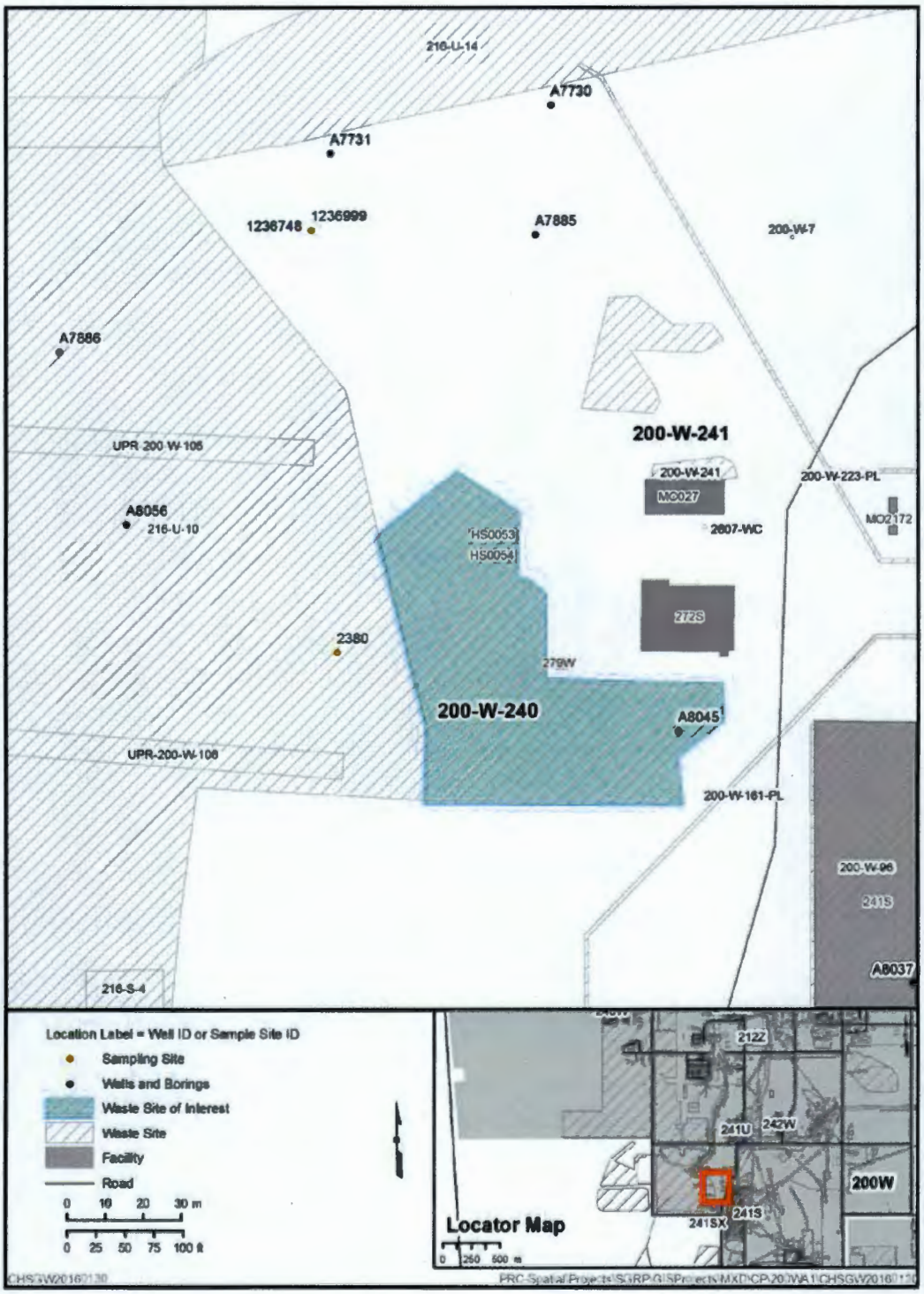
Shallow (0 – 4.6 m [0 –15 ft] below ground surface [bgs]): Potential radiological contamination at the surface.

References:

NA-1205180532. Phipps, Dave. Fw: Downed "SCA" postings (July 2011).

Waste Information Data System General Summary Report for the 200-W-240 Waste Site.

Site: 200-W-240	Plant: S Plant	Category: Shallow – Surface Only



ID = identification

Figure 1. 200-W-240 Waste Site Map

Site: 200-W-240	Plant: S Plant	Category: Shallow – Surface Only

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Site: 200-W-241	Plant: S Plant	Category: Shallow – Surface

Site Description

Alternate Site Identification: Contaminated Tumbleweed Fragment Areas West of Cooper Ave.
Site Type: Contamination Migration
Facility/Geographic Area: 200 West
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: Not applicable
Service Dates: Not applicable

Waste Site Location and Physical Description: The 200-W-241 waste site includes two areas that contain contaminated tumbleweeds and contaminated tumbleweed fragments. One area surrounds several Conex boxes and one is located on the north side of the MO-027 trailer. A large posted contamination area extends northward from the MO-633 trailer, into the vacant property. Tumbleweeds are visible beneath the MO-633 trailer. The 200-W-241 waste site is located on the west side of Cooper Ave., west of the 242-S Evaporator building (Figure 1).

Waste Site Coordinates:
E-566686.456566 N-134624.199197

Site Dimensions:
Site Length: 30.5 m (100 ft) Site Width: 30.5 m (100 ft)
These are the dimensions of the largest extents of the irregularly-shaped waste site.

Site Posting: The waste site is posted with Contamination Area signs.

Site History

Release Summary: In 2011, the area was recognized as an area that was often re-contaminated from biological vectors. Contaminated tumbleweed fragments have been identified in this area, possibly due to the Tank 241-S-102 spill.

The type of waste and the volume of waste released at the 200-W-241 waste site are not specified. Therefore, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Site: 200-W-241	Plant: S Plant	Category: Shallow – Surface

Previous Site Characterization

Site Characterization Summary: Global Positioning System surveys were performed in September 2011 to define the boundaries of the 200-W-240 and 200-W-241 waste sites. It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided. If surveys do occur, their frequency is not specified.

Nature and Extent of Contamination: No data are available for this site. Release history is poorly defined.

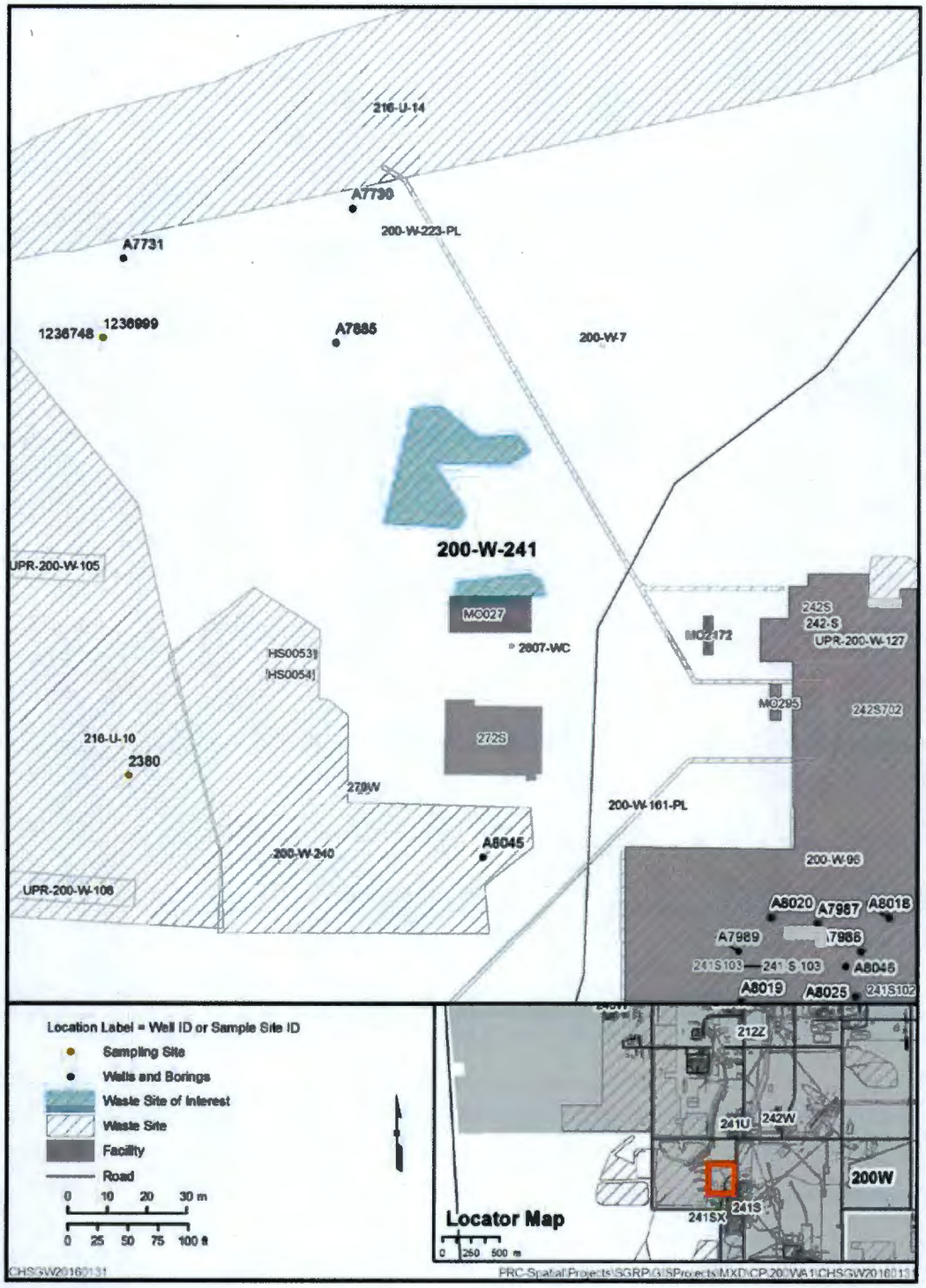
Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Potential radiological contamination at the surface.

References:

NA-1205180532. 2011. Phipps, Dave. Fw: Downed "SCA" postings. July.

Waste Information Data System General Summary Report for the 200-W-241 Waste Site.

Site: 200-W-241	Plant: S Plant	Category: Shallow – Surface



ID = identification

Figure 1. 200-W-241 Waste Site Map

Site: 200-W-241	Plant: S Plant	Category: Shallow – Surface

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Site: 207-S	Area: S Plant	Category: Intermediate

Site Description

Alternate Site Identification: Reduction-Oxidation (REDOX) Retention Basin, 207-S Retention Basin
Site Type: Retention Basin
Facility/Geographic Area: S Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-CW-2
Service Dates: 1951 to April 1954

Waste Site Location and Physical Description: The 207-S waste site is located west of the 222-S Laboratory Building and north of 10th Street (Figure 1). The site is a Retention Basin with an associated Overflow Tank and piping. The Basin was a 39.6 m by 39.6 m (130 ft by 130 ft) concrete structure with 25 cm (10-in.) thick walls, and a 20.3 cm (8-in.) thick floor (Figure 2). The overflow tank was 1.7 m (5.5 ft) high with 0.48 cm (3/16-in.) steel walls, and was located at in the north and center end of the basin, just within the north basin wall. A 61 cm (24-in.) vitrified clay pipe roughly 610 m (2,000 ft) in length carried waste water into and out of the overflow tank. The concrete floors and walls of the basin were found to be grossly contaminated and subsequently filled with dirt to prevent contamination from spreading. In June 1975, the soil was treated with herbicides and covered with an additional 23 cm (9 in.) of gravel to prevent radioactive weed growth. The most recent surface stabilization effort at this basin occurred in 1993.

Waste Site Coordinates:
E-566978.44077 N-133891.93441

Site Dimensions:
Site Length: 39.6 m (130 ft)
Site Width: 39.6 m (130 ft)
Site Area: 1,570 m^2 (16,900 ft^2)
Site Depth: 2.06 m (6.75 ft)
Cover Thickness: 0.45 to 0.60 m (1.5 to 2.0 ft)

Related Site Structure(s): The basin is associated with the 202-S Facility, the 216-S-16 and S-17 Ponds, UPR-200-W-13, UPR-200-W-15, UPR-200-W-95, 241-S/SX Tank Farm, UPR-200-W-114, and 200-W-152-PL.

Site Posting: The basin is posted as an Underground Radioactive Material Area (URMA), and is surrounded by concrete marker posts and URMA signs.

Site History

Release Summary: No estimated release volume is presented in the Waste Information Data System (WIDS) for this waste site. The basin received process cooling water and steam condensate from the 202-S Building via the 200-W-152-PL, a 61 cm (24-in.) diameter and 610 m (2,000-ft) long vitrified clay

Site: 207-S	Area: S Plant	Category: Intermediate

pipeline. The water was released via the 200W-152 PL pipeline into the 216-S-16 and 216-S-17 ponds. Several coil leaks within the 202-S Building caused contaminated effluent to be released into the basin. The first leak discussed in WIDS occurred in October 1952. An unplanned release (UPR) of liquid or steam waste occurred due to a steam coil failure in the REDOX D-12 Waste Concentrator, causing gross contamination of the process cooling water.

In November 1952, a UPR of liquid or steam waste resulted from a leak in the oxidizer vessel (H-4) steam coil at the REDOX Facility caused further gross contamination within the basin.

In 1993, the basin was backfilled with contaminated soil from a soil contamination area located east of 241-S/SX Tank Farm (UPR-200-W-114). The soil at this UPR site contained contaminated specks from the 241-S/SX Tank Farm operations. The 207-S Basin was then covered with an additional 46 – 61 cm (18 – 24 in.) of uncontaminated backfill to meet the approximate grade level of the surrounding area.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Radionuclide content unknown.

Previous Site Characterization

Site Characterization Summary: The November 1952 UPR resulted in contamination measuring between 2 to 200 mr/hr at 5 cm (2 in.) for the processing cooling header; and 80 mrep/hr, including 40 mr/hr to 250 mrep/hr and 70 mr/hr readings approximately 1.5 m (5 ft) above the cooling water condensate.

A radiation survey conducted on September 4, 1981, reported maximum readings of 9,000 cpm on blowing tumbleweeds measured inside the basin.

No soil or recent geophysical log data are available.

Nature and Extent of Contamination:

The characteristics and volume of waste discharged to the basin are unknown. The concrete floors and walls of the basin were contaminated, and at least some of the soil used to backfill the basin was contaminated. Up to 0.6 m (2 ft) of clean soil covers the site. Deeper soil could be contaminated if discharged liquids leaked through the basin and infiltrated the underlying soil. The approximate depth to groundwater is 65.8 m (216 ft) below ground surface (bgs).

References:

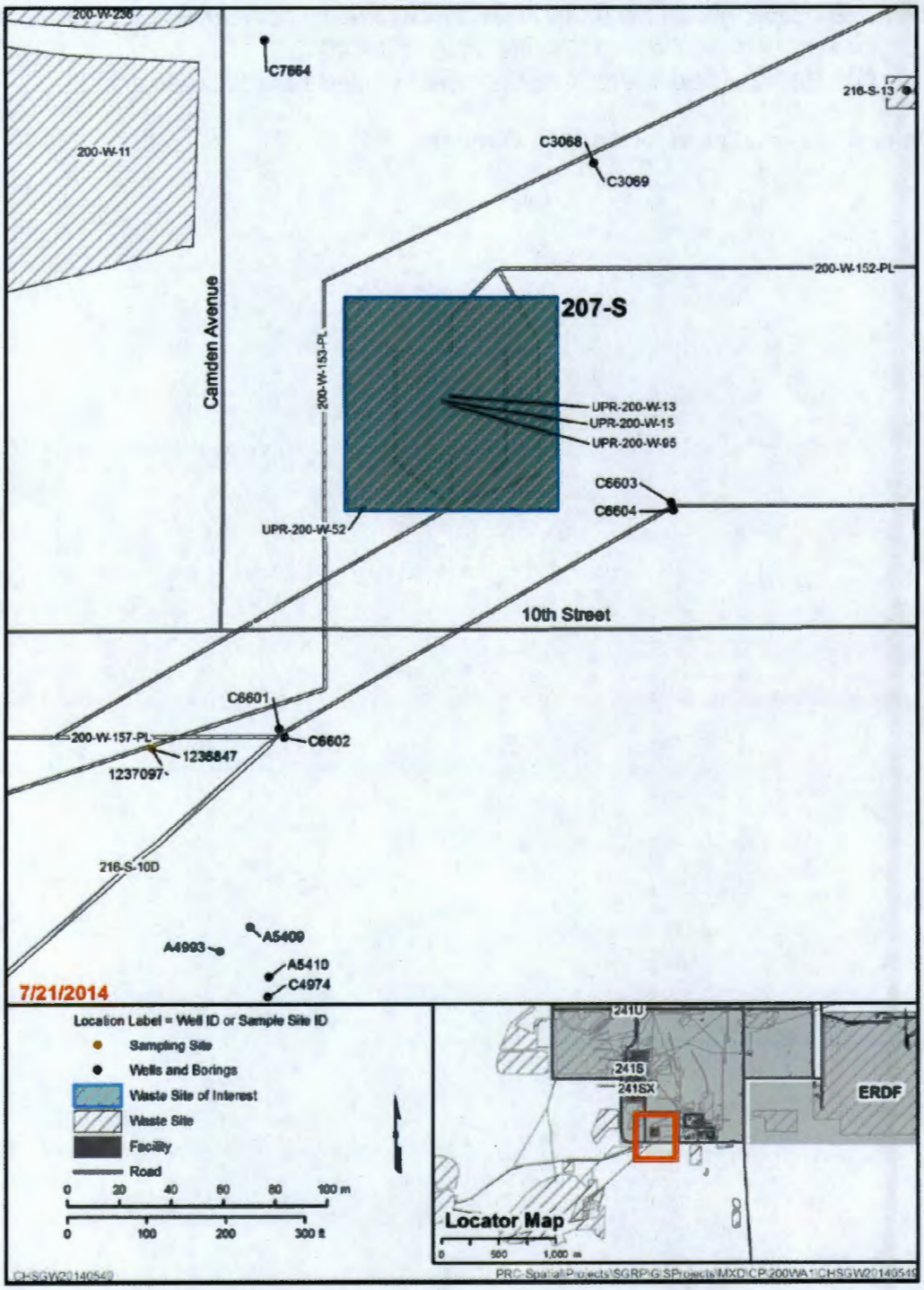
H-2-5541 (drawing), 1989, *Structural Steel Elevations & Section2 1953 Extension to Power House*, Rev. 2, General Electric Company, Richland, Washington.

Site: 207-S	Area: S Plant	Category: Intermediate

HW-83718, 1964 (public release 1999), *200 Areas Disposal Sites for Radioactive Liquid Wastes*, General Electric Company, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0081061H.

WIDS General Summary Report for the 207-S Waste Site.

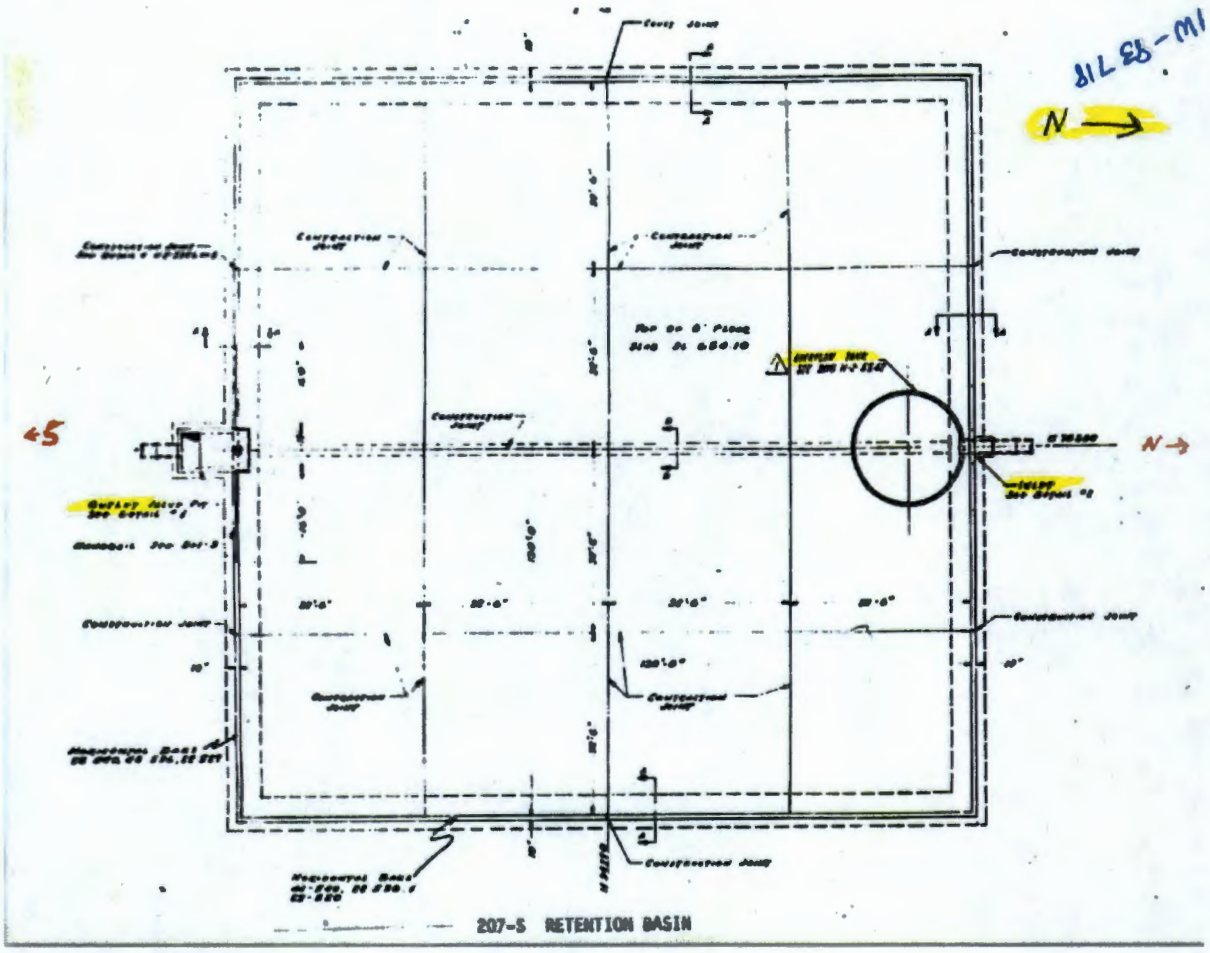
Site: 207-S	Area: S Plant	Category: Intermediate



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 207-S Waste Site Map

Site: 207-S	Area: S Plant	Category: Intermediate



Source: HW-83718, *200 Areas Disposal Sites for Radioactive Liquid Wastes.*

Note: Produced from the best available copy.

Figure 2. 207-S Waste Site Construction

Site: 207-S	Area: S Plant	Category: Intermediate

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Site: 216-S-1&2	Area: S Plant	Category: Deep

Site Description

Alternate Site Identification: 216-S-5 Crib, 216-SL-1&2
Site Type: Crib
Facility/Geographic Area: S-Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-LW-2
Service Dates: January 1952 to January 1956

Waste Site Location and Physical Description: The 216-S-1&2 Cribs are located east of the 241-SX Tank Farm, and southeast of the 241-S-151 Diversion Box (Figure 1). The site contains two open-bottomed wooden crib boxes and associated piping set in a gravel lined trench covered with backfill (Figures 2 and 3). The cribs are connected in series, with a buried pipe conveying overflow from the S-1 Crib to the S-2 Crib.

Waste Site Coordinates:
Lon-566979.43753 Lat-134261.11720

Site Dimensions:
Site Length: 27.4 m (90.0 ft)
Site Width: 12.2 m (40.0 ft)
Site Area: 334 m^2 (3,595 ft^2)
Site Depth: 10.7 m (35.0 ft)
Cover Thickness: 1.8 m (6 ft) of overburden

Related Site Structure(s): The 216-S-1&2 Crib site is associated with the 241-S-151 diversion box, 200-W-137-PL pipeline, and the 216-S-7 Crib.

Site Posting: The cribs are located within a common radiologically posted area. The area is marked and posted with Underground Radioactive Material Area (URMA) and Cave-in Potential signs. There is a second, smaller posted URMA that borders well 299-W22-11 and the cribs on their southern end (see Site Characterization Summary for further discussion).

Site History

Release Summary: The 216-S-1&2 Cribs were active from January 1952 to January 1956. The cribs were used for the subsurface distribution of cell drainage from the D-1 Receiver Tank and process condensate from the D-2 Receiver Tank in the 202-S Building. The liquid waste contained nitrate, aluminum nitrate, nitric acid, and sodium, and had a pH of 2.1. The waste was discharged to the cribs in batches, with 10 batches discharged per day on average. Each batch contained approximately 19,000 L (4,940 gal) of process effluent. Over their lifetime, the cribs received 1.6E+07 L (4.3E+07 gal) of process effluent containing approximately 750,000 Curies of mixed fission products.

Volume Discharged: 1.6E+07 L (4.3E+07 gal) (see Figure 4).

Site: 216-S-1&2	Area: S Plant	Category: Deep

Pore Volume Discharged: 1.6E+07 L/ (188 ft x 3,595 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 2.8

Waste Inventory: Table 1 presents the waste inventory for the 216-S-1&2 Cribs.

Table 1. Waste Inventory: Radionuclide Content 216-S-1&2 Waste Site

Contaminant	Mass (from discharge data)
Pu	1,200 g
Beta	750,000 Ci
Sr-90	3,000 Ci
Ru-106	3,000 Ci
Cs-137	2,500 Ci
Co-60	10 Ci
U	2,200 kg

Source: RHO-CD-673, *Handbook 200 Area Waste Sites.*

Previous Site Characterization

Site Characterization Summary: In August 1955, process vapors and high dose rates were detected by the cribs. The source was determined to be a contaminated well cap on test well 207-S-11 (also known as well 299-W22-3), which is adjacent to the cribs. The well cap was found to have a dose rate of 4 rad/hr. During sampling, gurgling noises were heard coming from the well. It was decided the well casing had failed or ruptured, and that process waste was bypassing the crib soil column and penetrating the water column via the rupture. The well was backfilled with sand upon this discovery and the 216-S-1&2 Cribs were deactivated and replaced by the 216-S-7 Crib. The pipeline which fed into the cribs was capped at the 241-S-151 diversion box and the waste was redirected to the 216-S-7 Crib. This unplanned release was recorded as UPR-200-W-36.

A number of wells monitor the site, six of which were drilled in 1956 to document the 1955 unplanned release (UPR-200-W-36). Core samples taken from the wells showed cesium-137 (Cs-137) had penetrated the upper strata beneath the cribs and that strontium-90 (Sr-90) was present in the groundwater. Core samples from another five wells drilled in the area surrounding the cribs in 1966 found that 90 percent of the Cs-137 and less than 10 percent of the Sr-90 were located between 4.8 m (16 ft) to 10 m (33 ft) below the cribs. Samples taken during drilling by the groundwater table had 1,200 µCi/g of Sr-90. Groundwater samples contained 0.00005 µCi/mL of Sr-90. These findings were five times higher than the permissible limit for this contaminant in groundwater. Additional scintillation logging and borehole gamma spectrometry were conducted in 1984. Readings of Cs-137 were greatest immediately below the crib bottoms, with levels dropping quickly deeper into the soil column.

Site: 216-S-1&2	Area: S Plant	Category: Deep

There was no significant variation between the 1984 gamma activity profiles and the profiles taken in 1958.

Since deactivation, work has occurred to stabilize and characterize the waste site. The site's ground surface was stabilized in 1994. In addition, the site is kept free of vegetation due to the discovery of contaminated weeds growing in the site in September 2000, which were subsequently removed. A site walkdown of the area on January 9, 2001, lead to the discovery of a 6 m by 3 m (20 by 10 ft) URMA bordering the southern edge of the cribs. In addition, visual and radiological surveys occur annually, and several groundwater monitoring wells monitor the site.

Spectral gamma (SGLS), high rate logging, neutron moisture, and passive neutron data are available from two boreholes, C6554 and C6835, installed in 2008.

Borehole and data summaries are presented in Tables 2 and 3, below. Borehole locations are shown in Figure 1.

Groundwater wells associated with 216 S 1&2 (299-W22-1, 299-W22-2, 299-W22-11, 299-W22-18, 299-W22-31, and 299-W22-36) had detections above drinking water standards for nitrate and radionuclides (Cs-137, Sr-90, technetium-99, and tritium). Nitrate concentrations were first measured at 22,000 µg/L in 1957, were as high as 1.6 million µg/L in 1958, and were last measured at 23,500 µg/L in 2001. For radionuclides, Cs-137 was initially measured at 740 pCi/L in 1956, was 1,000 pCi/L in 1962, and was not detected when last measured in 2000. Strontium-90 was first measured at 200 pCi/L in 1956, was as high as 36,000 pCi/L in 1975, and was last measured at 2.03 pCi/L in 2001. Technetium-99 concentrations in 1988, 2000, and 2001 ranged between 62.5 pCi/L and 1,160 pCi/L in 2000. Tritium results ranged from nondetect to 12 million pCi/L, with the highest concentration detected in 1962. The tritium concentration was 18,200 pCi/L in 2001.

Table 2. Borehole Summary 216-S-1&2 Waste Site

Year	Borehole ID	Location with Respect to Site	Depth (ft)
2008	C6554	Inside S-1 Crib	0 to 74 (GPL only)
2008	C6835	Inside S-2 Crib	0 to 43.5 (GPL only)

GPL = geophysical log
ID = identification

Site: 216-S-1&2	Area: S Plant	Category: Deep

Table 3. Geophysical Logging Summary 216-S-1&2 Waste Site

Interval (bgs)	Method	Borehole	Depth(ft)	Contaminant	Max Concentration*
0 – 15	SGLS and HRLS	C6554	0 to 15	Cs-137	~1 pCi/g
	SGLS and HRLS	C6835	0 to 15	Cs-137,	<1 pCi/g at 3 – 4 ft bgs
>15	SGLS and HRLS	C6554	15 to 74	Cs-137	2,000,000 pCi/g
	SGLS and HRLS	C6835	15 to 45	Cs-137	~10,000,000 pCi/g at 38 ft bgs

*Max concentrations estimated from Stoller logs (Figures 5 through 8).

bgs = below ground surface
HRLS = high rate logging system
SGLS = spectral gamma logging system

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 to 15 ft] below ground surface [bgs]): Bottom of cribs is 10.3 m (34 ft) bgs; however, the top of gravel fill is 3 m (10 ft) bgs. See Figure 3. Riser was present. Stoller logs (Figures 5 through 8) show some evidence of contamination above 4.6 m (15 ft) bgs. At borehole C6554, Cs-137 was detected throughout the borehole. The geophysical log report (HGLP-LDR-323, *C6554 Log Data Report*) notes that contamination may reside on the inside of the steel casing in unknown amounts and activity. No soil data are available to evaluate contaminant concentrations in shallow soil. Based on existing information, the soil could be contaminated.

Deep (>4.6 m [>15 ft]) bgs:
An estimated 2.8 pore volumes of liquid were discharged to the cribs at a depth of about 7.3 m (24 ft) bgs. Boreholes extended to 19.8 m (65 ft) (C6554) and 13.7 m (45 ft) (C6835) showed maximum radiation concentrations between 10.7 – 12.2 m (35 – 40 ft) bgs (Figures 5 and 7). The maximum concentration was measured at approximately 20 million pCi/g at 11.3 m (37 ft) bgs (C6554). The depth to groundwater is approximately 68 m (223 ft) bgs.

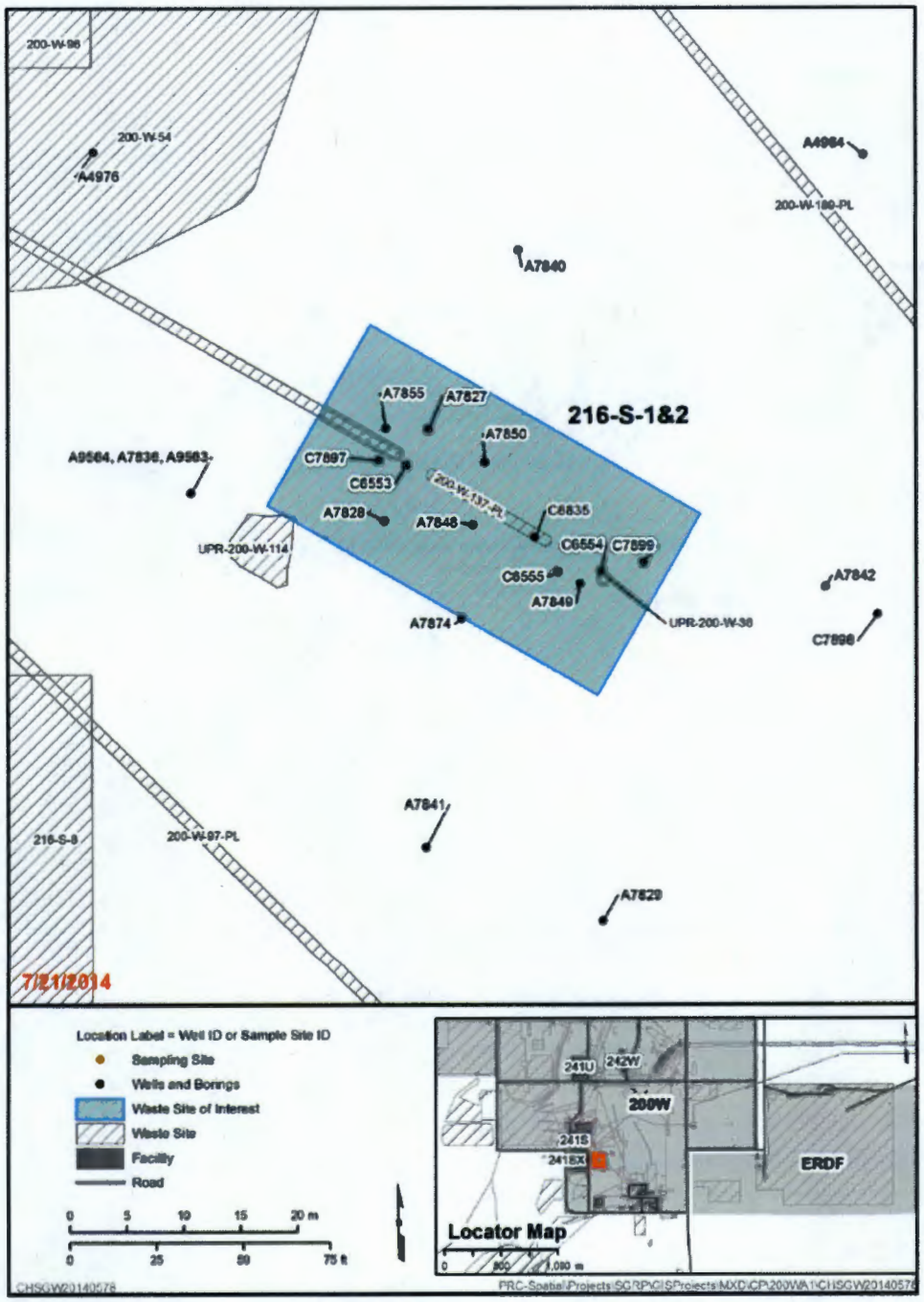
References:

DOE/RL-2007-02-VOLII-ADD5, 2008, *Site-Specific Field-Sampling Plans for 216-A-5 Crib and 216-S-1&2 Cribs, 200-PW-2/4 Operable Unit: (Addendum 5)*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0804160137.

EPA, 1983, Staff Site Visit, Tour/Data Book, Volume 2, Section L, p. 15.

HGLP-LDR-323, 2009, *C6554 Log Data Report*, Rev. 0, Stoller Hanford Office, Richland, Washington.

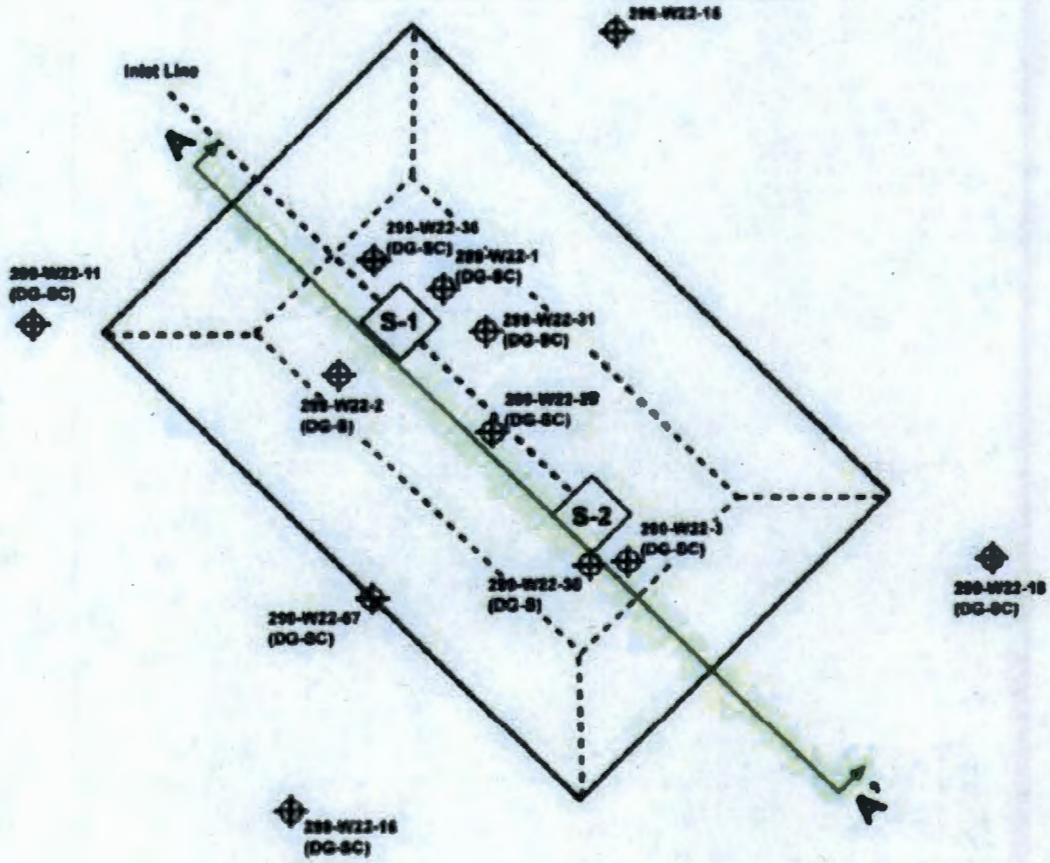
Site: 216-S-1&2	Area: S Plant	Category: Deep



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 216-S-1&2 Waste Site Map

Site: 216-S-1&2	Area: S Plant	Category: Deep



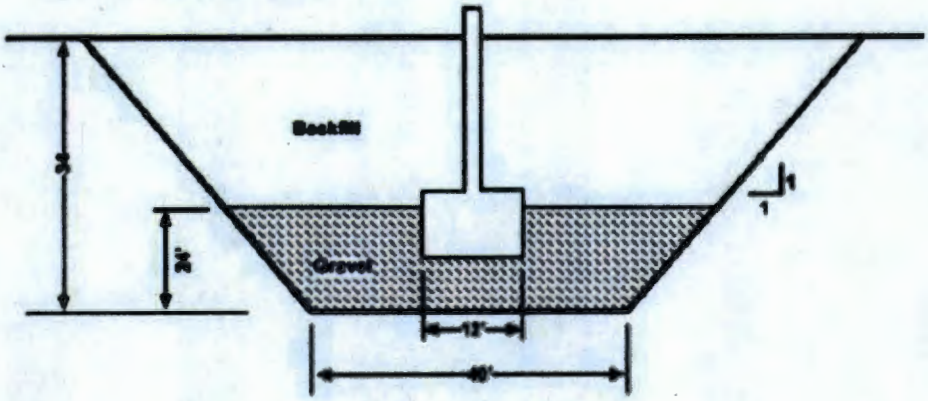
Source: DOE/RL-2007-02-VOLII-ADD5, *Site-Specific Field-Sampling Plans for 216-A-5 Crib and 216-S-1&2 Cribs, 200-PW-2/4 Operable Unit: (Addendum 5)*, Figure AD5-6.

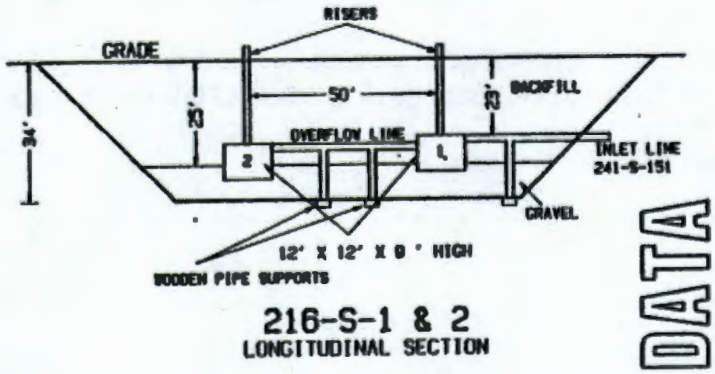
Note: Produced from best available copy.

Figure 2. 216-S-1&2 Crib Plan View

Site: 216-S-1&2	Area: S Plant	Category: Deep

CONSTRUCTION: 12.2 by 27.4 m (40 by 90 ft) (each individual crib is 1.1 m² [12 ft²]). Depth of crib is 10.4 m (34 ft). Side slope is 1:1.





Sources: DOE/RL-2007-02-VOLII-ADD5, *Site-Specific Field-Sampling Plans for 216-A-5 Crib and 216-S-1&2 Cribs, 200-PW-2/4 Operable Unit: (Addendum 5)*, Figure AD5-6. (Top figure.)

EPA, 1983, Staff Site Visit, Tour/Data Book, Volume 2, Section L, p. 15. (Bottom figure.)

Note: Produced from best available copy.

Figure 3. 216-S-1&2 Crib Cross Sections

Site: 216-S-1&2	Area: S Plant	Category: Deep

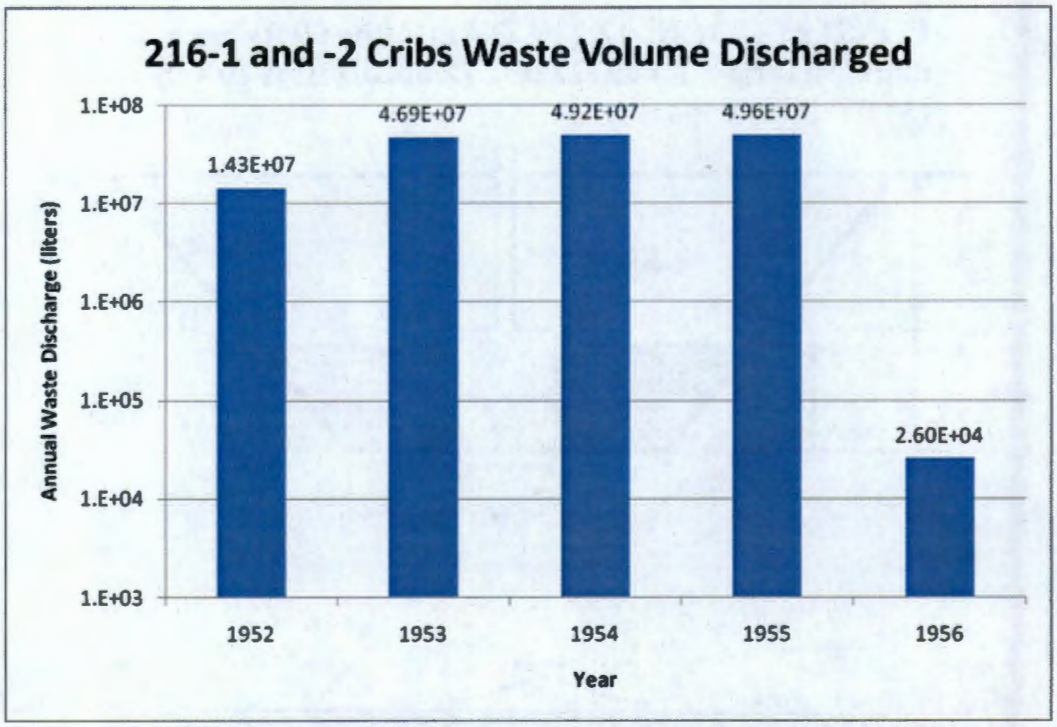
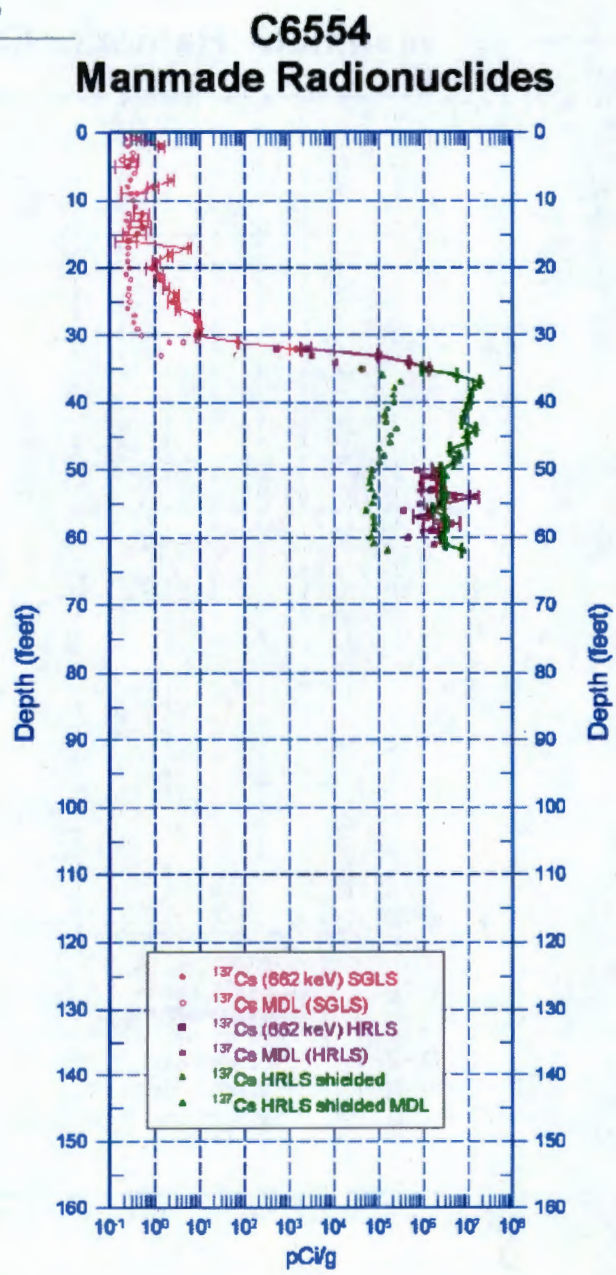


Figure 4. Waste Volume Discharged into 216-S-1&2 Cribs in Liters per Year

Site: 216-S-1&2	Area: S Plant	Category: Deep

Stoller
Hanford Office



Zero Reference - Ground surface

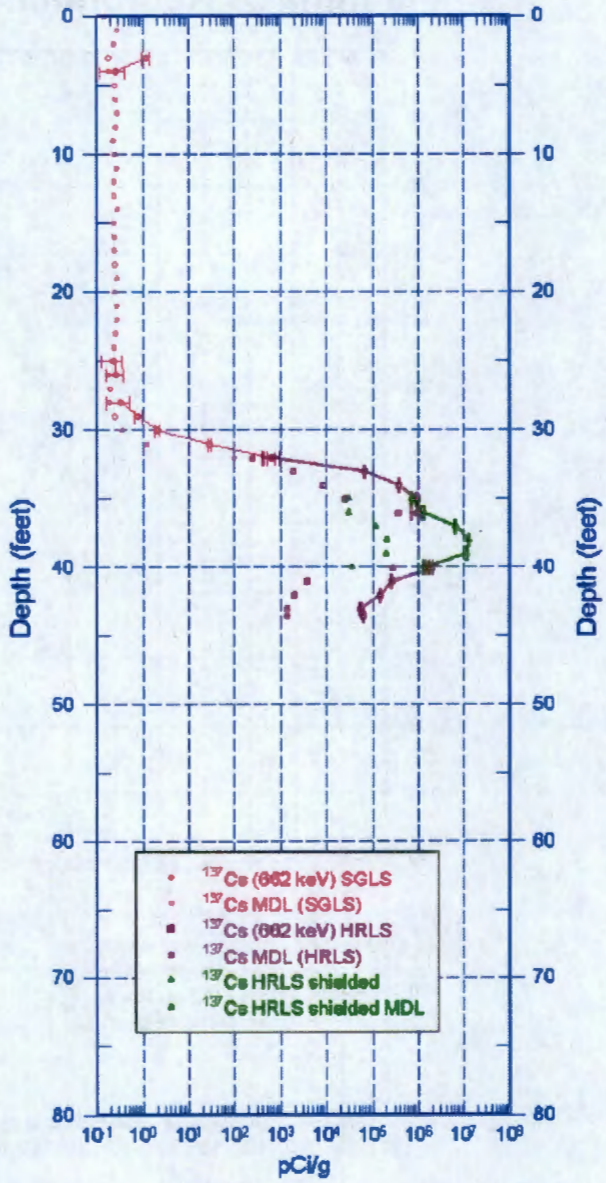
HRLS = high rate logging system
MDL = minimum detectable level
SGLS = spectral gamma logging system

Figure 5. Plot of Geophysical Logging Results for C6554 – Manmade Radionuclides

Site: 216-S-1&2	Area: S Plant	Category: Deep

Stoller
Hanford Office

C6835
Manmade Radionuclides



Zero Reference - Ground surface

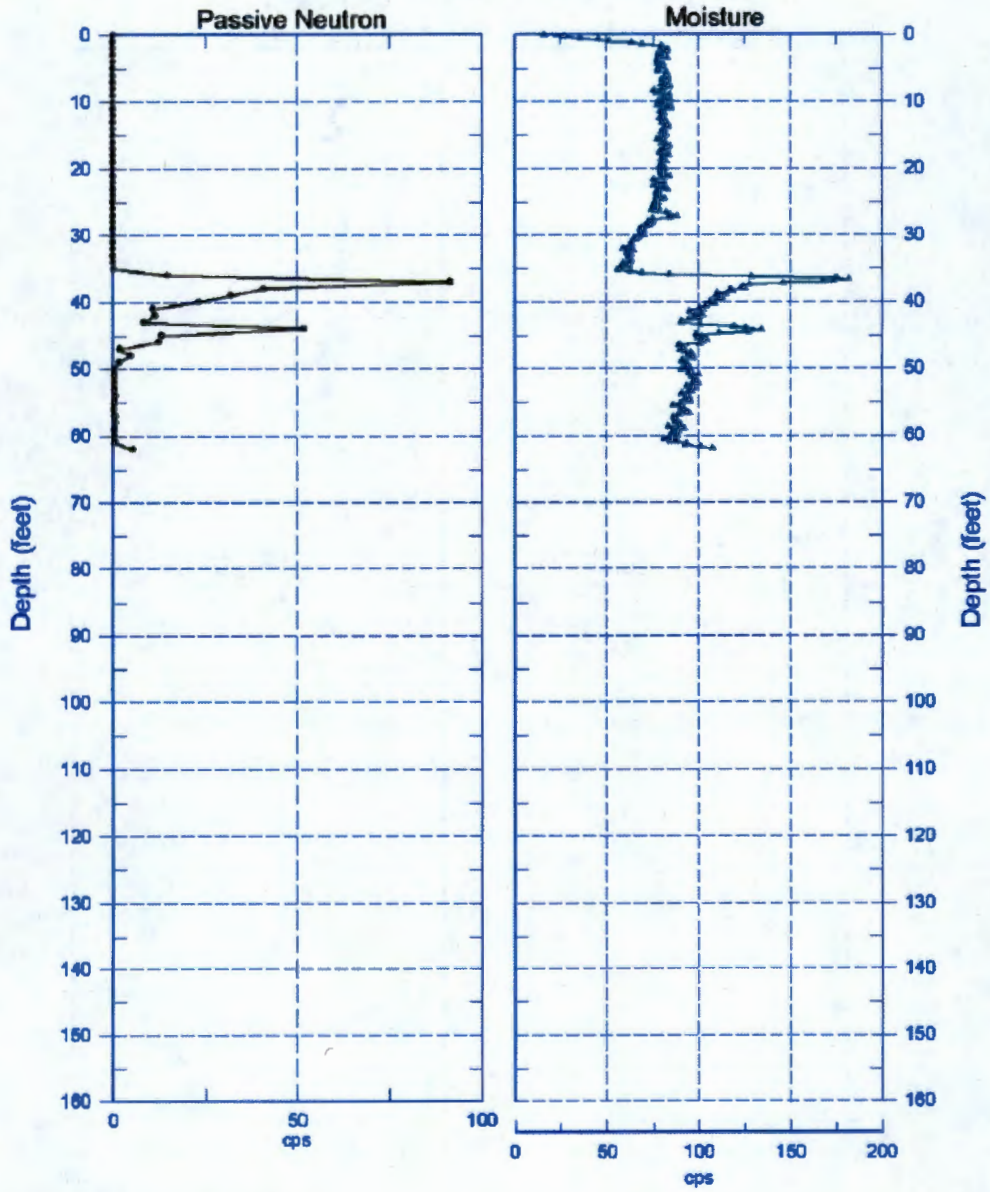
HRLS = high rate logging system
MDL = minimum detectable level
SGLS = spectral gamma logging system

Figure 6. Plot of Geophysical Logging Results for C6554 – Passive Neutron and Moisture

Site: 216-S-1&2	Area: S Plant	Category: Deep

Stoller
Hanford Office

C6554
Passive Neutron & Moisture

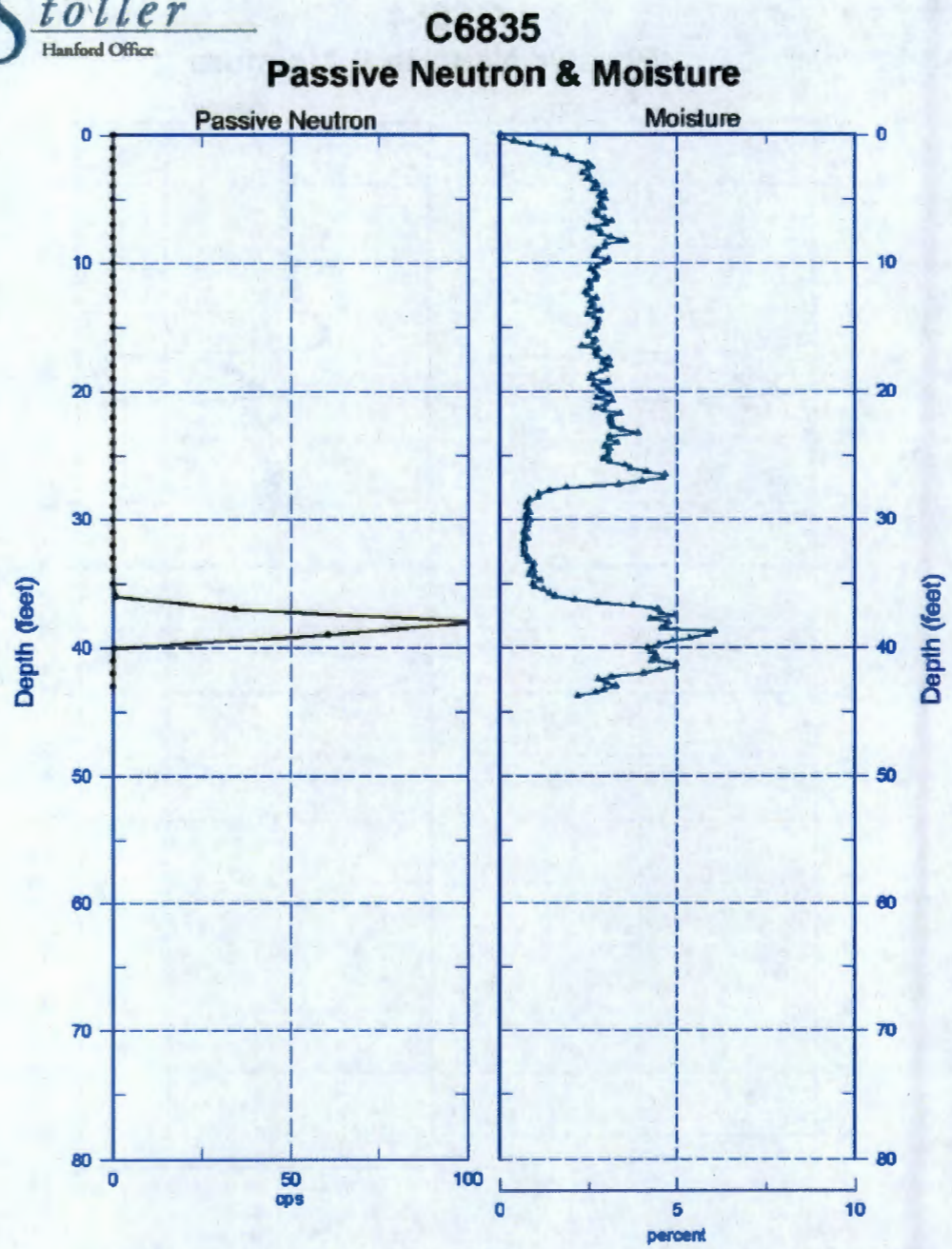


Reference - Ground surface

Figure 7. Plots of Geophysical Logging Results for C6835 – Manmade Radionuclides

Site: 216-S-1&2	Area: S Plant	Category: Deep

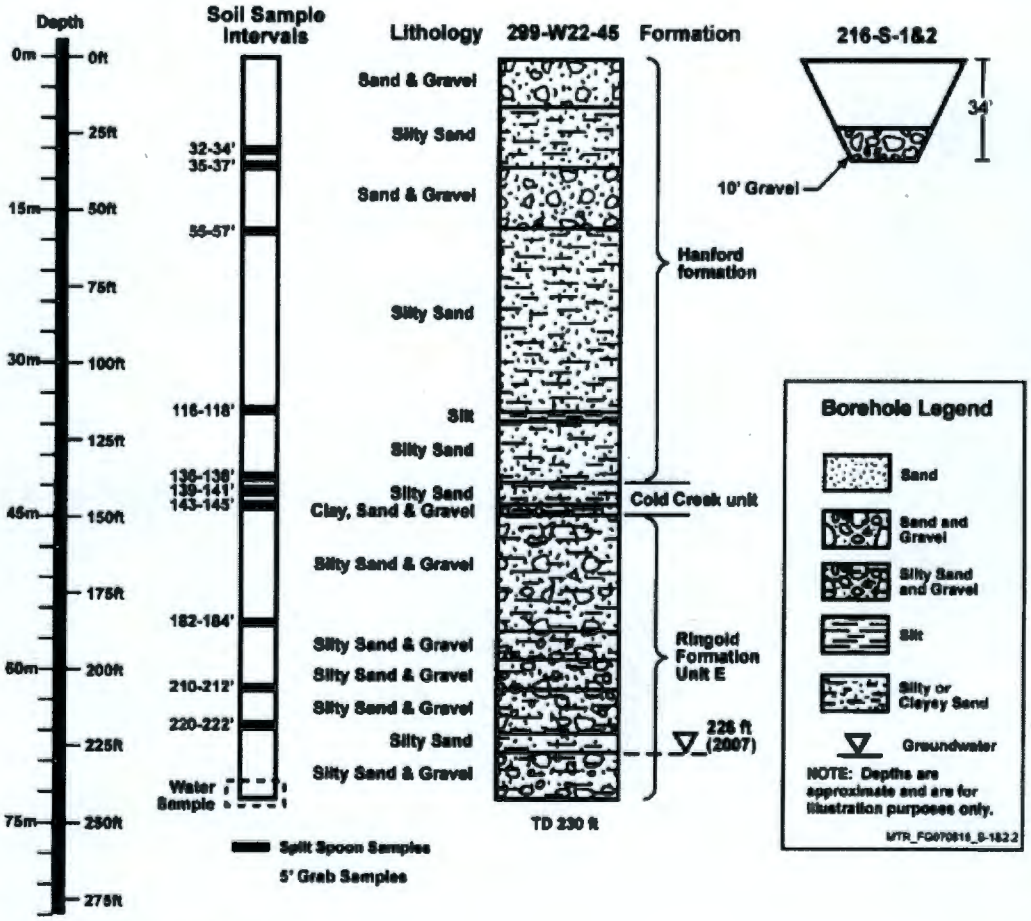
Stoller
Hanford Office



Reference - Ground surface

Figure 8. Plots of Geophysical Logging Results for C6835 – Passive Neutron and Moisture

Site: 216-S-1&2	Area: S Plant	Category: Deep



TD = total depth of borehole.

Source: DOE/RL-2007-02-VOLII-ADD5, *Site-Specific Field-Sampling Plans for 216-A-5 Crib and 216-S-1&2 Cribs, 200-PW-2/4 Operable Unit: (Addendum 5)*, Figure AD5-5.

Note: Produced from best available copy.

Figure 9. Estimated Stratigraphy at 216-S-1&2 Cribs

Site: 216-S-1&2	Area: S Plant	Category: Deep

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Site: 216-S-4	Area: S Plant	Category: Deep

Site Description

Alternate Site Identification: 216-S-7, 216-S-4 Sump
Site Type: French Drains or Crib UN-216-W-1
Facility/Geographic Area: S Plant Area (200 W Ponds Area)
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1, 200-PW- 4
Service Dates: August 1953 to August 1956

Waste Site Location and Physical Description: The 216-S-4 waste site is located east of the 216-U-1 Pond and northwest of the 216-S-21 Crib (Figure 1). The site is constructed of two vertically buried metal culvert pipes. The culverts are rock-filled, 6.1 m (20 ft) long and connected in series (see Figure 2 and drawing H-2-44511, Sheet 47, *Area Map 200 West "S" Plant Facilities*). The site received liquid from the Tank 241-S-101 and 241-S-104 condensers via an aboveground pipe. The site operated from August 1953 to August 1956. The site was retired when the Tank 241-S air condensers were reactivated. The site was deactivated by removing the aboveground piping in the tank farm to the units.

Waste Site Coordinates:
Lon-566549.25301 Lat-134456.60475

Site Dimensions:
Site Length: Not applicable
Site Width: 0.9 m (2.5 ft)
Site Area: 14.6 m^2 (157 ft^2)
Site Depth: 6.6 m (21.8 ft)
Cover Thickness: 0.3-0.6 m (1-2 ft)

Related Site Structure(s): The site is associated with the condensers on Tanks 241-S-101 and 241-S-104 located inside the 241-S Tank Farm.

Site Posting: The site was marked and posted with Underground Radiological Material Area signs following interim surface stabilization work in 1991. Document RHO-CD-673, *Handbook 200 Areas Waste Sites*, states that the marker "216-S-4 Crib" appears to have been placed 37 m (40 yd) too far south of the site.

Site History

Release Summary: From August to September 1953, the site received condensate and cooling water effluent contaminated with chemical nitrate from the Tank 241-S-101 and 241-S-104 condensers. Both condensers are located within the 241-S Tank Farm. From September 1953 to August 1956, only cooling water was sent to the site, as the condensate waste was routed to the 216-S-3 Crib. According the Waste Information Data System (WIDS) summary, the chemical component of this waste was nitrate.

Volume/Mass Discharged: 1,000,000.00 L (264,172 gal) (estimated).

Site: 216-S-4	Area: S Plant	Category: Deep

Pore Volume Discharged: 1E+06 L/ (194 ft x 157 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 3.9

Waste Inventory: Radionuclide data not available per RHO-CD-673: "Data not available. Assumed to be low level contamination."

Previous Site Characterization

Site Characterization Summary: Interim surface stabilization work in 1991 covered the 216-S-4 waste site with clean backfill material. Two site hazards are listed for this site. On October 13, 1997, the site was listed as a potential hazard due to the presence of chemicals. The site was listed on July 22, 1998, as being at risk of collapse. Visual and surface radiological surveys are performed at this site. However, no details are provided regarding survey frequency or survey results. No soil or geophysical log data are available.

Nature and Extent of Contamination: No data are available to evaluate shallow or deep soil contamination. Based on existing information, the soil could be contaminated by former discharge of contaminated condensate and cooling water effluent. An estimated 3.9 pore volumes of liquid containing nitrates and radionuclides were discharged to the sumps (culverts), indicating contamination could extend to groundwater (65.8 m [216 ft] below ground surface [bgs]). While most of the contamination is likely to be present beneath the sumps from approximately 6.1 m (20 ft) bgs, shallow soil beneath the stabilization cover could be contaminated if the sumps backed up and overflowed.

References:

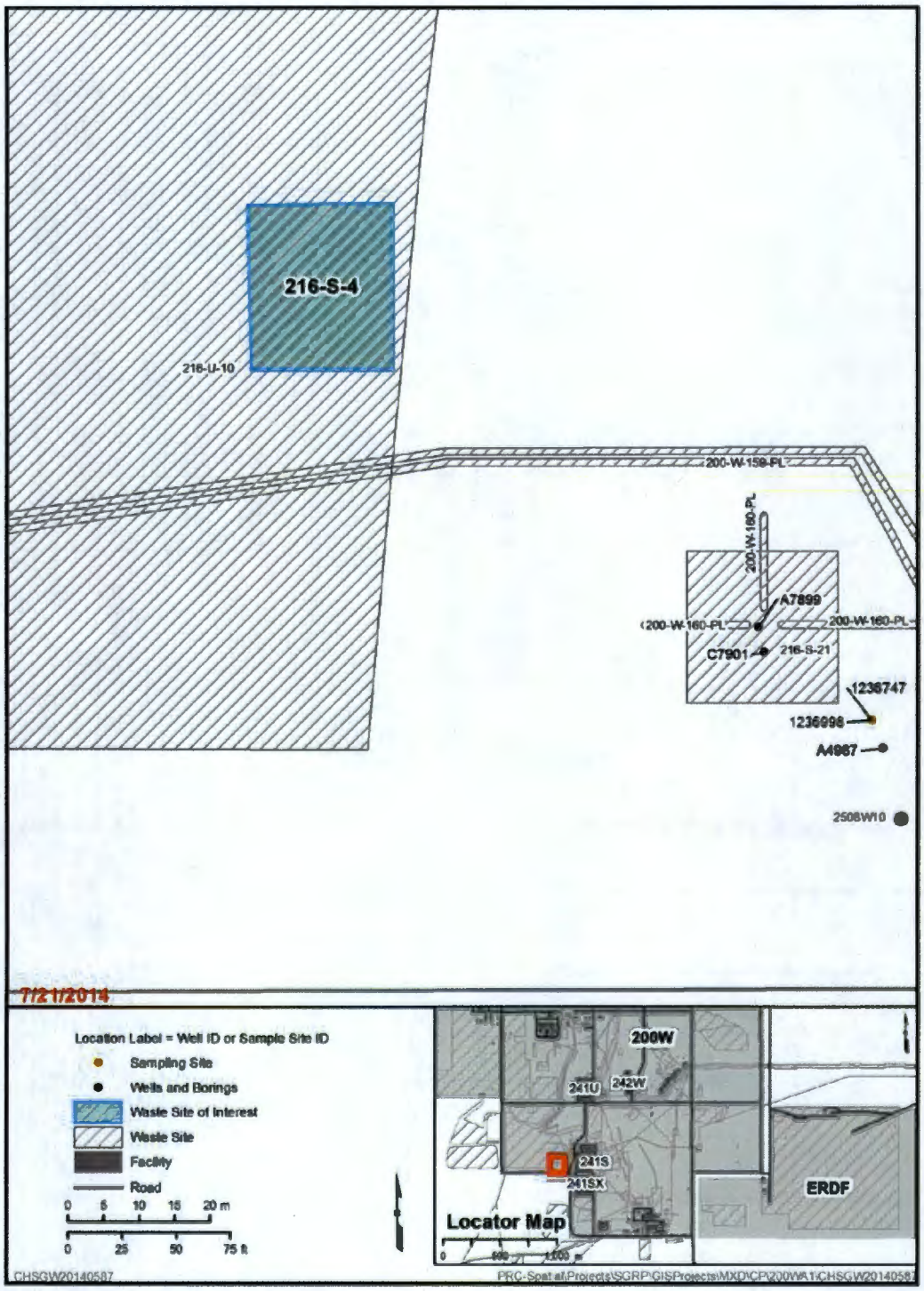
H-2-44511 (drawing), 1973, *Area Map 200 West "S" Plant Facilities*, Sh. 47, Rev. 3, Atlantic Richfield Hanford Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

Vadose Zone Hydrogeology Data Package for Hanford Assessments.

WIDS General Summary Report for the 216-S-4 Waste Site.

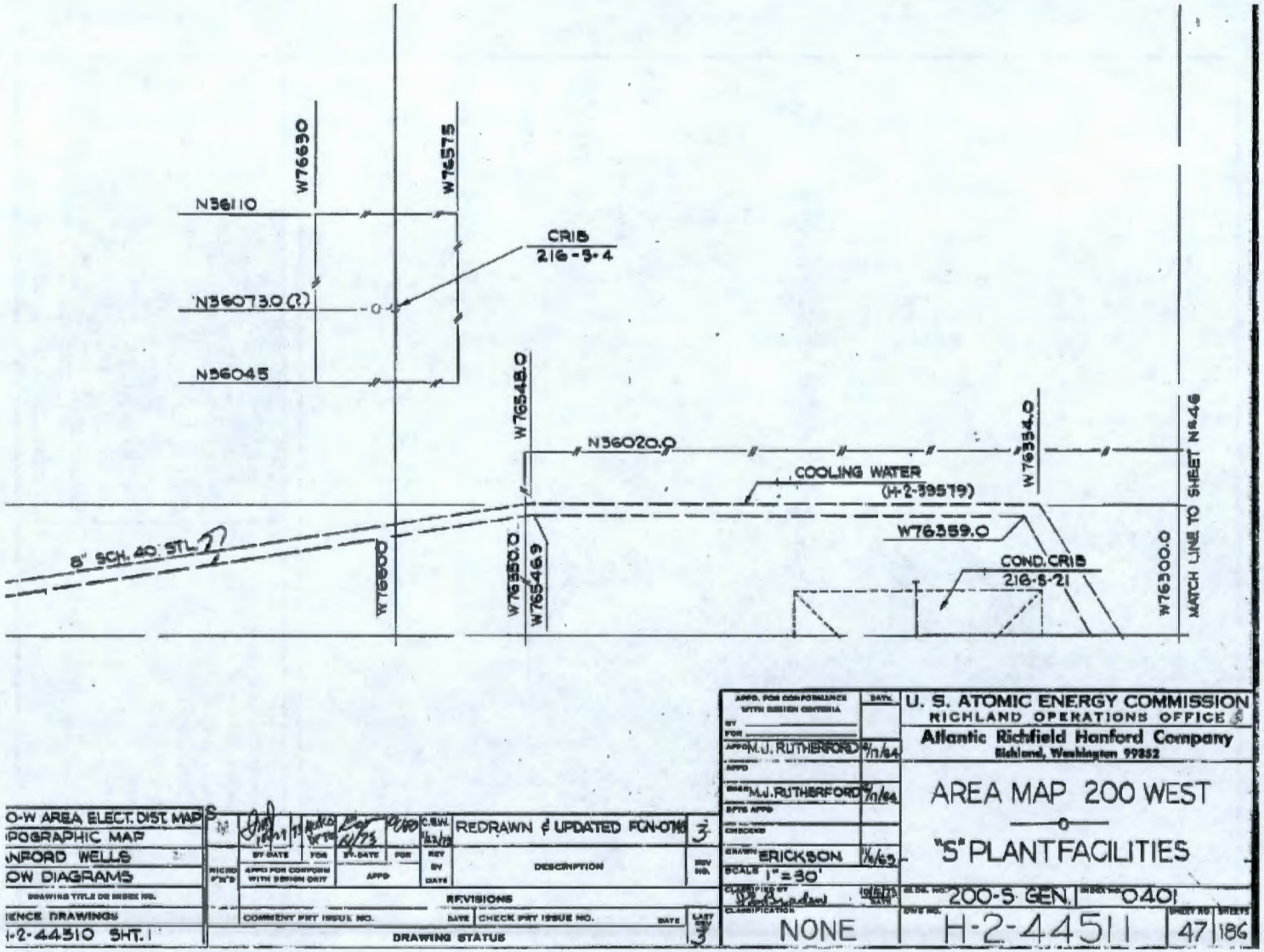
Site: 216-S-4	Area: S Plant	Category: Deep



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 216-S-4 Waste Site Map

Site: 216-S-4	Area: S Plant	Category: Deep



Source: H-2-44511, *Area Map 200 West "S" Plant Facilities*, Sheet 47.

Figure 2. Plan View of 216-S-4 Crib

Site: 216-S-5	Area: S Plant	Category: Deep (Similar Site to 216-S-6)

Site Description

Alternate Site Identification: 216-S-5 Cavern #1, 216-S-9, 216-S-5:1, 216-S-6 Crib (see Related Site Structures section)
Site Type: Crib
Facility/Geographic Area: S Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-SC-1
Service Dates: March 1954 to September 1957

Waste Site Location and Physical Description: The 216-S-5 waste site is located outside of the 200 West Area perimeter fence, southwest of 207-S Retention Basin, and west of the 216-S-10 Ditch (Figure 1). The site consists of a gravel-filled crib and an overflow trench (Figures 1 and 2). The site was originally labeled as an underground swamp. The overflow trench south of the crib is bounded on the east and west by overflow dikes. The crib is constructed of two lengths of perforated, corrugated metal pipe that form a "t" or cross. Interim surface stabilization work has occurred at the site; however, the work conducted and/or the depth of any interim covering is not specified in the Waste Information Data System (WIDS).

Waste Site Coordinates:
Lon-566358.57850 Lat-133308.21620

Site Dimensions:
Site Length: 64.0 m (210.0 ft)
Site Width: 64.0 m (210.0 ft)
Site Area: 4,096 m^2 (44,089 ft^2)
Site Depth: 4.6 m (15.0 ft)
Cover Thickness: None

Related Site Structure(s): The 216-S-5 Crib is associated with the 202-S Building, the 207-S Retention Basin, Reduction-Oxidation (REDOX) A-2 dissolver and H-4 coils, and the 216-S-6 Crib. Pipelines associated with this site include the 200-W-154-PL and 200-W-152-PL. In addition, several site features are connected to, and considered part of, the 216-S-5 Crib. These features include the 216-S-5 Overflow Pond, and the 216-S-5 Overflow Trench.

Site Posting: The 216-S-5 Crib is marked and posted with Underground Radioactive Material Area signs.

Site History

Release Summary: The 216-S-5 Crib operated from March 1954 to 1957 and was used for the subsurface disposal of an estimated volume of 4.10E+09 L (1.10E+08 gal) of acidic, liquid waste containing nitrates. The effluent consisted of process vessel cooling water and steam condensate from the 202-S Building, which was deposited into the crib through an underground clay pipeline via the 207-S Retention Basin.

Site: 216-S-5	Area: S Plant	Category: Deep (Similar Site to 216-S-6)

The 216-S-5 Crib was constructed as a temporary disposal site for the replacement of the heavily contaminated 216-S-17 Pond. In addition, the 216-S-5 Crib was also used for the Segregation Project. The Segregation Project routed REDOX effluent with a high potential for contamination to the 216-S-6 Crib, while effluent with a low contamination potential was sent to the 216-S-5 Crib.

In September 1955, both the 216-S-5 and 216-S-6 Cribs were operated at rates beyond their capacity level. As a result, in 1956 the site was at risk of flooding due to the high volumes of cooling water discharged. To prevent flooding, a hole was cut along the top edge of the 216-S-5 Crib to discharge overflow cooling water into a trench southwest and adjacent to the crib structure. The overflow rate was estimated at 189.2 – 378.6 L (50 – 100 gal) per minute; which represented approximately 5 percent 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. Contamination readings taken along the edge of the crib overflow area increased from 100 mRad/hr to 350 mRad/hr; with several areas reading up to 17 rad/hr. The emergency crib overflow pond was used until the 216-S-16 Pond was completed in September 1957.

Volume Discharged: 4.10E+09 L (1.10E+08 gal) (see Figure 3 for more details).

Pore Volume Discharged: 4.10E+09 L/ (189 ft x 44,089 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 58

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-S-5 Waste Site

Contaminant	Mass Discharged
Pu	580 g
Beta	960 Ci
Sr-90	130 Ci
Ru-106	30 Ci
Cs-137	60 Ci
Co-60	<0.100 Ci
U	270 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: In 1954, the 207-S Retention Basin was bypassed due to heavy contamination. The basin was later backfilled with soil to prevent contamination migration.

Site: 216-S-5	Area: S Plant	Category: Deep (Similar Site to 216-S-6)

The 216-S-5 Crib was deactivated 3 years later by valving out and locking the pipeline to the unit. The waste was redirected to the 216-S-16 Pond.

In 1974, action was taken to fill in four "cave-in" depressions at the 216-S-5 Crib. In addition, the surface of the 216-S-5 Crib was stabilized in August 1990. The site was mapped using Global Positioning System equipment on April 16, 1998.

Ongoing surveys at this site include groundwater monitoring and visual and radiological surveys. The frequency of surveys and their results are not provided in WIDS. Wells 299-W26-1, 299-W26-3, 299-W26-4, and 200-W26-5 monitor the 216-S-5 Crib.

Borehole and data summaries are presented in Tables 2 through 4. Borehole locations are shown in Figure 1.

Groundwater wells (216-W26-1, 216-W26-2, 216-W26-6, and 216-W26-7) associated with 216-S-5 and 216-S-6 Cribs had detections above drinking water standards for hexavalent chromium, nitrate, cesium-137 (Cs-137), and strontium-90 (Sr-90). Hexavalent chromium concentrations were 11 µg/L to 209 µg/L between 1999 and 2003. Nitrate concentrations were 1,710 µg/L upon first measurement in 1983, were as high as 135,000 µg/L in 1985 and were last measured at 8,410 µg/L in 2002. Cesium-137 was detected at 740 pCi/L in 1959 (well 216-W26-1). Strontium was detected at a concentration of 960 pCi/L in 1960 (well 216-W26-2).

Table 2. Borehole Summary for the 216-S-5 Waste Site

Year	Well / Borehole ID	Location with Respect to Site	Depth (ft)
2006	299-W26-1 / A8057	Inside crib	2 – 56 (GPL)
2003	299-W26-6 / A5445	Edge of crib	2 – 209 (GPL)
2006	299-W26-4 / A8059	Outside – northwest	2 – 77 (GPL)
2006	299-W26-5 / A8060	Outside – northwest	2 – 106 (GPL)
2006	299-W26-3 / A5444	Outside –northwest	0 – 188 (GPL)
2010	299-W26-7 / A5446	Outside – southwest (within overflow area)	3 – 140 (GPL)
2008	C5748	Outside – southwest (within overflow area)	0 – 99.5 (GPL)
2008	C5756	Outside – southwest (within overflow area)	1 – 69 (3 soil samples)

GPL = geophysical log
ID = identification

Site: 216-S-5	Area: S Plant	Category: Deep (Similar Site to 216-S-6)

Table 3. Geophysical Data Summary (Soil Borehole 216-S-5)

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A5445	0 to 5	0.69	pCi/g	5.0	9,679.9	cpm	2
	5 to 10	2.5	pCi/g	8.0	7,483.4	cpm	9
	10 to 15	2	pCi/g	11	6,992.9	cpm	11
	>15	0.5	pCi/g	53	12,056.7	cpm	33
A8057	0 to 5	12.7	pCi/g	5.0	54,518.6	cpm	5
	5 to 10	1,594.4	pCi/g	10.0	3,772,820	cpm	10
	10 to 15	1,742.7	pCi/g	15	6,858	cpm	15
	>15	13,070.3	pCi/g	18.5	1,221,680	cpm	38
C5741	0 to 5	–	pCi/g	–	2,681.6	cpm	3
	5 to 10	–	pCi/g	–	2,537.9	cpm	5
	10 to 15	–	pCi/g	–	2,409	cpm	14.5
	>15	–	pCi/g	–	–	cpm	–
C5748	0 to 5	–	pCi/g	–	4,421.6	cpm	3.5
	5 to 10	–	pCi/g	–	2,458.7	cpm	9.5
	10 to 15	–	pCi/g	–	2,548.3	cpm	11
	>15	–	pCi/g	–	3,498.7	cpm	63

bgs = below ground surface

ID = identification

Site: 216-S-5	Area: S Plant	Category: Deep (Similar Site to 216-S-6)

Table 4. Soil Maximum Detection Summary (Soil Borehole C5756)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Aluminum	6,240,000	µg/kg	3	9,260,000	µg/kg	69
Am-241	0.18	pCi/g	3	nd	–	–
Barium	103,000	µg/kg	3	98100	µg/kg	63
Cadmium	–	–	–	120	µg/kg	63
Calcium	5,830,000	µg/kg	3	11,300,000	µg/kg	63
Cs-137	2.66	pCi/g	3	nd	–	–
Chromium	7,910	µg/kg	3	21,100	µg/kg	69
Cobalt	9,170	µg/kg	3	8,270	µg/kg	63
Copper	12,400	µg/kg	3	16,900	µg/kg	63
Cyanide	–	–	–	243	µg/kg	63
Iron	21,000,000	µg/kg	3	17,500,000	µg/kg	69
Lead	5,220	µg/kg	3	12,100	µg/kg	63
Lithium	5,030	µg/kg	3	10,500	µg/kg	63
Magnesium	4,230,000	µg/kg	3	5,340,000	µg/kg	63
Manganese	387,000	µg/kg	3	389,000	µg/kg	63
Nickel	8,980	µg/kg	3	15,100	µg/kg	69
Pu-239/240	0.49	pCi/g	3	nd	–	–
Potassium	1,170,000	µg/kg	3	1,770,000	µg/kg	63
Selenium	299	µg/kg	3	298	µg/kg	69
Strontium	21,900	µg/kg	3	29,900	µg/kg	69
Thallium	190	µg/kg	3	200	µg/kg	63
Titanium	–	–	–	736,000	µg/kg	69
Uranium	1,710	µg/kg	3	930	µg/kg	63
U-233/234	0.16	pCi/g	3	0.27	pCi/g	63
U-235	0.007	pCi/g	3	0.021	pCi/g	63

Site: 216-S-5	Area: S Plant	Category: Deep (Similar Site to 216-S-6)

Table 4. Soil Maximum Detection Summary (Soil Borehole C5756)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
U-238	0.16	pCi/g	3	0.26	pCi/g	63
Vanadium	55,300	µg/kg	3	36,500	µg/kg	63
Zinc	41,800	µg/kg	3	49,800	µg/kg	63

Note: Samples collected at 3, 63, and 69 ft bgs.

bgs = below ground surface

nd = nondetect

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 to 15 ft] below ground surface [bgs]): The geophysical log (GPL) indicates Cs-137 in soil within crib increases with depth between 09. – 4.6 m (3 – 15 ft) bgs.

Deep (>4.6 m [>15 ft] bgs): GPL results indicate Cs-137 in soil within crib increases with depth between 4.6 – 5.8 m (15 – 19 ft) bgs, then decreases to below detection at 14 m (46 ft) bgs. The lateral extent of Cs-137 is defined by below background and nondetect GPL results at the southeast edge of crib outside crib to the northwest. Scintillation probe and spectral gamma profiles indicate residual gamma emitters to about 9.1 m (30 ft) bgs within the crib footprint.

Within the crib, shallow and deep soil could be contaminated by direct discharge of waste. The 216-S-5 and 216-S-6 cribs are considered similar sites because both received cooling water and steam condensate from the 202-S Building, and both received similar volumes of waste water. Effluent with a high potential for contamination was routed to the 216-S-6 Crib, while effluent with a low contamination potential was sent to the 216-S-5 Crib. A comparison of the inventories from each crib bears this out. Therefore, the soil data to be collected from the 216-S-6 Crib will be used to characterize soil beneath the 216-S-5 Crib.

Soil could also be contaminated in the overflow area southwest of the crib (Figure 1). Data from soil borehole C5756 indicates low-level radiological contamination at 0.9 (3 ft) bgs, and non-detect at 19.2 and 21 m (63 and 69 ft) bgs (Table 5). There are no data for the interval between (or below) these sample depths.

The approximate depth to groundwater is 62.1 m (204 ft) bgs.

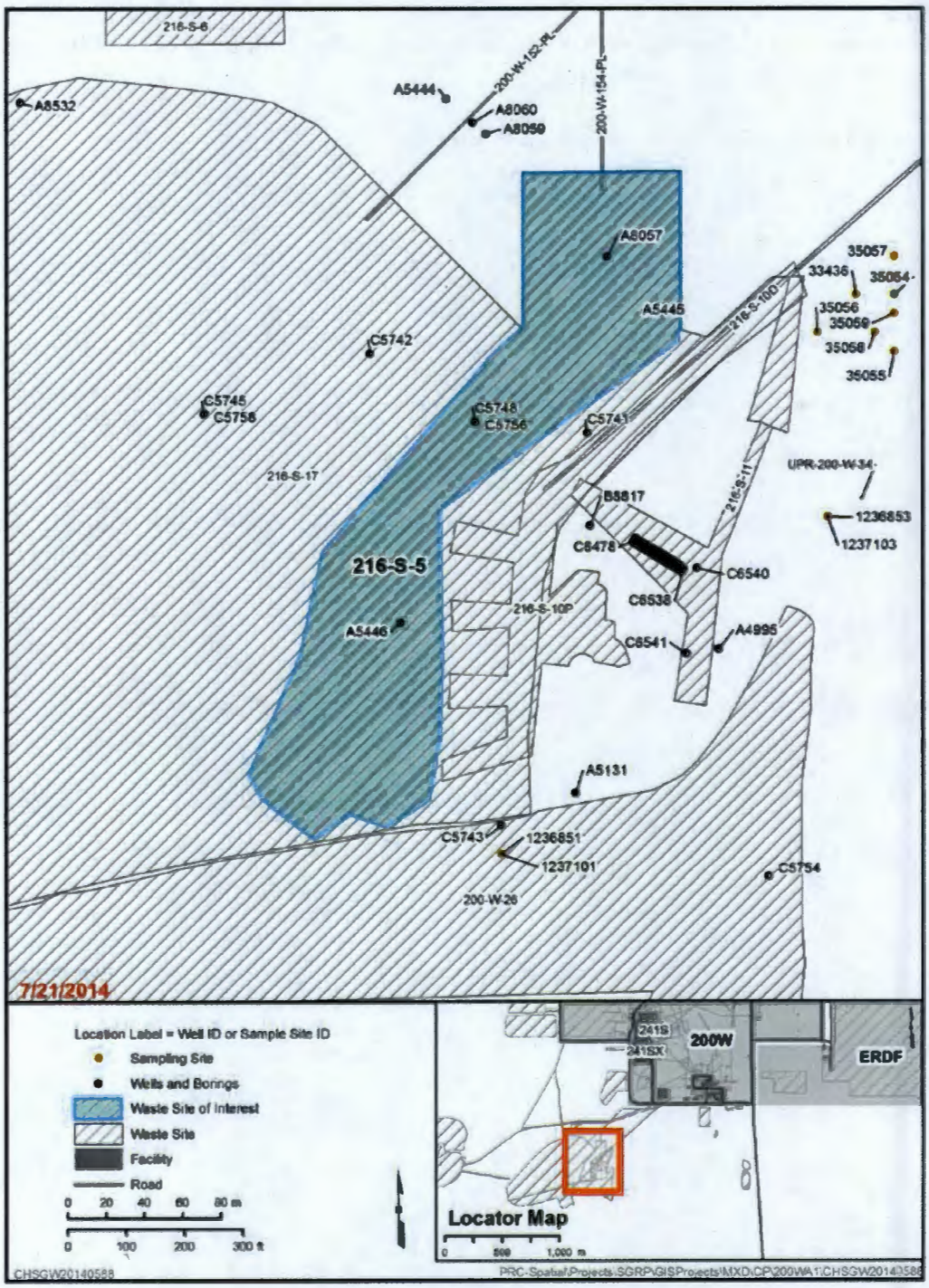
Site: 216-S-5	Area: S Plant	Category: Deep (Similar Site to 216-S-6)

References:

H-6-466 (drawing), 1971, *Area Map REDOX Pond Area*, Sheet 7, Rev. 0, Atlantic Richfield Hanford Company, Richland, Washington.

WIDS General Summary Report for the 216-S-5 Waste Site.

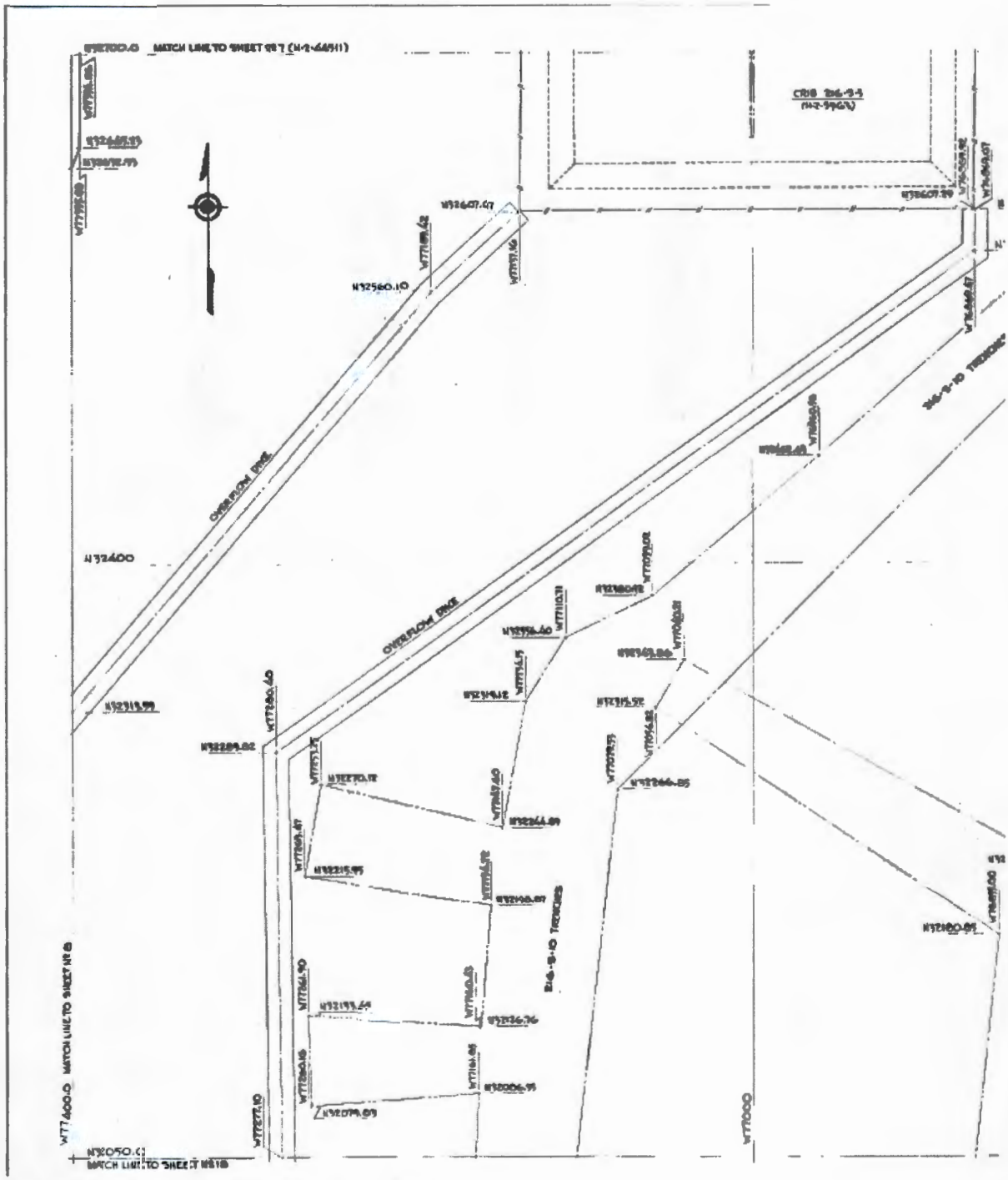
Site: 216-S-5	Area: S Plant	Category: Deep (Similar Site to 216-S-6)



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 216-S-5 Waste Site Map

Site: 216-S-5	Area: S Plant	Category: Deep (Similar Site to 216-S-6)



Source: H-6-466, *Area Map REDOX Pond Area*, Sheet 7.

Figure 2. 216-S-5 Crib and Overflow Trench

Site: 216-S-5	Area: S Plant	Category: Deep (Similar Site to 216-S-6)

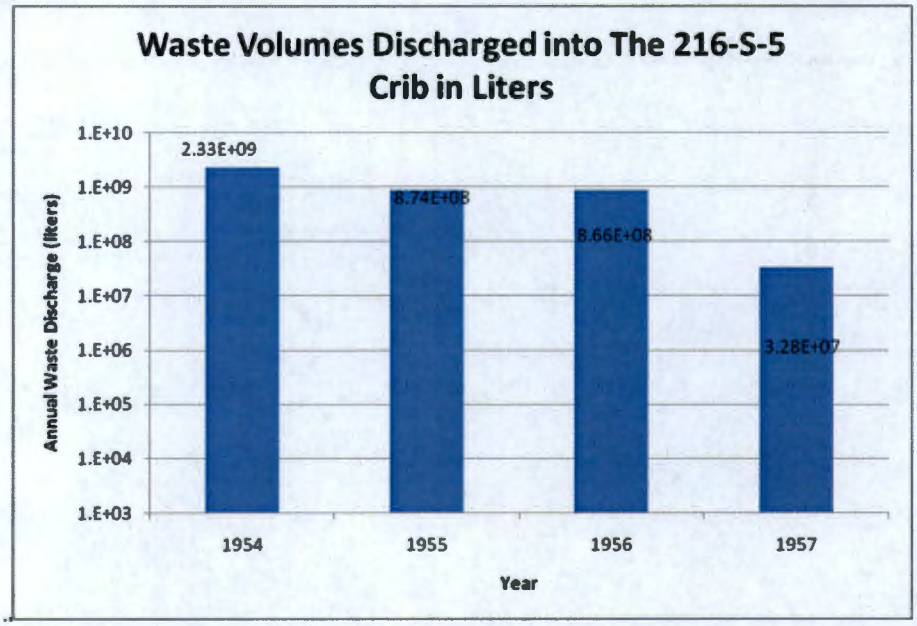


Figure 3. Waste Volumes Discharged into the 216-S-5 Crib in Liters Per Year

Site: 216-S-6	Area: S Plant	Category: Deep (Representative Site to 216-S-5)

Site Description

Alternate Site Identification: 216-S-6 Cavern #2 216-S-5 Crib, 216-S-13 Crib (see Related Site Structures section)
Site Type: Crib
Facility/Geographic Area: S Plant
Current OU Assignment: 200-WA-1
Former OU Assignment: 200-SC-1
Service Dates: November 1954 to July 1972

Waste Site Location and Physical Description: The 216-S-6 waste site is located outside the 200 West Area perimeter fence, northwest of the 216-S-5 Crib, and north of the 216-S-17 Pond (Figure 1). The site consists of a gravel-filled square-shaped pit, with corrugated metal perforated piping running through the center. Six pipes branch off at perpendicular angles to the main pipe. The site is covered by an unspecified amount of backfill.

Location relative to the 216-S-5 waste site is shown in Figure 2.

Waste Site Coordinates:
Lon-566216.68745 Lat-133591.79297

Site Dimensions:
Site Length: 64.0 m (210 ft)
Site Width: 64.0 m (210 ft)
Site Area: 4,096 m^2 (44,088 ft^2)
Site Depth: 4.6 m (15 ft)
Cover Thickness: None

Related Site Structure(s): The 216-S-6 Crib is associated with the 202-S Building, the 207-S Retention Basin, and the 216-S-5 Crib. Pipelines associated with this site include 200-W-153-PL, 200-W-155-PL, and 200-W-156-PL. In addition, the 2904-S-171 control structure was built to measure and regulate flow of process waste being routed to the 216-S-6 Crib.

Site Posting: The 216-S-6 Crib is marked and posted with Underground Radioactive Material Area signs.

Site History

Release Summary: The 216-S-6 Crib began operation in November 1954, and was constructed as part of the Segregation Project. The Segregation Project routed Reduction-Oxidation effluent with a high potential for contamination to the 216-S-6 Crib, while effluent with a low contamination potential was sent to the 216-S-5 Crib. The 216-S-6 Crib received an estimated 4.50E+09 L (1.20E+09 gal) of liquid waste during its operational lifetime.

Site: 216-S-6	Area: S Plant	Category: Deep (Representative Site to 216-S-5)

The 216-S-6 Crib was used for the subsurface disposal of process vessel cooling water and steam condensate from the 202-S Building. The waste was deposited into the crib through underground pipelines 200-W-153-PL, 200-W-155-PL, and 200-W-156-PL, via the 207-S Retention Basin.

From June to July 1967, production operations were shut down and the 202-S Building was put on standby. After July 1967, the waste site received the steam condensate from the D-12 and D-14 waste concentrators in the 202-S Building. The waste was low in salt, neutral to basic, and contained nitrates.

In September 1955, both the 216-S-5 and 216-S-6 Cribs were operated at rates beyond their capacity level. Interim relief was provided by blading off the corner of the 216-S-6 Crib and excavating a run-off trench. 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.

Volume Discharged: 4.50E+09 L (1.20E+09 gal) of process vessel cooling water and steam condensate (Figure 3).

Pore Volumes Discharged: 4.50E+09 L/ (188 ft x 44,100 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 64

Waste Inventory: Waste inventory information for the 216-S-6 waste site is provided in Table 1.

Table 1. Waste Inventory Radionuclide Content for the 216-S-6 Waste Site

Contaminant	Mass Discharged
Pu	470 g
Beta	530 Ci
Sr-90	410 Ci
Ru-106	130 Ci
Cs-137	210 Ci
Co-60	2.9 Ci
U	270 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Site: 216-S-6	Area: S Plant	Category: Deep (Representative Site to 216-S-5)

Previous Site Characterization

Site Characterization Summary: The 216-S-6 Crib was stabilized in September 14, 1990. Ongoing surveys at this waste site include borehole characterization and annual visual and radiological surveys. The results of the surveys are not provided in the Waste Information Data System (WIDS). Characterization borehole (C6174) was drilled in this crib in 2008. The site was mapped using Global Positioning System equipment on April 16, 1998.

Borehole and data summaries are presented in Tables 2, 3 and 4. Borehole locations are shown in Figure 1.

Groundwater wells (216-W26-1, 216-W26-2, 216-W26-6, and 216-W26-7) associated with the 216-S-5 and 216-S-6 Cribs had detections above drinking water standards for hexavalent chromium, nitrate, cesium-137, and strontium-90. Hexavalent chromium concentrations were 11 µg/L to 209 µg/L between 1999 and 2003. Nitrate concentrations were 1,710 µg/L upon first measurement in 1983, were as high as 135,000 µg/L in 1985, and were last measured at 8,410 µg/L in 2002. Cesium-137 was detected at 740 pCi/L in 1959 (well 216-W26-1). Strontium-90 was detected at a concentration of 960 pCi/L in 1960 (well 216-W26-2).

Table 2. Borehole Summary for the 216-S-6 Waste Site

Year	Well / Borehole ID	Location with Respect to Site	Depth (ft)
1977	299-W26-2 / A8058	Outside crib	92 (GPL)
2006	299-W26-51 / A8061	Inside crib	106 (GPL)
2008	C6174	Inside crib	99 (GPL)
2008	C6174	Inside crib	3 – 100 (9 soil samples)

GPL = geophysical log
ID = identification

Site: 216-S-6	Area: S Plant	Category: Deep (Representative Site to 216-S-5)

Table 3. Geophysical Log Summary for the 216-S-6 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A8061	0 to 5	–	pCi/g	–	–	cpm	–
	5 to 10	–	pCi/g	–	–	cpm	–
	10 to 15	1,784.2	pCi/g	15	8,053.3	cpm	15
	>15	4,107.8	pCi/g	17	11,227,500	cpm	45
C6174	0 to 5	0.2	pCi/g	1.0	13,526.6	cpm	3
	5 to 10	–	pCi/g	–	1,929,820	cpm	10
	10 to 15	812.8	pCi/g	10	17,736.5	cpm	15
	>15	14,015	pCi/g	16.5	2,004,380	cpm	18

bgs = below ground surface
ID = identification

Site: 216-S-6	Area: S Plant	Category: Deep (Representative Site to 216-S-5)

Table 4. Soil Maximum Detection Summary for the 216-S-6 Waste Site (Soil Borehole C6174)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Am-241	15	pCi/g	9	273	pCi/g	17.5
Arsenic	3,090	µg/kg	5	3,930	µg/kg	100
Beryllium	270	µg/kg	9	290	µg/kg	100
Cadmium	130	µg/kg	5	130	µg/kg	17.5
Cs-137	3.71	pCi/g	9	7,620	pCi/g	17.5
Chromium	7,540	µg/kg	9	29,000	µg/kg	17.5
Copper	11,400	µg/kg	9	18,300	µg/kg	17.5
Di-n-butylphthalate	340	µg/kg	9	690	µg/kg	47.5
Hexavalent Chromium	nd	–	–	270	µg/kg	47.5
Lead	4,760	µg/kg	9	5,550	µg/kg	100
Manganese	316,000	µg/kg	9	361,000	µg/kg	31.7
Mercury	50	µg/kg	5	–	–	–
Methylene Chloride	nd	–	–	2.2	µg/kg	17.5
Np-237	0.012	pCi/g	9	0.58	pCi/g	25.2
Nickel	8,810	µg/kg	9	21,700	µg/kg	17.5
Ni-63	nd	–	–	46.4	pCi/g	25.2
Pu-238	1.4	pCi/g	9	20	pCi/g	17.5
Pu-239/240	75	pCi/g	9	1,000	pCi/g	17.5
K-40	16.1	pCi/g	5	19.4	pCi/g	85.1
Ra-226	0.738	pCi/g	5	0.704	pCi/g	85.1
Ra-228	0.87	pCi/g	5	1.08	pCi/g	70
Selenium	320	µg/kg	9	380	µg/kg	17.5
Sulfide	28,200	µg/kg	9	38,700	µg/kg	25.2
Thallium	269	µg/kg	9	146	µg/kg	17.5
Th-228	0.828	pCi/g	5	2.62	pCi/g	31.7

Site: 216-S-6	Area: S Plant	Category: Deep (Representative Site to 216-S-5)

Table 4. Soil Maximum Detection Summary for the 216-S-6 Waste Site (Soil Borehole C6174)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Th-230	0.877	pCi/g	5	1.14	pCi/g	70
Th-232	1.15	pCi/g	5	0.887	pCi/g	100
Total beta radiostrontium	–	nd	–	6,600	pCi/g	25.2
Total petroleum hydrocarbons diesel	–	nd	–	5,600	µg/kg	85.1
Tritium	nd	–	–	0.0895	pCi/g	25.2
U-233/234	0.19	pCi/g	9	3.1	pCi/g	31.7
U-235	0.011	pCi/g	5	1.4	pCi/g	25.2
U-238	0.22	pCi/g	9	2.6	pCi/g	25.2, 31.7
Zinc	34400	µg/kg	9	37,600	pCi/g	31.7

nd = nondetect

Nature and Extent of Contamination:

Soil data were collected from one soil borehole conducted to 30.1 m (99 ft) below ground surface (bgs) inside the crib site. Of the nine soil samples analyzed, two were from the top 4.6 m (15 ft).

Shallow (0 – 4.6 m [0 – 15 ft] bgs): Geophysical log (GPL) and soil sample results indicate the presence of chemical and radiological constituents in shallow soil within crib. Concentrations increase with depth.

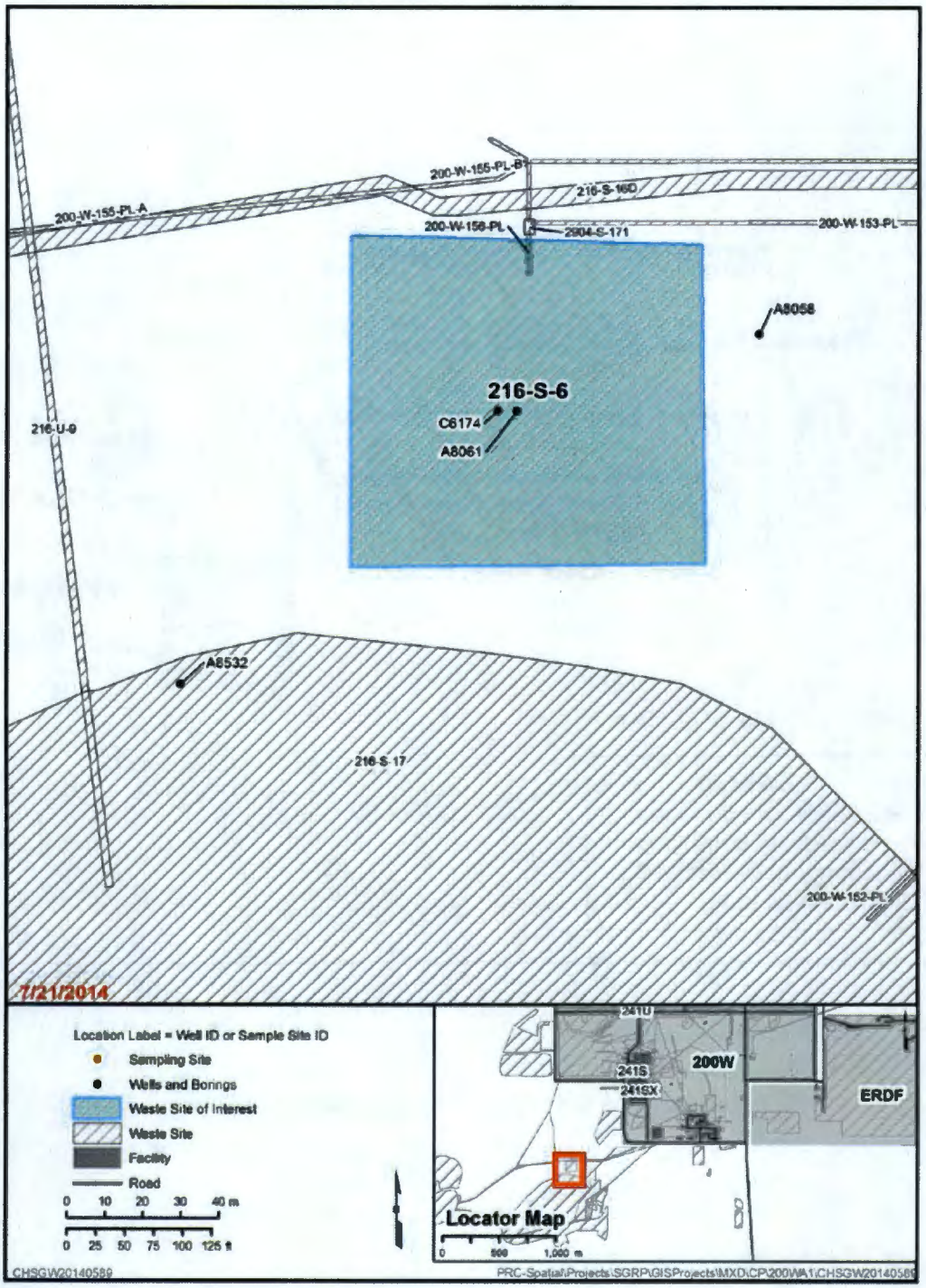
Deep (> 4.6 m [>15 ft] bgs): GPL and soil results indicate the presence of chemical and radiological constituents in soil beneath the crib, with the highest concentrations occurring between 4.6 and 5.3 m (15 and 17.5 ft) bgs (base of crib). Concentrations decrease to below background levels at approximately 18.6 m (61 ft) bgs for most constituents, although elevated radium and potassium-40 are elevated in samples collected at 26 m (85 ft) bgs. The approximate depth to groundwater is 61.9 m (203 ft) bgs.

References:

DOE/RL-2007-02-VOL I-ADD 1, 2008, *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 (Addendum 1)*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

WIDS General Summary Report for the 216-S-6 Waste Site.

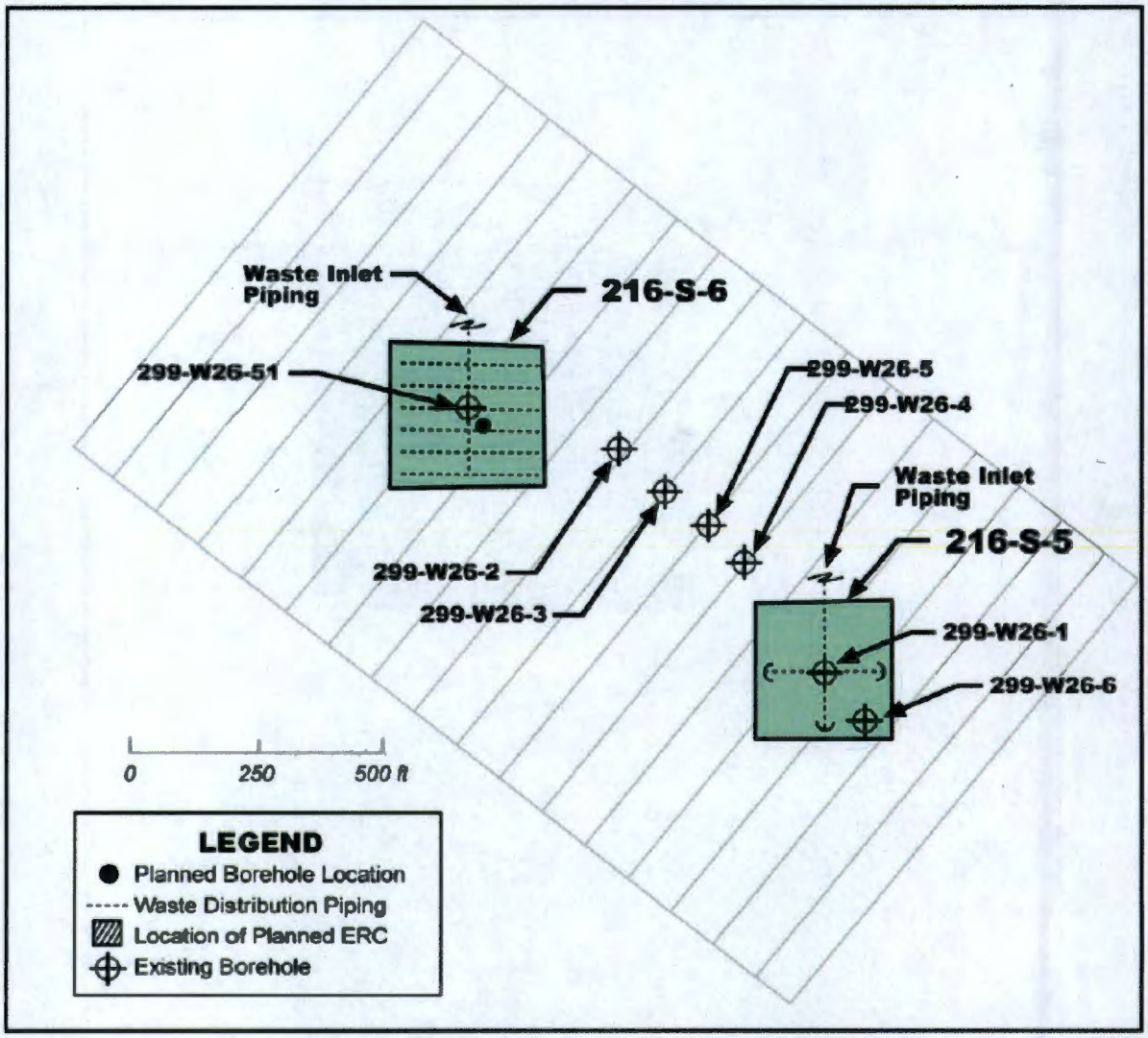
Site: 216-S-6	Area: S Plant	Category: Deep (Representative Site to 216-S-5)



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 216-S-6 Waste Site Map

Site: 216-S-6	Area: S Plant	Category: Deep (Representative Site to 216-S-5)



Source: DOE/RL-2007-02-VOL I-ADD 1, *Site-Specific Field Sampling Plans for the 216-S-5, 216-S-6, 216-T-36, 216B-55, 216-A-37-2, and 216-A-30 Cribs in the 200 SC 1 Operable Unit (Addendum 1)*, Figure AD1-1.

ERC = electrical resistivity characterization

Figure 2. 216-S-5 and 216-S-6 Cribs Data-Collection Locations

Site: 216-S-6	Area: S Plant	Category: Deep (Representative Site to 216-S-5)

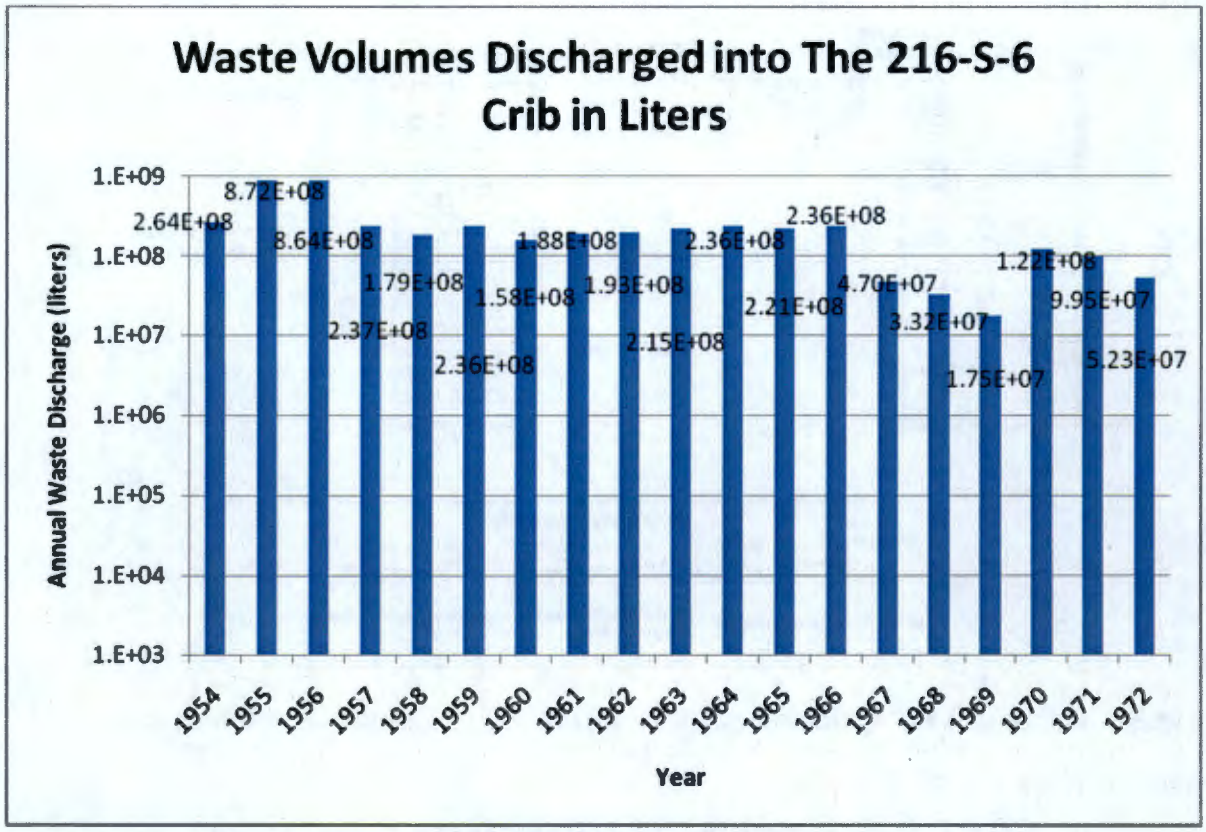
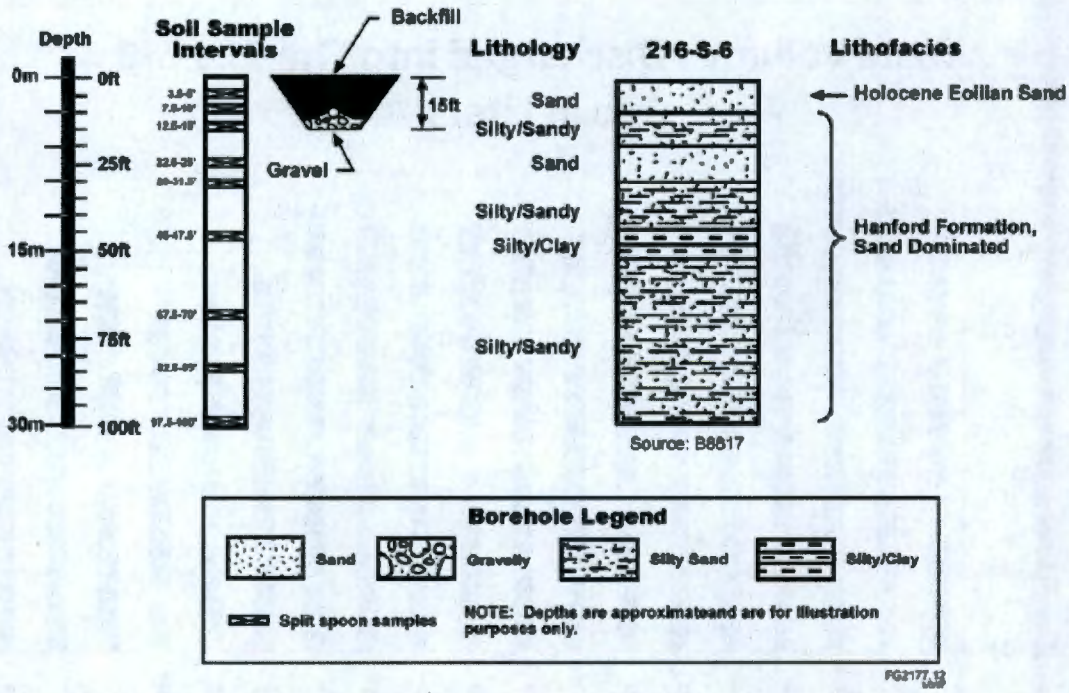


Figure 3. Waste Volumes Received by the 216-S-6 Crib in Liters per Year

Site: 216-S-6	Area: S Plant	Category: Deep (Representative Site to 216-S-5)



Source: DOE/RL-2007-02-VOL I-ADD 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 (Addendum 1)*, Figure AD1-2.

Note: Produced from best available copy.

Figure 4. 216-S-6 Crib Stratigraphy

Site: 216-S-7	Area: S Plant	Category: Deep

Site Description

Alternate Site Identification: 216-S-7 Crib
Site Type: Crib 216-S-15
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-PW-2
Service Dates: January 12, 1956, to July 1965

Waste Site Location and Physical Description: The 216-S-7 waste site is located north of 10th Street and northwest of the 202-S Building (Figure 1). The site consists of two wooden cribs measuring 4.9 m^2 (16.1 ft^2) and 1.6 m^2 (5.2 ft^2) (see Figures 2 and 3). Both crib boxes are located in the same excavation pit, and are spaced 15.3 m (50 ft) from each other, center to center. The boxes are set in a layer of gravel and covered with backfill. A pipe connected the two cribs allowed for the waste entering the site to be equally distributed between both cribs. Each crib box had two risers that extended to the surface. The depth of overburden is 4.5 m (14.6 ft).

Waste Site Coordinates:
Lon-567168.28122 Lat-134176.49220

Site Dimensions:
Site Length: 30.5 m (100.0 ft)
Site Width: 15.3 m (50.0 ft)
Site Area: 467 m^2 (5,000 ft^2)
Site Depth: 6.6 m (21.8 ft)
Cover Thickness: Overburden is 4.5 m (14.6 ft)

Related Site Structure(s): The 216-S-7 Cribs are associated with the 202-S Building, Reduction-Oxidation (REDOX) D-1 and D-2 receiver tanks, 240-S-151 diversion box, and the 200-W-138-PL pipeline.

Site Posting: The 216-S-7 Cribs are marked and posted with Underground Radioactive Material Area and Cave-In Potential signs.

Site History

Site Summary: The 216-S-7 Cribs were constructed as a replacement to the 216-S1 and S-2 Cribs. From January 12, 1956, to April 12, 1959, the Cribs were used for the subsurface disposal of REDOX cell drainage from the D-1 receiver tank, process condensate from the D-2 receiver tank, and condensate from the H-6 condenser in the 202-S Building. The site was used for the disposal of D-1 and D-2 waste until July 1965. However, the site stopped receiving the H-6 waste material after a buildup of beta activity was reported. The H-6 waste was redirected to the underground waste storage tanks for disposal after the jumper charges were finished on April 12, 1959. The liquid wastes disposed at this site contained chemical waste in the form of nitrate, aluminum nitrate, nitric acid, and sodium.
The Site was retired in July 1965, when it reached the set radionuclide disposal limit. The site was deactivated by capping the pipeline that fed the Cribs at the northwest corner of the 202-S perimeter

Site: 216-S-7	Area: S Plant	Category: Deep

fence. After capping, the D-2 waste was redirected to the 216-S-9 Crib, while the D-1 waste was concentrated and deposited into the underground storage tanks.

Interim stabilization activities have occurred at this site in 1975, 1992, and 2004. In August 1975, the aboveground piping was removed and the leftover piping was blanked beneath the surface. In addition, several sink holes were filled and the ground surface was graded above the cribs. Additional surface stabilization work occurred in 1992, when another 0.61 m (2 ft) of clean dirt was deposited at the site.

Volume Discharged: 3.90E+08 L (103E+06 gal) of cell drainage and process condensate (Figure 4).

Pore Volume Discharged: 3.90E+08 L/ (209 ft x 5,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 44

Waste Inventory: REDOX cell drainage from the D-1 receiver tank, process condensate from the D-2 receiver tank, and condensate from the H-6 condenser in 202-S Building. The waste inventory for the 216-S-7 waste site is provided in Table 1.

Table 1. Waste Inventory Radionuclide Content for the 216-S-7 Waste Site

Contaminant	Mass Discharged
Pu	440 g
Beta	280,000 Ci
Sr-90	3100 Ci
Ru-106	1500 Ci
Cs-137	1500 Ci
Co-60	25 Ci
U	2,600 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: In 1965, two wells (A7837 and A7838) were drilled at the cribs to document the amount of radionuclide activity and spread beneath the surface. Two more wells were drilled in 1966: A7851 and A7852. See Figure 1 for well locations. Core samples from well A7852 revealed a maximum of 13 microcuries per gram for cesium-137 (Cs-137) and 2.7 microcuries per gram of strontium-90 (Sr-90) at 6.4 m (21 ft) beneath the surface.

Site: 216-S-7	Area: S Plant	Category: Deep

In November 2004, the drilling for characterization borehole C4557 began. The borehole was finished and deactivated in January 2005. The well was drilled to 69.0 m (226.5 ft) below ground surface and a Downhole Spectral Gamma-Ray Logging System was used to identify and document the distribution of radionuclides. Sample analyses from four soil samples showed a maximum concentration of 20,000 pCi/g Cs-137 at 7.6 m (25 ft) below ground surface (Table 4).

Ongoing surveys at this site include groundwater monitoring and annual radiological surveys. The well monitoring and radiological survey results are not provided in the Waste Information Data System (WIDS).

Borehole and data summaries are presented in Tables 2, 3 and 4. Borehole locations are shown in Figure 1.

Groundwater wells (299-W22-12, 299-W22-13, 299-W22-14, and 299-W22-14P) associated with the 216-S-7 waste site had detections above drinking water standards for nitrate and radionuclides (Cs-137, Sr-90, and tritium). Nitrate concentrations were first measured at 1,000 µg/L in 1957, were as high as 710,000 µg/L in 1975, and were last measured at 2,500 µg/L in 1993. Cesium-137 was initially measured at 740 pCi/L in 1956, was at its highest level of 1,000 pCi/L in 1962, and was 0.6 pCi/L when last measured in 1990. Strontium-90 was initially measured at 70 pCi/L in 1956, was at its highest level of 5.7 million pCi/L in 1957, and was last measured at 0.177 pCi/L in 1990. Tritium was first measured at 200 million pCi/L in 1962 (its highest level) and was last measured at 15,600 pCi/L in 1993.

Table 2. Borehole Summary for the 216-S-7 Waste Site

Year	Well / Borehole ID	Location with Respect to Site	Depth (ft)
2004	299-W22-12 / A7837	Edge	3.3 – 219 (GPL)
2004	299-W22-13 / A7838	Edge	3.3 – 223 (GPL)
2004	299-W22-14 / A7839	Outside	3.3 – 235 (GPL)
2004	299-W22-32 / A7851	Inside	3.3 – 215 (GPL)
2004	299-W22-33 / A7852	Inside	3.3 – 212 (GPL)
2004	C4557	Inside	0 – 225 (GPL) 0.5 – 225 (12 soil samples)
2005	C4557	Inside	16 – 33 (GPL)

GPL = geophysical log
ID = identification

Site: 216-S-7	Area: S Plant	Category: Deep

Table 3. Geophysical Log Summary for the 216-S-7 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A7837	0 to 5	–	pCi/g	–	6,321.6	cpm	4
	5 to 10	–	pCi/g	–	6,680.8	cpm	10
	10 to 15	–	pCi/g	–	6,551.3	cpm	11
	>15	397	pCi/g	39	398,282	cpm	39
A7838	0 to 5	0.26	pCi/g	4.0	5,930.8	cpm	3
	5 to 10	–	pCi/g	–	5,450.6	cpm	10
	10 to 15	–	pCi/g	–	5,545.3	cpm	12
	>15	61.9	pCi/g	37	89,811.6	cpm	38
A7839	0 to 5	0.5	pCi/g	3.0	6,815.9	cpm	3
	5 to 10	–	pCi/g	–	6,178.9	cpm	6
	10 to 15	–	pCi/g	–	6,119.5	cpm	15
	>15	454	pCi/g	35	559,579	cpm	35
A7851	0 to 5	0.4	pCi/g	4.0	8,543.5	cpm	4
	5 to 10	18.4	pCi/g	9.0	36,097.6	cpm	9
	10 to 15	2	pCi/g	12	11,226.9	cpm	11
	>15	3,118,984.6	pCi/g	28	5,185,350	cpm	28
A7852	0 to 5	0.34	pCi/g	4.5	6,846.3	cpm	4.5
	5 to 10	10.8	pCi/g	9.5	19,523	cpm	9.5
	10 to 15	3.37	pCi/g	10.5	10,626.7	cpm	10.5
	>15	313,646.9	pCi/g	26.5	85,504,200	cpm	28.5
C4557	0 to 5	0.96	pCi/g	5.0	17,797.4	cpm	5
	5 to 10	1.4	pCi/g	8.0	30,702.2	cpm	10
	10 to 15	1	pCi/g	14	206,306	cpm	15
	>15	1,705,657.6	pCi/g	25	6,0843,000	cpm	18

bgs = below ground surface ID = identification

Site: 216-S-7	Area: S Plant	Category: Deep

Table 4. Soil Maximum Detection Summary (Soil Borehole C4557)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
2-Ethyl-1-hexanol	–	–	–	1900	µg/kg	17
4,4'-DDE	1.4	µg/kg	3	–	–	–
4,4'-DDT	0.42	µg/kg	3	–	–	–
Acetone	–	–	–	16	µg/kg	201.5
Aldrin	0.81	µg/kg	3	–	–	–
Americium-241	–	–	–	1,900	pCi/g	26.5
Ammonium ion	–	–	–	18,800	µg/kg	26.5
Arsenic	–	–	–	7,090	µg/kg	56.5
Barium	–	–	–	127,000	µg/kg	26.5
Beryllium	–	–	–	31	µg/kg	46.5
Bromomethane	–	–	–	1.1	µg/kg	26.5
Calcium Carbonate	–	–	–	36	–	155.5
Cs-137	–	–	–	20,000	pCi/g	26.5
Chloride	–	–	–	16,700	µg/kg	46.5
Chromium	–	–	–	146,000	µg/kg	201.5
Co-60	–	–	–	0.022	pCi/g	46.3
Copper	–	–	–	52,100	µg/kg	225.5
Diethylphthalate	–	–	–	1,100	µg/kg	36.5
Ethyl acetate	–	–	–	21	µg/kg	26.5
Eu-155	–	–	–	0.063	pCi/g	68.5
Hexavalent Chromium	–	–	–	800	µg/kg	17
Lead	–	–	–	–	µg/kg	46.5
Mercury	–	–	–	–	µg/kg	17
Methylene chloride	–	–	–	–	µg/kg	36.5
Nickel	–	–	–	82,400	µg/kg	201.5

Site: 216-S-7	Area: S Plant	Category: Deep

Table 4. Soil Maximum Detection Summary (Soil Borehole C4557)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Ni-63	–	–	–	13.7	pCi/g	26.5
Nitrate	–	–	–	235,000	µg/kg	128.5
Nitrogen in nitrite and nitrate	–	–	–	36,000	µg/kg	46.5
Phosphate	–	–	–	2,110	µg/kg	46.5
Pu-238	–	–	–	190	pCi/g	26.5
Pu-239/240	–	–	–	11,000	pCi/g	26.5
K-40	–	–	–	16.2	pCi/g	46.5
Ra-226	–	–	–	0.649	pCi/g	17
Ra-228	–	–	–	0.846	pCi/g	36.5
Silver	–	–	–	3,950	µg/kg	17
Sulfate	–	–	–	41,600	µg/kg	46.5
Tc-99	–	–	–	14.7	pCi/g	26.5
Th-228	–	–	–	4.78	pCi/g	26.5
Th-230	–	–	–	0.844	pCi/g	155.5
Th-232	–	–	–	0.846	pCi/g	46.5
Total beta radiostrontium	–	–	–	53,000	pCi/g	26.5
Trimethylsilanol	–	–	–	5.9	µg/kg	26.5
Tritium	–	–	–	1,410	pCi/g	155.5
Uranium	–	–	–	463,000	µg/kg	26.5
U-233/234	–	–	–	230	pCi/g	26.5
U-235	–	–	–	25	pCi/g	26.5
U-238	–	–	–	200	pCi/g	26.5

Site: 216-S-7	Area: S Plant	Category: Deep

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): No soil analytical data are available for the upper 4.6 m (15 ft). Geophysical log (GPL) results between 0.3 and 4.6 m (1 and 15 ft) bgs show very low or nondetect Cs-137 and total gamma concentrations at boreholes drilled outside or at the edges of the crib site (A7837, A7838, and A7839). Cesium-137 and total gamma concentrations were elevated within the shallow soil interval (primarily from 1.5 – 4.6 m [5 to 15 ft] bgs) at locations within the crib site (A7851, A7852, and C4557).

Deep (<4.6 m [>15 ft]): Soil analytical data are available from deep soil borehole C4557 located within the crib site footprint. This borehole extended to 71.7 m (235 ft), which is above the present groundwater table. However, contamination found below 38.1 m (125 ft) was generally consistent and low level. Detected radionuclides at C4557 included amerecium-241, europium-155, plutonium-238 and 238/239, potassium-40, radium-226 and -228, technetium-99, thorium-228, -230, and -232, and uranium 233/234, -235, and -238 were generally above background levels. GPL results inside and outside the crib footprint confirm the lateral extent of contamination to within the crib.

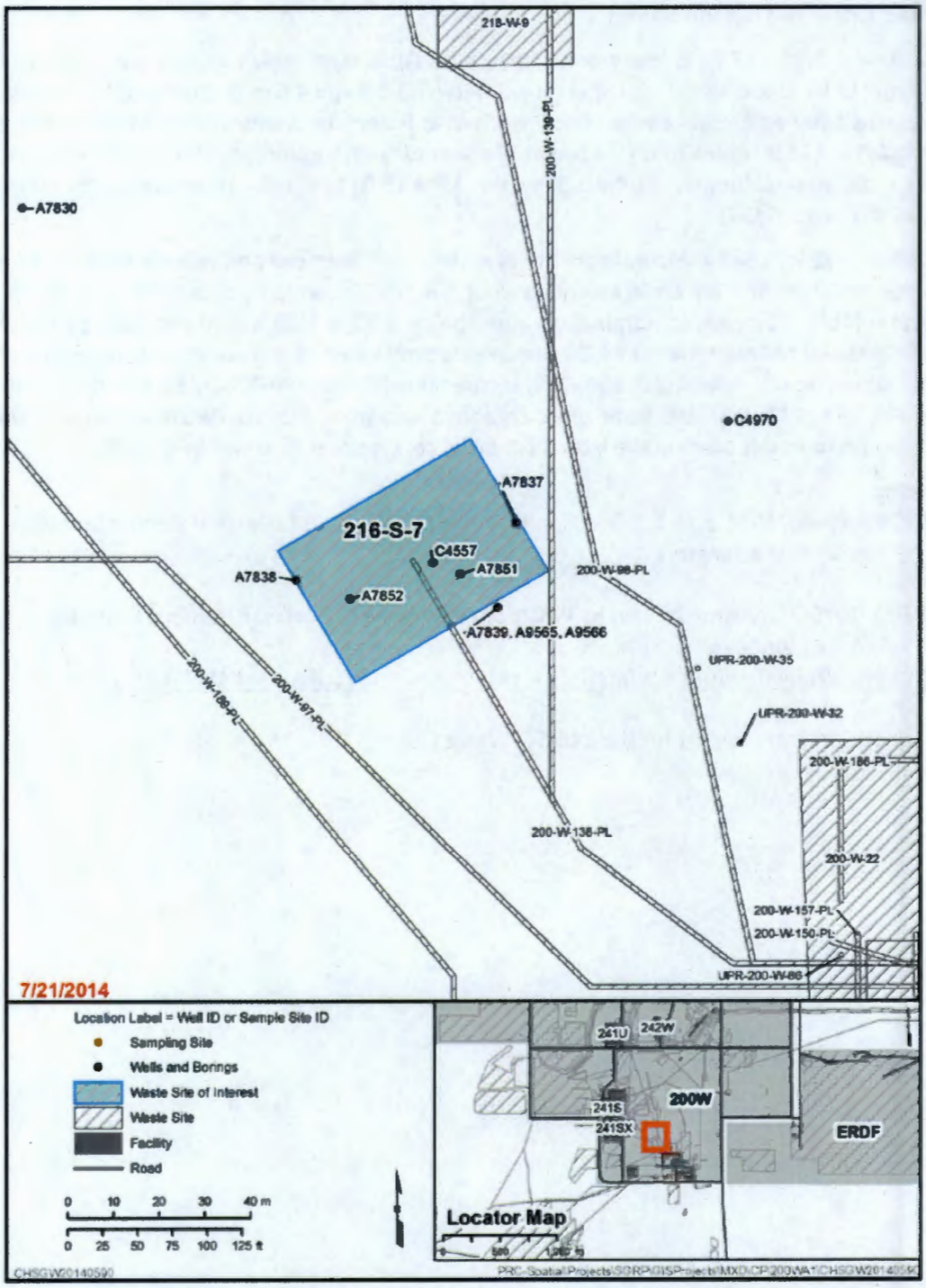
References:

H-2-30135 (drawing), 1956, *216-S-7 Crib Plan & Profile Details*, Rev. 1, General Electric Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

WIDS General Summary Report for the 216-S-7 Waste Site.

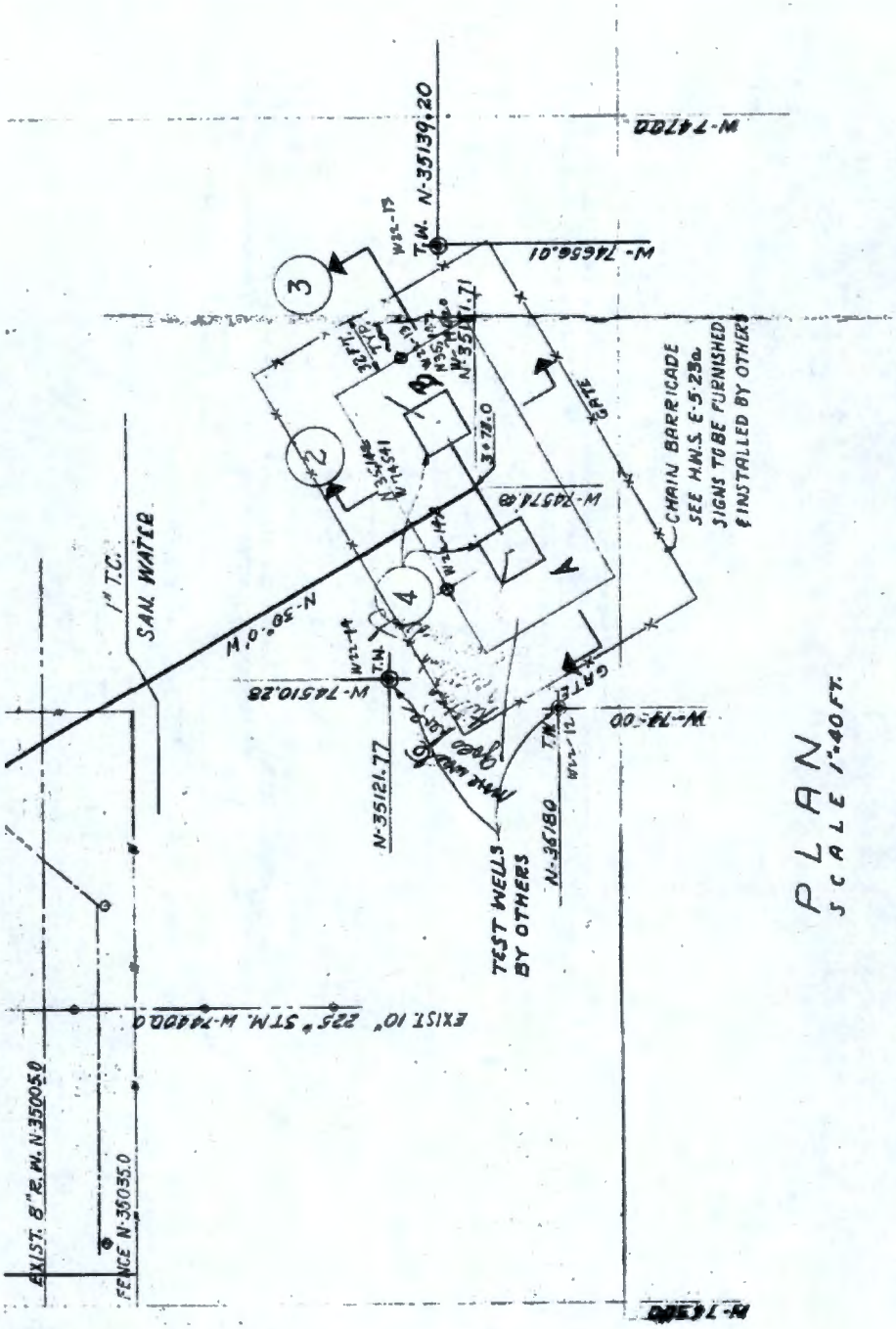
Site: 216-S-7	Area: S Plant	Category: Deep



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 216-S-7 Waste Site Map

Site: 216-S-7	Area: S Plant	Category: Deep

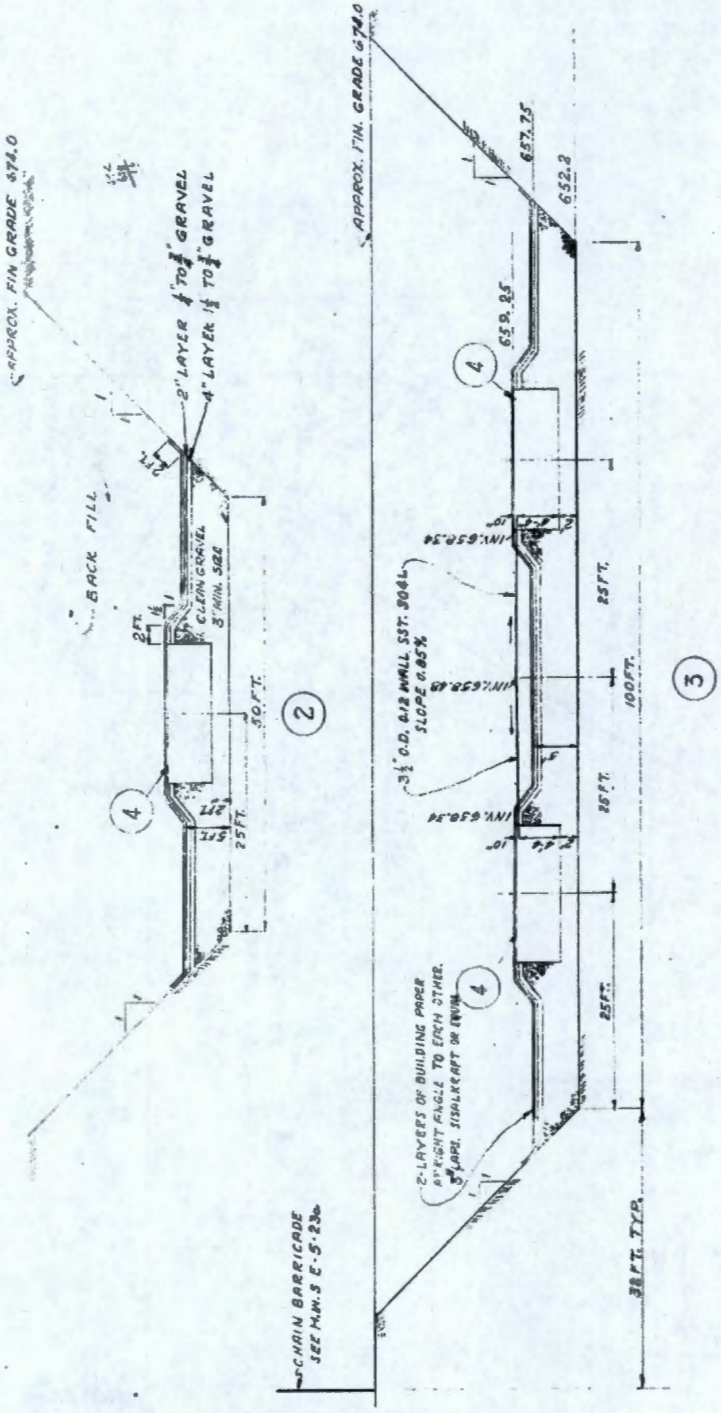


Source: H-2-30135, *216-S-7 Crib Plan & Profile Details.*

Note: Produced from best available copy.

Figure 2: 216-S-7 Plan View

Site: 216-S-7	Area: S Plant	Category: Deep



Source: H-2-30135, *216-S-7 Crib Plan & Profile Details.*

Note: Produced from best available copy.

Figure 3: 216-S-7 Crib Cross-Section

Site: 216-S-7	Area: S Plant	Category: Deep

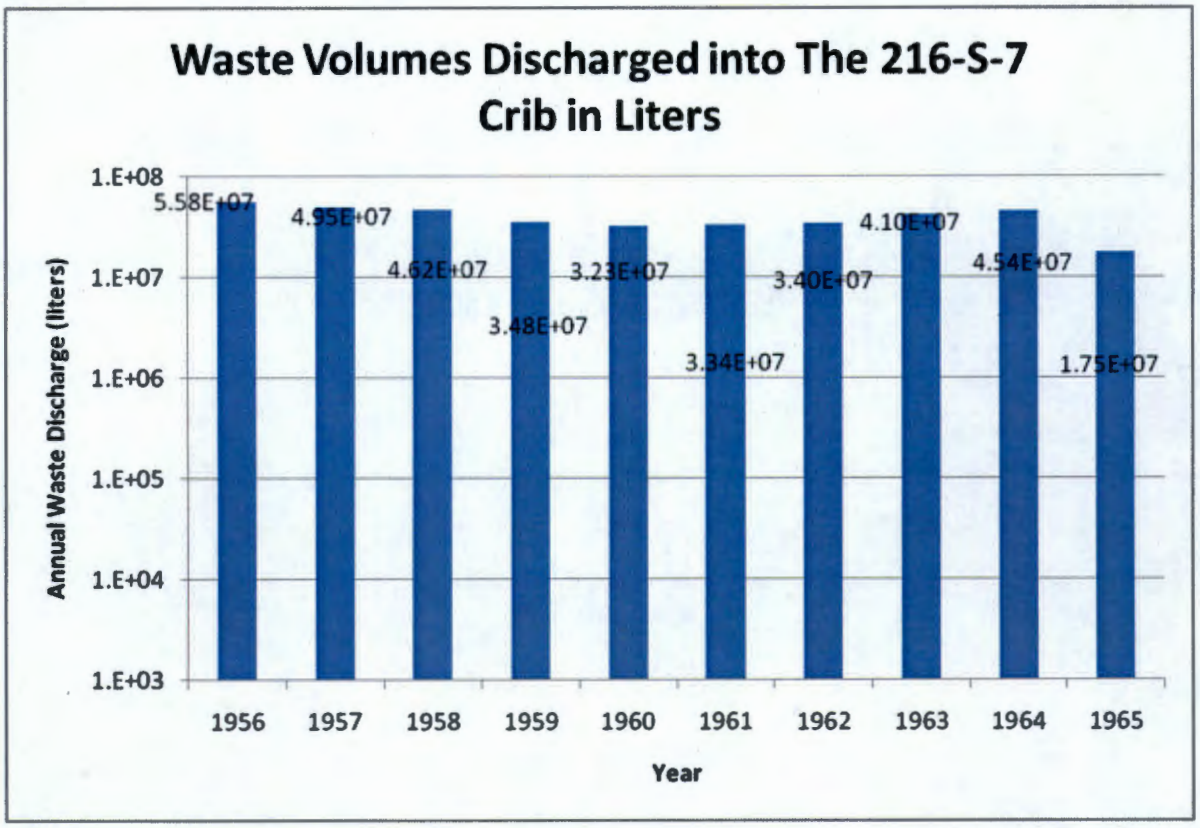


Figure 4. Annual Waste Volumes Discharged

Site: 216-S-7	Area: S Plant	Category: Deep

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Site: 216-S-8	Area: S Plant	Category: Deep

Site Description

Alternate Site Identification: Cold Aqueous Trench, Cold Aqueous Crib, 216-S-3, Un-irradiated Uranium Waste Trench, Cold Aqueous Grave Trench
Site Type:
Facility/Geographic Area: S Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Service Dates: 1951 to 1952

Waste Site Location and Physical Description: The 216-S-8 waste site is located on the east side of the 241-SX Tank Farm and southwest of the 216-S1&2 Cribs (Figures 1 and 2). The site consists of a single trench that was constructed for a single discharge event. The trench has been backfilled to grade.

Waste Site Coordinates:
Lon-566925.32814 Lat-134220.90721

Site Dimensions:
Site Length: 30.5 m (100.0 ft)
Site Width: 18.3 m (60.0 ft)
Site Area: 558 m^2 (6,000 ft^2)
Site Depth: 7.6 m (25.0 ft)
Cover Thickness: Not Specified

Related Site Structure(s): The 216-S-8 waste site is associated with the 202-S Building.

Site Posting: The 216-S-8 Trench is marked and is posted with Underground Radioactive Material Area signs.

Site Characterization Summary: Interim stabilization occurred at this site in 1994. The interim actions and the amount of material used for temporary stabilization are not specified. The site is monitored by groundwater wells. In addition, radiological surveys are conducted on an annual basis. The results of these surveys are not provided in the Waste Information Data System (WIDS), and the frequency of groundwater monitoring is not specified.

Site History

Release Summary: The 216-S-8 Trench operated from November 1951 to February 1952. The trench was a single-use structure that received un-irradiated uranium startup waste from the 202-S Building. Waste concentrations were estimated to be 0.2 grams of uranium per liter. The estimated total volume was expected to be only 152,000 L (40,000 gal). The WIDS General Summary Report cites document HW-28471, *Unconfined Underground Radioactive Waste and Contamination in the 200 Areas*, which states that the trench was used between October 1951 and January 1952, and that a total of 3.1E+06 L (8.1E+04 gal) containing 193 kg (430 lb) of un-irradiated uranium was discharged to this trench. The site was retired once the discharge of startup waste from the 202-S Building was finished.

Site: 216-S-8	Area: S Plant	Category: Deep

Volume/Mass Discharged: 1.0E+07 L (2.6E+06 gal) or 3.1E+06 L (8.1E+04 gal) of un-irradiated uranium (see Figure 3 for further detail).

Pore Volume Discharged: 1.0E+07 L/ (193 ft x 6,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 1.0

Waste Inventory: The waste inventory for the 216-S-8 waste site in provided in Table 1.

Table 1. Waste Inventory Radionuclide Content

Contaminant	Mass Discharged
Pu	2 g
Beta	1,500 Ci
Sr-90	1 Ci
Ru-106	50 Ci
Cs-137	12 Ci
Co-60	<0.1 Ci
U	0.02 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Interim stabilization occurred at this site in 1994. The interim actions and the amount of material used for temporary stabilization are not specified.

The site is monitored by groundwater wells. In addition, radiological surveys are conducted on an annual basis. The results of these surveys are not provided in WIDS and the frequency of groundwater monitoring is not specified.

Borehole and data summaries are presented in Tables 2 through 4. Borehole locations are shown on Figure 1.

Site: 216-S-8	Area: S Plant	Category: Deep

Table 2. Borehole Summary for the 216-S-8 Waste Site

Year	Borehole / Well ID	Location with Respect to Site	Depth (ft)
1999	B8813/299-W22-49	–	85, 220 (2 soil samples)
2001	C3399 /299-W22-85	60 ft north of site	2 – 260 (GPL) 219 - 224 (1 soil sample*)

*Analysis for CCl4 only

GPL = geophysical log
ID = identification

Table 3. Geophysical Log Summary for the 216-S-8 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
C3399	0 to 5	0.17	pCi/g	4.0	12,581.8	cpm	3
	5 to 10	–	pCi/g	–	12,620.9	cpm	7
	10 to 15	–	pCi/g	–	13,019.3	cpm	15
	> 15	–	pCi/g	–	18,482	cpm	136

bgs = below ground surface
ID = identification

Site: 216-S-8	Area: S Plant	Category: Deep

Table 4. Soil Maximum Detection Summary (Soil Borehole B8813)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Arsenic	–	–	–	5,100	µg/kg	85
Barium	–	–	–	60,000	µg/kg	85
Benzene (TCLP)*	–	–	–	73	µg/L	220
Cadmium	–	–	–	70	µg/kg	85
Chromium	–	–	–	10,000	µg/kg	85
Gross alpha	–	–	–	9.74	pCi/g	85
Gross beta	–	–	–	22.7	pCi/g	85
Lead	–	–	–	4,900	µg/kg	85
K-40	–	–	–	19.1	pCi/g	85
Ra-226	–	–	–	0.612	pCi/g	85
Ra-228	–	–	–	1.06	pCi/g	85
Th-228	–	–	–	0.871	pCi/g	85
Th-232	–	–	–	1.06	pCi/g	85
Tritium	–	–	–	2.25	pCi/g	220
Uranium	–	–	–	648	µg/kg	85

*SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update III-A.*

TCLP = Toxicity Characteristic Leaching Procedure

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 to 15 ft] below ground surface [bgs]): Geophysical log (GPL) results indicate cesium-137 (Cs-137) levels are below background 18.3 m (60 ft) north of the trench. No soil or GPL data are available for the trench. However, the trench depth was 7.6 m (25 ft) bgs, indicating the potential for contamination in shallow soil is low.

Deep (>4.6 m [>15 ft] bgs): An estimated 1 pore volume of liquid was discharged to the trench at a discharge depth of about 7.5 m (25 ft) bgs. GPL results indicate Cs-137 levels are below background 18.3 m (60 ft) north of the trench. Available deep soil data are limited to three samples collected at 26 m (85 ft), and at the bottom of the vadose zone. Based on the pore volume discharged,

Site: 216-S-8	Area: S Plant	Category: Deep

contamination could extend to groundwater. The depth to groundwater is approximately 66.5 m (218 ft) bgs.

References:

H-2-44511 (drawing), *Area Map 200 West "S" Plant Facilities*, Atlantic Richfield Hanford Company, Richland, Washington.

1963, Sheet 30 of 186, Rev. 6.

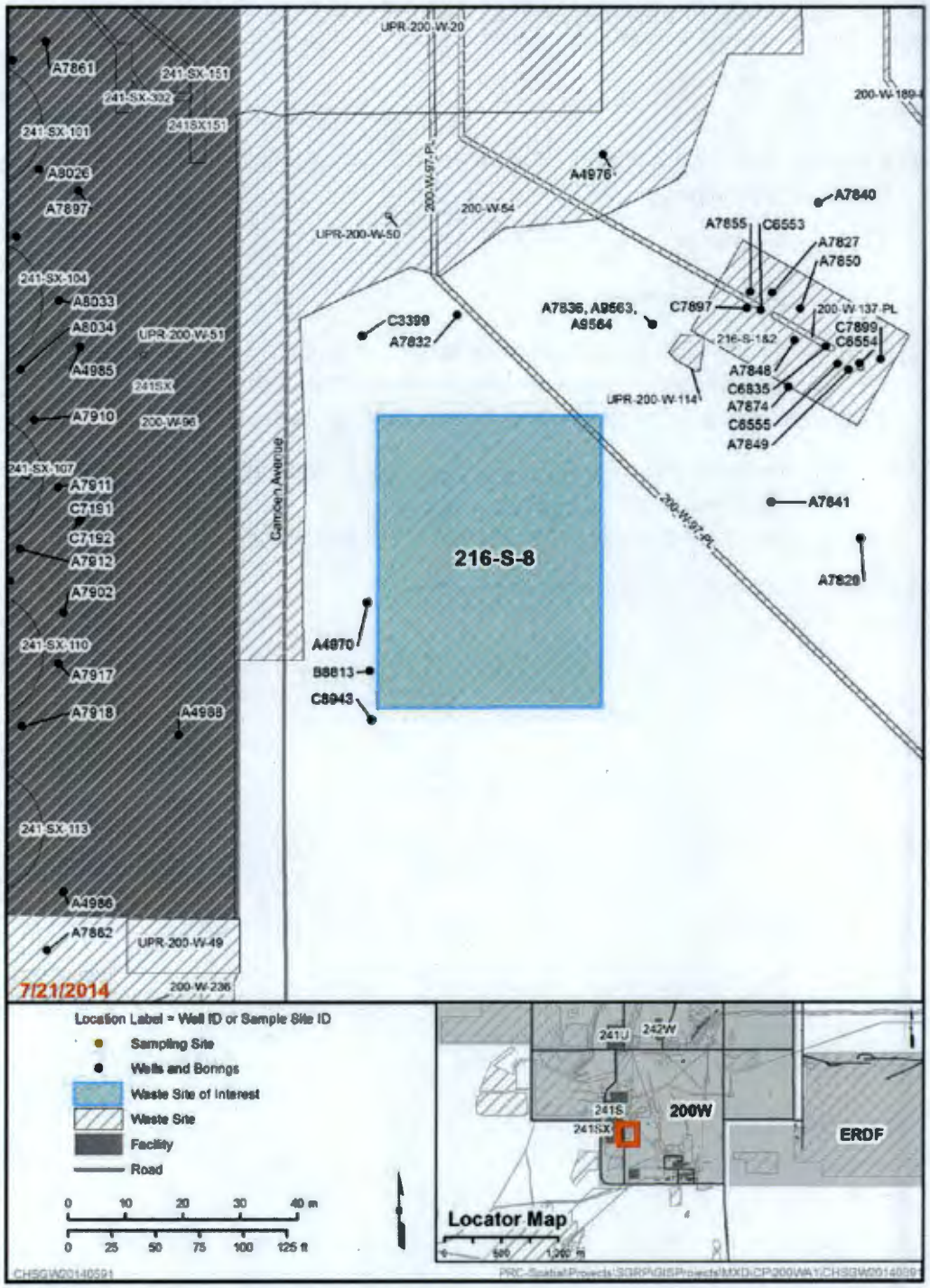
1963, Sh. 38 of 186, Rev. 7.

HW-28471, 1953 (declassified 1974), *Unconfined Underground Radioactive Waste and Contamination in the 200 Areas*, General Electric Company, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0081988H.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

WIDS General Summary Report for the 216-S-8 Waste Site.

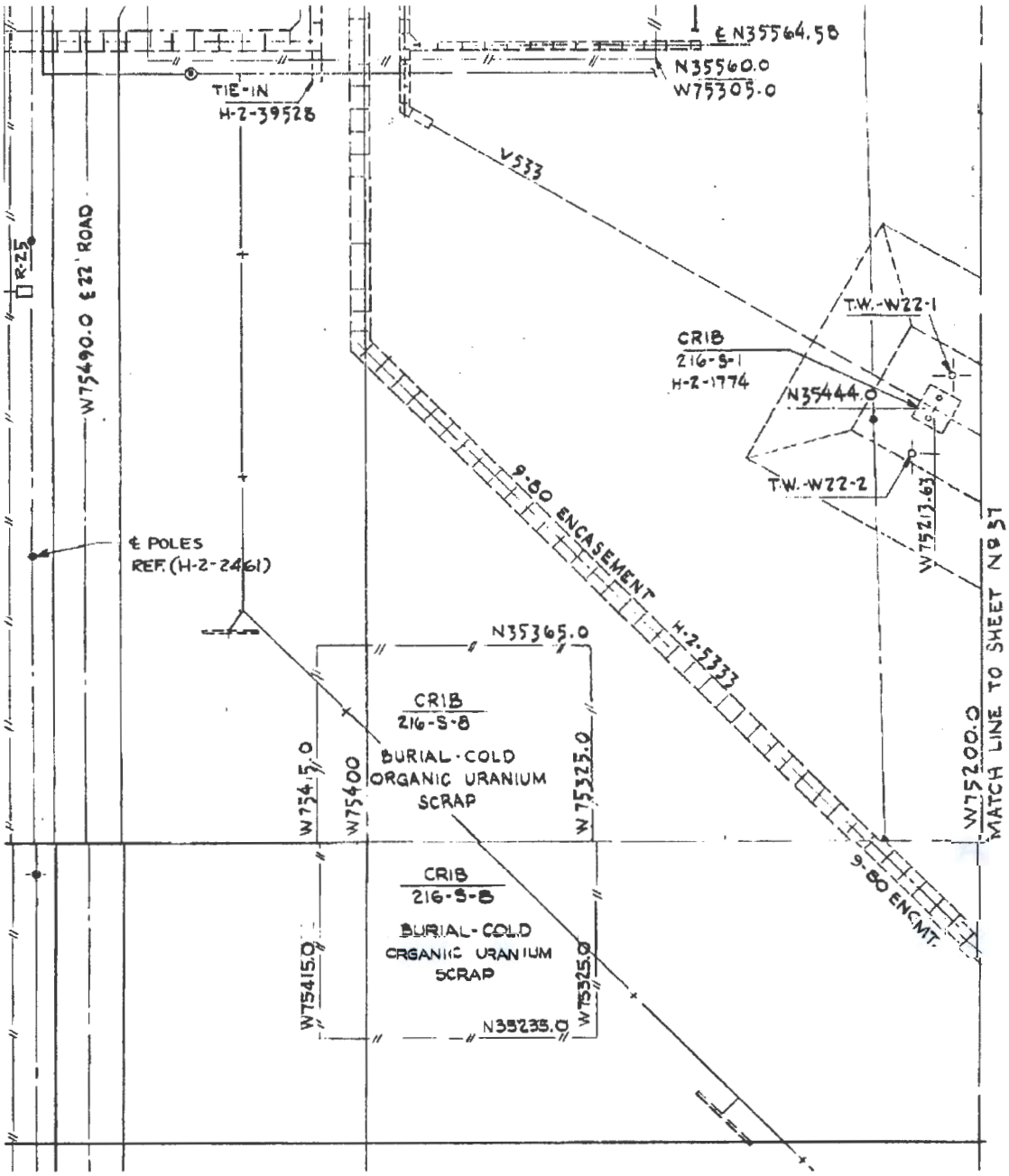
Site: 216-S-8	Area: S Plant	Category: Deep



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 216-S-8 Waste Site Map

Site: 216-S-8	Area: S Plant	Category: Deep



Source: H-2-44511, *Area Map 200 West "S" Plant Facilities*, Sheets 30 and 38.

Note: Produced from the best available copy.

Figure 2. 216-S-8 Waste Site Area Map

Site: 216-S-8	Area: S Plant	Category: Deep

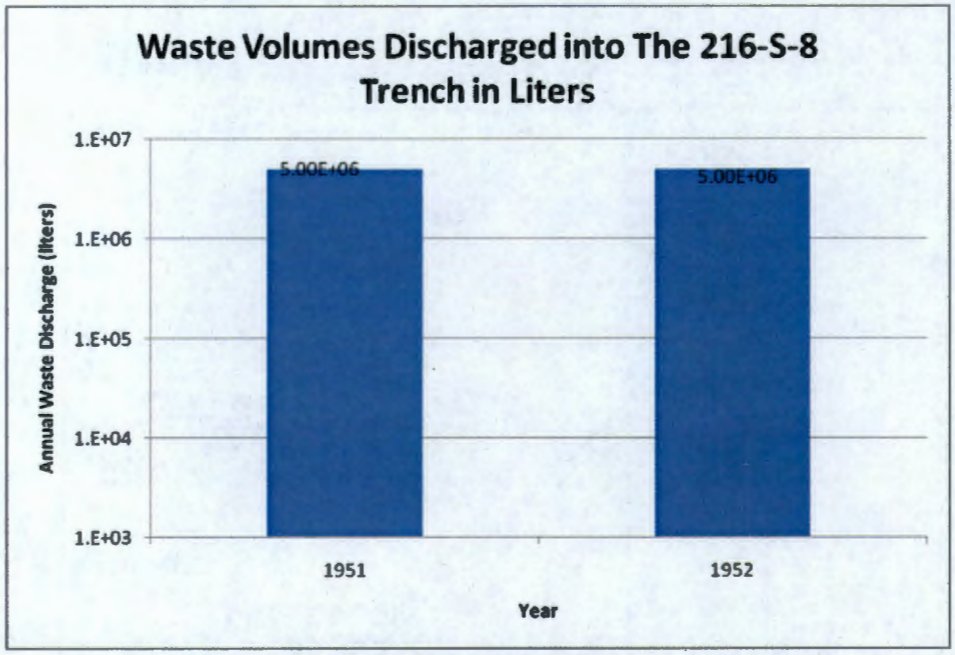


Figure 3. Waste Volume Discharge by Liters per Year

Site: 216-S-12	Area: S Plant	Category: Intermediate

Site Description

Alternate Site Identification: UPR-200-W-30 (duplicate site)
Site Type: Trench
Facility/Geographic Area: S Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MW- I, 200-MG-2
Service Dates: July 1954 to an unspecified date

Waste Site Location and Physical Description: The 216-S-12 waste site consists of a single-use liquid waste disposal trench that was used for the liquid disposal of 219-S Stack flush water, which occurred through the month of July 1954. The site is located northeast of the 202-S (Reduction-Oxidation [REDOX]) Facility and north of the 291-S Stack (Figure 1). The trench was fed with an aboveground pipeline. The trench was deactivated after the flush operation was complete by removing the temporary aboveground pipe and backfilling the trench.

Waste Site Coordinates:
Lon-567544.69808 Lat-134117.13538

Site Dimensions:
Site Length: 27.4 m (90 ft) Site Depth: 3.0 m (10 ft)
Site Width: 6.1 m (20 ft) Cover Thickness: Not applicable
Site Area: 167 m^2 (1,800 ft^2)

Related Site Structure(s): The site is associated with the 291-S Stack. The site is also known as the 291-S Stack Wash Sump, REDOX Stack Flush Trench. UPR-200-W-30 has an identical site description and history and is considered to be a duplicate of 216-S-12.

Site Posting: The site is surrounded with cement marker posts and chain, and posted with Underground Radioactive Material Area signs.

Site History

Release Summary: In July 1954, approximately 68,100 L (18,000 gal) of flush water was drained from the REDOX Stack into 216-S-12. The water contained 600 kg (1,323 lb) of ammonium nitrate. An estimated 5 Ci of beta particle emitters and 2-3 Ci of gamma particle emitters were present in the waste stream, with ruthenium and zirconium-niobium predominant.

Volume Discharged: 68,100 L (18,000 gal) of liquid flush water.

Pore Volume Discharged: 68,100 L/ (238 ft x 1,800 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.02

Site: 216-S-12	Area: S Plant	Category: Intermediate

Waste Inventory: Table 1 presents the waste inventory for the 216-S-12 Trench.

Table 1. Waste Inventory Radionuclide Content

Contaminant	Mass Discharged
Pu	1 g
Beta	6.5 Ci
Sr-90	1 Ci
Ru-160	1 Ci
Cs-137	1 Ci
Co-60	<0.1 Ci
U	5.0 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites.*

Previous Site Characterization

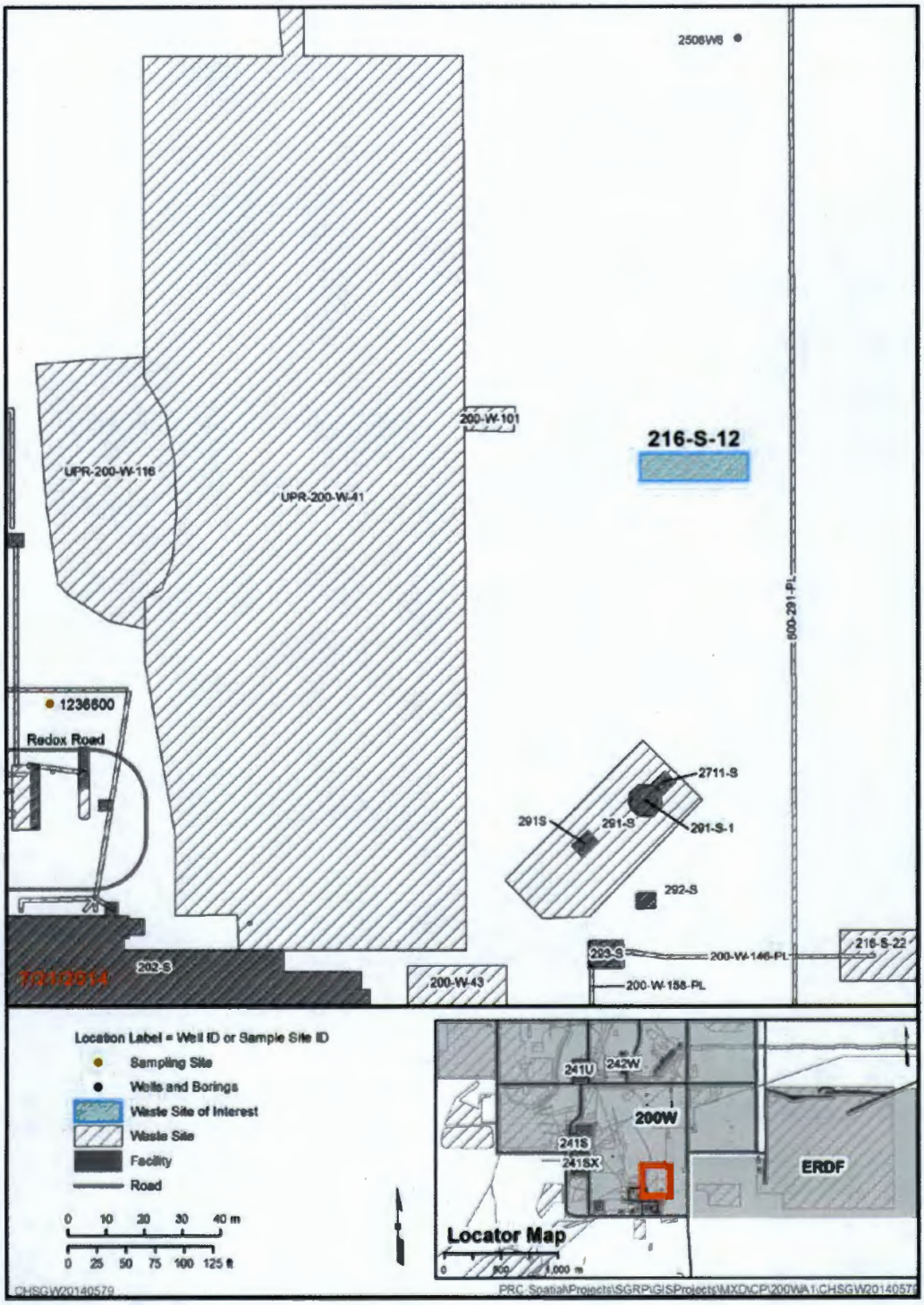
Site Characterization Summary: Visual and radiological surveys are performed at this site. No description is provided detailing the frequency of surveys. The last documented Global Positioning System survey occurred on January 13, 2000, when the area located within the AC-5-40 markers was re-mapped from a point to a polygon feature. No soil or geophysical log data are available.

Nature and Extent of Contamination: No data are available to evaluate shallow or intermediate depth soil contamination. Based on existing information, the shallow and intermediate depth soil could be contaminated by former discharge of waste containing radionuclides and ammonium nitrate. Within the trench, soil 3 m (10 ft) below ground surface (bgs) and below could be contaminated by direct discharge of waste into the trench. Because the trench was backfilled after use, the soil from 0 – 3 m (0 – 10 ft) bgs within the trench has a low potential for contamination. An estimated 0.02 pore volumes of liquid were discharged to the trench, suggesting a low potential for groundwater contamination. The approximate depth to groundwater is 75.6 m (248 ft) bgs.

References:

WIDS General Summary Report for the 216-S-12 Waste Site.

Site: 216-S-12	Area: S Plant	Category: Intermediate



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 216-S-12 Waste Site Map

Site: 216-S-12	Area: S Plant	Category: Intermediate

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Site: 216-S-14	Area: S Plant	Category: Intermediate

Site Description

Alternate Site Identification: Buried Contaminated Hexone, 216-S-4 Burial Contaminated Hexone; Cold Organic Trench or Grave
Site Type: Trench
Facility/Geographic Area: S Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-PW-1
Service Dates: December 1951 to January 1952

Waste Site Location and Physical Description: The 216-S-14 waste site is located 388 m (1,273 ft) south of the 202-S Canyon Building and northwest of 216-S-19 pond. It is approximately 46 m (150 ft) southeast of the 222-S sanitary tile field (Figure 1). The site consists of a backfilled trench that received hexone contaminated with trace amounts of unirradiated uranium from the initial test runs in the 201-S Reduction-Oxidation (REDOX) Facility. The waste site was fed with an aboveground pipeline. The site was retired when discharge of hexone to the unit was completed and then deactivated by removing the aboveground piping and backfilling the area.

Early site drawings place the trench center point at N33100/W73700 and indicate security fencing around the trench. Currently, no fence exists (Figure 2). BHI-11076, *S Plant Aggregate Area Management Study Technical Baseline Report*, states "south of and in line with the trench, there is a row of roughly 10 clay tile pipes that rise above grade running in an east-west line. The surface of this area has grass cover." However, a site visit and Global Positioning System survey done in 1998 determined the tile pipes are located north of the documented trench coordinates. Evidence of a few wooden fence posts was noted near the southwest corner of the trench. An area of distressed vegetation was also noted southwest of the trench (see Figure 2).

Waste Site Coordinates:
E-567430 (m) N-133541 (m)

Site Dimensions:
Site Length: 30.48 m (100 ft)
Site Width: 2.44 m (8 ft)
Site Area: 74.32 m^2 (800 ft^2)
Site Depth: 1.83 m (6 ft)
Cover Thickness: 1.83 m (6 ft)

Related Site Structure(s): The site is associated with the 202-S Building.

Site Posting: Currently, the site is not marked or posted.

Site History

Release Summary: The site was used from December 1951 to January 1952 for disposal of REDOX start-up waste. Approximately 76,000 L (20,000 gal) of hexone contaminated with only trace quantities

Site: 216-S-14	Area: S Plant	Category: Intermediate

of unirradiated uranium used in the initial tests of REDOX was disposed through an aboveground piping in the trench. The site was deactivated by removing the aboveground piping and backfilling the trench with clean soil. The area was then enclosed aboveground with a single rail wooden fence and posted with radiation zone and 'Do Not Excavate within 20 feet' signs.

Volume Discharged: 76,000 L (20,000 gal)

Pore Volume Discharged: 76,000 L/ (238 ft x 800 ft^2 / 35.3 m^3/ft^3 * 1000 L/m^3 * 0.3) = 0.05

Waste Inventory: Not known.

Previous Site Characterization

Site Characterization Summary: After discharge of hexone to the site was completed in January 1952, the trench was surrounded with a wooden fence and posted with 'Radiation Zone, Do Not Excavate' signs. Core drillings were made of this site during February 1971. There was a strong odor of hexone from each of the sample cores and the core holes, but no radioactivity was found. The site was released from radiation zone status in February 1971. It is assumed that the fence and radiation warning signs were removed at this time.

Borehole and data summaries are presented in Tables 1 through 3. Borehole locations are shown on Figure 1.

Table 1. Borehole Summary for the 216-S-14 Waste Site

Year	Well / Borehole ID	Location with Respect to Site	Depth (ft)
2008	699-33-74 / C4973	Outside – 100 ft east	350 (GPL) Not available (1 soil sample)

GPL = geophysical log
ID = identification

Site: 216-S-14	Area: S Plant	Category: Intermediate

Table 2. Geophysical Log Summary for the 216-S-14 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
C4973	0 – 5	–	pCi/g	–	16,527.5	cpm	5
	5 – 10	–	pCi/g	–	17,298.7	cpm	7
	10 – 15	–	pCi/g	–	16,355.8	cpm	15
	> 5	0.28	pCi/g	313	27,925.9	cpm	220

bgs = below ground surface
ID = identification

Table 3. Soil Maximum Detection Summary (Soil Borehole C4973)

Chemical	Sample Interval: 0 –15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth	Maximum Detected Concentration	Units	Sample Depth
Chromium	–	–	–	417,00	µg/kg	–
U-233/234	–	–	–	0.16	pCi/g	–
U-238	–	–	–	0.15	pCi/g	–
Vanadium	–	–	–	50,400	µg/kg	–

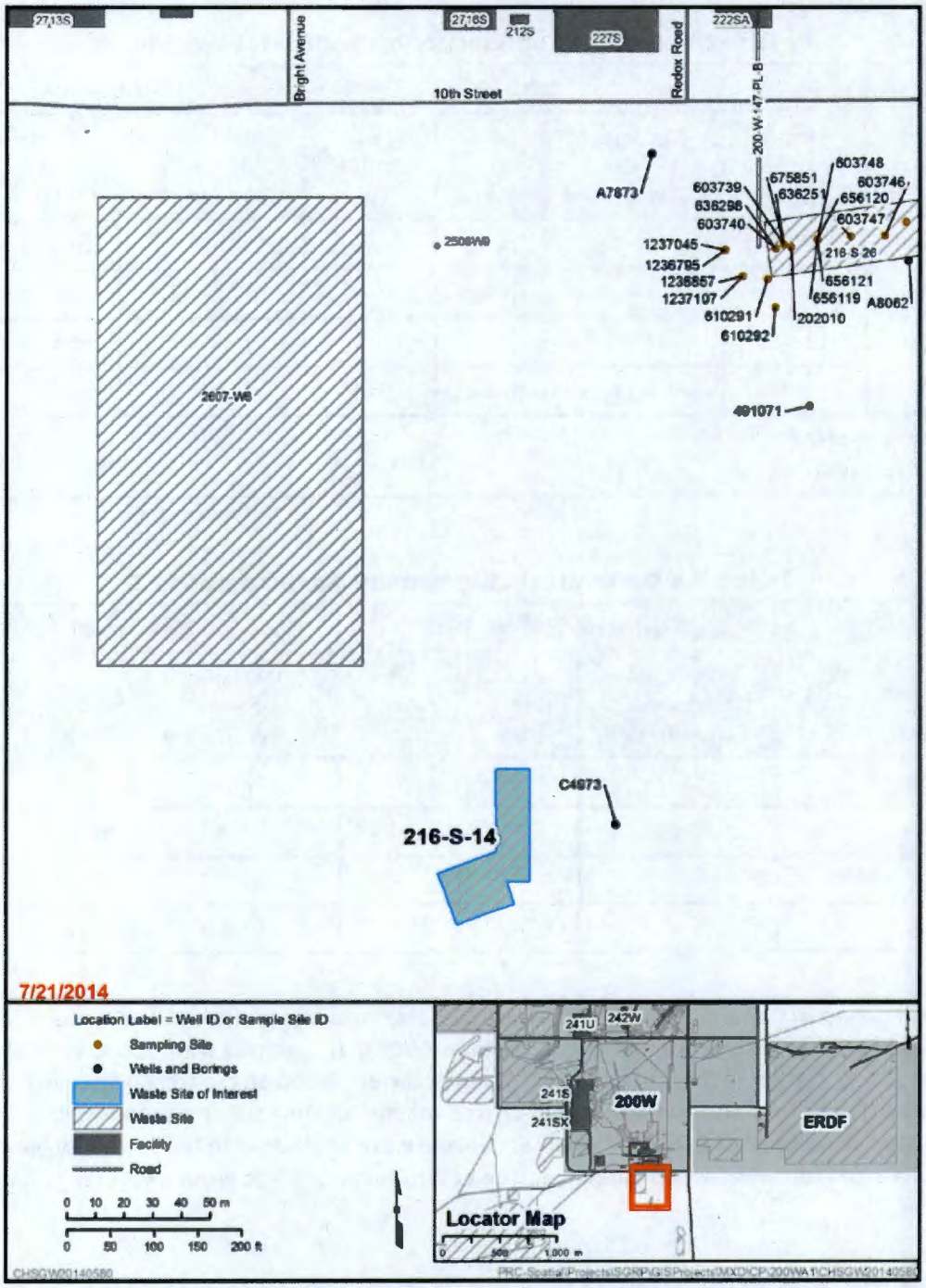
Nature and Extent of Contamination: No data are available to evaluate shallow or intermediate depth soil contamination by hexone (methyl isobutyl ketone [MIBK]). No samples were collected inside the trench. It is likely that some degradation of MIBK has occurred. Based on the trench discharge depth of 0.9 m (3 ft) below ground surface (bgs) and discharge volume, shallow soil and deeper soil could be contaminated. An estimated 0.05 pore volumes of liquid were discharged to the trench, suggesting a low potential for groundwater contamination. The approximate depth to groundwater is 74.4 m (244 ft) bgs.

References:

BHI-11076, 1995, *S Plant Aggregate Area Management Study Technical Baseline Report*, Rev. 0, Bechtel Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D198038143.

Waste Information Data System General Summary Report for the 216-S-14 Waste Site.

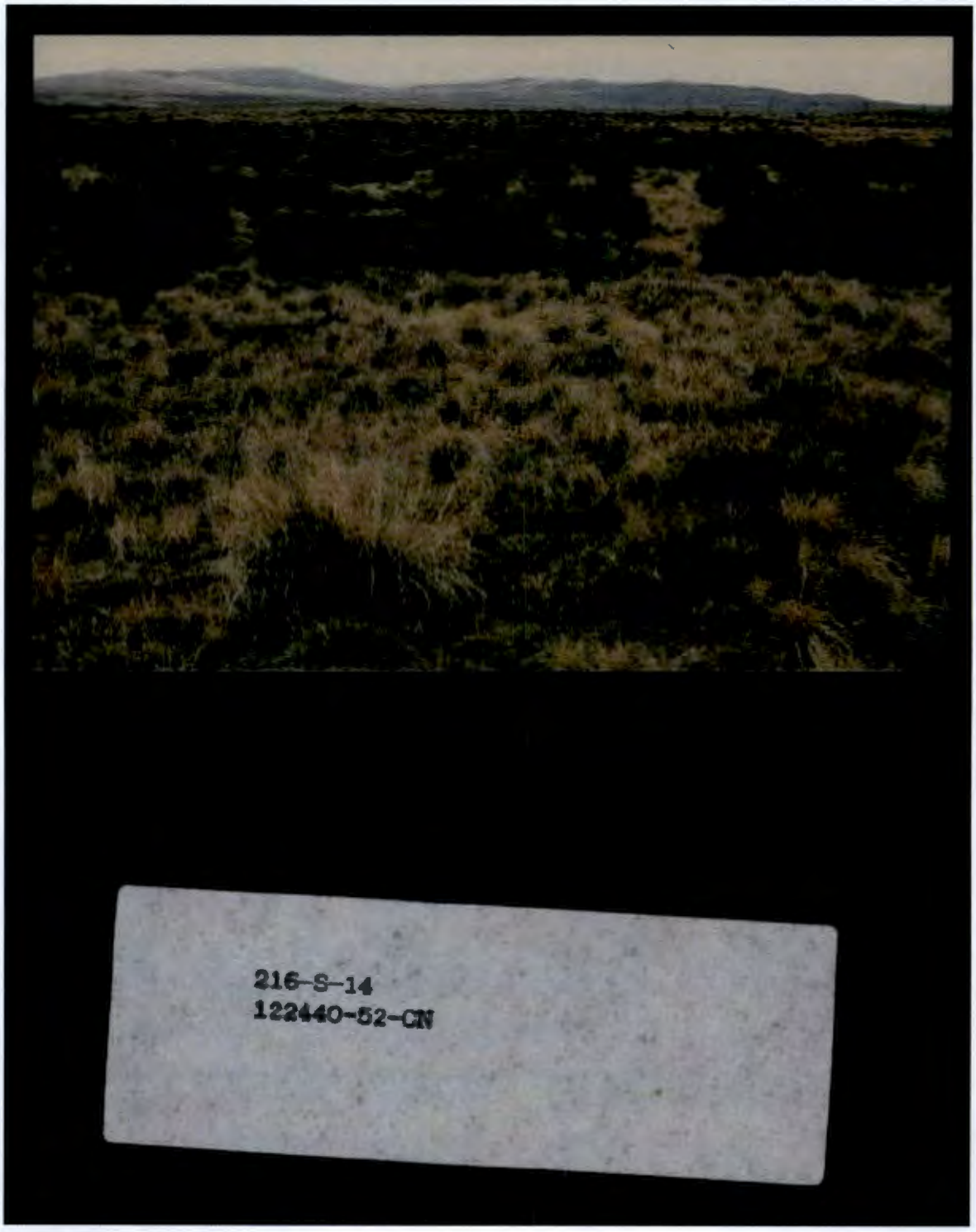
Site: 216-S-14	Area: S Plant	Category: Intermediate



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 216-S-14 Site Map

Site: 216-S-14	Area: S Plant	Category: Intermediate



Note: Produced from best available copy.

Figure 2. 216-S-14 Waste Site Photograph

Site: 216-S-14	Area: S Plant	Category: Intermediate

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Site: 216-S-18	Area: S Plant	Category: Intermediate

Site Description

Alternate Site Identification:	241-SX Steam Cleaning Pit, 216-S-14 Steam Cleaning Pit
Site Type:	Trench
Facility/Geographic Area:	S Plant Area (S/U Farm Area)
Current Operable Unit (OU) Assignment:	200-WA-1
Former OU Assignment:	200-MW-1, 200-MG-2
Service Dates:	1954 to an unspecified date

Waste Site Location and Physical Description: The 216-S-18 waste site consists of one backfilled trench and is located east of the 241-S Tank Farms and southwest of the 216-S-9 Crib. The trench runs in an east-west direction, adjacent to the north side of 13th Street (Figure 1). This site was first used in October 1954 as a steam-cleaning pit for contaminated vehicles. After October 1954, the site was used to consolidate contaminated soil from the surrounding area.

This site has been mapped at three different locations:

- Location 1, shown on H-2-44511 , Sheet 37, *Area Map 200 West S Plant Facilities* (Figure 1), is an east-west trending trench adjacent to the north side of 13th Street, south of a raw water line and steam line.
- Location 2, shown in HW-55176, Part III, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites* (Figure 2) and on H-2-32535, *REDOX Plant Liquid Waste Disposal Sites 216-S Series*, is further north of 13th Street and is orientated in a northwest-southeast direction, parallel to and west of the 216-S-9 Crib.
- Location 3 corresponds to an approximately 1.8 m (6-ft) deep depression (Figures 3 and 4), just north of the steam line running parallel to 13th Street, that was filled with contaminated soil scraped from an adjacent unplanned release site UN-216-W-24 (UPR-200-W-114) as reported in BHI-01048, *UN-216-W-4 and 216-S-18 Interim Stabilization Final Report*.

According to the Waste Information Data System (WIDS), it was determined that Location 1 is the correct 216-S-18 location, and Location 2 is believed to be incorrect. WIDS notes that the location mapped in ArcView®[1] (Geographic Information System) was changed to add Location 2. However, the ArcView mapping shown in Figure 5 corresponds to Locations 3, not location 1.

While there is uncertainty in the correct location of the original steam cleaning pit, Location 3 corresponds to a surface depression north of the former raw water line and steam line located along the north side of 13th Street (Figures 3 and 4) and is well documented with land survey information. The interim stabilization report for UN-216-W-24 and UN-216-W-30 (BHI-00257, *UN-216-W-24 and UN-216-W-30 Interim Stabilization Final Report*) shows pre-stabilization and post-stabilization land survey of the depression, believed at the time to be 216-S-18 Trench. The steam line north of 13th Street was between 1.2 – 1.8 m (4 – 6 ft) above grade, which would have limited vehicular access to that location from 13th

[1] ArcView is a registered trademark of AccuData, Inc.

Site: 216-S-18	Area: S Plant	Category: Intermediate

Street. While it is unclear whether the depression that was filled in was the former steam pit location, it is certain that contamination existed in the Location 3 depression, and that the depression was used to consolidate contaminated soil from UPR-200-W-114.

All three locations will be investigated, due to the uncertainty in the original location of the 216-S-18 Trench.

Waste Site Coordinates:
E-567066.91420 N-134409.76140

Site Dimensions:
Site Length: 38 m (125 ft)
Site Width: 4.6 m (15 ft)
Site Area: 174.8 m^2 (1,882 ft^2)
Site Depth: 2.0 m (6 ft)
Cover Thickness: 0.3 – 0.6 m (1 – 2 ft)

Related Site Structure(s): The 216-S-18 waste site is associated with the 241-S Tank Farms, UPR-200-W-165 and UPR-200-W-114.

Site Posting: The 216-S-18 waste site was posted with lightweight chain and Underground Radioactive Material Area (URMA) signs following interim surface stabilization work.

Site History

Release Summary: The 218-2-18 Trench received an unspecified volume of steam condensate during its use as a vehicle decontamination pit in October 1954. BHI-00176, *S Plant Aggregate Area Management Study Technical Baseline Report*, indicates that chlorinated solvents may have been used in the decontamination process.

Contamination specks were discovered in the depression north of the steam line during stabilization work for UPR-200-W-165 and UPR-200-W-114 in 1993, as documented in BHI-00257. An unsuccessful attempt was made to decontaminate this depression during the stabilization effort between 1993 and 1995. In 1997, contaminated soil from UPR-200-W-114 was deposited into the depression as documented in BHI-01048.

While the volume of water and amount of soil deposited in the trench is not specified, the trench received an estimated 98,400 L (25,995 gal) of mixed water and soil during its lifetime.

Volume Discharged: 9.8E+04 L (2.6E+04 gal)

Pore Volume Discharged: 9.8E+04 L/ (224 ft x 1,882 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.03

Site: 216-S-18	Area: S Plant	Category: Intermediate

Waste Inventory: Table 1 presents the waste inventory for the 216-S-18 Crib.

Table 1. Waste Inventory Radionuclide Content

Contaminant	Mass Discharged
Pu	<0.1 g
Beta	<0.7 Ci
Sr-90	<0.1 Ci
Ru-160	<0.1 Ci
Cs-137	<0.1 Ci
Co-60	<0.1 Ci
U (kg)	<0.045 kg
U (g)	None

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: Radioactive items were discovered during the excavation of the 216-S-18 Trench in October 1972. The contaminated objects were removed and deposited in the 200 West Dry Waste Burial Ground. After removal, the trench was backfilled, and released from radiation zone status. The location from which these materials were removed from is not clear.

In 1995, contamination specks were discovered in the depression believed to be the 216-S-18 Trench during stabilization work for UPR-200-W-165 and UPR-200-W-114, and the 216-S-18 waste site was reposted as a radiation area. The contamination source was assumed to be speck contamination from 241-S Tank Farm operations. An attempt was made to decontaminate this approximately 1.8 m (6-ft) deep depression by scraping approximately 0.2 m (8 in.) of contaminated soil during that stabilization effort, but decontamination was not successful since contamination was found another 0.3 m (1 ft) deeper.

In 1997, a small area of contaminated soil from UPR-200-W-114 was pushed into the 216-S-18 Trench depression (BHI-01048). This contaminated soil could not be removed from UPR-200-W-114 in the 1993 to 1995 stabilization efforts because it was located beneath an active steam line that was later removed. After the deposition of contaminated soils, the trench was covered with 1.8 meters (6 ft) of clean soil and reposted as an URMA.

Nature and Extent of Contamination: No data are available to evaluate shallow or intermediate depth soil contamination at the 216-S-18 Trench. Based on the trench depth (1.8 m [6 ft]), disposal history, and

Site: 216-S-18	Area: S Plant	Category: Intermediate

discharge volume, shallow soil, and deeper soil could be contaminated. An estimated 0.03 pore volumes of liquid were discharged to the trench, suggesting a low potential for groundwater contamination. The approximate depth to groundwater is 70.1 m (230 ft) below ground surface (bgs).

References:

BHI-00176, 1995, *S Plant Aggregate Area Management Study Technical Baseline Report*, Rev. 00, Bechtel Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D198038143.

BHI-00257, 1995, *UN-216-W-24 and UN-216-W-30 Interim Stabilization Final Report*, Rev. 00, Bechtel Hanford, Inc., Richland, Washington.

BHI-01048, 1997, *UN-216-W-4 and 216-S-18 Interim Stabilization Final Report*, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

H-2-32535 (drawing), 1973, *REDOX Plant Liquid Waste Disposal Sites 216-S Series*, Rev. 1, U.S. Atomic Energy Commission, Hanford Atomic Products Operation, General Electric.

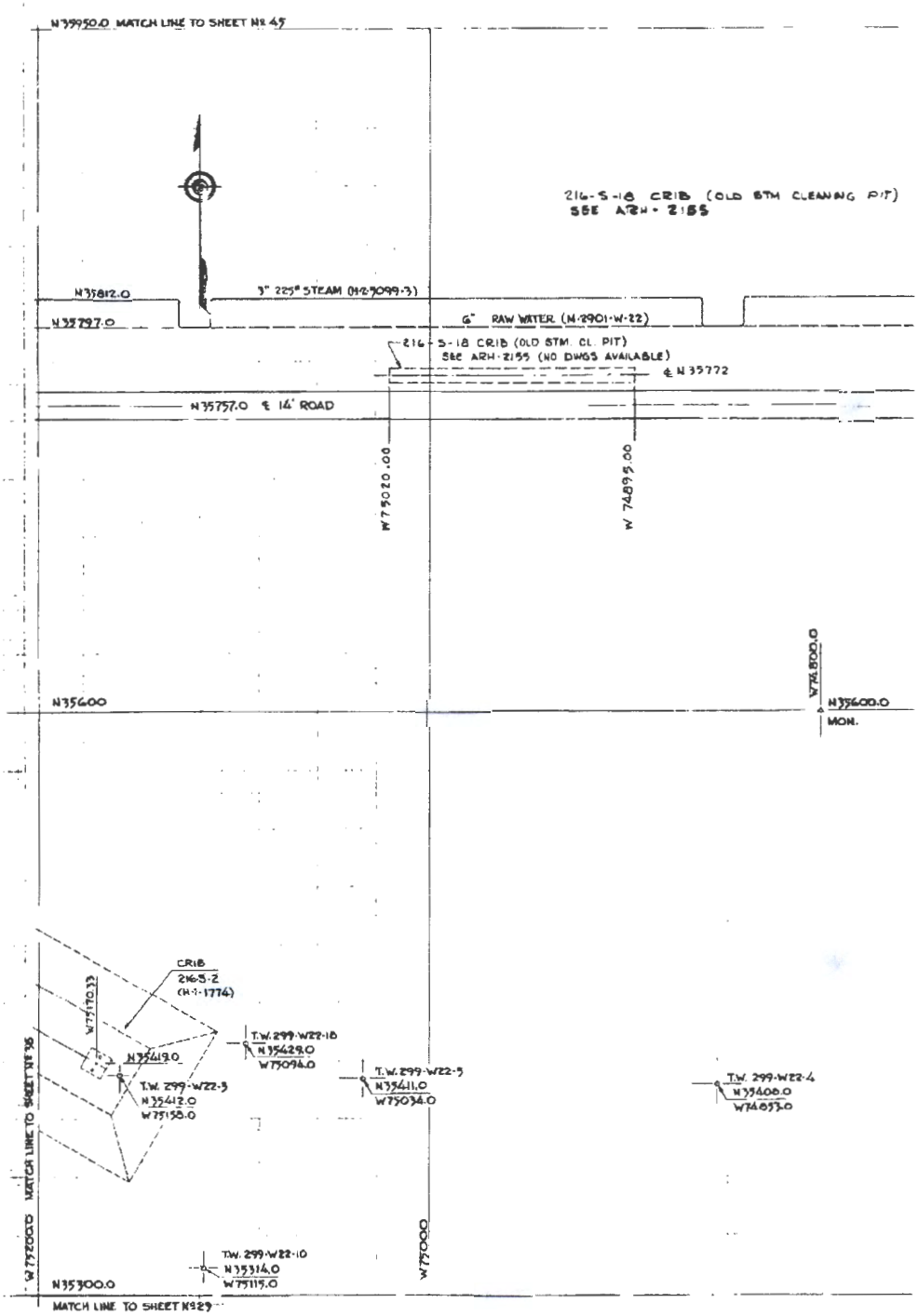
H-2-44511 (drawing), 1963, *Area Map 200 West S Plant Facilities*, Sheet 37 of 186, Rev. 2, Vitro Engineering Company, Richland, Washington.

HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part III, General Electric, Richland Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

WIDS General Summary Report for the 216-S-18 Waste Site.

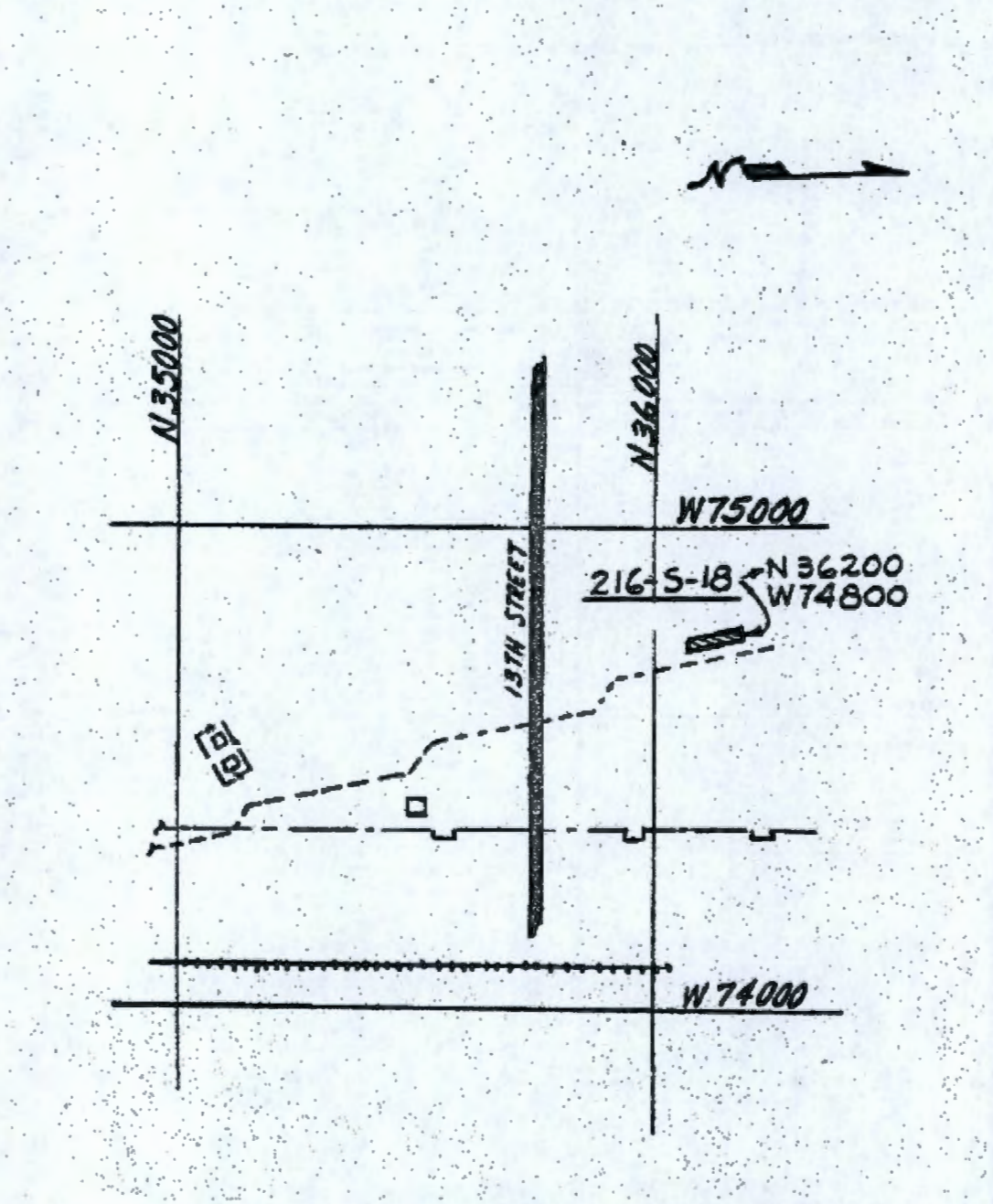
Site: 216-S-18	Area: S Plant	Category: Intermediate



Source: H-2-44511, *Area Map 200 West S Plant Facilities*, Sheet 37.

Figure 1. 216-S-18 Waste Site Location

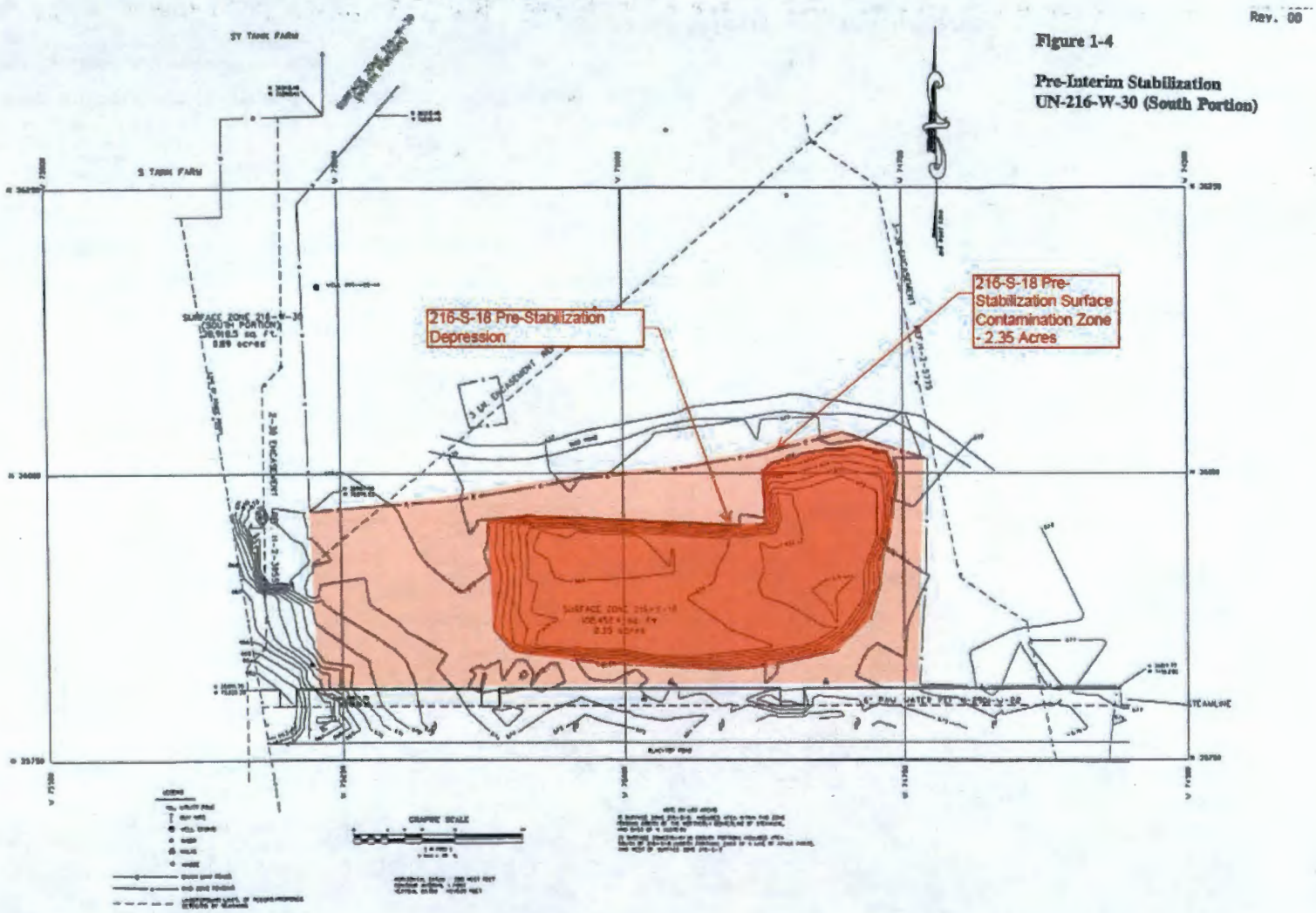
Site: 216-S-18	Area: S Plant	Category: Intermediate



Source: HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part III.

Figure 2. 216-S-18 Waste Site Location (determined to be incorrect)

Site: 216-S-18	Area: S Plant	Category: Intermediate

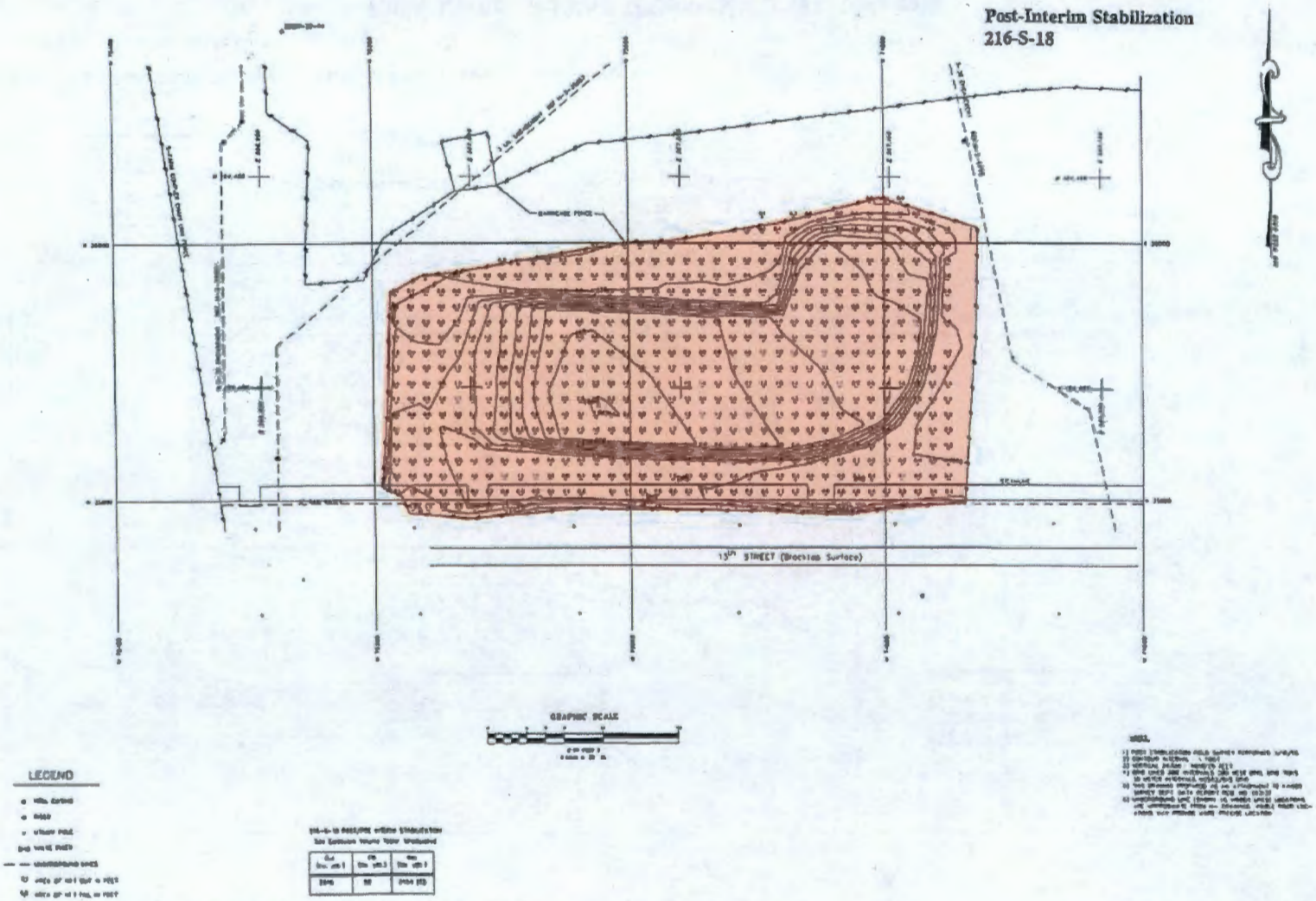


Source: BHI-00257, *UN-216-W-24 and UN-216-W-30 Interim Stabilization Final Report.*

Note: Produced from best available copy.

Figure 3. Suspected 216-S-18 Depression prior to Stabilization

Site: 216-S-18	Area: S Plant	Category: Intermediate

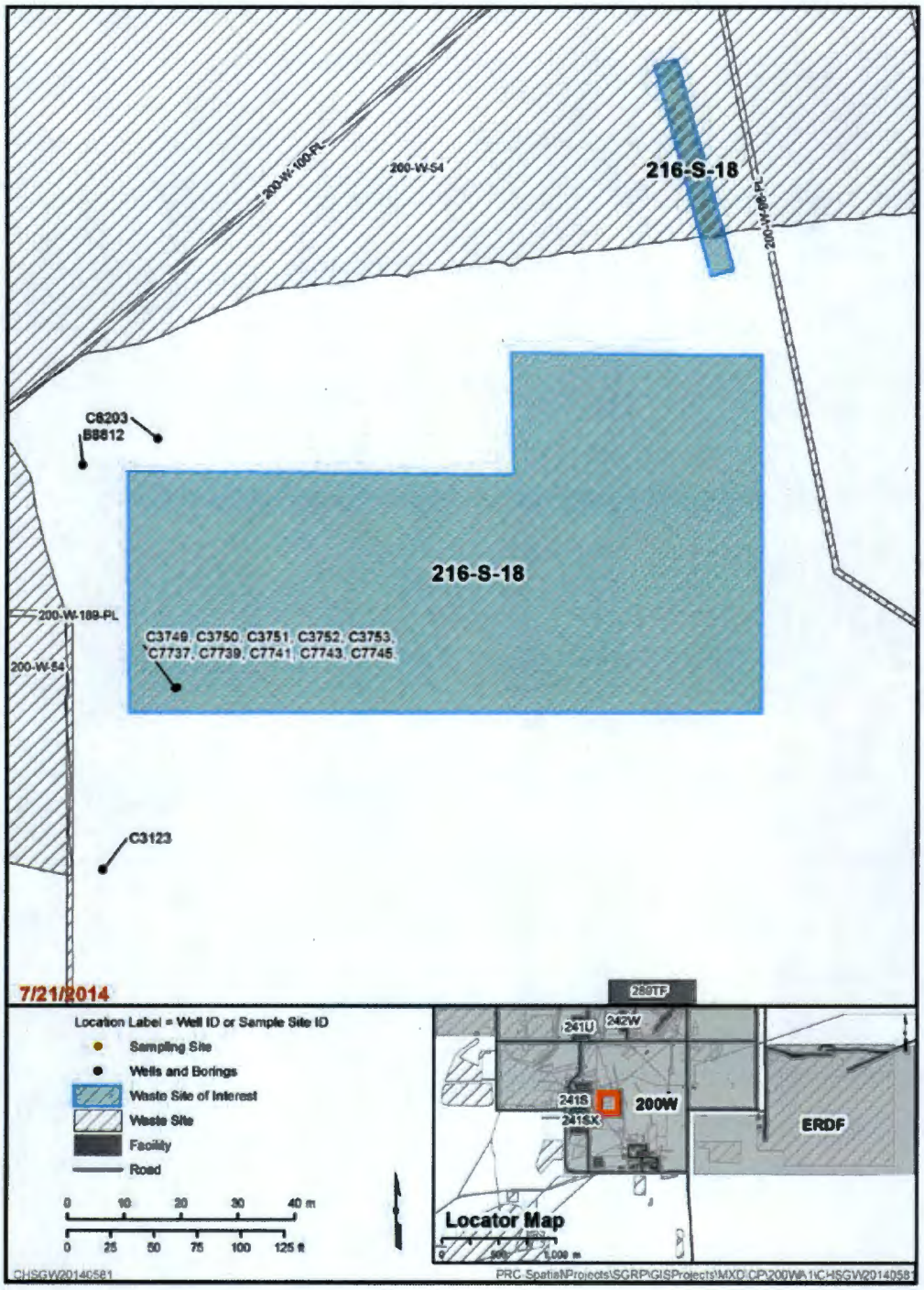


Source: BHI-00257, *UN-216-W-24 and UN-216-W-30 Interim Stabilization Final Report.*

Note: Produced from best available copy.

Figure 4. Suspected 216-S-18 Depression Post-Stabilization

Site: 216-S-18	Area: S Plant	Category: Intermediate



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 5. Waste Site 216-S-18 Location from (upper right location determined to be incorrect)

Site: 216-S-18	Area: S Plant	Category: Intermediate

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Site: 216-S-20	Area: S Plant	Category: Deep

Site Description

Alternate Site Identification: 216-SL-1&2 Crib, 216-SL-2
Site Type: Crib
Facility/Geographic Area: S Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-LW-2
Service Dates: 1952 to 1972

Waste Site Location and Physical Description: The 216-S-20 waste site is located southeast of the 202-S (Reduction-Oxidation) Facility, and is east of the 222-S Laboratory building (Figure 1). The waste site contains two wooden crib boxes and associated piping (Figures 2 and 3). An abandoned waste unloading station and manhole are located approximately 7.6 m (25 ft) south of the posted cribs (Figure 1).

The two wooden crib boxes both measure 3.7 by 3.7 m (12 by 12 ft) in area, and are 15 m (50 ft) apart, and 2.9 m (9.6 ft) deep. The bottom of each crib box was covered with 1.2 m (4 ft) of gravel, and both boxes had two risers each extending from the top of the box to aboveground. The crib boxes were connected in series with the first box overflowing into the second box via an overflow pipe. After the cribs were abandoned, they were backfilled with approximately 6.4 m (21 ft) of overburden to match the grade of the surrounding area. The dimensions posted below in the "Site Dimensions" section are for the posted surface area. This includes the area covered by both cribs.

Waste Site Coordinates:
Lon-567553.59374 Lat-133916.54687

Site Dimensions:
Site Length: 27.4 m (90.0 ft)
Site Width: 12.2 m (40.0 ft)
Site Area: 31 m^2 (334 ft^2)
Site Depth: 9.3 m (30.6 ft)
Cover Thickness: 6.4 m (21 ft) of overburden

Related Site Structure(s): The 216-S-20 Crib site is associated with the 222-S Building, 219-S Building, the 207-SL Retention Basin, and the "manhole" unloading station that received 300 Area Laboratory wastes via truck. The 200-W-149-PL pipeline is associated with this crib.

Site Posting: The site is posted with Underground Radioactive Material Area (URMA) signs at each corner. In addition, the abandoned waste unloading station adjacent to the Cribs is posted with Contaminated Area signs. Within this site's URMA, there are two areas above the crib structures that are marked with Post and Chain and Cave-In Potential signs. The Cave-In Potential signs were posted on July 22, 1998.

Site: 216-S-20	Area: S Plant	Category: Deep

Site History

Release Summary: The 216-S-20 Cribs were active from 1952 to 1972 and received an estimated 1.4E+08 L (3.6E+067 gal) of liquid waste during its operational lifetime. From January 1952 to July 1953, the cribs received miscellaneous waste from lab hoods and decontamination sinks in the 222-S Building via the 219-S Retention Building. From July 1953 to September 1963, the site received additional miscellaneous waste via the 207-SL Retention Basin, the 219-D Retention Building, and the 300 Area Laboratory via truck. The miscellaneous waste was deposited into the cribs via the manhole unloading structure. From September 1963 to January 1969, the site received miscellaneous waste from lab hoods and decontamination sinks in 222-S Building via the 219-S Retention Building. From January 1969 to November 1972, the 216-S-20 waste site was inactive due to surface subsidence on this unit, which is discussed further in the "Site Characterization Summary" section.

Volume Discharged: 1.4E+08 L (3.7E+07 gal) (see Figure 4 for details).

Pore Volume Discharged: 1.4E+08 L/ (211 ft x 3,600 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 22

Waste Inventory: Table 1 presents the waste inventory for the 216-S-20 crib.

Table 1. Waste Inventory Radionuclide Content

Contaminant	Mass Discharged
Pu	170 g
Beta	7,600 Ci
Sr-90	45 Ci
Ru-106	100 Ci
Cs-137	110 Ci
Co-60	1.4 Ci
U	38 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Site: 216-S-20	Area: S Plant	Category: Deep

Previous Site Characterization

Site Characterization Summary: The 216-S-20 waste site has a history of surface subsidence. During the past 15 years, sink holes at this site have been filled in on three different occasions with several cubic yards of fill dirt. As part of the ongoing stabilization effort and additional surface subsidence within the site, the cribs were brought offline from January 1969 to November 1972. The site was deactivated by closing the valve and removing the valve wheel on the discharge line that connected the 216-S-20 cribs to the 207-SL Retention Basin. During the deactivation period, effluents from within the 222-S Building were rerouted to the 202-S Building concentrators for boildown, while the 300 Area Laboratory waste was rerouted to the 216-T-28 Crib. In addition, the gang valve on the discharge line from the 219-S Building to this site was locked out. The steam supply line to the value was removed and all openings into this unit were closed by removing the vents and capping off all risers and filling sink holes within the zone to ground level. The work was completed December 13, 1974. It is unlikely any cavities remain below the ground surface.

Additional efforts to stabilize the 216-S-20 waste site include site characterization surveys. This includes the drilling of borehole C4176 into the crib in August 2004. On September 13, 2004, data collected during the drilling of borehole C4176 were submitted to the Hanford Information Environmental System database. Ongoing environmental monitoring for this site includes routine radiological surveys, visual inspections, and groundwater monitoring via borehole C4176. Sampling results from the 2004 drilling, or from more recent radiological surveys or inspections, are not included in the Waste Information Data System (WIDS) General Summary Report.

In 2003 and 2004, boreholes were installed inside and near the cribs. Geophysical surveys were completed at five locations and soil samples collected at one location at the west crib box. Borehole and data summaries for boreholes located are presented in Tables 2 through 5. Well and borehole locations are shown on Figure 1.

Table 2. Borehole Summary for the 216-S-20 Waste Site

Year	Borehole/Well ID	Location with respect to Site	Depth (ft)
2003	A7878 / 299-W22-74	Edge - north	2 – 169 (GPL)
2004	A7868 / 299-W22-61	Inside	1 – 151 (GPL)
2004	A7870 / 299-W22-63	Inside	2 – 149 (GPL)
2004	A7843 / 299-W22-20	Outside – 120 ft southeast	1 – 232 (GPL to 1 ft above groundwater)
2004	C4176	Inside	0 – 241 (GPL) 12.5 – 240.5 (10 soil samples)

ID = identification
GPL = geophysical log

Site: 216-S-20	Area: S Plant	Category: Deep

Table 3. Geophysical Log Summary for the 216-S-20 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A7868	0 to 5	0.56	pCi/g	5.0	9,910.74	cpm	5
	5 to 10	1.28	pCi/g	6.0	10,744	cpm	6
	10 to 15	–	pCi/g	–	10,358.8	cpm	15
	>15	153,157.3	pCi/g	30	779,166	cpm	37
A7870	0 to 5	0.17	pCi/g	3.0	8,397	cpm	5
	5 to 10	0.83	pCi/g	8.0	9,968.4	cpm	8
	10 to 15	–	pCi/g	–	9,700.56	cpm	15
	>15	74,004.5	pCi/g	32	3,176,030	cpm	35
C4176	0 to 5	131.4	pCi/g	1.0	173,870	cpm	1
	5 to 10	0.59	pCi/g	10.0	12,759.4	cpm	9
	10 to 15	0.57	pCi/g	14	13,968.1	cpm	15
	>15	85,486.1	pCi/g	31	–	cpm	–

bgs = below ground surface

Table 4. Soil Maximum Detection Summary (Soil Borehole C4176)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Am-241	–	–	–	5,800	pCi/g	32
Ammonium ion	–	–	–	2,870	µg/kg	50
Antimony	–	–	–	2,900	µg/kg	32
Aroclor-1254	–	–	–	170	µg/kg	32
Arsenic	6,700	µg/kg	15	9,160	µg/kg	99.5
Barium	11,200	µg/kg	15	136,000	µg/kg	35

Site: 216-S-20	Area: S Plant	Category: Deep

Table 4. Soil Maximum Detection Summary (Soil Borehole C4176)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Beryllium	–	–	–	2,700	µg/kg	35
Bismuth	–	–	–	202,000	µg/kg	32
C-14	–	–	–	35.6	pCi/g	32
Cs-137	–	–	–	95,600	pCi/g	32
Chloride	–	–	–	16,700	µg/kg	35
Chromium	–	–	–	259,000	µg/kg	32
Co-60	–	–	–	104	pCi/g	32
Copper	–	–	–	122,000	µg/kg	32
Di-n-butylphthalate	–	–	–	1,200	µg/kg	42.5
Eu-154	–	–	–	70.8	pCi/g	32
Eu-155	0.062	pCi/g	15	0.144	pCi/g	154
Hexavalent Chromium	–	–	–	1,280	µg/kg	35
Lead	–	–	–	489,000	µg/kg	32
Mercury	–	–	–	69,200	µg/kg	32
Nickel	10,400	µg/kg	15	55,000	µg/kg	32
Ni-63	–	–	–	4,580	pCi/g	32
Nitrate	–	–	–	8,500	µg/kg	35
Nitrogen in nitrite and nitrate	2,800	µg/kg	15	3,400	µg/kg	35
Pu-238	–	–	–	2.6	pCi/g	35
Pu-239/240	–	–	–	78	pCi/g	35
K-40	9.06	pCi/g	15	13.8	pCi/g	154
Ra-226	0.358	pCi/g	15	0.594	pCi/g	42.5
Ra-228	0.624	pCi/g	15	0.687	pCi/g	42.5
Silver	–	–	–	6,000	µg/kg	32
Sulfate	–	–	–	4,850	µg/kg	35

Site: 216-S-20	Area: S Plant	Category: Deep

Table 4. Soil Maximum Detection Summary (Soil Borehole C4176)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Tc-99	–	–	–	9.18	pCi/g	32
Th-228	0.64	pCi/g	15	15.9	pCi/g	32
Th-230	0.319	pCi/g	15	1.03	pCi/g	99.5
Th-232	0.958	pCi/g	15	1.41	pCi/g	35
Total beta radiostrontium	–	–	–	96,300	pCi/g	32
Tritium	–	–	–	63.1	pCi/g	32
Uranium	–	–	–	818,000	µg/kg	35
U-233/234	0.19	pCi/g	15	250	pCi/g	35
U-235	0.02	pCi/g	15	26.4	pCi/g	35
U-238	0.22	pCi/g	15	270	pCi/g	35

Table 5. Results Summary for Shallow and Deep Soil for the 216-S-20 Waste Site

Interval	Method	Borehole ID	Depth (ft)	Contaminant	Max Concentration
0 – 15 ft	Soil Borehole	C4176	12.5 – 15	Rad, Inorganics	Low levels
	GPL (SGLS)	C4176	1	Cs-137	131 pCi/g
	GPL (SGLS)	A7868	4 – 7	Cs-137	1.3 pCi/g
	GPL (SGLS)	A7870	3 – 9	Cs-137	0.84 pCi/g
	GPL (SGLS)	A7878	4 – 8	Cs-137	0.23 pCi/g
	GPL (SGLS)	A7843	2	Cs-137	0.4 pCi/g

Site: 216-S-20	Area: S Plant	Category: Deep

Table 5. Results Summary for Shallow and Deep Soil for the 216-S-20 Waste Site

Interval	Method	Borehole ID	Depth (ft)	Contaminant	Max Concentration
>15 ft	Soil Borehole	C4176	29.5 -50	Am-241	5,800 pCi/g
				Cs-137	95,600 pCi/g
				Co-60	104 pCi/g
				Eu-154	70.8 pCi/g
				Ni-63	4,580 pCi/g
				Pu-238	2.6 pCi/g
				Pu-239/240	78 pCi/g
				Tc-99	9.18 pCi/g
				Th-228	15.9 pCi/g
				H-3	63.1 pCi/g
				U-233/234	250 pCi/g
				U-235	26.4 pCi/g
				U-238	270 pCi/g
			50 – 238	Rads	Low Levels
	GPL (SGLS)	C4176	19 - 55	Cs-137	85,000 pCi/g
				Co-60	1.4 pCi/g
				U-238	201 pCi/g
	GPL (SGLS)	A7868	18 - 42	Cs-137	153,000 pCi/g
				Co-60	5.4 pCi/g
				U-235	24 pCi/g
				U-238	410 pCi/g
	GPL (SGLS)	A7870	23 – 37	Cs-137	74,000 pCi/g
			35 –63	Co-60	2.4 pCi/g
				U-235	17 pCi/g
				U-238	330 pCi/g
	GPL (SGLS)	A7878	19 – 28	Cs-137	0.2 pCi/g
			29 – 39	Co-60	0.48 pCi/g
			69 – 131	Cs-137	0.32 pCi/g

GPL = geophysical log
ID = identification
SGLS = spectral gamma

Site: 216-S-20	Area: S Plant	Category: Deep

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): After the cribs were abandoned, they were backfilled with approximately 6.4 m (21 ft) of overburden to match the grade of the surrounding area. The geophysical log (GPL) shows elevated Cs-137 (131 pCi/g) and total gamma (173,870 cpm) in soil from 0.3 m (1 ft) bgs collected from borehole C4176 (Table 3). GPL results for other locations and depths between 0 – 4.6 m (0 – 15 ft) bgs are low or nondetect. Soil data are available for one shallow sample collected from borehole C4176 (3.8 – 4.6 m [12.5 – 15 ft] bgs at C4176). Several radionuclides were detected at low levels (Table 4).

Deep (>4.6 m [>15 ft] bgs): Existing GPL and analytical data indicate that the maximum contamination levels occur between about 5.8 – 11.6 m (19 and 38 ft) bgs. GPL and soil results show radionuclide detections in deeper samples (15.2 – 73.5 m [50 to 241 ft] bgs), but levels are generally low (below background or screening level values). Cesium-137 (Cs-137) (maximum 0.2 pCi/g) and cobalt-60 (Co-60) (maximum 0.5 pCi/g at 11.6 m [38 ft] bgs) were the only manmade radionuclides detected by GPL at borehole A7878, indicating the lateral extent of contamination has been defined to the north. Cesium-137 (maximum 0.4 pCi/g at 0.6 m [2 ft] bgs) was the only manmade radionuclide detected in the borehole installed 36.6 m (120 ft) southeast of the crib to groundwater. The depth to groundwater is approximately 73.4 (242 ft) bgs.

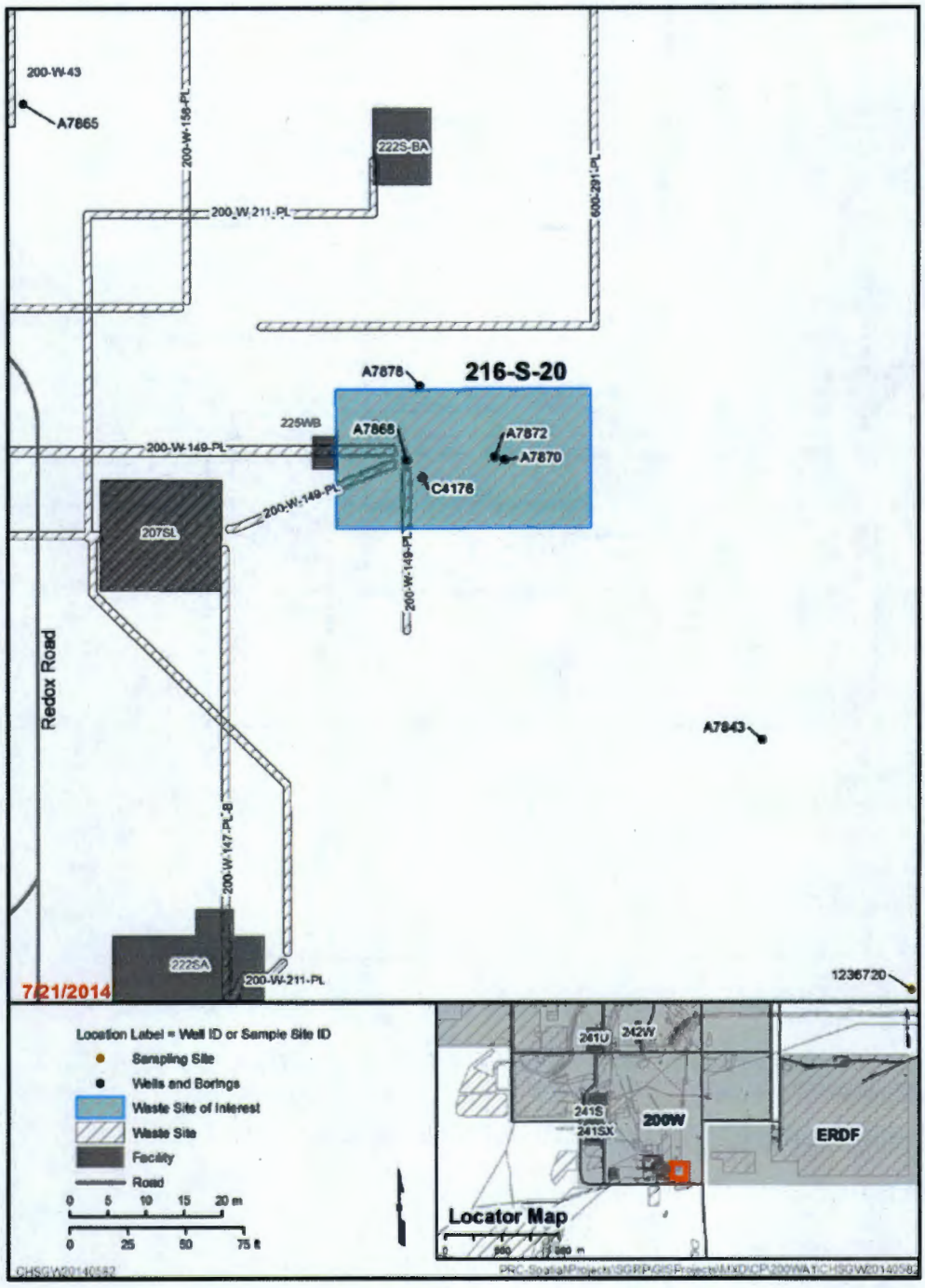
References:

H-2-5229 (drawing), 1973, *216-S-20 Aqueous Waste Disposal Facilities Waste Crib Structure & Details*, Sheet 1, Rev. 6, General Electric Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

WIDS General Summary Report for the 216-S-20 Waste Site.

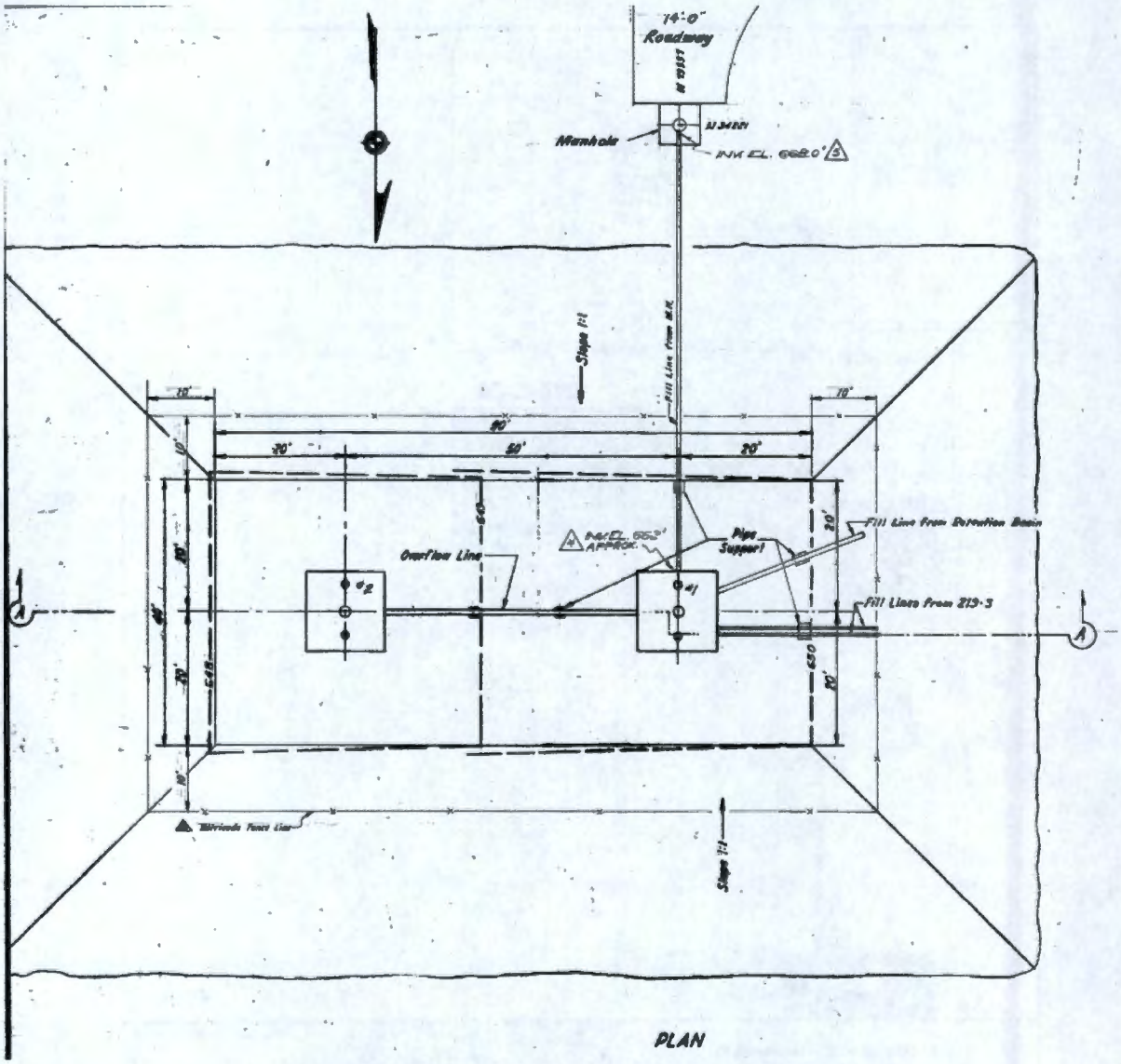
Site: 216-S-20	Area: S Plant	Category: Deep



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 216-S-20 Waste Site Map

Site: 216-S-20	Area: S Plant	Category: Deep

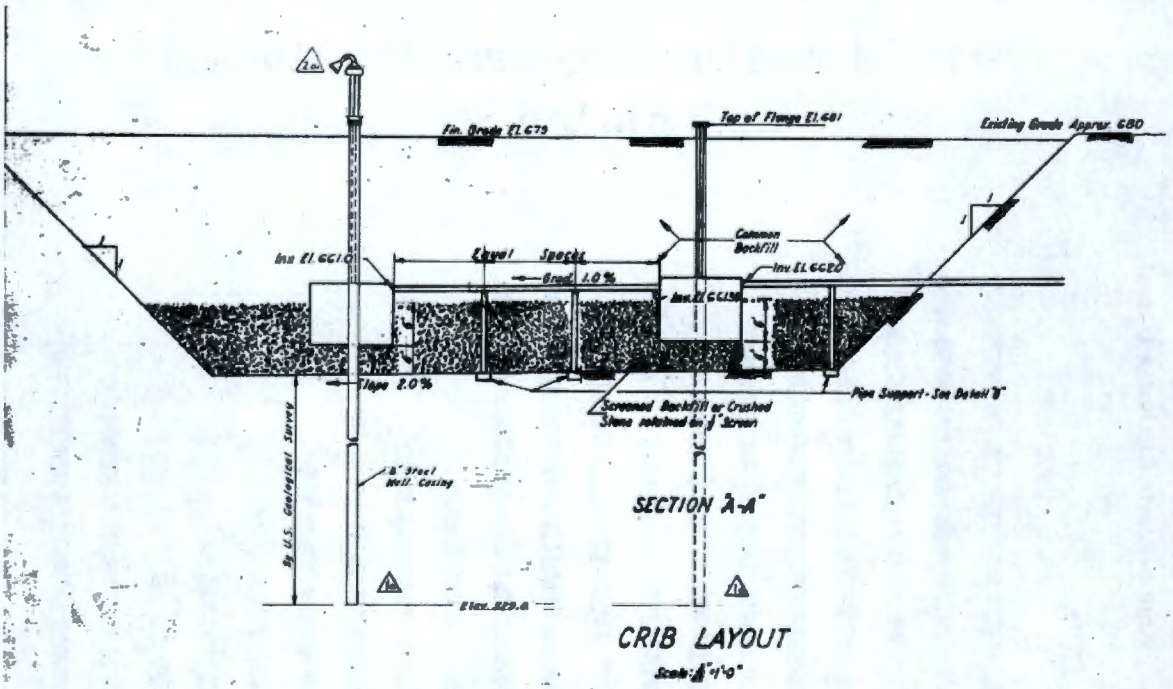


Source: H-2-5229*216-S-20 Aqueous Waste Disposal Facilities Waste Crib Structure & Details,* Sheet 1.

Note: Produced from best available copy.

Figure 2. 216-S-20 Crib Plan View

Site: 216-S-20	Area: S Plant	Category: Deep



Source: H-2-5229, *216-S-20 Aqueous Waste Disposal Facilities Waste Crib Structure & Details,* Sheet 1.

Note: Produced from best available copy.

Figure 3. 216-S-20 Crib Cross Section

Site: 216-S-20	Area: S Plant	Category: Deep

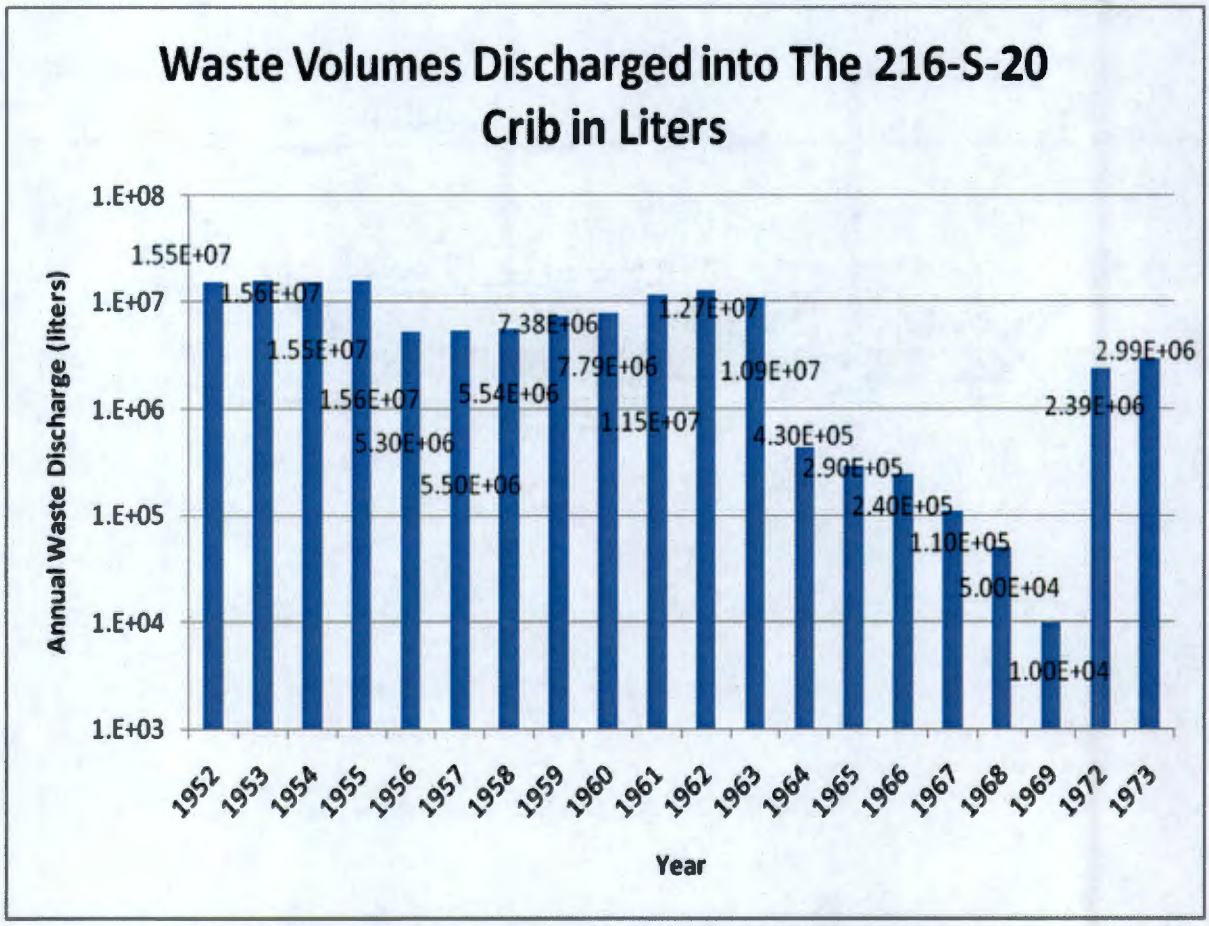


Figure 4. Waste Volumes Discharged into the 216-S-20 Crib in Liters per Year

Site: 216-S-22	Area: S Plant	Category: Intermediate

Site Description

Alternate Site Identification: 216-S-22 Crib
Site Type: Crib
Facility/Geographic Area: S Plant Area
Current Operable Unit (OU) Assignment 200-WA-1
Former OU Assignment: 200-MG-1
Service Dates: October 1957 to June 1967

Waste Site Location and Physical Description: The 216-S-22 waste site consists of a crib and associated piping, located east of the 202-S Building and northeast of the 216-S-20 Crib (Figure 1). The 216-S-22 Crib is a gravel structure with a 1:1.5 side slope. A pipe enters the unit below grade and branches out at right angles downward, to the bottom of the structure. The pipe runs along the bottom of the crib for its entire length. The section of pipe along the crib bottom has open joint. The rest of the structure is filled with backfill. Cross-section and plan view are shown in Figures 2 and 3, respectively.

Waste Site Coordinates:
Lon-567608.42190 Lat-133989.03262

Site Dimensions:
Site Length: 30.5 m (100.0 ft) Site Depth: 3.0 m (9.8 ft)
Site Width: 1.1 m (3.6 ft) (at crib base) Cover Thickness: Not specified
Site Area: 34 m^2 (360 ft^2)

Related Site Structure(s): The 216-S-22 Crib is associated with the 293-S Building. The pipeline associated with this crib is labeled as 200-W-146-PL under the Waste Information Data System (WIDS) site code.

Site Posting: The 216-S-22 Crib is marked and posted with Underground Radioactive Material Area signs.

Site History

Release Summary: The 216-S-22 Crib operated from October 1957 to June 1967. The crib was used for the disposal of liquid waste from the acid recovery facility located in the 293-S Building. Both nitrate and sodium were deposited into the crib. Approximately 98,400 L (25,994 gal) of liquid process effluent was deposited into the crib. The site was retired when production operations were terminated at the Reduction-Oxidation Facility.

Volume/Mass Discharged: 98,400 L (25,994 gal) of process effluent

Pore Volume Discharged: 98,400 L/ (232 ft x 360 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.14

Waste Inventory: Table 1 presents the waste inventory for the 216-S-22 waste site.

Site: 216-S-22	Area: S Plant	Category: Intermediate

Table 1. Waste Inventory Radionuclide Content* for the 216-S-22 Waste Site

Contaminant	Mass Discharged
Pu	<0.10 g
Beta	15 Ci
Sr-90	1 Ci
Ru-106	5 Ci
Cs-137	1 Ci
Co-60	<0.1 Ci
U	<0.045 kg

Source: RHO-CD-673 *Handbook 200 Areas Waste Sites*, Volume II.

*Radionuclide inventory data were not reported until 1967 and values were back calculated for 1957 – 1959. The bulk of the waste was discharged to the crib from 1957 – 1959 but discharges through 1966 are essentially undocumented. The contaminant inventories for the 216-S-22 waste site are estimated values from the Soil Inventory Model. These values have been decayed through 2001.

Previous Site Characterization

Site Characterization Summary: The piping in the 293-S Building was blanked in 1967. In July 2000, the vent risers were sealed as a preventive measure for potential passive radioactive emissions.

The groundwater at the site is monitored by well 299-W22-19, located approximately 15.2 m (50 ft) southeast of the crib. Groundwater well 299-W22-19, associated with the 216-S-22 Crib, had detections above drinking water standards for nitrate, Cs-137, Sr-90, and uranium between 1957 and 1974. Nitrate concentrations were 16,000 µg/L upon first measurement in 1957, were as high as 5.7 million µg/L in 1971, and were last measured at 4.4 million µg/L in 1974. Cesium-137 concentrations ranged from 7 pCi/L to 1,000 pCi/L. Strontium-90 concentrations ranged from 2.6 pCi/L to 200 pCi/L. Uranium concentrations ranged from 2.24 µg/L to 49.3 µg/L.

The scintillation probe profiles from well 299-W22-19 (A4965) for >0 – 91.4 m (0 to 300 ft) below ground surface (bgs) show background levels of radiation. In addition, visual and surface radiological surveys occur annually. The results of these surveys are not provided in WIDS.
No soil or geophysical log data are available from within the crib.

Nature and Extent of Contamination: No data are available to evaluate for the presence or absence of shallow or intermediate depth soil contamination. Based on existing information, the shallow and

Site: 216-S-22	Area: S Plant	Category: Intermediate

intermediate depth soil could be contaminated by former discharge of waste containing radionuclides, nitrates, and sodium. Shallow soil could be contaminated by direct discharge of waste at 3 m (9.8 ft) bgs in the shallow zone. An estimated 0.14 pore volumes of liquid were discharged to the crib, suggesting a low potential for groundwater contamination. The approximate depth to groundwater is 73.8 m (242 ft) bgs.

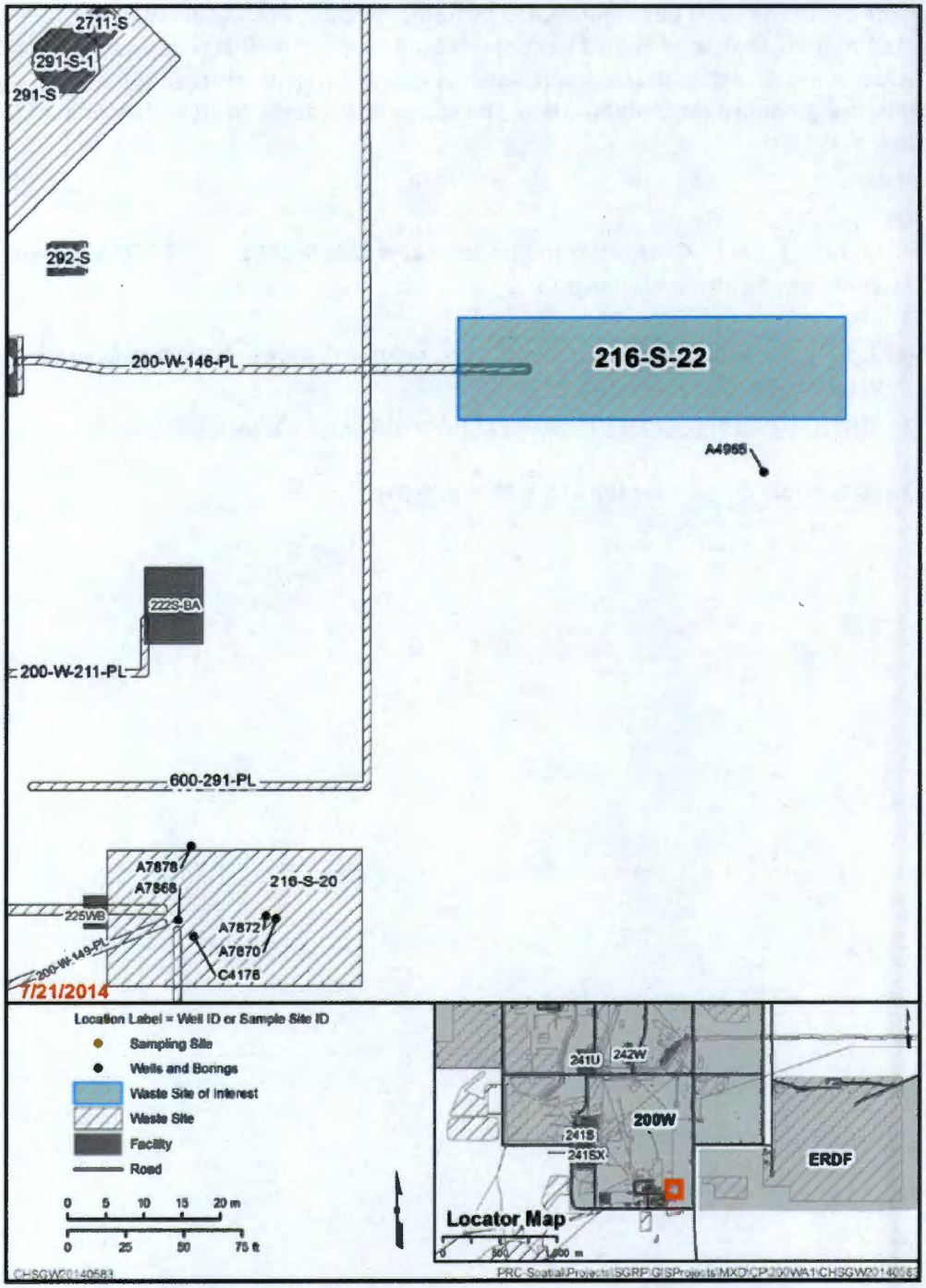
References:

H-2-31047 (drawing), 1964, *Waste Drain and Underground Crib*, Sheet 1, Rev. 2, General Electric Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

WIDS General Summary Report for the 216-S-22 Waste Site.

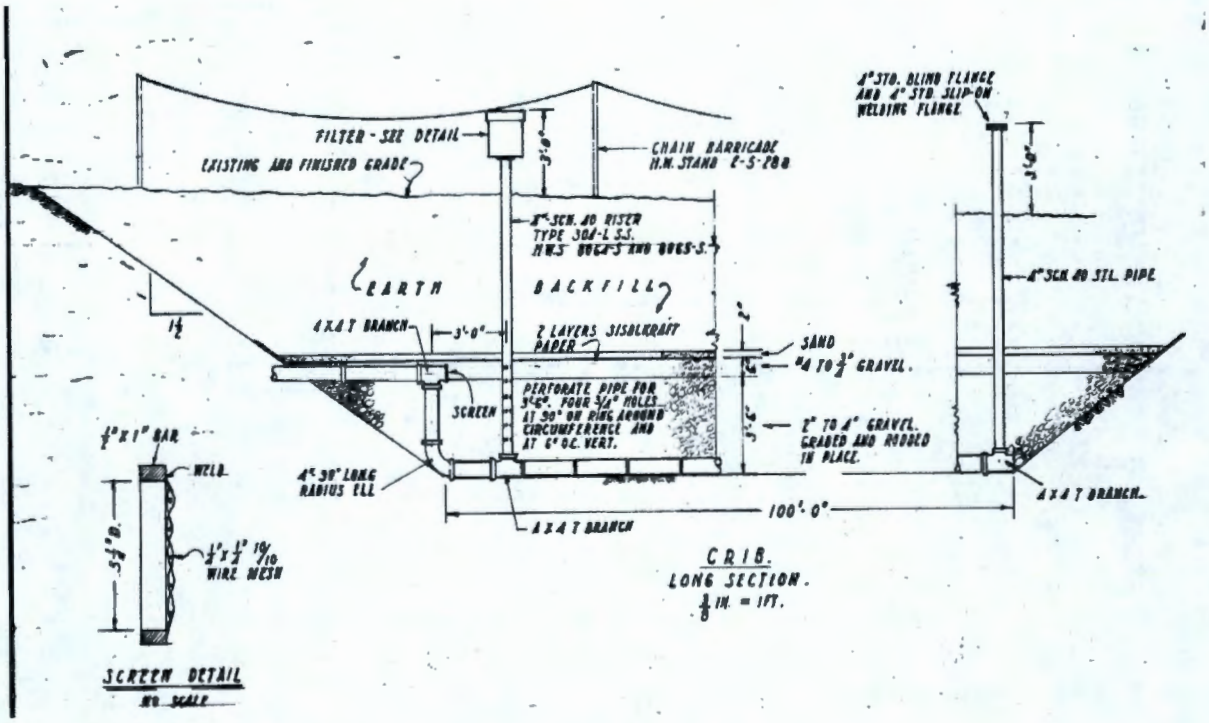
Site: 216-S-22	Area: S Plant	Category: Intermediate



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 216-S-22 Waste Site Map

Site: 216-S-22	Area: S Plant	Category: Intermediate

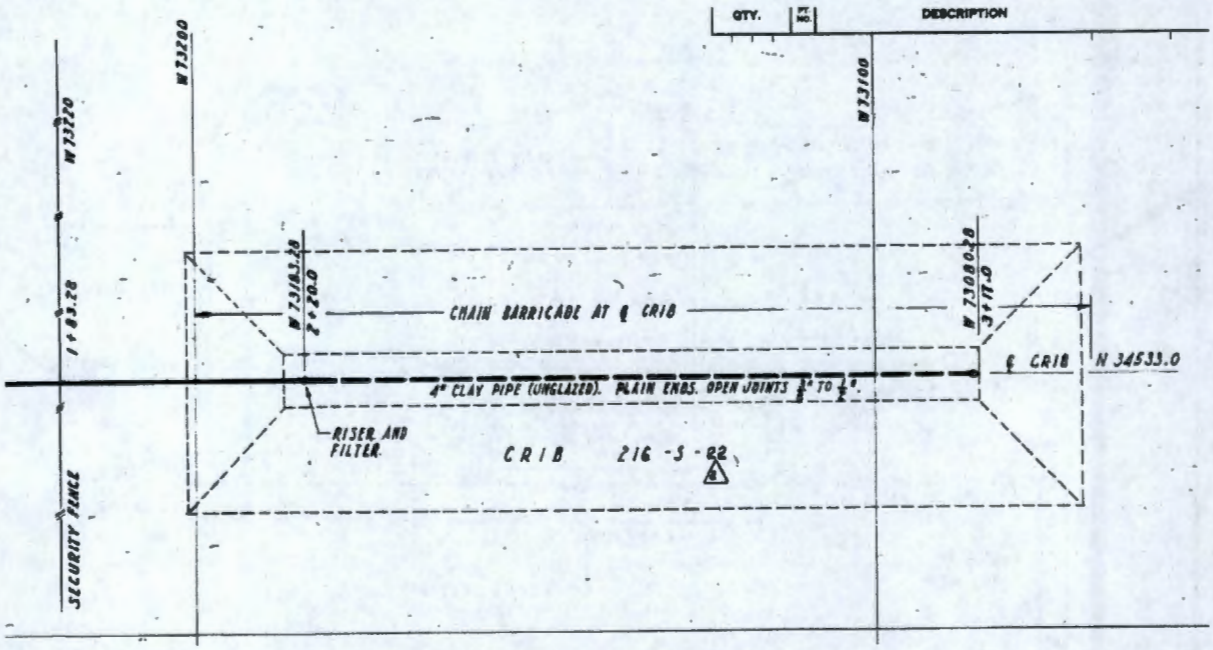


Source: H-2-31047, *Waste Drain and Underground Crib*, Sheet 1.

Note: Produced from best available copy.

Figure 2. 216-S-22 Crib Cross-Section

Site: 216-S-22	Area: S Plant	Category: Intermediate



Source: H-2-31047 *Waste Drain and Underground Crib*, Sheet 1.

Note: Produced from best available copy.

Figure 3. 216-S-22 Crib Plan View

Site: 216-S-23	Area: S Plant	Category: Deep

Site Description

Alternate Site Identification: 216-S-23 Crib
Site Type: Crib
Facility/Geographic Area: S Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-PW-4
Service Dates: January 1969 to January 1972

Waste Site Location and Physical Description: The 216-S-23 waste site consists of a crib and associated piping, located northeast of the 241-SY Tank Farm and north of the 216-S-9 Crib (Figure 1). The 200-W-141-PL pipeline, which feeds into the 216-S-23 Crib, was tied into the 216-S-9 pipeline; pipeline 200-W-141-PL. The crib was constructed to replace the 216-S-9 Crib. The 216-S-23 Crib is a gravel and fill structure with a 1:1 side slope. A pipe enters the unit below grade and runs the length of the crib within a gravel layer. The rest of the crib contains backfill. The pipe runs along the bottom of the crib for its entire length. The section of pipe along the crib bottom has open joint. Cross sections and plan views are shown in Figures 2 through 6.

Note that the bottom of the crib is at elevation 650 ft and the finish grade is elevation 684 ft (Figure 5). A polyethylene barrier was placed above the distributor and over the rock fill at approximately 655 ft elevation.

Waste Site Coordinates:
Easting-567115 Northing-134691

Site Dimensions:
Site Length: 109.7 m (360.0 ft) Site Depth: 8.5 m (28.0 ft)
Site Width: 3.1 m (10.0 ft) (at crib base) Cover Thickness: 0.6 m (2.0 ft)
Site Area: 334.5 m^2 (3,600 ft^2)

Related Site Structure(s): The 216-S-23 Crib is associated with the 202-S Building the 240-S-151 Diversion Box, the 216-S-7 Crib, and the 216-S-23 Crib. The pipelines associated with this crib include the 200-W-138-PL, 200-W-139-PL, and 200-W-141-PL pipelines.

Site Posting: The 216-S-23 Crib is marked with concrete AC-540 markers, and is posted with Underground Radioactive Material Area signs.

Site History

Release Summary: The 216-S-23 Crib operated from January 1969 to January 1972 (Figure 7). The Crib received Reduction-Oxidation (REDOX) Facility process condensate from the D-2 receiving tank in the 202-S Building. The waste was low salt and neutral to basic. However, a total of approximately 300 kg (661 lb) of nitric acid was received in the crib. Several radionuclides were also present in the waste

Site: 216-S-23	Area: S Plant	Category: Deep

including cobalt-60, strontium-90 (Sr-90), ruthenium-106, and cesium-137 (Cs-137). Approximately 34,000,000 L (8,994,709 gal) of liquid process effluent was deposited into the crib. The site was retired when production operations were terminated at REDOX.

Volume Discharged: 34,000,000 L (8,994,709.0 gal) of process condensate effluent (low salt, neutral to basic process effluent [see Figure 1 for more details]).

Pore Volume Discharged: 3.4E+07 L/ (203 ft x 3,600 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 5.5

Waste Inventory: Table 1 presents the waste inventory for the 216-S-23 waste site.

Table 1. Waste Inventory Radionuclide Content for the 216-S-23 Waste Site

Contaminant	Mass Discharged
Pu	<0.99 g
Beta	190 Ci
Sr-90	1.9 Ci
Ru-106	56
Cs-137	<5.4 Ci
Co-60	<1.4 Ci
U	<0.40 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: The groundwater in the vicinity of the site is monitored by groundwater wells 299-W19-5, 299-W19-6, 299-W19-7, 299-W22-37, and 299-W22-38. In 1976, scintillation probe profiles from these wells indicated that breakthrough of radionuclide groundwater had not occurred. However, both Cs-137 and Sr-90 have been detected in groundwater in wells adjacent to the 216-S-23 waste site. In 1995, soil from the surrounding UPR-200-W-165 site was scraped and consolidated onto the surface of the 216-S-23 Crib. The crib was interim stabilized afterwards with 0.6 m (2 ft) of clean backfill material.

Groundwater wells associated with the 216-S-23 waste site (299-W19-5, 299-W19-6, 299-W19-7, 299-W22-37, and 299-W22-38), had detections above drinking water standards for carbon tetrachloride (CTET), nitrate, Cs-137, Sr-90, and tritium. CTET was detected at 37 µg/L in 2013 and 46 µg/L in 2014. Nitrate concentrations were first measured at 99,000 µg/L in 1971, were as high as 100,000 µg/L in 1973, and were last measured at 3,720 µg/L in 2014. Cesium-137 was initially measured at 640 pCi/L in

Site: 216-S-23	Area: S Plant	Category: Deep

1969 (its highest level) and was not detected when last sampled in 1990. Strontium-90 was first measured at 30 pCi/L in 1969, was as high as 46 pCi/L in 1972, and was last measured at 2.4 pCi/L in 1977. Tritium results ranged from 450,000 pCi/L 1972 to non-detect in 2014.

Borehole and data summaries are presented in Tables 2 and 3. Borehole locations are shown in Figure 1.

Table 2. Borehole Summary* for the 216-S-23 Waste Site

Year	Borehole / Well ID	Location with Respect to Site	Depth (ft)
2003	A7734 / 299-W19-05	Outside – east	228
2003	A7735 / 299-W19-07	Outside – northeast	221
2003	A7856 / 299-W22-37	Outside – west	243
2003	A7857 / 299-W22-38	Outside – southeast	224

*Geophysical logging was conducted in each borehole; no soil samples were collected.

ID = identification

Table 3. Geophysical Log Summary for the 216-S-23 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A7734	0 to 5	2.68	pCi/g	4.0	21,592.4	cpm	4
	5 to 10	0.25	pCi/g	6.0	16,462	cpm	6
	10 to 15	–	pCi/g	–	13,056.7	cpm	12
	>15	0.26	pCi/g	127	25,775.6	cpm	158
A7735	0 to 5	0.5	pCi/g	3.0	16,422.2	cpm	5
	5 to 10	–	pCi/g	–	15,793.4	cpm	6
	10 to 15	–	pCi/g	–	12,395.2	cpm	14
	>15	0.23	pCi/g	137	26,256.5	cpm	158
A7856	0 to 5	0.6	pCi/g	4.0	18,232.3	cpm	5
	5 to 10	–	pCi/g	–	17,246	cpm	6
	10 to 15	–	pCi/g	–	14,491.7	cpm	11
	>15	0.25	pCi/g	137	24,047.8	cpm	168

Site: 216-S-23	Area: S Plant	Category: Deep

Table 3. Geophysical Log Summary for the 216-S-23 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A7857	0 to 5	1	pCi/g	3.0	16,523.9	cpm	4
	5 to 10	0.2	pCi/g	8.0	16,220.2	cpm	6
	10 to 15	–	pCi/g	–	14,666.5	cpm	15
	>15	0.22	pCi/g	173	24,649.3	cpm	154

bgs = below ground surface
ID = identification

Nature and Extent of Contamination:

An estimated 5.5 pore volumes of liquid potentially containing nitrates and radionuclides were discharged to the crib, indicating that contaminated soil could extend to groundwater (70.4 m [231 ft] below ground surface [bgs]). Because the discharge point was in a membrane-covered gravel layer located 8.5 m (28 ft) bgs, it is unlikely that liquids contacted and contaminated shallow soil. The crib was backfilled with approximately 8.5 m (28 ft) of overburden.

Shallow (0 – 4.6 m [0 – 15 ft] bgs: Based on GPL results for locations outside the crib, Cs-137 is nondetect or below background at all shallow samples except for one collected at 1.2 m (4 ft) bgs. No GPL samples were collected inside crib.

Deep (> 4.6 m [15 ft] bgs): Cesium-137 results were nondetect or below background at all deep sample locations based on the geophysical log (GPL). No GPL samples were collected inside crib. No soil data are available to evaluate deep vadose zone contamination.

References:

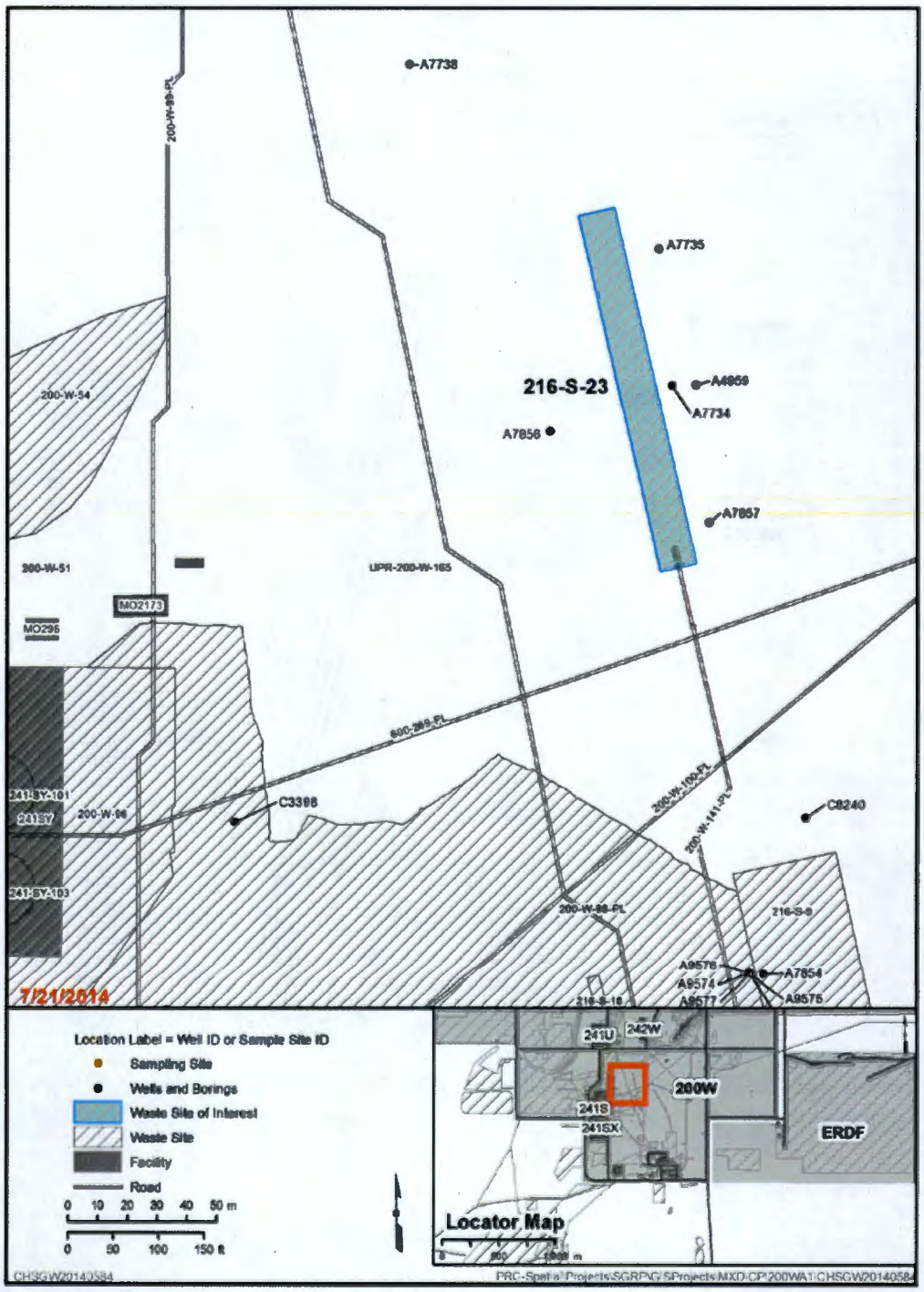
ARH-329, 1968, *Design Criteria 202-S Building Waste Disposal Crib 216-S-23*, Atlantic Richfield Hanford Company, Richland, Washington.

H-2-46111 (drawing), 1972, *Civil 216-S-23 Crib Plan & Profile*, Sheet 1, Rev. 2, Vitro Hanford Engineering Services, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

Waste Information Data System General Summary Report for the 216-S-23 Waste Site.

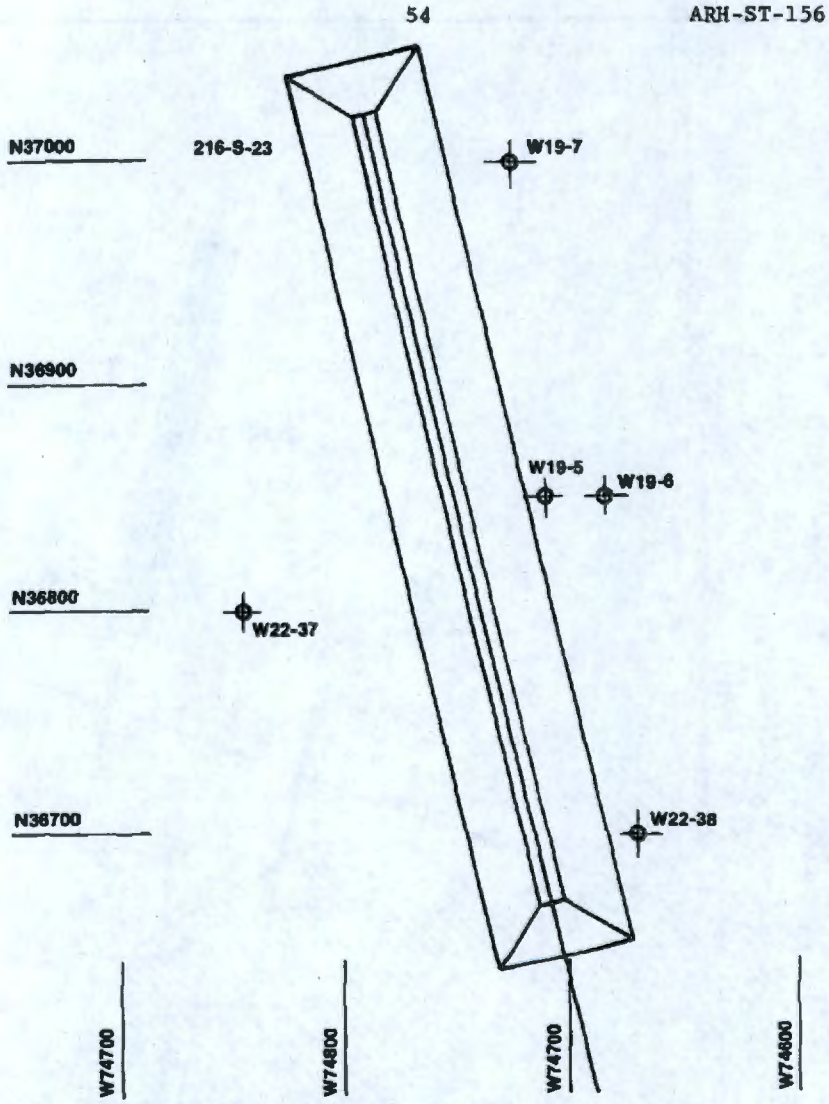
Site: 216-S-23	Area: S Plant	Category: Deep



ERDF = Environmental Restoration Disposal Facility
ID = Identification

Figure 1. 216-S-23 Waste Site Map

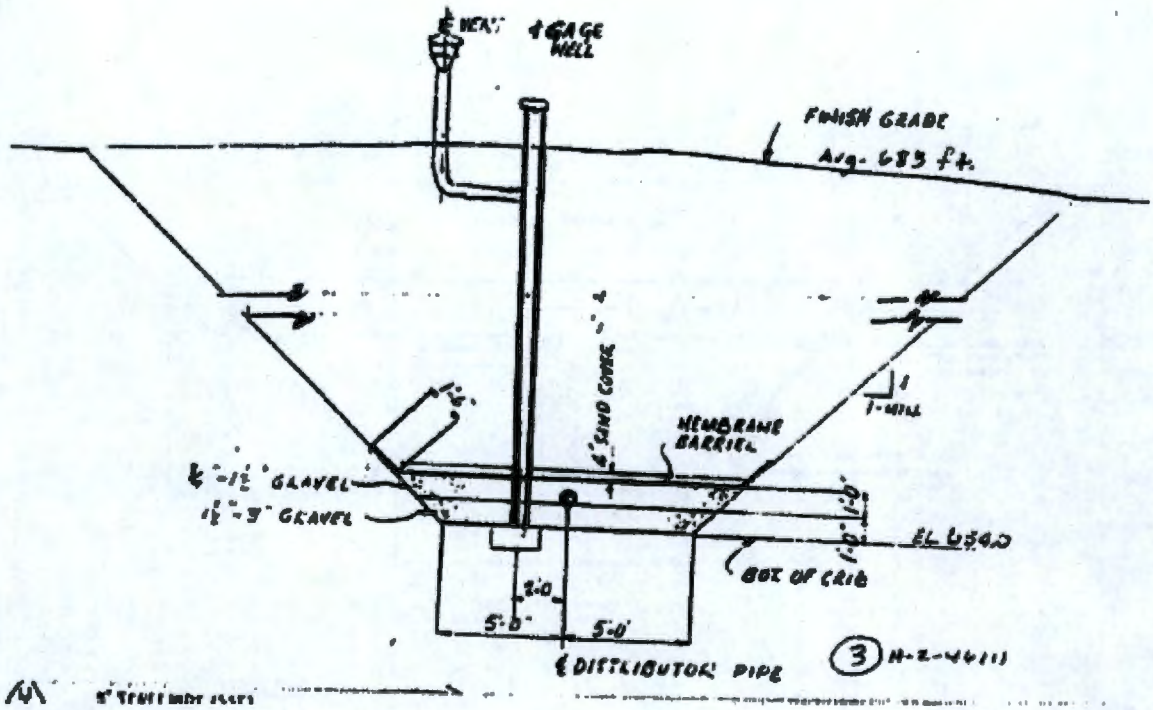
Site: 216-S-23	Area: S Plant	Category: Deep



Source: ARH-ST-156, *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells*, Figure B-41.

Figure 2: 216-S-23 Crib Plot Plan

Site: 216-S-23	Area: S Plant	Category: Deep

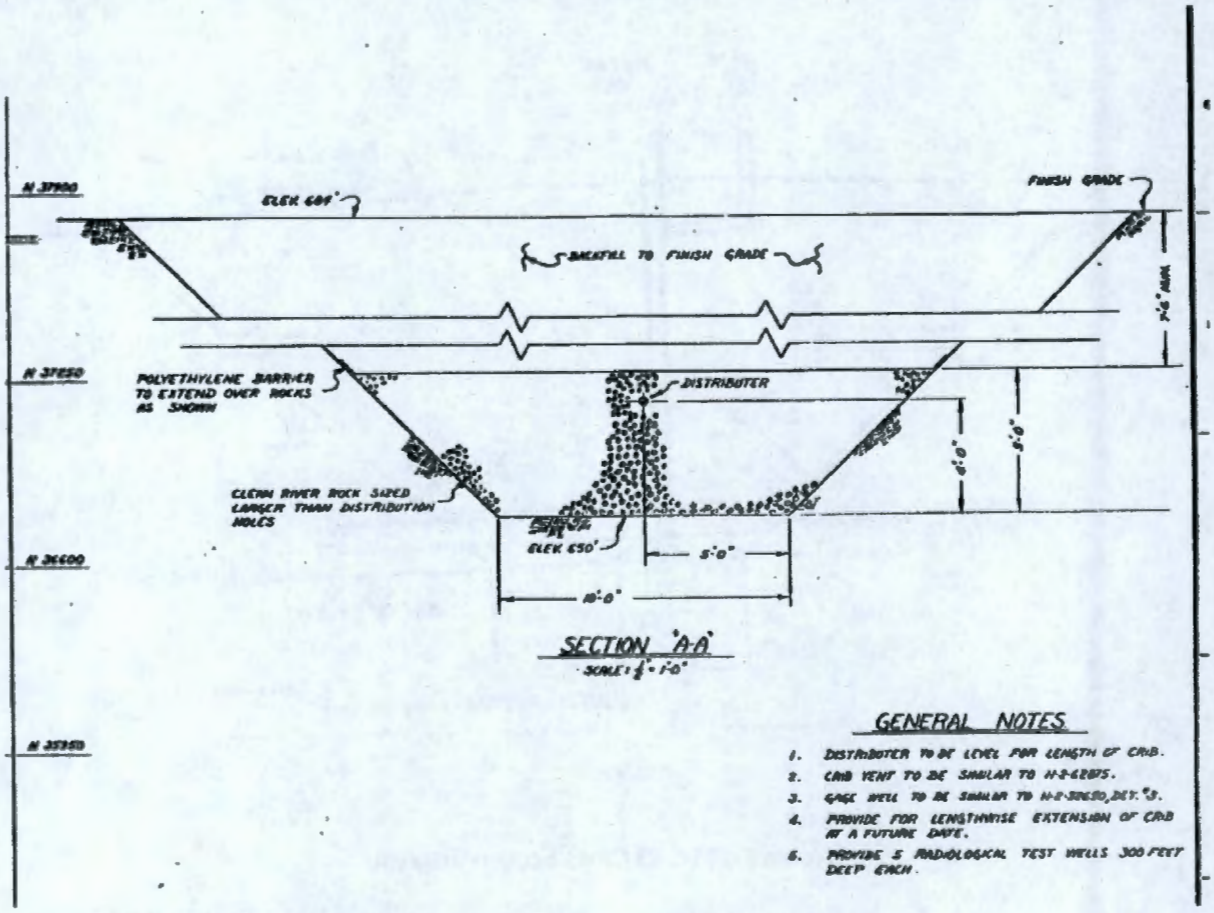


H-2-46111, *Civil 216-S-23 Crib Plan & Profile.*

Note: Produced from best available copy.

Figure 3. 216-S-23 Cross Section Diagram

Site: 216-S-23	Area: S Plant	Category: Deep

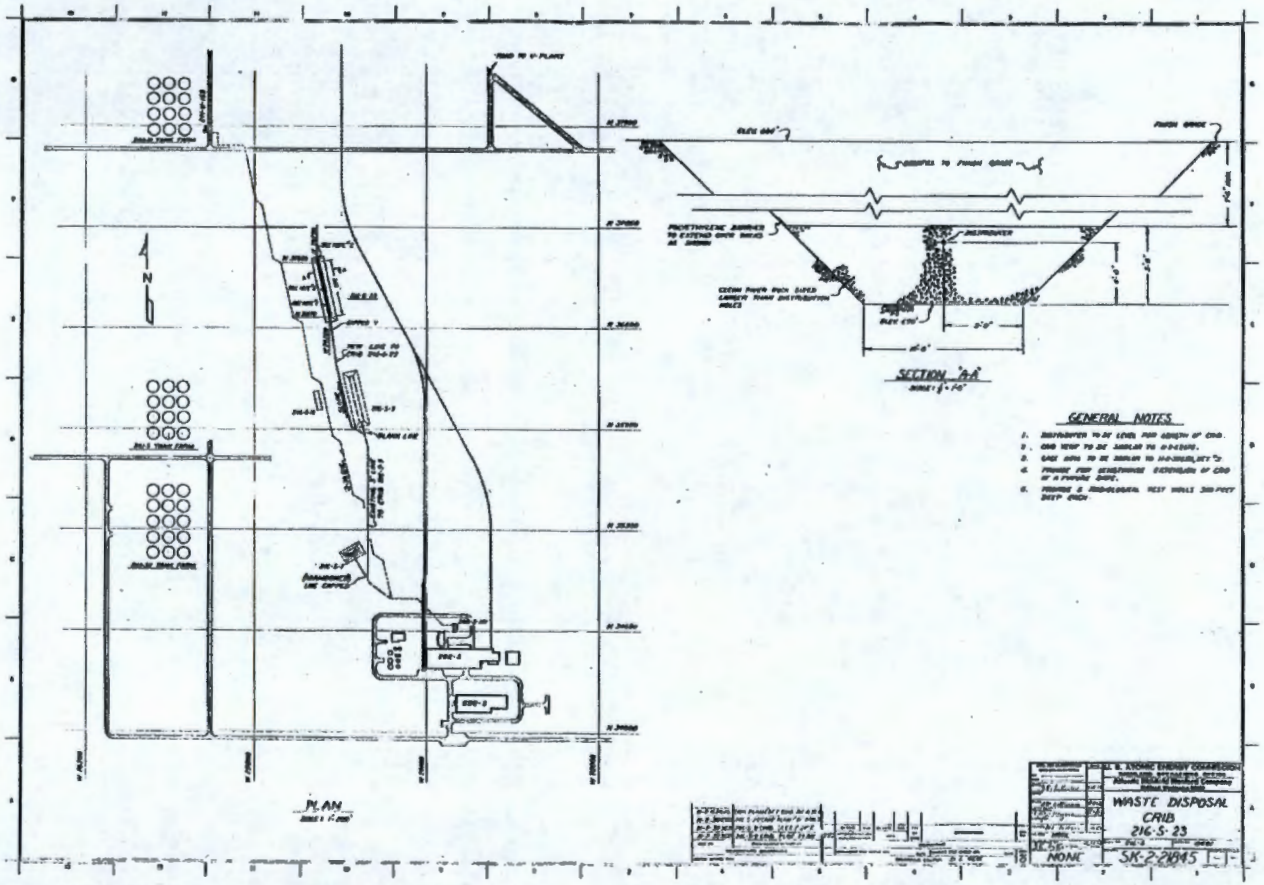


Source: ARH-329, *Design Criteria 202-S Building Waste Disposal Crib 216-S-23.*

Note: Produces from best available copy.

Figure 4. 216-S-23 Cross Section Diagram

Site: 216-S-23	Area: S Plant	Category: Deep



Source: ARH-329, *Design Criteria 202-S Building Waste Disposal Crib 216-S-23.*

Note: Produced from best available copy.

Figure 5. 216-S-23 Crib Plot Plan and Cross Section Diagram

Site: 216-S-23	Area: S Plant	Category: Deep

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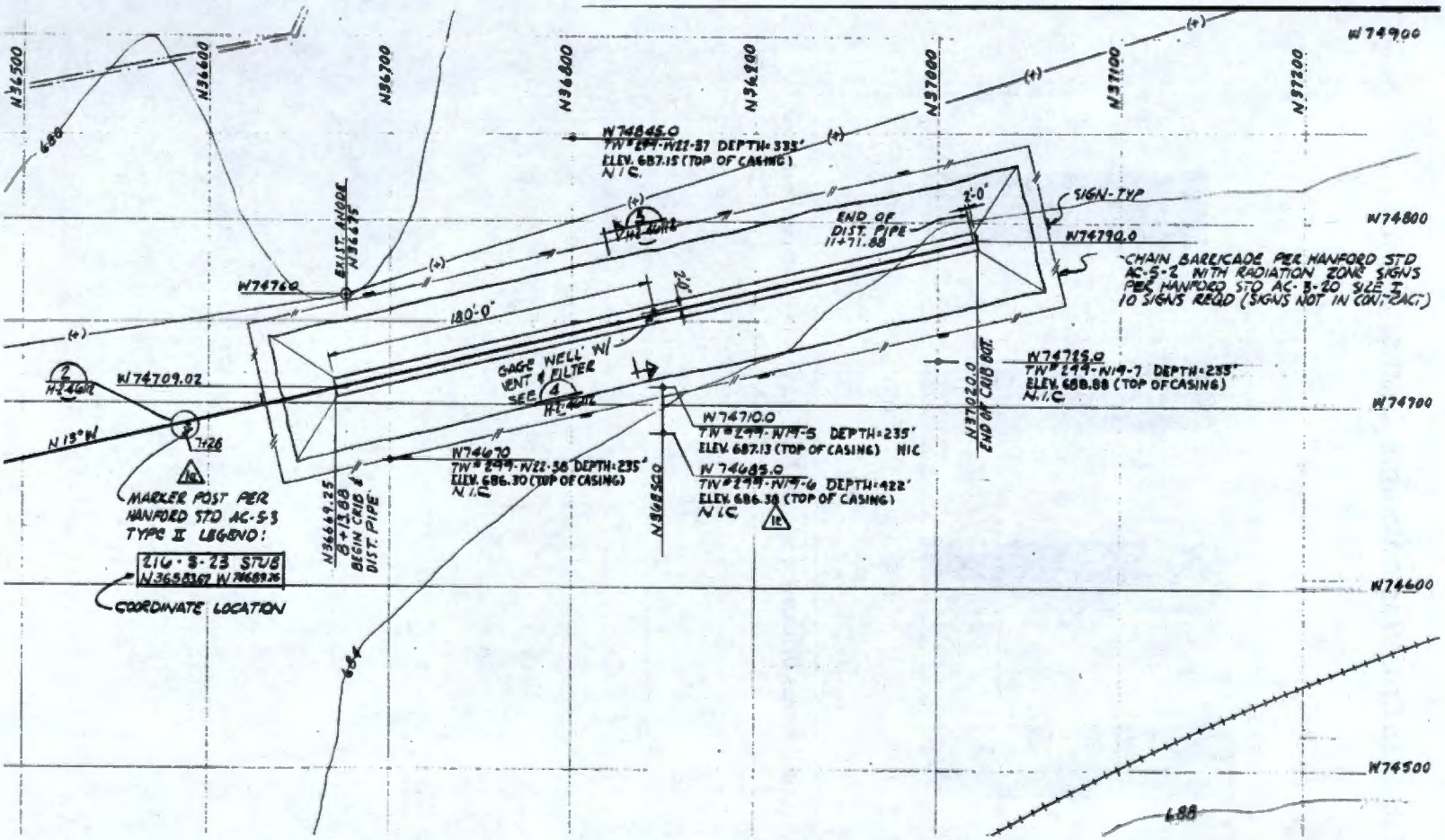
Site: 216-S-23	Area: S Plant	Category: Deep



Source: H-2-46111, *Civil 216-S-23 Crib Plan & Profile.*

Note: Produced from best available copy

Figure 6. 216-S-23 Crib Plot Plan

Site: 216-S-23	Area: S Plant	Category: Deep

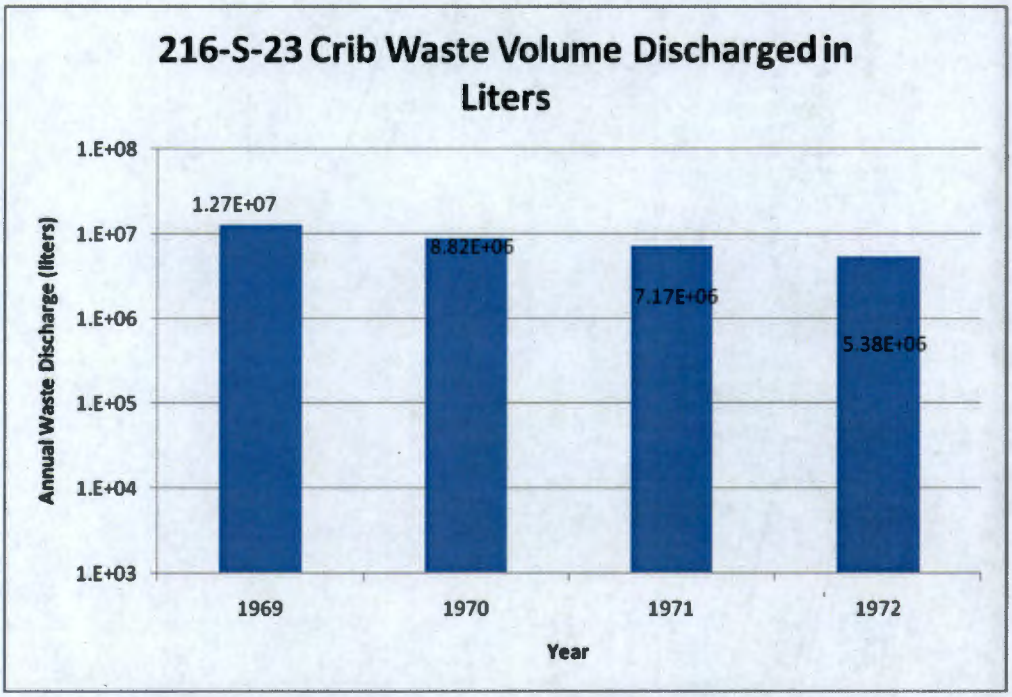


Figure 7. Waste Volumes Discharged into the 216-S-23 Crib in Liters per Year

Site: 216-S-25	Area: S Plant	Category: Deep

Site Description

Alternate Site Identification: 216-S-25 Crib
Site Type: Crib
Facility/Geographic Area: S Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-SC-1
Service Dates: January 1973 to January 1992

Waste Site Location and Physical Description: The 216-S-25 waste site consists of a crib and associated piping, located west of 241-S/SX Tank Farm and north of the 216-S-4 Crib (Figure 1). The 216-S-23 Crib is a gravel and fill structure with an approximate 1.5:1 side slope. A distribution pipe enters the unit below grade and runs the length of the crib within a gravel layer. The pipe is currently 2.1 m (7 ft) below grade. Three gage and vent wells are attached to the distribution pipe. The bottom 0.9 m (3 ft) of the crib consists of gravel, overlain by approximately 0.3 m (1 ft) of sand, with remainder of the crib containing backfill (Figure 2). The pipe runs along the bottom of the crib for its entire length. The crib received effluent from the 242-S Evaporator Building via the 200-W-161-PL pipeline, which is a 10 cm (4-in) diameter pipeline buried 2.1 m (7 ft) below grade. In 1984, the 200-W-159-PL pipeline from the 241-SX-402 Condenser Facility was tied into the 200-W-161-PL pipeline for deposition into the crib.

Waste Site Coordinates:
Easting-566572 Northing-134285

Site Dimensions:
Site Length: 175.3 m (575.0 ft) Site Depth: 3.1 m (10.0 ft)
Site Width: 3.1 m (10.0 ft) Cover Thickness: 1.8 m (6.0 ft)
Site Area: 534.2 m^2 (5,750 ft^2)

Related Site Structure(s): The 216-S-25 crib is associated with the 242-S Evaporator Building. The pipelines associated with this crib are 200-W-161-PL and the 200-W-159-PL from the 241-SX Tank Farm.

Site Posting: The 216-S-25 crib area is marked with AC-540 markers and posted with Underground Radioactive Material Area signs.

Site History

Release Summary: The 216-S-25 Crib operated from January 1973 to January 1992. The crib received Reduction-Oxidation Facility process steam condensate from the 242-S Evaporator Building until November 1980, at which time the evaporator was placed in standby mode. After November 1980, the crib received intermittent streams of 241-SX Tank Farm cooling water. In 1985, the crib received effluent from groundwater pump-and-treat associated with the 216-U-1&2 waste site. The waste was basic and low salt. Several radionuclides were also present in the waste including cesium-137, strontium-90 (Sr-90), and ruthenium-106. Approximately 288,000,000 L (76,190,476 gal) of liquid was deposited into

Site: 216-S-25	Area: S Plant	Category: Deep

the crib. In 1992 the 241-SX Tank Farm sludge cooler steam heater was shut off due to leaking tubes. A new steam heater unit was scheduled for installation in 1993 and slated for startup in the winter of 1995. However, it is not specified whether the new heater unit was ever brought online. The heater unit was scheduled to operate through the winter and into early spring; approximately 5 months total. The unit was slated to produce roughly 15 – 30 L (4 –8 gal) of condensate per hour that would be sent to the 216-S-26 crib for disposal. Use of the crib was discontinued in 1992.

Volume Discharged: 288,000,000 L (76,190,476 gal) of process steam condensate effluent, tank farm cooling water, and 216-U-1&2 groundwater pump-and-treat effluent.

Pore Volume Discharged: 2.88E+08 L/ (207 ft x 5,750 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 28.5

Waste Inventory: Table 1 presents the waste inventory for the 216-S-25 waste site.

Table 1. Waste Inventory Radionuclide Content for the 216-S-25 Waste Site

Contaminant	Mass Discharged
Pu	<0.01 g
Beta	<0.01 Ci
Sr-90	<0.01 Ci
Ru-106	<0.01 Ci
Cs-137	<0.01 Ci
Co-60	<0.01 Ci
U	<0.07 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: In 1976, scintillation probe profiles from wells 299-W23-9, 299-W23-10, and 299-W23-11 indicated that breakthrough of radionuclide groundwater had not occurred. The groundwater in the vicinity of the site is monitored by well 299-W23-09. Gross alpha, gross beta, uranium isotopes, and tritium have been detected in groundwater from the well.

A radiation survey occurred on June 18, 1997, as part of a routine site survey. One dust particle with a reading of 150,000 d/m was detected and subsequently removed. No other contamination was found within the crib. A GM/P-11 Probe (15.5 cm^2 [2.4 $in.^2$]) for Beta/Gamma was used during the survey. Radiological surveys are performed annually; however, there is no documentation detailing recent survey results.

Site: 216-S-25	Area: S Plant	Category: Deep

Well and Borehole locations are shown on Figure 1.

Groundwater wells associated with the 216-S-25 waste site (299-W23-9, 299-W23-10, 299-W23-11) and borehole C4890 had detections above drinking water standards for carbon tetrachloride (CTET), nitrate, Sr-90, tritium, and uranium. CTET was not detected in 1987, was detected at its highest concentration (290 µg/L) in 2002, and was last measured at 12 µg/L in 2007. Nitrate concentrations were first measured at 14,000 µg/L in 1975, were as high as 483,000 µg/L in 2003, and were last measured at 216,000 µg/L in 2007. Strontium-90 was first measured at 9.1 pCi/L in 1969, was as high as 25 pCi/L in 1981, and was not detected when last measured in 2005. Tritium was first measured at 2.6 million pCi/L in 1974, was as high as 9.2 million pCi/L in 1976, and was last measured at 150,000 pCi/L in 2007. Uranium was initially detected at 13.6 µg/L in 1980, reached a maximum concentration of 73.3 µg/L in 1989, and was last measured at 19.8 µg/L in 2007. Cesium-137 was detected below the drinking water standard.

Geophysical Log Summary: Groundwater wells 299-W23-9, 299-W23-10, and 299-W23-11 were logged in the 1970s. No recent log data are available.

Nature and Extent of Contamination: No data are available to evaluate shallow or deep soil contamination. Based on existing information, contaminated soil is likely within and beneath the crib. Because the discharge point was 2.1 m (7 ft) below ground surface (bgs), shallow soil could be contaminated. The discharge pipe was covered by 25.4 cm (10 in.) of sand and a membrane barrier (approximately 1.8 m [6 ft] bgs). An estimated 28.5 pore volumes of liquid potentially containing radionuclides and uranium were discharged to the crib, indicating contamination could extend to groundwater (66 m [217 ft] bgs).

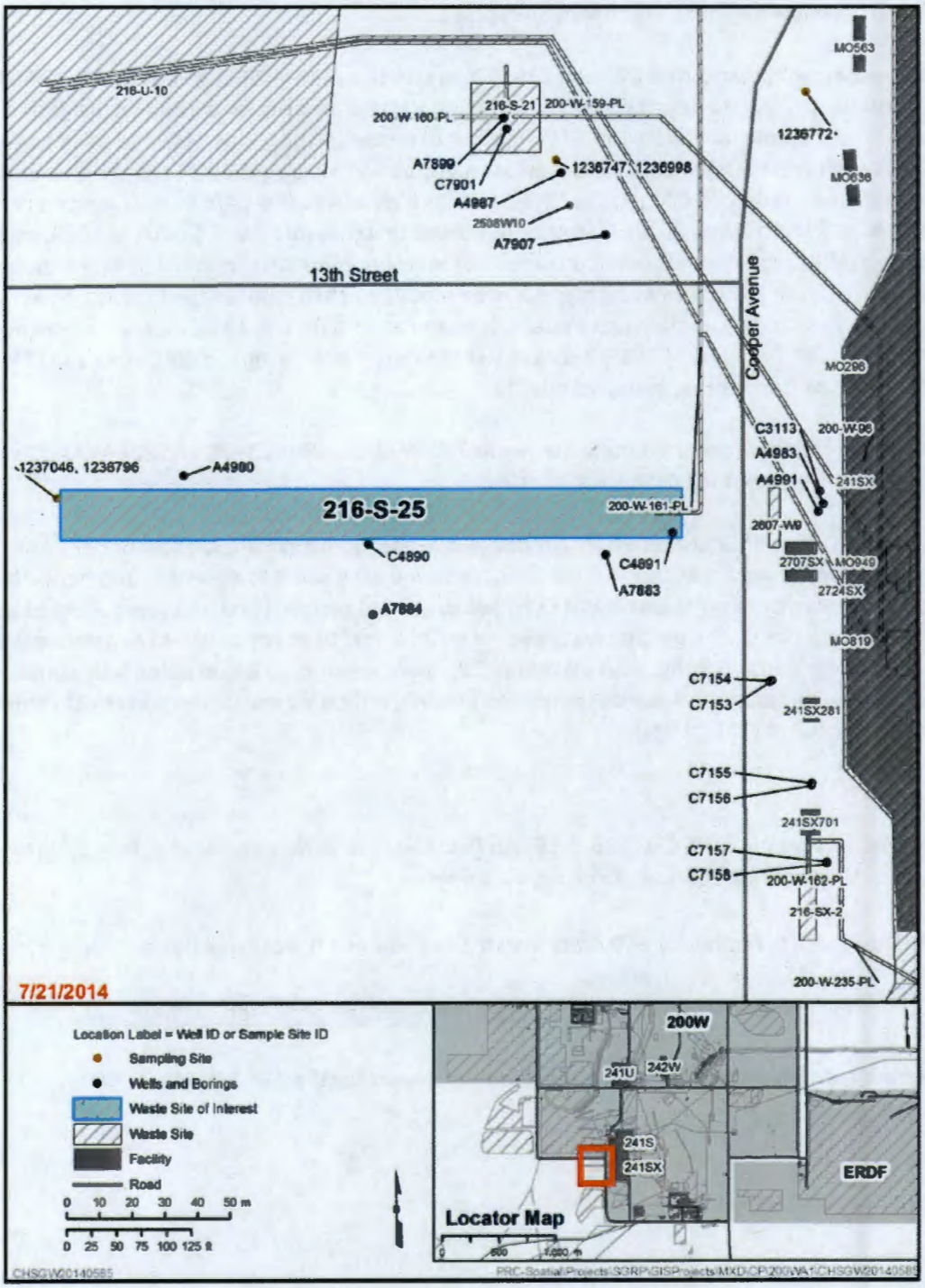
References:

H-2-46292 (drawing), 1973, *Civil 216-S-25 Crib Plan, Sections & Details*, Sheet 1, Rev. 1, Vitro Hanford Engineering Services, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

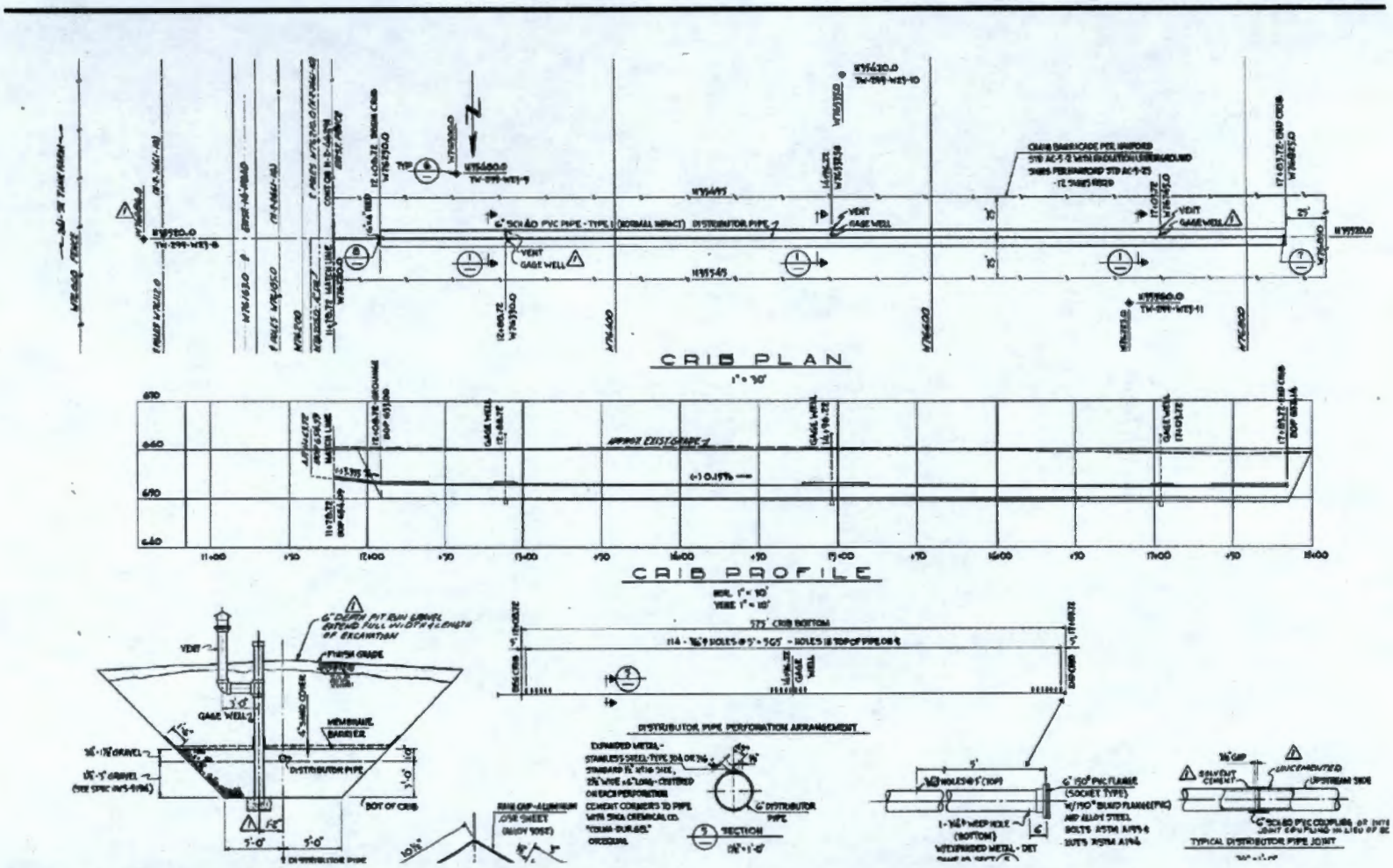
Waste Information Data System General Summary Report for the 216-S-25 Waste Site.

Site: 216-S-25	Area: S Plant	Category: Deep



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 216-S-25 Waste Site Plan



Source: H-2-46292, *Civil 216-S-25 Crib Plan, Sections & Details*, Sheet 1.

Note: Produced from best available copy.

Figure 2. 216-S-25 Crib Plan and Profile

Site: 216-S-25	Area: S Plant	Category: Deep

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Site: 216-SX-2	Area: S Plant	Category: Intermediate

Site Description

Alternate Site Identification: 216-SX-2 Crib
Site Type: Crib
Facility/Geographic Area: S Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: 1952 to 1965

Waste Site Location and Physical Description: The 216-SX-2 Crib is located on the east side of Cooper Ave., approximately 23 m (75 ft) west of the 241-SX Tank Farm (Figure 1). Plan view and cross-section drawings of the crib are shown in Figures 2 and 3. The crib is connected to the 241-SX-701 Compressor House located approximately 7.6 m (25 ft) to the north. The crib is filled with gravel and is topped with a subsurface layer of Sisalkraft®[1] paper.

Waste Site Coordinates:
Lon-566703.81248 Lat-134164.72661

Site Dimensions:
Site Length: 19.0 m (62.3 ft) Site Depth: 1.52 m (5 ft)
Site Width: 8.0 m (26.3 ft) Cover Thickness: None
Site Area: 152 m^2 (1,639 ft^2)

Related Site Structure(s): The 216-SX-2 Crib is associated with the 241-SX-701 Compressor House. Pipeline 200-W-162-PL is also associated with this crib.

Site Posting: The 216-SX-2 Crib is currently surrounded by light post and chain and posted with Underground Radioactive Material Area signs. It is labeled "216-SX-2" on three sides with old style black and white signs.

Site History

Release Summary: During its operational lifetime, the 216-SX-2 Crib received mixed liquid waste in the form of steam condensate from the 241-SX-701 Compressor House. The 216 SX 2 Crib received air compressor condensate from a tank farm compressor system. The discharge was expected to contain some compressor oil residues. The crib was brought online in 1952, and was abandoned in 1965 when it stopped percolating. As flow rates to the crib are not specified, the total estimated volume of waste the 216-SX-2 Crib received over its lifetime cannot be estimated.

Volume/Mass Discharged: Not specified.

[1] Sisalkraft is a registered trademark of the Fortifiber Corporation, Incline Village, Nevada.

Site: 216-SX-2	Area: S Plant	Category: Intermediate

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: The 216-SX-2 waste site was mapped using Global Positioning System survey equipment from October 8 to October 29, 1996. A site walk down occurred on March 25, 1997, to observe the site and its condition. It was determined the crib was easily identifiable, due to its proximity just outside the western edge of the 241-S Tank Farm fence. The radiological posting at the site was confirmed on this date as well. In July 2000, the vent risers were sealed as a preventive measure for potential passive radioactive emissions.

Borehole and data summaries are presented in Tables 1 through 3. Borehole locations are shown on Figure 1.

Table 1. Borehole Summary for the 216-SX-2 Waste Site

Year	Borehole ID	Location with Respect to Site	Depth (ft)
2009	C7157*	Outside – 25 ft northeast	0.25 – 159 (GPL)
2009	C7158	Outside – 25 ft northeast	87 – 89 (1 sample) 124 – 126 (1 sample) 141 – 143 (1 sample)

*Borehole C7157 was monitored to 159 ft bgs for equivalent radium, natural potassium, thorium, and uranium. Cs-137 monitored only at 130 ft bgs

bgs = below ground surface

GPL = geophysical log

ID = identification

Table 2. Geophysical Log Summary for the 216-SX-2 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
C7157	>15	1.08	pCi/g	130	–	–	–

bgs = below ground surface

ID = identification

Site: 216-SX-2	Area: S Plant	Category: Intermediate

Table 3. Soil Maximum Detection Summary (Borehole C7158)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Aluminum	–	–	–	13,300,000	µg/kg	126
Barium	–	–	–	111,000	µg/kg	143
Calcium	–	–	–	13,400,000	µg/kg	126
Chloride	–	–	–	16,400	µg/kg	143
Chromium	–	–	–	36,800	µg/kg	89
Fluoride	–	–	–	1,210	µg/kg	89
Iron	–	–	–	18,500,000	µg/kg	126
Magnesium	–	–	–	6,590,000	µg/kg	143
Manganese	–	–	–	428,000	µg/kg	143
Nitrate	–	–	–	62,300	µg/kg	143
Nitrite	–	–	–	636	µg/kg	143
Oxalate	–	–	–	778	µg/kg	89
Phosphate	–	–	–	1090	µg/kg	126
Phosphorus	–	–	–	568,000	µg/kg	126
Silicon	–	–	–	34,700	µg/kg	89
Sodium	–	–	–	41,900	µg/kg	143
Strontium	–	–	–	38,000	µg/kg	126
Sulfate	–	–	–	41,700	µg/kg	143
Sulfur	–	–	–	14,100	µg/kg	143
Tc-99	–	–	–	5.9	pCi/g	143
Titanium	–	–	–	760,000	µg/kg	89
U-233	–	–	–	0.00135	pCi/g	89
U-234	–	–	–	0.000445	pCi/g	143
U-235	–	–	–	0.0000313	pCi/g	126
U-238	–	–	–	0.29	pCi/g	126

Site: 216-SX-2	Area: S Plant	Category: Intermediate

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): No data are available to evaluate shallow soil contamination. Based on existing information, the soil could be contaminated by former discharge of waste because the discharge point was shallow (1.5 m [5 ft] bgs). Geophysical data are available for one location outside the crib, but no data have been collected from inside the crib.

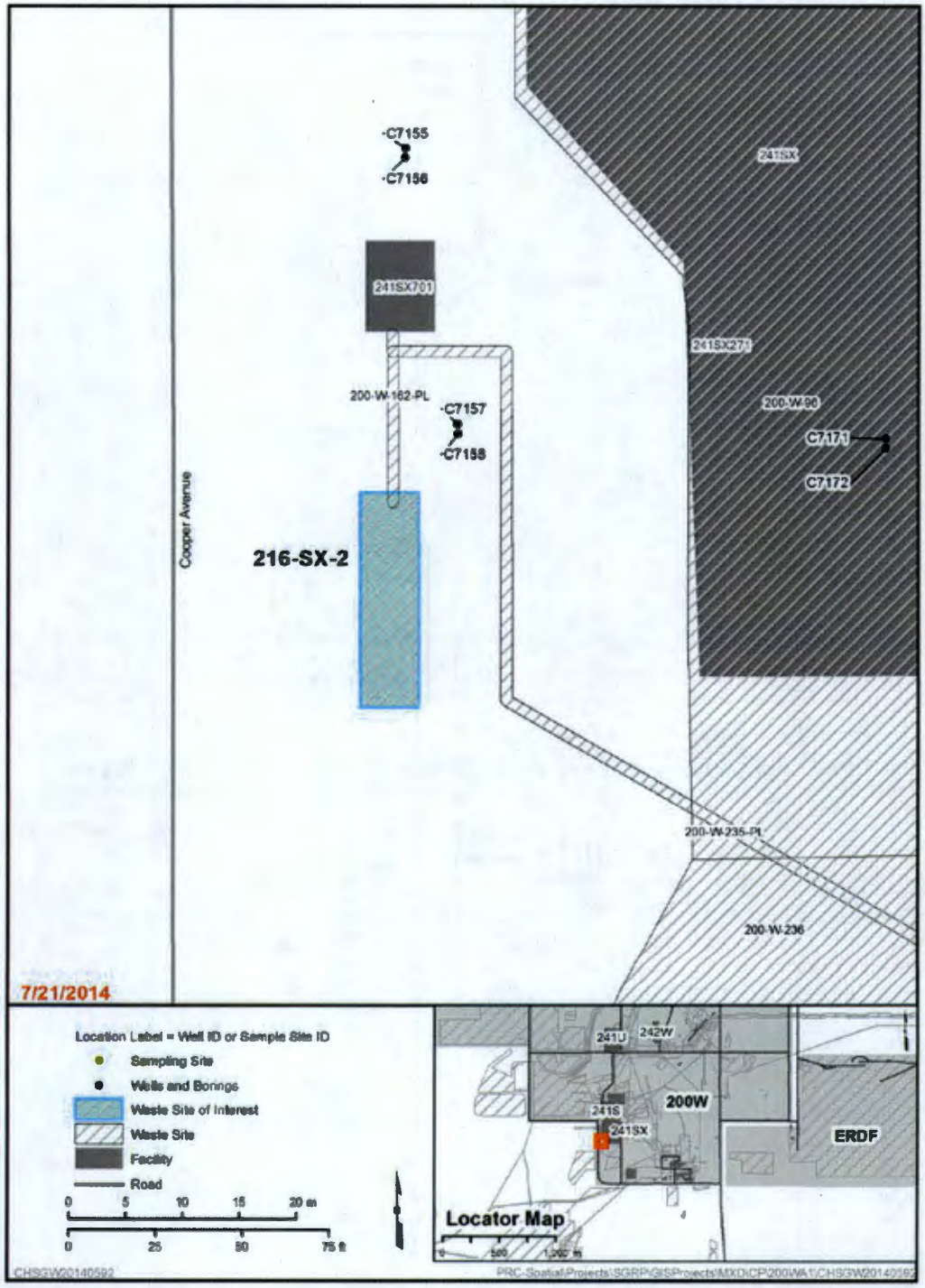
Intermediate (>4.6 m [>15 ft] bgs): No soil samples were collected within the crib. Soil concentrations (uranium) and geophysical log results from soil boreholes to 48.5 m (159 ft) bgs located 7.6 (25 ft) outside the trench were below background. Technitium-99 was detected at 43.6 m (143 ft) bgs. The discharge volume is unknown; therefore, the potential for deep soil or groundwater contamination is uncertain. The approximate depth to groundwater at this location is 67.4 m (221 ft) bgs.

References:

H-2-39952 (drawing), 1966, *Air Life Circulators Plot Plan & Outside Lines*, Rev. 3, General Electric Company, Richland, Washington.

WIDS General Summary Report for the 216-SX-2 Waste Site.

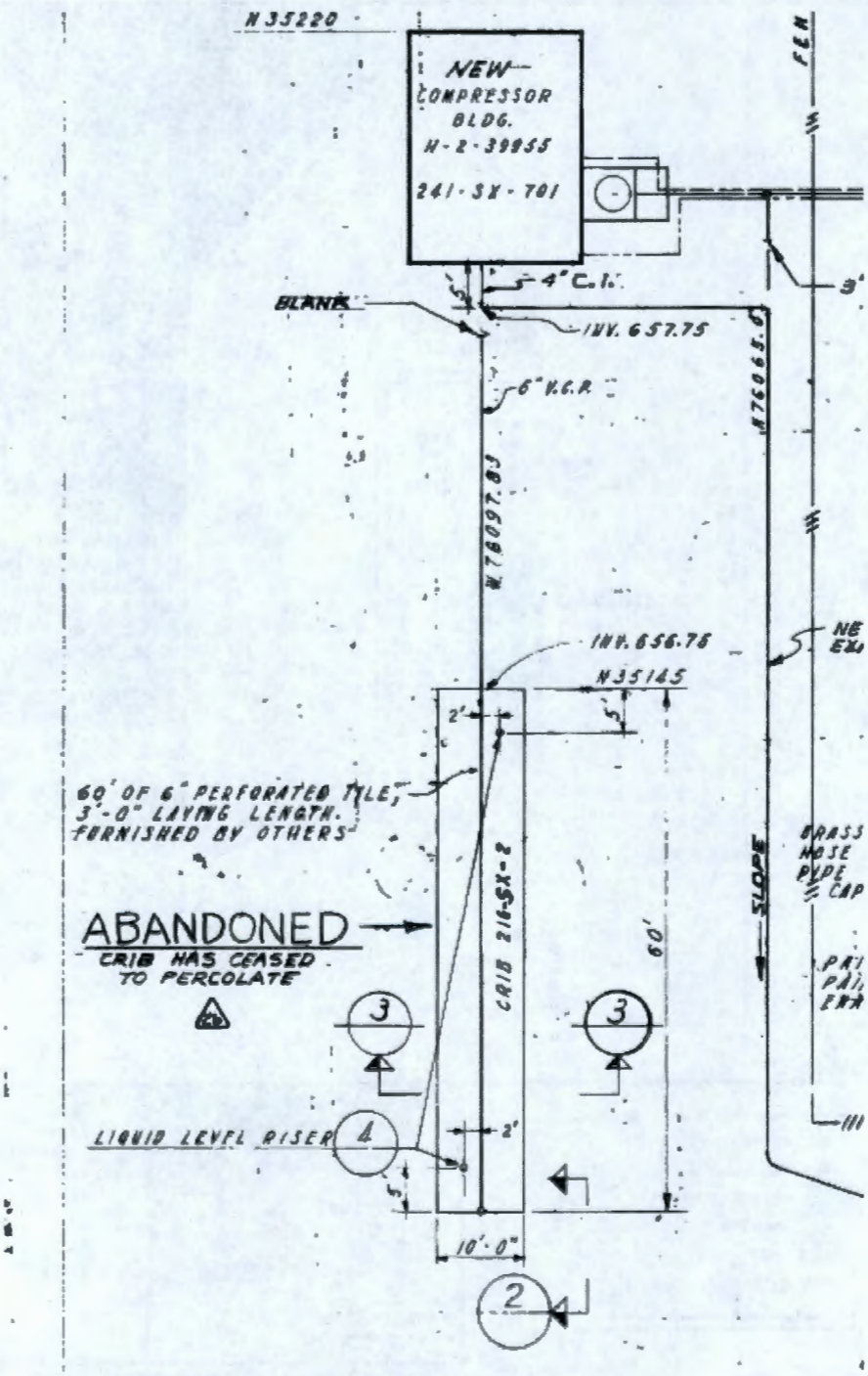
Site: 216-SX-2	Area: S Plant	Category: Intermediate



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 216-SX-2 Waste Site Map

Site: 216-SX-2	Area: S Plant	Category: Intermediate

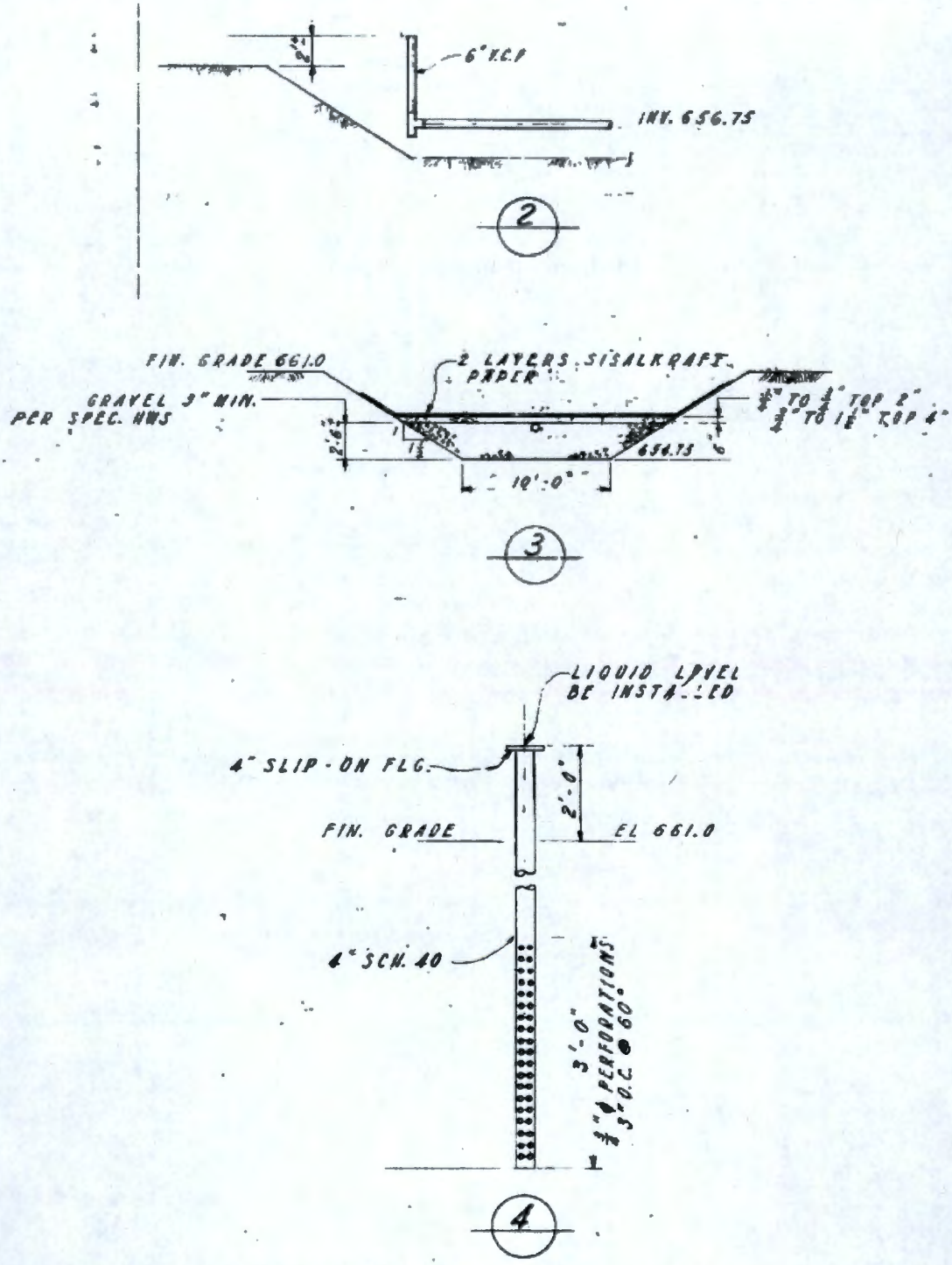


Source: H-2-39952, *Air Life Circulators Plot Plan & Outside Lines.*

Note: Produced from best available copy.

Figure 2. Plan View of Crib and Compressor Building

Site: 216-SX-2	Area: S Plant	Category: Intermediate



Source: H-2-39952, *Air Life Circulators Plot Plan & Outside Lines.*

Note: Produced from best available copy.

Figure 3. 216-SX-2 Crib Cross-Section

Site: 216-SX-2	Area: S Plant	Category: Intermediate

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Site: 218-W-9	Area: S Plant	Category: Shallow-Subsurface

Site Description

Alternate Site Identification: 218-W-9 Dry Waste Burial Ground No. 9, Non-TRU Dry Waste No. 009
Site Type: Burial Ground and Unplanned Release
Facility/Geographic Area: S Plant Area
Current OU Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Service Dates: 1954 to 1954

Waste Site Location and Physical Description: The 218-W-9 waste site is located northwest of the 202-S Building and north of the 216-S-7 Crib (Figure 1). The 200-W-139-PL pipeline runs beneath the eastern edge of the 218-W-9 posted area. Interim stabilization activities in 1991 covered the site with 45 to 60 cm (18 to 24 in.) of clean backfill.

Waste Site Coordinates:
Lon-567188.55106 Lat-134306.61817

Site Dimensions:
Site Length: 42.7 m (140.0 ft) Site Depth: Not specified
Site Width: 29.9 m (98.0 ft) Cover Thickness: 0.45 to 0.6 m (1.5 to 2.0 ft)
Site Area: 1,274.6 m^2 (13,719.9 ft^2)

Related Site Structure(s): The 218-W-9 is associated with the 200-W-139-PL pipeline, UPR-200-W-109, and the 216-S-9 Crib.

Site Posting: The posting for site 218-W-9 is not specified.

Site History

Release Summary: No estimated release volume is presented for this waste site for either the burial ground or the unplanned release (UPR-200-W-109) from the waste line by the 216-S-9 Crib in 1969. The 1969 leak occurred while repairing a buckled section of the 200-W-139-PL waste line near the 216-S-9 Crib. A pressure test indicated a second leak had sprung in the line. Additional hydrostatic testing forced the water to bubble to the surface, emerging within the radiation zone for the 218-W-9 waste site.

In addition, the site contains an unspecified amount of sheet metal scrap, including Tank 211-S taken from the Reduction-Oxidation Facility. The waste contains less than 0.1 Ci total beta activity. The material may be contaminated with ruthenium-106.

Volume Discharged: Unknown.

Site: 218-W-9	Area: S Plant	Category: Shallow-Subsurface

Pore Volume Discharged: Unknown.

Waste Inventory: The waste inventory for the 218-W-9 waste site is provided in Table 1.

Table 1. Waste Inventory Radionuclide Content

Contaminant	Mass Discharged
Total Beta	<0.1 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: After repairing the buckled portions of the waste line near the 216-S-9 Crib, a pressure test indicated a second leak existed in the line. Additional hydrostatic testing finally forced the water to bubble to the surface inside the 218-W-9 radiation zone. Radiological readings detected dose rates up to 450 mR/hr at the point of emergence; however, dose rates dropped to 20 mR/hr as the water was absorbed into the soil. Excavation of the liquid bubble site disclosed a vertical buckle in the pipeline with a sizeable break in the line at that point.

The 218-W-9 waste site was interim stabilized in 1991. Interim stabilization included covering the site with clean backfill material. The ground surface is radiologically surveyed on an annual basis.

Nature and Extent of Contamination:

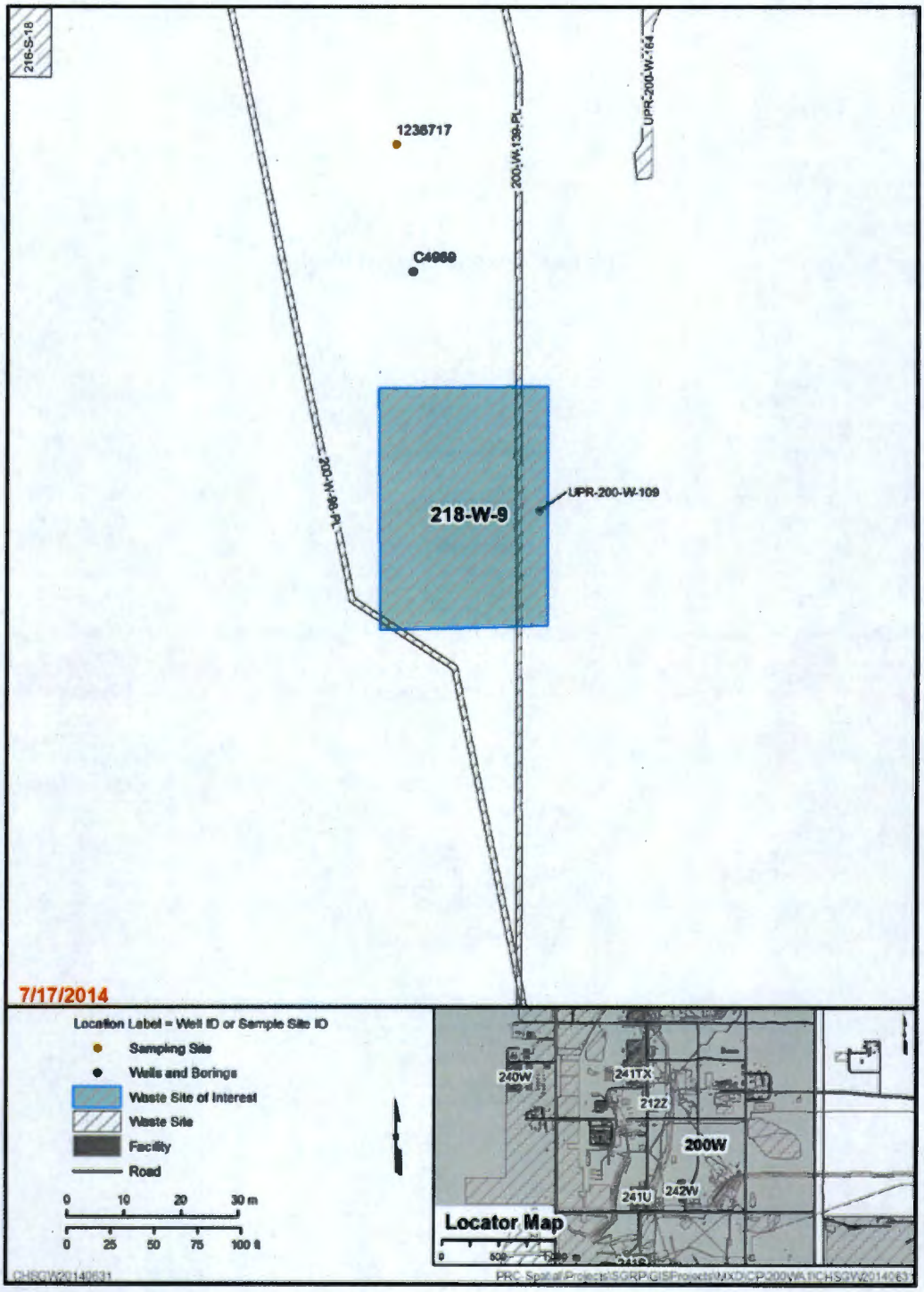
Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Potential radiological contamination in the subsurface.

References:

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

WIDS General Summary Report for the 218-W-9 Waste Site.

Site: 218-W-9	Area: S Plant	Category: Shallow-Subsurface



ID = identification

Figure 1. 218-W-9 Waste Site Map

Site: 218-W-9	Area: S Plant	Category: Shallow-Subsurface

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Site: 600-70	Area: S Plant	Category: Shallow - Subsurface

Site Description

Alternate Site Identification: None
Site Type: Dumping Area
Facility/Geographic Area: S Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Service Dates: 1950

Waste Site Location and Physical Description: The 600-70 waste site is located 360 m (1,181 ft) east of the Reduction-Oxidation (REDOX) Facility, outside the 200 West Area perimeter fence (Figure 1). In early 1950, the United States Government began construction of the REDOX plant in the south portion of the 200 West Area. A construction storage, heavy equipment vehicle parking and maintenance, concrete truck washdown area, and a waste disposal area associated with the REDOX plant construction were at this site. The site is located on relatively flat terrain except for natural depressions and evidence that trenches may have been dug. Large amounts of construction materials such as concrete, wood, metal, cans, barrels, and transite are visible. Numerous areas of burned materials were also observed. Photos taken during a site walkover in 1999 are attached.

Waste Site Coordinates:
E-568065.81447 N-133989.50648

Site Dimensions:
Site Length: 425 m (1,394 ft)
Site Width: 280 m (919 ft)
Site Area: 104,179 m^2 (1,121,337 ft^2)
Site Depth: Not applicable
Cover Thickness: Not applicable

Related Site Structure(s): Not applicable.

Site Posting: Not applicable.

Site History

Release Summary: The site contains large areas of metal and concrete debris. There are large numbers of barrels and cans and several areas with evidence of burning. In addition, miscellaneous trash such as glass, lumber and tar, and both friable and non-friable types of asbestos were also associated with the site. Likely waste disposal during the 2-year construction period included trash burning, acid "pickling" (metal preparation) wastes, cooling water from heliarc welding operations (into a french drain), and sandblasting wastes. Other possible contaminants disposed of in this area include gasoline, oil, other lubricants, anti-freeze, and other vehicle-related fluids. The exact locations of the french drain and other disposal units are unknown.

Site: 600-70	Area: S Plant	Category: Shallow - Subsurface

Volume/Mass Discharged: Not applicable.

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: There are six groundwater monitoring wells within the 365 hectares (900 acres) of state-leased land and six other wells near the tract (two belong to the U.S. Ecology). At least one or more of the six on-site wells shows regulatory exceedances of carbon tetrachloride, iodine-124, tritium, coliform bacteria, and iron. Nitrate and technetium-99 plumes also lie below the tract. These plumes have migrated from the 200 West Area and are not associated with sources within the tract. There is no surface water flowing through or adjacent to the 365-hectare (900-acre) tract. One borehole (C4972) was installed 144.8 m (475 ft) southwest of this waste site in 2008 (Figure 1). Data showed minimal contamination but are not considered relevant to this site and are not included.

Nature and Extent of Contamination
No data are available to evaluate shallow soil contamination. Site boundaries are shown on Figure 1.

References:
WIDS General Summary Report for the 600-70 Waste Site.

Site: 600-70	Area: S Plant	Category: Shallow - Subsurface

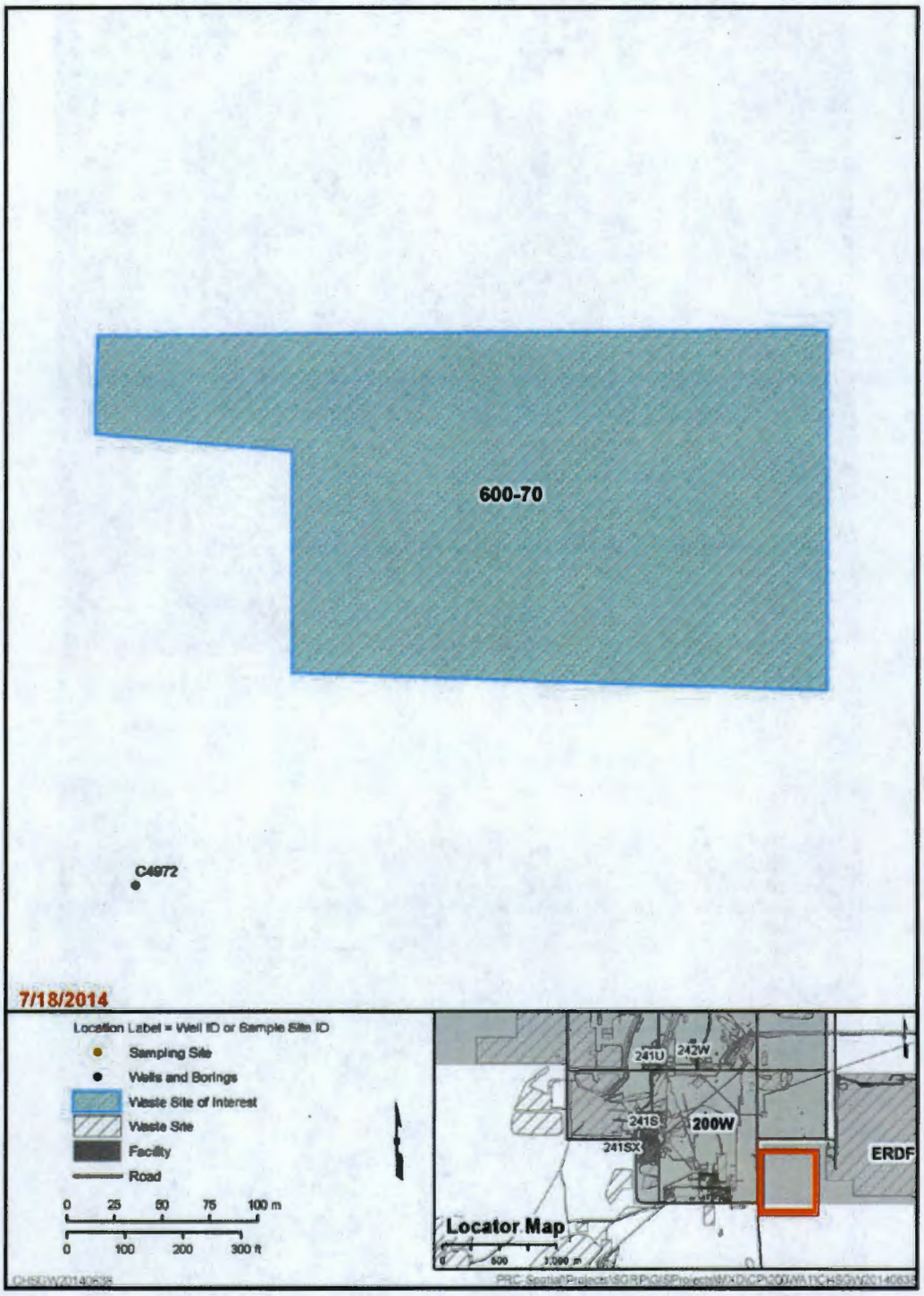


Figure 1. 600-70 Waste Site Map

Site: 600-70	Area: S Plant	Category: Shallow - Subsurface

Figure 2. Photos of Waste Site 600-70 (taken in 1999) (page 1 of 3)

Site: 600-70	Area: S Plant	Category: Shallow - Subsurface

Figure 2. Photos of Waste Site 600-70 (taken in 1999) (page 2 of 3)

Site: 600-70	Area: S Plant	Category: Shallow - Subsurface

Figure 2. Photos of Waste Site 600-70 (taken in 1999) (page 3 of 3)

Site: 2607-WC	Area: S Plant	Category: Intermediate

Site Description

Alternate Site Identification: 2607-WC Septic System
Site Type: Septic Tank and Drain Field
Facility/Geographic Area: S Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Service Dates: 1971

Waste Site Location and Physical Description: The 2607-WC waste site is an inactive septic system located west of the 242-S Evaporator Building and northeast of the 272-S Maintenance Shop (Figure 1). The Waste Information Data System (WIDS) indicates 2607-WC consists of two tanks and a trench-type drain field. However, drawings H-2-46267, *Civil Plot Plan* (Figure 2) and H-2-46287, *Civil Process Drain Lines & Sanitary Facilities Plan, Profiles, & Details* (Figure 3), show a septic system consisting of a 2,839 m (750-gal) septic tank and a seepage pit. Figure 3 shows that the bottom of the seepage pit is approximately 4.9 m (16 ft) below grade. The top of the septic tank is approximately 2.4 m (7 ft) below grade, and the piping between the tank and the pit is approximately 2.4 m (9 ft) below grade. A site visit by Mission Support Alliance (MSA) in July 2015 observed that the 2607-WC septic system appears to be functional, although not currently being used. The control panel is not operating but could be fixed and brought back into service.

Waste Site Coordinates:

E – 566701.58	N – 134584.64 (tank)
E – 566709.75	N – 134584.58 (tank)

Site Dimensions (from WIDS):

Site Length: 6.6 m (21.8 ft)	Site Depth: 2.3 m (7.5 ft)
Site Width: 1.8 m (6.0 ft)	Cover Thickness: Not Specified
Site Area: 11.9 m^2 (130.8 ft^2)	Capacity: 11,356 L (3,000 gal)

Dimensions of the septic tank (from WIDS).

Related Site Structure(s): The 2607-WC septic system is associated with the 272-S Building, the 242-S Building, and MO-027.

Site Posting: Not specified.

Site History

Release Summary: The 2607-WC septic tank and associated drain field are designed to accept sanitary sewer effluent from connected facilities and potentially from the 2607-W9 system. The 2607-WC system received sanitary waste at an estimated rate of 4,770 L (1,260 gal) per day (estimated in 1995).

Site: 2607-WC	Area: S Plant	Category: Intermediate

The system was constructed in 1971 and was pumped twice per week through the 1990s. Use of the system was reduced administratively so regular pumping could be discontinued. HNF-6612, *Hanford Site Sanitary Sewer System Master Plan* indicates the failing system would be replaced in 2013.

Volume/Mass Discharged: Not Specified

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: In 1994, a soil investigation was performed to determine the soil type because the system was beyond its useful life and needed to be replaced. Based on the soil type, it was determined there may not be enough non-contaminated land nearby for a new system.

Nature and Extent of Contamination: Insufficient data are available to evaluate shallow or intermediate soil contamination.

References:

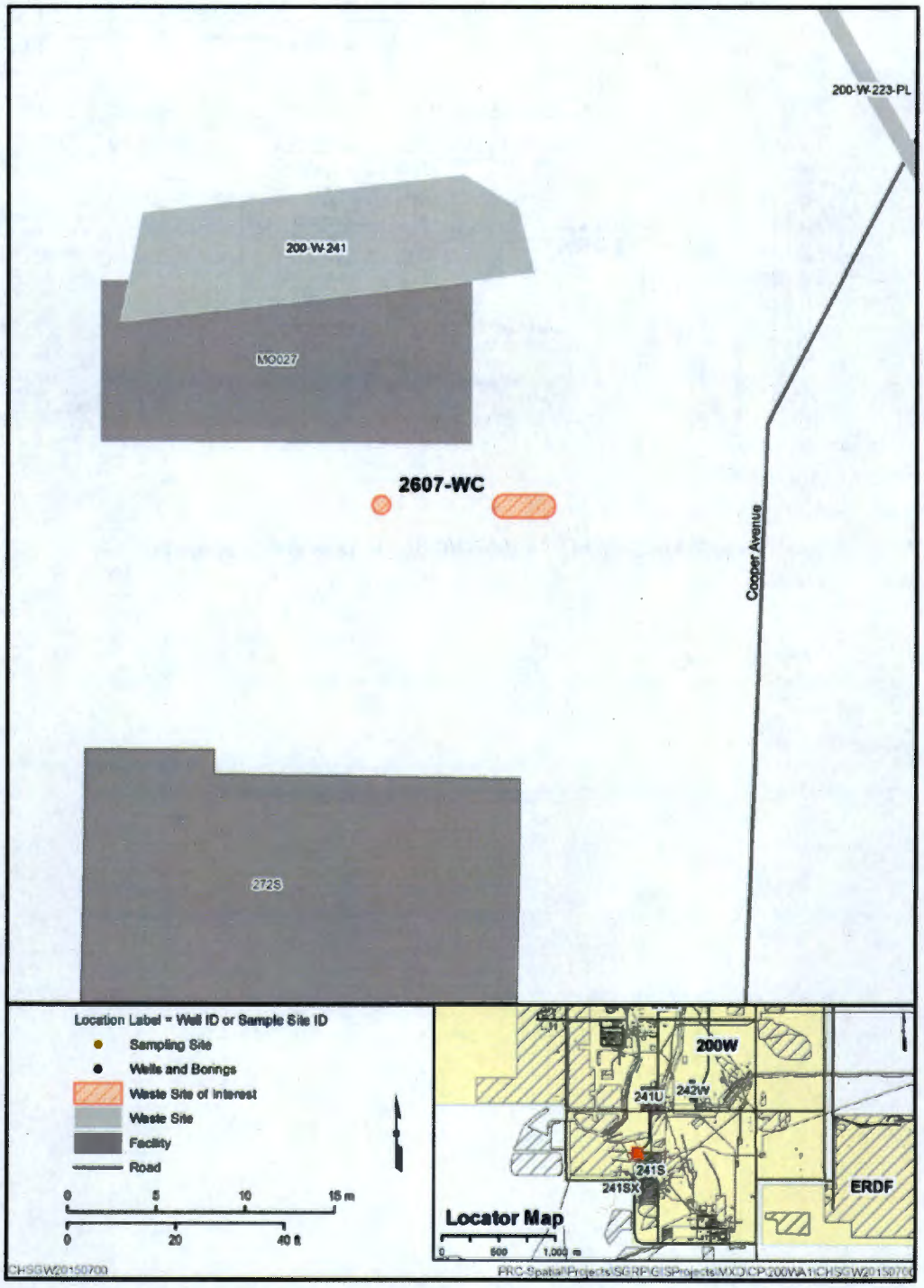
H-2-46267 (drawing), 1977, *Civil Plot Plan*, Rev. 3, Vitro Hanford Engineering Services, Richland, Washington.

H-2-46287 (drawing), 1973, *Civil Process Drain Lines & Sanitary Facilities Plan, Profiles, & Details*, Rev. 1, Vitro Hanford Engineering Services, Richland, Washington.

HNF-6612, 2012, *Hanford Site Sewer System Master Plan*, Rev. 3, Mission Support Alliance, LLC, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0081072H.

WIDS General Summary Report for the 2607-WC Waste Site.

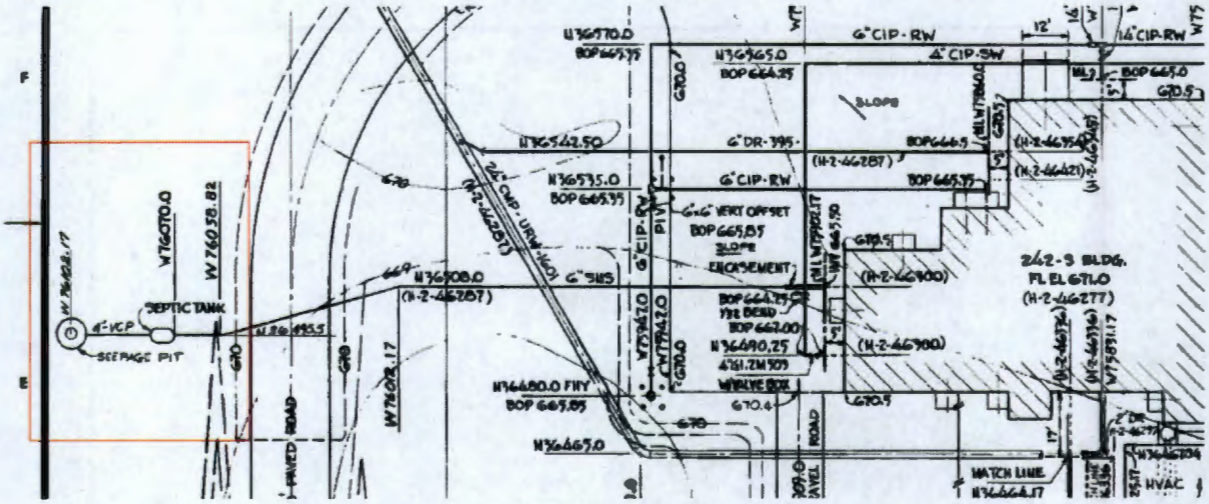
Site: 2607-WC	Area: S Plant	Category: Intermediate



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 2607-WC Waste Site Map

Site: 2607-WC	Area: S Plant	Category: Intermediate

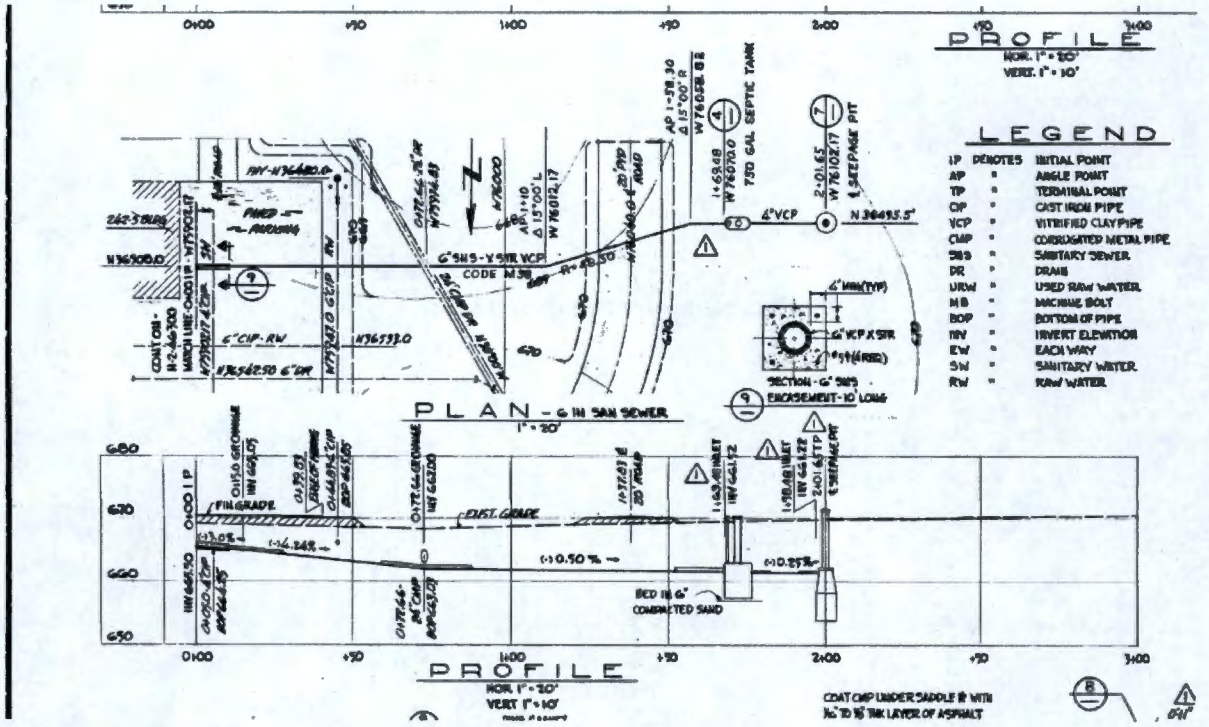


Source: H-2-46267, *Civil Plot Plan*.

Note: Produced from best available copy.

Figure 2. Location of Site 2607-WC Septic Tank and Seepage Pit

Site: 2607-WC	Area: S Plant	Category: Intermediate



Source: H-2-46287 *Civil Process Drain Lines & Sanitary Facilities Plan, Profiles, & Details.*

Note: Produced from the best available copy.

Figure 3. Plan View and Profile of Site 2607-WC Septic Tank and Seepage Pit (As-Built)

Site: 2607-WC	Area: S Plant	Category: Intermediate

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Site: 2607-WZ	Area: S Plant	Category: Intermediate

Site Description

Site Identification: 2607-WZ
Site Type: Septic Tank
Facility/Geographic Area: S-Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Service Dates: 1944 to Unknown

Waste Site Location and Physical Description: The 2607-WZ waste site is an inactive septic system. The location of the waste site is uncertain, but assumed to be located inside the 200 West Area, southwest of the 241-SX Tank Farm and southeast of the 216-S-25 Crib (Figure 1). BHI-00176, *S Plant Aggregate Area Management Study Technical Baseline Report*, indicates that the 2607-WZ septic system was still an active site in 1995.

A Waste Information Data System (WIDS) site code sign marks the assumed location of the waste site (Figure 2).

Waste Site Coordinates:
Lon-566718.99 Lat-134083.30

Site Dimensions:
Site Length: Not specified
Site Width: Not specified
Site Area: Not specified
Site Depth: Not specified
Cover Thickness: Not specified
Capacity: Not specified*

*BHI-00176 indicates that the 2607-WZ septic tank consists of two septic tanks with a 5,678 L (1,500-gal) capacity each.

Related Site Structure(s): The 2607-WZ septic tank is associated with the 241-SX-Tank Farm (WIDS).

Site Posting: No site posting is specified for 2607-WZ.

Site History

Release Summary: The operational history of the 2607-WZ septic tank is unknown.

Volume/Mass Discharged: Unspecified volume of liquid (assumed to be sanitary sewage) from unknown building. The system received effluent at an estimated rate of 22.6 m^3 (789 ft^3) per day in 1987.

Pore Volume Discharged: L/ (vadose zone thickness ft x area ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = Unknown

Site: 2607-WZ	Area: S Plant	Category: Intermediate

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: A geophysical survey using ground penetrating radar was conducted in April 2004 to verify the waste site location. A 30.5 by 30.5 m (100 by 100 ft) area (15.2 m [50-ft] radius around the WIDS sitecode sign) was surveyed. No evidence of a tank was seen in the ground scan. In July 2005, a larger area was scanned north, east, and south of the area surveyed in 2004. A rectangular object 2.1 m (7 ft) deep was noted southwest of the 241-SX Tank Farm (Figure 3).

No site characterization information is available for 2607-WZ. The site is not routinely surveyed or monitored.

Nature and Extent of Contamination: Insufficient data are available to evaluate shallow or intermediate depth soil contamination.

References:

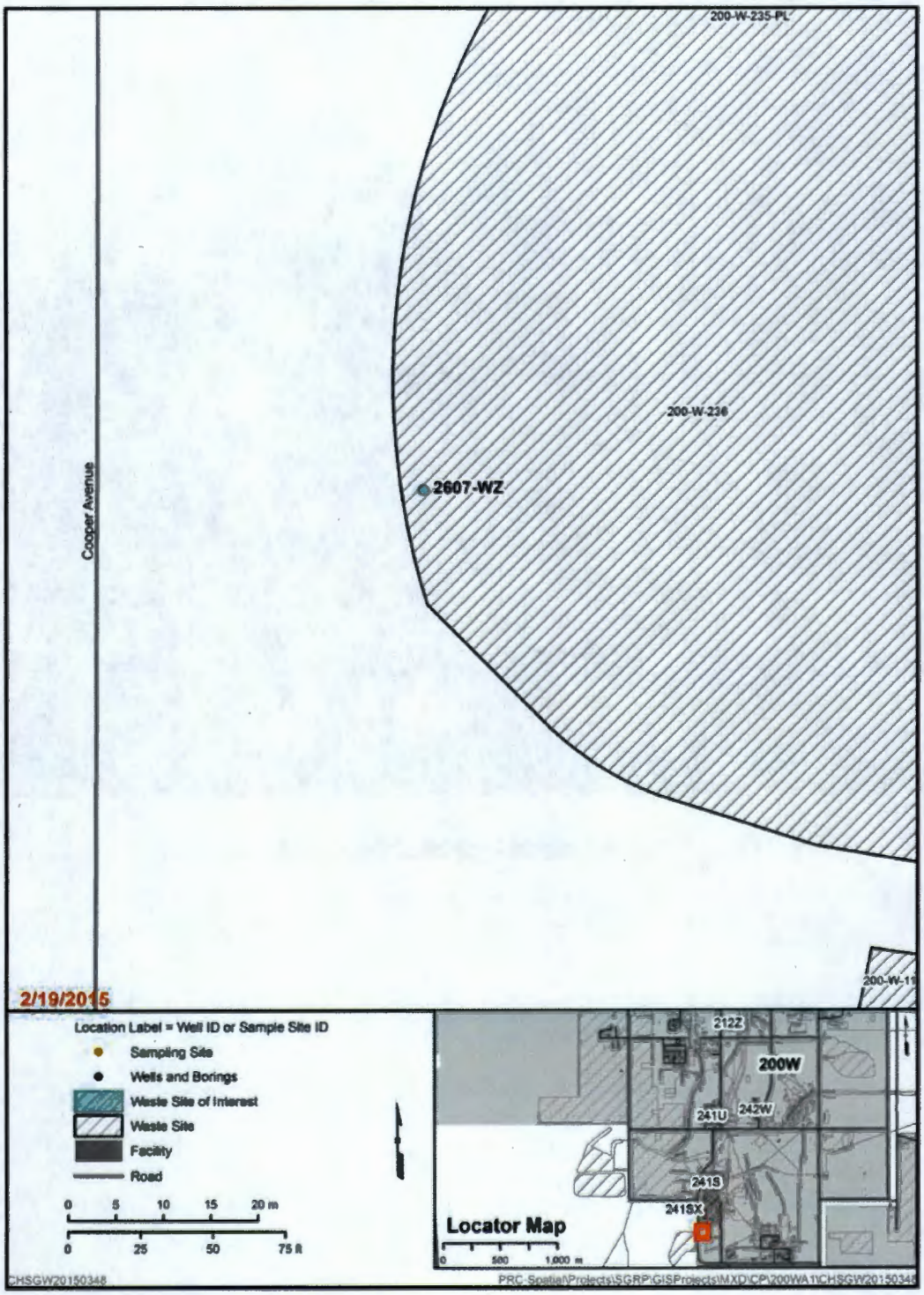
054-280, 2005, *2607-WZ Septic Tank Location @ SX Farm* (including Field Survey Notes), Fluor Federal Services, Richland, Washington.

042-192, 2004, *2607-WZ Septic Tank Location @ SX Farm* (including Field Survey Notes), Fluor Federal Services, Richland, Washington.

BHI-00176, 1995, *S Plant Aggregate Area Management Study Technical Baseline Report*, Rev. 00, Bechtel Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D198038143.

WIDS General Summary Report for the 2607-WZ Waste Site.

Site: 2607-WZ	Area: S Plant	Category: Intermediate



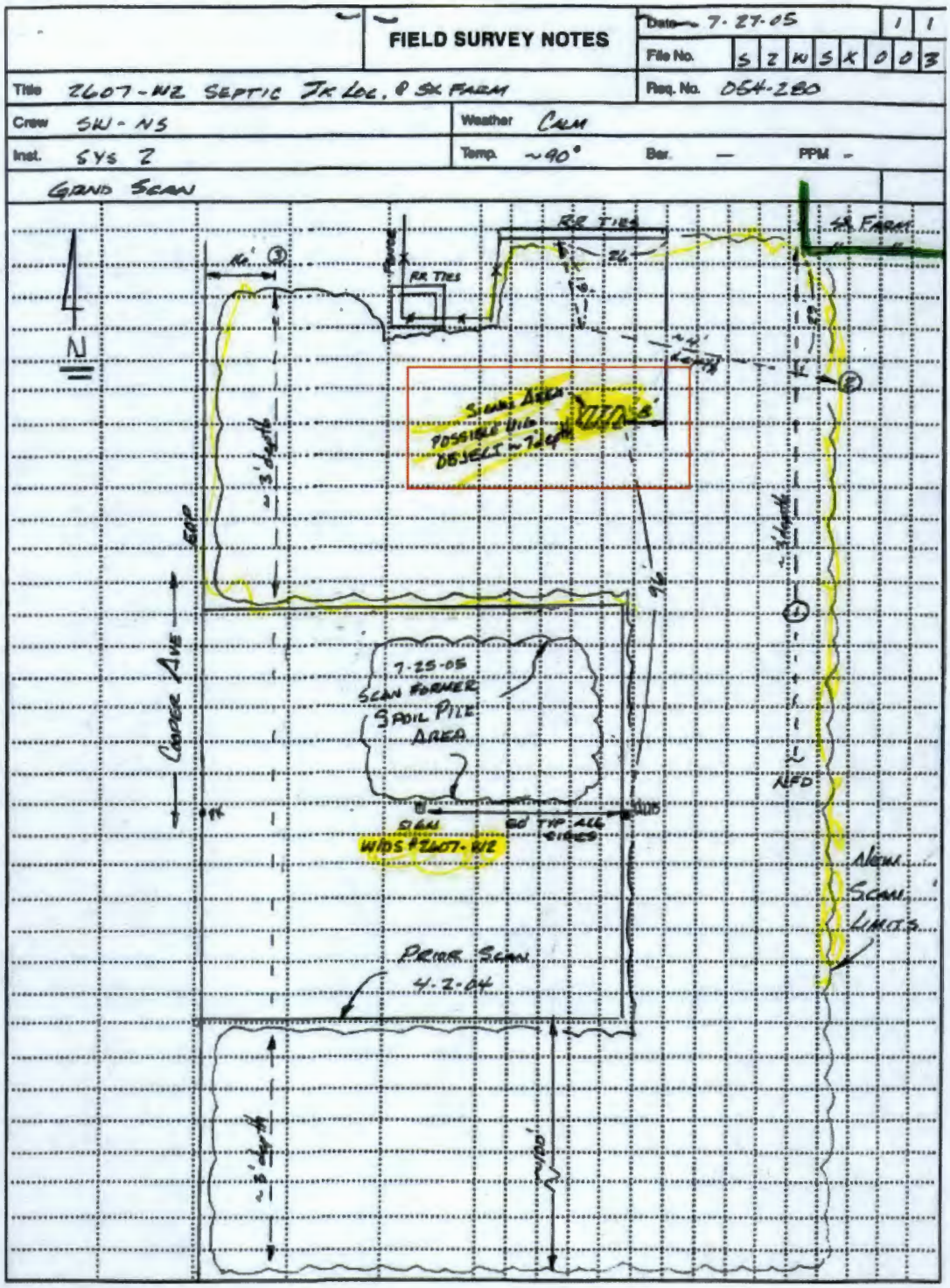
ID = identification

Figure 1. 2607-WZ Waste Site Map

Site: 2607-WZ	Area: S Plant	Category: Intermediate

Figure 2. Sign at Potential Location of the 2607-WZ Waste Site

Site: 2607-WZ	Area: S Plant	Category: Intermediate



Note: Produced from the best available copy.

Figure 3. Potential Location of the 2607-WZ Septic Tank from Geophysical Survey

Site: 2607-WZ	Area: S Plant	Category: Intermediate

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Site: UPR-200-W-36	Area: S Plant	Category: Deep

Site Description

Alternate Site Identification: Groundwater contamination at 216-S-1 and 216-S-2
Site Type: Unplanned Release
Facility/Geographic Area: S Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-PW-1
Service Dates: 1955

Waste Site Location and Physical Description: The unplanned release is groundwater contamination that occurred at a well (299-W22-3) located near the east end of 216-S-1 & 2 Cribs, east of the 241-SX Tank Farm (Figure 1). The test well originally consisted of a 20.3 cm (8-in.) steel casing driven to a depth of 45.7 m (150 ft). In January 1955, the well was extended an additional 50 m (163 ft), beneath the groundwater table, which was at a depth of about 65.5 m (215 ft) in 1955. Although the current well database states well 299-W22-3 is listed as "in use," the as-built drawing shows it was filled with sand. The 216-S-1 & 2 Cribs are currently bare ground, marked by concrete posts and a light chain posted with Underground Radioactive Material Area and Cave-in Potential signs, and the well is painted yellow and marked 299-W22-3.

Waste Site Coordinates:
E-566989.99999 N-134255.03120

Site Dimensions (estimated dimension for the posted Underground Radiation Material Area):
Site Length: 30 m (98.43 ft) Site Depth: Not applicable
Site Width: 15 m (49.21 ft) Cover Thickness: Not applicable
Site Area: 450 m^2 (4,844 ft^2)

Related Site Structure(s): The release is associated with the 216-S-1&2 Cribs and well 299-W22-3.

Site Posting: The site was posted as a Radiation Zone.

Site History

Release Summary: Between June 9 and August 4, 1955, approximately 7,500,000 L (1,900,000 gal) of cell drainage from the D-1 Receiver Tank and redistilled condensate from the D-2 Receiver Tank in the 202-S Facility was discharged to the 216-S-1&2 Cribs, containing an estimated 7,500 Ci of beta/ gamma contamination and 40 grams (1.4 ounces) of plutonium. It is possible that a significant amount of this waste could have been transported directly to the groundwater via the cracked well casing for well 299-W22-3, hence the unplanned release (UPR-200-W-36). No surface contamination was involved with this release because the waste discharged to the cribs through a subsurface distribution system.

Site: UPR-200-W-36	Area: S Plant	Category: Deep

On August 2, 1955, process vapors were smelled near the 216-S-1&2 Cribs. A radiation monitor investigated the area and found the well cap on test well 207-S-11 (alias 299-W22-3) to have a dose rate of 4 rad per hour on the well cap. A water sample was collected from the well on August 4, 1955, that resulted in a personnel contamination incident. The sampler also reported a gurgling sound coming from the well. It was concluded that the well casing had failed or ruptured. The rupture was apparently allowing process waste to bypass the crib soil column and flow directly into the groundwater. After the discovery was confirmed, the well was promptly backfilled with sand.

Volume/Mass Discharged: Not applicable.

Pore Volume Discharged: Unknown.

Waste Inventory: See 216-S-1&2 Cribs.

Previous Site Characterization

Site Characterization Summary: Well 299-W22-3 had been sampled on June 9, 1955, and showed no unusual radioactivity. In 1955, additional wells were drilled around this site to evaluate and monitor groundwater conditions. The inorganics found at the site include: aluminum, nitrate, nitric acid, and sodium. The radionuclides found at this site are: cobalt-60, americium-241, cesium-137, uranium, and plutonium.

Borehole and data summaries are presented in Table 1. Borehole locations are shown in Figure 1. Figure 2 is a geophysical log plot for manmade radionuclides detected at borehole C6554.

Groundwater wells associated with the 216-S-1&2 Cribs had detections above regulatory levels of cyanide, nitrate and radionuclides to include cesium-137, strontium-90, technetium-99, and tritium. Cyanide was measured at 10 µg/L in 1988 and 1990. Nitrate concentrations were first measured at 22,000 µg/L in 1957, were as high as 1.6 million µg/L in 1958, and were last measured at 23,500 µg/L in 2001. For radionuclides, cesium-137 was initially measured at 740 pCi/L in 1956, was 1,000 pCi/L in 1962, and was not detected when last measured in 2001. Strontium-90 was first measured at 200 pCi/L in 1956, was as high as 36,000 pCi/L in 1975, and was last measured at 2.03 pCi/L in 2001. Technetium-99 ranged between 62.5 pCi/L in 1988 to 1,160 pCi/L in 2000. Tritium ranged from 12 million pCi/L 1962 to 18,200 pCi/L in 2001.

Table 1. Borehole Summary for the UPR-200-W-36 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2008	C6554	Inside the S-1 Crib	0 to 62 (GPL only)

GPL = geophysical log
ID = identification

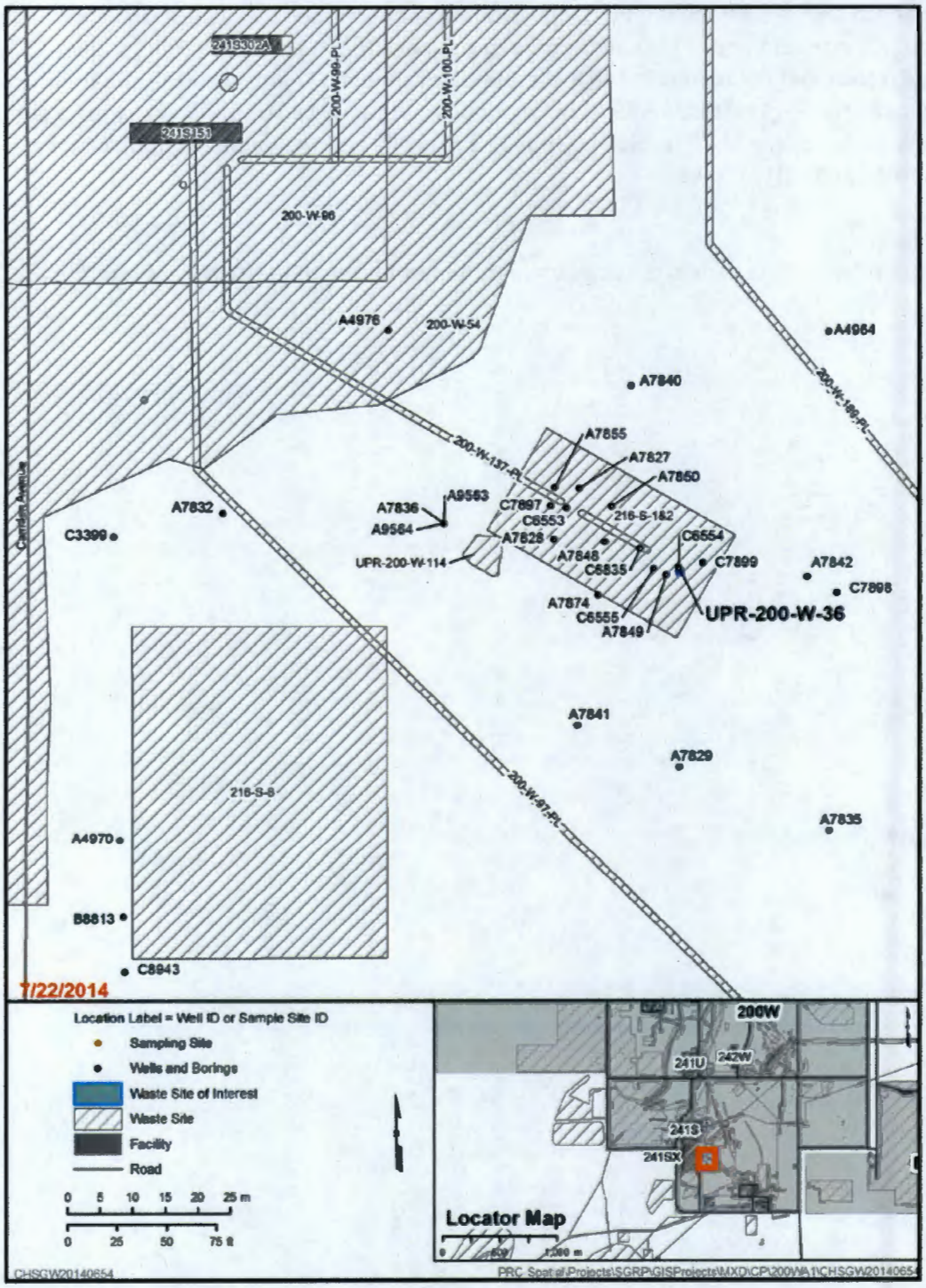
Site: UPR-200-W-36	Area: S Plant	Category: Deep

Nature and Extent of Contamination: Geophysical logging confirmed that vadose-zone contamination (cesium-137) extends through the vadose zone to groundwater. At borehole C6554, cesium-137 was detected throughout the borehole. The highest levels of cesium-137 are below the crib from approximately 10.7 – 19.8 m (35 – 65 ft) below ground surface (bgs). The maximum concentration was measured at approximately 20 million pCi/g at 11.3 m (37 ft) bgs. The depth to groundwater is approximately 68 m (223 ft) bgs.

References:

Waste Information Data System General Summary Report for the UPR-200-W-36 Waste Site.

Site: UPR-200-W-36	Area: S Plant	Category: Deep



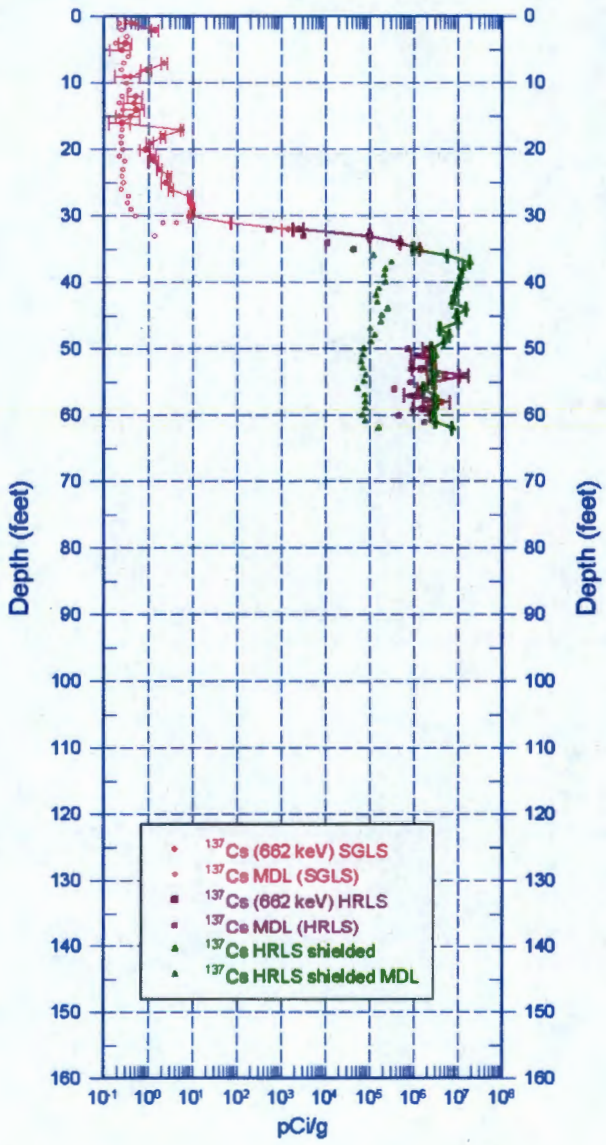
ID = identification

Figure 1. UPR-200-W-36 Waste Site Map

Site: UPR-200-W-36	Area: S Plant	Category: Deep

Stoller
Hanford Office

C6554
Manmade Radionuclides



Zero Reference - Ground surface

HRLS = high rate logging system
MDL = method detection limit
SGLS = spectral gamma logging system

Figure 2. Geophysical Log for Borehole C6554

Site: UPR-200-W-36	Area: S Plant	Category: Deep

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Site: UPR-200-W-41	Area: S Plant	Category: Shallow—Surface

Site Description

Alternate Site Identification: None
Site Type: Unplanned Release
Facility/Geographic Area: 200 Inner Area West
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Occurrence Date: July 7, 1956

Waste Site Location and Physical Description: The unplanned release occurred on the railroad right-of-way from the 202-S Railroad cut to the burial ground (Figure 1).

Waste Site Coordinates:
E-567434.51512 N-134156.21826

Site Dimensions:
Site Area: Unspecified Cover Thickness: 2.7 m (9 ft).

Related Site Structure(s): The site is associated with the 202-S Building and UPR-200-W-42.

Site Posting: Berms on the sides of the railroad cut have been pushed in and posted as an Underground Radioactive Material Area.

Site History

Release Summary: Radiologically contaminated fuel rods were transported to the Reduction-Oxidation (REDOX) Facility for processing by rail car. Contaminated material and equipment were transported to the burial grounds on the same rail road track. Over time, the railroad track became contaminated. On July 7, 1956, contamination was spread along the right-of-way presumably from liquid contained in a box transporting the J-5 Filter and miscellaneous equipment.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Site: UPR-200-W-41	Area: S Plant	Category: Shallow—Surface

Previous Site Characterization

Site Characterization Summary: During the transit of the box containing the J-5 Filter and miscellaneous equipment from the 202-S Building Canyon, spotty contamination up to 1,000 millirads/hour at the surface was spread along the right-of-way from the 202-S Building railroad cut to the burial ground. Six spots of 1,000 millirads/hour were found on the east side of the track on the blacktop at the 16th Avenue crossing. The area was immediately roped off and eventually decontaminated to less than 1,000 cpm. Initial surveys indicated spotty contamination from 100 to 500 millirads/hour along the east site of the right-of-way diminishing in frequency from 19th Avenue to the burial ground. A check of the flat car used for the burial showed low-level contamination on all horizontal surfaces of 10,000 to 20,000 cpm at several areas on the paper in the southeast corner of the flat car to 3,000 millirads/hour at surface. Special fiberglass deposition filters placed along the tracks did not indicate a general contamination spread.

In the mid-1980s, the section of railroad track from the 202-S Tunnel to the REDOX Facility fence was backfilled and stabilized to contain the contamination and prevent parking of railroad cars. In 1997, the section of railroad track extending northwest from the facility boundary fence to the intersection of the track with the first gravel road was backfilled with 0.6 m (2 ft) of clean soil (Figure 2). In 2000, the berms on the sides of the railroad cut were pushed in and an average of 2.1 m (7 ft) of soil was placed over the bottom of the railroad cut [BHI-01373, *Final Report for Interim Stabilization of REDOX Railroad Cut (UPR-200-W-41)*].

A site surveillance walkdown was performed on March 4, 1998.

Nature and Extent of Contamination: Potential radiological contamination in shallow soil. No data are available to evaluate shallow soil contamination. Site boundaries are shown in Figure 1.

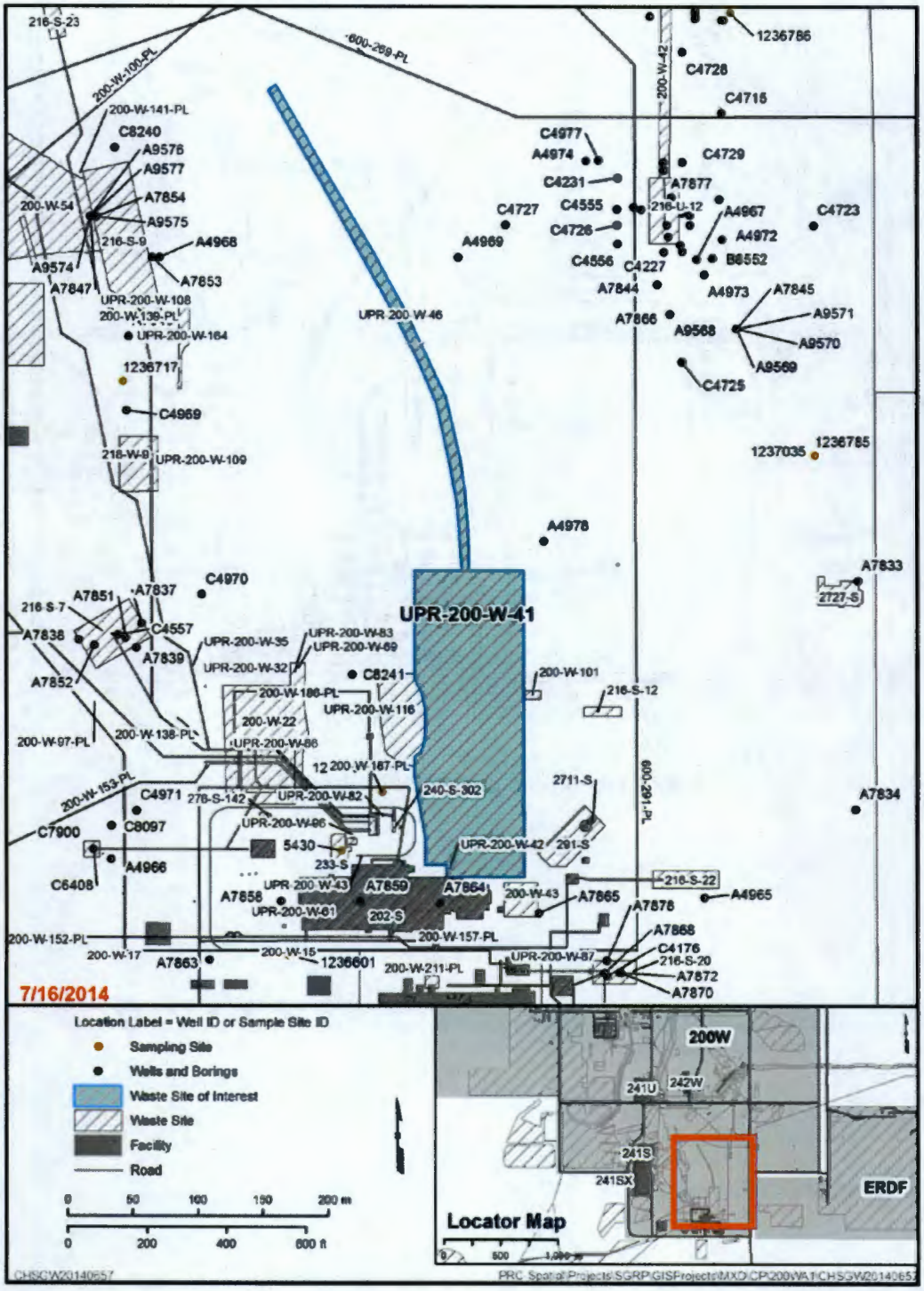
References:

BHI-01147, 1998, *REDOX Railroad Cut Interim Stabilization Final Report*, Rev. 0, Bechtel Hanford Inc., Richland, Washington.

BHI-01373, 2000, *Final Report for Interim Stabilization of REDOX Railroad Cut (UPR-200-W-41)*, Rev. 0, Bechtel Hanford Inc., Richland, Washington.

Waste Information Data System General Summary Report for the UPR-200-W-41 Waste Site.

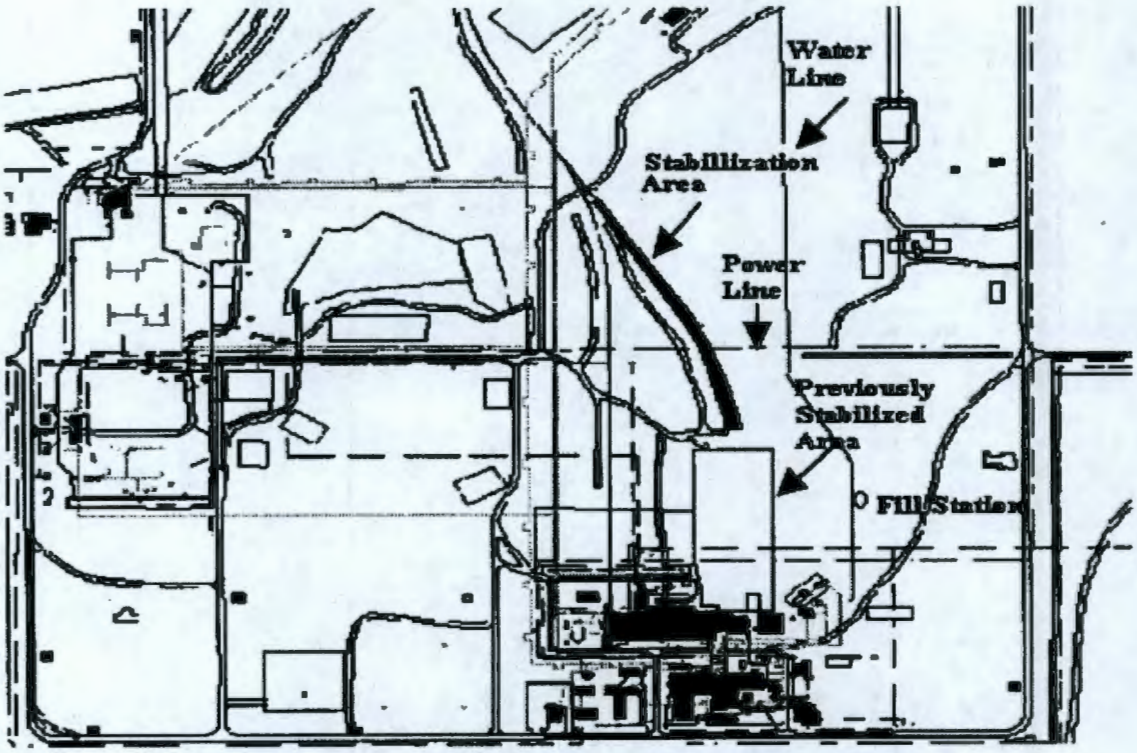
Site: UPR-200-W-41	Area: S Plant	Category: Shallow—Surface



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. UPR-200-W-41 Site Map

Site: UPR-200-W-41	Area: S Plant	Category: Shallow—Surface



Source: BHI-01147, *REDOX Railroad Cut Interim Stabilization Final Report.*

Note: Produced from the best available copy.

Figure 2. Location of Railroad Tracks Stabilized in 1997

Site: UPR-200-W-46	Area: S Plant	Category: Shallow-Surface Only

Site Description

Alternate Site Identification: None
Site Type: Unplanned Release
Facility/Geographic Area: 200 Inner Area West
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Occurrence Date: December 30, 1957

Waste Site Location and Physical Description: The unplanned release occurred during burial operation of a contaminated centrifuge, spotty contamination resulted in the Reduction-Oxidation (REDOX), 234-5Z, and 224-U Plant Areas (Figure 1). Contamination was also found along the railroad right-of-way to the burial ground.

Waste Site Coordinates:
E-567389.43757 N-134421.70308

Site Dimensions:
Site Area: Unspecified Cover Thickness: 0.6 m (2 ft)

Related Site Structure(s): Unspecified.

Site Posting: The railroad cut located inside the REDOX Facility fence is posted as a Contamination Area. The section of covered track form the fence to the first gravel road intersection is posted as an Underground Radioactive Material Area.

Site History

Release Summary: The H-2 Centrifuge was ruthenium contaminated. The centrifuge was placed in a burial box in the REDOX Railroad Tunnel on December 30, 1957. Shortly after placement, fumes were observed coming from the centrifuge. Corrective measures to control the escape of fumes were attempted, but generally unsuccessful. After about 4 hours, fumes escaped the tunnel and circulated throughout the REDOX Building via the ventilation system. By 4:30 a.m., December 31, 1957, respiratory protection was required for the north side of REDOX (233-S Building), and was extended to the south operating areas of REDOX. Considerable surface contamination was deposited in and around REDOX, including construction work areas outside the building. The centrifuge was transported by train to the burial ground. The burial box was observed to be "puffing" slightly as it proceeded to the burial site but no contamination was observed along the railroad right-of-way. The centrifuge was buried at about 10:00 a.m. on December 31, 1957. Dose rates related to the burial were documented as 185 millirads/hour at 177 m (580 ft), and about 2 millirads/hour at 0.8 km (0.5 mi). Radiation field averaging 1 rad/hour during backfilling of the centrifuge box in the burial ground prevented the box

Site: UPR-200-W-46	Area: S Plant	Category: Shallow-Surface Only

from being completely buried in 1 day. Two employees received face and nostril contamination during the backfill operation. Two days later, radiation surveys revealed a general low-level smearable contamination along the railroad right-of-way.

Volume/Mass Discharged: Unspecified.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: In the mid-1980s, the section of railroad track from the 202-S Tunnel to the REDOX Facility fence was backfilled and stabilized to contain the contamination and prevent parking of railroad cars. In 1997, the section of railroad track extending northwest from the facility boundary fence to the intersection of the track with the first gravel road was backfilled with 0.6 m (2 ft) of clean soil. The REDOX crane was decontaminated.

A site surveillance walkdown was performed on February 25, 1998.

Nature and Extent of Contamination: Potential radiological contamination in shallow soil. No data are available to evaluate shallow soil contamination. Site boundaries are shown in Figure 1.

References:
Waste Information Data System General Summary Report for the UPR-200-W-46 Waste Site.

Site: UPR-200-W-46	Area: S Plant	Category: Shallow-Surface Only

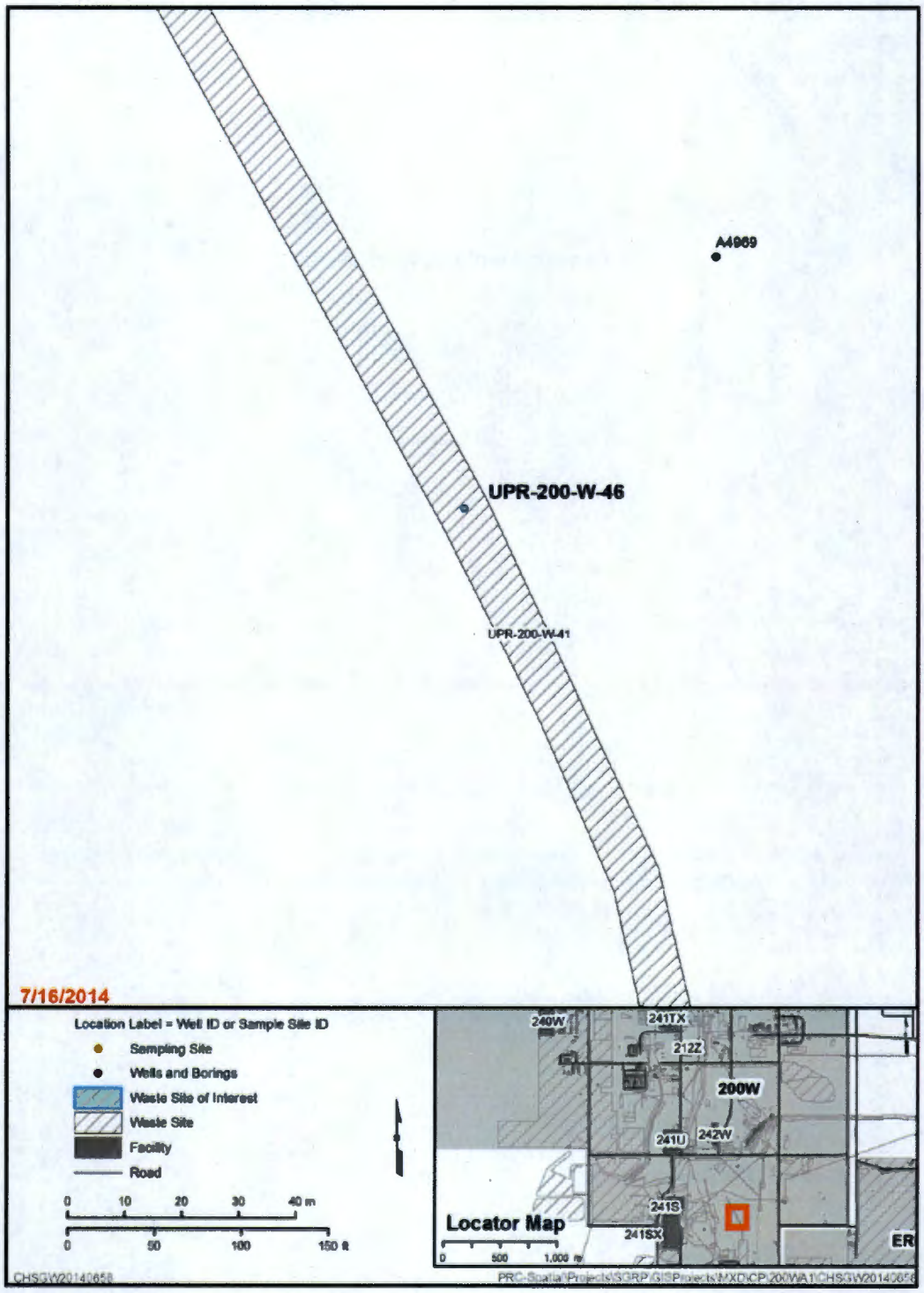


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Figure 1. Map of the UPR-200-W-46 Waste Site

Site: UPR-200-W-46	Area: S Plant	Category: Shallow-Surface Only

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Site: UPR-200-W-51	Area: S Plant	Category: Shallow-Surface Only

Site Description

Alternate Site Identification: None
Site Type: Unplanned Release
Facility/Geographic Area: 200 Inner Area West
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Occurrence Date: September 12, 1958

Waste Site Location and Physical Description: The unplanned release spread southward from the 241-S-151 Diversion Box (inside the 241-S Tank Farm) to approximately 30 m (100 ft) beyond the 200 West Area fence. The plume was approximately 100 m (300 ft) wide. This unplanned release was located is near an area that was surface stabilized in 1992 and known as UPR-200-W-165.

Waste Site Coordinates:
E-566864.87499 N-134257.24996

Site Dimensions:
Site Length: 525 m (1,722 ft) Cover Thickness: Unspecified
Site Width: 91.4 m (300 ft)
Site Area: 47,775 m^2 (516,600 ft^2)

Related Site Structure(s): The unplanned release is associated with the 241-S-151 Diversion Box, UPR-200-W-52, UPR-200-W-114, and the unplanned release affected a portion of the area known as UPR-200-W-165.

Site Posting: The unplanned release area is not marked or posted.

Site History

Release Summary: On September 12, 1958, high pressure steam was applied to the D-8 line of the 241-S Diversion Box in an attempt to unplug it. The pressure bled back into the diversion box and caused a release of contamination. A follow-up survey showed contamination readings up to 1 rad/hour immediately around the box. Contamination levels 30 m (100 ft) south of the diversion box were 50 millirad/hour. A narrow strip of contamination extended southward, across 10th Street, with contamination levels of 4,000 cpm. The contamination continued southward approximately 91.4 m (300 ft) beyond the 200 West Area fence. The particles outside of the 200 West Area fence read on the order of 5,000 cpm. The contaminated areas were posted and the gross contamination was flushed with water.

Volume/Mass Discharged: Unknown.

Site: UPR-200-W-51	Area: S Plant	Category: Shallow-Surface Only

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

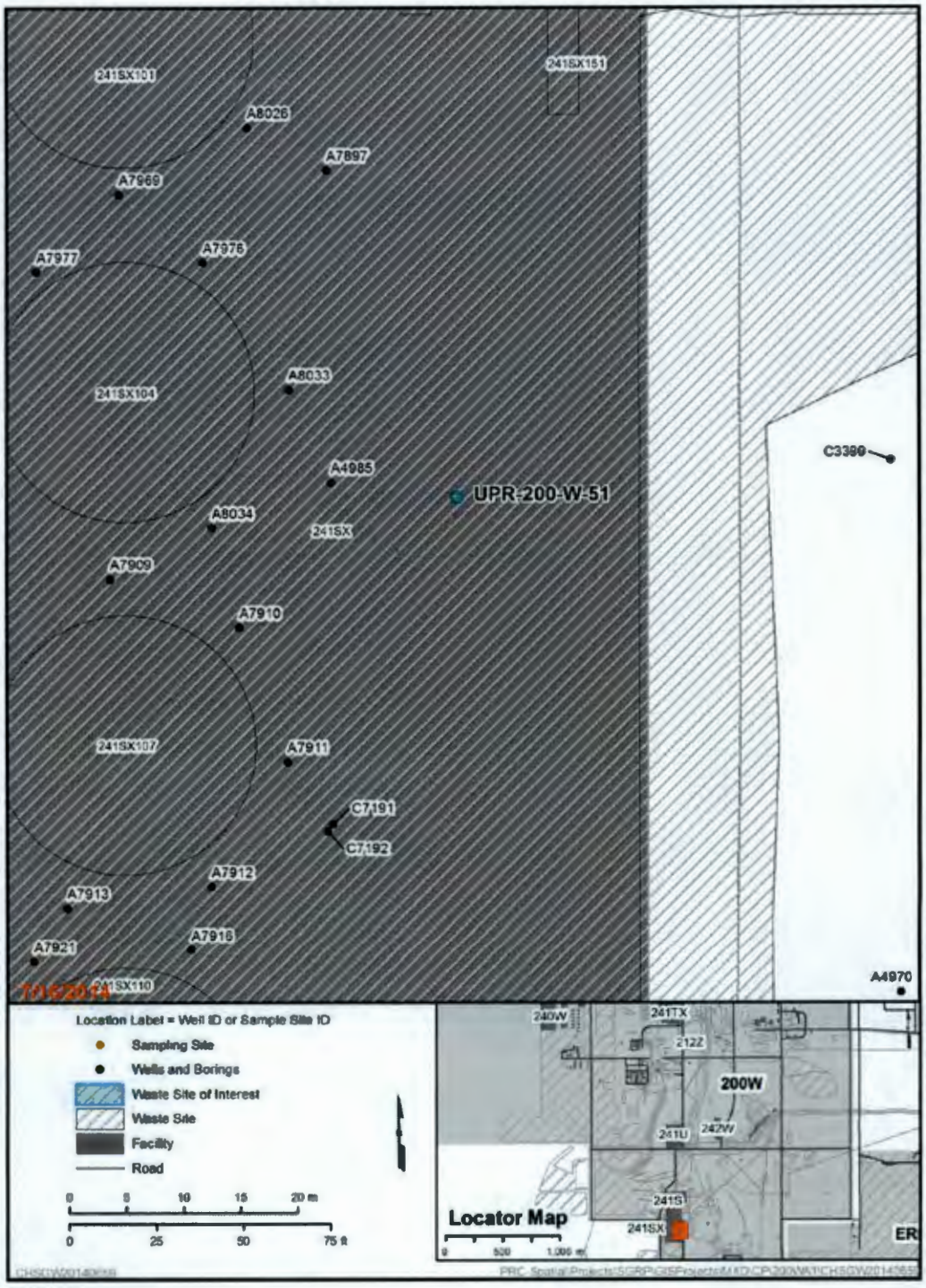
Previous Site Characterization

Site Characterization Summary: Immediately following the unplanned release, the contaminated areas were zoned off and the gross contamination was flushed with water. In 1992, two large soil contamination areas (UPR-200-W-165 and UPR-200-W-114), located northeast and east of the 241-SX Tank Farm, were scraped and consolidated onto other existing nearby waste sites and into the 207-S Retention Basin. After collecting soil samples of the scraped areas, the areas were removed from radiological control. Some residual contamination from this unplanned release may have contributed to the contaminated soil in these areas.

Nature and Extent of Contamination: Potential radiological contamination in the surface soil (0 – 0.3 m [0 – 1 ft]). No data are available to evaluate shallow soil contamination. Site boundaries shown in Figure 1 are tentative.

References:
Waste Information Data System General Summary Report for the UPR-200-W-51 Waste Site.

Site: UPR-200-W-51	Area: S Plant	Category: Shallow-Surface Only



ID = identification

Figure 1. UPR-200-W-51 Waste Site Map

Site: UPR-200-W-51	Area: S Plant	Category: Shallow-Surface Only

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Site: UPR-200-W-82	Area: S Plant	Category: Shallow-Subsurface

Site Description

Alternate Site Identification: UN-200-W-82, Contamination Spread at 240-S-151
Site Type: Unplanned Release
Facility/Geographic Area: S Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: Not applicable
Service Dates: Not applicable

Waste Site Location and Physical Description: The site is a contamination spread occurred in the soil at the north and east side of the 240-S-151 Diversion Box and the 240-S-302 Catch Tank, on the north side of the Reduction-Oxidation Facility (202-S) (Figure 1).

Waste Site Coordinates:
E-567376 (m) N-134038 (m)

Site Dimensions:
Site Length: 18.29 m (60.00 ft)
Site Width: 10.67 m (35.00 ft)
Site Area: 195.10 m^2 (2,100 ft^2)
Site Depth: Not applicable
Cover Thickness: Not applicable

Related Site Structure(s): The site is associated with the 240-S-151 Diversion Box and the 240-S-302 Catch Tank.

Site Posting: The 240-S-151 Diversion Box is posted with radiological warning signs. A Waste Information Data System (WIDS) sign has been placed at the approximate location of the release.

Site History

Release Summary: A piece of equipment moved in for the 240-S-151 Diversion Box installation, was caught under the late snow cover. Moisture from the melting snow and rain penetrated the plastic wrap, and ran off toward the catch tank area spreading contamination over the areas of run-off. Traffic from daily routine surveillance of the catch tank liquid levels apparently tracked some contamination to the chain boundary and step-off area. The release consisted of beta/gamma particulates spread with readings up to 80,000 cpm found outside the radiation zone.

Volume Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Site: UPR-200-W-82	Area: S Plant	Category: Shallow-Subsurface

Previous Site Characterization

Site Characterization Summary: A radiation monitor survey done in January 1980 detected high levels of contamination ranging from 40,000 to 60,000 disintegrations per minute inside the radiation zone. The maximum reading outside the radiation zone was 80,000 cpm.

Because of the size of the contaminated area, manual clean-up was impractical. In 1980, the area around the diversion box was covered with Fabro Film. Some specks beyond the radiation zone were removed and taken to a burial ground.

Nature and Extent of Contamination:
No data are available to evaluate shallow soil contamination. Approximate location of waste site is shown in Figure 1.

References:
All information from WIDS General Summary Report for the UPR-200-W-82 Waste Site unless otherwise noted.

Site: UPR-200-W-82	Area: S Plant	Category: Shallow-Subsurface

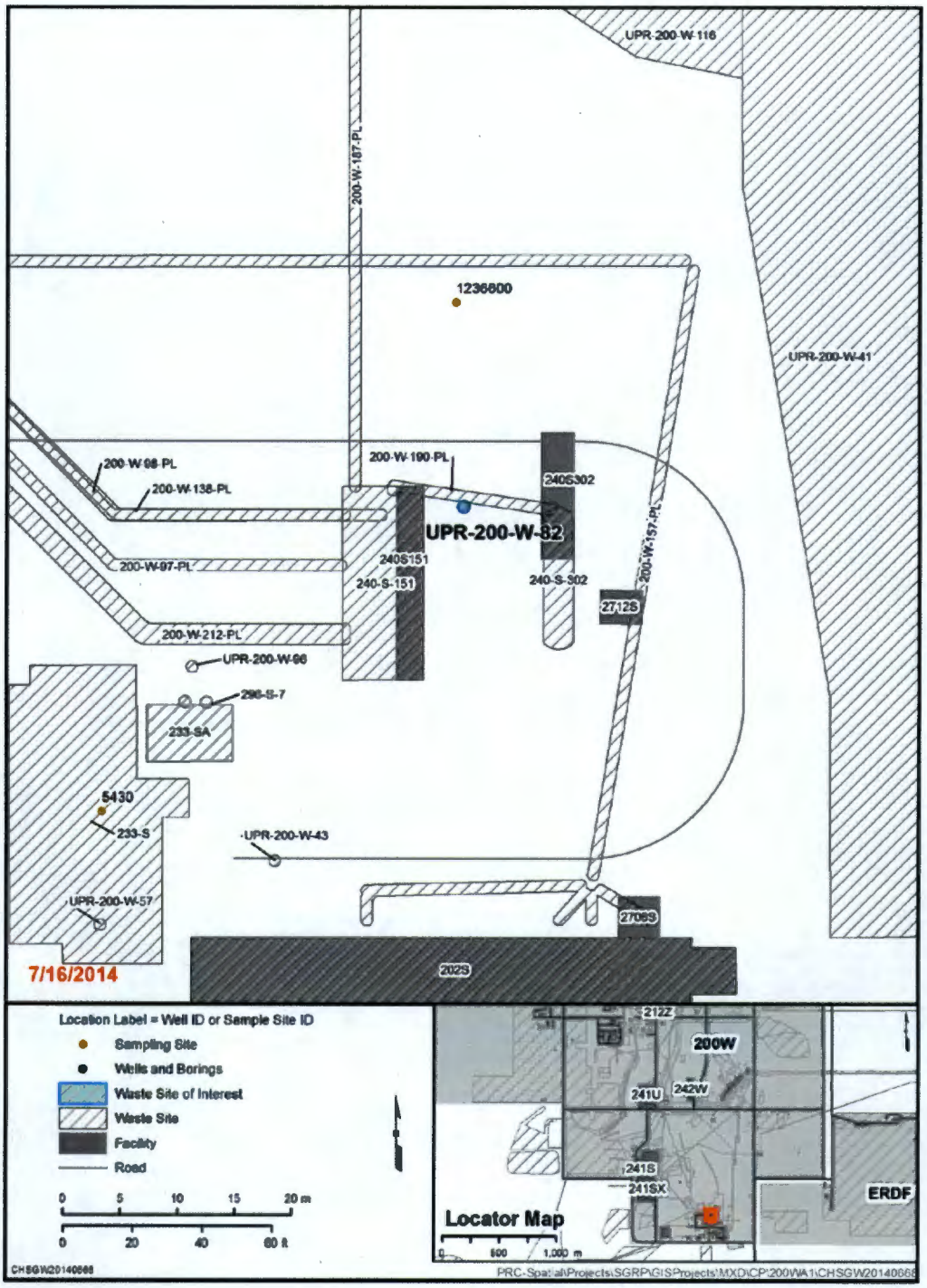

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Figure 1. UPR-200-W-82 Site Map

Site: UPR-200-W-82	Area: S Plant	Category: Shallow-Subsurface

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Site: UPR-200-W-116	Area: S Plant	Category: Shallow – Surface

Site Description

Alternate Site Identification: None
Site Type: Unplanned Release
Facility/Geographic Area: S Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Service Dates: 1968 to 1981

Waste Site Location and Physical Description: The release affected an area east of the 204-S Unloading Station, north of the 202-S Building and west of the Reduction-Oxidation (REDOX) railroad cut (Figure 1). The area was bladed into windrows in 1974. In 1993, the area was interim stabilized. The contaminated soil was scraped and pushed eastward, consolidating it next to the REDOX railroad cut soil berm.
A portion of the chemical spur railroad tracks and a section along the western perimeter of the posted area was interim stabilized with 46 to 61 cm (18 to 24 in.) of uncontaminated soil. The site currently has a light chain barricade.

Waste Site Coordinates:
E-567389.98362 N-134113.20959

Site Dimensions:
Site Length: 66 m (217 ft)
Site Width: 36 m (118 ft)
Site Area: ~0.24 hectares (~0.6 acres)
Site Depth: Not applicable
Cover Thickness: 46 to 61 cm (18 to 24 in.)

Related Site Structure(s): UPR-200-W-116 was associated with the 204-S Waste Storage Tank, the 204-S Railroad Tanker Waste Unloading Station, and 200-W-22.

Site Posting: The site is posted with Underground Radioactive Material Area signs.

Site History

Release Summary: The area designated as UPR-200-W-116 in 1980 was contaminated with particulates spreading by wind from the 204-S Waste Storage Tank exhaust and the related Railroad Tanker Waste Unloading Station. Radioactive particulates traveled eastward and affected an area approximately 0.8 hectares (2 acres) in size. In 1974, ground contamination, with radioactive levels up to 20,000 cpm, was identified. It is possible that UPR-200-W-69 (a 1973 contamination spread from a contaminated drain pit) also contributed to the contamination at this location.

Volume/Mass Discharged: Unknown.

Site: UPR-200-W-116	Area: S Plant	Category: Shallow – Surface

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: Routine surface radiological surveys are done annually. The September 10, 1981, survey found many specks ranging from 200 to 3,000 cpm.

Nature and Extent of Contamination: No data are available to evaluate shallow soil contamination. Site boundaries are shown on Figure 1.

References:
Waste Information Data System General Summary Report for the UPR-200-W-116 Waste Site.

Site: UPR-200-W-116	Area: S Plant	Category: Shallow – Surface

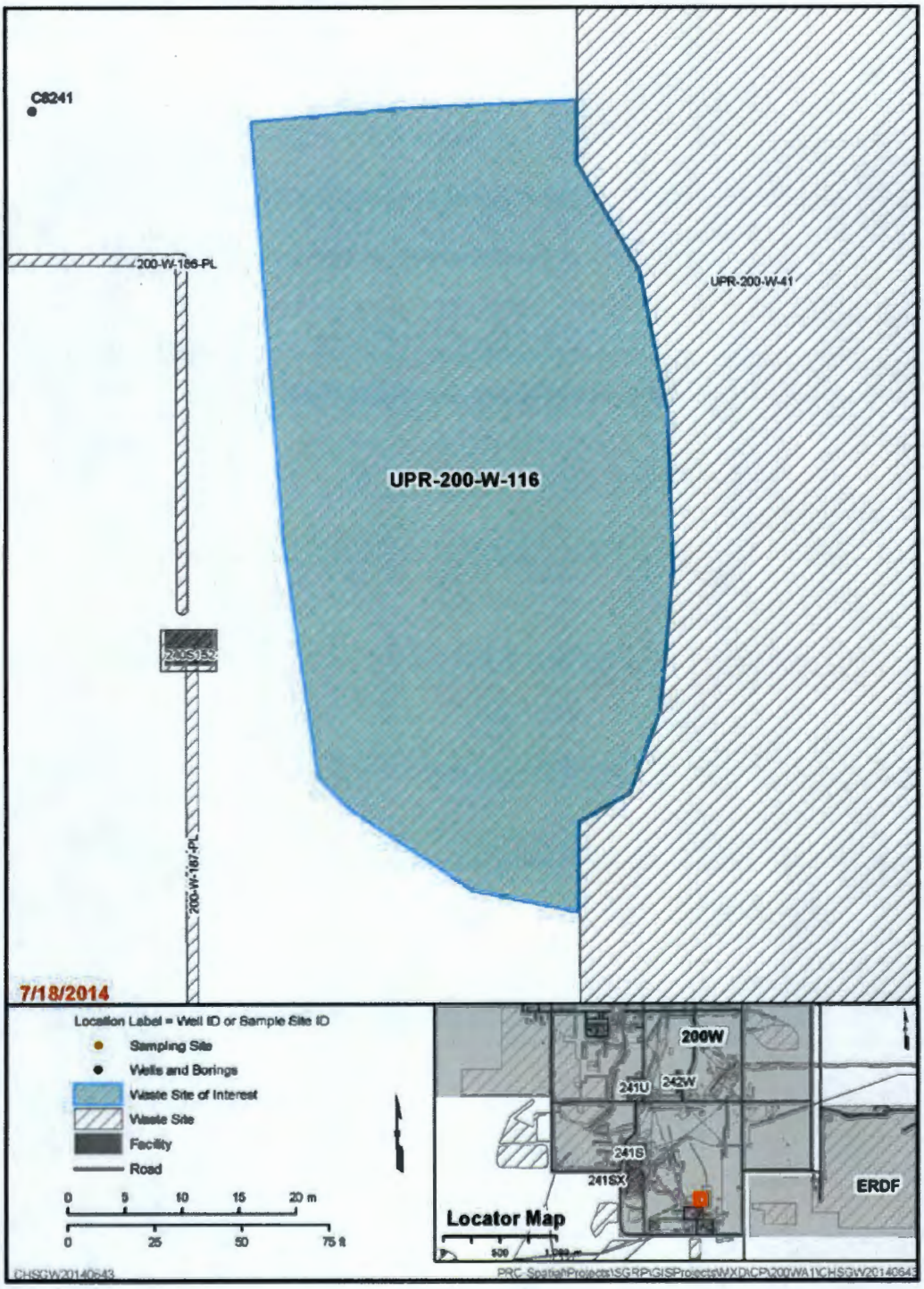

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Figure 1. UPR-200-W-116 Site Map

Site: UPR-200-W-116	Area: S Plant	Category: Shallow – Surface

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Site: UPR-200-W-165	Area: S Plant	Category: Shallow – Surface Only

Site Description

Alternate Site Identification: UPR-200-W-165; Contamination Area East of 241-S; UN-216-W-30
Site Type: Unplanned Release
Facility/Geographic Area: S Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: Unknown
Service Dates: Unknown

Waste Site Location and Physical Description: The UPR-200-W-165 waste site is located east of the 241-S, 241-SX, and 241-SY Tank Farms and west of the 216-S-9 Crib in the 200 West Area. The site was interim stabilized over time from 1992 through 1995. The site was evaluated and reclassified to Rejected in 2014. It was originally a radiologically posted area that was scraped and the contaminated soil combined with other waste sites. The site had been a large posted Surface Contamination Area, located east of the 241-S Tank Farm, north of the steam line. The 216-S-23 and 216-S-9 Cribs and the 216-S-18 excavation were inside the Surface Contamination Area posting. Some of the contaminated soil was placed on top of the 216-S-9, 216-S-8, 216-S-1 &2, and 216-S-23 Cribs, while a portion of the contaminated soil was used for backfill in the 216-S-18 depression. After collecting soil samples of the scraped area, portions of the area was removed from radiological control in 1993.

Waste Site Coordinates:
E- 567037.4376 N- 134632.7812

Site Dimensions:
Site Length: 115.0 m (377.3 ft) Site Depth: Not specified
Site Width: 115.0 m (377.3 ft) Cover Thickness: Not specified
Site Area: 13,354.6 m^2 (143,747.86 ft^2)
Approximate dimensions of posted contamination area prior to being scraped.

Related Site Structure(s): UPR-200-W-165 was associated with contamination migration from operational activities in the 241-S, 241-SX, and 241-SY Tank Farms.

Site Posting: The site is no longer marked or posted. Areas decontaminated during the stabilization action between 1992 and 1995 resulted in these areas being released from radiological posting. The areas where the contaminated soil was consolidated are posted individually as part of those Waste Information Data System (WIDS) sites.

Site Characterization Summary: The stabilization effort divided the contaminated area into two parts. The north part (north of the northern-most steam line) was done first and was completed in July 1992. The southern portion (the area between the two steam lines) became larger during the stabilization effort as more and deeper contamination was identified during the initial scraping. Some of the

Site: UPR-200-W-165	Area: S Plant	Category: Shallow – Surface Only

contamination was placed on 216-S-9 Crib. The 216-S-9 Crib and the contaminated soil were covered with clean dirt and reposted as an Underground Radioactive Material Area in July 1992. Approximately 460 m^2 (5,000 ft^2) were scraped down to 46 cm (18 in.) below the original surface and released from radiological controls. Soil samples for radiological screening were collected and radiological surveys were done prior to releasing areas from radiological control. The results of these samples are presented in BHI-00257, *UN-216-W-24 and UN-216-W-30 Interim Stabilization Final Report*, Appendix A.

Because of accessibility problems near the steam line, the remaining contamination was consolidated and posted as a Soil Contamination Area and left to be addressed at a later date. This area was completed in 1995 when the inactive steam line was removed. The remaining contamination was pushed into the 216-S-18 Trench and surface stabilized. A total of 45 sample points were randomly selected from the northern portion and 23 sample points were randomly selected from the southern portion of the area. After collecting soil samples of the scraped area, the site was removed from radiological control.

Figures 2 through 6 provide information on the limits of the areas decontaminated during the interim stabilization effort.

Site History

Release Summary: Radioactive surface contamination migrated from the 241-S, 241-SX, and 241-SY Tank Farms, eventually contaminating an area of approximately 4.7 hectares (11.5 acres).

Volume/Mass Discharged: Not specified.

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: Characterization data for this site is limited to the radiological screening data presented in the Interim stabilization report (BHI-00257). No other soil or geophysical data are available within the site boundary.

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 – 15 ft] below ground surface): Potential radiological contamination at the surface.

Site: UPR-200-W-165	Area: S Plant	Category: Shallow – Surface Only

References:

BHI-00257, 1995, *UN-216-W-24 and UN-216-W-30 Interim Stabilization Final Report*, Rev. 00, Bechtel Hanford, Inc., Richland, Washington.

WIDS General Summary Report for the UPR-200-W-165 Waste Site.

Site: UPR-200-W-165	Area: S Plant	Category: Shallow – Surface Only

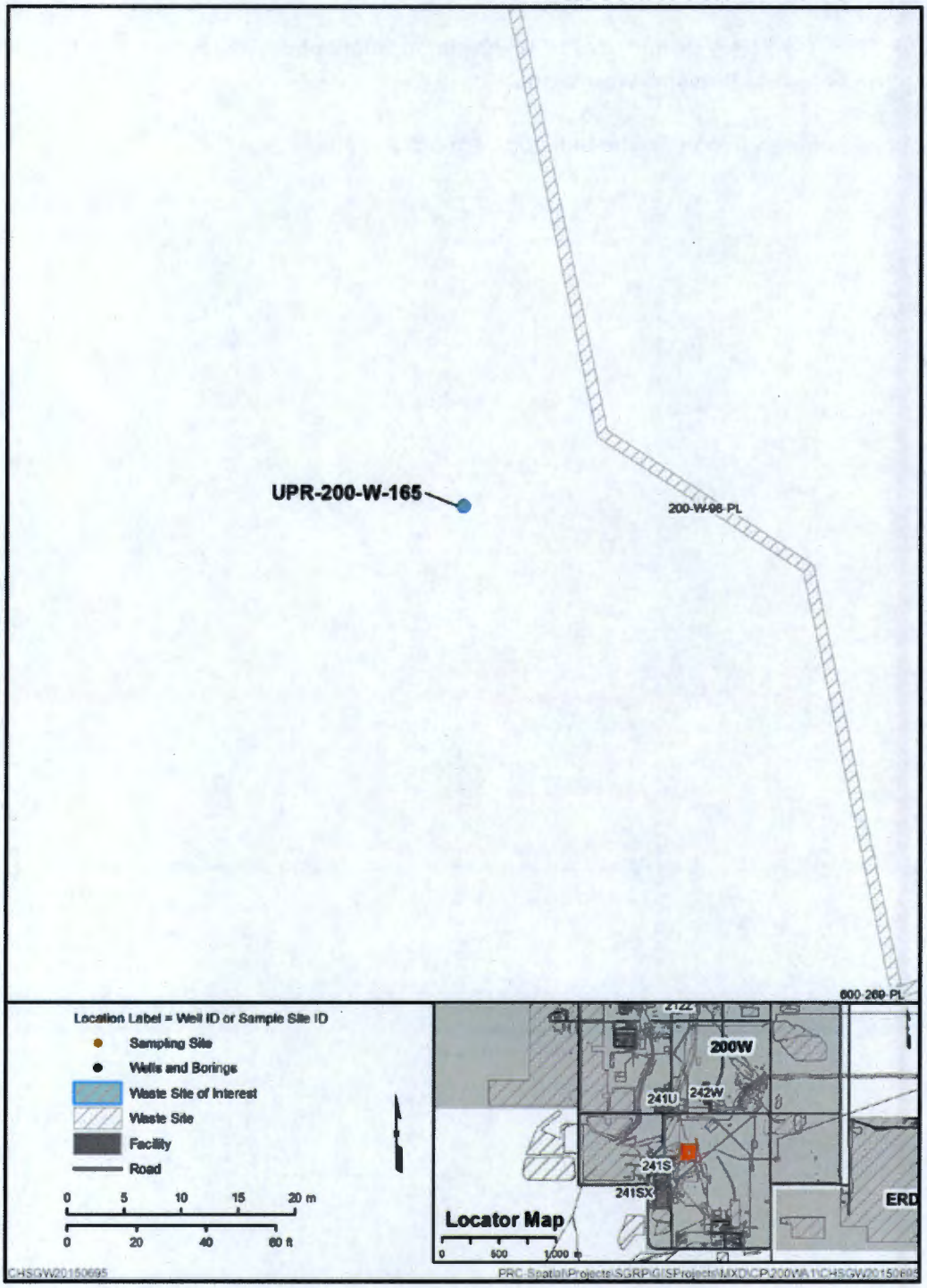

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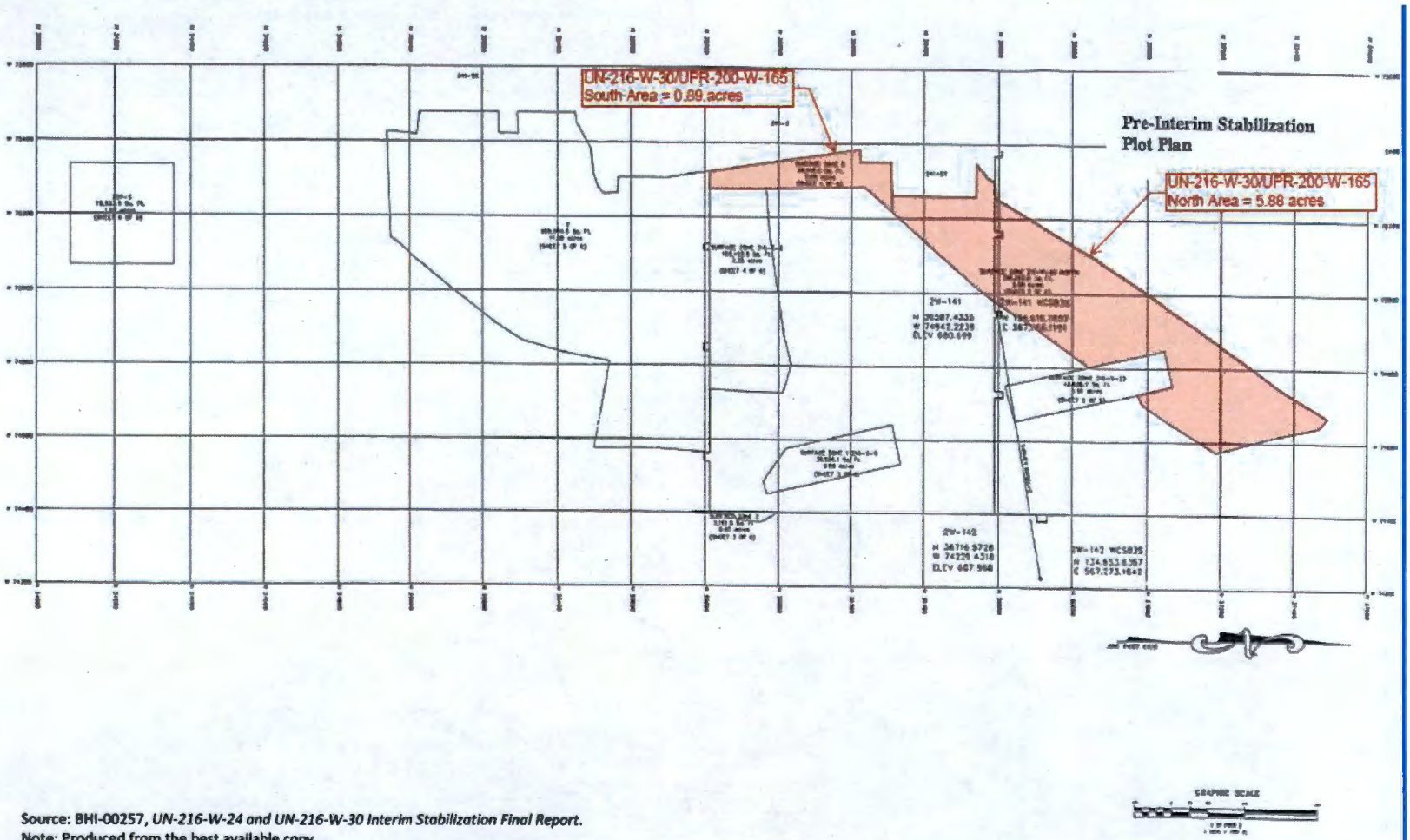
Figure 1. UPR-200-W-165 Waste Site Map

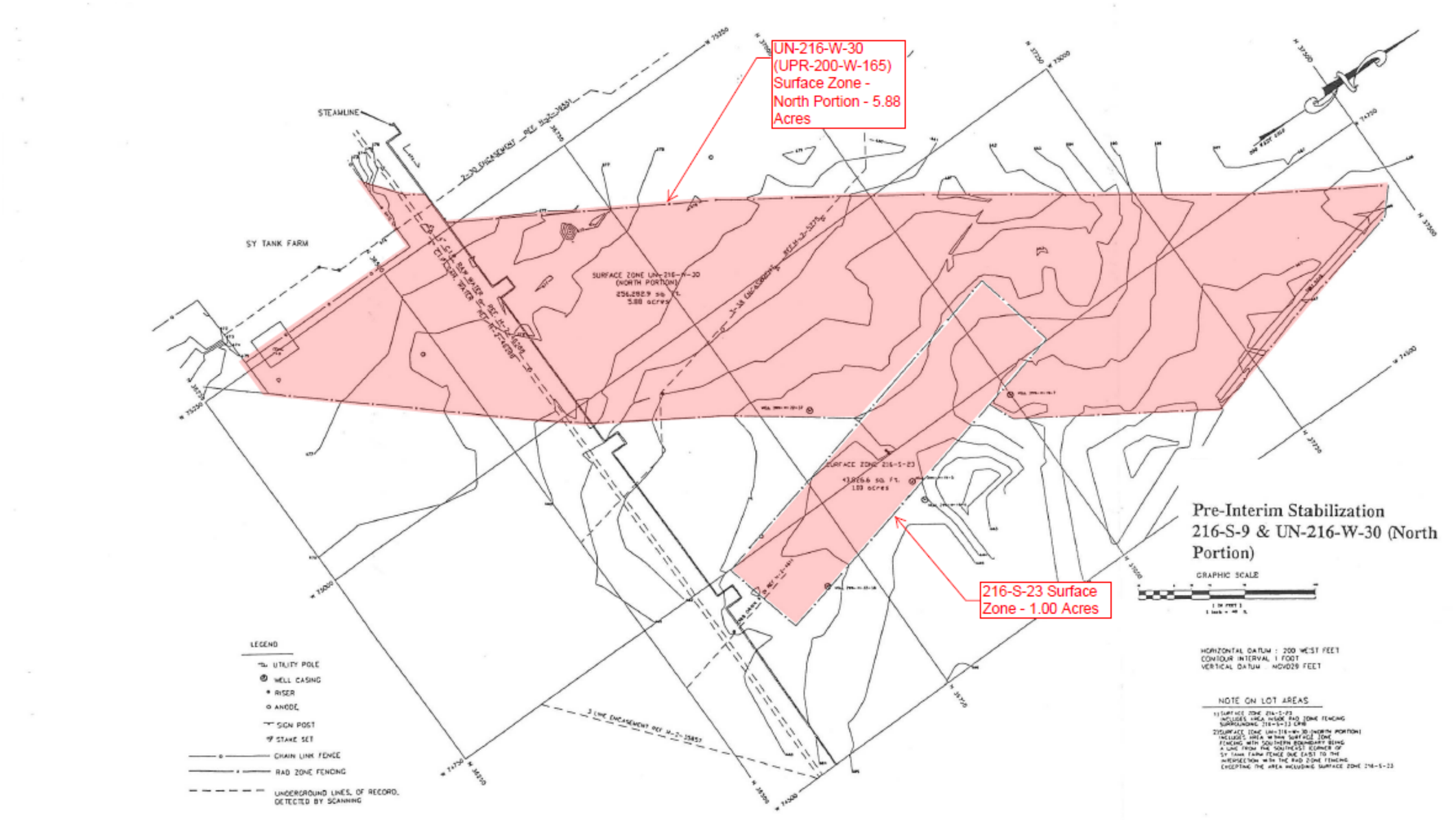
Site: UPR-200-W-165	Area: S Plant	Category: Shallow – Surface Only



Source: BHI-00257, *UN-216-W-24 and UN-216-W-30 Interim Stabilization Final Report.*
Note: Produced from the best available copy.

Figure 2. UPR-200-W-165 Pre-Stabilization Soil Contamination Areas

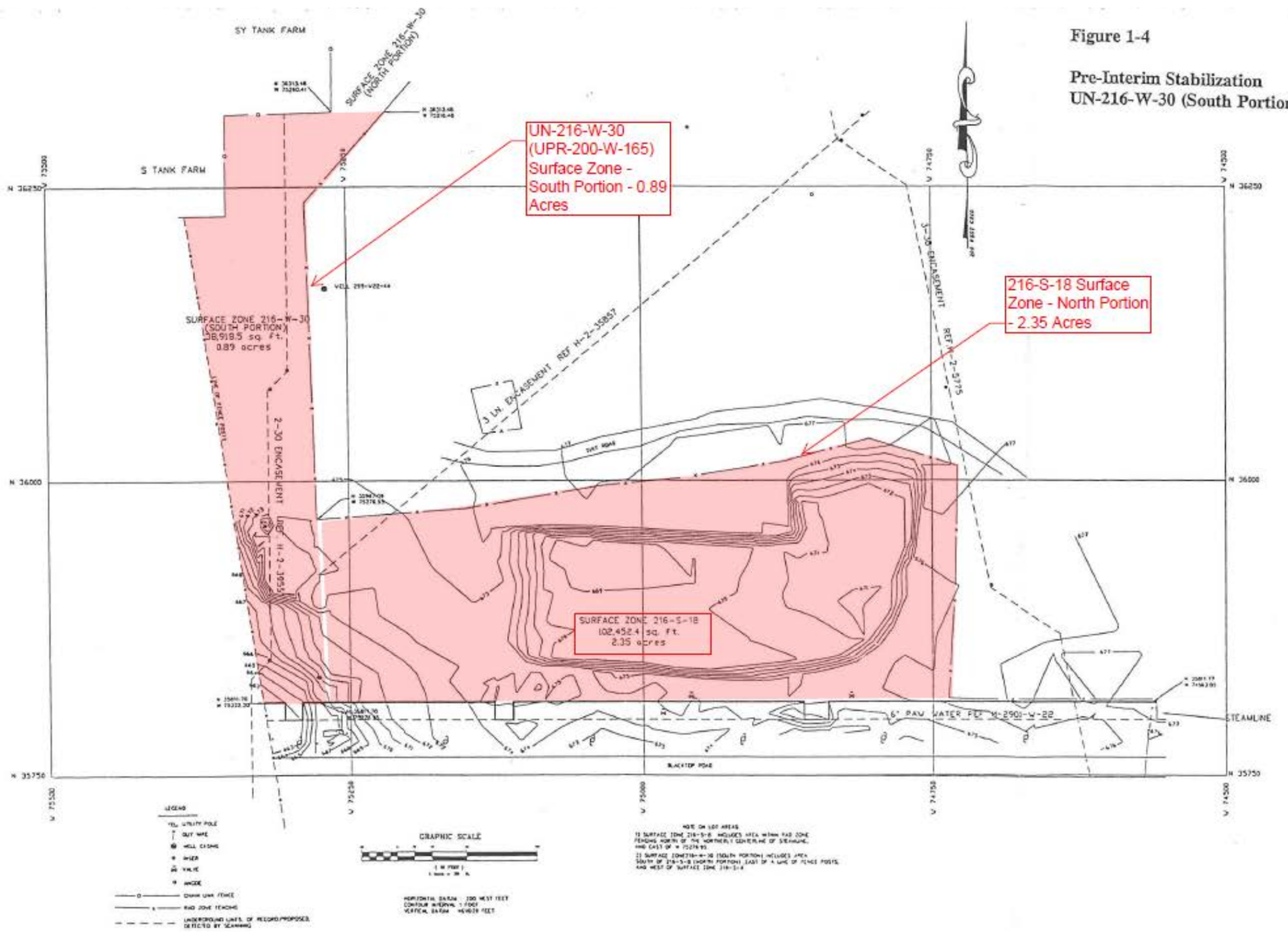
Site: UPR-200-W-165	Area: S Plant	Category: Shallow – Surface Only



Source: BHI-00257, *UN-216-W-24 and UN-216-W-30 Interim Stabilization Final Report*.
Note: Produced from the best available copy.

Figure 3. UPR-200-W-165 Pre-Stabilization Soil Contamination North Portion

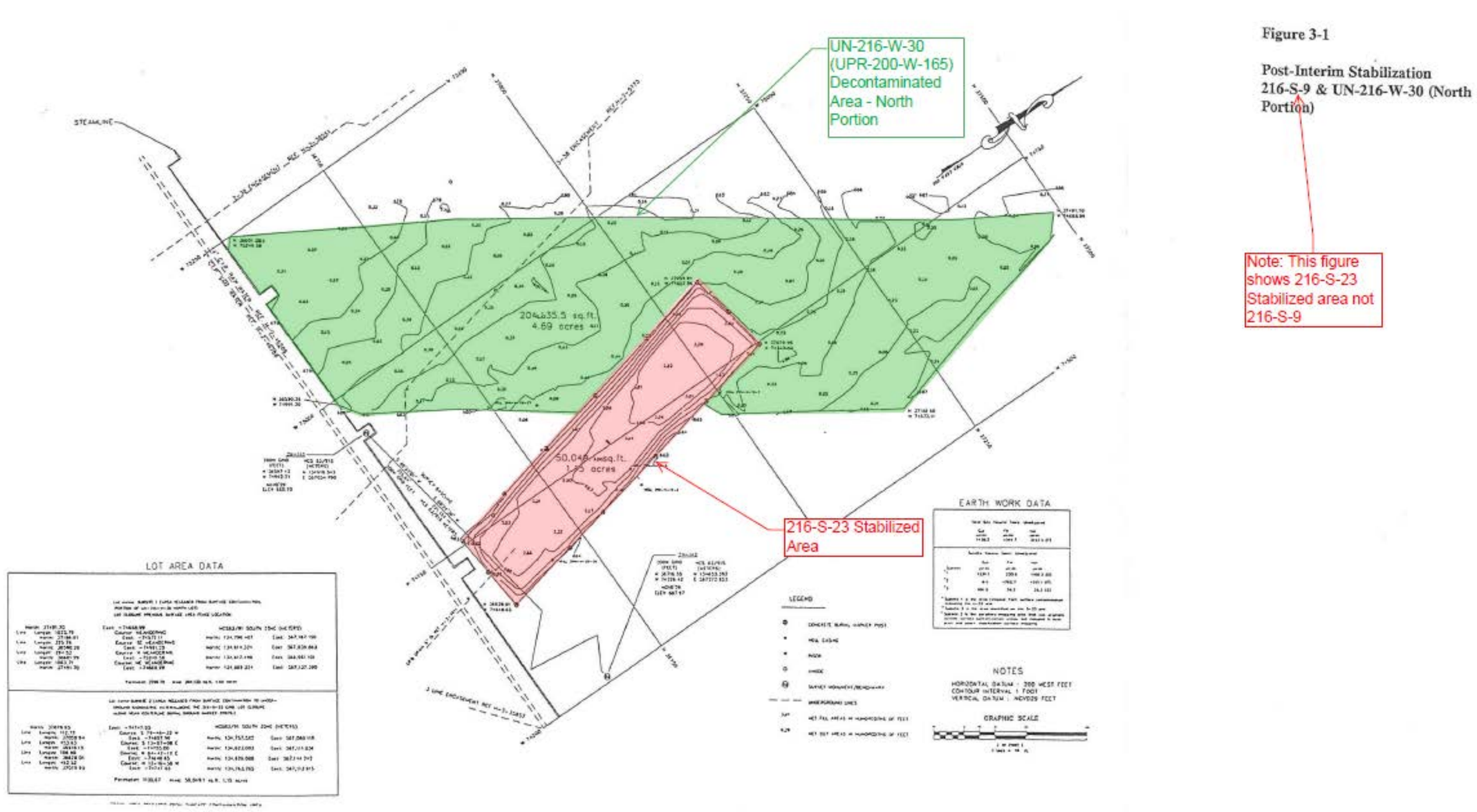
Site: UPR-200-W-165	Area: S Plant	Category: Shallow – Surface Only



Source: BHI-00257, *UN-216-W-24 and UN-216-W-30 Interim Stabilization Final Report*.
Note: Produced from the best available copy.

Figure 4. UPR-200-W-165 Pre-Stabilization Soil Contamination South Portion and 216-S-18 Soil Contamination Area

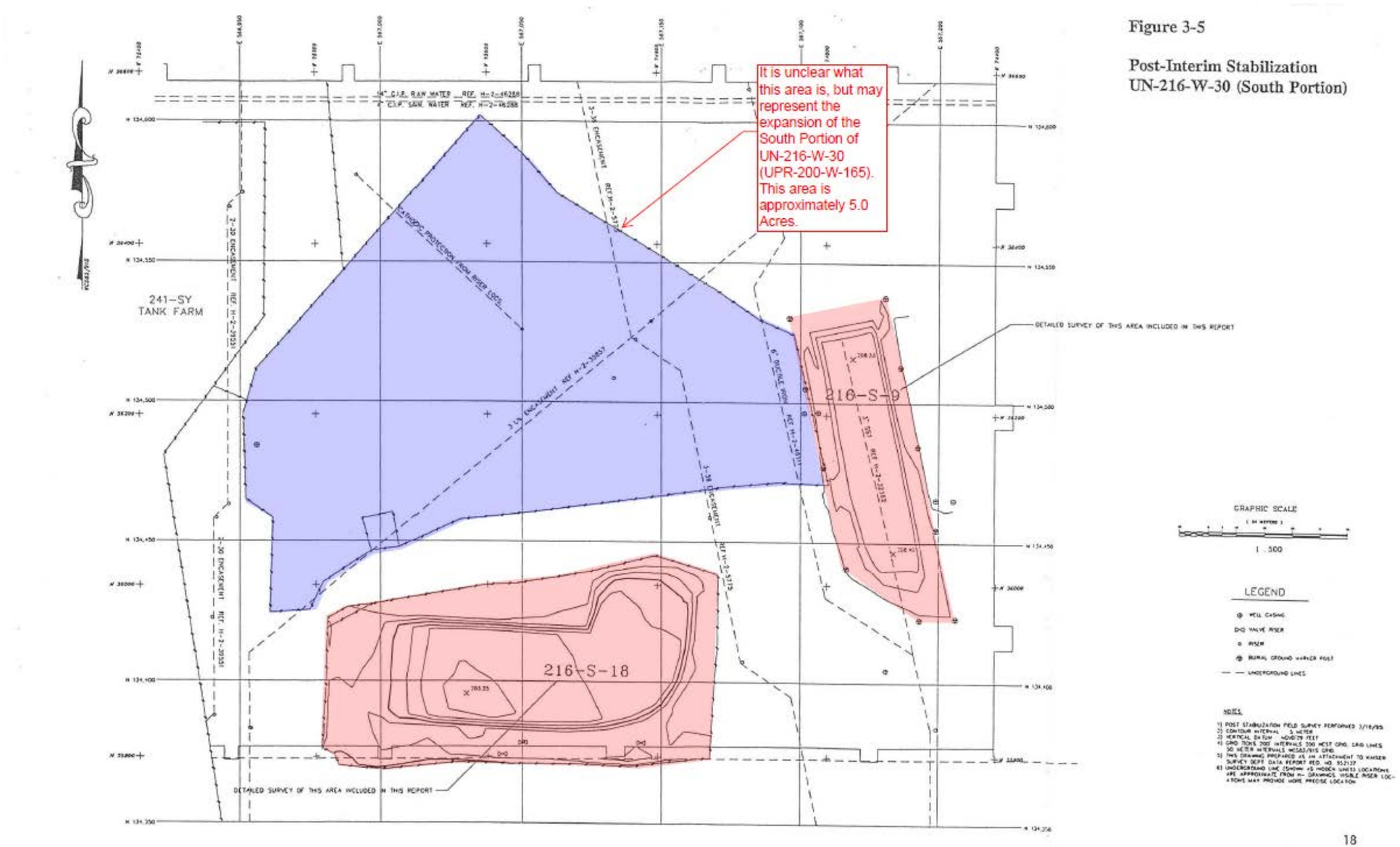
Site: UPR-200-W-165	Area: S Plant	Category: Shallow – Surface Only



Source: BHI-00257, *UN-216-W-24 and UN-216-W-30 Interim Stabilization Final Report*.
Note: Produced from the best available copy.

Figure 5. UPR-200-W-165 Post-Stabilization North Decontamination Area and 216-S-23 Consolidated Soil Contamination Area

Site: UPR-200-W-165	Area: S Plant	Category: Shallow – Surface Only



Source: BHI-00257, *UN-216-W-24 and UN-216-W-30 Interim Stabilization Final Report*.
Notes: Original South Portion Decontamination Limits not clearly identified. Produced from the best available copy.

Figure 6. UPR-200-W-165 Post-Stabilization 216-S-9 and 216-S-18 Consolidated Soil Contamination Area and Assumed South Portion Decontamination Area)

Site: UPR-200-W-165	Area: S Plant	Category: Shallow – Surface Only

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Site: UPR-200-W-4	Area: T Plant	Category: Shallow – Surface Only

Site Description

Site Type: Unplanned Release
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Occurrence Date: 1949

Waste Site Location and Physical Description: The unplanned release was located on the railroad tracks extending from the 221-T Canyon Building Tunnel to the Heavy Equipment Burial Ground (Figure 1).

Waste Site Coordinates:
E-567324.74993 N-137134.93751

Site Dimensions:
Site Area: Unspecified Cover Thickness: Unspecified

Related Site Structure(s): The 218-W-1A Burial Ground is known to contain large pieces of contaminated equipment and is likely to be the Heavy Equipment Burial Ground. The UPR-200-W-4 waste site is associated with the 221-T Building and may overlap with UPR-200-W-58, UPR-200-W-65, and UPR-200-W-73.

Site Posting: The unplanned release area is not physically marked or posted.

Site History

Release Summary: The contamination resulted from a burial box that had been transported from the 221-T Canyon Building to the Heavy Equipment Burial Ground. After the box was buried, a bulldozer used to cover the trench was found to be contaminated with dust which had readings of up to 10,000 cpm. Contamination specks along the railroad track had an average reading of 7 millirem/hour.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Site: UPR-200-W-4	Area: T Plant	Category: Shallow – Surface Only

Previous Site Characterization

Site Characterization Summary: A complete survey was made from the Canyon Building to the Heavy Equipment Burial Ground, which revealed a spread of contaminated particles. The most contamination was found in the vicinity northeast of the burial ground.

Decontamination of the area was initiated in 1949.

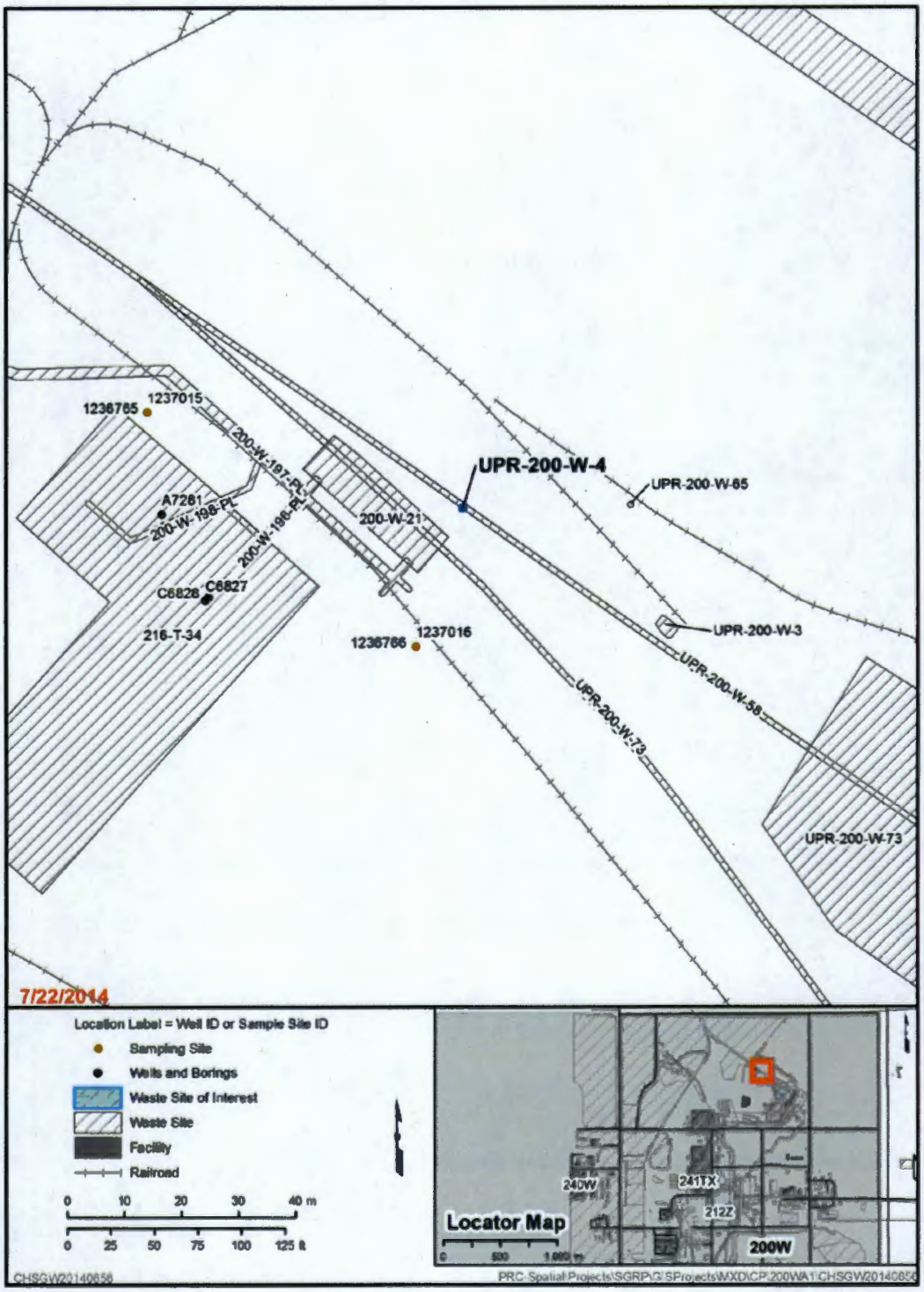
A site walkdown was performed in February 1998.

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 – 15 ft] below ground surface): Potential radiological contamination at the surface.

References:
Waste Information Data System General Summary Report for the UPR-200-W-4 Waste Site.

Site: UPR-200-W-4	Area: T Plant	Category: Shallow – Surface Only



ID = identification

Figure 1. UPR-200-W-4 Waste Site Map

Site: UPR-200-W-4	Area: T Plant	Category: Shallow – Surface Only

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Site: 200-W-6	Area: T Plant	Category: Intermediate

Site Description

Alternate Site Identification: 200-W Painter Shop Paint Solvent Disposal Area
Site Type: Dumping Area
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Service Dates: Not specified

Waste Site Location and Physical Description: The 200-W-6 waste site is a dumping area located north of 19th Street and east of Bridgeport Avenue (Figures 1 and 2). It is within the construction forces shop complex at the 2318W Annex (also known as the 15019 shop building). In 1993, contaminated soil was discovered at the site during building modifications at the paint shop. The shop had existed at the location for years prior to the building modification work. No reference drawings are available for this waste site.

Waste Site Coordinates:
E-567263.50330 N-135889.01255

Site Dimensions:
Site Length: Not specified
Site Width: Not specified
Site Area: Not specified
Site Depth: Not specified
Cover Thickness: Not specified

Related Site Structure(s): The 200-W-6 waste site is associated with the construction forces shop complex.

Site Posting: The posting for the 200-W-6 waste site is not specified.

Site History

Release Summary: The 200-W-6 waste site is the result of paint solvents routinely being dumped onto the ground prior to 1984. In 1993, soil excavated to a depth of approximately 0.61 m (2 ft) from a hole drilled in the floor of the 200-W-6 painter's shop at emitted a strong solvent odor. The soil was immediately placed back into the excavation and work was halted.

It is unclear exactly when the releases occurred. The volume of wastes released to the 200-W-6 waste site is not specified. Therefore, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Not specified.

Site: 200-W-6	Area: T Plant	Category: Intermediate

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: In 1993, a section of the concrete floor was removed to allow for building modification work at the paint shop facility. The soil beneath the removed floor section was being excavated by hand when a strong solvent odor was detected; work was immediately halted. The excavated soil was placed back into the excavation hole and the incident was reported to the construction supervisor. Staff report that prior to 1984, it was common practice to dispose of paint and solvents directly to the ground. A Suspect Waste Site Information Report was submitted to the monitoring group on November 23, 1993. The site was submitted to the Waste Information Data System (WIDS) database in January 1994. Survey data and photographs from the WIDS Information Acquisition Form are provided in Figures 2 and 3.

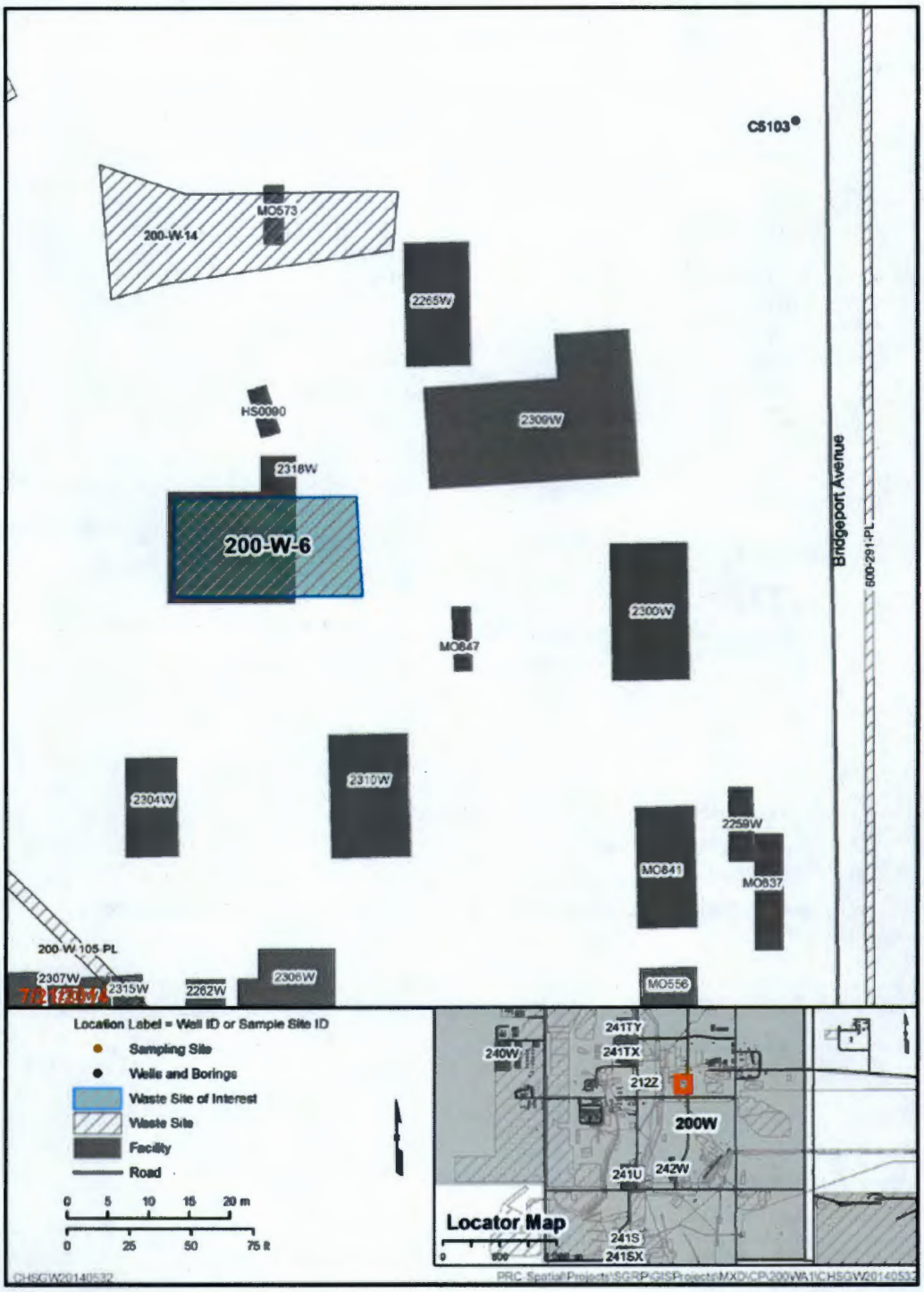
It is not specified if any surface stabilization work has occurred at the 200-W-6 waste site. It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided for the site. If surveys do occur, their frequency is not specified.

Nature and Extent of Contamination: No data are available to evaluate for the presence or absence of shallow or intermediate depth soil contamination. Solvent contamination is suspected. Existing information indicates that the paint shop occupied the western portion of the 200-W-6 waste site (Figure 2). The contamination is beneath a building. The release volume and depth of affected soil are unknown. The approximate depth to groundwater is 76 m (249 ft) below ground surface (bgs).

References:

Waste Information Data System General Summary Report for the 200-W-6 Waste Site.

Site: 200-W-6	Area: T Plant	Category: Intermediate

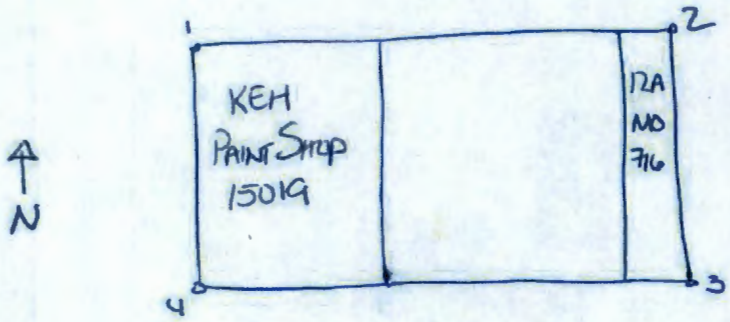


ID = identification

Figure 1. 200-W-6 Waste Site Map

Site: 200-W-6	Area: T Plant	Category: Intermediate

Kaiser Construction Complex 200 West



1. 567252.2 135894.9
2. 567274.4 135895.3
3. 567275.2 135883.1
4. 567252.1 135882.9

All coordinates are Washington State Plane units are meters datum is NAD 83

Source: Waste Information Data System for the 200-W-6 Waste Site.

KEH = Kaiser Engineers Hanford
NAD = North American Datum

Figure 2. Survey Coordinates for Paint Shop 15019 and Adjacent Structures

Site: 200-W-6	Area: T Plant	Category: Intermediate

Source: Waste Information Data System for the 200-W-6 Waste Site.

Note: Produced from the best available copy.

Figure 3. Photographs of Paint Shop dated 1993

Site: 200-W-6	Area: T Plant	Category: Intermediate

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Site: 200-W-9	Area: T Plant	Category: Intermediate

Site Description

Alternate Site Identification: 200-W-9, Project W291 Excavation Vitrified Clay Pipe Contamination
Site Type: Unplanned Release
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UR-1, 200-MG-1
Service Dates: 1994

Waste Site Location and Physical Description: The 200-W-9 waste site is an unplanned release located near the southeast corner of 221T Facility (Figure 1). The site is 42 m (138 ft) north of 23rd Street (Figures 1 and 2). The site includes two metal caissons in a gravel covered area. The tops of the caissons are labeled MH T-1 and MH T-2. The site is not marked or posted. The 200-W-163-PL pipeline is located in the area, and is a 25 cm (10-in.) vitrified clay pipe. The 200-W-163-PL pipeline was uncovered during an excavation for the MH T-2 manhole for the new waste line from T Plant to the 200 Area Treated Effluent Disposal Facility (Project W291). Photographs of excavation are provided in Figure 3.

Waste Site Coordinates:
E-567467.18743 N-136676.90629

Site Dimensions:
Site Length: Not specified
Site Width: Not specified
Site Area: Not specified
Site Depth: 1.8 m (6.0 ft)
Cover Thickness: Not specified
Overburden Depth: 1.5 m (5.0 ft)

Related Site Structure(s): The 200-W-9 waste site is associated with 200-W-163-PL, which was used to convey chemical sewer effluent from the 291T, 222T, and 224T Facilities to the 216-T-3 Crib.

Site Posting: The posting for the 200-W-9 waste site is not specified.

Site History

Release Summary: The 200-W-9 waste site is the result of the discovery of smear contamination on an old vitrified clay pipeline that was used to carry chemical sewer effluent. The discovery occurred when pipeline 200-W-163-PL was uncovered during excavation for the new T Plant waste line. A reading taken from a 100 cm^2 (15.5 $in.^2$) smear on the pipe revealed contamination up to 3,000 dpm, with a 5,500 dpm direct reading. It is unclear when the release occurred that resulted in the smear contamination. The volume of wastes released is not specified. Therefore, no volume estimates can be ascertained for this waste site.

Site: 200-W-9	Area: T Plant	Category: Intermediate

Volume/Mass Discharged: Not specified.
Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: 200-W-163-PL is an old vitrified clay pipeline that was uncovered while excavating for the MH T-2 manhole for the 200 Area Treated Effluent Disposal Facility (Project W291). The pipeline was left in place following the excavation. It is not specified if any surface stabilization work has occurred at the 200-W-9 waste site. A site walkdown occurred on March 3, 2000, for verification purposes. The site visit confirmed that both manholes are labeled; however, no radiological posting was observed at the location. It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided for the site. If surveys do occur, their frequency is not specified.

No borehole or soil data from leak of pipeline 200-W-163-PL are available.

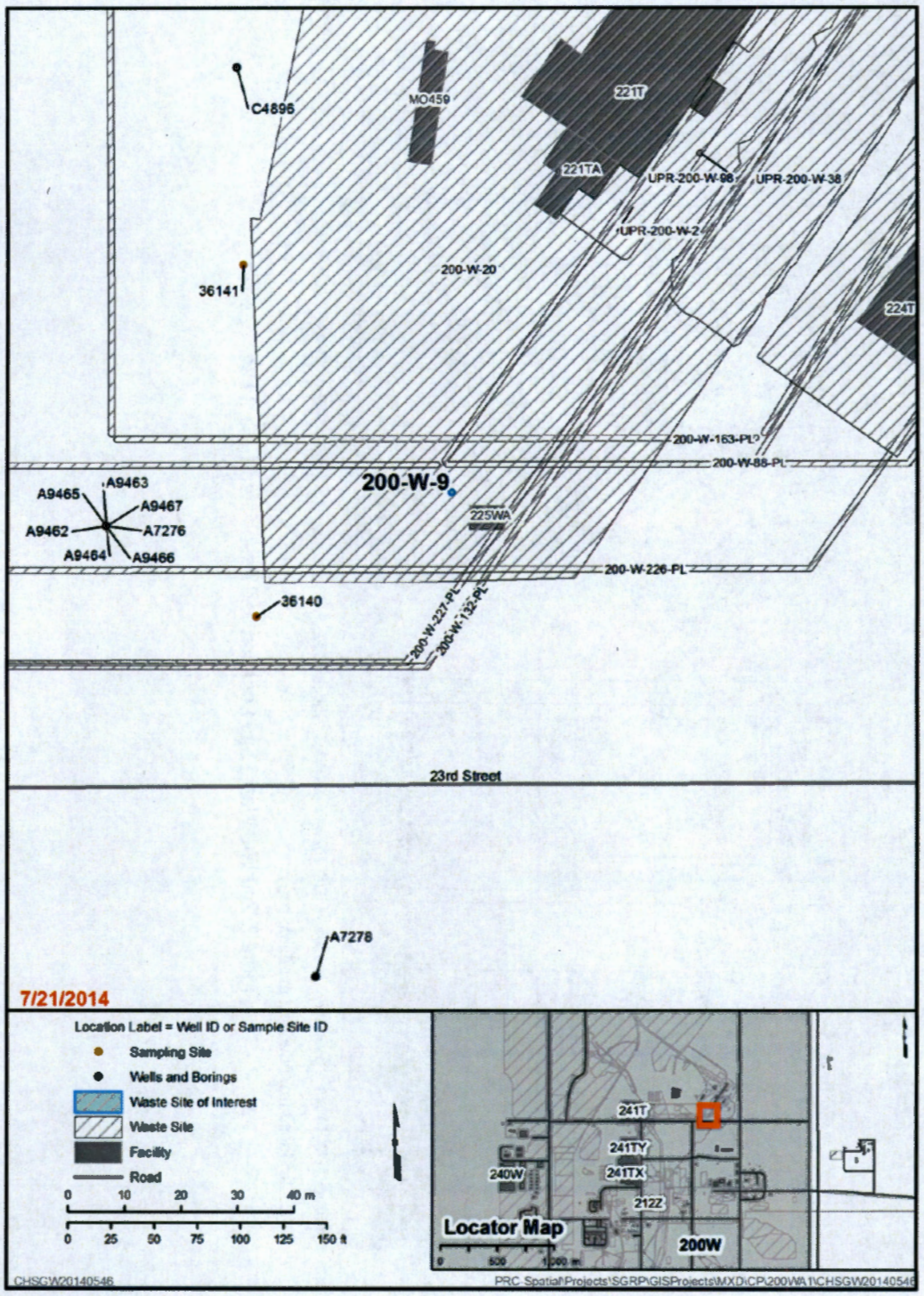
Nature and Extent of Contamination: No data are available to evaluate the nature and extent of soil contamination. The type and volume of waste released and depth are unknown, although radiological contamination was detected. Use as a chemical sewer indicates mixed waste may have been released. The approximate depth to groundwater is 69.5 m (228 ft) below ground surface (bgs). The top of the pipeline is approximately 1.5 m (5 ft) bgs, indicating shallow and intermediate depth soil could be contaminated.

References:

H-2-44511 (drawing), *Area Map 200 West "T" Plant Facilities*, Sheet 132 of 186, Rev. 9, U.S. Department of Energy, Richland Operations Office, Richland Washington.

Waste Information Data System General Summary Report for the 200-W-9 Waste Site.

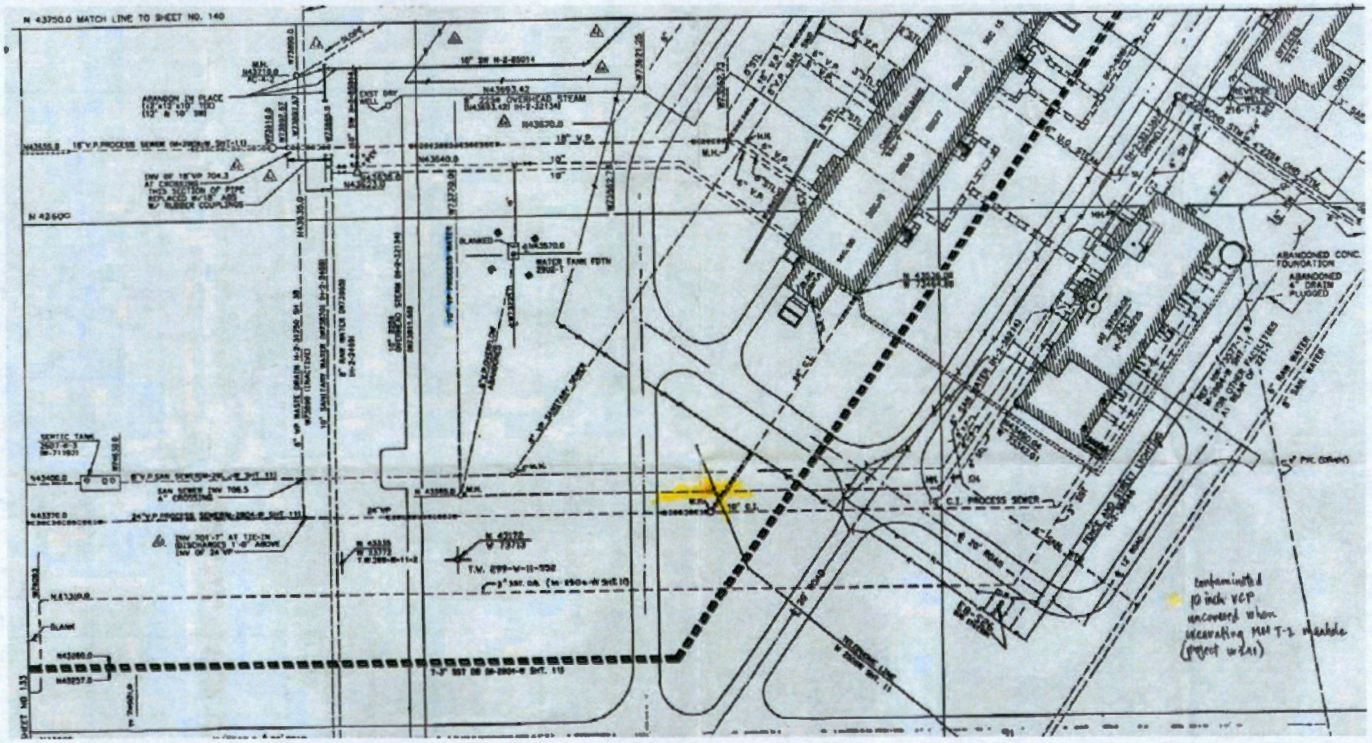
Site: 200-W-9	Area: T Plant	Category: Intermediate



ID = identification

Figure 1. 200-W-9 Waste Site Map

Site: 200-W-9	Area: T Plant	Category: Intermediate



Source: H-2-44511, *Area Map 200 West "T" Plant Facilities*, Sheet 132.

Note: Produced from the best available copy.

Figure 2. 200-W-9 Waste Site Location and Associated T Plant Facilities

Site: 200-W-9	Area: T Plant	Category: Intermediate

Figure 3. Excavation Photographs

Site: 200-W-9	Area: T Plant	Category: Intermediate

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Site: 200-W-13	Area: T Plant	Category: Intermediate

Site Description

Alternate Site Identification: 200-W-13, 2713-WB Green Hut Complex
Site Type: Maintenance Shop
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UR-1, 200-MG-1
Service Dates: The site was active from an unspecified start date to 1991.

Waste Site Location and Physical Description: The 200-W-13 waste site consists of areas of discolored soil, trash, and debris. The site is located north of 19th Street. The site (alias 2713-WB Green Hut Complex) is approximately 100 m (321 ft) west of Bridgeport Avenue (Figure 1). The soil may potentially be discolored by petroleum, and the debris includes vitrified clay pipes, wood, metal, glass, cloth, plastic, rubber, brick, and aerosol cans. In addition, miscellaneous regulated equipment has been stored to the north of the 2713-WB Green Hut Complex). A silver painted Quonset Hut is located onsite. The hut was originally painted green, hence the site's secondary name "the Green Hut Complex."

The site also includes areas with radiation protection posting signs (Figure 2). There is a pink coated stream line on the south side of the 2713-WB Green Hut Complex, suggesting asbestos contamination. In 1995, the north parking area and the area on the west side of the building were chained and posted with Contamination Area (CA) signs.

Waste Site Coordinates:
E-567180.78772 N-135952.86956

Site Dimensions:
Site Length: 135 m (443.0 ft) Site Depth: Not specified
Site Width: 70.0 m (230.0 ft) Cover Thickness: Not specified
Site Area: Not specified

Related Site Structure(s): The 200-W-13 waste site is associated with the Minor Construction Area, Paint Shop, Shops, and the Power House.

Site Posting: In 1995, the north parking area and the area on the west side of the building were chained and posted with CA signs. The site also includes areas with radiation protection posting signs.

Site History

Release Summary: The 200-W-13 waste site was used for the maintenance and storage of radioactively contaminated equipment and materials; including vehicles. The material and equipment were stored

Site: 200-W-13	Area: T Plant	Category: Intermediate

outside and north of the 2713-WB Green Hut Complex until 1991. The inside of the "Green Hut" was used as a regulated vehicle repair shop during the 1980s.

The type and volume of wastes released is not specified. In addition, it is not clear how long the site was actively used as a storage yard and maintenance facility for contaminated equipment. Therefore, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Not specified.

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: It is not specified if any surface stabilization work has occurred at the 200-W-13 waste site. For initial review purposes, a site walkdown occurred on August 11, 1995. Figure 2 shows posted and debris areas observed during the walkdown. From October 25 to November 14, 1995, the site was mapped using Global Positioning System survey equipment. It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided for the site. If surveys do occur, their frequency is not specified.

Nature and Extent of Contamination: No data are available to evaluate for the presence or absence of shallow or intermediate depth soil contamination. The type and volume of waste and depth are unknown. The approximate depth to groundwater is 76 m (249 ft) below ground surface (bgs).

References:
Waste Information Data System General Summary Report for the 200-W-13 Waste Site.

Site: 200-W-13	Area: T Plant	Category: Intermediate

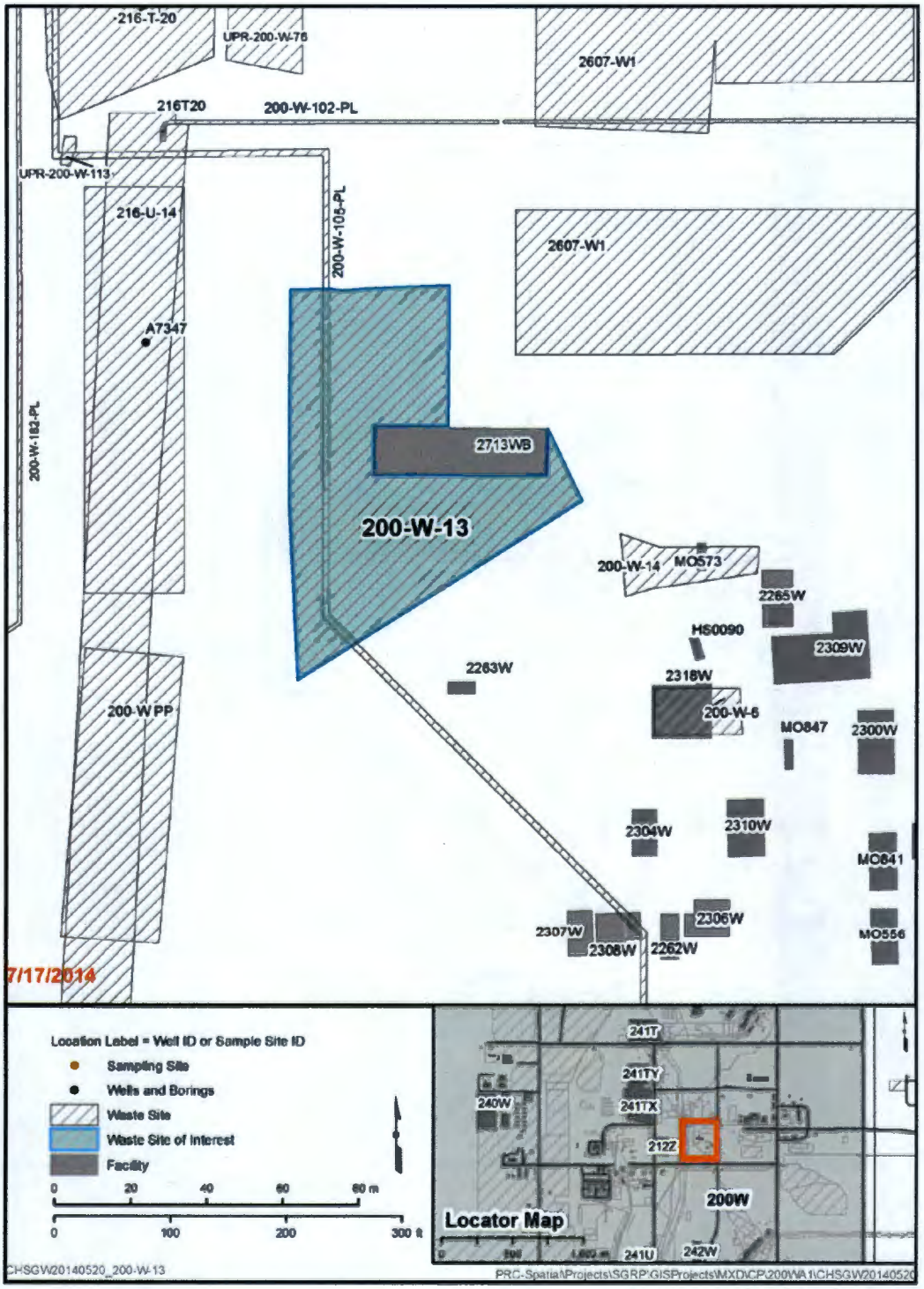

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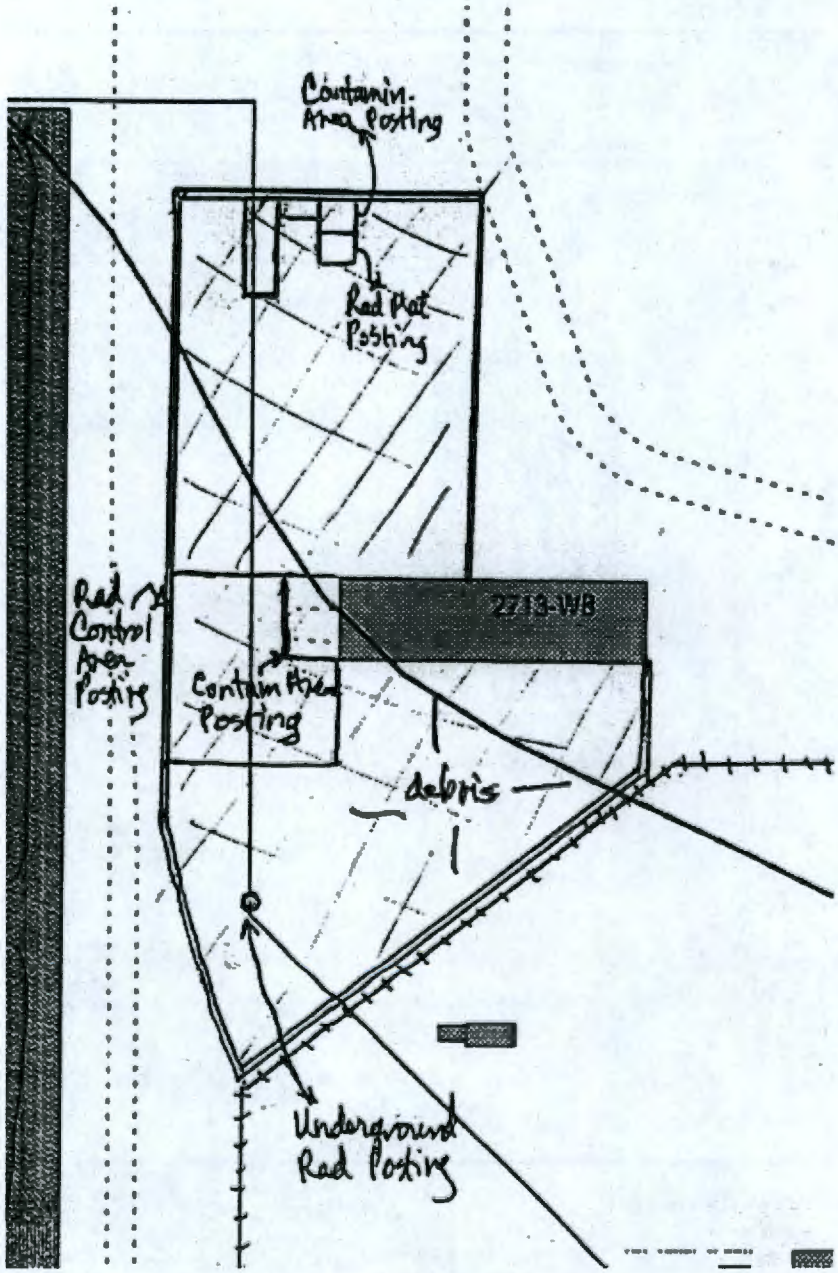
Figure 1. 200-W-13 Waste Site Map

Site: 200-W-13	Area: T Plant	Category: Intermediate



Note: Produced from the best available copy.

Figure 2. Field Observations from 1995 Walkdown

Site: 200-W-14	Area: T Plant	Category: Shallow - Subsurface

Site Description

Alternate Site Identification: 200-W-14, 200 West Heavy Equipment Storage Area
Site Type: Dumping Area
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1, 200-MW-1
Service Dates: Not specified

Waste Site Location and Physical Description: The 200-W-14 waste site is a large, irregularly shaped gravel parking lot (Figure 1) that was used for the storage and parking of heavy equipment, including cranes, forklifts, diesel generators, and backhoes. The site includes five or six large patches of petroleum contaminated soil. The site is located northwest of the intersection of Bridgeport Avenue and 19th Street.

Waste Site Coordinates:
Lon-567259.13595 Lat-135927.87469

Site Dimensions:
Site Length: 24 m (80 ft) Site Depth: 0.6 m (2.0 ft)
Site Width: 9 m (30 ft) Cover Thickness: Not specified
Site Area: 222 m^2 (2,400 ft^2)
Dimensions are for the five or six large spots of petroleum contaminated soil.

Site Length: 36 m (118 ft) Site Depth: 0.6 m (2.0 ft)
Site Width: 11 m (36 ft) Cover Thickness: Not specified
Site Area: 360 m^2 (3,775 ft^2)
The length and width values are estimates of the irregular shape. These values were obtained from the GPS survey data using ArcInfo and ArcView.

Related Site Structure(s): The 200-W-14 waste site is associated with the building trades and craft shops.

Site Posting: The posting for 200-W-14 is not specified.

Site History

Release Summary: 200-W-14 waste site was used for the parking and storage of heavy equipment. Soil contamination occurred at this site overtime due to leaks, seepage, or overflow from the parked vehicles. The leaks and overflow were more frequent during hot weather. No drip pans or containment

Site: 200-W-14	Area: T Plant	Category: Shallow - Subsurface

equipment was used at this site. The soil at the site is contaminated down to a depth 0.6 m (2 ft) or more.

The volume of wastes released is not specified for this site. In addition, it is not clear how long the site was actively used as a storage yard, or how long equipment had been leaking or overflowing. Therefore, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: A site walkdown performed on August 11, 1995, for initial review purposes confirmed that no drain pans or containment equipment were present. In addition, staff noted that the parked equipment was leaking during the site investigation. The site was mapped on November 14, 1995, using Global Positioning System (GPS) survey equipment. It is not specified if any surface stabilization work has occurred at the 200-W-14 waste site. In addition, it is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided for the site. If surveys do occur, their frequency is not specified.

Nature and Extent of Contamination:
Shallow (0 – 4.6 m [0 to 15 ft] below ground surface [bgs]): Potential hydrocarbon contamination in the subsurface.

References:
Waste Information Data System General Summary Report for the 200-W-14 Waste Site.

Site: 200-W-14	Area: T Plant	Category: Shallow - Subsurface

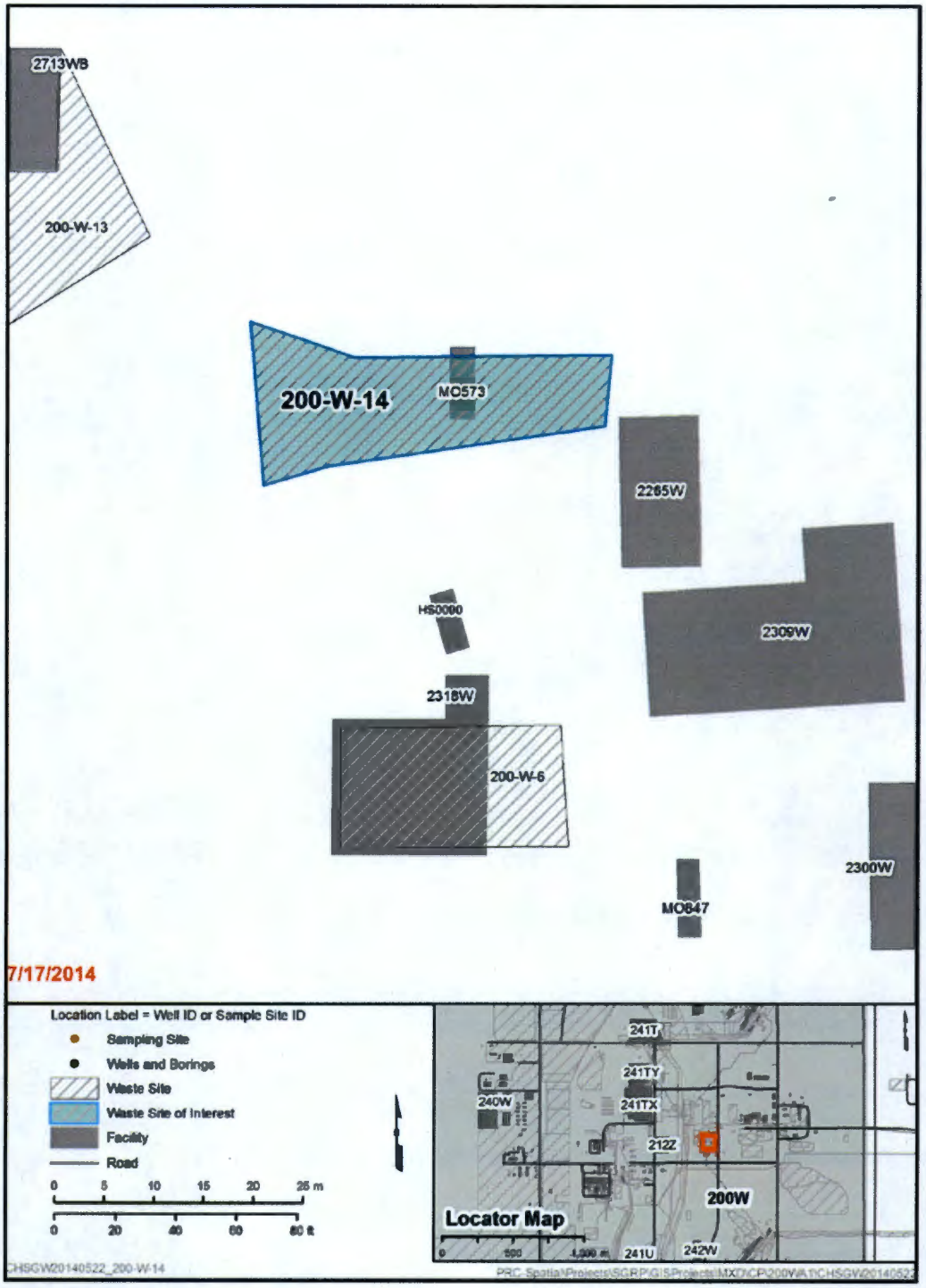


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Figure 1. 200-W-14 Waste Site Map

Site: 200-W-14	Area: T Plant	Category: Shallow - Subsurface

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Site: 200-W-21	Area: T Plant	Category: Shallow - Subsurface

Site Description

Alternate Site Identification: 204-T Unloading Station, T-Plant Waste Railcar Unloading Facility, Unloading Station 1 and Unloading Station 2
Site Type: Pump Station
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1, 200-MW-1
Service Dates: From 1966 to 1968

Waste Site Location and Physical Description: The 204-T Unloading Station is located west of 221-T at the north end of the 216-T-34 Crib (Figures 1 and 2). Site 200-W-21 was an unloading station, and included two unloading platforms: Unloading Station 1, Unloading Station 2, and associated piping (see Figure 2). In addition, the area has a short railroad siding extending from the main rail line into T Plant. Both unloading platforms and their piping were removed in 1996. The photographs in Figure 3 show the platforms before they were removed. However, the concrete structural foundations were left behind and were eventually buried beneath a layer of poured concrete. A layer of gravel 15 cm (6 in.) deep was later placed on top of the poured concrete. The site is posted with Underground Radioactive Material Area (URMA) signs.

Waste Site Coordinates:
E-567309.49781 N-137135.90074

Site Dimensions:
Site Length: 26 m (86 ft) Site Depth: Not specified
Site Width: 8 m (26 ft) Cover Thickness: Not specified
Site Area: 208 m^2 (2,236 ft^2)
Note: Dimensions are estimated from area shown in Figure 1.

Related Site Structure(s): The 200-W-21 waste site is associated with the 216-T-34 Crib, 216-T-35 Crib, and the 340 Facility in the 300 Area. The pipeline from Unloading Station 1 to the 216-T-34 Crib is labeled as sitecode 200-W-196-PL. The pipeline from Unloading Station 2 to the 216-T-35 Crib is labeled as sitecode 200-W-197-PL.

Site Posting: Site 200-W-21 is posted as an URMA.

Site History

Release Summary: The platform structures at the 200-W-21 waste site were used to unload 300 Area liquid laboratory waste transported via railroad tanker cars from the 340 Facility. The radioactive

Site: 200-W-21	Area: T Plant	Category: Shallow - Subsurface

laboratory waste was pumped through one of two pipelines into the adjoining 216-T-34 and 216-T-35 Cribs.

In 1967, an estimated 30 m^3 (40 yd^3) of contaminated soil was removed from the base of the unloading station. Additional surface contamination was discovered and documented in 1987 and 1989. The contamination discovered in 1989 was located within the two unloading platform station drains. Readings taken from the drains showed contamination levels as high as 4,000 dpm of beta/gamma and 1,800 dpm of alpha contamination. Contamination smears on the eastern drain found 600 dpm of removable alpha contamination. In addition, a brick inside the posted URMA was found to have fixed alpha contamination up to 2,450 dpm on September 14, 1995. However, the total volume of wastes unloaded or potentially released at this site is not specified. Therefore, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: The ground was partially surface stabilized in 1989, when the pump and piping equipment were removed, and concrete was poured into the drain pads.

In 1996, additional remediation work removed the platform structures, storage sheds and light fixtures. The contaminated area was buried beneath 15 cm (6 in.) of gravel and reposted as an URMA.

The site was mapped using Global Positioning System equipment on February 11, 1998. On September 14, 1995, a radiation investigation occurred as part of a routine outdoor survey. A portable alpha meter instrument detected maximum, fixed alpha contamination on a brick inside the posted boundary of 2,450 dpm. A site walkdown performed on March 1, 2000 ,for verification purposes confirmed that site structures had been removed, and that only the concrete foundation pads remained. A surface radiological survey occurs annually.

Nature and Extent of Contamination:
Shallow (0 – 4.6 m [0 to 15 ft] below ground surface [bgs]): Potential radiological contamination in the subsurface, below the concrete and gravel stabilization cover.

References:
H-2-32649 (drawing), 1967, *Civil Plot Plan*, Rev. 2, Vitro Engineering Company, Richland, Washington.

Waste Information Data System General Summary Report for the 200-W-21 Waste Site.

Site: 200-W-21	Area: T Plant	Category: Shallow - Subsurface

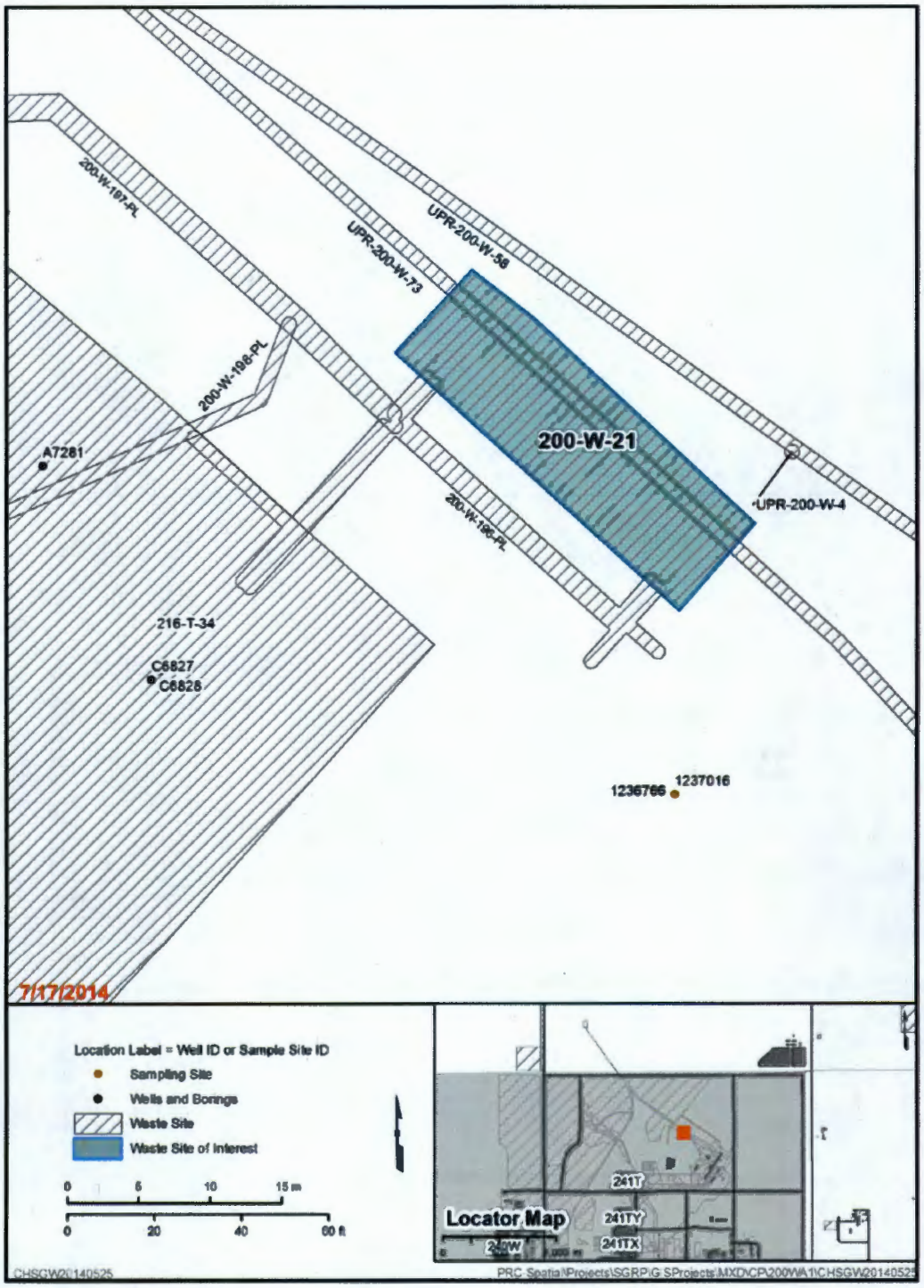

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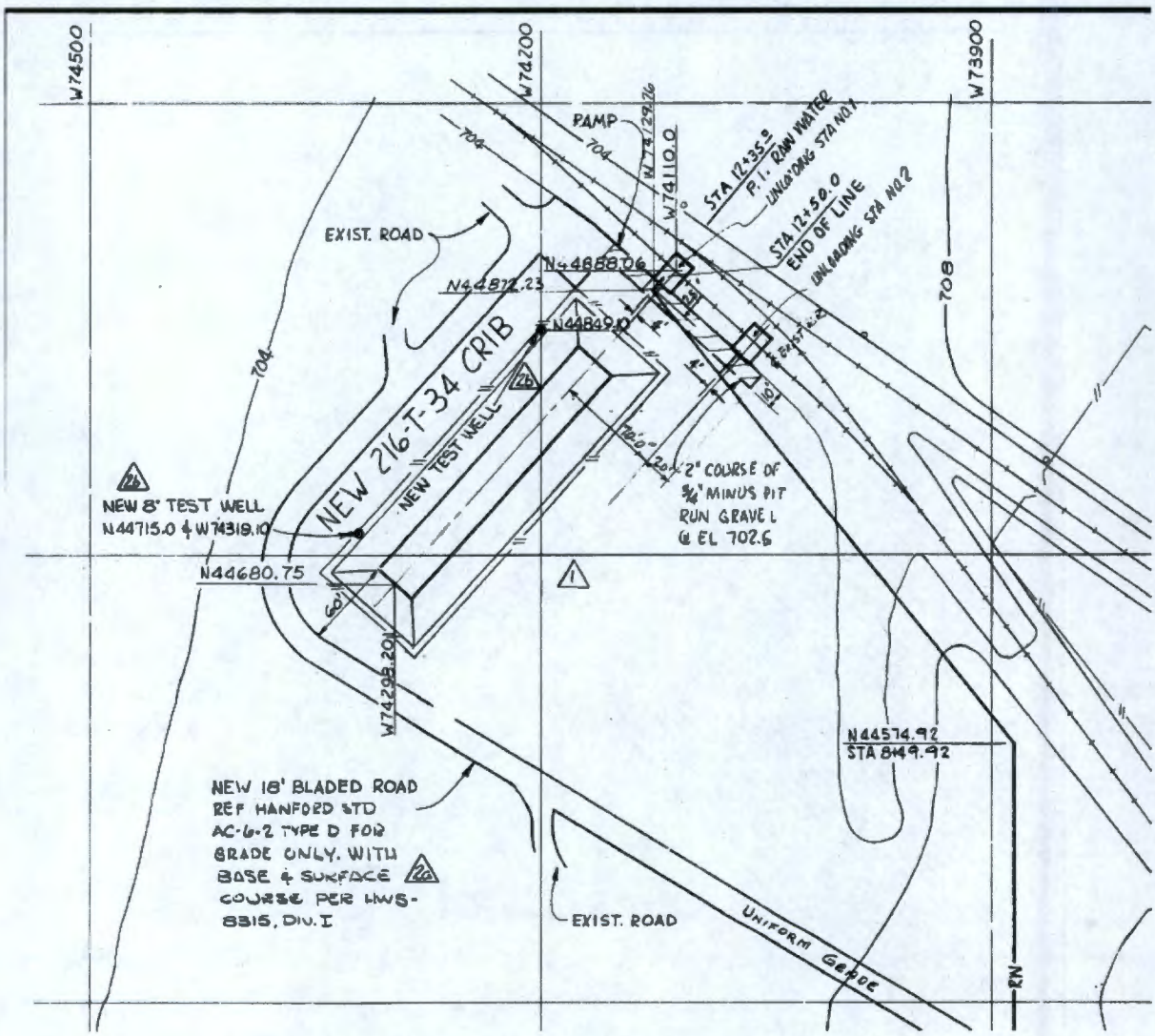
Figure 1. 200-W-21 Waste Site Map

Site: 200-W-21	Area: T Plant	Category: Shallow - Subsurface



Source: H-2-32649 (drawing), 1967, *Civil Plot Plan*, Rev. 2, Vitro Engineering Company, Richland, Washington.

Note: Produced from the best available copy.

Figure 2. Site Details

Site: 200-W-21	Area: T Plant	Category: Shallow - Subsurface

204-T Looking N.E.
4/96

204-T Looking S.W

Figure 3. Photographs of the Unloading Stations 1 and 2, 1996

Site: 200-W-21	Area: T Plant	Category: Shallow - Subsurface

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Site: 200-W-53	Area: T Plant	Category: Shallow – Surface Only

Site Description

Alternate Site Identification: UPR-200-W-166, UN-216-W-31
Site Type: Unplanned Release
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1, 200-MW-1
Service Dates: Not specified

Waste Site Location and Physical Description: The 200-W-53 waste site consists of a large area of posted surface soil contamination located east of the 207-T Retention Basins (Figure 1). Discovered in 1994, the site covers roughly 14,466 m^2 (155,706 ft^2) or 1.4 hectares (3.6 acres) of ground marked and posted as a Soil Contamination Area. In 1996, the contaminated soil was scraped and consolidated within the 207-T Retention Basins. The basins have been completely backfilled and covered with clean dirt. The site is posted as an Underground Radioactive Material Area (URMA).

A small URMA surrounding well 299-W11-28, on the west side of the retention basins, is considered to be part of the 200-W-53 waste site. This is discussed further under the Site Characterization Summary section. No reference drawings are available for this site.

Waste Site Coordinates:
E-567038.38433 N-136721.10881

Site Dimensions:
Site Length: 120 m (394 ft) Site Depth: Not specified
Site Width: 120 m (394 ft) Cover Thickness: Not specified
Site Area: 14,400 m^2 (155,000 ft^2).
These are the approximate dimensions of the posted area.

Related Site Structure(s): The 200-W-53 waste site is associated with the 207-T Retention Basin.

Site Posting: The 200-W-53 waste site is posted as an URMA.

Site History

Release Summary: The source of contamination was assumed to be the 241-T Tank Farm and the 207-T Retention Basin. Speck contamination originating from operations at the 241-T Tank Farm spread via the wind and contaminated the soil at the 200-W-53 waste site.

The total volume of wastes unloaded or potentially released at this site is not specified. Therefore, no volume estimates can be ascertained for this site.

Site: 200-W-53	Area: T Plant	Category: Shallow – Surface Only

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: Soil contamination located east of the 207-T Retention Basin was scraped up and placed inside the 207-T Retention Basin in 1996. The basins were completely backfilled and covered with clean soil. The scraped area is currently posted as an URMA. It appears the intent was to remove all surface contamination in the 200-W-53 waste site and there is no documentation that any soil or gravel cover was placed on this area after stabilization.

The pre-stabilization boundary was mapped using Global Positioning System equipment on February 13, 1996.

The Tank Waste Remediation Group used waste site number UN-216-W-31 (alias UPR-200-W-166) to document their 1996 clean-up effort. However, the contaminated soil was not located at the same place as the original UN-216-W-31 waste site, which was consolidated and stabilized by the Radiation Area Remedial Action in 1992. The original UN-216-W-31 area of contamination was described as being located north and east of 241-T Tank Farms. In 1996, the UN-216-W-41 number was used again for the contamination found further east, because the source of the contamination was assumed to be the same as the source for UN-216-W-31. Because of programmatic responsibility issues, it was necessary to give the second area of contamination a separate site code (200-W-53) to explain the two separate remediation activities.

It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided for the site. If surveys do occur, their frequency is not specified. Several boreholes were installed within the boundaries of this waste site (Figure 1), but no surface soil data were collected.

Nature and Extent of Contamination:
Shallow (0 – 4.6 m [0 to 15 ft] below ground surface [bgs]): Potential radiological contamination at the surface, below the stabilization cover.

References:
Interview Guide, 207-T Retention Basin Interim Stabilization, and 1996 Surface Contamination Reduction Program-[1006221654]

Waste Information Data System General Summary Report for the 200-W-53 Waste Site.

Site: 200-W-53	Area: T Plant	Category: Shallow – Surface Only

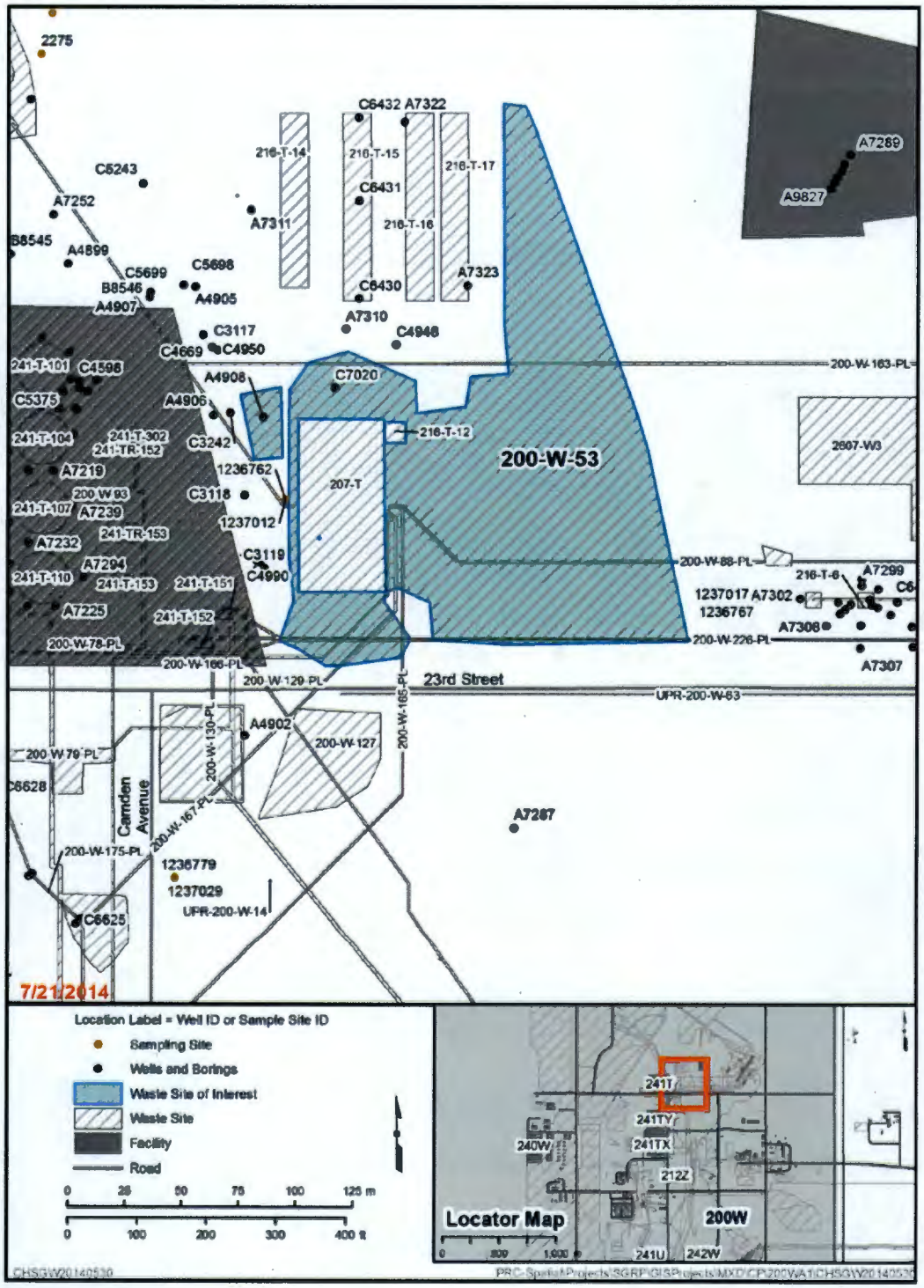

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Figure 1. 200-W-53 Waste Site Map

Site: 200-W-53	Area: T Plant	Category: Shallow – Surface Only

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Site: 200-W-63	Area: T Plant	Category: Shallow - Subsurface

Site Description

Alternate Site Identification: Contaminated Concrete Pad
Site Type: Dumping Area
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1, 200-MW-1
Service Dates: Not specified

Waste Site Location and Physical Description: The 200-W-63 waste site is a "T" shaped covered concrete pad. The site was originally posted as a Surface Contamination Area (SCA); however, the site was reposted as an Underground Radioactive Material Area (URMA) following the placement of a layer of gravel over the area. The pad is located roughly 180 meters (591 ft) northwest of 241-TY Tank Farm and 80 m (262 ft) south of 23rd Street in 200 West Area (see Figure 1, site map). The debris consists of concrete rubble, wood, cans, pipes, and rusted sheet metal.

Waste Site Coordinates:
E-566518.57541 N-136523.56314

Site Dimensions:
Site Length: 42.7 m (140.0 ft) Site Depth: Not specified
Site Width: 13.7 m (45.0 ft) Cover Thickness: Not specified
Dimensions of the pad prior to it being covered by a layer of gravel.

Related Site Structure(s): The 200-W-63 waste site is not associated with any other waste sites or facilities.

Site Posting: The 200-W-63 waste site is currently posted as an URMA.

Site History

Release Summary: Staff reported in interviews regarding this site that the pads were used to store radiologically contaminated tanks in the late 1980s.

The total volume of wastes stored or potentially released at this site is not specified. Therefore, no volume estimates can be ascertained.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Site: 200-W-63	Area: T Plant	Category: Shallow - Subsurface

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: In 1991, the tanks were removed and the pad was posted as an SCA. A radiation area remedial action site walkdown occurred on September 1, 1999. During the walkdown, it was noted that the pad had been covered with gravel, and that the pad was posted with old, faded SCA signs and rusted chain. At the time, it did not appear that any group was responsible for surveillance or routine site maintenance. Staff attempted to locate a responsible party for the site; however, none was found.

In addition, the site has been mapped and radiologically surveyed. The site was mapped using Global Positioning System equipment on September 12, 1997. A radiological investigation occurred on December 5, 1997. A GM/P-11 Probe (15.5 cm^2 [2.4 $in.^2$) (beta-gamma) unit detected beta/gamma contamination at Spot #1 up to 50,000 dpm. The average dpm value detected at the site was 2,000.

In addition, coyote tracks through the area suggest that coyotes were drinking water from a small depression in the concrete. A radiological investigation on December 5, 1997, discovered both alpha and beta/gamma contamination on the pad. It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided for the site. If surveys do occur, their frequency is not specified.

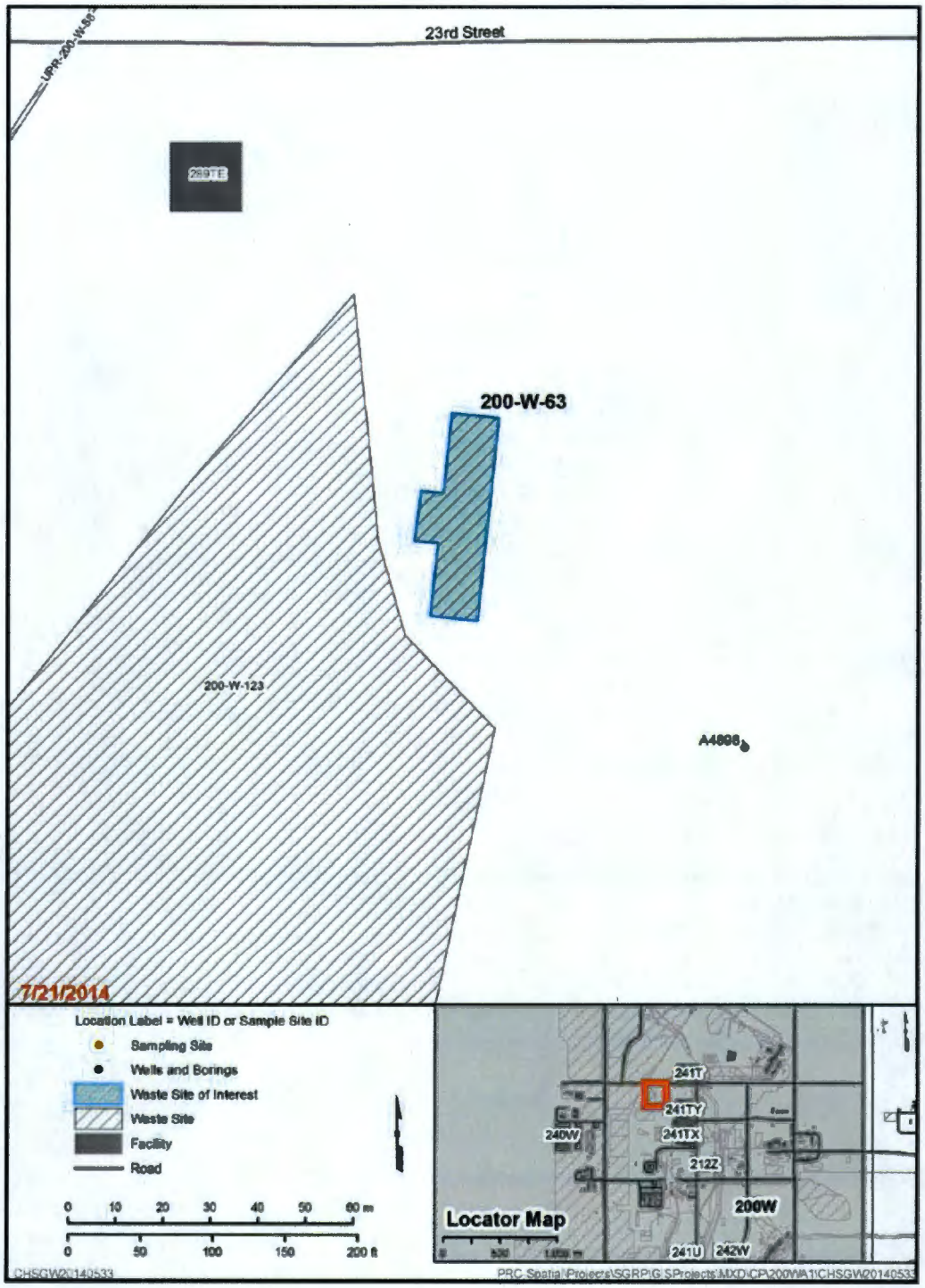
Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Potential radiological contamination at the surface and below the stabilization cover.

References:
Radiological Survey Report SS246425-[1006231085].pdf

Waste Information Data System General Summary Report for the 200-W-63 Waste Site.

Site: 200-W-63	Area: T Plant	Category: Shallow - Subsurface



ID = identification

Figure 1. 200-W-63 Waste Site Map

Site: 200-W-63	Area: T Plant	Category: Shallow - Subsurface

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Site: 200-W-80	Area: T Plant	Category: Shallow - Subsurface

Site Description

Alternate Site Identification: Stabilized Contaminated Soil Area Southwest of T Plant, Mound of Contaminated Soil Southwest of T Plant
Site Type: Spoils Pile/Berm
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1, 200-MW-1
Service Dates: Not specified

Waste Site Location and Physical Description: The 200-W-80 waste site is composed of a gravel area encompassed by posts and chain. Originally, the site contained a soil mound surrounded by radiation rope and posted as a Contamination Area (CA). The mound was leveled in 2000. The site is currently posted with Underground Radioactive Material Area (URMA) signs. Approximately 3 m (10 ft) east of the site is a small posted URMA, with one capped well inside the posted area and a second capped well located just outside the boundary. This second well is locked and is posted with a potential contamination warning.

In addition, postings on the fence line along the northern section of the CA indicate an underground pipeline is present, running from the east to the west. This area is also posted as an URMA. The site is located west of 221-T and northeast of the 241-T-361 settling tank. It is about 15 m (50 ft) west of the steam pipeline (Figure 1). No reference drawings are available for this site.

Waste Site Coordinates:
E-567370.95721 N-136762.31332

Site Dimensions:
Site Length: 15 m (49 ft) Site Depth: Flattened mound
Site Width: 14 m (46 ft) Cover Thickness: 15.2 cm (6 in.) of clean gravel
Dimensions of the posted area.

Site Length: 8.2 m (27 ft) Site Depth: 1.5 m (5.0 ft)
Site Width: 3.1 m (10 ft) Cover Thickness: Not specified
Dimensions of the soil mound that has been flattened inside the posted area.

Related Site Structure(s): The 200-W-80 waste site is associated with the 216-T-27 and 216-T-28 Cribs. The pipeline associated with the unloading station is labeled as 200-W-188-PL.

Site Posting: 200-W-80 waste site is currently posted as an URMA.

Site: 200-W-80	Area: T Plant	Category: Shallow - Subsurface

Site History

Release Summary: The 200-W-80 waste site consisted of a mound of soil encompassed by radiation rope and CA signs. While no radiation contamination was discovered during a radiological survey in 1999 or 2000, it is possible that contamination was present inside the mound itself. However, no information is provided detailing the waste released or stored at the site. Therefore, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: The 200-W-80 waste site was mapped with Global Positioning System equipment on July 7, 1998. A radiological investigation of the soil mound on November 30, 1999, did not discover any contamination on the mound surface. However, the survey did detect up to 100 cpm of contamination on miscellaneous equipment and a mouse burrow around the waste site west of T Plant. The mound and its CA posting were submitted to the Waste Information Data System (WIDS) as a Discovery Site on May 2000. A site walkdown on October 12, 2000, occurred to evaluate the conditions of the site. The mound was observed to be roughly 1.5 m (5 ft) tall, 8.2 m (27 ft) long, and 3 m (10 ft) wide. The mound and the immediate area contained numerous pieces of asphalt, similar to that in the neighboring T Plant parking lot.

In December 2000, the site was surface stabilized. The soil mound was leveled and a layer of gravel was placed over the area. The site was surveyed and down posted to a URMA following the remediation work. Radiological surveys were performed on:

- November 2, 2000, after the mound was flattened
- December 4, 2000, during placement of clean gravel
- December 18, 2000, as part of a final radiation survey with 64 points surveyed

These radiological surveys did not discovery any contamination within the site boundary. A GM/P-11 Probe (15.5 cm^2 [2.4 $in.^2$) (beta-gamma) was used during all surveys. Due to the presence of asphalt inside and surrounding the mound, it is assumed that the mound was created several years prior during a parking lot expansion at T Plant.

It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided for the site. If surveys do occur, their frequency is not specified.

Site: 200-W-80	Area: T Plant	Category: Shallow - Subsurface

Nature and Extent of Contamination:

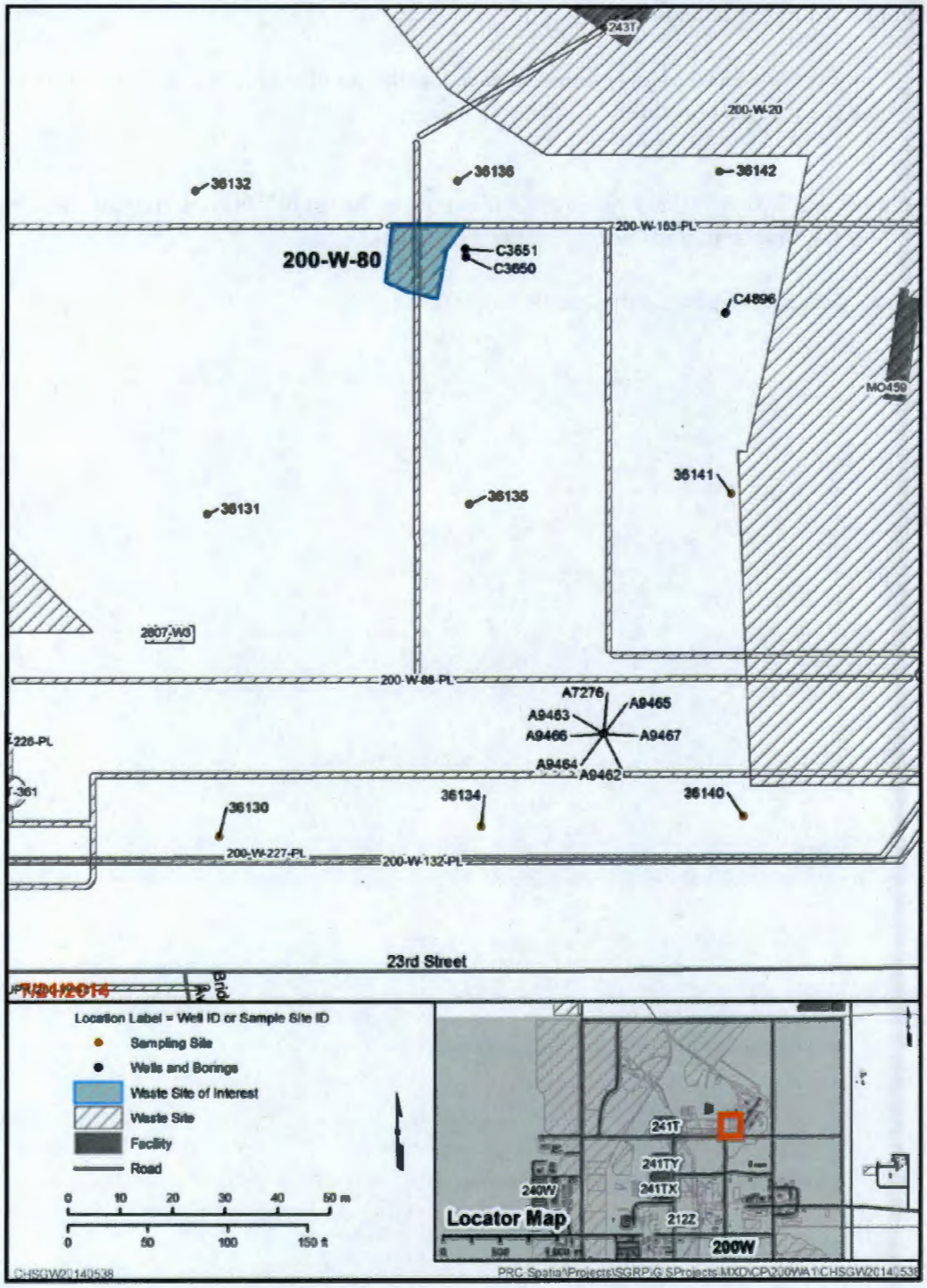
Shallow (0 – 4.6 m [0 to 15 ft] below ground surface [bgs]): Potential radiological contamination at the surface, below the stabilization cover.

References:

Memo with subject- 200-W-80, Downpost of CA Located Southwest of T Plant, DYNCORP Radiological Report, Diagrams, and Photos_-_[1006231402].pdf

WIDS General Summary Report for the 200-W-80 Waste Site.

Site: 200-W-80	Area: T Plant	Category: Shallow - Subsurface



ID = identification

Figure 1. 200-W-80 Waste Site Map

Site: 200-W-81	Area: T Plant	Category: Shallow – Surface

Site Description

Alternate Site Identification: 200-W-81, Contaminated Tumbleweed Fragments Along Railroad Track East
Site Type: Unplanned Release
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1, 200-MW-1
Service Dates: Not specified

Waste Site Location and Physical Description: The 200-W-81 waste site consists of three posted Contamination Areas (CAs). The three CAs are located on the railroad tracks east of the 218-W-3AE Burial Grounds and south of 12th Street and the 610 Gate (Figure 1). No reference drawings are available for this site.

Waste Site Coordinates:
E-566848.77629 N-137283.07443

Site Dimensions:
Site Length: 30.5 m (100 ft) Site Depth: Not Specified
Site Width: 12.2 m (40 ft) Cover Thickness: Not Specified
Site Area: 372 m^2 (4,000 ft^2)

Site Length: 1.8 m (6.0 ft) Site Depth: Not Specified
Site Width: 1.8 m (6.0 ft) Cover Thickness: Not Specified
Site Area: 111 m^2 (36 ft^2)

Site Length: 6.1 m (20.0 ft) Site Depth: Not specified
Site Width: 3.1 m (10.0 ft) Cover Thickness: 15.2 cm (6 in.) of clean gravel
Site Area: 19 m^2 (200 ft^2)
Note: Provided above are the three dimensions of the three CAs discovered on railroad tracks on a portion of the T Plant Spur.

Related Site Structure(s): The 200-W-81 waste site is not associated with any other waste sites or facilities.

Site Posting: Site 200-W-81 is currently posted as a Underground Radioactive Material Area (URMA).

Site: 200-W-81	Area: T Plant	Category: Shallow – Surface

Site History

Release Summary: The site consists of three areas that have been contaminated by blown-in tumbleweed fragments. The tumbleweed fragments have contaminated the soil, which in turn has led to additional vegetation contamination. The windblown, contaminated tumbleweed fragments are believed to originate from the southern end of the 218-W-3AE Burial Grounds. The total volume of wastes stored or potentially released at this site is not specified. Therefore, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: The three posted areas contain blown-in contaminated tumbleweeds and tumbleweed fragments. The three sites were submitted to Waste Information Data System (WIDS) together, for incorporation into the WIDS database as a single Discovery Site.

The site has been surveyed several times since its discovery. On June 29, 1998, a railroad survey using a GM/P-11 Probe (15.5 cm^2 [2.4 $in.^2$]) (beta-gamma) discovered contamination on a railroad tie and within the soil in a portion of the T Plant Spur. A second radiation survey on July 31, 2000, identified the three CAs that were created as a result of a consolidation of blown-in contaminated tumbleweeds and new vegetation growth. In addition, a site walkdown performed on November 15, 2000, for verification purposes confirmed the site's location and noted that the three posted CAs still contained blown-in tumbleweeds.

During a routine radiological investigation within the burial ground, contaminated vegetation with readings up to 7,000 dpm were found. The contaminated vegetation was subsequently removed. A verification survey conducted after vegetation was removed discovered contaminated soil with beta/gamma readings of 70,000 dpm. Staff sprayed the site with soil cement and posted the area as a CA.

In 2009, all three CAs were radiologically surveyed and down posted to Soil Contamination Areas (SCAs). Later that same year, each SCA was covered with 15 cm (6 in.) of clean gravel and the postings at each site were changed to URMA.

It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided for the site. If surveys do occur, their frequency is not specified.

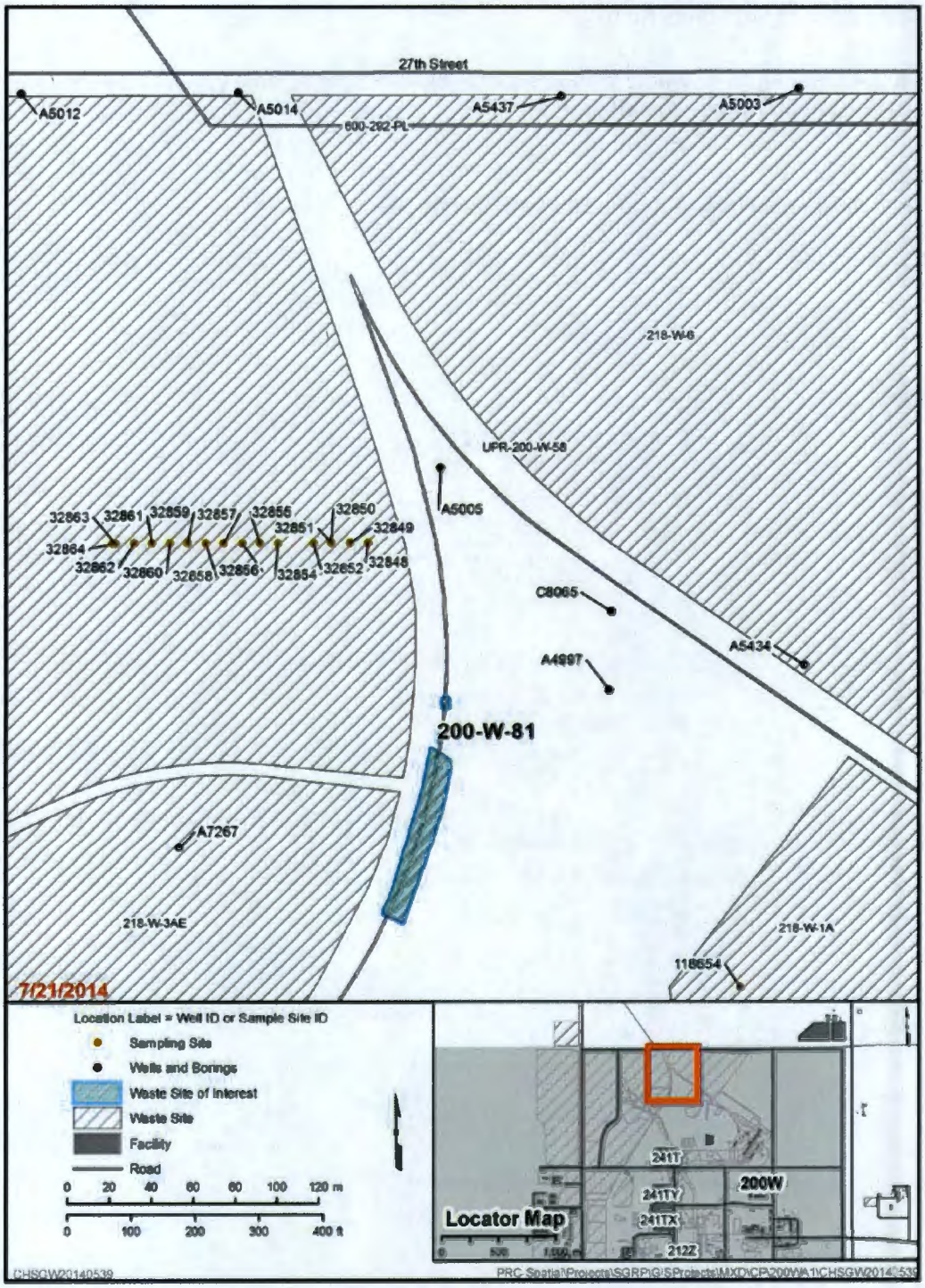
Site: 200-W-81	Area: T Plant	Category: Shallow – Surface

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Potential radiological contamination below the stabilization cover (0.15 m [0.5 ft] bgs).

References:
WIDS General Summary Report for the 200-W-81 Waste Site.

Site: 200-W-81	Area: T Plant	Category: Shallow – Surface



ID = identification

Figure 1. 200-W-81 Waste Site Map

Site: 200-W-82	Area: T Plant	Category: Shallow - Subsurface

Site Description

Alternate Site Identification: Risers East of the 216-TY-201, 216-T-26, 216-T-27, 216-T-28 Cribs, Crib Unloading Station
Site Type: Product Piping
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1, 200-MW-1
Service Dates: Not specified

Waste Site Location and Physical Description: The 200-W-82 waste site consists of two 1.2 m^2 (4.0 ft^2) concrete pads, each with a stainless-steel flanged riser. The metal pipe flanges have a bolted top, and rise approximately 7 cm (3 in.) above the level of the concrete. The site is located east of Camden Avenue, 30 m (100 ft) east of the 216-TY-201 Flush Tank and the 216-T-26, 216-T-27, and 216-T-28 Cribs (Figure 1).

The unloading station was constructed to fit tanker trucks unloading 300 Area liquid wastes into the 216-T-27 and 216-T-28 Cribs. The unloading station conveyed waste from the trucks to the cribs and was capable of unloading up to two trucks at once. The two cement pads with risers are located east of the blanked pipeline 200-W-188-PL, which ran towards the 216-TY-201 Flush Tank. Just south of the flush tank, the pipe continued to run westward to the 216-T-26, 216-T-27, 216-T-28 Crib line (Figure 2). The site is posted with Contamination Area (CA) signs and covers approximately 6 by 12 m (20 by 40 ft) of ground.

Waste Site Coordinates:
E-566975.54038 N-136404.59529

Site Dimensions:
Site Length: 10.7 m (35 ft)
Site Width: 4.9 m (16 ft)
Site Area: 52 m^2 (560 ft^2)
Dimensions measured from Figure 1.

Site Depth: Not specified
Cover Thickness: Not specified

Related Site Structure(s): The 200-W-82 waste site is associated with the 216-T-27 and 216-T-28 Cribs. The pipeline associated with the unloading station is labeled as 200-W-188-PL.

Site Posting: The 200-W-82 waste site is currently posted as a CA.

Site: 200-W-82	Area: T Plant	Category: Shallow - Subsurface

Site History

Release Summary: There is some uncertainty regarding the source of waste sent to the 200-W-82 unloading station. The more likely scenario is that 300 Area wastes, originating from the 340 Waste Transfer Facility, were discharged into the 216-T-28 Crib. However, an additional source states that the waste from the 340 Waste Transfer Facility was instead combined with T Plant and 2706-T waste and discharged into the 216-T-28 Crib via single-shell tanks. This suggests that the 300 Area waste was added to the tank farm tanks instead of disposed of into the 216-T-28 Crib. Based on available drawings and the presence of the unloading platform to the east of the crib series, it is assumed that the latter statement is incorrect.

It is believed that 200-W-82 waste site was constructed for use as a truck unloading station for liquid waste from the 300 Area. It is thought that 200-W-188-PL, which is the short pipeline connected to the station, extended eastward to the risers. Drawing SK-2-3706, *Truck Unload Station* (Figure 3), shows plans for a truck unloading station at the 216-T-34 Crib. A note on the drawing says, "relocate hose connections & support from existing truck unloading station 200W." Since the 300 Area liquid waste that had been going to the 216-T-28 Crib was "rerouted" to the 216-T-34 Crib (ARH-2155), the existing truck unloading station mentioned on the drawing is assumed to be this site. The visible riser configuration east of the 216-TY-201 Flush Tank matches the design on Figure 3. The waste at the unloading station is located on the underground transfer piping, on the risers and pads, and within the ground in areas exposed to contamination via leaks. The total volume of wastes unloaded or potentially released at this site is not specified. Therefore, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: Drawings indicate that the "T" pipe (200-W-188-PL) was originally designed for the construction of three additional cribs that were scheduled to receive wastes from the 216-TY-201 Flush Tank (Figure 2). However, the additional cribs were never constructed.

A site walkdown performed on November 15, 2000, occurred for verification purposes. The site walkdown confirmed the dimensions of the two concrete pads and the site posting. It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided for the site. If surveys do occur, their frequency is not specified.

Site: 200-W-82	Area: T Plant	Category: Shallow - Subsurface

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Potential radiological contamination in the subsurface.

References:

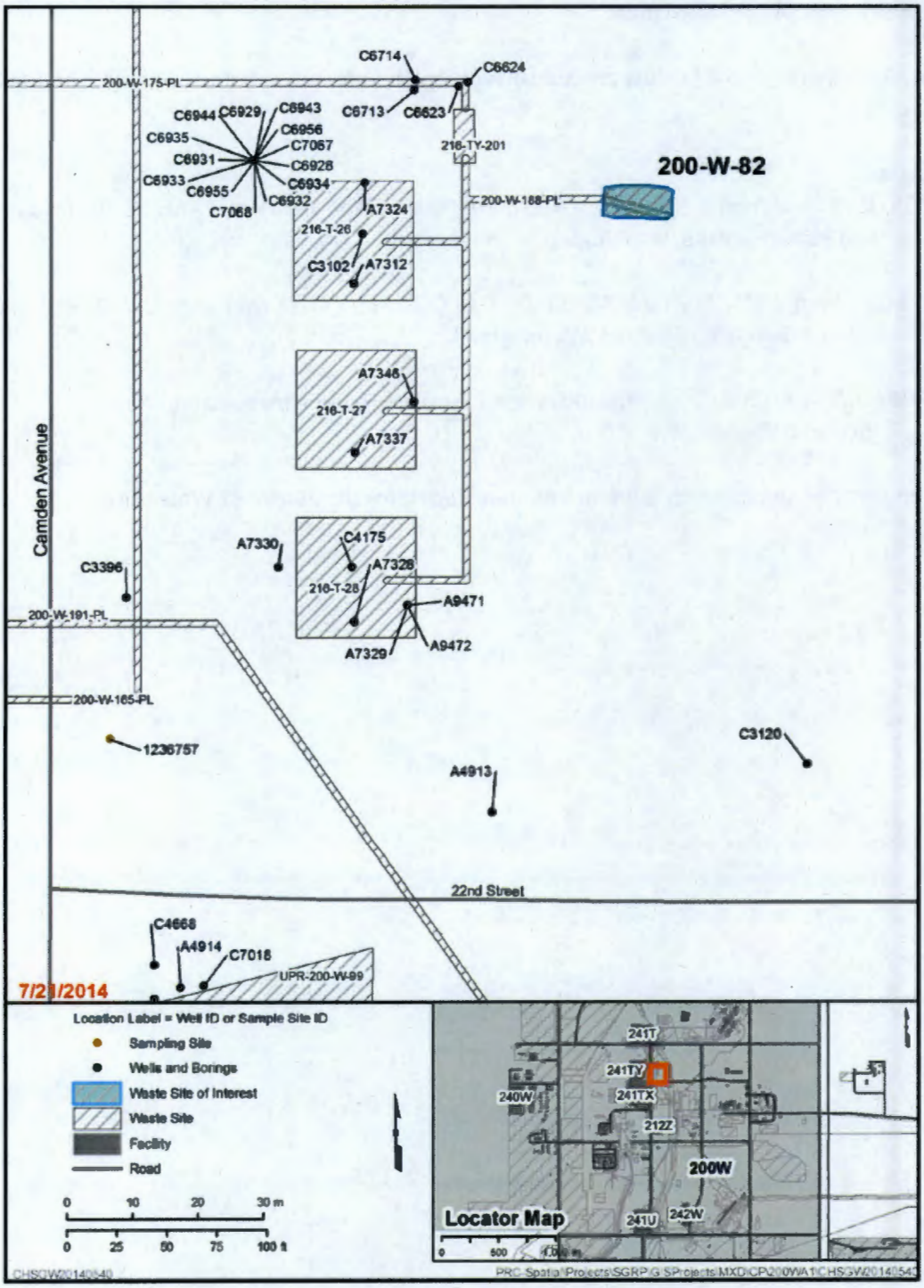
ARH-2155, 1971, *Radioactive Liquid Waste Disposal Facilities 200 West Area*, Atlantic Richfield Hanford Company, Richland, Washington.

H-2-2733 (drawing), 1973, *216-T-26, T-27, T-28, T-18 Cribs Adj. 241-TX & TY Farms*, Sh. 1, Rev. 4, General Electric Company, Richland, Washington.

SK-2-3706 (drawing), 1966, *Truck Unload Station*, Rev. 0, Pacific Northwest Laboratory, Richland, Washington.

Waste Information Data System General Summary Report for the 200-W-82 Waste Site.

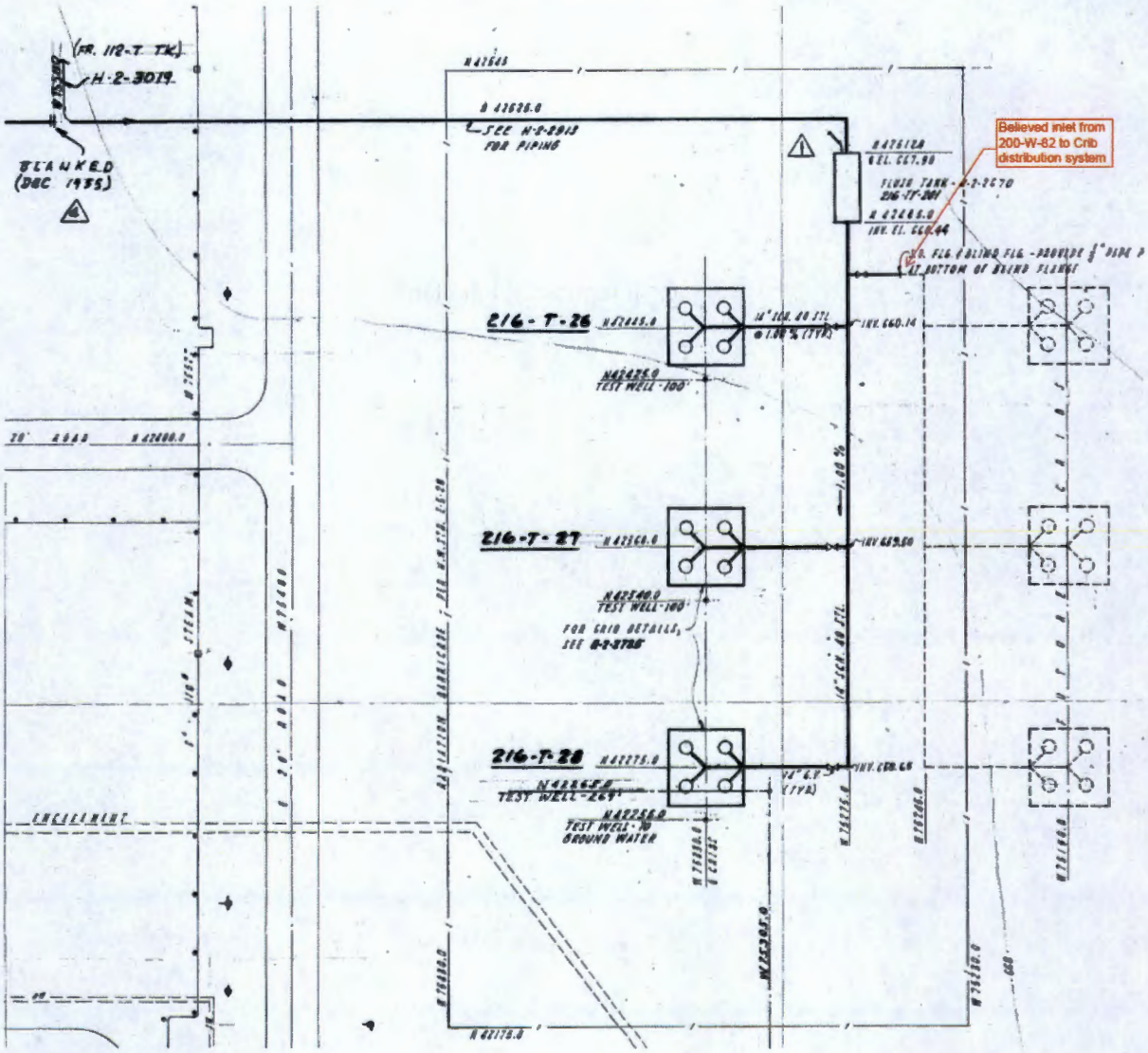
Site: 200-W-82	Area: T Plant	Category: Shallow - Subsurface



ID = identification

Figure 1. 200-W-82 Waste Site Map

Site: 200-W-82	Area: T Plant	Category: Shallow - Subsurface



Source: H-2-2733, *216-T-26, T-27, T-28, T-18 Cribs Adj. 241-TX & TY Farm*, Sheet 1.

Note: Produced from the best available copy.

Figure 2. Pipeline

Site: 200-W-82	Area: T Plant	Category: Shallow - Subsurface

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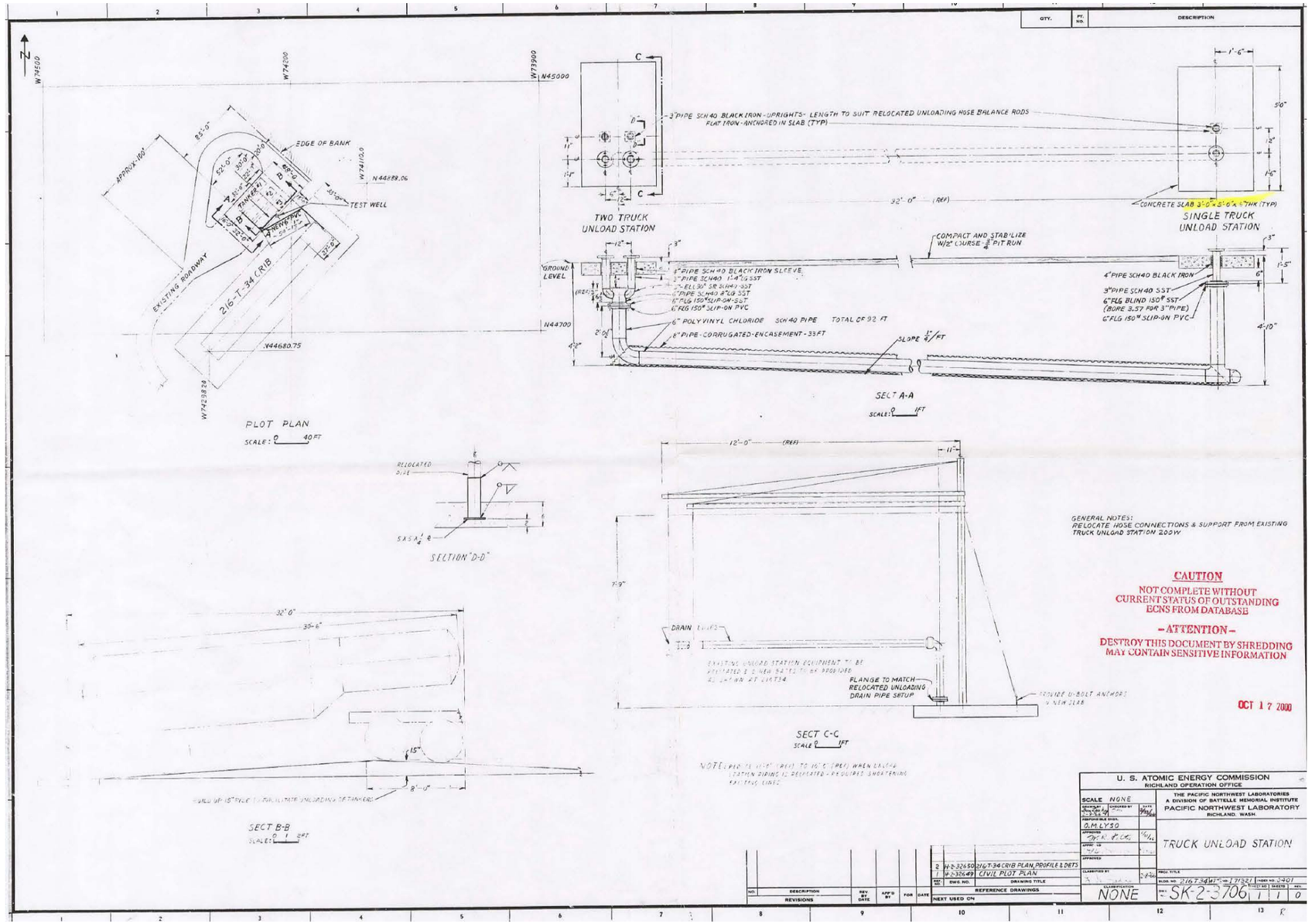
Site: 200-W-82	Area: T Plant	Category: Shallow - Subsurface



Source: SK-2-3706, *Truck Unload Station*.

Note: Produced from the best available copy.

Figure 3. Truck Unload Station

Site: 200-W-82	Area: T Plant	Category: Shallow - Subsurface

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Site: 200-W-90	Area: T Plant	Category: Shallow – Surface Only

Site Description

Alternate Site Identification: Underground Radioactive Material Areas Posted Along 23rd Street in 200 West
Site Type: Unplanned Release
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MW-1, 200-MG-1
Service Dates: Not specified

Waste Site Location and Physical Description: The 200-W-90 waste site consists of three posted Underground Radioactive Material Areas (URMAs). Two are located on the south shoulder of 23rd Street, between Camden and Dayton Avenue, across from the 218-W-2A Burial Ground (Figures 1 through 3). The third waste site is located further east, on the south end of 23rd Street, across from the 241-T Tank Farm. There are no underground pipelines in the area. The ground of all three sites is bare, with no live or growing vegetation present. No reference drawings are available for this site.

Waste Site Coordinates:
E-566399.78498 N-136621.65819

Site Dimensions:
Site Length: 6.1 m (20 ft) Site Depth: Not specified
Site Width: 3.1 m (10 ft) Cover Thickness: Not specified
Dimensions of each of the posted areas.

Related Site Structure(s): The 200-W-90 waste site may be related to UPR-200-W-63.

Site Posting: The 200-W-90 waste site is posted as an URMA.

Site History

Release Summary: The 200-W-90 waste site consists of three unplanned releases that are relatively the same size and near one another. The type and volume of waste released are not documented. It is also unclear what the contamination source is for this site. However, the three waste sites are located close to the 218-W-2A Burial Ground, thus it is possible the contamination originated from there. As the total volume of wastes released at this site is not available, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Site: 200-W-90	Area: T Plant	Category: Shallow – Surface Only

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: The three posted areas that make up the 200-W-90 waste site, which was submitted to the Waste Information Data System (WIDS) as a Discovery Site in 2000. The three areas are similar in size. No radiological investigation describing the characteristics of the areas could be located, nor when they were originally posted.

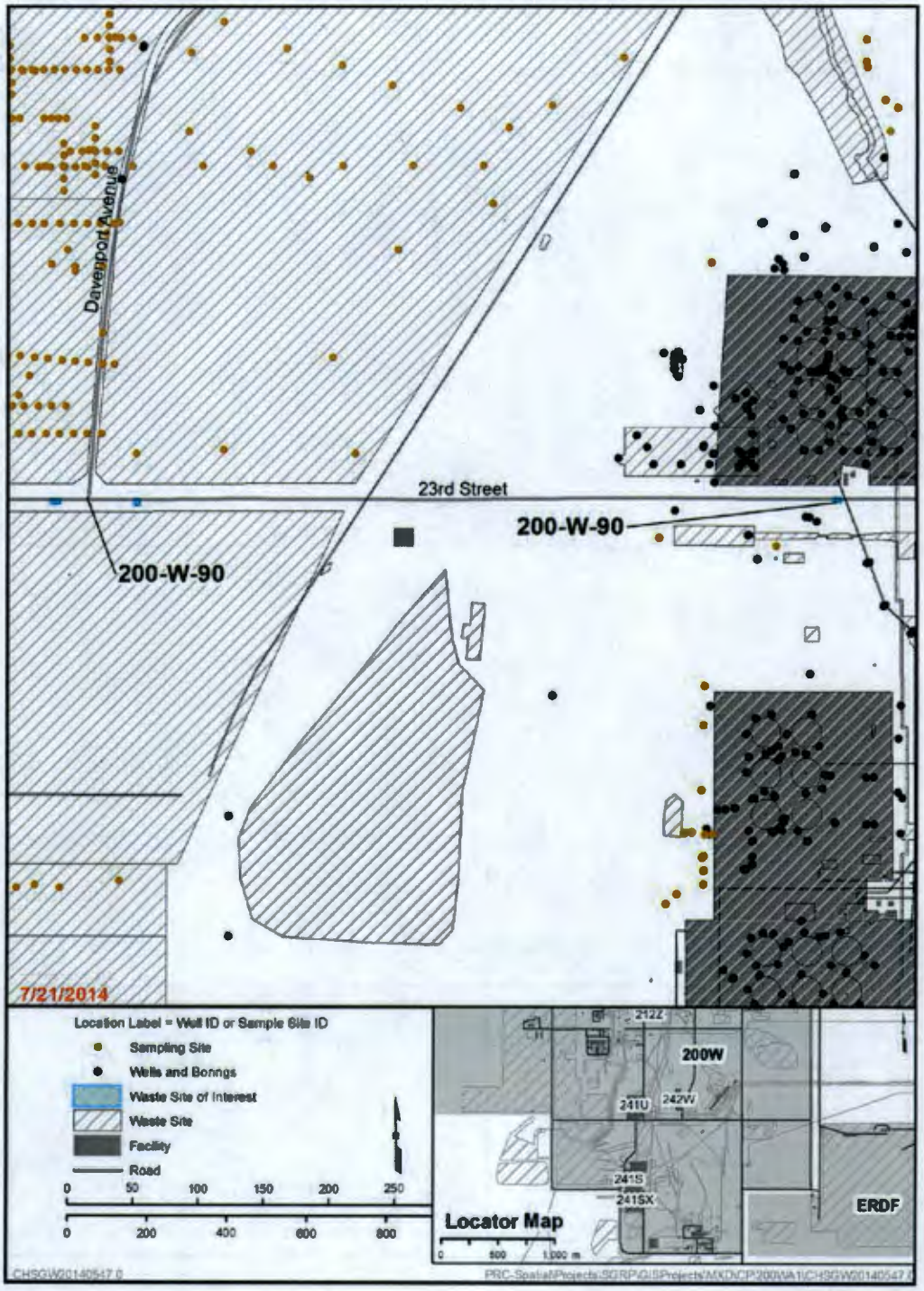
A site walkdown performed on January 9, 2001, occurred for verification purposes. The site walkdown confirmed the dimensions of the three posted areas and their location along the south side of 23rd Street. It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided for the site. If surveys do occur, their frequency is not specified.

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Potential radiological contamination at the surface.

References:
WIDS General Summary Report for THE 200-W-90 Waste Site.

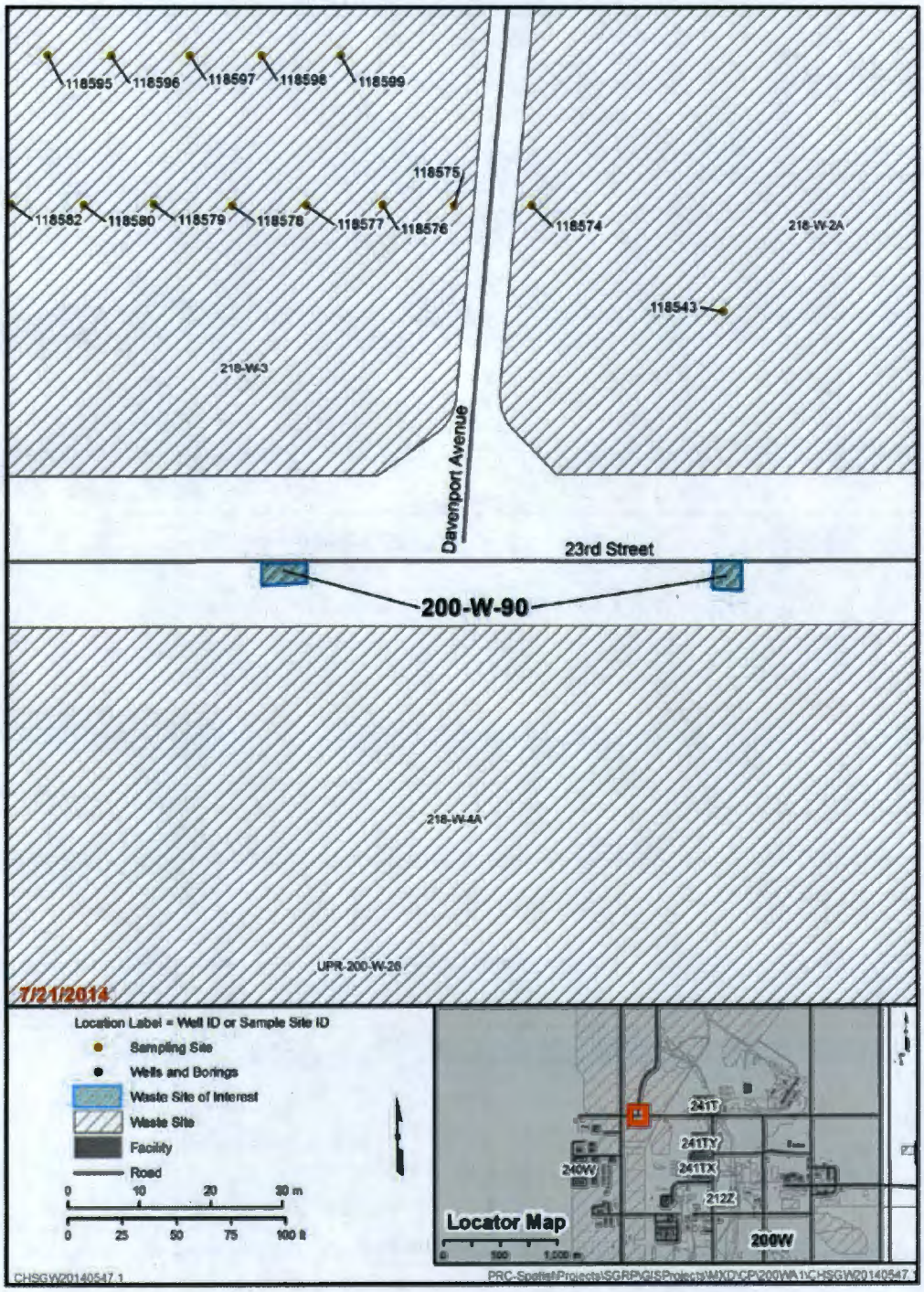
Site: 200-W-90	Area: T Plant	Category: Shallow – Surface Only



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 200-W-90 Waste Site Map

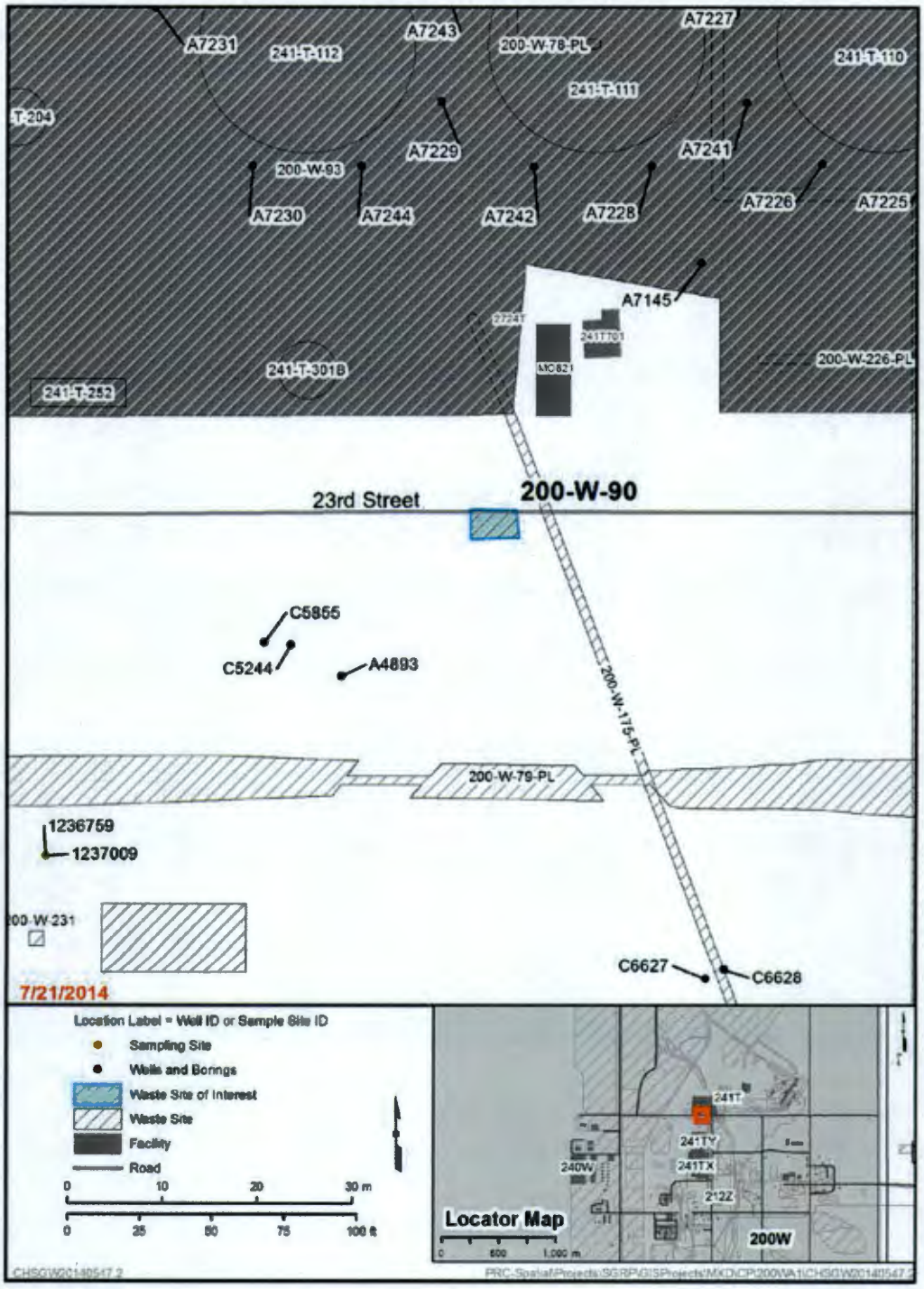
Site: 200-W-90	Area: T Plant	Category: Shallow – Surface Only



ID = identification

Figure 2. 200-W-90 Waste Site Detail Map (showing one of the three site areas)

Site: 200-W-90	Area: T Plant	Category: Shallow – Surface Only



ID = identification

Figure 3. 200-W-90 Waste Site Detail Map (showing one of the three site areas)

Site: 200-W-90	Area: T Plant	Category: Shallow – Surface Only

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Site: 200-W-92	Area: T Plant	Category: Shallow - Subsurface

Site Description

Alternate Site Identification: 200-W-92, Contaminated Mound of Soil and Debris, Soil Mound West of 241-TY Tank Farm
Site Type: Dumping Area
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1, 200-MW-1
Service Dates: Not specified

Waste Site Location and Physical Description: The 200-W-92 waste site is a soil mound roughly 1.5 m (5 ft) tall. The site is surrounded by chain and posted with Contamination Area (CA) signs. A few radiation flags identifying significant contamination are located on the mound. In addition, rocks and chunks of asphalt and cement are visible. Rabbitbrush and other vegetation were observed growing on the mound. The site is covered with a layer of gravel and is currently posted with Underground Radioactive Material Area (URMA) signs. The mound is located west of an unnamed gravel road, west of the 241-TY Tank Farm (Figure 1). No reference engineering drawings are available for this site.

Waste Site Coordinates:
Lon-566670.40106 Lat-136382.51632

Site Dimensions:
Site Length: 24 m (80 ft) Site Depth: Not specified
Site Width: 9 m (30 ft) Cover Thickness: Not specified
This dimension was estimated by the Radiological Control Technician who posted the area.

Related Site Structure(s): The 200-W-92 waste site is not associated with any other known waste sites or facilities.

Site Posting: The 200-W-92 waste site was originally posted as a CA. Following surface stabilization work in 2007, the site was down posted to an URMA.

Site History

Release Summary: The 200-W-92 waste site consists of a pile of dumped soil and miscellaneous debris. It is unclear where the soil and debris originated from. It is also unclear the amount of time the soil and debris had been present at the site. Rabbitbrush shrubs were observed growing on the soil mound, thus the debris and soil had likely been dumped several years prior. As the total volume of contamination released at this site is not available, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Unknown.

Site: 200-W-92	Area: T Plant	Category: Shallow - Subsurface

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: On May 23, 2001, a large mound of contaminated soil and miscellaneous debris was discovered west of the 241-TY Tank Farm during an environmental investigation. Following its discovery, the extent of contamination was identified and the boundary was posted. A GM/P-11 Probe (15.5 cm^2 [2.4 $in.^2$) (beta-gamma) was used during the survey. The probe detected a maximum direct reading of 40,050 cpm on a 10 cm (3.9-in.) rock.

After the contamination's discovery, the site was submitted to the Waste Information Data System as a Discovery Site. In 2001, contamination levels were detected up to 1.6 million dpm per 100 cm^2 (15.5 $in.^2$) of beta gamma and 14,000 dpm per 100 cm^2 (15.5 $in.^2$) of alpha in the soil and debris. It is believed that the soil was dumped at this site several years prior.

A site walkdown performed on July 17, 2001, occurred for verification purposes. The walkdown confirmed the location of the posted mound and documented the site characteristics. In addition, staff noted that a moderate amount of vegetation, primarily rabbitbrush, was growing on the soil pile. The site was mapped using Global Positioning System equipment on October 24, 2004. The site was surface stabilized with clean gravel in April 2007.

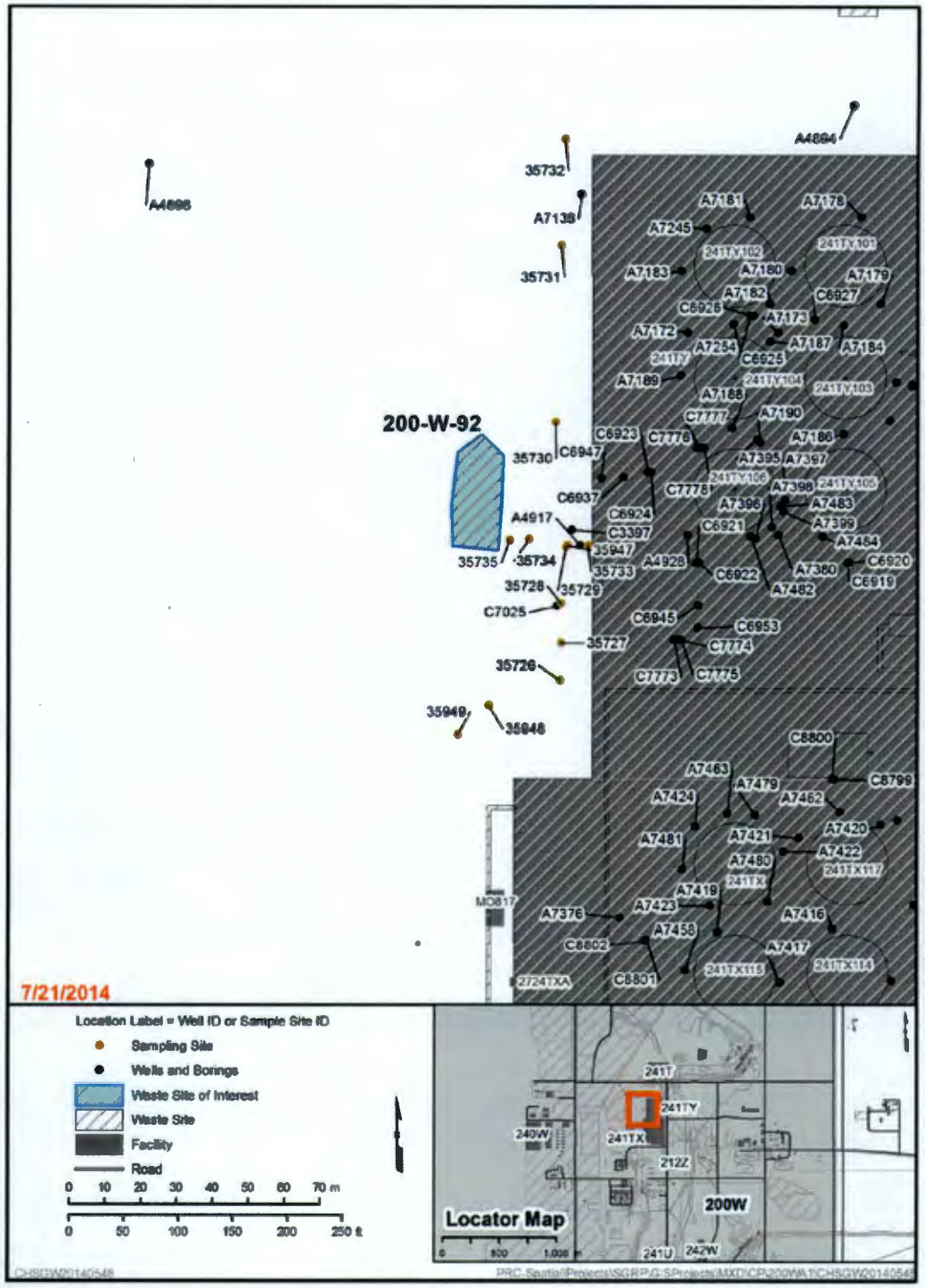
It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided for the site. If surveys do occur, their frequency is not specified.

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 to 15 ft] below ground surface [bgs]): Potential radiological contamination at the surface, below the stabilization cover.

References:
Waste Information Data System General Summary Report for the 200-W-92 Waste Site

Site: 200-W-92	Area: T Plant	Category: Shallow - Subsurface



ID = identification

Figure 1. 200-W-92 Waste Site Map

Site: 200-W-92	Area: T Plant	Category: Shallow - Subsurface

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Site: 200-W-106	Area: T Plant	Category: Shallow - Subsurface

Site Description

Alternate Site Identification: Soil Contamination Area Adjacent
Site Type: Unplanned Release
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MW-1, 200-MG-1
Service Dates: Not Specified

Waste Site Location and Physical Description: The 200-W-106 waste site is an unplanned release of contaminated soil west of the 241-TX Tank Farm. The site is west of the 216-T-25 Trench and northeast of the 200-W-55 dump site (Figure 1). The 200-W-106 waste site was covered with 15.2 – 30.5 cm (6 – 12 in.) of gravel as part of a surface stabilization effort in March 2010. No engineering reference drawings are available for this site. The immediate area supported large, growing rabbitbrush and sagebrush shrubs, suggesting that the vegetation had been growing at the site for several years. The area containing the contamination has little to no vegetation.

Waste Site Coordinates:
E-566449.45300 N-136174.00800

Site Dimensions:
Site Length: 20 m (67 ft)
Site Width: 16 m (53 ft)
Site Area: 330 m^2 (3,551 ft^2)
Site Depth: Not specified
Cover Thickness: 15 – 30 cm (6 – 12 in.)

Related Site Structure(s): The 200-W-106 waste site is not associated with any other known waste sites or facilities, but it is adjacent to the 200-W-55 dump site.

Site Posting: The 200-W-106 waste site was originally posted as a Surface Contamination Area (SCA). Following surface stabilization work in 2010, the site was down posted to an Underground Radiation Material Area (URMA).

Site History

Release Summary: Site 200-W-106 was discovered on February 13, 2003, when an employee was driving past the 200-W-55 dump site. The employee was unfamiliar with the dump site, and stopped to make a perfunctory radiological investigation of the site. The employee discovered soil contamination on the top rim of the debris pit not associated with or connected to the 200-W-55 dump site. Further investigation of the site indicated that the soil had been dumped at the site many years ago, as indicated by the presence of undisturbed, large, growing rabbitbrush and sagebrush shrubs surrounding the contaminated area. Over 15 individual contaminated spots were located at this site.

Site: 200-W-106	Area: T Plant	Category: Shallow - Subsurface

The site consists of a pile of dumped soil and miscellaneous debris. It is unclear where the soil and debris originated from. It is also unclear the amount of time the soil and debris had been present at the site. Large shrubs were observed growing around the soil mound, thus the debris and soil had likely been dumped several years prior. As the total volume of contamination released at this site is not available, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Not specified.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: The site has been surveyed several times since its discovery. The first radiation survey occurred on February 13, 2003, when a routine contamination survey discovered a maximum surface reading of 3,600 cpm. The levels of contamination increased as investigators probed deeper into the soil profile. Readings taken from the surface showed 300 cpm present, with contamination levels increasing deeper into the soil profile. Readings rose to 7,600 cpm at a depth of 7.6 cm (3 in.). Further investigations were conducted to calculate the depth of contamination. Most of the contamination was discovered within 15 cm (6 in.) of the ground surface. A maximum reading of 20,100 cpm was found at a depth of 10 cm (4 in.).

A second radiation survey took place on February 25, 2003, to further investigate the site's characteristics and the depth of contamination. A maximum contamination level of 20,100 cpm was found at 10 cm (4 in.) below the ground.

A final series of radiation surveys occurred on March 25, 2010, to document the downposting of the site from a SCA to an URMA following surface stabilization. Surface stabilization involved removing non-radiologically contaminated debris and covering the site with a layer of clean backfill 15.2 – 30.5 cm (6 – 12 in.) deep. However, some large chunks of asphalt and concrete were left behind and buried beneath the backfill instead. While no contamination was detected on removed debris, spotty contamination was discovered in the soil before surface stabilization occurred. Radiation readings ranged from 15,000 to 20,000 dpm beta gamma. A verification survey took place following the placement of the clean backfill. The survey did not find any contamination in the area after backfilling occurred.

The site was mapped using Global Positioning System survey equipment on February 24 and 25, 2003.

It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided for the site. If surveys do occur, the frequency is not specified.

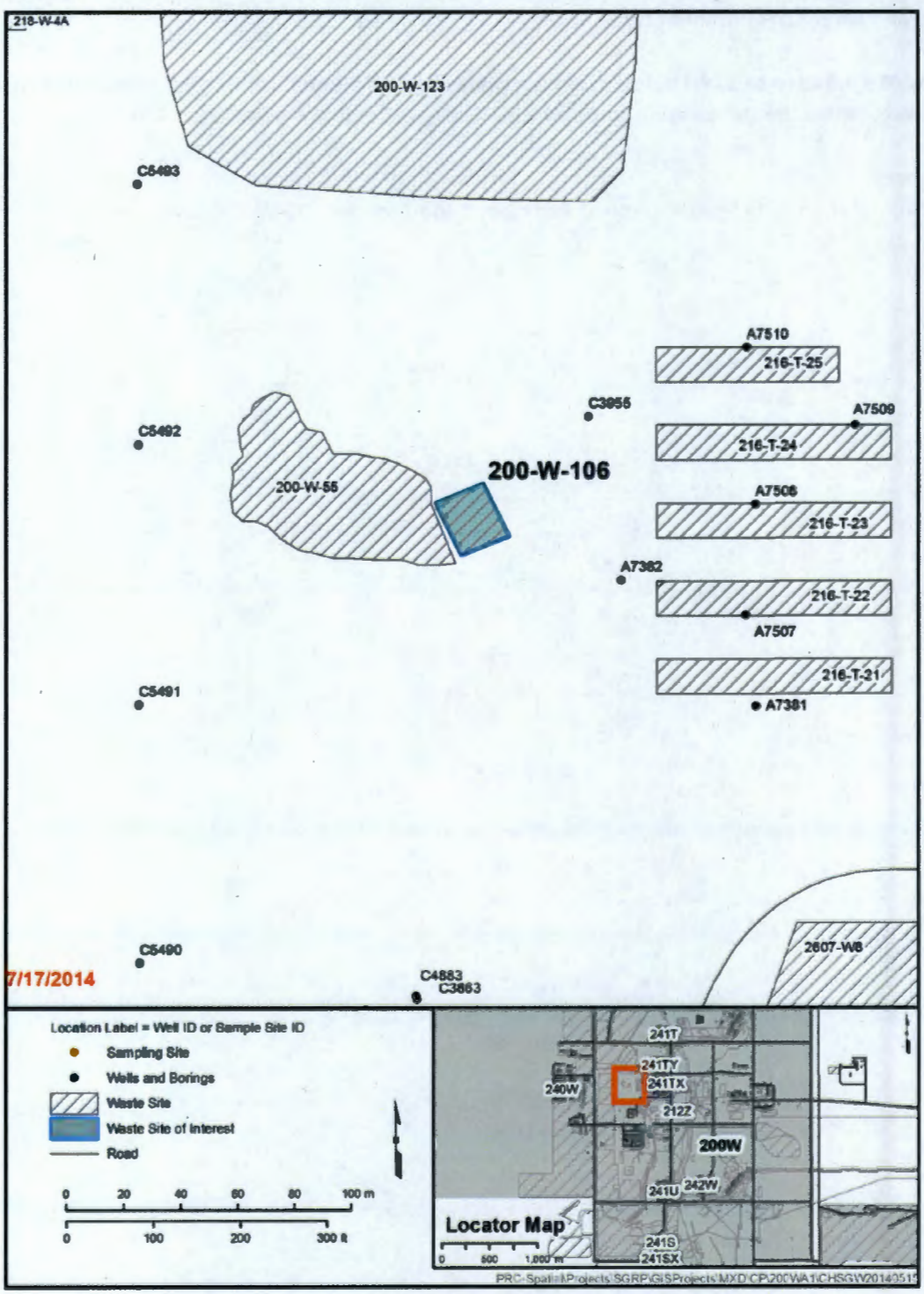
Site: 200-W-106	Area: T Plant	Category: Shallow - Subsurface

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 to 15 ft] below ground surface [bgs]): Potential radiological contamination in the subsurface, below the stabilization cover which is 0.15 – 0.3 m (0.5 – 1 ft) thick.

References:
Waste Information Data System General Summary Report for the 200-W-106 Waste Site.

Site: 200-W-106	Area: T Plant	Category: Shallow - Subsurface



ID = identification

Figure 1. 200-W-106 Waste Site Map

Site: 200-W-127	Area: T Plant	Category: Intermediate

Site Description

Site Alternate Identification: 200-W-127, Surface Stabilization Area East of UPR-200-W29/UPR-200-W-97 (UN-216-W-5)
Site Type: Unplanned Release
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2, 200-MW-1
Service Dates: Not specified

Waste Site Location and Physical Description: Site 200-W-127 is an unplanned release located on the south side of 23rd Street (Figure 1). It is west of T Plant and east of UPR-200-W-29/UPR-200-W-97, which is a posted Underground Radioactive Material Area (URMA) on the corner of 23rd Street and Camden Avenue. Two pipelines are buried beneath the site (Figure 2).

Waste Site Coordinates:
E-566961.82304 N-136592.78837

Site Dimensions:
Site Length: Not specified Site Depth: Not specified
Site Width: Not specified Cover Thickness: 0.6 m (2 ft)

Related Site Structure(s): The encased pipeline 200-W-129-PL pipeline crosses the URMA of waste site 200-W-127.

Site Posting: Site 200-W-127 is currently posted as an URMA.

Site History

Release Summary: It is assumed that waste was released from one of the two pipelines buried beneath the site, resulting in the site becoming contaminated. It is unclear the type of waste or volumes of waste sent through the pipelines beneath this site, or the type of waste or volume of waste that was released that created this waste site. As the total volume of contamination released at this site is not available, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Not specified

Pore Volume Discharged: Unknown.

Waste Inventory: Not available

Site: 200-W-127	Area: T Plant	Category: Intermediate

Previous Site Characterization

Site Characterization Summary: Two underground pipelines run across and intersect each other beneath 200-W-127 (Figure 2). One pipeline is an encased tank farm line that connects the 241-T-151 and 241-T-155 Diversion Boxes. The second line is an underground black iron pipe that ran to the 207-T Retention Basin. Both pipelines are different than the pipelines that were the source of contamination for the UPR-200-W-29 and UPR-200-W-97 waste sites.

The site was surface stabilized with 0.6 m (2 ft) of clean gravel in 1994. The location of the site was documented using Global Positioning System equipment on October 20, 2004. It is not specified if any other surveys or investigations have occurred at this site. It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided for the site. If surveys do occur, their frequency is not specified.

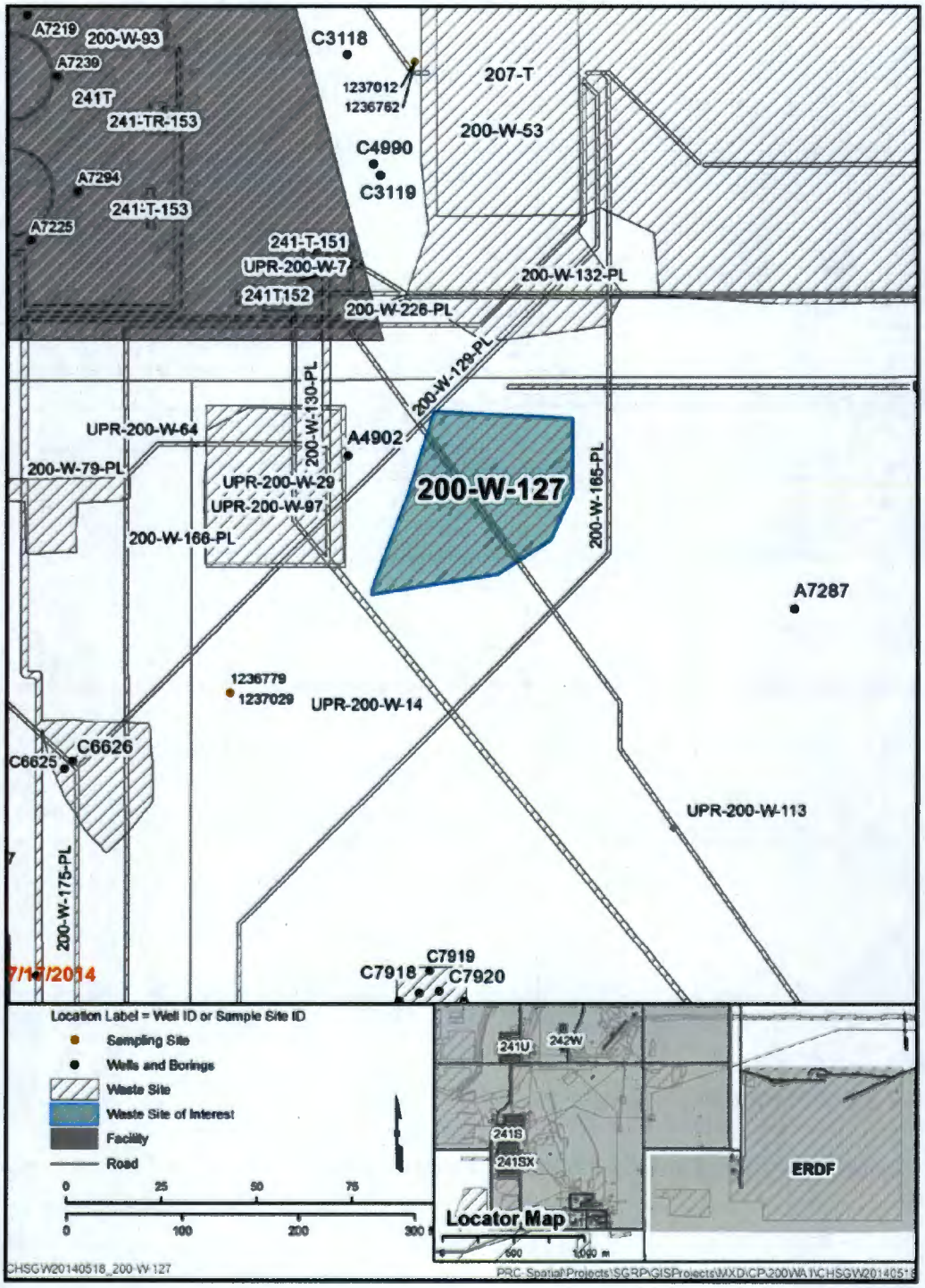
Nature and Extent of Contamination: No data are available to evaluate for the presence or absence of shallow or intermediate depth soil contamination. The type and volume of waste and depth are unknown. The approximate depth to groundwater is 69.5 m (228 ft) below ground surface (bgs).

References:

H-2-3020 (drawing), 1956, *Waste Line to 241-T-112 Tank to 241-TX-3 Crib*, Rev. 2, General Electric Company, Richland, Washington.

Waste Information Data System General Summary Report for the 200-W-127 Waste Site.

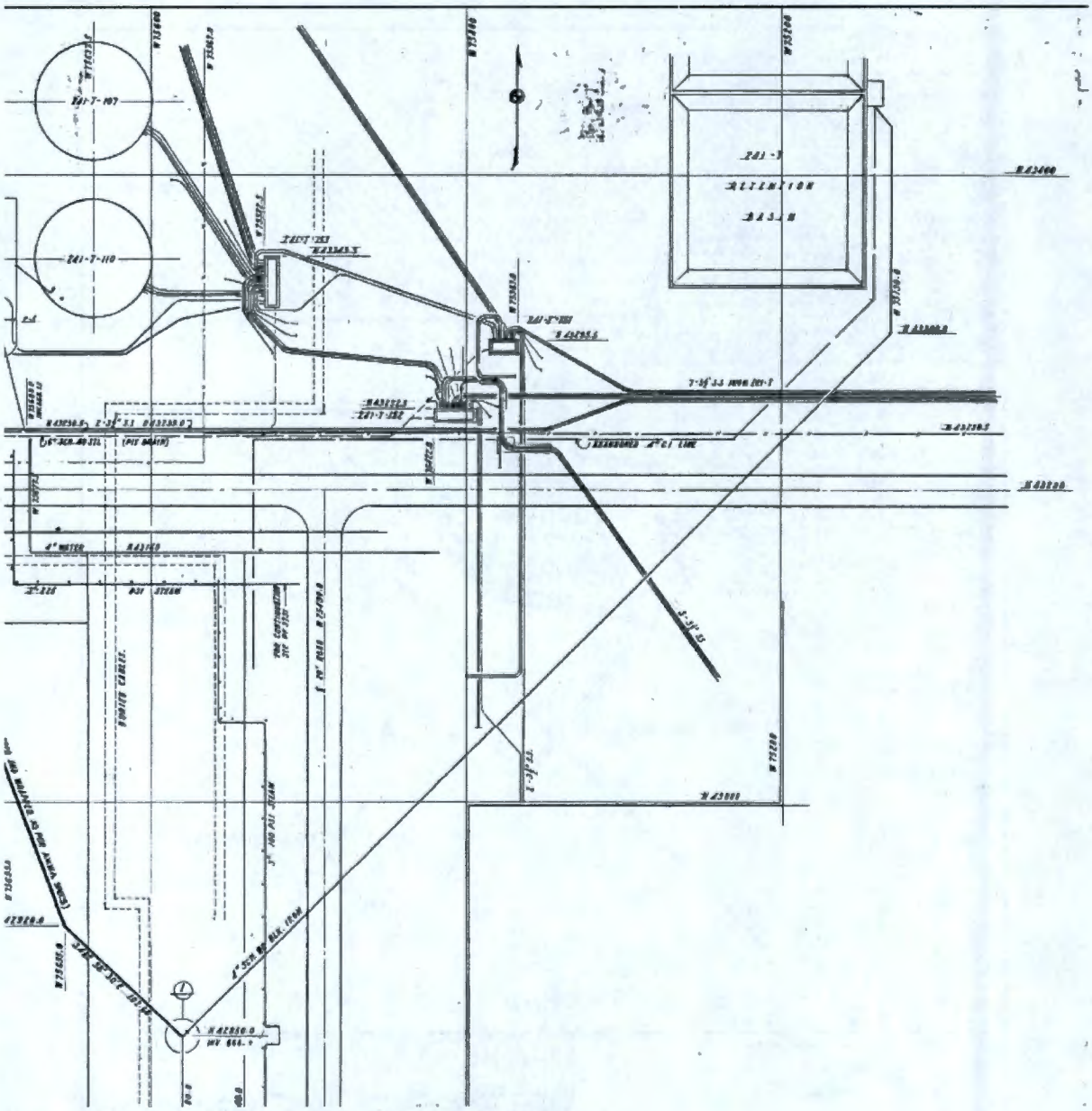
Site: 200-W-127	Area: T Plant	Category: Intermediate



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 200-W-127 Waste Site Map

Site: 200-W-127	Area: T Plant	Category: Intermediate



Source: H-2-3020, *Waste Line to 241-T-112 Tank to 241-TX-3 Crib.*

Note: Produced from the best available copy.

Figure 2. Pipeline Locations

Site: 200-W-128	Area: T Plant	Category: Shallow – Surface Only

Site Description

Alternate Site Identification: Underground Radioactive Material Area (URMA)
Site Type: Unplanned Release
Facility/Geographic Area: T Plant Area East of 218-W-4A
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: Not specified

Waste Site Location and Physical Description: The 200-W-128 waste site is an unplanned release located 30 m (100 ft) south of 23rd Street, next to the 218-W-4A fence (Figure 1). The site is posted with URMA signs. No engineering reference drawings are available for this site.

Waste Site Coordinates:
E-566406.14592 N-136570.69753

Site Dimensions:
Site Length: 15 m (50 ft) Site Depth: Not specified
Site Width: 5.5 m (18 ft) Cover Thickness: Not specified
Dimensions have been estimated by visual observance.

Related Site Structure(s): The 200-W-128 waste site is associated with the 218-W-4A Burial Ground.

Site Posting: The 200-W-128 waste site is posted with URMA signs.

Site History

Release Summary: The contaminated sand was deposited onto the site via wind deposition, and was eventually buried beneath an additional layer of blown in sand. The contaminated sand originated from the 218-W-4A Burial Ground. It is thought the contamination was first identified in 1988.

The levels of contamination present in the sand are not specified. In addition, it is not specified how deep the layer of contaminated sand was, nor how deep the covering layer of sand is. As the total volume of contamination present is not available, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Site: 200-W-128	Area: T Plant	Category: Shallow – Surface Only

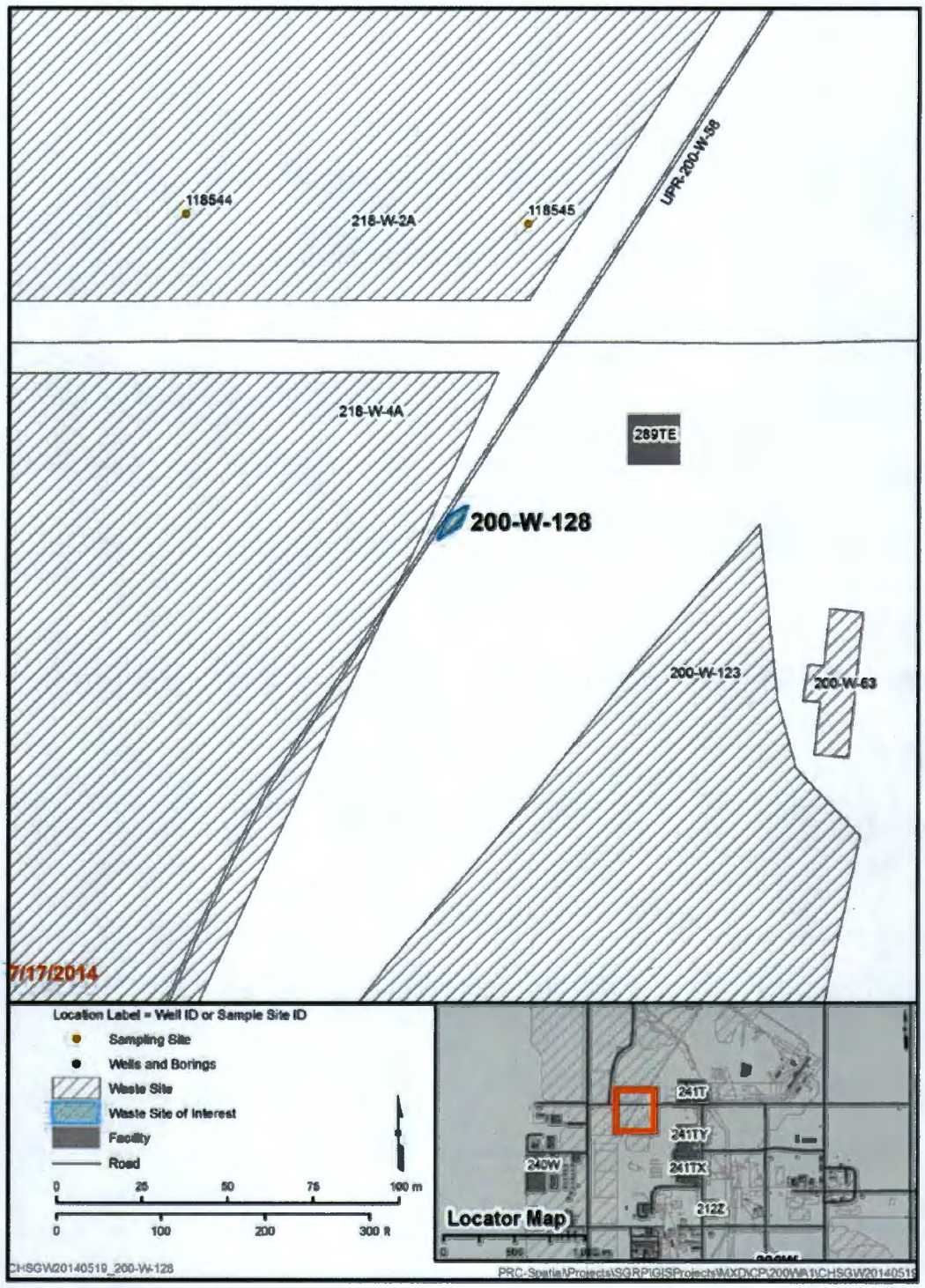
Previous Site Characterization

Site Characterization Summary: The 200-W-128 waste site was mapped using Global Positioning System equipment on February 10, 2005. No radiological survey data are provided for this site. It is unclear if the site is routinely surveyed or monitored as no survey results or sample data analyses are provided. If surveys do occur, their frequency is not specified. In addition, it is unclear if any remediation work has occurred at this site.

Nature and Extent of Contamination:
Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Potential radiological contamination in the subsurface.

References:
Waste Information Data System General Summary Report for the 200-W-128 Waste Site.

Site: 200-W-128	Area: T Plant	Category: Shallow – Surface Only



ID = identification

Figure 1. 200-W-128 Site Map

Site: 200-W-128	Area: T Plant	Category: Shallow – Surface Only

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Site: 200-W-231	Area: T Plant	Category: Intermediate

Site Description

Alternate Site Identification: Temporary Facilities Construction Trailer Septic Tank and Tile Field
Site Type: Septic Tank
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: 1951 to Unspecified Date

Waste Site Location and Physical Description: The 200-W-231 waste site is comprised of a septic and tile field. Neither feature is posted or marked, nor are their exact coordinates available. The site is located west of Camden Avenue, and south of 23rd Street (Figure 1). The septic and tile field are roughly 16.7 m (55 ft) south of the 200-W-79-PL pipeline, which is the pipeline that feeds the 216-T-36 Crib. Since the crib was constructed in 1967, it is possible the crib construction could have affected the septic system.

Waste Site Coordinates:
E-566762.94453 N-136579.00000

Site Dimensions:
Site Length: Not specified Site Depth: Not specified
Site Width: Not specified Cover Thickness: Not specified

Related Site Structure(s): The 200-W-231 waste site is associated with the temporary construction facilities used during the construction of the 241-TY Tank Farm.

Site Posting: The 200-W-231 waste site is currently not posted or marked.

Site History

Release Summary: During the 1950s, numerous temporary construction buildings were established to support construction efforts. Drawing H-2-2289, *Utilities & Facilities Temporary and Permanent Plot Plan*, shows the septic tank and tile field that supported a temporary construction office and an X-ray laboratory (Figure 2). The temporary construction facilities were set up to support construction activities of the 241-TY Tank Farm.

It is possible that X-ray development solutions were disposed of via the septic system. Solutions may have contained sulfur dioxide, acetic acid, boric acid, potassium sulfite, and sodium sulfite. However, the volume of solution and the amount of chemicals released into the septic tank and tile field are not

Site: 200-W-231	Area: T Plant	Category: Intermediate

specified. As the total volume of contamination released is not available, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Not specified.

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: No survey data or investigative history is provided for this site. It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided. If surveys do occur, their frequency is not specified. In addition, it is unclear if any remediation work has occurred at this site.

Well and borehole locations are shown on Figure 1.

Well/Borehole 299-W10-4/A7137 monitored the 216-T-36 Crib (ARH-ST-156, *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells*, Volume III). On the basis of the scintillation probe profiles, minor activity in the logs was attributed to the 216-T-7 Crib located to the north (ARH-ST-156 , Volume III).

Nature and Extent of Contamination: No data are available to evaluate for the presence or absence of shallow or intermediate depth soil contamination at the 200-W-231 waste site. The type and volume of waste and depth are unknown. It is possible that X-ray development solutions were disposed of via the septic system. The approximate depth to groundwater is 69.8 m (229 ft) below ground surface (bgs).

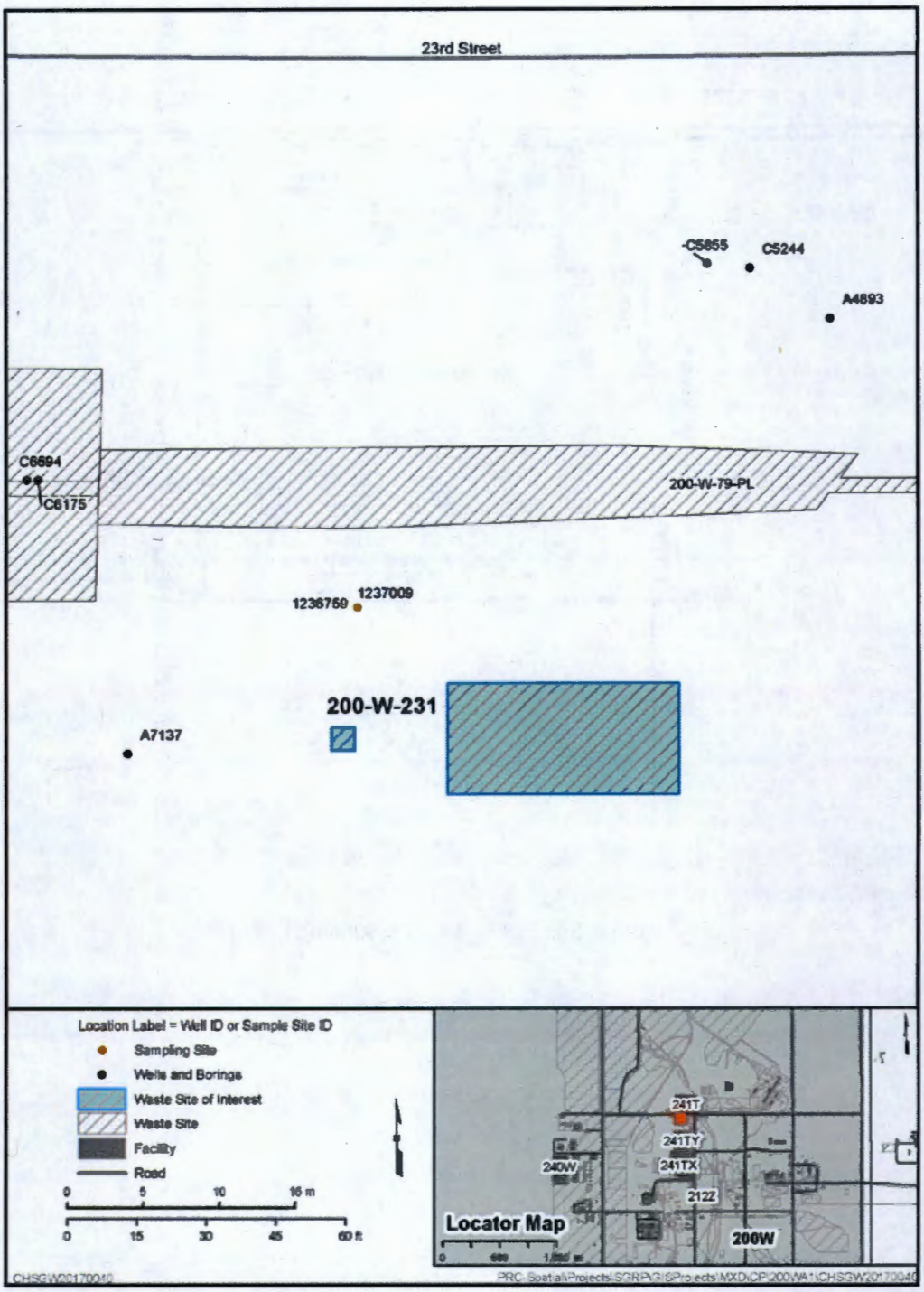
References:

ARH-ST-156, 1977, *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells*, Volume III, Atlantic Richfield Hanford Company, Richland, Washington.

H-2-2289 (drawing), 1955, *Utilities & Facilities Temporary and Permanent Plot Plan*, Rev. 3, General Electric Company, Richland, Washington.

Waste Information Data System General Summary Report for the 200-W-231 Waste Site.

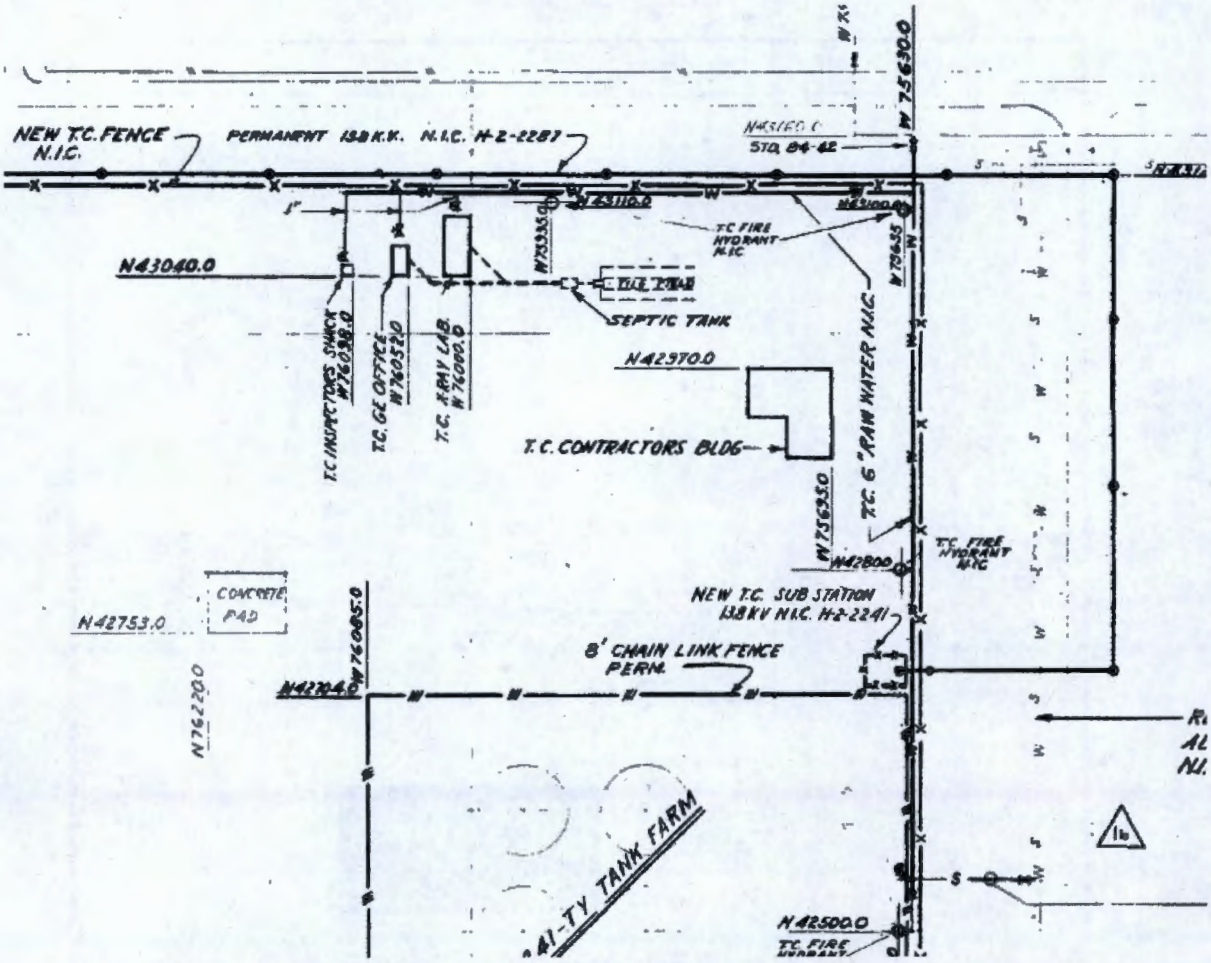
Site: 200-W-231	Area: T Plant	Category: Intermediate



ID = identification

Figure 1. 200-W-231 Site Map

Site: 200-W-231	Area: T Plant	Category: Intermediate



Source: H-2-2289 *Utilities & Facilities Temporary and Permanent Plot Plan.*

Note: Produced from the best available copy.

Figure 2. Site Layout and Surrounding Features

Site: 200-W-237	Plant: T Plant	Category: Intermediate

Site Description

Alternate Site Identification: Effluent Pond South of T Plant
Site Type: Pond
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: Not applicable
Service Dates: Unknown

Waste Site Location and Physical Description: The 200-W-237 waste site is located inside the 200 West Area south of the 224-T Building about 6 m (20 ft) south of 23rd Street, near Beloit Ave (Figure 1).

The waste site is a square open excavation that was visually apparent in January 2011. It is surrounded by several orange stakes. The top of the square excavation is estimated to be approximately 15 m^2 (50 ft^2) and 1.2 m (4 ft) deep. A grey 10.1 cm (4-in.) polyvinyl chloride pipe (PVC) is visible extending into the excavation in the northeast corner of the hole.

Waste Site Coordinates:
E-567607.375344 N-136609.934548

Site Dimensions:
Site Length: 15.0 m (50 ft) Site Depth: 1.2 m (4.0 ft)
Site Width: 15.0 m (50 ft)
Area: 225 m^2 (2,500 ft^2)
Note: Site dimensions are based on visual observation.

Related Site Structure(s): The excavation is fed by a 10.1 cm (4 in.) PVC pipeline that originates at the 224-T Building.

Site Posting: The posting for the 200-W-237 waste site is not specified

Site History

Release Summary: It is unknown if this site received liquid waste. The area is labeled "Pond" on H-2-44511, *Area Map 200 West "T" Plant Facilities*, Sheet 132. However, the excavation was never assigned a Hanford Site liquid waste site number. Cribs, ponds and ditches in the 200 Areas were usually assigned a number that began with 216, indicating it was a liquid waste site in the 200 Area. Since it was not assigned a number, it is possible it was built but never put into service. The drain line has been plugged and abandoned.

Volume/Mass Discharged: Unknown.

Site: 200-W-237	Plant: T Plant	Category: Intermediate

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: No site characterization has been performed.

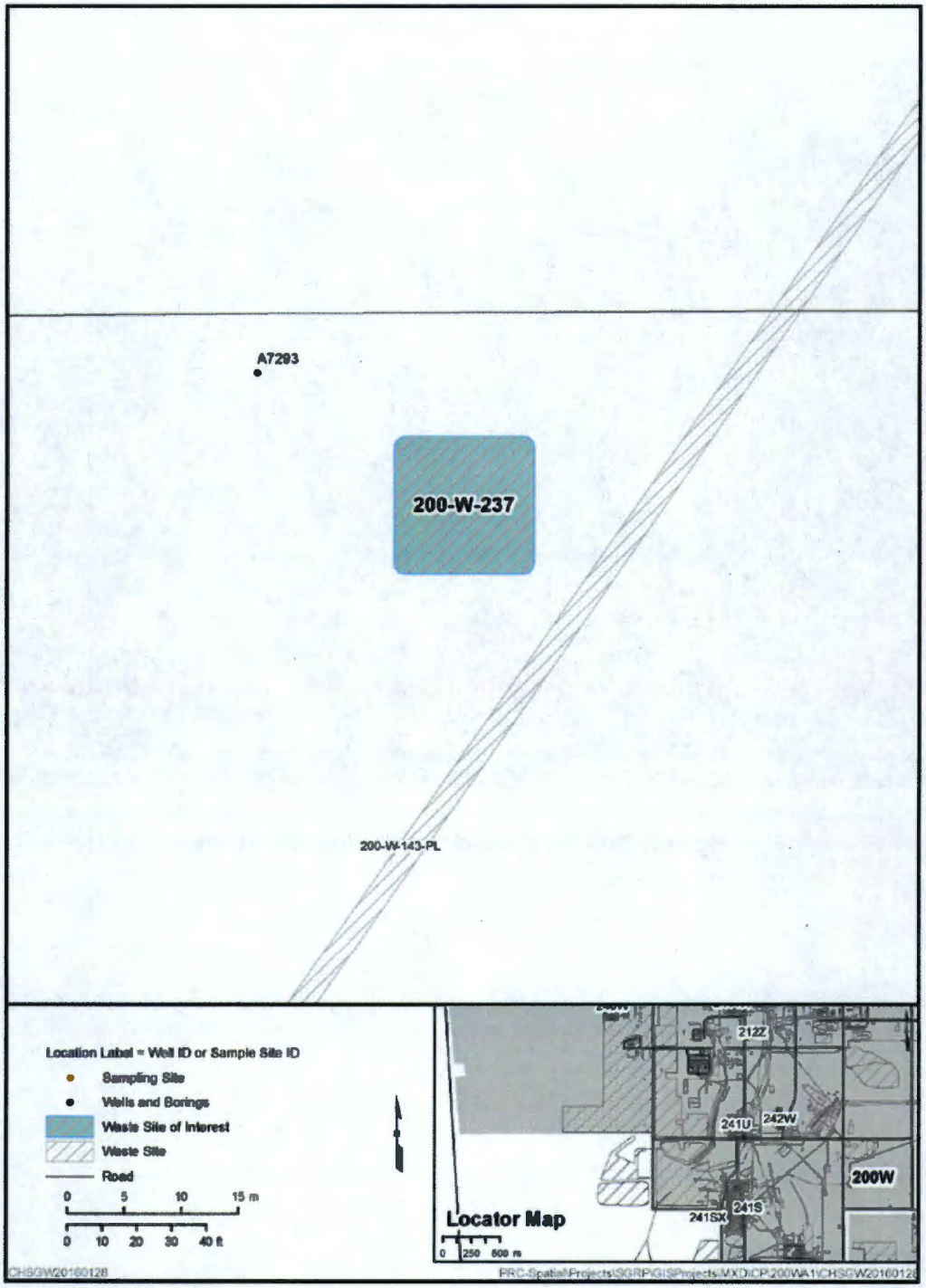
Nature and Extent of Contamination: No release has been documented.

References:

H-2-44511 (drawing), 2001, *Area Map 200 West "T" Plant Facilities*, Sh. 132, Rev. 9, Westinghouse Hanford Company, Richland, Washington.

Waste Information Data System General Summary Report for the 200-W-237 Waste Site.

Site: 200-W-237	Plant: T Plant	Category: Intermediate



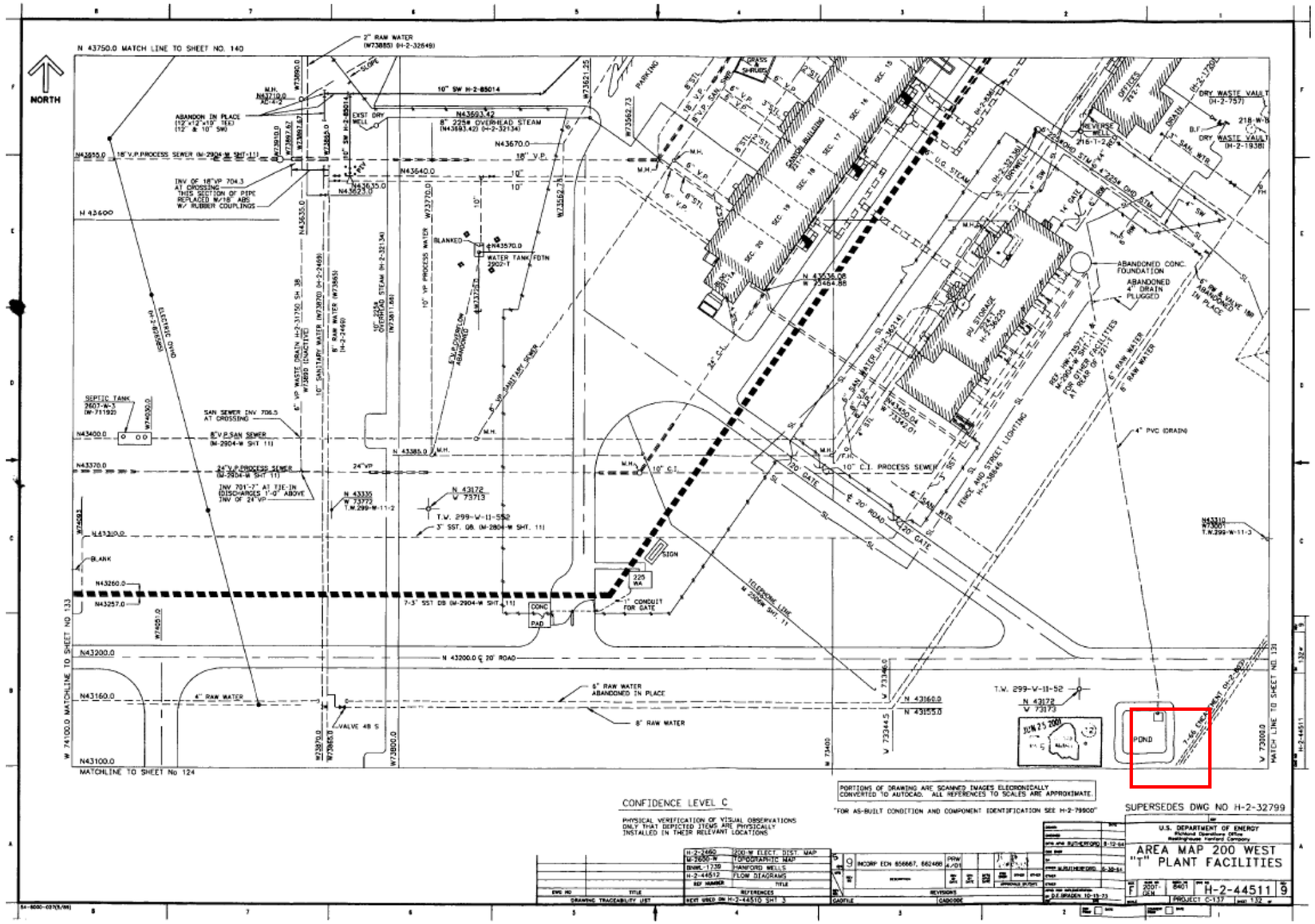
ID = identification

Figure 1. 200-W-237 Waste Site Map

Site: 200-W-237	Plant: T Plant	Category: Intermediate

Figure 2. 2011 Site Photo of the 200-W-237 Waste Site

Site: 200-W-237	Plant: T Plant	Category: Intermediate



Source: H-2-44511, *Area Map 200 West "T" Plant Facilities*.

Note: Produced from the best available copy.

Figure 3. 200-W-237 Waste Site Construction Drawing

Site: 200-W-237	Plant: T Plant	Category: Intermediate

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Site: 207-T	Area: T Plant	Category: Intermediate

Site Description

Alternate Site Identification: 207-T, T Plant Retention Basin, 207-T Retention Basin
Site Type: Retention Basin
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: 1944 to 1995

Waste Site Location and Physical Description: The 207-T Retention Basin has been backfilled to match the surrounding grade. The site is posted as an Underground Radioactive Material Area (URMA), and is marked with T Posts at each corner. The site is located west of 221-T Building and north of 23rd Street (Figure 1). The basin is a concrete feature split into two halves (Figure 2), with a 3,800,000 L (1,000,000-gal) capacity. The bottom dimensions for each half is 32.3 m^2 (106 ft^2). Two 40.6 cm (16-in.) diameter cast iron pipes were connected to two 0.9 m (3 ft) sumps, one for each basin. An estimated 1,830 m (6,000 ft) of 61 cm (24 in.) diameter vitrified clay pipeline was used to convey wastewater to and from the basin. A black pipeline leaves the east side of the basin, heading south (Figure 2). The pipeline terminates at a pipeline that feeds into the 216-TY-201 Flush Tank.

Waste Site Coordinates:
E-566969.04471 N-136705.03107

Site Dimensions:
Site Length: 75.0 m (246.0 ft)
Site Width: 37.5 m (123 ft)
Area: 2,811 m^2 (30,258 ft^2)
Note: Total dimensions for both basins.
Site Depth: 2.0 m (6.5 ft)
Cover Thickness: 46 – 61 cm (18 – 24 in.) of clean soil

Related Site Structure(s): The 207-T Retention Basin is associated with the 221-T and 224-T Facilities, 216-T-12 and 200-W-53 waste sites, and with the 216-T-4-1 and 216-T-4-2 ditches. The inlet pipelines associated with these basins are Waste Information Data System (WIDS) site codes 200-W-88-PL, 200-W-165-PL, 200-W-166-PL, and 200-W-167-PL. The outlet pipeline that leads to the 216-T-4 ditch is WIDS site code 200-W-164-PL.

Site Posting: The 207-T waste site is posted as an URMA.

Site History

Release Summary: The 207-T Retention Basin received potentially low-level radioactive cooling water effluent and ventilated steam condensate from 221-T and 224-T. The 207-T Retention Basin was operable from 1944 to 1995. The effluent entered the basins through an outlet structure on the east

Site: 207-T	Area: T Plant	Category: Intermediate

side of the basins. The basin effluent was released to the 216-T-4-1 and 216-T-4-2 ditches via an outlet structure on the west site, adjacent to the outside walls of the basins, and opposite the inlet structure.

From November 1944 to the 1950s, the site received process cooling water from process equipment jackets in the 221-T and 224-T Buildings. From the early 1950s to 1955, 242-T Evaporator cooling water was added to the waste stream. From 1955 to 1965, the 242-T Evaporator cooling water was removed from the waste stream. The 242-T Evaporator cooling water was added back to waste stream from 1965 to the late 1960s. The evaporator cooling water was removed a second time from the waste stream during the late 1960s to 1973, and then added back to the effluent sent to the basins from 1973 to 1976. After 1976, the site received intermittent flow from the 221-T, 221-TA, and 224-T Buildings. The effluent discharge was rerouted to the 200 Area Treatment Effluent Disposal Facility in 1995. The basins were backfilled with soil as part of the deactivation process in 1996.

On September 12, 1985, T Plant sent 1,900 L (500 gal) of aqueous five percent sodium hydroxide solution containing 100 kg (219 lb) of sodium hydroxide to the basins and subsequently to the 214-T-4-2 ditch. At the time of the release, pH was 12.5. No cleanup actions were undertaken. After 6 hours of dilution by continued condensate discharge, the pH was 7.7. Over time, the sludge that built up on the floor of the basins was occasionally cleaned out. The sludge was set in holes spaced along the boundary of the basins and covered with a layer of clean dirt. It is likely that holes were dug and filled with sludge and were not individually documented. The total amount of effluent the 207-T waste site received during its lifetime is not specified. As the total volume of effluent sent to the site is not available, no volume estimates can be ascertained.

Volume Discharged: Not specified.

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: A contaminated site north of the 207-T Basins was labeled as site UPR-200-W-166 (also called UN-216-W-31). The contaminated dirt was scraped and relocated on the crest of the 216-T-14 through 216-T-17 Trenches and buried beneath a layer of clean soil in 1992. In 1994, further contamination was discovered east of the 207-T Basins. At the time, it was thought that the contamination was from the same source and this additional contamination was also labeled as UPR-200-W-166. This second contamination patch was scraped and used inside the basins as fill material in 1996. To differentiate between the 1992 and the 1993 contaminated sites, the second site was re-labeled as 200-W-53.

The 207-T Retention Basins and 200-W-53 were temporarily stabilized in May 1996. Between 7.6 and 45.7 cm (3 to 18 in.) of contaminated soil were scraped from 200-W-53 and disposed of at the bottom of

Site: 207-T	Area: T Plant	Category: Intermediate

the basins. The basins were then capped with 45.7 – 60.9 cm (18 – 24 in) of clean soil and down posted from a Surface Contamination Area to an URMA.

When active, water samples were collected weekly and composited for analysis. A radiological investigation was conducted December 11, 1997, as part of a routine survey of the area. No contamination was discovered during the investigation. A GM/P-11 Probe (15.5 cm^2 [2.4 in.]) (beta-gamma) was used for the survey.

Existing well and borehole locations are shown on Figure 1 and listed in Table 1. Sample results are summarized in Tables 2 and 3.

Table 1. 207-T Borehole Summary

Year	Borehole / Well ID	Location with Respect to Site	Depth (ft)
2000	299-W11-41 / C3119	Outside – 50 ft west	Unknown (4 soil samples)
2006	299-W11-47 / C4990	Outside – 55 ft west	404 (GPL only)

GPL = geophysical log
ID = identification

Table 2. 207-T Geophysical Log Summary

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
C4990	0 – 5	0.2	pCi/g	4.0	14,653.7	cpm	4
	5 – 10	0.23	pCi/g	8.0	14,116.9	cpm	6
	10 – 15	–	pCi/g	–	11,413.4	cpm	13
	>15	0.72	pCi/g	340	22,163.3	cpm	98

bgs = below ground surface
ID = identification

Site: 207-T	Area: T Plant	Category: Intermediate

Table 3. 207-T Soil Maximum Detection Summary (Soil Borehole C3119)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Arsenic	–	–	–	2,900	µg/kg	–
Barium	–	–	–	103,000	µg/kg	–
Bis(2-ethylhexyl) phthalate	–	–	–	65	µg/kg	–
Cs-137	–	–	–	0.326	pCi/g	–
Chloroform	–	–	–	1	µg/kg	–
Chromium	–	–	–	16,200	µg/kg	–
Lead	–	–	–	3,600	µg/kg	–
Nitrate	–	–	–	52,000	µg/kg	–
K-40	–	–	–	12.7	pCi/g	–
Ra-226	–	–	–	0.49	pCi/g	–
Ra-228	–	–	–	0.719	pCi/g	–
Selenium	–	–	–	670	µg/kg	–
Tc-99	–	–	–	0.827	pCi/g	–
Th-228	–	–	–	0.637	pCi/g	–
Th-230	–	–	–	0.467	pCi/g	–
Th-232	–	–	–	0.719	pCi/g	–
Tritium	–	–	–	8.84	pCi/g	–
U-233/234	–	–	–	0.437	pCi/g	–
U-238	–	–	–	0.474	pCi/g	–

Nature and Extent of Contamination: Geophysical log (GPL) results detected cesium-137 near its method detection limit at a few sporadic depth locations throughout the borehole. These detections are likely the result of statistical fluctuations in the routine processing software and are not valid. GPL results found the naturally occurring radionuclides indicate some variation throughout the borehole. The most notable variation is indicated between 30.5 and 36.6 m (100 and 120 ft) and is attributed to the "caliche" sediment layer.

Site: 207-T	Area: T Plant	Category: Intermediate

Shallow soil within the basin is likely contaminated from historical discharges to the basin and from emplacing contaminated soil (removed from the adjacent area) into the basin. Deeper soil could be contaminated if contaminated liquids leaked from the basin to the soil underlying the basin floor (greater than 2 m [6.5 ft] bgs). The total amount of effluent discharged to the retention basin is not specified; therefore, the depth to which soil could potentially be affected could not be estimated. The approximate depth to groundwater is 69.5 m (228 ft) bgs.

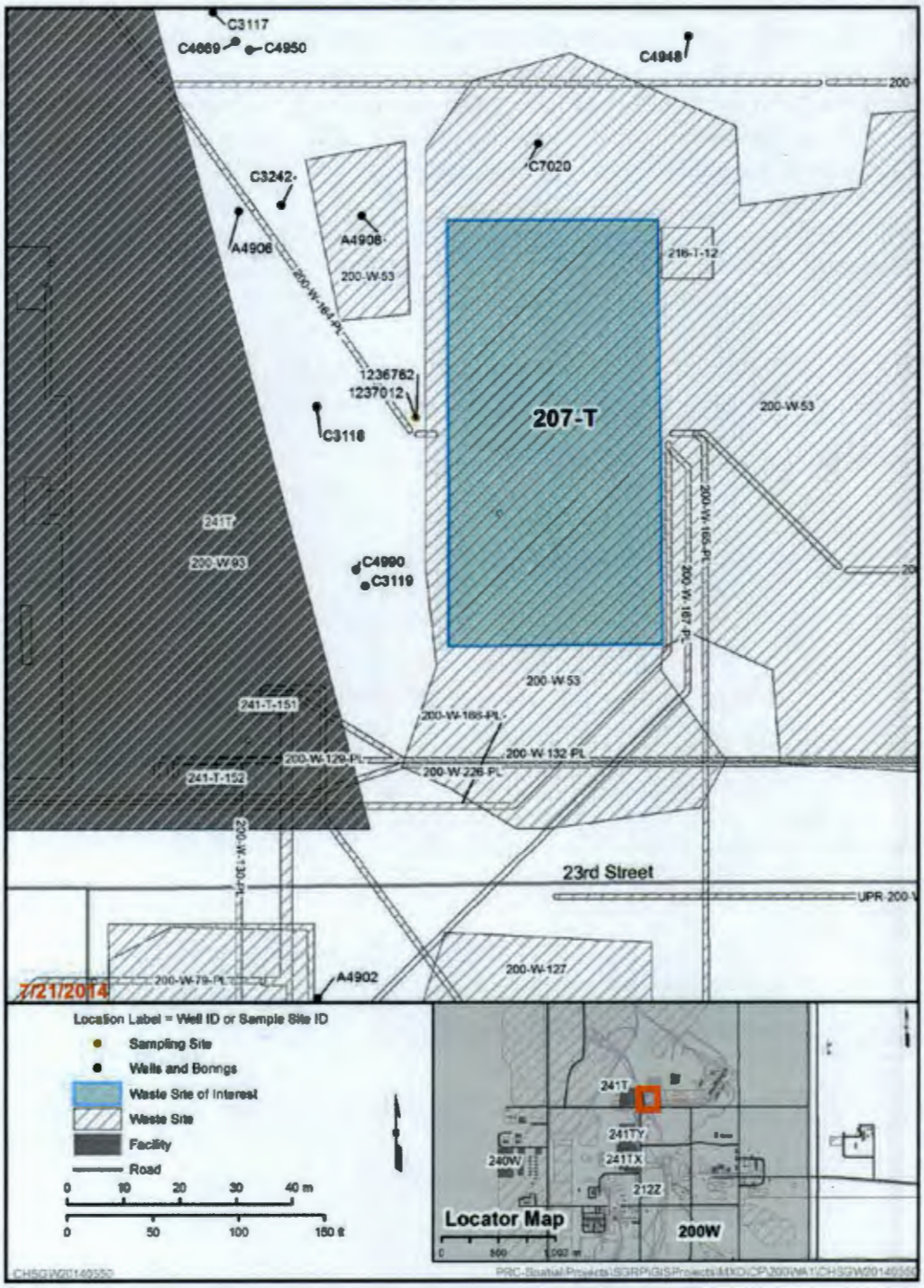
References:

H-2-3019 (drawing), 1973, *Waste Routing 241-T-112 to 216-T-26, T-27, T28 Cribs*, Sh. 1, Rev. 4, General Electric Company, Richland, Washington.

H-2-3020 (drawing), 1955, *Waste Line 241-T-112 Tank to 241-TX-3 Crib*, Sh. 1, Rev. 2, General Electric Company, Richland, Washington.

WIDS General Summary Report for the 207-T Waste Site.

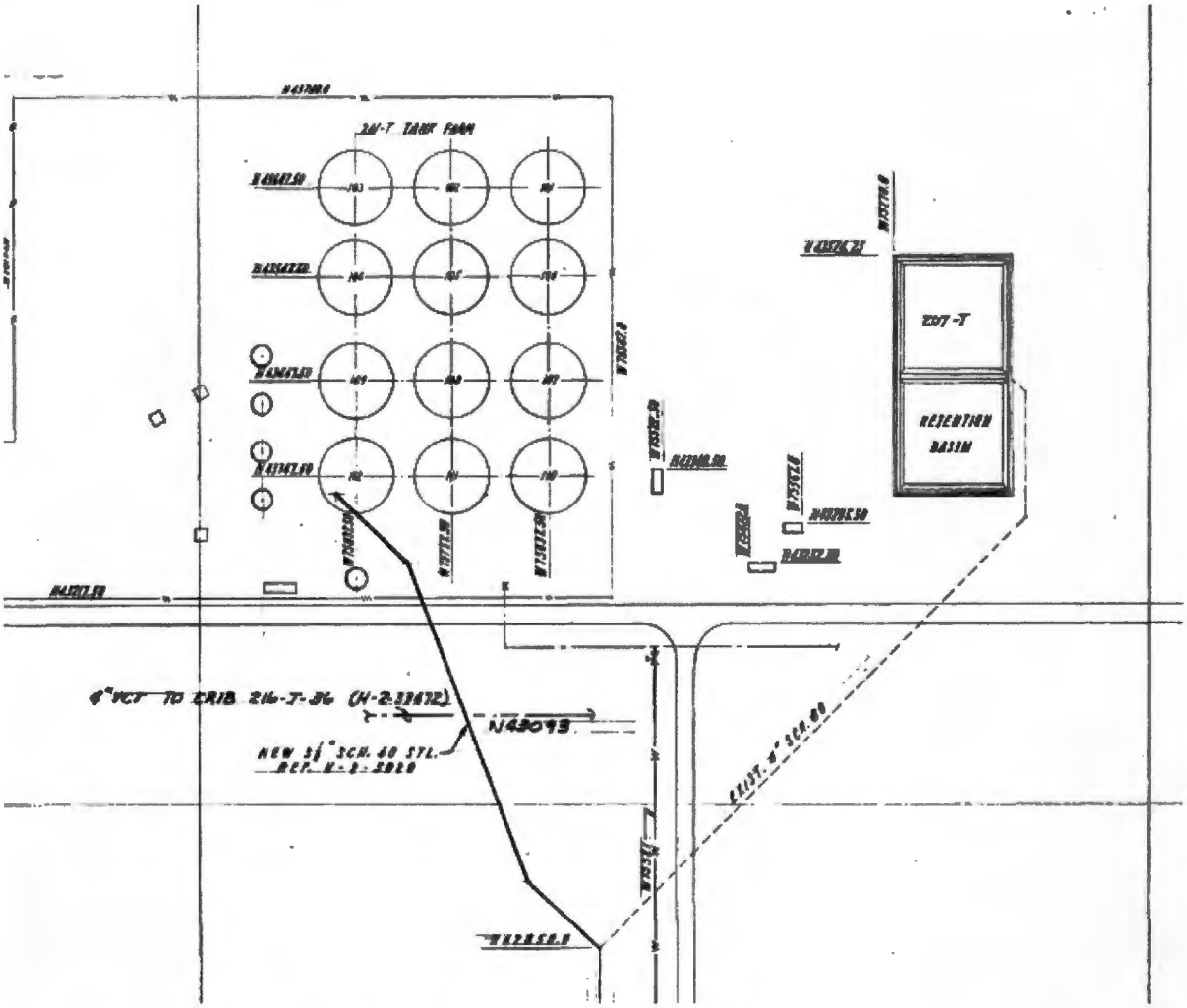
Site: 207-T	Area: T Plant	Category: Intermediate



ID = identification

Figure 1. 207-T Waste Site Map

Site: 207-T	Area: T Plant	Category: Intermediate



Source: H-2-3019, *Waste Routing 241-T-112 to 216-T-26, T-27, T28 Cribs*, Sheet 1.

Note: Produced from the best available copy.

Figure 2. 207-T Retention Basin Waste Routing

Site: 207-T	Area: T Plant	Category: Intermediate

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Site: 216-T-2	Area: T Plant	Category: Deep

Site Description

Alternate Site Identification: 222-T-110 Dry Well, 222-T Reverse Well
Site Type: Injection/Reverse Well
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200- MG-2
Service Dates: January 1945 to May 1950

Waste Site Location and Physical Description: Injection/reverse well 216-T-2 is located near the southwest corner of the 222-T Building (Figure 1). The 216-T-2 waste site consists of a below-grade reverse well with a 15.2 cm (6.0 in.) well casing and a 7.6 cm (3-in.) diameter vent pipe (Figure 2). The vent pipe extends roughly 1.2 m (4 ft) above the surface and has been capped. In addition, the pipe connected to the reverse well extends vertically 22.9 m (75.0 ft) below grade, with the final 6.1 m (20 ft) of the pipe perforated with 39 holes. Each hole is 1.3 cm (0.5 in.) in diameter, with holes spaced roughly 12 per foot. The site is surrounded with light post and chain, and is posted as an Underground Radioactive Material Area (URMA). A single cement AC-540 marker identifies the site.

Waste Site Coordinates:
Lon-567588.87500 Lat-136781.89059

Site Dimensions:
Site Length: Not specified
Site Width: Not specified
Diameter: 0.2 m (0.5 ft)
Site Depth: 22.9 m (75.0 ft)
Cover Thickness: Not specified

Related Site Structure(s): The 216-T-2 waste site is associated with activities at the 222-T Laboratory.

Site Posting: The 216-T-2 waste site is posted as an URMA.

Site History

Release Summary: Reverse well 216-T-2 was constructed for the disposal of acidic decontamination laboratory "hot" sink waste and acidic sample slurper waste from the 221-T Building. The site was operable from January 1945 to May 1950, and received an estimated 6E+06 L (1.6E+06 gal) of waste over its lifetime. Each month, the 222-T Facility discharged waste with an estimated 2.6 Ci of fission products and 600 mg of plutonium into the dry wells.

Volume/Mass Discharged: An estimated 6E+06 L (1.6E+06 gal) of acidic decontamination waste from the 222-T Building. Approximately 2.6 Ci of fission products and 600 mg of plutonium were discharged per month.

Site: 216-T-2	Area: T Plant	Category: Deep

Pore Volume Discharged: 6E+06 L/ (205 ft x 19.6 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 175

Waste Inventory: Not available. The well received waste from the 222-T decontamination sink and sample "slurper" from startup until the spring of 1950, after which time the wastes were routed to the 222-T cribs. Acidic decontamination and sample waste from 222-T cribs (RHO-CD-673, *Handbook 200 Areas Waste Sites*). Chemicals disposed include sulfuric acid, nitric acid, and sodium dichromate (PNL-6456, *Hazard Ranking System Evaluation of CERCLA Inactive Waste Sites at Hanford: Volume 1 – Evaluation Methods and Results*).

Previous Site Characterization

Site Characterization Summary: During the bismuth phosphate fuel separation process, batch samples were analyzed at the 222-T and 222-B Laboratories. The reverse well was placed to support the disposal of 222-T Building laboratory "hot" sink and sample table decontamination waste.

Little information is provided regarding the site's deactivation. The pipeline was blanked at the well in 1950. The laboratory waste was redirected to the 216-T-8 Crib. The site was mapped using Global Positioning System survey equipment between February 11 and March 11, 2998. A site walkdown occurred on February 19, 1998, for surveillance purposes. The results of the site walkdown are not specified. In addition, no survey data are provided for this site. It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided. If surveys do occur, their frequency is not specified.

Nature and Extent of Contamination: No data are available to evaluate for the presence or absence of shallow or deep soil contamination. Based on existing information, the soil could be contaminated by former discharge of waste. Shallow soil beneath the surface cover could be contaminated if the well backed up and overflowed. An estimated 175 pore volumes of liquid potentially containing radionuclides were discharged to the reverse well, indicating contamination could extend to groundwater (85.3 m [280 ft] below ground surface [bgs]).

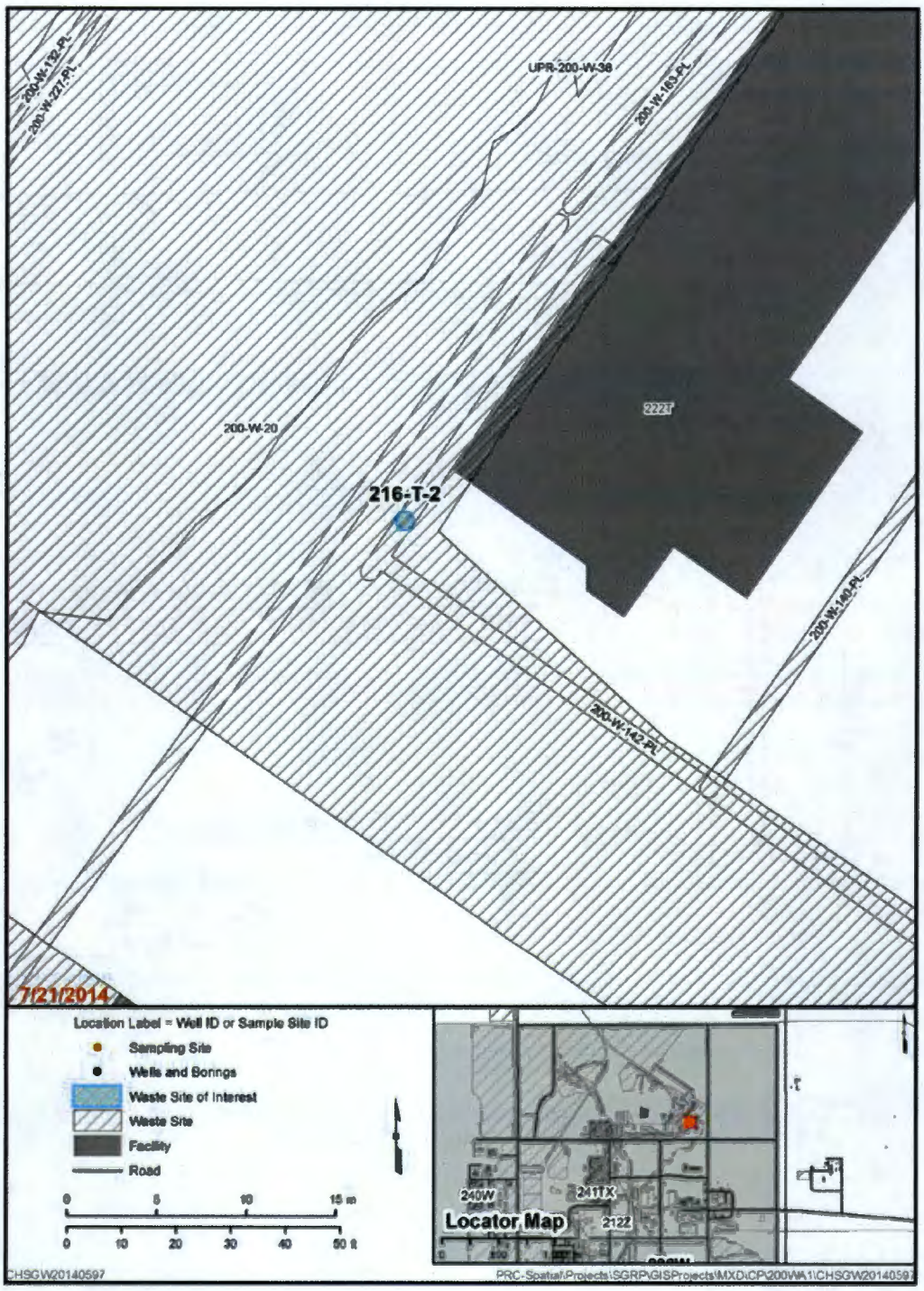
References:

PNL-6456, 1988, *Hazard Ranking System Evaluation of CERCLA Inactive Waste Sites at Hanford: Volume 1 – Evaluation Methods and Results*, Vol. 1, Pacific Northwest Laboratory, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196006954.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

Waste Information Data System General Summary Report for the 216-T-2 Waste Site.

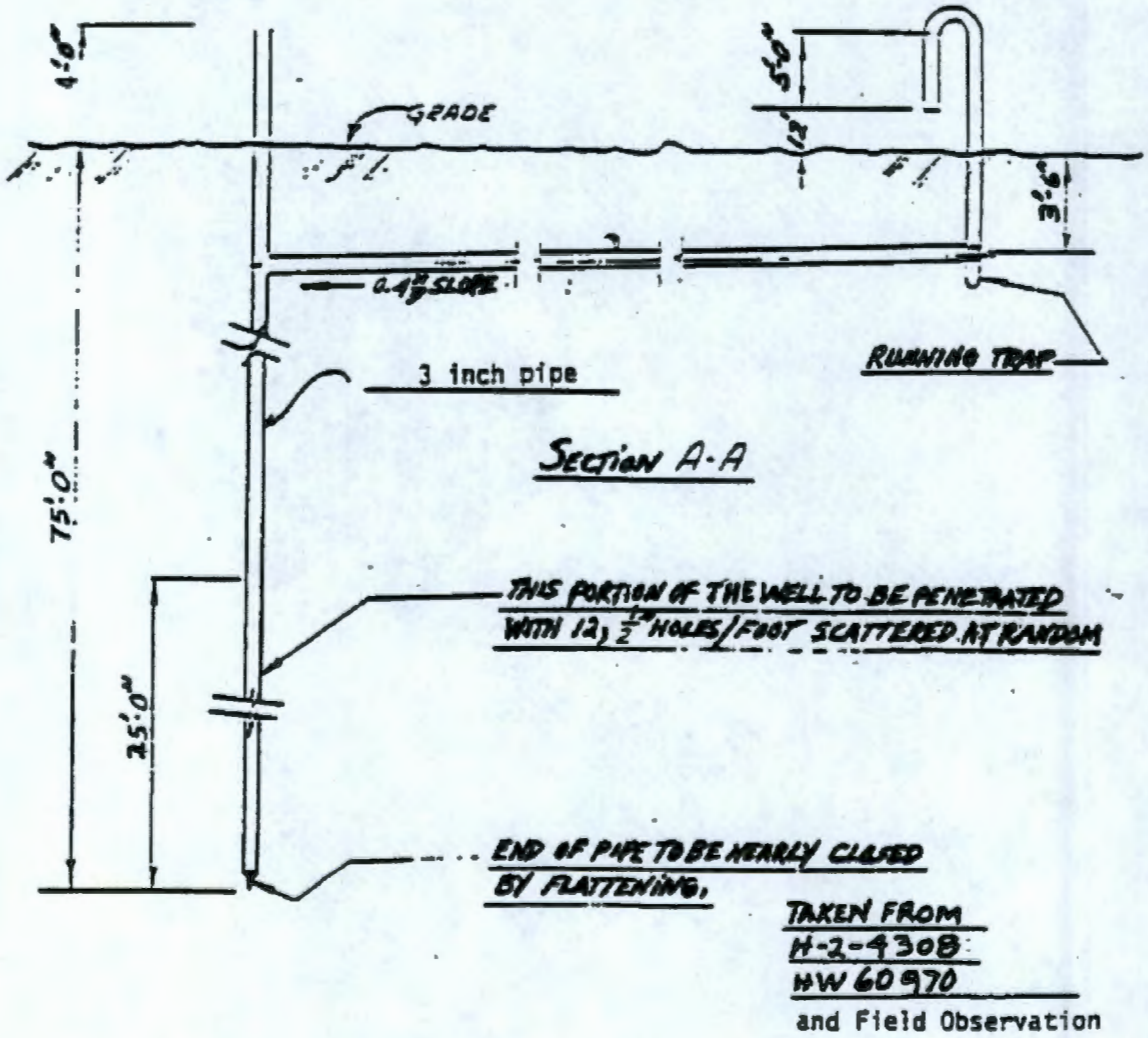
Site: 216-T-2	Area: T Plant	Category: Deep



ID = identification

Figure 1. 216-T-2 Waste Site Map

Site: 216-T-2	Area: T Plant	Category: Deep



216-T-2

Note: Produced from the best available copy.

Figure 2. Reverse Well 216-T-2 Construction

Site: 216-T-4-1D	Area: T Plant	Category: Deep

Site Description

Alternate Site Identification: None
Site Type: Ditch
Facility/Geographic Area: 200 Inner Area West
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: November 1944 to May 1972

Waste Site Location and Physical Description: The 216-T-4-1D Ditch (Figures 1 and 2) is located north of 23rd Street, west of the 221-T Building and northwest of the 241-T Tank Farm. The original ditch is not currently visible. The original ditch bottom dimensions are 259 m (850 ft) long by 2.4 m (8 ft) wide (Figures 2 and 3). The ditch was replaced by the 216-T-4-2 Ditch in 1972. The first 15 m (50 ft) of the original 216-T-4-1D Ditch was reused in the replacement ditch construction.

Waste Site Coordinates:
Lon-566773.95573 Lat-136976.02378

Site Dimensions:
Site Length: 259 m (850 ft) (bottom dimension)
Site Width: 2.4 m (8 ft) (bottom dimension)
Site Area: 622 m^2 (6,800 ft^2)
Site Depth: Unspecified
Cover Thickness: Unspecified

Related Site Structure(s): The ditch is associated with the 216-T-4A Pond and the 216-T-4-2 Ditch. Pipeline 200-W-163-PL connected to the ditch and the pipeline that fed the ditch from 207-T Retention Basin was site code 200-W-164-PL.

Site Posting: The area is posted as an Underground Radioactive Material Area.

Site History

Release Summary: 216-T-4-1D Ditch received process cooling water from the 221-T and 224-T Buildings via the 207-T Retention Basin and steam condensate from 221-T Building. The ditch also received condenser cooling water and steam condensate from the 242-T Evaporator. The ditch also received decontamination waste from 2706-T. The total plutonium received was 1.41 g. The release volume is not specified.

Volume/Mass Discharged: 4.19E+10 L (1.11E+10 gal) was discharged through the ditch to the 216-T-4A Pond. To estimate pore volume discharge, it was assumed 0.1 percent of this volume infiltrated the ditch during operations.

Site: 216-T-4-1D	Area: T Plant	Category: Deep

Pore Volume Discharged: 4.19E+07 L/ (226ft x 6,800 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 3.2

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-T-4-1D Waste Site

Contaminant	Mass Discharged
Pu	<3.7 g
Beta	500 Ci
Sr-90	<6.2 Ci
Ru-106	110 Ci
Cs-137	11 Ci
Co-60	<3.4 Ci
U	<690 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: By 1971 the 216-T-4-1D Ditch had become contaminated to a maximum of 20,000 cpm at the bottom, was overgrown with aquatic plants, shrubs and small willow trees and was an attractive nuisance for area waterfowl. The berm for the new 216-T-4-2 Ditch was used to cover 216-T-4-1D in 1972. The original ditch is not visible and it was surface stabilized by backfill and clean dirt cover, along with the replacement ditch in 1995.

The radionuclide inventory is included in the 216-T-4A Pond inventory.

Well and borehole locations are shown on Figure 1. No data are available for ditch or immediate vicinity.

Groundwater well 299-W10-22 (A9890), associated with the 216-T-4-1D Ditch, had detections above drinking water standards for carbon tetrachloride (CTET), trichloroethene (TCE), nitrate, and chromium. CTET was initially measured at 380 µg/L in 2000, reached a maximum concentration of 1,270 µg/L in 2008, and was last detected at 42 µg/L in 2010. TCE was historically detected at concentrations ranging from 1 µg/L to 8.8 µg/L but was not detected when last sampled in 2010. Nitrate concentrations were first measured at 530 µg/L in 1995, were as high as 348,000 µg/L in 2006 and were last measured at 223,000 µg/L in 2010. Chromium concentrations ranged between 2.9 µg/L and 87.3 µg/L from 1987 to 2009, and were 157 µg/L when last measured in 2010. Cesium-137 was historically detected in groundwater southeast of the ditch at well 299-W10-8 (84899).

Site: 216-T-4-1D	Area: T Plant	Category: Deep

Nature and Extent of Contamination: No data are available to evaluate for the presence or absence of shallow or deep soil contamination. The approximate depth to groundwater is 68.9 m (226 ft) bgs.

References:

H-2-34998 (drawing), 1973, *216-T-42 Ditch and Dike for 216-T-4 Pond*, Sh. 1, Rev. 1, Atlantic Richfield Hanford Company, Richland, Washington.

H-2-44511 (drawing), 1984, *Area Map 200 West "T" Plant Facilities*, Sh. 142, Rev. 4, Rockwell Hanford Operations, Richland, Washington.

M-2600-W (drawing), 1973, *Topographic Map 200W Area*, Sh. 10, Rev. 5, Atlantic Richfield Hanford Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

Waste Information Data System General Summary Report for the 216-T-4-1D Waste Site.

Site: 216-T-4-1D	Area: T Plant	Category: Deep

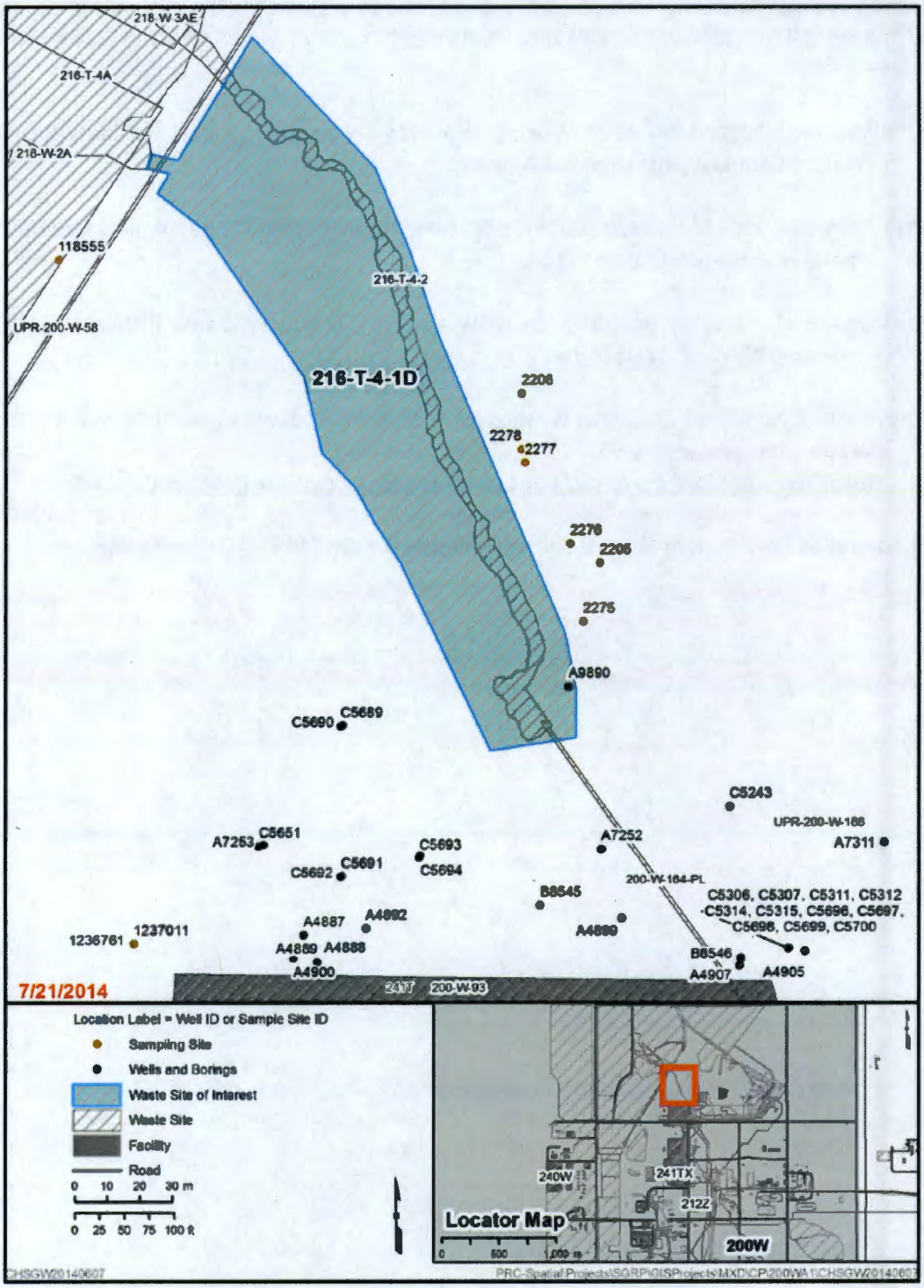
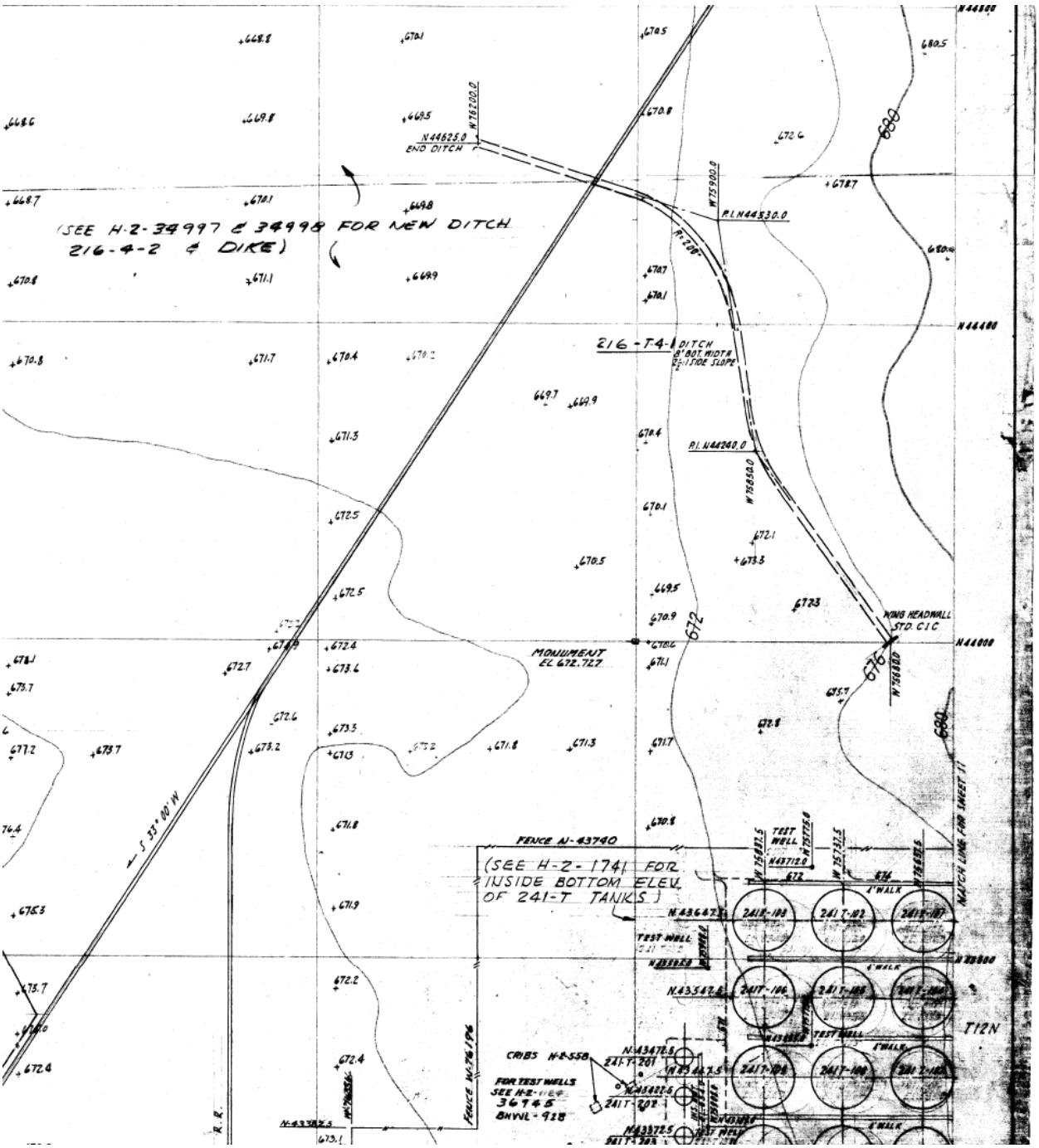


Figure 1. 216-T-4-1D Waste Site Map

Site: 216-T-4-1D	Area: T Plant	Category: Deep

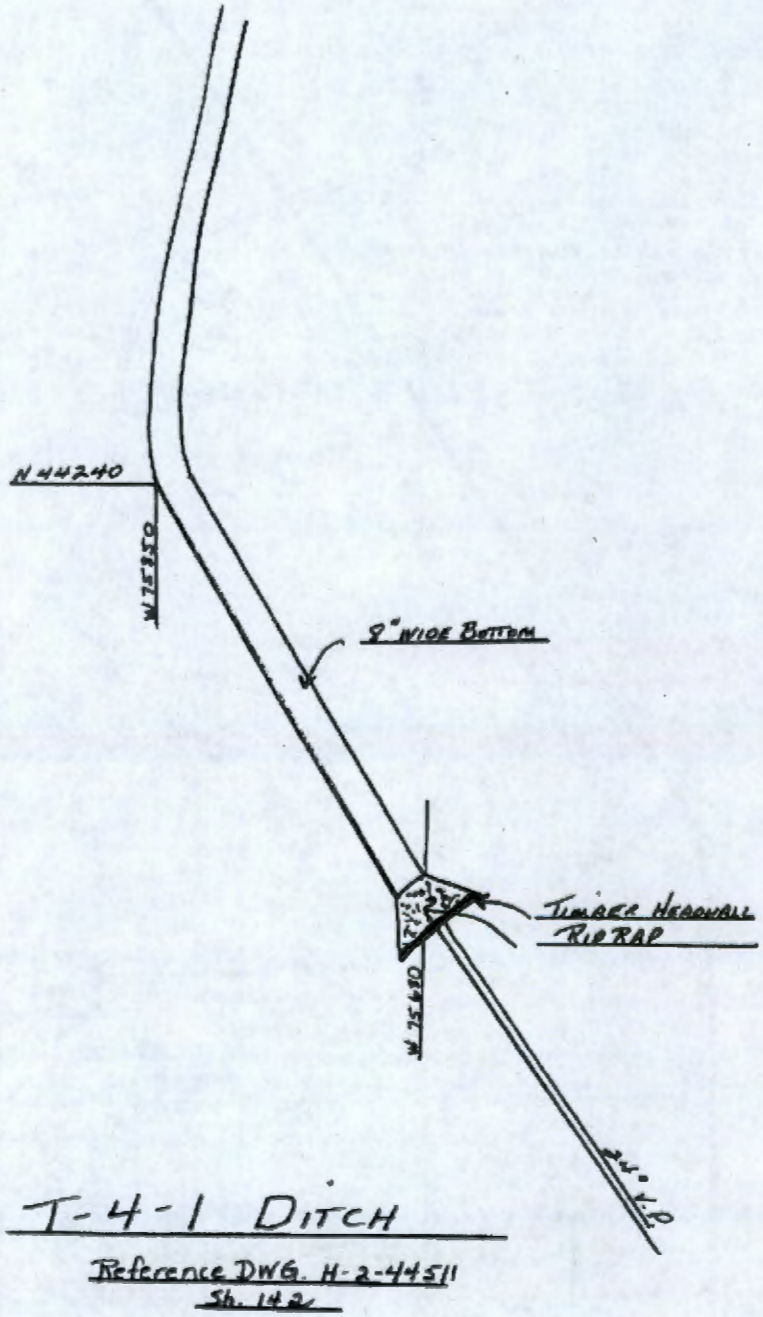


Source: M-2600-2, *Topographic Map 200W Area*.

Note: Produced from the best available copy.

Figure 2. 216-T-4-1D Ditch Location

Site: 216-T-4-1D	Area: T Plant	Category: Deep



Source: H-2-44511, *Area Map 200 West "T" Plant Facilities*, Sheet 142.

Figure 3. 216-T-4-1D Details

Site: 216-T-8	Area: T Plant	Category: Deep

Site Description

Alternate Site Identification: None
Site Type: Crib
Facility/Geographic Area: 200 Inner Area West
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-LW-2
Service Dates: May 1950 to September 1951

Waste Site Location and Physical Description: The 216-T-6 Crib (Figure 1) is located just on the east side of the 224-T Building 1. The crib is two wood crib boxes, each set into a pit with sloped sides. Each crib pit has 4.3 m (14 ft) by 4.3 m (14 ft) bottom dimension with a 1:1 side slope. The pits are 23 m (75 ft) apart. The wood boxes have risers connected in series by a pipe, one box overflowing into the other (Figures 2 and 3). The pits are backfilled.

Waste Site Coordinates:
Lon-567650.73167 Lat-136726.89976

Site Dimensions:
Site Length: 4.3 m (14 ft) (bottom dimension if each crib)
Site Width: 4.3 m (14 ft) (bottom dimension of each crib)
Site Area: 18.5 m^2 (196 ft^2 each crib box)
Site Depth: 6.4 m (21 ft)
Cover Thickness: 5.18 m (17 ft)

Related Site Structure(s): The 216-T-6 Crib is associated with the 222-T and 292-T Facilities and pipeline 200-W-142-PL.

Site Posting: The 216-T-6 Crib was interim stabilized in 1991 and posted with Underground Radioactive Material Area signs.

Site History

Release Summary:
216-T-8 Crib received 5.0E+5 L (1.3 E+5 gal) of liquid disposal for 222-T Decontamination Sink Waste and Sample Slurper waste. A pipeline from 292-T tied into the 216-T-8 waste line. The process effluent waste was neutral to basic and contained sulfuric acid, nitric acid, and sodium dichromate.

Volume Discharged: 3.3E+05 L (8.8 E+4 gal). Assumed 2/3 of total volume (5E+05 L) went into the first crib.

Pore Volume Discharged: 3.3E+05 L * (2/3) / (256 ft x 196 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.52

Site: 216-T-8	Area: T Plant	Category: Deep

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-T-8 Waste Site

Contaminant	Mass Discharged
Pu	5 g
Beta	100 Ci
Sr-90	1 Ci
Ru-106	5 Ci
Cs-137	<1 Ci
Co-60	<0.1 Ci
U	4.5 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: The pipeline to the crib was blanked inside 222-T when the operations were shut down. Visual and radiological surveys are performed at this site. The crib is monitored by a groundwater well.

No soil data are available.

Nature and Extent of Contamination: No data are available to evaluate for the presence or absence of shallow or deep soil contamination. Based on existing information, the shallow and deep soil could be contaminated by former discharge of waste containing radionuclides, sulfuric acid, nitric acid, and sodium dichromate (Figure 4). The subsurface stratigraphy is shown in Figure 5. The approximate depth to groundwater is 85.6 m (281 ft) below ground surface (bgs). Based on the crib construction (wooden crib with no membrane barrier), shallow soil could be contaminated above the 5.2 m (17 ft) bgs discharge depth. An estimated 0.52 pore volumes of liquid were discharged to the crib, suggesting a potential for groundwater contamination.

References:

DOE/RL-2007-02-VOL II-ADD 2, 2008, *Site-Specific Field-Sampling Plans for 216-T-34, 216-T-8, 216-T-B-10A&B, and 216-Z-16 Cribs (Addendum 2)*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0807140234.

Site: 216-T-8	Area: T Plant	Category: Deep

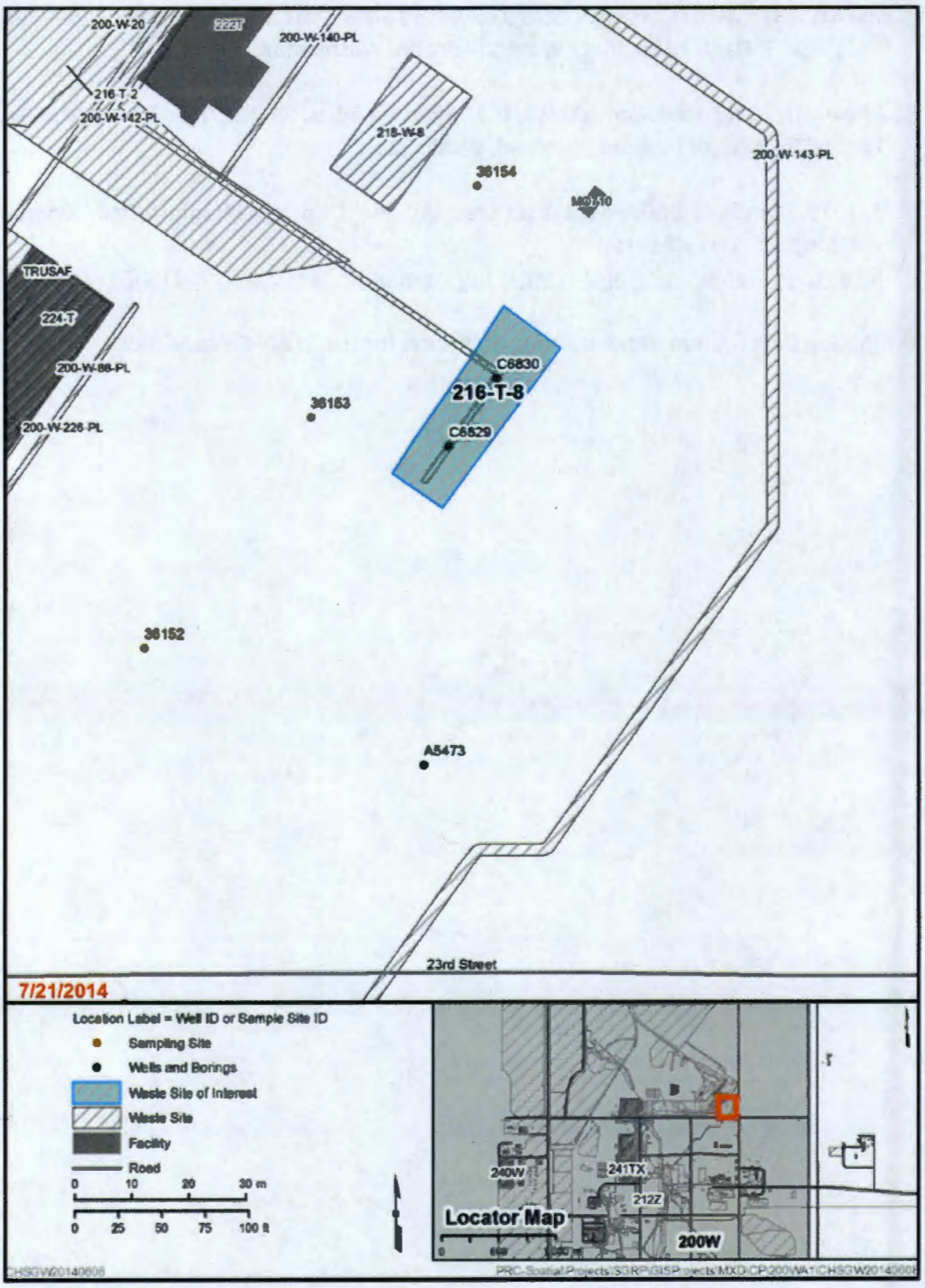
H-2-353 (drawing), 1973, *Waste Disposal Cribs 216-T-6, 216-T-8 Cribs & Reverse Wells 216-T-3 & T-2*, Sh. 1 Rev. 3, Hanford Engineer Works, Richland, Washington.

H-2-44511 (drawing), 1998, *Area Map 200 West "T" Plant Facilities*, Sh. 131, Rev. 2, Waste Management Federal Services of Hanford, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

Waste Information Data System General Summary Report for the 216-T-8 Waste Site.

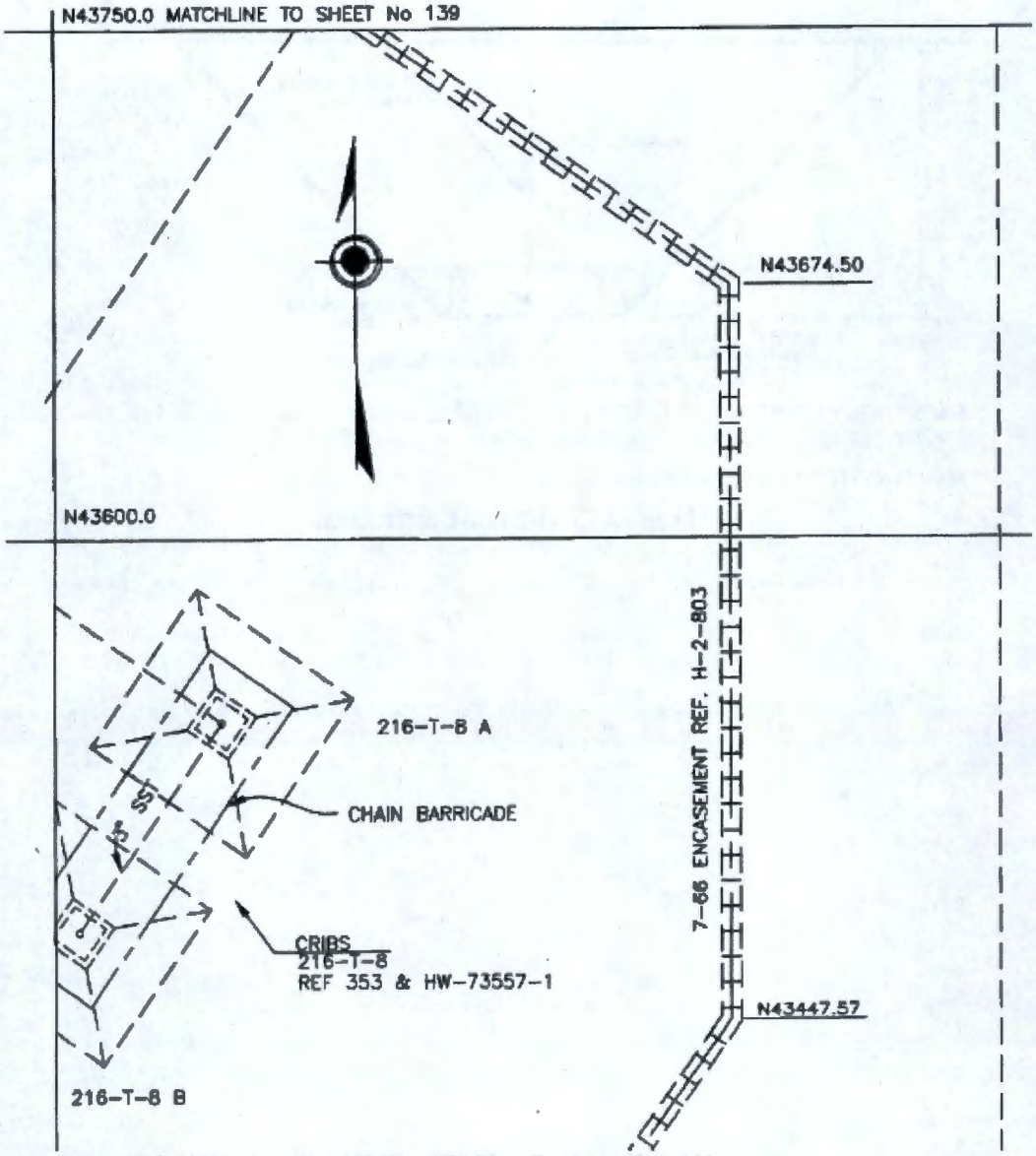
Site: 216-T-8	Area: T Plant	Category: Deep



ID = identification

Figure 1. 216-T-8 Site Map

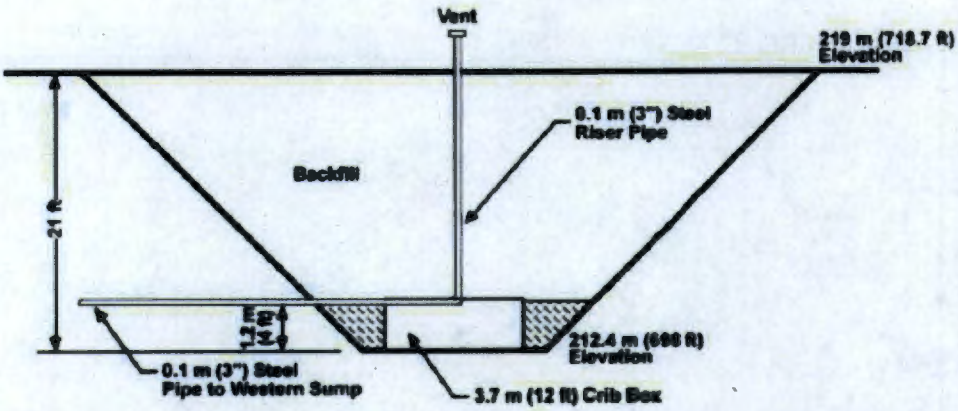
Site: 216-T-8	Area: T Plant	Category: Deep



Source: H-2-44511, *Area Map 200 West "T" Plant Facilities*, Sheet 131.

Figure 2. 216-T-8 Crib Detail

Site: 216-T-8	Area: T Plant	Category: Deep



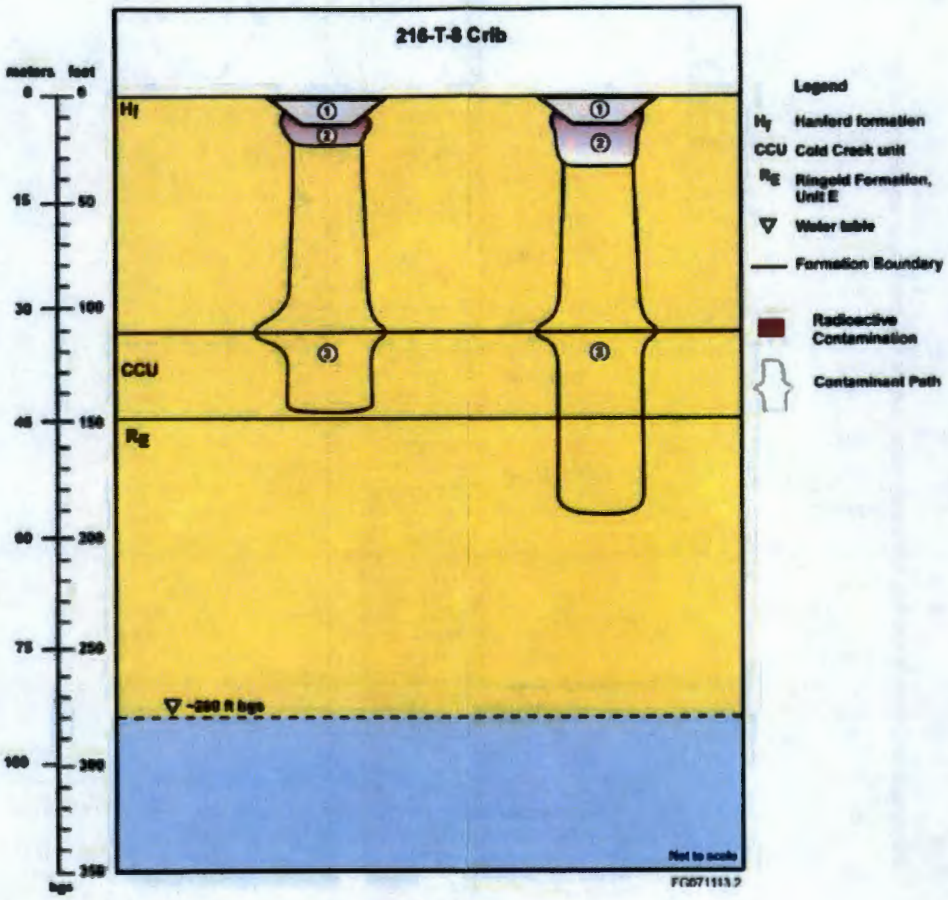
Source: DOE/RL-2007-02-VOL II-ADD 2, *Site-Specific Field-Sampling Plans for 216-T-34, 216-T-8, 216-T-B-10A&B, and 216-Z-16 Cribs (Addendum 2).*

Note: Produced from the best available copy.

Figure 3. 216-T-8 Crib Construction

Site: 216-T-8	Area: T Plant	Category: Deep

Conceptual Contaminant Distribution Model



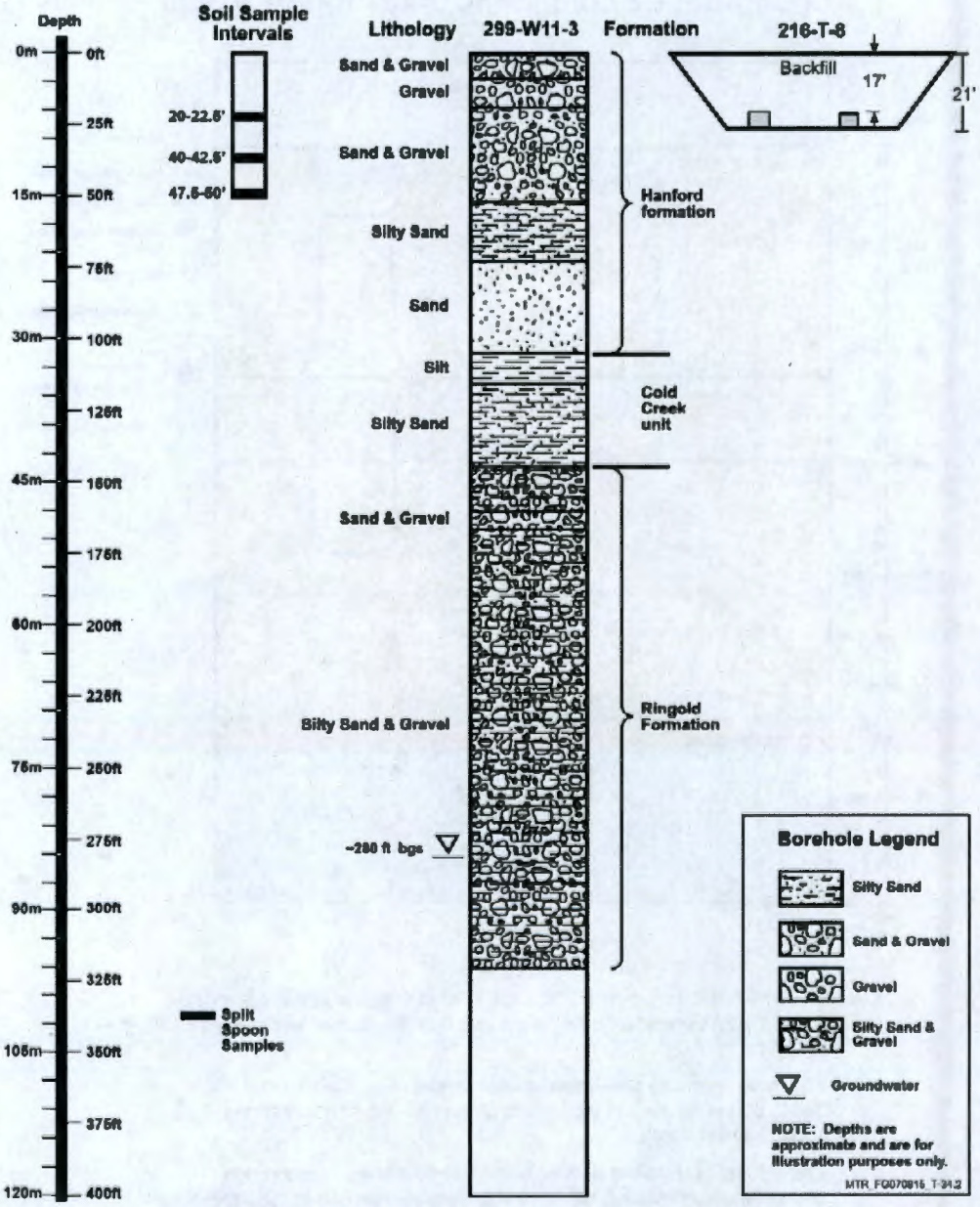
1. The 216-T-8 Crib received 500,000 L (132,000 gal) of effluent from the 222-T Decontamination Sink Waste and Sample Slurper waste from 1950 to 1951.
2. The more immobile radioactive contaminants (e.g., Cs-137, Sr-90) sorbed to soils at the bottom of the crib and concentrations decrease with depth.
3. The effluent and mobile contaminants traveled downward through coarser-grained material but tended to slow and spread at the intersection with finer-grained material. As the effluent traveled downward after discharge, contaminants may have been deposited along the top of these zones. Migration of contaminants may have been exacerbated by the 1,000 kg (2,200 lb) nitric acid and 1,000 kg (2,200 lb) sulfuric acid received by the crib.

Source: DOE/RL-2007-02-VOL II-ADD 2, *Site-Specific Field-Sampling Plans for 216-T-34, 216-T-8, 216-T-B-10A&B, and 216-Z-16 Cribs (Addendum 2).*

Note: Produced from the best available copy.

Figure 4. Conceptual Contaminant Distribution Model

Site: 216-T-8	Area: T Plant	Category: Deep



Source: DOE/RL-2007-02-VOL II-ADD 2, *Site-Specific Field-Sampling Plans for 216-T-34, 216-T-8, 216-T-B-10A&B, and 216-Z-16 Cribs (Addendum 2).*

Note: Produced from the best available copy.

Figure 5. Subsurface Stratigraphy at the 216-T-8 Waste Site

Site: 216-T-9	Area: T Plant	Category: Intermediate

Site Description

Alternate Site Identification: None
Site Type: Trench
Facility/Geographic Area: 200 Inner Area West
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: February 1951 to March 1954

Waste Site Location and Physical Description: The 216-T-9 Trench is located west of the 221-T Building and southwest of the 216-T-33 Crib (Figure 1). The trench was backfilled in 1954 and is not marked or posted.

Waste Site Coordinates:
Lon-567348.77648 Lat-136844.36533

Site Dimensions:
Site Length: 15.2 m (50 ft) (bottom dimension)
Site Width: 3.1 m (10 ft) (bottom dimension)
Site Area: 47 m^2 (500 ft^2)
Site Depth: 1.8 m (6 ft)
Cover Thickness: The site was exhumed and backfill Activities after exhumation are unspecified

Related Site Structure(s): The 216-T-9 Crib is associated with the 222-T and 292-T Facilities, the 216-T-10 and 216-T-11 Trenches, and pipeline 200-W-142-PL.

Site Posting: The 216-T-9 Crib was interim stabilized in 1991 and posted with Underground Radioactive Material Area signs.

Site History

Release Summary: 216-T-9 Trench received liquid disposal of vehicle decontamination waste from heavy equipment and other vehicles. No radionuclide or chemical contamination has been documented; however, all contamination was exhumed. The possibility of hazardous substance contamination exists.

Volume/Mass Discharged: Unspecified.

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Site: 216-T-9	Area: T Plant	Category: Intermediate

Previous Site Characterization

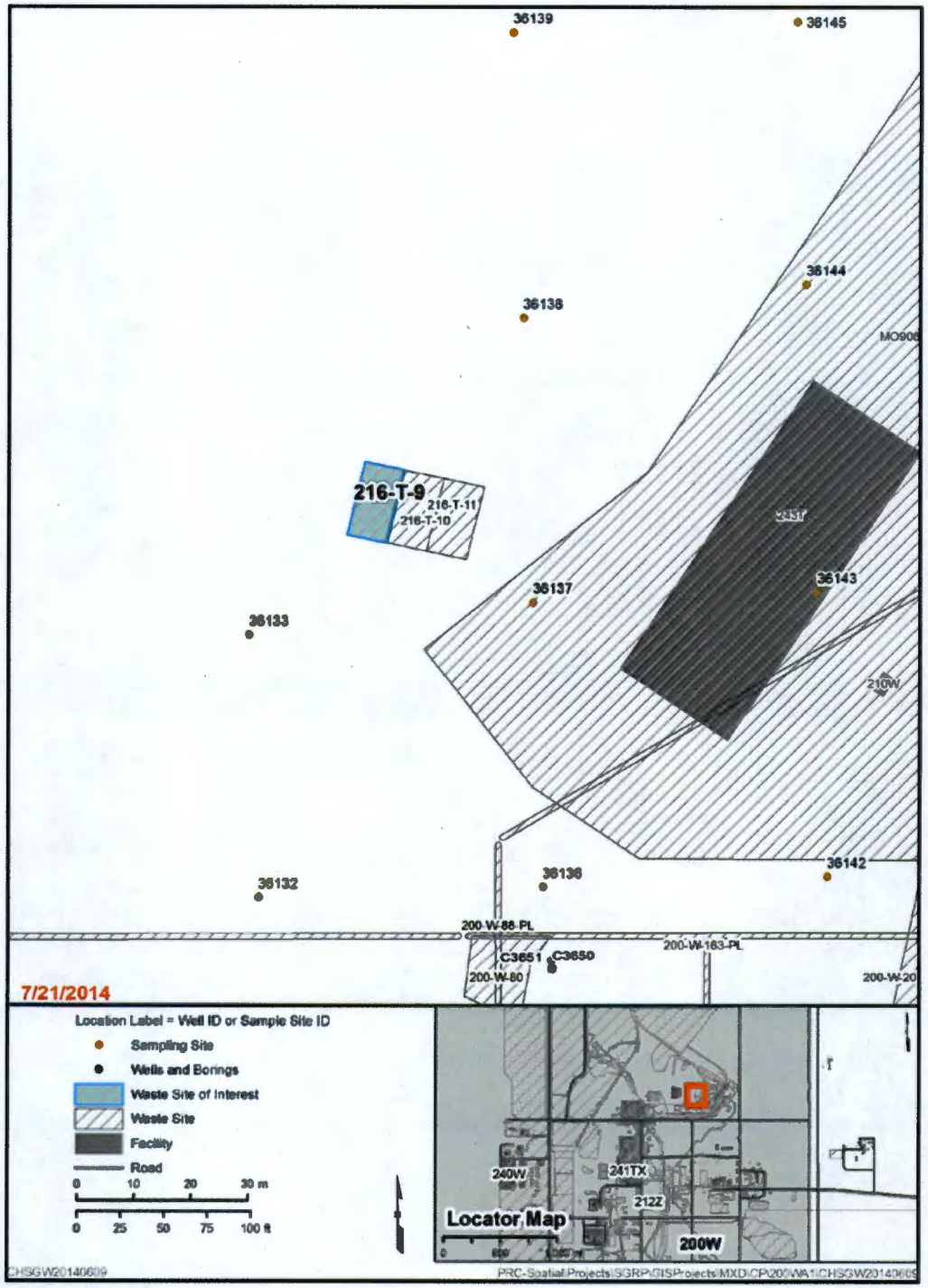
Site Characterization Summary: Decontamination operations were transferred to the 269-W garage facility that discharged to the 216-T-13 Trench. The 216-T-9 Trench was exhumed in May 1972. All contamination (maximum 3,000 cpm) was taken to the 200 West Area Dry Waste Burial Ground. The trench was then released from radiation zone status. A site walkdown was performed in February 1998.

Nature and Extent of Contamination: No data are available to evaluate for the presence or absence of shallow or deep soil contamination. Soil 1.8 m (6 ft) below ground surface (bgs) and below could be contaminated by discharge of waste though the bottom of the trench. Because the trench was backfilled after use, the soil from 0 – 1.8 m (0 – 6 ft) bgs within the trench has a low potential for contamination. However, the material used for backfill is unspecified. Based on existing information, the shallow and deep soil could be contaminated by former disposal of liquids from equipment and vehicle decontamination activities. The approximate depth to groundwater is 83 m (272 ft) bgs.

References:

Waste Information Data System General Summary Report for the 216-T-9 Waste Site.

Site: 216-T-9	Area: T Plant	Category: Intermediate



ID = identification

Figure 1. 216-T-9 Site Map

Site: 216-T-9	Area: T Plant	Category: Intermediate

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Site: 216-T-10	Area: T Plant	Category: Intermediate

Site Description

Alternate Site Identification: Decontamination Trenches, Equipment Decontamination Area
Site Type: Trench
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: 1951 to 1954

Waste Site Location and Physical Description: The 216-T-10 waste site is located west of the 221-T Building and southwest of the 216-T-33 Crib (Figure 1). The site consists of a decontamination wash trench that has been backfilled. The trench is no longer mark or posted.

Waste Site Coordinates:
Lon-567355.68124 Lat-136842.95177

Site Dimensions:
Site Length: 15.2 m (50.0 ft) Site Depth: 1.8 m (6.0 ft)
Site Width: 3.1 m (10.0 ft) Cover Thickness: Not specified
Site Area: 47 m^2 (500 ft^2)

Related Site Structure(s): The 216-T-10 waste sites is associated with the 216-T-29 and 216-T-11 waste sites.

Site Posting: The 216-T-10 waste site was released from radiation zone status and is currently not marked or posted.

Site History

Release Summary: The 216-T-10 Trench was constructed for the subsurface disposal of liquid contaminated with heavy equipment and vehicle decontamination waste. The trench was in use from June 1951 to March 1954.

Contrasting information is presented regarding potential contamination at this site. While no radionuclide or chemical contamination has been documented, contamination with readings up to 3,000 cpm were removed and shipped to the 200 Area Burial Ground for disposal. In addition, while no cleaning agents are listed as having been used, it is possible that hazardous substance contamination is present due to the trench receiving vehicle decontamination waste.

Site: 216-T-10	Area: T Plant	Category: Intermediate

The amount of decontaminate waste the trench received, and the levels of chemical and radionuclide contamination potentially deposited into the trench, are not specified. In addition, the amount of contamination removed during remediation activities in 1972 is not specified. As the total volume of decontamination waste is not available, no volume estimates can be ascertained for this site.

Volume Discharged: Not specified.

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: The 216-T-10 Trench was deactivated in 1954. Following the site's deactivation, vehicle decontamination operations were transferred to the 269-W garage facility. A second date of March 1957 is also provided as the termination date for the trench. However, the March 1957 ending date is likely incorrect as the site was backfilled in 1954 as part of the deactivation process.

In May 1972, the site was exhumed and all contamination was removed and sent to the 200 West Area Dry Waste Burial Ground for disposal. Maximum contamination readings reached 3,000 cpm. After the contamination was removed, the 216-T-9, 216-T-10 and 216-T-11 Trenches were released from radiation zone status.

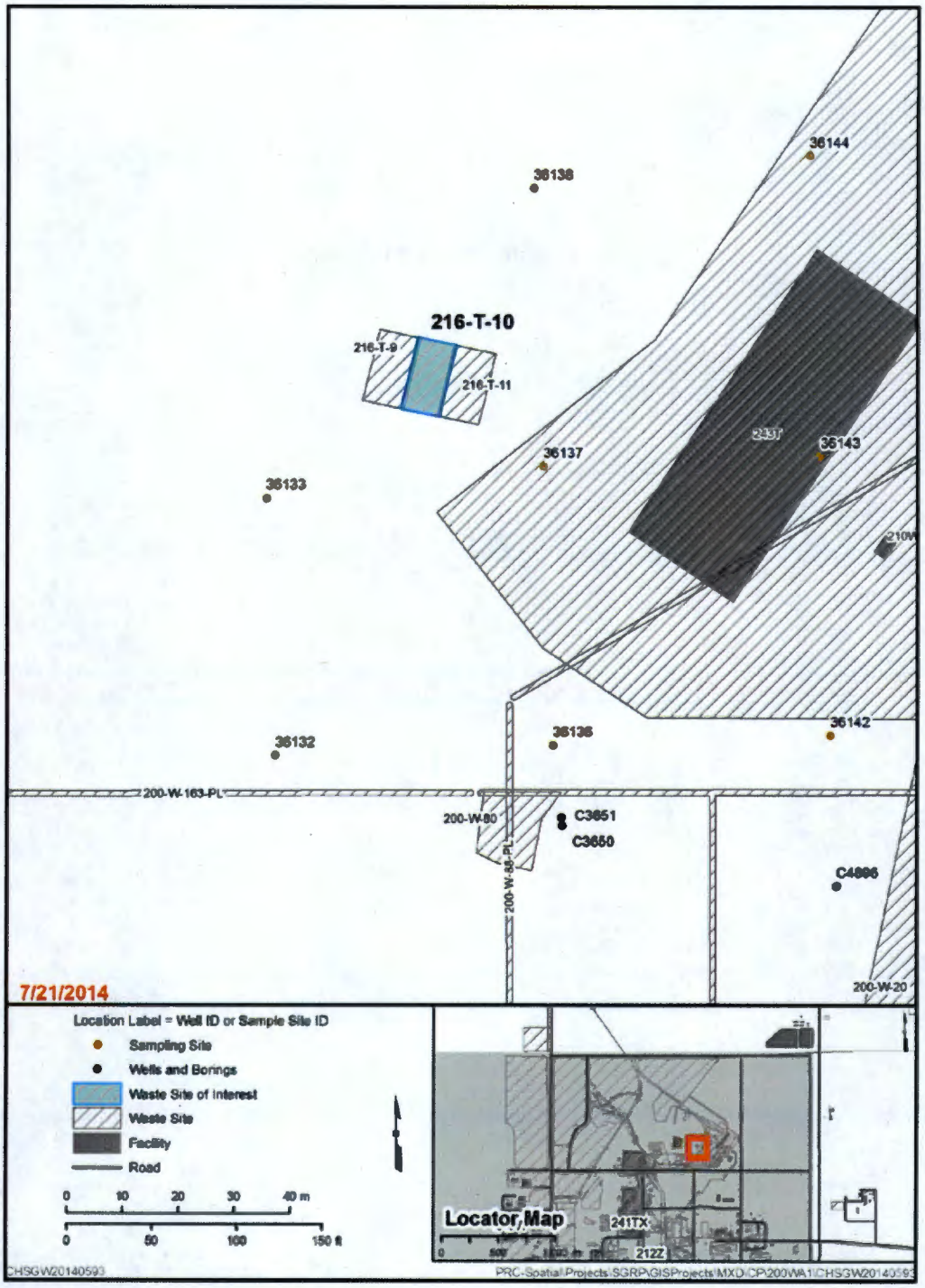
A site walkdown for surveillance purposes occurred on February 28, 1998. The results of the walkdown are not presented. In addition, no survey data are provided for this site. It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided. If surveys do occur, their frequency is not specified.

Nature and Extent of Contamination: No data are available to evaluate for the presence or absence of shallow or intermediate depth soil contamination. Soil 1.8 m (6 ft) below ground surface (bgs) and below could be contaminated by discharge of waste though the bottom of the trench. Because the trench was backfilled after use, the soil from 0 – 1.8 m (0 – 6 ft) bgs within the trench has a low potential for contamination. However, the material used for backfill is unspecified. Based on existing information, the shallow and intermediate depth soil could be contaminated by former disposal of liquids from equipment and vehicle decontamination activities. The approximate depth to groundwater is 83 m (272 ft) bgs.

References:

Waste Information Data System General Summary Report for the 216-T-10 Waste Site.

Site: 216-T-10	Area: T Plant	Category: Intermediate



ID = identification

Figure 1. 216-T-10 Waste Site Map

Site: 216-T-10	Area: T Plant	Category: Intermediate

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Site: 216-T-11	Area: T Plant	Category: Intermediate

Site Description

Alternate Site Identification: 216-T-11, Decontamination Trenches, Equipment Decontamination Area
Site Type: Trench
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: 1951 to 1954

Waste Site Location and Physical Description: The 216-T-11 waste site consists of a trench located west of 221-T Facility and southwest of the 216-T-33 Crib (Figure 1). The trench has been backfilled and is no longer marked or radiologically posted.

Waste Site Coordinates:
Lon-567362.66941 Lat-136841.50583

Site Dimensions:
Site Length: 15.2 m (50.0 ft) Site Depth: 1.8 m (6.0 ft)
Site Width: 3.1 m (10.0 ft) Cover Thickness: Not specified
Site Area: 47 m^2 (506 ft^2)

Related Site Structure(s): The structures and features associated with the 216-T-11 waste site are not presented.

Site Posting: The 216-T-11 waste site is not currently marked or posted.

Site History

Release Summary: The 216-T-11 Trench was constructed in 1951 for the subsurface disposal of liquid heavy equipment and vehicle decontamination waste. The trench received decontaminate waste from June 1951 to March 1954. However, a second date deactivation date of March 1957 is also provided as the termination date for the trench. The March 1957 ending date is likely incorrect as the site was backfilled in 1954 as part of the deactivation process.

Contrasting information is presented regarding potential contamination at this site. While no radionuclide or chemical contamination has been documented, contamination with readings up to 3,000 cpm were removed and shipped to the 200 Area Burial Ground for disposal. In addition, while no cleaning agents are listed as having been used, it is possible that hazardous substance contamination is present due to the trench receiving vehicle decontamination waste.

Site: 216-T-11	Area: T Plant	Category: Intermediate

The amount of decontaminate waste the trench received, and the levels of chemical and radionuclide contamination potentially deposited into the trench, are not specified. In addition, the amount of contamination removed during remediation activities in 1972 is not specified. As the total volume of decontamination waste is not available, no volume estimates can be ascertained for this site.

Volume Discharged: Not specified.

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: The 216-T-11 Trench was backfilled in 1954 as part of the site's deactivation. The decontamination waste was transferred to the 269-W garage facility after the 216-T-11 Trench was deactivated.

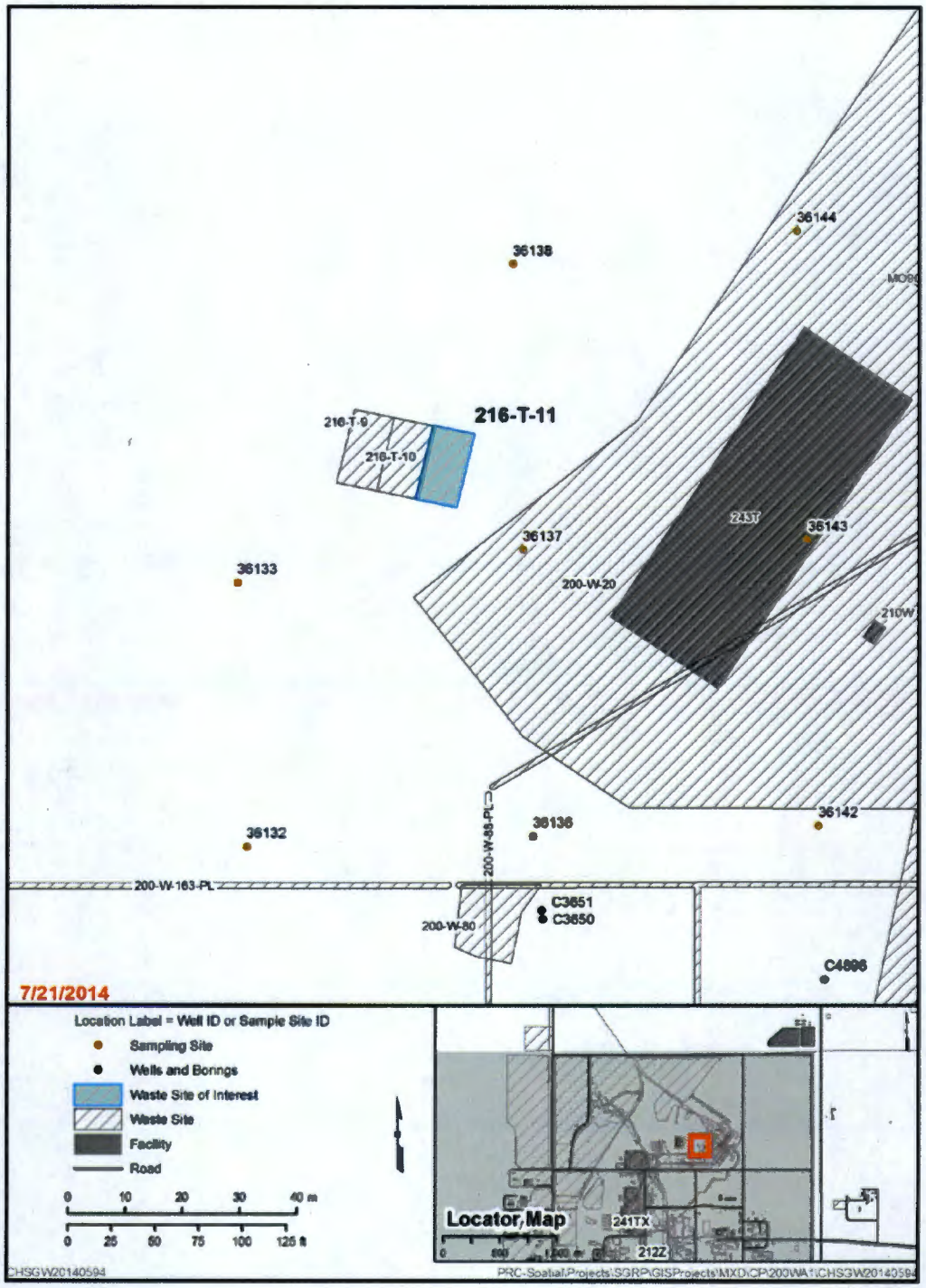
In May 1972, the site was exhumed and all contamination was removed and sent to the 200 West Area Dry Waste Burial Ground for disposal. Maximum contamination readings reached 3,000 cpm. After the contamination was removed, the 216-T-9, 216-T-10 and 216-T-11 Trenches were released from radiation zone status.

A site walkdown for surveillance purposes occurred on February 18, 1998. The results of the walkdown are not presented. In addition, no survey data are provided for this site. It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided. If surveys do occur, their frequency is not specified.

Nature and Extent of Contamination: No data are available to evaluate for the presence or absence of shallow or intermediate depth soil contamination. Soil 1.8 m (6 ft) below ground surface (bgs) and below could be contaminated by discharge of waste though the bottom of the trench. Because the trench was backfilled after use, the soil from 0 – 1.8 m (0 – 6 ft) bgs within the trench has a low potential for contamination, but the material used for backfill is unspecified. Based on existing information, the shallow and intermediate depth soil could be contaminated by former disposal of liquids from equipment and vehicle decontamination activities. The approximate depth to groundwater is 83 m (272 ft) bgs.

References:
Waste Information Data System General Summary Report for the 216-T-11 Waste Site.

Site: 216-T-11	Area: T Plant	Category: Intermediate



ID = identification

Figure 1. 216-T-11 Waste Site Map

Site: 216-T-11	Area: T Plant	Category: Intermediate

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Site: 216-T-12	Area: T Plant	Category: Deep

Site Description

Alternate Site Identification: 207-T Sludge Grave, 207-T Sludge Pit, 216-T-11
Site Type: Trench
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: 1954 to 1954

Waste Site Location and Physical Description: The 216-T-12 waste site is a small trench located at the northeast corner of the 207-T Retention Basin (Figures 1 and 2). The trench is not visible because the northeastern edge of the trench, along with the entire area surrounding the 207-T Retention Basin, was covered by a layer of clean backfill. This larger area is posted with Underground Radioactive Material Area (URMA) signs. The trench is not individually marked.

Waste Site Coordinates:
E-566992.60930 N-136737.05210

Site Dimensions:
Site Length: 4.6 m (15.0 ft)
Site Width: 3.1 m (10.0 ft)
Site Area: 14.3 m^2 (150 ft^2)
Site Depth: 2.4 m (8.0 ft)
Cover Thickness: Not specified

Related Site Structure(s): The 216-T-12 waste site is associated with the 207-T Retention Basin.

Site Posting: The 216-T-12 waste site is not individually posted. It shares an URMA posting with the larger 207-T Retention Basin stabilized area.

Site History

Release Summary: The 216-T-12 Trench was constructed in November 1954 for the disposal of sludge dredged from the 207-T Retention Basin. The sludge was covered once it was placed in the trench. An estimated 5,000,000 L (1,320,000 gal) of contaminated sludge was deposited into the trench. The sludge was low in salt and was neutral to basic in nature.

Volume Discharged: An estimated 5,000,000 L (1,320,000 gal) of contaminated sludge was deposited into the trench. Assumed 20 percent was free liquid for pore volume estimate.

Pore Volume Discharged: 5.0E6 L (x 20%)/ (220 ft x 150 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 3.6

Site: 216-T-12	Area: T Plant	Category: Deep

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-T-12 Waste Site

Contaminant	Mass Discharged
Pu	1 g
Beta	55 Ci
Sr-90	5 Ci
Ru-106	10 Ci
Cs-137	10 Ci
Co-60	2 Ci
U	45 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: A backhoe was used for the construction of the trench in 1954. That same year, a radiological investigation was conducted prior to the sludge being covered. Radiological equipment detected contamination readings up to 15 millirads/hour from the sludge. However, most of the readings ranged from 2 to 5 millirads/hour. The pit was used for a single disposal event, and was backfilled once the dredging operations were finished.

An additional cover layer was placed over the site in 1996, when the 207-T Retention Basin and surrounding area was backfilled with clean soil and posted as an URMA. The 216-T-12 Trench site was included in the surface stabilization effort due to its proximity to the retention basin. Radiological surveys are conducted on a regular basis for the backfilled portion of the 207-T Retention Basin. The 216-T-12 Trench is also investigated during these surveys.

A site walkdown for surveillance purposes occurred on February 28, 1998. The results of the walkdown are not available. In addition, no survey data are available for this site. It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided. If surveys do occur, their frequency is not specified.

Borehole and data summaries are presented in Tables 2 through 4. Borehole locations are shown on Figure 1. The nearest data are for borehole 299-W11-50/C7020, located 26 m (85 ft) northwest of the 216-T-12 waste site. Data from borehole C7020 are not considered applicable to the trench characterization due to distance from the trench.

Site: 216-T-12	Area: T Plant	Category: Deep

Table 2. Borehole Summary for the 216-T-12 Waste Site

Year	Borehole / Well ID	Location with Respect to Site	Depth (ft)
2005	C7020 / 299-W11-50	Outside Site, 85 ft to northwest	85, 113, 128 (3 soil samples)
2010	–	–	0 – 128 (GPL)

GPL = geophysical log
ID = identification

Table 3. Geophysical Log Summary for the 216-T-12 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
C7020	0 – 5	–	pCi/g	–	11,054.7	cpm	1
	5 – 10	–	pCi/g	–	9,810.7	cpm	8
	10 – 15	–	pCi/g	–	9,062.5	cpm	15
	>15	–	pCi/g	–	16,513.9	cpm	100

bgs = below ground surface
ID = identification

Site: 216-T-12	Area: T Plant	Category: Deep

Table 4. Soil Maximum Detection Summary for the 216-T-12 Waste Site

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Nitrate	–	–	–	344,000	µg/kg	113
Tc-99	–	–	–	0.298	pCi/g	113

Nature and Extent of Contamination: No data are available to evaluate for the presence or absence of shallow or deep soil contamination in the trench. Based on existing information, the shallow and deep soil could be contaminated by former disposal of sludge from the 207-T Retention Basin. Soil within and below the trench could be contaminated by discharge of sludge into the trench and percolation of liquids though the bottom of the trench (2.4 m [8 ft] bgs). The volume of waste discharged to the trench (17.8 pore volumes) suggests a potential for contamination to extend to the bottom of the vadose zone/top of groundwater (approximately 69.5 m [228 ft] bgs).

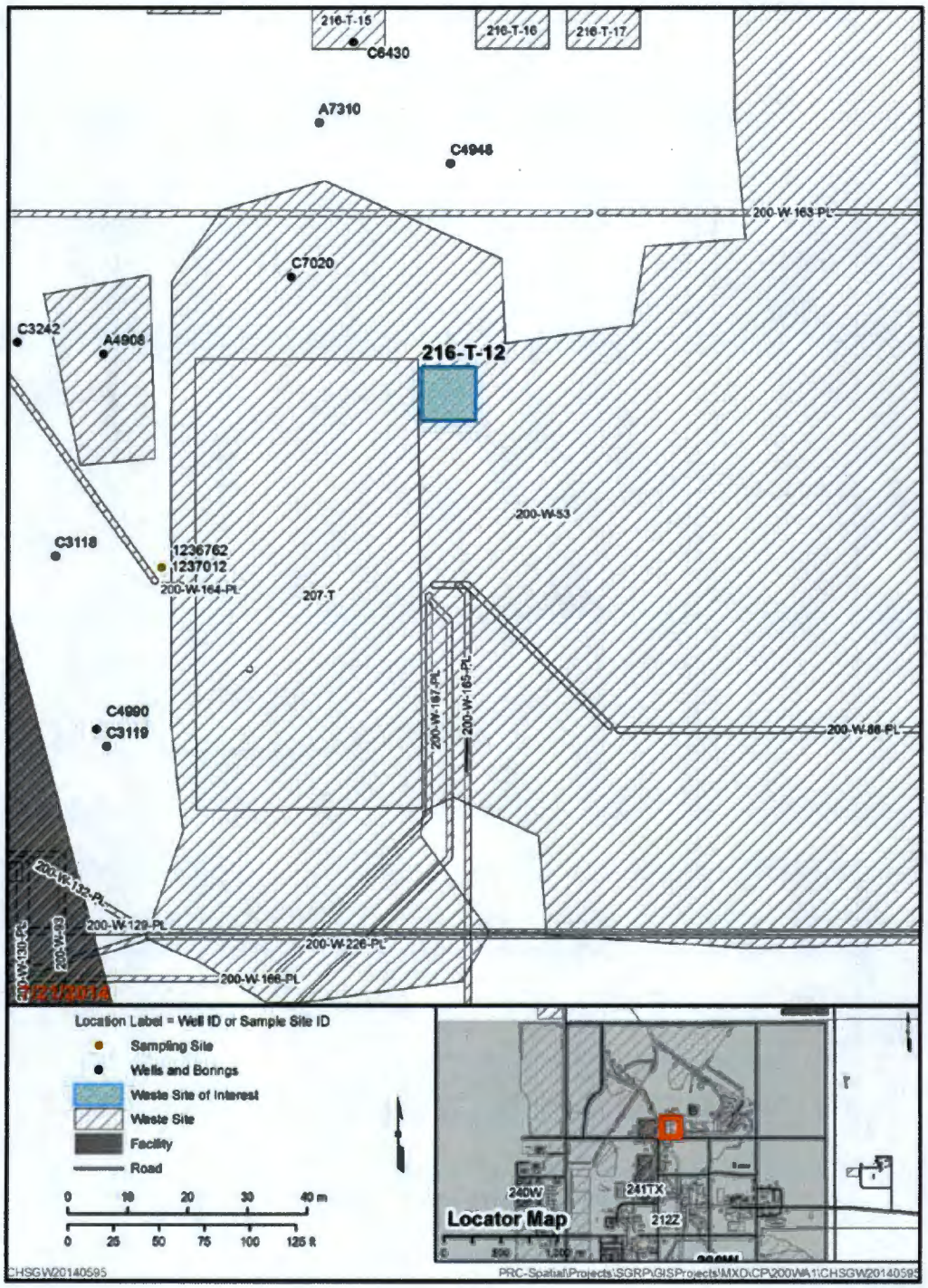
References:

H-2-44511 (drawing), 1984, *Area Map 200 West "T" Plant Facilities*, Sh. 133, Rev. 5, Rockwell Hanford Operations, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

Waste Information Data System General Summary Report for the 216-T-12 Waste Site.

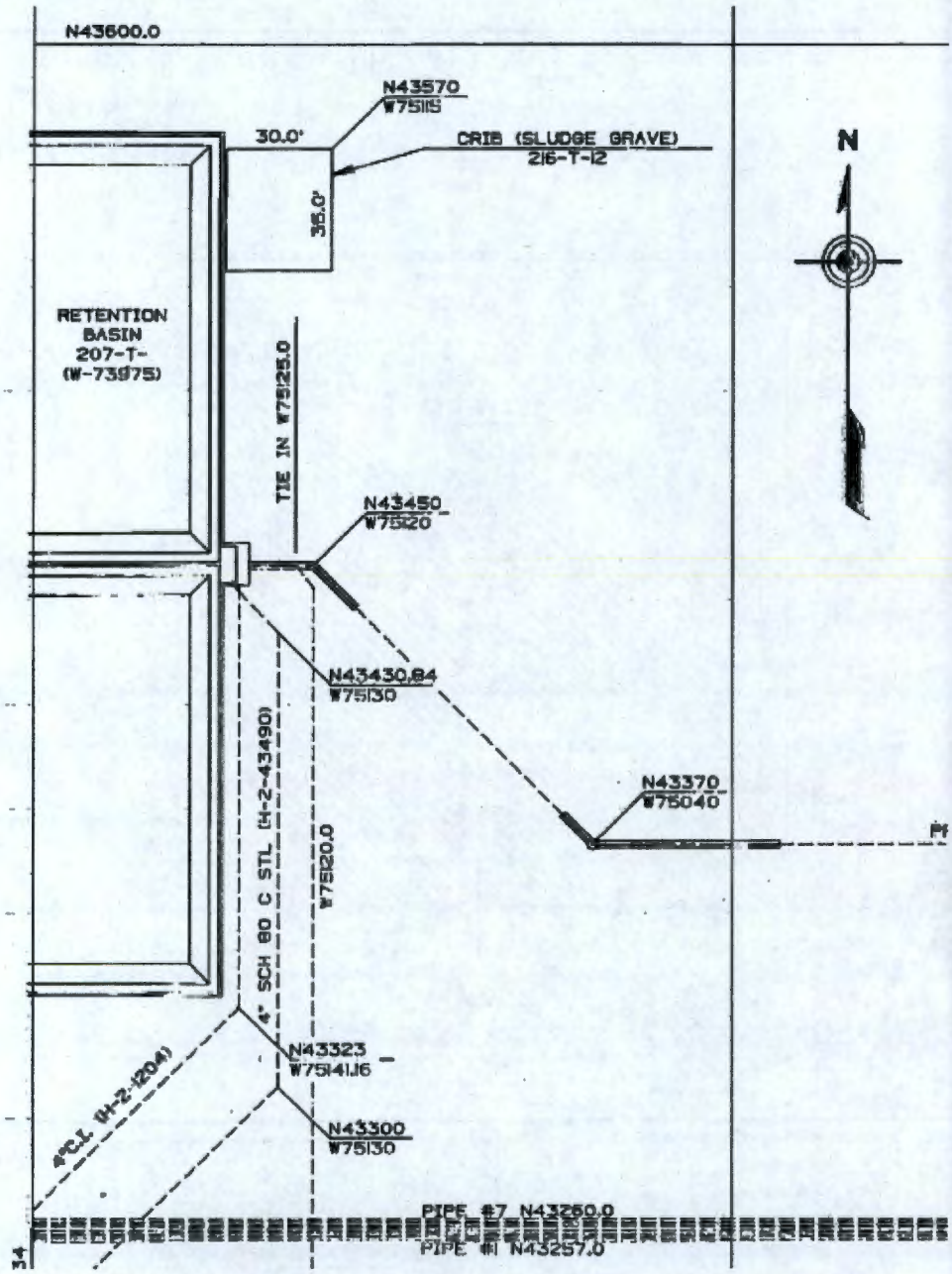
Site: 216-T-12	Area: T Plant	Category: Deep



ID = identification

Figure 1. 216-T-12 Waste Site Map

Site: 216-T-12	Area: T Plant	Category: Deep



Source: H-2-44511, *Area Map 200 West "T" Plant Facilities*, Sheet 133.

Figure 2. 216-T-12 Waste Site Layout

Site: 216-T-13	Area: T Plant	Category: Intermediate

Site Description

Alternate Site Identification: 269-W Regulated Garage, 269-W Decontamination Pit or Trench, 216-T-12, 269-W Regulated Garage Decontamination Pit
Site Type: Trench
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: June 1954 to June 1964

Waste Site Location and Physical Description: The 216-T-13 waste site is comprised of a single, open trench that was used to decontaminate vehicles. A tip rack was located in the bottom of the open trench. Vehicles were driven into the trench and onto the rack, where they were sprayed with water or steam to remove any contamination.

The trench is located west of the 269-W Regulated Garage, which has been demolished. The concrete building foundation of the garage still remains at the site. The trench is reportedly located on the north side of the 241-TY Farm, north of the tank farm perimeter fence (Figure 1). There is some uncertainty as to the actual location. A concrete ramp is located at the site, buried beneath 0.6 m (2 ft) of gravel. The ramp is visible near the footprint of the garage. In addition, a dirt unloading ramp is located to the west, near the trench. However, the ramp was used to unload equipment, and its use was not related to the decontamination activities that occurred in the trench. The trench is no longer marked or posted.

In addition, the ground around the site is mostly level. However, surface disturbances and small soil mounds are located surrounding the site. The substrate is a mix of sand and gravel, and a moderate growth of vegetation, consisting mostly of rabbitbrush and bunchgrass, is present.

Waste Site Coordinates:
Lon-566776.50000 Lat-136521.35938

Site Dimensions:
Site Length: 11 m (35 ft) Site Depth: 3.1 m (10.0 ft)
Site Width: 11 m (35 ft) Cover Thickness: Not specified
Site Area: 114 m^2 (1,225 ft^2) site dimensions estimated from Figure 1.
According to HW-33305, *Tabulation of Radioactive Liquid Waste Disposal Facilities*, the trench was 7.6 m (25 ft) long, 3.1 m (10 ft) wide and 2.4 m (8 ft) deep.

Related Site Structure(s): The 216-T-13 waste site is associated with the 269-W Regulated Garage. Vehicles were cleaned at the 216-T-13 Trench prior to being sent to the garage for servicing. The two structures are not physically linked to each other.

Site: 216-T-13	Area: T Plant	Category: Intermediate

Site Posting: The 216-T-13 waste site is no longer posted or marked.

Site History

Release Summary: The 216-T-13 Trench was constructed in 1954 for the subsurface disposal of vehicle decontamination waste. The trench received decontaminate waste from June 1954 to June 1964. No cleaning agents are listed as having been used at the site. However, since the site was used for decontamination purposes, it is possible that hazardous substance contamination is present.

Volume/Mass Discharged: An estimated 9.8E+04 L (2.6E+04 gal).

Pore Volume Discharged: 9.8E+04 L/ (214 ft x 250 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.21

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content

Contaminant	Mass Discharged
Pu	<0.1 g
Beta	84 Ci
Sr-90	0.1 Ci
Ru-106	40 Ci
Cs-137	0.1 Ci
Co-60	<0.1 Ci
U	<0.05 kg

Source: RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

Previous Site Characterization

Site Characterization Summary: The site was deactivated in June 1964 after all decontamination activities were transferred to the 2706-T Building (also called 2706-W). The site was backfilled in 1964 as part of the deactivation process. In April 1972, approximately 3 m^3 (4 yd^3) of contaminated soil was excavated with contamination readings up to 1,500 cpm. The contaminated soil was removed and transported to the 200 West Area Dry Waste Burial Ground. The site was removed from radiological posting following the removal of the contaminated soil.

A site walkdown was performed for surveillance purposes occurred on February 18, 1998. The results of the walk are not available. In addition, no survey data is provided for this site. It is unclear if the site is

Site: 216-T-13	Area: T Plant	Category: Intermediate

A site walkdown was performed for surveillance purposes occurred on February 18, 1998. The results of the walk are not available. In addition, no survey data is provided for this site. It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided. If surveys do occur, their frequency is not specified.

Information is presented detailing three different mapped locations provided for this site:

1. The first location provided for this site is due north of the 241-TY Tank Farm (Figure 2). This drawing has the 269-W Garage further north from the site than is accurate based on a review of historical aerial photographs. The building's orientation is also incorrect on this drawing. In addition, conversion to the Washington State Plane coordinate system distorted the site's location, based on the existing building foundations from the Waste Information Data System (WIDS) in 2014.

2. The second location is shown next to the south side of the 269-W Garage and north of the 241-TY Tank Farm (Figure 3). An interview with a staff member indicated that the second location is the correct location (WIDS, 2014).

3. The third location is also due north of the 241-TY Tank Farm (Figure 4). The site location on this figure appears to be further east than the location shown on drawing H-2-32526, *"T" Plant Liquid Waste Disposal Sites 216-T-Series*. However, it is uncertain whether Figure 4 represents a scaled drawing or only approximate locations of the waste site and test pits (no scale was provided on the drawing).

In December 2001, a final mapping effort was undertaken for this site to determine the location of the backfilled trench. However, Ground Penetrating Radar and Electromagnetic Induction scans were unable to locate the covered trench. The survey did identify two areas of relatively high concentrations of anomalies (buried debris) during the survey. It is not clear whether either is associated with the 216-T-13 Trench.

In April 2005, two characterization test pits (T-13A and T-13B) were excavated near the trench (see Figure 4 and Table 2). The first test pit was dug to roughly 7.6 m (25 ft) beneath the ground, while the second was dug to 2.7 m (9 ft) deep (D&D-26572, *200-MW-1 Operable Unit Waste Site Characterization Borehole Summary Report for the 216-U-3 French Drain*). Analytical data for the test pits were not located. Field screening data are summarized in Table 3.

Table 2. Borehole Summary for the 216-T-13 Waste Site

Year	Borehole/Well ID	Location with respect to Site	Depth (ft)
2005	T-13A	West	25 (6 samples)
2005	T-13B	Southwest	9 (1 sample)

ID = identification

Site: 216-T-13	Area: T Plant	Category: Intermediate

Table 3. Test Pit Field Readings

216-T-13 Trench			Field Readings					Rad Screen Results	
			RCT			IHT			
Test Pit Location	Samples Taken (HEIS)	Depths	Alpha (d/min)	Beta/Gamma (d/min)	Dose	Max TOV 10.6 eV lamp	Max TOV 11.8 eV lamp	Alpha	Beta/Gamma
T-13A	B1C784, B1C785	8 - 9	Background		Not applicable	Less than detectable	Less than detectable	Undetected	9 pCi/g
	B1C769, B1C770, B1C771, B1C773	10 - 11				Less than detectable	Less than detectable	Undetected	6 pCi/g
	B1C774, B1C778, B1C780	12 - 13				Less than detectable	Less than detectable	Undetected	5.50 pCi/g
	B1C775, B1C781	14 - 15				Less than detectable	Less than detectable	Undetected	6.80 pCi/g
	B1C776, B1C782	19 - 20				0.2 ppm at spoils pile	Less than detectable	Undetected	9.60 pCi/g
	B1C777, B1C779, B1C783	24 - 25				Less than detectable	Less than detectable	Undetected	17 pCi/g
T-13B	B1CY49, B1CY50	8 - 9				0.2 at Excavator bucket	Less than detectable	Undetected	7.10 pCi/g

d/min = disintegrations per minute. HEIS = *Hanford Environmental Information System*. IHT = Industrial Hygiene Technician. ppm = parts per million. RCT = Radiological Control Technician. TOV = total organic vapor.

Source: D&D-26572, 2005, *200-MW-1 Operable Unit Waste Site Characterization Borehole Summary Report for the 216-U-3 French Drain, 216-T-33 Crib, 200-E-4 French Drain, and 216-T-13 Trench*, Table 5, Rev. 0, Fluor Hanford, Inc., Richland, Washington.

Note: Produced from the best available copy.

The nearest geophysical log is a 1990 scintillation log for 299-W10-17 / A4894, located 26 m (85 ft) to the south. Near-background levels of radioactivity (total gamma) were detected over most of the logged interval (0 – 67.7 m [0 – 222 ft] (DOE/RL-2001-65, *200-MW-1 Miscellaneous Waste Group Operable Unit RI/FS Work Plan*).

Nature and Extent of Contamination: No data are available to evaluate for the presence or absence of shallow or intermediate depth soil contamination in the trench. Based on existing information, the shallow and intermediate depth soil could be contaminated by former disposal of liquids from equipment and vehicle decontamination activities. Within the trench, soil 26 m (8 ft) below ground surface (bgs) and below could be contaminated by discharge of waste though the bottom of the trench. Because the trench was backfilled after use and a portion of the shallow soil (3 m^3 [4 yd^3) subsequently excavated, shallow soil within the trench has a low potential for contamination (but may still be contaminated if contaminated backfill was used). The approximate depth to groundwater is 69.8 m (229 ft) bgs.

References:

ARH-2757 Pt. 3, 1973, *Radioactive Liquid Wastes Discharged to Ground in the 200 Areas During 1972*, Atlantic Richfield Company, Richland, Washington.

D&D-26572, 2005, *200-MW-1 Operable Unit Waste Site Characterization Borehole Summary Report for the 216-U-3 French Drain, 216-T-33 Crib, 200-E-4 French Drain, and 216-T-13 Trench*, Rev. 0, Fluor Hanford, Inc., Richland, Washington.

Site: 216-T-13	Area: T Plant	Category: Intermediate

DOE/RL-2001-65, 2002, *200-MW-1 Miscellaneous Waste Group Operable Unit RI/FS Work Plan*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D9085032.

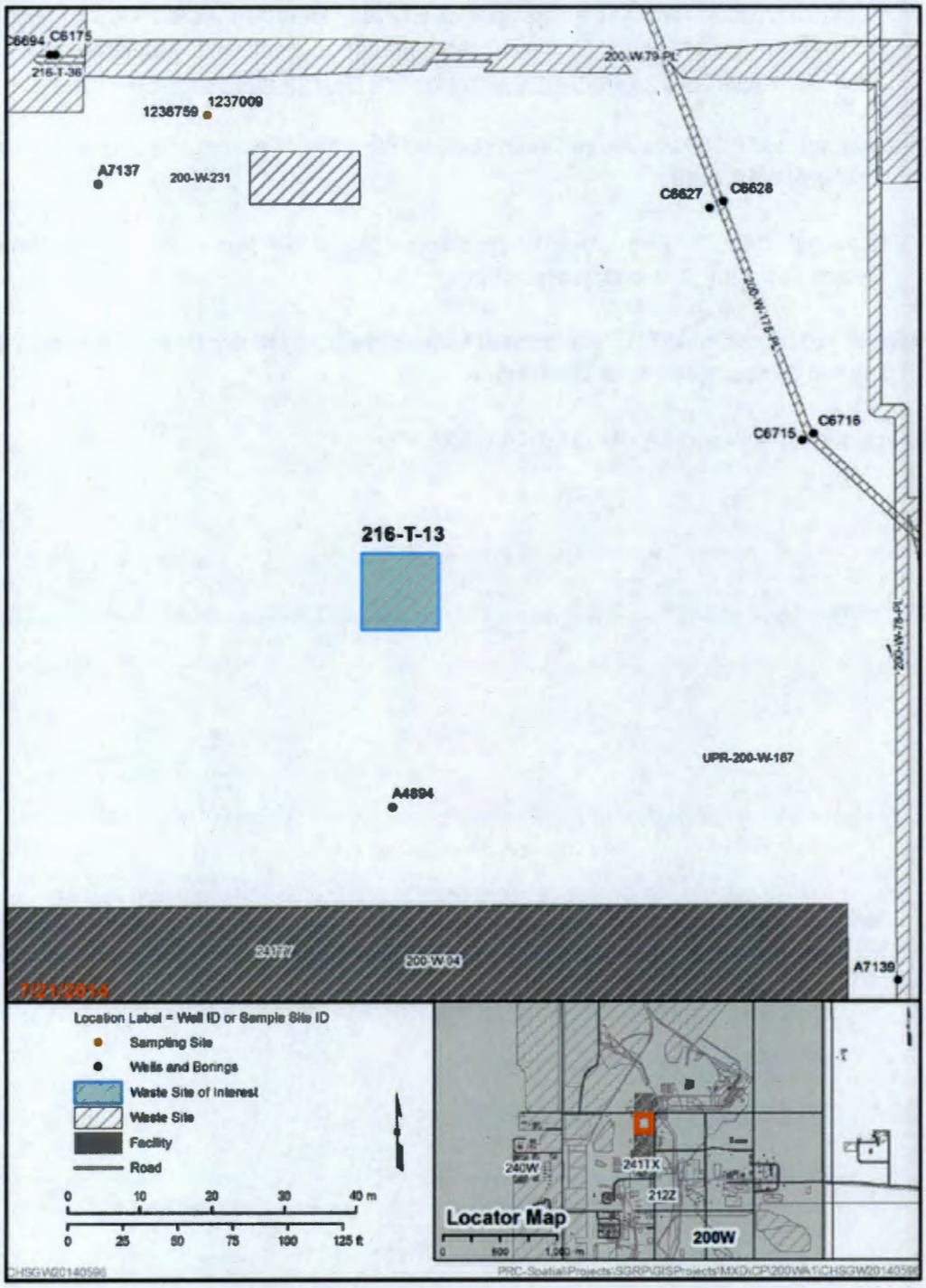
H-2-1495 (drawing), 1973, *200 West Area Steam Line Plot Plan*, Rev. 2, General Electric Company, Richland, Washington.

H-2-32526 (drawing), 1967, *"T" Plant Liquid Waste Disposal Sites 216-T-Series*, Sh. 1, Rev. 3, General Electric Company, Richland, Washington.

HW-33305, 1954 (declassified 1978), *Tabulation of Radioactive Liquid Waste Disposal Facilities*, General Electric Company, Richland, Washington.

WIDS General Summary Report for the 216-T-13 Waste Site.

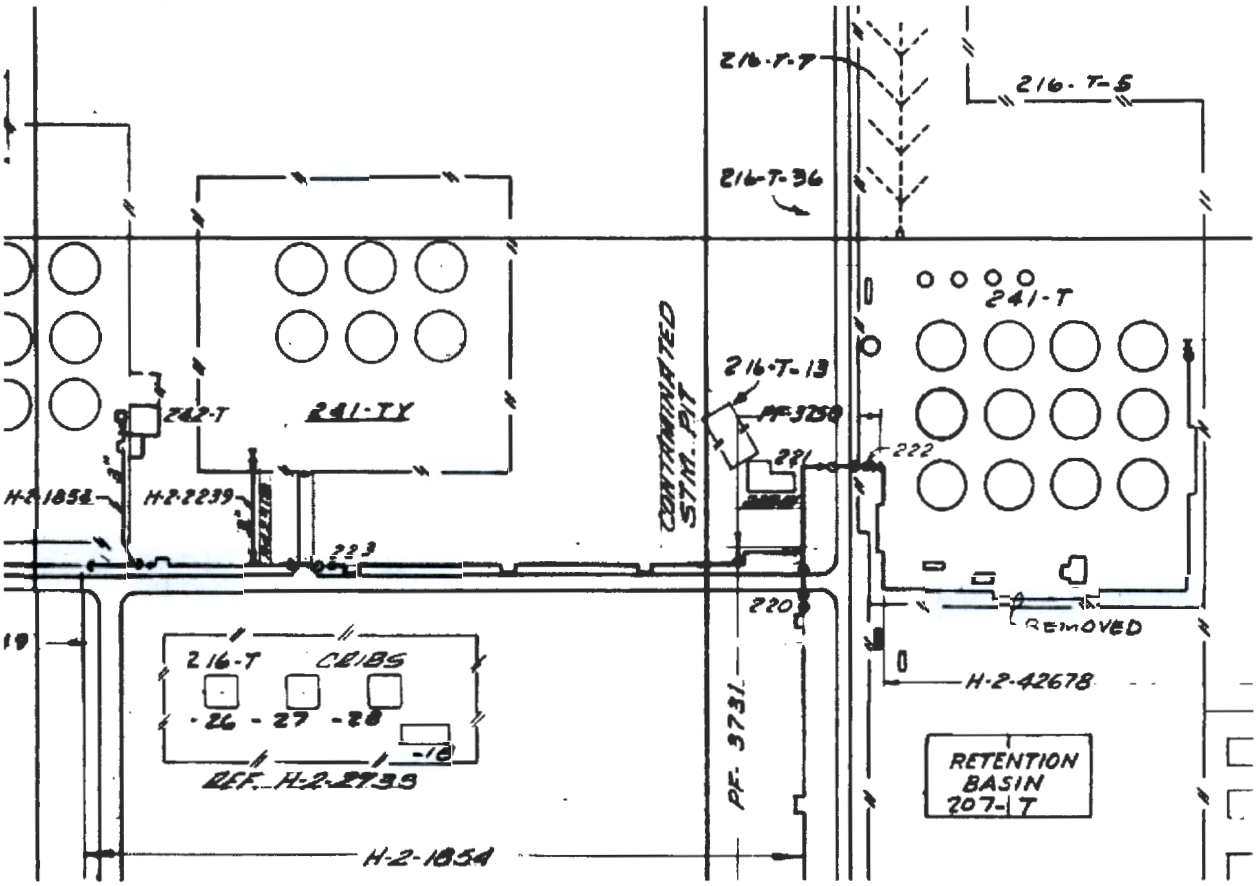
Site: 216-T-13	Area: T Plant	Category: Intermediate



ID = identification

Figure 1. 216-T-13 Waste Site Map

Site: 216-T-13	Area: T Plant	Category: Intermediate

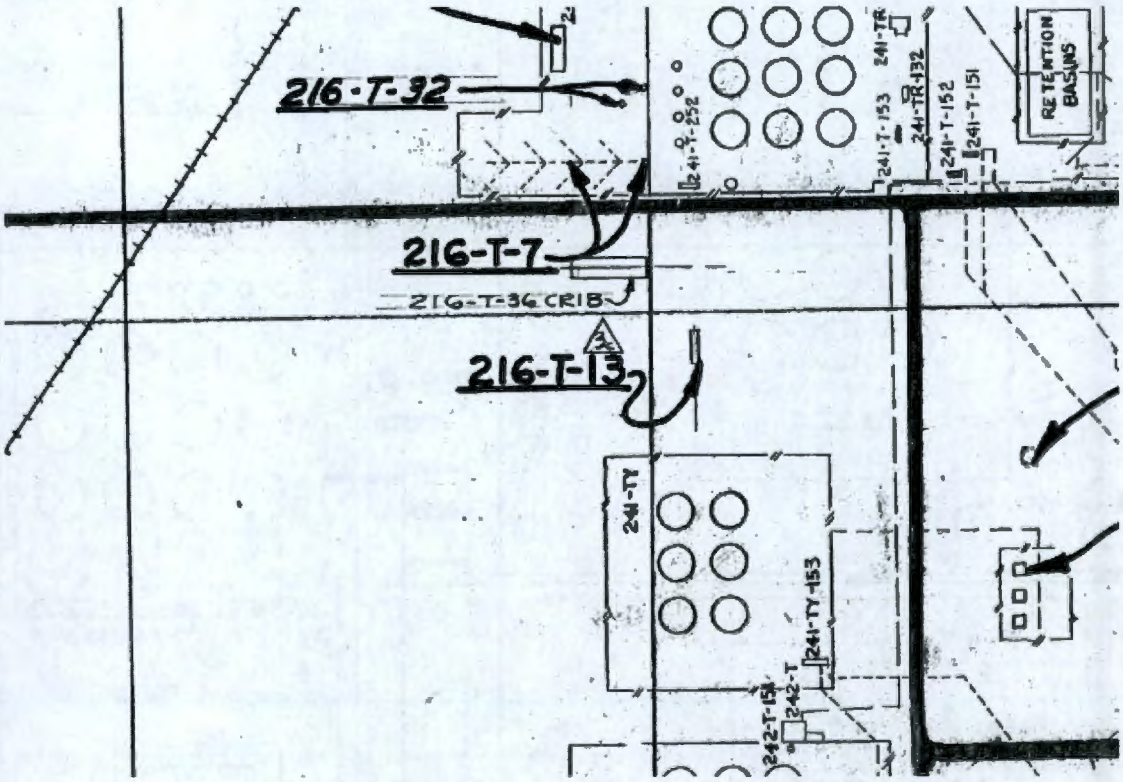


Source: H-2-1495, *200 West Area Steam Line Plot Plan*.

Note: Produced from the best available copy.

Figure 2. 216-T-13 Waste Site Location (right = north)

Site: 216-T-13	Area: T Plant	Category: Intermediate

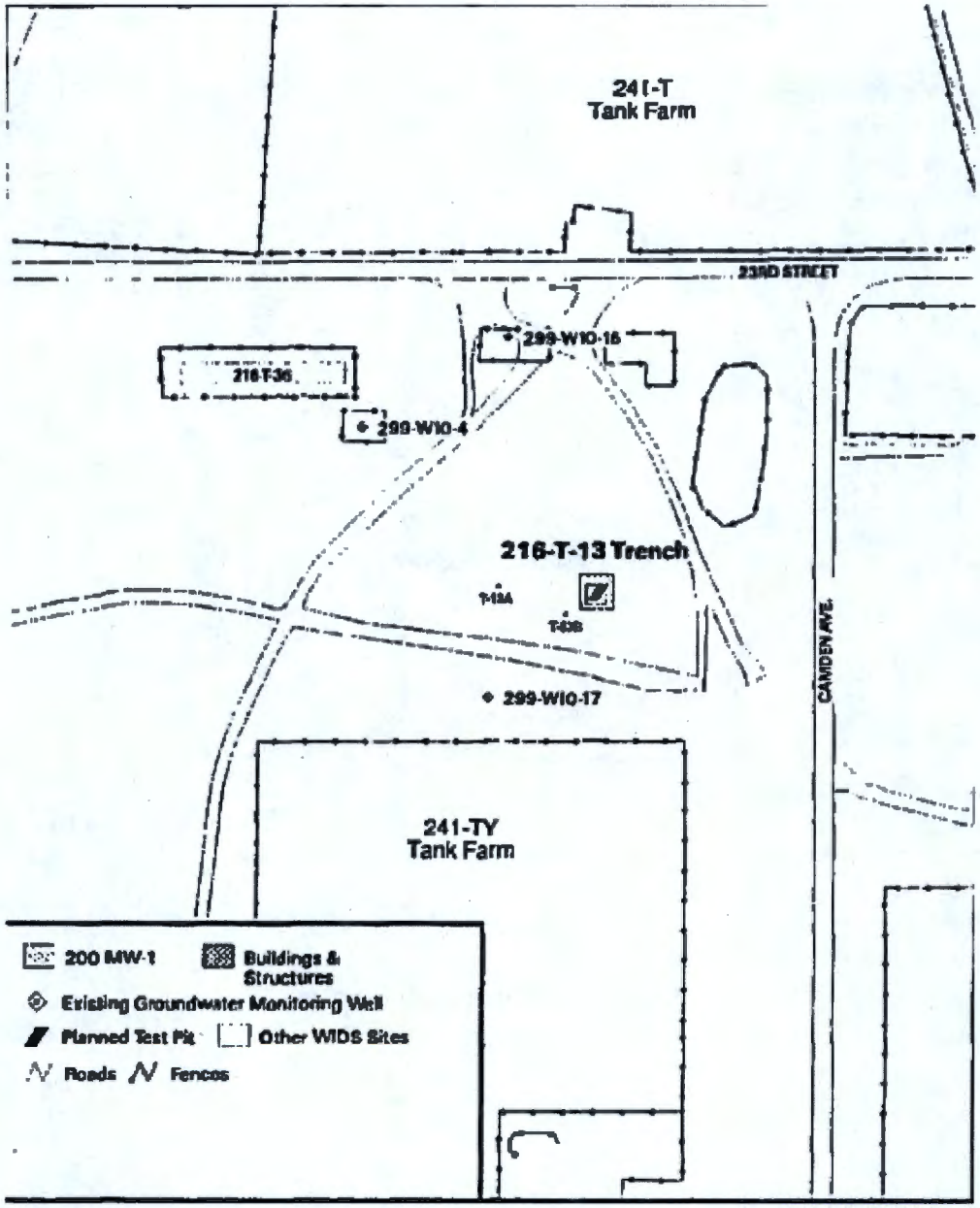


Source: H-2-3256, *Aqueous Makeup Electrical Details.*

Note: Produced from the best available copy.

Figure 3. 216-T-13 Waste Site Location (top = north)

Site: 216-T-13	Area: T Plant	Category: Intermediate

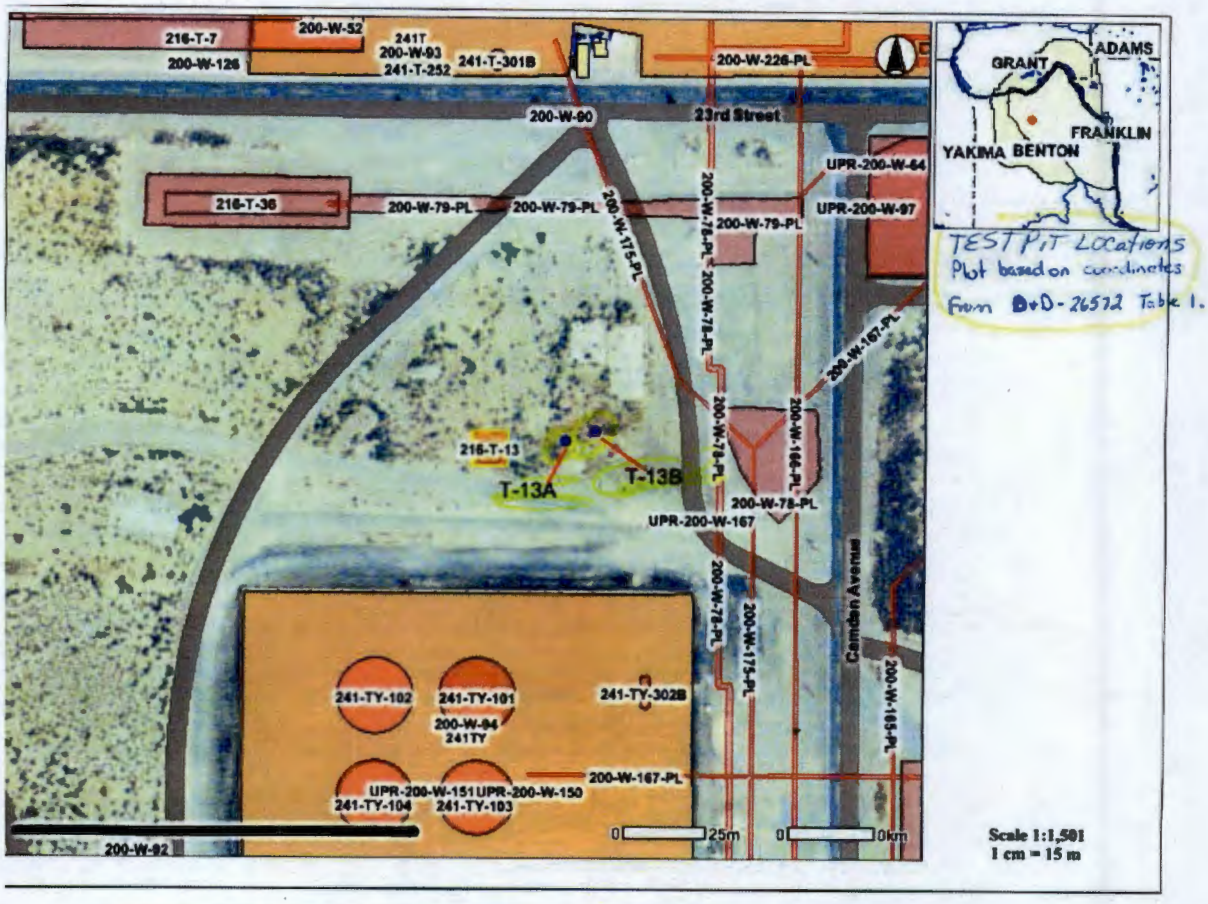


Source: D&D-26572, *200-MW-1 Operable Unit Waste Site Characterization Borehole Summary Report for the 216-U-3 French Drain, 216-T-33 Crib, 200-E-4 French Drain, and 216-T-13 Trench.*

Note: Produced from the best available copy.

Figure 4. Locations of 216-T-13 and Test Pits 13A and 13B

Site: 216-T-13	Area: T Plant	Category: Intermediate



Source: D&D-26572, *200-MW-1 Operable Unit Waste Site Characterization Borehole Summary Report for the 216-U-3 French Drain, 216-T-33 Crib, 200-E-4 French Drain, and 216-T-13 Trench*, Table 1.

Note: Produced from the best available copy.

Figure 5. Another Possible Location

Site: 216-T-20	Area: T Plant	Category: Intermediate

Site Description

Alternate Site Identification: 216-TX-2, 216-T-20 Crib, 241-TX-155 Contaminated Acid Grave
Site Type: Trench
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: November 1952 to November 1952

Waste Site Location and Physical Description: The 216-T-20 waste site (Figure 1) is a trench located east of Camden Avenue, adjacent to the north end of the 200 West Area Power House Pond. When constructed, the trench excavation resembled a pit. The excavated hole has since been filled with backfill material. On the surface, a small concrete block structure with a metal lid is visible. The lid is labeled as a "Confined Space" and with signs warning of "Potential Internal Contamination." In addition, there is a concrete marker with an Underground Radioactive Material Area (URMA) sign. The concrete block structure is surrounded with cobbles, the same type which covers the surface of the Powerhouse Pond.

Waste Site Coordinates:
Lon-567118.93750 Lat-136074.22660

Site Dimensions:
Site Length: 3.1 m (10.0 ft) Site Depth: Not specified
Site Width: 3.1 m (10.0 ft) Cover Thickness: Not specified
Overburden Depth: 1.2 m (4.0 ft)

Related Site Structure(s): The 216-T-20 waste site is associated with the 241-TX-155 Diversion Box.

Site Posting: The 216-T-20 waste site is posted with URMA and Potential Internal Contamination signs.

Site History

Release Summary: The 216-T-20 Trench was constructed for the subsurface disposal of a single release of contaminated nitric acid from the 241-TX-155 Diversion Box Catch Tank. The site was active during November 1952, and received 1.8E+04 L (4.8E+03 gal) of process effluent.

Volume/Mass Discharged: 1.8E+04 L (4.8E+03 gal)of process effluent consisting of contaminated nitric acid.

Pore Volume Discharged: 1.8E+04 L/ (245 ft x 100 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.1

Site: 216-T-20	Area: T Plant	Category: Intermediate

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content

Contaminant	Mass Discharged
Pu	None
Beta	50 Ci
Sr-90	0.99 Ci
Ru-106	2.1 Ci
Cs-137	1.1 Ci
Co-60	None
U	5 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: The start date was November 1952 and the end date was November 1952. During deactivation, the aboveground piping was removed and the trench was backfilled.

A site walkdown for surveillance purposes occurred on April 5, 2000. The results of the walkdown are not presented. In addition, no survey data are provided for this site. It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided. If surveys do occur, their frequency is not specified.

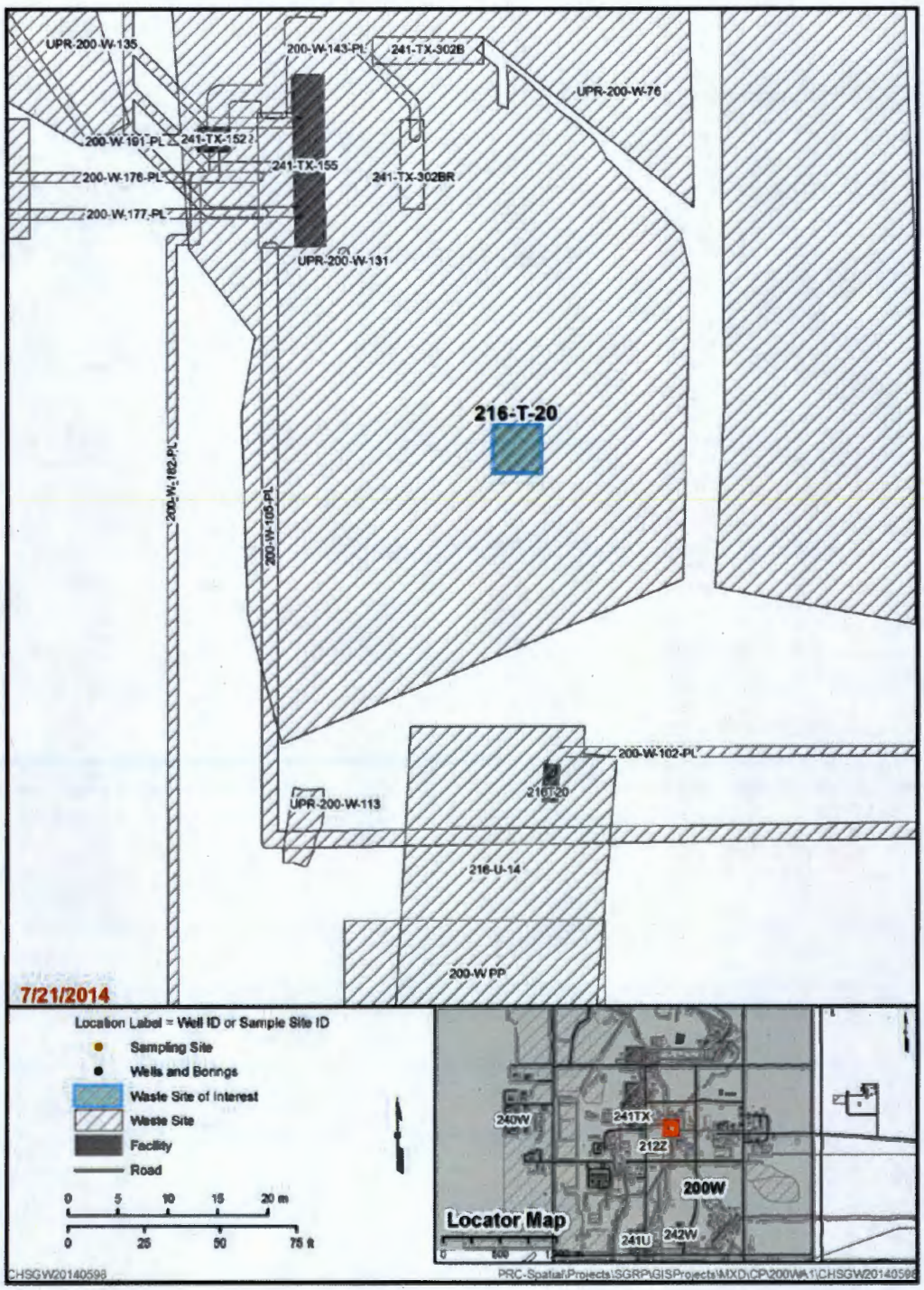
Nature and Extent of Contamination: Based on existing information, the shallow and intermediate depth soil could be contaminated by a one-time disposal of liquid waste containing nitric acid into the trench. Within the trench, soil beneath the backfill (1.2 m [4 ft] below ground surface [bgs]) could be contaminated. The potential for contamination to extend to groundwater (approximately 75.9 m [249 ft] bgs) is low based on the estimated pore volume of 0.1.

References:

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

Waste Information Data System General Summary Report for the 216-T-20 Waste Site.

Site: 216-T-20	Area: T Plant	Category: Intermediate



ID = identification

Figure 1. 216-T-20 Site Map

Site: 216-T-20	Area: T Plant	Category: Intermediate

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Site: 216-T-27	Area: T Plant	Category: Deep – Similar Site

Site Description

Alternate Site Identification: 216-TY-3 Cavern, 216-TY-3 Crib, 216-TX-3 Cavern, 216-TX-3 Crib
Site Type: Crib
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-LW-1
Service Dates: September1965 to November 1965

Waste Site Location and Physical Description: The 216-T-26, 216-T-27, and 216-T-28 Cribs are located within the same enclosure (Figure 1). The enclosure is posted as an Underground Radioactive Material Area (URMA), and is surrounded by a common steel post and chain barricade. The enclosure is south of 23rd Street and east of Camden Avenue. The inlet pipe branches to four steel pipes, each one discharging into a concrete open-end sewer pipe. The 216-TY-201 Flush Tank is located northeast of the site. The crib construction is shown on Figure 2. A crib riser may have been used during the disposal of 300 Area Wastes into the 216-T-28 Crib.

Waste Site Coordinates:
Lon-566932.49995 Lat-136372.82815

Site Dimensions:
Site Length: 9.1 m (30.0 ft) Site Depth: 4.6 m (15.0 ft)
Site Width: 9.1 m (30.0 ft) Cover Thickness: Not specified
Site Area: 84 m^2 (900 ft^2)
Dimensions are for the bottom of the excavation.

Related Site Structure(s): The 216-T-27 Crib is associated with the 221-T Building, 2706-T Building, 216-TY-201 Flush Tank, with pipeline 200-W-188-PL, and with the 200-W-82 waste site.

Site Posting: The enclosure that surrounds the 216-T-26, 216-T-27, and 216-T-28 Cribs is posted as an URMA.

Site History

Release Summary: The 216-T-27 Crib was used for the disposal of T Plant Facility liquid waste and 300 Area Laboratory waste. Wastes deposited into the 216-T-27 Crib consisted of steam condensate and process decontamination waste from Tank 241-T-112 in the 241-T Tank Farm, and 2607-T equipment decontamination waste. In 1963 or 1964, 300 Area Laboratory waste was added to the waste stream deposited into the 216-T-28 Crib. In November 1965, the 300 Area waste was redirected from the

Site: 216-T-27	Area: T Plant	Category: Deep – Similar Site

216-T-28 Crib to the 216-T-27 Crib for deposition, due to the presence of cesium and strontium contamination in the groundwater beneath the 216-T-28 Crib.

There is some uncertainty regarding the volume of 300 Area waste sent to the 216-T-27 and 216-T-28 Cribs. Information is provided stating that the waste was scheduled for disposal into the 216-T-27 Crib. However, contradicting information is also shown, stating that over 100 truckloads of waste from the 300 Area's Plutonium Recycle Test Reactor (PRTR) release were deposited into the 216-T-28 Crib between September and October 1965. Finally, the Waste Information Data System (WIDS) document for the 216-T-28 waste site states that approximately 189 truckloads of PRTR waste were shipped to the 216-T-28 Crib for disposal. This equates to approximately 3.6E+06 L (9.5E+05 gal) of liquid waste. The same truck unloading station would have been used for either crib, thus is it difficult to ascertain the amount of waste discharged into either crib.

Volume/Mass Discharged: Uncertain. See Release Summary section below.

Pore Volume Discharged: 7.1E+06 L/ (210 ft x 900 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 4.5

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-T-27 Waste Site

Contaminant	Mass Discharged
Pu	13 g
Beta	3,600 Ci
Sr-90	140 Ci
Ru-106	1,500 Ci
Cs-137	100 Ci
Co-60	1 Ci
U	7.3 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: In November 1965, a limited volume of 300 Area waste and T Plant waste was rerouted from the 216-T-28 Crib to the 216-T-27 Crib due to the presence of groundwater contamination beneath the 216-T-28 Crib. It was assumed the 216-T-27 Crib would only be in use for

Site: 216-T-27	Area: T Plant	Category: Deep – Similar Site

18 months. However, it was recommended that the crib be retired earlier than originally scheduled, as collected data suggested that the 300 Area waste reacted poorly to the crib soil.

The 216-T-27 Crib was deactivated in November 1965, when its set radionuclide disposal limit was reached. The site was deactivated by inserting a blank flange in the pipeline that fed the 216-T-27 and 216-T-28 Cribs.

From 1969 to 1979, several live, contaminated Russian thistles were discovered surrounding the crib. Most of the thistles were removed immediately after they were discovered; however, some had deteriorated, releasing contamination onto the ground surface. A radiological investigation in May 1975 located spotty ground contamination with readings up to 30,000 cpm. Surface stabilization work occurred in June and July, and involved blading 15 cm (6 in.) of soil from the contaminated areas. The soil was then collected and deposited into the 200 West Dry Waste Burial Grounds for disposal. Following the removal of the contaminated soil and vegetation, the ground was brought back to its previous grade with a layer of clean soil.

The site was surface stabilized a second time on May 21, 1990. Visual and radiological surveys are performed annually. The site is monitored by groundwater wells 299-W14-2 and 299-W14-3.

In 2004 and 2006, geophysical logging was completed at two boreholes located within the waste site footprint.

Borehole locations are shown on Figure 1 and existing data are summarized in Tables 2 and 3.

Table 2. Borehole Summary for the 216-T-27 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2006	299-W14-53 (A7337)	Inside	4 – 146 (GPL)
2004	299-W14-62 (A7346)	Edge	3.5 – 69.5 (GPL)

GPL = geophysical log
ID = identification

Site: 216-T-27	Area: T Plant	Category: Deep – Similar Site

Table 3. Geophysical Log Summary for the 216-T-27 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A7337	0 – 5	0.19	pCi/g	5.0	18,096.8	cpm	5
	5 – 10	1.5	pCi/g	6.0	21,715.4	cpm	10
	10 – 15	31.9	pCi/g	15	47,0197	cpm	15
	>15	912,456.9	pCi/g	30	11,454,700	cpm	16
A7346	0 – 5	0.2	pCi/g	4.5	15,186.2	cpm	3.5
	5 – 10	0.95	pCi/g	6.5	15,629.6	cpm	9.5
	10 – 15	0.66	pCi/g	10.5	15,549.5	cpm	10.5
	>15	1313.1	pCi/g	51.5	768,708	cpm	30.5

bgs = below ground surface
ID = identification

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): The geophysical log (GPL) detected manmade radionuclides in shallow soil from 0 – 4.6 m (0 – 15 ft) bgs. Based on GPL results for boreholes 299-W14-53 (A7337) and 299-W14-62 (A7346), radionuclides are present in shallow soil within the crib. Cesium-137 (Cs-137) was detected from 0 – 4.6 m (0 – 15 ft) bgs (maximum 31.9 pCi/g at 4.6 m [15 ft] bgs) at borehole A7337. Cesium-137 concentrations in shallow soil at borehole A7346 were below background. The maximum total gamma concentration (470,197 cpm) was detected at borehole A7337 at 4.6 m (15 ft) bgs.

Deep (>4.6 m [>15 ft] bgs): The GPL detected manmade radionuclides in deep vadose zone soil from 4.6 – 44.5 m (15 – 146 ft) bgs. The highest Cs-137 and total gamma concentrations were detected between 4.6 and 15.9 m (15 and 52 ft) bgs. At borehole 299-W14-53 (A7337), radionuclides were detected in deep vadose zone soil within the crib as follows:

- Cs-137 from 4.6 – 42.3 m (15 – 139 ft) bgs (maximum 912,457 pCi/g at 9.1 m [30 ft] bgs)
- Cobalt-60 (Co-60) from 4.6 – 44.5 m (15 – 146 ft) bgs (maximum 2.4 pCi/g at 14.9 [49 ft] bgs)
- Europium-154 (Eu-154) from 4.6 – 22.6 m (15 – 74 ft) bgs (maximum 298 pCi/g at 14.9 m [49 ft] bgs)
- Europum-152 (Eu-152) from 15.2 – 20.7 m (50 – 68 ft) bgs (maximum 1.5 pCi/g at 15.2 m [50 ft] bgs)

Site: 216-T-27	Area: T Plant	Category: Deep – Similar Site

At borehole 299-W14-62 (A7346), radionuclides were detected in deep vadose zone soil at the edge of the crib as follows:

- Cs-137 from 4.6 – 21.2 m (15 – 69.5 ft) bgs (maximum 1313 pCi/g at 15.7 m [51.5 ft] bgs)
- Co-60 from 9 – 19.7 m (29.5 – 64.5 ft) bgs (maximum 0.67 pCi/g at 11.4 m [37.5 ft] bgs)
- Eu-154 from 9 – 21.2 m (29.5 – 69.5 ft) bgs (maximum 71 pCi/g at 14.5 m [47.5 ft] bgs)
- Eu-152 from 18.8 – 20.3 m (61.5 – 66.5 ft) bgs (maximum 1 pCi/g at 20.3 m [66.5 ft] bgs)

References:

DOE/RL-2005-61, 2006, *Remedial Investigation Report for the 200-LW-1 (300 Area Chemical Laboratory Waste Group) and 200-LW-2 (200 Area Chemical Laboratory Waste Group) Operable Units*, Draft A, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA02009333. http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA02009967.

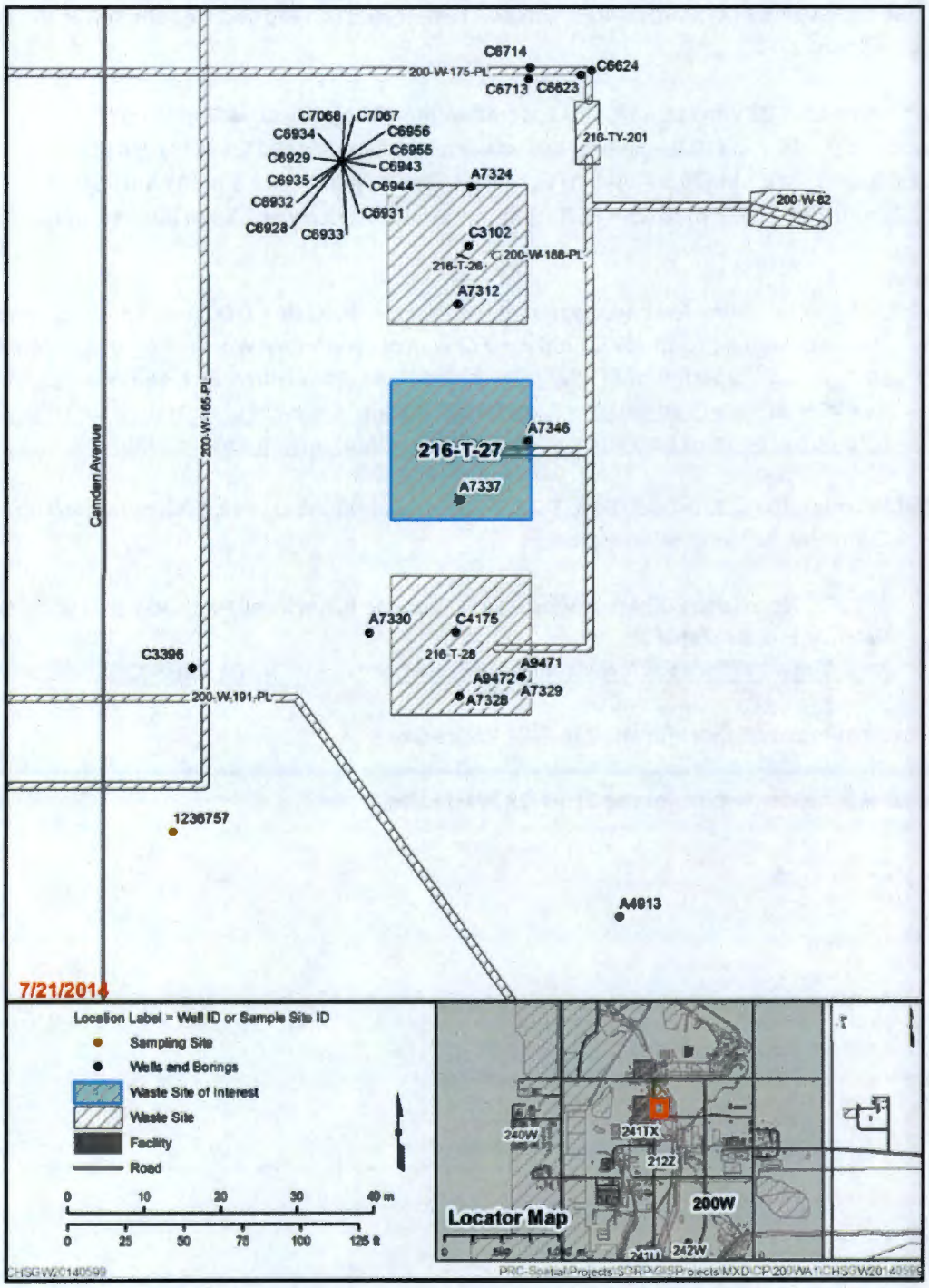
H-2-2735 (drawing), 1978, *216-T-18, T-26, T-27, T-28 Crib Details*, Sh. 1, Rev. 3, General Electric Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

WIDS General Summary Report for the 216-T-27 Waste Site.

WIDS General Summary Report for the 216-T-28 Waste Site.

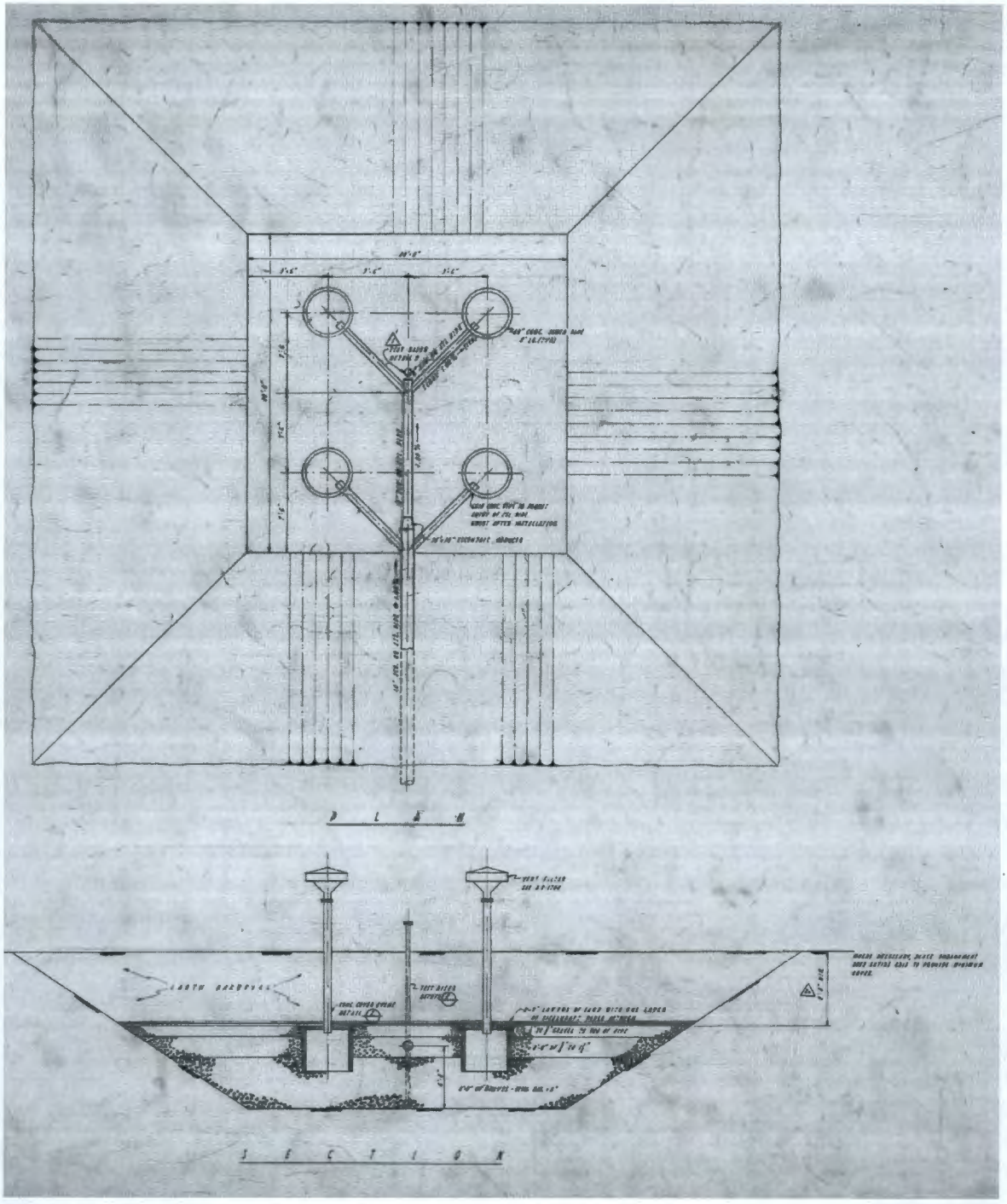
Site: 216-T-27	Area: T Plant	Category: Deep – Similar Site



ID = identification

Figure 1. 216-T-27 Waste Site Map

Site: 216-T-27	Area: T Plant	Category: Deep – Similar Site



Source: H-2-2735, *216-T-18, T-26, T-27, T-28 Crib Details*, Sheet 1.

Note: Produced from the best available copy.

Figure 2. 216-T-27 Crib Construction and Cross-Section

Site: 216-T-27	Area: T Plant	Category: Deep – Similar Site

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Site: 216-T-28	Area: T Plant	Category: Deep (Representative Site)

Site Description

Alternate Site Identification: 216-TY-3 Cavern, 216-TY-3 Crib, 216-TX-3 Cavern, 216-TX-3 Crib
Site Type: Crib
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-LW-1
Service Dates: 1960 to 1966

Waste Site Location and Physical Description: The 216-T-26, 216-T-27, and 216-T-28 Cribs are located within the same enclosure (Figures 1 and 2). The enclosure is posted as an Underground Radioactive Material Area (URMA), and is surrounded by a common steel post and chain barricade. The enclosure is south of 23rd Street and east of Camden Avenue. The inlet pipe branches to four steel pipes, each one discharging into a concrete open-end sewer pipe. The 216-TY-201 Flush Tank is located northeast of the site (see Figure 2). A crib riser may have been used during the disposal of 300 Area Wastes into the 216 T-28 Crib (Figure 3).

Waste Site Coordinates:
Lon-566932.49995 Lat-136347.15625

Site Dimensions:
Site Length: 9.1 m (30 ft) Site Depth: 4.6 m (15 ft)
Site Width: 9.1 m (30 ft) Discharge Depth: 2.4 m (8 ft)
Site Area: 84 m^2 (900 ft^2) Cover Thickness: Not specified
Dimensions are for the waste site floor.

Related Site Structure(s): The 216-T-28 Crib is associated with the 221-T Building, the 2706-T Building, the 216-TY-201 Flush Tank, and the 200-W-82 waste site.

Site Posting: The enclosure that surrounds the 216-T-26, 216-T-27, and 216-T-28 Cribs is posted as an URMA.

Site History

Release Summary: The 216-T-28 Crib was used for the disposal of liquid waste from February 1960 to December 1966. From February 1960 to February 1963, steam condensate and process decontamination waste from Tank 241-T-112 in the 241-T Tank Farm was deposited into the crib. In 1963 or 1964, 300 Area Laboratory waste was added to the waste stream deposited into the 216-T-28 Crib. The laboratory waste was shipped via truck from the 340 Facility. It is believed that between September 1965 and October 25, 1965, approximately 189 truckloads, equivalent to roughly

Site: 216-T-28	Area: T Plant	Category: Deep (Representative Site)

3.6E+06 L (9.5E+05 gal) of liquid waste, were shipped from the 300 Area and deposited into the crib. The majority of the waste originated from the Plutonium Recycle Test Reactor (PRTR) rupture that had occurred previously. The estimated volume sent to the crib during its lifetime is 4.2E+07 L (1.1E+07 gal).

There is some uncertainty regarding the volume of 300 Area waste sent to the 216-T-27 and 216-T-28 Cribs. Information provided in the Waste Information Data System (WIDS) report for the 216-T-27 waste site states that the waste was scheduled for disposal into the 216-T-27 Crib. However, contradicting information is shown on page 2 of that same report, stating that over 100 truckloads of waste from the 300 Area's PRTR release were deposited into the 216-T-28 Crib between September and October 1965. Finally, the WIDS document for the 216-T-28 waste site states that approximately 189 truckloads of PRTR waste were shipped to the 216-T-28 Crib for disposal. This equates to approximately 3.6E+06 L (9.5E+05 gal) of liquid waste. The same truck unloading station would have been used for either crib, thus it is difficult to ascertain the amount of waste discharged into either crib.

In 1965, it was discovered that radioactive strontium and cesium had penetrated the soil profile and entered the groundwater beneath the 216-T-28 Crib. Following this discovery, in November 1965 the waste stream was temporarily rerouted to the 216-T-27 Crib. The 216-T-28 Crib was deactivated in 1966, when the set radionuclide limit for the crib was reached. In May 1966, waste from the 2706-T Building was rerouted to the 216-T-4 Ditch. In December 1966, the pipeline that fed into the crib and the 300 Area waste disposal riser were isolated. The 300 Area Laboratory waste was redirected to the 216-T-34 Crib, while the T Plant effluent was rerouted to the 216-T-36 Crib, which was constructed to take the place of 216-T-28.

Volume Discharged: Approximately 4.2E+07 L (1.1E+07 gal) of waste, consisting of steam condensate and process decontamination waste from Tank 241-T-112, and laboratory waste from the 300 Area's 340 Laboratory Facility.

Pore Volume Discharged: 4.2E+07 L/ (210 ft x 900 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 26

Site: 216-T-28	Area: T Plant	Category: Deep (Representative Site)

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-T-28 Waste Site

Contaminant	Mass Discharged
Pu	70 g
Beta	59,000 Ci
Sr-90	200 Ci
Ru-106	1,000 Ci
Cs-137	350 Ci
Co-60	5.0 Ci
U	390 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: From 1969 to 1979, several live, contaminated Russian thistles were discovered surrounding the crib. Most of the thistles were removed immediately after they were discovered; however, some had deteriorated, releasing contamination onto the ground surface. A radiological investigation in May 1975 located spotty ground contamination with readings up to 30,000 cpm. Surface stabilization work occurred in June and July, and involved blading 15 cm (6 in.) of soil from the contaminated areas. The soil was then collected and deposited into the 200 West Dry Waste Burial Grounds for disposal. Following the removal of the contaminated soil and vegetation, the ground was brought back to its previous grade with a layer of clean soil. The site was surface stabilized a second time on May 21, 1990.

Visual and radiological surveys are performed annually.

In 2001/2002, geophysical logging and soil sampling was completed at groundwater well 299-W14-18 (C3396) located west of the crib.

The site is monitored by groundwater wells 299-W14-1 (A4913), 299-W14-2 (A7328), 299-W14-3 (A7329), and 299-W14-4 (A7330). In 2004, geophysical logging was completed at these boreholes to a maximum depth of 69.2 m (227 ft) below ground surface (bgs).

A characterization borehole (C4175) was drilled into the center of the waste site footprint in November 2004 and geophysical logging of the borehole was performed. Samples were obtained for

Site: 216-T-28	Area: T Plant	Category: Deep (Representative Site)

laboratory analysis, and the results were submitted to the Hanford Environmental Information System database (see Table 4).

Borehole and data summaries are presented in Tables 2, 3, and 4. Borehole locations are shown in Figure 1.

Groundwater wells 299-W14-2 and 299-W14-3 had detections above drinking water standards for volatile organic compounds (VOCs), chromium, cyanide, nitrate, and radionuclides (cesium-137 [Cs-137], iodine-129 [I-29], strontium-90 [Sr-90], technetium-99 [Tc-99], tritium, and uranium). Detected VOCs included carbon tetrachloride (CTET) and trichloroethene (TCE). CTET concentrations ranged from 75 µg/L 1,220 µg/L from 1987 to 2000. TCE was initially detected at 17 µg/L in 1987 and was last measured at 0.82 µg/L in 2000. Cyanide was measured at 115 µg/L in 1987, was as high as 160 µg/L in 1996, and was last measured in 2000 at 34.9 µg/L. Nitrate concentrations were first measured at 1,700,000 µg/L in 1957, were as high as 11,000,000 µg/L in 1958, and were last measured at 70,400 µg/L in 2000. Cs-137 concentrations were as high as 2,800 pCi/L in 1965. Cs-137 was not detected when last sampled in 2000. I-129 concentrations were initially measured at 2.93 pCi/L in 1994, were as high as 81.4 pCi/L in 1998, and were last measured at 63.9 pCi/L in 2000. Sr-90 concentrations were initially measured at 200 pCi/L in 1955 (maximum detection) and were last measured at 1.18 pCi/L in 1988. Tc-99 concentrations were initially measured at 351 pCi/L in 1988, were as high as 1,450 pCi/L in 1999, and were last measured at 767 pCi/L in 2000. Tritium concentrations were initially measured at 270,000 pCi/L in 1964, were as high as 3,210,000 pCi/L in 1998, and were last measured at 1,480,000 pCi/L in 2000. Uranium was initially measured at 22.4 µg/L in 1955 and was last measured at 1 µg/L in 1994.

Table 2. Borehole Summary for the 216-T-28 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2004	C4175	Center of crib	0 – 224 (GPL) 17.5 – 226 (10 soil samples)
2004	A7328/299-W14-2	Inside crib near south edge	4 – 225 (GPL)
2004	A7329/299-W14-3	Inside crib near southeast edge	4 – 227 (GPL)
2004	A7330/299-W14-4	West of crib 20 ft	4 – 207 (GPL)
2001/2002	C3396/299-W14-18	West of crib 90 ft	0 - 256 (GPL) 43 – 230 (3 soil samples)
2004	A4913/299-W14-1	Southeast of crib 100 ft	3 – 224 (GPL)

GPL = geophysical log
ID = identification

Site: 216-T-28	Area: T Plant	Category: Deep (Representative Site)

Table 3. Geophysical Log Summary for the 216-T-28 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A7328	0 – 5	1.29	pCi/g	5.0	53,090.1	cpm	5
	5 – 10	6235	pCi/g	10.0	19,173,800	cpm	10
	10 – 15	509,405.8	pCi/g	15	31,632,500	cpm	11
	>15	7,431,385.4	pCi/g	25	98,083,800	cpm	33
A7330	0 – 5	1.8	pCi/g	5.0	11,244.2	cpm	5
	5 – 10	6.4	pCi/g	6.0	13,084.1	cpm	6
	10 – 15	0.77	pCi/g	15	7,963.2	cpm	11
	>15	1,769.9	pCi/g	38	2,144,480	cpm	38
C4175	0 – 5	20.43	pCi/g	4.5	271,965	cpm	4.5
	5 – 10	76,345.2	pCi/g	9.5	5,836,180	cpm	7.5
	10 – 15	1,208,230.4	pCi/g	14.25	2,615,300	cpm	14.25
	>15	25,484,087	pCi/g	16.5	182,903,000	cpm	24.5

bgs = below ground surface

Site: 216-T-28	Area: T Plant	Category: Deep (Representative Site)

Table 4. Soil Maximum Detection Summary for the 216-T-28 Waste Site (Soil Borehole C4175)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
2-Butoxyethanol	–	–	–	150	µg/kg	30
4-Chloro-3-methylphenol	–	–	–	23	µg/kg	25
Acetone	–	–	–	8	µg/kg	25
Am-241	–	–	–	802	pCi/g	20
Ammonia	–	–	–	14500	µg/kg	25
Ammonium ion	–	–	–	24700	µg/kg	70
Antimony	–	–	–	5030	µg/kg	200
Sb-125	–	–	–	2.39	pCi/g	30
Aroclor-1254	–	–	–	240	µg/kg	20, 25
Arsenic	–	–	–	9290	µg/kg	92.5
Barium	–	–	–	110000	µg/kg	160
Beryllium	–	–	–	912	µg/kg	50
Bismuth	–	–	–	202000	µg/kg	25
Cadmium	–	–	–	204	µg/kg	160
C-14	–	–	–	4.52	pCi/g	92.5
Cs-134	–	–	–	456	pCi/g	20
Cs-137	–	–	–	3100000	pCi/g	20
Chloride	–	–	–	13300	µg/kg	25
Chromium	–	–	–	81700	µg/kg	25
Co-60	–	–	–	1180	pCi/g	20
Copper	–	–	–	19900	µg/kg	30
Diethylphthalate	–	–	–	730	µg/kg	92.5
Di-n-butylphthalate	–	–	–	1700	µg/kg	70
Eicosane	–	–	–	970	µg/kg	200
Eu-152	–	–	–	0.733	pCi/g	92.5

Site: 216-T-28	Area: T Plant	Category: Deep (Representative Site)

Table 4. Soil Maximum Detection Summary for the 216-T-28 Waste Site (Soil Borehole C4175)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Eu-154	–	–	–	43	pCi/g	92.5
Eu-155	–	–	–	19.9	pCi/g	92.5
Fluoride	–	–	–	39,600	µg/kg	92.5
Hexanal	–	–	–	1.5	µg/kg	200
Hexavalent Chromium	–	–	–	1,500	µg/kg	92.5
Lead	–	–	–	34,400	µg/kg	200
Mercury	–	–	–	6,840	µg/kg	25
Methylene chloride	–	–	–	3.7	µg/kg	20
n-Hexanoic acid	–	–	–	570	µg/kg	200
Nickel	–	–	–	52,700	µg/kg	25
Ni-63	–	–	–	843	pCi/g	20
Nitrate	–	–	–	245,000	µg/kg	92.5
Nitrite	–	–	–	2530	µg/kg	20
Nitrogen in nitrite and nitrate	–	–	–	45,800	µg/kg	92.5
Phenol	–	–	–	24	µg/kg	25
Phosphate	–	–	–	59,100	µg/kg	25
Pu-238	–	–	–	84.5	pCi/g	20
Pu-239/240	–	–	–	1110	pCi/g	20
K-40	–	–	–	14.6	pCi/g	200
Pyrene	–	–	–	21	µg/kg	25
Ra-226	–	–	–	0.523	pCi/g	92.5
Ra-228	–	–	–	0.974	pCi/g	92.5
Selenium	–	–	–	869	µg/kg	160
Silver	–	–	–	4,980	µg/kg	70
Sulfate	–	–	–	57,200	µg/kg	160

Site: 216-T-28	Area: T Plant	Category: Deep (Representative Site)

Table 4. Soil Maximum Detection Summary for the 216-T-28 Waste Site (Soil Borehole C4175)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Tc-99	–	–	–	1.61	pCi/g	200
Th-228	–	–	–	2.69	pCi/g	25
Th-230	–	–	–	0.932	pCi/g	30
Th-232	–	–	–	1.09	pCi/g	50
Total beta radiostrontium	–	–	–	642,000	pCi/g	20
Total petroleum hydrocarbons diesel	–	–	–	13,000	µg/kg	200
Tritium	–	–	–	19,000	pCi/g	92.5
Uranium	–	–	–	125,000	µg/kg	25
U-233/234	–	–	–	59.4	pCi/g	25
U-235	–	–	–	3.44	pCi/g	25
U-238	–	–	–	35.1	pCi/g	25

Nature and Extent of Contamination:

Shallow (0 – 4.6 M [0 – 15 ft] below ground surface [bgs]): No shallow soil samples have been collected. At locations within the crib, the geophysical log (GPL) detected manmade radionuclides in shallow soil from 0 – 4.6 m (0 – 15 ft) bgs as follows: Cs-137 from 0 – 4.6 m [0 – 15 ft] bgs (maximum 1,208,230 pCi/g at C4175, 4.3 m [14 ft] bgs) and total gamma from 0 – 4.6 m (0 – 15 ft) bgs (maximum 31,632,500 pCi/g at A7328, 3.4 [11 ft] bgs).

At locations outside the crib, Cs-137 was detected above background from 1.2 – 2.4 m (4 – 8 ft) bgs (A7330) and europium-152 (Eu-152) was detected at 3.6 m (11 ft) bgs (A7330).

Deep (>4.6 m [>15 ft] bgs): Radiological and chemical constituents (metals, semivolatile organic compounds, VOCs, Aroclors, and total petroleum hydrocarbons) were detected in the deep soil samples collected in the crib (5.1 – 68.9 m [17.5 – 226 ft] bgs).

Site: 216-T-28	Area: T Plant	Category: Deep (Representative Site)

GPL detected manmade radionuclides in and outside the crib from 4.6 m – 78 m (15 – 256 ft) bgs as follows:

- Cs-137 from 4.6 – 21.3 m (15 – 70 ft) bgs (maximum 25,484,087 pCi/g at C4175, 5 m [16.5 ft] bgs)
- Co-60 from 6.7 – 68 m (22 – 223 ft) bgs (maximum 1.7 pCi/g at A7330, 12.2 m [40 ft] bgs)
- Eu-152 at 12.5 – 31 m (41 – 102 ft) bgs (maximum 2.8 pCi/g at C3396, 13.4 m [44 ft] bgs)
- Europium-154 (Eu-154) at 5.1 – 43 m (17 to 141 ft) bgs (maximum 114 pCi/g at C3396, 1.34 m [44 ft] bgs)

Cs-137, Co-60, and Eu-154 were detected at all crib locations. In addition, Eu-152 and tin-126 were detected at A7329 in the southeast portion of the crib.

References:

DOE/RL-2005-61, 2006, *Remedial Investigation Report for the 200-LW-1 (300 Area Chemical Laboratory Waste Group) and 200-LW-2 (200 Area Chemical Laboratory Waste Group) Operable Units*, Draft A, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA02009333. http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA02009967.

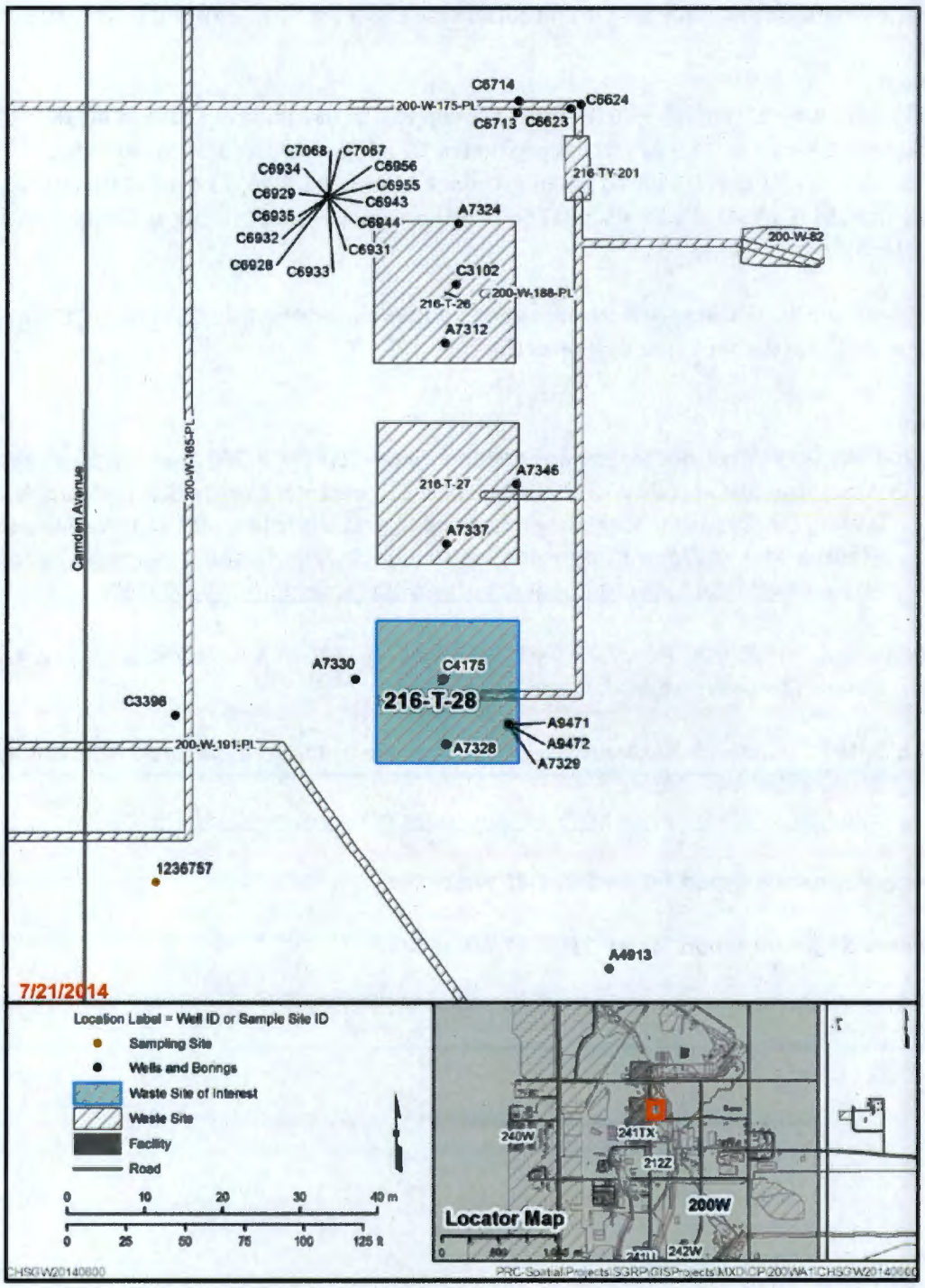
H-2-2733 (drawing), 1973, *216-T-26, T-27, T-28, 5-18 Cribs Adj. 241-TX & TY Farms*, Sh. 1, Rev. 4, General Electric Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

WIDS General Summary Report for the 216-T-28 Waste Site.

WIDS General Summary Report for the 216-T-27 Waste Site.

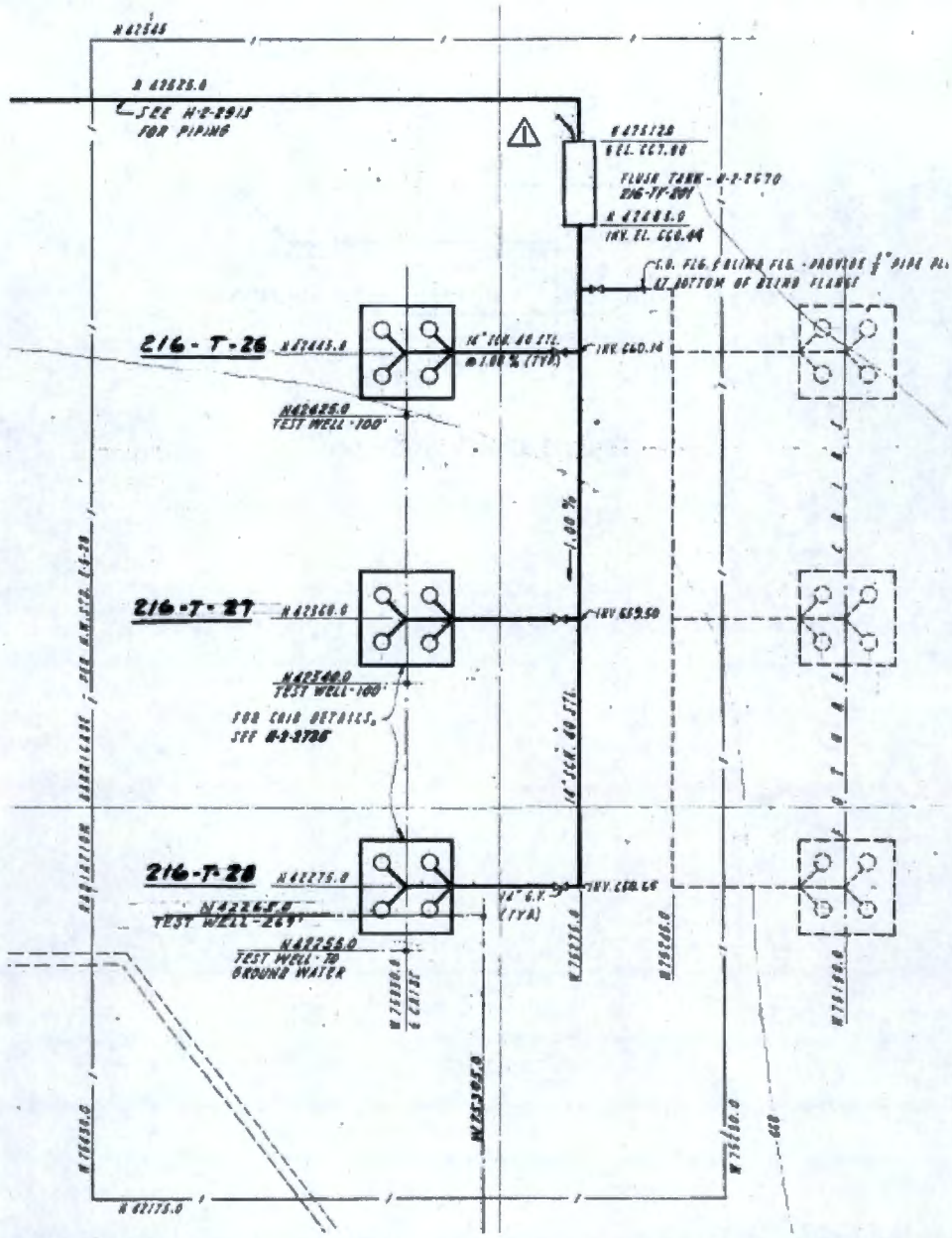
Site: 216-T-28	Area: T Plant	Category: Deep (Representative Site)



ID = identification

Figure 1. 216-T-28 Site Map

Site: 216-T-28	Area: T Plant	Category: Deep (Representative Site)



Source: H-2-2733, *216-T-26, T-27, T-28, 5-18 Cribs Adj. 241-TX & TY Farms*, Sheet 1.

Note: Produced from the best available copy.

Figure 2. Site Layout

Site: 216-T-28	Area: T Plant	Category: Deep (Representative Site)

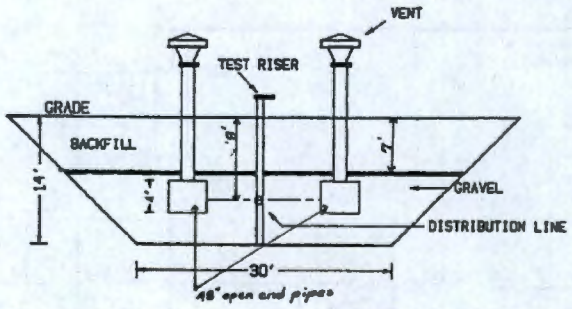


Figure 3. Crib Cross-Section

Site: 216-T-29	Area: T Plant	Category: Intermediate

Site Description

Alternate Site Identification: 216-T-29, 216-T-29 French Drain, 291-T Sand Filter Sewer
Site Type: French Drain
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: 1954 to 1964

Waste Site Location and Physical Description: The 216-T-29 waste site consists of a french drain system located northeast of the 291-T Building (Figure 1). The 216-T-29 French Drain is part of the 291-T Sand Filter system, which is adjacent to the north end of the 291-T Sand Filter (Figure 2). The sand filter is marked and posted as a Contamination Area (CA).

There is some uncertainty regarding the location and site characteristics of the 216-T-29 French Drain. While the exact location of the french drain is not certain, the drain is assumed buried beneath the sand filter's northwestern corner (Figure 1). This point is noticeable on the ground, as the vent riser extends through the sand filter's ceiling at this location. In the 1950s, silver reactor filters, made of fiberglass soaked in silver nitrate, were added to the stack ducts.

However, information regarding the similarities between the B and T-Plant construction designs is presented in Figures 3 and 4. The french drain for the B Plant Sand Filter is located near the center and eastern end of the Sand Filter (Figure 3), and is not underneath the Sand Filter structure. Due to their similar designs, there is a possibility that the french drain for the T-Plant Sand Filter is also similarly located.

Waste Site Coordinates:
Lon-567695.06251 Lat-136928.81246

Site Dimensions:
Site Length: 1.1 m (3.5 ft) Site Depth: Not Specified
Site Width: Not Specified Cover Thickness: Not Specified
Diameter: 0.2 m (0.5 ft)

Related Site Structure(s): The 216-T-29 French Drain is associated with 200-W-45 (291-T Sand Filter).

Site Posting: The 216-T-29 waste site is associated with the 291-T Sand Filter, which is posted as a CA.

Site: 216-T-29	Area: T Plant	Category: Intermediate

Site History

Release Summary: The 216-T-29 French Drain was brought online in March 1954 to convey moisture from condensed canyon air away from the 291-T Sand Filter. An estimated 7.4E+04 L (2.0E+04 gal) of steam condensate containing an estimated 8,000 kg (1.8E+04 lb) of nitric acid was sent to the french drain during its lifetime. In the 1950s, silver reactor filters made from fiberglass soaked in silver nitrate were added to the stack ducts. The filters reacted with the radioiodine to form silver iodide.

Volume/Mass Discharged: An estimated 7.4E+04 L (2.0E+04 gal) of steam condensate containing an estimated 8,000 kg (1.8E+04 lb) of nitric acid.

Pore Volume Discharged: 7.4E+04 L/ (277 ft x 100 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.31

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-T-29 Waste Site

Contaminant	Mass Discharged
Beta	<10 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: In March 1964, the drain was deactivated by removing the sand filter bypass water seal. The deactivation occurred due to the installation of new air filters in each cell of the 221-T Building. With the removal of the sand filter bypass water seal, the 221-T Building exhaust air could flow directly to the 291-T-1 Stack.

A site walkdown occurred on March 8, 2000, for verification purposes. Staff noted that it was assumed that the french drain was located beneath the sand filter structure, and that the vent pipe visible on the northwest corner was believed connected to the french drain.

No additional survey history and no radiological data are provided for this site. It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided. If surveys do occur, their frequency is not specified.

Nature and Extent of Contamination: No data are available to evaluate for the presence or absence of shallow or intermediate depth soil contamination. Based on existing information, the soil could be contaminated by former discharge of waste. An estimated 0.31 pore volumes of liquid potentially containing nitric acid and possibly radionuclides were discharged to the french drains (based on

Site: 216-T-29	Area: T Plant	Category: Intermediate

9.3 m^2 [100 ft^2]). The low pore volume suggests contamination does not extend to groundwater (88.7 m [291 ft] below ground surface [bgs]). The depth of the drain is uncertain but is approximately 4.3 m (14 ft) bgs if similar to other site drains. Therefore, shallow and intermediate depth soil could be contaminated.

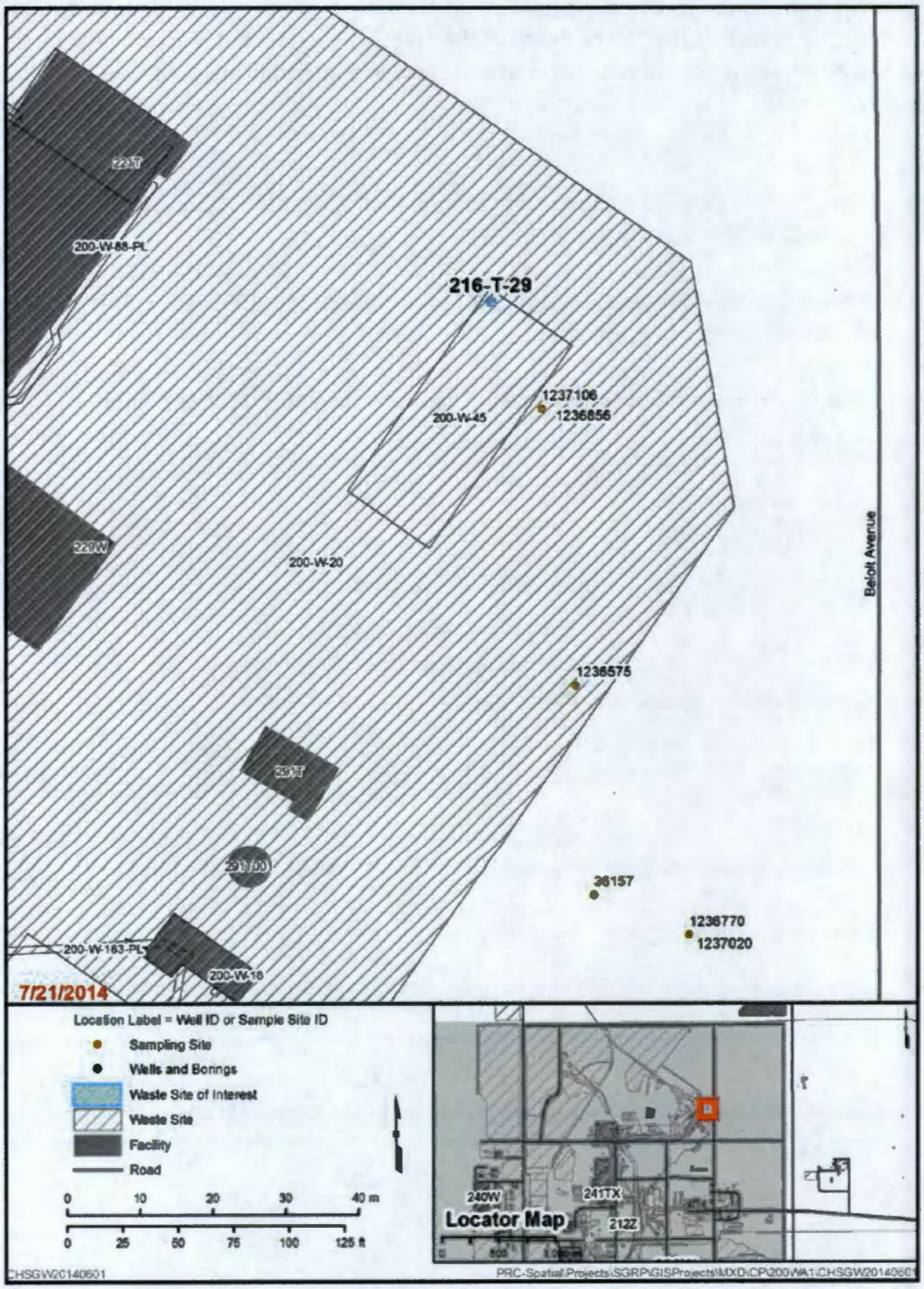
References:

H-2-1378 (drawing), 1948, *Exhaust Air Sand Filter Longitudinal Section*, Sh. 1, Rev. 0, General Electric Company, Richland, Washington.

H-2-44511 (drawing), 1964, *Area Map 200 West "T" Plant Facilities*, Sh. 139, Rev. 3, Rockwell Hanford Operations, Richland, Washington.

Waste Information Data System General Summary Report for the 216-T-29 Waste Site.

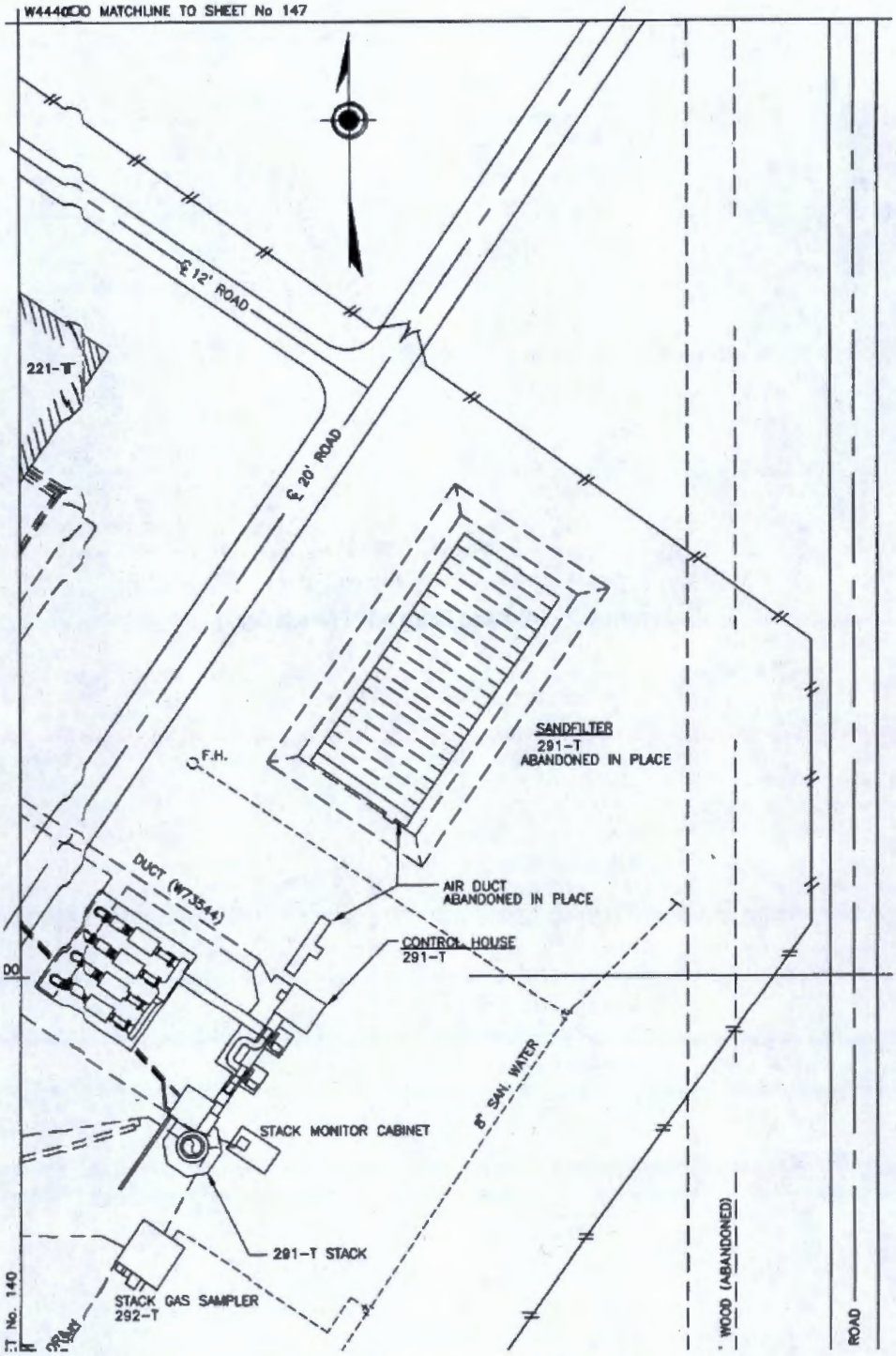
Site: 216-T-29	Area: T Plant	Category: Intermediate



ID = identification

Figure 1. 216-T-29 Waste Site Map

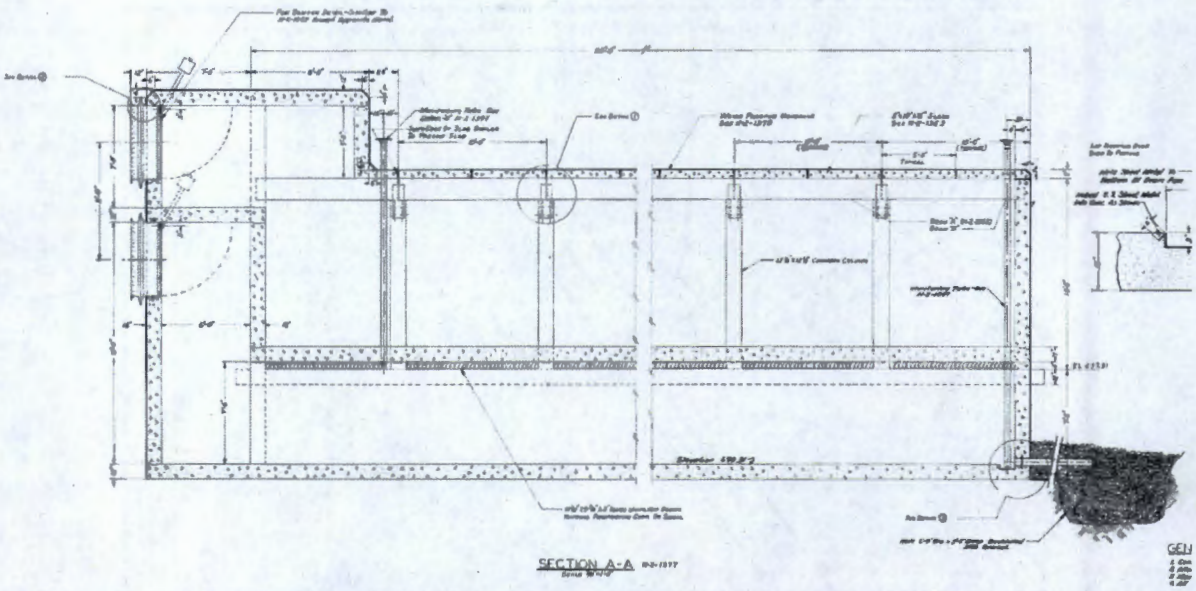
Site: 216-T-29	Area: T Plant	Category: Intermediate



Source: H-2-44511, *Area Map 200 West "T" Plant Facilities*, Sheet 139.

Figure 2. 291-T Sand Filter

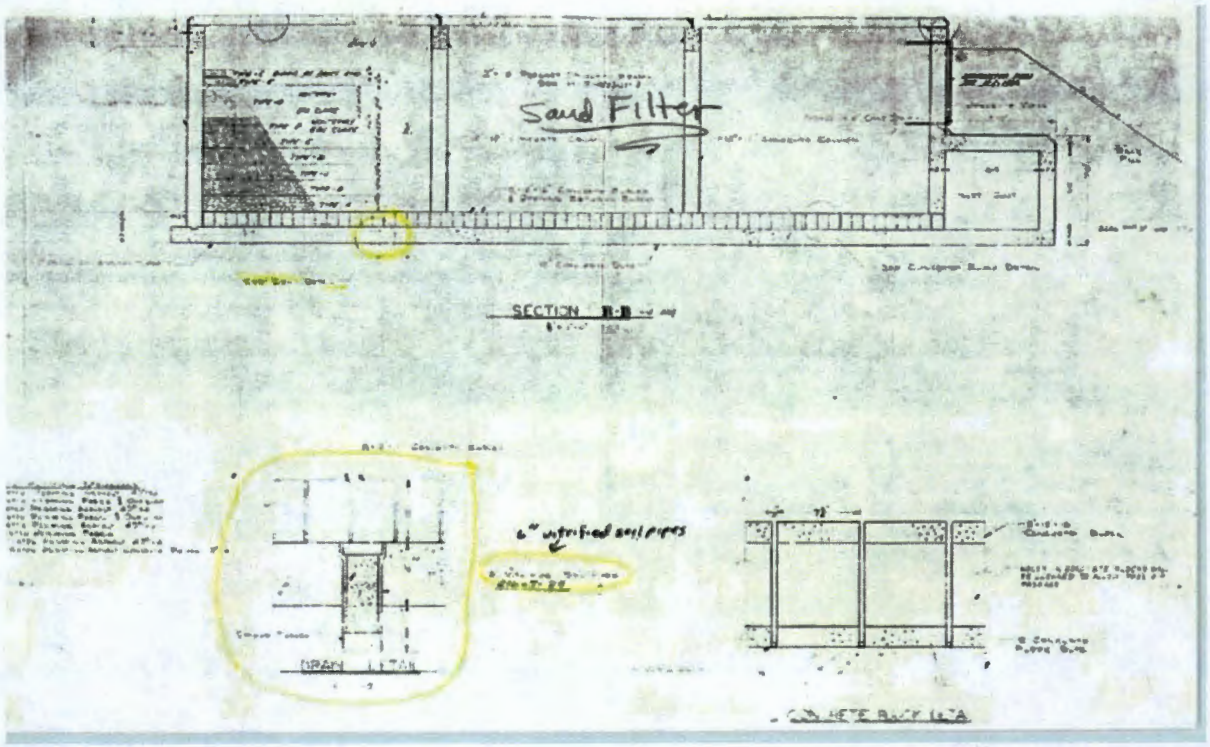
Site: 216-T-29	Area: T Plant	Category: Intermediate



Source: H-2-1378, *Exhaust Air Sand Filter Longitudinal Section*, Sheet 1.

Figure 3. 291-B Sand Filter and French Drain

Site: 216-T-29	Area: T Plant	Category: Intermediate



Source: Unknown.

Note: Produced from the best available source.

Figure 4. 216-T-29 Sand Filter and French Drain

Site: 216-T-29	Area: T Plant	Category: Intermediate

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Site: 216-T-31	Area: T Plant	Category: Intermediate

Site Description

Alternate Site Identification: 216-T-31, 216-T-31 French Drain
Site Type: French Drain
Facility/Geographic Area: T Plant
Current OU Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: 1954 to 1962

Waste Site Location and Physical Description: The 216-T-31 french drain was located west of Camden Avenue, near the southeast corner of the 241-TX Farm, on the east side of 241-TX Tank Farm fence (Figures 1 and 2). The french drain is comprised of 0.9 m (3.0 ft) diameter french drain, which was unearthed in 1962 and left unmarked. The approximate location of the french drain was later posted with Waste Information Data System (WIDS) site code 216-T-31. The contaminated culvert, gravel and soil associated with this site have been removed.

Waste Site Coordinates:
Lon-566872.77500 Lat-136159.54998

Site Dimensions:
Site Length: Not specified
Site Width: Not specified
Diameter: 0.9 m (3.0 ft)
Site Depth: Not specified
Cover Thickness: Not specified

Related Site Structure(s): The 216-T-31 waste site is not associated with any other waste sites or with buildings in the T Plant area.

Site Posting: The 216-T-31 waste site was released from radiation zone status in February 1962.

Site History

Release Summary: The french drain was in use from 1954 to 1959. The drain was accidentally contaminated by radioactive steam condensate during attempts to unclog a blocked waste line in October 1959. A new steam line and steam condensate drain were built in 1959 to take the place of the contaminated french drain.

The amount of steam condensate and the levels of contamination released into the french drain are not specified. In addition, the radiation levels detected in the contaminated soil are not specified. As the total volume of contamination released is not available, no volume estimates can be ascertained for this site.

Site: 216-T-31	Area: T Plant	Category: Intermediate

Volume/Mass Discharged: Not specified.

Pore Volume Discharged: Unknown.

Waste Inventory: Radionuclides - None (RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II).

Previous Site Characterization

Site Characterization Summary: Information is presented detailing a discrepancy regarding the dates the french drain was operational, and when the french drain became contaminated. It is believed that the french drain was in use from 1954 to 1959, and that the drain was unearthed in 1962. After the french drain was unearthed, the contaminated culvert, gravel and soil were taken offsite and placed in the 200 West Area Burial Ground for disposal.

No survey data or investigative history is provided for this site. It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided. If surveys do occur, their frequency is not specified.

Nature and Extent of Contamination: The volume and characteristics of the contaminated steam condensate discharged to the drain are unknown, but no significant contamination is expected. The depth of the drain is uncertain but is approximately 4.3 m (14 ft) below ground surface (bgs) if similar to other site french drains. Therefore, shallow and intermediate depth soil could be contaminated. The depth to groundwater approximately 67.4 m (221 ft) bgs.

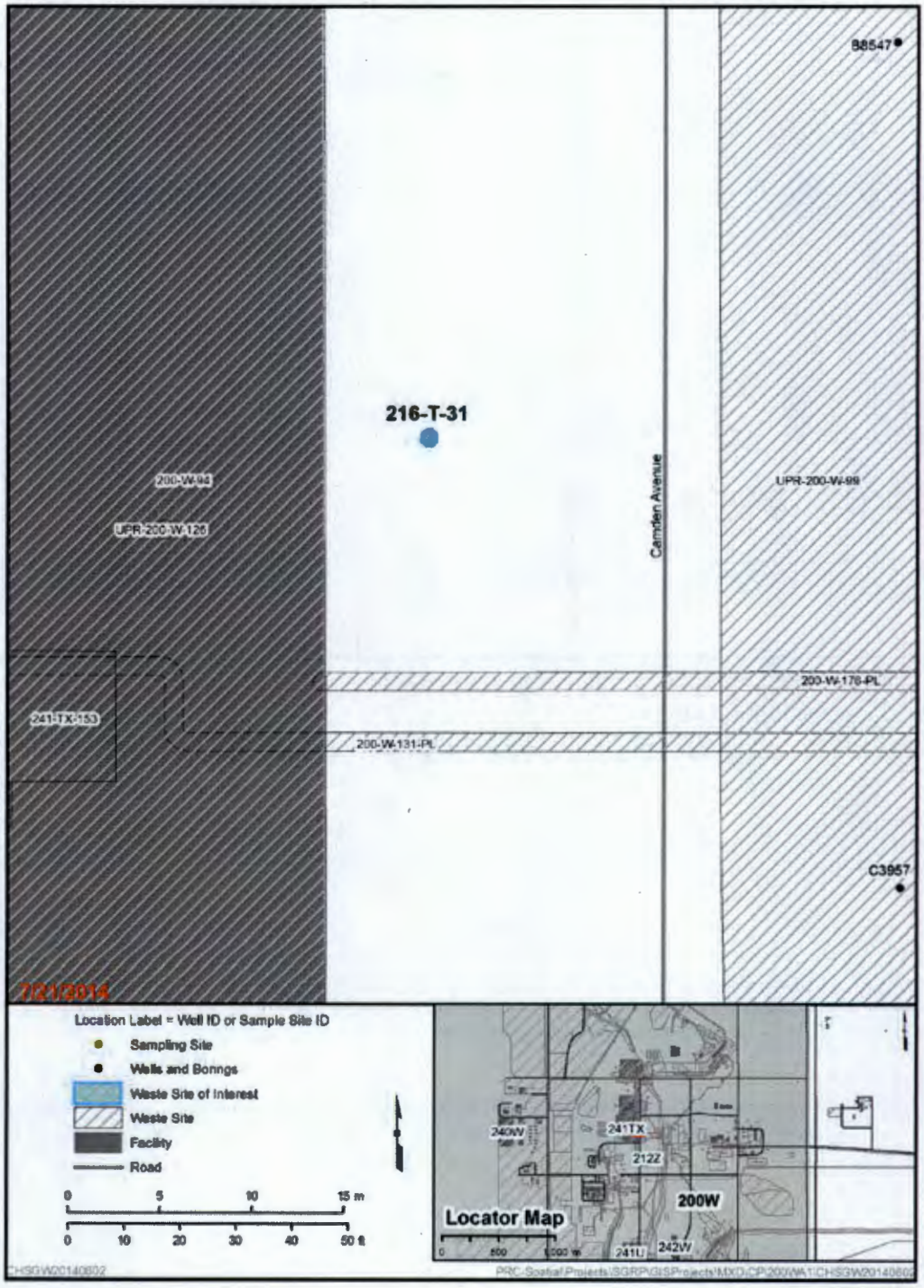
References:

H-2-32526 (drawing), 1967, *"T" Plant Liquid Waste Disposal Sites 216-T-Series*, Sh. 1, Rev. 3, General Electric Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

WIDS General Summary Report for the 216-T-31 Waste Site.

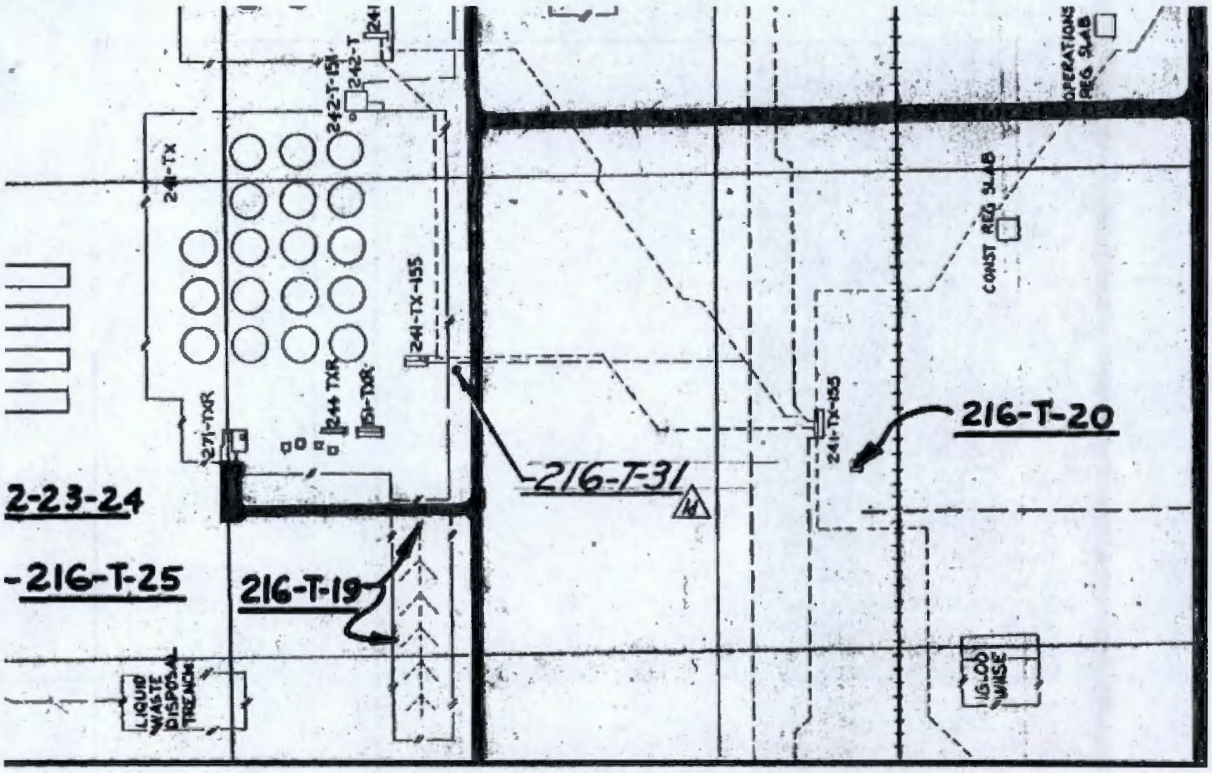
Site: 216-T-31	Area: T Plant	Category: Intermediate



ID = identification

Figure 1. 216-T-31 Waste Site Map

Site: 216-T-31	Area: T Plant	Category: Intermediate



Source: H-2-32526, *"T" Plant Liquid Waste Disposal Sites 216-T-Series.*

Note: Produced from the best available copy.

Figure 2. 216-T-31 Waste Site Location

Site: 216-T-33	Area: T Plant	Category: Deep

Site Description

Site Identification: 216-T-33
Site Type: Crib
Facility/Geographic Area: 200 Inner Area West
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: January to February 1963

Waste Site Location and Physical Description: The 216-T-33 Crib is located west of the 221-T Canyon Building and southwest of 2706-T Decontamination Facility (Figure 1). The crib bottom dimensions are 9.1 m (30 ft) long, 1.5 m (5 ft) wide and 3.3 m (11.8 ft) deep (Figure 2). The top dimensions of the crib are 12.2 m (40 ft) long and 6.1 m (20 ft) wide. The overburden depth is 2.1 m (6.8 ft) deep. The crib had a vitreous clay inlet pipe set into a gravel layer. A layer of plastic sheeting, clean sand, and backfill are above the pipe. The line to the crib plugged shortly after the crib became active and it is believed the line retained all of the waste. Portions of the underground crib pipeline were removed in 1963.

Waste Site Coordinates:
Lon-567453.62185 Lat-136897.94142

Site Dimensions:
Site Length: 9.1 m (30 ft) (bottom dimension) Site Depth: 3.3 m (11.8 ft) minimum
Site Width: 1.5 m (5 ft) (bottom dimension) Cover Thickness: 2.1 m (6.8 ft)
Site Area: 13.7 m^2 (150 ft^2)

Related Site Structure(s): The crib is associated with the 2706-T Decontamination Building and pipeline 200-W-173-PL.

Site Posting: The site is surrounded with light metal posts and chain and is posted with Underground Radioactive Material Area signs.

Site History

Release Summary: 216-T-33 Crib received 1.9 E+6 L (0.5 E+6 gal) of liquid equipment decontamination waste from the 2706-T Decontamination Building. The waste was low in salt, neutral to basic, and contained sodium hydroxide. The total effluent discharged to the crib is questionable since the discharge line plugged shortly after the crib became active. Sections of the tile line were removed and the building effluent was rerouted to the 216-T-28 Crib via Tank 241-T-112 in the 241-T Tank Farm.

Volume Discharged: 1.9E+06 L (5E+05 gal).

Site: 216-T-33	Area: T Plant	Category: Deep

Pore Volume Discharged: 1.9E+06 L/ (266 ft x 150 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 5.6

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-T-33 Waste Site

Contaminant	Mass Discharged
Pu	5 g
Beta	50 Ci
Sr-90	0.5 Ci
Ru-106	10 Ci
Cs-137	0.5 Ci
Co-60	1 Ci
U	4.5 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: Characterization borehole C4558 was installed in 2005 but was terminated due to borehole refusal at 4.6 m (15 ft) below ground surface (bgs) (D&D-26572, *200-MW-1 Operable Unit Waste Site Characterization Borehole Summary Report for the 216-U-3 French Drain, 216-T-33 Crib, 200-E-4 French Drain, and 216-T-13 Trench*). Characterization borehole C4738 was drilled at this crib in February 2005 to a depth of 40.3 m (132.5 ft). Samples were analyzed for radionuclides, metals and inorganic/organic chemicals. Visual and radiological surveys are performed at this site.

Groundwater well 299-W11-14 (A4903) monitors the 216-T-33 crib. Near background levels of radiation are detected in the well (ARH-ST-156, *Evaluation of Scintillation Probe Profiles From 200 Area Crib Monitoring Wells*, Volume III).

Groundwater well 299-W11-14 near the 216-T-33 Crib had detections above drinking water standards for volatile organic compounds (VOCs), cyanide, nitrate, iodine-129, tritium and uranium. Detected VOCs included carbon tetrachloride (CTET) and trichloroethene (TCE). CTET concentrations ranged from 860 µg/L in 1988 to as high as 1,700 µg/L in 2004, and was last measured at 240 µg/L in 2006. TCE was initially detected at 2 µg/L in 1992, reached a maximum concentration of 14 µg/L in 2004, and was not detected when last sampled in 2006. Cyanide was detected in one sample at 6 µg/L in 2004. Nitrate concentrations were first measured at 210,000 µg/L in 1963, were as high as 310,000 µg/L in 1993, and were last measured at 247,000 µg/L in 2004. Iodine-129 was initially measured at 2.24 pCi/L in 1990, was as high as 4.247 pCi/L in 1996, and was last measured at 1.98 pCi/L in 2004. Tritium was initially

Site: 216-T-33	Area: T Plant	Category: Deep

measured at 16,000 pCi/L in 1964, was as high as 210,000 pCi/L in 1993, and was last measured at 55,800 pCi/L in 2004. Uranium was initially measured at 106 µg/L in 1992 and was last measured at 41.3 µg/L in 2004. Strontium-90 was detected below the drinking water standard in one sample collected in 1996.

Borehole locations are shown on Figure 1, and sample summaries are presented in Tables 2 through 4.

Table 2. Borehole Summary for the 216-T-33 Waste Site

Year	Borehole/Well ID	Location with Respect to site	Depth (ft)
2005	C4738	Inside	0 – 124 (GPL) 12.5 – 133 (8 soil samples)
2009	C6611*	Outside – 45 ft east	12 (GPL)
2009	C6612*	Outside – 45 ft east	19 (GPL)

*Monitoring of pipeline 200-W-173-PL at 8 ft bgs.

bgs = below ground surface

GPL = geophysical log

ID = identification

Table 3. Geophysical Log Summary for the 216-T-33 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
C4738	0 – 5	–	pCi/g	–	180	cpm	2
	5 – 10	2	pCi/g	7.0	230	cpm	8
	10 – 15	15	pCi/g	11	–	cpm	–
	>15	11	pCi/g	15	340	cpm	18

bgs = below ground surface

ID = identification

Site: 216-T-33	Area: T Plant	Category: Deep

Table 4. Soil Maximum Detect Summary for the 216-T-33 Waste Site (Soil Borehole C4738)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
4-Nitrophenol	1,100	µg/kg	15	–	–	–
Acetone	–	–	–	10	µg/kg	21.5
Am-241	2.3	pCi/g	15	0.821	pCi/g	21.5
Ammonium ion	3,640	µg/kg	15	–	–	–
Aroclor-1254	9,400	µg/kg	15	3,000	µg/kg	19
Aroclor-1260	3,900	µg/kg	15	1,200	µg/kg	19
Arsenic	4,630	µg/kg	15	–	–	–
Barium	90,100	µg/kg	15	–	–	–
Benzyl alcohol	100	µg/kg	15	–	–	–
Beryllium	390	µg/kg	15	–	–	–
Cadmium	1,630	µg/kg	15	932	µg/kg	21.5
Cs-137	33.1	pCi/g	15	6.84	pCi/g	19
Chromium	33,700	µg/kg	15	24,400	µg/kg	21.5
Co-60	0.18	pCi/g	15	0.0634	pCi/g	19
Copper	21,000	µg/kg	15	30800	µg/kg	21.5
Diethylphthalate	–	–	–	370	µg/kg	21.5
Di-n-butylphthalate	110	µg/kg	15	360	µg/kg	133
Eu-152	2.64	pCi/g	15	4.68	pCi/g	19
Eu-154	0.317	pCi/g	15	0.508	pCi/g	19
Eu-155	–	–	–	0.052	pCi/g	113
Fluoride	5,990	µg/kg	15	–	–	–
Hexavalent Chromium	–	–	–	469	µg/kg	21.5
Lead	30,700	µg/kg	15	19,600	µg/kg	21.5
Mercury	1,030	µg/kg	15	525	µg/kg	19
Nickel	20,600	µg/kg	15	–	–	–

Site: 216-T-33	Area: T Plant	Category: Deep

Table 4. Soil Maximum Detect Summary for the 216-T-33 Waste Site (Soil Borehole C4738)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Ni-63	34.9	pCi/g	15	–	–	–
Nitrate	–	–	–	191,000	µg/kg	19
Nitrogen in nitrite and nitrate	66,400	µg/kg	15	43,200	µg/kg	19
Phosphate	–	–	–	8,300	µg/kg	21.5
Pu-238	0.34	pCi/g	15	0.09	pCi/g	19
Pu-239/240	63	pCi/g	15	10	pCi/g	21.5
K-40	–	–	–	9.78	pCi/g	21.5
Ra-226	0.395	pCi/g	15	0.382	pCi/g	21.5
Ra-228	0.463	pCi/g	15	0.587	pCi/g	21.5
Selenium	933	µg/kg	15	–	–	–
Silver	341	µg/kg	15	203	µg/kg	19
Sulfate	159,000	µg/kg	15	145,000	µg/kg	21.5
Th-228	0.83	pCi/g	15	0.539	pCi/g	21.5
Th-232	0.47	pCi/g	15	0.587	pCi/g	21.5
Total beta radiostrontium	49	pCi/g	15	22.3	pCi/g	21.5
Total petroleum hydrocarbons motor oil	–	–	–	230,000	µg/kg	19
Tritium	–	–	–	0.094	pCi/g	21.5
Uranium	–	–	–	1700	µg/kg	21.5
U-233/234	0.94	pCi/g	15	1.03	pCi/g	21.5
U-235	0.084	pCi/g	15	0.051	pCi/g	19
U-238	0.8	pCi/g	15	0.79	pCi/g	19

Site: 216-T-33	Area: T Plant	Category: Deep

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 – 15 ft] bgs): Radiological and chemical constituents were detected in the shallow soil sample collected within the crib. Radionuclides (americium-241; cesium-137 [CS-137]; cobalt-60 [Co-60]; europium-152, -154, and -155 [Eu-152, -154, and -155]; plutonium-238 and -239/240 [Pu-238 and -239/240]; radium-226 and -228 [Ra-226 and -228]; thorium-229 and -232 (Th-229 and -232]; total beta radiostrontium; and uranium-233/234, -235, and -238 [U-233/234, -235, and -238]) were detected in the soil sample from 3.8 – 4.6 m (12.5 – 15 ft) bgs. This is consistent with geophysical log (GPL) results, which detected manmade radionuclides in shallow soil from 1.8 – 4.6 m [6 to 15 ft] bgs as follows:

- Cs-137 from 1.8 – 4.6 m (6 – 15 ft) bgs (maximum 15 pCi/g at 3.6 m [11 ft] bgs)
- Co-60 from 3.6 – 4.6 m [11 – 15 ft) bgs (maximum 0.1 pCi/g)
- Eu-154 at 4.3 – 4.6 m (14 – 15 ft) bgs
- Eu-152 at 3 – 4.6 m (10 to 15 ft) bgs

Metals, semi-volatile organic compounds (SVOCs), and Aroclors were also detected in the soil samples collected from 1.8 – 4.6 m (6 – 15 ft) bgs within the crib footprint.

Deep (> 4.6 m [>15 ft] bgs): Based on soil sample and GPL results, chemical (metal, SVOC, polychlorinated biphenyl, and total petroleum hydrocarbons) and radionuclide contaminants were detected in soil samples collected below 4.6 m (15 ft) bgs within the crib footprint. The maximum concentrations were observed in samples from 4.6 – 6.7 m (15 – 22 ft) bgs. Radiological and chemical constituents were detected in the deep soil samples collected beneath the crib (4.6 – 40.5 m [15 – 133 ft] bgs) with the maximum concentrations generally occurring in the samples from 5 – 5.8 m (16.5 – 19 ft) bgs and from 5.8 – 6.6 m (19 – 21.5 ft) bgs. Maximum radionuclide concentrations are generally similar to or less than concentrations detected in the shallow soil sample. This is consistent with GPL results, which detected manmade radionuclides from 4.6 – 6.7 m (15 – 22 ft) bgs as follows:

- Cs-137 from 4.6 – 6 m (15 – 20 ft) bgs
- Eu-154 at 4.6 – 6 m (15 – 20 ft) bgs (maximum 0.4 pCi/g)
- Eu-152 at 4.6 – 6.4 m (15 – 21 ft) bgs (maximum 6 pCi/g at 16 ft bgs

At the 216-T-33 Crib, logging results for borehole C4738 (D&D-26572) indicate that the Hanford formation is overlain with 3.4 m (11 ft) of gravelly backfill material and 0.3 m (1 ft) of sandy gravel crib materials. The gravel-dominated facies of the Hanford formation was observed from 4 – 11 m (13 – 36 ft) bgs, and the sand-dominated facies of the Hanford formation was observed from 11 – 32.3 m (36 – 106 ft) bgs. The interbedded sand-to-silt dominated facies was observed from 32.3 – 40.4 m (106 – 132.5 ft) bgs.

Site: 216-T-33	Area: T Plant	Category: Deep

Field screening and physical property data for C4738 (D&D 26572):

Table 4. Field and Radiation Screening Summary for the 216-T-33 Crib.

216-T-33 Crib			Field Readings					Rad Screen Results	
			RCT			IHT			
Borehole Location	Samples Taken (HEIS)	Depths	Alpha (d/min)	Beta/Gamma (d/min)	Done	Max TOV 10.6 eV lamp	Max TOV 11.8 eV lamp	Alpha	Beta/Gamma
C4738	B1B3R1, B1B3R2, B1B3R3	12.5 - 15	Background		Not applicable	Less than detectable	0.2 ppm at Well Head	---	---
	B19PM5, B19PM6, B19PN7, B19PP8, B19PP9	16.5 - 19				Less than detectable	Less than detectable	Undetected	15.0 pCi/g
	B19PM7, B19PN8, B19PR0, B19PT4, B19PT3	19 - 21.5				Less than detectable	Less than detectable	Undetected	19.0 pCi/g
	B19PM8, B19PN9, B19PR1, B19PR9	22.5 - 25				Less than detectable	Less than detectable	Undetected	3.0 pCi/g
	B19PM9, B19PT0, B19PR2	27.5 - 30				Less than detectable	Less than detectable	Undetected	2.90 pCi/g
	B19PN0, B19PP1, B19PR3	47.5 - 50				Less than detectable	1.4 ppm Splitspoon Table	Undetected	9.80 pCi/g
	B19PN1, B19PP2, B19PR4, B19PT0	110.5 - 113				Less than detectable	Less than detectable	Undetected	3.60 pCi/g
	B19PN2, B19PP3, B19PR5, B19PT1	130.5 - 133				Less than detectable	Less than detectable	Undetected	4.90 pCi/g

d/min = disintegrations per minute. HEIS = *Hanford Environmental Information System*. IHT = Industrial Hygiene Technician. ppm = parts per million. RCT = Radiological Control Technician. TOV = total organic vapor. --- = no reading.

D&D-26572 REV 0

Table 7. Soil Physical Property Summary.

HEIS Sample Number	Sample Depth (ft bgs)	Formation[a]	Particle Size Distribution (Units)			Moisture Content (%)	Bulk Density (g/cm³)
			Gravel (%)	Sand (%)	Silt/Clay (%)		
216-T-33 Crib (Borehole C4738)							
B19PR9	22.5 – 25	Hanford formation, gravel dominant	55.7	41.0	3.2	5.5	2.37
B19PT0	110.5 – 113	Cold Creek unit	1.4	36.3	62.3	6.8	1.69
B19PT1	130.5 – 133	Upper Ringold Formation	0	86.6	13.4	4.1	1.74

References:

ARH-ST-156, 1977, *Evaluation of Scintillation Probe Profiles From 200 Area Crib Monitoring Wells*, Volume III, Atlantic Richfield Hanford Company, Richland, Washington.

D&D-26572, 2005, *200-MW-1 Operable Unit Waste Site Characterization Borehole Summary Report for the 216-U-3 French Drain, 216-T-33 Crib, 200-E-4 French Drain, and 216-T-13 Trench*, Rev. 0, Fluor Hanford, Inc., Richland, Washington.

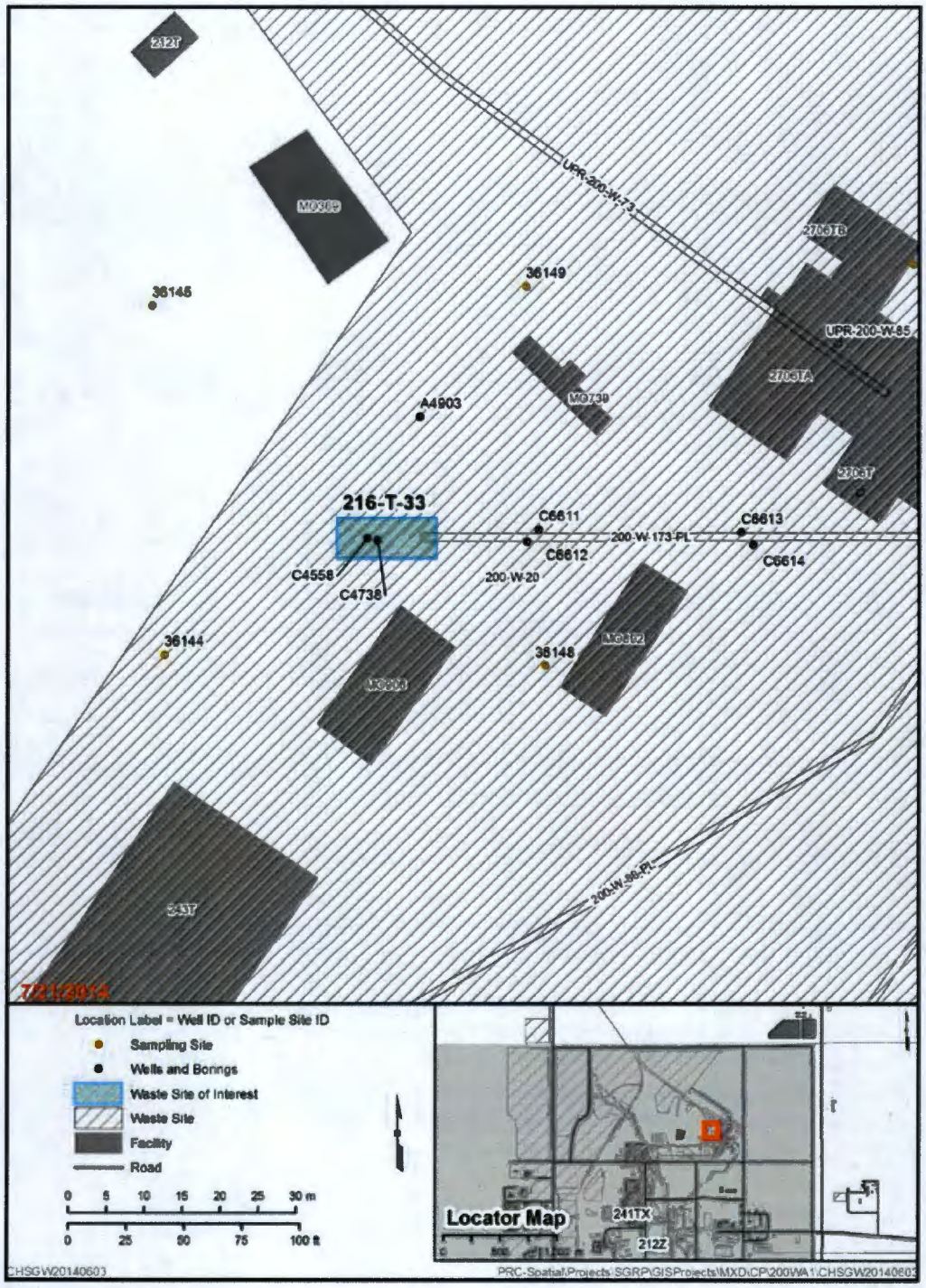
H-2-32097 (drawing), 1963, *Decontamination Waste Crib Sections & Dets*, Rev. 2, General Electric Company, Richland, Washington.

Site: 216-T-33	Area: T Plant	Category: Deep

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

Waste Information Data System General Summary Report for the 216-T-33 Waste Site.

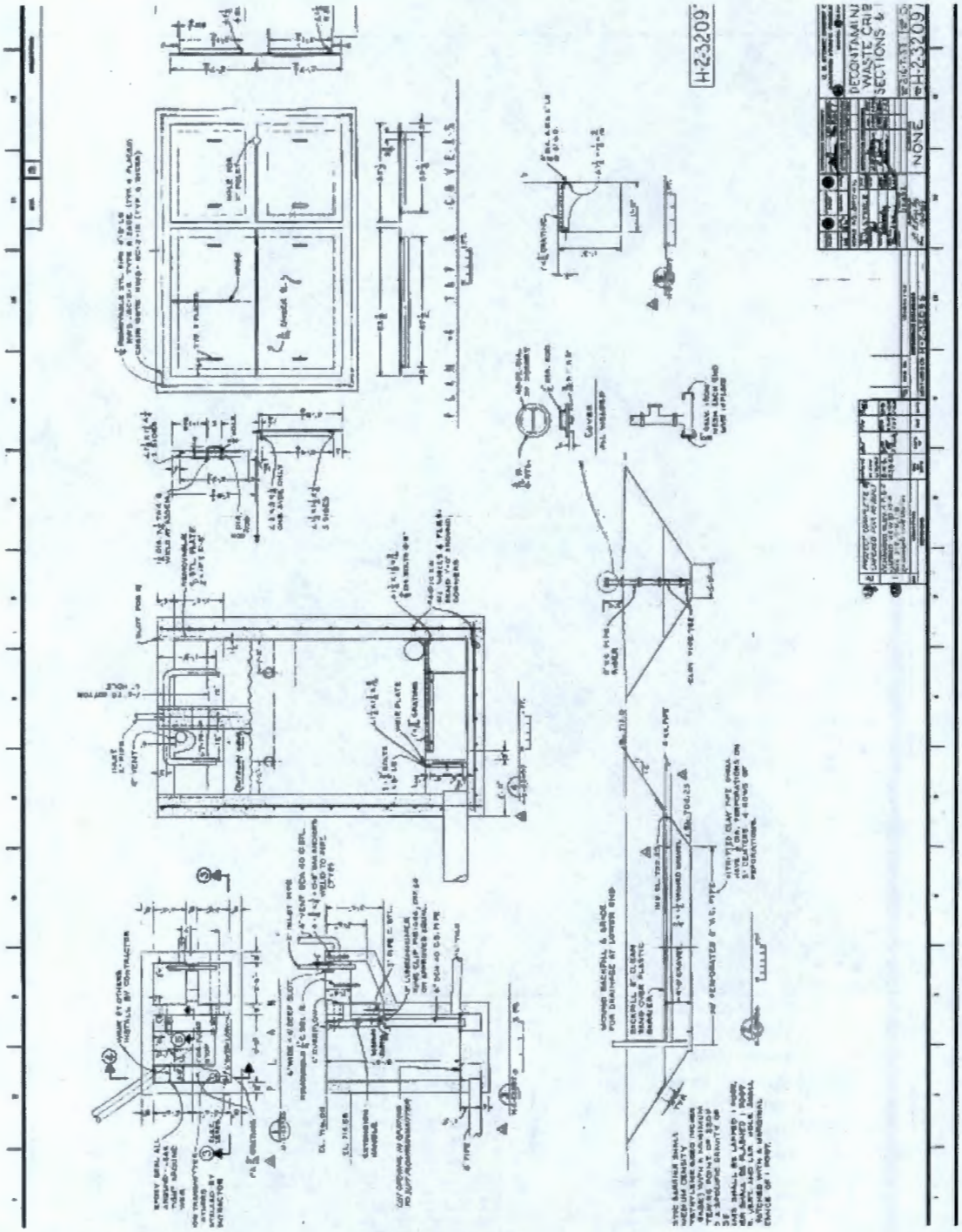
Site: 216-T-33	Area: T Plant	Category: Deep



ID = identification

Figure 1. 216-T-33 Waste Site Map

Site: 216-T-33	Area: T Plant	Category: Deep



Source: H-2-32097, *Decontamination Waste Crib Sections & Dets.*

Note: Produced from the best available copy.

Figure 2. 216-T-33 Crib Construction

Site: 216-T-34	Area: T Plant	Category: Deep – Representative Site

Site Description

Alternate Site Identification: None
Site Type: Crib
Facility/Geographic Area: 200 Inner Area West
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-LW-1
Service Dates: May 1966 to March 1967

Waste Site Location and Physical Description: The 216-T-34 Crib is located northwest of the 221-T Building, on the east side of the 216-T-35 Crib (Figure 1). The crib bottom dimensions are 61 m (200 ft) long, 9.1 m (30 ft) wide, and 4.6 m (15 ft) deep (Figure 2). The crib's piping consisted of perforated vitrified clay pipe rectangular loop, and a vitreous clay pipe extending into the center of the crib. The piping rested on a layer of gravel. Two gage well risers and one filter riser are visible from the surface. The drain line from an unloading station located in the northwest corner of the 216-T-34 Crib was extended to the 216-T-35 Crib distributor pipe. The 216-T-34 Crib drain line was blanked.

Waste Site Coordinates:
E-567265.71212 N-137111.26556

Site Dimensions:
Site Length: 61 m (200 ft) (bottom dimension) Site Depth: 4.6 m (15 ft) minimum
Site Width: 9.1 m (30 ft) (bottom dimension) Cover Thickness: Unspecified
Site Area: 555 m^2 (5,974 ft^2)

Related Site Structure(s): The crib is associated with the 340 Waste Facility located in the 300 Area. A railcar tanker unloading station (200-W-21) was removed from the northwest corner of the 216-T-34 Crib in 1996. The pipeline from the railcar unloading station to the crib is site code 200-W-196-PL. The pipeline from the truck unloading station to the crib is site code 200-W-198-PL.

Site Posting: The crib is posted with Underground Radioactive Material Area signs.

Site History

Release Summary: The 216-T-34 Crib received 17.3E+6 L (4.6 E+6 gal) of liquid disposal waste from the 340 Building in the 300 Area. The waste was low in salt, neutral to basic, and contained nitrate. The waste was transported to the 200 West Area in railroad tank cars and 18,927 L (5,000 gal) trucks.

Volume Discharged: 17.3E+6 L (4.6 E+6 gal)

Pore Volume Discharged: 17.3E+6 L/ (250 ft x 6,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 1.4

Site: 216-T-34	Area: T Plant	Category: Deep – Representative Site

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-T-34 Waste Site

Contaminant	Mass Discharged
Pu	110 g
Beta	26,000 Ci
Sr-90	320 Ci
Ru-106	110 Ci
Cs-137	280 Ci
Co-60	7.3 Ci
U	4.1 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: The site operated from May 1966 to March 1967. Due to increased radionuclide content in the waste being sent to the crib, contamination began to be detected in the groundwater after only 5 months of use. The site was deactivated when the crib reached its radionuclide limit. The pipeline northeast of the crib was capped. The waste was rerouted to the 216-T-35 Crib. During the construction and tie-in of the 216-T-35 Crib in February 1967, low-level beta/gamma soil contamination up to 30,000 cpm was found around the 216-T-34 Unloading Station piping. Contaminated soil was removed and buried in the 200 West Dry Burial Ground. Residual contamination remained near the ground surface at the unloading station. The 216-T-34 Crib was interim stabilized on July 26, 1990.

Visual and surface radiological surveys are performed at the site annually.

Groundwater wells 299-W11-15 (A7281) and 299-W11-16 (A7282) at the northwest and southwest corners of the crib monitor the site (see Figure 1). Scintillation probe logging of these wells was performed in 1968, 1970, and 1976. Radiation near background were detected in both wells (ARH-ST-156, *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells*, Volume III). ARH-ST-156 suggests the logging results are inconsistent with the waste inventory data, and that either the waste inventory is too high or the waste preferentially migrated southeast, away from the monitoring wells.

Site: 216-T-34	Area: T Plant	Category: Deep – Representative Site

Boreholes C6827 and C6828 (see Figure 1) were planned in DOE/RL-2007-02, *Supplemental Remedial Investigation/Feasibility Study Work Plan for the 200 Areas Central Plateau Operable Units, Volume II: Site-Specific Field-Sampling Plan Addenda,* but were not installed.

Groundwater wells associated with 216-T-34 (299-W11-15 and 299-W11-16) had detections above drinking water standards for strontium-90 and tritium. Strontium-90 was initially measured at 61 pCi/L in 1966 (highest concentration) and was last measured at 1.8 pCi/L in 1977. Tritium was initially measured at 110,000 pCi/L in 1966 and was last measured at 226,000 pCi/L in 1990. Cesium-137 was detected at concentrations below the drinking water standard.

Nature and Extent of Contamination: Based on existing information, the shallow and deep soil could be contaminated by former discharge of waste containing radionuclides and nitrate. Shallow soil is potentially contaminated from direct discharge of waste to the crib from the discharge piping located 3.7 m (12 ft) below ground surface (bgs), and deeper soil beneath the crib (bottom 4.6 m [15 ft] bgs) is potentially contaminated. An estimated 1.4 pore volumes of liquid were discharged to the crib, suggesting a potential for deeper vadose zone soil and groundwater contamination. The approximate depth to groundwater is 80.8 m (265 ft) bgs.

References:

ARH-ST-156, 1977, *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells,* Volume III, Atlantic Richfield Hanford Company, Richland, Washington.

DOE/RL-2007-02, 2007, *Supplemental Remedial Investigation/Feasibility Study Work Plan for the 200 Areas Central Plateau Operable Units, Volume II: Site-Specific Field-Sampling Plan Addenda*, Rev. 0, Vol. II, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=00099913

DOE/RL-2007-02-VOL II-ADD 2, 2008, *Site-Specific Field-Sampling Plans for 216-T-34, 216-T-8, 216-T-B-10A&B, and 216-Z-16 Cribs (Addendum 2)*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0807140234

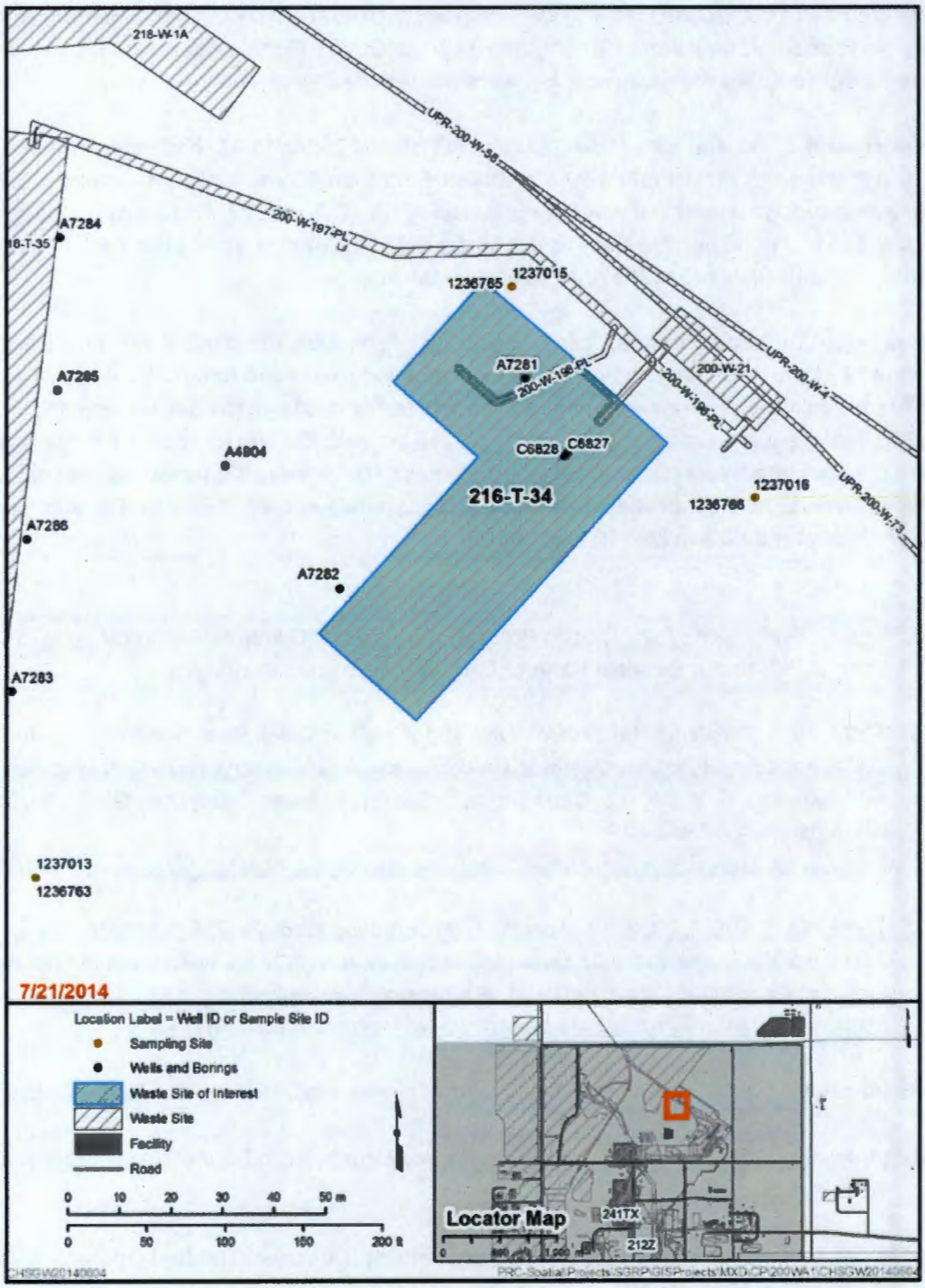
H-2-32649 (drawing), 1967, *Civil Plot Plan*, Rev. 2, Vitro Engineering Company, Richland, Washington.

H-2-32650 (drawing), 1964, *216-T-34 Crib Plan, Profile and Details*, Vitro Engineering Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

WIDS General Summary Report for the 216-T-34 Waste Site.

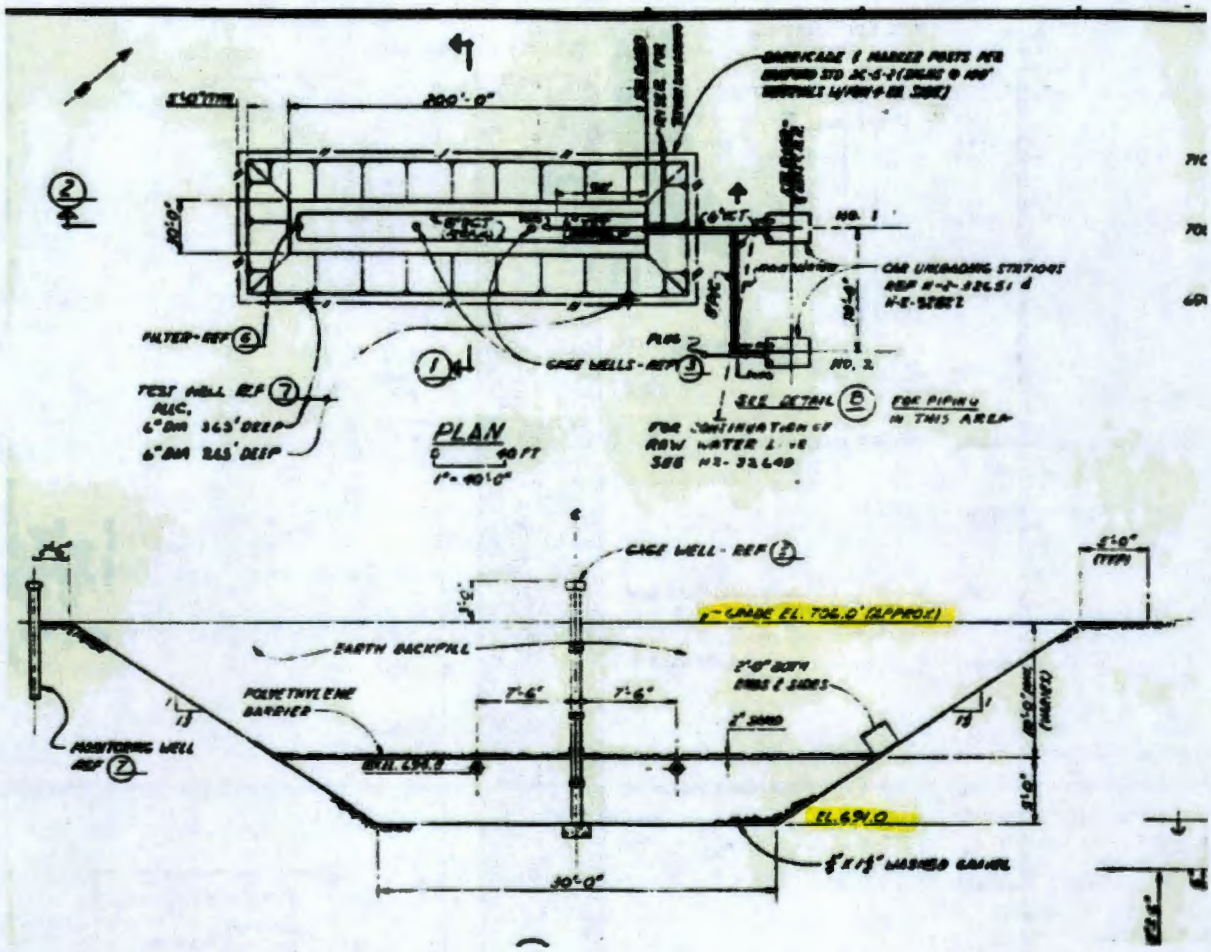
Site: 216-T-34	Area: T Plant	Category: Deep – Representative Site



ID = identification

Figure 1. 216-T-34 Waste Site Map

Site: 216-T-34	Area: T Plant	Category: Deep – Representative Site

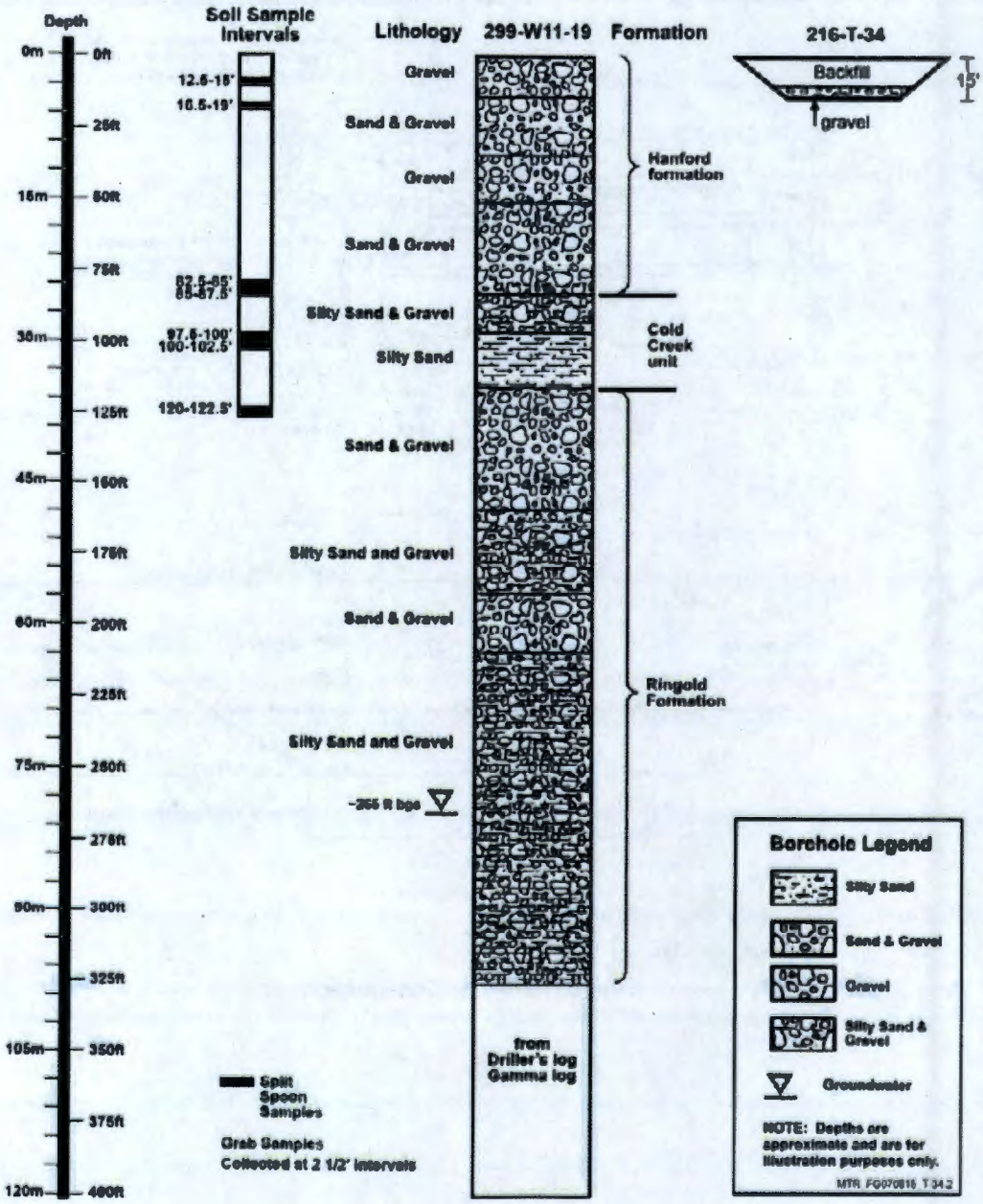


Source: H-2-32650, *216-T-34 Crib Plan, Profile and Details.*

Note: Produced from the best available copy.

Figure 2. 216-T-34 Construction

Site: 216-T-34	Area: T Plant	Category: Deep – Representative Site



Source: DOE/RL-2007-02-VOL II-ADD 2, *Site-Specific Field-Sampling Plans for 216-T-34, 216-T-8, 216-T-B-10A&B, and 216-Z-16 Cribs (Addendum 2)*, Figure AD2-2.

Note: Produced from the best available copy.

Figure 3. 216-T-34 Stratigraphy

Site: 216-T-35	Area: T Plant	Category: Deep – Similar to 216-T-34

Site Description

Alternate Site Identification: None
Site Type: Crib
Facility/Geographic Area: 200 Inner Area West
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-LW-1
Service Dates: March 1967 to January 1968

Waste Site Location and Physical Description: The 216-T-35 Crib is located west of the 221-T Building and west of the 216-T-34 Crib (Figure 1). The crib bottom dimensions are 137 m (450 ft) long, 3.1 m (10 ft) wide and 4.6 m (15 ft) deep (see Figure 2). The crib was constructed with one perforated drain line, and one perforated crib waste distribution line, in parallel. Both liners were placed horizontally below grade and covered by gravel. The crib has two gage well risers and one vent riser visible from the surface. The 216-T-35 Crib replaced the 216-T-34 Crib. The drain line from the unloading station located in the northwest corner of the 216-T-34 Crib was extended to the 216-T-35 Crib distributor pipe.

Waste Site Coordinates:
E-567178.46538 N-137114.03835

Site Dimensions:
Site Length: 137 m (450 ft) (bottom dimension) Site Depth: 4.6 m (15 ft) minimum
Site Width: 3.1 m (10 ft) (bottom dimension) Cover Thickness: Unspecified
Site Area: 411 m^2 (4,500 ft^2)

Related Site Structure(s): The crib is associated with the 340 Waste Facility located in the 300 Area and the railcar unloaded station (200-W-21) and the 216-T-34 Crib. The pipeline associated with the crib is 200-W-197-PL. The pipeline from the truck unloading station is 200-W-198-PL.

Site Posting: The crib is surface stabilized and posted with Underground Radioactive Material Area signs.

Site History

Release Summary: The 216-T-35 Crib received 5.7E+06 L (1.5 E+06 gal) of liquid disposal waste from the 340 Building in the 300 Area. The waste contained nitrate. The waste was transported to the 200 West Area in railroad tank cars and 18.9 E+03 L (5.0 E+03 gal) trucks.

Volume Discharged: 5.7E+06 L (1.5E+06 gal)

Pore Volume Discharged: 5.7E+06 L/ (247 ft x 4500 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.6

Site: 216-T-35	Area: T Plant	Category: Deep – Similar to 216-T-34

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-T-35 Waste Site

Contaminant	Mass Discharged
Pu	66 g
Beta	930 Ci
Sr-90	<20 Ci
Ru-106	130 Ci
Cs-137	20 Ci
Co-60	3.4 Ci
U	49 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: The 216-T-35 Crib was interim stabilized on July 26, 1990. Visual and surface radiological surveys are performed at the site annually.

Groundwater wells 299-W11-17 (A7283), 299-W11-18 (A7284), 299-W11-19 (A4904), 299-W11-20 (A7285), and 299-W11-21 (A7286), located east of the 216-T-35 Crib, monitor the site. Scintillation probe logging of these wells was performed in 1967, 1970, and 1976. Results were presented in ARH-ST-156, *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells*, Volume III. The scintillation probe profiles indicate that most of the radioactive contaminants are concentration at the head end (north end) of the crib. In well 299-W11-18 (A7284), radioactive contaminants were detected between 4.6 and 32 m (15 and 105 ft) below ground surface (bgs). Wells 299-W11-20 (A7285) and 299-W11-21 (A7286) showed minor levels of radiation between 12.2 and 32 m (40 and 105 ft) bgs. Radiation near background were detected in wells 299-W11-17 (A7283) and 299-W11-19 (A4904) (ARH-ST-156).

Wells 299-W11-17, 299-W11-18. 299-W11-20, and 299-W11-21 had groundwater detections above drinking water standards for volatile organic compounds (VOCs), chromium, nitrate, and radionuclides (cesium-137 [Cs-137], strontium-90 [Sr-90], and tritium). Detected VOCs included carbon tetrachloride (CTET) and trichloroethene (TCE). CTET concentrations ranged from 130 µg/L to 600 µg/L and TCE concentrations ranged from 1.9 µg/L to 6.6 µg/L between 1992 and 2013. Chromium concentrations ranged from 21.1 µg/L to 163 µg/L during the same period. Nitrate was initially measured in 1969 at a concentration of 680,000 µg/L and was last measured at a concentration of 109,000 µg/L in 2013.

Site: 216-T-35	Area: T Plant	Category: Deep – Similar to 216-T-34

Cs-137 was initially measured at 640 pCi/L in 1969 and was last measured in 2002 at non-detect levels. Sr-90 was initially measured at 15 pCi/L in 1967, was as high as 88 pCi/L in 1969 and was not detected when last sampled in 1998. Tritium was initially measured as high as 500,000 pCi/L in 1972 and was last measured at 37,000 pCi/L in 2013.

Well and borehole locations are shown on Figure 1 and summarized in Tables 2 and 3.

Table 2. Borehole Summary for the 216-T-35 Waste Site

Year	Borehole/Well ID	Location with respect to site	Depth (ft)
2007	299-W11-18 (A7284)	Edge – northeast portion of crib	3 – 297 (GPL)

GPL = geophysical log
ID = identification

Table 3. Geophysical Log Summary for the 216-T-35 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A7284	0 – 5	0.18	pCi/g	3.0	15,039.8	cpm	5
	5 – 10	0.17	pCi/g	6.0	14,531.8	cpm	6
	10 – 15	–	pCi/g	–	13,116.8	cpm	14
	>15	1,399	pCi/g	25	2,687,030	cpm	25

bgs = below ground surface
ID = identification

Nature and Extent of Contamination: At 299-W11-18 (A7284), the geophysical log (GPL) detected manmade radionuclides between 6.7 and 14.6 m (22 and 48 ft) bgs. The maximum concentrations were measured at approximately 7.6 m (25 ft) bgs (3 m [10 ft] below the bottom of the crib).

Cs-137 concentrations were below background from 0.9 – 4.6 m (3 to 15 ft) bgs. In deeper soil, Cs-137 was detected from 6.7 – 13.7 m (22 – 45 ft). The maximum Cs-137 concentration of 1,399 pCi/g was measured at 7.6 m (25 ft) bgs. Other sporadic detections of Cs-137 near its method detection limit were less than 1 pCi/g. Cobalt-60 was detected between 7.3 and 14.3 m (24 and 47 ft). The maximum concentration was 2.3 pCi/g at 7.6 m (25 ft) bgs. Europiium-154 was detected from 7.3 – 15.8 m (24 to 52 ft). The maximum concentration was measured at approximately 5.5 pCi/g at 7.6 m (25 ft) bgs. Total

Site: 216-T-35	Area: T Plant	Category: Deep – Similar to 216-T-34

gamma concentrations were highest between 7 and 8.5 m (23 and 28 ft) bgs. Radiological contamination appears to be less extensive compared with the 1970s scintillation results for this location (radioactive contaminants were detected between 4.6 and 32 m [15 and 105 ft] bgs).

Based on existing information, the shallow and deep soil could be contaminated by former discharge of waste containing radionuclides and nitrate. Shallow soil is potentially contaminated from direct discharge of waste to the crib from the discharge piping located 3.7 m (12 ft) bgs, and deeper soil beneath the crib (bottom 4.6 m [15 ft] bgs) is potentially contaminated. An estimated 0.6 pore volumes of liquid were discharged to the crib, suggesting a potential for deeper vadose zone soil and groundwater contamination. The approximate depth to groundwater is 79.9 m (262 ft) bgs.

References:

ARH-ST-156, 1977, *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells*, Volume III, Atlantic Richfield Hanford Company, Richland, Washington.

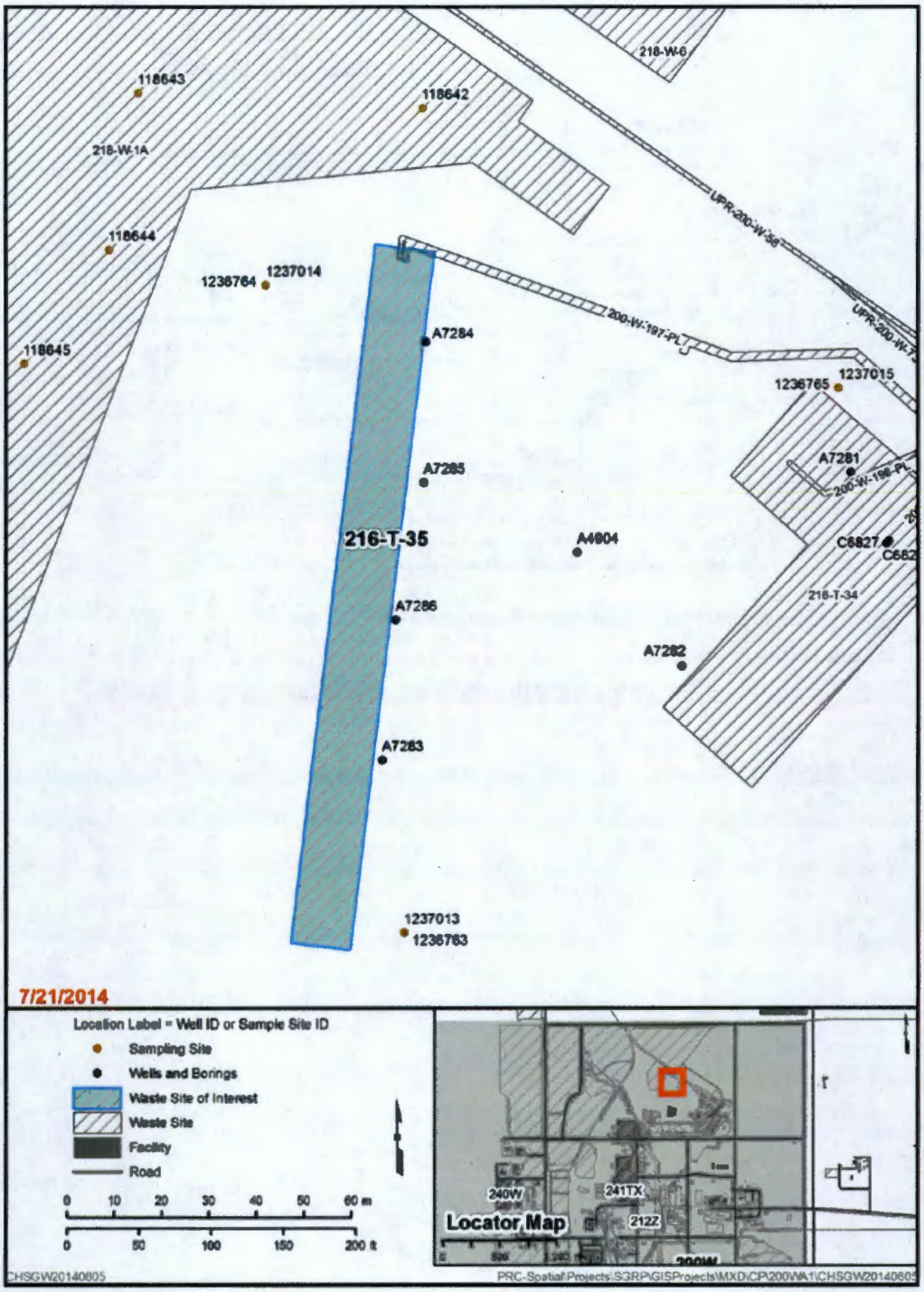
DOE/RL-2007-02-VOL II-ADD 2, 2008, *Site-Specific Field-Sampling Plans for 216-T-34, 216-T-8, 216-T-B-10A&B, and 216-Z-16 Cribs (Addendum 2)*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0807140234

H-2-33447 (drawing), 1967, *216-S-35 Crib Profile & Section Misc Details*, Sh. 1, Rev. 1, Hanford Engineering Services, Richland, Washington.

H-2-44511 (drawing), 1943, *Area Map 200 West "T" Plant Facilities*, Sh. 149, Rev. 5, Rockwell Hanford Operations, Richland, Washington.

WIDS General Summary Report for the 216-T-35 Waste Site.

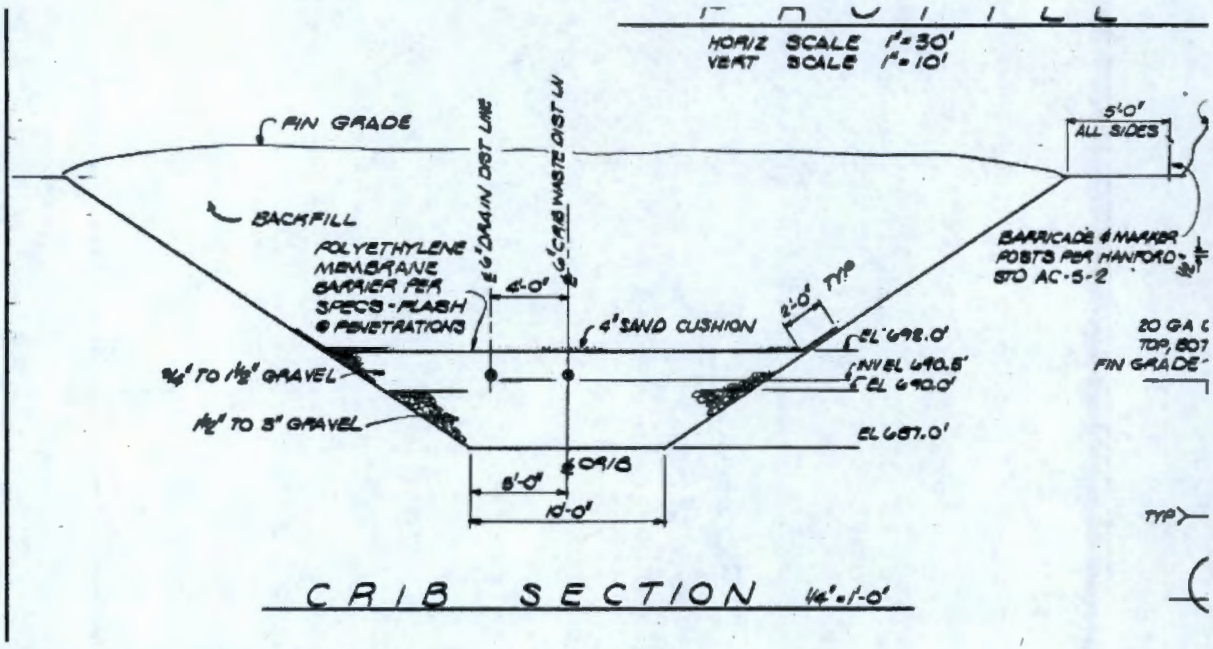
Site: 216-T-35	Area: T Plant	Category: Deep – Similar to 216-T-34



ID = identification

Figure 1. 216-T-35 Waste Site Map

Site: 216-T-35	Area: T Plant	Category: Deep – Similar to 216-T-34

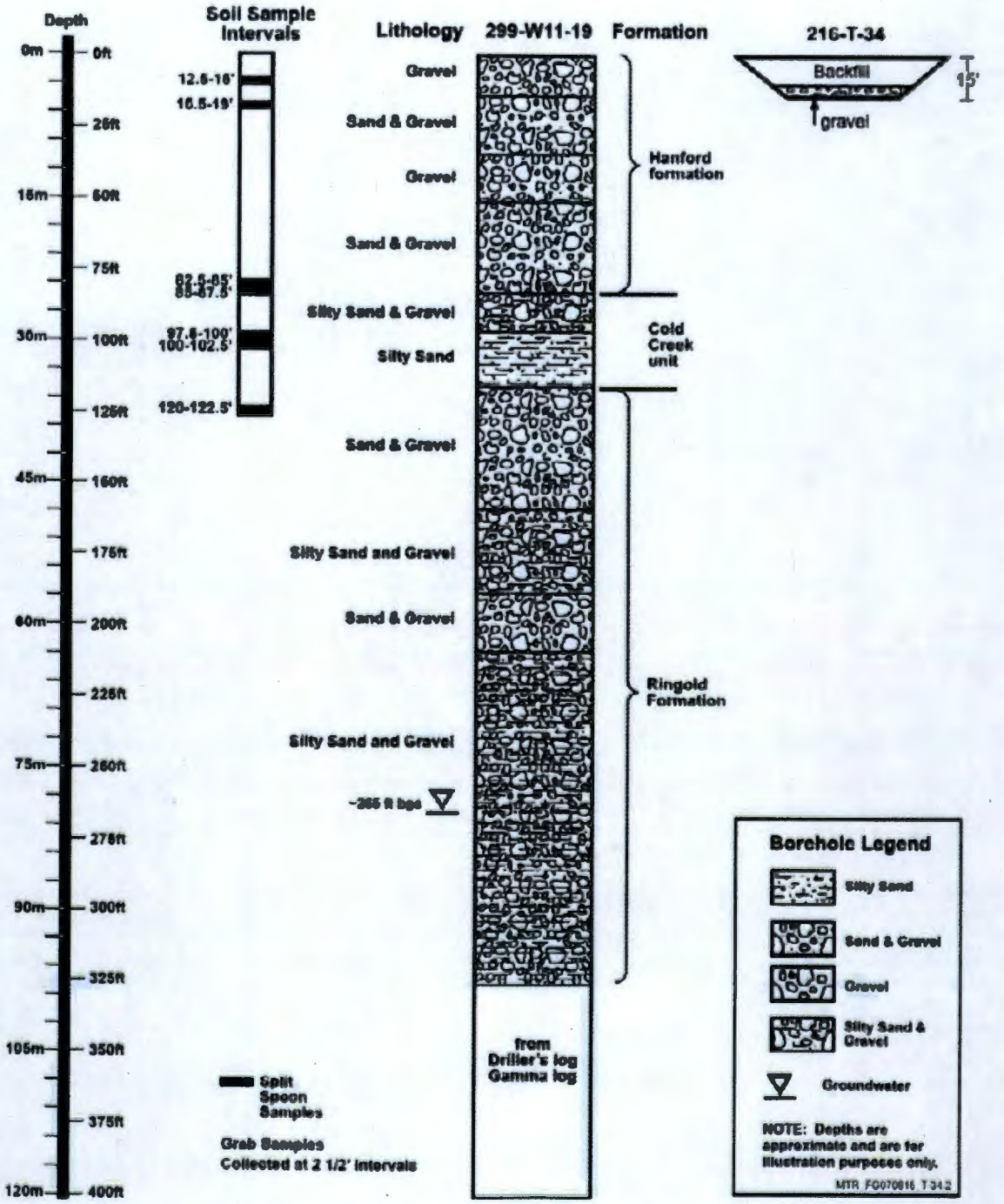


Source: H-2-33447, *216-S-35 Crib Profile & Section Misc Details.*

Note: Produced from the best available copy.

Figure 2. 216-T-35 Crib Construction

Site: 216-T-35	Area: T Plant	Category: Deep – Similar to 216-T-34



Source: DOE/RL-2007-02-VOL II-ADD 2, *Site-Specific Field-Sampling Plans for 216-T-34, 216-T-8, 216-T-B-10A&B, and 216-Z-16 Cribs (Addendum 2)*, Figure AD2-2.

Note: Produced from the best available copy.

Figure 3. 216-T-35 Representative Stratigraphy

Site: 216-T-35	Area: T Plant	Category: Deep – Similar to 216-T-34

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Site: 216-T-36	Area: T Plant	Category: Intermediate

Site Description

Alternate Site Identification: None
Site Type: Crib
Facility/Geographic Area: 200 Inner Area West
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-SC-1
Service Dates: May 1967 to unspecified end date

Waste Site Location and Physical Description: The 216-T-36 Crib is located southwest of the 241-T Tank Farm and south of the 216-T-7 Tile Field (Figure 1). The crib dimensions are 49 m (160 ft) long, 3.1 m (10 ft) wide, and 4.6 m (15 ft) deep (Figure 2). The crib consists of a single vitreous clay distribution pipe at approximately 3 m (10 ft) below ground surface (bgs) 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. The crib was built to replace the 216-T-28 Crib.

Waste Site Coordinates:
Lon-566701.99077 Lat-136595.95881

Site Dimensions:
Site Length: 49 m (160 ft) (bottom dimension) Site Depth: 4.6 m (15 ft) minimum
Site Width: 3.1 m (10 ft) (bottom dimension) Cover Thickness: 3.0 m (9.7 ft)
Site Area: 152 m^2 (1,636 ft^2)

Related Site Structure(s): The 216-T-36 Crib is associated with the 221-T, 221-U, 2706-T Buildings and the 241-T-151 Diversion Box. The associated pipelines are 200-W-79-PL and 200-W-130-PL.

Site Posting: The 216-T-36 Crib has been interim surface stabilized and posted with Underground Radioactive Material Area (URMA) signs.

Site History

Release Summary: 216-T-36 Crib received 5.2E5 L (1.4 E5 gal) of liquid disposal consisting of steam condensate, equipment decontamination waste, and miscellaneous waste from the 221-T and 221-U Buildings and decontamination waste from the 2706-T Building. The waste contained sodium hydroxide. The site shutdown date has been documented between 1970 and 1973.

Volume Discharged: 5.2E+05 L (1.4E+05 gal)

Pore Volume Discharged: 5.2E+05 L/ (214 ft x 1,636 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.18

Site: 216-T-36	Area: T Plant	Category: Intermediate

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-T-36 Crib

Contaminant	Mass Discharged
Pu	2.5 g
Beta	710 Ci
Sr-90	7.7 Ci
Ru-106	46 Ci
Cs-137	6.4 Ci
Co-60	<0.51 Ci
U	1.2 kg

RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II .

Previous Site Characterization

Site Characterization Summary: The 216-T-36 Crib vent risers were sealed as a preventive measure for potential passive radioactive emissions. In May 2000 a long, narrow area of posted contamination was identified adjacent to the east end of the crib. In November 2000, a bio-barrier and a layer of clean gravel were placed over the contamination area on the pipeline east of the crib and the area downposted to an URMA.

Well 299-W10-2 (A4896) to the northwest and well 299-W10-4 (A7137) to the southeast monitor this unit. Well data indicate breakthrough to groundwater has not occurred at the site. Scintillation probe logging of these wells was performed in 1959, 1963, and 1976 (ARH-ST-156, *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells*, Volume III). Radiation detected in the wells predates the 216-T-36 Crib.

Visual and radiological surveys are performed at this site.

Well and borehole locations are shown on Figure 1. Boreholes C6694 and C6175 were proposed in DOE/RL-2007-02, *Supplemental Remedial Investigation/Feasibility Study Work Plan for the 200 Areas Central Plateau Operable Units, Volume II: Site-Specific Field-Sampling Plan Addenda,* but were not installed.

Nature and Extent of Contamination: Based on existing information, the shallow and deep soil could be contaminated by former discharge of waste containing radionuclides, uranium, and nitrate. Shallow soil

Site: 216-T-36	Area: T Plant	Category: Intermediate

is potentially contaminated from direct discharge of waste to the crib from the discharge piping located 3 m (10 ft) bgs, and deeper soil beneath the crib (bottom 4.6 m [15 ft] bgs) is potentially contaminated. An estimated 0.18 pore volumes of liquid were discharged to the crib, suggesting a low potential for deeper vadose zone soil and groundwater contamination. The approximate depth to groundwater is 67.3 m (229 ft) bgs.

References:

ARH-ST-156, 1977, *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells*, Volume III, Atlantic Richfield Hanford Company, Richland, Washington.

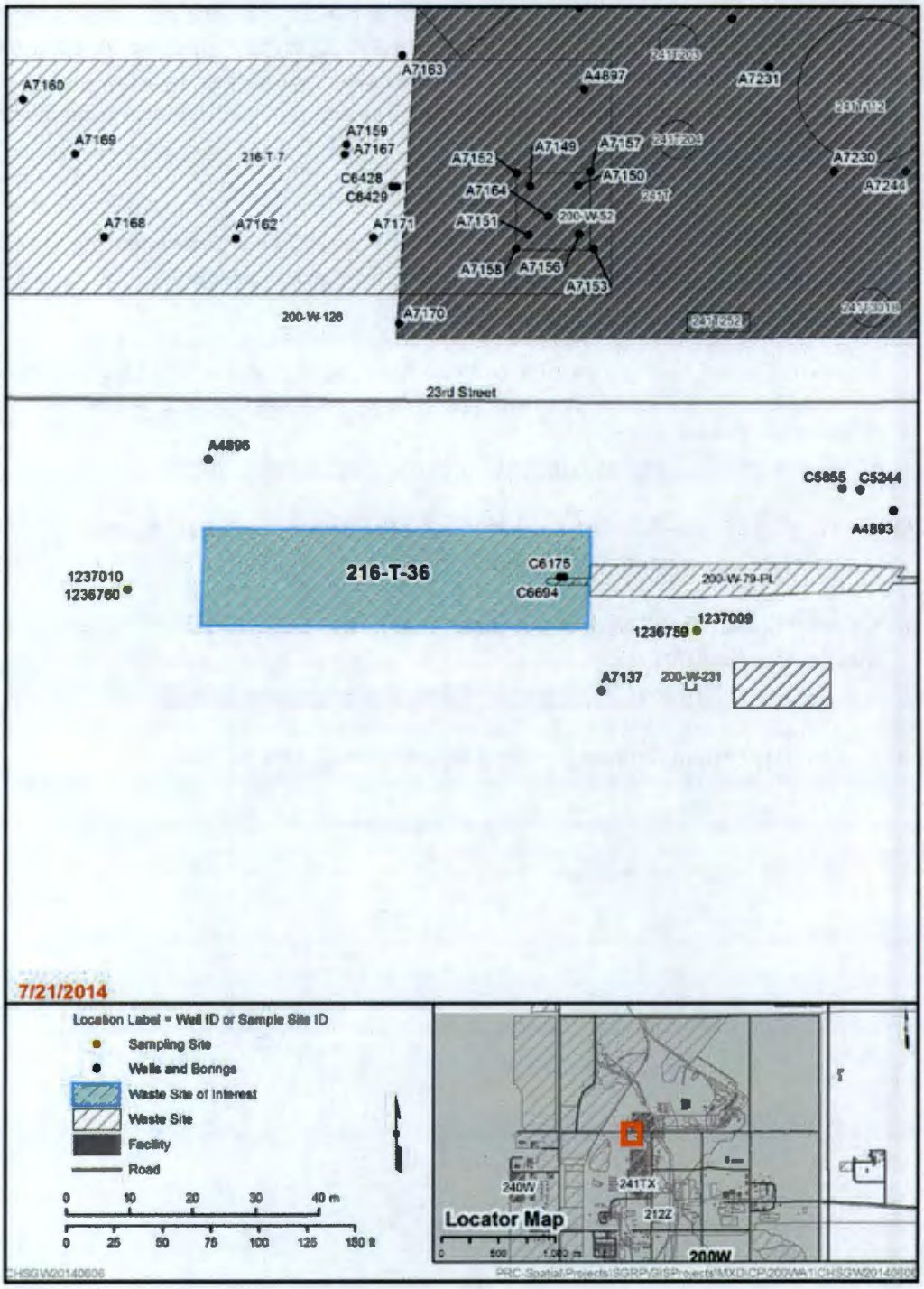
DOE/RL-2007-02, 2007, *Supplemental Remedial Investigation/Feasibility Study Work Plan for the 200 Areas Central Plateau Operable Units: Volume II: Site-Specific Field-Sampling Plan Addenda*, Rev. 0, Vol. II, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=00099913.

H-2-33472 (drawing), 1967, *216-T-36 Crib Plan, Profile & Misc Details*, Sh. 1, Rev. 1, Vitro Engineering Co., Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

Waste Information Data System General Summary Report for the 216-T-36 Waste Site.

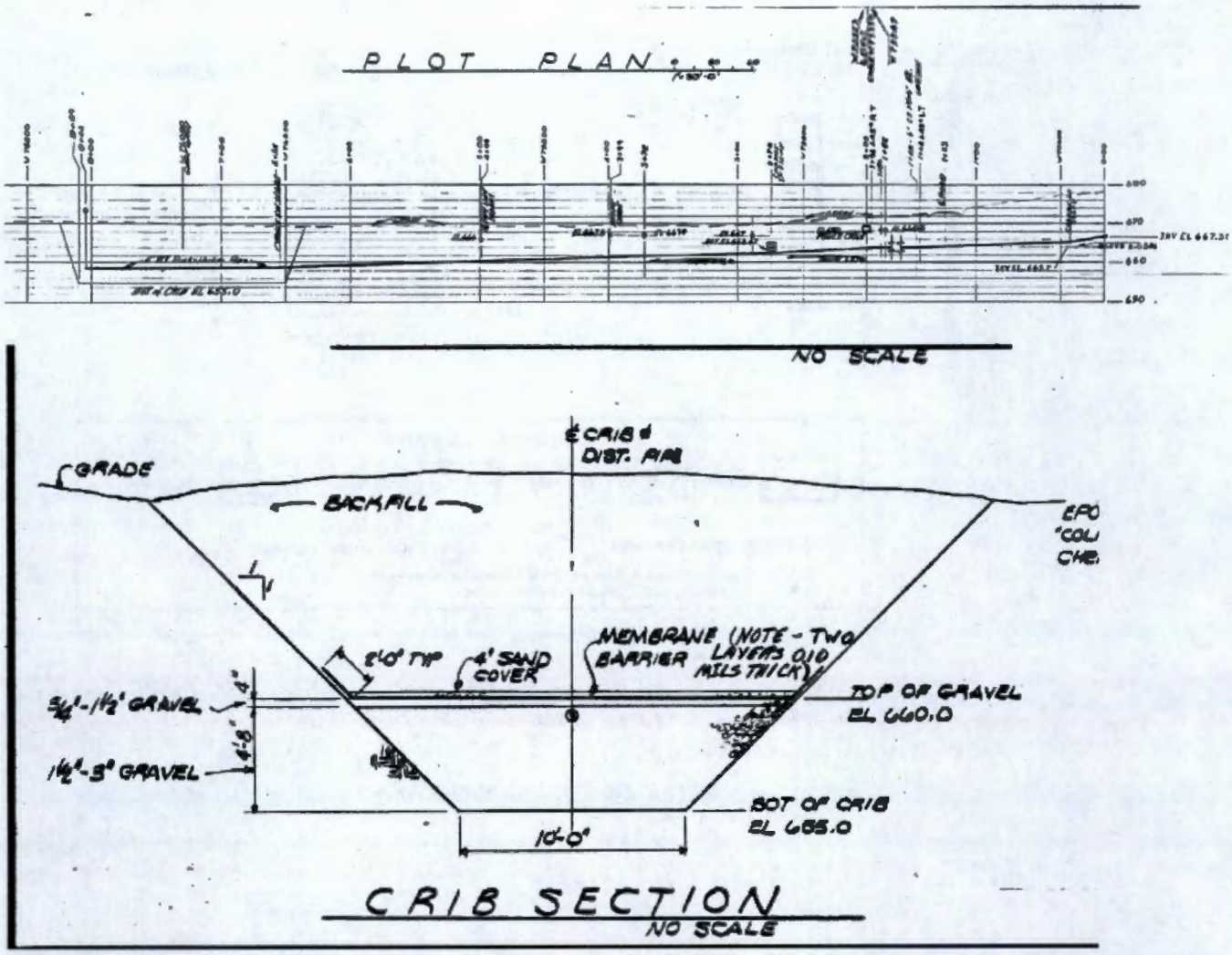
Site: 216-T-36	Area: T Plant	Category: Intermediate



ID = identification

Figure 1. 216-T-36 Waste Site Map

Site: 216-T-36	Area: T Plant	Category: Intermediate

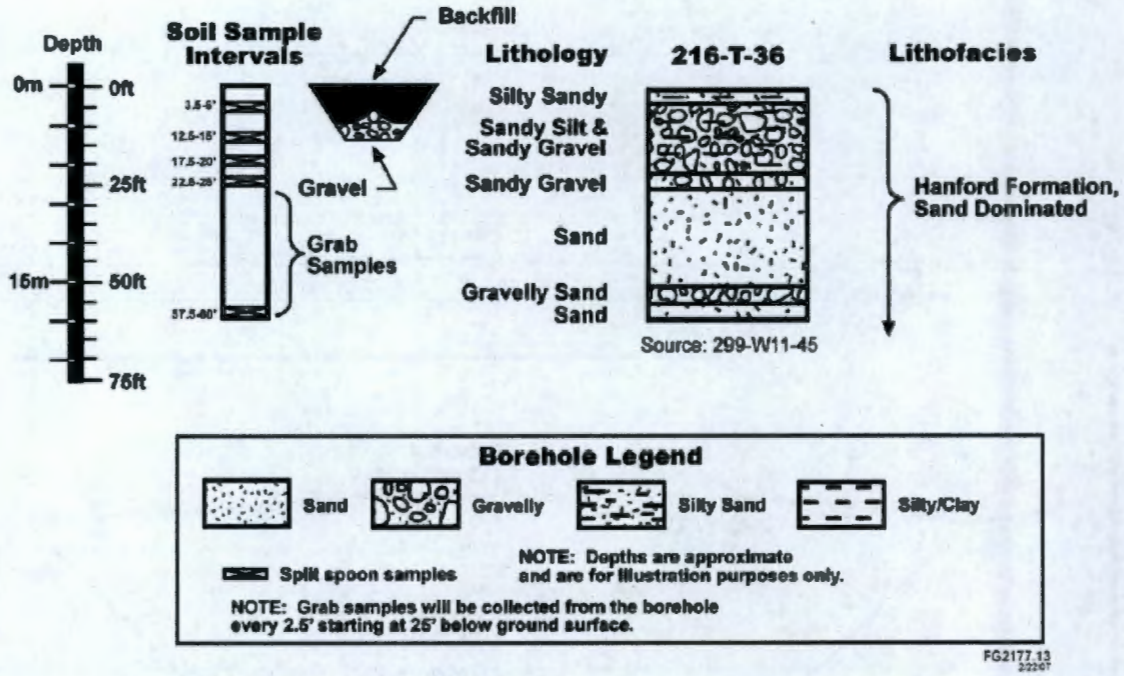


Source: H-2-33472, *216-T-36 Crib Plan, Profile & Misc Details.*

Note: Produced from the best available copy.

Figure 2. 216-T-36 Construction

Site: 216-T-36	Area: T Plant	Category: Intermediate



Source: *Supplemental Remedial Investigation/Feasibility Study Work Plan for the 200 Areas Central Plateau Operable Units: Volume II: Site-Specific Field-Sampling Plan Addenda*, Figure AD1-6.

Note: Produced from the best available copy.

Figure 3. 216-T-36 Crib Stratigraphy

Site: 218-W-8	Area: T Plant	Category: Intermediate

Site Description

Site Identification: 218-W-8
Site Type: Burial Vault
Facility/Geographic Area: 200 Inner Area West
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Service Dates: 1945 to 1952

Waste Site Location and Physical Description: The 218-W-8 Burial Vaults are located southeast of the 222-T Building (Figure 1). Three underground burial vaults are contained at the site (Figures 1 and 2). The two original burial vaults are 3 m by 3 m by 3.7 m (10 ft by 10 ft by 12 ft), made of 5.1 cm by 30.5 cm (2 in by 12 in.) wooden planking, with the top 1.5 m (5 ft) below grade (Figures 2 and 3). The third replacement burial vault is concrete culvert pipe encasement 2.4 m (8 ft) diameter and 7.6 m (25 ft) long and 1 m (3.2 ft) below grade (Figures 2 and 4). The top of the encasement is a 23 cm (9 in.) precast concrete cover and the bottom is a 30.5 cm (12 in.) thick concrete floor. The disposal chutes for the wooden burial vaults were removed.

Waste Site Coordinates:
E-567637.65625 N-136775.28122

Site Dimensions:
Site Length: 25 m (81 ft)
Site Width: 13 m (43 ft)
Site Diameter: 2.4 m (8 ft)
Cover Thickness: 0.3 m (1 ft) (BHI-00881, *218-W-8 and 218-E-7 Vaults Regrading and Reposting Final Report*)
Site Area: 324 m^2 (3,480 ft^2)
Note: The diameter is the dimension of one of the three vaults. The length and width are surface dimensions for the area that includes all three vaults. The length and width were calculated from Figure 1.

Related Site Structure(s): The 218-W-8 Burial Vaults are associated with the 222-T Building.

Site Posting: Markings identifying the 218-W-8 Burial Vaults are not specified.

Site History

Release Summary: 218-W-8 Burial Vault received 68 m^3 (89 yd^3) of laboratory process sample waste from the 222-T Building. The waste was categorized as miscellaneous solid trash and debris.

Volume Discharged: 68 m^3 (89 yd^3).

Site: 218-W-8	Area: T Plant	Category: Intermediate

Pore Volume Discharged: Not applicable.

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 218-W-8 Waste Site

Contaminant	Mass Discharged
Pu	0.30 g
Total Beta	770 Ci
Sr-90	15 Ci
Ru-106	33 Ci
Cs-137	16 Ci
U	0.30 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: In 1975, 11.5 m^3 (15 yd^3) of soil was added to the surface of the radiation zone to fill in sink holes that had settled around the vault openings. A site investigation was performed in 1996. Excavations were made to a depth of 3 m (10 ft). Based on the excavations, it was determined the two wooded structures had previously filled in with dirt. The concrete structure was not investigated. The site was regraded and surface stabilized. The Cave-in Potential posting was removed. A surface radiological survey is performed annually.

Nature and Extent of Contamination: No data are available to evaluate for the presence or absence of shallow or intermediate depth soil contamination. The vaults received 68 m^3 (89 yd^3) of laboratory process sample waste from the 222-T Building. The approximate depth to groundwater is 85.3 m (280 ft) below ground surface (bgs).

References:

BHI-00881, 1996, *218-W-8 and 218-E-7 Vaults Regrading and Reposting Final Report*, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

H-2-757 (drawing), 1971, *218-E-7 Dry Waste Disposal Site*, General Electric Company, Richland, Washington.

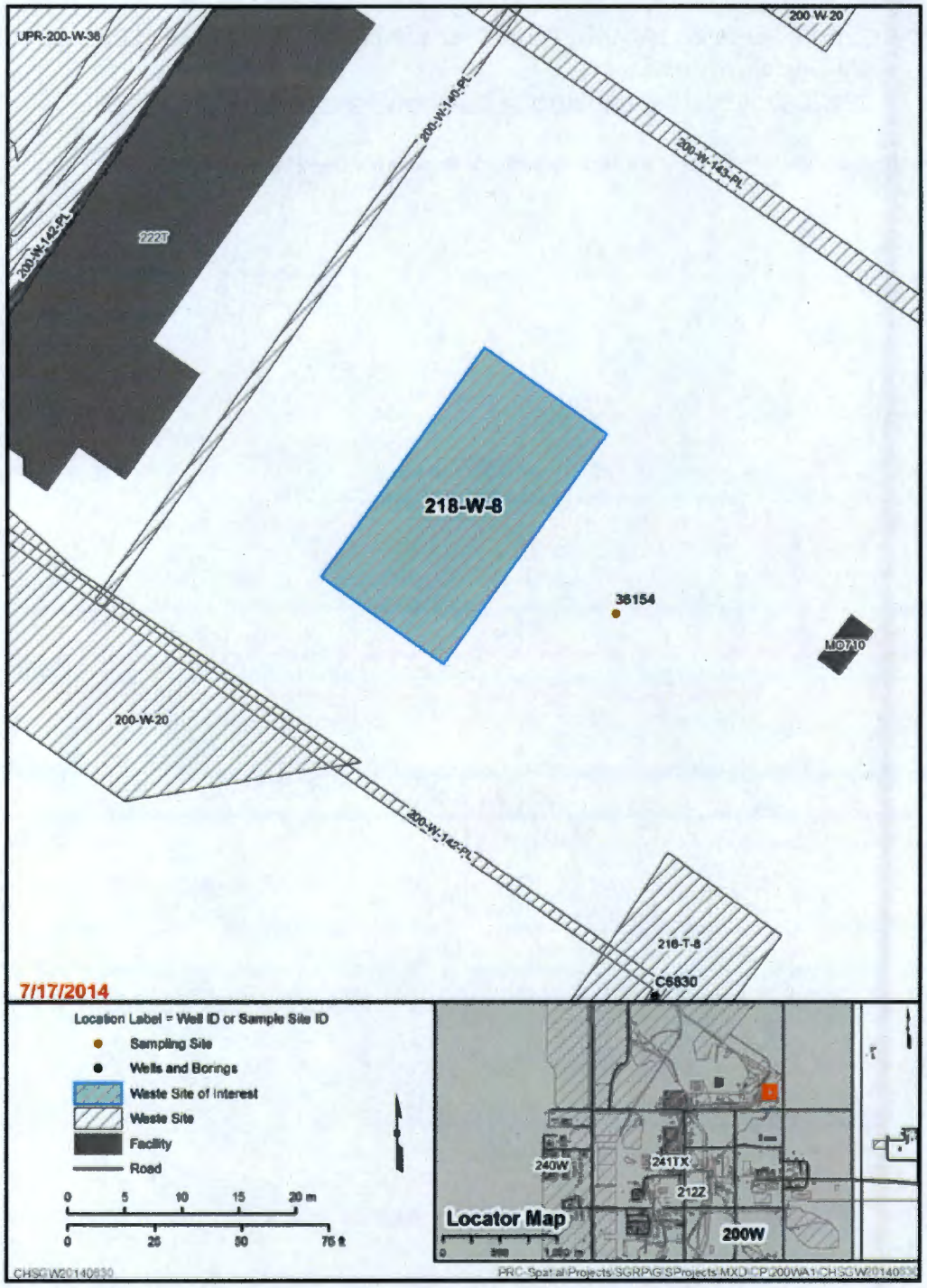
H-2-1938 (drawing), 1971, *218-E-7 and 218-W-8 Dry Waste Disposal Sites*, Sh. 1, Rev. 4, General Electric Company, Richland, Washington.

Site: 218-W-8	Area: T Plant	Category: Intermediate

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

Waste Information Data System General Summary Report for the 218-W-8 Waste Site.

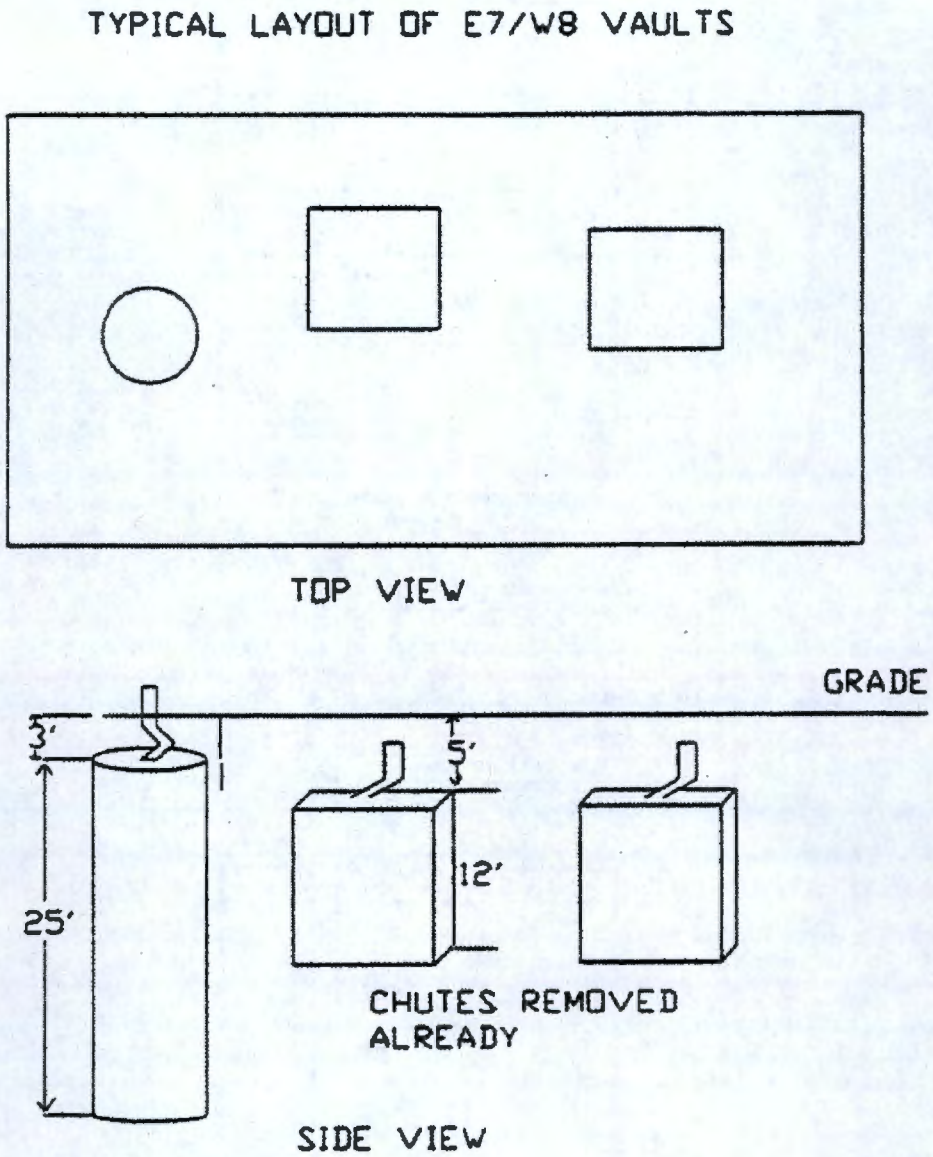
Site: 218-W-8	Area: T Plant	Category: Intermediate



ID = identification

Figure 1. 218-W-8 Site Map

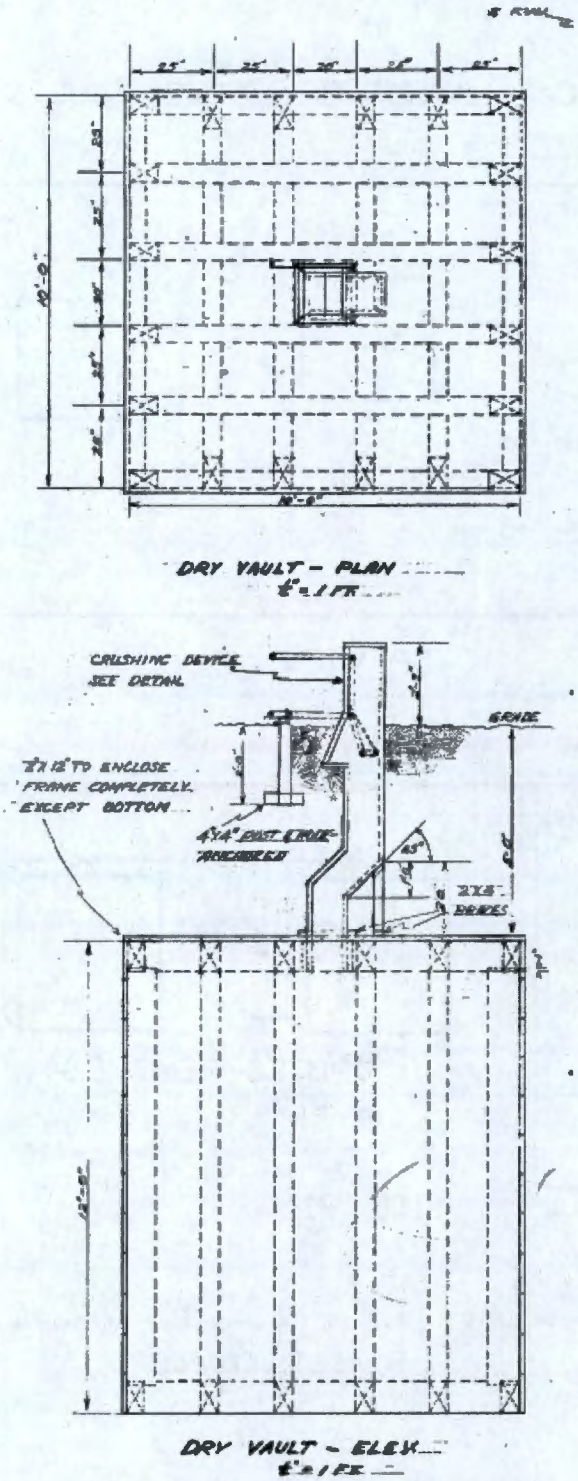
Site: 218-W-8	Area: T Plant	Category: Intermediate



Source: BHI-00881, *218-W-8 and 218-E-7 Vaults Regrading and Reposting Final Report*

Figure 2. Vault Layout

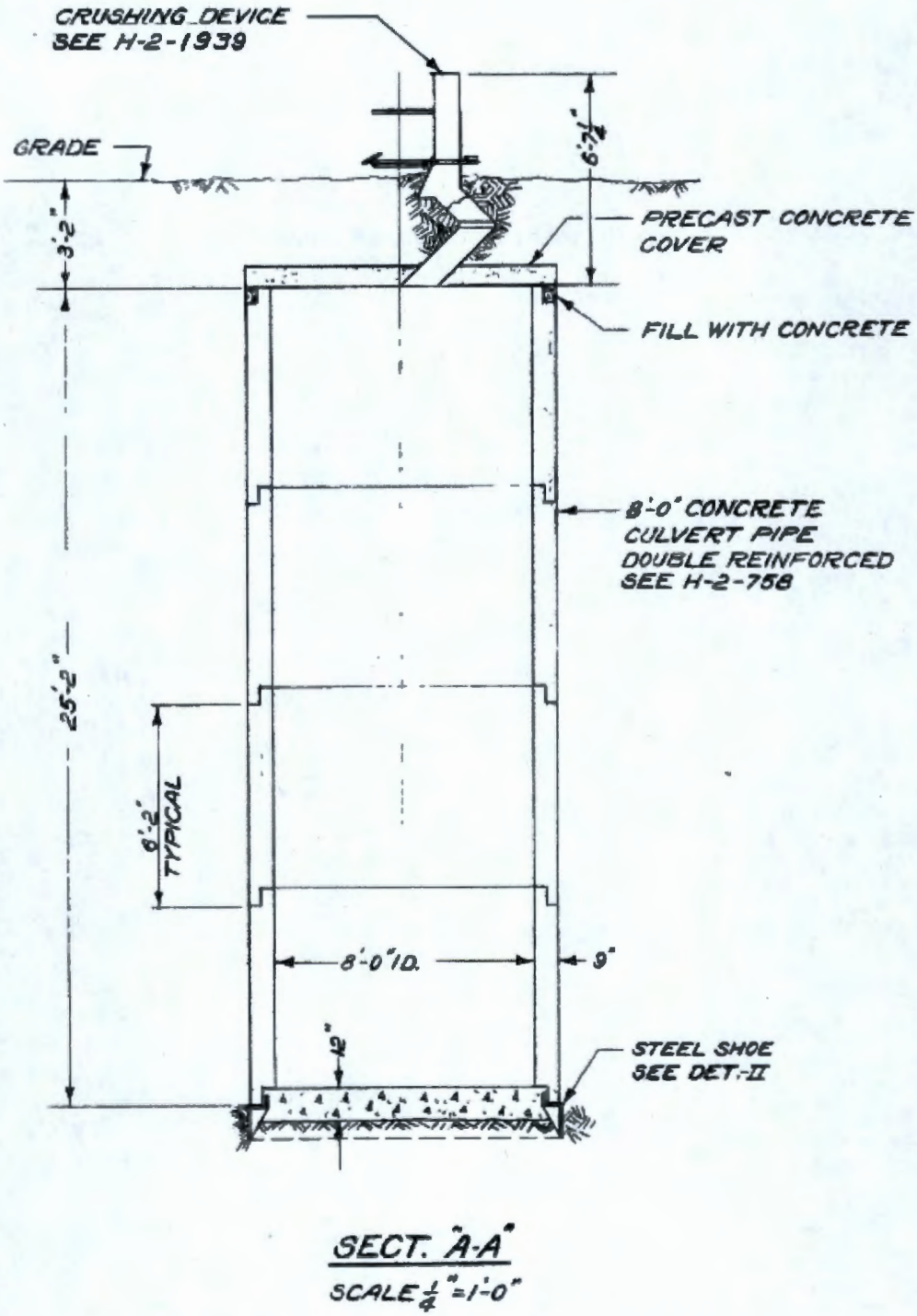
Site: 218-W-8	Area: T Plant	Category: Intermediate



Source: H-2-757, *218-E-7 Dry Waste Disposal Site.*

Figure 3. 218-W-8 Wooden Vault Construction

Site: 218-W-8	Area: T Plant	Category: Intermediate



Source: H-2-1938, *218-E-7 and 218-W-8 Dry Waste Disposal Sites.*

Figure 4. 218-W-8 Concrete Vault Construction

Site: 218-W-8	Area: T Plant	Category: Intermediate

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Site: 241-T-361	Area: T Plant	Category: Intermediate

Site Description

Site Type: Settling Tank
Facility/Geographic Area: 200 Inner Area West
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-TW-2
Service Dates: 1946 to June 1951

Waste Site Location and Physical Description: Settling Tank 241-T-361 is located southwest of the 221-T Building and north of 23rd Street (Figures 1 and 2). It is adjacent to the 216-T-6 Cribs. The tank is cylindrical and made of reinforced, pre-stressed concrete (Figure 3). The tank is located underground for shielding purposes. The capacity of the tank was 13.6 E+4 L (3.6E+4 gal).

Waste Site Coordinates:
E-567279.99762 N-136665.16797

Site Dimensions:
Tank Height: 7.6 m (25 ft) Site Diameter: 6.1 M (20 ft)
Site Area: 29.21 m^2 (314 ft^2) Overburden Depth: 1.83 m (6 ft)

Related Site Structure(s): Settling Tank 241-T-361 is associated with reverse well 216-T-3, the 216-T-6 Cribs, and the 221-T and 224-T Facilities. The pipeline from 224-T that fed the reverse well via Tank 241-T-361 is site code 200-W-226-PL.

Site Posting: Settling Tank 241-T-361 is enclosed with light post and chain and concrete AC-540 markers. The underground tank is posted with Inactive Miscellaneous Underground Storage Tank and Underground Radioactive Material Area (URMA) signs.

Site History

Release Summary: The settling tank received 10.6E+4 L (2.8E+4 gal) of radioactive contaminated liquid waste from the 221-T and 224-T Buildings. The tank discharged to reverse well 216-T-3 during 1945 and 1946. When the reverse well was abandoned, the settling tank discharge was directed to the 216-T-6 Cribs. The settling tank was deactivated in June 1951.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Site: 241-T-361	Area: T Plant	Category: Intermediate

Previous Site Characterization

Site Characterization Summary: In 1974, the contents of the tank were measured and sampled. Sludge 1.5 m (5.2 ft) deep was covered with 2.3 m (7.4 ft) of yellow liquid. The liquid was pumped out in 1985. After pumping, 45.6E+3 L (12E+3 gal) of sludge and 41.8E+3 L (11E+3 gal) of liquid were left in the tank. Settling Tank 241-T-361 was isolated in 1985.

A sludge sample form the tank was analyzed in 1976. It was described as being black and the consistency of axle grease. The 2.7 gram sample was dissolved in acid. It contained 23 µg of plutonium, 0.12 µCi/g of strontium-90 and 67.6 µCi/g of cesium-137. A supernatant sample from the tank was analyzed in 1976. The sample contained 0.22 µg of plutonium per liter of supernatant, 0.53 µCi of strontium-89/90 per liter of supernatant and 4.10 µCi of cesium-137 per liter of supernatant.

The aboveground piping was removed, all sink holes were filled, and the ground surface was decontaminated and leveled in August 1975. Settling Tank 241-T-361 and reverse well 216-T-3 were surface stabilized in 1993. The radiological posting was changed from Surface Contamination to URMA. Annual radiation surveys and visual inspection are performed. A site walkdown was performed in October 1999.

Well and boring locations are shown on Figure 1 and summarized in Tables 1 and 2. No soil samples are available.

Table 1. Borehole Summary for the 241-T-361 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2003	299-W11-79 / A7321	Outside – 75 ft northwest	4 – 146 (GPL)
2005	299-W11-22 / A9794	Outside – 80 ft northwest	1 – 248 (GPL)

GPL = geophysical log
ID = identification

Site: 241-T-361	Area: T Plant	Category: Intermediate

Table 2. Geophysical Log Summary for the 241-T-361 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A7321	0 – 5	30.4	pCi/g	4.0	128,005	cpm	5
	5 – 10	99.6	pCi/g	6.0	128,645	cpm	6
	10 – 15	36	pCi/g	14	41,982.2	cpm	15
	>15	55,733	pCi/g	19	26,365,000	cpm	22
A9794	0 – 5	0.3	pCi/g	1.0	14,805.7	cpm	4
	5 – 10	–	pCi/g	–	14,394.3	cpm	7
	10 – 15	–	pCi/g	–	12,493.3	cpm	11
	>15	273.1	pCi/g	109	494,575	cpm	18

bgs = below ground surface

The geophysical logs monitored reverse well 216-T-3, located 24.4 m (80 ft) to the northwest.

Nature and Extent of Contamination: No data are available to evaluate for the presence or absence of shallow or intermediate depth soil contamination. Although no releases from the tank have been documented, potential release mechanisms include from the tank or associated piping to surrounding soil from direct leaks or overfilling. The approximate depth to groundwater is 82 m (269 ft) below ground surface (bgs).

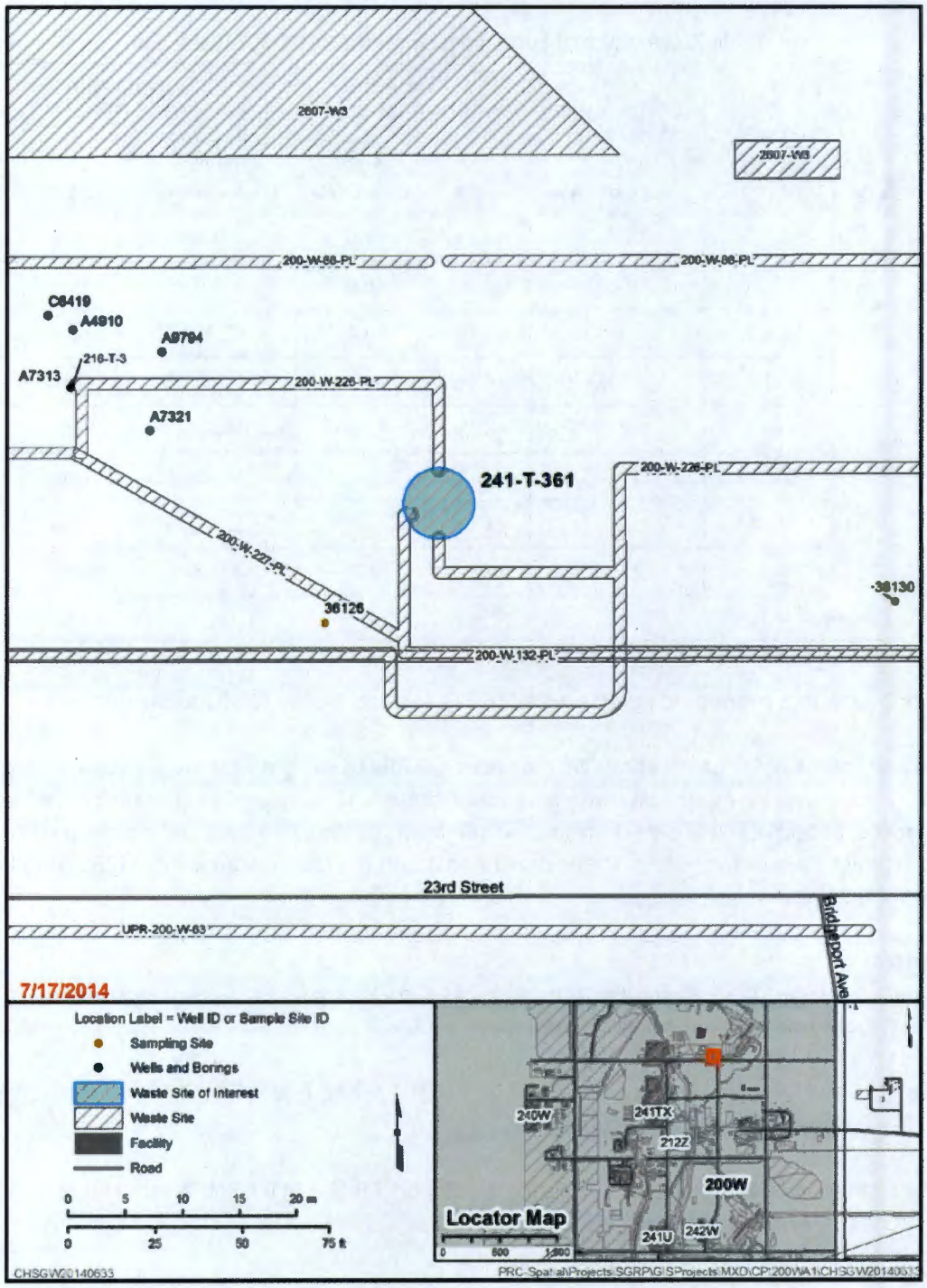
References:

H-2-71641 (drawing), 1985, *Piping Enlarged Plan 241-T & TY Areas*, Rev. 1, Vitro Engineering Corporation, Richland, Washington.

H-2-71676 (drawing), 1985, *Piping Plans Tanks 241-U-361 & 241-T-361*, Rev. 1, Vitro Engineering Corporation, Richland, Washington.

Waste Information Data System General Summary Report for the 241-T-361 Waste Site.

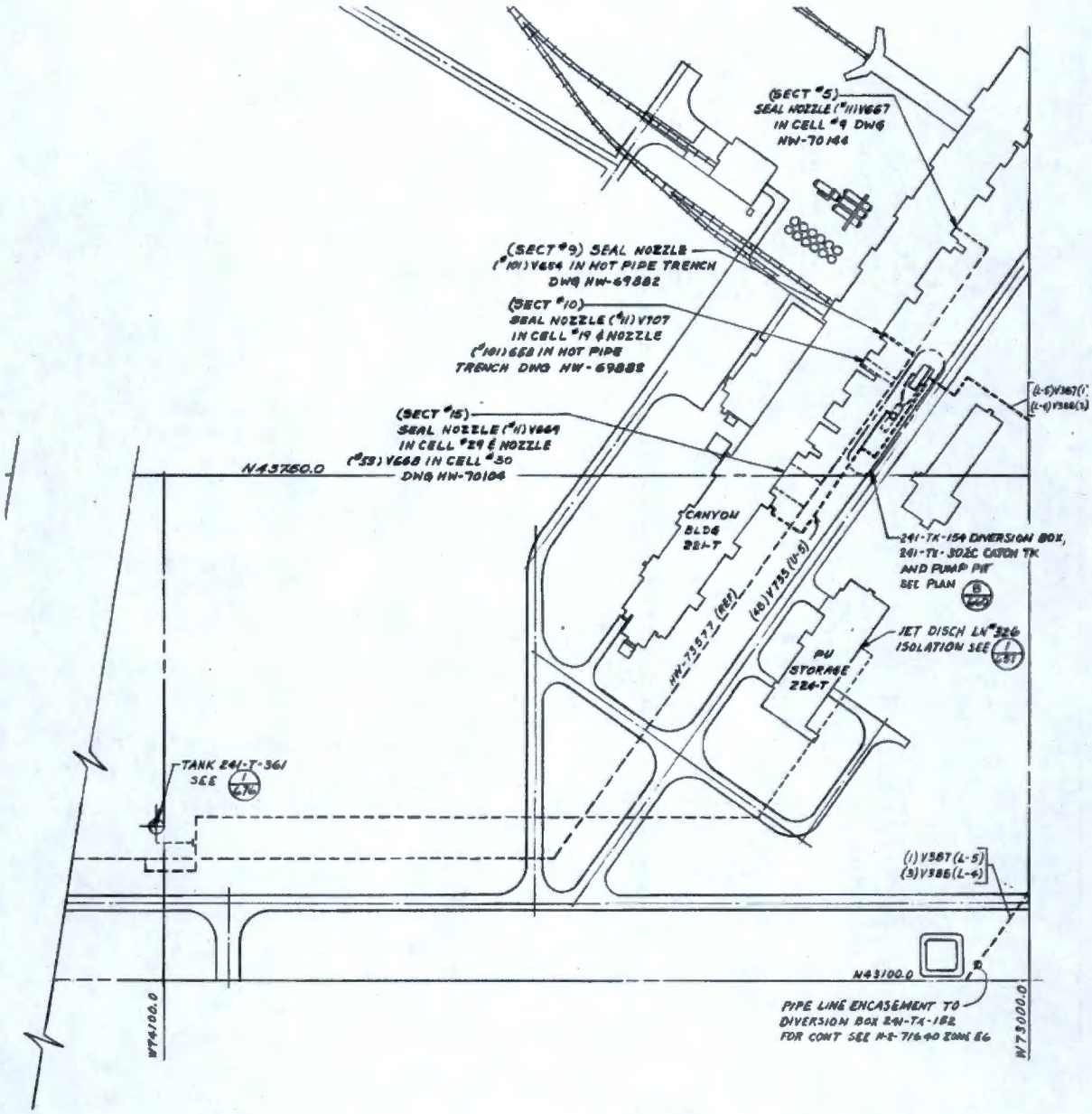
Site: 241-T-361	Area: T Plant	Category: Intermediate



ID = identification

Figure 1. 241-T-361 Site Map

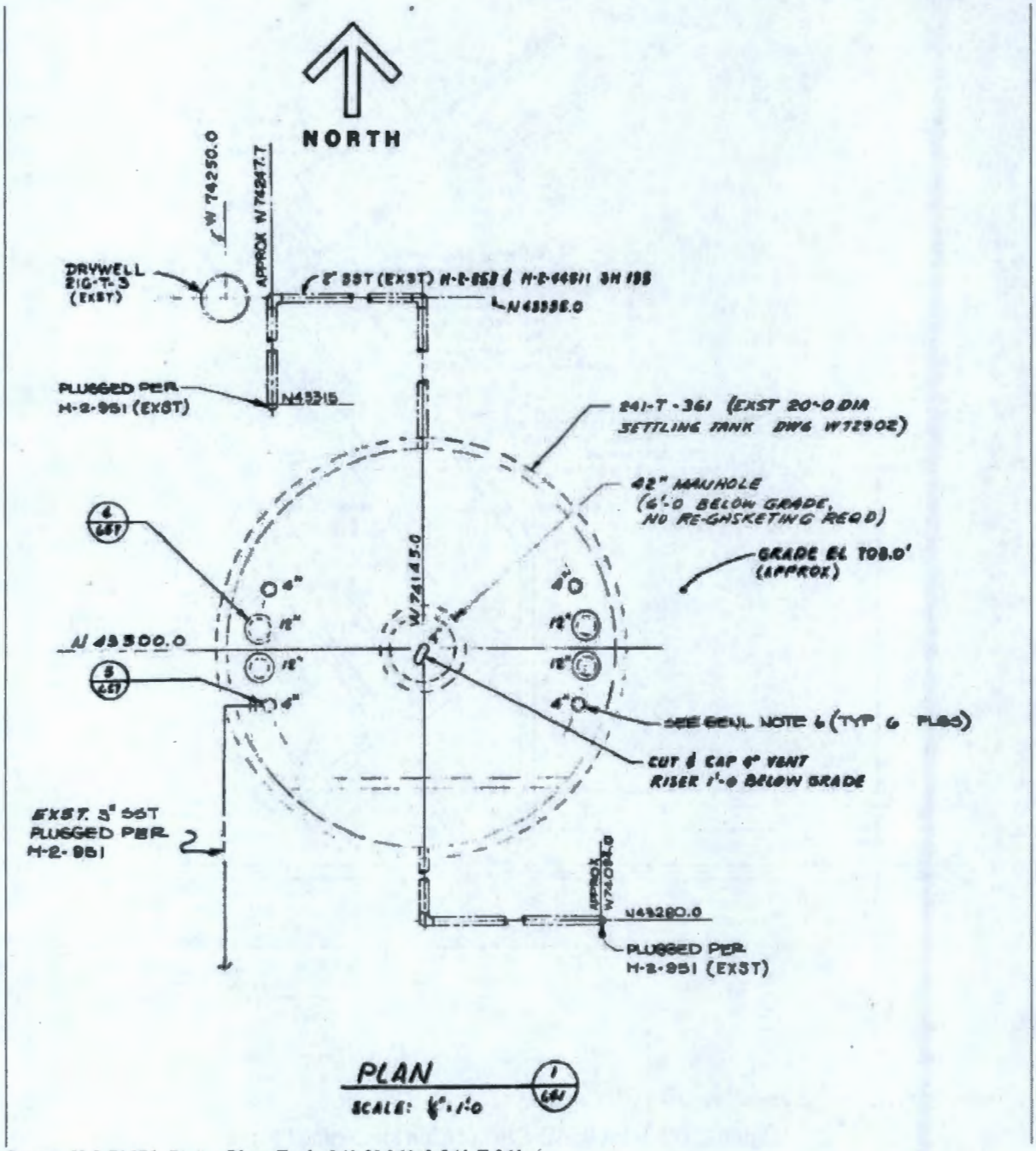
Site: 241-T-361	Area: T Plant	Category: Intermediate



Source: H-2-71641, *Piping Enlarged Plan 241-T & TY Areas.*

Figure 2. 241-T-361 Waste Site Location and Piping Plan

Site: 241-T-361	Area: T Plant	Category: Intermediate



Source: H-2-71676, *Piping Plans Tanks 241-U-361 & 241-T-361.*

Note: Produced from the best available copy.

Figure 3. Piping Plan

Site: 2607-W3	Area: T Plant	Category: Intermediate

Site Description

Alternate Site Identification: 2607-W3
Site Type: Septic Tank
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Service Dates: 1944 to 08/01/1998

Waste Site Location and Physical Description: The 2607-W3 waste site is located northeast of Settling Tank 241-T-361, approximately 61 m (200 ft) north of 23rd Street and 244 m (800 ft) southwest of the 221-T Building (Figure 1). Site 2607-W3 is comprised of a septic and drain field that was expanded northward in the 1950s. Septic Tank 2607-W3, drain field, piping layout, and associated buildings are shown on Figure 2. In August 1998, under project W-396, Septic Tank 2607-W3 was pumped, sampled, filled with sand, and abandoned in place per *Washington Administrative Codes* (WACs). Septic Tank 2607-W3 was constructed of reinforced concrete.

Waste Site Coordinates:
E – 5673232.60 N – 136695.28 (tank)
E – 567232.612 N – 136722.046 (drain field, irregular)

Site Dimensions:
Site Length: 6.40 m (21 ft) Site Depth: 3.81 m (12.5 ft)
Site Width: 2.74 m (9 ft) Cover Thickness: Not specified
Site Area: 17.5 m^2 (189 ft^2) Capacity: 54,428 L (14,378 gal)
Dimensions of the septic tank.

Site Length: Varies Site Depth: Approximately 2.1 m (7 ft)
Site Width: Varies Cover Thickness: Not specified
Site Area: Approximately 3,900 m^2 (42,000 ft^2)
Dimensions of the drain field.

Related Site Structure(s): Septic Tank 2607-W3 and drain field are associated with the 221-T, 222-T, and 271-T Buildings.

Site Posting: The 2607-W3 waste site is currently not posted or marked. At one time, the eastern access was posted with a Radioactive Material warning sign.

Site: 2607-W3	Area: T Plant	Category: Intermediate

Site History

Release Summary: Septic Tank 2607-W3 and drain field were built in 1944 for the treatment of nondangerous and nonradioactive sanitary sewer effluent from the 221-T, 222-T, and 271-T Buildings. The drain field was expanded in the 1950s.

After the septic system was abandoned in 1998, effluent was redirected to the 2607-W1 system. The tie-line is expected to remain operational throughout the remaining Hanford Site mission.

Volume/Mass Discharged: Septic Tank 2607-W3 was constructed with a 54,428 L (14,378 gal) per day holding capacity. The system received sanitary sewer effluent at an estimated rate of 14,200 L (3,751 gal) per day.

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: The septic system was deactivated following established WAC guidelines in 1998. All waste inside the tank was removed and the empty tank was filled with sand to eliminate void space. Liquid and sludge samples (samples W980000585 and W980000586) were collected from Septic Tank 2607-W3 in April 1998 (Klages 1998). Total Alpha, Total Beta, and Gamma Scans were done. All analytical results were below HNF-EP-0063-4, *Hanford Site Solid Waste Acceptance Criteria,* Appendix J.

Nature and Extent of Contamination: Insufficient data are available to evaluate shallow or intermediate soil contamination.

References:

H-2-1139 (drawing), 1948, *Sanitary Sewers, Septic Tank & Tile Field Extend Tile Field 2607 W3 200 W Area*, Rev. 1, General Electric Company, Richland, Washington.

H-2-1865 (drawing), 1949, *Tile Field 2607-W3*, General Electric Company, Richland, Washington.

W-71192 (drawing), *Septic Tanks Plan and Sections*, Rev. 31, General Electric Company, Richland, Washington.

HNF-SD-LL-SP-001, 1998, *200 and 600 Areas Sanitary Wastewater Master Plan*, Rev. 1, Fluor Hanford, Inc., Richland, Washington.

Site: 2607-W3	Area: T Plant	Category: Intermediate

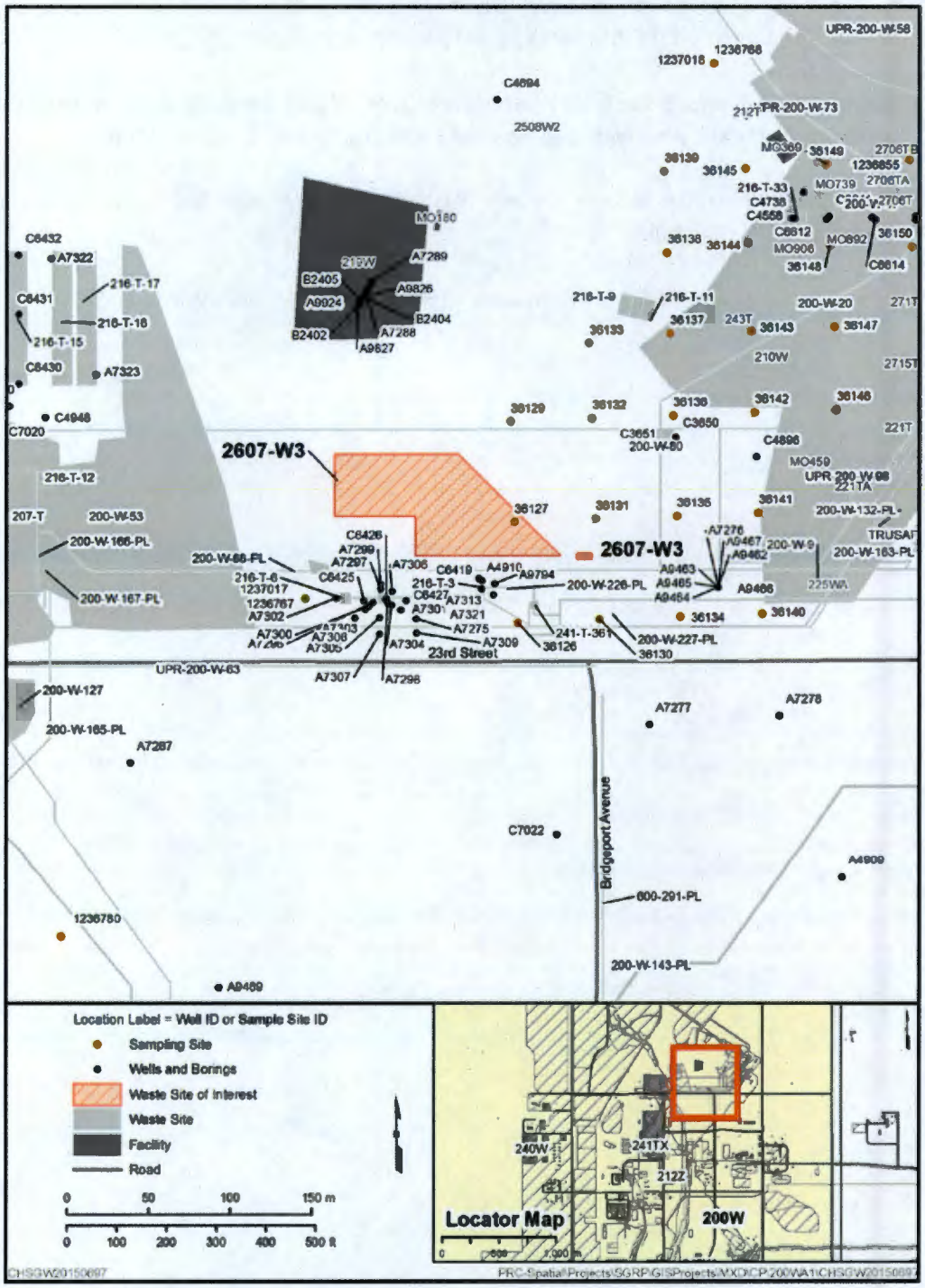
Klages, D.L., 1998, "Test Results for 2607-W," (Don't Say It...Write It! to C. Johnson from D.L. Klages, April 28), Dyncorp Tri-Cities Services, Inc., Richland, WA.

WHC-EP-0063-4, 1993, *Hanford Site Solid Waste Acceptance Criteria,* Appendix J, "Release of Waste for Offsite Disposal," Westinghouse Hanford Company, Richland, Washington.

WHC-SD-LL-SP-001, 1996, *200/600 Area Sanitary Wastewater Master Plan*, Rev. 1, ICF Kaiser Hanford, Richland, Washington.

Waste Information Data System General Summary Report for the 2607-W3 Waste Site.

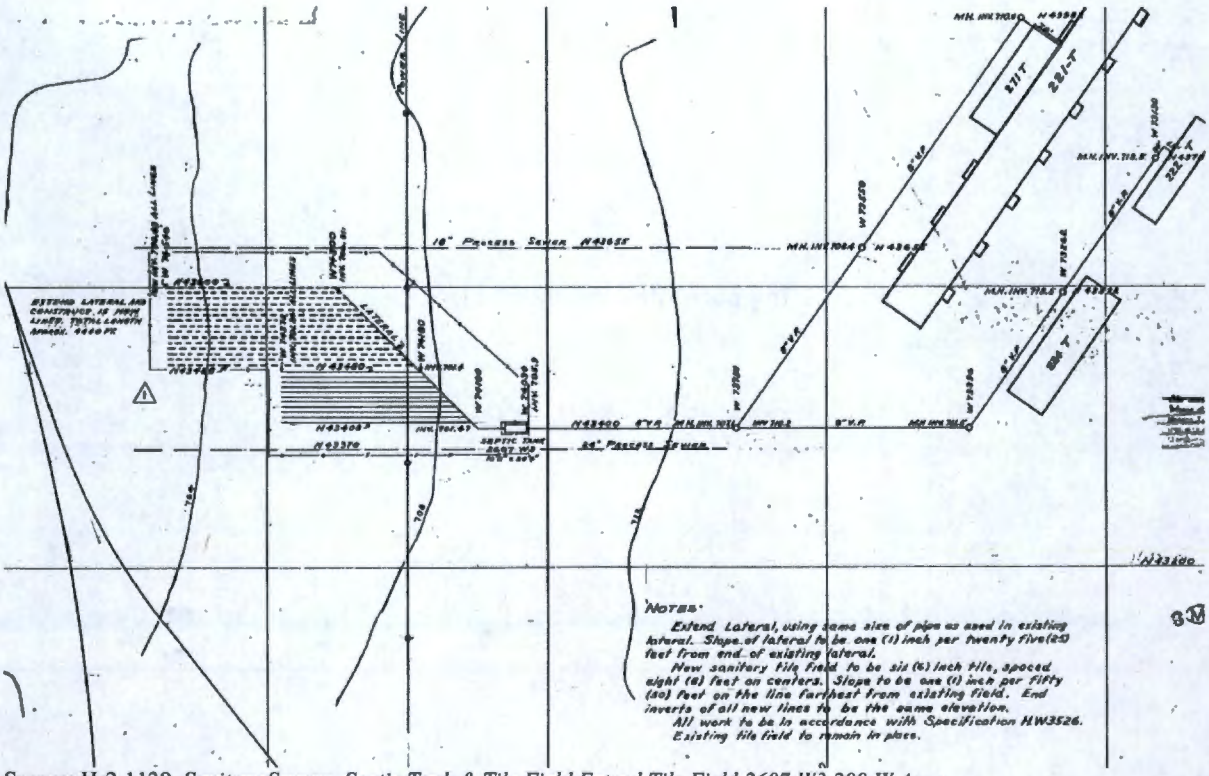
Site: 2607-W3	Area: T Plant	Category: Intermediate



ID = identification

Figure 1. 2607-W3 Site Map

Site: 2607-W3	Area: T Plant	Category: Intermediate



Source: H-2-1139, *Sanitary Sewers, Septic Tank & Tile Field Extend Tile Field 2607 W3 200 W Area.*

Note: Produced from the best available copy.

Figure 2. 2607-W3 Septic Tank, Drain Field, and Piping

Site: 2607-W3	Area: T Plant	Category: Intermediate

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Site: 2607-W4	Area: T Plant	Category: Intermediate

Site Description

Alternate Site Identification: 2607-W4
Site Type: Septic Tank and Drain Field
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Service Dates: 1944 to 1985 (original system), 1985 to 08/01/1998 (replacement system)

Waste Site Location and Physical Description: The 2607-W4 waste site (Figure 1) consists of two abandoned septic systems (an original and a replacement system) that both used the 2607-W4 identifier. Both systems are located northwest of the 221-T Head End Addition (Figure 2), although the location of the original drain field is not known.

The original 2607-W4 septic system had a single 908 L (240 gal) chamber with inside dimensions of 1.2 m (4 ft) long, 0.6 m (2 ft) wide, and 2.5 m (8.3 ft) deep (drawing W-71192, *Septic Tanks Plan and Sections*). The tank extended approximately 0.15 m [0.5 ft] above grade when it was constructed and had a wooden lid. The drain field is assumed to have had a minimum of 19.5 m (64 ft) of perforated drain tile, but the location and configuration of the drain field has not been found on drawings. No features of this system are visible at the ground surface.

The replacement system is a 3,700 L (1,000 gal), pre-cast concrete tank with two chambers. The drain field is roughly 17 m (56 ft) by 4.9 m (16 ft). The abandoned tank has a metal manhole cover. The abandoned drain field is located in a depression and was surrounded by post and chain when it was photographed during a 2000 site visit (Figure 3).

Waste Site Coordinates:
E – 567597.813 N – 136995.969 (tank)
Not available (drain field)

Site Dimensions:
Site Length: 1.31 m (4.3 ft) Site Depth: Not specified
Site Width: 0.6 m (2 ft) Cover Thickness: Not specified
Site Area: 0.79 m^2 (8.6 ft^2) Capacity: 908.4 L (240 gal)
Dimensions of the original septic tank.

Related Site Structure(s): Septic Tank 2607-W4 and drain field are associated with the 221-T Head End Addition.

Site Posting: The 2607-W4 waste site is currently not posted or marked. In 1991, the area was within a radiological zone. In 1998, the area had been downposted.

Site: 2607-W4	Area: T Plant	Category: Intermediate

Site History

Release Summary: The original 2607-W4 septic system was installed in 1944 and taken out of service in 1985. The line from the 221-T Head End Addition was cut and routed to the replacement system. General note 4 on drawing H-2-76676, *Civil/Specification 221 T SNS Disposal System*, states "Cover existing septic tank with uncompacted fill. Grade to match existing finish grade." No other decommissioning details are known.

The replacement septic system was installed in 1985. The tank was abandoned in June 1998. The lid was left on the tank and outlet tank piping on the septic tank was grouted. In 1987, it was estimated that the replacement system received sanitary sewer effluent at a rate of 10.6 m^3 (374 ft^3) per day. In 1995, it was estimated that the replacement system received sanitary sewer effluent at a rate of 5,000 L (1,330 gal) per day.

Volume/Mass Discharged: Not specified

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: The septic system was deactivated following WAC 246-272-18501, "Wastewater and Reclaimed Water Use Fees," "Abandonment," requirements guidelines in 1998. All waste inside the tank was removed. A liquid sample (sample # W980000692) and a sludge sample (sample #W980000693) were collected and sent to the Waste Sampling and Characterization Facility (WSCF) Laboratory. The samples were analyzed for Gamma energy analysis (radionuclide), Total Alpha, and Gross Beta. All results were below release criteria from HNF-EP-0063, *Hanford Site Solid Waste Acceptance Criteria*, Appendix J. The tank was pumped empty and was filled with sand to eliminate void spaces. The drain field was not sampled. A site visit in 1998 indicated that the area is no longer a Radiation Area.

Nature and Extent of Contamination: Insufficient data are available to evaluate vadose zone contamination.

References:

H-2-76676 (drawing), 1985, *Civil/Specification 221 T SNS Disposal System*, Rev. 1, Kaiser Engineers Hanford Company, Richland, Washington.

M-2904-W (drawing), 1973, *Outside Sewer Lines*, Sheet 11, General Electric Company, Richland, Washington.

Site: 2607-W4	Area: T Plant	Category: Intermediate

W-71192 (drawing), 1943, *Septic Tanks Plan and Sections*, Rev. 31, General Electric Company, Richland, Washington.

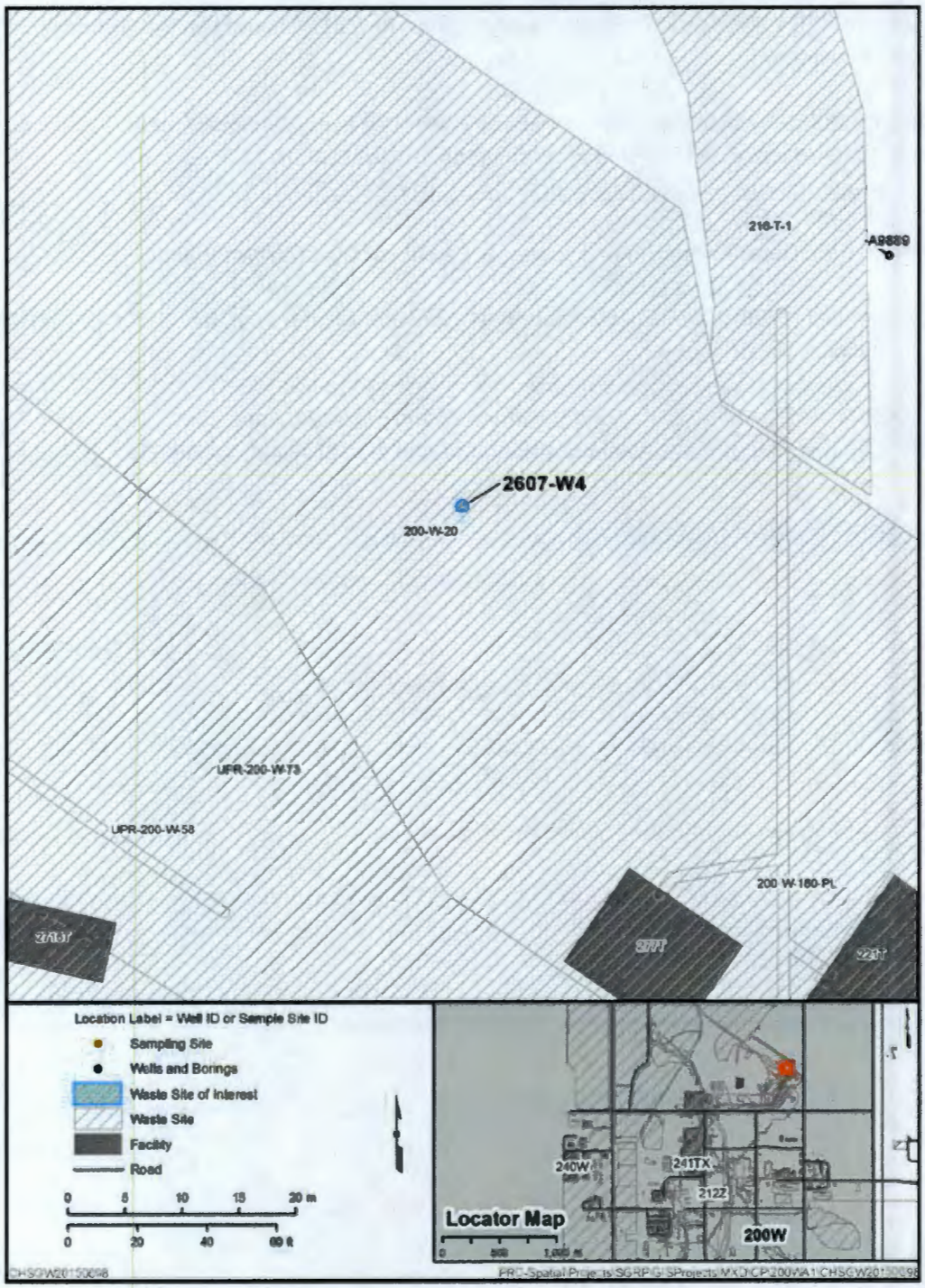
WAC 246-272-18501, "Wastewater and Reclaimed Water Use Fees," "Abandonment," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=246-272.

Waste Information Data System General Summary Report for the 2607-W4 Waste Site.

WHC-SD-LL-SP-001, 1996, *200/600 Area Sanitary Wastewater Master Plan*, Rev. 1, ICF Kaiser Hanford, Richland, Washington.

WHC-EP-0063-4, 1993, *Hanford Site Solid Waste Acceptance Criteria*, Appendix J, "Release of Waste for Offsite Disposal," Westinghouse Hanford Company, Richland, Washington.

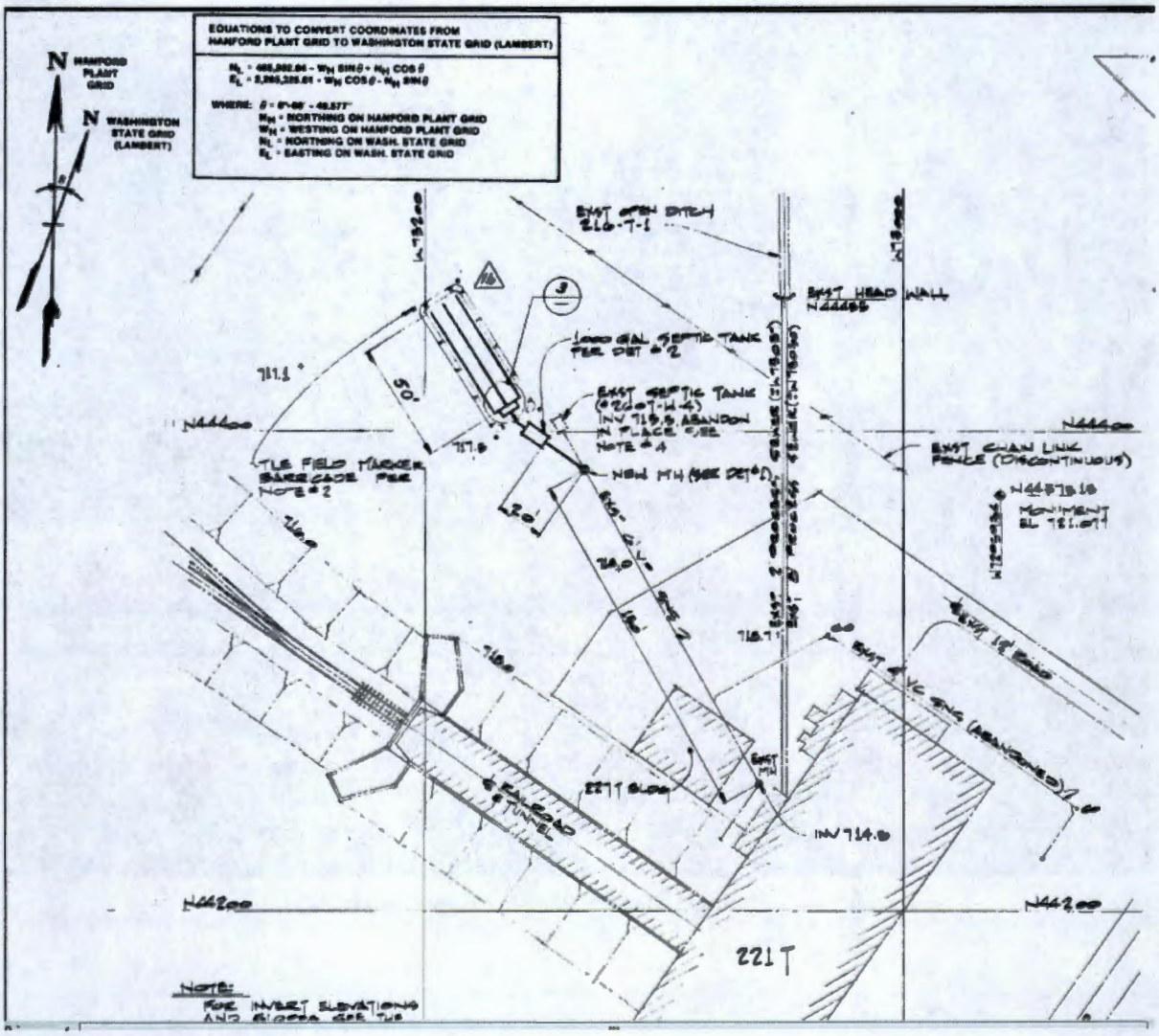
Site: 2607-W4	Area: T Plant	Category: Intermediate



ID = identification

Figure 1. 2607-W4 Waste Site Map

Site: 2607-W4	Area: T Plant	Category: Intermediate



Source: H-2-76676, *Civil/Specification 221 T SNS Disposal System.*

Note: Produced from the best available copy.

Figure 2. 2607-W4 Original Septic Tank Location, and Replacement Septic Tank, and Drain Field Locations

Site: 2607-W4	Area: T Plant	Category: Intermediate

Figure 3. Photograph of the 2607-W4 Waste Site in 2000

Site: UPR-200-W-3	Area: T Plant	Category: Shallow – Surface Only

Site Description

Site Type: Unplanned Release
Facility/Geographic Area: T Plant
Current OU Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Occurrence Date: 1949

Waste Site Location and Physical Description: The unplanned release is located on the T Plant railroad cut track, northwest of the 221-T Canyon Building (Figure 1). The railroad cut is a posted Contamination Area from the tunnel door westward to a chain link gate. The area is approximately 6 m (20 ft) west of the T Plant chain link fence that crosses the railroad cut track and encloses the T Plant Facility.

Waste Site Coordinates:
E-567360.53445 N-137114.21026

Site Dimensions:
Site Length: 1.8 m (6 ft) Site Area: 3.2 m^2 (36 ft^2)
Site width: 1.8 m (6 ft) Cover Thickness: 25 cm (10 in.)

Related Site Structure(s): There are no related structures for this unplanned release site.

Site Posting: No markers or signs of stabilization are apparent. The area is posted with Contamination Area signs.

Site History

Release Summary: On several occasions in 1949, contaminated equipment being hauled to the 200 West Burial Ground from T Plant contaminated the ground near the railroad. The contamination type released was undefined radioactive contamination.

In 1990 a rail-mounted monitor survey identified an area west of T Plant, near the 2706 branch, with three separate spots of contamination. One spot read 4 millirads per hour, one spot was 1,000 cpm and one spot was 300 cpm.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Site: UPR-200-W-3	Area: T Plant	Category: Shallow – Surface Only

Previous Site Characterization

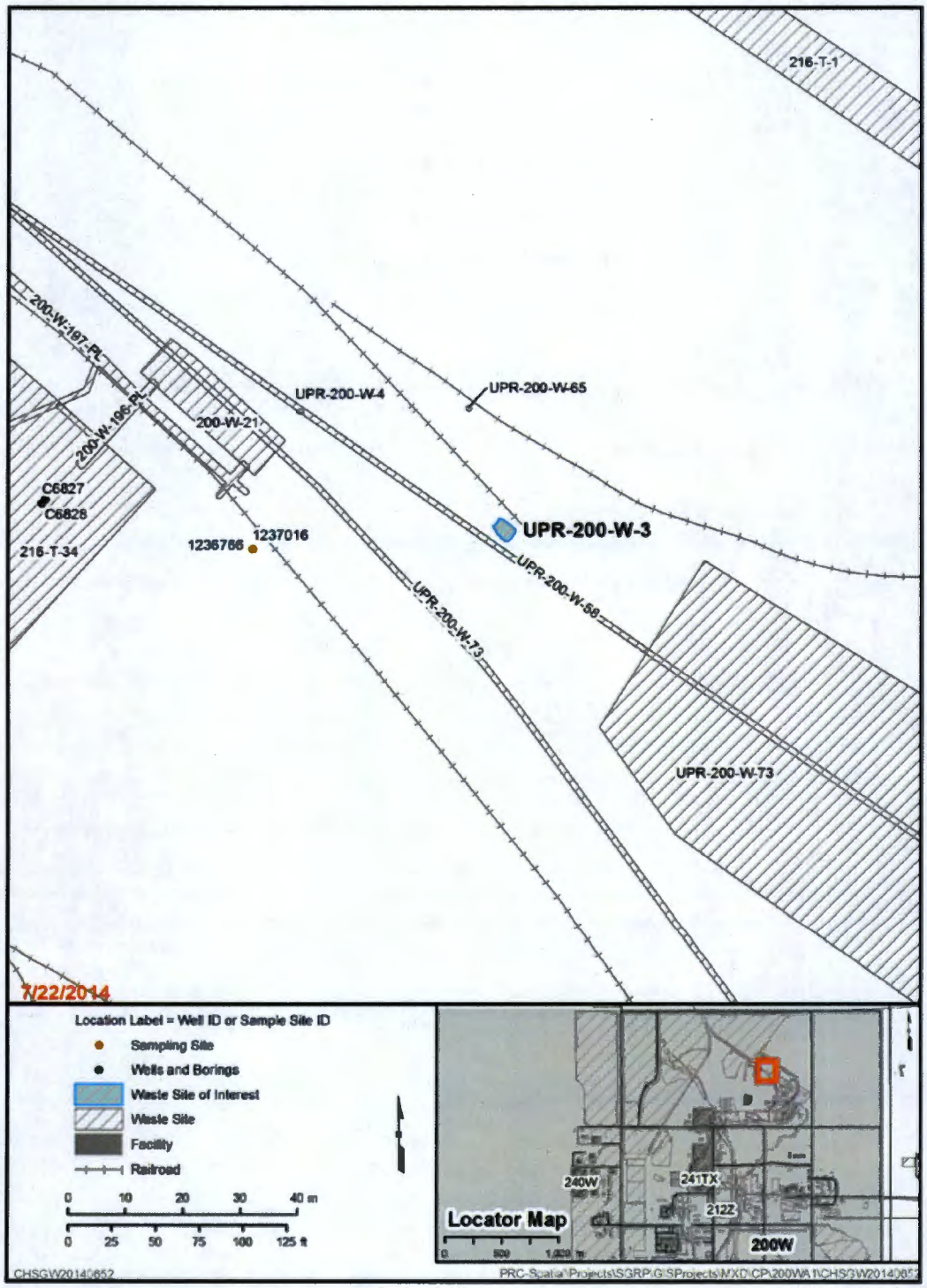
Site Characterization Summary: In spring of 1950 railroad track contamination was covered with approximately 25 cm (10 in.) of clean gravel. The small posted Contamination Area was photographed and surveyed with Global Positioning equipment to map its location in February 1998 and September 2000.

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 – 15 ft] below ground surface): Potential radiological contamination at the surface, below the stabilization cover.

References:
Waste Information Data System General Summary Report for the UPR-200-W-3 Waste Site.

Site: UPR-200-W-3	Area: T Plant	Category: Shallow – Surface Only



ID = identification

Figure 1. UPR-200-W-3 Waste Site Map

Site: UPR-200-W-3	Area: T Plant	Category: Shallow – Surface Only

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Site: UPR-200-W-14	Area: T Plant	Category: Intermediate

Site Description

Site Type: Unplanned Release
Facility/Geographic Area: 200 Inner Area West
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UR-1
Occurrence Date: 1952

Waste Site Location and Physical Description: The unplanned release site exact location is not documented although it is estimated to lie between the 242-T Evaporator and the 207-T Retention Basin along a pipeline running north to south along the east side of the 241-TY Tank Farm, parallel to an encased waste transfer line. Refer to Figures 1 through 3. Figure 1 shows the currently mapped location of the site. A sketch (Figure 2) in document HW-60807, *Unconfined Underground Radioactive Waste and Contamination in the 200 Areas 1959*, places the release location near the 241-TY east fence, although this cannot be verified. Figure 3 shows both (currently mapped and hand sketch) locations.

Waste Site Coordinates:
E-566938.24999 N-136540.31249
Coordinates for the unplanned release have been estimated.

Site Dimensions:
Site Area: Unspecified Cover Thickness: ~30.5 cm (12 in.)

Related Site Structure(s): The unplanned release is associated with the 242-T Evaporator, 207-T Basin and pipelines 200-W-78-PL, 200-W-166-PL, and 200-W-167-PL. Refer to Figure 3.

Site Posting: The area was formerly posted at intervals with Underground Radioactive Material Area (URMA) signs. A Waste Information Data System (WIDS) sign has been placed at the approximate location of the release.

Site History

Release Summary: In October 1952, a steam coil in the 242-T waste evaporator tank caused ground contamination along the surface above the leaking cast iron pipe, which carried cooling water and steam condensate from the waste evaporator building to the 207-T Retention Basin.

Contaminants were not identified, but since 242-T was the source of the stream, the material probably had a similar composition to the liquid discharged to the cribs.

Volume/Mass Discharged: Unspecified.

Site: UPR-200-W-14	Area: T Plant	Category: Intermediate

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: The leak in the pipeline was repaired in 1952 and the contaminated areas were covered with approximately 30.5 cm (12 in.) of clean soil and gravel. In 1999, 2000, and 2001 the Dyncorp Integrated Soil, Vegetation and Animal Control group made an effort to mark all underground lines in the 200 West Area. Many areas of contamination were identified above the underground lines being marked. The Contamination Areas were posted and later stabilized and changed to URMAs. It is possible one of the areas is in the same location as UPR-200-W-14.

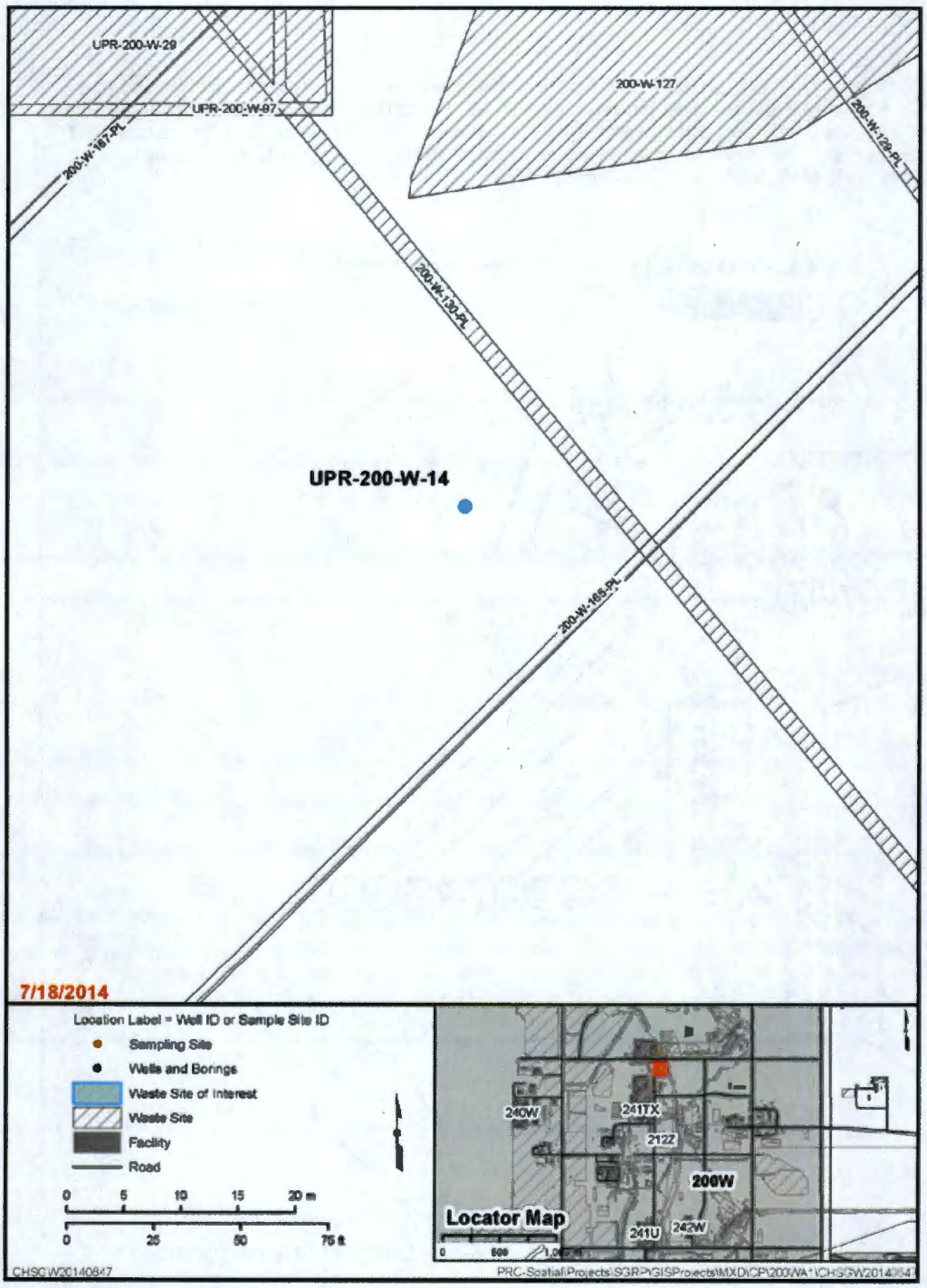
Nature and Extent of Contamination: No data are available to evaluate shallow or intermediate depth soil contamination. The exact location of the release is unknown. The type and volume of waste and depth are unknown, but the material probably had a similar composition to the liquid discharged to the cribs associated with the 242-T Evaporator. The approximate depth to groundwater is 68.9 m (226 ft) below ground surface (bgs).

References:

HW-60807, 1959, *Unconfined Underground Radioactive Waste and Contamination in the 200 Areas 1959*, General Electric Company, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0081555H

WIDS General Summary Report for the UPR-200-W-14 Waste Site.

Site: UPR-200-W-14	Area: T Plant	Category: Intermediate



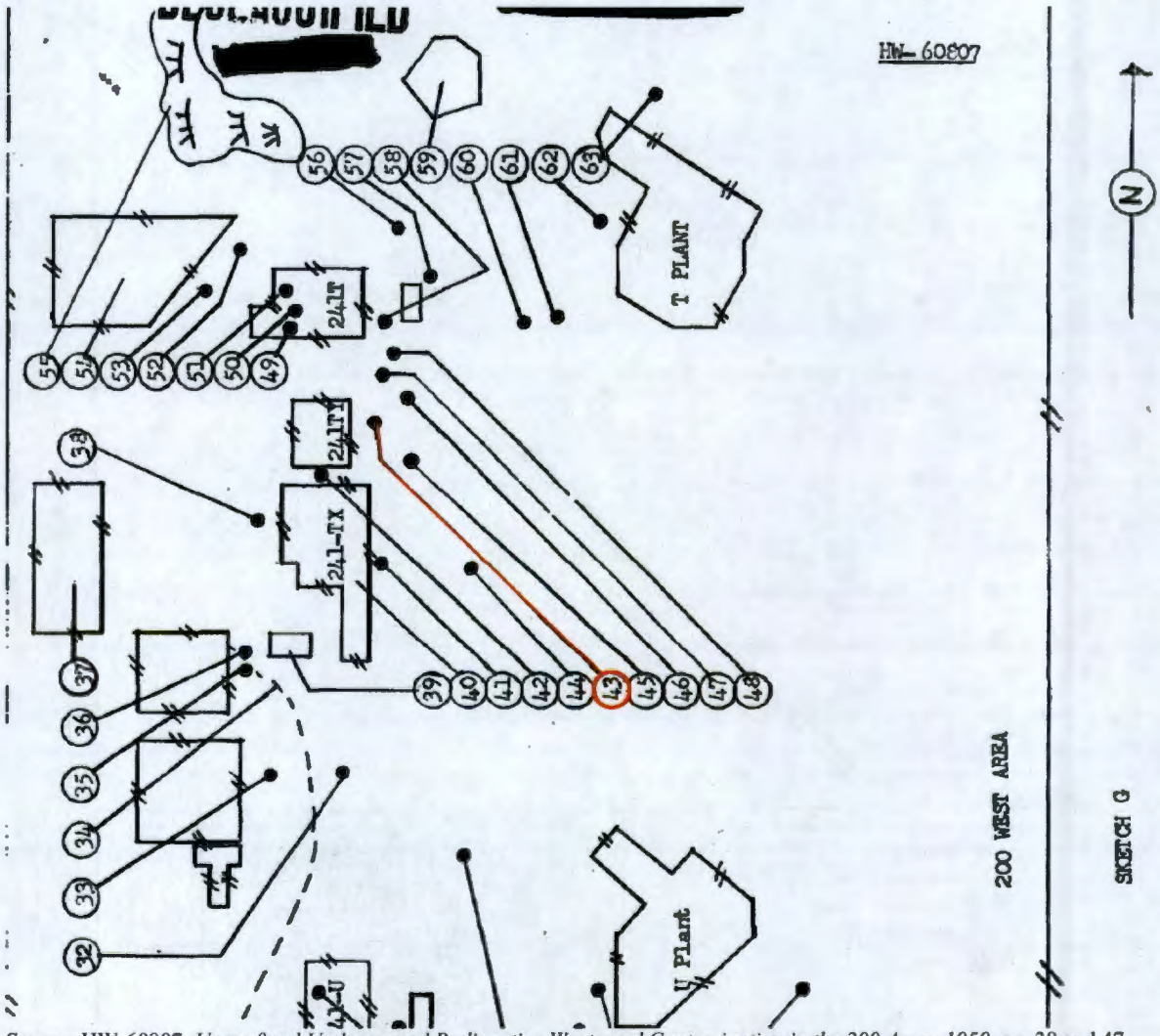
ID = identification

Figure 1. UPR-200-W-14 Site Map

Site: UPR-200-W-14	Area: T Plant	Category: Intermediate

WASTE LINE 242-T TO 207-T

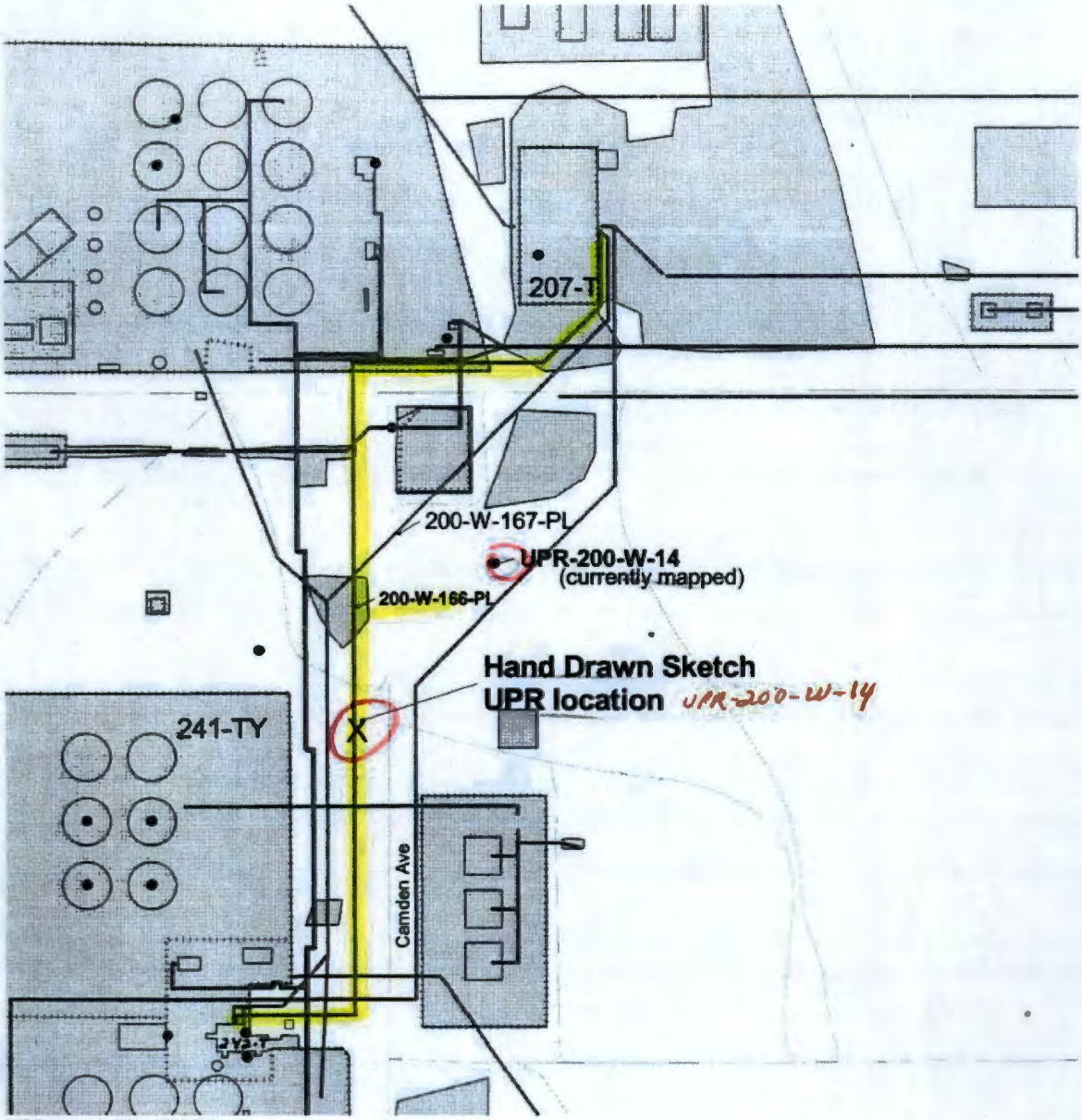
In October 1952 contaminated water was observed to be rising to the ground surface above the waste line between 242-T and the 207-T retention basin. The leak was repaired and the contaminated areas covered with about a foot of clean soil and gravel. The area is posted at intervals with "Underground Contamination" signs. (Sketch G, Drawing Reference 43)



Source: HW-60807, *Unconfined Underground Radioactive Waste and Contamination in the 200 Areas 1959*, pp. 38 and 47.

Figure 2. Description and Handrawn Sketch of Release Location

Site: UPR-200-W-14	Area: T Plant	Category: Intermediate



UPR = unplanned release

Figure 3. Mapped versus Sketch of Possible Site Location

Site: UPR-200-W-14	Area: T Plant	Category: Intermediate

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Site: UPR-200-W-63	Area: T Plant	Category: Shallow – Surface Only

Site Description

Site Type: Unplanned Release
Facility/Geographic Area: 200 Inner Area West
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Occurrence Date: September 1966

Waste Site Location and Physical Description: The unplanned release site affected the road surface of 23rd Street in the 200 West Area. The contamination was spread west of the west railroad crossing on 23rd Street and extended eastward to the intersection of Bridgeport and 23rd Street along the south shoulder of 23rd Street (Figure 1).

Waste Site Coordinates:
E-567150.06251 N-136622.28130

Site Dimensions:
Site Length: 360 m (1,175 ft) length of contamination along roadway based on Figure 1.
Site Area: Unspecified Cover Thickness: 15.2 cm (6 in) of soil

Related Site Structure(s): It is possible the unplanned release is associated with the radiologically posted area 200-W-90.

Site Posting: The unplanned release site is not marked.

Site History

Release Summary: On September 21, 1966, strontium-90 in the form of particulate matter spread from a used diversion box jumper as it was being transported from the 200 Dry Waste Burial Ground to the 221-T Canyon. The jumper had just previously been removed from the 241-TX-153 Diversion Box.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown quantity of strontium-90.

Site: UPR-200-W-63	Area: T Plant	Category: Shallow – Surface Only

Previous Site Characterization

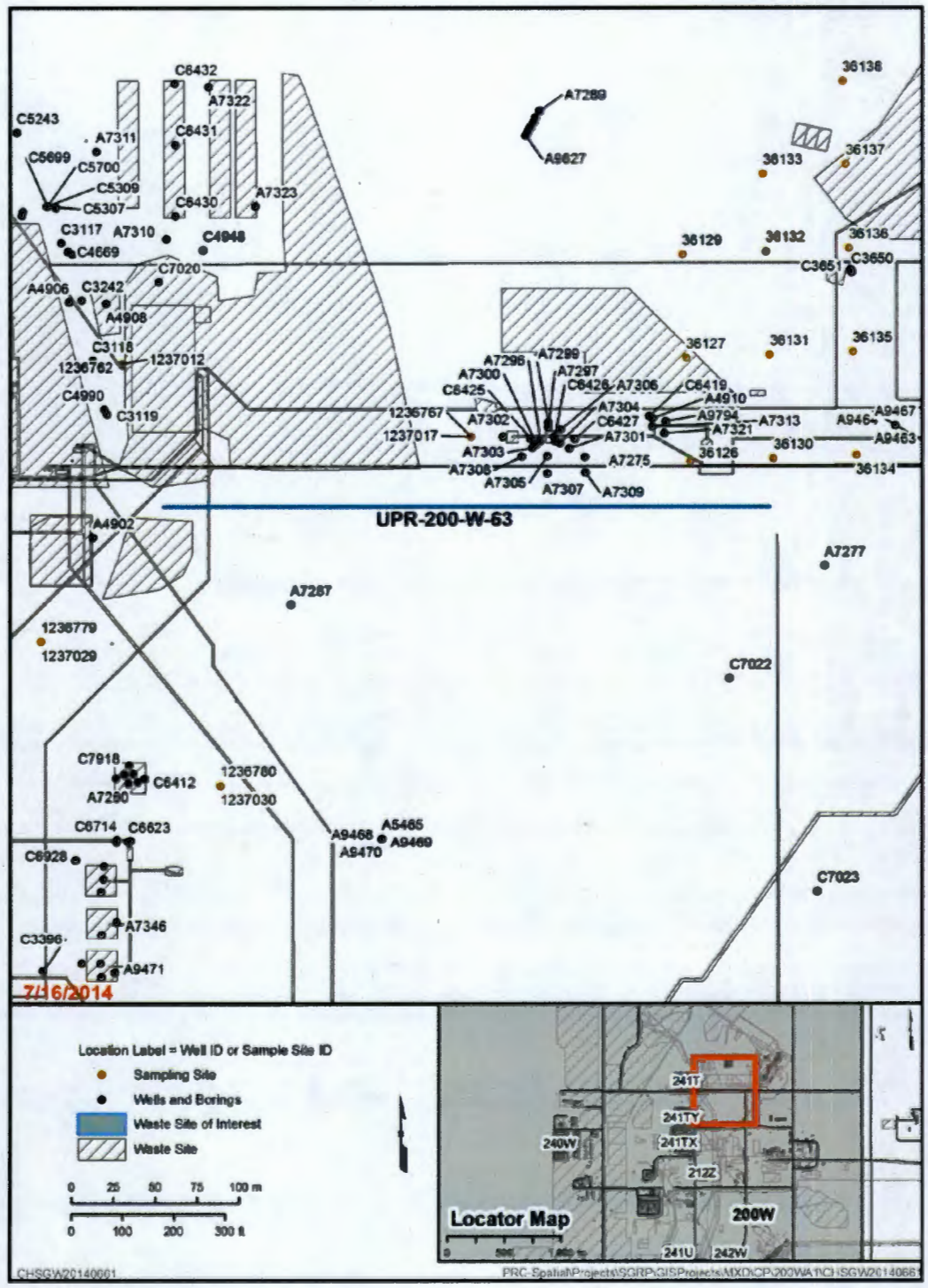
Site Characterization Summary: The contamination was in the form of strontium-90 with an activity of approximately 1 Ci. Spotty contamination with a maximum of 500 millirads/hour on 23rd Street was found along the road and shoulder. Speck contamination approximated one per square yard of ground surface along the shoulder of 23rd Street. The contamination on the road was removed, the contamination on the shoulder of the road and in the borrow pit was covered with 15.2 cm (6 in.) of soil. The area was removed from radiation zone status in November 1972. In September 1991 there were no visible site markers or signs of stabilization in the area.

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Potential radiological contamination at the surface, below the stabilization cover.

References:
Waste Information Data System General Summary Report for the UPR-200-W-63 Waste Site.

Site: UPR-200-W-63	Area: T Plant	Category: Shallow – Surface Only



ID = identification

Figure 1. UPR-200-W-63 Waste Site Map

Site: UPR-200-W-63	Area: T Plant	Category: Shallow – Surface Only

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Site: UPR-200-W-65	Area: T Plant	Category: Shallow – Surface Only

Site Description

Site Type: Unplanned Release
Facility/Geographic Area: T Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Service Dates: 1969

Waste Site Location and Physical Description: The contamination was found in the T Plant railroad cut, which is located on the west side of the 221-T Facility adjacent to the railroad tunnel (Figure 1). The railroad cut is currently posted as a Contamination Area, extending from the tunnel door westward to a chain link gate and fence. In 1969, the areas described in the occurrence report were decontaminated.

Waste Site Coordinates:
E-567354.24999 N-137135.57814

Site Dimensions:
Site Length: 114 m (375 ft)
Site Width: 1 m (3 ft)
Site Area: Not applicable
Site Depth: Surface
Cover Thickness: Not specified

Related Site Structure(s): The UPR-200-W-65 waste site is associated with the 221-T Building and may overlap with UPR-200-W-4, UPR-200-W-58, and UPR-200-W-73.

Site Posting: The railroad cut is currently posted as a Contamination Area.

Site History

Release Summary: Contaminated equipment was sent to T Plant on railcars for repair and decontamination. On October 27, 1969, contamination was found during a routine survey of the 221-T Plant railroad cut. Spots of contamination from 5,000 cpm to 150 millirads/hour were found between the rails of the spur line and adjacent to the spur line. One area, about 46 m (50 yd) from the tunnel door, was generally contaminated over an area measuring 1 m (3 ft) by 3 m (10 ft). From this area west, the contamination spots were spaced a few inches to a few feet until approximately 114 m (375 ft) from the tunnel door, where the contamination was non-detectable. The exact source of the contamination is unknown, but the location limits the cause to a rail car carrying radioactive material which was not effectively contained.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Site: UPR-200-W-65	Area: T Plant	Category: Shallow – Surface Only

Previous Site Characterization

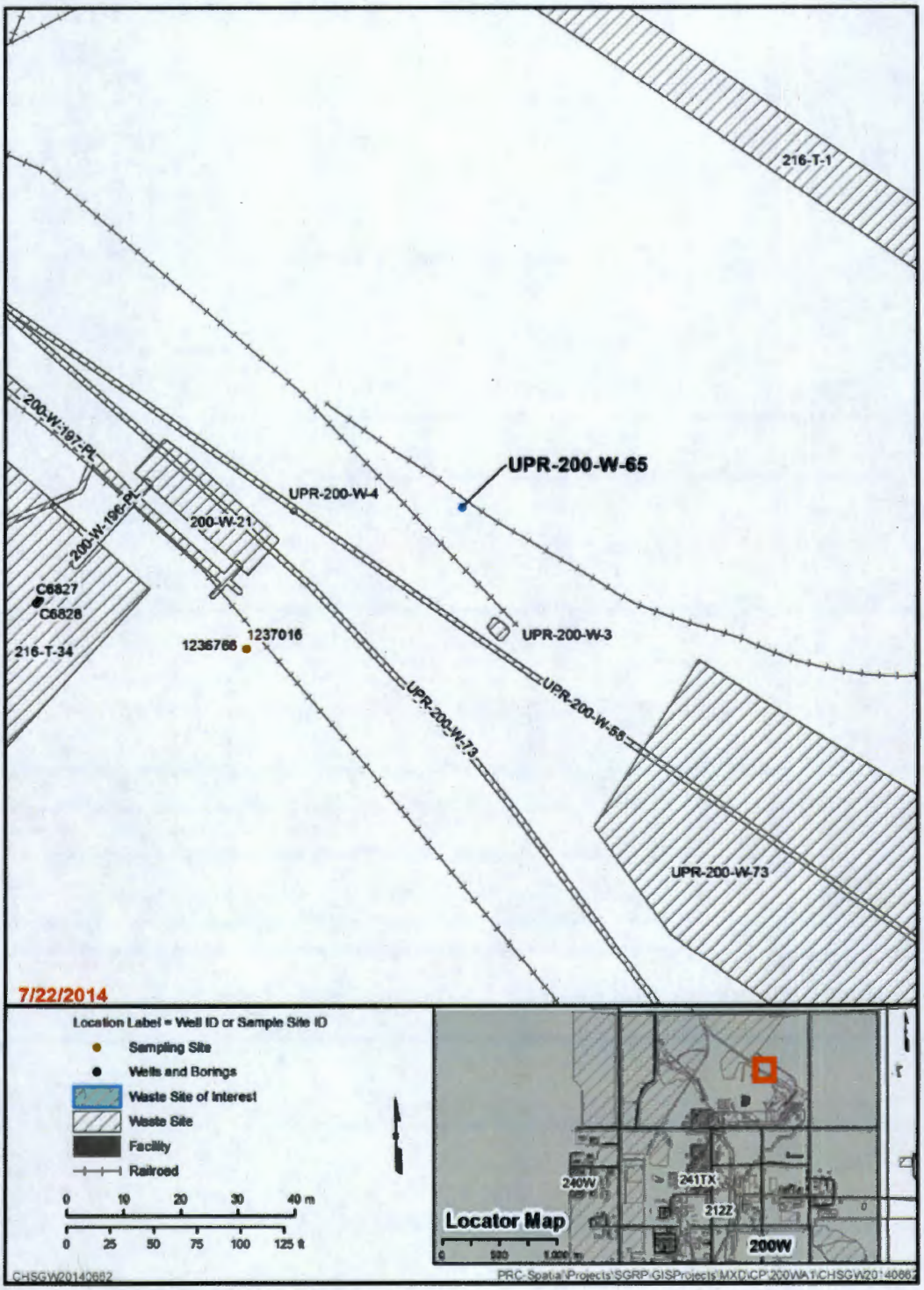
Site Characterization Summary: Characterization information is not available for the site.

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Potential radiological contamination at the surface.

References:
Waste Information Data System General Summary Report for the UPR-200-W-65 Waste Site.

Site: UPR-200-W-65	Area: T Plant	Category: Shallow – Surface Only



ID = identification

Figure 1. UPR-200-W-65 Waste Site Map

Site: UPR-200-W-65	Area: T Plant	Category: Shallow – Surface Only

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Site: UPR-200-W-67	Area: T Plant	Category: Shallow – Surface Only

Site Description

Site Type: Unplanned Release
Facility/Geographic Area: T Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Service Dates: 1970

Waste Site Location and Physical Description: The contamination was located on the north side of 2706-T Building adjacent to the MO433 trailer (Figure 1). The unplanned release site is marked with a single post with a Waste Information Data System (WIDS) site number sign. The sign is adjacent to the MO433 trailer. A site visit in October 1991 found a fence surrounding the 2706-T Building on the south, west, and north sides extending about 30.48 m (100 ft) from the building. The north side of the building is paved with gravel and is used for equipment storage. No mention of any action concerning cleanup has been found.

Waste Site Coordinates:
E-567536.49997 N-136923.39061

Site Dimensions:
Site Length: 7.32 m (24 ft) Site Depth: Not applicable
Site Width: 0.91 m (3.0 ft) Cover Thickness: Not applicable
Site Area: Not applicable

Related Site Structure(s): Not applicable.

Site Posting: Not applicable.

Site History

Release Summary: The 2706-T Building is a vehicle and equipment decontamination facility. On August 5, 1970, a contaminated electric lift from the 221-B Plant was parked outside a radiation zone on the north side of the 2706-T Building. Contamination from the vehicle affected the ground beneath the vehicle to a maximum of 20,000 cpm and the contaminated electric lift read as high as 500 millirads/hour.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Site: UPR-200-W-67	Area: T Plant	Category: Shallow – Surface Only

Previous Site Characterization

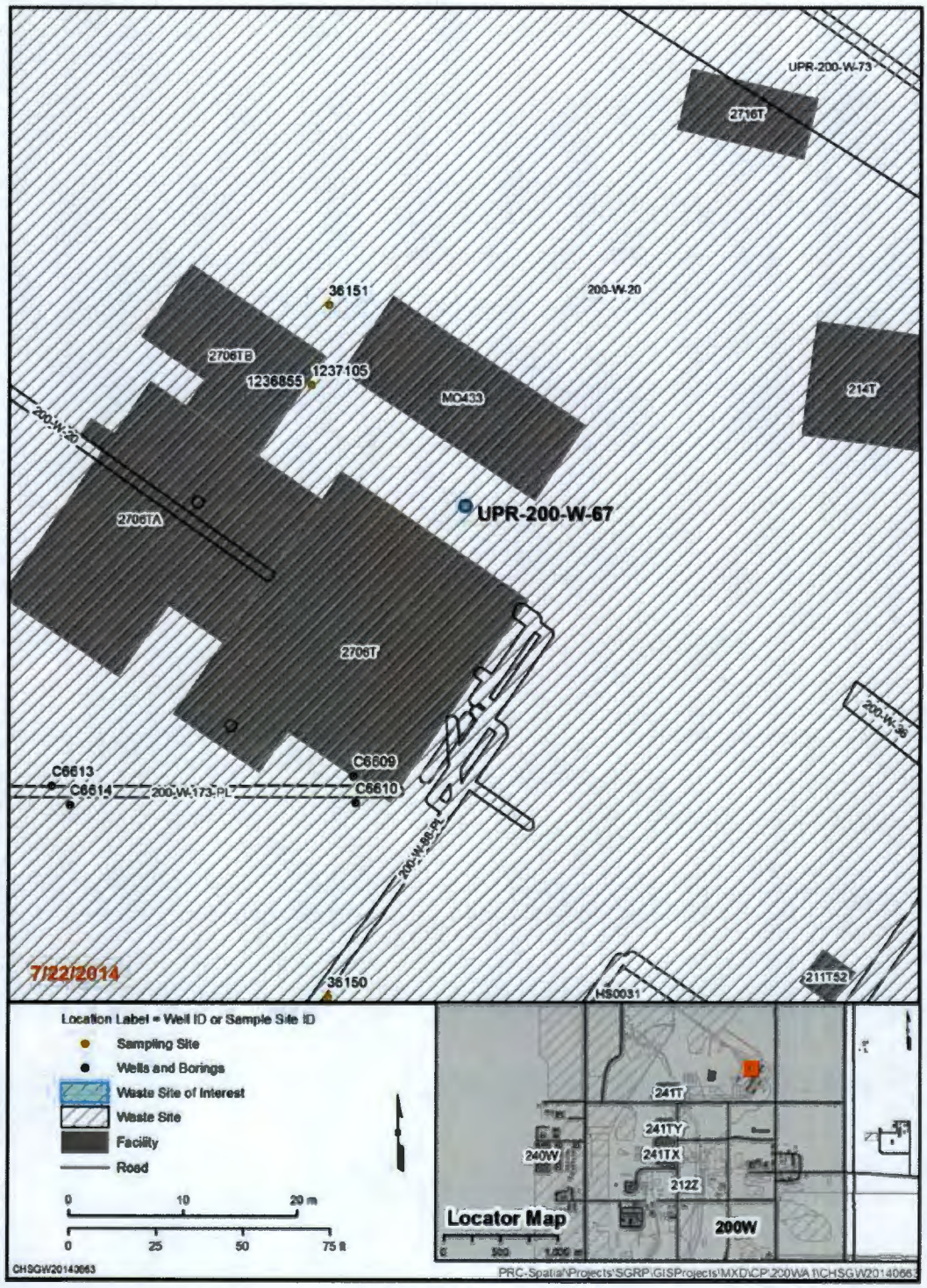
Site Characterization Summary: Characterization information is not available for this site.

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Potential radiological contamination at the surface.

References:
WIDS General Summary Report for the UPR-200-W-67 Waste Site.

Site: UPR-200-W-67	Area: T Plant	Category: Shallow – Surface Only



ID = identification

Figure 1. UPR-200-W-67 Waste Site Map

Site: UPR-200-W-67	Area: T Plant	Category: Shallow – Surface Only

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Site: UPR-200-W-73	Area: T Plant	Category: Shallow - Subsurface

Site Description

Alternate Site Identification: Contaminated Railroad Track at 221-T, UN-200-W-73
Site Type: Unplanned Release
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Service Dates: 1974

Waste Site Location and Physical Description: The UPR-200-W-73 waste site was an unplanned release (UPR) of contaminated waste on a rail road cut adjacent to the 221-T Tunnel. The release occurred on the track section that connects the 221-T Building Tunnel to the 2706-T Building (Figure 1). The UPR and the rail spur leading into 2706-T Facility are not posted. No engineering reference drawings are available for this site.

Waste Site Coordinates:
E-567487.37194 N-137022.82227

Site Dimensions:
Site Length: 366 m (1,200 ft) Site Depth: Not specified
Site Width: 6 m (20 ft) Cover Thickness: Not specified
Site Area: 2,233 m^2 (24,000 ft^2)

Related Site Structure(s): The UPR-200-W-73 waste site is associated with the 2607-T and 221-T Buildings and may overlap with UPR-200-W-4, UPR-200-W-58, and UPR-200-W-65.

Site Posting: The posting for the UPR-200-W-73 waste site is not specified.

Site History

Release Summary: Site UPR-200-W-73 is located on railroad tracks that were used to transfer contaminated equipment to and from the T Plant for repairs and decontamination. This waste site consists of several spots of ground contamination that were created as a result of a multi-purpose transfer box rail car leaking decontamination solution onto the railroad tracks and ground. The releases occurred through a hair-line crack in a weld of the outer shell of the transfer box. Decontamination solution seeped through the crack, and then subsequently leaked onto the rail track while the transfer box was in motion.

The total volume of waste released via the leak in the transfer box is not known. Therefore, no volume estimates can be ascertained for this site.

Site: UPR-200-W-73	Area: T Plant	Category: Shallow - Subsurface

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: On October 14, 1974, contamination levels up to 3,800 millirads per hour were detected on the bed of the multi-purpose transfer box railroad car. The rail car was scheduled for decontamination the following day. During the decontamination, a hair-line crack was observed in a weld of the outer shell of the transfer box. On October 16, 1974, detectable radiation levels on the transfer box had been reduced to 350 millirads per hour and 600 cpm smearable. Following the decontamination effort, the railcar was moved to the 2706-T Building for repairs. The railcar was investigated a second time at 2706-T, and readings suggested that further contamination had leaked from the rail car. Radiation readings on the rail car had increased from 600 cpm smearable to 50,000 cpm smearable. A subsequent investigation occurred for an estimated 366.0 m (400 yd) of railroad track located between the 221-T Building Tunnel and the 2706-T Building. During the survey, several patches of soil contamination were located with beta/gamma readings up to 40 millirads per hour. It is not specified what, if any, surface stabilization efforts occurred following the discovery of the ground and rail track contamination. No occurrence reports have been presented that discuss cleanup efforts along the rail line or on the ground.

The only survey information that is presented after the 1974 incident occurred on March 7, 2000. On that date, a site walkdown occurred for verification purposes. The survey confirmed that the spur leading to the 2706-T Building was not radiologically posted.

It is not specified if any surface stabilization work has occurred at 200-W-73. It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided for the site. If surveys do occur, their frequency is not specified.

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Potential radiological contamination in the subsurface.

References:
Waste Information Data System General Summary Report for the UPR-200-W-73 Waste Site.

Site: UPR-200-W-73	Area: T Plant	Category: Shallow - Subsurface

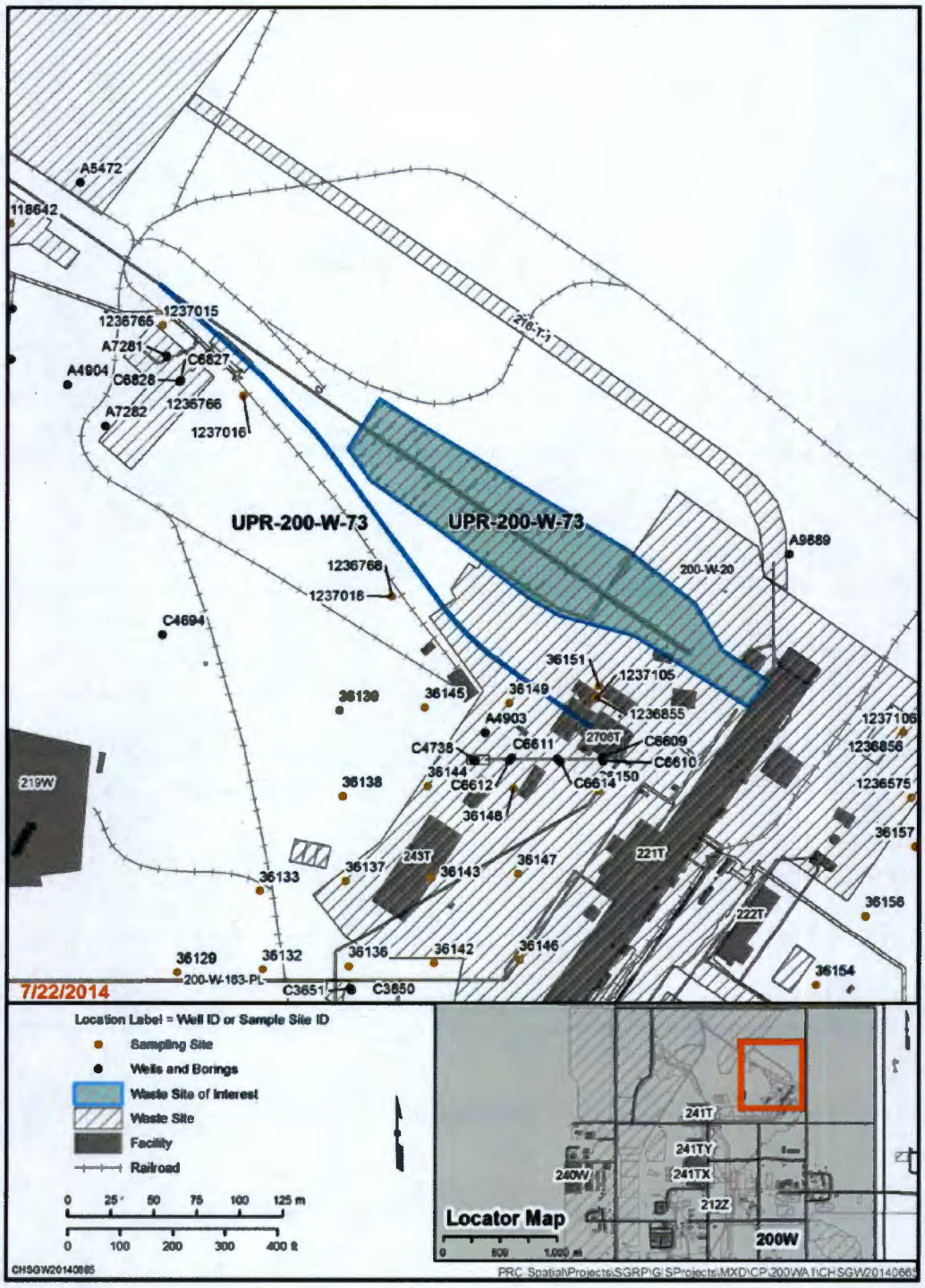

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Figure 1. UPR-200-W-73 Waste Site Map

Site: UPR-200-W-73	Area: T Plant	Category: Shallow - Subsurface

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Site: UPR-200-W-76	Area: T Plant	Category: Shallow – Surface Only

Site Description

Alternate Site Identification: Un-200-W-76, Contamination Found at 241-TX-155
Site Type: Unplanned Release
Facility/Geographic Area: T Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-IS-1
Service Dates: Not Applicable

Waste Site Location and Physical Description: The site is located east of Camden Avenue at an area surrounding the 241-TX-152 Diversion Box, 241-TX-155 Diversion Box, and 241-TX-302B Catch Tank (Figure 1). The area around the 241-TX-152 Diversion Box is surrounded with posts and chain. A black and white site number sign reading "WIDS UPR-200-W-76" is hanging on the chain. There are power poles and an electrical box inside the posted area along with the241-TX-152 Diversion Box.

Waste Site Coordinates:
E-567121 (m) N-136133 (m)

Site Dimensions:
Site Length: 91.44 m (300.00 ft) Site Depth: Not applicable
Site Width: 45.72 m (150.00 ft) Cover Thickness: 0.15 m (0.5 ft)
Site Area: 4,180 m^2 (45,000 ft^2)

Related Site Structure(s): The UPR-200-W-76 waste site is associated with 241-TX-155 and 241-TX-152 Diversion Boxes, and 241-TX-302B Catch Tank.

Site Posting: The UPR-200-W-76 waste site is posted with Bio-Barrier and Underground Radioactive Material signs. A single white sign with black letters reading "WIDS UPR-200-W-76" is hanging on the chain near the south side of the 241-TX-152 Diversion Box.

Site History

Release Summary: On August 24, 1977, contaminated rabbit fecal pellets were found around the 241-TX-155 Diversion Box. A more extensive survey revealed contaminated pellets with readings as high as 100 millirads per hour scattered in an area of about 45.7 m (50 yd) by 91.4 m (100 yd) around the diversion box. Two pellets were analyzed for radiological contaminants and found to contain mostly cesium-137. Subsequent surveys found additional spotty contamination extending in a 152 m (500 ft) radius around the 241-TX-155 Diversion Box. The source of the contamination was traced to leaks from the 241-TX-155 Diversion Box. The east side of the diversion box had been partially excavated in 1976. The excavation was left open for more than a year, allowing access for animal intrusion.

Site: UPR-200-W-76	Area: T Plant	Category: Shallow – Surface Only

Volume Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: Radioisotopic analyses on two individual rabbit pellets revealed: 18.6 µCi Cs-137 per gram of sample, 0.044 µCi Cs-134 per gram of sample, 0.093 µCi Eu-55 per gram of sample, 0.026 µCi Eu-54 per gram of sample, and 2.63 µCi Sr-90 per gram of sample. Beta-gamma readings up to 100 millirads per hour were found. Subsequent surveys found additional contamination reading from 500 to 100,000 in small spots within a 152 m (500 ft) radius around the 241-TX-155 Diversion Box.

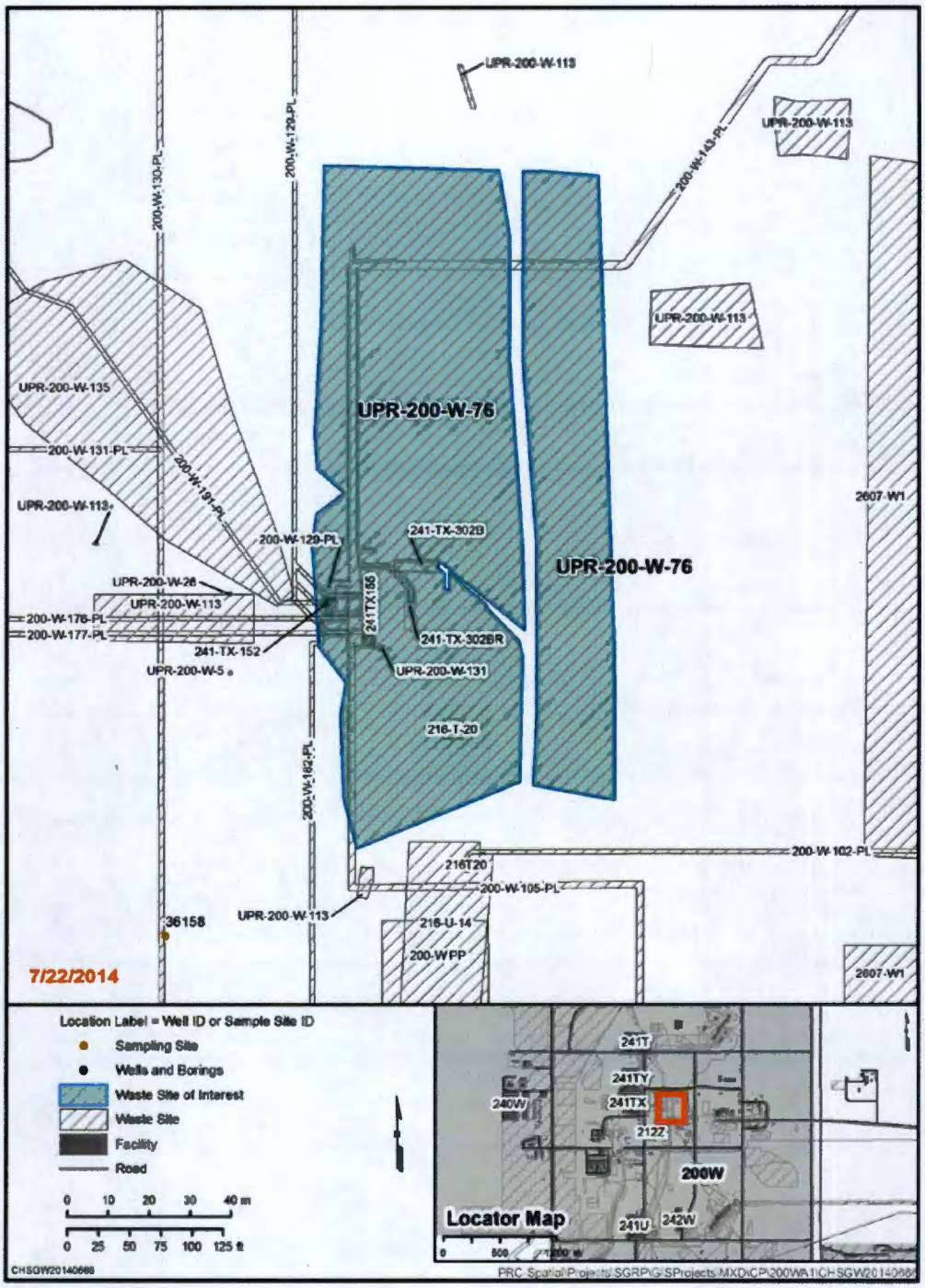
In 1977, an area approximately 91 m by 45 m (300 by 150 ft) around the diversion box was cleaned up and the contaminated rabbit droppings and soil were taken to dry waste burial. Contaminated soil was removed from the excavation hole to the extent possible and buried. Clean soil was used to replace the removed soil and cover the remaining contaminated soil.

In August 2000, the radiologically posted area around the 241-TX-155 and 241-TX 152 Diversion Boxes was covered with a layer of gravel and posted with Bio-Barrier signs.

Nature and Extent of Contamination: Potential radiological contamination in the surface soil (0 to 1 ft). No data are available to evaluate shallow soil contamination. Site boundaries shown in Figure 1 are approximate.

References:
All information from Waste Information Data System General Summary Report unless otherwise noted.

Site: UPR-200-W-76	Area: T Plant	Category: Shallow – Surface Only



ID = identification

Figure 1. UPR-200-W-76 Waste Site Map

Site: UPR-200-W-76	Area: T Plant	Category: Shallow – Surface Only

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Site: UPR-200-W-99	Area: T Plant	Category: Shallow - Subsurface

Site Description

Site Type: Unplanned Release
Facility/Geographic Area: 200 Inner Area West
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UR-1
Occurrence Date: September 21, 1966

Waste Site Location and Physical Description: The unplanned release occurred on the east side of Camden Ave., east of the 241-TX Tank Farm, extending approximately 69 to 91 m (225 to 300 ft) east of Camden Ave (Figure 1).

Waste Site Coordinates:
E-566911.97283 N-136176.40384

Site Dimensions:
Original Release Area Dimensions
Site Length: 229 m (750 ft) Site Width: 91 m (300 ft)
Site Area: 20,930 m^2 (225,000 ft^2)

Stabilized Area Dimensions
Site Length: 229 m (750 ft) Cover Thickness: Unspecified
Site Width: 44 m (144 ft) Site Area: 10,120 m^2 (108,000 ft^2)

Related Site Structure(s): The unplanned release is associated with the 241-TX-153 Diversion Box and Camden Ave.

Site Posting: The unplanned release is marked with Underground Radioactive Material Area (URMA) signs.

Site History

Release Summary: Two plumes of airborne contamination from the 241-TX-153 Diversion Box floated northeast and southeast. The releases contaminated the ground and road on both sides of Camden Avenue. The maximum contamination found around the diversion box was 700 millirem per hour and the airborne particles contained approximately 1 Ci of strontium-90.

Volume/Mass Discharged: Unspecified.

Pore Volume Discharged: Unknown.

Site: UPR-200-W-99	Area: T Plant	Category: Shallow - Subsurface

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: In 1966 the road contamination was covered with a new tar mat and the sides of the road were fixed with tar. In 1976, a road grader on the east side of Camden Avenue pushed the contamination into windrows. Test plots revealed the presence of a thin layer of strontium-90 particles. This area on the east side of Camden Ave. was stabilized in 1990 with clean soil and grass, surrounded with URMA signs and maintained by Bechtel Hanford, Inc.

The area on the west side of Camden Ave., adjacent to the tank farm fence, was covered with gravel, but was re-contaminated by windblown particles from the 241-TX Tank Farm in 1993. In 2001, the area on the west side of Camden Ave. was no longer marked or posted.

Soil data from several boreholes installed within the site area are available (Tables 1 through 4). Data from 1.5 m (5 ft) below ground surface (bgs) indicates low level radiological contamination. Well and boring locations are shown on Figure 1.

Table 1 Borehole Summary UPR-200-W-99

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2000	299-W14-15/C3114	Within site, north of middle	Not specified (5 samples)
2002	299-W14-19/C3957	Within site, south of middle	0 - 345 (GPL) 0 - 30 (2 samples)
2009	299-W14-20/C7018	North boundary of site	0 – 435 (GPL) 90 – 310 (11 samples)

GPL = geophysical log
ID = identification

Site: UPR-200-W-99	Area: T Plant	Category: Shallow - Subsurface

Table 2. Geophysical Log Summary for the UPR-200-W-99 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
C3957	0 – 5	1.04	pCi/g	4.0	7619.22	cpm	4
	5 – 10	–	pCi/g	–	7573.38	cpm	9
	10 – 15	–	pCi/g	–	6760.62	cpm	12
	>15	–	pCi/g	–	16886	cpm	102

bgs = below ground surface

Table 3. Soil Maximum Detection Summary (Soil Borehole C3114)

Chemical	Sample Interval: 0-15 ft			Sample Interval: > 15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Arsenic	–	–	–	3,300	µg/kg	–
Barium	–	–	–	79,100	µg/kg	–
Cadmium	–	–	–	50	µg/kg	–
Cesium-137	4.86	pCi/g	10	4.36	pCi/g	–
Chromium	–	–	–	302,000	µg/kg	–
Lead	–	–	–	5,800	µg/kg	–
Nitrate	–	–	–	22,000	µg/kg	–
Plutonium-239/240	–	–	–	0.031	pCi/g	–
Potassium-40	14.4	pCi/g	10	13.4	pCi/g	–
Radium-226	0.598	pCi/g	10	0.519	pCi/g	–
Radium-228	0.934	pCi/g	10	0.874	pCi/g	–
Thorium-228	0.949	pCi/g	10	0.934	pCi/g	–
Thorium-230	0.563	pCi/g	10	0.913	pCi/g	–
Thorium-232	0.934	pCi/g	10	0.874	pCi/g	–

Site: UPR-200-W-99	Area: T Plant	Category: Shallow - Subsurface

Table 3. Soil Maximum Detection Summary (Soil Borehole C3114)

Chemical	Sample Interval: 0-15 ft			Sample Interval: > 15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Total beta radiostrontium	11.5	pCi/g	10	4.69	pCi/g	–
Tritium	–	–	–	0.107	pCi/g	–
Uranium	–	–	–	908	µg/kg	–
Uranium-233/234	0.554	pCi/g	10	0.468	pCi/g	–
Uranium-238	0.59	pCi/g	10	0.696	pCi/g	–

Table 4. Soil Maximum Detection Summary (Soil Borehole C3957)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
2-Chlorophenol	23	µg/kg	5	–	–	–
4-Chloro-3-methylphenol	22	µg/kg	5	–	–	–
Antimony	–	–	–	260	µg/kg	30
Arsenic	1,100	µg/kg	5	3,200	µg/kg	30
Barium	46,000	µg/kg	5	73,700	µg/kg	30
Beryllium	290	µg/kg	5	430	µg/kg	30
Bis(2-ethylhexyl) phthalate	790	µg/kg	5	41	µg/kg	30
Carbon-14	3.28	pCi/g	5	2.61	pCi/g	30
Cesium-137	–	–	–	0.162	pCi/g	30
Chromium	11,200	µg/kg	5	24,700	µg/kg	30
Copper	13,800	µg/kg	5	14,400	µg/kg	30
Di-n-butylphthalate	43	µg/kg	5	19	µg/kg	30
Hexavalent Chromium	740	µg/kg	5	–	–	–
Lead	2,100	µg/kg	5	3,200	µg/kg	30

Site: UPR-200-W-99	Area: T Plant	Category: Shallow - Subsurface

Table 4. Soil Maximum Detection Summary (Soil Borehole C3957)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Manganese	310,000	µg/kg	5	320,000	µg/kg	30
Methylene chloride	12	µg/kg	5	16	µg/kg	30
Molybdenum	480	µg/kg	5	1,500	µg/kg	30
Nickel	12,500	µg/kg	5	10,100	µg/kg	30
Nitrate	7,600	µg/kg	5	27,100	µg/kg	30
n-Nitrosodi-n-dipropylamine	19	µg/kg	5	–	–	–
Phenol	40	µg/kg	5	–	–	–
Potassium-40	11.1	pCi/g	5	13	pCi/g	30
Pyrene	20	µg/kg	5	–	–	–
Radium-226	0.269	pCi/g	5	0.576	pCi/g	30
Radium-228	–	–	–	0.78	pCi/g	30
Selenium	570	µg/kg	5	–	–	–
Thorium-228	0.564	pCi/g	5	0.733	pCi/g	30
Thorium-230	0.359	pCi/g	5	0.317	pCi/g	30
Thorium-232	0.606	pCi/g	5	0.78	pCi/g	30
Tin	1,700	µg/kg	5	2500	µg/kg	30
Tin-126	–	–	–	0.222	pCi/g	30
Total beta radiostrontium	–	–	–	0.839	pCi/g	30
Total petroleum hydrocarbons	24,200	µg/kg	5	18,800	µg/kg	30
Uranium-233/234	–	–	–	0.361	pCi/g	30
Uranium-238	0.455	pCi/g	5	0.662	pCi/g	30
Vanadium	33,700	µg/kg	5	59,500	µg/kg	30
Zinc	33,400	µg/kg	5	43,200	µg/kg	30

Site: UPR-200-W-99	Area: T Plant	Category: Shallow - Subsurface

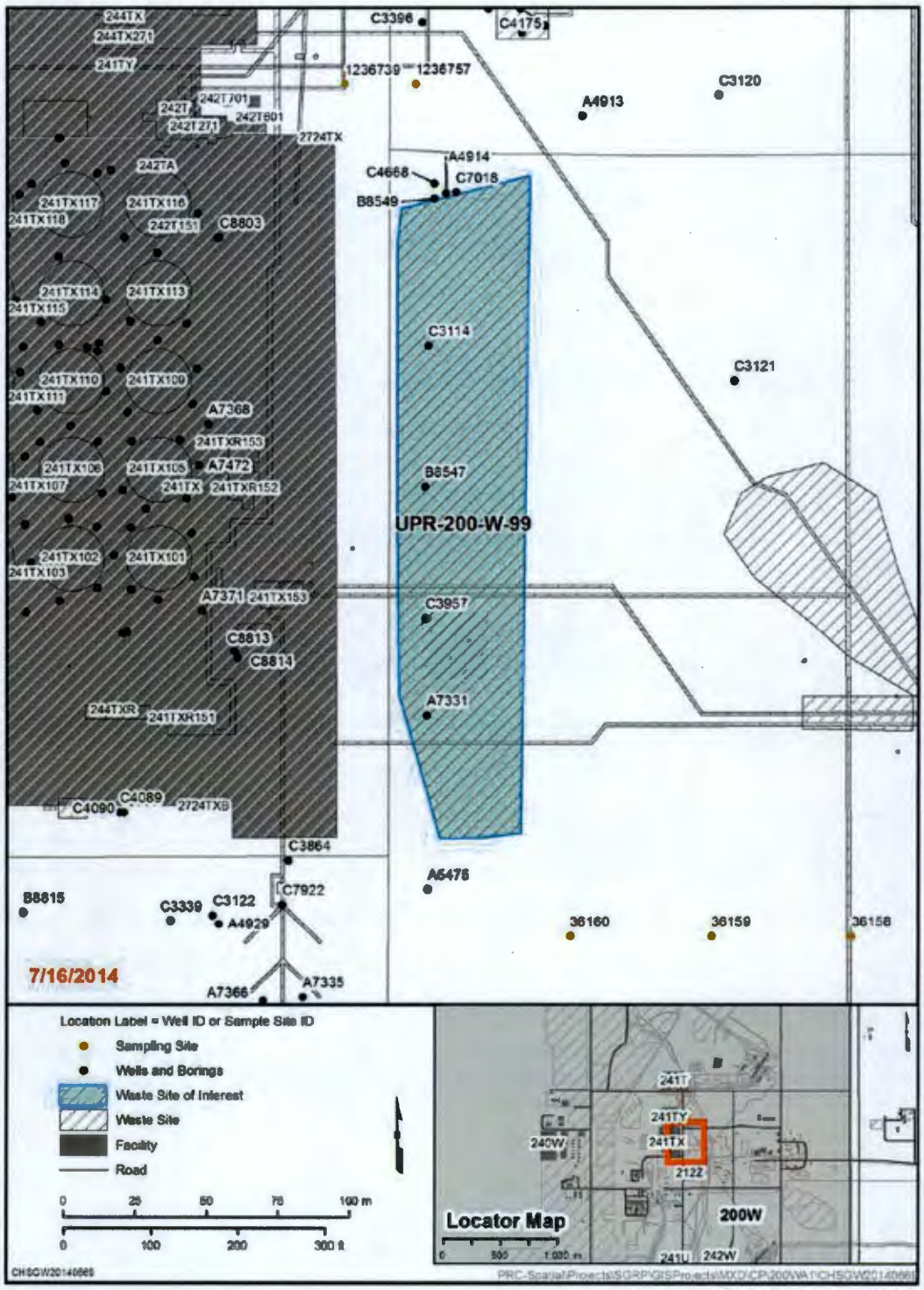
Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 – 15 ft] bgs): Potential radiological contamination in the subsurface.

References:

Waste Information Data System General Summary Report for the UPR-200-W-99 Waste Site.

Site: UPR-200-W-99	Area: T Plant	Category: Shallow - Subsurface



ID = identification

Figure 1. UPR-200-W-99 Waste Site Map

Site: UPR-200-W-99	Area: T Plant	Category: Shallow - Subsurface

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Site: UPR-200-W-166	Area: T Plant	Category: Shallow – Subsurface

Site Description

Site Type: Unplanned Release
Facility/Geographic Area: T Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UR-1
Occurrence Date: Unspecified

Waste Site Location and Physical Description: In 1985, the unplanned release site was originally a large, irregularly shaped area of surface contamination located north and east of the 241-T Tank Farm, west of the 216-T-14 through 216-T-17 Trenches and surrounding the 207-T Retention Basin (Figure 1). In 1996, additional contamination was found east of the 207-T Retention Basin and was also considered to be UPR-200-W-166.

Waste Site Coordinates:
E-566923.02618 N-136841.12779

Site Dimensions:
Site Area: 25.7E+03 m^2 (276.6E+03 ft^2) Cover Thickness: Unspecified
*This is the approximate size of the original surface contamination area that was removed.

Site Dimensions:
Site Length: 87 m (285 ft) Site Depth: varies across previous sloped hillside
Site Width: 23 m (75 ft) Cover Thickness: 45.7 to 60.1 cm (18 to 24 in.) of clean soil
Site Area: 2,000 m^2 (21,400 ft^2)
Area estimated on Figure 2.

Related Site Structure(s): The unplanned release was associated with the 216-T-14 through 216-T-17 Trenches, 241-T Tank Farm, the 207-T Retention Basin and the 200-W-53 waste site.

Site Posting: The unplanned release area is not marked or posted.

Site History

Release Summary: Contamination in the soil surrounding the exterior of the 241-T Tank Farm and the 207-T Retention Basin ranged from 25,000 to 250,000 dpm. The source of the contamination is suspected to be years of operating activities in the tank farm and dried particles blowing out of the retention basin.

Volume/Mass Discharged: Unknown.

Site: UPR-200-W-166	Area: T Plant	Category: Shallow – Subsurface

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: In 1991, the contaminated interior fenced area of the 241-T Tank Farm (not part of the UPR-200-W-166 waste site) was decontaminated and covered by a layer of clean gravel, which eliminated one source of contamination. In 1992, the Radiation Area Removal Action group scraped the contaminated soil at the UPR 200-W-166 waste site and consolidated it on the west slope of the 216-T-14 through 216-T-17 Trenches. The slope and the trenches were covered with a layer of clean dirt and posted as an Underground Radioactive Material Area. The scraped area was radiologically surveyed, sampled, and released from radiological posting.

In 1994, an additional area of surface soil contamination was identified east of the 207-T Retention Basin and the 216-T-14 through 216-T-17 Trenches. It was assumed that the contamination had also spread with the wind from the 241-T Tank Farm; at that time the area was also called UPR-200-W-166. This area of contamination was scraped and placed into the 207-T Retention Basin in 1996. Reference to the contamination found east of the 207-T Retention Basin and the 216-T-14 through 216-T-17 Trenches is now known as 200-W-53. Annual radiological surveys and annual herbicide applications are performed on the 216-T-14 through 216-T-17 Trenches.

Nature and Extent of Contamination:

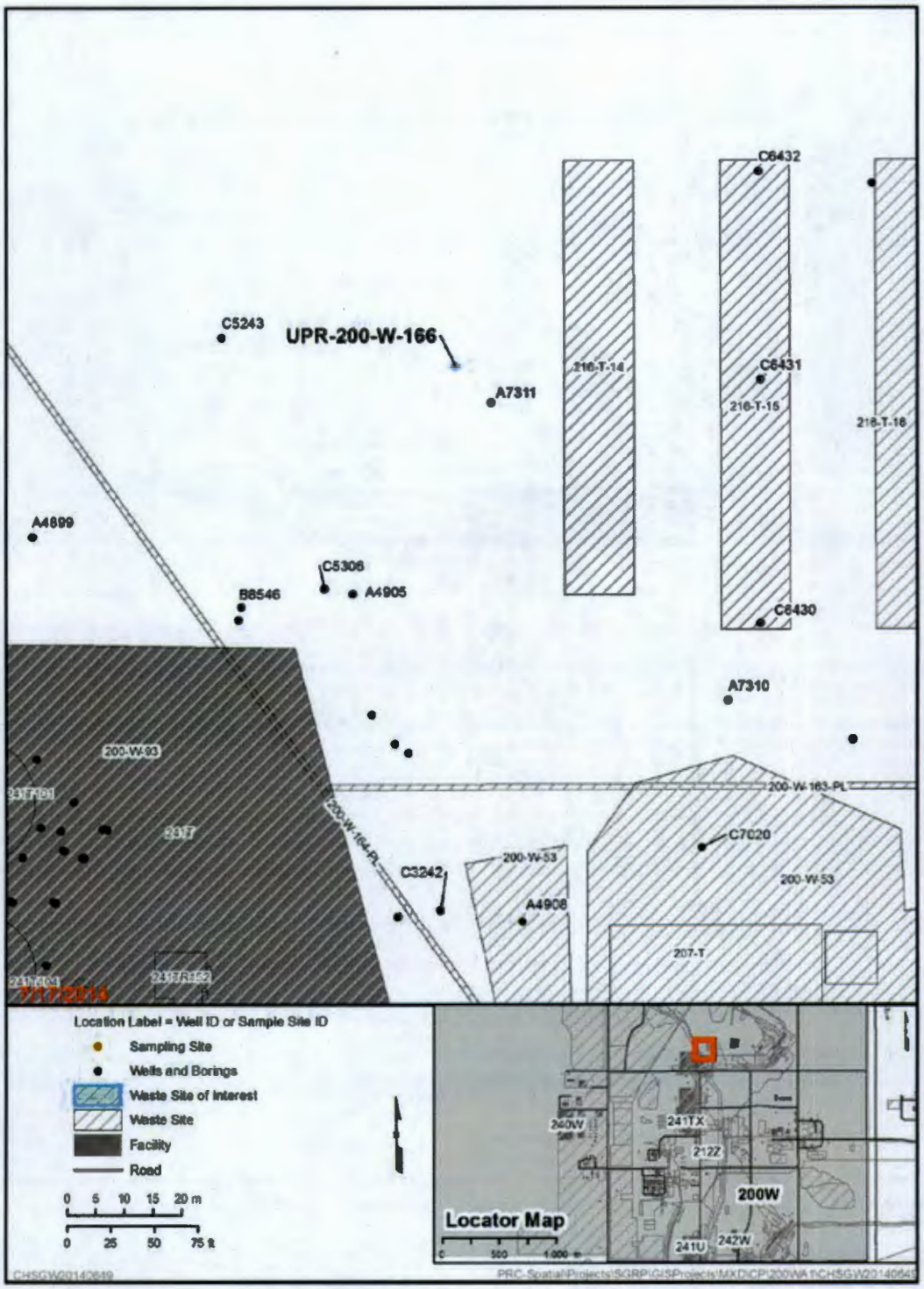
Shallow (0 – 4.6 M [0 – 15 ft] below ground surface [bgs]): Potential radiological contamination at the surface.

References:

Waste Information Data System General Summary Report for the UPR-200-W-166 Waste Site.

WHC-SD-DD-AP-013, 1992, *UN-216-W-31 Unplanned Release Site Interim Stabilization Plan and Alternatives Evaluation*, Rev. 0A, Westinghouse Hanford Company, Richland, Washington.

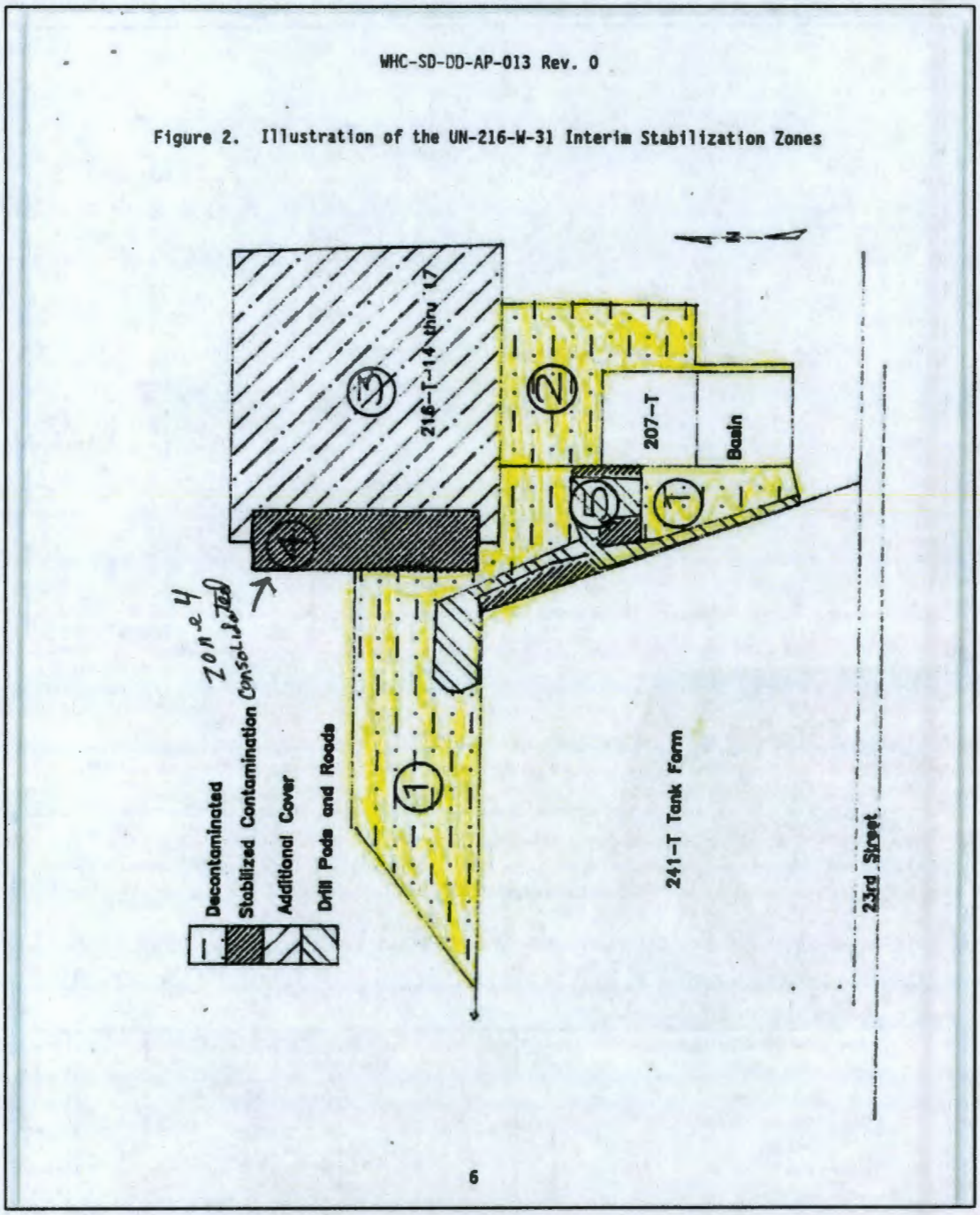
Site: UPR-200-W-166	Area: T Plant	Category: Shallow – Subsurface



ID = identification

Figure 1. UPR-200-W-166 Waste Site Map

Site: UPR-200-W-166	Area: T Plant	Category: Shallow – Subsurface



Source: WHC-SD-DD-AP-013, *UN-216-W-31 Unplanned Release Site Interim Stabilization Plan and Alternatives Evaluation*.

Note: Produced from the best available copy.

Figure 2. Sketch of Stabilized Area and UPR-200-W-166 (Zone 4)

Site: 200-W-12	Area: U Plant	Category: Shallow - Subsurface

Site Description

Alternate Site Identification (ID): 201-W Soil Mound and Plastic Pipe
Site Type: Dumping Area
Facility/Geographic Area: U Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Service Dates: Not Specified

Waste Site Location and Physical Description: The 200-W-12 waste site is northwest of 201-W, adjacent to the 1970s Reduction-Oxidation (REDOX) Facility, and an estimated 75 m (246 ft) north of 13th Street. The site is also west of Albany Avenue (Figure 1). Site 200-W-12 is a soil mound with one plastic pipe extending 0.8 m (2.5 ft) aboveground, and a second pipe extending 20 cm (8 in.) aboveground. The second pipe is topped with tees and elbows. In addition, insulated electrical wires and an electric heat controller are visible. It has been speculated that a tank could be buried beneath the site; however, this has not been verified. The mound rises roughly 0.6 m (2 ft) aboveground. No soil discoloration is visible, and the site has a moderate growth of rabbitbrush present. No reference drawings are available for this site.

Waste Site Coordinates:
E-568154.72997 N-134443.43306

Site Dimensions:
Site Length: 3.7 m (12.0 ft) Site Depth: Not specified
Site Width: 1.8 m (6.0 ft) Cover Thickness: Not specified
Site Area: Not specified

Related Site Structure(s): The 200-W-12 waste site was associated with other, neighboring test sites (200-W-35 and 200-W-10).

Site Posting: The posting for site 200-W-12 is not specified.

Site History

Release Summary: It is not specified when site 200-W-12 was constructed. In addition, the exact purpose the site fulfilled is not clear. It is thought 200-W-12 was used to test equipment and evaluate processes in support of waste management operations during the 1970s. The site is adjacent to several test sites and pits that were used to evaluate grout, slurry, and soil infiltration from the late 1970s to early 1980s. 200-W-12 was likely selected as a test site due to its location next to the REDOX Facility and because the site and surrounding facilities were free of any pre-existing contamination. However, several staff members that were involved with the grout, slurry, and infiltration testing had no

Site: 200-W-12	Area: U Plant	Category: Shallow - Subsurface

knowledge of this site when interviewed. Interviewed staff members were also uncertain regarding use of the associated plastic piping. In addition, it is possible a tank or some other form of disposed waste is buried beneath the vents. It is stated that 200-W-12 may warrant a Solid Waste Management Unit consideration based on discarded materials at the site. Thus, despite the site most likely being a test mound, Site 200-W-12 cannot be rejected as a waste management unit until proven otherwise.

The type and volume of waste released at 200-W-12 are not specified. Therefore, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: Two site walkdowns have occurred at 200-W-12. The first occurred on August 7, 1995, as part of an initial review of the site. The second survey took place on August 18, 1999, as part of a radiation area remedial action walkdown. During that survey, the mound was noted and described as a small mound of dirt with polyvinyl chloride piping protruding from the top of the mound.

A global positioning system survey mapped the boundaries of the site from October 25 to November 14, 1995.

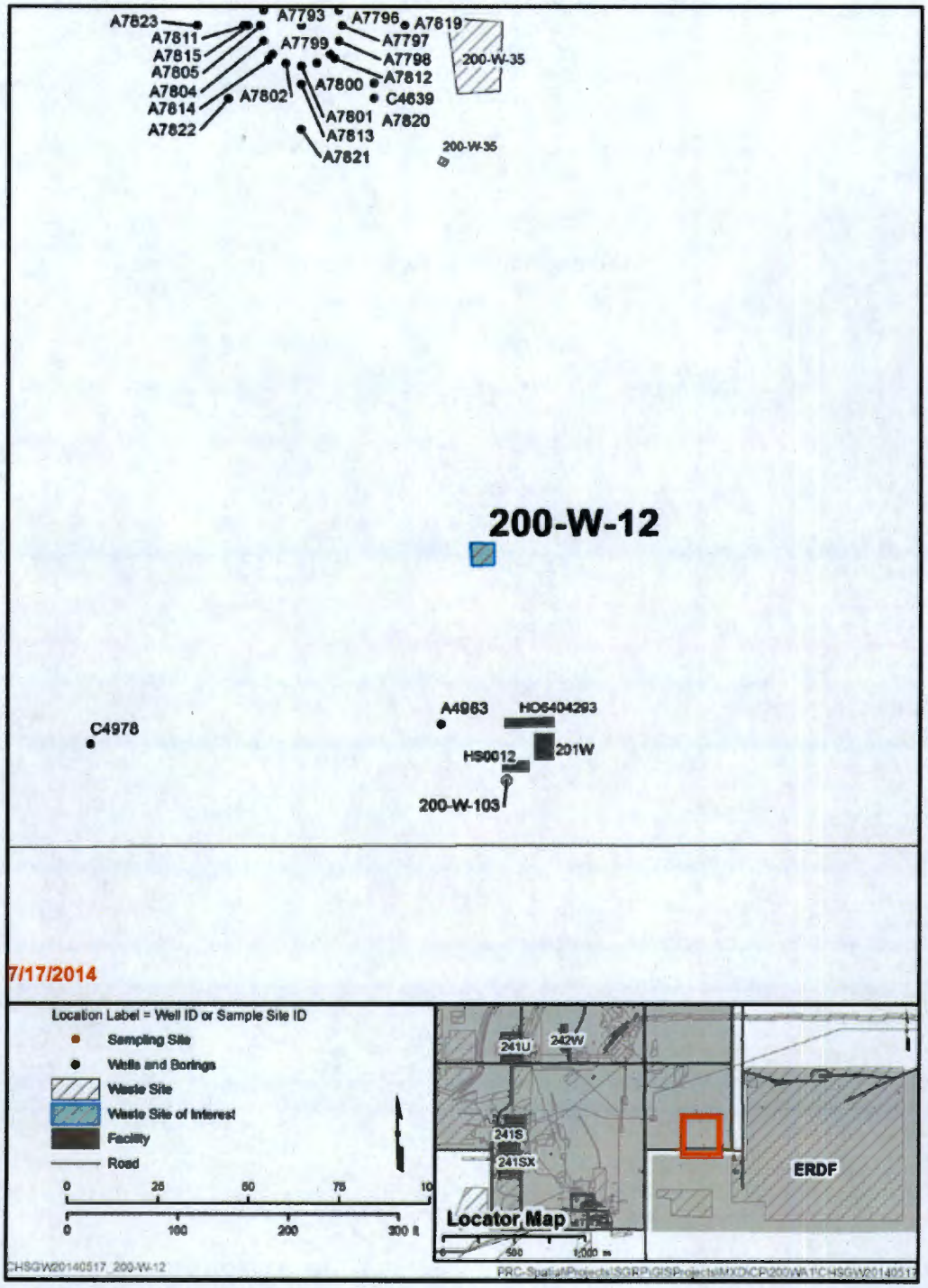
It is not specified if any remediation work has occurred at the site. In addition, no radiological survey information is presented for 200-W-12. Thus, it is unclear what the radiological conditions are within the site. It is also unclear if 200-W-12 is routinely surveyed or monitored, as no survey results or sample data analyses are provided. If surveys do occur, their frequency is not specified.

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): Potential radiological contamination in the surface and/or subsurface.

References:
Waste Information Data System General Summary Report for the 200-W-12 Waste Site.

Site: 200-W-12	Area: U Plant	Category: Shallow - Subsurface



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 1. 200-W-12 Waste Site Map

Site: 200-W-12	Area: U Plant	Category: Shallow - Subsurface

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Site: 200-W-42	Area: U Plant	Category: Intermediate

Site Description

Alternate Site Identification: U-Plant Radioactive Process Sewer from 221-U to 216-U-8 and 216-U-12 Cribs
Site Type: Radioactive Process Sewer
Facility/Geographic Area: U Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1, 200-MG-1, or 200-MG-2
Service Dates: 1952 to 1988

Waste Site Location and Physical Description: The 200-2-42 waste site is an underground pipeline that extends from the 221-U Building to the 216-U-8 and 216-U-12 Cribs. It is located west of Beloit Avenue. A portion of the pipeline is north of 16th Street, but the majority of it is located south of 16th Street (Figures 1 and 2). The pipeline is constructed of 0.1 m (0.25 ft) diameter stainless steel upstream of the 270-W Neutralization Tank. The pipeline transitions to a 0.2 m (0.5 ft) vitrified clay pipeline (VCP) immediately downstream of the tank. The VCP was constructed with bell and spigot joints with an acid resistant seal.

A large portion of this pipeline was removed in 2006. The portion removed was from the 270-W Neutralization Tank (southward) to the 216-U-12 Crib. The excavation (approximately 4.6 m [15 ft] deep) was left open when remediation activities ceased in 2006. The open trench was marked with steel posts along the entire length. The angle of the side slopes was greater than the requirements for safe entry. The steepness of the slope resulted in surveillance, tumbleweed removal, and sampling activities being conducted remotely from the top of the trench.

Blown in tumbleweeds and live, growing contaminated tumbleweeds in the open trench caused the area to be posted as a Contamination Area. In 2010, 15.2 to 91.4 cm (6 to 36 in.) of clean backfill material was added to the open excavation on the south side of 16th Street. The area was downposted to Underground Radioactive Material Area. In 2012, 15.2 to 91.4 cm (6 to 36 in.) of clean backfill was added to the open excavation on the north side of 16th Street. This activity achieved a safe side slope and covered residual radiological contamination. The Contamination Area on the north side of 16th Street was downposted to an Underground Radioactive Material Area (URMA) in July 2012. A portion of the pipeline from 221-U to the neutralization tank still remains.

Waste Site Coordinates:
E-567598.08463 N-134714.09784

Site Dimensions:
Site Length: 646 m (2,119.4 ft) Site Depth: 3.1 m (10.0 ft)
Diameter: 0.1 m (0.25 ft) upstream of the 270 Neutralization Tank, 0.2 m (0.5 ft) downstream of the 270-W Neutralization Tank.

Site: 200-W-42	Area: U Plant	Category: Intermediate

Related Site Structure(s): The 200-W-42 waste site is associated with the 221-U Building, 224-U Facility, 270-W, 291-U Stack, 216-U-8 and 216-U-12 Cribs, UPR-200-W-163, 200-W-151-PL, and UPR-200-W-33.

Site Posting: Site 200-W-42 was downposted to an URMA following surface stabilization work in 2010.

Site History

Release Summary: The pipeline was used from 1952 to 1988 to convey acidic process condensate from the 221-U and 224-U Buildings and the 291-U Stack to the 216-U-8 and 216-U-12 Cribs. The pipeline was first connected to the 216-U-8 Crib; however, the 216-U-12 Crib was built in 1960 to replace the 216-U-8 Crib when evidence of a potential cave-in was detected. A wye joint was installed on the 216-U-8 Crib pipeline to redirect and extended the pipeline to the 216-U-12 Crib, which in turn was extended further to the south.

From 1952 to 1960, the pipeline conveyed waste from 221-U, 224-U, and 291-U to the 216-U-8 Crib. From April 1960 to May 1967, the pipeline conveyed waste from the 291-U Stack drainage, 241-WR Vault waste, and 224-U process condensate via C-5 Tank, to the 216-U-12 Crib. Additional waste conveyed through the pipeline consisted of occasional waste influxes from the C-7 Tank in the 244-U Building, and contaminated water from 241-WR Vault. The contaminated 241-WR Vault water was a single transfer event to the 216-U-12 Crib for disposal in October 1965. The water included 3.1 kg (6.9 lb) of thorium.

From May 1967 to September 1972, the 241-WR Vault waste and C-7 Tank waste were removed from the waste stream. The pipeline was temporarily removed from service from September 1972 to November 1981. When the pipeline was returned to service in 1981, it was used to convey 224-U Building process condensate with a corrosive average pH range from 0.5 to 1.5. In addition, an unspecified volume of miscellaneous storm drain waste from 224-U was sent through the pipe.

Contamination accumulated on this site over time, as growing vegetation above the pipeline continued to absorb radioactive contamination below the surface. In addition, an unplanned release labeled UPR-200-W-33 occurred in March 1955 from a leaking flange on the C-5 Condensate Line from the 224-U Building. Characterization of UPR-200-W-33 will be conducted separately, as noted in the waste site summary and field sampling plan for UPR-200-W-33.

As the contamination occurred over a prolonged period, the volume leaked or released cannot be ascertained. Therefore, no volume estimates can be ascertained for this site.

Volume Discharged: Not specified.

Pore Volume Discharged: Unknown.

Site: 200-W-42	Area: U Plant	Category: Intermediate

Waste Inventory:
The pipeline was used from 1952 to 1988 to convey acidic process condensate from the 221-U and 224-U Buildings and the 291-U Stack to the 216-U-8 and 216-U-12 Cribs. This site was not intended as a waste discharge site; therefore, releases of contamination from the pipeline structure was unintentional and the volume of liquids and associated waste inventory released is unknown.

Previous Site Characterization

Site Characterization Summary: In November 2000, the posted Soil Contamination Area north of 16th Street was submitted as a Discovery Site.

A limited field investigation (LFI) was conducted in 1994 to document the conditions at several predetermined waste sites in the 200-UP-2 OU, and to assess their contamination risk. The investigation included radiological surveys, in-line camera surveys, soil and vegetation sampling, as well as borehole sediment sampling and logging along the VCP. The pipeline was surveyed from the 224-U to 216-U-8 and 216-U-12 Cribs. A total of 14 surface and subsurface samples and 4 plant samples were gathered for characterization purposes.

In addition, an effort was made to ascertain whether any contamination had migrated outward from the pipeline. This determination was made by excavating two boreholes with an auger rig west of locations where subsurface contamination had been identified (approximately 140 m (460 ft) north of the 216-U-8 Crib). Field screening of samples from the first borehole excavated 0.9 m (3 ft) west of the pipeline found a rise in radioactivity at roughly 3 m (10 ft) below the surface. However, the auger encountered large cobbles at 3.3 m (11 ft), and could not penetrate deeper. A second auger hole excavated 1.5 m (5 ft) west of the pipeline did not encounter any radiological activity.

With the exception of strontium-90, the greatest concentrations of contaminants were detected in subsurface soil samples collected near the VCP. Strontium-90 readings were greatest in plant samples taken along the VCP. Additional contaminants detected include americium-241, cesium-137, plutonium-238, plutonium-239, plutonium-240, and uranium.

An in-line camera survey was also conducted as part of the 1994 LFI. The camera survey took place inside the VCP to detail the pipe's characteristics. The camera entered the pipeline at two points, one north of the 216-U-8 Crib and the second west of the 216-U-8 Crib, in the portion of the pipeline connecting to the 216-U-12 Crib. In the northern portion of the pipeline, numerous joints were dislodged and sandy material was seen within the pipeline. The pipeline section connecting to the 216-U-12 Crib was determined to be in excellent condition. The joints were not displaced, and additional sandy material was not observed in this segment. The stainless steel portion of 200-W-42 upstream of the 270-W Tank was not investigated. However, the LFI conducted an in-line camera survey of the stainless steel pipeline feeding the 216-U-1 and 216-U-2 Cribs, which is of a similar vintage and construction to the 200-W-42 stainless steel pipeline. The LFI in-line camera survey found the stainless steel pipeline to be in virtually the same condition as when it was installed and the potential of that

Site: 200-W-42	Area: U Plant	Category: Intermediate

pipeline having leaked appeared to be nonexistent (BHI-00033, *Surface and Near Surface Field Investigation Data Summary Report for the 200-UP-2 Operable Unit*). Based on the similarities of these two pipelines in vintage and construction, it can be inferred that the likelihood of release from the stainless steel segments of the 200-W-42 pipeline is low.

During the installation of the Replacement Cross Site Transfer Line (Project W-058), it was necessary to cross the existing VCP that led from 224-U to the 216-U-12 Crib. During the excavation, a section of the pipeline close to the 216-U-12 was severed and the exposed ends were grouted. Following the excavation, cracks within the VCP were discovered (presumably caused by settlement during excavation work) and, while no smear contamination was detected inside the pipe, direct readings of 500 cpm and 2000 dpm were discovered in the excavated soil. It was determined that cutting and removing a portion of the pipeline under controlled conditions was the best option for remediation. Severed portions of the pipeline were cut into smaller pieces and placed inside the ends of the remaining VCP line. The soil contamination was left in place and backfilled. The excavation was estimated to be 5 m (16 ft) deep, and was located west of Beloit Avenue. The area was roped off and posted with URMA and soil contamination area (SCA) signs.

In addition, site walkdowns occurred on September 17, 1996, for initial review purposes, and on August 18, 1999, as part of a radiation area remedial action survey. The results of these surveys are not presented. A final site walkdown occurred on November 21, 2000. During the walkdown, staff confirmed an SCA measuring roughly 18 m (60 ft) by 12 m (40 ft), located above the pipeline on the north side of 16th Street. A second SCA, UPR-200-W-163, is located on the south side of 16th Street. The surface of the second SCA was surface stabilized and covered with gravel. The site was surveyed with geophysical survey equipment on March 3, 2005. The survey detected numerous linear anomalies that were determined to be buried utilities. In addition, an area near the northern boundary of the survey, located within the U-Plant fence, was surveyed. The area was heavily disturbed, reducing the accuracy behind any detection or mapping of subsurface features.

In 2004 and 2005, soil samples were collected within and near the site footprint during field investigations conducted to support the remedial design for several waste sites within the 200-W-1 OU. As shown in Table 1, 10 boreholes were installed inside or within 7.6 m (25 ft) of the site 200-W-42 footprint. The investigation included geophysical logging of soil and sample collection to a maximum depth of 18.3 m (60 ft) below ground surface (bgs).

An interim time-critical removal action (TCRA) was completed at 200-W-42 in two phases between November 2005 and October 2006. The interim TCRA is documented in DOE/RL-2005-71, *Action Memorandum for the Time-Critical Removal Action for Support Activities to the 200-UW-1 Operable Unit*.

Phase I of the TCRA included excavation and disposal of the 200-W-42 VCP and contaminated soil down to a depth of 4.6 m (15 ft) bgs between the 216-U-12 and 216-U-8 Cribs. A portion of the VCP and contaminated soil on the north side of the 216-U-8 Crib (6.1 to 12.2 m [20 to 40 ft]) also was excavated to 4.6 m (15 ft) bgs. Once the two trench portions were excavated, radiological screening was

Site: 200-W-42	Area: U Plant	Category: Intermediate

completed. Samples were collected and analyzed to verify removal action objectives were met. The action objectives were achieved and the open trenches were backfilled.

Phase II of the TCRA included excavation and disposal of the 200-W-42 VCP and contaminated soil to a depth of 4.6 m (15 ft) bgs. The excavation started from the point of the Phase I excavation north of the 216-U-8 Crib to the south side of 16th Street and from the north side of 16th street to the concrete slab covering the 270-W Tank. Once the two trench portions were excavated, radiological screening was completed and samples were collected and analyzed to verify removal action objectives were met.

A decision was made to leave the portion of pipeline that lies beneath 16th Street in place (see site code 200-W-151-PL) and remove it later, with the tank farm pipeline 200-W-100-PL work scope that also lies beneath 16th Street. The 200-W-151-PL site is not included in the 200-WA-1 OU.

The Phase II excavations remained open trenches. Growing contaminated tumbleweeds and contaminated tumbleweed fragments were identified inside the open excavation. In September 2010, some larger contaminated tumbleweeds were removed, but the numerous fragments were impractical to remove by hand. Between 15.3 and 30.5 cm (6 and 12 in.) of clean backfill material was added to the open excavation to cover the contamination. The open trench was posted with URMA signs in 2010.

While site walkdowns and geophysical surveys have occurred, it is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided. If surveys do occur, their frequency is not specified.

Soil borehole locations are shown on Figures 1 and 2. Geophysical logging and soil sample results are summarized in Tables 1 through 8. Soil boreholes in Table 1 are listed from north to south.

Table 1. Borehole Summary for the 290-W-42 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
1994	299-W19-98 / A9798	Inside northern portion	4 – 15 (2 samples) 15 – 193 (11 samples)
2004	C4719	Outside – west of southern portion	0.5 – 48.5 (GPL) 44 – 45.5 (1 sample)
2004	C4547	Edge – east of C4224	0.5 – 48.5 (GPL)
2004	C4224	Inside southern portion	0.5 – 54.6 (GPL)
2004	C4551	Outside – west of C4224	0 – 59.6 (GPL)
2004	C4717	Outside 25 ft west – southern portion	0.5 – 48.91 (GPL) 1 – 45.5 (3 samples)

Site: 200-W-42	Area: U Plant	Category: Intermediate

Table 1. Borehole Summary for the 290-W-42 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2004	C4554	Outside 25 ft west – southern portion	0 – 59.6 (GPL)
2004	C4728	Outside 25 ft east – southern portion	48 – 49.7 (1 sample)
2004	C4229	Inside southern portion	0 – 49.1 (GPL)
2005	C4729	Outside – East of C4229	44 – 45.5 (1 sample)
2004	C4225	Inside southern portion	1 – 48 (GPL)

GPL = geophysical log
ID = identification

Table 2. Geophysical Log Results Summary

DPT Casing/ Well Number	Cesium-137	Uranium-238/Uranium-235	Other man-made contaminants detected
C4224	0.5 ft: 0.529 pCi/g 40.5 to 44.5 ft: 1.1 to 84 pCi/g (max at 41.5 ft)	U-238: 50.5 ft at 18 pCi/g No U-235 detected	None
C4547	0.5 ft: 0.362 pCi/g 33.5 to 48.5 ft: 0.3 to 534 pCi/g (max at 34.5 ft)	U-238: 34.5 to 35.5 ft, 157 pCi/g (max at 34.5 ft) No U-235 detected	None
C4551	0 ft at 0.315 pCi/g	None detected	None
C4554	0 ft at 1 pCi/g 46 ft at 0.1 pCi/g	None detected	None

Source: D&D-27783, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*, Table 3-3.

Site: 200-W-42	Area: U Plant	Category: Intermediate

Table 3. Geophysical Log Results Summary

DPT Casing/ Well Number	Interval of Detection of Cs-137 in Feet and Concentration Range	Interval of Detection of U-238/U-235 in Feet and Concentration Range
C4225	9 to 21 ft: 0.3 to 80 pCi/g (max at 10 ft) 29 and 41 ft: 0.2 pCi/g	None detected
C4229	0 ft: 0.3 pCi/g 10 to 11 ft: 1.1 to 1.22 pCi/g (max at 10 ft)	None detected

Source: D&D-27783200-UW-1 *Field Summary Report for Fiscal Years 2004 and 2005*, Table 3-4.

Table 4. Soil Maximum Detection Summary (Soil Borehole A9798)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Acetone	7	µg/kg	6	–	–	–
Aluminum	7,400,000	µg/kg	6	30,400,000	µg/kg	199
Americium-241	–	–	–	0.733	pCi/g	32
Arsenic	–	–	–	9,440	µg/kg	32
Barium	–	–	–	149,000	µg/kg	199
Bis(2-ethylhexyl) phthalate	–	–	–	120	µg/kg	91.5
Cadmium	–	–	–	20	µg/kg	32
Calcium	14,500,000	µg/kg	6	90,600,000	µg/kg	189
Cesium-137	–	–	–	91,190	pCi/g	32
Chloride	8,200	µg/kg	6	21,700	µg/kg	150
Chromium	–	–	–	28,400	µg/kg	199
Cobalt	13,200	µg/kg	6	15,700	µg/kg	40
Cobalt-60	–	–	–	0.55	pCi/g	40
Copper	18,000	µg/kg	6	18,200	µg/kg	17.5
Curium-244	–	–	–	0.11	pCi/g	189
Di-n-octylphthalate	–	–	–	290	µg/kg	167.5

Site: 200-W-42	Area: U Plant	Category: Intermediate

Table 4. Soil Maximum Detection Summary (Soil Borehole A9798)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Europium-154	–	–	–	3.1	pCi/g	40
Europium-155	–	–	–	4.5	pCi/g	40
Fluoride	1,500	µg/kg	6	17,700	µg/kg	36
Gross alpha	7.9	pCi/g	6	210	pCi/g	189
Gross beta	16	pCi/g	6	94,800	pCi/g	32
Iron	23,500,000	µg/kg	6	40,400,000	µg/kg	199
Lead	7,400	µg/kg	6	8,200	µg/kg	167.5
Magnesium	6,610,000	µg/kg	6	9,320,000	µg/kg	199
Manganese	421000	µg/kg	6	505,000	µg/kg	189
Mercury	–	–	–	2100	µg/kg	40
Methylene chloride	2	µg/kg	6	–	–	–
Neptunium-237	0.019	pCi/g	6	0.092	pCi/g	189
Nickel	10,000	µg/kg	6	22,500	µg/kg	199
Nitrate	–	–	–	1,200,000	µg/kg	32
Nitrogen in nitrite and nitrate	7,080	µg/kg	6	304,000	µg/kg	199
Phosphate	–	–	–	17,000	µg/kg	32
Plutonium-238	–	–	–	0.0766	pCi/g	32
Plutonium-239/240	–	–	–	4.95	pCi/g	32
Potassium	1,360,000	µg/kg	6	3,060,000	µg/kg	199
Potassium-40	14	pCi/g	6	19	pCi/g	70, 130
Radium-226	0.76	pCi/g	6	5.79	pCi/g	150
Radium-228	1.2	pCi/g	6	2.1	pCi/g	40
Strontium-90	–	–	–	520	pCi/g	116, 167.5
Sulfate	13,000	µg/kg	6	40,000	µg/kg	17.5

Site: 200-W-42	Area: U Plant	Category: Intermediate

Table 4. Soil Maximum Detection Summary (Soil Borehole A9798)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Technetium-99	–	–	–	1.17	pCi/g	32
Thallium	–	–	–	3,560	µg/kg	36
Thorium-228	0.94	pCi/g	6	1.4	pCi/g	91.5
Thorium-232	1.2	pCi/g	6	2.1	pCi/g	40
Thorium-234	–	–	–	7.3	pCi/g	150
Titanium	1,880,000	µg/kg	6	3,710,000	µg/kg	32
Total petroleum hydrocarbons-kerosene	–	–	–	8,800,000	µg/kg	40
Uranium (metal)	1,500	µg/kg	6	280,000	µg/kg	189
Uranium-233/234	0.58	pCi/g	6	140	pCi/g	189
Uranium-234	–	–	–	8.4	pCi/g	150
Uranium-235	–	–	–	10.9	pCi/g	32
Uranium-238	0.55	pCi/g	6	150	pCi/g	189
Vanadium	58,300	µg/kg	6	107,000	µg/kg	32
Zinc	–	–	–	84,000	µg/kg	32
Zirconium-95	–	–	–	0.068	pCi/g	150

Site: 200-W-42	Area: U Plant	Category: Intermediate

Table 5. Soil Maximum Detection Summary (Soil Borehole C4719)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Barium	–	–	–	64,200	µg/kg	46
Chromium	–	–	–	8,570	µg/kg	46
Cobalt	–	–	–	7,030	µg/kg	46
Copper	–	–	–	12,100	µg/kg	46
Lead	–	–	–	2,780	µg/kg	46
Manganese	–	–	–	296,000	µg/kg	46
Nickel	–	–	–	9,140	µg/kg	46
Nitrogen in Nitrite and Nitrate	–	–	–	7,200	µg/kg	46
Strontium	–	–	–	26,600	µg/kg	46
Thallium	–	–	–	150	µg/kg	46
Titanium	–	–	–	1,510,000	µg/kg	46
Uranium (metal)	–	–	–	475	µg/kg	46
Uranium-234	–	–	–	0.572	pCi/g	46
Uranium-235	–	–	–	0.028	pCi/g	46
Uranium-238	–	–	–	0.617	pCi/g	46
Vanadium	–	–	–	45,000	µg/kg	46
Zinc	–	–	–	42,300	µg/kg	46

Site: 200-W-42	Area: U Plant	Category: Intermediate

Table 6. Soil Maximum Detection Summary (Soil Borehole C4717)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Arsenic	9,070	µg/kg	3	7,840	µg/kg	39
Barium	91,100	µg/kg	3	111,000	µg/kg	39
Cadmium	318	µg/kg	3	635	µg/kg	39
Chromium	9,650	µg/kg	3	11,600	µg/kg	39
Cobalt	9,560	µg/kg	3	11,200	µg/kg	39
Copper	15,900	µg/kg	3	17,900	µg/kg	39
Lead	7,010	µg/kg	3	6,490	µg/kg	39
Manganese	395,000	µg/kg	3	457,000	µg/kg	39
Mercury	52	µg/kg	3	91	µg/kg	39
Nickel	9,160	µg/kg	3	13,100	µg/kg	39
Nitrogen in nitrite and nitrate	3,400	µg/kg	3	–	–	–
Selenium	1,230	µg/kg	3	1,030	µg/kg	39
Silver	111	µg/kg	3	300	µg/kg	39
Strontium	33,600	µg/kg	3	37,500	µg/kg	39
Thallium	2,940	µg/kg	3	1,310	µg/kg	39
Titanium	1,960,000	µg/kg	3	1,960,000	µg/kg	39
Uranium (metal)	1,340	µg/kg	3	7480	µg/kg	46
Uranium-234	0.841	pCi/g	3	4.43	pCi/g	46
Uranium-235	0.055	pCi/g	3	0.175	pCi/g	46
Uranium-238	0.866	pCi/g	3	4.46	pCi/g	46
Vanadium	56,200	µg/kg	3	61,700	µg/kg	39
Zinc	55,800	µg/kg	3	65,200	µg/kg	39

Site: 200-W-42	Area: U Plant	Category: Intermediate

Table 7. Soil Maximum Detection Summary (Soil Borehole C4728)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Arsenic	–	–	–	7,910	µg/kg	50
Barium	–	–	–	7,710	µg/kg	50
Cadmium	–	–	–	1,400	µg/kg	50
Chromium	–	–	–	16,200	µg/kg	50
Cobalt	–	–	–	10,300	µg/kg	46
Copper	–	–	–	20,000	µg/kg	46
Lead	–	–	–	7,860	µg/kg	46
Manganese	–	–	–	438,000	µg/kg	46
Nickel	–	–	–	14,700	µg/kg	46
Selenium	–	–	–	1,900	µg/kg	50
Silver	–	–	–	1,000	µg/kg	50
Strontium	–	–	–	53,700	µg/kg	46
Thallium	–	–	–	1,420	µg/kg	50
Titanium	–	–	–	1,530,000	µg/kg	50
Uranium (metal)	–	–	–	2,840	µg/kg	46
Uranium-234	–	–	–	1.69	pCi/g	51
Uranium-235	–	–	–	0.078	pCi/g	51
Uranium-238	–	–	–	1.83	pCi/g	50
Vanadium	–	–	–	48,600	µg/kg	46
Zinc	–	–	–	61,100	µg/kg	46

Site: 200-W-42	Area: U Plant	Category: Intermediate

Table 8. Soil Maximum Detection Summary (Soil Borehole C4729)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Arsenic	–	–	–	7,000	µg/kg	46
Barium	–	–	–	76,000	µg/kg	46
Chromium	–	–	–	13,700	µg/kg	46
Cobalt	–	–	–	7,690	µg/kg	46
Copper	–	–	–	13,100	µg/kg	46
Lead	–	–	–	4,470	µg/kg	46
Manganese	–	–	–	508,000	µg/kg	46
Nickel	–	–	–	13,100	µg/kg	46
Nitrogen in Nitrite and Nitrate	–	–	–	6,900	µg/kg	46
Selenium	–	–	–	950	µg/kg	46
Strontium	–	–	–	34,900	µg/kg	46
Thallium	–	–	–	80	µg/kg	46
Titanium	–	–	–	1,100,000	µg/kg	46
Uranium (metal)	–	–	–	399	µg/kg	46
Uranium-234	–	–	–	0.741	pCi/g	46
Uranium-235	–	–	–	0.031	pCi/g	46
Uranium-238	–	–	–	0.778	pCi/g	46
Vanadium	–	–	–	39,100	µg/kg	46
Zinc	–	–	–	51,400	µg/kg	46

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] bgs): Radionuclides (neptunium-237, radium-226, radium-228, thorium-228, thorium-232, uranium 233/234, and uranium-238) and inorganics were detected in the soil sample collected in the northern portion of the pipeline (A9798) between 16th Avenue and the 216-U-8 Crib. No shallow soil samples were collected within the southern portion of the pipeline. Radionuclides (uranium-234, -235, and -238) and metals were detected in the soil sample from 0.9 m (3 ft) bgs west of the pipeline (C4717). All the GPL results are for boreholes located in/near the southern portion of the

Site: 200-W-42	Area: U Plant	Category: Intermediate

pipeline. Cesium-137 was the only manmade radionuclide detected by GPL in the southern portion of the pipeline. Detected concentrations were generally less than 1 pCi/g, except at two locations north of the 216-U-12 crib. At C4225, the maximum detected cesium-137 was 80 pCi/g at 3 m (10 ft) bgs. At C4229, the maximum detected cesium-137 was 1.22 pCi/g at 3 m (10 ft) bgs. No characterization data exist for the portion of the pipeline upstream of the 270-W Tank. Multi-increment confirmation sampling collected at the bottom of the TCRA excavation indicated that maximum post-removal soil concentrations were below the Preliminary Remediation Goals (PRGs) for human health direct-contact, terrestrial wildlife, and groundwater protection for all contaminants of potential concern except uranium (metal). The uranium (metal) exceedances were for groundwater protection, and occurred in the Phase II excavation portions of the VCP north of the 216-U-8 Crib. The PRGs used in this comparison were taken from the Focused Feasibility Study for the 200-UW-1 OU (DOE/RL-2003-23, *Focused Feasibility Study for the 200-UW-1 Operable Unit*). DOE/RL-2008-44, *Draft On-Scene Coordinator Report: 200-W-42 Waste Site Located in the 200-UW-1 Operable Unit on the Hanford Site*, indicated that the uranium (metal) PRG of 1.31 pCi/g for groundwater protection was below the Hanford Site-Specific background level of 3.21 pCi/g. Negotiations between the U.S. Department of Energy-Richland Operations Office (DOE/RL) and the regulators have not resulted in an agreed upon PRG for uranium (metal).

Intermediate (>4.6 m [>15 ft] bgs): Radionuclides (cesium-137 [maximum 91,190 pCi/g at 32 ft bgs], cobalt-60, curium-244, europium-154 and -155, neptunium-237, plutonium-238, plutonium-239/240, radium-226, radium-228, strontium-90 [maximum 520 pCi/g at 116 and 167.5 ft bgs], technetium-99, thorium-228, -232, and 234, uranium 233/234, -234, -235, and -238 [maximum 150 pCi/g at 57.6 m (189 ft) bgs], and zirconium-95) and inorganics were detected in the soil sample collected adjacent to the northern portion of the pipeline (A9798). No soil samples below 4.6 m (15 ft) were collected within the southern portion of the pipeline. Radionuclides (uranium-234, -235, and -238) and metals were detected in the soil samples collected within 7.6 m (25 ft) of the pipeline. All of the GPL results are for boreholes located in/near the southern portion of the pipeline, which were collected nearest to the 216-U-8 and 216-U-12 Cribs. At borehole locations within the site footprint, cesium-137 and uranium-238 were the only manmade radionuclides detected by GPL. The highest measurements were for the boreholes located near the 216-U-8 Crib: cesium-137 (84 pCi/g at 12.6 m [41.5 ft] bgs at C4224, 534 pCi/g at 10.5 m [34.5 ft] bgs at C4547) and uranium-238 (18 pCi/g at 15.4 m [50.5 ft] bgs at C4224, 157 pCi/g at 10.5 m [34.5 ft] bgs at C4547).

Based on comparison of borehole sampling data from the 1994 and 2005 investigations and multi-increment sample results at the bottom of the TCRA excavation at 4.6 m (15 ft) bgs, contamination appears to be highest near the pipeline depth of 3 m (10 ft) bgs, then decreases by the bottom of the excavation at 4.6 m (15 ft) bgs. Therefore, the elevated contaminant concentrations at depths greater than 4.6 m (15 ft) bgs are more likely indicative of contamination from the 216-U-8 Crib, rather than from releases from the 200-W-42 Pipeline. The characterization data at these greater depths are provided for completeness.

Site: 200-W-42	Area: U Plant	Category: Intermediate

References:

BHI-00033, 1994, *Surface and Near Surface Field Investigation Data Summary Report for the 200-UP-2 Operable Unit*, Rev. 00, Bechtel Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196059635.

D&D-27783, 2006, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*, Rev 0, Fluor Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA01917974.

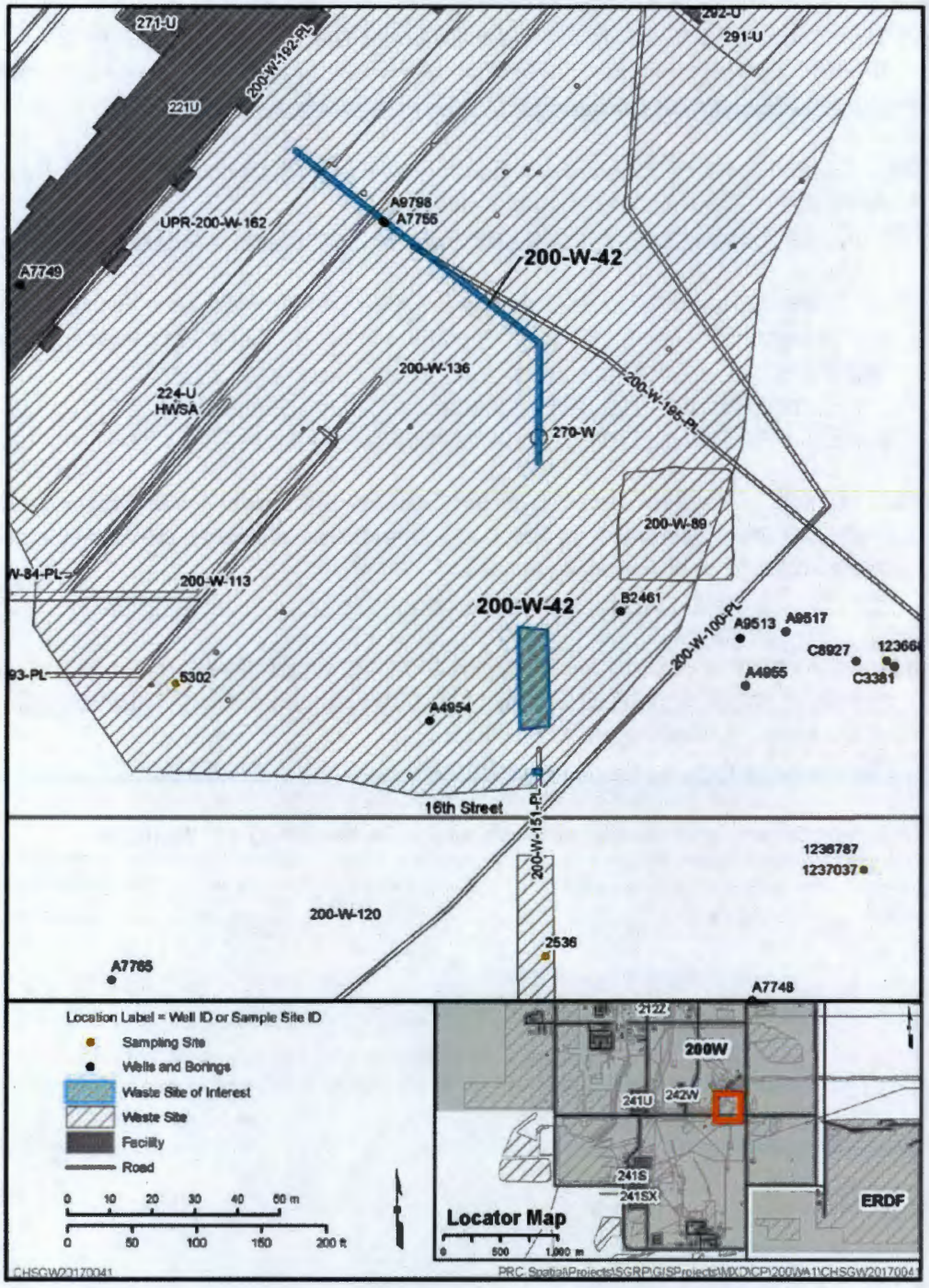
DOE/RL-2003-23, 2005, *Focused Feasibility Study for the 200-UW-1 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D7944638. http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D7944918. http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D7950655.

DOE/RL-2005-71, 2005, *Action Memorandum for the Time-Critical Removal Action for Support Activities to the 200-UW-1 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA01059946

DOE/RL-2008-44, 2009, *On-Scene Coordinator Report 200-W-42 Waste Site Located in the 200-UW-1 Operable Unit on the Hanford Site*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0096350.

Waste Information Data System General Summary Report for the 200-W-42 Waste Site.

Site: 200-W-42	Area: U Plant	Category: Intermediate

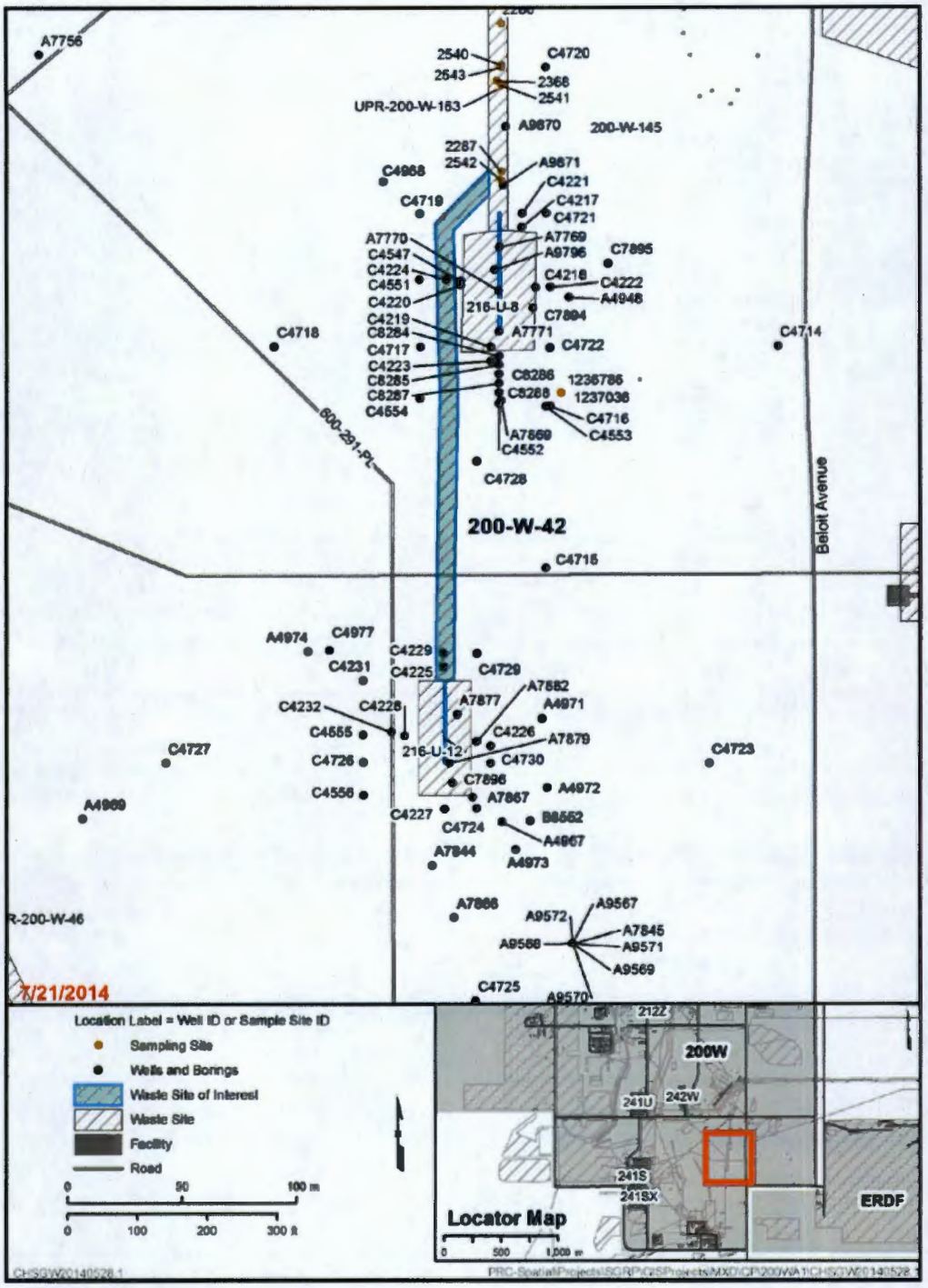


ERDF = Environmental Restoration and Disposal Facility

ID = identification

Figure 1. 200-W-42 Waste Site Northern Portion Map

Site: 200-W-42	Area: U Plant	Category: Intermediate



ERDF = Environmental Restoration Disposal Facility
ID = identification

Figure 2. 200-W-42 Southern Portion Site Map

Site: 200-W-42	Area: U Plant	Category: Intermediate

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Site: 200-W-44	Area: U Plant	Category: Intermediate

Site Description

Site Type: Sand Filter
Facility/Geographic Area: 200 Inner Area West
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: January 1948 to September 15, 2011

Waste Site Location and Physical Description: The sand filter is located east of the 221-U Building and northeast of the 291-U Stack (Figure 1). The sand filter is constructed of reinforced concrete that is partially belowgrade with an asphalt covered, concrete slab roof. The chain link fence was removed in March 2002, when the area was surface stabilized. It is posted as an Underground Radioactive Material area.

Waste Site Coordinates:

Site Dimensions:
Site Length: 29.3 m (96 ft)
Site Width: 29.3 m (96 ft)
Site Area: 857 m^2 (9,216 ft^2)
Site Depth: 6.7 m (22 ft)
Cover Thickness: None

Related Site Structure(s): The sand filter is associated with the 291-U-1 Stack, 291-U Fan Control House, and 291-U Vessel Vent Pit.

Site Posting: The sides of the sand filter that extend abovegrade were covered with gravel in 2002. The roof of the sand filter was not covered or disturbed during this activity. The posting was changed to an Underground Radioactive Material Area). In 2011, the 200-W-136 Underground Radioactive Material area was expanded and now includes 200-W-44.

Site History

Process Description: The 221-U Building was built in 1945. Sand filters were added to T Plant and B Plant in 1948. It is assumed the sand filter at U Plant was constructed in that same period. From 1945 until 1952, it was only used for training canyon building workers. In 1952, the facility began the Uranium Metal Recovery process. The exhaust ventilation system remained in service until September 15, 2011. The system was completely deactivated and final effluent samples were obtained.

Release Summary: The bottom of the sand filter slopes so that condensate that collected in the bottom of the sand filter flowed into the French drain located 1.5 m (5 ft) from the west corner of the sand filter as shown on drawing H-2-43151, *French Drain*.

Site: 200-W-44	Area: U Plant	Category: Intermediate

Volume Discharged: No quantity has been estimated.

Pore Volume Discharged: Not applicable.

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 200-W-44 Waste Site

Contaminant	Mass Discharged
Pu	41 g
Sr-90	787 Ci
Cs-137	6,821 Ci

Source: HNF-13829, *U Plant Document Safety Analysis*.

Previous Site Characterization

Site Characterization Summary: No site characterization has been performed.

Nature and Extent of Contamination: No release has been document.

References:

H-2-40971 (drawing), 1953, *Structural-Concrete-Plan & Section Foundations & Base Slab-Exhaust Air Filter*, Rev. 1, General Electric Company, Richland, Washington.

H-2-41022 (drawing), 1953, *Heat & Vent-Plan & Sections Stack Gas Filter*, Rev. 2, General Electric Company, Richland, Washington

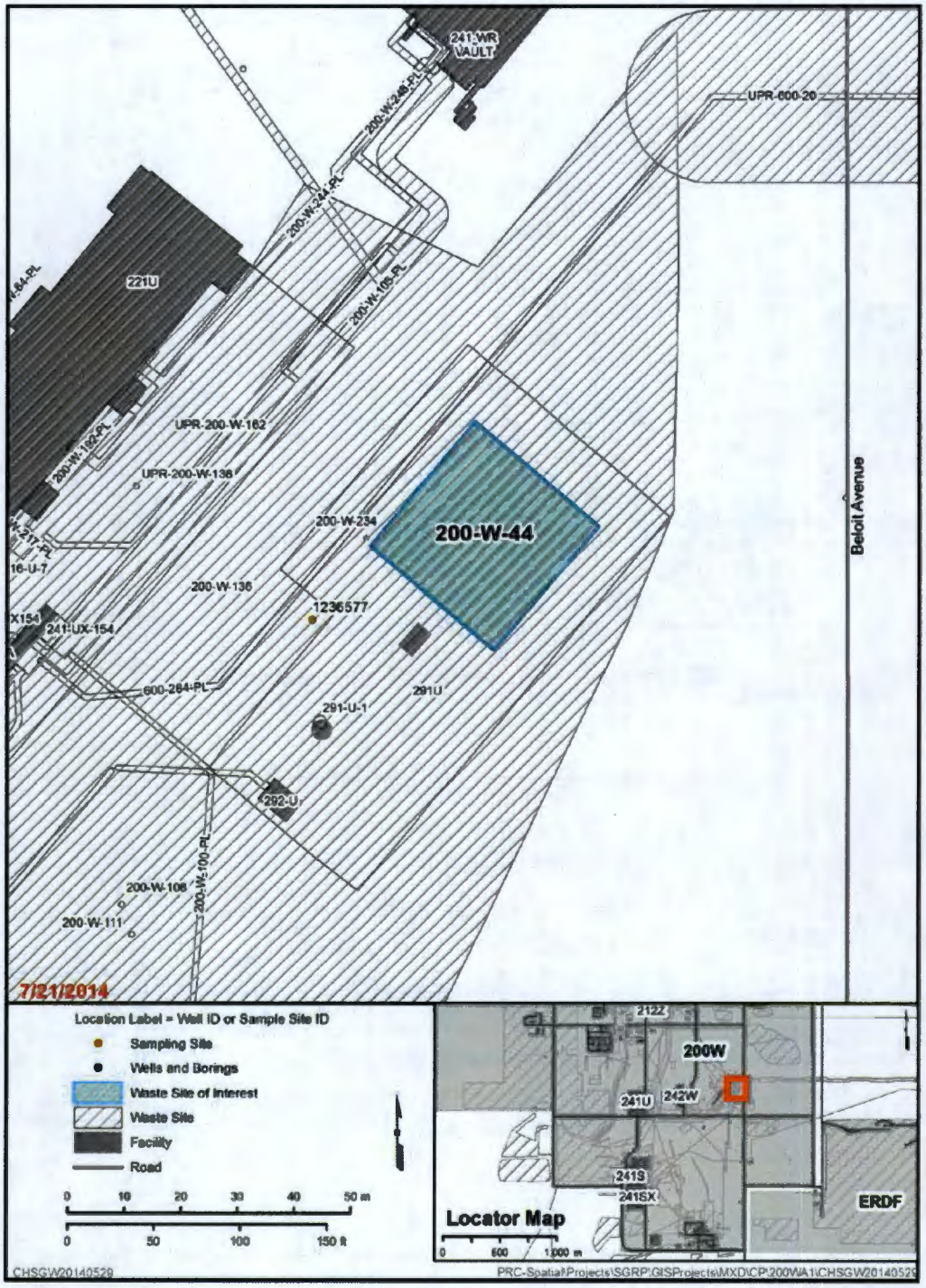
H-2-41763 (drawing), 1953, *Heat & Vent:–Exhaust Air-Sand Filter Monitoring Tubes*, Rev. 1, General Electric Company, Richland, Washington.

H-2-43151 (drawing), 1953, *French Drain*, Rev. 2, General Electric Company, Richland, Washington.

HNF-13829, 2012, *U Plant Document Safety Analysis*, Rev. 5, Fluor Federal Services, Inc., Richland, Washington.

Waste Information Data System General Summary Report for the 200-W-44 Waste Site.

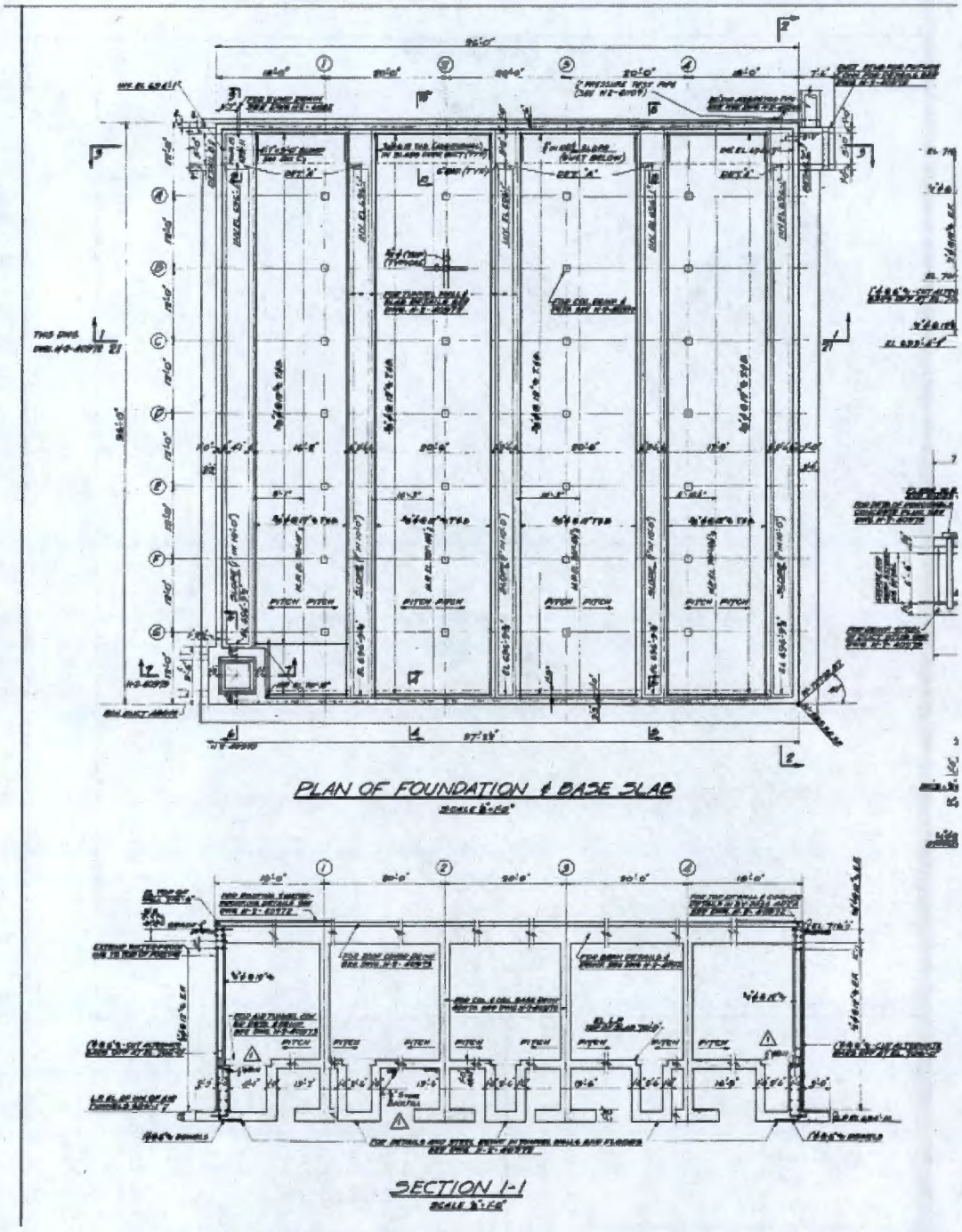
Site: 200-W-44	Area: U Plant	Category: Intermediate



ERDF = Environmental Restoration Disposal Facility
ID = Identification

Figure 1. 200-W-44 Waste Site Location Map

Site: 200-W-44	Area: U Plant	Category: Intermediate

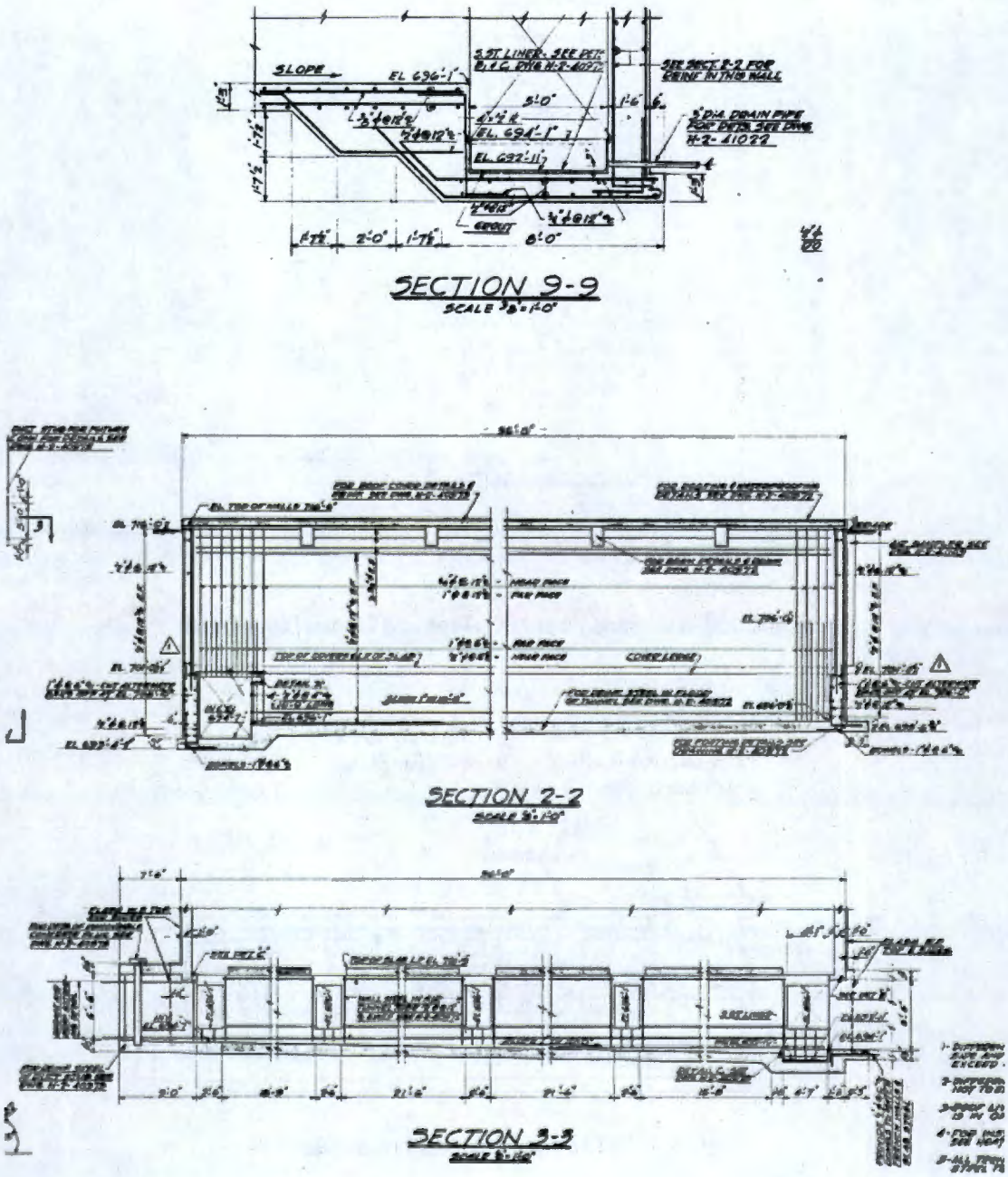


Source: H-2-40971, *Structural-Concrete-Plan & Section Foundations & Base Slab-Exhaust Air Filter.*

Note: Produced from the best available copy.

Figure 2. 200-W-44 Sand Filter Construction: Plan and Section Views

Site: 200-W-44	Area: U Plant	Category: Intermediate

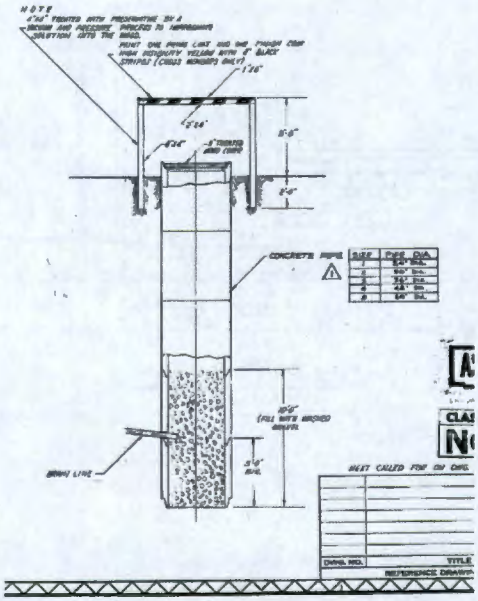


Source: H-2-40971, *Structural-Concrete-Plan & Section Foundations & Base Slab-Exhaust Air Filter.*

Note: Produced from the best available copy.

Figure 3. 200-W-44 Sand Filter Construction: Section Views

Site: 200-W-44	Area: U Plant	Category: Intermediate



Sources: H-2-40971, *Structural-Concrete-Plan & Section Foundations & Base Slab-Exhaust Air Filter* and H-2-43151, *French Drain*.

Note: Produced from the best available copy.

Figure 4. 200-W-44 Sand Filter Drain Pipe and French Drain Details

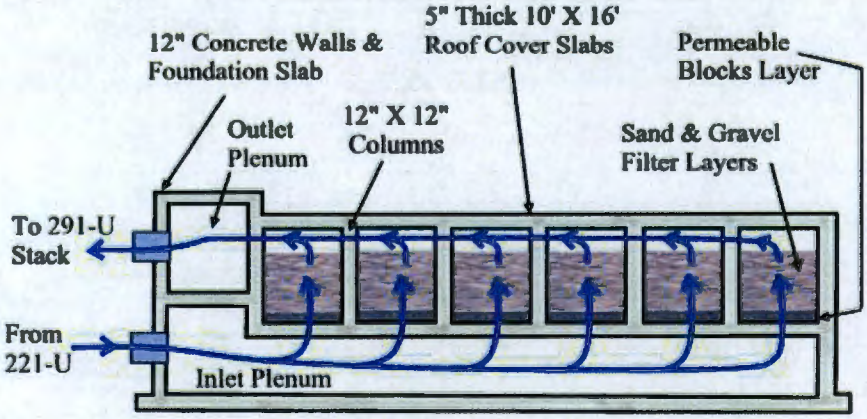
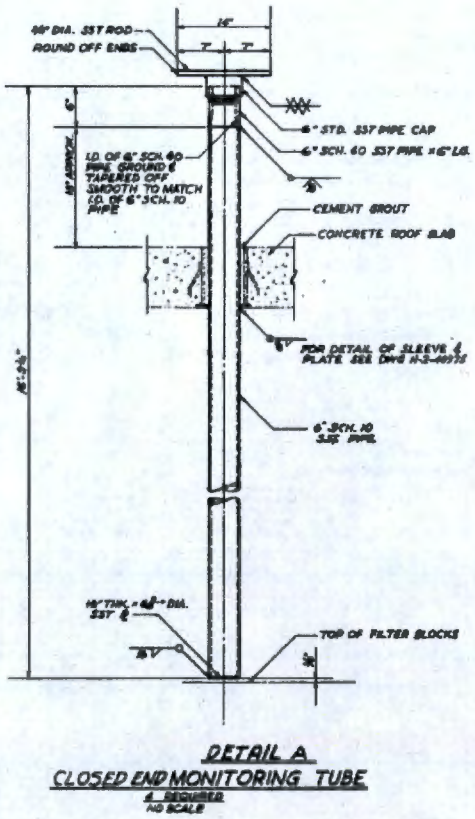


Figure 5. 200-W-44 Sand Filter Schematic Diagram

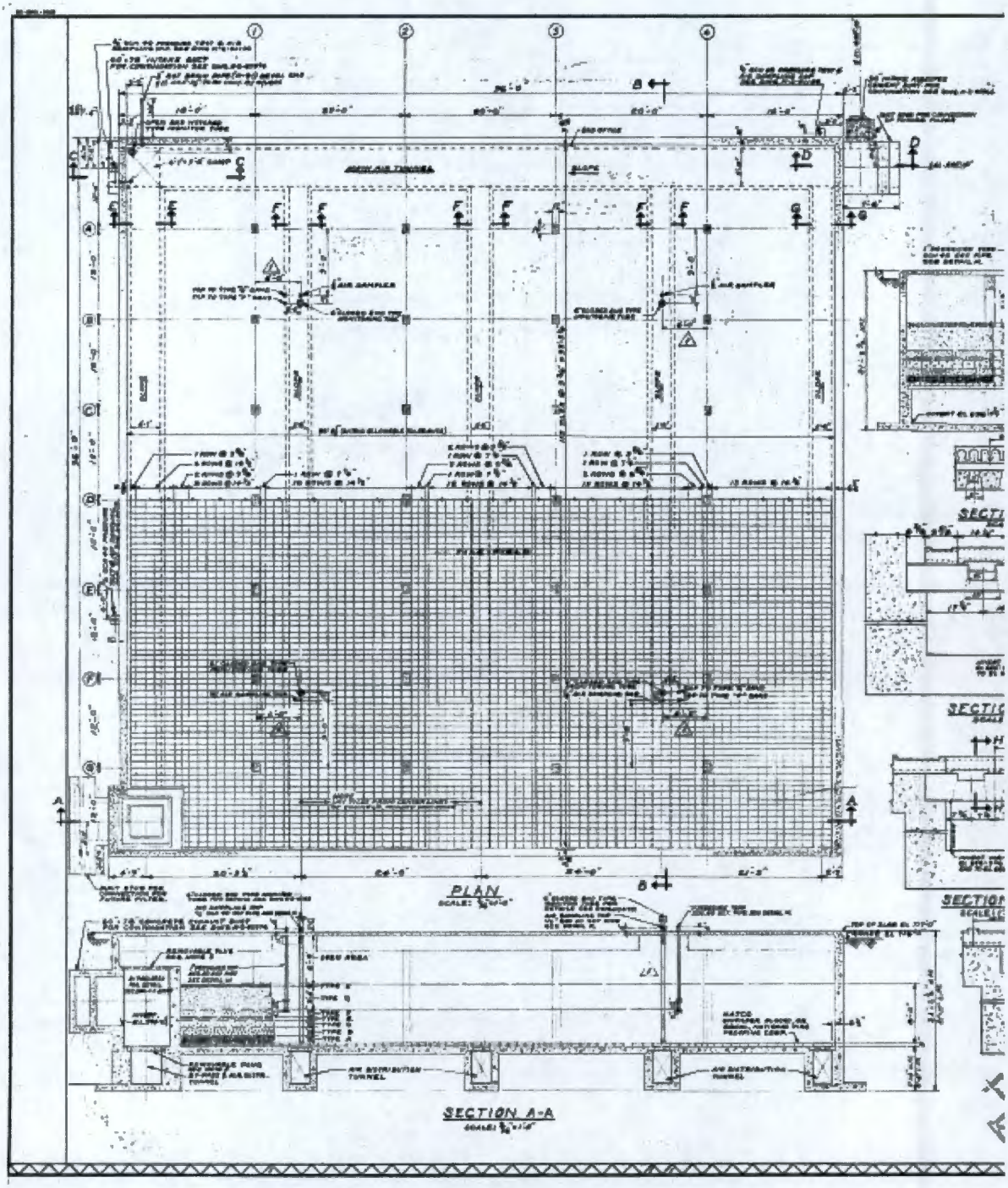
Site: 200-W-44	Area: U Plant	Category: Intermediate



Source: H-2-41763, *Heat & Vent:–Exhaust Air-Sand Filter Monitoring Tubes.*

Figure 6. Sand Filter Monitoring Tube Detail

Site: 200-W-44	Area: U Plant	Category: Intermediate



Source: H-2-41022, *Heat & Vent-Plan & Sections Stack Gas Filter.*

Note: Produced from the best available copy.

Figure 7. Sand Filter Tile Field Plan and Sand Media Section

Site: 200-W-67	Area: U Plant	Category: Shallow – Surface

Site Description

Alternate Site Identification: Contaminated Soil at the Corner of Cooper and 16th Street
Site Type: Unplanned Release
Facility/Geographic Area: U Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1, 200-MG-1
Service Dates: Not Specified

Waste Site Location and Physical Description: The 200-W-67 waste site is an unplanned release located south of 16th Street and Cooper Avenue, and is adjacent to the 216-U-3 French Drain (Figure 1). In 1998, a layer of clean backfill material was placed over the site. The site is currently posted as an Underground Radioactive Material Area (URMA), and covers a 100 m (328 ft) by 18 m (59.1 ft) area. No reference drawings are available for this site.

Waste Site Coordinates:
E-566880.47442 N-134951.71579

Site Dimensions:
Site Length: 100.0 m (328.0 ft) Site Depth: Not specified
Site Width: 18.0 m (59.1 ft) Cover Thickness: Not specified
Site Area: Not specified

Related Site Structure(s): The 200-W-67 waste site is not currently associated with any other waste sites or site facilities.

Site Posting: The 200-W-67 waste site was originally posted as a Soil Contamination Area in 1998. Currently, the site is posted as an URMA.

Site History

Release Summary: It is unclear what the contamination source is for this site, or when the release occurred. The type of wastes and the volume of wastes released to 200-W-67 are not specified. Therefore, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Site: 200-W-67	Area: U Plant	Category: Shallow – Surface

Previous Site Characterization

Site Characterization Summary: When the waste site was discovered in 1998, it was assumed to be part of UPR-200-W-24, which was an unplanned release in 1953 within the 241-U Tank Farm. However, since it was not possible to definitively connect the contaminated soil found inside the 241-U Tank Farm in 1998 with a release that occurred 45 years earlier, the contaminated area was given a new Waste Information Data System (WIDS) number; 200-W-67. Some Radiation Surveys and Stabilization Reports have recorded the site as UPR-200-W-24 despite the name change.

200-W-67 has been surveyed several times over the years. The site was discovered when a radiological investigation on April 17, 1998, located patches of contamination and a contaminated ant hill near the intersection of 16th Street and Cooper Avenue. Radiological readings from the contamination spots were as high as 11 mr/hr, with a second contamination spot having a maximum reading of 6 mr/hr. In addition, the investigation also had readings varying from 500 to 70,000 cpm. The contamination levels at the ant hill were as high as 3,000 cpm. Some areas of contamination were immediately removed after they were discovered. The rest of the area was posted as a Contamination Area (CA).

On May 5, 1998, the site that was to become 200-W-67 and a second site were both mapped using Global Positioning Survey equipment. The survey was conducted to determine if the southern site (200-W-67) warranted its own separate WIDS label. In February 1999, the southern unit was determined to be a separate unit, and was renamed 200-W-67.

On September 10, 1998, a layer of clean backfill was placed over the site as part of surface stabilization efforts. The site was downposted from a CA to an URMA following the stabilization work.

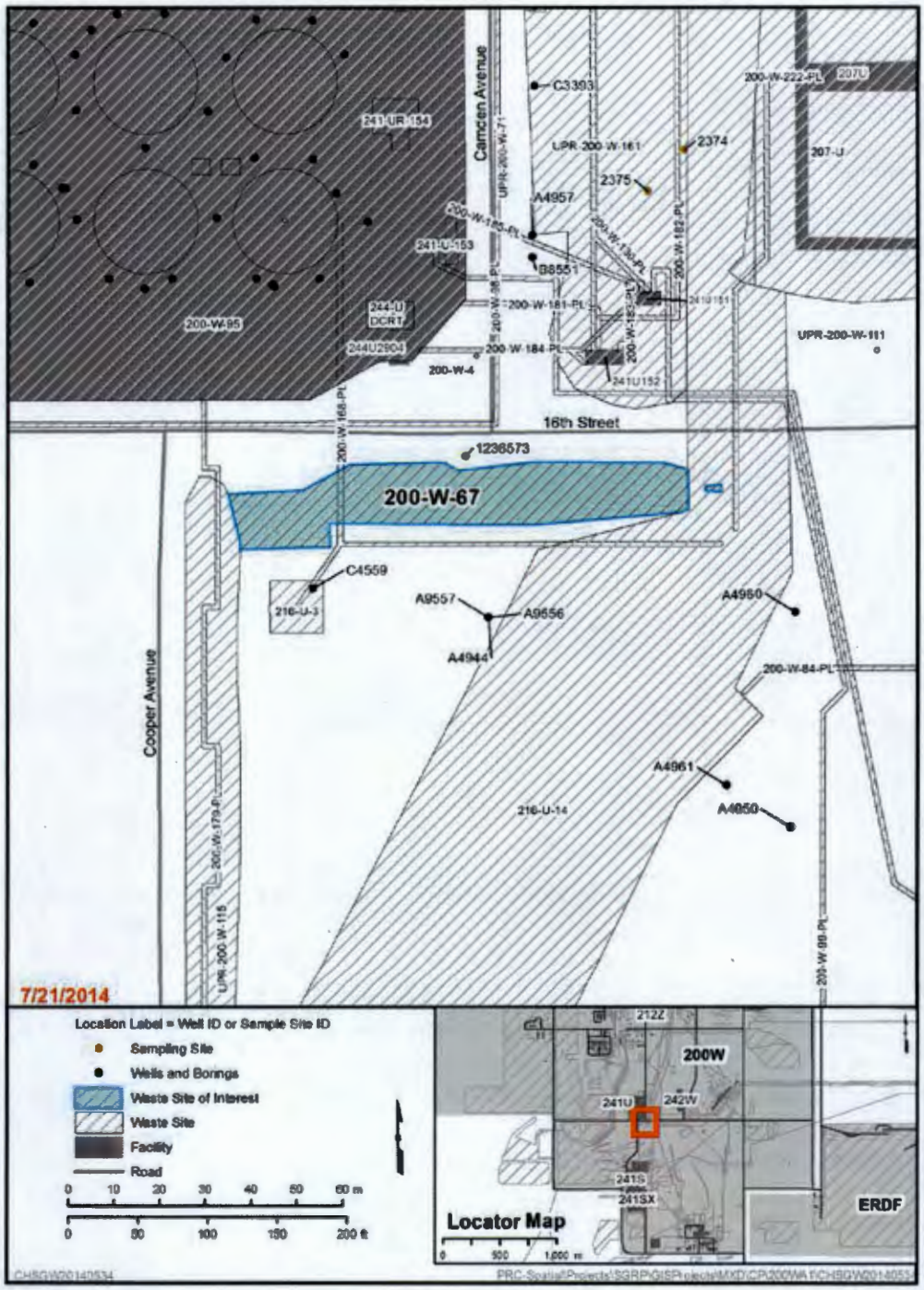
Nature and Extent of Contamination:

Shallow (0 to 46 m [0 to 15 ft] below ground surface): Potential radiological contamination at the surface, below the stabilization cover.

References:

WIDS General Summary Report for the 200-W-67 Waste Site.

Site: 200-W-67	Area: U Plant	Category: Shallow – Surface



ID = identification
ERDF = Environmental Restoration Disposal Facility

Figure 1. 200-W-67 Waste Site Map

Site: 200-W-67	Area: U Plant	Category: Shallow – Surface

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Site: 200-W-71	Area: U Plant	Category: Shallow - Subsurface

Site Description

Alternate Site Identification: Undocumented Trench, Undocumented Burn Pit
Site Type: Trench
Facility/Geographic Area: U Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1 or 200-MG-2, 200-UW-1
Service Dates: Not Specified

Waste Site Location and Physical Description: The 200-W-71 waste site is an open trench that, based on provided information, was historically used as a burn pit, a spoil pile, and/or a Maintenance Disposal Ground. The trench was located southeast of the 221-U Facility. It is south of 16th Street and east of Beloit Avenue (Figures 1 and 2). The trench has been backfilled; however, the area where the trench was located is not marked or posted. The ground surface appears slightly disturbed, and supports a growth of cheatgrass and a few rabbitbrush shrubs. Surface debris located at the site is believed to be associated with the site being used as a laydown area during the reconstruction of the U Plant Facility.

Waste Site Coordinates:
Lon-567988.23894 Lat-134889.66953

Site Dimensions:
Site Length: 80.0 m (262.5 ft) Site Depth: Not specified
Site Width: 15.0 m (49.2 ft) Cover Thickness: Not specified
The dimensions were estimated by comparing the scar shown in a 1948 aerial photograph with the ArcView image of the same area.

Related Site Structure(s): Site 200-W-71 is associated with the Construction Surface Lay Down Area (site code 200-WCSLA).

Site Posting: Site 200-W-71 is not posted or marked.

Site Characterization Summary: In 1988, the 216-U-17 Crib was constructed immediately to the west of the 200-W-71 Trench. Prior to its installation, a meeting on July 2, 1987, occurred to discuss the background of the proposed Crib location. During the meeting, several staff recalled the existence of an old burial ground bordering the 216-U-17 Crib location. The crib location is heavily documented; however, the documentation did not include the area east of Beloit Avenue, which is where the 200-W-71 Trench is located. In the 1990s, the Interim 200-UP-1 Groundwater Pump and Treat Project was located in this area.

A site walkdown occurred for verification purposes on February 28, 2000. No visible evidence was observed indicating that a trench was present in the area. A geophysical survey investigation was

Site: 200-W-71	Area: U Plant	Category: Shallow - Subsurface

conducted on December 1, 2003. During the investigation, multiple individual anomalies were discovered. No information is presented detailing the characteristics of the anomalies.

A geophysical survey was conducted in 2003 (D&D-27783, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*). Results are presented on Figures 3 and 4. Two depressions in the vicinity of N200/EI65 are in the middle of an anomalous magnetic and electromagnetic interference (EMI) zone that extends between roughly N184 to N230. There is also some scattered surface debris in this zone. This area appears to be within the 200-W-71 Trench/Burial Ground. The abundance of anomalous magnetic features in the northwest comer appears primarily to correlate with changes within the soil (due to the lack of corresponding anomalies in the EMI and/or time domain electromagnetic induction data). A notable east-west linear anomaly that crosses the southern portion of the site correlates with the documented pipeline that is marked on the surface. The east-west linear along the northern edge most likely is a buried utility that parallels the paved road.

Site History

Release Summary: The reason the 200-W-71 Trench was constructed and the purpose the trench was to fulfill is unclear. Information is presented that the trench was used as a Maintenance Disposal Ground and as a burn pit. However, there are no assigned burial grounds in the area. This site was used as a construction laydown area for the updating of the U-Plant for the uranium recovery process.

Staff members knowledgeable of the area recalled that natural uranium was disposed in the trench. However, no radioactivity was found during several core sampling efforts undertaken in the surrounding area over the years.

It is unclear what the contamination source is at the site, or when the release occurred. The type of waste and the volume of waste released at 200-W-71 are not specified. Therefore, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: No soil or geophysical data are available for monitoring well B2464 / 299-W19-40 located within the site boundary.

Site: 200-W-71	Area: U Plant	Category: Shallow - Subsurface

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): Potential radiological contamination at the surface.

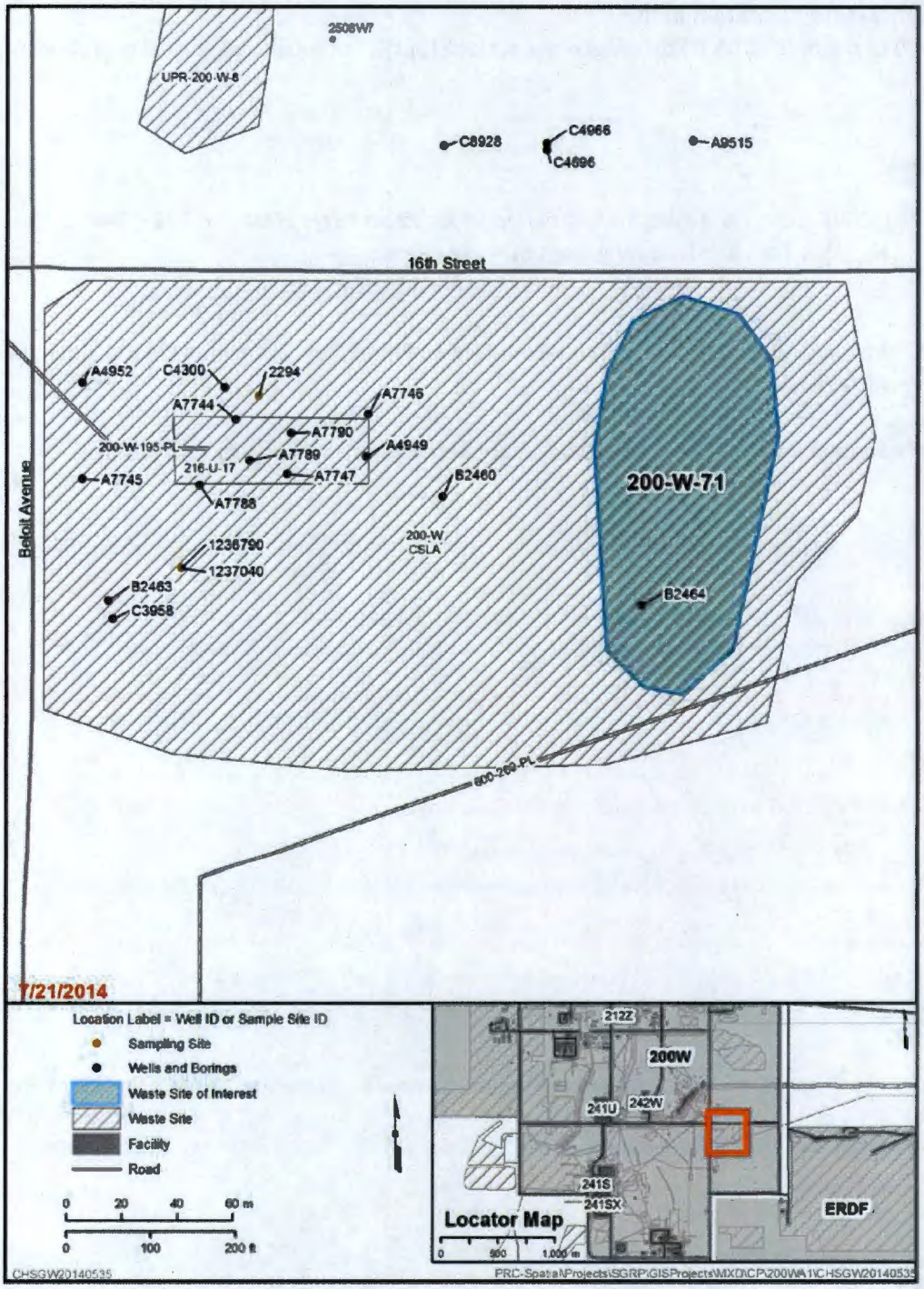
References:

D&D-27783, 2006, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*, Rev. 0, Fluor Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA01917974.

H-2-1495 (drawing), 1973, *200 West Area Steam Line Plot Plan*, Rev. 2, General Electric Company, Richland, Washington.

Waste Information Data System General Summary Report for the 200-W-71 Waste Site.

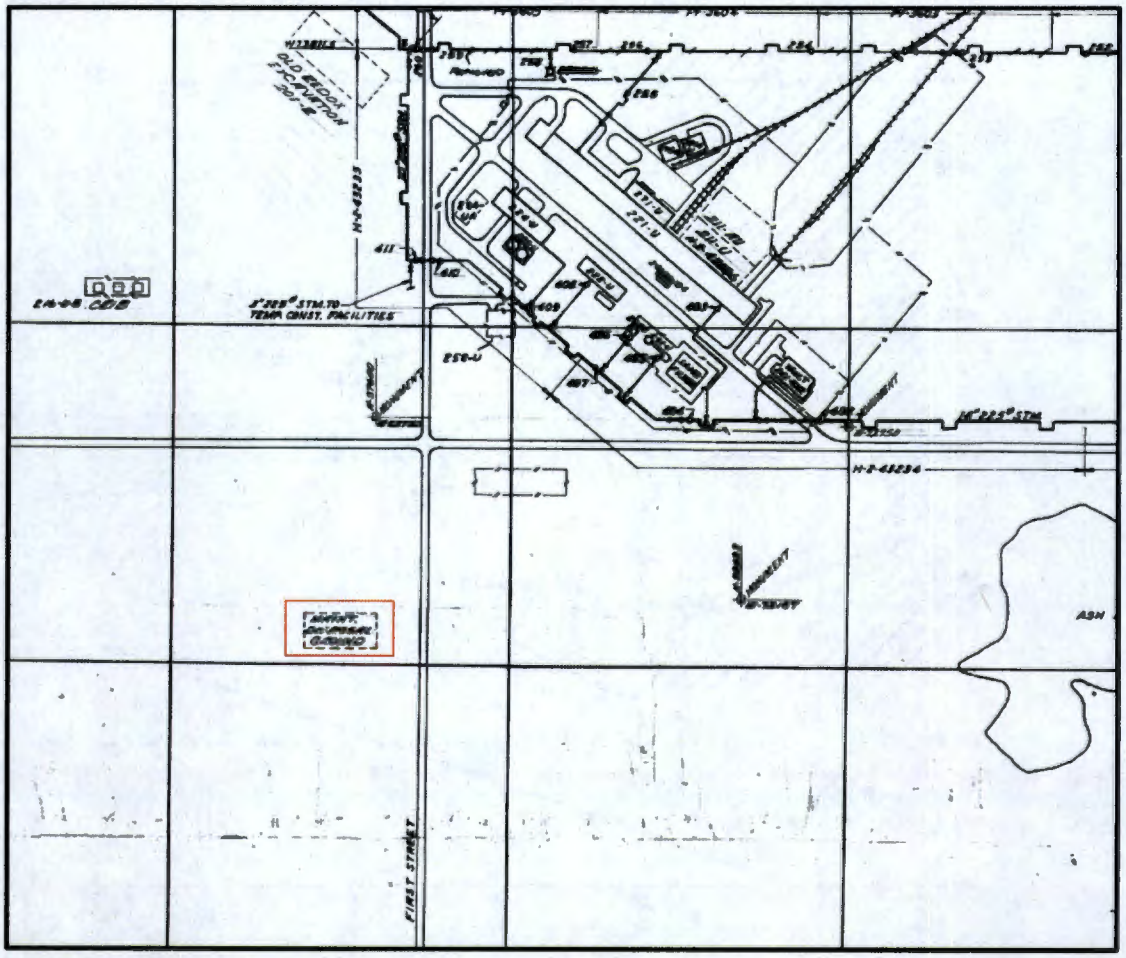
Site: 200-W-71	Area: U Plant	Category: Shallow - Subsurface



ID = identification
ERDF = Environmental Restoration Disposal Facility

Figure 1. 200-W-71 Waste Site Map

Site: 200-W-71	Area: U Plant	Category: Shallow - Subsurface



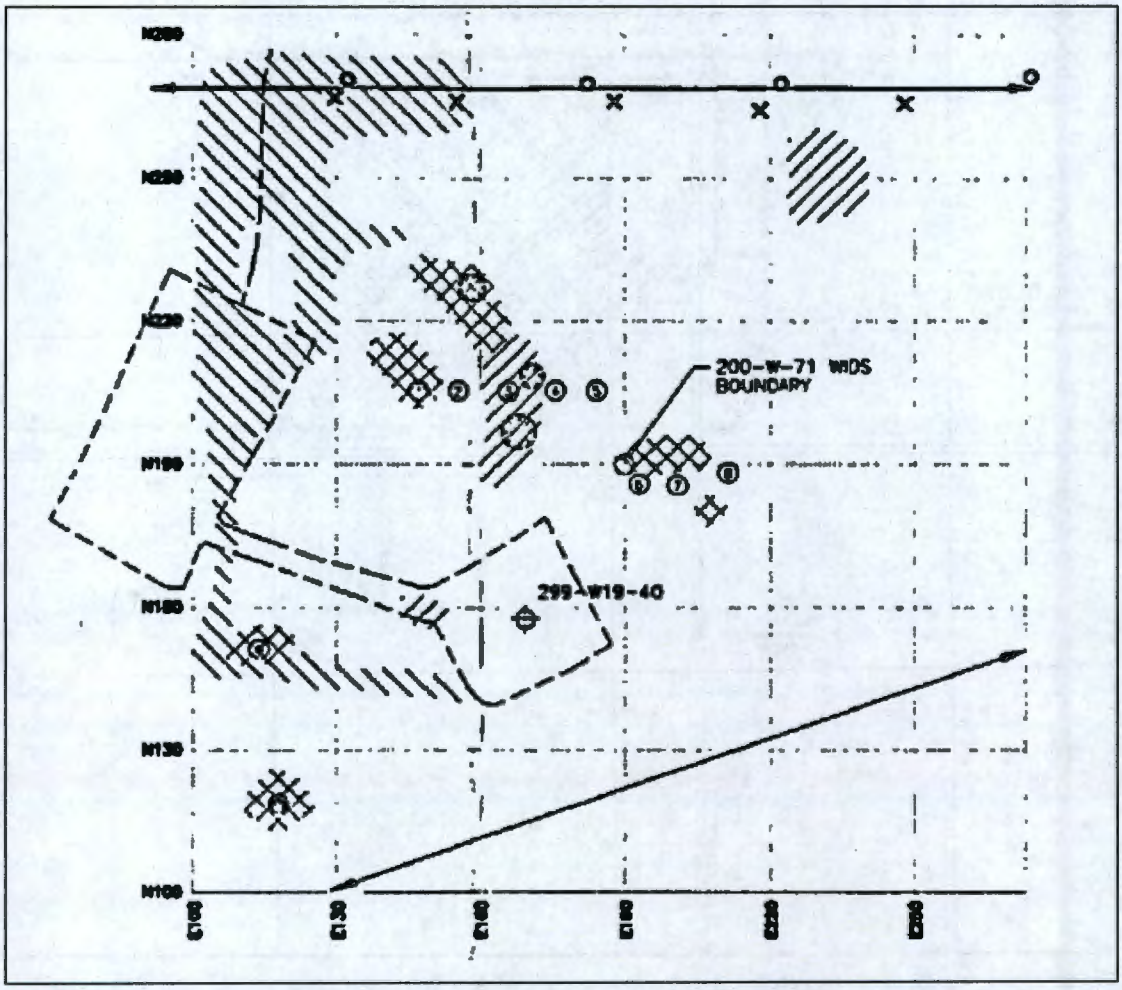
Source: H-2-1495, *200 West Area Steam Line Plot Plan*

Note: The 200-W-71 waste site is highlighted, right=north.

Note: Produced from the best available copy.

Figure 2. Site Location Southeast of 221-U

Site: 200-W-71	Area: U Plant	Category: Shallow - Subsurface

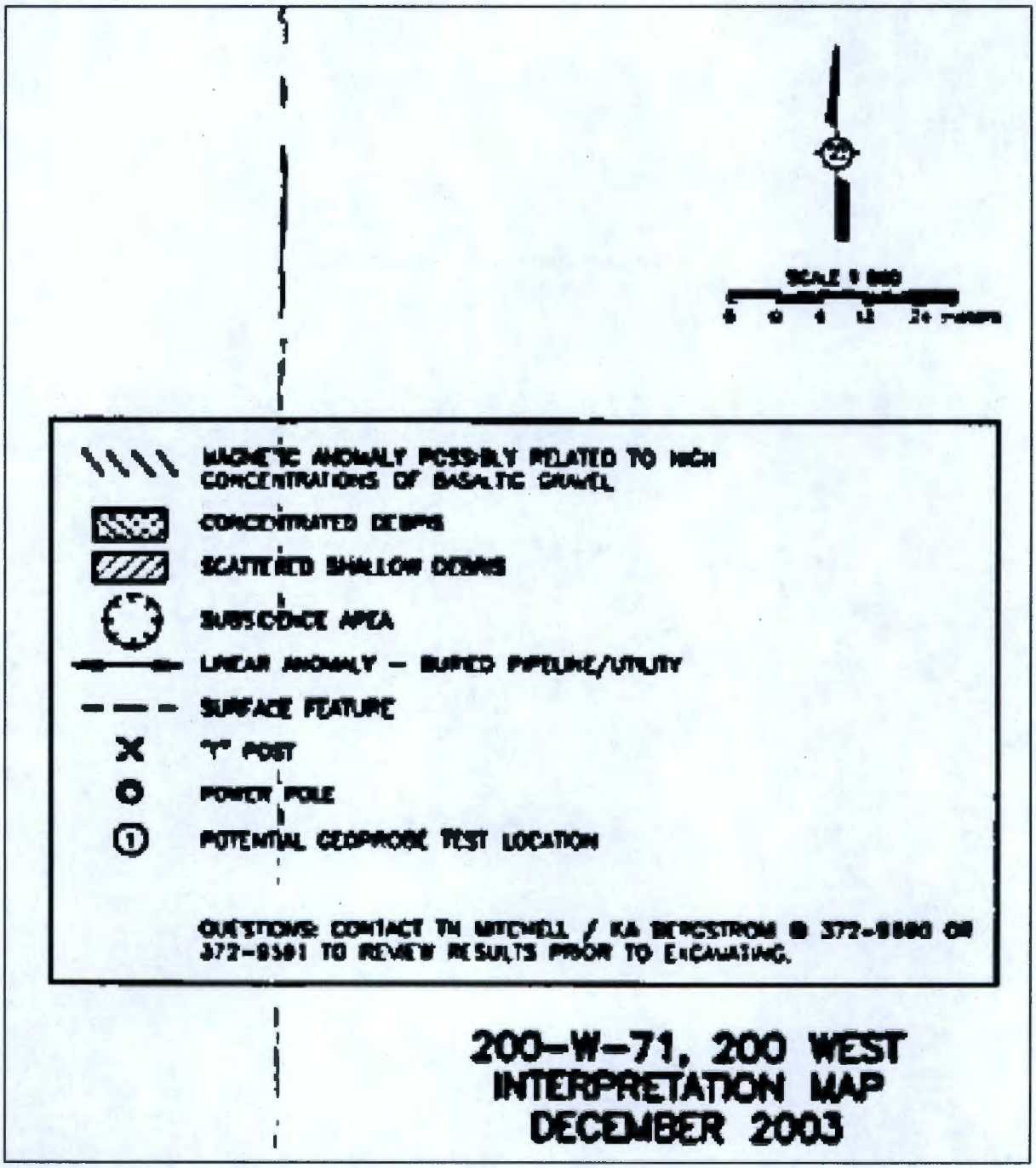


Source: D&D-27783, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005.*

Note: Produced from the best available copy.

Figure 3. Geophysical Survey Results

Site: 200-W-71	Area: U Plant	Category: Shallow - Subsurface



Source: D&D-27783, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005.*

Note: Produced from the best available copy.

Figure 4. Geophysical Survey Results Legend

Site: 200-W-71	Area: U Plant	Category: Shallow - Subsurface

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Site: 200-W-77	Area: U Plant	Category: Shallow – Surface Only

Site Description

Alternate Site Identification: Posted Contamination Area East of 216-U-14 Ditch
Site Type: Unplanned Release
Facility/Geographic Area: U Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1, 200-UW-1
Service Dates: Not Specified

Waste Site Location and Physical Description: The 200-W-77 waste site was an unplanned release to the ground adjacent to the railroad track, west of 216-U-16 Crib and east of the stabilized 216-U-14 Ditch (Figure 1). The site is a small, 2.4 m (8.0 ft) by 4.6 m (15.0 ft) area marked with posts, chains, and Contamination Area (CA) signs. In 2000, the area was covered with a layer of clean gravel backfill and downposted to an Underground Radioactive Material Area (URMA). No reference drawings are available for this site.

Waste Site Coordinates:
Lon-567158.10192 Lat-134842.38865

Site Dimensions:
Site Length: 2.4 m (8.0 ft) Site Depth: Not specified
Site Width: 4.6 m (15.0 ft) Cover Thickness: Not specified
Site Area: Not specified

Related Site Structure(s): The 200-W-77 waste site is associated with the 216-U-14 Ditch.

Site Posting: The 200-W-77 waste site was originally posted as a High Contamination Area when it was first discovered. The site was downposted to a CA after contaminated tumbleweed fragments were removed. Following interim remediation activities in 2000, the site was downposted a final time to an URMA.

Site History

Release Summary: The 200-W-77 waste site is located downwind of the southern portion of the 216-U-14 Ditch, which was undergoing surface stabilization efforts when 200-W-77 was discovered in November 1997. At the time, the 216-U-14 Ditch was a known source for windblown contaminated vegetation for the surrounding areas. Site 200-W-77 was originally posted as a High Contamination Area. In September 2000, radiological investigations found contamination levels up to 10,000 cpm on tumbleweed fragments in the posted area, which were subsequently removed. 200-W-77 was reposted as a CA after contamination spots was removed. It is assumed that the 216-U-14 Ditch is the source of the contaminated tumbleweeds found at 200-W-77.

Site: 200-W-77	Area: U Plant	Category: Shallow – Surface Only

It is unclear when the release occurred, or how long the contaminated vegetation had been present. No volume estimates can be ascertained for this site.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

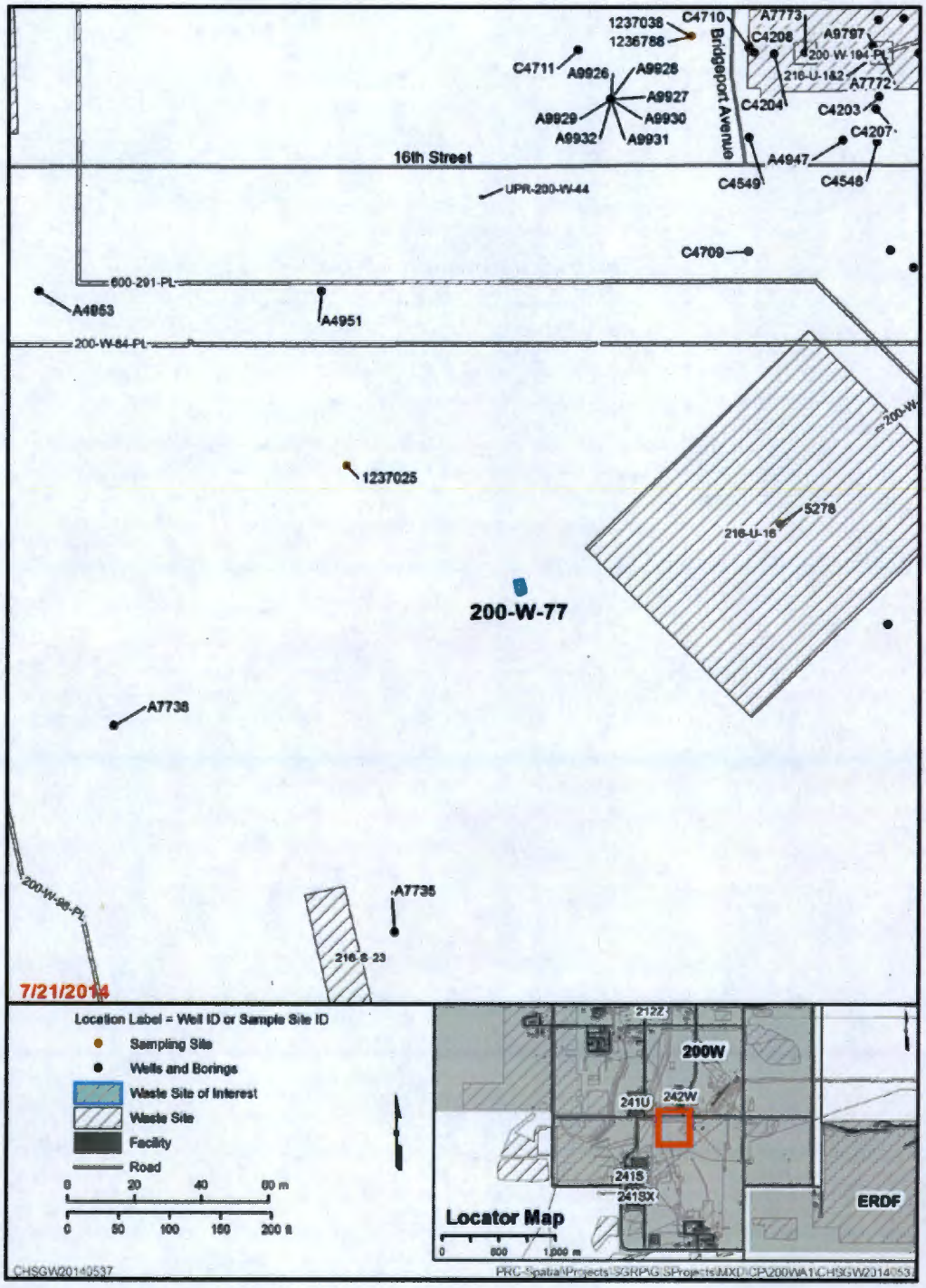
Site Characterization Summary: The site has been surveyed several times over the years. The site was mapped using Global Positioning Survey equipment in 1999. A radiation survey on September 20, 2000, led to the discovery of the contaminated tumbleweed fragments, which were immediately removed. A GM/P-11 Probe (15.5 cm^2 [0.95 $in.^3$]) (Beta-Gamma) was used during the investigation. A site walkdown occurred on November 1, 2000, to verify the site location and the condition of the site.

The site was covered with a layer of clean gravel backfill and downposted from a SCA to an URM area in 2000. No subsequent radiological survey or site characterization information is presented for the site. It is unclear if the site is routinely surveyed or monitored. If surveys do occur, their frequency is not specified.

Nature and Extent of Contamination:
Shallow (0 to 4.6 m [0 to 15 ft] below ground surface): Potential radiological contamination at the surface, below the stabilization cover.

References:
Waste Information Data System General Summary Report for the 200-W-77 Waste Site.

Site: 200-W-77	Area: U Plant	Category: Shallow – Surface Only



ID = identification
ERDF = Environmental Restoration Disposal Facility

Figure 1. 200-W-77 Waste Site Map

Site: 200-W-77	Area: U Plant	Category: Shallow – Surface Only

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Site: 200-W-83	Area: U Plant	Category: Shallow – Surface Only

Site Description

Alternate Site Identification: Soil Contamination Area North of 2727 W
Site Type: Unplanned Release
Facility/Geographic Area: U Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1, 200-MG-1
Service Dates: Not Specified

Waste Site Location and Physical Description: The 200-W-83 waste site was an unplanned release to the ground at the railroad tracks north of the 2727-WA Sodium Storage Building (Figure 1). When discovered, the site was posted as a Contamination Area (CA). The site was downposted to an Underground Radioactive Material Area (URMA) after the site was backfilled by clean soil in April 2007. The posted area extends across the railroad track and covers an estimated 18.3 m (60 ft) by 7.6 m (25.0 ft) area. Roughly 100 m (109 yd) of the site is posted with Danger signs. The railroad tracks have been abandoned. No reference drawing is available for this site.

Waste Site Coordinates:
E-567146.08334 N-135203.43796

Site Dimensions:
Site Length: 18.3 m (60.0 ft) Site Depth: Not specified
Site Width: 7.6 m (25.0 ft) Cover Thickness: Not specified
Site Area: 139 m^2 (1,500 ft^2)

Related Site Structure(s): The 200-W-83 waste site is associated with the 2727-WA Sodium Storage Building and railroad track.

Site Posting: Site 200-W-83 was originally posted as a CA when it was first discovered. The site was downposted from CA to URMA after interim remediation activities in April 2007. The 2727-W Building and three neighboring trailers are also posted as Radiological Material areas. In addition, the 2727-W Building, and approximately 100 m (109 yd) of the 200-W-83 site is also posted with "Danger" signs due to the sodium stored inside the 2727-W Building.

Site History

Release Summary: It is unclear what the contamination source is at the site, or when the release occurred. The type of waste and the volume of waste released at 200-W-83 are not specified. Therefore, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Unknown.

Site: 200-W-83	Area: U Plant	Category: Shallow – Surface Only

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: The site was discovered during a radiation survey on March 4, 1990. The survey was part of a routine radiological investigation documenting radiological conditions along railroad tracks in the 200 West Area. Surveys were conducted using a rail mounted survey vehicle. At the time of discovery, site 200-W-83 consisted of a speck of contamination with readings up to 3 millirem/hr on the tracks near the "concrete slabs" west of 221-U.

A Radiological Problem Report was issued in March 1990, following the discovery of 200-W-83 and three other contamination areas identified along 200 West Area railroad tracks. Site 200-W-83 was submitted to Waste Information Data System as a Discovery Site in September 2000. When it was submitted, the radiological conditions within the site were unclear, as no radiological surveys or site characterization probes had occurred since 1990. The most recent radiological survey for 200-W-83 occurred in March 2005.

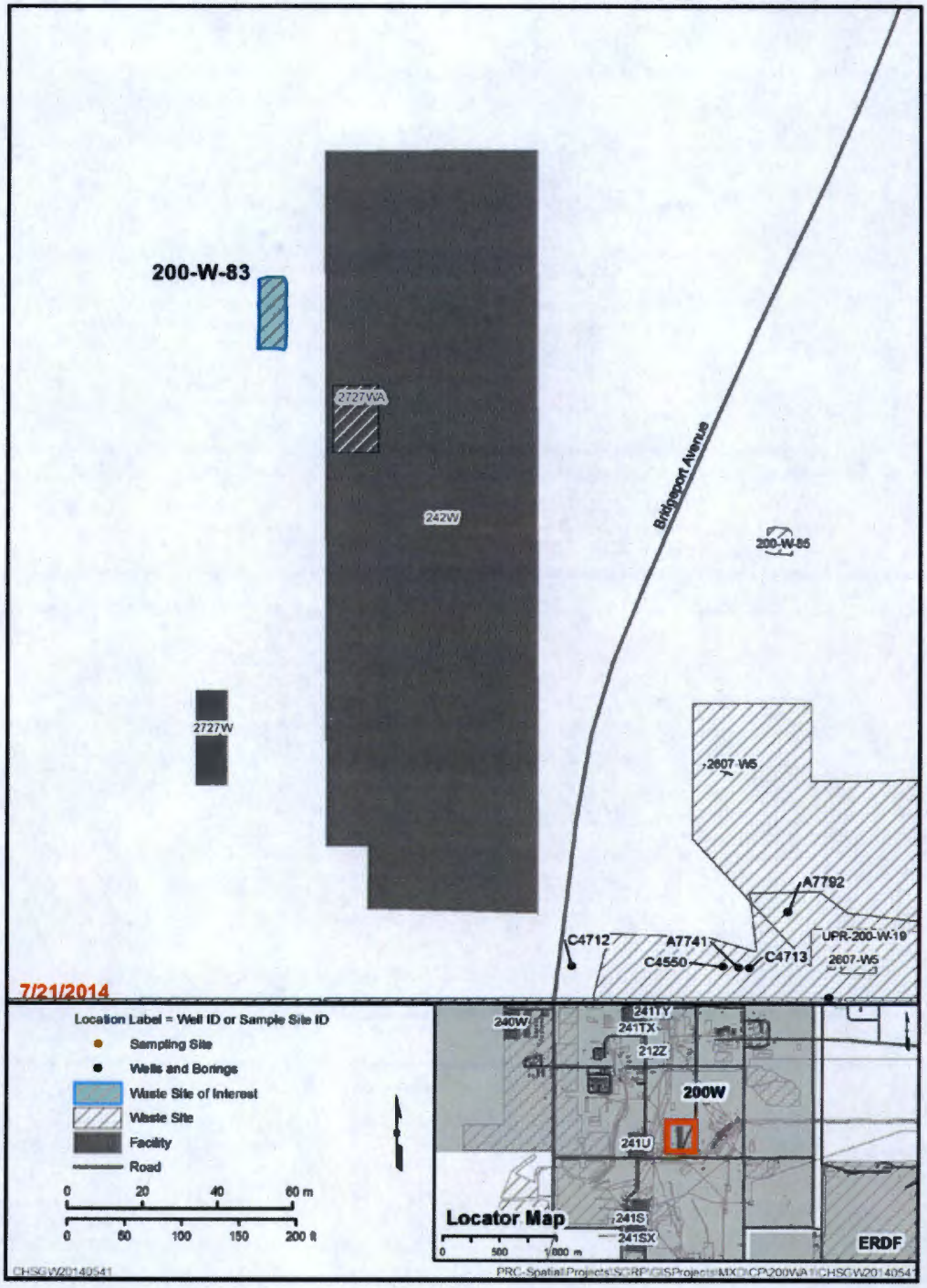
The site has been surveyed several times since its discovery. In September 2000, the site was surveyed with Global Positioning System equipment to map the site. A site walkdown on November 1, 2000, verified that the CA posting extended north across the railroad tracks. A second walkdown on May 24, 2001, occurred to determine the contamination source based on site conditions, and to document site characteristics. However, no obvious contamination source was located during the site visit. A radiation survey on March 8, 2005, updated site conditions. During the survey, a few additional specks of contamination were located. The radiological posting was changed from a CA to a Soil Contamination Area (SCA).

Interim stabilization occurred in April 2007. The site was covered with a layer of clean soil backfill and the site was downposted from a SCA to an URMA. It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided since 2005. If surveys do occur, their frequency is not specified.

Nature and Extent of Contamination:
Shallow (0 to 4.6 m [0 to 15 ft] below ground surface): Potential radiological contamination at the surface, below the stabilization cover.

References:
Waste Information Data System General Summary Report for the 200-W-83 Waste Site.

Site: 200-W-83	Area: U Plant	Category: Shallow – Surface Only



ID = identification
ERDF = Environmental Restoration Disposal Facility

Figure 1. 200-W-83 Waste Site Map

Site: 200-W-83	Area: U Plant	Category: Shallow – Surface Only

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Site: 200-W-84-PL	Area: U Plant	Category: Shallow - Subsurface

Site Description

Alternate Site Identification Names:	200-W-84-PL; U Plant Chemical Process Sewer to 216-U-14 Ditch; Vitrified Clay Pipeline Process Sewer; 200-W-84
Site Type:	Radioactive Process Sewer
Facility/Geographic Area:	U Plant
Current Operable Unit (OU) Assignment:	200-WA-1
Former OU Assignment:	200-IS-1
Service Dates:	1952 through 1984

The scoping summary in Figure 1 (pages 1 through 4) provides a summary of the site history, construction, features of interest, waste streams, site interfaces, relevant characterization, and other relevant information. The scoping summary includes information relevant to the complete length of the 200-W-84-PL pipeline. Portions of this waste site within the U Plant area have been segmented into waste sites 200-W-84-PL-X and 200-W-84-PL-A, for inclusion in the 200-WA-1 OU. Figure 2 provides the limits of the 200-W-84-PL waste site included in the 200-WA-1 OU. 200-W-84-PL-X is the portion of the original site located within the proposed footprint of the U Plant Canyon Barrier. 200-W-84-PL-A is the rest of the pipeline portions assigned to 200-WA-1. The balance of the 200-W-84-PL site is assigned to the 200-IS-1 OU.

The 200-WA-1 Final Pipeline data quality objectives meeting on June 2, 2016, with U.S. Environmental Protection Agency, Washington State Department of Ecology (Ecology), and U.S. Department of Energy concluded that sufficient information is available for the 200-WA-1 portions of site 200-W-84-PL and no sampling is required.

References:

Waste Information Data System General Summary Report for the 200-W-84-PL Waste Site.

Site: 200-W-84-PL	Area: U Plant	Category: Shallow - Subsurface

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Site: 200-W-84-PL	Area: U Plant	Category: Shallow - Subsurface

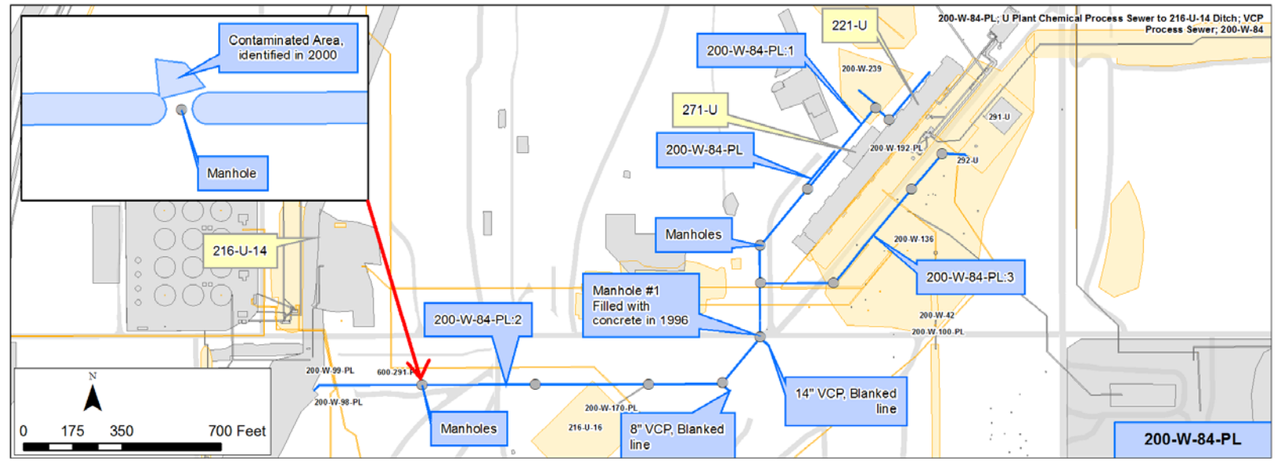
Scoping Summary: 200-W-84-PL

History

The 200-W-84-PL waste site is an inactive underground process sewer line network extending from the northwest side of the 221-U Building to the 216-U-14 Ditch. The line runs south, under 16th Street, and turns to the west until it intersects with the 216-U-14 Ditch.

In addition to the 221-U Building, the line transferred waste from the 222-U, 224-U, 271-U, and 292-U facilities. This line was constructed to carry non-tributyl phosphate waste from the 221-U Building.

The pipeline was in service from Jan-1952 through Jul-1984; however, given the various sources and the associated junctions, some feed lines were constructed or removed from service at various times throughout that span. 222-U was demolished in 2005 and 224-U was demolished in 2010.



Construction

- Length: 3,914 ft total
  - 200-W-84-PL:1: 587 ft, plus 167 ft feed line to 271-U, 86 ft feed line from 211-U, and 211 ft at eastern end of 221-U
  - 200-W-84-PL:2: 1,927 ft
  - 200-W-84-PL:3: 936 ft
- Diameter: Various
  - 200-W-84-PL:1: 12 in. VCP
    - 271-U feed line: 8 in. steel
    - 211-U feed line: 6 in. stainless steel
    - Eastern 211-U Segment: 6 in. VCP to 8 in. VCP to 10 in. VCP connecting to PVC
  - 200-W-84-PL:2: 18 in. VCP
    - Two blanked and unused VCP stubs at the southeast corner of the run; one is 14 in. VCP, the other is 8 in. VCP.
  - 200-W-84-PL:3: 8 in. VCP
- Composition: Primarily VCP with acid-proof joints (variations described above)
- Gravity Flow
- Direct Buried
  - Subsite 3 is encased in 6 in. thick concrete as it passes under 16th street and for the subsequent 205 ft to the south.
- Depth: 3 ft - 8 ft bgs
- Calculated Volume: 31,365 gal

Features of Interest

- Approximately six 'T' and/or 'Y' joints
- Four junctions with material change (i.e. VCP to PVC (x2), VCP to Steel, and PVC to Steel)
- Approximately 13 manholes, which are located above joints/material changes, and some elbows/bends in the line.
- Approximately 14 bends/elbows

Relevant Characterization

- A remotely operated crawler (with video camera and gamma detection equipment) was sent through the 221-U process sewer. Though not part of 200-W-84-PL, results are expected to be similar.
- Average dose rate inside the sewer was ~100 mrem/hr.
- Two samples of thin layers of dried, small-grain material were taken, detecting radionuclides including:
  - Strontium-89/90, Cesium-137, Americium-241, Europium-154, Uranium-238, and Plutonium isotopes

Waste Streams

- Non-tributyl phosphate waste generated in U-Plant by the uranium recovery process
  - Included fission products, sulphate, nitrate, and phosphate ions in aqueous solution
- Steam condensate from several buildings, primarily 221-U and 224-U (1952-1984)
  - These condensates were generally considered non-toxic

Misc./Other Relevant Information

- In 1983, the 50 ft section of pipe in Subsite 1 was modified from 12 in. VCP to 8 in. PVC. The manholes and fittings on either side of this pipe run were replaced. PVC piping was pushed/pulled through the existing VCP and space around the PVC line was filled with acid-proof concrete
- In 2000, a 5 ft x 5 ft Contamination Area was identified west of the 216-U-16 Crib. The area and the associated manhole are part of 200-W-84-PL

Site Interfaces

Origin/Termination	Site Intersects
U-Plant Facility	200-IS-1
• 221-U	• 200-W-98-PL
• 222-U (Demolished)	• 200-W-99-PL
• 224-U (Demolished)	• 200-W-170-PL
• 271-U	• 200-W-192-PL
• 292-U	• 200-W-103-PL
200-WA-1	200-WA-1
• 216-U-14 (Ditch)	• 200-W-42 (Process Sewer)
	• 216-U-16 (Crib)
	No Operable Unit
	• 200-W-136 (URMA)
	• 200-W-239 (UPR)
	• 600-291-PL

Figure 1. 200-W-84-PL Pipeline Scoping Summary (page 1)

Site: 200-W-84-PL	Area: U Plant	Category: Shallow - Subsurface

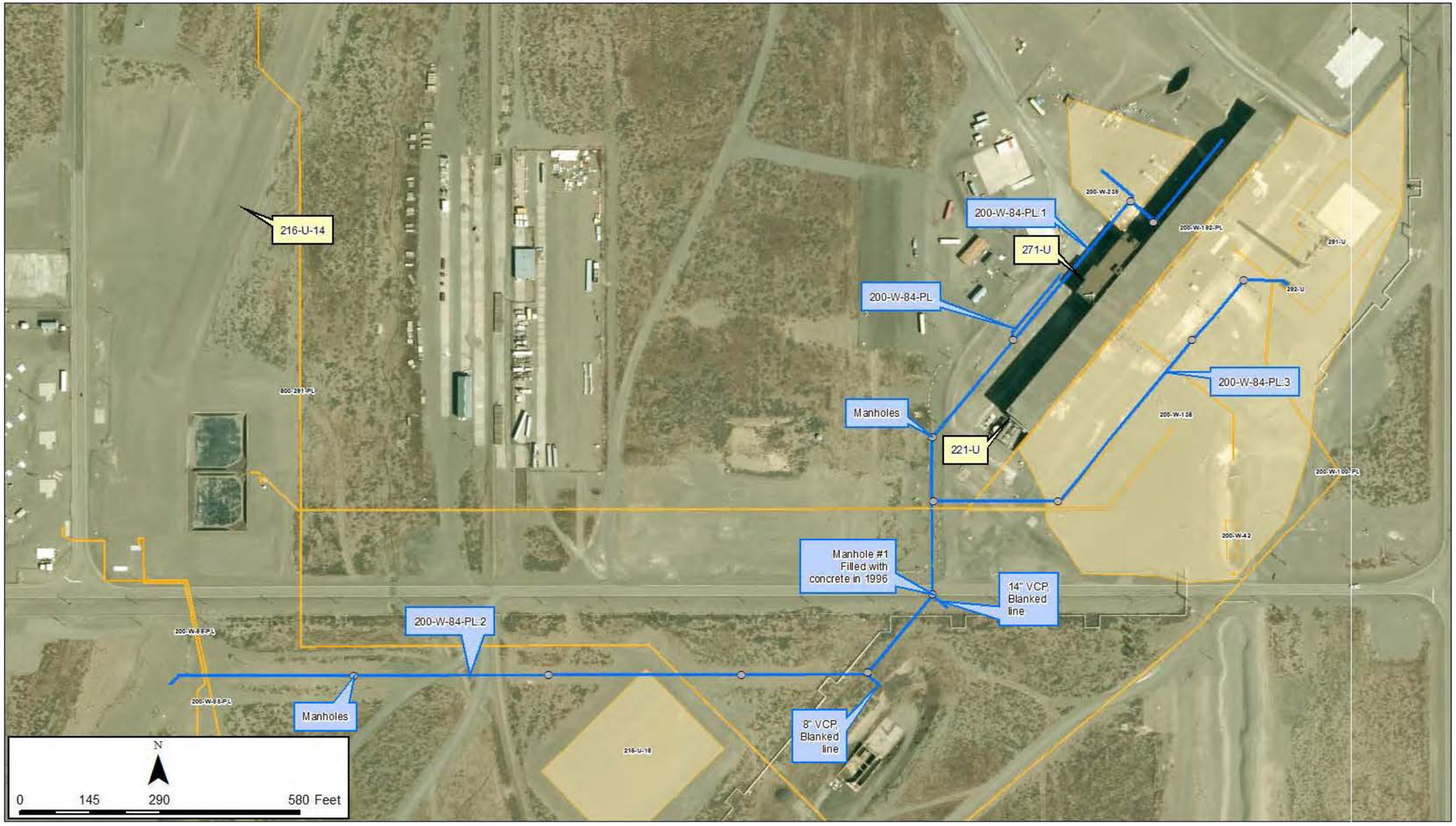
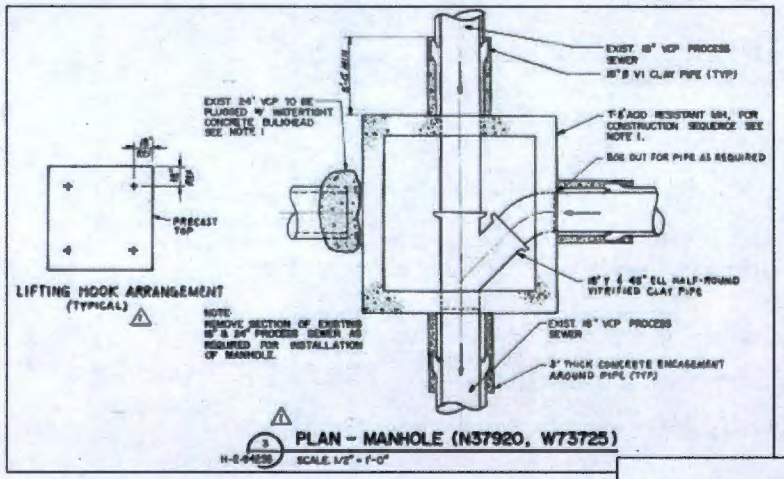
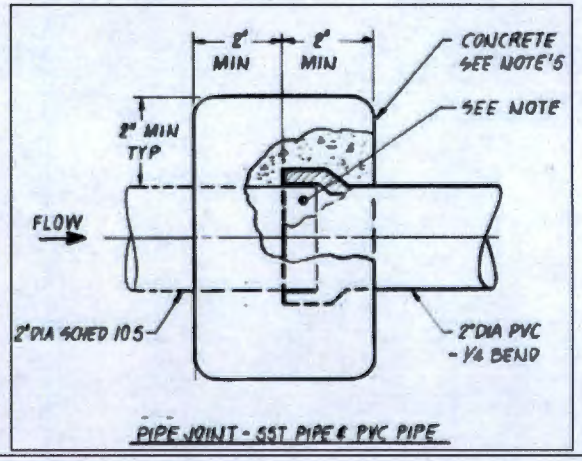


Figure 1. 200-W-84-PL Pipeline Scoping Summary (page 2)

Site: 200-W-84-PL	Area: U Plant	Category: Shallow - Subsurface





Note: the manhole detail drawing above is specific to manholes installed with the PVC piping in 1983.

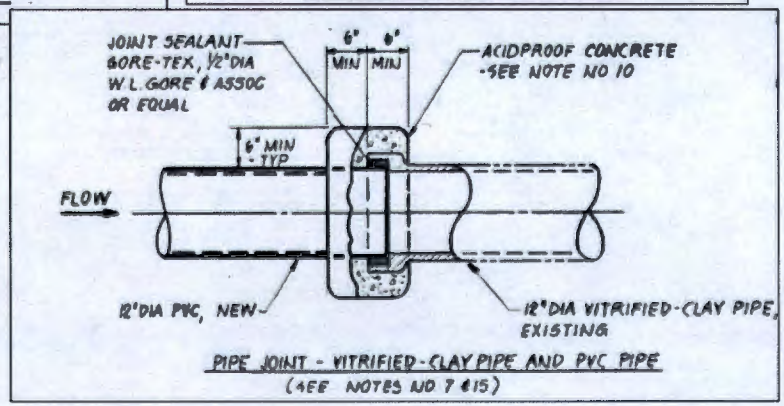


Figure 1. 200-W-84-PL Pipeline Scoping Summary (page 3)

Site: 200-W-84-PL	Area: U Plant	Category: Shallow - Subsurface

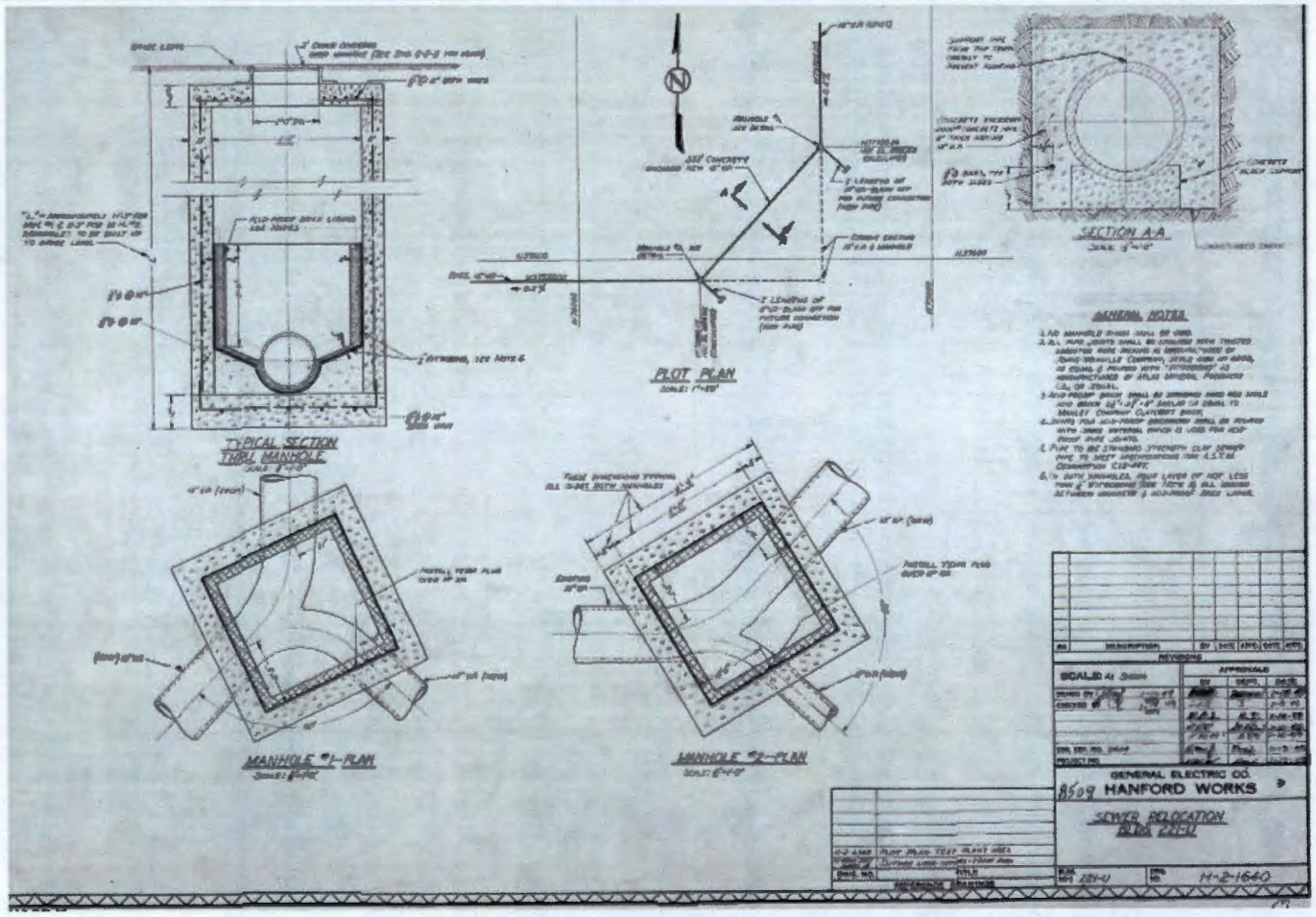
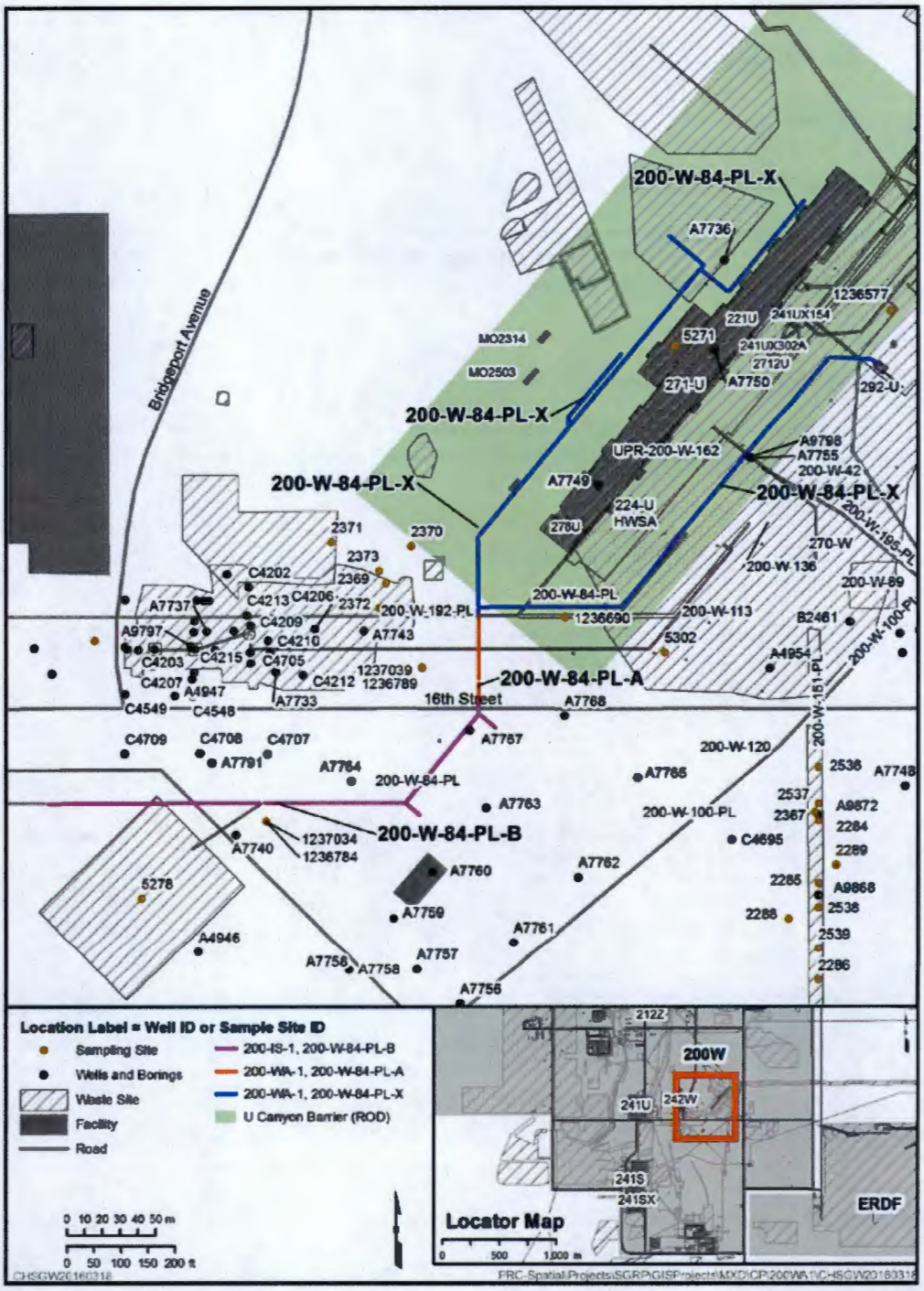


Figure 1. 200-W-84-PL Pipeline Scoping Summary (page 4)

Site: 200-W-84-PL	Area: U Plant	Category: Shallow - Subsurface



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ERDF = Environmental Restoration Disposal Facility

Figure 2. Location of 200-W-184-PL-X and 200-W-184-PL-A Pipeline Segments

Site: 200-W-84-PL	Area: U Plant	Category: Shallow - Subsurface

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Site: 200-W-85	Area: U Plant	Category: Shallow – Surface Only

Site Description

Alternate Site Identification: Soil Contamination Area East of 2727 W
Site Type: Unplanned Release
Facility/Geographic Area: U Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1, 200-MG-2
Service Dates: Not Specified

Waste Site Location and Physical Description: Site 200-W-85 was an unplanned release to the ground approximately 30 m (100 ft) east of the fenced 2727-WA Equipment Storage Yard (Figure 1). When discovered, the site was posted as a Soil Contamination Area (SCA) with no visible soil discoloration or disturbances. The posting encompassed an area supporting live rabbitbrush and grasses. In December 2001, the area was buried beneath a layer of clean backfill material and downposted to an Underground Radioactive Material Area (URMA). No reference drawings are available for this site.

Waste Site Coordinates:
E-567281.25950 N-135142.92639

Site Dimensions:
Site Length: 6.1 m (20.0 ft) Site Depth: Not specified
Site Width: 6.1 m (20.0 ft) Cover Thickness: Not specified
Site Area: Not specified

Related Site Structure(s): The 200-W-85 waste site is associated with the 2727-WA Equipment Storage Yard.

Site Posting: The 200-W-85 waste site was originally posted as a SCA when it was discovered. The site was downposted from SCA to URMA after interim remediation activities in December 2001.

Site History

Release Summary: The source of contamination and date of release at the site is unknown. The type of waste and the volume of waste released at 200-W-85 are not specified. Therefore, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Site: 200-W-85	Area: U Plant	Category: Shallow – Surface Only

Previous Site Characterization

Site Characterization Summary: The site has been surveyed several times over the years. In September 2000, the site was mapped using Global Positioning System equipment. A Ground Penetrating Radar (GPR) scan was done in February 2005. The GPR scan discovered a disturbed area close to the center of the site. Several pieces of buried metal debris were found in the posted area.

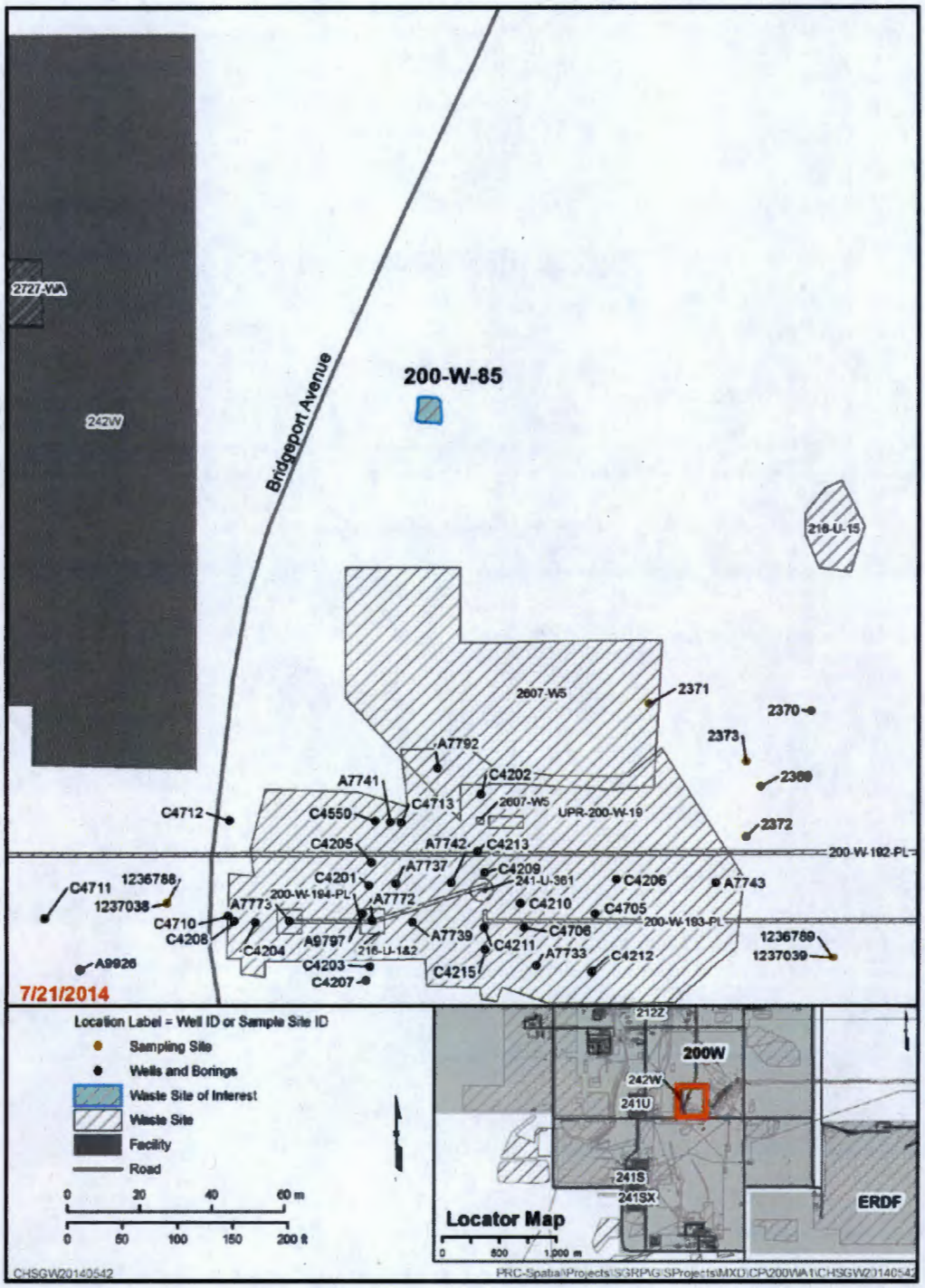
In addition, a site walkdown to verify site conditions was performed on November 1, 2000. Staff observed sparse rabbitbrush and grass growing inside the posted area. The vegetation did not appear stressed by site conditions, and no soil discoloration was observed. Interim stabilization occurred in December 2001. The site was covered with a layer of clean backfill material and downposted from an SCA to an URMA.

Site 200-W-85 was submitted to Waste Information Data System as a Discovery Site on an unspecified date. No radiological survey or site characterization information is presented for the site. It is unclear when the site was originally posted or the radiological conditions of the site. It is also unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided. If surveys do occur, their frequency is not specified.

Nature and Extent of Contamination:
Shallow (0 to 4.6 m [0 to 15 ft] below ground surface): Potential radiological contamination at the surface, below the stabilization cover.

References:
Waste Information Data System General Summary Report for the 200-W-85 Waste Site.

Site: 200-W-85	Area: U Plant	Category: Shallow – Surface Only



ID = identification
ERDF = Environmental Restoration Disposal Facility

Figure 1. 200-W-85 Waste Site Map

Site: 200-W-85	Area: U Plant	Category: Shallow – Surface Only

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Site: 200-W-86	Area: U Plant	Category: Shallow - Subsurface

Site Description

Alternate Site Identification: Contamination Area Around Light Pole
Site Type: Unplanned Release
Facility/Geographic Area: U Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1, 200-MG-1
Service Dates: Not Specified

Waste Site Location and Physical Description: The 200-W-86 waste site was an unplanned release around an active (in-use) light pole with a street light attached on Bridgeport Avenue, which is a gravel road. The site is located northwest of 221-U, and covers an estimated 3.1 m^2 (10 ft^2) area on each side (Figure 1). In December 2001, the utility pole was removed and the area was buried by a layer of clean gravel or rock backfill. Following interim remediation work, the site was downposted from Soil Contamination Area (SCA) to Underground Radioactive Material Area (URMA). No reference drawing is available for this site.

Waste Site Coordinates:
E-567327.70339 N-135507.21781

Site Dimensions:
Site Length: 3.1 m (10.0 ft) Site Depth: Not specified
Site Width: 3.1 m (10.0 ft) Cover Thickness: Not specified
Site Area: Not specified

Related Site Structure(s): The light pole at the 200-W-86 waste site is associated with electrical utility facilities.

Site Posting: It is not clear when the 200-W-86 waste site was originally posted. The site was downposted from SCA to URMA after interim remediation activities in December 2001.

Site History

Release Summary: The history, source, and volume of contamination at site 200-W-86 are not known. The unplanned release consisted of a small SCA surrounding a power pole. It is unclear what the contamination source is at the site, or when the release occurred. The type of waste and the volume of waste released at 200-W-86 are not specified. Therefore, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Unknown.

Site: 200-W-86	Area: U Plant	Category: Shallow - Subsurface

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: The 200-W-86 waste site was submitted to Waste Information Data System (WIDS) as a Discovery Site in 2000. No radiological surveys are presented for this site, and the conditions inside the posted area, and the source of contamination, are not known.

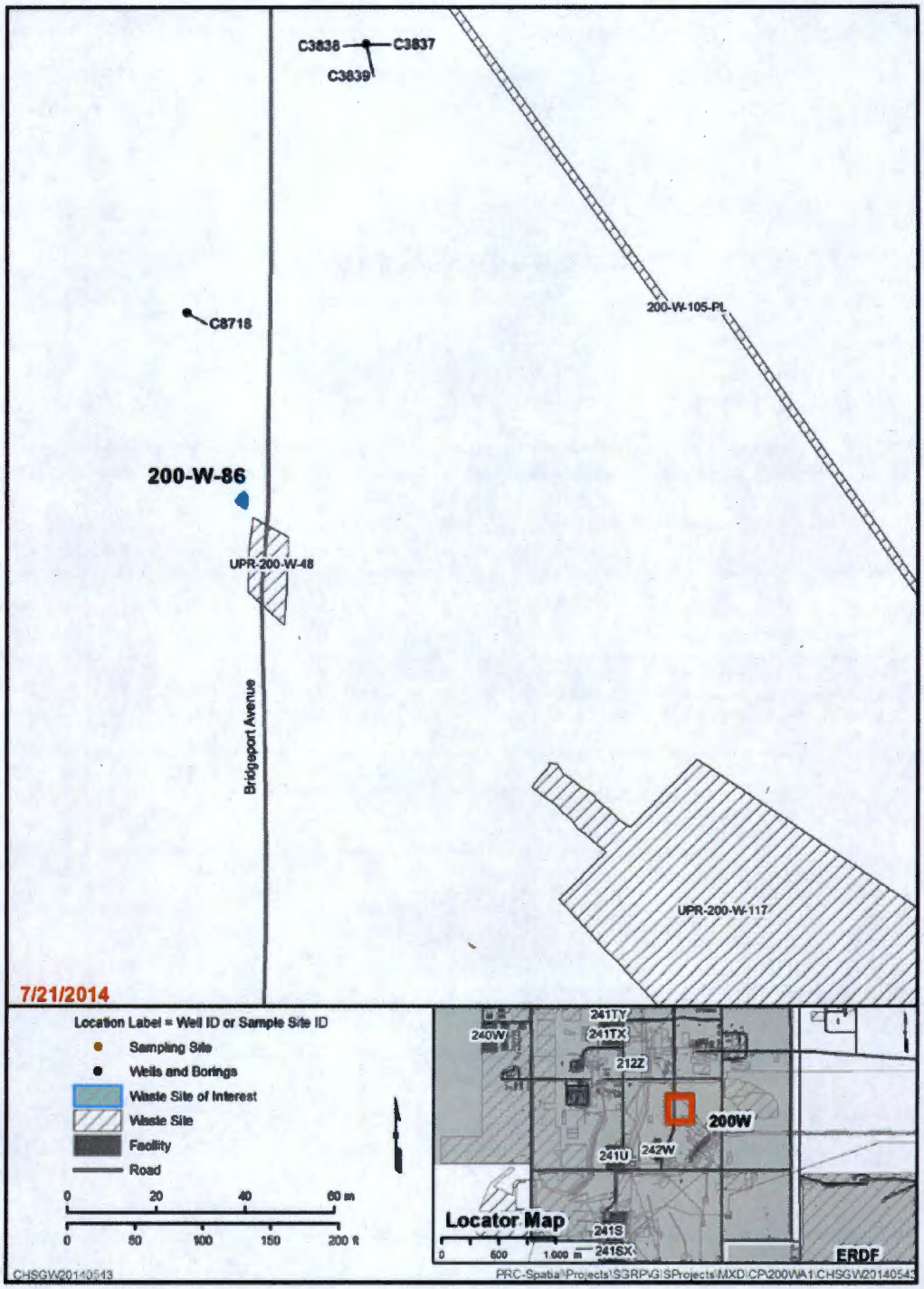
Interim stabilization work in December 2001 removed the utility pole and buried the site beneath a layer of clean backfill material. The area was downposted from a SCA to a URMA following interim work. It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided for the site. If surveys do occur, their frequency is not specified.

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): Potential radiological contamination in the subsurface, below the stabilization cover.

References:
WIDS General Summary Report for the 200-W-86 Waste Site.

Site: 200-W-86	Area: U Plant	Category: Shallow - Subsurface



ID = identification
ERDF = Environmental Restoration Disposal Facility

Figure 1. 200-W-86 Waste Site Map

Site: 200-W-86	Area: U Plant	Category: Shallow - Subsurface

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Site: 200-W-87	Area: U Plant	Category: Shallow – Surface Only

Site Description

Alternate Site Identification: Unplanned Release of Chemical Spur Railroad Track Northwest of 221-U Plant
Site Type: Unplanned Release
Facility/Geographic Area: U Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2, 200-UW-1
Service Dates: Not Specified

Waste Site Location and Physical Description: The 200-W-87 waste site consists of an unplanned release on an abandoned railroad track. The site is located roughly 61 m (200 ft) northwest of the 2714-U Building and T-Hopper yard on the U Plant chemical spur railroad track (Figure 1). A portion of the railroad spur was originally posted as a Contamination Area (CA). In December 2001, the area was covered with clean backfill material and downposted to an Underground Radioactive Material Area (URMA). No reference drawing is available for this site.

Waste Site Coordinates:
E-567462.51743 N-135291.88241

Site Dimensions:
Site Length: 36.6 m (120.0 ft) Site Depth: Not specified
Site Width: 9.1 m (30.0 ft) Cover Thickness: Not specified
Site Area: 333 m^2 (3,584 ft^2)
Note: These are the estimated dimensions based on visual observations.

Related Site Structure(s): The site is associated with the U Plant chemical spur railroad track. The 200-W-104 site lies within the limits of 200-W-87.

Site Posting: The 200-W-87 waste site is currently within the posted zone of the URMA remediation stabilization area known as 200-W-136. The URMA was created when the 222-U Building was demolished in 2005. The site is a posted CA on the U-Plant chemical spur railroad track.

Site History

Release Summary: The railroad spur was used to move chemicals to and from the 211-U Tank Farm and also to transport "T-Hopper" containers. The containers held calcined uranium powder that had undergone processing at the 224-U Uranium Trioxide plant. The containers were kept in a fenced area west of the 2714-U Building for storage. The URMA signs were erected due to the spur being used to park rail cars and engines, not due to the transport and storage of chemicals.

Site: 200-W-87	Area: U Plant	Category: Shallow – Surface Only

The posted CA was submitted to the Waste Information Data System database as a Discovery Site in September 2000. No radiological survey could be located to explain the radiological conditions inside the posted area. In March 1996, a small train used at the Plutonium-Uranium Extraction (PUREX) Railroad cut and tunnel was transferred to this location and was roped off for potential radiation concerns. The train remained at the site until it was transported back to the PUREX Facility in 1998. The rail cars did not have smearable contamination; however, the site was still posted as a precaution, based on the potential of contamination from the engine and railcars. When the railcars were removed, the posted status of the site was overlooked and the posting was not removed or downposted.

No waste volume information is available for site 200-W-87. The amount of waste in the "T-Hopper" containers and the number of containers stored at the site is not specified. In addition, the volume of material transported along the railroad spur during all or part of its operational lifetime is not specified. Therefore, no volume estimates can be ascertained for this site.

Volume Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: A site walkdown of 200-W-87 occurred on November 15, 2000, for site verification. Observers noted that some tumbleweeds were growing on the track bed, both inside and outside the posted area. Whether the vegetation was removed or not is not specified.

It is unlikely that any contamination remains in the area. The rail cars were free of any smearable contamination. In addition, in December 2001, the area was covered with clean backfill and downposted to an URMA.

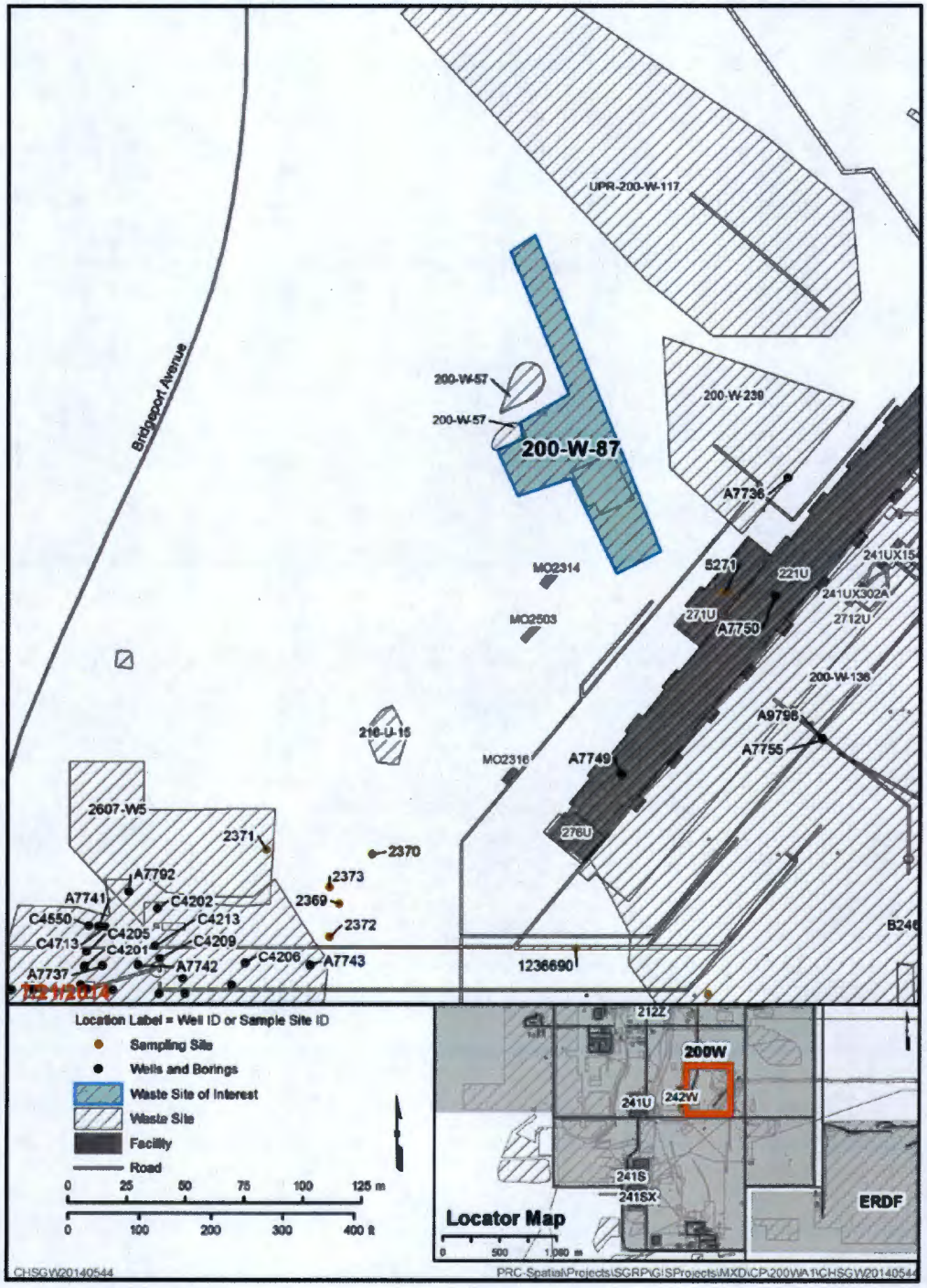
No site characterization information is presented for 200-W-87. It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided. If surveys do occur, their frequency is not specified.

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface): Potential radiological contamination in the subsurface, below the stabilization cover.

References:
Waste Information Data System General Summary Report for the 200-W-87 Waste Site.

Site: 200-W-87	Area: U Plant	Category: Shallow – Surface Only



ID = identification
ERDF = Environmental Restoration Disposal Facility

Figure 1. 200-W-87 Waste Site Map

Site: 200-W-87	Area: U Plant	Category: Shallow – Surface Only

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Site: 200-W-89	Area: U Plant	Category: Shallow – Surface Only

Site Description

Alternate Site Identification: 252-U, U Plant Electrical Substation, C8S17 Substation, U-Cat Substation
Site Type: Foundation
Facility/Geographic Area: U Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1, 200-MW-1
Service Dates: Not Specified

Waste Site Location and Physical Description: The 200-W-89 waste site is located near the intersection of Beloit and 16th Street in the 200 West Area, east of the 224-U Building (Figure 1). The site is a large, posted gravel Underground Radioactive Material Area (URMA) where the 252-U Electrical Substation had been located (Figure 2).

Waste Site Coordinates:
E-567647.69083 N-135037.37563

Site Dimensions:
Site Length: 30.5 m (100.0 ft) Site Depth: Not Specified
Site Width: 30.5 m (100.0 ft) Cover Thickness: Not Specified
Site Area: Not specified
Note: This is the estimated dimensions of the site based on visual observations.

Related Site Structure(s): The site is associated with the 221-U and the 224-U Buildings.

Site Posting: Site 200-W-89 is currently within the posted zone of the URMA remediation stabilization area known as 200-W-136. The URMA was created when the 222-U Building was demolished in 2005.

Site History

Release Summary: Prior to being decommissioned, the 252-U Substation provided electric utility support to the 221-U and 224-U Facilities. The 200-W-89 waste site is located where the substation was originally located. The site has lingering radioactive contamination confined within the soil, and a posted URMA remains after the demolition of the 252-U Substation. Additional contamination was discovered inside the Substation in 1994. It is believed the existing metal discoloration and metal contamination present at this site occurred overtime from exposure to fallout from the neighboring 224-U stack, generated during the Uranium Tri-Oxide Facility operations. Surveys detected cesium-134 and cesium-137 contamination, in addition to some barium, cadmium, chrome, and lead contamination. Most recently, contaminated rodent feces have been found at the site.

Site: 200-W-89	Area: U Plant	Category: Shallow – Surface Only

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: In 1994, radiological surveys detected contamination on equipment in the Electrical Substation. Direct readings of 5,000 dpm beta/gamma and 3,500 dpm alpha were discovered on discolored metal objects. On August 1, 1998, samples of black mastic, gray mastic, charcoal disks, metal and ceramic objects, and asbestos fibers were gathered for analytical testing. Tests detected cesium-134 and cesium-137 contamination on metal and ceramic items and in the asbestos fibers. In addition, varying levels of barium, cadmium, chrome, and lead were detected. No gross alpha or beta contamination, nor polychlorinated biphenyls (PCBs) or silver, were detected in the samples. All samples were determined to be below regulatory limits for asbestos, except for the black mastic.

In 1998, the 252-U Substation was deactivated. The site was surface stabilized with a layer of gravel in 1999 and posted with URMA signs. All the contaminated equipment was sent offsite to Oak Ridge, Tennessee, to be recycled except for a single, large transformer. The transformer was posted with Fixed Contamination signs and left in place as it was too expensive to remove. A site walkdown on November 21, 2000, occurred to verify site conditions. Staff noted that the remaining transformer was located in the center of the posted area and surrounded with rope and Radioactive Material Area signs. In 2005, the transformer was sent to the Environmental Restoration Disposal Facility with other material associated with the 224-U Facility demolition.

Following the deactivation of the substation, contaminated mouse droppings were discovered under the switch gear and in the soil. The mouse feces had readings up to 700 cpm. It is unclear if the site is routinely surveyed or monitored. If surveys do occur, their frequency is not specified.

Nature and Extent of Contamination:

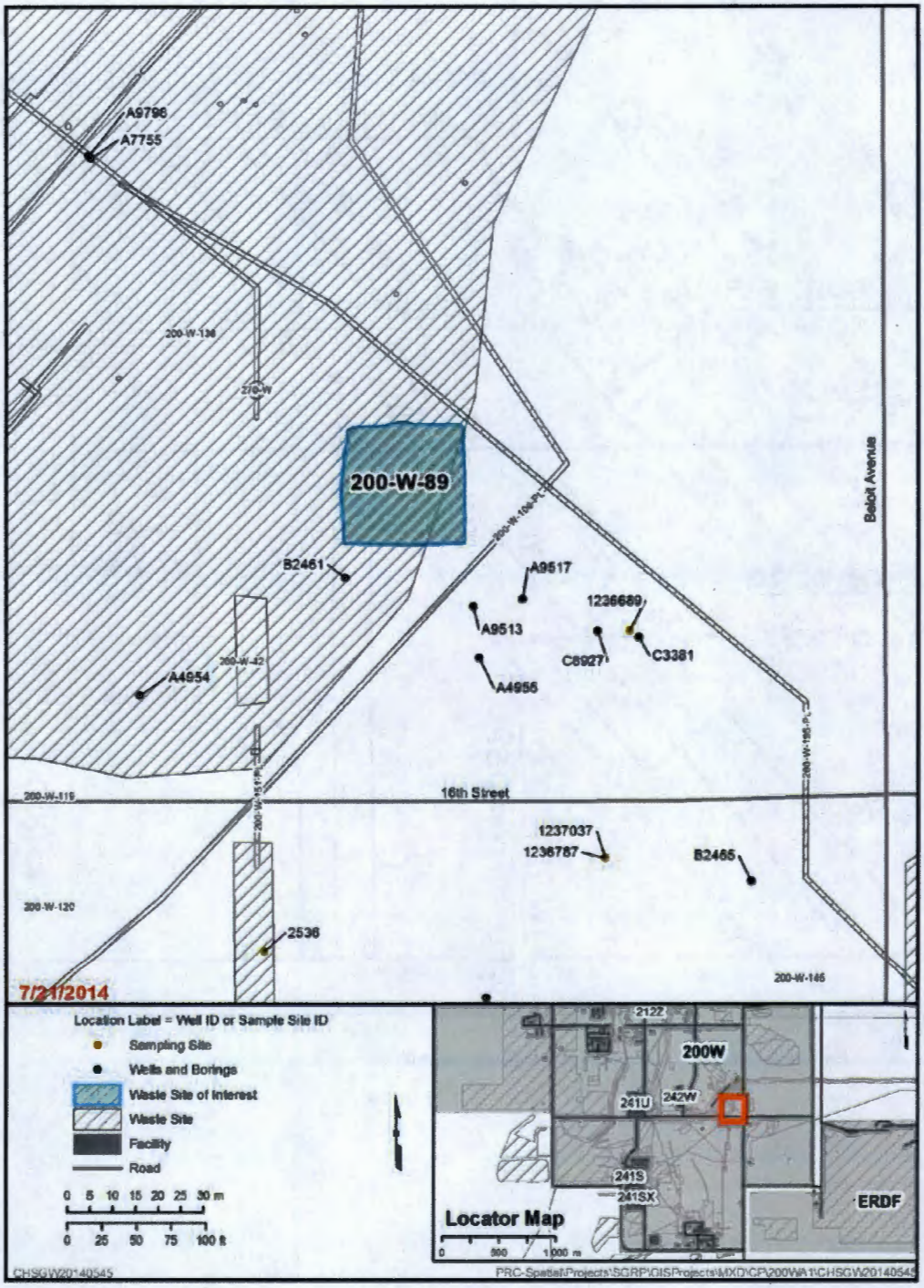
Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): Potential radiological contamination at the surface, below the stabilization cover.

References:

H-2-44511 (drawing), 1973, *Area Map 200 West U Plant Facilities*, Sh. 68, Rev. 6, Atlantic Richfield Hanford Company, Richland, Washington.

Waste Information Data System General Summary Report for the 200-W-89 Waste Site.

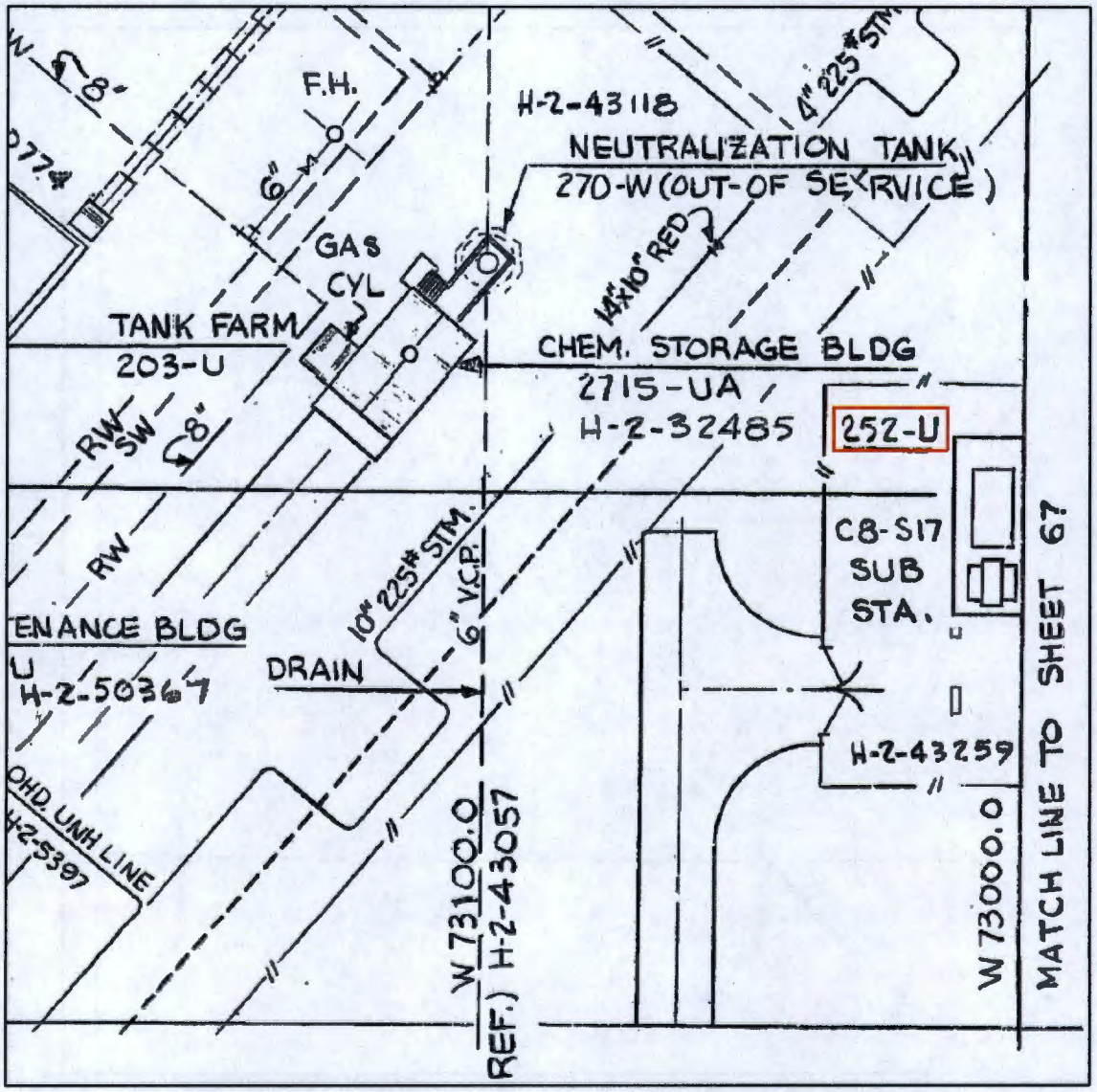
Site: 200-W-89	Area: U Plant	Category: Shallow – Surface Only



ID = identification
ERDF = Environmental Restoration Disposal Facility

Figure 1. 200-W-89 Waste Site Map

Site: 200-W-89	Area: U Plant	Category: Shallow – Surface Only



Source: H-2-44511, *Area Map 200 West U Plant Facilities*, Sheet 68.

Figure 2. Site Detail

Site: 200-W-100-PL	Area: U Plant	Category: Shallow - Subsurface

Site Description

Alternate Site Identification Names:	200-W-100-PL; Encased Pipeline from 241-UX-154 to 241-SX-152 and 241-S-151 Diversion Boxes; Lines V762/4853, V503/4700, and V505/4701
Site Type:	Encased Tank Farm Pipeline
Facility/Geographic Area:	U Plant
Current Operable Unit (OU) Assignment:	200-WA-1
Former OU Assignment:	200-IS-1
Service Dates:	1970 through 1976

The scoping summary in Figure 1 provides a summary of the site history, construction, features of interest, waste streams, site interfaces, relevant characterization, and other relevant information. The scoping summary includes information relevant to the complete length of the 200-W-100-PL pipeline. A portion of this waste site within the U Plant area has been segmented into waste site 200-W-100-PL-X, for inclusion in the 200-WA-1 OU. 200-W-100-PL-X is the portion of the original site located within the proposed footprint of the U Plant Canyon Barrier. The balance of the 200-W-100-PL site is assigned to the 200-IS-1 OU. Figure 2 provides the limits of the 200-W-100-PL-X waste site included in the 200-WA-1 OU.

References:

Waste Information Data System General Summary Report for the 200-W-100-PL Waste Site.

Site: 200-W-100-PL	Area: U Plant	Category: Shallow - Subsurface

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Site: 200-W-100-PL	Area: U Plant	Category: Shallow - Subsurface

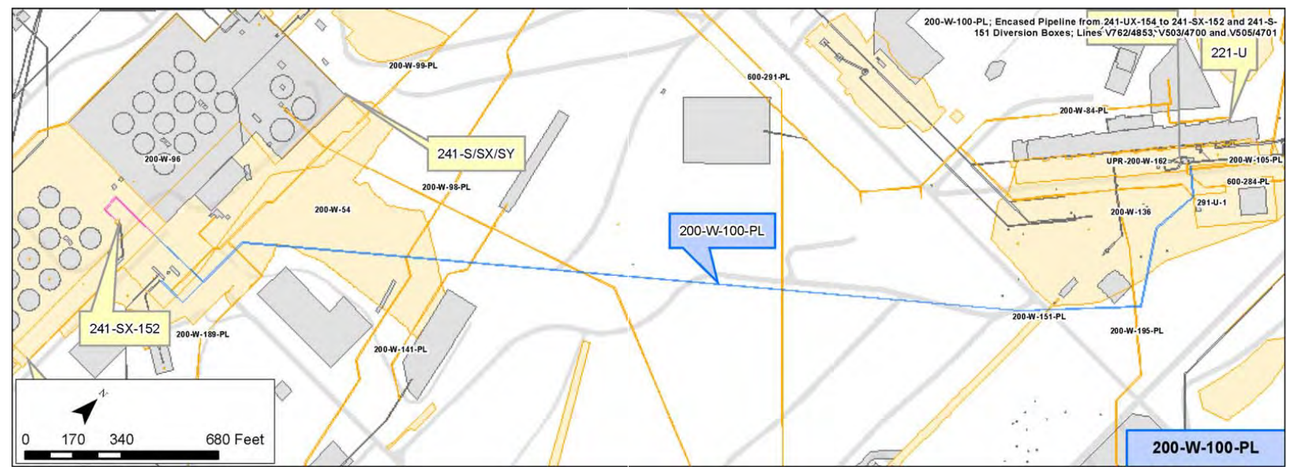
Scoping Summary: 200-W-100-PL

History

The 200-W-100-PL waste site is an inactive underground encased tank farm pipeline beginning near the 221-U Building at the 241-UX-154 Diversion Box and terminating at both the 241-SX-152 and 241-S-151 Diversion Boxes located on the east side of the 241-S/SX Tank Farm.

The pipeline was constructed in 1970 to facilitate the transfer of waste between the S/SX Tank Farms and the 241-UX-154 Diversion Box. These lines were used for this process from 1971 through roughly 1972, and then remained in use until approximately 1976, as the S/SX tank farm wastes were evaporated and pumped elsewhere.

The lines have been flushed and are considered to be empty (RPP-10466), excluding any residual liquid that may have accumulated at the low points in the line.



Construction

- Length:
  - V762/4853: 3,967 ft
  - V503/4700: 3,927 ft
  - V505/4701: 3,927 ft
- Diameter: 3 in.
- Composition: Stainless Steel
- Pressurized
- Encasement specifications:
  - 5.5 in. thick concrete floor
  - 5 in. thick side walls
  - Covered with 36 in. wide carbon steel plating (.25-in thick)
  - 5 in. concrete top over steel plating
  - 4,360 ft total encasement length
  - Drain line to 241-UX-154 Diversion Box
- Depth: 1 ft - 13 ft bgs
- Total Calculated Volume: 4,537 gal

- Both the 241-S-151 and 241-SX-152 Diversion Boxes sit at the lowest elevation of the pipe run. If any residual liquids existed in the line, both locations could accumulate liquid. The slope of the lines suggest more residual liquids would have settled at the 241-S-151 Diversion Box.

Features of Interest

- 11 Expansion loops
- 13 Test Risers
- 7 bends/joints (not co-located with expansion loops)

Relevant Characterization

- Since no identified leaks are associated with this pipeline, characterization data for the waste site has not been collected.

Waste Streams

- Line V762/4853 flowed west to east, sending RSN from 241-SX-152 to 241-UX-154 (and ultimately to B Plant)
- Line V505/4701 flowed east to west, sending RSNW from 241-UX-152 to 241-S-151.
- Specific waste stream and flow direction for line V503/4700 is unidentified, but likely the same as the other two lines given its designed purpose
- Supported transfer of S/SX tank farm waste evaporation process (1972-1976)

Misc./Other Relevant Information

- When the encasement reaches the 241-S/SX Tank Farms, it branches. One branch carries the V762/4853 line to 241-SX-152 Diversion Box. The other carries lines V503/4700 and V505/4701 to the 241-S-151 Diversion Box.
- At 241-UX-154 Diversion Box, 200-W-100-PL shares an encasement with 200-W-105-PL waste site for less than 25 ft before entering the diversion box.

Site Interfaces

Origin/Termination

200-IS-1
- 241-UX-154

WMA S/SX
- 241-SX-152
- 241-S-151

Site Intersects

200-IS-1
- 200-W-84-PL
- 200-W-98-PL
- 200-W-99-PL
- 200-W-105-PL
- 200-W-141-PL
- 200-W-151-PL
- 200-W-195-PL
- 600-W-284-PL

Site Intersects

WMA S/SX
- 200-W-96 (UPR)

No Operable Unit
- 200-W-136 (UPR)
- 200-W-189-PL
- 600-269-PL
- 600-291-PL

200-WA-1
- 200-W-54 (Contamination Migration)
- UPR-200-W-162

200-CU-1
- 291-U (Fan Control House)

Figure 1. 200-W-100-PL Pipeline Scoping Summary (page 1)

Site: 200-W-100-PL	Area: U Plant	Category: Shallow - Subsurface

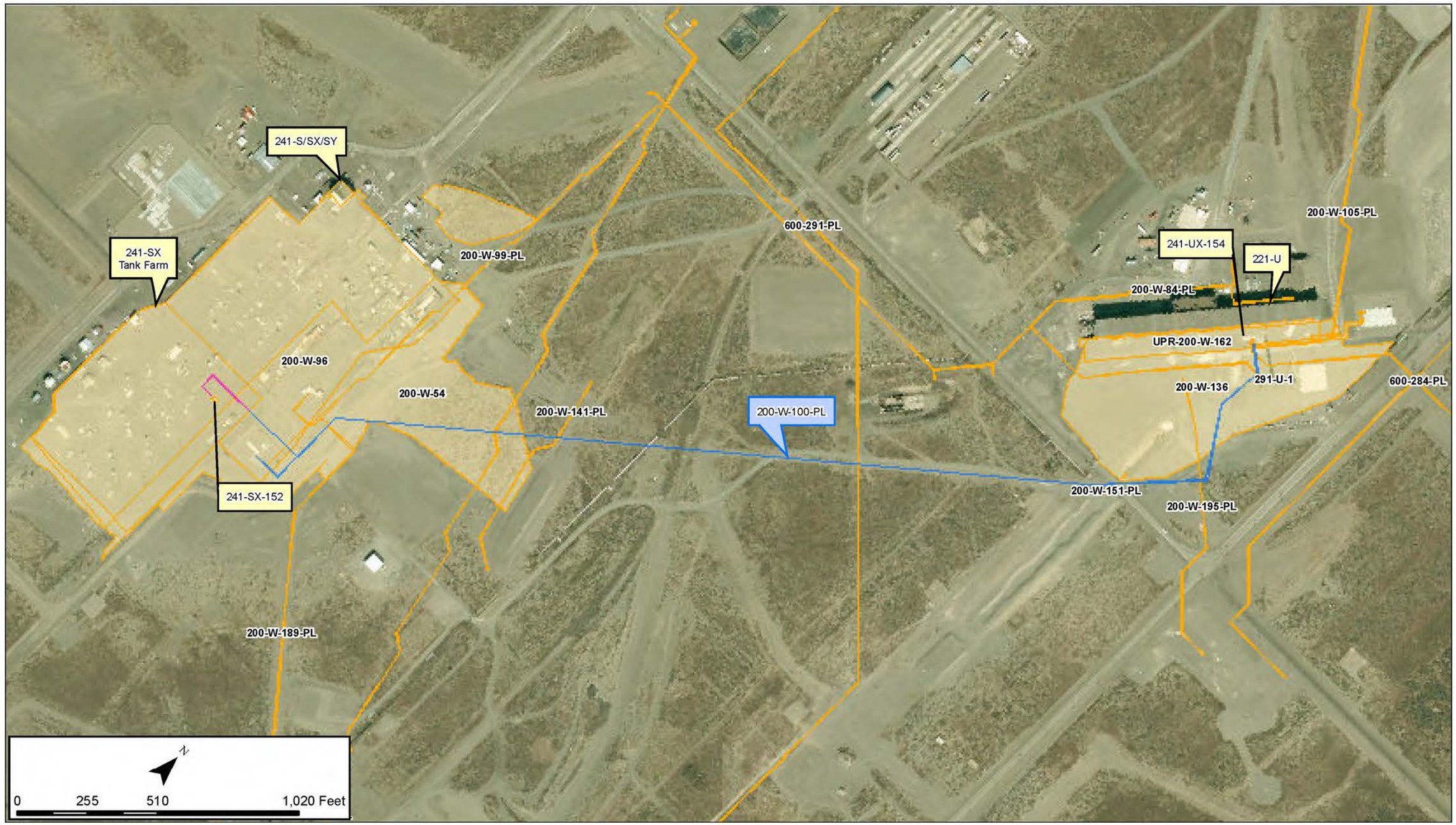


Figure 1. 200-W-100-PL Pipeline Scoping Summary – (page 2)

Site: 200-W-100-PL	Area: U Plant	Category: Shallow - Subsurface

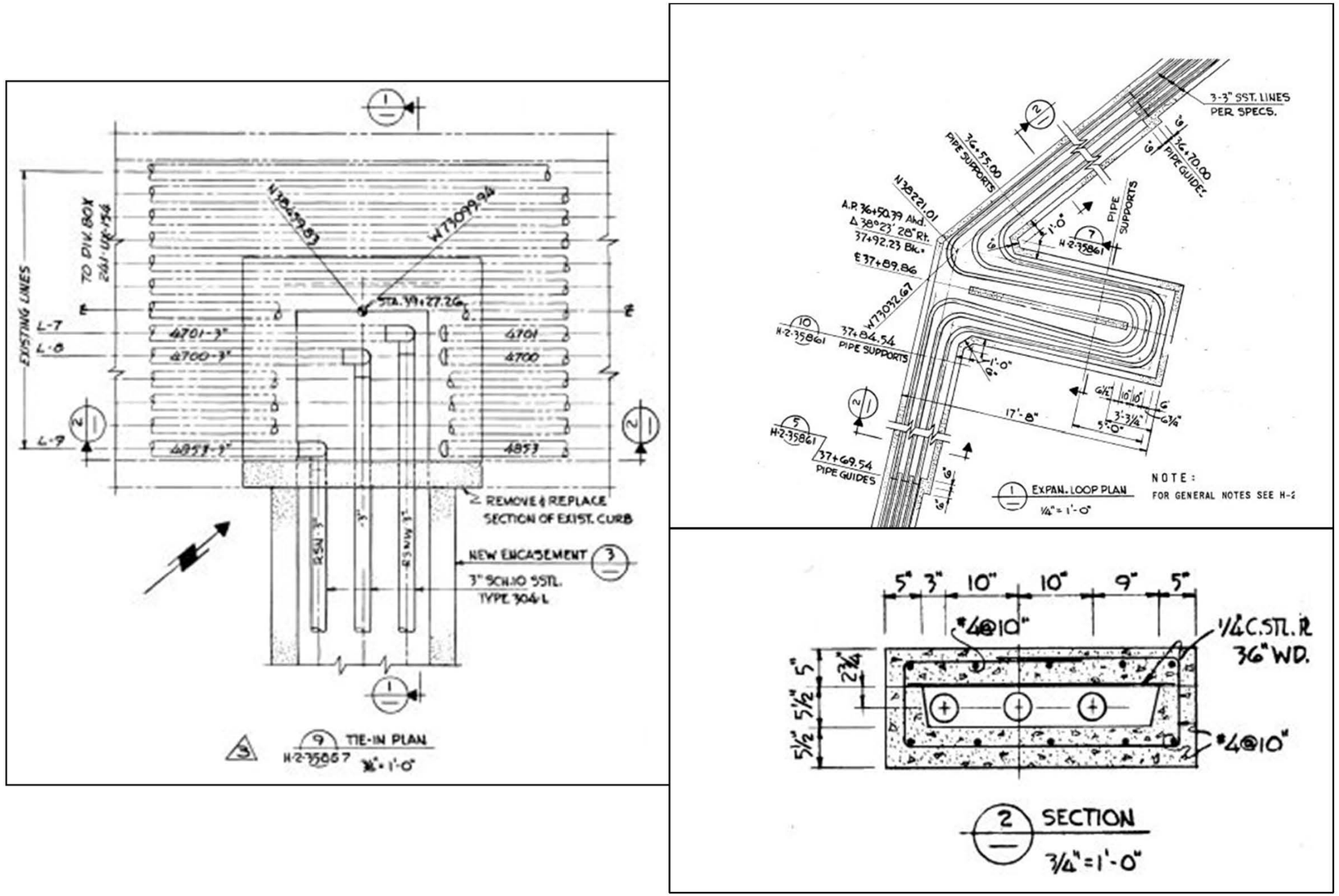


Figure 1. 200-W-100-PL Pipeline Scoping Summary – (page 3)

Site: 200-W-100-PL	Area: U Plant	Category: Shallow - Subsurface

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Site: 200-W-100-PL	Area: U Plant	Category: Shallow - Subsurface

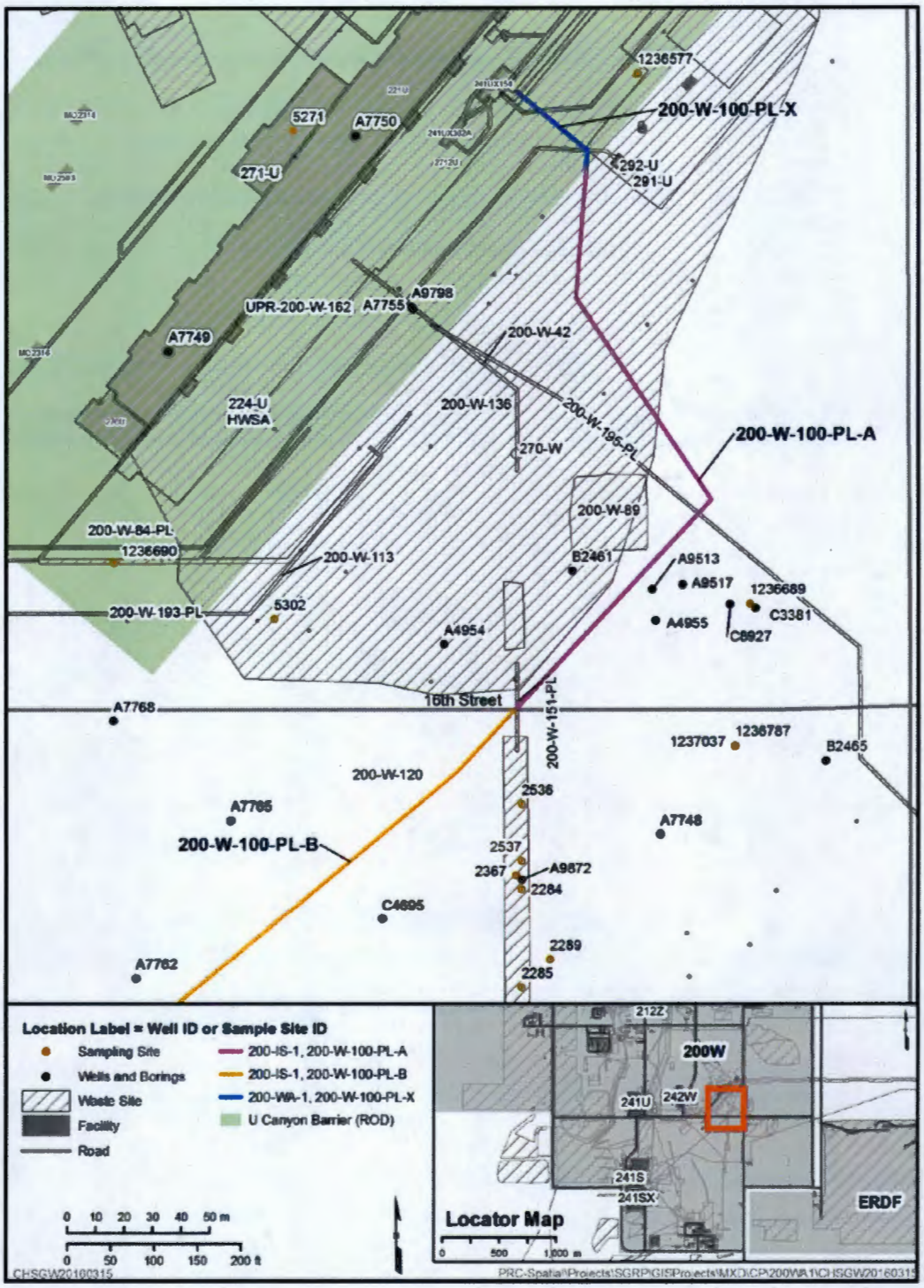

Figure 2. Location of 200-W-100-PL-X Pipeline Segment

Site: 200-W-100-PL	Area: U Plant	Category: Shallow - Subsurface

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Site: 200-W-104	Plant: U Plant	Category: Shallow-Subsurface

Site Description

Alternate Site Identification: 200-W-14, 2714-U Building, UO3 Storage Warehouse, 2714-U Foundation
Site Type: Structures and Foundations
Facility/Geographic Area: U Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: Not applicable
Service Dates: Unknown start date - 2005

Waste Site Location and Physical Description: The site was a metal building posted with Contamination Area, Radioactive Material Area signs. Figure 1 shows the site location. The 2714-U and 275-UR buildings were demolished in 2005. Figure 2 shows the building foundations remaining after the demolition. The 2714-U foundation is posted with Underground Radioactive Material Area (URMA) signs (see site code 200-W-87). The buildings were located northwest of the 221-U canyon facility. A minimum of 15 cm (6 in.) of gravel was placed over the foundation and the area was posted as URMA based on post-demolition radiological surveys (DOE/RL-2011-04, *U Plant Ancillary Facilities Removal Action Report*).

Waste Site Coordinates:
E-567484.843082 N-135217.668836

Site Dimensions: Not specified.

Related Site Structure(s): 200-W-104 is associated with buildings 2714-U and 275-UR. Both buildings were demolished in 2005.

Site Posting: The site is posed with URMA signs.

Site History

Release Summary: The 2714-U Storage Facility was used previously to store material related to the uranium trioxide operations occurring in 224-U: two water shield doors and some miscellaneous metal piping. The water shield doors were for the Plutonium Finishing Plant and the water had been drained. Before being demolished, the main incoming power lines were disconnected at the building and contaminated equipment was removed. The doors were locked and bird netting was placed at the entrances on both sides of the building for pest control.

The type of waste and the volume of waste released at 200-W-104 are not specified. Therefore, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Unknown.

Site: 200-W-104	Plant: U Plant	Category: Shallow-Subsurface

Pore Volume Discharged: Unknown.

Waste Inventory: Not Available

Previous Site Characterization

Site Characterization Summary: A site walkdown was performed in 2000. Visual inspections of the post-demolition area confirmed no visible staining or evidence of chemical contamination. The area was posted as an URMA based on post-demolition radiological surveys (DOE/RL-2011-04).

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): Potential radiological contamination in the surface and/or subsurface of the foundation.

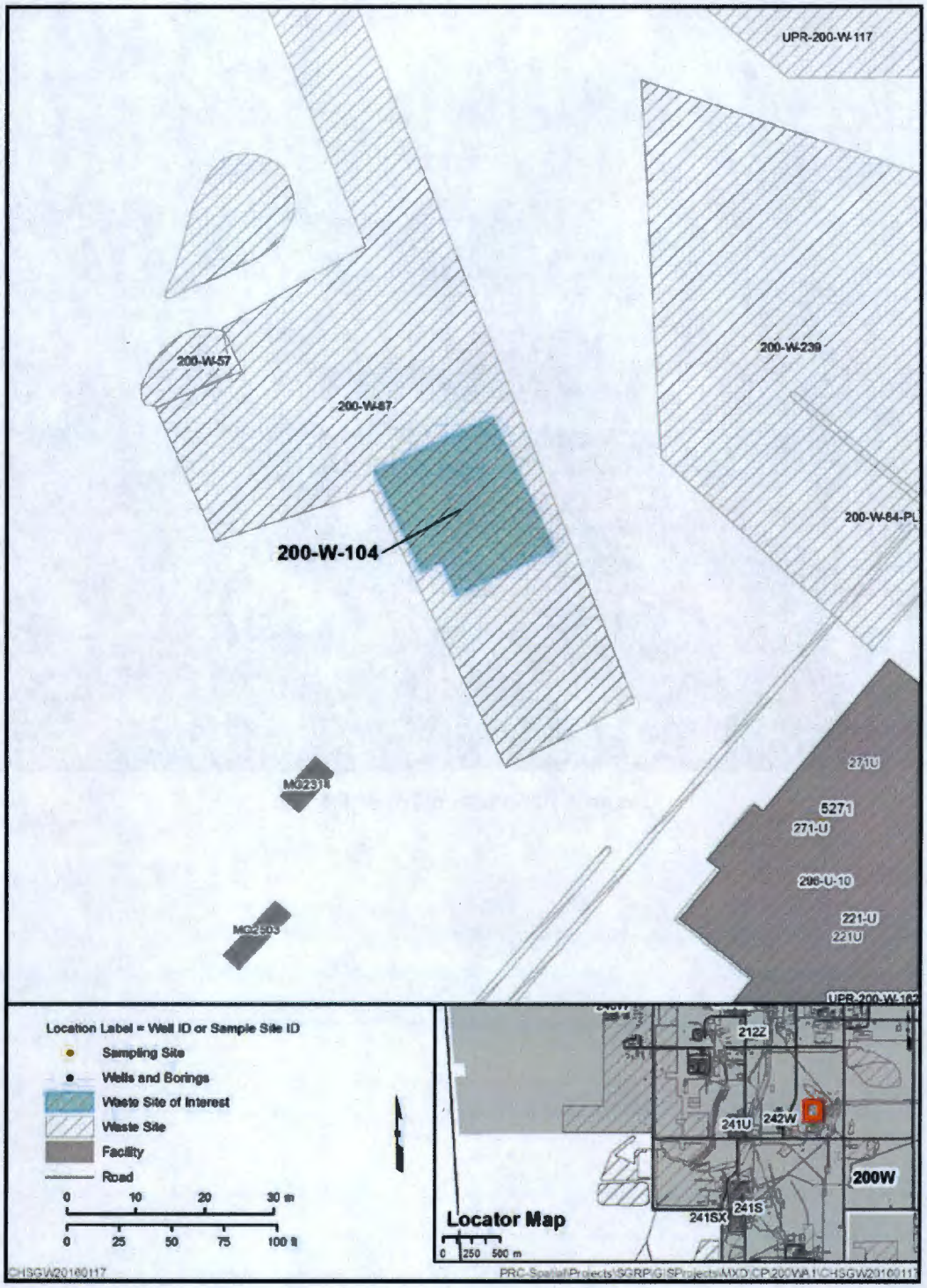
References:

Carter, George J. 2005. Email to Christine Webb; Buildings on WIDS. September.

DOE/RL-2011-04, 2011, *U Plant Ancillary Facilities Removal Action Report*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0088389.

Waste Information Data System General Summary Report for the 200-W-104 Waste Site.

Site: 200-W-104	Plant: U Plant	Category: Shallow-Subsurface



ID = identification

Figure 1. 200-W-104 Waste Site Map

Site: 200-W-104	Plant: U Plant	Category: Shallow-Subsurface

Figure 2. 2005 Photo of 200-W-104 Slab

Site: 200-W-105-PL	Area: U Plant	Category: Intermediate

Site Description

Alternate Site Identification:	Names: 200-W-105-PL; Encased Lines V375, V376, V382, 4877, 4851 and 4859/4703, 4878, 4857, 4876, 4702, 4701, 4700, 4855, 4854, 4860, 4853; Encased Transfer Line between 241-UX-154 Diversion Box and 241-TX-155 Diversion Box and between 241-UX-154 Diversion Box and 241-WR Vault; Stubbed Lines V389/V839
Site Type:	Encased Tank Farm Pipeline
Facility/Geographic Area:	U Plant
Current Operable Unit (OU) Assignment:	200-WA-1
Former OU Assignment:	200-IS-1
Service Dates:	1946 through 2005

The scoping summary in Figure 1 (pages 1 through 5) depicts the site history, construction, features of interest, waste streams, site interfaces, relevant characterization, and other relevant information. The scoping summary includes information relevant to the complete length of the 200-W-105-PL pipeline. Portions of this waste site located within the proposed footprint of the U Plant Canyon Barrier have been segmented into waste site 200-W-105-PL-X for inclusion in the 200-WA-1 OU. Figure 2 provides the limits of the 200-W-105-PL-X waste site included in the 200-WA-1 OU. The balance of the 200-W-105-PL site is assigned to the 200-IS-1 OU.

References:

Waste Information Data System General Summary Report for the 200-W-105-PL Waste Site.

Site: 200-W-105-PL	Area: U Plant	Category: Intermediate

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Site: 200-W-105-PL	Area: U Plant	Category: Intermediate

Scoping Summary: 200-W-105-PL

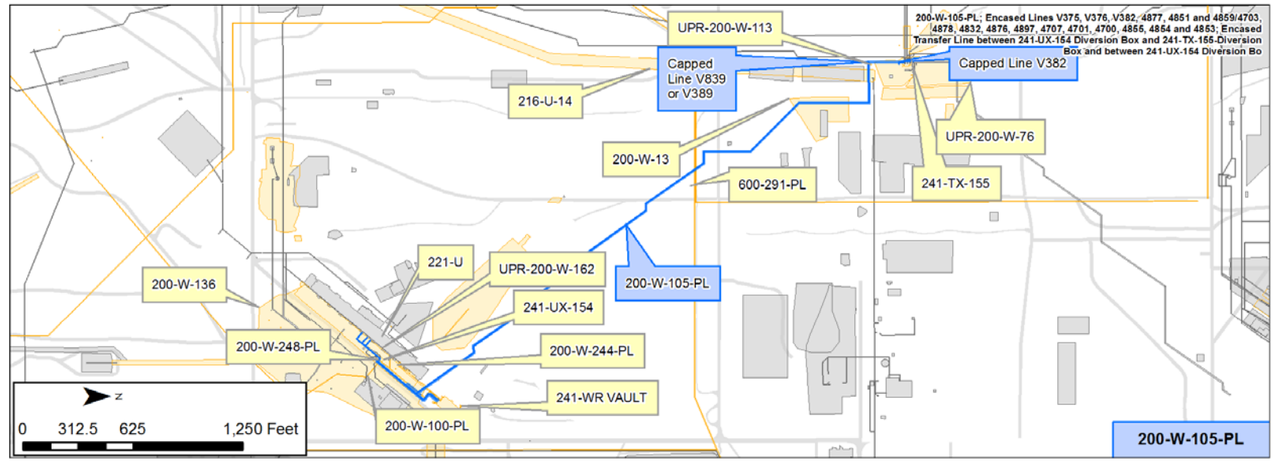
History

The 200-W-105-PL waste site transferred Uranium process fluids through multiple encased stainless steel lines from the 221-U Building and 241-UX-154 Diversion Box to the 241-WR-Vault (contained PUREX and REDOX supernates) and 241-TX-155 Diversion Box.

The first set of pipes was constructed and operational between 1946-to-1950 with multiple lines connecting to 241-UX-154, 241-WR-Vault, and 241-TX-155. Waste was transferred between the Vault and 241-UX-154. The remaining lines terminated at 241-TX-155.

By 1970, six of the lines connected to 241-WR-Vault and four of the lines connected to 241-TX-155 were capped. In 1970, three lines connecting to 241-UX-154 were rerouted to the 200-W-100-PL to support Redox Supernate Transfer System, and the three remaining lines were capped. 241-WR Vault ceased operation in 1976, 241-TX-155 last received waste in 1980, and 241-UX-154 was out of service by 2005.

UPR-200-W-113 is a related release, while all other documented releases nearby relate to the vault or diversion boxes.



Construction

21 Pipes: 4700, 4701, 4702, 4703, 4851, 4851(4857), 4853, 4854, 4855, 4857, 4859, 4859(4703), 4860, 4876, 4877, 4878, Stub V382, Stub V389/V839, V375, V376, and V382

- Length: 33,250-ft
- Diameter: 3.5-in. (Line 4878 has small section of 3-in.)
- Composition: Stainless Steel
- Gravity (Appears that all lines are gravity fed)
- Encasement specifications: 10 Separate Encasement Sections: Two 14-115, Two 9-80, 7-56, 6-59, 3 pipe encasement, and Three single 6 in. encasements
- Buried and encased: 7-ft - 16-ft bgs
- Cathodic protection: None Located
- Volume: 16,624-gal
- Capped Lines: 4700, 4701, 4703, 4851, 4853, 4857,4876, 4877, 5859, stub V383, and stub V389/V839

Features of Interest

- Line 4851(4857) documented failure in 1971 (H-2-2338)
- Y Connection, southeast of the 241-WR Vault
- 22 Elbows/bends
- Crossing under building structures that appear to have been decommissioned, south of 2713WB Building
- 1 Reduction point for line 4878

Relevant Characterization

- Aug-17-2010 - An Ant Mound was found on top of pipeline and removed at 20,000 dpm/100 sq-cm; Rotting Rabbit Brush Fragments found on top of pipeline and removed at 18,000 dpm/100 sq-cm
- 1977- Radioactive rabbit feces found near diversion box; after soil removal radioactivity increased and source believed to be a leak in a waste transfer line (Acid spill from diversion box catch tank a possible influence) Area has been stabilized

Waste Streams

- Waste Processes: REDOX, PUREX, and U Plants
- Waste Streams: TBP: Tributyl phosphate waste (1952 – 1958), nitric acid and thorium from REDOX and PUREX, and uranyl nitrate hexahydrate from U Plant, and REDOX supernates to B-Plant for cesium recovery (waste by-product was disposed through lines connected to Vault)
- Following termination of uranium recovery operations in 1958, 241-WR Vault was used to store nitric acid and thorium from the REDOX and PUREX processes.

Misc./Other Relevant Information

- In 1986, 241-WR Vault isolated and estimated to include contamination burden of 60 curies beta
- WIDS does not show the 3 lines coming off the 221-U building and the single line that crosses under the Y connection

Site Interfaces

Origin/Termination

200-IS-1
- 241-UX-154
- 241-TX-155

200-WA-1
- 241-WR Vault

U- Plant
- 221-U (Sections 11, 12, & 13)

Site Intersects

200-IS-1
- 200-W-100-PL
- UPR-200-W-113

200-WA-1
- 200-244-PL
- 200-248-PL
- 200-W-13
- 216-U-14 (Ditch)
- UPR-200-W-76
- UPR-200-W-162

No Operable Unit
- 600-291-PL (Active)
- 200-W-136 (TBD)

Figure 1. 200-W-105-PL Pipeline Scoping Summary (page 1)

Site: 200-W-105-PL	Area: U Plant	Category: Intermediate

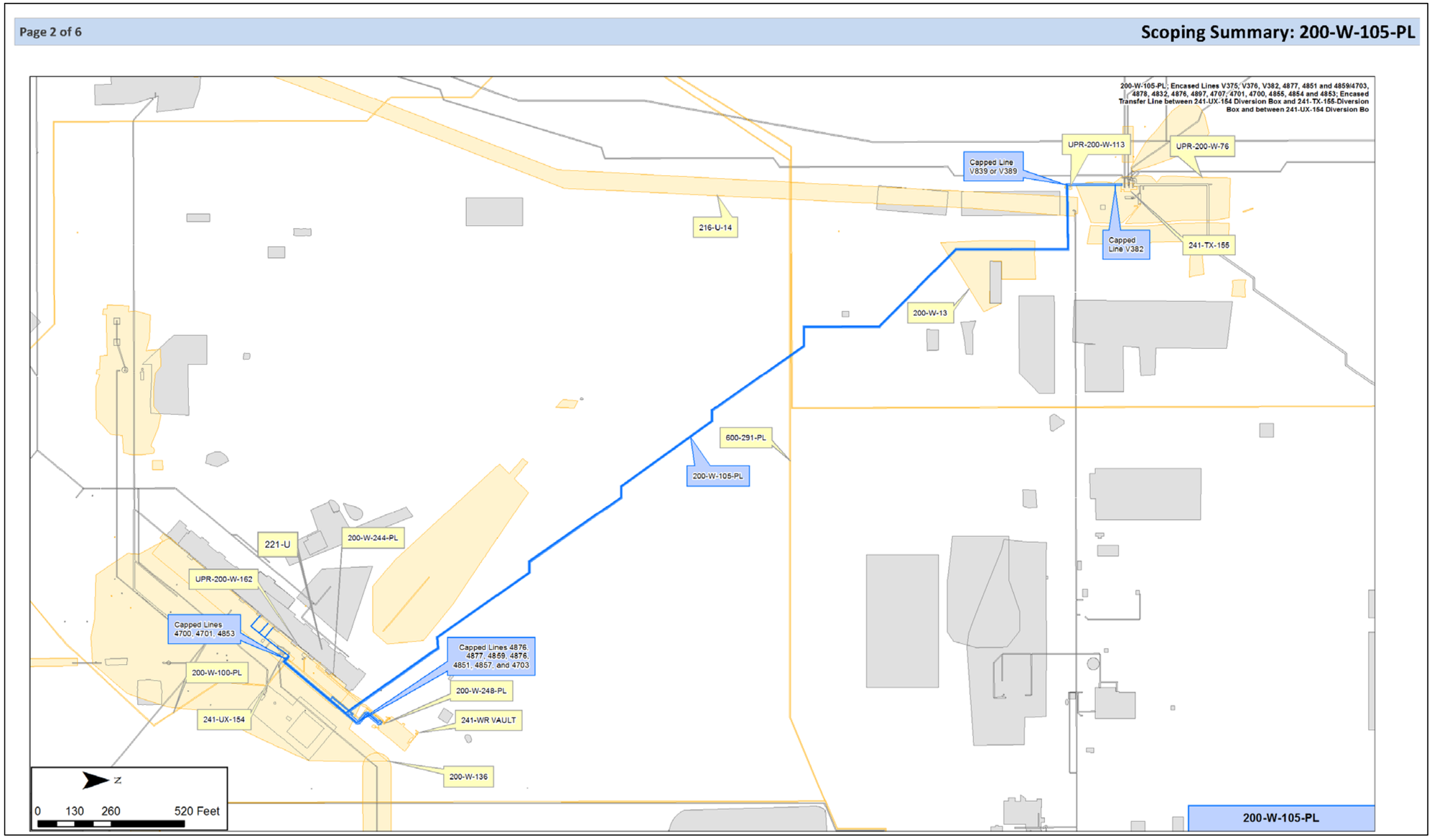


Figure 1. 200-W-105-PL Pipeline Scoping Summary (page 2)

Site: 200-W-105-PL	Area: U Plant	Category: Intermediate

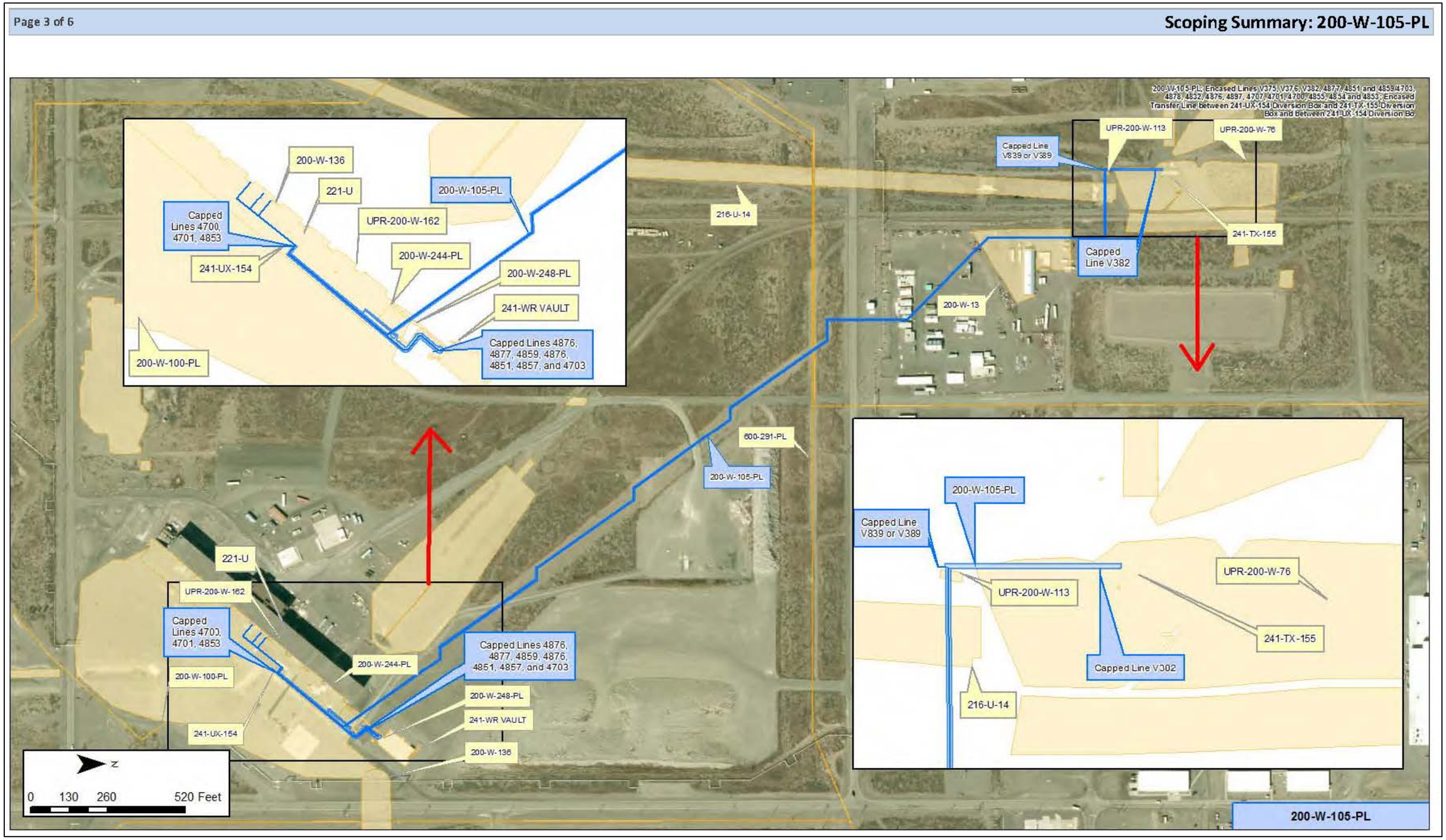


Figure 1. 200-W-105-PL Pipeline Scoping Summary (page 3)

Site: 200-W-105-PL	Area: U Plant	Category: Intermediate

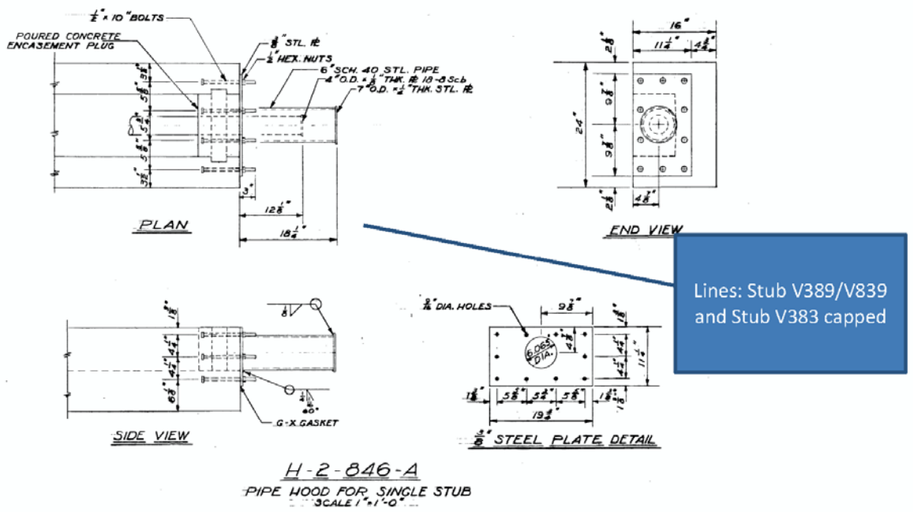


Figure 1 – Capping of the Lines Stub V398/V839 and Stub V383

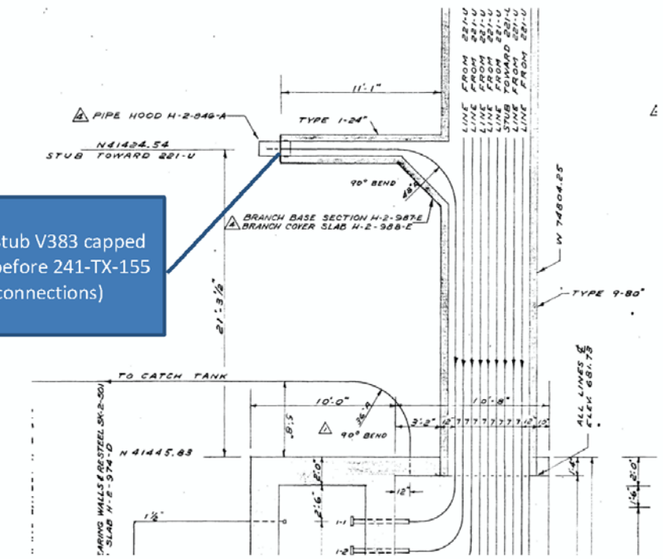


Figure 2 – Capping of the Line Stub V383

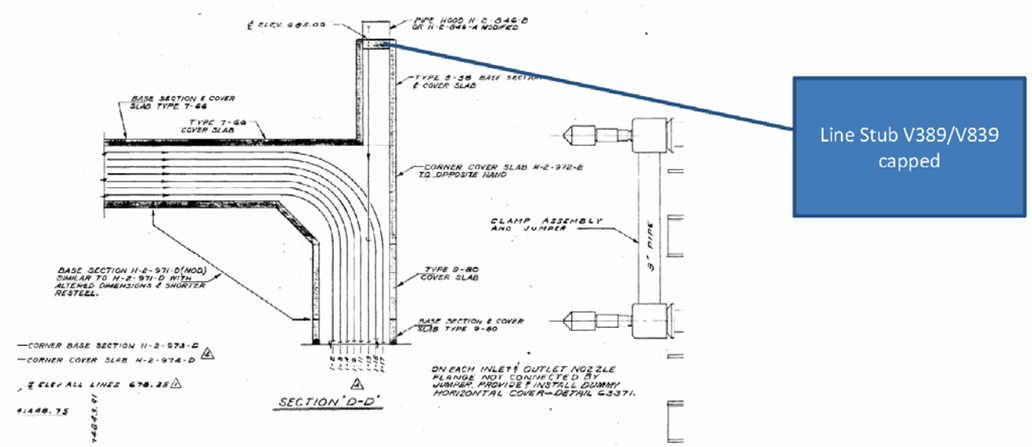


Figure 3 – Capping of the Line Stub V398/V839

Figure 1. 200-W-105-PL Pipeline Scoping Summary (page 4)

Site: 200-W-105-PL	Area: U Plant	Category: Intermediate

Scoping Summary: 200-W-105-PL

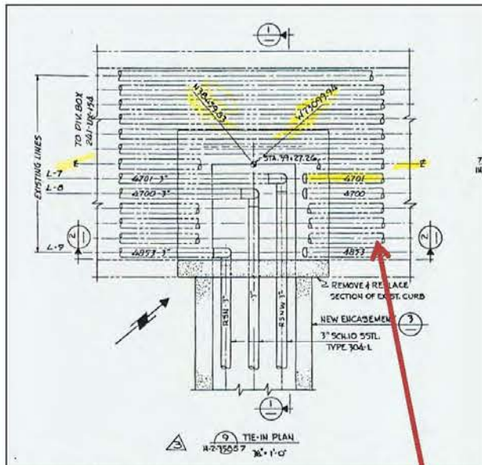


Figure 3 – Lines 4700, 4701, and 4853 cut, capped and diverted

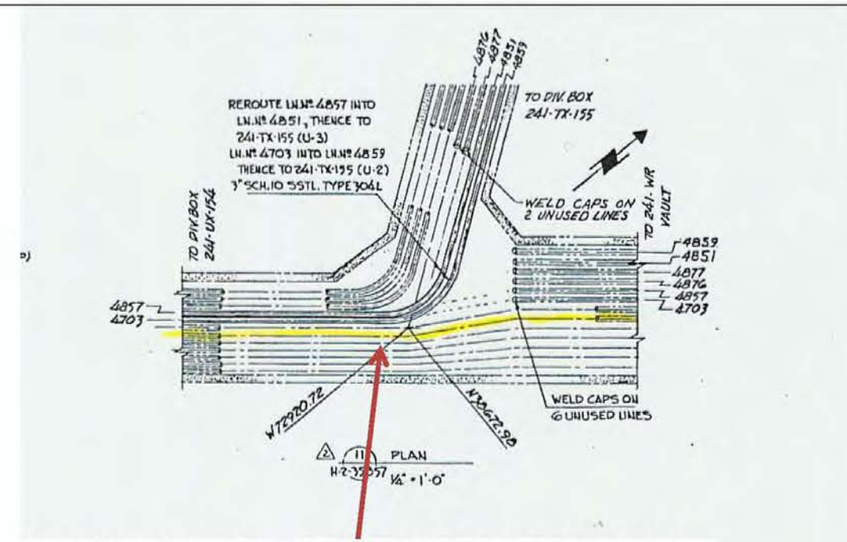


Figure 4 – Y Connection and Lines 4859, 4851, 4877, 4876, 4857, and 4703 cut and capped

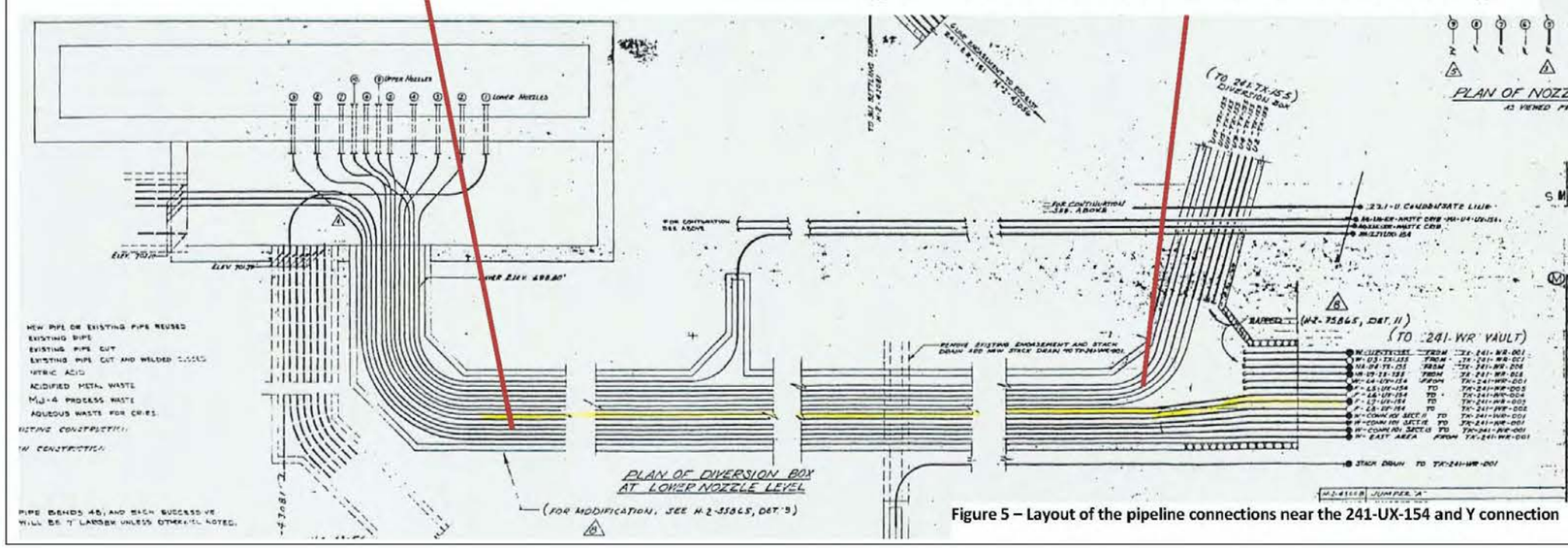


Figure 5 – Layout of the pipeline connections near the 241-UX-154 and Y connection

Figure 1. 200-W-105-PL Pipeline Scoping Summary (page 5)

Site: 200-W-105-PL	Area: U Plant	Category: Intermediate

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Figure 1. 200-W-105-PL Pipeline Scoping Summary (page 6)

Site: 200-W-105-PL	Area: U Plant	Category: Intermediate

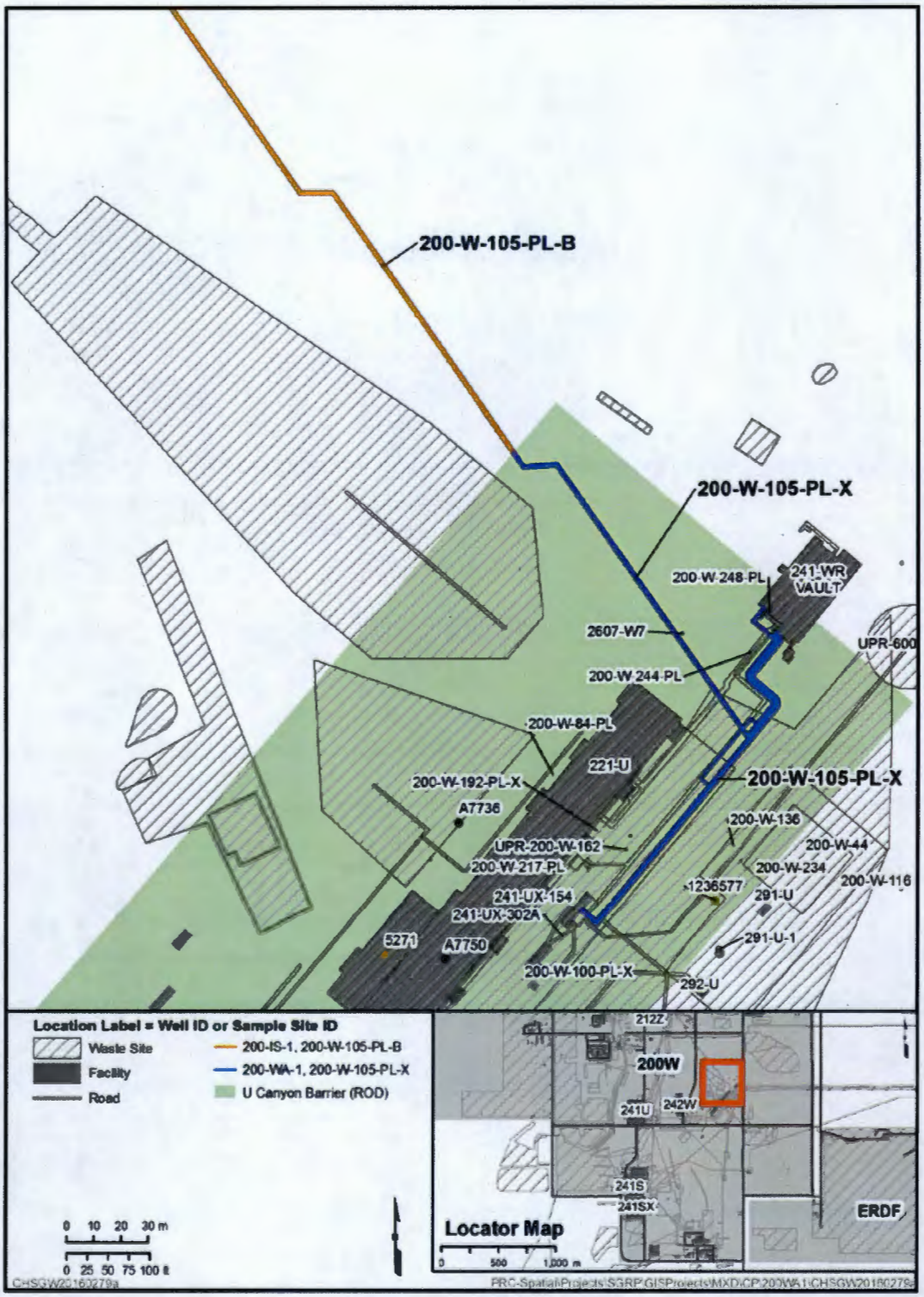

Figure 2. 200-W-105-PL-X Pipeline Segment Location

Site: 200-W-105-PL	Area: U Plant	Category: Intermediate

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Site: 200-W-136	Area: U Plant	Category: Shallow - Subsurface

Site Description

Alternate Site Identification:	Underground Radioactive Area including 222-U Building Foundation, Demolished 203-U Area and Contaminated Soil
Site Type:	Unplanned Releases, Demolished Buildings
Facility/Geographic Area:	U Plant
Current Operable Unit (OU) Assignment:	200-WA-1
Former OU Assignment:	200-UW-1, 200-MG-2
Service Dates:	1947 to 2005

Waste Site Location and Physical Description: Site 200-W-136 is located east of the 221-U Canyon Building, northeast of 224-U, and southwest of the 291-U exhaust stack. It is west of Beloit Avenue (Figure 1). The site is an irregular shaped gravel area consisting of demolished buildings and unplanned releases within an Underground Radioactive Material Area (URMA). The URMA posted area and gravel layer also cover the demolished remains of the 203-U tanks and 272-U Hot Shop and areas of soil contamination created during building demolition. No reference drawings are available for this site.

Site 200-W-136 was created subsequent to demolition of 17 U Plant Ancillary Facilities. Phase I of the removal action was completed in 2005 when 11 of the 17 ancillary facilities were demolished in accordance with *U Plant Ancillary Facilities Removal Action Work Plan, Phase II,* Rev. 0 (DOE/RL-2004-83). Completion of the first phase was documented in *U Plant Ancillary Facilities Project Status Summary* (D&D-28141). Phase II was completed in 2010 and included demolition of five of the six remaining structures. A Tri-Party Agreement (TPA) change notice was prepared that removed the 2712-U Instrument Building demolition from the scope of this removal action (TPA CN-423, *Change Notice for Modifying Approved Documents Workplans in Accordance with the Tri-Party Agreement Action Plan, Section 9.0, Documentation and Records: DOE/RL-2004-83, U Plant Ancillary Facilities Removal Action Work Plan, Phase II, Rev. 0 and Rev. 1).*

The main building associated with the U Plant Ancillary Facilities is the uranium trioxide (UO_3) Facility (224-U), which was used to convert uranyl nitrate hexahydrate (UNH) solution from the Plutonium-Uranium Extraction Plant (PUREX) into a solid UO_3 powder. The UO_3 Facility's processing schedule was determined by the PUREX uranium product inventory buildup. The last operating campaign was completed in June 1993 and deactivation of the facility began shortly thereafter.

Table 1 provides a summary of the U Plant Ancillary Facilities demolition.

Site: 200-W-136	Area: U Plant	Category: Shallow - Subsurface

Table 1. U Plant Ancillary Structure Demolition Summary

Structure Identifier	Structure Name/Aliases	Processing (P) or Support (S) Facility	Demolished in Phase I	Demolished in Phase II
203-U	Uranium Storage Tank Enclosure	S	August 2005	
203-UX	Concentrated Uranium Storage Tank Enclosure	S		June 2010
211-U	Bulk Storage Aqueous Chemical Make-Up Tanks	S		June 2009
211-UA	Tank Farm	S		July 2009
222-U	Office Administration Building	S	May 2005	
224-U	Uranium Trioxide (UO_3) Plant Concentration Building	P		November 2010
224-UA	UO_3 Calcination and Loadout Building	P		November 2010
272-U	Hot Shop and Cold Shop	S	March 2005	
275-UR	Metal Storage Building	S	July 2005	
2709-A	Change House	S	January 2005	
2714-U	Warehouse	S	July 2005	
2715-U	Oil Storage Shed	S	February 2005	
2715-UA	Insulator Shop/Adjacent Waste Shed	S	February 2005	
2716-U	Valve Station Shed	S	February 2005	
2726-U	Propane Gas Storage Area	S	February 2005	
2712-U	Instrument Building	S	*	*
U Plant Yard	UO_3 Plant Yard—includes miscellaneous structures found throughout the yard	S	January 2005	

* The 2712-U Instrument Building was removed from the scope of this Removal Action through TPA-CN-423, *Change Notice for Modifying Approved Documents/Workplans In Accordance with the Tri-Party Agreement Action Plan, Section 9.0, Documentation and Records: DOE/RL-2004-83, U Plant Ancillary Facilities Removal Action Work Plan, Phase II, Rev. 0 and Rev. 1*, because the facility is still in use.

The following describes the U Plant Ancillary Facilities that lie within the 200-W-136 site boundary. Figure 2 shows the location of each of the U Plant Ancillary Facilities.

203-U Uranium Storage Tank Enclosure: The 203-U structure was a 24 by 13 by 1.8 m (80 by 45 by 6 ft) concrete basin that contained two UNH storage tanks (Tanks X-1 and X-2). Each tank had a volume of 378,541 L (100,000 gal) to store UNH feed. The tanks were constructed of stainless steel and insulated. The UNH heel from Tanks X-1 and X-2, which potentially contained organics, was stored in Tank X-36, a 15,898 L (4,200-gal) stainless steel, insulated tank. Recycled UNH destined for purification at the PUREX Facility was stored in Tanks X-37 and X-38 and used in the process condensate neutralization system. Tank X-37 was a 45,425 L (12,000-gal) stainless steel insulated tank. Tank X-38 was a 24,605 L (6,500-gal)

Site: 200-W-136	Area: U Plant	Category: Shallow - Subsurface

stainless steel insulated tank. At the time that deactivation and decommissioning (D&D) commenced, these tanks were no longer used to store chemicals; all tanks had been flushed and all outside surfaces were cleaned as part of the UO_3 deactivation.

222-U Office Administration Building: The 222-U Building was a single-story, concrete cinder block structure, approximately 687 m^2 (7,400 ft^2) in area, with fixed contamination under the paint in some of the back rooms. The 222-U Building initially was used to provide laboratory support and then modified for use as office space for U Plant Complex workers. Areas within the building were posted as radiologically contaminated. In addition, the building contained asbestos and other industrial contaminants, such as polychlorinated biphenyl ballasts and mercury switches.

272-U Hot Shop and Cold Shop: The 272-U Building was a metal-sided structure, approximately 418 m^2 (4,500 ft^2) in size on a concrete slab, which served as the service and repair shop for plant equipment. The 272-U Building was divided into a "hot," radiologically controlled, shop area, with access only through the regulated area, and a cold shop area for nonradioactive maintenance.

2715-U Oil Storage Shed: The 2715-U Building was approximately 18 m^2 (192 ft^2) in area, constructed of steel frame with sheet metal siding on a concrete slab. Solvent and oil were stored in 208 L (55-gal) drums on the cold side. Piping provided access to the drums on the hot and cold sides. Both sides contained grease and lubrication guns. All unattached furniture, fixtures, and supplies were removed during UO_3 deactivation.

2715-UA Insulator Shop/Adjacent Waste Shed: The 2715-UA Building was commonly known as the "insulation shop." The building was an insulated sheet metal structure on a concrete slab. The building was previously used for storage by painters and thermal insulation installers.

2716-U Building—Valve Station Shed: The 2716-U Building comprised framed construction with sheet metal siding that housed a fire sprinkler riser. The building was approximately 4.2 m^2 (45 ft^2). During UO_3 deactivation, the sprinkler riser was deactivated.

2726-U Propane Gas Storage Area: The 2726-U Area comprised framed construction that had been used to store propane gas tanks. The building structure and all tanks were removed; all that remains are the four concrete tank saddles and some piping risers.

203-UX Concentrated Uranium Storage Tank Enclosure: The 203-UX Facility was composed of two small concrete enclosures. One enclosure contained two filters and Tank X-30 (the 100 percent UNH feed storage tank). Tank X-30 was a 13,627 L (3,600-gal) stainless steel insulated tank. The other enclosure contained Tank X-19, which was used as backup for Tank X-30, and Tank X-20, which received filter back flush from Tank X-30 filters F-l and F-2, and from "Luckey" pots used for filter bag cleaning. Tank X-19 was a 13,627 L (3,600-gal), stainless steel insulated tank. Tank X-20 was a 1,514 L (400-gal), stainless steel insulated tank.

Site: 200-W-136	Area: U Plant	Category: Shallow - Subsurface

224-U UO_3 Plant Concentration Building: The 224-U Building was a 1,114 m^2 (12,000 ft^2), multi-storied concrete structure. The building was approximately 61 m (200 ft) long, 18 m (60 ft) wide, and 18 m (60 ft) tall with approximately 6 m (20 ft) belowgrade. The building was divided along its length by a concrete shield wall into a gallery side and a canyon side. The gallery side was a three-story, reinforced-concrete, frame structure with a concrete floor and roof slab. Exterior and interior infill walls were nonreinforced-concrete blocks. The roof, which was supported by concrete beams, was a flat, reinforced-concrete slab. The canyon side of the 224-U Building was constructed of reinforced-concrete walls that were three stories in height. The canyon was divided into six cells, with each cell separated by a concrete wall.

224-UA UO3 Calcination and Loadout Building: The 224-UA Building was approximately 23 m (75 ft) long and 20 m (67 ft) wide. The floor slab and footing were reinforced concrete. Equipment footing and supports were reinforced-concrete pier columns with steel I-beam framing. The outside walls consisted of insulated, metallic-coated, steel panels. The ground floor consisted of six cells that contained calciners. The continuous calciners were located on the second floor of the calciner cells. The five-story section of the building located over the loadout room was used to handle the UO_3 powder. The tower contained two primary bag filters, two cyclones, and a storage bin. The 224-UA Building roof consisted of steel panels covered with insulation and built-up roofing material. Numerous pieces of process equipment, including the 296-U-2 and 296-U-14 exhausters, were located on the roof.

Waste Site Coordinates:

E-567590.25401 N-135084.09567

Site Dimensions:

Site Length: 375 m (1,230 ft) Site Depth: None
Site Width: 160 m (525 ft) Cover Thickness: Not Specified
Site Area: Not Specified
Note: Estimated dimensions of the irregularly shaped, posted URMA polygon. The dimensions were estimated from the map of this waste site.

Related Site Structure(s): Site 200-W-136 is associated with the U Plant Ancillary Facilities (Table 1).

Site Posting: Site 200-W-136 is posted with URMA signs.

Site: 200-W-136	Area: U Plant	Category: Shallow - Subsurface

Site History

Release Summary: The 200-W-136 waste site includes a number of demolished buildings and posted unplanned release sites. Demolition, in general, consisted of the following activities:

- Removing hazardous substances (chemical, radiological, and biological)
- Removing equipment and miscellaneous piping
- Dismantling each structure down to the foundation slab
- Disposing of waste

After each U Plant Ancillary Facility was demolished, visual and radiological surveys were conducted to identify residual chemical and radiological contamination. No chemical contamination was observed at any of the U Plant Ancillary Facilities. The following facilities were identified with remaining radiological contamination:

- 203-U Uranium Storage Tank Enclosure
- 203-UX Concentrated Uranium Storage Tank Enclosure
- 222-U Office Administration Building
- 224-U UO_3 Plant Concentration Building
- 224-UA UO_3 Calcination and Loadout Building
- 272-U Hot Shop and Cold Shop

The 200-W-136 Site also includes five roof drains associated with the 222-U facility that discharged stormwater into the soil through subsurface drains. These sites have been consolidated into the 200-W-136 waste site. Following are the Waste Information Data System (WIDS) site codes for these drains:

- 200-W-107: 222-U Building Stormwater Runoff; Miscellaneous Stream #685
- 200-W-108: 222-U Building Stormwater Runoff; Miscellaneous Stream #687
- 200-W-109: 222-U Building Stormwater Runoff; Miscellaneous Stream #521
- 200-W-110: 222-U Building Stormwater Runoff; Miscellaneous Stream #393
- 200-W-111: 222-U Building Stormwater Runoff; Miscellaneous Stream #394

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Site: 200-W-136	Area: U Plant	Category: Shallow - Subsurface

Previous Site Characterization

Site Characterization Summary:
A site walkdown occurred on October 28, 2005, to document site conditions. Observers discovered that the 222-U foundation had been covered with gravel and posted with URMA signs. A global positioning system survey mapped the site on January 18, 2006. No additional site characterization information is presented for 200-W-136. It is unclear whether the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided. If surveys do occur, their frequency is not specified.

Visual observations of site conditions at each of the U Plant Ancillary Facilities were documented in visual and radiological surveys performed after demolition, and documented in DOE/RL-2011-04, *U Plant Ancillary Facilities Removal Action Report*.

Existing borehole location A9798 (shown in Figure 1) is associated with the 216-U-4 and 216-U-4A waste sites, and are not considered representative of 200-W-136.

DOE/RL-88-11, *Registration of Hanford site Class V Underground Injection Wells*, states the stormwater drain is located on the back side of 222-U, on the eastern most corner. A 2003 field walkdown was unable to locate a drain structure from the description provided in DOE/RL-88-11.

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface): Potential radiological contamination at the surface and beneath building foundations.

References:

DOE/RL-88-11, 1995, *Registration of Hanford site Class V Underground Injection Wells*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/pdf.cfm?accession=E0041825.

DOE/RL-2004-83, *U Plant Ancillary Facilities Removal Action Work Plan, Phase II*, Rev. 0 and Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Rev. 1, Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0812290615.

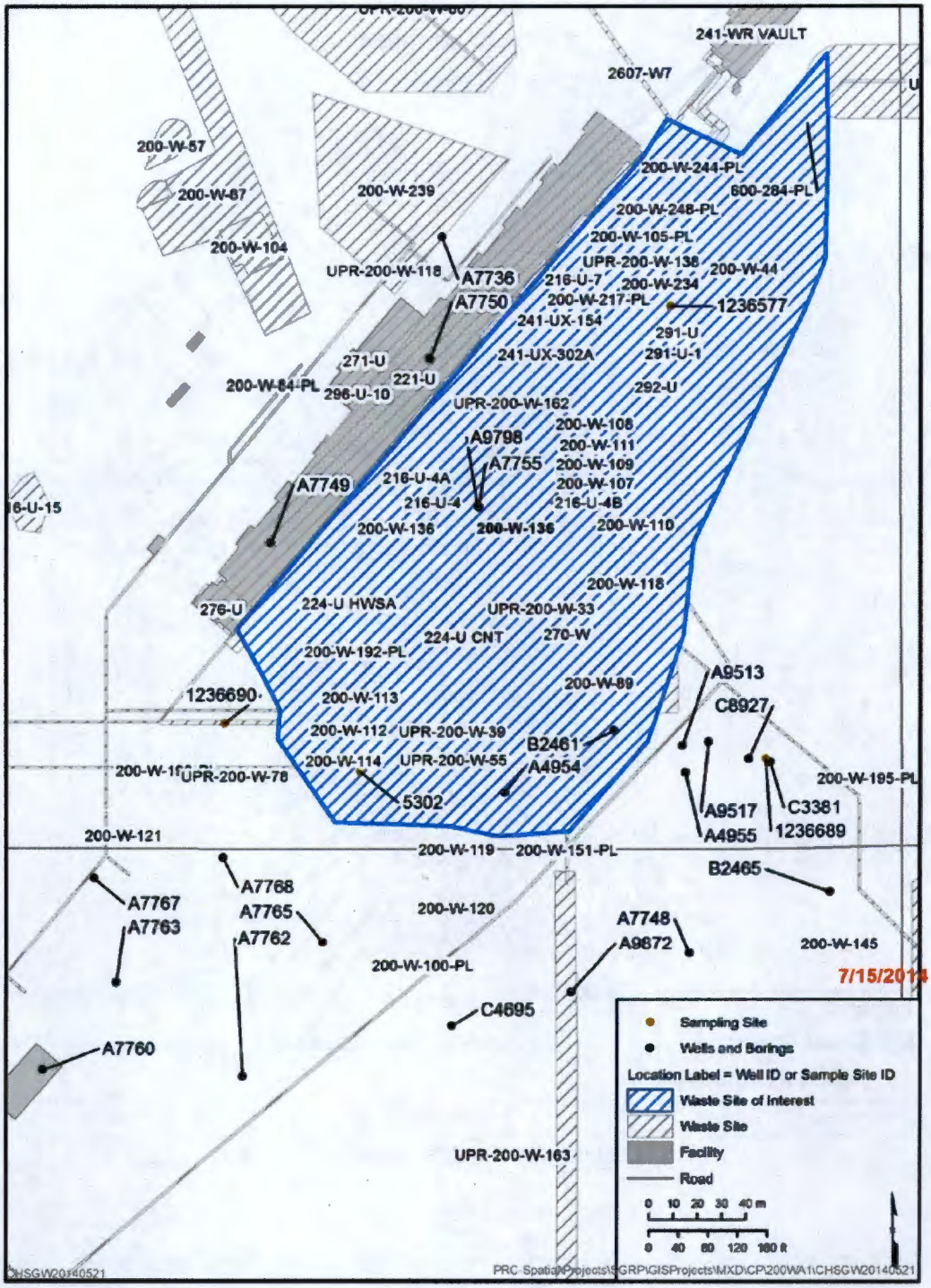
DOE/RL-2011-04, 2011, *U Plant Ancillary Facilities Removal Action Report*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0088389.

D&D-28141, 2006, *U Plant Ancillary Facilities Project Status Summary*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

TPA CN-423. *Change Notice for Modifying Approved Documents Workplans in Accordance with the Tri-Party Agreement Action Plan, Section 9.0, Documentation and Records.*

Waste Information Data System General Summary Report for the 200-W-136 Waste Site.

Site: 200-W-136	Area: U Plant	Category: Shallow - Subsurface



ID = identification

Figure 1. 200-W-136 Waste Site Map

Site: 200-W-136	Area: U Plant	Category: Shallow - Subsurface

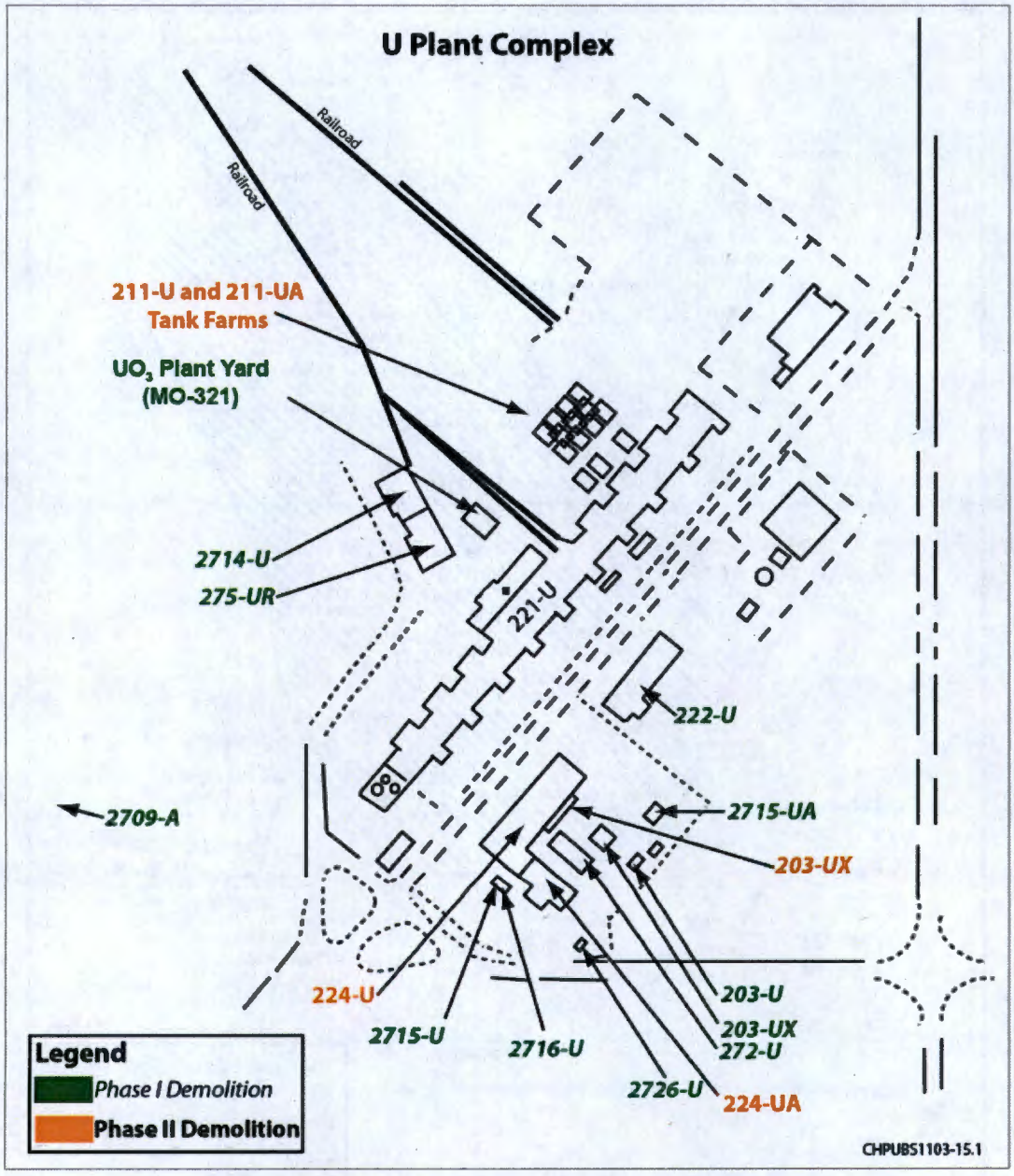


Figure 2. Location of U Plant Ancillary Facilities

Site: 200-W-136	Area: U Plant	Category: Shallow - Subsurface

Map dates:

1/18/2006 = Purple	Diagonal black = Buildings/Structures
6/15/2011 = Blue	Diagonal orange = Demolished Buildings/Structures
11/14/2014 = Green	Green = Waste Information Data System Sites

Figure 3. History of 200-W-136 Site Boundaries and Foundation Locations

Site: 200-W-136	Area: U Plant	Category: Shallow - Subsurface

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Site: 200-W-192-PL	Area: U Plant	Category: Shallow - Subsurface

Site Description

Alternate Site Identification:	Names: 200-W-192-PL; Pipeline from 221-U, 222-U and 224-U to the 207-U Retention Basin; U Plant Process Sewer
Site Type:	Radioactive Process Sewer
Facility/Geographic Area:	U Plant
Current Operable Unit (OU) Assignment:	200-WA-1
Former OU Assignment:	200-IS-1
Service Dates:	1940s through 1994

The scoping summary in Figure 1 provides a summary of the site history, construction, features of interest, waste streams, site interfaces, relevant characterization, and other relevant information. The scoping summary includes information relevant to the complete length of the 200-W-192-PL pipeline. Portions of this waste site within the U Plant area have been segmented into waste sites 200-W-192-PL-X and 200-W-192-A, for inclusion in the 200-WA-1 OU. Figure 2 provides the limits of the 200-W-192-PL waste site included in the 200-WA-1 OU. 200-W-192-PL-X is the portion of the original site located within the proposed footprint of the U Plant Canyon Barrier. 200-W-192-PL-A is the rest of the pipeline portions assigned to 200-WA-1. The balance of the 200-W-192-PL site is assigned to the 200-IS-1 OU.

References:

Waste Information Data System General Summary Report for the 200-W-192-PL Waste Site.

Site: 200-W-192-PL	Area: U Plant	Category: Shallow - Subsurface

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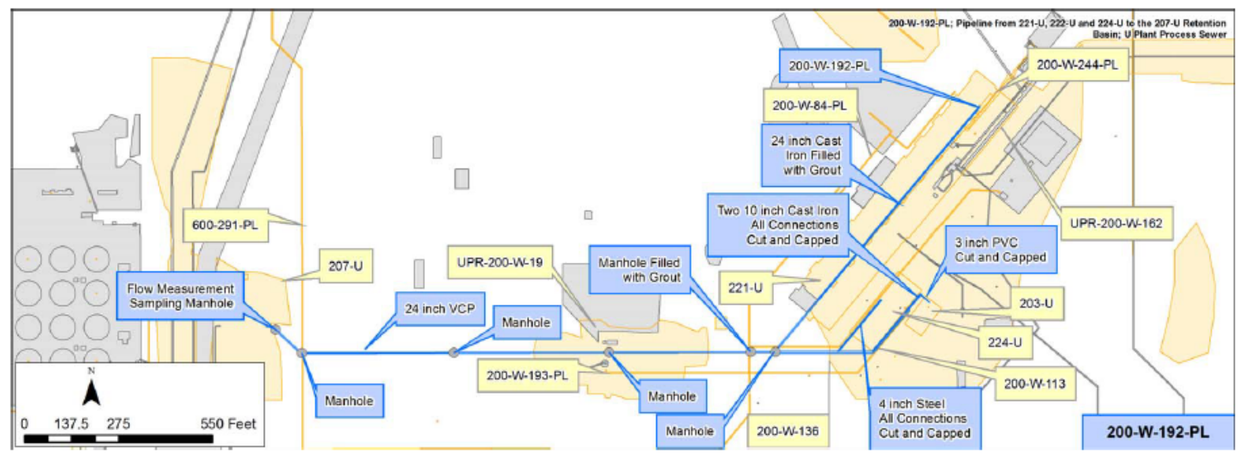
Site: 200-W-192-PL	Area: U Plant	Category: Shallow - Subsurface

Scoping Summary: 200-W-192-PL

History

The 200-W-192-PL site is the former chemical sewer drain from the 221-U and 224-U Buildings to the 207-U Retention Basin. The first set of pipelines were constructed in the 1940s with a 24 inch cast iron line (200-W-192-PL:4) connected to the south side of 221-U, two 10 inch cast iron lines that were connected 224-U (200-W-192-PL:2), and one 4 inch steel line that was connected to 224-U (200-W-192-PL:3). All four lines merged into one process sewer line (200-W-192-PL:1) that continued into the 207-U Retention Basin. In 1986, a 3 inch PVC sewer drain from the 203-U Building was added, which connects into 200-W-192-PL:2.

The 207-U Retention Basin was deactivated and filled with concrete in 1994. In 2011, the line connecting to the 221-U Building (200-W-192-PL:4) was filled with grout and all the associated line connections into the 224-U and 203-U Buildings were cut and capped as a part of the U-Plant Closure Plan (200-W-192-PL:2, 200-W-192-PL:3, and the PVC pipe). The remaining line, 200-W-192-PL:1, was left in place and was capped with grout at the manhole where 200-W-84-PL intersects with 200-W-192-PL.



Construction

3 Cast Iron Lines: 200-W-192-PL:2A; 200-W-192-PL:2B; 200-W-192-PL:4.
1 Steel Line: 200-W-192-PL:3
- Length: 505 ft, 450 ft, 940 ft, and 380 ft
- Diameter: two 10 in. lines, 24 in., and 4 in. steel line
- Gravity fed
- Cathodic Protection: Not Observed
- Direct Buried: 4 - 8 ft (with additional gravel/cover from the U-Plant closure)
- Total Calculated Volume: 26,240 gallons

1 Vitrified Clay Line: 200-W-192-PL:1
1 PVC Line: 200-W-192-PL:5
- Length: 1,500 ft (Vitrified Clay); 50 ft (PVC)
- Diameter: 24 in. (Vitrified Clay); 3 in. (PVC)
- Gravity fed
- Direct Buried: 2 - 8 ft (with additional gravel/cover from the U-Plant closure for PVC line)
- Total Calculated Volume: 35,270 gallons
- All lines capped or filled with grout

Features Of Interest

- 5 manholes (1 noted as being filled with grout)
- 1 Flow Measurement and Sampling Manhole
- 6 Bends
- Multiple capped connections near previous 224-U Building structure
- 24 in. cast iron line filled with grout, south of 221-U

Relevant Characterization

No relevant characterization data available for this site

Waste Streams

- Process: U Plant - Uranium Recovery and Scavenging (URP) and Drain Wastes & Cooling Water
- Waste Streams: Chemical sewer waste from 221-U Building; steam condensate and cooling water from 224-U building
- Last waste stream was stormwater from 224-U Building

Misc./Other Relevant Information

- Between 1984 and 1986 200-W-192-PL was deactivated; waste was temporarily diverted through 200-W-84-PL into 216-U-16 Crib, but reactivated when 216-U-16 Crib was taken out of service
- August 6, 1986 release of 796 gallons of reprocessed nitric acid into the 207-U Retention Basin (approximately 225,000 pounds of corrosive solution and 100 pounds of uranium)

Site Interfaces

Origin/Termination Point:

200-CU-1
- 221-U Building

200-WA-1
- 207-U (Retention Basin)

No Operable Unit
- 200-W-113 (224-U Building)

Site Intersects:

200-WA-1
- 200-W-244-PL
- UPR-200-W-162
- UPR-200-W-19

No Operable Unit
- 600-291-PL
- 200-W-136

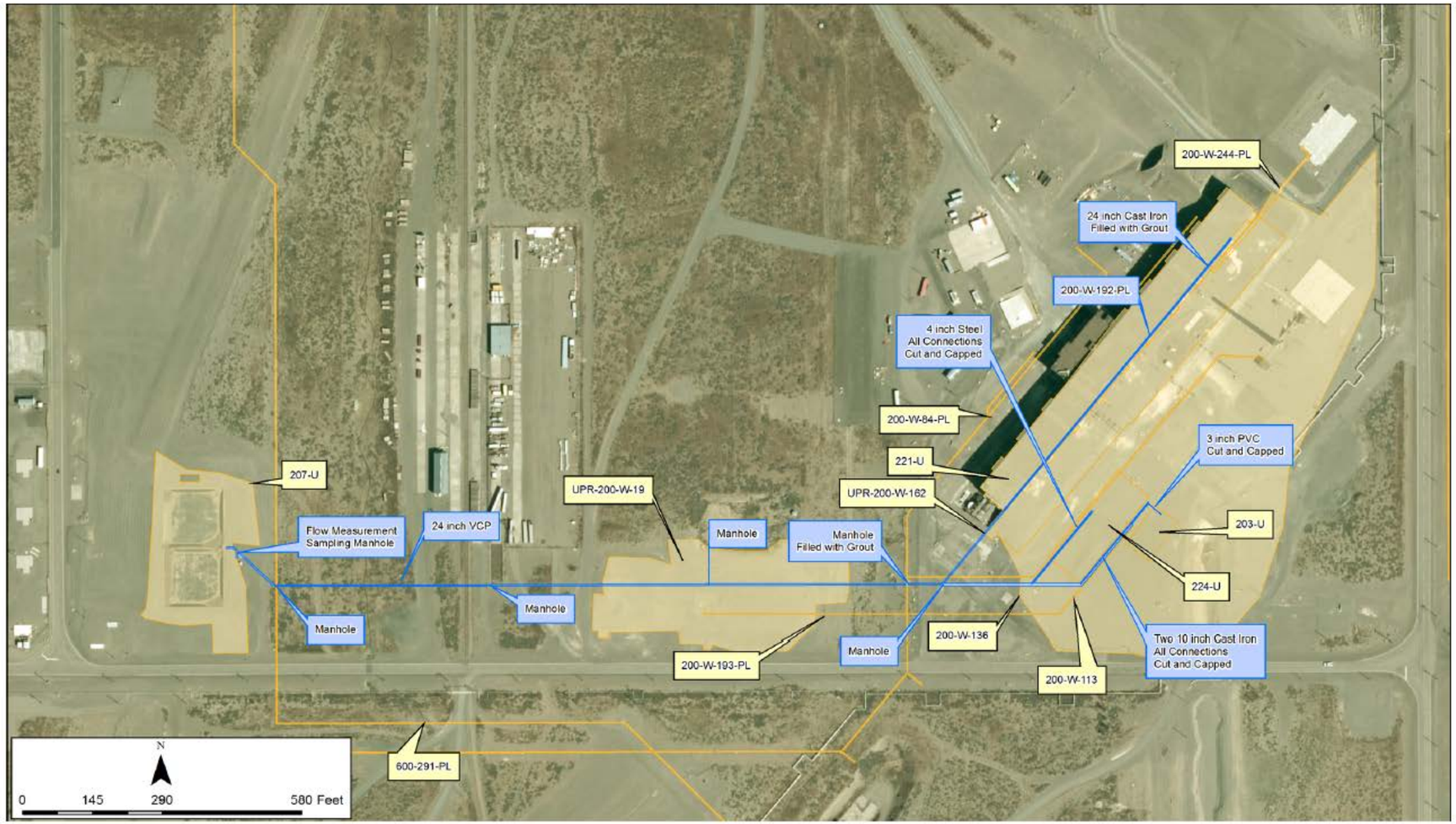
200-IS-1
- 200-W-84-PL
- 200-W-193-PL

200-WA-1

Figure 1. 200-W-192-PL Pipeline Scoping Summary (page 1)

Site: 200-W-192-PL	Area: U Plant	Category: Shallow - Subsurface

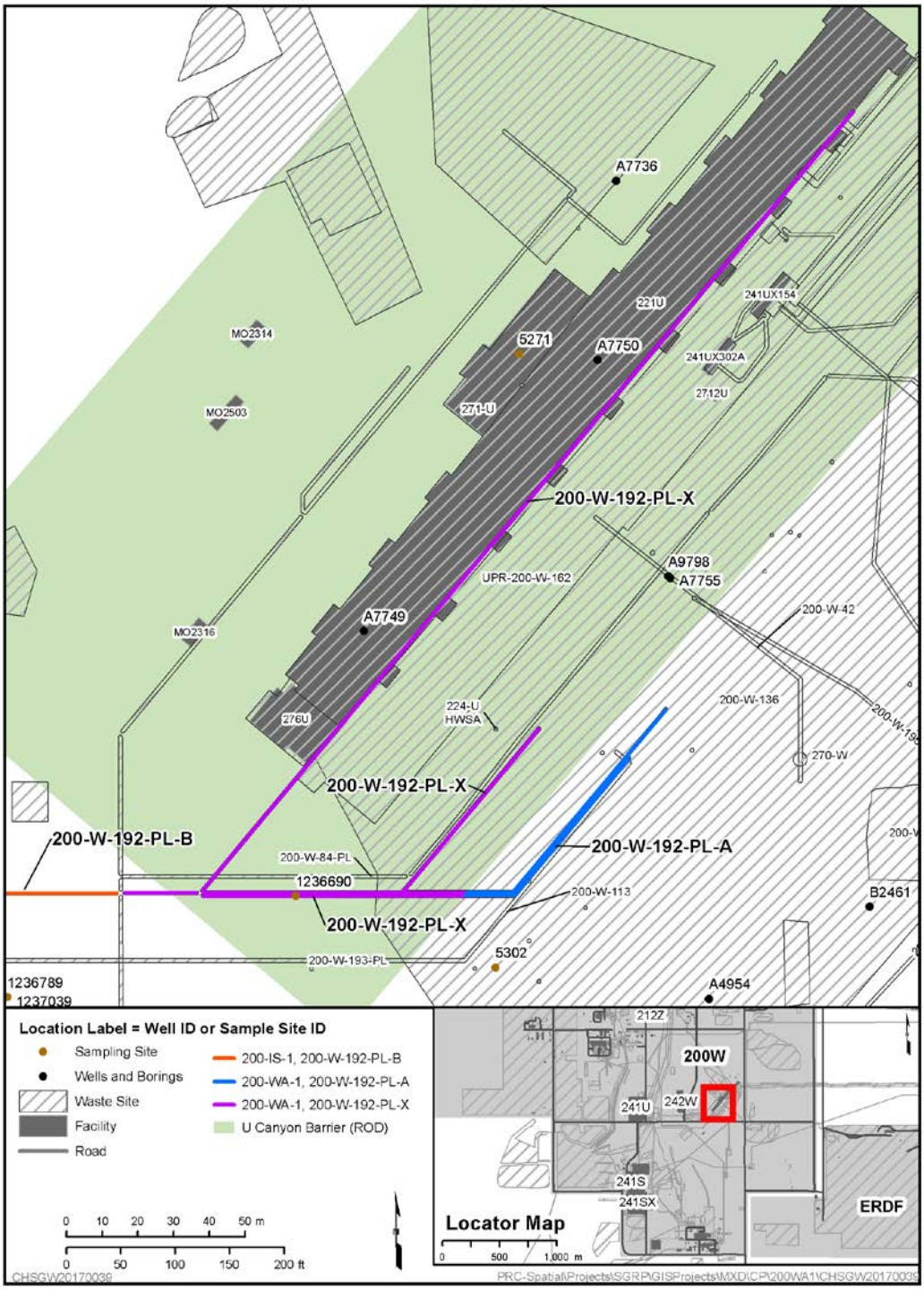
Scoping Summary: 200-W-192-PL



200-WA-1

Figure 1. 200-W-192-PL Pipeline Scoping Summary (page 2)

Site: 200-W-192-PL	Area: U Plant	Category: Shallow - Subsurface



ID = identification
ERDF = Environmental Restoration Disposal Facility

Figure 2. 200-W-192-PL-X and 200-W-192-PL-A Pipeline Segments

Site: 200-W-192-PL	Area: U Plant	Category: Shallow - Subsurface

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Site: 200-W-193-PL	Area: U Plant	Category: Shallow - Subsurface

Site Description

Alternate Site Identification:	Names: 200-W-193-PL; Pipeline from 224-U to 241-U-361 Settling Tank
Site Type:	Radioactive Process Sewer
Facility/Geographic Area:	U Plant
Current Operable Unit (OU) Assignment:	200-WA-1
Former OU Assignment:	200-IS-1
Service Dates:	1951 through 1967

The scoping summary in Figure 1 provides a summary of the site history, construction, features of interest, waste streams, site interfaces, relevant characterization, and other relevant information. The scoping summary includes information relevant to the complete length of the 200-W-193-PL pipeline. Portions of this waste site within the U Plant area have been segmented into waste sites 200-W-193-PL-X and 200-W-193-A, for inclusion in the 200-WA-1 OU. Figure 2 provides the limits of the 200-W-193-PL waste site included in the 200-WA-1 OU. 200-W-193-PL-X is the portion of the original site located within the proposed footprint of the U Plant Canyon Barrier. 200-W-193-PL-A is the rest of the pipeline portions assigned to 200-WA-1. The balance of the 200-W-193-PL site is assigned to the 200-IS-1 OU.

No release has been documented along the 200-W-193-PL pipeline. A video camera survey completed in the mid-1990s and found the pipeline to be in excellent condition. The video survey and smear sampling results do not suggest a subsurface release from the pipeline. The 200-WA-1 Final Pipeline Data Quality Objective Meeting on June 2, 2016, with U.S. Environmental Protection Agency), Washington State Department of Ecology, and U.S. Department of Energy concluded that sufficient information is available for sites 200-W-193-PL-X and 200-W-193-PL-A and no sampling is required.

References:

Waste Information Data System General Summary Report for the 200-W-193-PL Waste Site.

Site: 200-W-193-PL	Area: U Plant	Category: Shallow - Subsurface

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Site: 200-W-193-PL	Area: U Plant	Category: Shallow - Subsurface

Scoping Summary: 200-W-193-PL

History

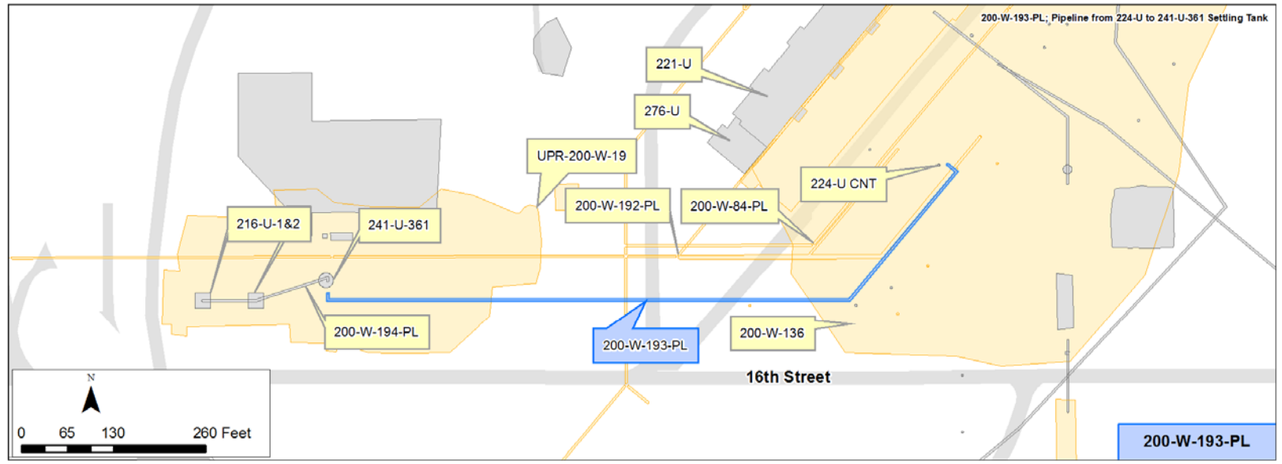
The 200-W-193-PL waste site is an inactive underground radioactive process sewer line that transferred liquid waste from the U Plant and its support facilities to the 216-U-1/2 Cribs system; specifically, to the 241-U-361 Settling Tank.

The line was constructed in the late 1940s, and in use from 1951 to 1967. In 1967, the Settling Tank was no longer used and its surface was covered over with clean fill and then shotcrete.

The U Plant Ancillary buildings were further deactivated in 1993, and, eventually removed in 2005/2006. This area is now labeled, 224-U CNT.

The pipeline's integrity was investigated in the mid-1990s and found to be in excellent condition, while the 241-U-361 Settling Tank was observed to be filled with approximately 27,500 gal of sludge with 160 grams plutonium content.

The final 20 ft to 30 ft of the pipe leading to the settling tank was also filled with liquid.



Construction

- Length: 1,000 ft
- Diameter: 3 in.
- Composition: Stainless Steel
- Direct Buried
- Depth: 5 ft to 10 ft bgs
- Calculated Volume: 370 gal

Features of Interest

- Two pipe tie-ins were observed during the 1994 video camera in-pipe investigation, from 276-U and 221-U buildings. A drawing from the early 1950s, suggests at least one of these tie-ins is the line from the 241-U-361 Settling Tank to the 216-U-1/2 Cribs. Drawings are not clear as to the whereabouts of the additional tie in.

Relevant Characterization

- A 1994 investigation of this area and the integrity of the stainless steel pipe consisted of interior and exterior pipe smear samples, as well as a video camera running the interior of the pipe for about 500 ft
- Smear samples inside the pipe were up to 30,000 counts per minute, while the pipe's exterior and surrounding soil identified no activity. The video monitoring showed puddles of liquid in low spots, as well as a completely full pipe for the final 20 ft to 30 ft entering the Settling Tank.

Waste Streams

Radioactive process sewer waste from U-Plant (221-U and 224-U, 276-U):

- 224-U Decontamination Waste

Misc./Other Relevant Information

- The 224-U Building and other ancillary U Plant structures were removed in 2005/2006
- 200-W-193-PL was cut at the surface, filled with grout and gravel, to grade, and the entire area was surface-stabilized

Site Interfaces

Origin/Termination:

- 224-U Building (demolished)

200-WA-1

- 241-U-361 Settling Tank

Site Intersects:

200-IS-1

- 200-W-84-PL
- 200-W-194-PL

200-WA-1

- UPR-200-W-19
- 216-U-1&2 Cribs

No Operable Unit

- 224-U CNT (Rejected)
- 200-W-192-PL
- 200-W-136

Figure 1. 200-W-193-PL Pipeline Scoping Summary (page 1)

Site: 200-W-193-PL	Area: U Plant	Category: Shallow - Subsurface

Page 2 of 2 **Scoping Summary: 200-W-193-PL**

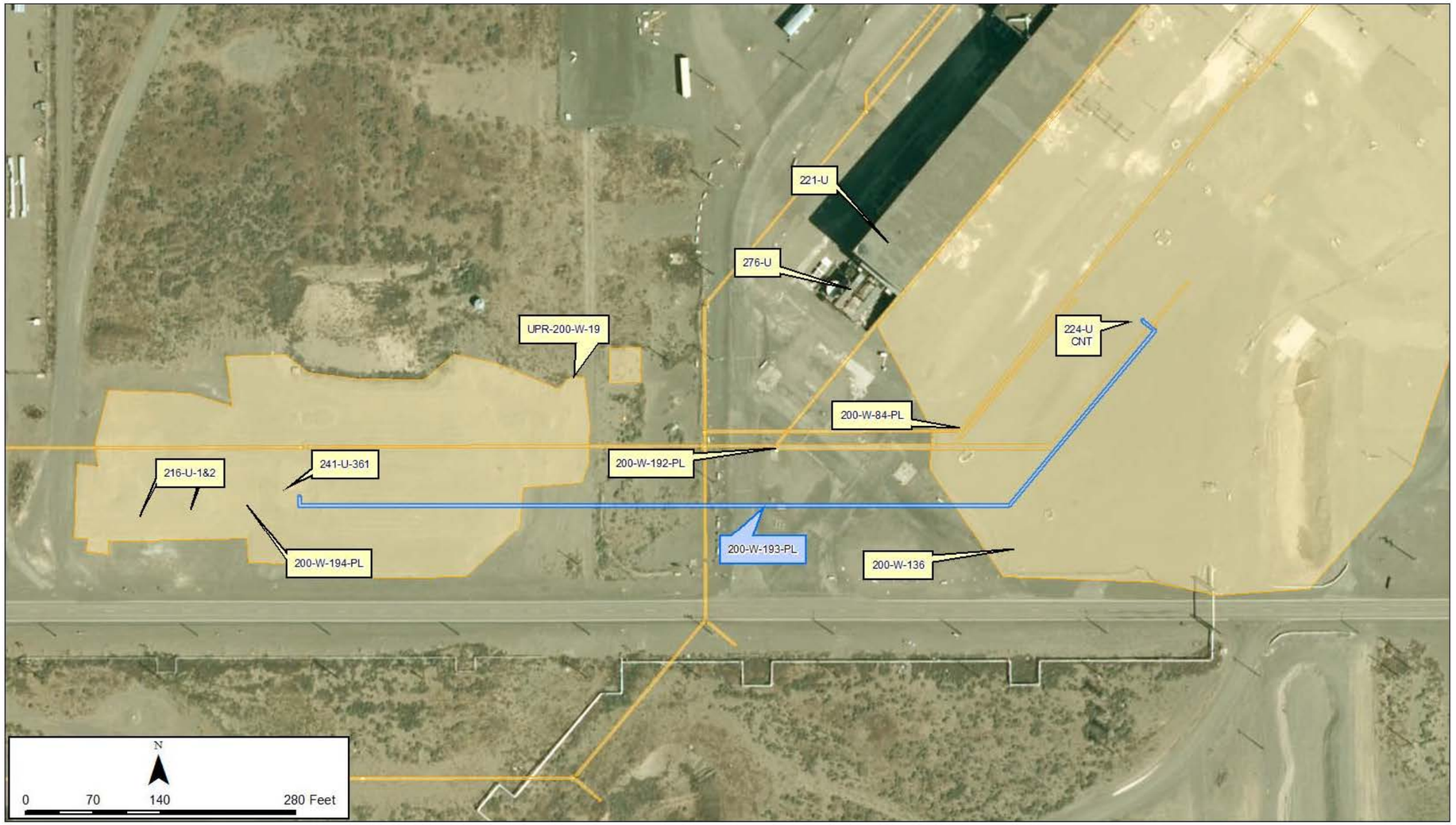
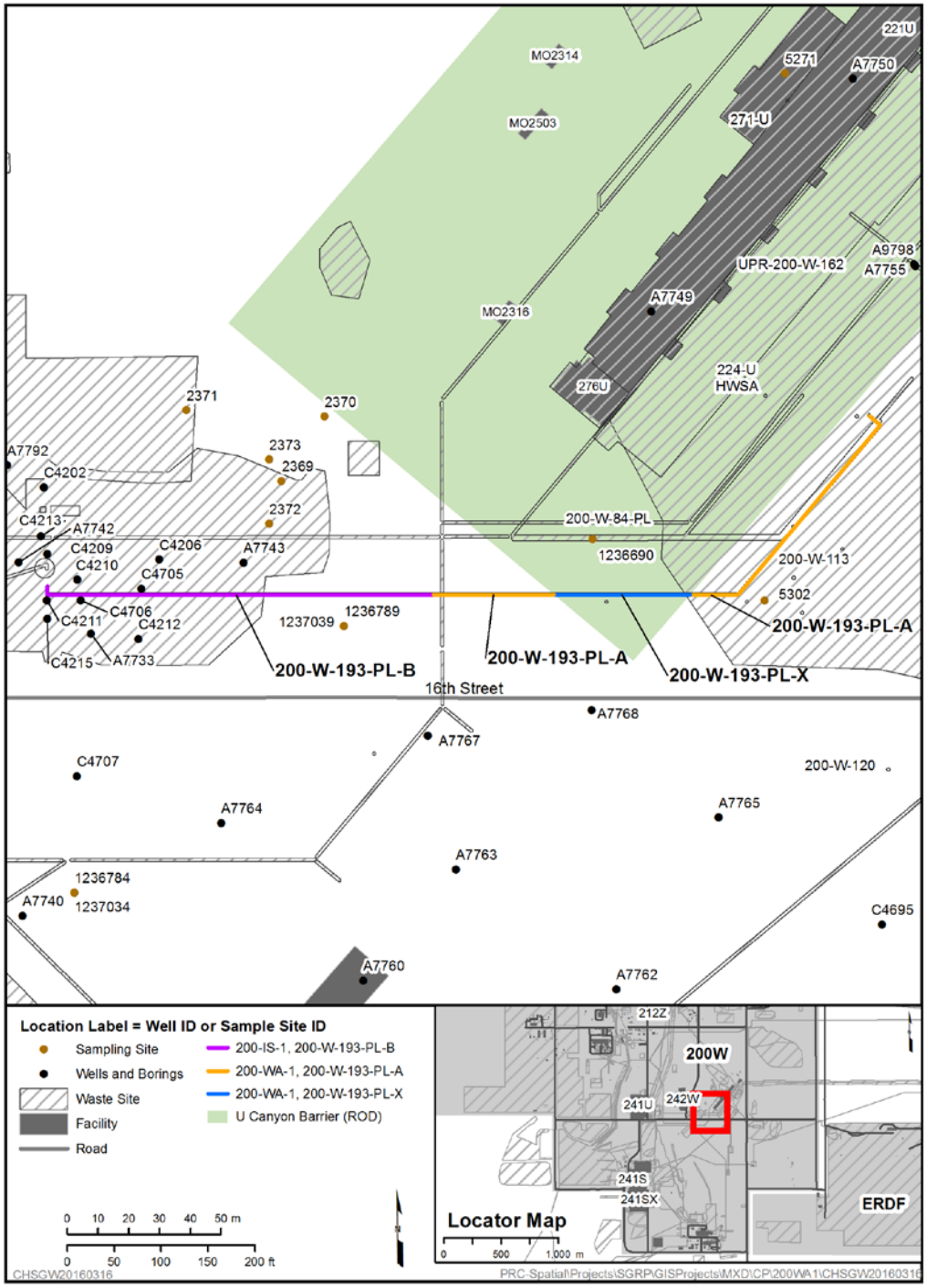


Figure 1. 200-W-193-PL Pipeline Scoping Summary (page 2)

Site: 200-W-193-PL	Area: U Plant	Category: Shallow - Subsurface



ID = identification
ERDF = Environmental Restoration Disposal Facility

Figure 2. Location of 200-W-193-PL-X and 200-W-193-PL-A Pipeline Segments

Site: 200-W-193-PL	Area: U Plant	Category: Shallow - Subsurface

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Site: 200-W-195-PL	Area: U Plant	Category: Shallow - Subsurface

Site Description

Alternate Site Identification Names: 200-W-195-PL; Pipeline from 224-U to 216-U-17 Crib
Site Type: Radioactive Process Sewer
Facility/Geographic Area: U Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-IS-1
Service Dates: 1988 through 1994

The scoping summary in Figure 1 provides a summary of the site history, construction, features of interest, waste streams, site interfaces, relevant characterization and other information for the 200-W-195-PL pipeline. Figure 2 shows the location of 200-W-195-PL. The western-most portion of this site lies within the proposed footprint of the U Plant Canyon Barrier.

No release has been documented along the 200-W-195-PL pipeline. The 200-W-195-PL is a polyethylene pipeline that was in service from 1988 to 1994 transferring Uranium Trioxide (UO_3) process condensate from 224U to the 216-U-17 Crib. As part of the decommissioning of 224U and related 224-U-CNT Condensate Neutralization Tank, the piping was cut off at grade, plugged with grout, and inspected. No anomalous solids or liquids were identified. In 1990, an investigation into the UO_3 Facility process condensate concluded it was not a dangerous waste.

References:
Waste Information Data System General Summary Report for the 200-W-195-PL Waste Site.

Site: 200-W-195-PL	Area: U Plant	Category: Shallow - Subsurface

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Site: 200-W-195-PL	Area: U Plant	Category: Shallow - Subsurface

Page 1 of 2

Scoping Summary: 200-W-195-PL

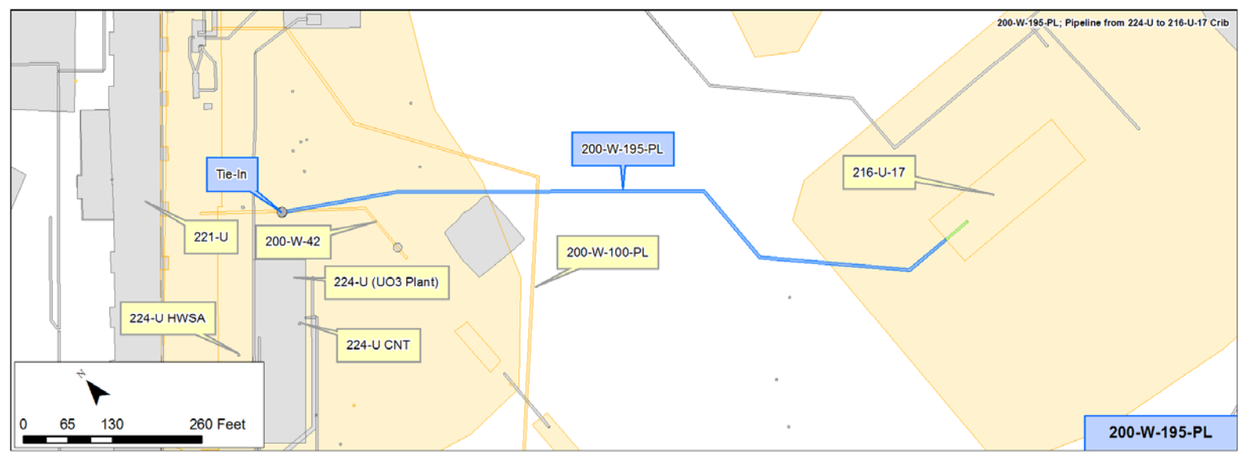
History

The 200-W-195-PL waste site is an inactive drain pipe from the 224-U Building to the 216-U-17 Crib. The line was fed by an above-ground process condensate line with a tie-in for the two lines at the northwest point of 200-W-195-PL.

The final twenty-plus feet of the drain line as it enters the crib is approximately 20 ft bgs.

The line was in use from 1988 to 1994. The 224-U Building and the neutralization tank used for the process condensate transferred through this drain pipe were removed in 2010. The tank was disposed in the ERDF landfill. All piping was cut off at grade, plugged with grout, and inspected. No anomalous solids or liquids were identified as part of the demolition activities.

For a period of time in 1989/1990, the process condensate was re-routed to storage tanks around the UO3 Plant while the effluent was studied to determine whether it warranted dangerous waste classification.



Construction

- Length: 1,075 ft
- Diameter: 6 in.
- Composition: Polyethylene
- Direct Buried
- Depth: 7 ft to 20 ft bgs
- Calculated Volume: 1,580 gal

Features of Interest

- None identified

Relevant Characterization

- Routine radiation surveys conducted in 1997 around the crib area found no contamination

Waste Streams

- Process condensate drain line to crib: UO3 Process condensate - 1988 through 1994
  - Effluent was neutralized prior to discharge to the crib
- A 1990 investigation into the UO3 Plant process condensate concluded it was not a dangerous waste

Misc./Other Relevant Information

- The 216-U-17 Crib's vent risers were sealed in July 2000 as a preventative measure for potential passive radioactive emissions

Site Interfaces

Origin/Termination:
200-WA-1
- 216-U-17 Crib
- 224-U (former building)

Site Intersects:
200-WA-1
- 200-W-100-PL
- 200-W-42
- 224-U CNT (Rejected)

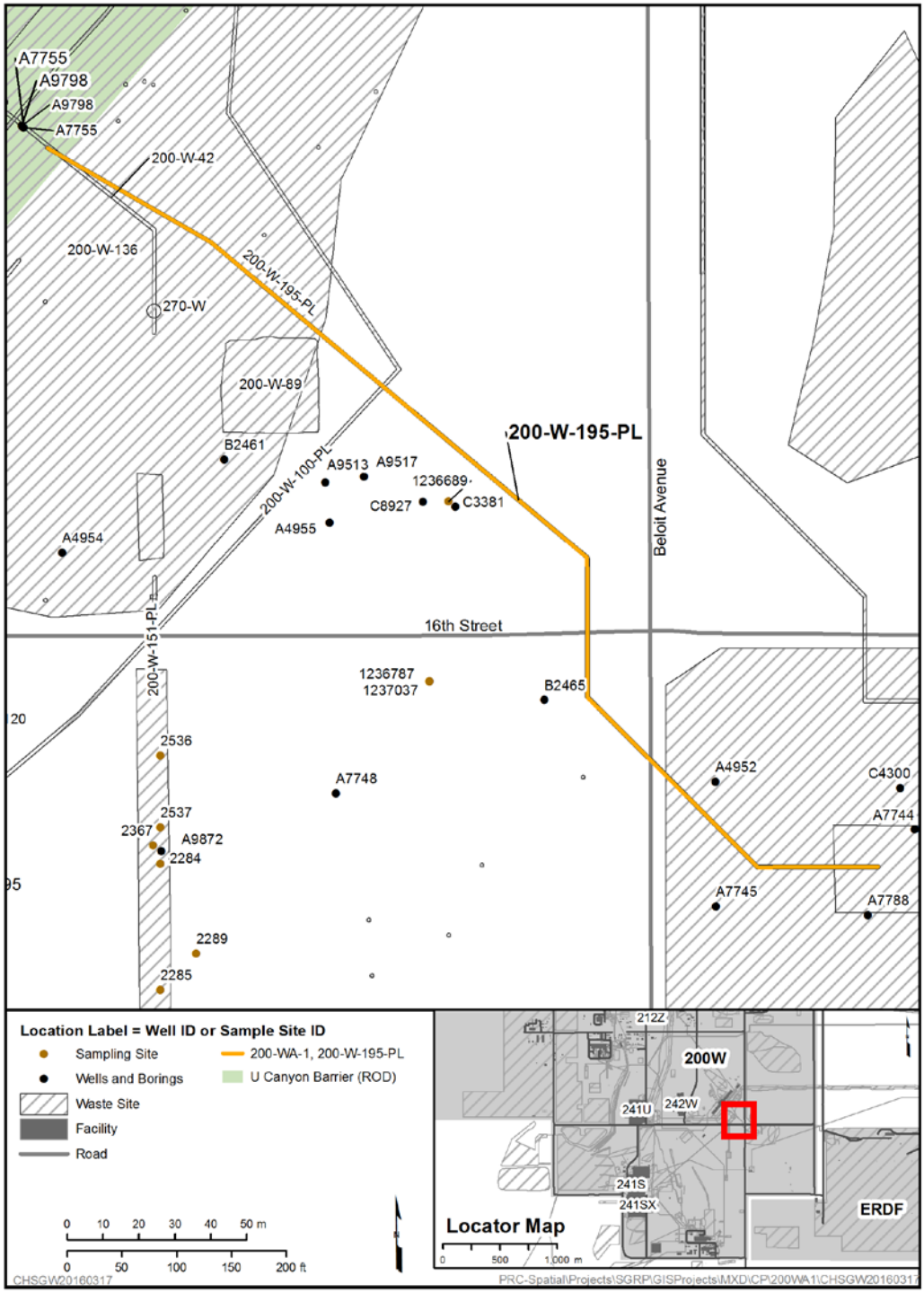
Figure 1. 200-W-195-PL Pipeline Scoping Summary (page 1)

Site: 200-W-195-PL	Area: U Plant	Category: Shallow - Subsurface

Page 2 of 2 **Scoping Summary: 200-W-195-PL**

Figure 1. 200-W-195-PL Pipeline Scoping Summary (page 2)

Site: 200-W-195-PL	Area: U Plant	Category: Shallow - Subsurface



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ERDF = Environmental Restoration Disposal Facility

Figure 2. Location of 200-W-195-PL

Site: 200-W-195-PL	Area: U Plant	Category: Shallow - Subsurface

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Site: 200-W-239	Plant: U Plant	Category: Shallow - Subsurface

Site Description

Alternate Site Identification: 11-U and 211-UA Potential Asbestos in Soil; Post Remediation Underground Radioactive Material Area (URMA)
Site Type: Unplanned Release
Facility/Geographic Area: 200W
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: Not Assigned
Service Dates: Not Applicable

Waste Site Location and Physical Description: 200-W-239 is located on the northwest side of 221-U, west of Beloit Ave., and north of 16th Street (Figure 1). The waste site was originally an irregularly shaped, posted URMA that was defined after the 211-A and 211-UA tank farms were demolished in 2009. Following demolition, 7.6 to 15.2 cm (3 to 6 in.) of surface material was removed prior to applying a gravel cap.

Waste Site Coordinates:
E-567542.880331 N-135241.090259

Related Site Structures: The demolished tank farm and resulting URMA are associated with 221-U, 221-U:1, and 221-U:2.

Site Dimensions:
Site Length: 81 m (266 ft) Site Width: 71 m (233 ft)
Note: Site is irregularly shaped. Dimensions are for the largest extents.

Site Posting: A site visit by the Waste Information Data System (WIDS) and Environmental Compliance Office team in September 2012 found that the radiological posting had been removed for 200-W-239. A larger URMA was posted that encompasses many WIDS sites, including 200-W-239. As of May 2016, the 200-W-239 waste site is separately marked but labeled with only "Potential Asbestos in Soil" signs.

Associated Sites: UPR-200-W-118.

Site History

Release Summary: The aboveground features of the 211-U Tank Farm were removed in 2009. The 211-U-Tank Farm was a bulk liquid storage area, consisting of nine aboveground storage tanks. The-tanks were located on the west side of the 221-U building. Six tanks were horizontal tanks (2.7 m [8.9 ft] in diameter, 11 m [36 ft] long). Of the horizontal tanks, three were sodium hydroxide storage tanks, one was a demineralized water storage tank, and two were considered spare tanks.

Site: 200-W-239	Plant: U Plant	Category: Shallow - Subsurface

200-W-239 had three vertical tanks (3 m [9.8 ft] in diameter, 4.2 m [13.8 ft] high). Of the vertical tanks, one was a demineralized water storage tank and two were chemical make-up tanks.

Bulk liquid was transferred to the 211-U tanks from rail cars or trucks, which included "reclaimed" nitric acid from uranyl nitrate after the uranium was removed from REDOX and PUREX. The slightly radioactive nitric acid was stored in 211-UA tanks. The reclaimed nitric acid was recycled to REDOX and PUREX by pumping it through underground pipes into an acid pump pit, and then into railcars. Some leakage was associated with the pumping process and caused low level radioactive contamination in that area. During the 211-U and 211-UA tank farm demolition, the underground acid pipeline trenches were filled with scaffolding, buried, and left in place. The acid pipelines are asbestos insulated pipes and most likely contain extremely low levels of beta or gamma contamination (i.e., <2,000 to 3,000 dpm).

The reclaimed nitric acid storage was moved from 211-UA to a holding tank within the 224-U Facility in the 1980s and the railcar unloading platform was abandoned. Some residual acid and wastewater, contaminated above crib release limits, continued to be stored in the 211-UA tanks. All the acid and wastewater was removed from the tanks prior to being transitioned to the new Environmental Restoration Contractor in 1994. Although the tanks were emptied, the acid pump pit and underground pipelines had not been flushed. Leaking valves and seals and residual contamination in the pump pit caused low level radioactive contamination to spread around the tanks and railcar unloading platform. The area was posted as a Contamination Area again in the early 1990s and is site UPR-200-W-118. The lines and pump pit were flushed in 1998 and the surface contamination was covered with gravel. The area was changed to an URMA.

The aboveground features of the 211-UA (alias 211-AU) Tank Farm were removed in 2009. The 211-UA-Tank Farm consisted of 16 aboveground storage tanks, 13 that had a capacity of 380,000 L (100,000 gal) each. The tanks were located on the west side of the 221-U building. Nine of these tanks were nitric acid storage tanks and four were sodium hydroxide storage tanks. Three smaller tanks (2.7 m [8.9 ft] in diameter and 2.7 m [8.9 ft] tall) were nitric acid sample tanks.

The type of waste and the volume of waste released at 200-W-239 are not specified. Therefore, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: Determination of potential asbestos-containing material (ACM) left in place and abated during demolition is based on a Quality Assurance review of project documentation

Site: 200-W-239	Plant: U Plant	Category: Shallow - Subsurface

and interviews with activity personnel. An asbestos site walkdown was performed in February 2012 with no visible ACM being noted.

Post-demolition visual inspections of the 211-UA Tank Farm identified a thin coating of a white powdery substance in an area approximately 15 by 45 cm (6 by 18 in.) where Tank 324 was located. The substance was investigated and identified to be sodium hydroxide, the same substance was discovered in Tank 324. The sodium hydroxide was cleaned up and properly disposed. The radiological surveys performed periodically throughout the demolition of the 211-U and 211-UA Tank Farm areas detected no contamination. The area was posted as a Radioactive Materials Area/Radiological Buffer Area (RMA/RBA) prior to the start of demolition activities. Post-demolition, the 211-U and 211-UA Tank Farm areas were covered with gravel. A final radiological survey conducted on July 30, 2009, did not detect area contamination. As a result of the final survey, the area of the 211-U Bulk Storage Aqueous Chemical Make-Up Tanks and 211-UA Tank Farm was down-posted from an RBA to a URMA.

In June 2011, the URMA was surveyed using Global Positioning System. The coordinates were used to map the boundary of the waste site.

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): Potential radiological contamination at the surface.

References:

BHI-01628, 2002, *Final Report for Interim Stabilization of 211-U and 211-UA Contamination Areas*, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

DOE/RL-2011-04, 2011, *U Plant Ancillary facilities removal Action Report*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0088389.

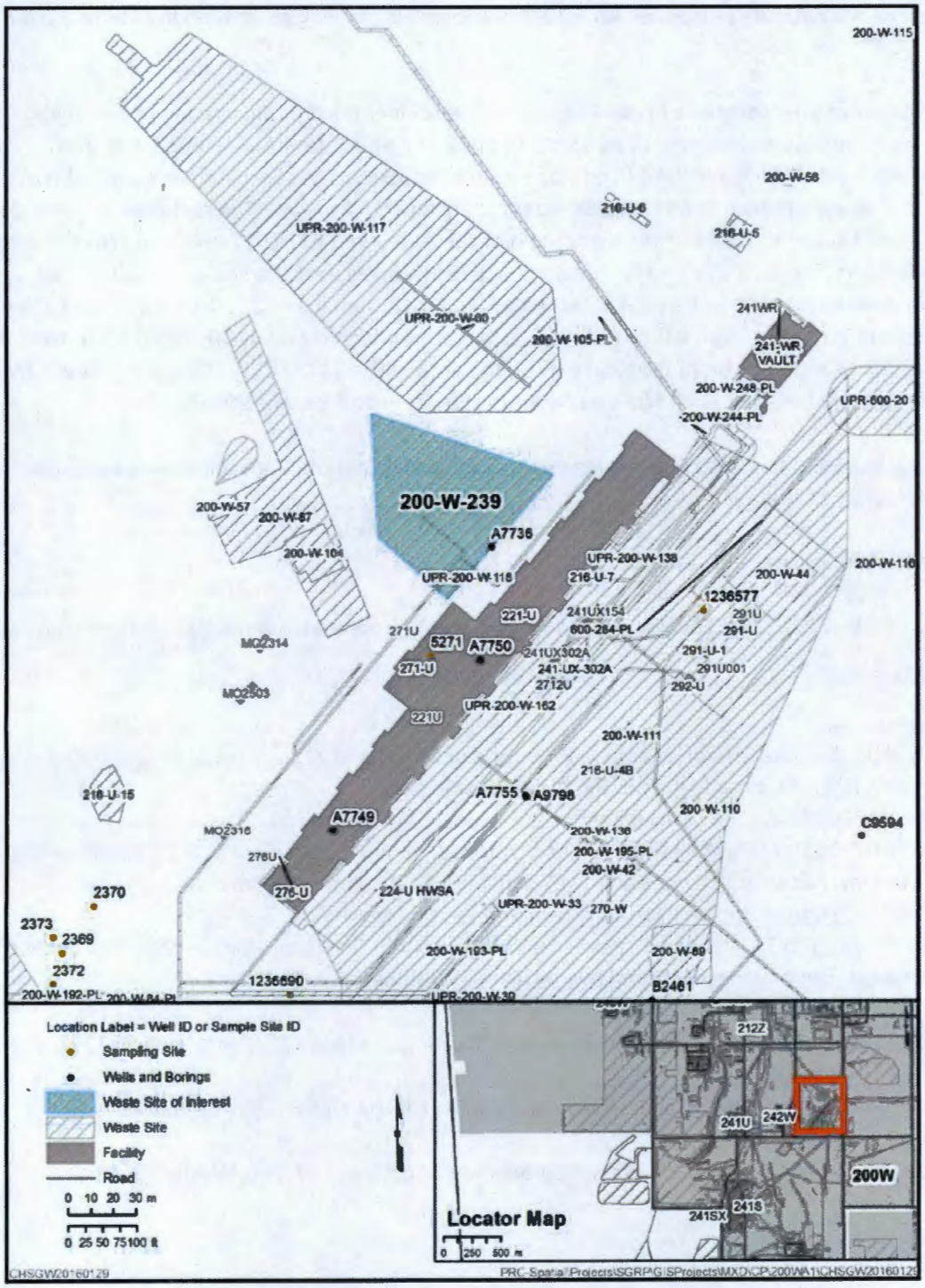
H-2-40695 (drawing), 1953, *Piping – Equipment Arrangement of Chemical Storage Tank Farm – Plan*, Rev. 2, General Electric Company, Richland, Washington.

Personal communication, 2016, "200-W-239 vs UPR-200-W-118 Mapping" Sherman, C.D. 2002.

Waste Information Data System General Summary Report for the 200-W-239 Waste Site.

Zinsli, L. to T. Dye et al., CH2M HILL Plateau Remediation Company, Richland, Washington, May.

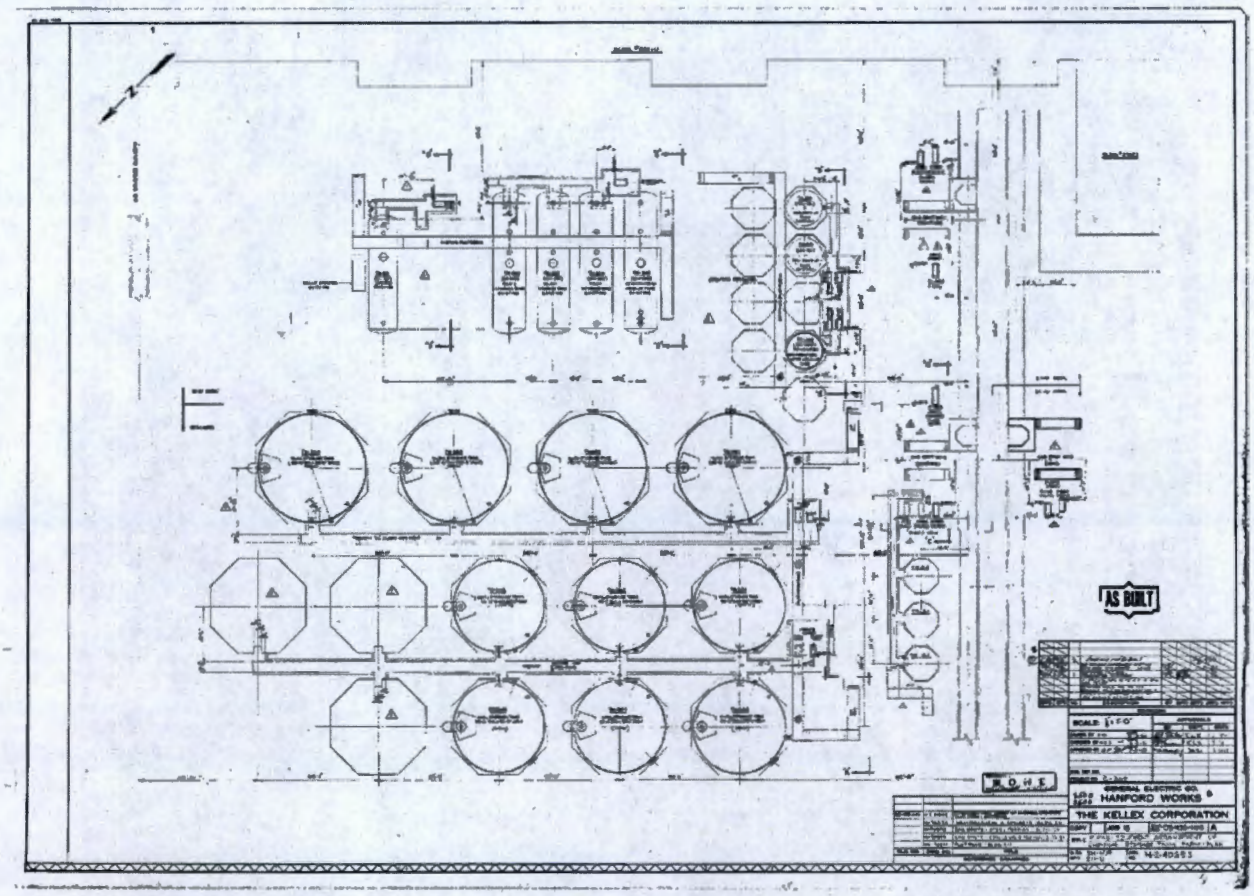
Site: 200-W-239	Plant: U Plant	Category: Shallow - Subsurface



ID = identification

Figure 1. 200-W-239 Waste Site Map

Site: 200-W-239	Plant: U Plant	Category: Shallow - Subsurface



Source: H-2-40695, *Piping – Equipment Arrangement of Chemical Storage Tank Farm – Plan.*

Figure 2. As-Built of 211-U Tanks

Site: 200-W-239	Plant: U Plant	Category: Shallow - Subsurface

Source: DOE/RL-2011-04, 2011, *U Plant Ancillary facilities removal Action Report*.

Figure 3. Historic Photo of 200-W-239

Site: 200-W-243	Plant: U Plant	Category: Shallow – Surface Only

Site Description

Alternate Site Identification: Lead Slag near 2727-WA Sodium Storage Building
Site Type: Dumping Area
Facility/Geographic Area: 200W
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: Not applicable
Service Dates: Unknown

Waste Site Location and Physical Description: The 200-W-243 waste site consists of scattered fragments of lead slag in gravel and soil. The lead slag area is along an unnamed gavel access road near a railroad track, north of 16th Street and the 2727-WA sodium storage building (Figures 1 and 2). After the discovery of the lead pieces in October 2011, a decision was made to close the gravel road to vehicle traffic.

Waste Site Coordinates:

Site Dimensions:
Site Length (estimated): 60.9 m (200 ft) Site Width (estimated): 30.5 m (100 ft)

Related Site Structures: No structures are associated with 200-W-243.

Site Posting: It is unclear if the site is posted.

Site History

Release Summary: The small pieces of lead may be "drips" of lead from old welding operations that were done many years ago, perhaps in the late 1940s or 1950s. A discarded welding rod was found in this area. The site was formerly used as a repair area.

The levels of contamination present in the soil are not specified. In addition, the depth of contaminated soil is not specified. As the total volume of contamination present is not available, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Site: 200-W-243	Plant: U Plant	Category: Shallow – Surface Only

Previous Site Characterization

Site Characterization Summary: A survey conducted on October 5, 2011, found material that appeared to be lead pieces. On October 6, 2011, a follow-on survey determined that the found material was small lead drippings. It is unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided. If surveys do occur, their frequency is not specified. In addition, it is unclear if any remediation work has occurred at this site.

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): Potential lead contamination at the surface.

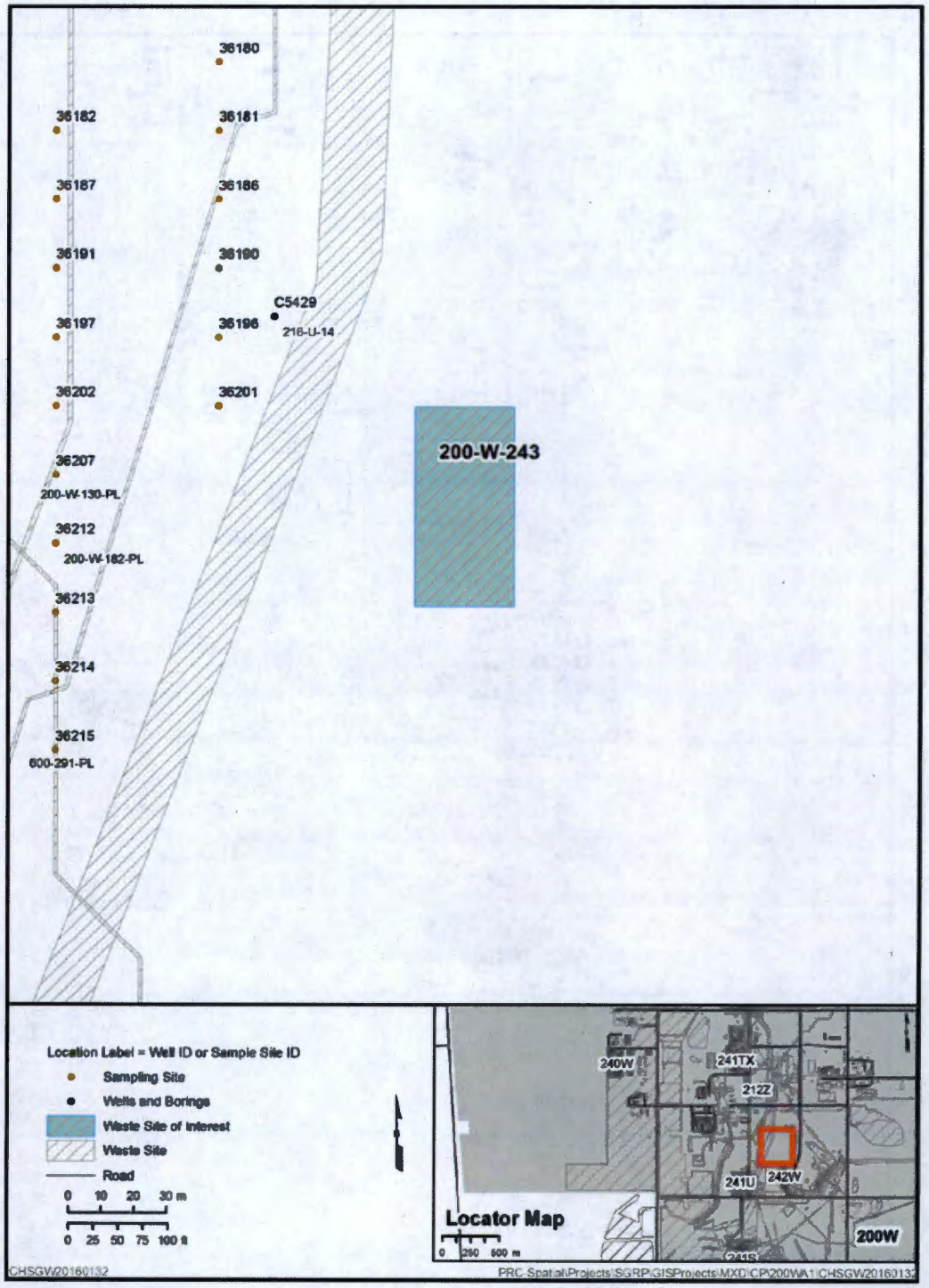
References:

NA-1205181128, Williams, Joel F Jr. Finding on lead issue identified in the 200 West area near 2727-WA-Sodium Storage Area (October 2011).

NA-1205181130, Williams, Joel F Jr. Initial site visit requesting site be added to WIDS (October 2011).

Waste Information Data System General Summary Report for the 200-W-43 Waste Site.

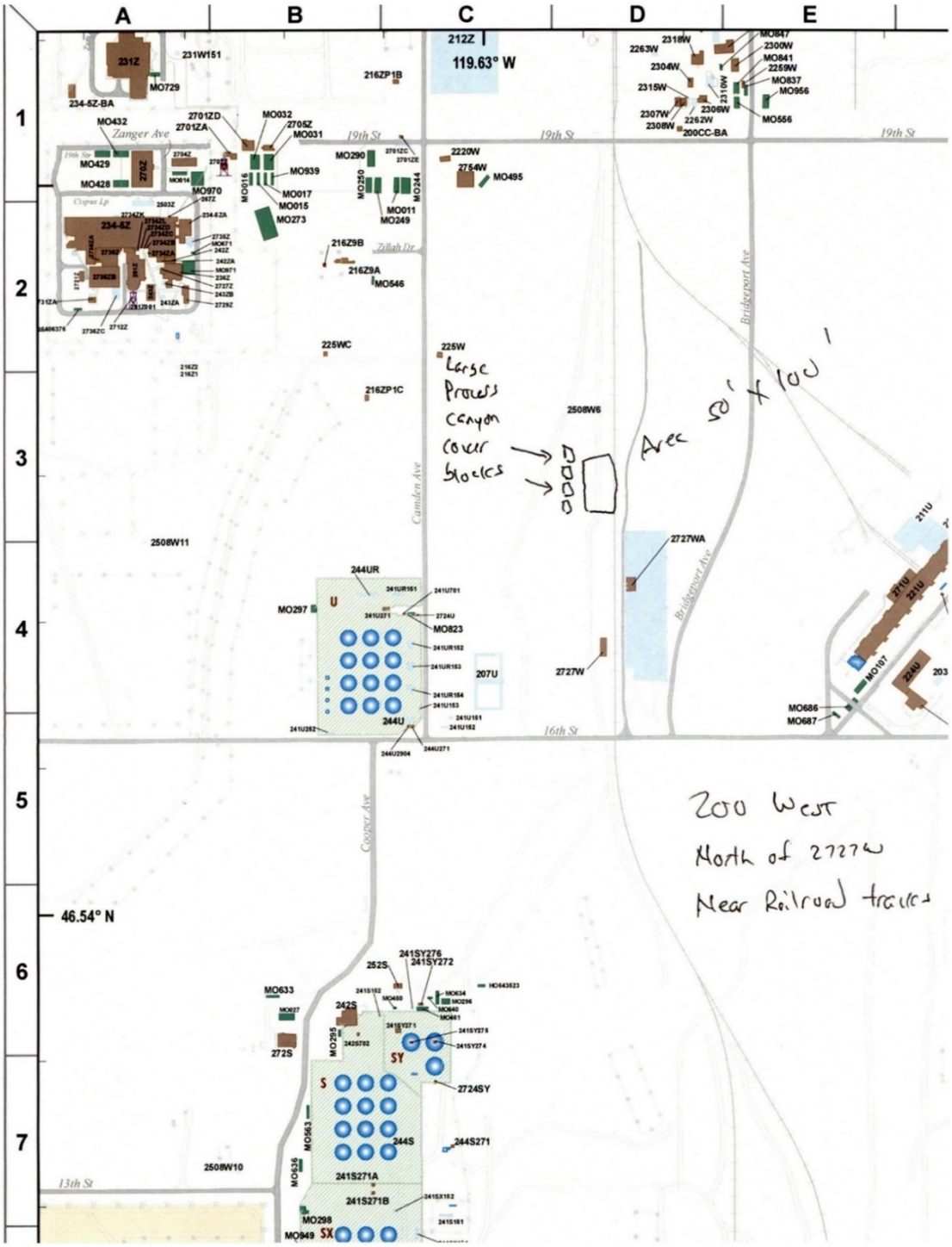
Site: 200-W-243	Plant: U Plant	Category: Shallow – Surface Only



ID = identification

Figure 1. 200-W-43 Waste Site Map

Site: 200-W-243	Plant: U Plant	Category: Shallow – Surface Only



Source: NA-1205181130, Williams, Joel F Jr. Initial site visit requesting site be added to WIDS.

Figure 2. Site Map for 200-W-243

Site: 200-W-244-PL	Area: U Plant	Category: Shallow Subsurface

Site Description

Alternate Site Identification Names:	200-W-244-PL; Encased Pipelines from 221-U Canyon Building to 241-WR Vault; Lines 4705, 4707, 4709, 4711, 4861, 4871
Site Type:	Encased Transfer Piping
Facility/Geographic Area:	U Plant
Current OU Assignment:	200-WA-1
Former OU Assignment:	200-IS-1
Service Dates:	Unknown

Waste Site Location and Physical Description: The 244-W-244-PL waste site is a grouping of six pipelines in a concrete encasement. Four lines connect to Section 3 of the 221-U canyon. Two lines connect to Section 4 of the 221-U canyon. All six lines also connect to the 241-WR Vault. The encased pipeline is located on the east side of the 221-U Facility, west of Beloit Ave. (Figure 1).

Waste Site Coordinates:

Site Dimensions:
Site Length: 110 m (360 ft) (estimated from Figure 1)
Diameter: 0.09 m (3.5 in.) outside diameter (H-2-40075, *Piping-Underground Process 241-WR Area – Plan*)

Related Site Structure(s): 221-U canyon, 241-WR Vault, and 200-W-248-PL.

Site History

Release Summary: The 241-WR Vault received uranium and thorium slurry solutions (via underground encased pipelines) from the single-shell tanks and prepared the waste to be fed into 221-U Facility to extract the uranium and thorium. The 241-WR vault added chemicals and adjusted the pH before it was transferred to the 221-U canyon to be processed through the tributyl phosphate extraction columns. The 241-WR Vault (Tank 241-WR-001) also received neutralized waste from the 221-U extraction process (via underground encased pipelines) and stored it until it was transferred back to the tank farms via the 241-UX-154 Diversion Box.

Volume Discharged: No release has been document or is suspected.

Pore Volume Discharged: Not applicable.

Site: 200-W-244-PL	Area: U Plant	Category: Shallow Subsurface

Previous Site Characterization

Site Characterization Summary: No site characterization has been performed.

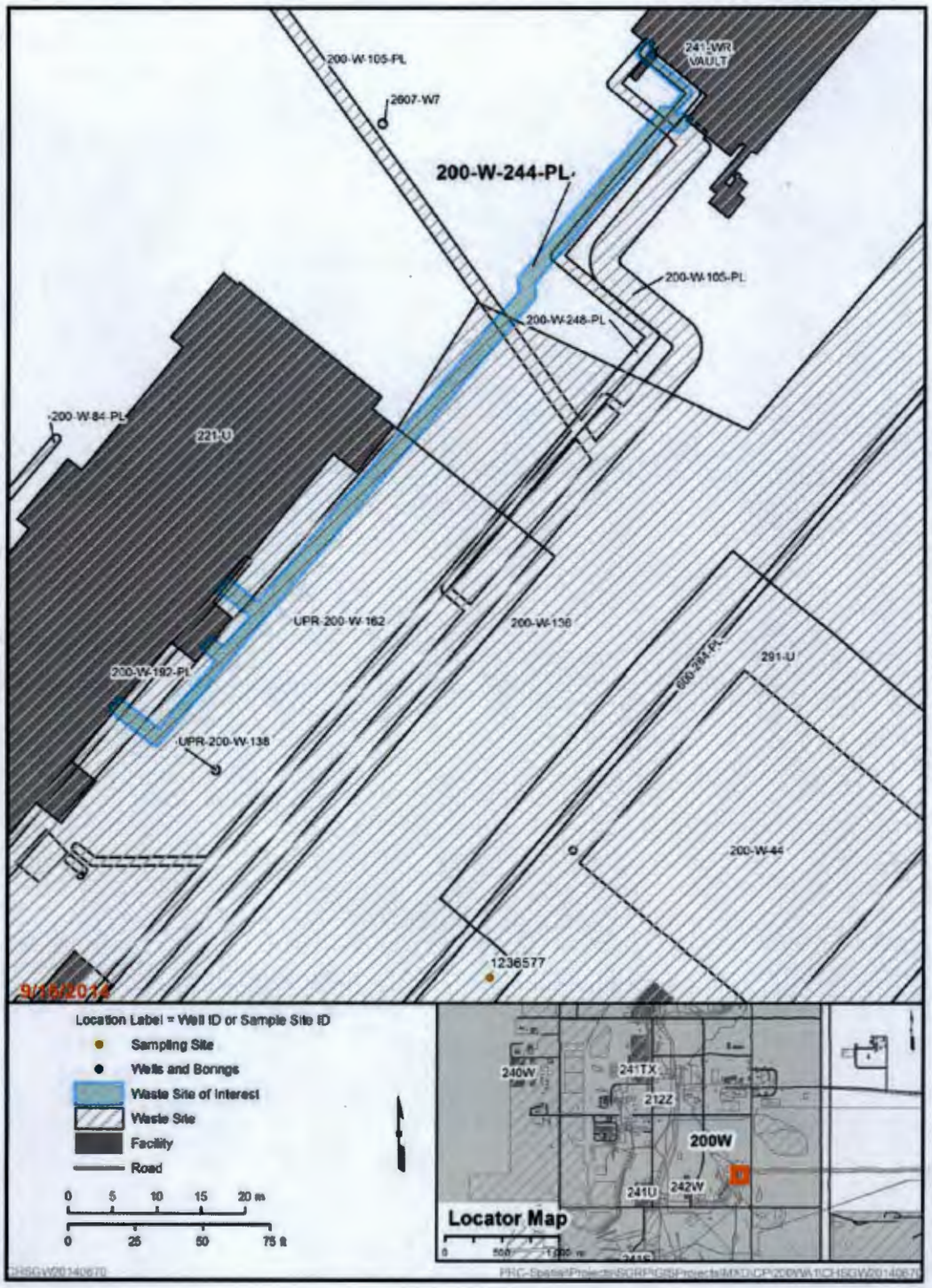
Nature and Extent of Contamination: No release has been document or is suspected.

References:

H-2-40075 (drawing), 1952, *Piping-Underground Process 241-WR Area – Plan*, Rev. 3, General Electric Company, Richland, Washington.

Waste Information Data System General Summary Report for the 200-W-244-PL Waste Site.

Site: 200-W-244-PL	Area: U Plant	Category: Shallow Subsurface



ID = identification

Figure 1. 200-W-244-PL Pipeline

Site: 200-W-244-PL	Area: U Plant	Category: Shallow Subsurface

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Site: 200-W-248-PL	Area: U Plant	Category: Shallow, Subsurface

Site Description

Alternate Site Identification Names: 200-W-248-PL; Direct Buried lines from 241-UX-154 to 200-W-244-PL and 241-WR Vault; Line Numbers 4866, 4976, and 4977
Site Type: Direct Buried Tank Farm Pipeline
Facility/Geographic Area: U Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-IS-1
Service Dates: Unknown

Waste Site Location and Physical Description: The 200-W-248-PL waste site is comprised of three underground, stainless steel pipelines buried in the same soil trench. Three stainless steel pipelines (lines 4866, 4976, and 4977) exit the north side of the 241-UX-154 Diversion Box. The three lines extend northward, buried in a single soil trench. They connect into the 200-W-244-PL concrete encasement near the south wall of the 241-WR Vault. The three direct buried pipelines are located on the east side of the 221-U Building (Figure 1).

Waste Site Coordinates:

Site Dimensions:
Site Length: 150 m (500 ft) (Estimated from Figure 1)
Diameter: 0.09 and 0.10 m (3.5 and 4 in.) outside diameter (H-2-40075 *Piping-Underground Process 241-WR Area – Plan*)

Related Site Structure(s): 241-UX-154 Diversion Box, 241-WR Vault, and 200-W-244-PL

Site History

Release Summary: The 241-WR Vault received uranium and thorium slurry solutions (via underground encased pipelines) from the single shell tanks and prepared the waste to be fed into 221-U facility to extract the uranium and thorium. The 241-WR Vault added chemicals and adjusted the pH before it was transferred to the 221-U canyon to be processed through the tributyl phosphate extraction columns. The 241-WR Vault (Tank 241-WR-001) also received neutralized waste from the 221-U extraction process (via underground encased pipelines) and stored it until it was transferred back to the Tank Farms via the 241-UX-154 Diversion Box.

Volume Discharged: No release has been document or is suspected.

Pore Volume Discharged: Not applicable.

Site: 200-W-248-PL	Area: U Plant	Category: Shallow, Subsurface

Previous Site Characterization

Site Characterization Summary: No site characterization has been performed.

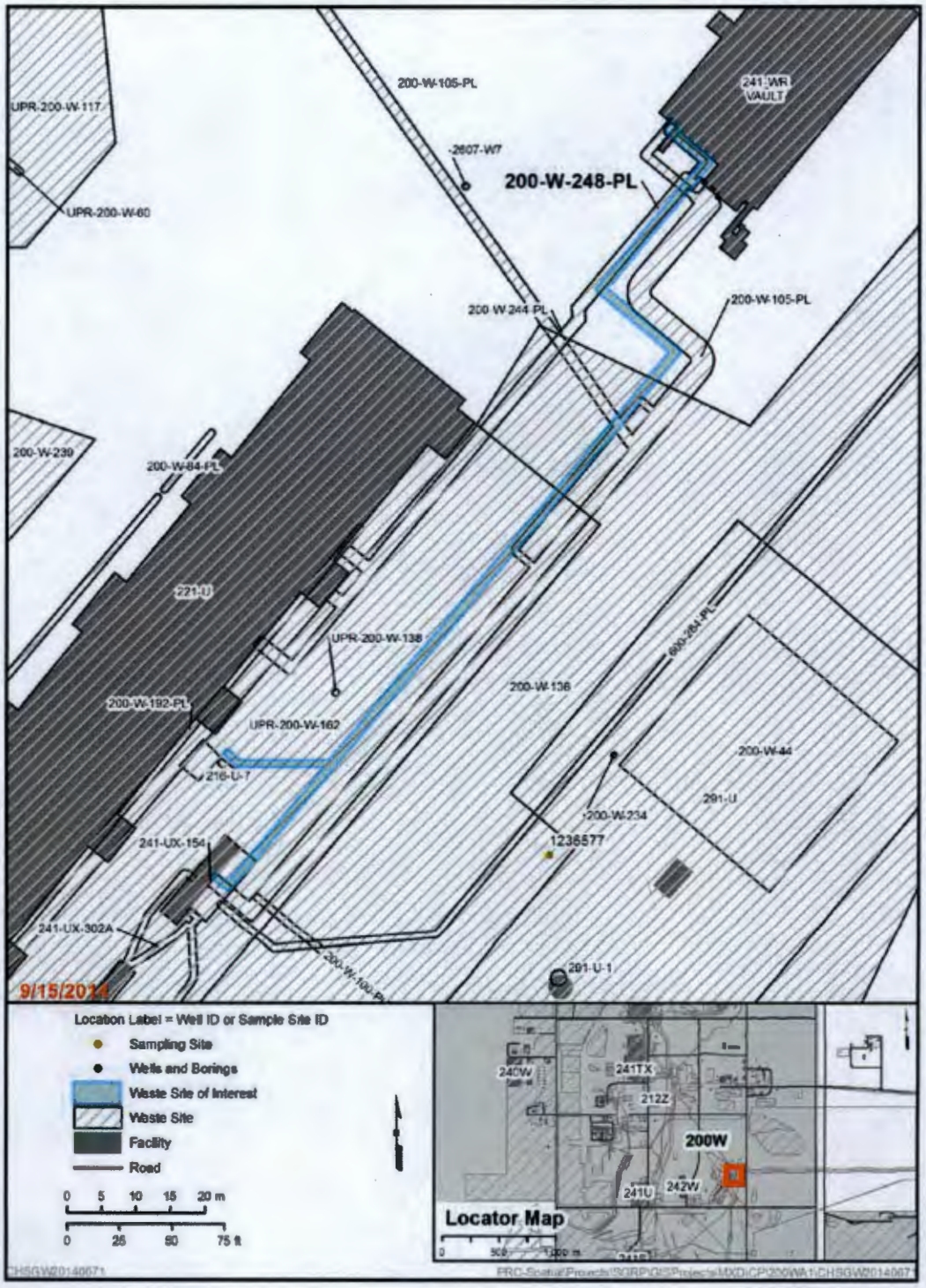
Nature and Extent of Contamination: No release has been document or is suspected.

References:

H-2-40075 (drawing), 1952, *Piping-Underground Process 241-WR Area – Plan*, Rev. 3, General Electric Company, Richland, Washington.

Waste Information Data System General Summary Report for the 200-W-248-PL Waste Site.

Site: 200-W-248-PL	Area: U Plant	Category: Shallow, Subsurface



ID = identification

Figure 1. 200-W-248-PL Pipeline

Site: 200-W-248-PL	Area: U Plant	Category: Shallow, Subsurface

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Site: 207-U	Plant: U Plant	Category: Intermediate

Site Description

Alternate Site Identification: 207-U Retention Basin
Site Type: Retention Basin
Facility/Geographic Area: U Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UP-2
Service Dates: 1952-2015

Waste Site Location and Physical Description: The 207-U waste site is located inside 200 West Area, near the corner of 16th St and Camden Ave (Figure 1). It is west of 221-U Building, north of 16th Street, and east of the 241-U Tank Farm.

The basin is a concrete basin divided into two equal halves, with a total capacity of 3.785E+06 L (1E+06 gal), with each half of the basin lined with plastic (Figure 2) and posted as a Contamination Area. The bottom dimensions for each basin are 32 by 32 m (106 by 106 ft), with total overall dimensions at the top ledge 75 by 38 m (246 by 123 ft) (Figure 3), and 2 m (6.5 ft) deep. There is an inlet structure on the east and an outlet structure on the west side, both outside of the basins. Each basin has a 0.9 by 0.9 m (3 by 3 ft) sump. There is also a sampler cabinet and a sample vault on the east side of the basins near the inlet structure.

There are two unplanned release sites (UPR-200-W-111 and UPR-200-W-112) adjacent to the basin, where sludge from the basin was removed and buried. These burial sites are located within 3 m (10 ft) of the basin on the north side and on the south side, near the western corners. An unused sampler cabinet is located on the east side of the basin, as well as a sample vault that is a confined space.

During the Uranium Trioxide (UO3) facility deactivation, the trench that runs between 224-UA and 224-U was tied into the 207-U Retention Basin pipeline to route the stormwater buildup from the contaminated zones on the backside of the facility to the 207-U basins for solar evaporation. The basin outlets have been isolated with concrete. The stormwater accumulating in the basin is allowed to evaporate. The Hanford Operational Environmental Monitoring Program will continue to monitor the air and soil in the vicinity of the basins to meet requirements stated in 40 CFR 61, "National Emission Standards for Hazardous Air Pollutants," for monitoring of diffuse and fugitive sources.

Originally, the basin received chemical sewer waste from the 221-U Building and cooling water from the 224-U Building. The water was held in the basin, sampled, and then discharged to the 216-U-10 Pond via the 216-U-14 Ditch. For several years, the basin received stormwater runoff from the 224-U building and grounds. The outlet was plugged so that the basins would serve as an evaporation pond for the stormwater it received. During the U Plant Deactivation Project, manholes in two process sewer pipelines (200-W-84-PL and 200-W-192-PL) were filled with grout to isolate U Plant and 224-U from the retention basin. This also eliminated the flow of stormwater to the basin, rendering it inactive.

Site: 207-U	Plant: U Plant	Category: Intermediate

Waste Site Coordinates: (Approximate)
E-566977.7 N-135040.9

Site Dimensions:
Site Length: 75.0 m (246 ft) Site Depth: 1.98 m (6.5 ft)
Site Width: 37.5 m (123 ft)
Area: 2,812.5 m^2 (30,258 ft^2)
Note: These are the overall dimensions of the Site and include both basins.

Related Site Structure(s): There is an inlet structure on the east and an outlet structure on the west side, on the outside of the basins. Each basin has a 0.9 m^2 (3 ft^2) sump. There is also a sampler cabinet and a sample vault on the east side of the basins near the inlet structure. The chemical sewer pipeline that fed the basin is site code 200-W-192-PL. The outlet pipe to the 216-U-14 Ditch is site code 200-W-222-PL.

Site Posting:

Site History

Release Summary: Occurrence Report 86-46 states that on August 6, 1986, 2,365 L (625 gal) of recovered nitric acid, containing 39 kg (86 lb) of uranium was discharged though the chemical sewer to the 207-U Retention Basin. Prior to the discovery of the release, the outlet valves on the retention basin were open to the 216-U-14 Ditch. The acid released to the ditch was greatly diluted with the 1,135.6 L (300 gal) per minute flow of cooling water from the 224-U facility being processed through the chemical sewer system. The *Hanford Site Waste Management Units Report* (DOE-RL 1987) reported different release values. It states that approximately 3,000 L (796 gal) of 50 percent reprocessed nitric acid was released to the basin and subsequently to 216-U-14 Ditch. The total release to the environment consisted of approximately 102,000 kg (225,000 lb) of corrosive solution (pH less than 2.0) and 45.4 kg (100 lb) of uranium.

Until 1972, the unit received steam condensate and cooling water from 224-U Building and chemical sewer waste from the 221-U Building. After 1972, the unit has received only cooling water from 224-U Building. The basin was temporarily replaced by 216-U-16 Crib (1984 through 1986), but was reactivated when 216-U-16 Crib was taken out of service. The effluent from the basin was discharged to the 216-U-10 Pond via the 216-U-14 Ditch until the basin outlet was plugged in 1994. The basin later received stormwater runoff from the 224-U Building area. The water was directed to a plastic lined portion of the basin and allowed to evaporate.

Contradictory information on the waste discharged after 1972 (cooling water or stormwater) and on the quantity of nitric acid and uranium discharged in 1986 (2,365.8 or 3,013.2 L [625 or 796 gal] and 39 or 45.3 kg [86 or 100 lb], respectively) is given in historical documents. The waste quantity is unverified by historical documents. There is a contradiction in the start of service dates (1952 and 1962) given in

Site: 207-U	Plant: U Plant	Category: Intermediate

historical documents. Information about the radiation survey conducted in 1997, including the equipment or method used, measured contaminants, and results are unverified by historical documents.

Volume/Mass Discharged: Not available.

Pore Volume Discharged: Not available.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: A radiation survey of the interior of the basin was done in 1997. No removable (smearable) contamination was identified during this survey.

Nature and Extent of Contamination:

The nature and extent of contamination released from the 207-U Retention Basin is unknown. The condition of the concrete basin is unknown, and cannot be readily inspected due to the liner, and the leakage rate through the concrete basins cannot be reliably estimated.

References:

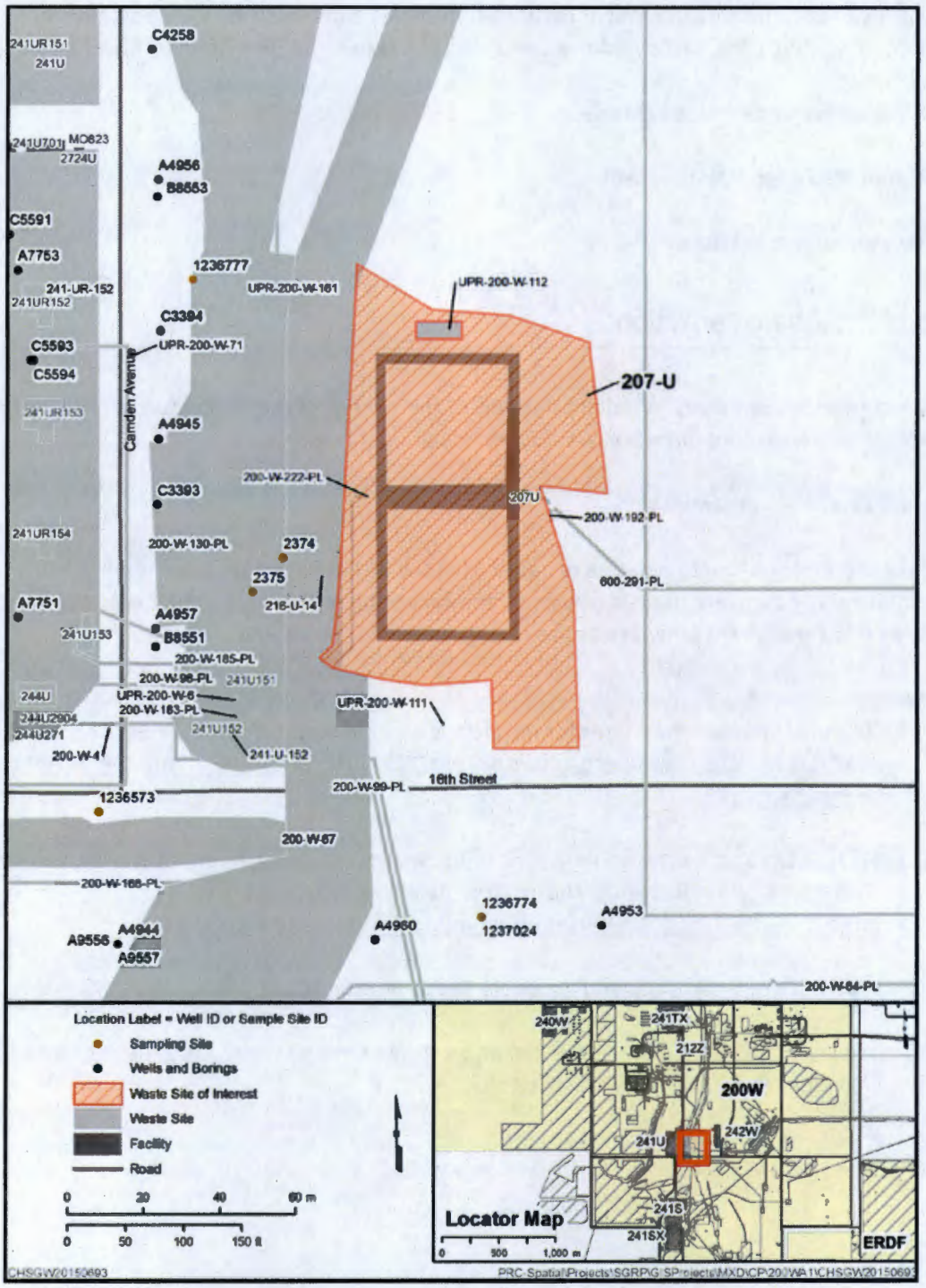
40 CFR 61, "National Emission Standards for Hazardous Air Pollutants," *Code of Federal Regulations*. Available at: http://www.gpo.gov/fdsys/pkg/CFR-2010-title40-vol8/xml/CFR-2010-title40-vol8-part61.xml.

DOE-RL, 1987, *Hanford Site Waste Management Units Report*, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=E0004690

Waste Information Data System General Summary Report for the 207-U Waste Site.

W-73975 (drawing), 1976, *Bldg. 207-T, U, B Retention Basins Arrangements*, Sh. 1, Rev. 3, Hanford Engineer Works, Richland, Washington.

Site: 207-U	Plant: U Plant	Category: Intermediate



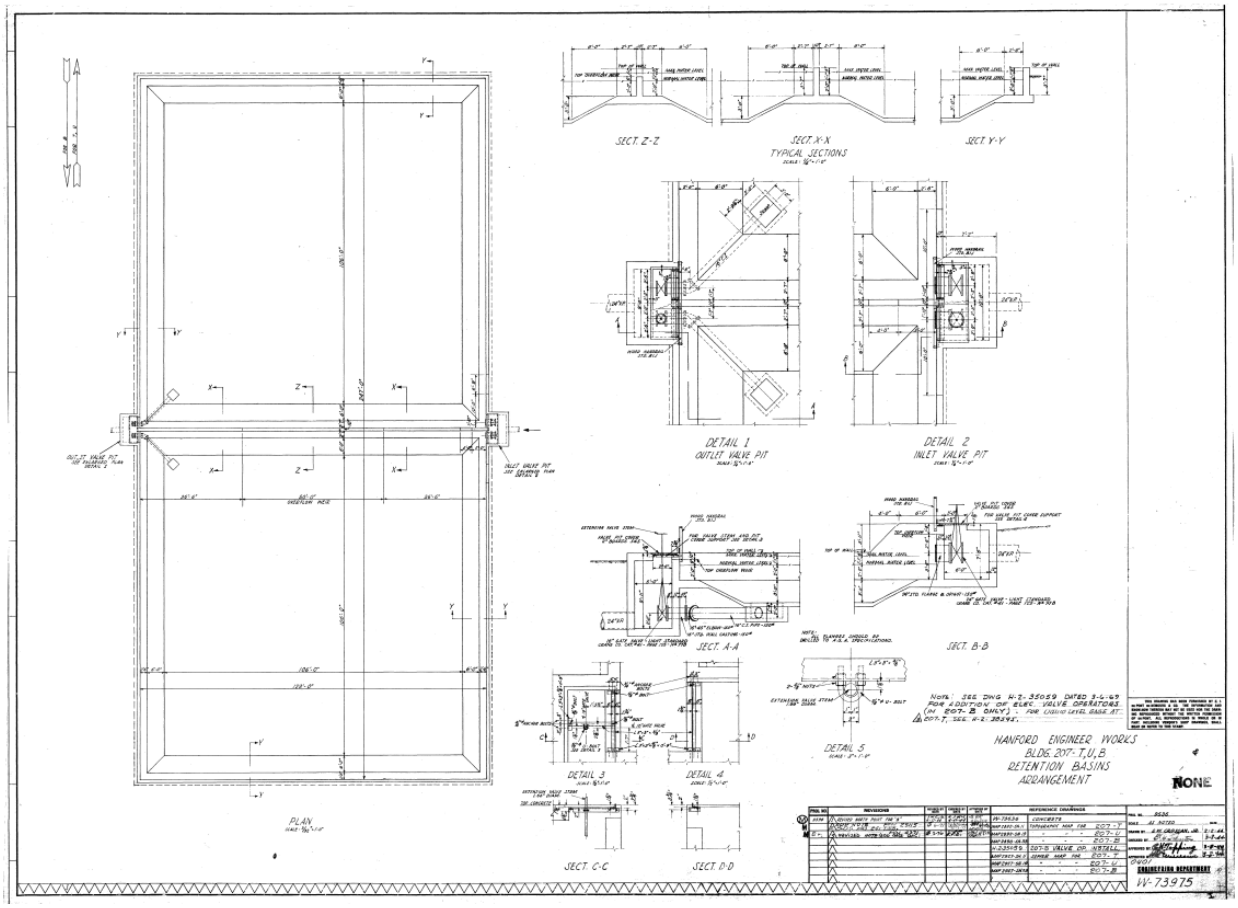
ID = identification
ERDF = Environmental Restoration Disposal Facility

Figure 1. 207-U Waste Site Map

Site: 207-U	Plant: U Plant	Category: Intermediate

Figure 2. 2004 207-U Waste Site Photo

Site: 207-U	Plant: U Plant	Category: Intermediate



Source: W-73975, *Bldg. 207-T, U, B Retention Basins Arrangements.*

Note: Produced from the best available copy.

Figure 3. 207-U Construction Drawing

Site: 216-U-1&2	Area: U Plant	Category: Deep

Site Description

Site Type: Crib
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1
Service Dates: 1951 to 1967

Waste Site Location and Physical Description: The cribs are located north of 16th Street, west of 221-U, and east of the 207-U Retention Basin (see Figure 1). The cribs are two wooden structures (see Figure 2) that received overflow from the 241-U-361 Settling Tank via pipeline 200-W-194-PL. The crib area has been surface stabilized with clean soil.

Waste Site Coordinates:
Lon-567254.32799 Lat-135001.76302

Site Dimensions:
Site Length: 27.13 m (89 ft)
Site Width: 8.53 m (28 ft)
Site Area: 231 m^2 (2,492 ft^2)
Site Depth: 6.1 m (20 ft)
Cover Thickness: 45 to 61 cm (18 to 24 in.)

Related Site Structure(s): The cribs are associated with the 241-U-361 Settling Tank and pipeline 200-W-194-PL.

Site Posting: The Site is delineated with posts and chain with Cave-In Potential signs and is located in a common Underground Radioactive Material Area.

Site History

Release Summary: The cribs received approximately 1.59E+07 L (4.2E+06 gal) of process liquid waste overflow from the 216-U-361 Settling Tank. From March 1952 to June 1957, the tank received cell drainage from Tank 5-6 in the 221-U Building and waste from the 224-U Building until the Uranium Recovery process operations shut down in 1957. From June 1957 to July 1957, the site received waste from the 224-U Building and contaminated solvent from the 276-U Settling Tank Solvent Storage area. From July 1957 through May 1967, the 216-U-1&2 Cribs received waste from the 224-U Building and equipment decontamination waste and reclamation waste from the Chemical Processing Division Services Operations in the 221-U Building canyon. The waste is low in salt and is neutral to basic. DOE/RL-2003-23 reports that 1,200,000 kg (2,645,547 lb) of nitrate was discharged to the 216-U-1&2 Cribs. A detailed summary of the waste discharge to the cribs are shown in Figure 3.

Volume Discharged 1: 1.59E+07 L (4.2E+06 gal)

Site: 216-U-1&2	Area: U Plant	Category: Deep

Pore Volume Discharged: 1.59E+07 L/ (238 ft x 288 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 27

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-U-1&2 Waste Site

Contaminant	Mass Discharged
Pu	43 g
Beta	1,200 Ci
Sr-90	5 Ci
Ru-160	500 Ci
Cs-137	10 Ci
Co-60	<0.1 Ci
U	4,000 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: Surface radiological surveys were performed in 1993 at the overlying UPR-200-W-19 site. A large portion of the surface above the cribs could not be surveyed. Surface soil surveys showed minor areas of low-level contamination. These areas were generally associated with areas presently posted as Soil Contamination Areas.

In 1993, three characterization boreholes (299-W19-95 / A7791, 299-W19-96 /A9797, and 299-W19-97/A7792) were drilled near the 216-U-1&2 Cribs. Borehole sediment sample and surface soil samples were collected and analyzed.

- Borehole (299-W 19-96/A9797) was advanced near center of the U-1 crib and soil samples collected to 53.6 m (176 ft) below ground surface (bgs). This borehole did not extend to groundwater (approximately 78.6 m [258 ft] bgs). Soil samples showed two depth intervals high in soil contamination. The first interval was below the crib bottom, generally 6 to 12 m (20 to 40 ft) bgs. The maximum concentrations of americium-241 (33 pCi/g), cobalt-60 (10.6 pCi/g), cesium-137 (1.7E6 pCi/g), strontium-90 (2.4E6 pCi/g), uranium-233/234 (1,400 pCi/g), and uranium-238 (1,500 pCi/g) were detected either at the bottom of the crib (6.25 m [20.5 ft] bgs) or at the bottom of this first contamination interval (12.3 m [40.5 ft] bgs). The next depth found to be high in contamination was the top of the caliche layer (at roughly 52 m [170 ft] bgs, where uranium isotopes were seen to increase in concentration when compared to the vadose zone above this layer. The uranium-233/234 concentration at the caliche layer was 32 pCi/g, the uranium-235

Site: 216-U-1&2	Area: U Plant	Category: Deep

concentration was 2.2 pCi/g, and the uranium-238 concentration was 32 pCi/g. Between the zone directly beneath the crib and the top of the caliche layer, radiological contaminants were detected, but at levels generally at or near background. Radionuclide logging system data show six man-made radionuclides (cesium-137, cobalt-60, europium-152, europium-154, and uranium-235, -238).

- Boreholes (299-W19-95 / A7791 and 299-W19-97/A7792) were advanced 64 m (210 ft) southeast and 45.7 m (150 ft) northeast of the cribs, respectively, to evaluate lateral migration along the caliche layer at 51.8 m (170 ft) bgs. Sediment samples from these boreholes show maximum concentrations for uranium isotopes (uranium-238 at 1.3 pCi/g and uranium-233/234 at 2.4 pCi/g) in these boreholes at the caliche layer. Radionuclide logging detected cesium-137 (maximum 20 pCi/g) in the top 2.3 m (7.5 ft) of the vadose zone.

- An in-line camera survey was done of the stainless steel pipeline connecting 224-U to the 216-U-1&2 Cribs and the pipeline was found to be intact.

On September 29, 2004, contaminated tumbleweeds were found in the 216-U-1&2 Underground Radioactive Material Area, with maximum contamination level of 198,000 d/m. Due to the cave-in potential, only the perimeter of the cribs is radiologically surveyed annually.

In 2004 and 2005, nine auger boreholes (C4705 through C4713) were installed to approximately 13.7 m (45 ft) bgs and soil samples collected at the bottom of each borehole. At one of these locations, samples were also collected at 3, 9.1, and 10.7 m (10, 30, and 35 ft) bgs. The soil samples were analyzed for: technetiam-99, nitrogen as nitrate/nitrite, mercury, cadmium, uranium (metal), U-235, U-238, antimony, and arsenic and other Inductively Coupled Plasma-Mass Spectrometer metals (barium, chromium [total], cobalt, copper, lead, manganese, selenium, silver, strontium, thallium, titanium, vanadium, and zinc). Geophysical logging (GPL) was completed at six direct push boreholes installed within 30.5 m (100 ft) of the cribs to 15.2 to 18.3 m (50 to 60 ft) bgs (C4201 to C4208) and at one well installed 24.4 m (80 ft) south of the cribs to 7605 m (251 ft) bgs (299-W19-15/A4947). GPL was completed at two locations within the cribs (299-W19-72 / A7772 and 299-W19-73 / A7773) to 22.9 m (75 ft) bgs. Borehole and data summaries are presented in Tables 2 through 6. Figure 1 shows borehole locations.

Groundwater wells associated with 216-U-1/-2 Crib (299-W19-3, 299-W19-9, and 299-W19-11) had detections above drinking water standards for carbon tetrachloride (CTET), nitrate, and radionuclides (iodine-129, strontium-90, technetium-99, tritium, and uranium). CTET concentrations ranged from 36 µg/L in 1987 to as high as 1,100 µg/L in 2000 and was last measured at 570 µg/L in 2004. Nitrate concentrations were first measured at 260,000 µg/L in 1958, were as high as 2.29 million µg/L in 1984 and were last measured at 81,500 µg/L in 2004. For radionuclides, iodine-129 was 32.9 and 1.23 pCi/L in 1987 and when last measured in 2004, respectively. Strontium-90 ranged from 70 pCi/L in 1960, was as high as 230 pCi/L in 1979, and was last detected at 0.252 pCi/L in 1994. Technetium-99 was highest upon initial measurement in 1987 at 3,200 pCi/L and was last measured at 760 pCi/L in 2004. Upon initial measurement, tritium was 73,000 pCi/L in 1975 (highest concentration measured) and was last measured at 322 pCi/L in 2001. Uranium was 10,800 µg/L in 1985, was as high as 24,700 µg/L in 1986, and was last measured at 18 µg/L in 2004. Cesium-137 results (non-detect to 8.25 pCi/L) were below the drinking water standard.

Site: 216-U-1&2	Area: U Plant	Category: Deep

Table 2. Borehole Summary for the 216-U-1&2 Waste Site

Year	Borehole/Well ID	Location With Respect to Site	Depth (ft)
1993	299-W19-96 / A9797	Inside U1 Crib	0 – 176 (GPL) 4 – 177 (17 soil samples)
1993	299-W19-97 / A7792	Outside - 150 ft northeast of U1 Crib	0 – 177 (GPL) (12 soil samples)
1993	299-W19-95 / A7791	Outside – 210 ft southeast of U1 Crib	0 – 177 (GPL) (12 soil samples)
2005	299-W19-72 / A7772	Inside U1 Crib	1 – 74 (GPL)
2005	299-W19-73 / A7773	Inside U2 Crib	1 – 74 (GPL)
2004	C4201	Outside – 25 ft north of U1 Crib	0.5 – 48.9 (GPL)
2004	C4203	Outside – 30 ft south of U1 Crib	0 – 49 (GPL)
2004	C4204	Outside – 20 ft west of U2 Crib	1 – 49.1 (GPL)
2004	C4205	Outside – 45 ft north of U1 Crib	0.5 – 48.9 (GPL)
2004	C4207	Outside – 45 ft south of U1 Crib	0.5 – 48.7 (GPL)
2004	C4208	Outside – 40 ft west of U2 Crib	0 – 49.4 (GPL)
2005	C4705	Outside - 225 ft east of U1 Crib	44 – 45.5 (1 soil sample)
2005	C4706	Outside - 125 ft east of U1 Crib	42 – 43.5 (1 soil sample)
2005	C4707	Outside - 220 ft southeast of U1 Crib	44 – 45.5 (1 soil sample)
2005	C4708	Outside - 180 ft south of U1 Crib	44 – 45.5 (1 soil sample)
2005	C4709	Outside - 190 ft southwest of U2 Crib	46.5 – 48 (1 soil sample)
2005	C4710	Outside - 45 ft west of U2 Crib	44.5 – 46 (1 soil sample)
2005	C4711	Outside - 250 ft west of U2 Crib	44 – 45.5 (1 soil sample)
2005	C4712	Outside - 90 ft northwest of U2 Crib	10 – 43.5 (4 soil samples)
2005	C4713	Outside - 80 ft northwest of U1 Crib	40 – 41.5 (1 soil sample)
2004	C4548	Outside – 75 ft south of U1 Crib	0 – 59.6 (GPL)
2004	C4549	Outside – 110 ft southwest of U2 Crib	0.5 – 49.6 (GPL)
2004	C4550	Outside – 80 ft north of U1 Crib	0 – 49.1 (GPL)

Site: 216-U-1&2	Area: U Plant	Category: Deep

Table 2. Borehole Summary for the 216-U-1&2 Waste Site

Year	Borehole/Well ID	Location With Respect to Site	Depth (ft)
2004	299-W19-15 / A4947	Outside – 80 ft southwest of U1 Crib	0 – 251 (GPL)

GPL = geophysical log

ID = identification

Table 3. 2004 Geophysical Logging Results

DPT Casing/ Well Number	Cesium-137	Uranium-238/Uranium-235	Other man-made contaminants detected
C4201	1.5 to 6.5 ft: 0.3 to 20.8 pCi/g (max at 2.5 ft) 30.5 to 40.5 ft: 0.4 to 60 pCi/g (max at 31.5 ft)	U-238: 35.5 to 44.5 ft, 22 to 155 pCi/g (max at 43.5 ft) No U-235 detected	None
C4203	0 ft: 0.556 pCi/g 30 to 39 ft: 0.3 to 160 pCi/g (max at 32 ft)	U-238: 31 to 46 ft (max of 389 pCi/g at 38 ft) No U-235 detected	Co-60: 37 and 39 ft (max of 8 pCi/g at 37 ft) Sr-90: 36 to 49 ft
C4204	2 to 7 ft: 0.3 to 21.9 pCi/g (max at 3 ft)	U-238: 26 and 44 to 46 ft (max of 34 pCi/g at 26 ft) No U-235 detected	None
C4205	1.5 to 9.5 ft: 0.3 to 42.9 pCi/g (max at 2.5 ft) 39.5 ft: near its minimum detection level (MDL) of 0.2 pCi/g	U-238: 41.5 to 42.5 ft, 19 to 32 pCi/g (max at 42.5 ft) No U-235 detected	None
C4207	0 to 3.5 ft: 0.773 pCi/g (max at 0.5 ft) 30.5 to 32.5 ft: 6 pCi/g (max at 31.5 ft)	U-238: 31.5 ft (24 pCi/g), 41.5 ft (32 pCi/g) and 42.5 ft (25 pCi/g)	None
C4208	2 to 7 ft: 0.2 to 45 pCi/g (max at 3 ft)	None detected	None

Site: 216-U-1&2	Area: U Plant	Category: Deep

Table 3. 2004 Geophysical Logging Results

DPT Casing/ Well Number	Cesium-137	Uranium-238/Uranium-235	Other man-made contaminants detected
C4548	0 to 3 ft: 0.3 to 1.1 pCi/g (max at 0 ft)	U-238: 52 ft (27 pCi/g) and 53 ft (42 pCi/g) No U-235 detected	None
C4549[a]	0.5 ft: 0.874 pCi/g	None detected	None
C4550	1 to 6 ft: 0.3 to 0.886 pCi/g (max at 2 ft)	None detected	None
A4947 (299-W19-15)[b]	Found sporadically near its maximum contaminant MDL of 0.315 pCi/g No detection 15-60 ft	U-238 found sporadically near the MDL of 15 pCi/g. Maximum concentration of 30 pCi/g at 244 ft U-235 at 244 ft, 4 pCi/g	None
A7772 (299-W19-72)	0 to 74 ft: Up to 4 million pCi/g (max at 26 ft), 1230 pCi/g at 11 ft.	Processed uranium: 9 ft, 13 ft, and from 37 to 74 ft. Probable processed uranium between 13 and 37 ft. U-238: maximum of 27,000 pCi/g, and U-235: maximum of 750 pCi/g, at 40 ft.	Co-60: 41 to 47 ft, (max of 0.9 pCi/g at 41 ft. Co-60 probable between 15 and 41 ft at higher concentrations.) Eu-154: 37 to 44 ft, (max of 16 pCi/g at 38 ft. Probable between 15 and 41 ft at higher concentrations.)
A7773 (299-W19-73)	0 to 62 ft: 0.16 to 4 million pCi/g (max at 27 ft), 310 pCi/g at 6 ft. 65 to 67 ft: Sporadically near 0.13 pCi/g.	U-238 present from 42 to 72 ft. Due to high levels of Cs-137 U-238 was not determined in the high activity zone. U-238: max of 87.8 pCi/g, and U-235: max of 17.5 pCi/g, at 43 ft.	Co-60: 43 to 53 ft, (max of 0.2 pCi/g at 50 ft probable between 18 to 42 ft at higher concentrations.) Ag-108m: 48 to 51 ft at about 1.5 pCi/g.

Source: DD-27783, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*, Table 3-2.

Note: Produced from the best available copy.

Site: 216-U-1&2	Area: U Plant	Category: Deep

Table 4. 2005 Geophysical Log Summary for the 216-U-1&2 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A7772	0 to 5	31,755.8	pCi/g	4.0	715,578	cpm	2
	5 to 10	449.9	pCi/g	6.0	141,614	cpm	7
	10 to 15	940.8	pCi/g	11	601,572	cpm	14
	>15	4,260,128.9	pCi/g	25	4,709,490	cpm	25
A7773	0 to 5	197.4	pCi/g	5	467,156	cpm	5
	5 to 10	310	pCi/g	6	606,264	cpm	6
	10 to 15	17.95	pCi/g	12	212,618	cpm	15
	>15	4,325,663.4	pCi/g	27	3,276,100	cpm	24

ID = identification

Table 5. Soil Maximum Detection Summary (Soil Borehole A9797)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
2-Hexanone	–	–	–	3	µg/kg	122
Acetone	6	µg/kg	6	–	–	–
Aluminum	6,940,000	µg/kg	6	9,860,000	µg/kg	24
Americium-241	–	–	–	33	pCi/g	24
Arsenic	4,500	µg/kg	6	5,500	µg/kg	122
Barium	80,100	µg/kg	6	121,000	µg/kg	142
Bis(2-ethylhexyl)	39	µg/kg	6	750	µg/kg	27
Cadmium	–	–	–	1,590	µg/kg	24
Calcium	–	–	–	74,000,000	µg/kg	170
Cesium-134	–	–	–	4.93	pCi/g	168
Cesium-137	320	pCi/g	6	1,758,000	pCi/g	27
Chloride	9,500	µg/kg	6	21,000	µg/kg	24
Chromium	7,500	µg/kg	6	48,100	µg/kg	24

Site: 216-U-1&2	Area: U Plant	Category: Deep

Table 5. Soil Maximum Detection Summary (Soil Borehole A9797)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Cobalt-60	–	–	–	10.6	pCi/g	24
Copper	13,300	µg/kg	6	58,500	µg/kg	27
Curium-244	–	–	–	0.067	pCi/g	24
Europium-154	–	–	–	2	pCi/g	42.5
Fluoride	1,900	µg/kg	6	12,500	µg/kg	24
Gross alpha	9.2	pCi/g	6	20,600	pCi/g	29.5
Gross beta	360	pCi/g	6	4,800,000	pCi/g	32
Iodine-129	–	–	–	1.6	pCi/g	122
Iron	18,600,000	µg/kg	6	36,200,000	µg/kg	32
Lead	4,300	µg/kg	6	215,320	µg/kg	27
Magnesium	4,530,000	µg/kg	6	6,760,000	µg/kg	161
Manganese	316,000	µg/kg	6	1,390,000	µg/kg	24
Mercury	–	–	–	120	µg/kg	42.5
Neptunium-237	–	–	–	2.41	pCi/g	24
Nickel	7,800	µg/kg	6	34,000	µg/kg	24
Nitrate	–	–	–	64,000	µg/kg	32
Nitrite	–	–	–	5,000	µg/kg	27
Nitrogen in nitrite and nitrate	11,400	µg/kg	6	14,300	µg/kg	82
Phenol	–	–	–	88	µg/kg	122
Phosphate	–	–	–	262,000	µg/kg	17
Plutonium-238	–	–	–	4.79	pCi/g	27
Plutonium-239/240	–	–	–	436	pCi/g	27
Potassium	127,000	µg/kg	6	2,130,000	µg/kg	24
Potassium-40	12	pCi/g	6	19	pCi/g	177
Radium-226	0.69	pCi/g	6	4.99	pCi/g	168
Radium-228	0.75	pCi/g	6	1.3	pCi/g	177
Selenium-79	–	–	–	3.9	pCi/g	170

Site: 216-U-1&2	Area: U Plant	Category: Deep

Table 5. Soil Maximum Detection Summary (Soil Borehole A9797)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Silver	–	–	–	21,820	µg/kg	29.5
Sodium	–	–	–	2,100,000	µg/kg	24
Sodium-22	–	–	–	2	pCi/g	32
Strontium	–	–	–	134,000	µg/kg	32
Strontium-90	42	pCi/g	6	2,380,000	pCi/g	32
Sulfate	14,000	µg/kg	6	54,400	µg/kg	168
Technetium-99	–	–	–	350	pCi/g	42.5
Tetrachloroethene	–	–	–	7	µg/kg	27
Thallium	–	–	–	3,460	µg/kg	27
Thorium-228	1	pCi/g	6	7.88	pCi/g	168
Thorium-232	0.75	pCi/g	6	1.3	pCi/g	177
Thorium-234	6.04	pCi/g	168	–	–	–
Titanium	1,430,000	µg/kg	6	3,260,000	µg/kg	32
Toluene	–	–	–	2	µg/kg	24
Total petroleum	–	–	–	11,000,000	µg/kg	42.5
Uranium	2,000	µg/kg	6	32,700,000	µg/kg	29.5
Uranium-233/234	0.69	pCi/g	6	1,400	pCi/g	42.5
Uranium-234	–	–	–	8.8	pCi/g	168
Uranium-235	–	–	–	148	pCi/g	29.5
Uranium-238	0.64	pCi/g	6	10,080	pCi/g	29.5
Vanadium	46300	µg/kg	6	103,000	µg/kg	32
Yttrium	–	–	–	13,300	µg/kg	32
Zinc	40,700	µg/kg	6	104,000	µg/kg	32
Zirconium	–	–	–	41,500	µg/kg	24

Site: 216-U-1&2	Area: U Plant	Category: Deep

Table 6. 2004 Soil Sample Results Summary

Well Identification Number	Waste Site Area	Sample Interval (ft bgs)	Uranium (mg/kg)	Uranium MDL	Nitrogen as Nitrate/ Nitrite (mg/kg)	N (mg/kg) MDL	Tc-99 (pCi/g)	Tc-99 (pCi/g) MDC/MDA
C4705	216-U-1/ 216-U-2	44 to 45.5	U[a]	0.94	6.1	0.5	U	0.642
C4706	216-U-1/ 216-U-2	42 to 43.5	2.86	0.15	3.7	0.5	U	0.612
C4707	216-U-1/ 216-U-2	44 to 45.5	U	0.97	2	0.5	U	0.648
C4708	216-U-1/ 216-U-2	44 to 45.5	U	0.93	1.1	0.5	U	0.612
C4709	216-U-1/ 216-U-2	46.5 to 48	U	0.99	1.1	0.5	U	0.642
C4710	216-U-1/ 216-U-2	44.5 to 46	3.9	0.16	0.8	0.5	U	0.642
C4711	216-U-1/ 216-U-2	44 to 45.5	U	0.92	0.86	0.5	U	0.585
C4712	216-U-1/ 216-U-2	10 to 11.5	1.61	1	1.3	0.5	U	0.642
C4712	216-U-1/ 216-U-2	30 to 31.5	U	0.99	2.2	0.5	U	0.642
C4712	216-U-1/ 216-U-2	35 to 36.5	U	1	3.4	0.5	U	0.612
C4712	216-U-1/ 216-U-2	42 to 43.5	U	0.81	2.7	0.5	U	0.587
C4713	216-U-1/ 216-U-2	40 to 41.5	2.56	0.15	2.6	0.5	U	0.584

Source: D&D-27783, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*, Table 3-5.

Note: Produced from the best available copy.

Nature and Extent of Contamination:

Shallow (<4.6 m [<15 ft] bgs): 2004/2005 GPL results for soil from 0 to 4.6 m (0 to 15 ft) bgs indicate cesium-137 concentrations are highest within the cribs (1239 pCi/g at A7772 and 259 pCi/g at A9797 in the U-1 crib; 310 pCi/g in the U-2 crib); are <1 to 45 pCi/g within 13.7 m (45 ft) of the cribs; and are <1 pCi/g from 13.7 to 24.4 m (45 to 80 ft) of the cribs. The maximum cesium-137 detections within and outside the crib were generally between 0.8 and 1.5 m (2.5 and 5 ft) bgs. Significant cesium-137 contamination (31,755 pCi/g) was detected near the surface (10 m [3 ft] bgs) within the U-1 crib. The contamination may be the result of an unplanned release (UPR-200-W-19) of effluent intended for crib discharge. Cesium-137 and strontium-90 were detected above background in the soil sample collected from 1.2 to 1.8 m (4 to 6 ft) bgs at A9797.

Site: 216-U-1&2	Area: U Plant	Category: Deep

Deep (>4.6 m [>15 ft] bgs): In the soil samples collected at A9797, several radionuclides were identified in and immediately below the crib discharge depth (cesium-137, cobalt-60, europium-152/154, and uranium-235/238) to 14.9 m (49 ft). Additionally, uranium-235/238 contamination was identified on top of the low permeable caliche zone (51.2 m [168 ft]). U-238 concentrations reached a maximum concentration of 10,800 pCi/g at 8.2 to 9 m (27 to 29.5 ft) bgs (below the base of crib), decreased to <10 pCi/g at the top of the Cold Creek Unit (CCU), increased to 32 pCi/g at 51.2 m (168 ft) bgs (within the CCU), and were nondetect to <4 pCi/g at the bottom of the borehole (53.9 m [177 ft] bgs).

The site is adequately characterized by existing data. However, if significant contamination is found between the bottom of the CCU and the water table at the deep boreholes (to groundwater) planned for 216-U-8 and 216-U-12, then an additional deep borehole (to groundwater) near the 216-U-2 crib footprint may be warranted.

References:

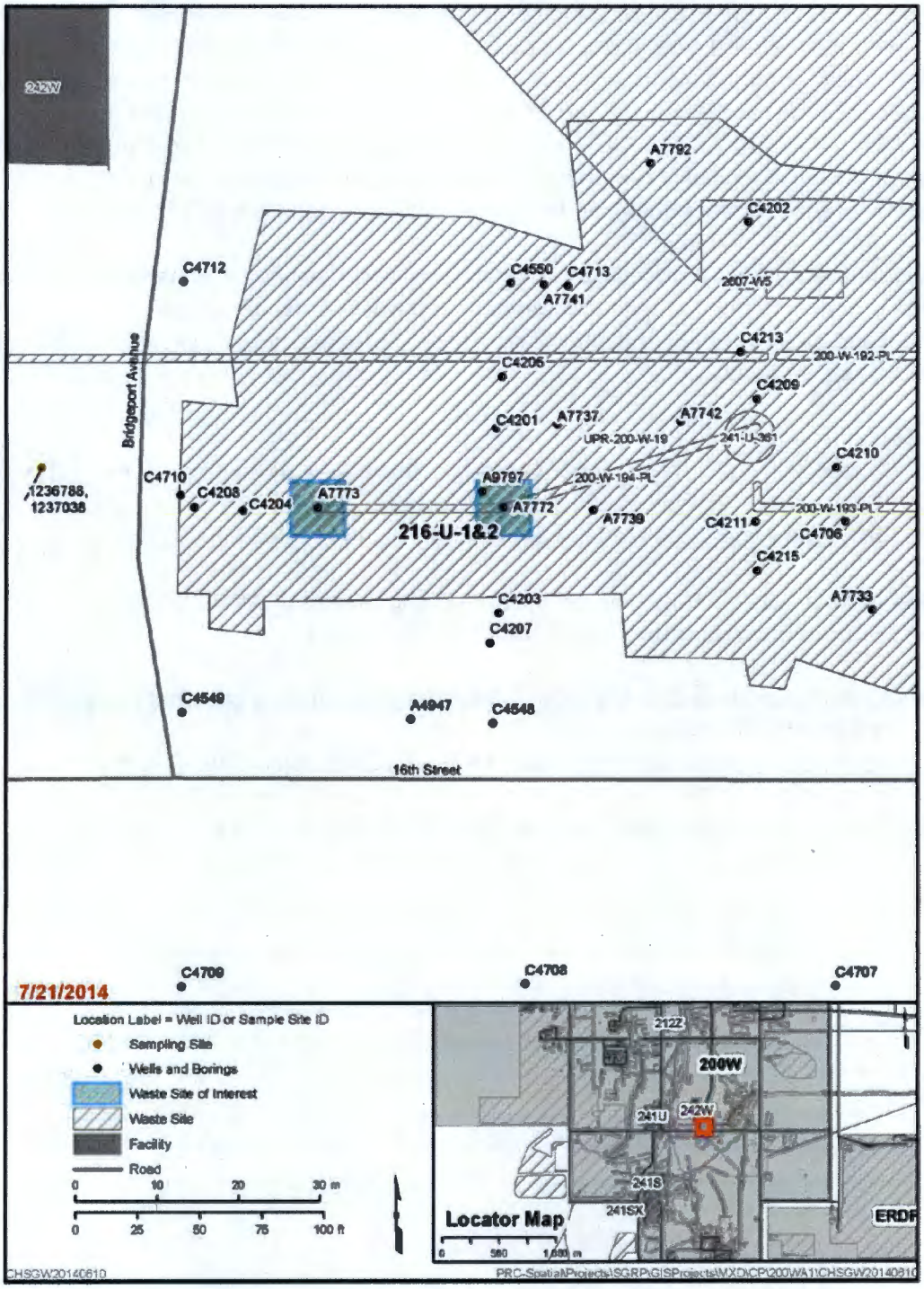
D&D-27783, 2006, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*, Rev. 0, Fluor Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA01917974.

H-2-50061 (drawing), 1974, *216-U-1 & 216-U-2 Cribs Piping, Structural Details & Temporary UNH Line*, Rev. 7, General Electric Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

Waste Information Data System Summary Report the 216-U-1&2 Waste Site.

Site: 216-U-1&2	Area: U Plant	Category: Deep

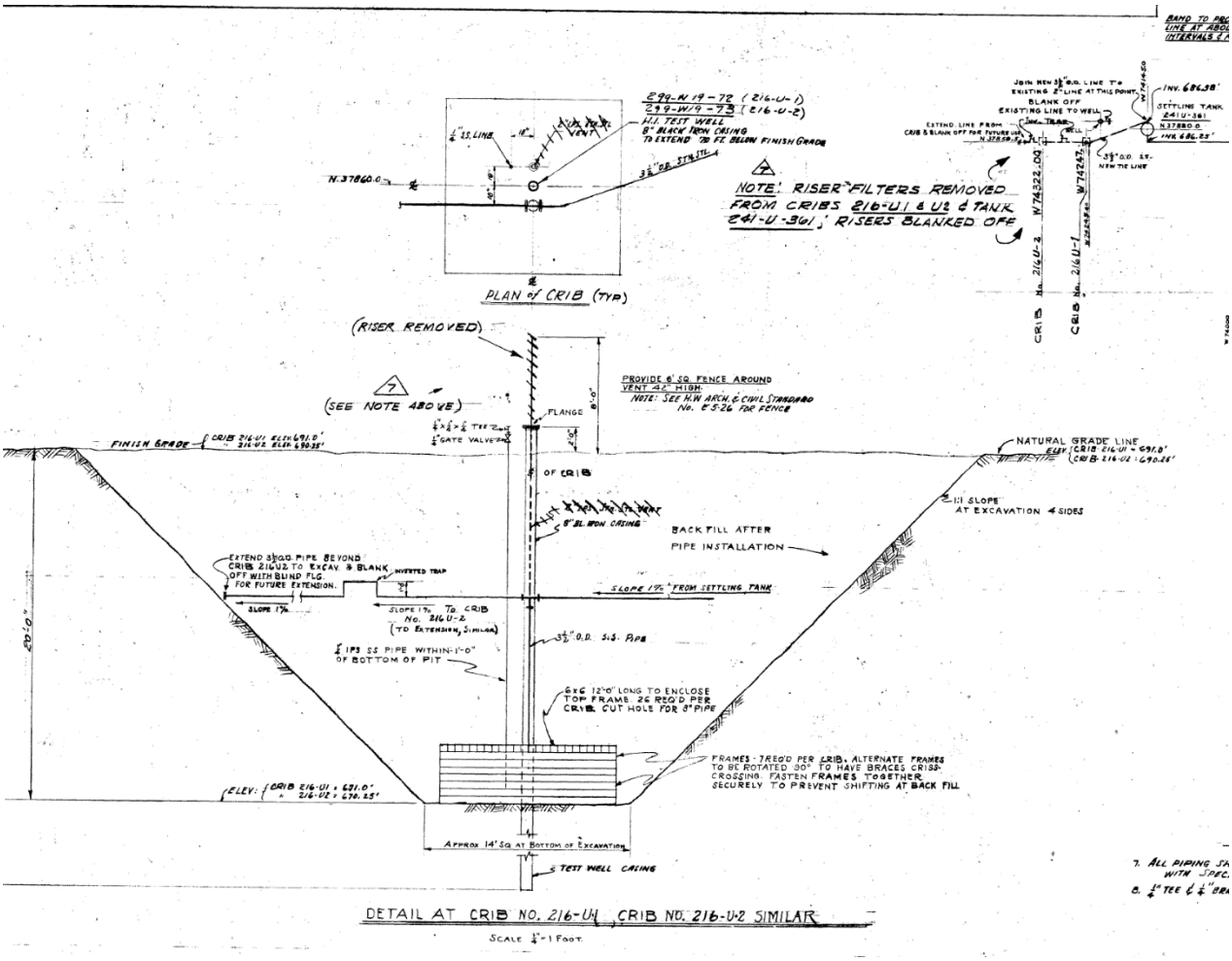


ERDF = Environmental Restoration Disposal Facility

ID = identification

Figure 1. 216-U1&2 Crib Waste Site Map and Borehole Locations

Site: 216-U-1&2	Area: U Plant	Category: Deep



Source: H-2-50061, *216-U-1 & 216-U-2 Cribs Piping, Structural Details & Temporary UNH Line*.

Note: Produced from the best available copy.

Figure 2. 216-U-1&2 Crib Construction

Site: 216-U-1&2	Area: U Plant	Category: Deep

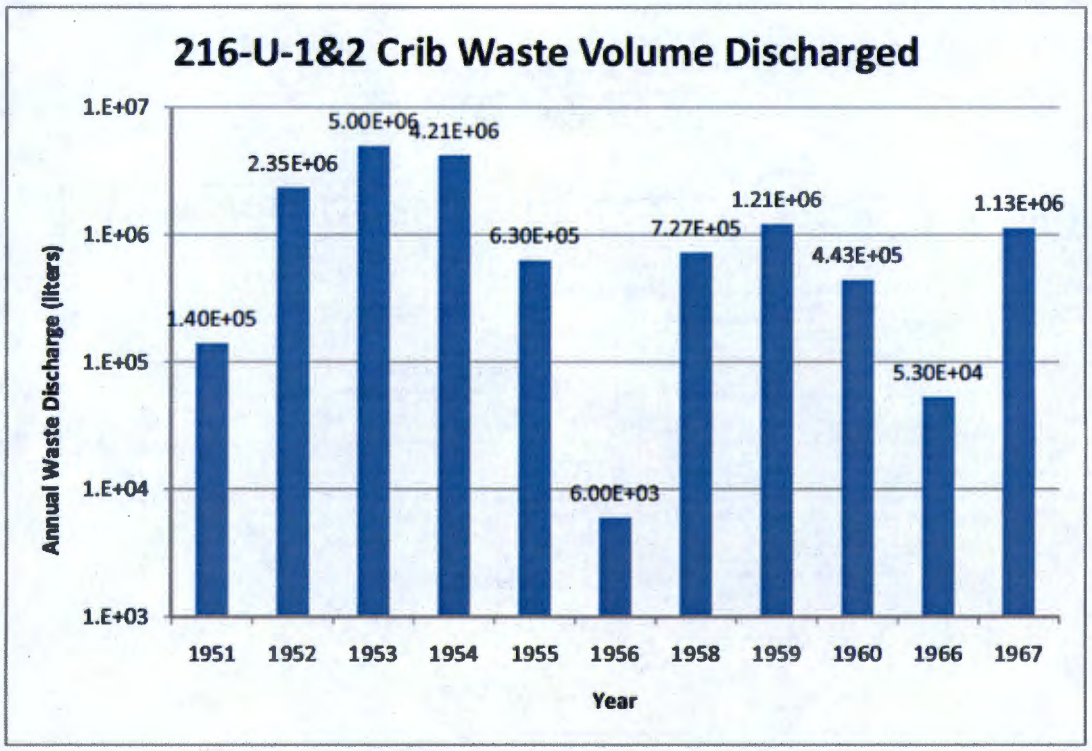


Figure 3. 216-U-1&2 Crib Waste Volume Discharged Summary

Site: 216-U-3	Area: U Plant	Category: Deep – Adequately Characterized

Site Description

Site Type: French Drain
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: May 1954 to August 1955

Waste Site Location and Physical Description: The round French drain is located south of the 241-U Tank Farm on the south side of 16th Street (see Figure 1). The drain is a rock-filled excavation with a 1:1 sloping sides and a 10 cm (4 in.) diameter vent riser. The site had a 1.8 m (6 ft) bottom diameter and the surface diameter of the excavation was 5.5 m (18 ft) (see Figure 2). The site was deactivated in 1955 by valving out the condenser piping. A large depression was noticed in 1985 and the cave-in was backfilled. It is assumed that a subsurface wash out had occurred.

Waste Site Coordinates:
E-566844.73101 N-134927.88972

Site Dimensions:
Site Diameter: 1.83 m (6 ft) Site Depth: 3.66 m (12 ft) to bottom of structure
Site Area: 7.3 m^2 (79 ft^2) Cover Thickness: Not applicable

Related Site Structure(s): The French drain is associated with the 241-U-104, 241-U-110 Tanks, and the 200-W-169-PL pipeline.

Site Posting: The site is marked with light steel posts and chain with Underground Radioactive Material Area signs.

Site Characterization Summary: Visual and radiological surveys are performed at this site. In December 2004, a characterization borehole (C4559) was drilled through the French drain to a depth of approximately 39.5 m (129.5 ft). Hanford Environmental Information System samples B19938 through B19972 were analyzed for radionuclides, metals, inorganic chemicals, and organic chemicals.

Site History

Release Summary: This site received condensate from the steam condensers on the 241-U-104 and 241-U-110 Tanks. The 241-U-104 and 241-U-110 tanks held REDOX boiling waste. The site waste contains nitrate.

The site received 6.48E+05 L and 1.43E+05 L of liquid waste in 1954 and 1955, respectively[1].
The estimated total volume of process effluent discharged to the site is approximately 7.91E+05 L

Site: 216-U-3	Area: U Plant	Category: Deep – Adequately Characterized

(2.09E+05 gal) and the calculated potential lifetime discharge could exceed one vadose zone pore volume.

Volume/Mass Discharged: 7.91E+05 L (2.09E+05 gal)

Pore Volume Discharged: 7.91E+05 L/ (219 ft x 79 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 5.4

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-U-3 Waste Site

Contaminant	Mass Discharged
Pu	<0.1 g
Beta	5 Ci
Sr-90	<0.1 Ci
Ru-160	1 Ci
Cs-137	1 Ci
Co-60	<0.1 Ci
U	1.8 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Borehole C4559 was installed in 2004 next to the French drain. Geophysical logging was performed using a Spectral Gamma Logging System and soil samples were collected at seven depth intervals between 3.8 and 39.5 m (12.5 and 129.5 ft) bgs. The samples were analyzed for radionuclides, organics, and inorganics. The borehole location is shown on Figure 1. Data summaries are provided in Tables 2, 3, and 4.

Table 2. Borehole Summary for the 216-U-3 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2004	C4559	Edge of French Drain	0 – 120 (GPL) 12.5 – 129.5 (7 soil samples)

GPL = geophysical log
ID = identification

Site: 216-U-3	Area: U Plant	Category: Deep – Adequately Characterized

Table 3. Geophysical Log Summary for the 216-U-3 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
C4559	0 to 5	1.35	pCi/g	2.0	17,821.3	cpm	5
	5 to 10	0.46	pCi/g	10.0	16,243	cpm	6
	10 to 15	0.55	pCi/g	11	16,342.6	cpm	14
	>15	0.35	pCi/g	192	23,988.5	cpm	93

bgs = below ground surface
ID = identification

Table 4. Soil Maximum Detection Summary (Soil Borehole C4559)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Americium-241	–	–	–	0.048	pCi/g	25
Barium	20,400	µg/kg	15	–	–	–
Beryllium	289	µg/kg	15	–	–	–
Boron	28,100	µg/kg	15	–	–	–
Chromium	–	–	–	52,100	µg/kg	37.5
Cobalt-60	–	–	–	0.011	pCi/g	37.5
Copper	2,540	µg/kg	15	21,900	µg/kg	129.5
Diethylphthalate	530	µg/kg	15	540	µg/kg	25
Di-n-butylphthalate	200	µg/kg	15	1,100	µg/kg	100
Europium-155	–	–	–	0.052	pCi/g	129.5
Hexavalent Chromium	–	–	–	240	µg/kg	129.5
Lead	–	–	–	3,600	µg/kg	25
Mercury	622	µg/kg	15	713	µg/kg	20
Nickel	2,930	µg/kg	15	–	–	–
Nitrate	–	–	–	2,550	µg/kg	25

Site: 216-U-3	Area: U Plant	Category: Deep – Adequately Characterized

Table 4. Soil Maximum Detection Summary (Soil Borehole C4559)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Nitrogen in nitrite and Nitrate	330	µg/kg	15	940	µg/kg	129.5
Potassium-40	–	–	–	10.4	pCi/g	25
Radium-226	0.345	pCi/g	15	0.43	pCi/g	25
Radium-228	0.42	pCi/g	15	0.634	pCi/g	25
Selenium	1,290	µg/kg	15	–	–	–
Silver	170	µg/kg	15	2,640	µg/kg	129.5
Sulfate	–	–	–	11,500	µg/kg	25
Thorium-228	0.488	pCi/g	15	0.553	pCi/g	25
Thorium-230	0.433	pCi/g	15	–	–	–
Thorium-232	0.486	pCi/g	15	0.634	pCi/g	25
Total beta radiostrontium	–	–	–	0.26	pCi/g	25
Total petroleum hydrocarbons motor oil				15,000	µg/kg	25
Tritium	–	–	–	1.78	pCi/g	100
Uranium	–	–	–	1,470	µg/kg	25
Uranium-233/234	0.16	pCi/g	15	0.592	pCi/g	25
Uranium-235	–	–	–	0.02	pCi/g	129.5
Uranium-238	0.13	pCi/g	15	0.551	pCi/g	25

Nature and Extent of Contamination: At C4559 located at the edge of the French drain structure, geophysical logging results indicate that cesium-137 was detected at 0.3 m (1 ft) bgs at 1 pCi/g. No other man-made radionuclides were detected in this borehole. Soil sample results for this borehole indicate low levels of radiological and chemical contaminants were found in soil samples collected between 3.8 and 39.5 m (12.5 and 129.5 ft) bgs. Only one shallow soil sample was collected from 0 to 4.6 m (0 to 15 ft) bgs; however, the release depth of French drain is at 3.7 m (12 ft) bgs with very low concentrations of contaminants at that depth.

One deep (39.5 m [129.5 ft] bgs) borehole was installed adjacent to the drain and sampled. Shallow and deep data are available. Existing data are sufficient for characterizing the site.

Site: 216-U-3	Area: U Plant	Category: Deep – Adequately Characterized

References:

BHI-00608, 1996, *Hanford Sitewide Groundwater Flow and Transport Model Calibration Report*, Rev. 1, Bechtel Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D197301520.

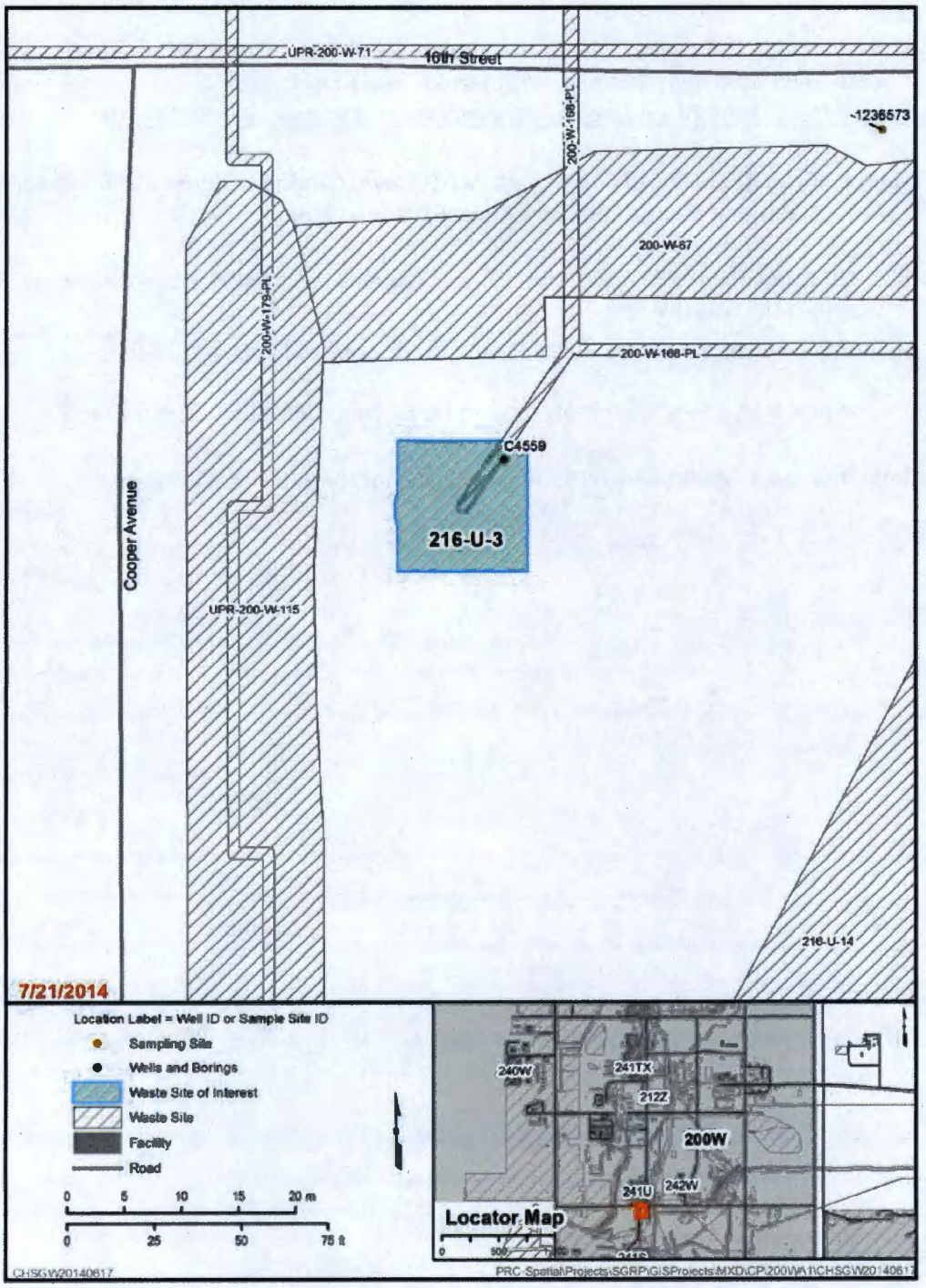
H-2-44004 (drawing), 1973, *216-U-3 Crib Details, 241-U Steam Condenser Water and Drain Piping*, Sh. 1, Rev. 11, General Electric Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

Waste Information Data System "Chemicals Disposed & Radionuclide Inventories.pdf" p. 5.

Waste Information Data System General Summary Report for the 216-U-3 Waste Site.

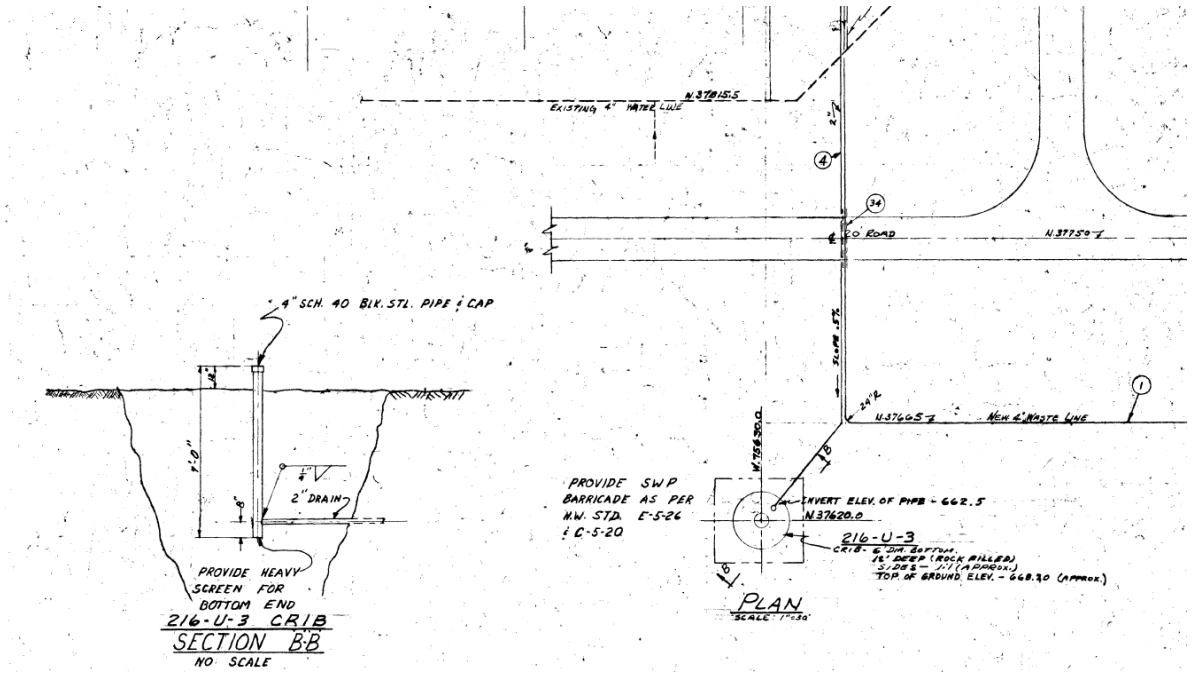
Site: 216-U-3	Area: U Plant	Category: Deep – Adequately Characterized



ID = identification

Figure 1. 216-U-3 Waste Site Map

Site: 216-U-3	Area: U Plant	Category: Deep – Adequately Characterized



Source: H-2-44004, *216-U-3 Crib Details, 241-U Steam Condenser Water and Drain Piping*, Sheet 1.

Note: Produced from the best available copy.

Figure 2. 216-U-3 French Drain Construction

Site: 216-U-3	Area: U Plant	Category: Deep – Adequately Characterized

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Site: 216-U-4	Area: U Plant	Category: Deep – Adequately Characterized

Site Description

Site Type: Injection/Reverse Well
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1
Service Dates: 1947 to 1955

Waste Site Location and Physical Description: The 216-U-4 Injection/Reverse Well is located at the southwest corner of the 222-U Building (see Figures 1 and 2). The well is marked with a small cement cover and a bronze medallion. The well consists of pipe sunk into the ground with the bottom 8 m (25 ft) of pipe perforated. The end of the pipe is nearly closed by flattening. The site was sealed off during deactivation by installing an overflow line to the new 216-U-4A French Drain.

Waste Site Coordinates:
E-567579.10700 N-135108.92299

Site Dimensions:
Site Diameter: 0.08 meters (0.25 ft) Site Depth: 22.86 m (75 ft)
Site Area: 0.005 m^2 (0.049 ft^2) Cover Thickness: Not applicable

Related Site Structure(s): The site is associated with the 222-U Building.

Site Posting: The site is posted as an Underground Radioactive Material Area.

Site History

Release Summary: The site received acidic decontamination waste containing fission products from the 222-U Laboratory hood sinks. Both plutonium and fission products were discharged to the site from laboratory hoods and sinks. The site waste discharge contained an estimated 400 kg (881 lb) of nitrate. The estimated total volume of process effluent discharged to the site is approximately 3.0E+05 L (7.9E+04 gal) and the calculated potential lifetime discharge could exceed one vadose zone pore volume.

Volume Discharged: 3.0E+05 L (7.9E+04 gal)

Pore Volume Discharged: 3.0E+05 L/ (183 ft x 20 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 9.8

Site: 216-U-4	Area: U Plant	Category: Deep – Adequately Characterized

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-U-4 Waste Site

Contaminant	Mass Discharged
Beta	<0.1 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: Visual and radiological surveys are performed at this site.

In 1993, characterization borehole 299-W19-98 / A9798 was drilled between 216-U-4 and 216-U-4A to characterize these two waste sites. Gamma logging and soil sampling were completed. DOE/RL-95-13, *Limited Field Investigation for the 200-UP-2 Operable Unit*, includes information related to characterization borehole 299-W19-98 / A9798. Results showed constituents in mainly in two zones. The first was interpreted to be associated with the 216-U-4A French Drain and extended to a depth of 5 m (16 ft). In this zone, americium-241 (200 pCi/g) and cesium-137 (420 pCi/g) were detected in the soil samples. At 11 m (37 ft) depth, activity levels were near or below background. Activity levels increased at a depth of 11 m (37 ft), with elevated activity levels extending to a depth of 30 m (100 ft). Based on the discharge depth, this contamination zone was interpreted as associated with the 216-U-4 Reverse Well. Radionuclide Logging System characterization of well 299-W19-98 / A9798 found maximum Cesium-137 readings of 1,460 pCi/g at a depth of 18.7 m (61.5 ft), maximum cobalt-60 readings of 2.5 pCi/g at a depth of 16.4 m (54 ft), and maximum europium readings of 5 pCi/g at a depth of 15.7 m (51.5 ft). Soil sampling within this zone found similar results. Constituents were detected below 30.5 m (100 ft) but at greatly reduced levels, generally at or below background until the caliche layer was reached at 53 m (175 ft) of depth, where a few constituents were seen to increase activity above background levels.

A site walk was conducted on October 27, 2005, where a hole was hand dug around the 7.6 cm (3-in.) well extension. A 20.3 cm (8-in.) casing and a steel plate were found belowgrade, attached to the extension pipe. The 7.6 cm (3-in.) annulus was accessed with a camera and a plumb bob. The camera got stuck at the point where the 7.6 m (3-in.) and 20.3 cm (8-in.) casings were welded together. The well was found to be clear to approximately 12.2 m (40 ft), which is the shoe of the 20.3 cm (8-in.) casing.

Borehole and analytical data summaries are presented in Tables 2 and 3. Borehole locations are shown on Figure 1.

Site: 216-U-4	Area: U Plant	Category: Deep – Adequately Characterized

Table 2. Borehole Summary for the 216-U-4 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
1993	299-W19-98 / A9798	2 ft from well	4.4 – 193 (12 soil samples) 0 – 193 (RLS)

ID = identification

RLS = Radionuclide Logging System

Table 3. Soil Maximum Detection Summary (Soil Borehole A9798)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
2-Butanone	–	–	–	3	µg/kg	49
Aluminum	6,270,000	µg/kg	5.4	11,400,000	µg/kg	175.3
Americium-241	200	pCi/g	13.5	194	pCi/g	49
Arsenic	3,800	µg/kg	5.4	7,100	µg/kg	175.3
Barium	74,100	µg/kg	5.4	148,000	µg/kg	26.5
Bis(2-ethyhexyl) phthalate	–	–	–	110	µg/kg	62.2
Calcium	7,370,000	µg/kg	5.4	116,000,000	µg/kg	185.5
Carbon disulfide	–	–	–	4	µg/kg	62.2
Cesium-137	420	pCi/g	5.4	1,980	pCi/g	62.2
Chloride	6,900	µg/kg	5.4	19,100	µg/kg	185.5
Chromium	15,000	µg/kg	5.4	15,200	µg/kg	132
Cobalt	11,100	µg/kg	5.4	16,800	µg/kg	26.5
Cobalt-60	0.96	pCi/g	5.4	2.08	pCi/g	49
Copper	15,000	µg/kg	13.5	21,100	µg/kg	49
Curium-244	0.064	pCi/g	5.4	0.00813	pCi/g	132
Diacetone alcohol	–	–	–	5.15	µg/kg	82.1

Site: 216-U-4	Area: U Plant	Category: Deep – Adequately Characterized

Table 3. Soil Maximum Detection Summary (Soil Borehole A9798)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Di-n-butylphthalate	–	–	–	74	µg/kg	193
Europium-152	1.1	pCi/g	5.4	0.587	pCi/g	49
Europium-154	0.64	pCi/g	5.4	0.211	pCi/g	49
Europium-155	–	–	–	0.0669	pCi/g	193
Fluoride	4,400	µg/kg	5.4	6,500	µg/kg	17.25
Gross alpha	130	pCi/g	5.4	196	pCi/g	49
Gross beta	110	pCi/g	13.5	2,410	pCi/g	62.2
Iron	19,500,000	µg/kg	13.5	28,700,000	µg/kg	26.5
Lead	7,900	µg/kg	5.4	156,000	µg/kg	49
Magnesium	4,520,000	µg/kg	5.4	8,250,000	µg/kg	185.5
Manganese	340,000	µg/kg	5.4	490,000	µg/kg	185.5
Mercury	720	µg/kg	5.4	4,700	µg/kg	62.2
Neptunium-237	0.21	pCi/g	5.4	0.853	pCi/g	62.2
Nickel	11,000	µg/kg	5.4	22,400	µg/kg	49
Nitrogen in nitrite and nitrate	3,980	µg/kg	5.4	8,840	µg/kg	185.5
Plutonium-238	0.55	pCi/g	5.4	0.351	pCi/g	49
Plutonium-239/240	0.61	pCi/g	5.4	6.81	pCi/g	49
Potassium	1,030,000	µg/kg	5.4	2,230,000	µg/kg	175.3
Potassium-40	12	pCi/g	5.4	19.6	pCi/g	193
Pyrene	–	–	–	72	µg/kg	62.2
Radium-226	0.91	pCi/g	5.4	0.7	pCi/g	185.5
Radium-228	1.6	pCi/g	5.4	0.66	pCi/g	185.5
Selenium-79	–	–	–	3.23	pCi/g	49
Silver	–	–	–	14,900	µg/kg	49

Site: 216-U-4	Area: U Plant	Category: Deep – Adequately Characterized

Table 3. Soil Maximum Detection Summary (Soil Borehole A9798)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Sodium-22	–	–	–	0.107	pCi/g	49
Strontium-90	93	pCi/g	5.4	72.4	pCi/g	49
Sulfate	10,000	µg/kg	5.4	107,000	µg/kg	185.5
Technetium-99	–	–	–	1.49	pCi/g	62.2
Tetrachloroethene	–	–	–	5	µg/kg	26.5
Thorium-228	1.3	pCi/g	5.4	0.85	pCi/g	185.5
Thorium-232	1.6	pCi/g	5.4	0.66	pCi/g	185.5
Titanium	1,550,000	µg/kg	5.4	970,000	µg/kg	185.5
Toluene	–	–	–	5	µg/kg	185.5
Uranium	4,400	µg/kg	5.4	12,500	µg/kg	62.2
Uranium-233/234	1.8	pCi/g	5.4	0.97	pCi/g	185.5
Uranium-234	–	–	–	5.75	pCi/g	62.2
Uranium-235	0.18	pCi/g	13.5	0.0827	pCi/g	175.3
Uranium-238	1.6	pCi/g	5.4	7.74	pCi/g	62.2
Vanadium	46,700	µg/kg	5.4	65,900	µg/kg	185.5
Zinc	431,00	µg/kg	5.4	43,300	µg/kg	26.5

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): Several radionuclides (cesium-137, americium-241, and others) were detected above background levels and inorganic constituents were detected in the shallow soil samples collected between 1.3 and 4.1 m (4.4 and 13.5 ft) bgs. Because the discharge depth for the 216-U-4 Reverse Well is over 15.2 m (50 ft) bgs, the shallow contamination is thought to be associated with the 216-U-4A French drain (DOE/RL-95-13). No organic compounds were detected.

No additional shallow characterization is warranted based on the release depth. The well was screened from 15.2 to 22.9 m (50 to 75 ft) bgs.

Site: 216-U-4	Area: U Plant	Category: Deep – Adequately Characterized

Deep (>4.6 [>15 ft] bgs): Several radionuclides were detected above background levels. Inorganic and organic compounds were also detected. In general, starting at 11.3 m (37 ft) bgs, concentrations of radionuclides and inorganics increase with depth, with the maximum detections occurring in the samples collected at 14.9 and 18.9 m (49 and 62 ft) bgs (within the well screen interval). Concentrations below 18.9 m (62 ft0 bgs decrease with depth to near background. At the caliche layer (located at approximately 53.3 m [175 ft] bgs), americium-241 (0.8 pCi/g), europium-152 (0.2 pCi/g), uranium-234 (1.8 pCi/g), uranium-235 (0.08 pCi/g), and uranium-238 (1.6 pCi/g) were detected above background levels (DOE/RL-95-13).

Deep vadose zone soil is adequately characterized to 59.1 m (194 ft) bgs. The estimated depth of the Cold Creek Unit at this location is 53.6 m (176 ft) bgs.

References:

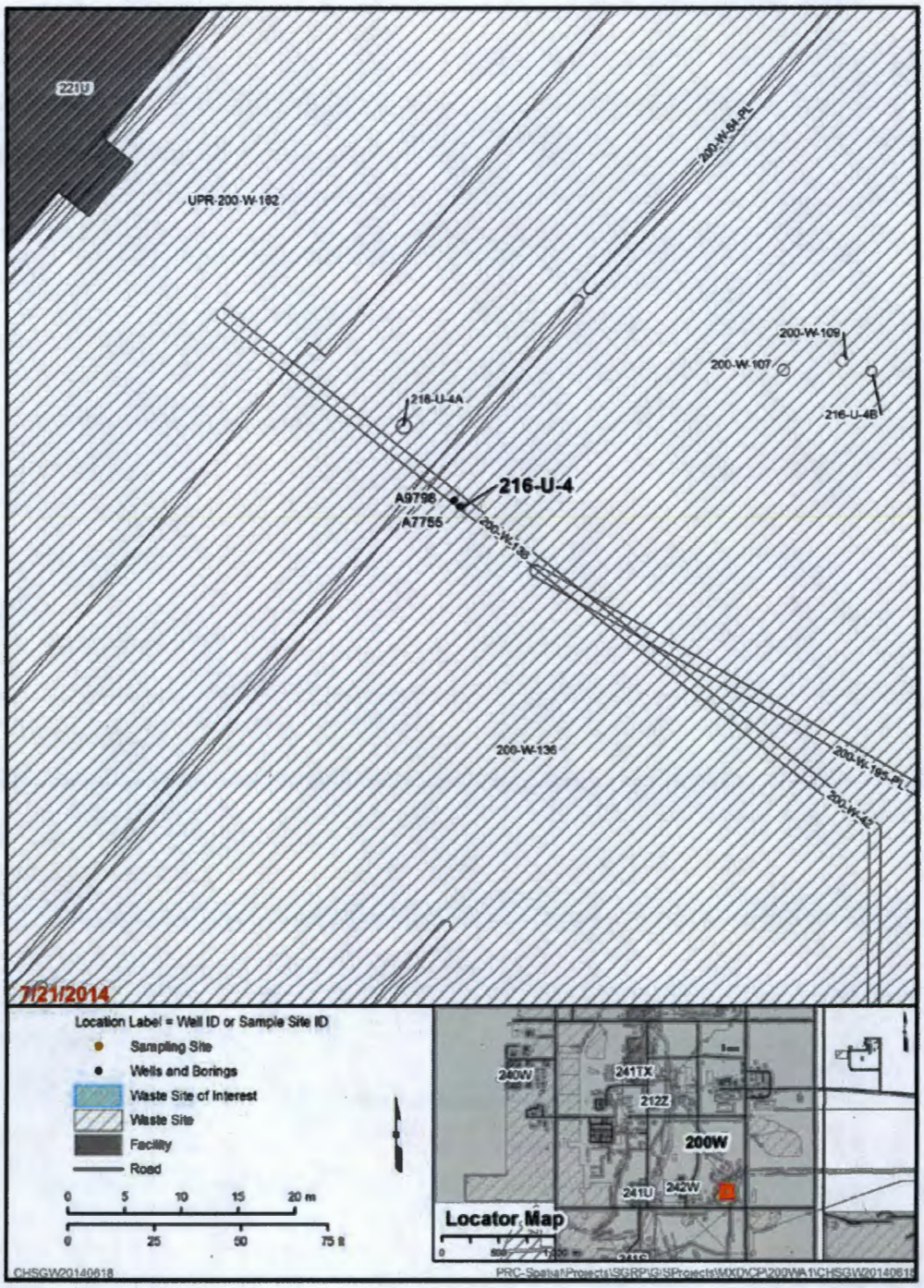
DOE/RL-95-13, 1995, *Limited Field Investigation for the 200-UP-2 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196003069.

H-2-44511 (drawing), 1973, *Area Map 200 West U Plant Facilities*, Sh. 68, Rev. 6, Atlantic Richfield Hanford Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

Waste Information Data System General Summary Report for the 216-U-4 Waste Site.

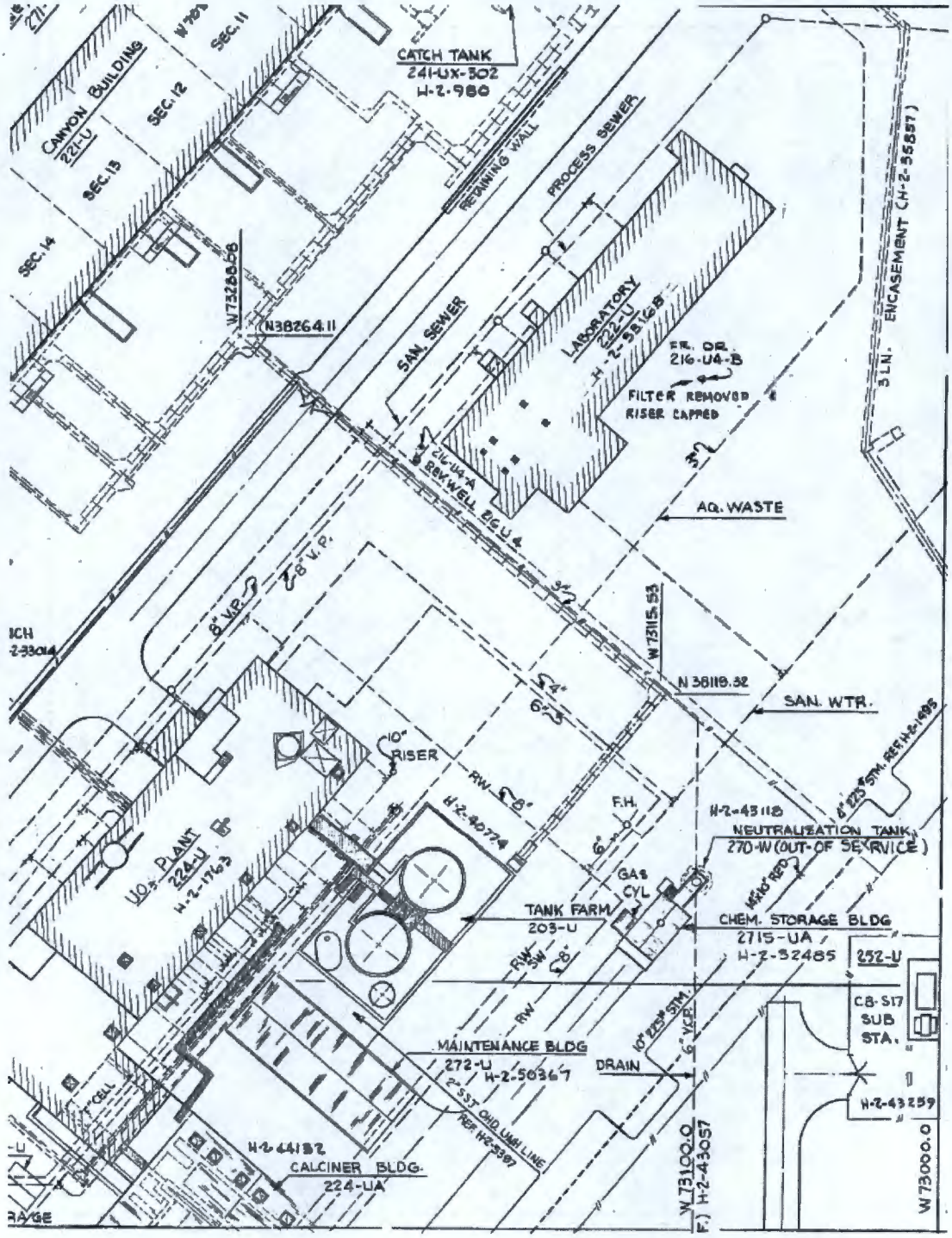
Site: 216-U-4	Area: U Plant	Category: Deep – Adequately Characterized



ID = identification

Figure 1. 216-U-4 Waste Site Map and Existing Borehole Locations

Site: 216-U-4	Area: U Plant	Category: Deep – Adequately Characterized



Source: H-2-44511, *Area Map 200 West U Plant Facilities*, Sheet 68.

Note: Produced from the best available copy.

Figure 2. 216-U-4 Location

Site: 216-U-4A	Area: U Plant	Category: Deep – Adequately Characterized

Site Description

Site Type: French Drain
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1
Service Dates: July 1955 to January 1970

Waste Site Location and Physical Description: The 216-U-4A French Drain is located at the southwest corner of the 222-U Building (see Figures 1 and 2). The drain consists of a vertically set concrete pipe. The drain rests on undisturbed soil and is not gravel filled. The top of the drain is painted yellow and has a removable lid (Figure 3).

Waste Site Coordinates:
E-567573.91899 N-135116.07404

Site Dimensions:
Site Diameter: 1.3 m (4.25 ft) Site Depth: 2.74 m (9 ft) to bottom of structure
Site Area: 1.33 m^2 (14.18 ft^2) Cover Thickness: Not applicable

Related Site Structure(s): The site is associated with the 222-U Building and the 216-U-4 Reverse Well.

Site Posting: This French drain is posted as an Underground Radioactive Material Area.

Site History

Release Summary: From July 1955 to January 1965, the site received acidic decontamination waste containing fission products from hood sinks in the 222-U. Waste flowed to the 216-U-4A French Drain via the overflow line from the 216-U-4 Reverse Well. From January 1965 to July 1970, the site received Pacific Northwest Laboratory operations decontamination waste from a hood sink in the 222-U Building. The waste discharged is estimated to have contained 900 kg (1,984 lb) of nitrate. A waste inventory radionuclide content summary is included in Table 1. The estimated total volume of process effluent discharged to the site is approximately 5.45E+05L (1.44E+05gal) and the calculated potential lifetime discharge could exceed one vadose zone pore volume.

Volume Discharged: 5.45E+05L (1.44E+05gal)

Pore Volume Discharged: 5.45E+05 L/ (259 ft x 14 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 17

Site: 216-U-4A	Area: U Plant	Category: Deep – Adequately Characterized

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-U-4A Waste Site

Contaminant	Mass Discharged
Pu	<0.009 g
Beta	5.3 Ci
Sr-90	<0.033 Ci
Ru-160	<1.1 Ci
Cs-137	0.37 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: Visual and radiological surveys are performed at this site. The site waste contains nitrate, phosphate, and sodium. RHO-CD-673 states that both plutonium and fission products were discharged to the site from laboratory hoods and sinks.

A limited field investigation of high-priority waste units was conducted from August 1993 through August 1994. DOE/RL-95-13, *Limited Field Investigation for the 200-UP-2 Operable Unit*, includes information related to characterization borehole 299-W19-98 (A9798) that was drilled between 216-U-4 and 216-U-4A. Gamma logging and soil sampling were completed. Results showed constituents in mainly in two zones. The first was interpreted to be associated with the 216-U-4A French Drain and extended to a depth of 5 m (16 ft). In this zone, americium-241 (200 pCi/g) and cesium-137 (420 pCi/g) were detected in the soil samples. At 11 m (37 ft) depth, activity levels were near or below background. Activity levels increased at a depth of 11 m (37 ft), with elevated activity levels extending to a depth of 30 m (100 ft). Based on the discharge depth, this contamination zone was interpreted as associated with the 216-U-4 Reverse Well.

Borehole and analytical data summaries are presented in Tables 2 and 3. Borehole locations are shown on Figure 1.

Site: 216-U-4A	Area: U Plant	Category: Deep – Adequately Characterized

Table 2. Borehole Summary for the 216-U-4A Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
1993	299-W19-98 / A9798	2 ft from drain	4.4 – 193 (12 soil samples) 0 – 193 (RLS)

ID = identification

RLS = Radionuclide Logging System

Table 3. Soil Maximum Detection Summary (Soil Borehole A9798)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
2-Butanone	–	–	–	3	µg/kg	49
Aluminum	6,270,000	µg/kg	5.4	11,400,000	µg/kg	175.3
Americium-241	200	pCi/g	13.5	194	pCi/g	49
Arsenic	3,800	µg/kg	5.4	7,100	µg/kg	175.3
Barium	74,100	µg/kg	5.4	148,000	µg/kg	26.5
Bis(2-ethyhexyl) phthalate	–	–	–	110	µg/kg	62.2
Calcium	7,370,000	µg/kg	5.4	116,000,000	µg/kg	185.5
Carbon disulfide	–	–	–	4	µg/kg	62.2
Cesium-137	420	pCi/g	5.4	1,980	pCi/g	62.2
Chloride	6,900	µg/kg	5.4	19,100	µg/kg	185.5
Chromium	15,000	µg/kg	5.4	15,200	µg/kg	132
Cobalt	11,100	µg/kg	5.4	16,800	µg/kg	26.5
Cobalt-60	0.96	pCi/g	5.4	2.08	pCi/g	49
Copper	15,000	µg/kg	13.5	21,100	µg/kg	49
Curium-244	0.064	pCi/g	5.4	0.00813	pCi/g	132
Diacetone alcohol	–	–	–	5.15	µg/kg	82.1
Di-n-butylphthalate	–	–	–	74	µg/kg	193

Site: 216-U-4A	Area: U Plant	Category: Deep – Adequately Characterized

Table 3. Soil Maximum Detection Summary (Soil Borehole A9798)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Europium-152	1.1	pCi/g	5.4	0.587	pCi/g	49
Europium-154	0.64	pCi/g	5.4	0.211	pCi/g	49
Europium-155	–	–	–	0.0669	pCi/g	193
Fluoride	4,400	µg/kg	5.4	6,500	µg/kg	17.25
Gross alpha	130	pCi/g	5.4	196	pCi/g	49
Gross beta	110	pCi/g	13.5	2,410	pCi/g	62.2
Iron	19,500,000	µg/kg	13.5	28,700,000	µg/kg	26.5
Lead	7,900	µg/kg	5.4	156,000	µg/kg	49
Magnesium	4,520,000	µg/kg	5.4	8,250,000	µg/kg	185.5
Manganese	340,000	µg/kg	5.4	490,000	µg/kg	185.5
Mercury	720	µg/kg	5.4	4,700	µg/kg	62.2
Neptunium-237	0.21	pCi/g	5.4	0.853	pCi/g	62.2
Nickel	11,000	µg/kg	5.4	22,400	µg/kg	49
Nitrogen in nitrite and nitrate	3,980	µg/kg	5.4	8,840	µg/kg	185.5
Plutonium-238	0.55	pCi/g	5.4	0.351	pCi/g	49
Plutonium-239/240	0.61	pCi/g	5.4	6.81	pCi/g	49
Potassium	1,030,000	µg/kg	5.4	2,230,000	µg/kg	175.3
Potassium-40	12	pCi/g	5.4	19.6	pCi/g	193
Pyrene	–	–	–	72	µg/kg	62.2
Radium-226	0.91	pCi/g	5.4	0.7	pCi/g	185.5
Radium-228	1.6	pCi/g	5.4	0.66	pCi/g	185.5
Selenium-79	–	–	–	3.23	pCi/g	49
Silver	–	–	–	14,900	µg/kg	49
Sodium-22	–	–	–	0.107	pCi/g	49

Site: 216-U-4A	Area: U Plant	Category: Deep – Adequately Characterized

Table 3. Soil Maximum Detection Summary (Soil Borehole A9798)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Strontium-90	93	pCi/g	5.4	72.4	pCi/g	49
Sulfate	10,000	µg/kg	5.4	107,000	µg/kg	185.5
Technetium-99	–	–	–	1.49	pCi/g	62.2
Tetrachloroethene	–	–	–	5	µg/kg	26.5
Thorium-228	1.3	pCi/g	5.4	0.85	pCi/g	185.5
Thorium-232	1.6	pCi/g	5.4	0.66	pCi/g	185.5
Titanium	1,550,000	µg/kg	5.4	970,000	µg/kg	185.5
Toluene	–	–	–	5	µg/kg	185.5
Uranium	4,400	µg/kg	5.4	12,500	µg/kg	62.2
Uranium-233/234	1.8	pCi/g	5.4	0.97	pCi/g	185.5
Uranium-234	–	–	–	5.75	pCi/g	62.2
Uranium-235	0.18	pCi/g	13.5	0.0827	pCi/g	175.3
Uranium-238	1.6	pCi/g	5.4	7.74	pCi/g	62.2
Vanadium	46,700	µg/kg	5.4	65,900	µg/kg	185.5
Zinc	43,100	µg/kg	5.4	43,300	µg/kg	26.5

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): Several radionuclides (cesium-137, americium-241, and others) were detected above background levels and inorganic constituents were detected in the shallow soil samples collected between 1.3 and 4.1 m (4.4 and 13.5 ft) bgs. The shallow contamination is thought to be associated with the 216-U-4A French Drain (DOE/RL-95-13). No organic compounds were detected.

No additional shallow characterization is warranted. Based on the small size of site and location within U Plant canyon barrier footprint, additional characterization from 0 to 4.6 m (0 to 15 ft) is not warranted. Existing data are sufficient to characterize contamination at this site.

Deep (>4.6 m [>15 ft] bgs): Several radionuclides were detected above background levels. Inorganic and organic compounds were also detected. The deep contamination is thought to be associated with the 216-U-4 Reverse Well (DOE/RL-95-13). In general, starting at 11.3 m (37 ft) bgs, concentrations of

Site: 216-U-4A	Area: U Plant	Category: Deep – Adequately Characterized

radionuclides and inorganics increase with depth, with the maximum detections occurring in the samples collected at 14.9 and 18.9 m (49 and 62 ft) bgs (within the well screen interval of reverse well 216-U-4). Concentrations below 18.9 m (62 ft) bgs decrease with depth to near background. At the caliche layer (located at approximately 53.3 m [175 ft] bgs), americium-241 (0.8 pCi/g), europium-152 (0.2 pCi/g), uranium-234 (1.8 pCi/g), uranium-235 (0.08 pCi/g), and uranium-238 (1.6 pCi/g) were detected above background levels (DOE-RL-95-13).

Deep vadose zone soil is adequately characterized to 59 m (194 ft) bgs. The estimated depth of the Cold Creek Unit at this location is 53.6 m (176 ft) bgs.

References:

BHI-00608, 1996, *Hanford Sitewide Groundwater Flow and Transport Model Calibration Report*, Rev. 1, Bechtel Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D197301520.

DOE/RL-95-13, 1995, *Limited Field Investigation for the 200-UP-2 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196003069.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

"Site Location Map & Cross Sections.pdf" pp. 2-3.

Waste Information Data System General Summary Report for the 216-U-4A Waste Site.

Site: 216-U-4A	Area: U Plant	Category: Deep – Adequately Characterized

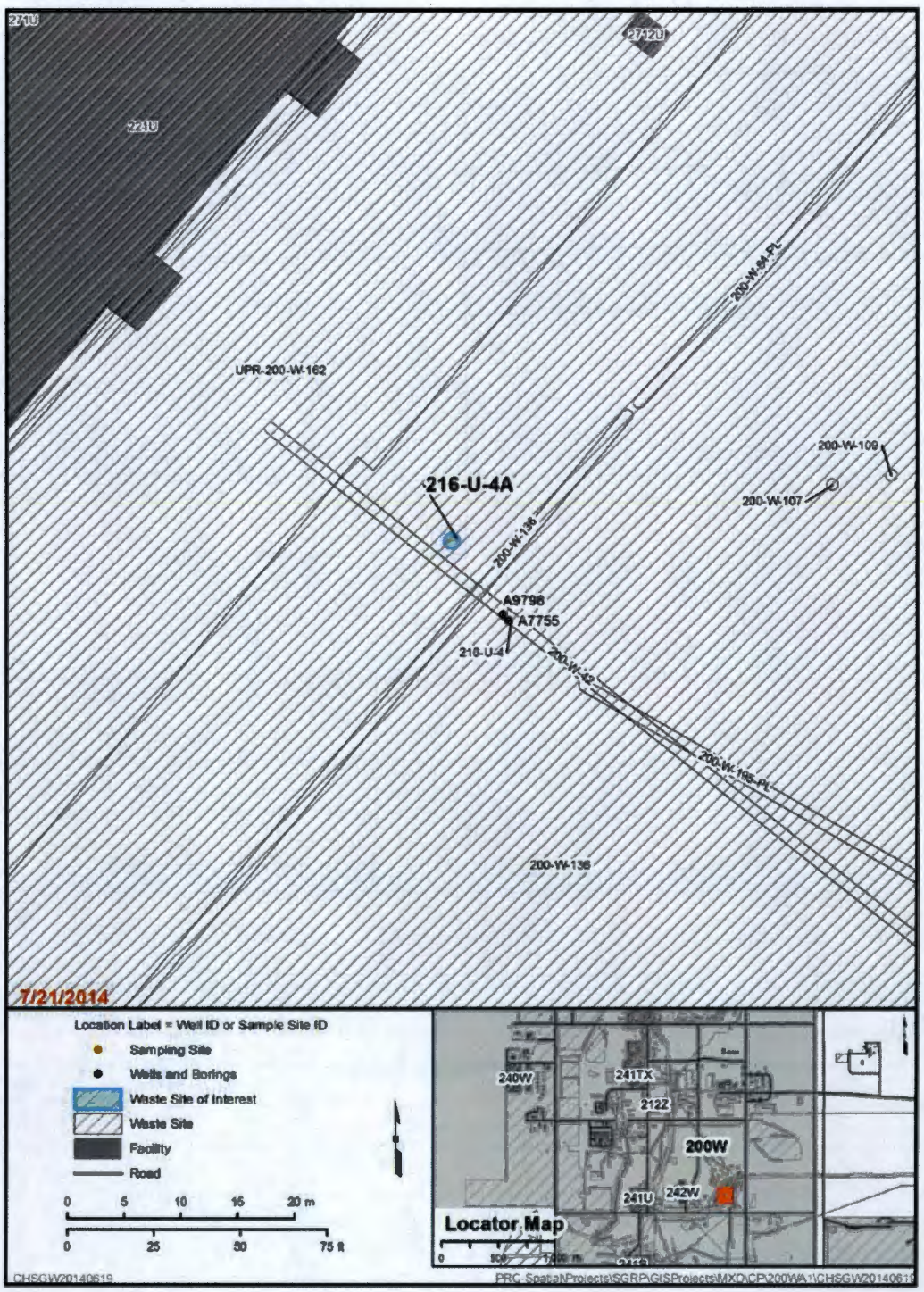


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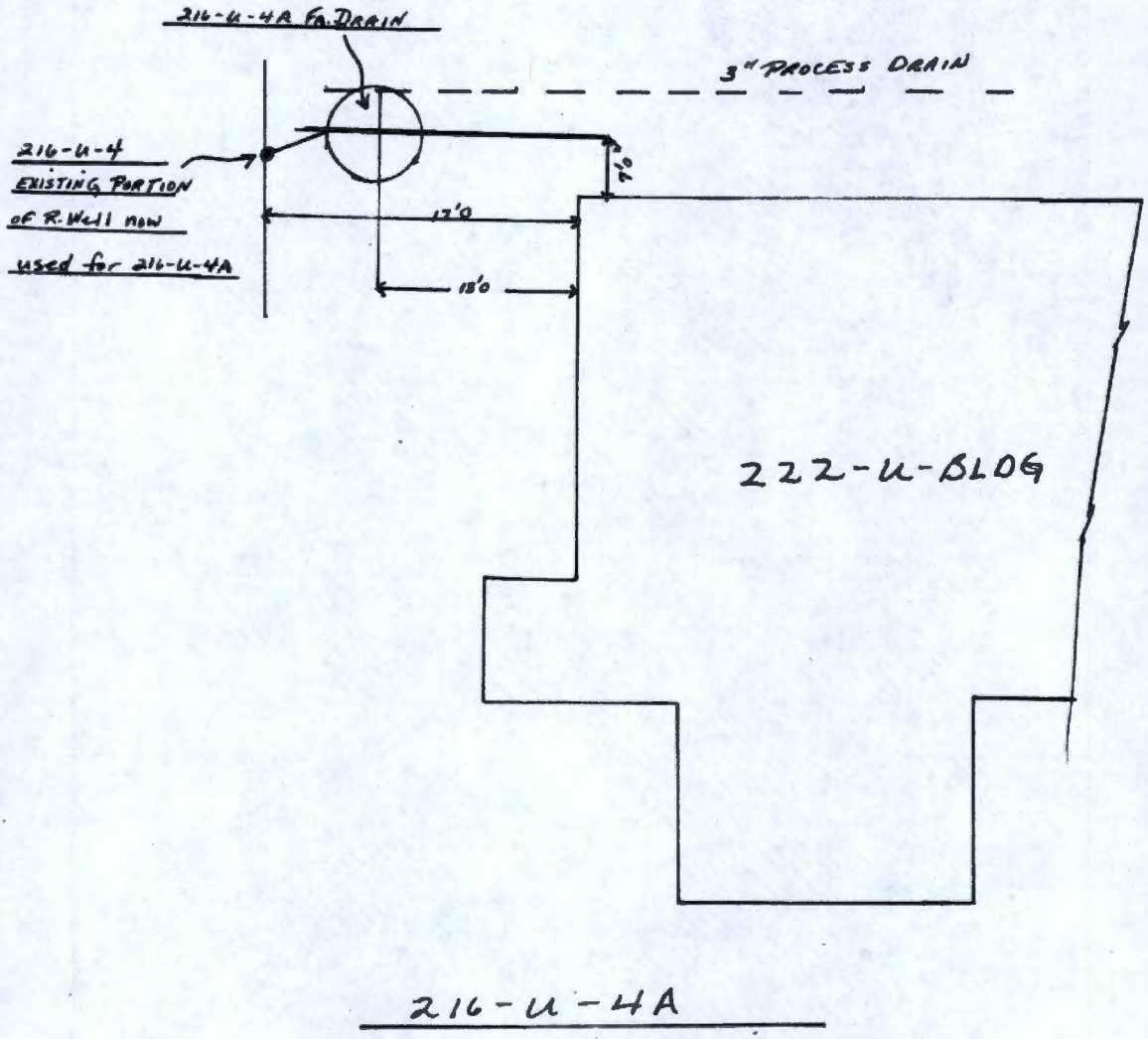
Figure 1. 216-U-4A Waste Site Map and Existing Borehole Locations

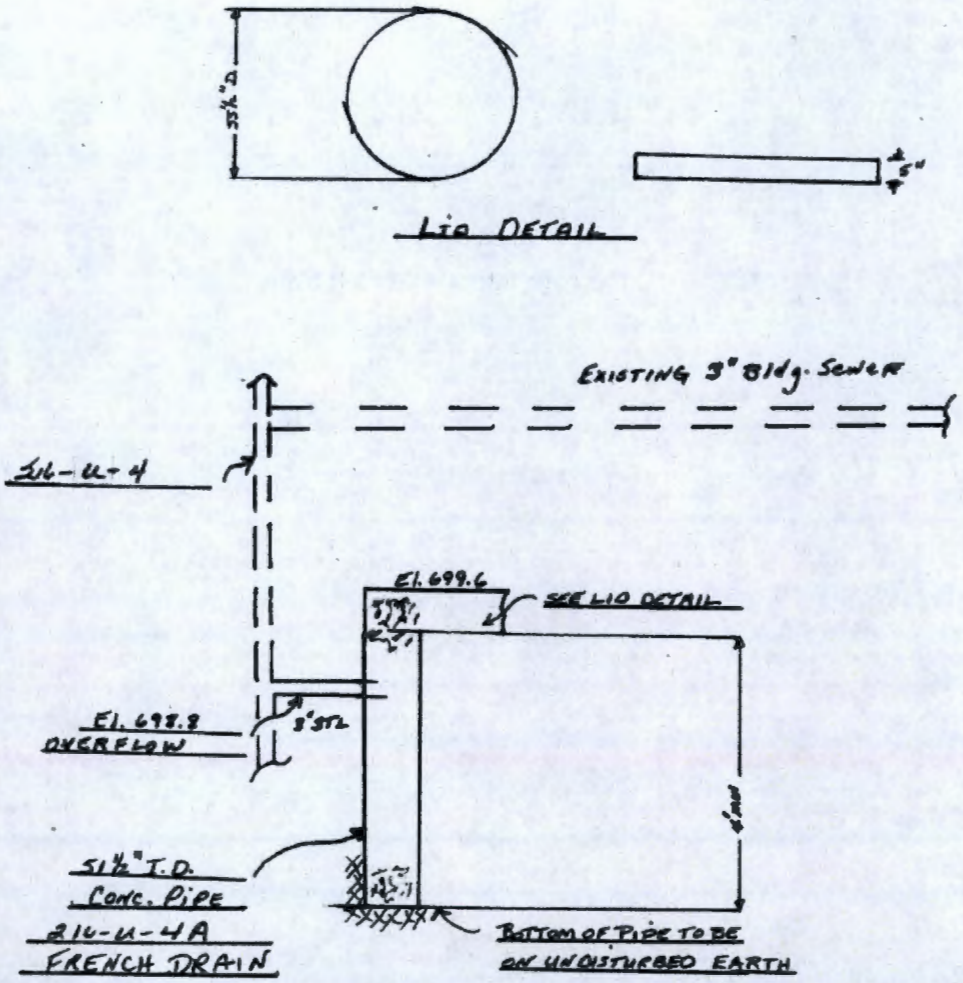
Site: 216-U-4A	Area: U Plant	Category: Deep – Adequately Characterized



Note: Produced from the best available copy.

Figure 2. 216-U-4A Location

Site: 216-U-4A	Area: U Plant	Category: Deep – Adequately Characterized



216-U-4A

Note: Produced from the best available copy.

Figure 3. 216-U-4A Construction

Site: 216-U-4A	Area: U Plant	Category: Deep – Adequately Characterized

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Site: 216-U-4B	Area: U Plant	Category: Intermediate

Site Description

Site Type: French Drain
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1
Service Dates: January 1960 to July 1970

Waste Site Location and Physical Description: The 216-U-4B waste site is located on the southeast side of the 222-U Building (Figures 1 and 2). The site consists of a French drain that is under a cement pad. A 2.5 cm (1 in.) diameter stainless steel vent riser extends approximately 1.2 m (4 ft) above the surface. The unit was deactivated when Pacific Northwest Laboratory operations in the 222-U Building were shutdown.

Waste Site Coordinates:
E-567615.03800 N-135120.89801

Site Dimensions:
Site Diameter: 0.91m (3 ft) Site Depth: 3.05 m (10 ft) to bottom of structure
Site Area: 0.65 m2 (7.07 ft^2) Cover Thickness: Not applicable

Related Site Structure(s): The site is associated with the 222-U Building.

Site Posting: The site is posted as an Underground Radioactive Material Area.

Site History

Release Summary: From January 1960 to July 1970, the site received waste from a hot cell and hood in the 222-U Building. From January 1965 to July 1970, the site received hot cell and hood waste from Pacific Northwest Laboratory experiments conducted in 222-U. The site waste contains nitrate, sstrontium-90 and cesium-137.2

A detailed summary of discharge volume for 216-U-4B is shown on Figure 3 The estimated total volume of process effluent discharged to the site is approximately 3.3E+04 L (8.7E+03 gal) and the calculated potential lifetime discharge is less than one vadose zone pore volume.

Volume/Mass Discharged: 3.3E+04 L (8.7E+03 gal)

Pore Volume Discharged: 3.3E+04 L/ (258 ft x 79 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.2

Site: 216-U-4B	Area: U Plant	Category: Intermediate

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-U-4B Waste Site

Contaminant	Mass Discharged
Pu	0.044 g
Beta	2.4 Ci
Sr-90	0.003 Ci
Ru-160	None
Cs-137	0.37 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: Visual and radiological surveys are performed at this site. The March 3, 2005, Geophysical Survey indicated that the subsurface beneath the investigation area is heavily disturbed. One north-south linear anomaly along the east edge of the investigation area is interpreted as a utility. Several isolated anomalies indicate buried debris.

There was also a site walkdown on July 15, 2002, that led to the discovery of a small yellow drain cover, adjacent to the 222-U Building wall, which was incorrectly labeled as 216-U-4B. Notification was made to U Plant Operations to fix the label mistake.

Nature and Extent of Contamination:

Based on existing information, the soil could be contaminated by former discharge of waste. An estimated 0.2 pore volumes of liquid potentially containing nitrates and radionuclides were discharged to the French drain, indicating low potential for contamination to extend to groundwater (81.2 m [268 ft] below ground surface [bgs]). Shallow soil could be contaminated by direct discharge of waste to 3 m (10 ft) bgs or shallower if the culvert backed up and overflowed.

Site: 216-U-4B	Area: U Plant	Category: Intermediate

References:

BHI-00608, 1996, *Hanford Sitewide Groundwater Flow and Transport Model Calibration Report*, Rev. 1, Bechtel Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D197301520.

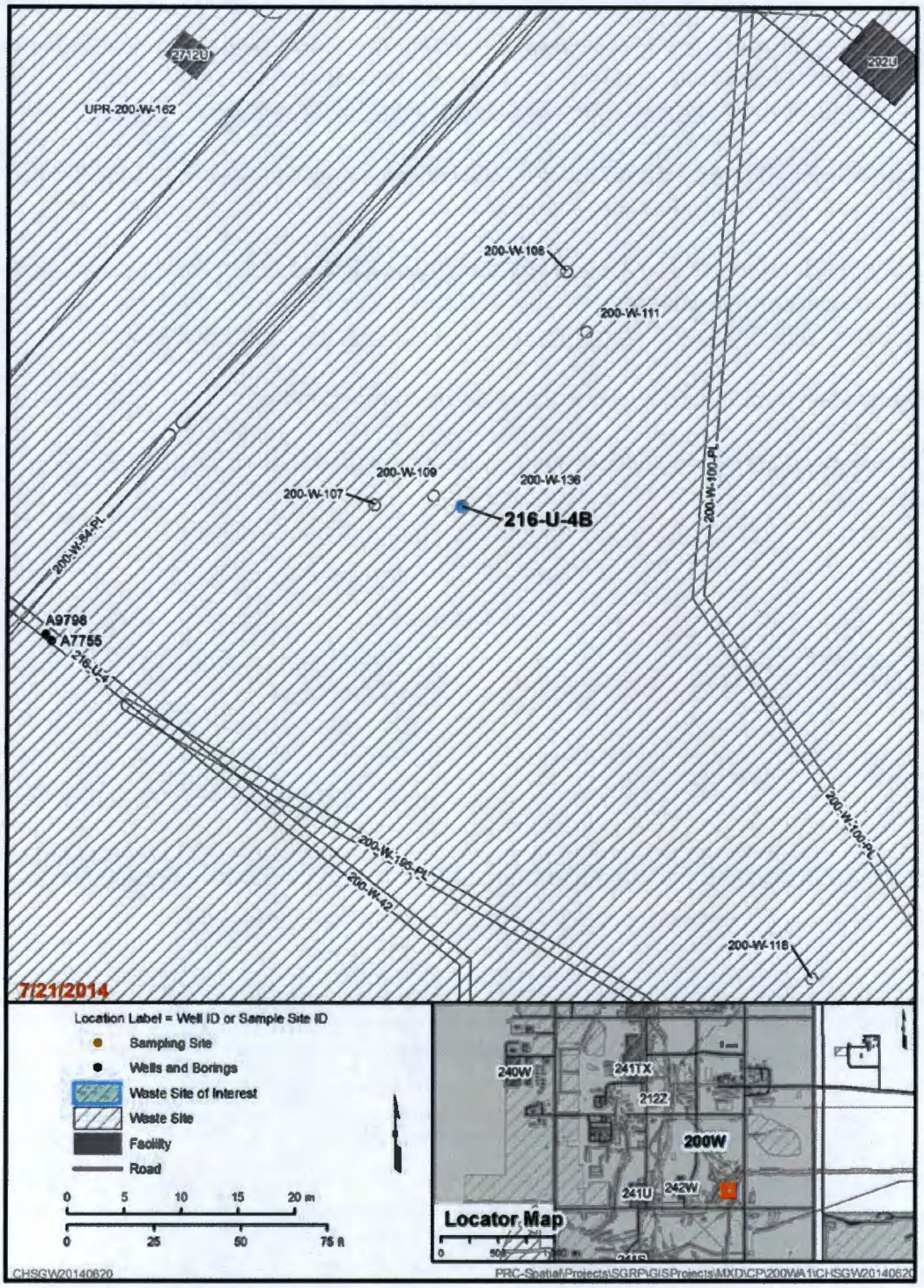
H-2-44511 (drawing), 1973, *Area Map 200 West U Plant Facilities*, Sh. 68, Rev. 6, Atlantic Richfield Hanford Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

Waste Information Data System "Waste Radionuclide Inventories.pdf" p. 1.

Waste Information Data System General Summary Report for the 216-U-4B Waste Site.

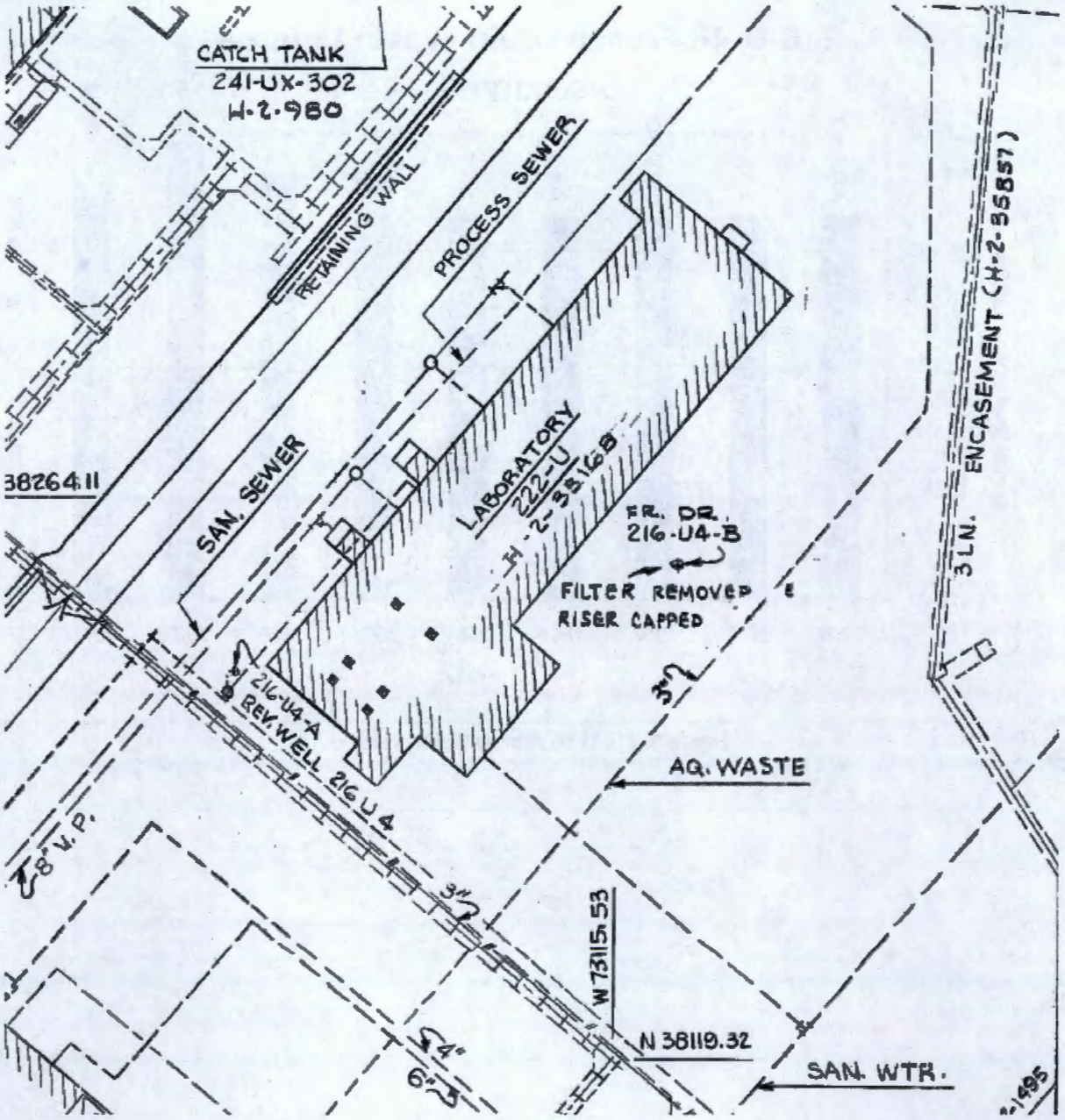
Site: 216-U-4B	Area: U Plant	Category: Intermediate



ID = identification

Figure 1. 216-U-4B Waste Site Map

Site: 216-U-4B	Area: U Plant	Category: Intermediate



Source: H-2-44511, *Area Map 200 West U Plant Facilities*, Sheet 68.

Note: Produced from the best available copy.

Figure 2. 216-U-4B Location

Site: 216-U-4B	Area: U Plant	Category: Intermediate

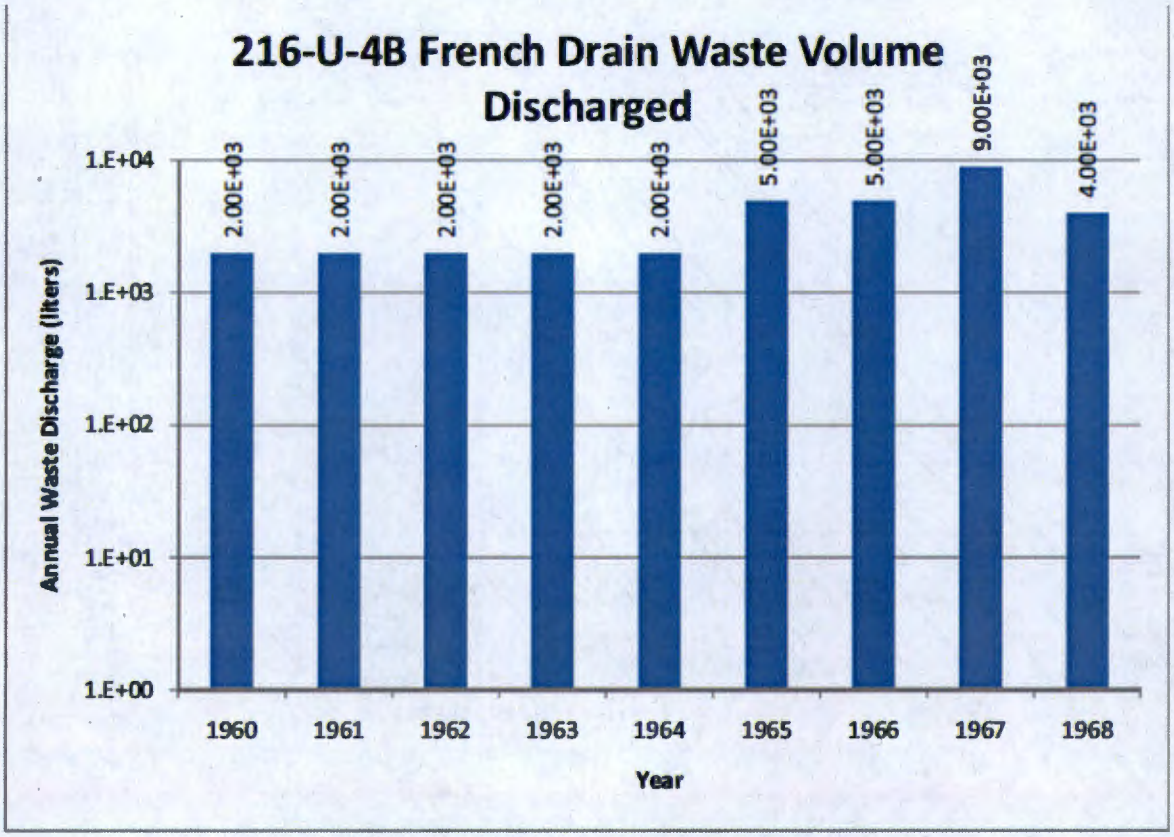


Figure 3. 216-U-4B Annual Waste Volume

Site: 216-U-5	Area: U Plant	Category: Deep – Similar Site

Site Description

Site Type: Trench
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1
Service Dates: March 1952

Waste Site Location and Physical Description: The 216-U-5 waste site is located northwest of the 221-U Building (Figure 1). The site consists of a backfilled trench that was deactivated when the startup waste disposal operation was complete. The aboveground piping was removed and the trench was backfilled. The site was interim stabilized in 1994 with 0.61 m (2 ft) of clean dirt.

Waste Site Coordinates:
E-567672.93748 N-135359.31255

Site Dimensions:
Site Length: 12.19 m (40 ft) Site Depth: 3.05 m (10.0 ft)
Site Width: 12.19 m (40 ft)* Cover Thickness: 0.61 m (2 ft)
Site Area: 37.2 m^2 (1600 ft^2)
*Note: Depending on source, the width is described as either 12.2 m (40 ft) (BHI-00174, *U Plant Aggregate Area Management Study Technical Baseline Report*, and RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II) as shown on Figure 1 or 3 m (10 ft) (HW-55176, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part IV, and H-2-44511, *Area Map 200 West "U" Plant Facilities*, Sheet 75) as shown on Figure 2.

Related Site Structure(s): The site is associated with the 221-U Building and the 216-U-6 Trench.

Site Posting: The site is posted as an Underground Radioactive Material Area.

Site History

Release Summary: This site was used as liquid disposal site for unirradiated uranium waste from the cold start-up run at the 221-U Building. The waste contained 200 kg (440 lb) of nitrate. The estimated total volume of process effluent discharged to the site is approximately 2.25E+06 L (5.9E+05 gal) and the calculated potential lifetime discharge could exceed one vadose zone pore volume.

Volume/Mass Discharged: 2.25E+06 L (5.9E+05 gal)

Pore Volume Discharged: 2.25E+06 L/ (258 ft x 1,600 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.64

Site: 216-U-5	Area: U Plant	Category: Deep – Similar Site

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-U-5 Waste Site

Contaminant	Mass Discharged
Pu	<0.05 g
Beta	0.5 Ci
Sr-90	<0.05 Ci
Ru-160	<0.05 Ci
Cs-137	<0.05 Ci
Co-60	<0.05 Ci
U	360 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: Annual radiological surveys are performed at this site. On April 22, 2002, a Global Positioning System survey was completed and the data is stored in the Hanford Geographic Information System. On February 1, 2005, a geophysical survey was completed to determine the boundaries of the 216-U-5 Trench as part of the U Plant remediation activities. An anomaly consistent with a burial pit or crib structure was detected and mapped within the marked boundary of the site. The location of this anomaly reportedly coincides with the Waste Information Data System location for this site (D&D-27783, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*).

Nature and Extent of Contamination: Based on existing information, the shallow and deep soil could be contaminated by former discharge of waste containing radionuclides and nitrate. Within the trench, soil 3 m (10 ft) below ground surface (bgs) and below could be contaminated by direct discharge of waste into the trench. Because the trench was backfilled after use, the soil from 0 to 3 m (0 to 10 ft) bgs within the trench has a low potential for contamination. If the open trench was filled with liquids during use, soil on the sidewalls from 0 to 3 m (0 to 10 ft) may have been contaminated. An estimated 0.64 pore volumes of liquid were discharged to the trench, suggesting a potential for groundwater contamination. The approximate depth to groundwater is 81.2 m (268 ft) bgs.

References:

BHI-00174, 1995, *U Plant Aggregate Area Management Study Technical Baseline Report*, Rev. 00, Bechtel Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D198038132.

Site: 216-U-5	Area: U Plant	Category: Deep – Similar Site

D&D-27783, 2006, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*, Rev. 0, Fluor Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA01917974.

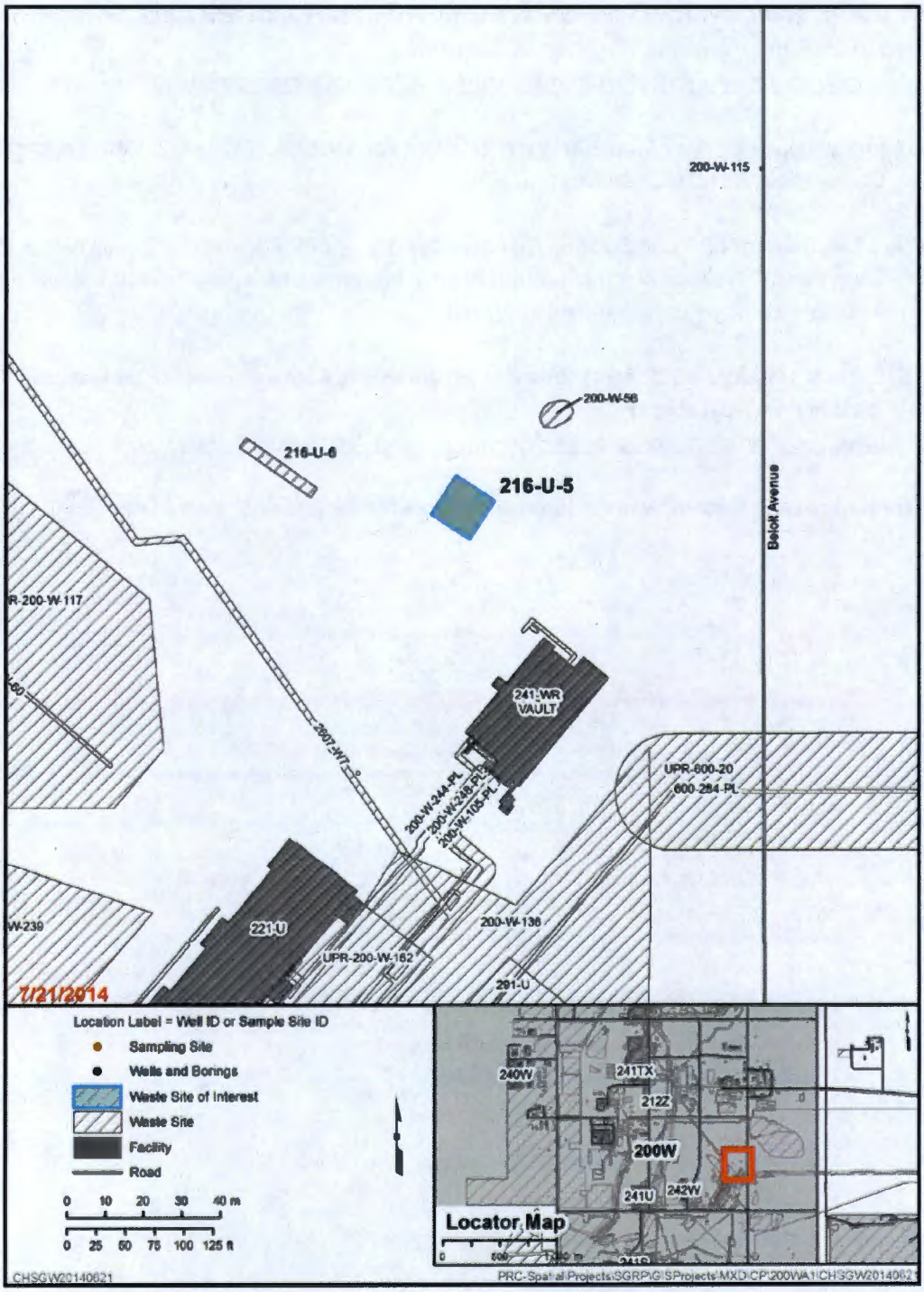
H-2-44511 (drawing), 1978, *Area Map 200 West "U" Plant Facilities*, Sh. 75, Rev. 2, Vitro Engineering Corporation, Richland, Washington.

HW-55176, 1958, *Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites*, Part IV, General Electric Hanford Atomic Products Operation, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0076045H.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

Waste Information Data System General Summary Report for the 216-U-5 Waste Site.

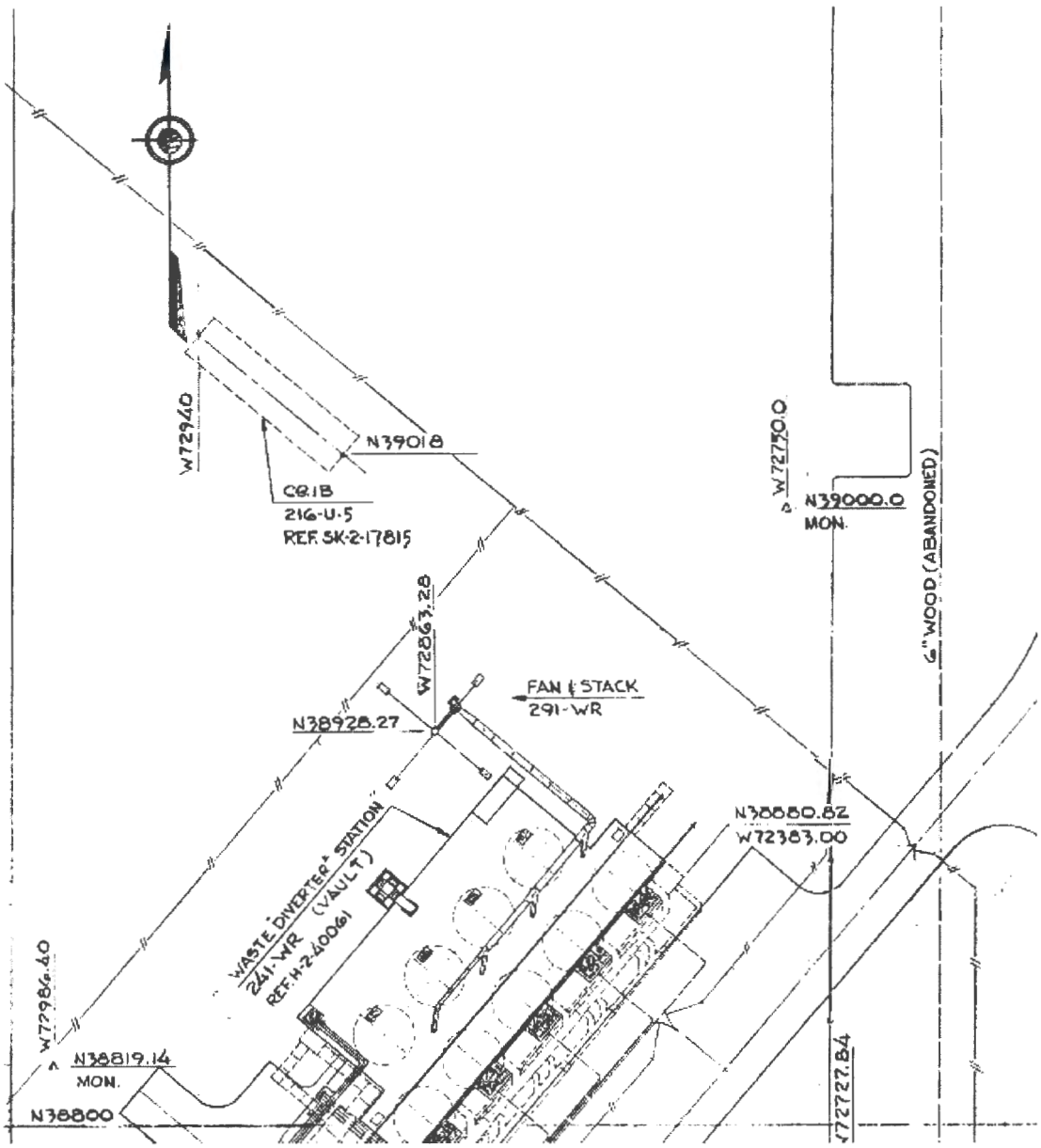
Site: 216-U-5	Area: U Plant	Category: Deep – Similar Site



ID = identification

Figure 1. 216-U-5 Waste Site Map

Site: 216-U-5	Area: U Plant	Category: Deep – Similar Site



Source: H-2-44511, *Area Map 200 West "U" Plant Facilities*, Sheet 75.

Figure 2. Alternative Site Dimensions

Site: 216-U-5	Area: U Plant	Category: Deep – Similar Site

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Site: 216-U-6	Area: U Plant	Category: Deep (Representative Site to 216-U-5)

Site Description

Site Type: Trench
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1
Service Dates: March 1952

Waste Site Location and Physical Description: The 216-U-6 Trench is located northwest of the 221-U Building. The trench was deactivated when the startup waste disposal operation was complete. The aboveground piping was removed and the trench was backfilled. In 1994, the crib surface was interim stabilized with 46 to 61 cm (18 to 24 in.) of uncontaminated backfill.

Waste Site Coordinates:
E-567624.21539 N-135369.77825

Site Dimensions (Bottom Dimensions):
Site Length: 22.86 m (75 ft)
Site Width: 3.05 m (10.0 ft)
Site Area: 69.7 m^2 (750 ft^2)
These are bottom dimensions.

Site Depth: 3.05 m (10.0 ft)
Cover Thickness: Not applicable

Related Site Structure(s): The site is associated with the 221-U Building and the 216-U-5 Trench.

Site Posting: The site is posted as an Underground Radioactive Material Area.

Site History

Release Summary: This site was used as liquid disposal site for unirradiated uranium waste from the cold start-up run at the 221-U Building. The waste included 200 kg (440 lb) of nitrate. The estimated total volume of process effluent discharged to the site is approximately 2.25E+06 L (5.9E+05 gal) and the calculated potential lifetime discharge could exceed one vadose zone pore volume.

Volume/Mass Discharged: 2.25E+06 L (5.94E+05 gal)

Pore Volume Discharged: 2.25E+06 L/ (258 ft x 750 ft^2 / 35.3 m^3/ft^3 * 1000 L/m^3 * 0.3) = 1.4

Site: 216-U-6	Area: U Plant	Category: Deep (Representative Site to 216-U-5)

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-U-6 Waste Site

Contaminant	Mass Discharged
Pu	<0.05 g
Beta	0.5 Ci
Sr-90	<0.05 Ci
Ru-160	<0.05 Ci
Cs-137	<0.05 Ci
Co-60	<0.05 Ci
U	360 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: An annual routine radiological survey is done at this site. On April 22, 2002, a Global Positioning System Survey of the site was completed and the data is stored in the Hanford Geographic Information System. Also on February 1, 2005, a geophysical survey was completed as part of the U Plant remediation activities. Anomalies consistent with a trench that was backfilled with fill material containing debris were detected and mapped. These anomalies extend out of the marked site boundaries to the southeast. A portion of the anomalies reportedly coincide with the Waste Information Data System (WIDS) location for this site (D&D-27783, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*).

Nature and Extent of Contamination:
Based on existing information, the shallow and deep soil could be contaminated by former discharge of waste containing radionuclides and nitrate. Within the trench, soil 3 m (10 ft) below ground surface (bgs) and below could be contaminated by direct discharge of waste into the trench. Because the trench was backfilled after use, the soil from 0 to 3 m (0 to 10 ft) bgs within the trench has a low potential for contamination. If the open trench was filled with liquids during use, soil outside the trench boundaries from 0 to 3 m (0 to 10 ft) (and deeper) may have been contaminated. An estimated 1.4 pore volumes of liquid were discharged to the trench, suggesting a potential for groundwater contamination. The approximate depth to groundwater is 81.7 m (268 ft) bgs.

Site: 216-U-6	Area: U Plant	Category: Deep (Representative Site to 216-U-5)

References:

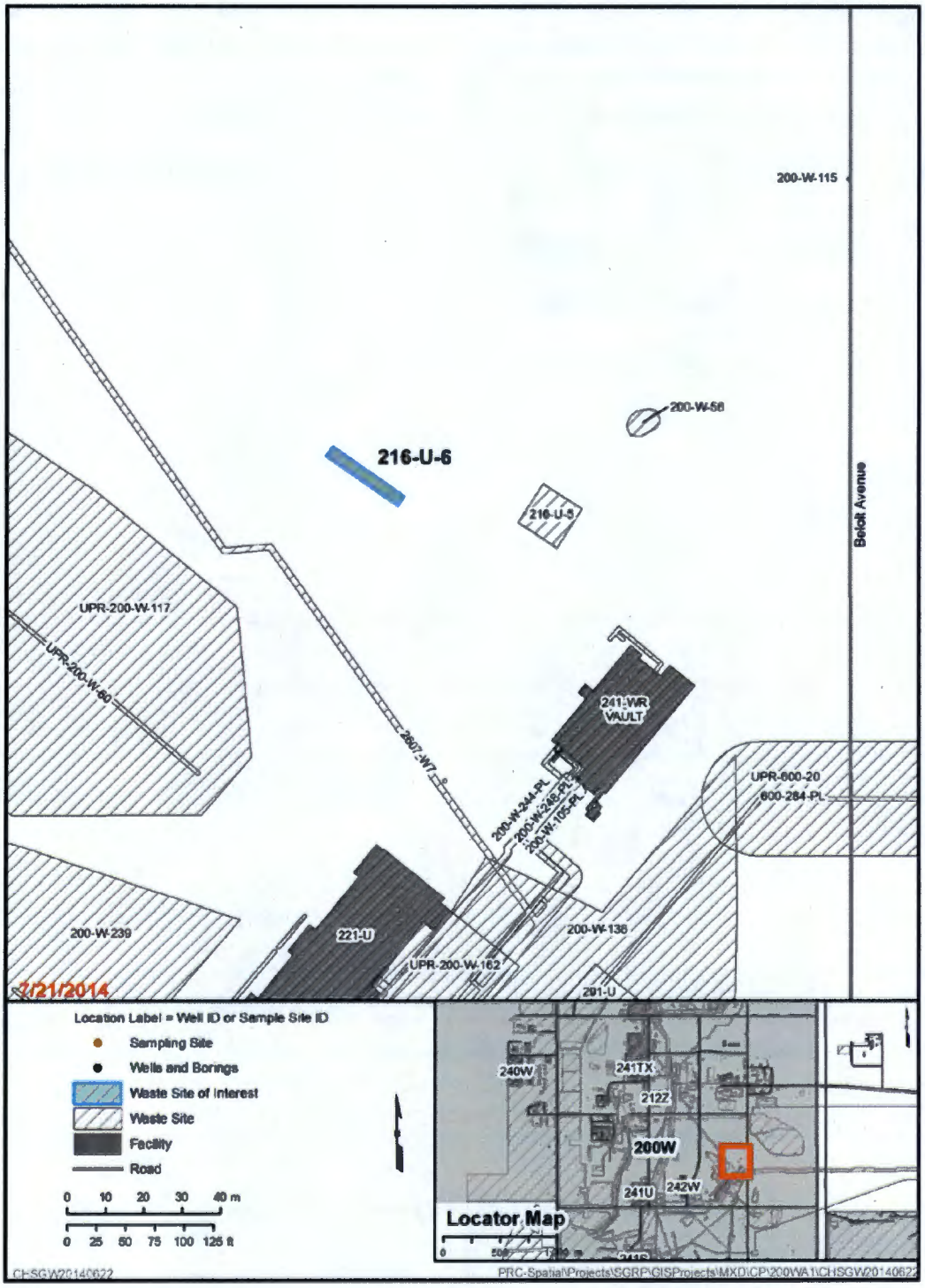
D&D-27783, 2006, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*, Rev. 0, Fluor Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA01917974.

RHO-CD-673, 1979, *Handbook 200 Area Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

WIDS General Summary Report for the 216-U-6 Waste Site.

WIDS "Chemicals Disposed & Radionuclide Inventories.pdf" p. 2.

Site: 216-U-6	Area: U Plant	Category: Deep (Representative Site to 216-U-5)



ID = identification

Figure 1. 216-U-6 Waste Site Map

Site: 216-U-7	Area: U Plant	Category: Intermediate

Site Description

Site Type: French Drain
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: March 1952 to June 1957

Waste Site Location and Physical Description: The 216-U-7 waste site is located on the southeast side of the 221-U Building near Section 6 and northwest of the 241-UX-154 Diversion Box (Figure 1). This drain is constructed of a concrete pipe set vertically into the ground. Gravel fills 1.1 m (3.5 ft) of the pipe (see Figure 2). The French drain was retired when the Uranium Recovery operations in the 221-U Building were shut down. The site was deactivated by removing the cell jumpers in the 221-U Building. In 1998, the contaminated areas on the east side of the 221-U Building (UPR-200-W-162 and UPR-200-W-138) were surface stabilized with material from the 200 Area Ash Pit. The 200-W-217-PL pipeline, shown on Figure 1, was consolidated with site 216-U-7. 200-W-217-PL is a direct buried inactive radioactive process sewer line that transferred liquid waste from the 221-U Counting Box floor drain to the 216-U-7 French drain. 200-W-217-PL is a 7.6 cm (3-in.) diameter carbon steel pipe that has a length of 2.1 m (7 ft) and carried waste from the metal recovery program in the 221-U Building.

Waste Site Coordinates:
E-567606.92172 N-135205.54293

Site Dimensions:
Site Diameter: 0.76 m (2.5 ft) Site Depth: 5.18 m (17 ft)
Site Area: 0.45 m^2 (4.9 ft^2) Cover Thickness: Not applicable

Related Site Structure(s): The site is associated with the 221-U Building, UPR-200-W-162, and UPR-200-W-138. The pipeline from the counting box to the French drain is 200-W-217-PL.

Site Posting: The area is posted as Underground Radioactive Material Area.

Site History

Release Summary: The site received liquid wastes from a counting box floor drain during the metal recovery program. The site waste contains nitrate. Due to UPR-200-W-138, it is assumed that 13 kg (30 lb) of uranium in uranyl nitrate hexahydrate solution were also introduced to the soil through the 216-U-7 French drain. However, the release associated with UPR-200-W-138 may be associated with a different French drain. The release information is vague. It is possible the event affected the 216-U-7-French drain if sufficient liquid volume was released to the surface to flow southward and reach the 216-U-7 French drain location.

Site: 216-U-7	Area: U Plant	Category: Intermediate

The estimated total volume of process effluent discharged to the site is approximately 7E+03 L (1.85E+03 gal) and the calculated potential lifetime discharge may exhibit deep vadose effects.

Volume Discharged: 7E+03 L (1.85E+03 gal)

Pore Volume Discharged: 7000 L/ (211 ft x 79 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.05

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-U-7 Waste Site

Contaminant	Mass Discharged
Total Beta	<1 Ci

Source: RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: Visual and radiological surveys are performed at this site. No soil data are available.

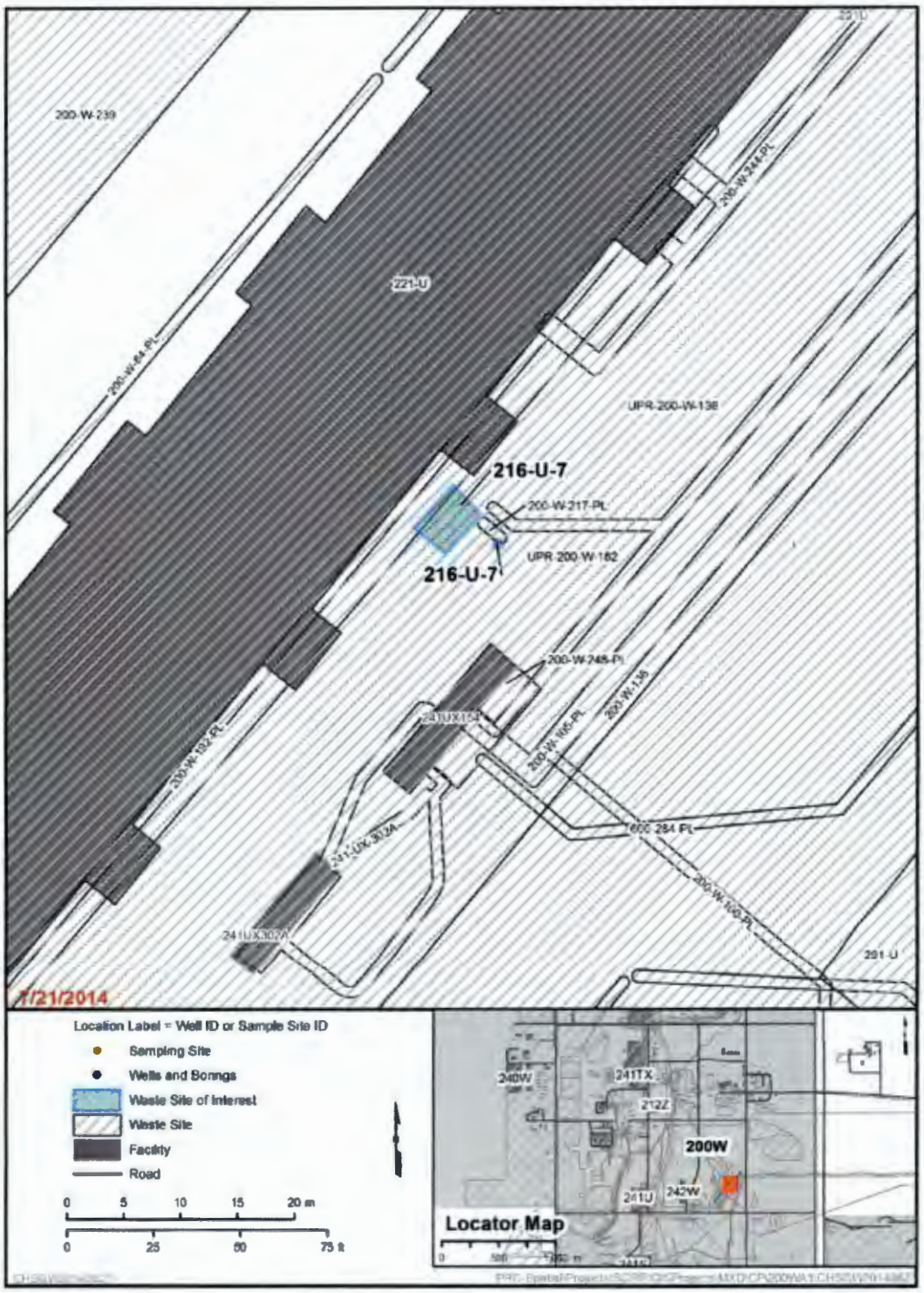
Nature and Extent of Contamination: Based on existing information, the soil could be contaminated by former discharge of waste. An estimated 0.05 pore volumes of liquid potentially containing nitrates and radionuclides were discharged to the French drain, indicating low potential for contamination to extend to groundwater (69.5 m [228 ft] below ground surface [bgs]). Deeper soil could be contaminated by direct discharge of waste at 5.2 m (17 ft) bgs. Shallow soil could be contaminated if leaks occurred at the pipe joint at 4 m (13 ft) bgs or if the culvert backed up and overflowed.

References:

H-2-43078 (drawing), 1973, *Count Box Rear of 221-U Bldg 216-U-7 French Drain Det's*, Rev. 5, General Electric Company, Richland, Washington.

Waste Information Data System General Summary Report for the 216-U-7 Waste Site.

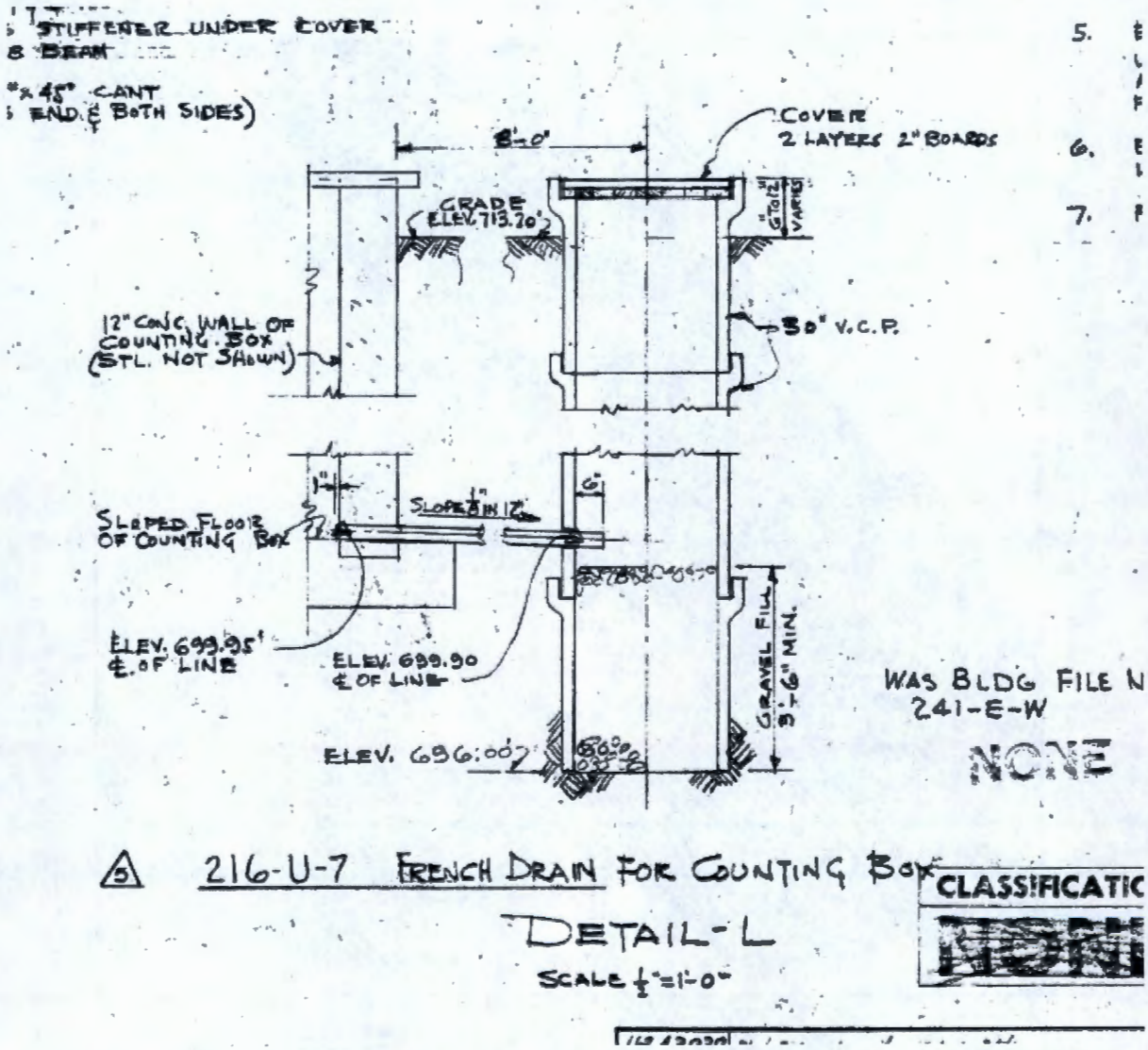
Site: 216-U-7	Area: U Plant	Category: Intermediate



ID = identification

Figure 1. 216-U-7 Waste Site Map

Site: 216-U-7	Area: U Plant	Category: Intermediate



Source: H-2-43078, *Count Box Rear of 221-U Bldg 216-U-7 French Drain Det's.*

Note: Produced from the best available copy.

Figure 2. 216-U-7 French Drain Construction

Site: 216-U-8	Area: U Plant	Category: Deep

Site Description

Site Type: Crib
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1
Service Dates: 1952 to 1960

Waste Site Location and Physical Description: The 216-U-8 waste site is located west of Beloit Avenue and south of 16th Street (Figure 1). The site consists of three wood timber cribs set in series. Each crib is 4.9 by 4.9 by 3.0 m deep (16 by 16 by 10 ft deep). The cribs were filled with 1.3 cm (0.5 in.) crushed stone to the tops of the wooden structures (Figure 2). There is roughly 2,070 m^3 (73,000 ft^3) of gravel fill in the cribs. The cribs were fed by a vitrified clay pipeline. The site was deactivated by blanking the pipeline north of the unit in 1960, when ground settling occurred around the crib vent risers. Approximately 57 m^3 (75 yd^3) of dirt was used to fill the sink holes. The crib surface and adjacent Surface Contamination Area (UPR-200-W-163) were interim stabilized in 1995. Contaminated soil from UPR-200-W-163 was consolidated onto the surface of the 216-U-8 Crib and the contaminated soil was covered with 0.3 to 0.6 m (1 to 2 ft) of clean soil.

Waste Site Coordinates:
E-567615.95189 N-134697.39153

Site Dimensions:
Site Length: 48.77 m (160 ft)
Site Width: 15.24 m (50 ft)
Site Area: 743 m^2 (8,000 ft^2)
Site Depth: 9.81 m (32.2 ft) to bottom of structure
Cover Thickness: Not applicable

Related Site Structure(s): The site is associated with 216-U-12, 200-W-42, the 221-U, and 224-U Buildings and the 291-U Stack.

Site Posting: The site is marked and posted with Underground Radioactive Material signs.

Site History

Release Summary: The cribs received acidic process condensate from the 221-U and 224-U Buildings along with drainage from the 291-U Stack via an underground vitrified clay pipeline. Contaminated soil from UPR-200-W-163 was scraped and consolidated onto the surface of the 216-U-8 Crib during the 1995 interim stabilization. The UPR-200-W-163 release consisted of radiologically contaminated vegetation growing above the underground pipeline to the 216-U-8 Crib.

Site: 216-U-8	Area: U Plant	Category: Deep

A detailed summary of liquid waste discharged to 216-U-8 is shown in Figure 3. The estimated total volume of process effluent discharged to the site is approximately 3.79E+08 L (1.00.E+08 gal) and the calculated potential lifetime discharge could exceed one vadose zone pore volume.

Volume/Mass Discharged: 3.79E+08 L (1.00.E+08 gal)

Pore Volume Discharged: 3.79E+08 L/(225 ft x 8,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 25

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-U-8 Waste Site

Contaminant	Mass Discharged
Pu	370 g
Beta	2,700 Ci
Sr-90	<0.1 Ci
Ru-160	230 Ci
Cs-137	<0.1 Ci
Co-60	<0.1 Ci
U	24,000 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: During the 1995 Limited Field Investigation, borehole 299-W19-94 (A9796) was drilled though the crib and abandoned following characterization. Gamma logging detected cesium-137, europium-154, uranium-235, and uranium-238 in the borehole. Borehole soil samples were collected to 60.7 m (199 ft) below ground surface (bgs) and analyzed for radionuclides, inorganics, and organics. This borehole did not extend to groundwater.

In 2004, soil samples were collected between 12.8 and 15.4 m (42 and 50.5 ft) bgs at nine auger boreholes (C4714 to C4728, see Table 2), with limited sampling for: technetium-99, nitrogen as nitrate/nitrite, mercury, cadmium, uranium (metal), uranium-235, uranium-238, antimony, and arsenic and other Inductively Coupled Plasma-Mass Spectrometer metals (barium, chromium [total], cobalt, copper, lead, manganese, selenium, silver, strontium, thallium, titanium, vanadium, and zinc). Samples were also collected at 0.3 and 11.3 m (1 and 37 ft) bgs at one of these locations. Geophysical logging was conducted to approximately 15.2 to 18.3 m (50 to 60 ft) bgs at 11 direct push boreholes located outside

Site: 216-U-8	Area: U Plant	Category: Deep

the crib (C4217 to C4554, see Table 2). Geophysical logging was conducted at two deeper (26.8 and 27.4 m [88 and 90 ft] bgs) wells located inside the crib (A7770 and A7771).

Well and borehole locations are shown on Figure 3. Sample results are summarized in Tables 2 through 5.

In groundwater well 299-W19-2, associated with 216-U-8, nitrate, iodine-129, strontium-90, tritium, and uranium were detected above drinking water standards. Nitrate concentrations were 3.2 million µg/L in 1958 and were below the maximum contaminant level of 45,000 µg/L (21,200 µg/L) in 1995. Iodine-129 results ranged from 3.16 to 8.83 pCi/L from 1990 to 1996. Strontium-90 concentrations were 70 pCi/L in 1958 and 1.8 pCi/L in 1994. The maximum strontium-90 concentration (160 pCi/L) was detected in 1961. Tritium concentrations ranged from 1,000 pCi/L to 32 million pCi/L from 1962 to 1994. Uranium concentrations ranged from 1.8 µg/L to 149 µg/L from 1985 to 1995.

Table 2. Borehole Summary for 216-U-8 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
1993	299-W19-94 / A9796	Inside	4 – 199 (16 soil samples)
2004	299-W19-70 / A7770	Inside	2 – 90.2 (GPL)
2004	299-W19-71 / A7771	Inside	3.5 – 87.9 (GPL)
2004	C4217	Outside – 5 ft north	0.5 – 48.9 (GPL)
2004	C4218	East Edge	0.5 – 48.9 (GPL)
2004	C4219	South Edge	0.5 – 48.5 (GPL)
2004	C4221	Outside – 25 ft north	0 – 48.9 (GPL)
2004	C4222	Outside – 20 ft east	0 – 49.1 (GPL)
2004	C4223	Outside – 15 ft south	0 – 54.1 (GPL)
2004	C4224	Outside – 25 ft west	0.5 – 54.6 (GPL)
2004	C4551	Outside – 60 ft west	0 – 59.6 (GPL)
2004	C4552	Outside – 75 ft south	0 – 59.6 (GPL)
2004	C4553	Outside – 80 ft southeast	0 – 59.1 (GPL)
2004	C4554	Outside – 90 ft southwest	0 – 59.6 (GPL)
2004	C4714	Outside – 340 ft east	44 – 45.5 (1 soil sample)
2004	C4716	Outside – 80 ft southeast	47.5 – 50.5 (1 soil sample)
2004	C4717	Outside – 60 ft west	1 – 45.5 (3 soil samples)
2004	C4718	Outside – 350 ft west	44 – 45.5 (1 soil sample)

Site: 216-U-8	Area: U Plant	Category: Deep

Table 2. Borehole Summary for 216-U-8 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2004	C4719	Outside – 70 ft northwest	44 – 45.5 (1 soil sample)
2004	C4720	Outside – 300 ft northwest	44 – 45.5 (1 soil sample)
2004	C4721	Outside – 15 ft east	42 – 43.5 (1 soil sample)
2004	C4722	Outside – 20 ft east	43 – 44.5 (1 soil sample)
2004	C4728	Outside – 155 ft south	48 – 49.7 (1 soil sample)

ID = identification

Table 3. Soil Maximum Detection Summary (Soil Borehole A9796)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth ft)
Acetone	7	µg/kg	6	–	–	–
Aluminum	7,400,000	µg/kg	6	30,400,000	µg/kg	199
Americium-241	–	–	–	0.733	pCi/g	32
Arsenic	–	–	–	9,440	µg/kg	32
Barium	–	–	–	149,000	µg/kg	199
Bis(2-ethylhexyl) phthalate	–	–	–	120	µg/kg	91.5
Cadmium	–	–	–	20	µg/kg	32
Calcium	14,500,000	µg/kg	6	90,600,000	µg/kg	189
Cesium-137	–	–	–	91,190	pCi/g	32
Chloride	8,200	µg/kg	6	21,700	µg/kg	150
Chromium	–	–	–	28,400	µg/kg	199
Cobalt	13,200	µg/kg	6	15,700	µg/kg	40
Cobalt-60	–	–	–	0.55	pCi/g	40
Copper	1,800	µg/kg	6	18,200	µg/kg	17.5
Curium-244	–	–	–	0.11	pCi/g	189

Site: 216-U-8	Area: U Plant	Category: Deep

Table 3. Soil Maximum Detection Summary (Soil Borehole A9796)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth ft)
Di-n-octylphthalate	–	–	–	290	µg/kg	167.5
Europium-154	–	–	–	3.1	pCi/g	40
Europium-155	–	–	–	4.5	pCi/g	40
Fluoride	1,500	µg/kg	6	17,700	µg/kg	36
Gross alpha	7.9	pCi/g	6	210	pCi/g	189
Gross beta	16	pCi/g	6	94,800	pCi/g	32
Iron	23,500,000	µg/kg	6	40,400,000	µg/kg	199
Lead	7,400	µg/kg	6	8,200	µg/kg	167.5
Magnesium	6,610,000	µg/kg	6	9,320,000	µg/kg	199
Manganese	421,000	µg/kg	6	505,000	µg/kg	189
Mercury	–	–	–	2,100	µg/kg	40
Methylene chloride	2	µg/kg	6	–	–	–
Neptunium-237	0.019	pCi/g	6	0.092	pCi/g	189
Nickel	10,000	µg/kg	6	22,500	µg/kg	199
Nitrate	–	–	–	1,200,000	µg/kg	32
Nitrogen in nitrite and nitrate	7,080	µg/kg	6	304,000	µg/kg	199
Phosphate	–	–	–	17,000	µg/kg	32
Plutonium-238	–	–	–	0.0766	pCi/g	32
Plutonium-239/240	–	–	–	4.95	pCi/g	32
Potassium	1,360,000	µg/kg	6	3,060,000	µg/kg	199
Potassium-40	14	pCi/g	6	19	pCi/g	130
Radium-226	0.76	pCi/g	6	5.79	pCi/g	150
Radium-228	1.2	pCi/g	6	2.1	pCi/g	40
Strontium-90	–	–	–	520	pCi/g	167.5

Site: 216-U-8	Area: U Plant	Category: Deep

Table 3. Soil Maximum Detection Summary (Soil Borehole A9796)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth ft)
Sulfate	13,000	µg/kg	6	40,000	µg/kg	17.5
Technetium-99	–	–	–	1.17	µg/kg	32
Thallium	–	–	–	3,560	µg/kg	36
Thorium-228	0.94	pCi/g	6	1.4	pCi/g	91.5
Thorium-232	1.2	pCi/g	6	2.1	pCi/g	40
Thorium-234	–	–	–	7.3	pCi/g	150
Titanium	1,880,000	µg/kg	6	3,710,000	µg/kg	32
Total petroleum hydrocarbons kerosene		–	–	8,800,000	µg/kg	40
Uranium	1,500	µg/kg	6	280,000	µg/kg	189
Uranium-233/234	0.58	pCi/g	6	140	pCi/g	189
Uranium-235	–	–	–	10.9	pCi/g	32
Uranium-238	0.55	pCi/g	6	150	pCi/g	189
Vanadium	58,300	µg/kg	6	107,000	µg/kg	32
Zinc	70,100	µg/kg	36	84,000	µg/kg	32
Zirconium-95	–	–	–	0.068	pCi/g	150

Site: 216-U-8	Area: U Plant	Category: Deep

Table 4. Geophysical Log Summary

DPT Casing/ Well Number	Cesium-137	Uranium-238/Uranium-235	Other man-made contaminants detected
C4217	0.5 ft at 0.368 pCi/g 32.5 to 36.5 and 23.5 ft: 0.2 to 37 pCi/g (max at 33.5 ft)	U-238: 32.5 to 34.5 ft, 39 to 300 pCi/g (max at 33.5 ft) U-235: 33.5 ft at 13.4 pCi/g	None
C4218	1.51 ft at 0.283 pCi/g	U-238: 37.5 ft at 34 pCi/g No U-235 detected	None
C4219	2.5 ft at 0.383 pCi/g 30.5 to 48.5 ft: 0.3 to 3,000 pCi/g (max at 37.5 ft) Note: detector was saturated from 33.5 to 37.5 ft.	U-238: 40 to 45 ft, to 3,100 pCi/g (max at 43.5 ft) U-235: 41 to 46 ft, max of 141 pCi/g at 43.5 ft	None
C4220	Not logged	Not logged	Not logged; did not reach 50 ft
C4221	0 to 1 ft: 0.3 to 0.702 pCi/g (max at surface)	None detected	None
C4222	9 ft: 0.276 pCi/g	None detected	None
C4223	3 ft: 0.276 pCi/g 29 to 54 ft: 0.3 to 52,000 pCi/g (max at 33 ft)	U-238: 41 ft at 229 pCi/g No U-235 detected	Eu-154: 41 ft at 2 pCi/g
C4224	0.5 ft: 0.529 pCi/g 40.5 to 44.5 ft: 1.1 to 84 pCi/g (max at 41.5 ft)	U-238: 50.5 ft at 18 pCi/g No U-235 detected	None
C4547	0.5 ft: 0.362 pCi/g 33.5 to 48.5 ft: 0.3 to 534 pCi/g (max at 34.5 ft)	U-238: 34.5 to 35.5 ft, 157 pCi/g (max at 34.5 ft) No U-235 detected	None
C4551	0 ft at 0.315 pCi/g	None detected	None
C4552[a]	0 ft at 0.263 pCi/g 46 to 57 ft: 0.5 to 600 pCi/g (max at 49 ft)	None detected	None
C4553	0 ft at 0.926 pCi/g 47 to 59.14 ft: to 85 pCi/g (max at 49 ft)	U-238: 46 ft and 48 ft - 9 and 17 pCi/g, respectively No U-235 detected	None
C4554	0 ft at 1 pCi/g 46 ft at 0.1 pCi/g	None detected	None
A7770 (299-W19-70)	3 to 13 ft: 0 to 0.91 pCi/g (max at 5 ft) 34 to 90 ft: 71,000 pCi/g (max at 39 ft)	U-238: 45 to 90 ft (max of 1,400 pCi/g at 45 ft) No U-235 detected	None
A7771 (299-W19-71)	3.5 to 14.5 ft: 0.2 to 6.13 pCi/g (max at 8.5 ft) 31.5 to 87.91 ft: 0.2 to 28,500 pCi/g (max at 39.5 ft)	U-238: 46.5 to 68.5 ft and 79.5 to 87.91 ft, 24 to 184 pCi/g (max at 46.5 ft) U-235: 46.5 to 68.5 and 79.5 to 87.91, 1.7 to 12 pCi/g (max at 56.5 ft)	None

a. Location of neutron moisture logging.

Source: D&D-27783, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*, Table 3-3.

Note: Produced from the best available copy.

Site: 216-U-8	Area: U Plant	Category: Deep

Table 5. Soil Maximum Detection Summary (from D&D-27783)

Well Identification Number	Waste Site Area	Sample Interval (ft bgs)	Uranium (mg/kg)	Uranium MDL	Nitrogen as Nitrate/ Nitrite (mg/kg)	N (mg/kg) MDL	Tc-99 (pCi/g)	Tc-99 (pCi/g) MDC/MDA
C4714	216-U-8	44 to 45.5	0.724	0.16	11	0.5	U	0.663
C4716	216-U-8	47.5 to 50.5	21.9	0.083	8	0.5	U	0.614
C4717	216-U-8	1 to 2.5	1.34	0.16	3.4	0.5	U	0.652
C4717	216-U-8	37 to 38.5	3.2	0.16	45.4	1	U	0.653
C4717	216-U-8	44 to 45.5	7.74	0.16	150	2	U	0.653
C4718	216-U-8	44 to 45.5	0.416	0.16	3.4	0.5	U	0.655
C4719	216-U-8	44 to 45.5	0.475	0.16	7.2	0.5	U	0.648
C4720	216-U-8	44 to 45.5	U	0.99	25.7	2	U	0.647
C4721	216-U-8	42 to 43.5	3.19	0.95	59.2	5	U	0.613
C4722	216-U-8	43 to 44.5	17.3	0.95	6.7	0.5	U	0.658
C4728	216-U-8	48 to 49.7	6.01	0.15	366	10	U	0.627

Source: D&D-27783, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*, Table 3-5.

Note: Produced from the best available copy.

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] bgs): Cesium-137 was the only manmade radionuclide detected by GPL from 0 to 4.6 m (0 to 15 ft) bgs. GPL results indicate Cesium-137 was detected at levels less than 1 pCi/g, except for one location (A7771/299-W19-71) where it was detected at 6.13 pCi/g at 8.5 ft bgs. Soil sample results for the deep borehole located within the crib (A9796/299-W19-94) indicate background levels of radionuclides in the sample collected at 1.2 to 1.8 m (4 to 6 ft) bgs.

Deep (>4.6 m [>15 ft] bgs): Cesium-137 and U-238 and -235 (also Eu-154 at one location only) were detected using GPL. Contaminant concentration were highest between 10.1 and 15.2 m (33 and 50 ft) bgs. Soil sample results indicate contaminant concentrations were generally highest immediately below the base of the crib, then decreased rapidly with depth to the Cold Creek Unit (CCU) at approximately 57.3 m (188 ft) bgs (with the exception of strontium-90, which was detected at 270 to 520 pCi/g between 30.5 and 61 m [100 and 200 ft] bgs). Uranium isotope concentrations increase at top of the CCU but decrease to non-detect by bottom of the borehole.

Site: 216-U-8	Area: U Plant	Category: Deep

References:

D&D-27783, 2006, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*, Rev. 0, Fluor Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA01917974.

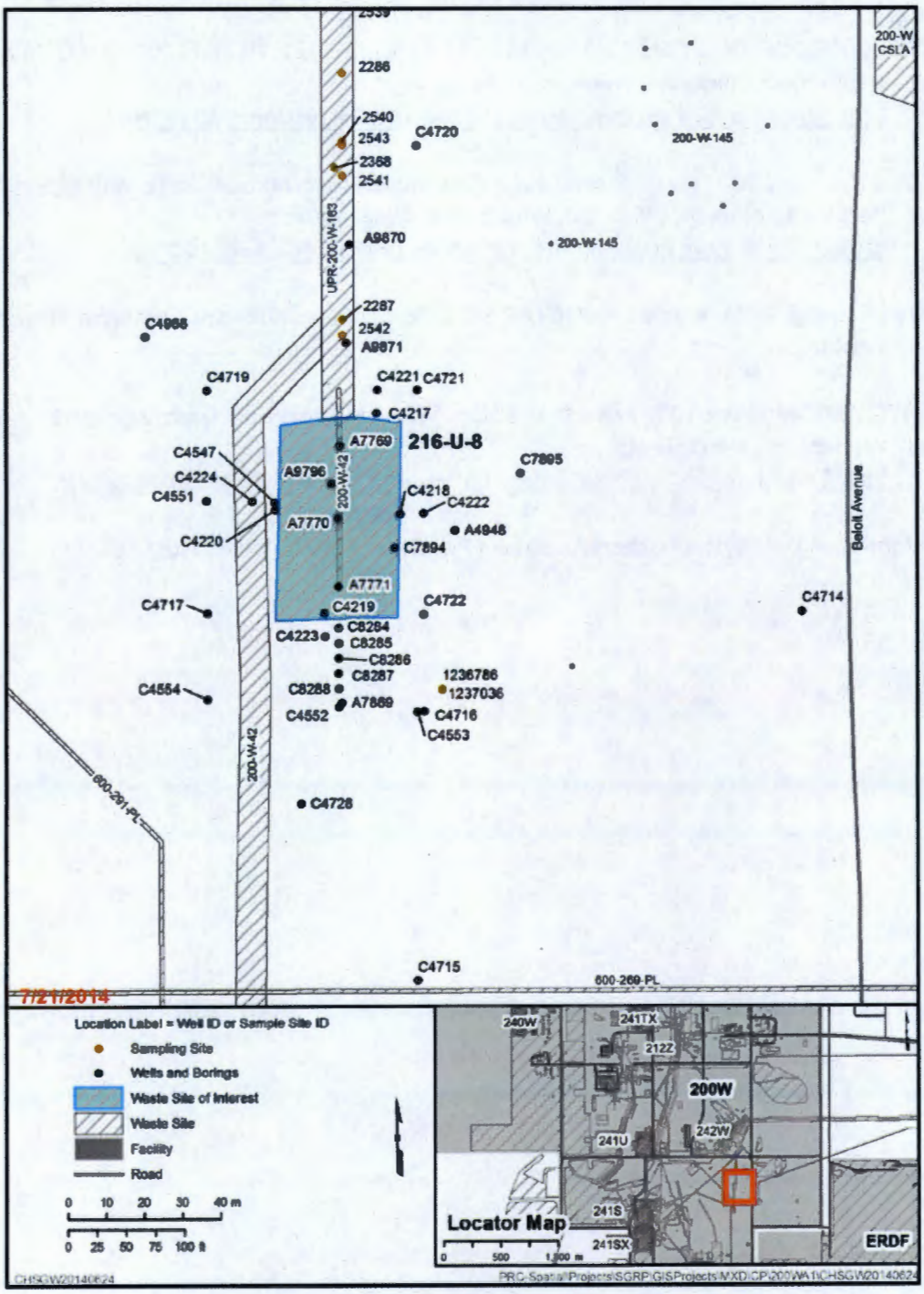
BHI-00608, 1996, *Hanford Sitewide Groundwater Flow and Transport Model Calibration Report*, Rev. 1, Bechtel Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D197301520.

H-2-43028 (drawing), 1974, *Waste Crib 216-U-8*, Sh. 1, Rev. 6, General Electric Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

Waste Information Data System General Summary Report for the 216-U-8 Waste Site.

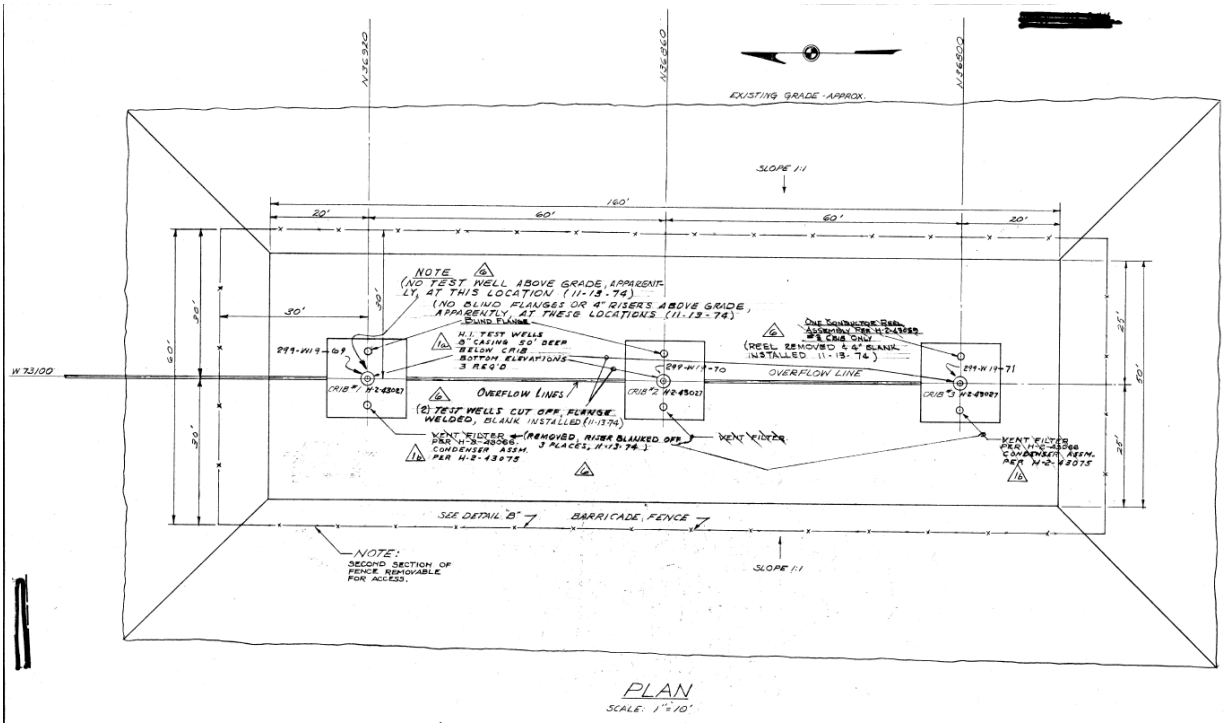
Site: 216-U-8	Area: U Plant	Category: Deep

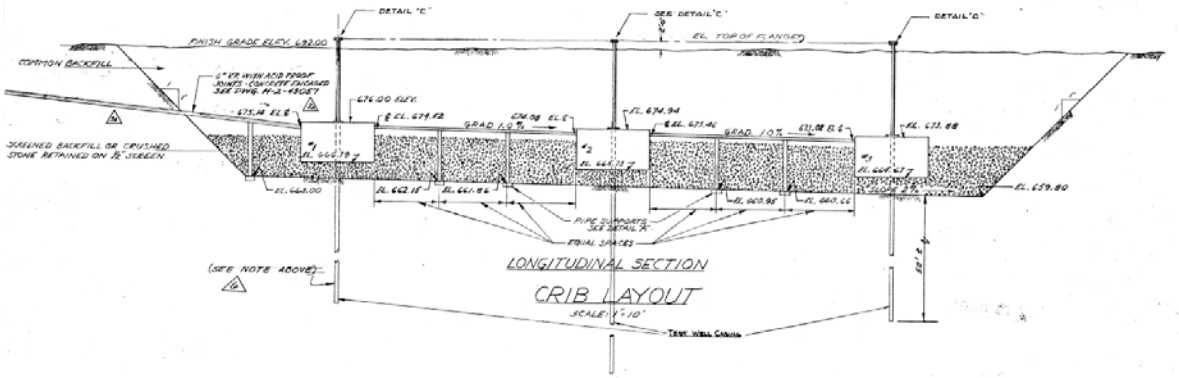


ID = identification
ERDF = Environmental Restoration Disposal Facility

Figure 1. 216-U-8 Waste Site Map

Site: 216-U-8	Area: U Plant	Category: Deep





Source: H-2-43028, *Waste Crib 216-U-8*.

Note: Produced from the best available copy.

Figure 2. 216-U-8 Crib Plan View and Cross Section

Site: 216-U-8	Area: U Plant	Category: Deep

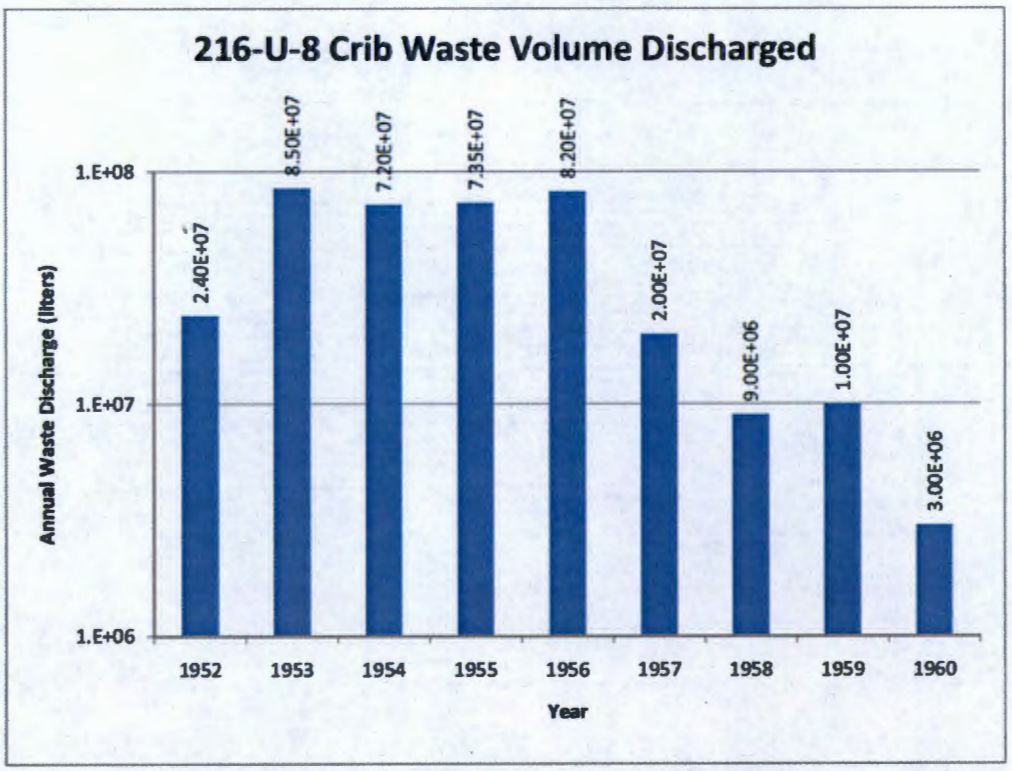


Figure 3. 216-U-8 Crib Waste Volume Discharged

Site: 216-U-12	Area: U Plant	Category: Deep

Site Description

Site Type: Crib
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1
Service Dates: 1960 to 1988

Waste Site Location and Physical Description: The Crib is located south of 16th Street, west of Beloit Avenue, and south of the 216-U-8 Crib (Figure 1). The bottom of the crib was filled with approximately 264 m^3 (9,320 ft^3) of gravel. A perforated 30 cm (12 in.) vitrified clay pipe runs horizontally the length of the unit below grade (Figure 2). In 1988, the pipeline connecting to the 216-U-12 Crib (200-W-42) was cut and capped.

Waste Site Coordinates:
E-567592.09208 N-134501.26825

Site Dimensions:
Site Length: 30.48 m (100 ft)
Site Width: 3.05 m (10.00 ft)
Site Area: 92.96 m^2 (1,000 ft^2)
Site Depth: 4.57 m (15 ft) to bottom of structure
Overburden Depth: 2.9 m (9.5 ft)

Related Site Structure(s): The 216-U-12 Crib was built to replace the 216-U-8 Crib when it showed signs of cave-in potential. The 216-U-12 Crib received drainage from the 224-U facility and 291-U stack via an underground vitrified clay pipeline, 200-W-42.

Site Posting: The Site is marked and posted with Underground Radioactive Material signs.

Site History

Release Summary: From April 1960 to May 1967, the site received 291-U-1 Stack drainage, 241-WR Vault waste, and 224-U process condensate via the C-5 Tank. Contaminated water from the 241-WR Vault was discharged to the crib in October 1965, including 3.14 kg (6.9 lb) of thorium. From May 1967 to September 1972, the site received the above wastes (excluding the 241-WR Vault waste) and occasional waste via the C-7 Tank in the 224-U building. From September 1972 to November 1981, the site was taken out of service. From November 1981 to January 1987, the site received corrosive process condensate (typical pH range of 0.5 – 1.5) from the 224-U building. The crib also received miscellaneous storm drain wastes from 224-U building. Between April 1960 and September 1972, 6.7+E05 kg (1.5E+06 lb) of nitrate was released to the crib from the Uranium Tri-Oxide process.

Site: 216-U-12	Area: U Plant	Category: Deep

The estimated volume of liquid waste discharged to the site is approximately 1.5E+08 L (3.96E+07 gal) and the calculated potential lifetime discharge exceeds one vadose zone pore volume.

A detailed summary of the waste discharge to the crib is shown in Figure 3.

Volume/Mass Discharged: 1.5E+08 L (3.96E+07 gal)

Pore Volume Discharged: 1.5E+08 L/ (227 ft x 1,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 78

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-U-12 Waste Site

Contaminant	Mass Discharged
Pu	1 g
Beta	850 Ci
Sr-90	100 Ci
Ru-160	80 Ci
Cs-137	<0.1 Ci
Co-60	<0.1 Ci
U	18,000 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: Radiological surveys of the surface are performed annually. Surveillance and maintenance inspections are done quarterly. A site walkdown was conducted on September 17, 1996. In June 2003, Well 299-W22-75, located near the crib center line, was characterized with gamma logging equipment. Cesium-137 was detected in the zone located from 5.1 to 18.3 m (17 to 61 ft) below the ground surface (bgs).

Borehole and data summaries are presented in Tables 2 through 11. Borehole locations are shown in Figure 1.

In 1993, characterization borehole 299-W22-78 / A7882 was installed 1.5 m (5 ft) east of the 216-U-12 waste site limits and soil samples collected for analysis. This borehole extended to 71.5 m (234.5 ft) bgs but did not extend to groundwater (approximately 82.3 m [270 ft] bgs). Contaminant concentrations were generally low at the Cold Creek Unit (CCU) at approximately 57 m (187 ft) bgs.

Site: 216-U-12	Area: U Plant	Category: Deep

In 2003 to 2005, geophysical surveys were conducted at two deep (29.9 and 53.6 m [98 and 176 ft] bgs) wells located inside the crib, and one deep (75.9 m (249 ft) bgs located 18.2 m (60 ft) southeast of the crib. Geophysical surveys were conducted to approximately 15.2 m (50 ft) bgs at nine direct push boreholes located outside the crib. Soil samples were collected between 12.5 and 13.9 m (41 and 45.5 ft) bgs at eight auger boreholes, with limited sampling for technetium-99, nitrogen as nitrate/nitrite, mercury, cadmium, uranium (metal), uranium-235, -238, antimony, and arsenic and other Inductively Coupled Plasma-Mass Spectrometer metals (barium, chromium [total], cobalt, copper, lead, manganese, selenium, silver, strontium, thallium, titanium, vanadium, and zinc). Samples were also collected at 5.5 and 11.6 m (18 and 38 ft) bgs at one of these locations.

Groundwater wells associated with 216 U 12 Crib (299-W22-22, 299-W22-23, 299-W22-24, 299-W22-24P through -24T, 299-W22-40, 299-W22-41, 299-W22-42, and 299-W22-79) had detections of carbon tetrachloride (CTET), nitrate, chromium and radionuclides, including cesium-137, strontium-90, and tritium, above drinking water standards. CTET results ranged from non-detect to 10 µg/L from 1987 to 2013. Nitrate concentrations up to 660,000 µg/L 1995 were detected from 1960 to 2013. Chromium concentrations up to 2,500 µg/L were detected from 1991 to 2013. For radionuclides, strontium-90 was detected at concentrations up to 900 pCi/L from 1961 to 2013. Tritium was detected at concentrations up to 889,000 pCi/L from 1971 to 2013. Cesium-137 results generally ranged from non-detect to 39 pCi/L. One detection in 1960 (500 pCi/L at 299-W22-24) exceeded the drinking water standard.

Table 2. Borehole Summary for the 216-U-12 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
1993	299-W22-78 / A7882	Outside – 5 ft east	4 – 232.5 (17 samples)
2003	299-W22-75 / A7879	Inside	2 – 176 (GPL)
2003	A4967	Outside – 60 ft southeast	2 – 249 (GPL)
2004	C4225	Outside – 20 ft north	1 – 48 (GPL)
2004	C4226	Outside – 25 ft east	1 – 48 (GPL)
2004	C4227	Outside – 20 ft south	0.5 – 48.5 (GPL)
2004	C4228	Outside – 20 ft west	0.5 – 48.5 (GPL)
2004	C4229	Outside – 40 ft north	0 – 49.1 (GPL)
2004	C4231	Outside – 80 ft northwest	0 – 49.5 (GPL)
2004	C4232	Outside – 40 ft west	0 – 49.2 (GPL)
2004	C4555	Outside – 80 ft west	0 – 49.6 (GPL)
2004	C4556	Outside – 80 ft southwest	0 – 49 (GPL)
2005	299-W22-73 / A7877	Inside	0.25 – 99.7 (GPL)

Site: 216-U-12	Area: U Plant	Category: Deep

Table 2. Borehole Summary for the 216-U-12 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2005	C4715	Outside - 200 ft northeast	44 – 46 (1 sample)
2005	C4723	Outside - 340 ft east	44 – 46 (1 sample)
2005	C4724	Outside – 20 ft southeast	44 – 46 (1 sample)
2005	C4725	Outside – 20 ft north	44 – 46 (1 sample)
2005	C4726	Outside – 80 ft west	44 – 46 (1 sample)
2005	C4730	Outside – 25 ft east	18 – 46 (3 samples)

GPL = geophysical log
ID = identification

Table 3. Geophysical Log Summary for the 216-U-12 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A7877	0 to 5	2.2	pCi/g	2.5	15,209	cpm	2.5
	5 to 10	3.9	pCi/g	9.5	20,239	cpm	9.5
	10 to 15	3.8	pCi/g	11.5	18,229.6	cpm	11.5
	>15	132.7	pCi/g	23.5	49,066.4	cpm	21.5
A7879	0 to 5	–	pCi/g	–	–	cpm	–
	5 to 10	–	pCi/g	–	–	cpm	–
	10 to 15	–	pCi/g	–	–	cpm	–
	>15	633.3	pCi/g	49	52,867.6	cpm	44

bgs = below ground surface
ID = identification

Site: 216-U-12	Area: U Plant	Category: Deep

Table 4. Summary of 2004 Geophysical Logging at the 216-U-12 Crib

DPT Casing/ Well Number	Interval of Detection of Cs-137 in Feet and Concentration Range	Interval of Detection of U-238/U-235 in Feet and Concentration Range
C4225	9 to 21 ft: 0.3 to 80 pCi/g (max at 10 ft) 29 and 41 ft: 0.2 pCi/g	None detected
C4226	23.5 ft: 0.3 pCi/g	None detected
C4227	None detected	None detected
C4228	None detected	U-238: 32.5 to 41.5 ft, 17 to 61 pCi/g (max at 40 ft) U-235: 31.5 to 40.5 ft, 2.1 to 3.8 pCi/g (max at 33.5 ft)
C4229	0 ft: 0.3 pCi/g 10 to 11 ft: 1.1 to 1.22 pCi/g (max at 10 ft)	None detected
C4231	0 ft: 0.653 pCi/g 2 ft: 0.3 pCi/g	None detected
C4232	0 ft: 0.207 pCi/g 17 ft: 0.1 pCi/g	U-238: 26 to 40 ft, to 77 pCi/g (max at 38 ft) U-235: 34 to 40 ft, to 4 pCi/g (max at 39 ft)
C4555[a]	0 to 1 ft: 0.3 to 1.31 pCi/g (max at 0 ft)	None detected
C4556	0 ft: 0.967 pCi/g	None detected
299-W22-22	Detected at a few sporadic locations in the borehole near its MDL of approximately 0.2 pCi/g	None
299-W22-23	Detected at a few sporadic locations in the borehole near its MDL of approximately 0.2 pCi/g	None
A7879 (299-W22-75)	12 to 61 ft: 0.3 to 8,400 pCi/g. (max at 25 ft)	U-238: 17 to 20 ft, 55 to 330 pCi/g. 29 to 31 ft; 20 to 30 pCi/g. 37 to 53 ft; 17 to 75 pCi/g. 61 to 81 ft ; 17 to 335 pCi/g. (max at 76 ft, although the highest concentration may be in the interval of high dead time 20-27 ft where the MDL significantly increases) U-235: 18 to 19 ft; 6 to 9 pCi/g. 68 to 81 ft ;1.8 to 22 pCi/g. (max at 75 ft)
A7877 (299-W22-73)	1.5 to 57.5 ft: 5 pCi/g at 10 ft (max 130 pCi/g at 23.5 ft)	U-238 and U-235 from 19.5 to 29.5 ft, max U-238 of 40 pCi/g and max U-235 of 2 pCi/g at 21 ft.

a. Location of neutron moisture logging.

Source: D&D-27783, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*, Table 3-4.

Site: 216-U-12	Area: U Plant	Category: Deep

Table 5. Soil Maximum Detection Summary (Soil Borehole A7882)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Aluminum	7,350,000	µg/kg	6	–	–	–
Arsenic	8,600	µg/kg	6	–	–	–
Barium	104,000	µg/kg	6	–	–	–
Calcium	20,400,000	µg/kg	6	–	–	–
Chloride	6,000	µg/kg	6	–	–	–
Chromium	8,400	µg/kg	6	–	–	–
Cobalt	11,800	µg/kg	6	–	–	–
Copper	15,800	µg/kg	6	–	–	–
Fluoride	3,200	µg/kg	6	–	–	–
Gross alpha	11	pCi/g	6	11	pCi/g	187.5
Gross beta	18	pCi/g	6	460	pCi/g	23
Iron	22,400,000	µg/kg	6	–	–	–
Lead	7,500	µg/kg	6	–	–	–
Magnesium	6,990,000	µg/kg	6	–	–	–
Nickel	8,400	µg/kg	6	–	–	–
Nitrogen in nitrite and nitrate	–	–	–	197,000	µg/kg	212
Potassium	1,200,000	µg/kg	6	–	–	–
Potassium-40	13	pCi/g	6	–	–	–
Radium-226	0.56	pCi/g	6	–	–	–
Radium-228	0.89	pCi/g	6	–	–	–
Sulfate	8,000	µg/kg	6	–	–	–
Technetium-99	–	–	–	1	pCi/g	212
Thorium-228	0.92	pCi/g	6	–	–	–
Thorium-232	0.89	pCi/g	6	–	–	–

Site: 216-U-12	Area: U Plant	Category: Deep

Table 5. Soil Maximum Detection Summary (Soil Borehole A7882)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Titanium	1,780,000	µg/kg	6	5,100	µg/kg	40.6
Uranium	–	–	–	–	–	–
Uranium-233/234	0.51	pCi/g	6	2.3	pCi/g	40.6
Uranium-234	–	–	–	0.25	pCi/g	152
Uranium-235	–	–	–	0.24	pCi/g	40.6
Uranium-238	0.6	pCi/g	11	2.2	pCi/g	40.6
Vanadium	55,200	µg/kg	6	–	–	–

Table 6. Soil Maximum Detection Summary (Soil Borehole C4723)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Arsenic	–	–	–	5,390	µg/kg	46
Barium	–	–	–	72,000	µg/kg	46
Chromium	–	–	–	9,090	µg/kg	46
Cobalt	–	–	–	6,160	µg/kg	46
Copper	–	–	–	12,500	µg/kg	46
Lead	–	–	–	2,700	µg/kg	46
Manganese	–	–	–	270,000	µg/kg	46
Nickel	–	–	–	10,500	µg/kg	46
Nitrogen in Nitrite and Nitrate	–	–	–	5,000	µg/kg	46
Selenium	–	–	–	1,300	µg/kg	46
Strontium	–	–	–	33,600	µg/kg	46
Thallium	–	–	–	149	µg/kg	46

Site: 216-U-12	Area: U Plant	Category: Deep

Table 6. Soil Maximum Detection Summary (Soil Borehole C4723)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Titanium	–	–	–	1,280,000	µg/kg	46
Uranium	–	–	–	413	µg/kg	46
Uranium-234	–	–	–	0.669	pCi/g	46
Uranium-238	–	–	–	0.647	pCi/g	46
Vanadium	–	–	–	42,100	µg/kg	46
Zinc	–	–	–	49,700	µg/kg	46

Table 7. Soil Maximum Detection Summary (Soil Borehole C4724)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Arsenic	–	–	–	2,740	µg/kg	46
Barium	–	–	–	64,000	µg/kg	46
Cadmium	–	–	–	118	µg/kg	46
Chromium	–	–	–	8,420	µg/kg	46
Cobalt	–	–	–	5,830	µg/kg	46
Copper	–	–	–	11,400	µg/kg	46
Lead	–	–	–	2,690	µg/kg	46
Manganese	–	–	–	259,000	µg/kg	46
Nickel	–	–	–	9,270	µg/kg	46
Selenium	–	–	–	1,110	µg/kg	46
Strontium	–	–	–	35,800	µg/kg	46
Technetium-99	–	–	–	0.993	pCi/g	46
Thallium	–	–	–	139	µg/kg	46
Titanium	–	–	–	1,130,000	µg/kg	46

Site: 216-U-12	Area: U Plant	Category: Deep

Table 7. Soil Maximum Detection Summary (Soil Borehole C4724)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Uranium	–	–	–	501	µg/kg	46
Uranium-234	–	–	–	0.6	pCi/g	46
Uranium-238	–	–	–	0.503	pCi/g	46
Vanadium	–	–	–	36,700	µg/kg	46
Zinc	–	–	–	40,500	µg/kg	46

Table 8. Soil Maximum Detection Summary (Soil Borehole C4725)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Arsenic	–	–	–	5,600	µg/kg	46
Barium	–	–	–	85,600	µg/kg	46
Cadmium	–	–	–	188	µg/kg	46
Chromium	–	–	–	12,700	µg/kg	46
Cobalt	–	–	–	7,730	µg/kg	46
Copper	–	–	–	14,600	µg/kg	46
Lead	–	–	–	3,580	µg/kg	46
Manganese	–	–	–	372,000	µg/kg	46
Nickel	–	–	–	14,200	µg/kg	46
Nitrogen in Nitrite and Nitrate	–	–	–	3,200	µg/kg	46
Selenium	–	–	–	729	µg/kg	46
Strontium	–	–	–	46,500	µg/kg	46
Thallium	–	–	–	102	µg/kg	46
Titanium	–	–	–	1,360,000	µg/kg	46

Site: 216-U-12	Area: U Plant	Category: Deep

Table 8. Soil Maximum Detection Summary (Soil Borehole C4725)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Uranium	–	–	–	517	µg/kg	46
Uranium-234	–	–	–	0.811	pCi/g	46
Uranium-235	–	–	–	0.023	pCi/g	46
Uranium-238	–	–	–	0.75	pCi/g	46
Vanadium	–	–	–	46,900	µg/kg	46
Zinc	–	–	–	47,400	µg/kg	46

Table 9. Soil Maximum Detection Summary (Soil Borehole C4726)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Technetium-99	–	–	–	2.35	pCi/g	46
Uranium-234	–	–	–	2.06	pCi/g	46
Uranium-235	–	–	–	0.088	pCi/g	46
Uranium-238	–	–	–	1.62	pCi/g	46

Table 10. Soil Maximum Detection Summary (Soil Borehole C4730)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Arsenic	–	–	–	6,060	µg/kg	40
Barium	–	–	–	118,000	µg/kg	46
Cadmium	–	–	–	159	µg/kg	20
Chromium	–	–	–	10,100	µg/kg	40

Site: 216-U-12	Area: U Plant	Category: Deep

Table 10. Soil Maximum Detection Summary (Soil Borehole C4730)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Cobalt	–	–	–	7,940	µg/kg	20
Copper	–	–	–	14,800	µg/kg	40
Lead	–	–	–	4,610	µg/kg	20
Manganese	–	–	–	317,000	µg/kg	40
Mercury	–	–	–	73	µg/kg	20
Nickel	–	–	–	9,180	µg/kg	46
Selenium	–	–	–	1,630	µg/kg	20
Strontium	–	–	–	38,700	µg/kg	40
Technetium-99	–	–	–	0.707	pCi/g	40
Thallium	–	–	–	133	µg/kg	40
Titanium	–	–	–	2,120,000	µg/kg	20
Uranium	–	–	–	5,660	µg/kg	40
Uranium-234	–	–	–	6.04	pCi/g	46
Uranium-235	–	–	–	0.29	pCi/g	46
Uranium-238	–	–	–	4.86	pCi/g	46
Vanadium	–	–	–	49,200	µg/kg	20
Zinc	–	–	–	55,800	µg/kg	40

Site: 216-U-12	Area: U Plant	Category: Deep

Table 11. Summary of 2004 Soil Samples for the 216-U-12 Crib

Well Identification Number	Waste Site Area	Sample Interval (ft bgs)	Uranium (mg/kg)	Uranium MDL	Nitrogen as Nitrate/ Nitrite (mg/kg)	N (mg/kg) MDL	Tc-99 (pCi/g)	Tc-99 (pCi/g) MDC/MDA
C4715	216-U-12	44 to 45.5	0.838	0.15	11	0.5	U	0.664
C4723	216-U-12	44 to 45.5	0.413	0.12	5	0.5	U	0.673
C4724	216-U-12	44 to 45.5	0.501	0.15	82.9	2	0.993	0.626
C4725	216-U-12	44 to 45.5	0.517	0.12	3.2	0.5	U	0.629
C4726	216-U-12	41 to 42.5	3.12	0.15	544	10	2.36	0.0951
C4727	216-U-12	44 to 45.5	0.476	0.15	3.7	0.5	U	0.63
C4729	216-U-12	44 to 45.5	0.399	0.16	6.9	0.5	U	0.625
C4730	216-U-12	18 to 19.5	0.848	0.15	U	0.5	U	0.633
C4730	216-U-12	38 to 39.5	8.01	0.16	149	2	0.707	0.625
C4730	216-U-12	44 to 45.5	3.63	0.16	109	0.5	U	0.628

a. U indicates that the contaminant was undetected at the shown location.

Source: D&D-27783, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*, Table 3-5.

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] bgs): Geophysical logging (GPL) detected cesium-137 from 0.46 to 4.6 m (1.5 to 15 ft) bgs (maximum 3.9 pCi/g at 2.9 m [9.5 ft] bgs) in one of two boreholes (299-W22-73/A7877) within the crib footprint. Cesium-137 results for the other borehole were below background or nondetect. Outside the crib, cesium-137 was detected above background at boreholes located north of the crib, with the maximum concentrations occurring at 3 m (10 ft) bgs (80 pCi/g at C4225 and 1.22 pCi/g at C4229). Soil sample results for the deep borehole installed at the eastern edge of the crib (A7882/299-W22-78) indicate background levels of radionuclides at 1.2 to 3.3 m (4 to 11 ft) bgs.

Deep (>4.6 m [>15 ft] bgs): Based on GPL results, cesium-137 was detected to a depth of 18.6 m (61 ft) bgs at boreholes located within the crib. Maximum cesium-137 for these boreholes were about 3 m (10 ft) below the crib bottom (130 pCi/g at 7.2 m (23.5 ft) at 299-W22-73/A7877 and 8,400 pCi/g at 7.6 m (25 ft) bgs at 299-W22-75/A7879). Outside the crib, cesium-137 results using GPL were generally below background or nondetect. Uranium-238 and -235 were detected by GPL at boreholes located inside and outside the crib. At A7877, detections occurred from 5.9 to 8.9 m (19.5 to 29.5 ft) bgs, with the maximum concentrations occurring at 6.4 m (21 ft) bgs. At the southernmost borehole within the crib (A7879), uranium-238 was detected at multiple depth intervals between 5.2 and 24.7 m (17 and 81 ft) bgs, with the maximum detections occurring at 22.9 to 23.1 m (75 to 76 ft) bgs (335 pCi/g uranium-238, 22 pCi/g uranium-235). Outside the crib, uranium-238 and -235 were detected between 7.9 and 12.7 m (26 and 41.5 ft) bgs at two boreholes located west of the crib (C4228 and C4232). At the deep borehole, 18.3 m (60 ft) southeast of the crib, cesium-137 and cobalt-60 were detected only

Site: 216-U-12	Area: U Plant	Category: Deep

sporadically at concentrations near the detection limit. Radiological and inorganic contaminants were detected in soil samples collected from the deep borehole at the eastern edge of the crib (A7882/299-W22-78). Maximum detected uranium-238 results were in the sample collected at 14 m (46 ft) bgs. Cesium-137 was not analyzed. Radiological and inorganic analytes were detected at locations surrounding the crib.

References:

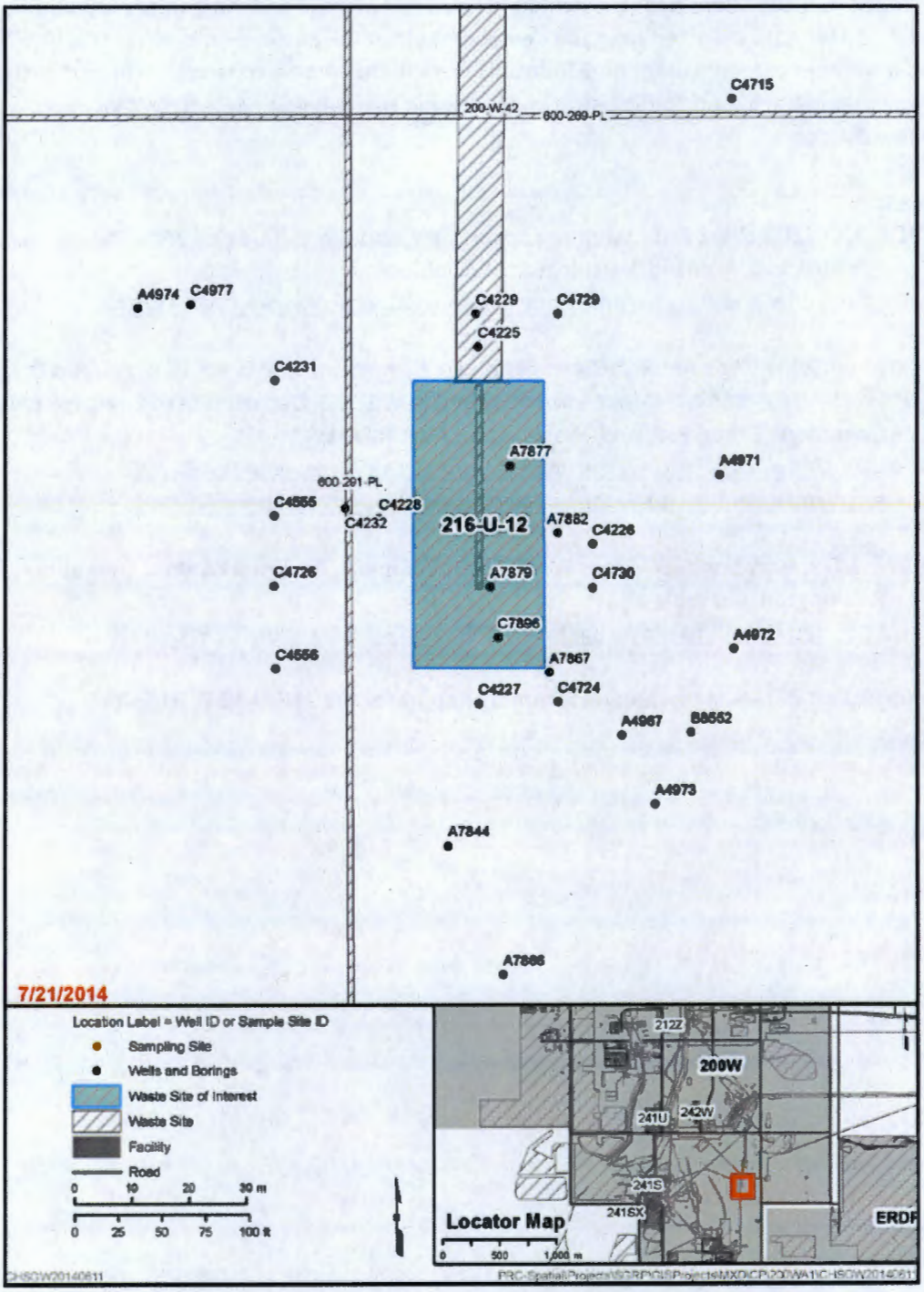
D&D-27783, 2006, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*, Rev. 0, Fluor Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA01917974.

DOE/RL-2000-60, 2004, *Uranium-Rich/General Process Condensate & Process Waste Group OU RI/FS Work Plan & RCRA TSD Unit Sampling Plan*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D5496707. http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D5496930.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

Waste Information Data System General Summary Report for the 216-U-12 Waste Site.

Site: 216-U-12	Area: U Plant	Category: Deep

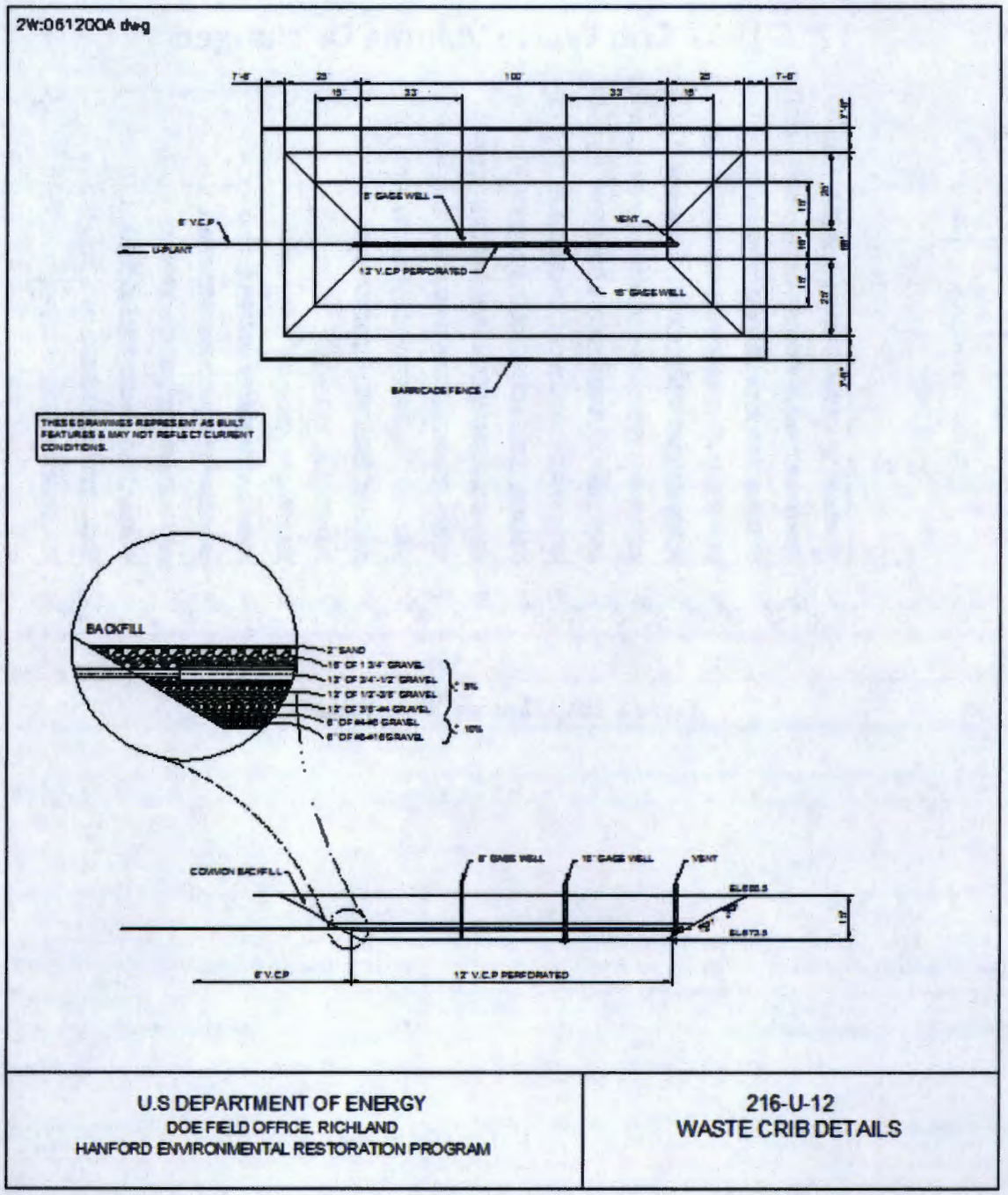


ERDF = Environmental Restoration Disposal Facility

ID = identification

Figure 1. 216-U-12 Waste Site Map

Site: 216-U-12	Area: U Plant	Category: Deep



Source: DOE/RL-2000-60, *Uranium-Rich/General Process Condensate & Process Waste Group OU RI/FS Work Plan & RCRA TSD Unit Sampling Plan.*

Note: Produced from the best available copy.

Figure 2. 216-U-12 Crib Construction Diagram

Site: 216-U-12	Area: U Plant	Category: Deep

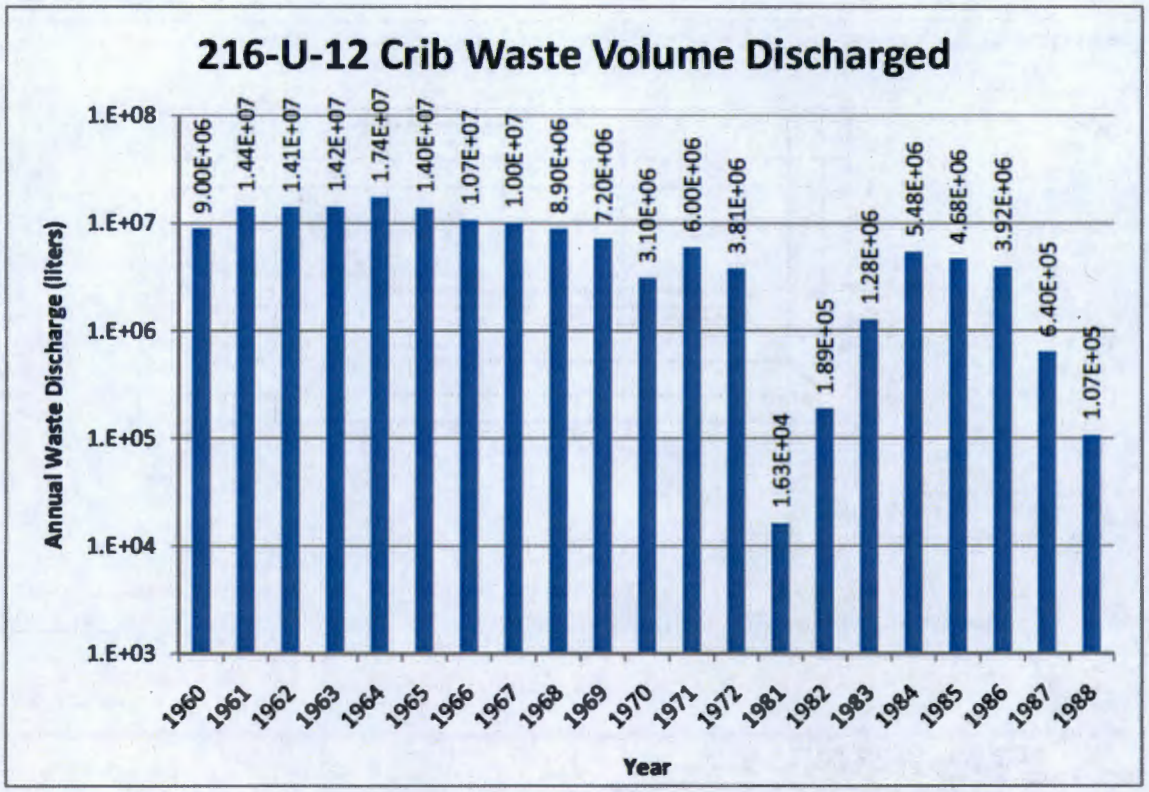


Figure 3. 216-U-12 Annual Waste Volume

Site: 216-U-13	Area: U Plant	Category: Intermediate

Site Description

Site Type: Trench
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: March 1952 to March 1956

Waste Site Location and Physical Description: This Trench was located west of the 241-U Tank Farm and consisted of two trenches of equal dimensions (Figures 1 and 2). The trenches were sloped so vehicles could be driven down to the decontamination station at the bottom. Some debris is visible in the area and the area is not level. Many deep gullies are located in the area west of the 241-U Tank Farm. When the pits were deactivated in 1956, contaminated soils in the bottom of the pits were removed. The steam cleaning equipment was removed in the 1960s and the pits were backfilled.

Waste Site Coordinates:
E-566717.62455 N-135067.46484

Site Dimensions:
Site Length: 61 m (200 ft)
Site Width: 6.1 m (20 ft)
Site Area: 372 m^2 (4,000 ft^2)
Site Depth: 5.49 m (18 ft) to bottom of structure
Cover Thickness: Not applicable
Note: These are the dimensions for each trench

Related Site Structure(s): Not applicable.

Site Posting: Not applicable.

Site History

Release Summary: The open trenches operated as a decontamination pit and received drainage from equipment steam cleaning and decontamination activities done inside the trenches. The pits were used mainly to decontaminate trucks and cranes bearing low levels of radioactive contamination. Several large pumps used in the Uranium Recovery operation were also cleaned here, but the residue was scrapped and taken to the 200 West Burial Grounds. The site waste may include traces of detergent and nitric acid.

The estimated volume of liquid waste discharged to the site is approximately 1.14E+04 L (3.01E+03 gal) and the calculated potential lifetime discharge would not exceed one vadose zone pore volume.

A detailed summary of the waste discharge to the trench is shown in Figure 3.

Site: 216-U-13	Area: U Plant	Category: Intermediate

Volume/Mass Discharged: 1.14E+04 L (3.01E+03 gal)

Pore Volume Discharged: 1.1E+04 L/ (219 ft x 8,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.001

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-U-13 Waste Site

Contaminant	Mass Discharged
Pu	<0.1 g
Beta	50 Ci
Sr-90	<0.1 Ci
Ru-160	10 Ci
Cs-137	<0.1 Ci
Co-60	<0.1 Ci
U	0.45 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: A radiation survey of the site was performed on September 24, 1981, and except for two spots, all ground surface and vegetation at the trench site was less than background. On August 10 and 11, 1982, excavations of the trenches were done to allow for sub-surface radiation surveys. The results found the site to be free of surface and subsurface radiological contamination.

Existing soil data are for a borehole located 30.5 m (100 ft) south of the trench. Samples at 2.1 and 70 m (7 and 230 ft) below ground surface (bgs) show no significant contamination. The geophysical log of this well shows no significant detections of manmade radionuclides.

Groundwater well (299-W18-31 [A4943]) was formerly located through center of site. The well was geophysically logged in 1991. Results show no significant detections of radionuclides.

Well and borehole locations are shown on Figure 1. Borehole and sample results summaries are presented in Tables 2 through 4.

Site: 216-U-13	Area: U Plant	Category: Intermediate

Table 2. Borehole Summary for the 216-U-13 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
1991	299-W18-31 / A4943	Inside	0.4 – 227 (GPL)
2001	299-W18-40 / C3395	Outside - South 100 ft	0 – 260 (GPL) 0- 230 (2 soil samples)

GPL = geophysical log
ID = identification

Table 3. Geophysical Log Summary for the 216-U-13 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
C3395	0 to 5	0.21	pCi/g	0.0	5,800.3	cpm	5
	5 to 10	–	pCi/g	–	6,115.9	cpm	6
	10 to 15	–	pCi/g	–	4,499.2	cpm	15
	>15	–	pCi/g	–	8,196.4	cpm	118

bgs = below ground surface
ID = identification

Table 4. Soil Maximum Detection Summary (Soil Borehole C3395)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Aluminum	8,100,000	µg/kg	7	7,280,000	µg/kg	230
Ammonia	3,280	µg/kg	7	–	–	–
Barium	537	µg/L	7	729	µg/L	230
Beryllium	–	–	–	0.79	µg/L	230
Bismuth	5,800	µg/kg	7	–	–	–

Site: 216-U-13	Area: U Plant	Category: Intermediate

Table 4. Soil Maximum Detection Summary (Soil Borehole C3395)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Chromium	–	–	–	94.6	µg/L	230
Copper	11,700	µg/kg	7	13,600	µg/kg	230
Hexavalent Chromium	–	–	–	4,300	µg/kg	230
Iron	25,100,000	µg/kg	7	19,900,000	µg/kg	230
Lead	–	–	–	33.8	µg/L	230
Magnesium	5,640,000	µg/kg	7	3,560,000	µg/kg	230
Manganese	397,000	µg/kg	7	497,000	µg/kg	230
Molybdenum	–	–	–	5,100	µg/kg	230
Nickel	–	–	–	39.9	µg/L	230
Potassium	1,280,000	µg/kg	7	880,000	µg/kg	230
Potassium-40	12.9	pCi/g	7	9.99	pCi/g	230
Radium-226	0.552	pCi/g	7	0.358	pCi/g	230
Radium-228	0.784	pCi/g	7	0.476	pCi/g	230
Sodium	383,000	µg/kg	7	664,000	µg/kg	230
Thorium-228	0.73	pCi/g	7	0.51	pCi/g	230
Thorium-230	0.706	pCi/g	7	–	–	–
Thorium-232	0.872	pCi/g	7	0.476	pCi/g	230
Tin	4,600	µg/kg	7	4,300	µg/kg	230
Uranium-233/234	0.49	pCi/g	7	0.319	pCi/g	230
Uranium-235	0.05	pCi/g	7	0.032	pCi/g	230
Uranium-238	0.593	pCi/g	7	0.341	pCi/g	230
Zinc	9.7	µg/L	7	21	µg/L	230

Site: 216-U-13	Area: U Plant	Category: Intermediate

Nature and Extent of Contamination:

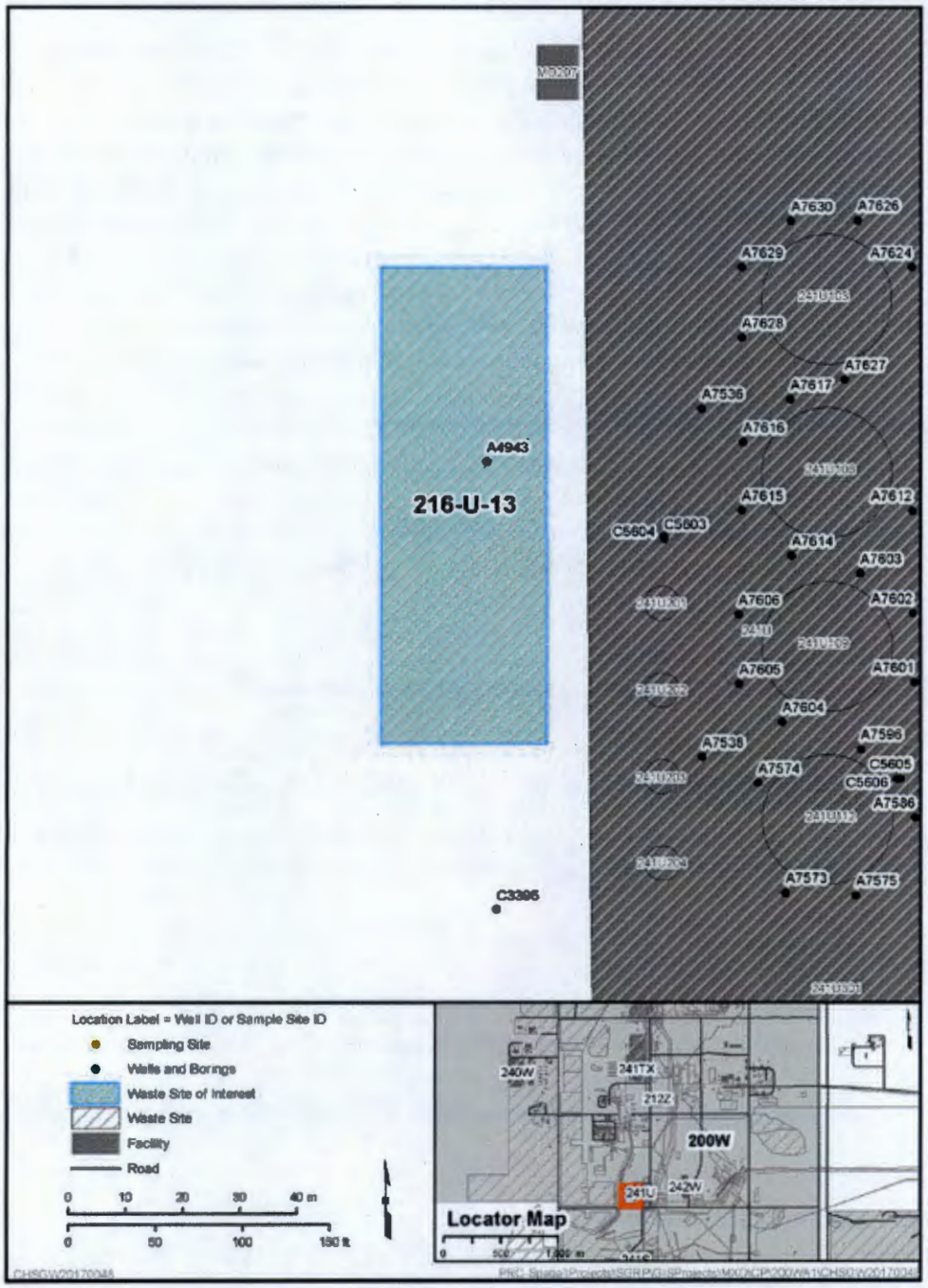
Based on existing information, the deep soil below the trench (>5.5 m [>18 ft] bgs) could be contaminated by former vehicle decontamination activities. Because the trench was backfilled after use and previous radiation surveys indicated no radiological contamination, the soil from 0 to 5.5 m (0 to 18 ft) bgs within the trench has a low potential for contamination. Contaminated soil was reportedly removed from the base of the trench before it was backfilled. Because vehicle decontamination activities were likely to have occurred near the center of the trenches on level ground, the potential for shallow soil contamination along the ends of the trench where the ground was sloped to accommodate vehicle access to the trench is low. The estimated volume of liquids discharged to the trench (0.001 pore volume) was insufficient to affect groundwater and suggests contamination, if present, would not extend very deep below the trench. The approximate depth to groundwater is 72.2 m (237 ft) bgs.

References:

H-2-44511 (drawing), 2002, Area Map 200 West "U" Plant Facilities, Sh. 70, Rev. 8, U.S. Department of Energy, Office of River Protection, Richland, Washington.

Waste Information Data System General Summary Report for the 216-U-13 Waste Site.

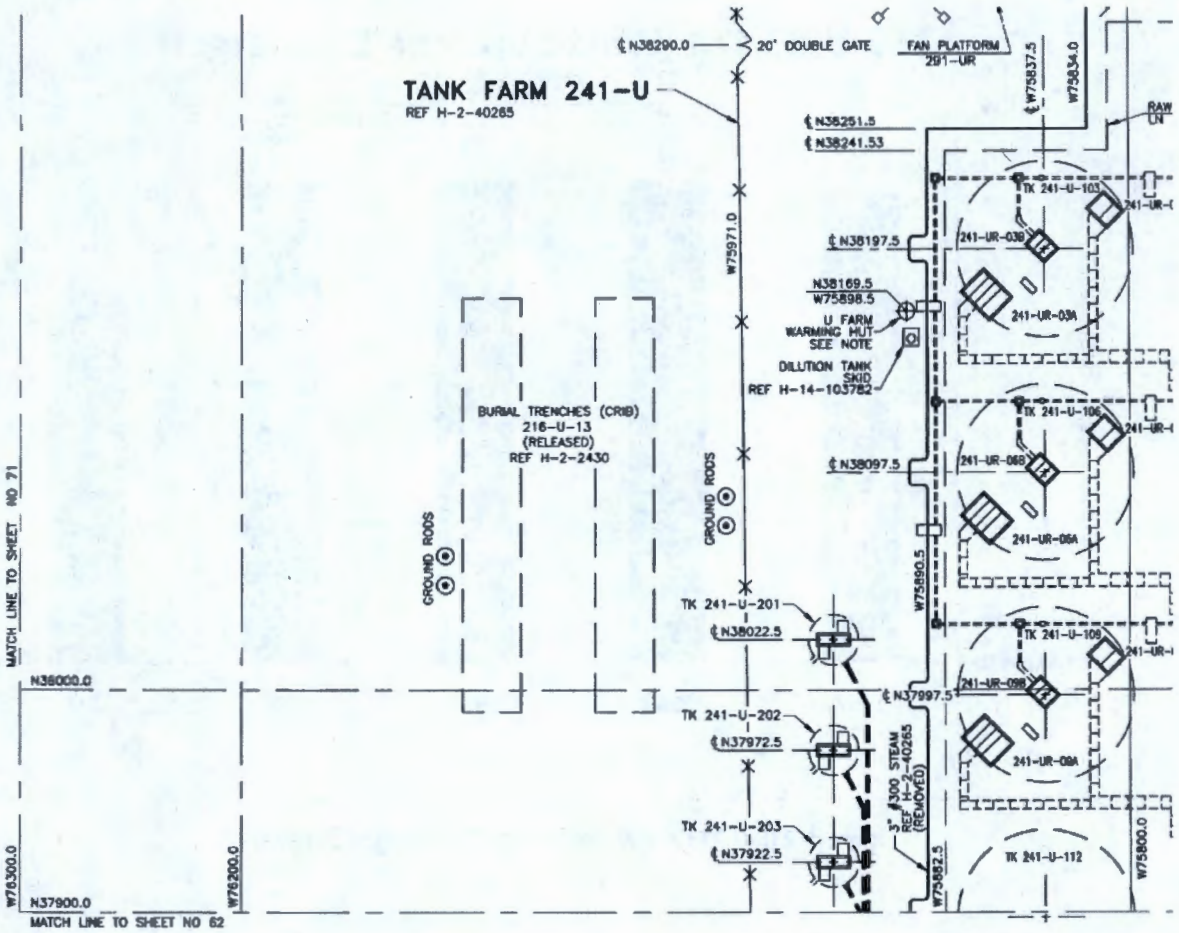
Site: 216-U-13	Area: U Plant	Category: Intermediate



ID = identification

Figure 1. 216-U-13 Waste Site Map

Site: 216-U-13	Area: U Plant	Category: Intermediate



Source: H-2-44511, *Area Map 200 West "U" Plant Facilities*, Sheet 70.

Figure 2. 216-U-13 Trenches

Site: 216-U-13	Area: U Plant	Category: Intermediate

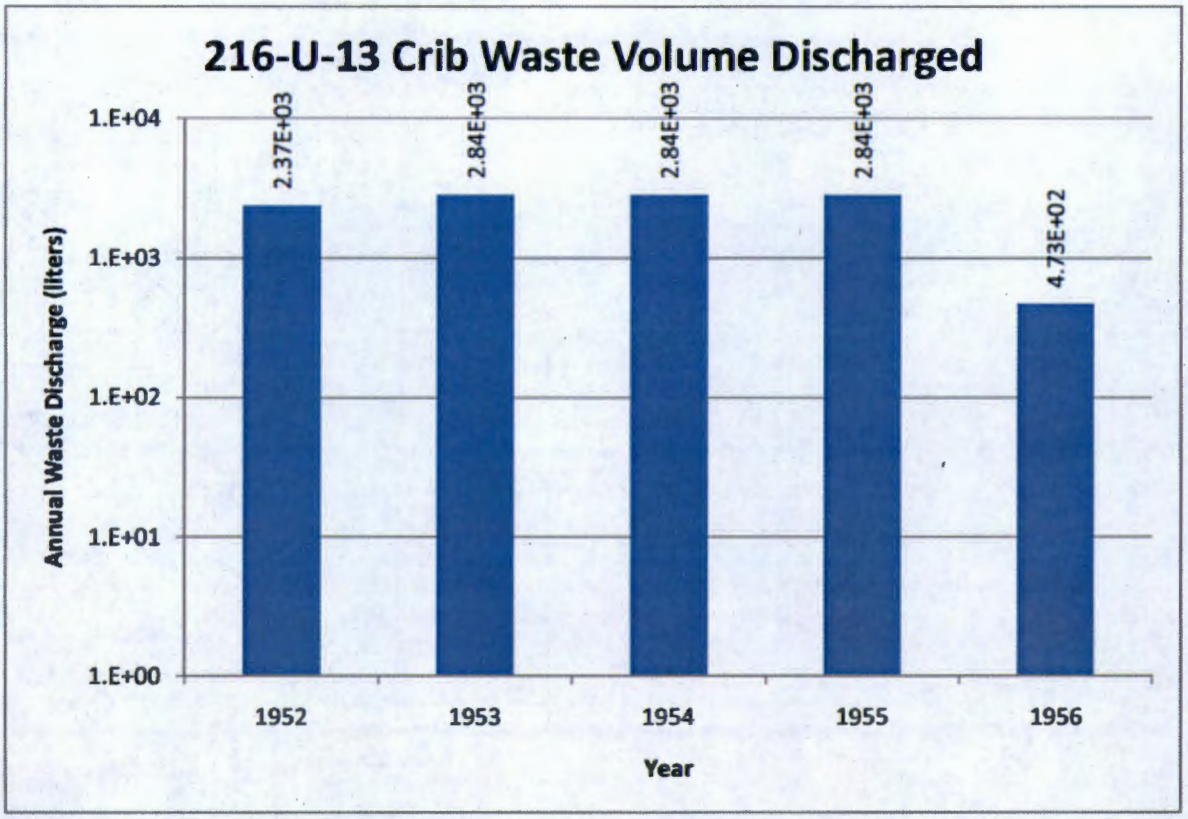


Figure 3. 216-U-13 Crib Waste Volume Discharged Summary

Site: 216-U-14	Area: U Plant	Category: Deep

Site Description

Site Type: Ditch
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: 1944 to 1995

Waste Site Location and Physical Description: The 216-U-14 Ditch originated west of the 284-W Powerhouse, west of Bridgeport Avenue, and extended southward, terminating at the 216-U-10 Pond (Figure 1). The ditch was an unlined and open manmade channel filled with large cobbles. The northern portion of the ditch is shown on Figure 2, and the southern portion on Figure 3. Near the head end of the ditch, a 0.6 m (2 ft) diameter pipe allowed 284-W Powerhouse and laundry effluent to flow under 19th Street and connect to the main portion of the ditch. The ditch also had a 1.22 m (4 ft) diameter culvert that allowed effluent to flow under 16th Street to the portion of the ditch located north of the 242-S Evaporator and also flowed under Cooper Avenue to terminate at 216-U-10 Pond. The ditch was deactivated and stabilized by 1995; the stabilization included backfilling with a minimum of 0.61 m (2 ft) of clean dirt. In 1997, the cobbles were covered with "pit run" gravel, and the site was posted as Underground Radiation Material Area (URMA).

Waste Site Coordinates:
E-566906.67492 N-135126.22815

Site Dimensions:
Site Length: 1,730 m (5,680 ft)
Site Width: 2.4 m (8 ft)
Site Area: 4,224 m^2 (45,440 ft^2)
Site Depth: 3 m (10 ft) to bottom of structure
Cover Thickness: Not applicable

Related Site Structure(s): The ditch is associated with the 284-W Powerhouse, 2723-W (old laundry facility), 2724-W (new laundry facility), 221-U, 224-U, 271-U, the 242-S Evaporator building, and the 241-U-110 Tank. The 200 West Area Powerhouse Pond was constructed over the location of the head end of the 216-U-14 Ditch. The direct pipeline from 221-U is 200-W-84-PL. The pipeline from 2724-W is 200-W-102-PL. A pipeline from the 241-U Tank Farm to the 216-U-14 ditch is 200-W-168-PL. The outlet pipe from 207-U is 200-W-222-PL. The effluent discharge pipe from 242-S Evaporator to the 216-U-14 ditch is 200-W-223-PL.

Site Posting: The Site is posted as an URMA.

Site: 216-U-14	Area: U Plant	Category: Deep

Site History

Release Summary: The 216-U-14 Ditch was the original effluent route to the 216-U-10 Pond. It received powerhouse wastewater, laundry wastewater (until 1981) via 200-W-102 Pipeline, and steam condensate and cooling water from 221-U, 224-U, and the 242-S Evaporator.

From July 1944 to September 1944, the site received wastewater from the 284-W Powerhouse. From September 1944 to January 1950, the site received the same wastewater plus waste from 2723-W (original laundry and mask cleaning station). From January 1950 to March 1952, the site received wastewater from 284-W and 2724-W Laundry Building (new laundry facility). From March 1952 to May 1954, the site received the same wastewater plus chemical sewer waste from 221-U and cooling water from 224-U. From May 1954 to August 1955, the site received the same wastewater plus cooling water from 241-U-110 condenser tank. From August 1955 to November 1973, the site received the same wastewater plus 271-U cooling water. From November 1973 to April 1980, the site received the same wastewater plus 242-S Evaporator condensate and cooling water. From April 1980 to September 1981, the site received the same wastewater except 242-S condensate, 2723-W, and 2724-W waste. From September 1981 to July 1984, the site received the same wastewater except 221-U, 224-U, and 271-U waste. The 221-U and 224-U effluent entered the ditch after passing through the 207-U Retention Basin. The 216-U-16 crib was built in 1984 to accept 224-U effluent that had previously been discharged to the ditch. However, the 216-U-16 crib failed in 1985. Some 224-U effluent was diverted back to the 216-U-14 Ditch until November 1994, when the outlet pipe from the 207-U Retention Basin was permanently isolated and filled with concrete.

The portion of the ditch located west of Cooper Avenue received effluent from the 242-S Evaporator and remained active until April 1995. Discharge from the 242-S Evaporator was eliminated in 1995, ending all discharges to the 216-U-14 Ditch. In addition, Occurrence Report 86-46 states that on August 6, 1986, 2,365 L (625 gal) of recovered nitric acid, containing 39 kg (86 lb) of uranium was discharged through the chemical sewer to the 207-U Retention Basin. Prior to the discovery of the release, the outlet valves on the retention basin were open to the 216-U-14 Ditch. The acid released to the ditch was greatly diluted with the 1,140 L (300 gal) per minute flow of cooling water from the 224-U Facility being processed through the chemical sewer system. The outlet valves from the retention basin were closed shortly after the discovery of the release and the remainder of the acid release was contained in the retention basin. The effluent in the retention basin was neutralized with 270 kg (600 lb) of sodium carbonate. Contrary to the release information provided in the Occurrence Report 86-46, the Hanford Site Waste Management Units Report stated approximately 3,000 L (796 gal) of 50 percent reprocessed nitric acid was released to the unit. The total release to the environment consisted of approximately 101,250 kg (225,000 lb) of corrosive solution (pH less than 2.0) and 45.4 kg (100 lb) of uranium.

The estimated total volume of process effluent discharged to the site is approximately 1.22E+09 L (3.22E+08 gal) and the calculated potential lifetime discharge would exceed one vadose zone pore volume.

Site: 216-U-14	Area: U Plant	Category: Deep

A detailed summary of the waste discharged to the ditch from 1985 to 1993 is shown in Figure 4. Groundwater at wells located near the 216 U 14 Ditch (299-W18-33, 299-W18-250, 299-W18-251, 299-W19-1, 299-W19-21, 299-W19-91, 299-W19-92, 299-W19-93, and 299-W23-16) had detections above drinking water standards for carbon tetrachloride (CTET), chromium, strontium-90, and uranium. CTET results ranged from non-detect to as high as 100 µg/L from 1987 to 2005. Chromium results ranged from non-detect to as high as 1,000 µg/L from 1987 to 2002. Strontium-90 was detected at three wells (299-W19-91, 299-W19-92, and 299-W19-93) at concentration ranging from 1.5pCi/L to 7,820 pCi/L from 1992 to 1994. Uranium results ranged from non-detect to 139 µg/L in samples collected from 1986 to 2005.

Volume/Mass Discharged: 1.22E+09 L (3.22E+08 gal)

Pore Volume Discharged: 1.22E+09 L/ (227ft x 45,440 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 13.9

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-U-14 Waste Site

Contaminant	Mass Discharged
Total Beta	<1 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: A surface radiological survey is done on the backfilled ditch annually. Sediment, soil, and vegetation samples were collected to characterize the 216-U-14 Ditch several times. In 1981, contamination levels found in sediment at the head end of the ditch, to a depth of 175 cm (70 in.), were above background levels for all radionuclides analyzed. The average concentration for all depths was 76.6 pCi/g cesium-137, 113.4 pCi/g cobalt-60, 101.6 pCi/g strontium-90, and 89.1 pCi/g plutonium 239/240. The highest concentrations of cobalt-60 were found in the head end of the ditch. The highest concentration of cesium-137 was found near where the ditch entered U- Pond. Core samples were collected in 1987 to determine the effects of the accidental nitric acid and uranium release that occurred in 1986. A maximum of 185 pCi/g of uranium was found at a depth of 15 to 30 cm (6 to 12 in.).

Test pits were excavated in the ditch in 1992 to support the Groundwater Impact Assessment for the 216-U-14 Ditch. The test pits were located in the portion of the ditch west of Cooper Ave and east of the 216-U-10 pond. Data indicated the contaminants were concentrated within a few feet of the bottom of the ditch.

Borehole locations are shown on Figure 3 and soil data is summarized in Tables 3 through 6.

Site: 216-U-14	Area: U Plant	Category: Deep

No geophysical boreholes or soil boreholes have been installed within the ditch footprint. A geophysical log is available for one location (A4944) adjacent to the ditch (see Figure 3). Soil borehole A7730 is located at the edge of the southern portion of the ditch (see Figure 3). The locations and/or sample depths for soil sample sites 35877 and 36368 could not be determined.

Table 2. Borehole Summary for the 216-U-14 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2003	A4944	Edge – southern portion of ditch	2 – 212 (GPL)
1993	A7730 / 299-W18-250	Edge – southern portion of ditch	Unknown (11 samples)
1993	35877	Undetermined	Unknown (7 samples)
1993	35638	Undetermined	Unknown (1 sample)

GPL = geophysical log
ID = identification

Table 3. Geophysical Log Summary for the 216-U-14 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A4944	0 to 5	1.35	pCi/g	2.0	17,821.3	cpm	5
	5 to 10	0.46	pCi/g	10.0	16,243	cpm	6
	10 to 15	0.55	pCi/g	11	16,342.6	cpm	14
	>15	0.35	pCi/g	192	23,988.5	cpm	93

bgs = below ground surface
ID = identification

Site: 216-U-14	Area: U Plant	Category: Deep

Table 4. Soil Maximum Detection Summary (Soil Borehole A7730)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Gross alpha	–	–	–	10.9	pCi/g	–
Gross beta	–	–	–	37.9	pCi/g	–
Radium	–	–	–	1.89	pCi/g	–

Table 5. Soil Maximum Detection Summary (Soil Borehole 35877)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Americium-241	–	–	–	1.45	pCi/g	–
Cesium-137	–	–	–	2740	pCi/g	–
Cobalt-60	–	–	–	1.35	pCi/g	–
Gross alpha	–	–	–	27.4	pCi/g	–
Gross beta	–	–	–	70.6	pCi/g	–
Iodine-129	–	–	–	0.79	pCi/g	–
Lead-212	–	–	–	1.25	pCi/g	–
Lead-214	–	–	–	0.621	pCi/g	–
Plutonium-238	–	–	–	0.00751	pCi/g	–
Plutonium-239/240	–	–	–	10.2	pCi/g	–
Radium	–	–	–	0.919	pCi/g	–
Radium-224	–	–	–	1.28	pCi/g	–
Radium-226	–	–	–	0.544	pCi/g	–
Strontium-90	–	–	–	3.56	pCi/g	–
Technetium-99	–	–	–	13.5	pCi/g	–
Uranium	–	–	–	15.8	pCi/g	–

Site: 216-U-14	Area: U Plant	Category: Deep

Table 6. Soil Maximum Detection Summary (Soil Borehole 36368)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Gross alpha	–	–	–	17.6	pCi/g	–
Gross beta	–	–	–	19.7	pCi/g	–
Radium	–	–	–	1.63	pCi/g	–

Nature and Extent of Contamination:

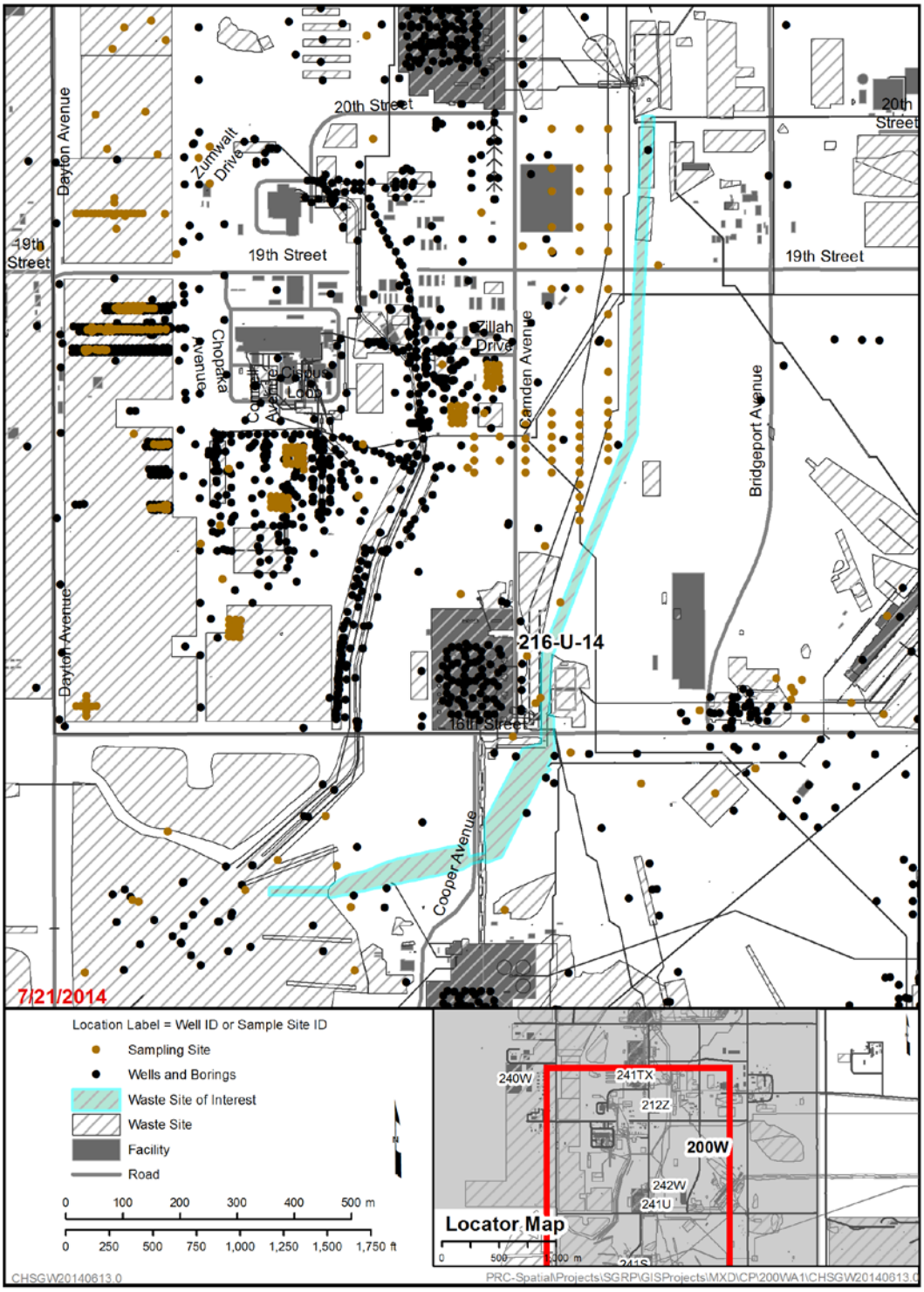
Previous characterization sampling found shallow soil contamination near the head of the ditch, near where the ditch entered the U-Pond, and in the portion of the ditch west of Cooper Ave. and east of the 216-U-10 pond. The approximate depth to groundwater is 72.2 m (237 ft) below ground surface (bgs).

References:

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

Waste Information Data System General Summary Report for the 216-U-14 Waste Site.

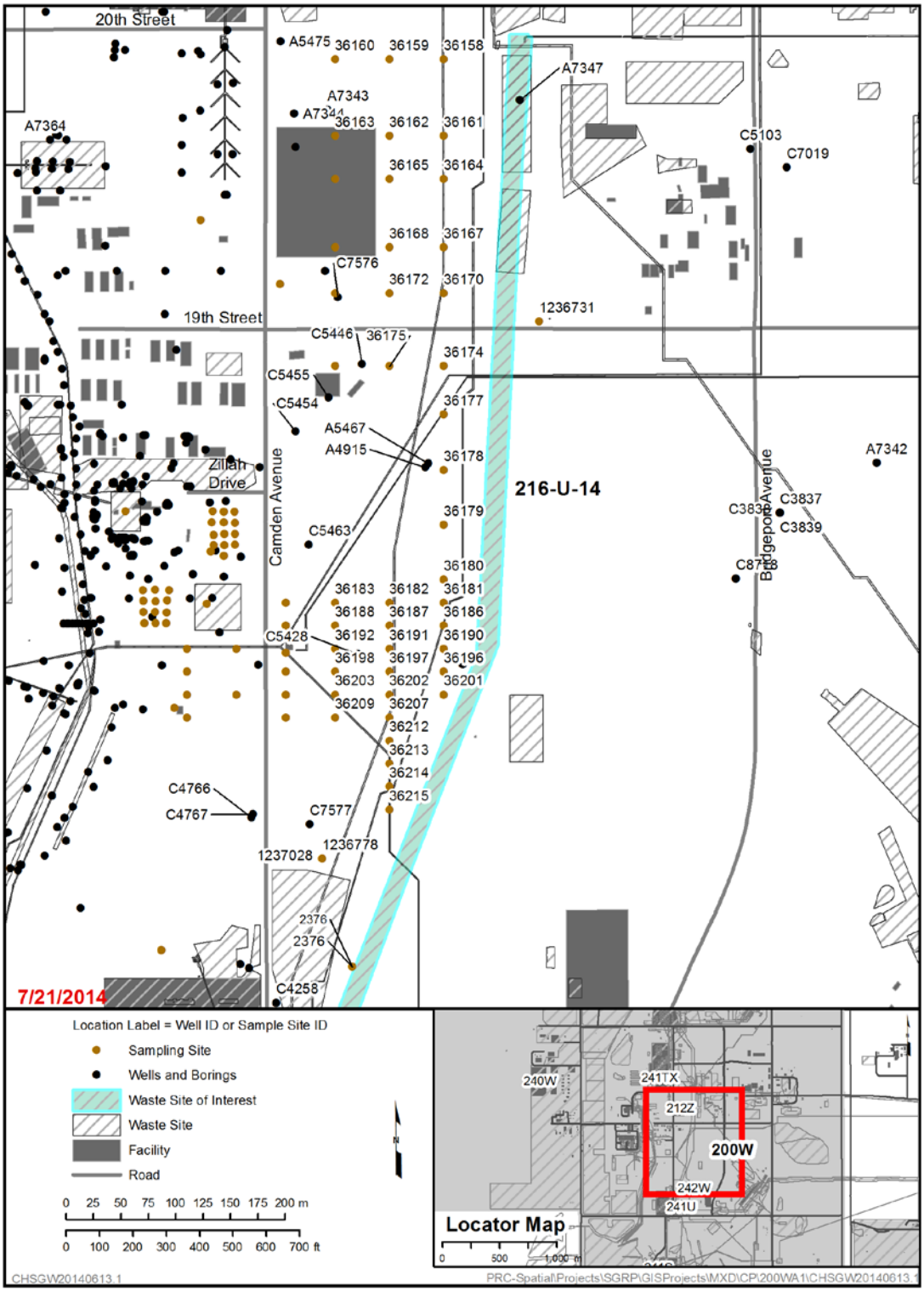
Site: 216-U-14	Area: U Plant	Category: Deep



ID = identification

Figure 1. 216-U-14 Waste Site Map

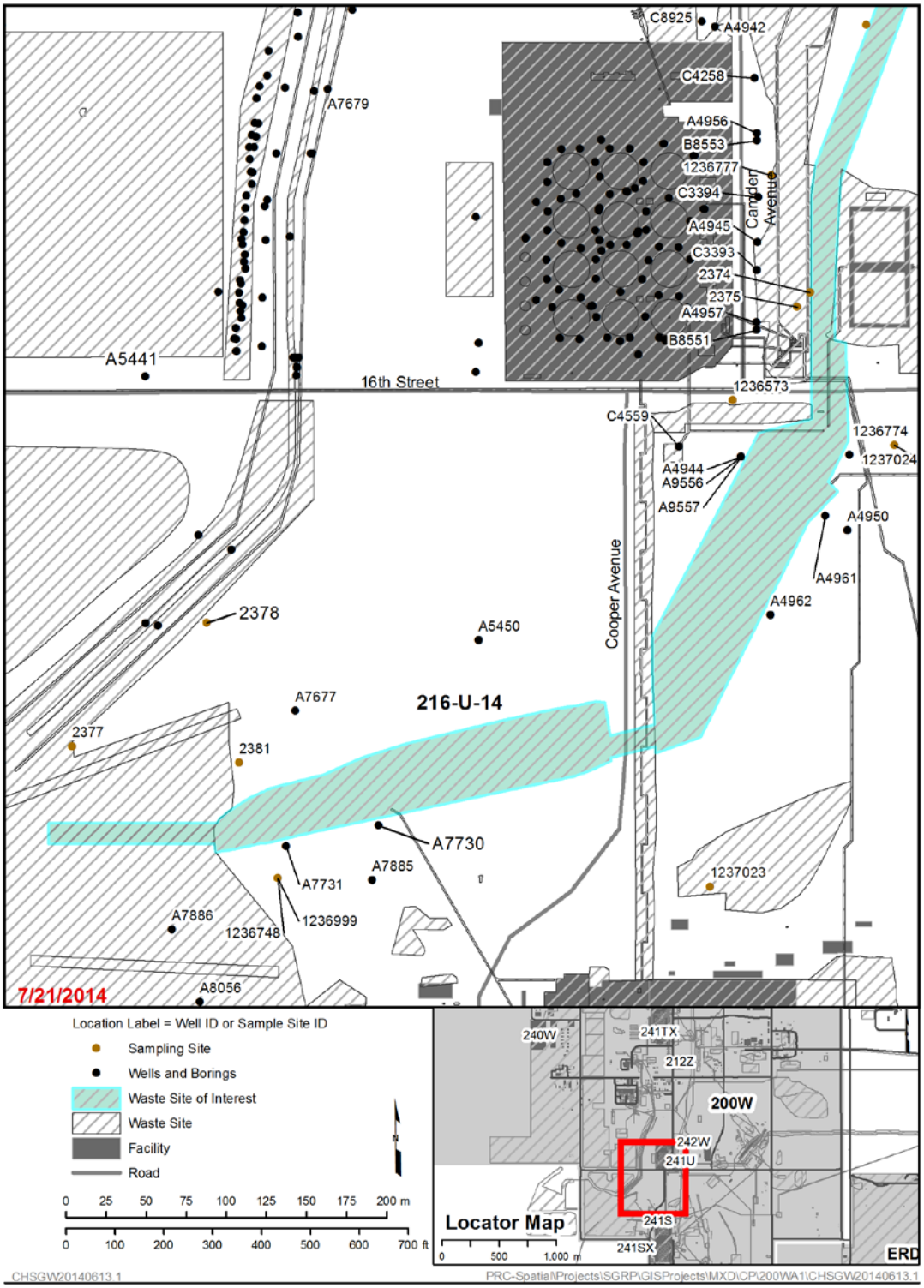
Site: 216-U-14	Area: U Plant	Category: Deep



ID = identification

Figure 2. Northern Portion of the 216-U-14 Waste Site

Site: 216-U-14	Area: U Plant	Category: Deep



ID = identification

Figure 3. Southern Portion of the 216-U-14 Waste Site

Site: 216-U-14	Area: U Plant	Category: Deep

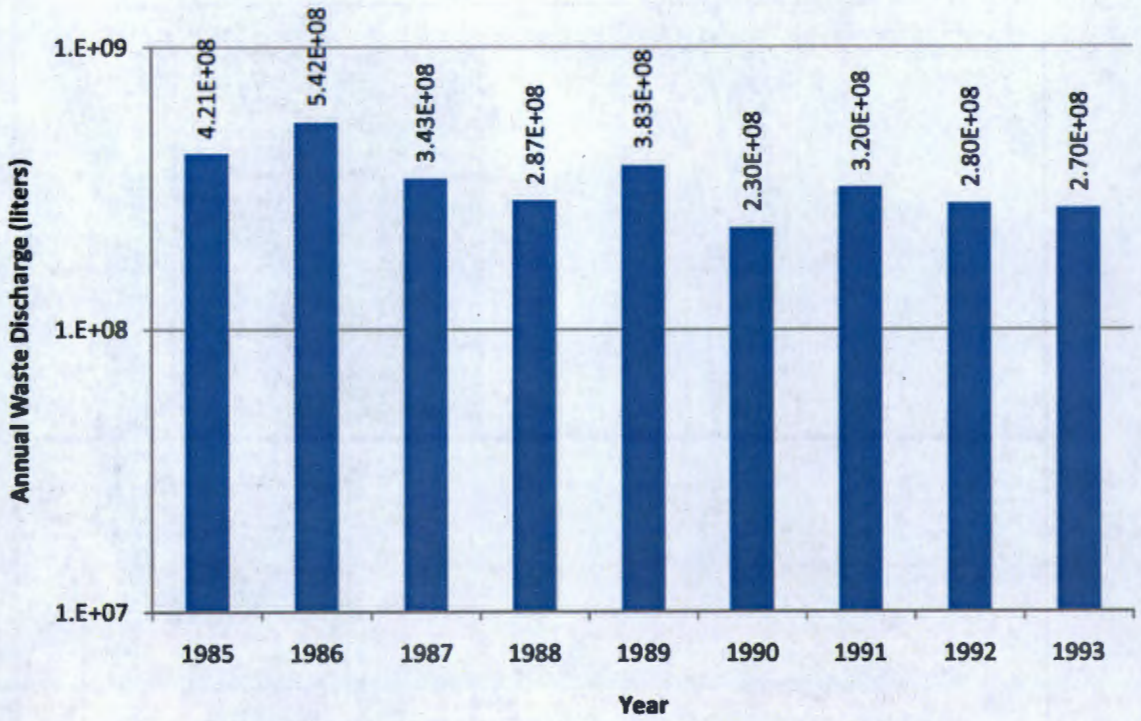


Figure 4. 216-U-14 Ditch Waste Volume Discharged Summary

Site: 216-U-15	Area: U Plant	Category: Intermediate

Site Description

Site Type: Trench
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1
Service Dates: During May 1957

Waste Site Location and Physical Description: The 216-U-15 Trench is the result of a deliberate discharge of liquid waste into an open excavation. The site was deactivated by backfilling the excavation and removing the aboveground piping.

This trench (Figure 1) was located west of the 271-U Building and north of 16th Street. In August 2002, translated Global Positioning System (GPS) coordinates were used to locate the area documented in 1957 as the disposal pit site. No visual signs of the site were noted, since the perimeter fence and all identification markings of this site were removed in 1971. Ground Penetrating Radar scans were done of several potential site locations in February 2005. GPR results found no subsurface disturbances, only a linear pipe anomaly beneath the location identified as the spot documented with Hanford Site coordinates. A large disturbed area was noted west and south of the Hanford Site coordinate spot. This large disturbance was determined to be the most likely 216-U-15 site location. Figure 2 shows the three possible site locations based on the GPS and geophysical survey result from May 2005. The location marked ARH-2155 represents the converted coordinates found in document ARH-2155, *Radioactive Liquid Waste Disposal Facilities 200 West Area*. The location marked Waste Information Data System (WIDS) represents the converted coordinates shown in the waste site coordinates below section, which is an estimated data point location. The location marked SH68 represents the center of the converted coordinates found on Figure 3 and is the as-built drawing of the site's location.

Though there are many surveys, sources, and speculations on where this site is, there is no conclusive evidence that gives an exact location for the 216-U-15 Waste Site.

Waste Site Coordinates: There is no conclusive evidence that gives an exact location for site 216-U-15.

Site Dimensions:
Site Length: 6.1 m (20 ft)
Site Width: 6.1 m (20 ft)
Site Area: 37 m^2 (400 ft^2)
Site Depth: 4.57 m (15 ft) to bottom of structure
Cover Thickness: Not applicable

Related Site Structure(s): The 216-U-15 Trench was associated with the 388-U Tank and the 276-U Solvent Storage Area.

Site Posting: All identification markings of this site were removed in 1971.

Site: 216-U-15	Area: U Plant	Category: Intermediate

Site History

Release Summary: This site received waste from the 388-U Tank in the 276-U Solvent Building. The waste consisted of interface crud, activated charcoal, and diatomaceous earth containing approximately 1 curie of fission products. The waste was contained 40,000 kg (88,184 lb) of hexone, and 13,000 kg (28,660 lb) of tributyl phosphate. HW-50584, *Chemical Processing Department Monthly Report for May, 1957*, presents conflicting information. The May 1957 monthly report states that the site received 79,494 L (21,000 gal) of organic solution from the tributyl phosphate recovery decontamination column extractant stream (RAX) was originally scheduled to be transferred to the PUREX plant, but was buried because it was found to be incompatible with the PUREX process. The material was buried, with minor ground contamination occurring when the aboveground line used to transport the material from 276-U leaked. One 20.3 cm (8-in.) culvert was replaced and the contaminated ground was dug up and buried.

The estimated total volume of process effluent discharged to the site is approximately 6.8E+04 L (1.8E+04 gal)[1] and the calculated potential lifetime discharge does not exceed one vadose zone pore volume.

Volume Discharged1: 6.8E+04 L (1.8E+04 gal)

Pore Volume Discharged: 6.8E+04 L/ (243 ft x 400 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.08

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content

Contaminant	Mass Discharged
Pu	0.1 g
Beta	7.0 Ci
Sr-90	0.1 Ci
Ru-160	1.0 Ci
Cs-137	0.1 Ci
Co-60	0.1 Ci
U	2.3 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Site: 216-U-15	Area: U Plant	Category: Intermediate

Previous Site Characterization

Site Characterization Summary: Exploratory core samples were taken in 1970 at the point of listed coordinates. No radioactivity was detected. The core sample results may have contributed to the removal of the Underground Radioactive Material Area signs.

Nature and Extent of Contamination: No existing characterization data are available in the suspected location of the 216-U-15 Trench. The site location is uncertain. The 2005 geophysical survey suggests an alternate trench location. The approximate depth to groundwater is 78.6 m (258 ft) below ground surface (bgs).

References:

BHI-00608, 1996, *Hanford Sitewide Groundwater Flow and Transport Model Calibration Report*, Rev. 1, Bechtel Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D197301520.

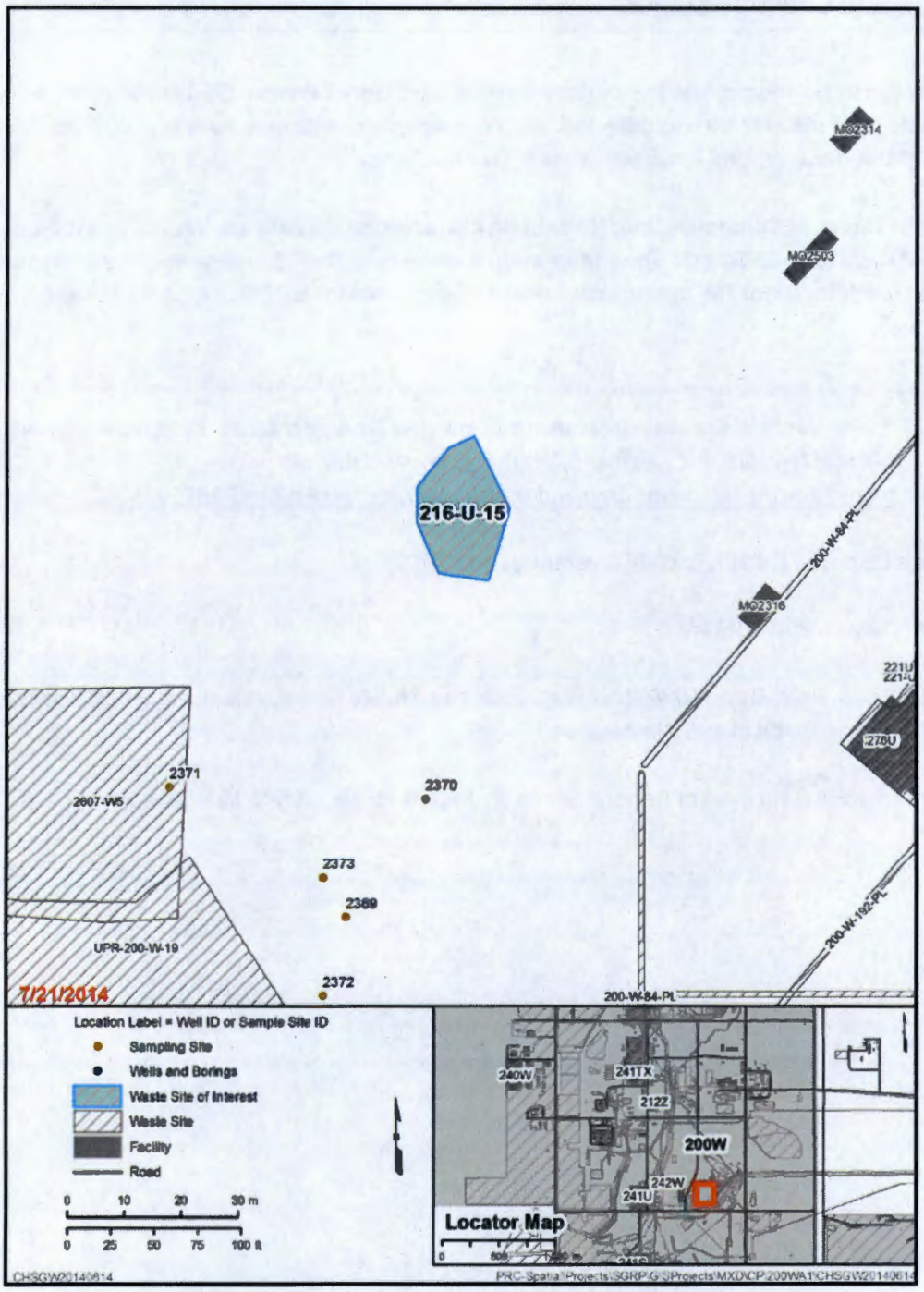
"Chemicals Disposed & Radionuclide Inventories.pdf," p. 5.

EVSDS Database. Virtual Library.

H-2-44511, 1973, *Area Map 200 West U Plant Facilities*, Sh. 68, Rev. 6, Atlantic Richfield Hanford Company, Richland, Washington.

Waste Information Data System General Summary Report for the 216-U-15 Waste Site.

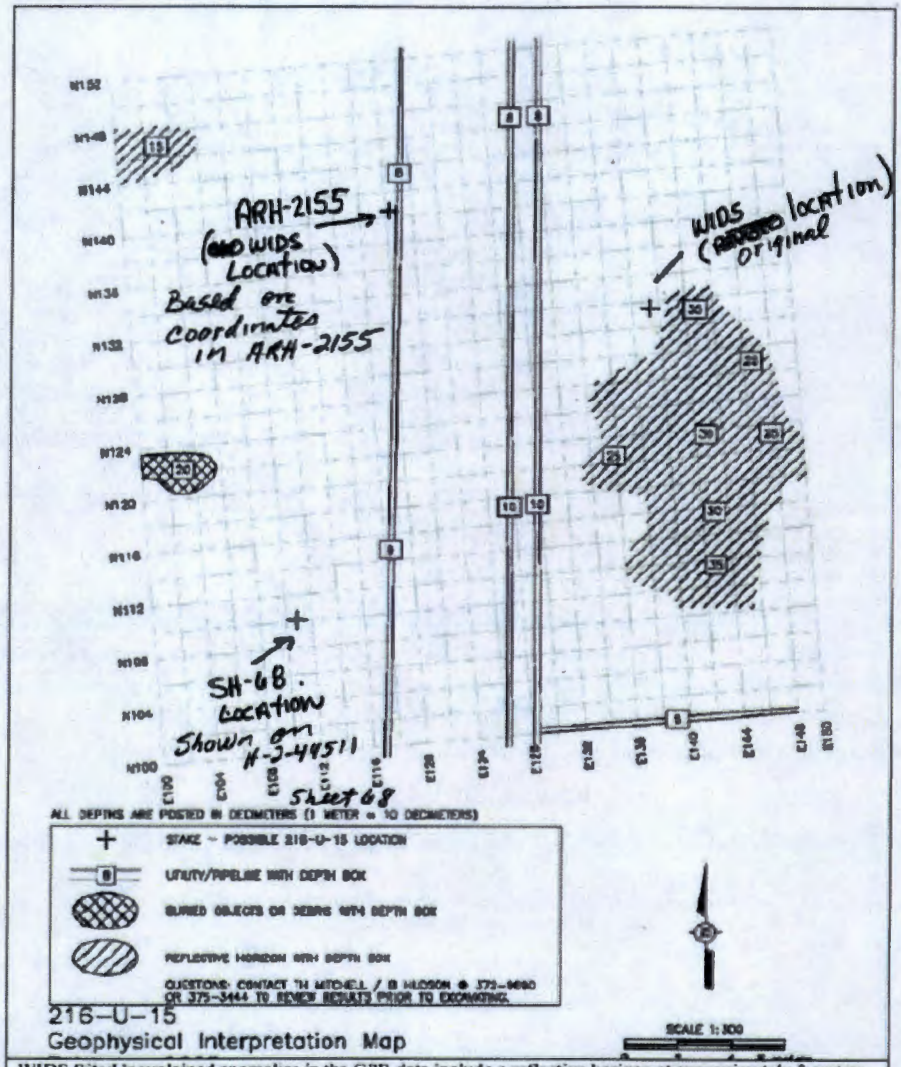
Site: 216-U-15	Area: U Plant	Category: Intermediate



ID = identification

Figure 1. 216-U-15 Waste Site Map

Site: 216-U-15	Area: U Plant	Category: Intermediate



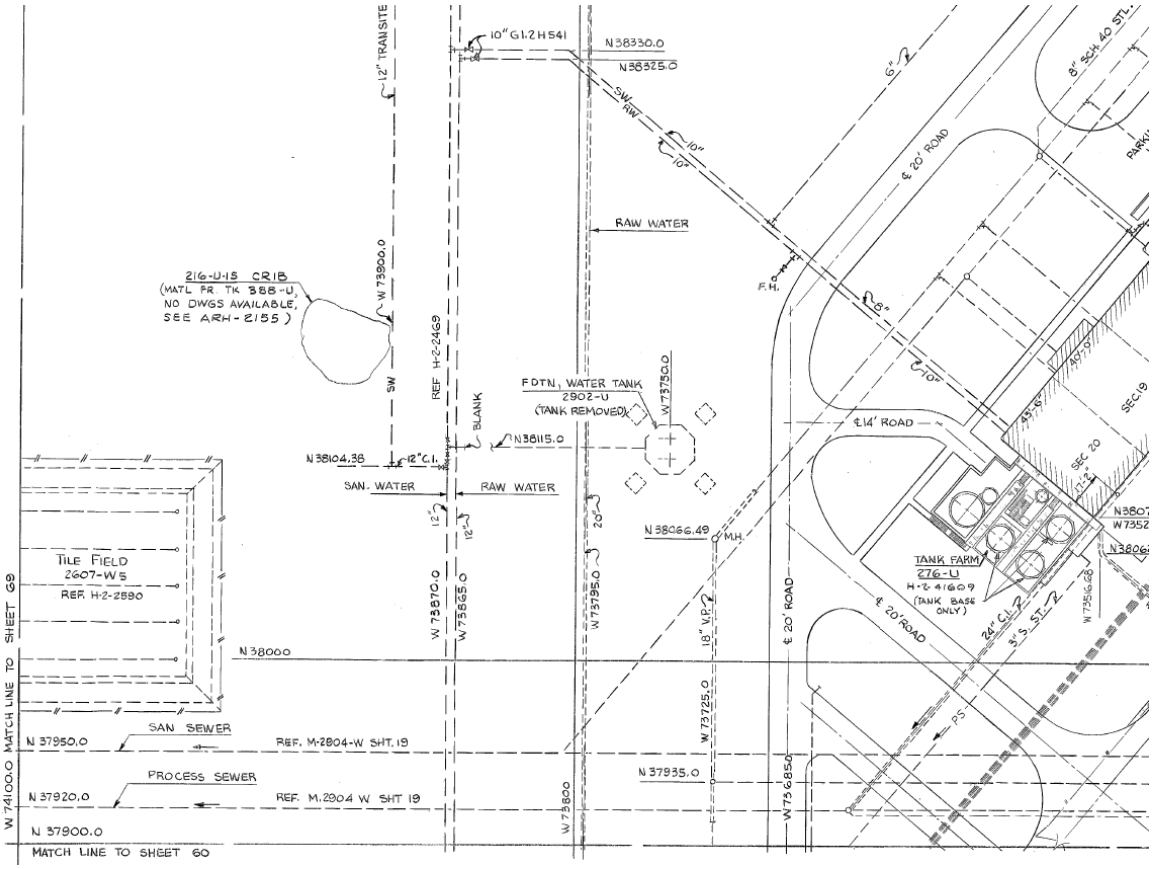
WIDS Site:Unexplained anomalies in the GPR data include a reflective horizon at approximately 3 meters depth along the eastern edge of the site. This feature is very low amplitude and may be caused by natural, geologic variation in the subsurface. It's proximity to one possible location for the 216-U-15 crib makes it worthy of note.

Note: Produced from the best available copy.

WIDS = Waste Information Data System

Figure 2. Diagram of Possible 216-U-15 Locations

Site: 216-U-15	Area: U Plant	Category: Intermediate



Source: H-2-44511, *Area Map 200 West U Plant Facilities*, Sheet 68.

Note: Produced from the best available copy.

Figure 3. 216-U-15 Location

Site: 216-U-16	Area: U Plant	Category: Deep

Site Description

Site Type: Crib
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1
Service Dates: July 20, 1984 to 1987

Waste Site Location and Physical Description: The crib is located south of 16th Street, between Beloit and Cooper Avenues, southwest of the 224-U Building (Figure 1). The crib construction is shown on Figures 2 and 3. The crib is constructed of two header pipes, 20 cm (8 in.) reducing to 15 cm (6 in.) that are located 0.9 m (3 ft) above the crib bottom, running the length of the unit, one on each side. At each end of the pipe is a 15 cm (6 in.) vent pipe. Connecting the two header pipes were twenty-two 10 cm (4 in.) perforated pipes running the width of the unit, equally spaced, 0.9 m (3 ft) above the bottom. Each header pipe has a 10 cm (4 in.) vent riser. An acid resistant distribution box is located at the crib inlet (northeast edge). A short pipeline connected the crib to the existing vitrified clay pipe process sewer line. In February 1996, the crib was permanently isolated by filling Manhole #1 with concrete. The action was done by Westinghouse Tank Farm Operations in preparation for transferring responsibility to the Environmental Restoration Contractor. In July 2000, the vent risers were sealed and cut off below grade. The riser openings were sealed with polyvinyl chloride cap and the risers were backfilled to grade. There are three gage wells, one each near the north and south ends and one near the center. The bottom is filled with 1.5 m (5 ft) of gravel. Covering the gravel is a reinforced polyethylene liner extending 2.4 m (8 ft) up the sides of the excavation. The crib structure has been backfilled over to grade. A 15 cm (6 in.) subdrainage pipe runs the width of the unit at the west side.

Waste Site Coordinates:
E-567235.60145 N-134861.31606

Site Dimensions:
Site Length: 79.86 m (262 ft)
Site Width: 58.22 m (191 ft)
Site Area: 4,649 m^2 (50,042 ft^2)
Site Depth: 5.18 m (17 ft) to bottom of structure
Cover Thickness: Not applicable

Related Site Structure(s): The crib is associated with the 224-U and the 221-U facilities and the 216-U-14 ditch. The pipeline that feeds this crib is 200-W-170-PL.

Site Posting: The site is posted with Underground Radioactive Material Area signs.

Site History

Release Summary: The 216-U-16 crib received 224-U steam condensate, 224-U chemical sewer waste, 271-U compressor cooling water, 221-U chemical sewer waste, and 224-U process condensate. The 224-U effluent stream had previously gone to the 216-U-10 pond by way of the 216-U-14 ditch. Due to

Site: 216-U-16	Area: U Plant	Category: Deep

plans to deactivate the ditch and stabilize the pond, the 216-U-16 crib was constructed. By February 1985, high flow rates of liquid discharged to the 216-U-16 Crib caused pooling above a caliche layer located 50 m (165 ft) below the crib. The crib effluent moved laterally, northward to the 216-U-1&2 cribs. The liquid flushed contaminants from the 216-U-1&2 cribs into the groundwater, using an existing groundwater well as a pathway. After confirming the effluent source was the 216-U-16 crib, use of the crib was discontinued and an investigation was initiated. The effluent was routed to the 216-U-14 ditch.

In 1984 and 1985, approximately 2.86E+08 L and 1.23E+08 L of liquid waste were discharged to the 216-U-16 crib, respectively[1].

Volume Discharged: 4.09E+08 L (1.08E+08 gal)

Pore Volume Discharged: 4.09E+08 L/ (237.5 ft x 50,042 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 4

Waste Inventory: DOE/RL-2003-23 reports that 216-U-16 waste discharges contained 17.6 kg (38 lb) of Uranium, 0.0165 Ci of cesium-137, and 0.0092 Ci of strontium-90.

Previous Site Characterization

Site Characterization Summary: Surface radiological surveys are performed annually. On June 7, 1995, a radiation survey was conducted as part of a routine survey. No contamination was found. On April 5, 2000, a site walkdown was completed for verification purposes. Also on December 4, 2003, a geophysical survey was completed for characterization purposes. No recent geophysical logs are available. Two wells adjacent to the crib (299-W-19-13 [A7740] and 299-W-19-14 [A4946]) were geophysically logged in 1985 for gamma and neutron moisture.

No soil boreholes have been installed within the crib footprint.

Groundwater wells associated with 216-U-16 Crib (299-W19-13 and 299-W19-14) had detections above drinking water standards for carbon tetrachloride (CTET), nitrate, and uranium. CTET ranged from 17 µg/L in 1987 to as high as 580 µg/L in 1998 and was last measured at 250 µg/L in 2001. Nitrate concentrations were first measured at 80,100 µg/L in 1984, were as high as 279,000 µg/L in 1985, and were last measured at 8,410 µg/L in 2001. Uranium was detected at concentrations up to 37.9 µg/L. Cesium-137 and strontium were detected at concentrations below drinking water standards.

Well and borehole locations are shown on Figure 1.

Nature and Extent of Contamination:

Based on existing information, the shallow and deep soil could be contaminated by former discharge of waste containing radionuclides and nitrate. Shallow soil is potentially contaminated from direct discharge of waste to the crib from the discharge piping located 3.7 m (12 ft) bgs, and deeper soil beneath the crib (bottom 5.2 m [17 ft] bgs) is potentially contaminated. An estimated 4 pore volumes of liquid were discharged to the crib, suggesting a potential for deeper vadose zone soil and groundwater contamination. Existing information indicates that liquid discharged to the 216-U-16 Crib pooled above a caliche layer located 50 m (165 ft) below the crib then moved laterally (northward) to the

Site: 216-U-16	Area: U Plant	Category: Deep

216-U-1&2 Cribs. The liquid flushed contaminants from the 216-U-1&2 cribs into the groundwater, using an existing groundwater well as a pathway. The approximate depth to groundwater is 77.7 m (255 ft) bgs.

References:

BHI-00608, 1996, *Hanford Sitewide Groundwater Flow and Transport Model Calibration Report*, Rev. 1, Bechtel Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D197301520.

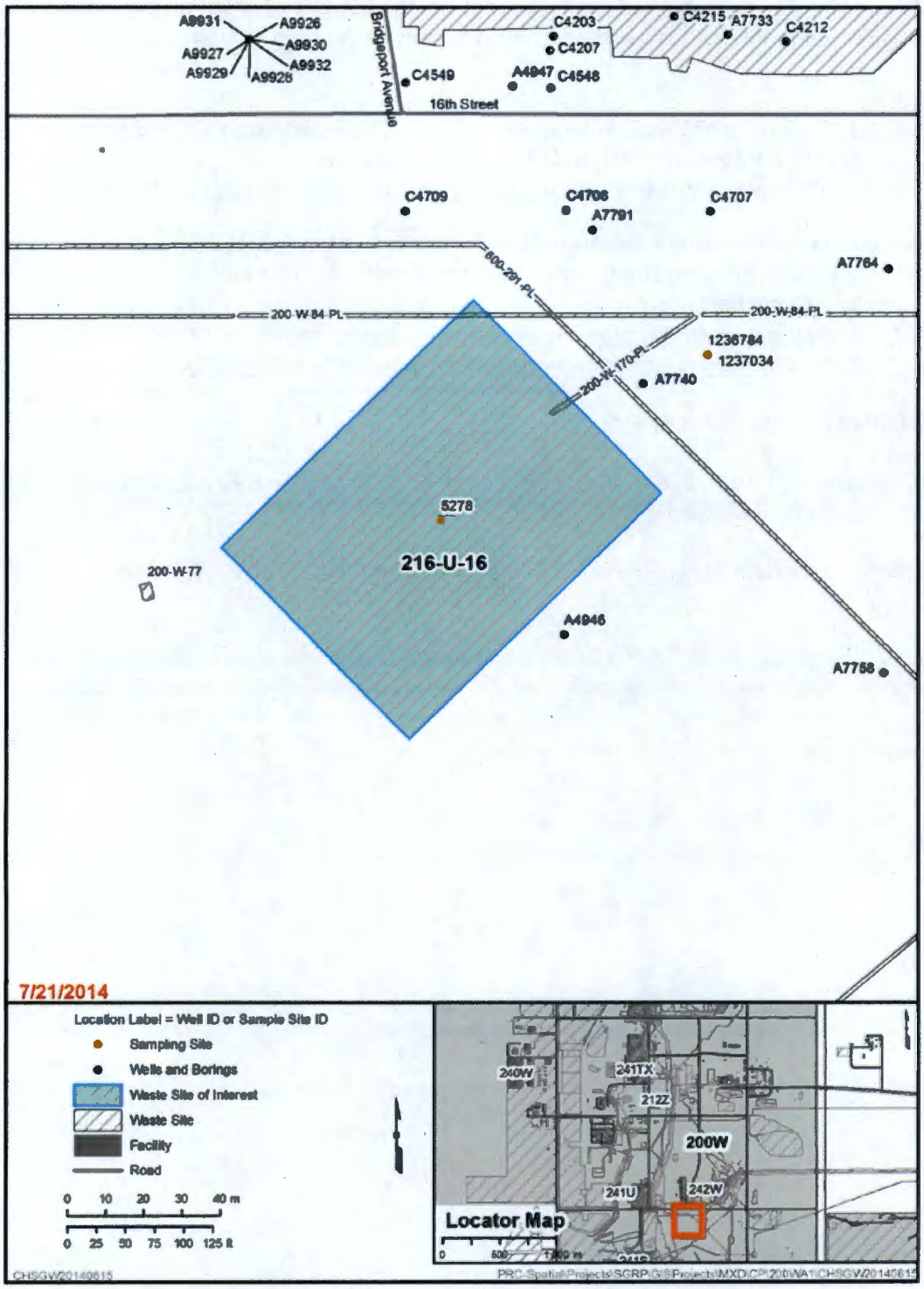
DOE/RL-2003-23, 2005, *Focused Feasibility Study for the 200-UW-1 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at:
http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D7944638
http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D7944918
http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D7950655

EVSDS Database. Virtual Library.

H-2-94256 (drawing), 1983, *216-U-16 Crib Plan, Sections & Details*, Sh. 1, Rev. 1, Rockwell Hanford Operations, Richland, Washington.

Waste Information Data System General Summary Report for the 216-U-16 Waste Site.

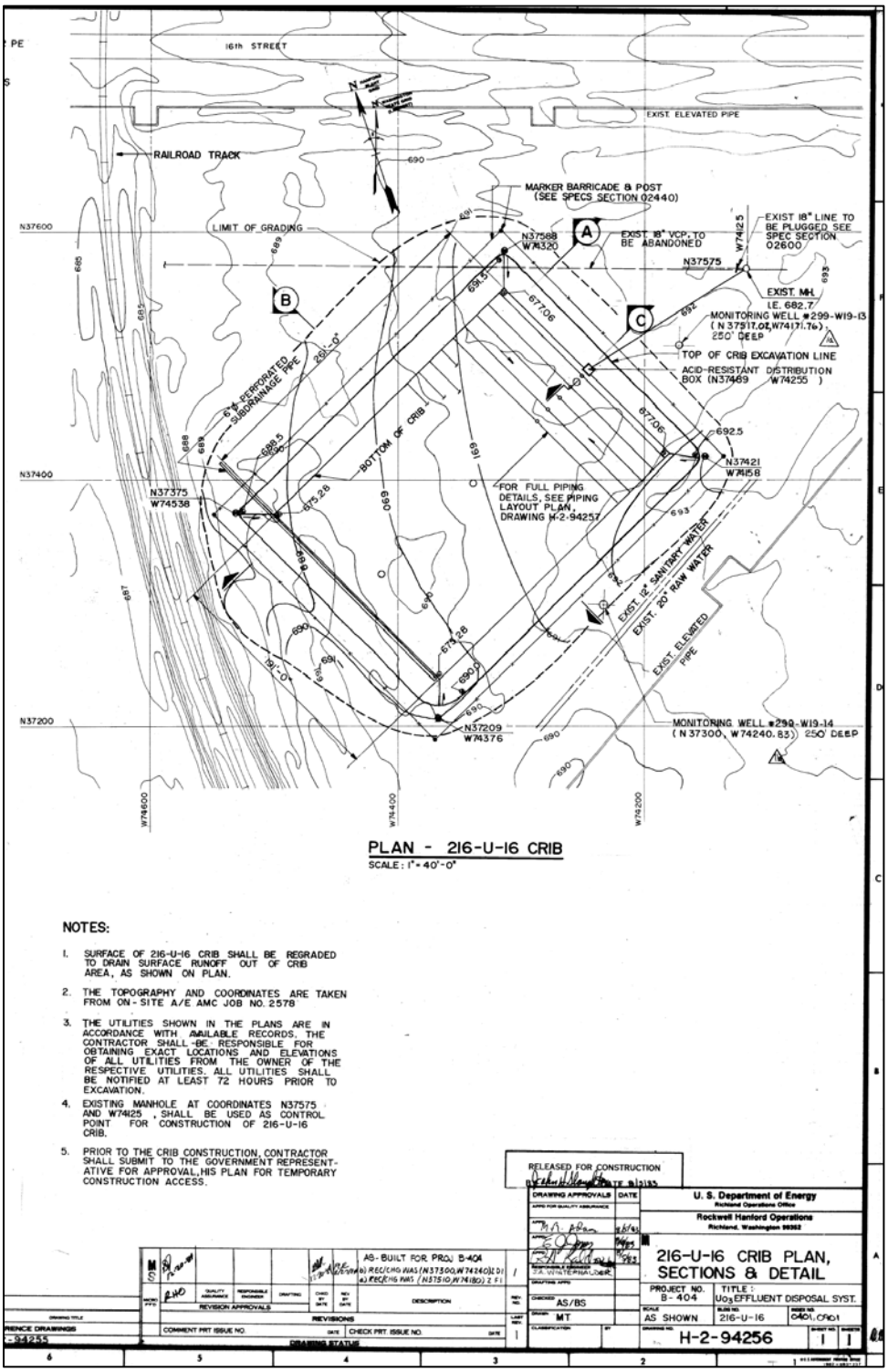
Site: 216-U-16	Area: U Plant	Category: Deep



ID = identification

Figure 1. 216-U-16 Waste Site Map

Site: 216-U-16	Area: U Plant	Category: Deep

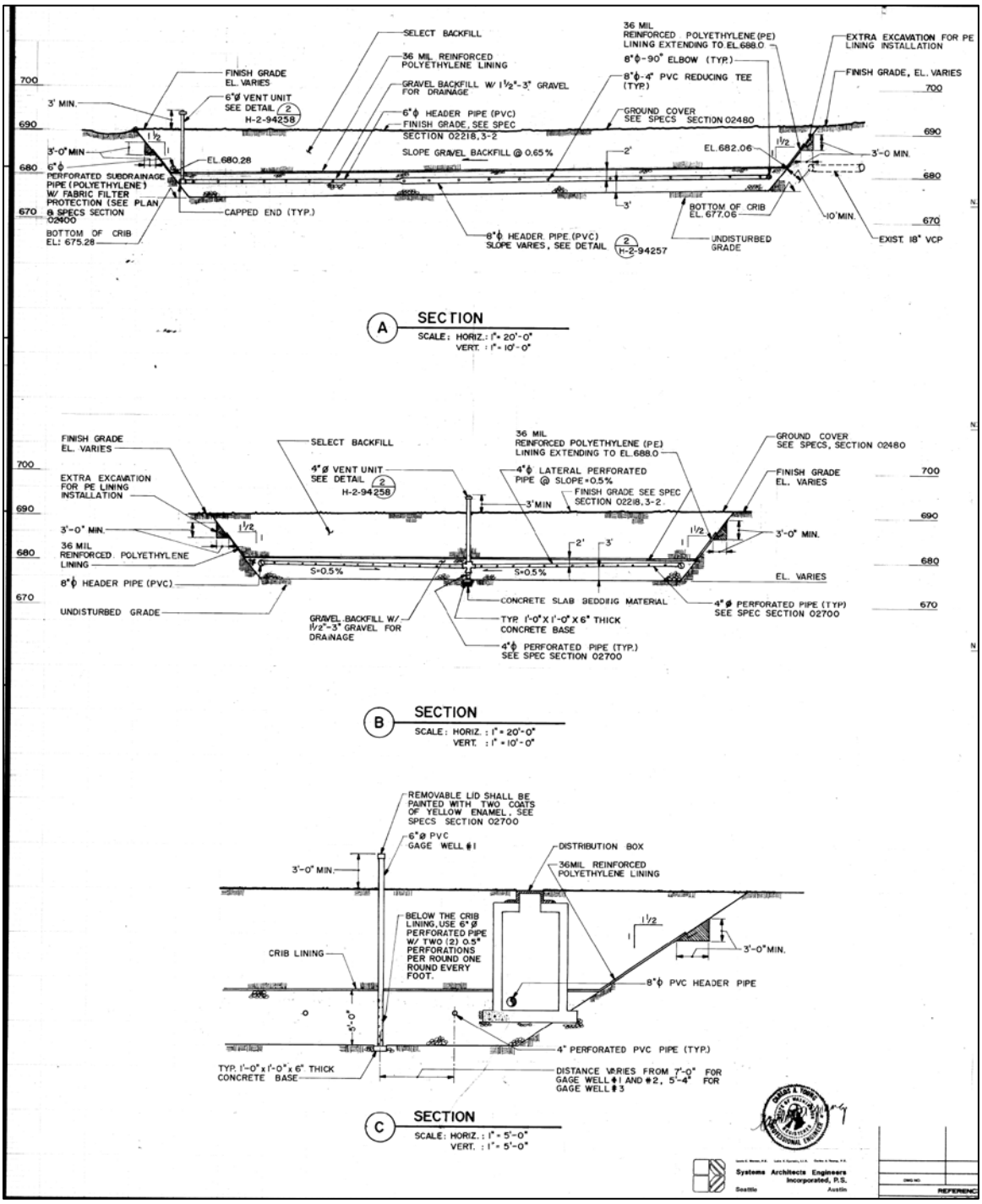


Source: H-2-94256, *216-U-16 Crib Plan, Sections & Details*.

Note: Produced from the best available copy.

Figure 2. Plan View of 216-U-16 Crib

Site: 216-U-16	Area: U Plant	Category: Deep



Source: H-2-94256, *216-U-16 Crib Plan, Sections & Details*.

Note: Produced from the best available copy.

Figure 3. Cross Section of 216-U-16 Crib

Site: 216-U-17	Area: U Plant	Category: Deep

Site Description

Site Type: Crib
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1
Service Dates: 1988 to September 1994

Waste Site Location and Physical Description: The 216-U-17 Crib was built to replace the 216-U-12 Crib. The crib is located south of 16th Street and east of Beloit Avenue, inside the 200 West Area, and southeast of the 221-U Facility (Figure 1). Engineering Drawing for 216-U-17 from H-2-77175, *Civil Profile, Crib Plan Sections & Details*, shows the detailed design of the crib (Figures 2 and 3). A large amount of debris was identified on the surface of the site prior to crib construction. It was determined the site had previously been used as a construction laydown area. In July 2000, the vent risers were sealed as a preventive measure for potential passive radioactive emissions. On November 9, 1994, the 224-U Facility was permanently isolated from the crib by cutting and capping the crib pipeline.

Waste Site Coordinates:
E-567839.36161 N-134903.32494

Site Dimensions:
Site Length: 45.72 m (150 ft)
Site Width: 3.05 m (10.00 ft)
Site Area: 139 m^2 (1,500 ft^2)
Site Depth: 5.49 m (18 ft) to bottom of structure
Cover Thickness: Not applicable
Overburden depth: 3.51 m (11.5 ft)

Related Site Structure(s): The crib is associated with the 224-U Facility and the 200-W CSLA (Construction Surface Laydown Area). The pipeline associated with the crib is 200-W-195-PL.

Site Posting: The crib is marked and posted with Underground Radioactive Material Area signs.

Site History

Release Summary: The crib received effluent from the 224-U Building process condensate from the conversion of uranyl nitrate hexahydrate to Uranium Tri-oxide through the calcining operations. Effluent flow was evenly distributed over the entire unit from the distribution line lying in an aggregate field with a polyvinyl chloride (PVC) vapor barrier. A neutralization system was placed into operation before startup of this crib to preclude the discharge of process condensate outside the range of 2.0 to 12.5 pH.

The estimated total volume of process effluent discharged to the site is approximately 4.97E+06 L (1.3E+06 gal)[1] and a detailed discharge summary for the crib is shown on Figure 4. The calculated potential lifetime discharge could exceed one vadose zone pore volume.

Site: 216-U-17	Area: U Plant	Category: Deep

Volume Discharged: 4.97E+06 L (1.3E+06 gal)

Pore Volume Discharged: 4.97E+06 L/ (235 ft x 1500 ft^2 / 35.3 m^3/ft^3 * 1000 L/m^3 * 0.3) = 1.7

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-U-17 Waste Site

Contaminant	Mass Discharged
Alpha	0.000195 Ci
H3	69.7 Ci
U-gross	0.000478 Ci
Pu-239	<0.0000296 Ci
Am-241	<0.000053 Ci

Source: WHC-EP-0141-2, *Westinghouse Hanford Company Effluent Discharges and Sold Waste Management Report for Calendar Year 1989: 200/600 Areas.*

Previous Site Characterization

Site Characterization Summary: On May 2, 1996, a Global Positioning System Survey was performed and the data is stored in the Hanford Geographic Information System. A radiological survey was conducted on June 30, 1997, and no contamination was found. On December 4, 2003, a geophysical survey was performed for characterization purposes.

Borehole locations are shown on Figure 1 and soil data are summarized in Tables 2 through 4.

Table 2. Borehole Summary for the 216-U-17 Waste Site

Year	Borehole/Well ID	Location with respect to Site	Depth (ft)
2004	299-W19-48 / C4300	North – 35 ft	1 – 397 (GPL) 285-429 (4 soil samples)
2006	299-W19-89 / A7789	Inside footprint	2 – 157 (GPL)

GPL = geophysical log
ID = identification

Site: 216-U-17	Area: U Plant	Category: Deep

Table 3. Geophysical Log Summary 216-U-17

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A7789	0 to 5	–	pCi/g	–	8.084.7	cpm	2
	5 to 10	–	pCi/g	–	8.777.6	cpm	8
	10 to 15	–	pCi/g	–	7.506.9	cpm	12
	>15	–	pCi/g	–	31.942.4	cpm	102
C4300	0 to 5	–	pCi/g	–	14.261.3	cpm	5
	5 to 10	–	pCi/g	–	16.232.5	cpm	8
	10 to 15	–	pCi/g	–	13.411.3	cpm	12
	>5	0.58	pCi/g	375.8	19.853	cpm	206

bgs = below ground surface
ID = identification

Table 4. Soil Maximum Detection Summary (Soil Borehole C4300)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
2-Butanone	–	–	–	6.6	µg/kg	407
Acetone	–	–	–	2.9	µg/kg	407
Aluminum	–	–	–	9,680,000	µg/kg	429
Arsenic	–	–	–	2,780	µg/kg	407
Barium	–	–	–	92,100	µg/kg	340
Beryllium	–	–	–	362	µg/kg	340
Boron	–	–	–	16,600	µg/kg	429
Calcium	–	–	–	3,350,000	µg/kg	340
Chromium	–	–	–	77,200	µg/kg	340
Cobalt	–	–	–	6,240	µg/kg	429
Copper	–	–	–	13,600	µg/kg	429

Site: 216-U-17	Area: U Plant	Category: Deep

Table 4. Soil Maximum Detection Summary (Soil Borehole C4300)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Diethylphthalate	–	–	–	490	µg/kg	429
Di-n-butylphthalate	–	–	–	660	µg/kg	429
Gross alpha	–	–	–	1.2	pCi/g	290
Iron	–	–	–	16,900,000	µg/kg	340
Lead	–	–	–	496	µg/kg	290
Lithium	–	–	–	15,500	µg/kg	429
Magnesium	–	–	–	5,680,000	µg/kg	429
Manganese	–	–	–	170,000	µg/kg	290
Mercury	–	–	–	739	µg/kg	340
Molybdenum	–	–	–	3,600	µg/kg	340
Neptunium-237	–	–	–	0.008	pCi/g	429
Nickel	–	–	–	40,600	µg/kg	340
Nitrogen in nitrite and nitrate	–	–	–	3,010	µg/kg	290
Phosphorus	–	–	–	439,000	µg/kg	290
Potassium	–	–	–	1,260,000	µg/kg	429
Silicon	–	–	–	862,000	µg/kg	340
Silver	–	–	–	2,780	µg/kg	429
Strontium	–	–	–	13,500	µg/kg	429
Thallium	–	–	–	2,660	µg/kg	429
Total beta radiostrontium	–	–	–	0.23	pCi/g	290
Uranium	–	–	–	790	µg/kg	407
Uranium-233/234	–	–	–	0.098	pCi/g	290
Uranium-238	–	–	–	0.14	pCi/g	290
Vanadium	–	–	–	40,300	µg/kg	407
Zinc	–	–	–	47,100	µg/kg	429

Site: 216-U-17	Area: U Plant	Category: Deep

Nature and Extent of Contamination: The discharge depth was within shallow soil (3.5 m [11.5 ft] below ground surface [bgs]). The crib construction included an impermeable membrane above drainage layers. Geophysical log (GPL) results indicate shallow soil is not contaminated.

No manmade radionuclides were detected in shallow or deep soil during the geophysical logging of borehole 299-W19-89 / A7789 located within the crib. Borehole 299-W19-48 / C4300 located 9.1 m (30 ft) north of the crib was also nondetect for manmade radionuclides. The only available soil analytical data are for deep (88.3, 103.6, 124, and 130.7 m [290, 340, 407, and 429 ft] bgs) samples collected at well 299-W19-48 located approximately 10.7 m (35 ft) north of the crib footprint. These sample depths are below the water table (approximately 77.1 m [253 ft] bgs).

References:

BHI-00608, 1996, *Hanford Sitewide Groundwater Flow and Transport Model Calibration Report*, Rev. 1, Bechtel Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D197301520.

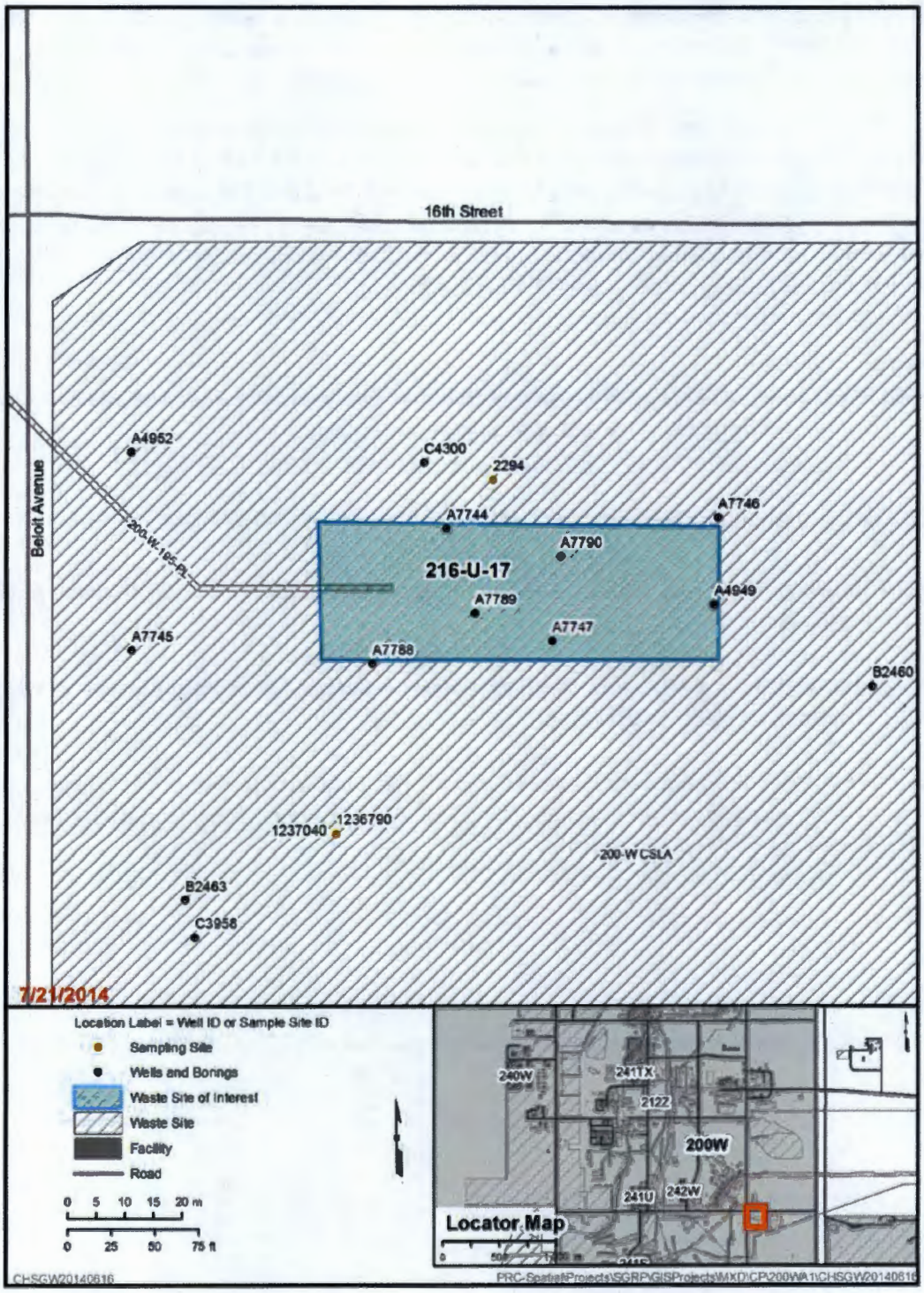
EVSDS Database. Virtual Library.

H-2-77174 (drawing), 1986, *Dwg List/Civil Site Plan*, Rev. 1, Kaiser Engineers Hanford Company, Richland, Washington.

H-2-77175 (drawing), 1988, *Civil Profile, Crib Plan Sections & Details*, Rev. 1, Kaiser Engineers Hanford Company, Richland, Washington

WHC-EP-0141-2, 1990, *Westinghouse Hanford Company Effluent Discharges and Sold Waste Management Report for Calendar Year 1989: 200/600 Areas*, Westinghouse Hanford Company, Richland, Washington.

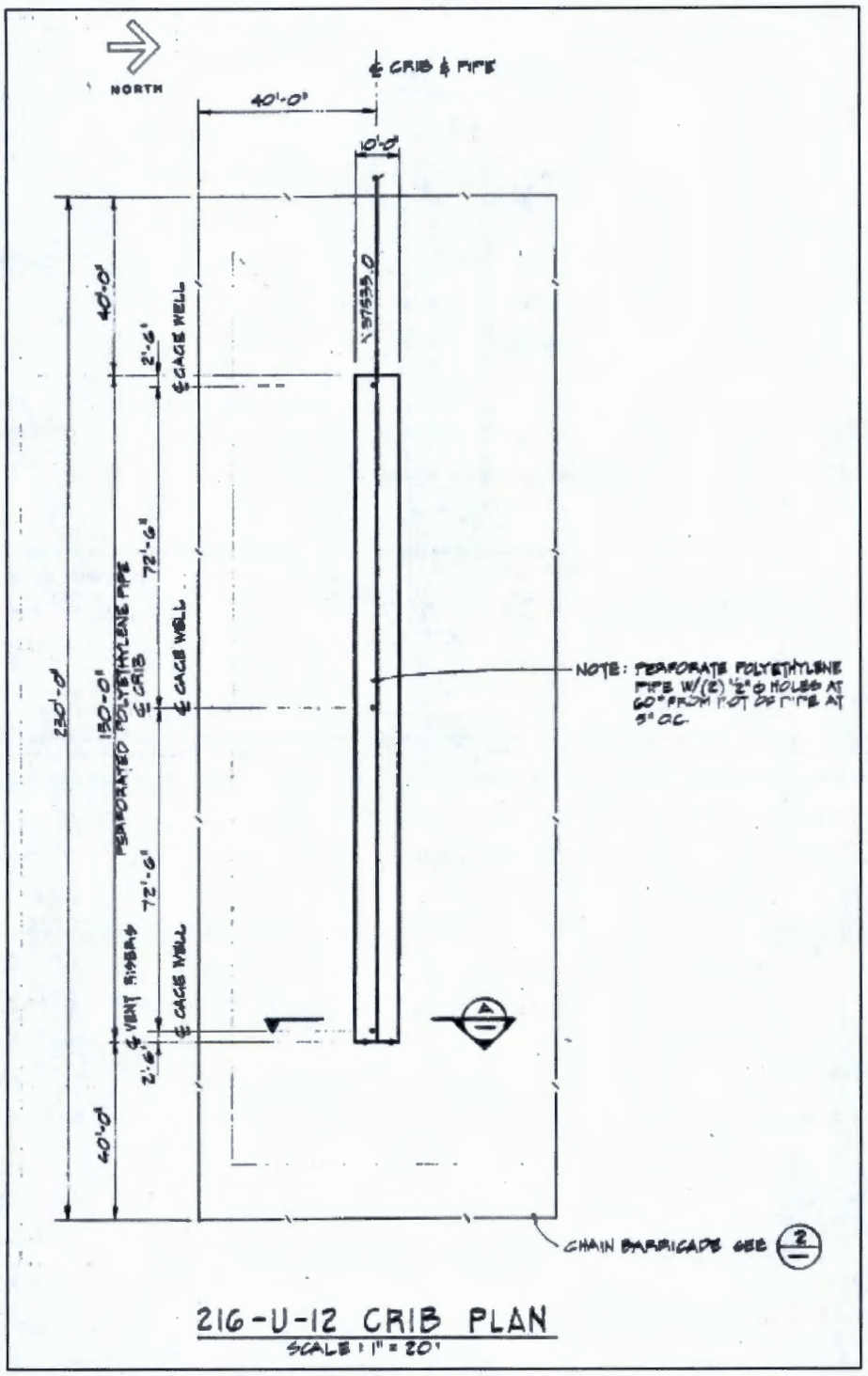
Site: 216-U-17	Area: U Plant	Category: Deep



ID = identification

Figure 1. 216-U-17 Waste Site Map

Site: 216-U-17	Area: U Plant	Category: Deep

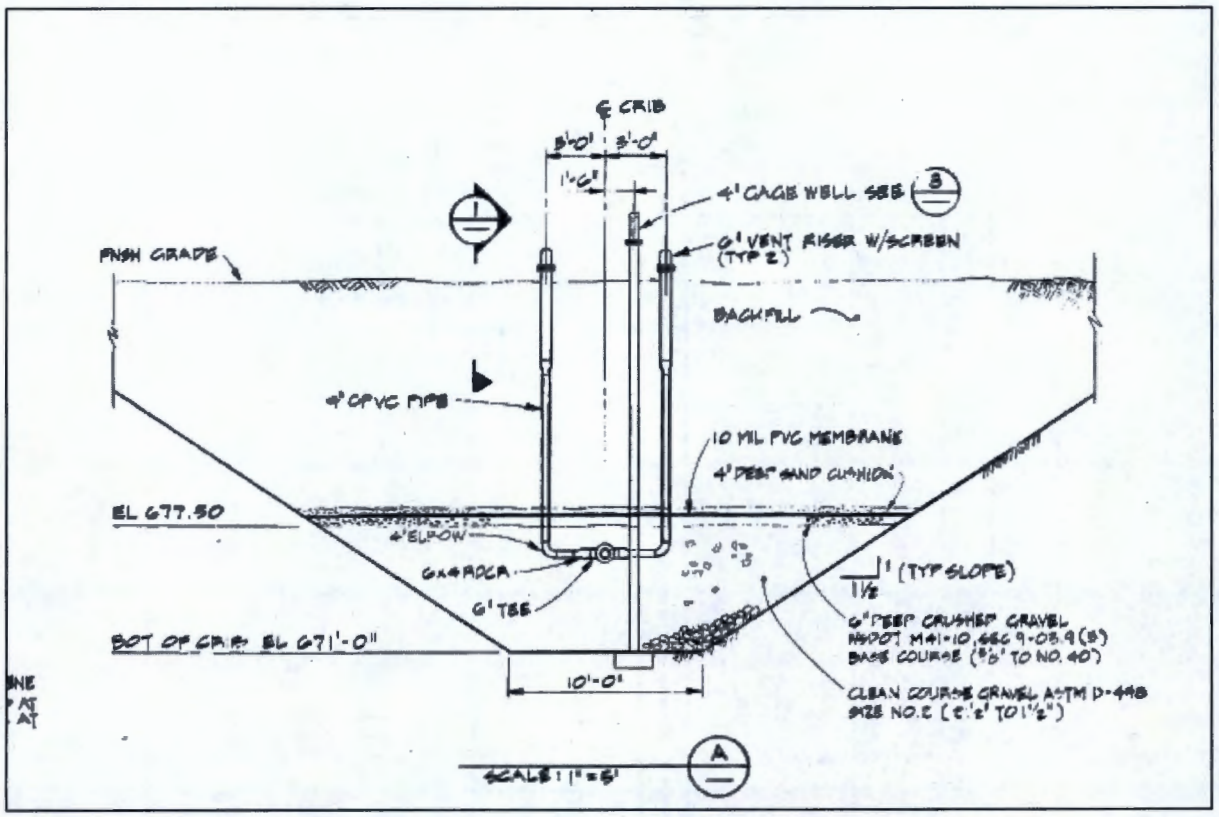


Source: H-2-77175, *Civil Profile, Crib Plan Sections & Details.*

Note: Produced from the best available copy.

Figure 2. Plan View of 216-U-17 Crib

Site: 216-U-17	Area: U Plant	Category: Deep



Source: H-2-77175, *Civil Profile, Crib Plan Sections & Details.*

Note: Produced from the best available copy.

Figure 3. Cross Section of 216-U-17 Crib

Site: 216-U-17	Area: U Plant	Category: Deep

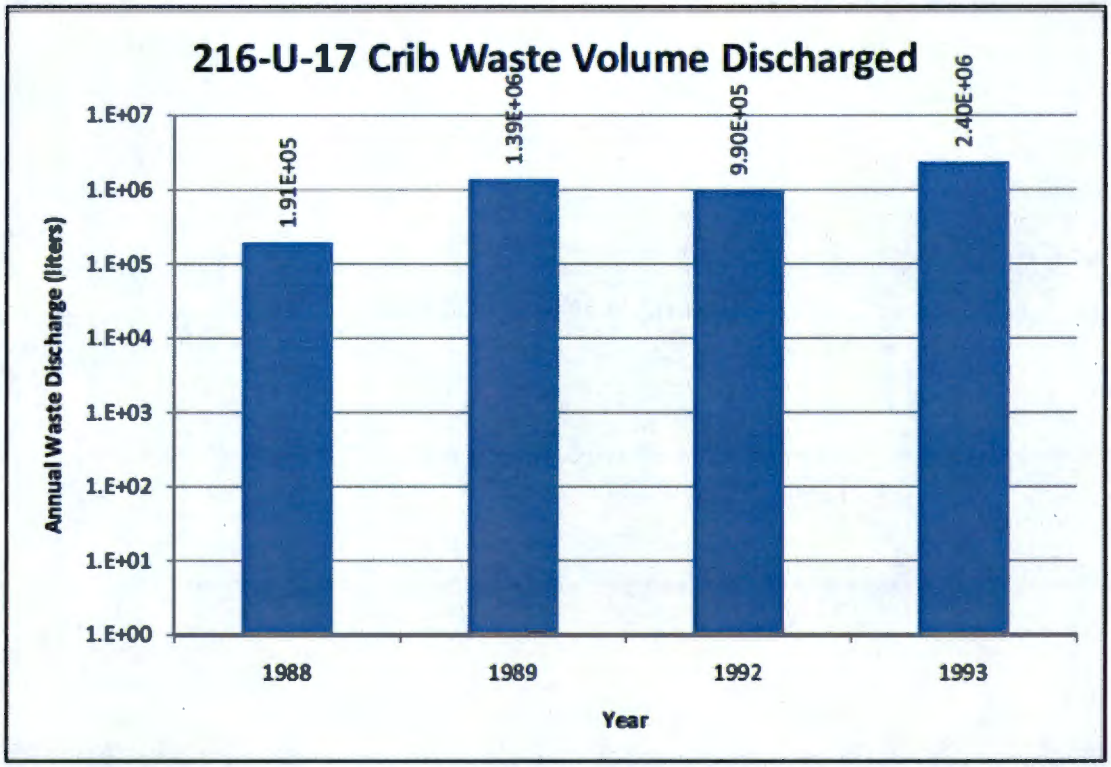


Figure 4. 216-U-17 Annual Waste Volume Discharged

Site: 216-U-17	Area: U Plant	Category: Deep

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Site: 241-U-361	Area: U Plant	Category: Intermediate – Adequately Characterized

Site Description

Site Type: Settling Tank
Facility/Geographic Area: U-Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1
Service Dates: 1951 to 1967

Waste Site Location and Physical Description: Settling Tank 241-U-361 is located southwest of 221-U, north of 16th Street (Figure 1). The tank is an underground settling tank constructed of reinforced concrete in 1945. The tank construction is shown on Figure 2 and the piping plan on Figure 3. The settling tank was originally constructed with overflow piping connected to reverse well 299-W19-9 / A7737, located adjacent to Tank 241-U-361. The reverse well never received waste and the waste line was extended from Tank 241-U-361 to the 216-U-1 and 216-U-2 Cribs. Due to the 1953 unplanned release (UPR-200-W-19), the surface surrounding the settling tank has been covered with shotcrete. In 1985, the manual tape was removed and the tank was interim stabilized.

The 216-U-1 & 2 Cribs and Settling Tank 241-U-361 are located within a common radiologically controlled area. In 1992, the area was surface stabilized by scraping the contaminated surface soil and consolidating it near the settling tank. The contaminated soil was covered with 45 to 61 cm (18 to 24 in.) of clean backfill.

Waste Site Coordinates:
E-567295.95953 N-135010.48085

Site Dimensions:
Site Diameter: 6.1 m (20 ft) Site Depth: 7.62 m (25 ft)
Site Area: 29.2 m^2 (314 ft^2) Cover Thickness: Not applicable

Related Site Structure(s): This unit is associated with the 221-U Building, UPR-200-W-19 and the 216-U-1 and 216-U-2 Cribs. The pipeline to the tank is 200-W-193-PL. The pipeline from the tank to the 216-U-1 and 2 Cribs is site code 200-W-194-PL.

Site Posting: It is posted with Underground Radioactive Material Area signs and Inactive Miscellaneous Underground Storage Tank signs.

Site History

Release Summary: The tank received cell drainage from the 5-6 tank in the 221-U Building and waste from the 224-U Building until the Uranium Recovery operations shut down in 1957. From July 1957 through May 1967, the 216-U-1&2 Crib system received waste from the 224-U Facility and equipment decontamination waste and reclamation waste from the 221-U Canyon via Settling Tank 241-U-361. The waste flowed through Settling Tank 241-U-361 and then to the 216-U-1 & 2 Cribs, located 26 m

Site: 241-U-361	Area: U Plant	Category: Intermediate – Adequately Characterized

(85 ft) west, via an underground pipe. Settling Tank 241-U-361 also received organic waste and cell drainage from the 221-U Building during an unplanned release (UPR-200-W-19) in 1953. The contaminated area was subsequently backfilled. Limited information is available to estimate the process effluent volume.

Volume/Mass Discharged: 1.04E+05 L (2.75E+04 gal) Note: volume listed is the volume of liquid process effluent that passed through the tank to the 216-U-1 & 2 Cribs.

Pore Volume Discharged: Not applicable. The tank itself was not a waste discharge facility, and no specific release from the tank has been confirmed.

Waste Inventory: The settling tank inventory, provided in Table 1, was estimated in D&D-36428, *Characterization Report for the 241-U-361 Settling Tank in the 200-UW-1 Operable Unit*, using results from the 2007 supernate and sludge sampling.

Table 1. Waste Inventory Summary for the 241-U-361 Waste Site

Constituent	Units	Supernate	Sludge	Total
Total Volume	L	3794	100056	103850
Total Mass	Kg	3907	127071	130979
Major Constituents				
Water	Kg	3716	90220	93936
Uranium (total)	Kg	0.12	15757	15757
Nitrate	Kg	140	3012	3152
Sulfate	Kg	2.05	120	122
Kerosene	Kg	<0.1	1076	1076
TBP	Kg	<0.1	278	278
Tetrachloroethylene	Kg	<0.1	0.44	0.44
1-Butanol	Kg	<0.1	6.26	6.26
Other constituents	Kg	54	16601	16655
Radionuclides				
U-234	Ci	4.96e-5	5.36	5.36
U-235	Ci	1.81e-6	0.226	0.226
U-236	Ci	2.03e-6	0.121	0.121
U-238	Ci	4.02e-5	5.31	5.31
Pu-239/240	Ci	<7.44e-6	3.04	3.04
Am-241	Ci	<9.64e-6	0.310	0.310
Sr-90	Ci	1.76	84.1	85.9
Cs-137	Ci	0.031	31.1	31.1
Co-60	Ci	3.21e-05	<1.0	<1.0
Tc-99	Ci	0.0123	1.59	1.60

(1)Tank Volume Calculations:
Tank OD - 20' 10" (H-2-1749)
Wall thickness - batters from 5" at top to 6" at bottom - use 5.5"
Tank ID = 19'11" = 19.917'
Radius = 9.9585'

Depth to supernate layer from top of riser 4 (measured July 07) = 11'5" = 11.42'
Depth to sludge layer from top of riser 4 (measured July 07) = 11'10 1/2" = 11.85'
Depth from top of riser 4 to bottom of tank (H-2-1749) = 694.90-671.71 = 23.19'
Depth of sludge layer = 23.19 - 11.85 = 11.34'
Depth of supernate layer = 5 1/2" = 0.43'
Total depth of tank contents = 23.19 - 11.42 = 11.77'

Volume of supernate = (0.43)(pi)(9.9585)**2 = 133.97cu. ft. = 1002gal = 3794L
Volume of sludge = (11.34)(pi)(9.9585)**2 = 3533 cu ft = 26431gal = 100056L
Total contents = (11.77)(pi)(9.9585)**2 = 3667 cu ft = 27433gal = 103849L

1 cubic foot = 7.481 gal
1 cubic foot = 28.32 Liters

Site: 241-U-361	Area: U Plant	Category: Intermediate – Adequately Characterized

Previous Site Characterization

Site Characterization Summary: Annual radiation surveys and visual inspections are performed. Sample data collected in 1976 estimated the tank contained 760 Ci of strontium-90, 1,365 Ci of cesium-137, 69,000 kg of uranium, and less than one gram of plutonium.

In 1993, an in-pipe camera survey of the pipeline from the 216-U-1&2 Cribs to Settling Tank 241-U-361 was completed. The field data gathered from this investigation supported the conceptual model of pipeline integrity (DOE/RL-95-13, *Limited Field Investigation for the 200-UP-2 Operable Unit*).

In 2004/2005, during investigation of the 216-U-1&2 Cribs and Settling Tank 241-U-361, auger borehole C4706 was installed near the settling tank to approximately 13.4 m (44 ft) below ground surface (bgs) and soil samples collected at the bottom of the borehole. The soil samples were analyzed for technetium-99, nitrogen as nitrate/nitrite, mercury, cadmium, uranium (metal), uranium-235, uranium-238, antimony, and arsenic and other inductively coupled plasma-mass spectrometry metals (barium, chromium [total], cobalt, copper, lead, manganese, selenium, silver, strontium, thallium, titanium, vanadium, and zinc). Geophysical log (GPL) was completed at six direct push boreholes installed within 15.2 m (50 ft) of the tank to approximately 14.9 m (49 ft) bgs (C4209 to C4215). GPL results indicate shallow soil contamination (0.3 to 1.07 m [1 to 3.5 ft] bgs) by cesium-137, most likely associated with UPR-200-W-19.

In December 2006, vapor samples were collected from the tank and a video camera was lowered through a riser. Dose rates inside the tank were less than 150 millirad per hour. The void space in the tank is only approximately 0.6 m (2 ft). In August and September 2007, the settling tank was sampled. Two supernatant samples were collected along with a seven-segment core sample of the sludge. It is presently estimated to contain 104,100 L (27,500 gal) of sludge with an unknown plutonium content. The presence of sludge and supernate within the tank 40 years after the tank was removed from service indicates that the tank is not likely to have leaked to a significant degree, if at all.

Borehole locations are shown on Figure 1 and soil data are summarized in Tables 2 through 4.

Table 2. Borehole Summary for the 241-U-361 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2004	C4209	North – 5 ft	0.5 – 48.8 (GPL)
2004	C4210	Southeast – 25 ft	0.5 – 48.8 (GPL)
2004	C4211	South – 25 ft	0.5 – 49.5 (GPL)
2004	C4213	North – 25 ft	0 – 49.1 (GPL)
2004	C4215	South – 45 ft	0 – 48.5 (GPL)

Site: 241-U-361	Area: U Plant	Category: Intermediate – Adequately Characterized

Table 2. Borehole Summary for the 241-U-361 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2005	C4706	Southeast – 40 ft	42 – 43.5 (1 soil sample)

GPL = geophysical log
ID = identification

Table 3. Geophysical Log Summary for the 241-U-361 Waste Site

DPT Casing/Well Number	Cesium-137	Uranium-238/Uranium-235	Other Man-made Contaminants Detected
C4209	0.5 to 16.5 ft: 0.2 to 42.9 pCi/g (max at 3.5 ft)	None detected	None
C4210	1.5 to 3.5 ft: 0.3 to 1.87 pCi/g (max at 2.5 ft)	None detected	None
C4211	1.5 to 10.5 ft: 0.2 to 9.69 pCi/g (max at 2.5 ft)	None detected	None
C4213	0 to 8 ft: 0.3 to 44.1 pCi/g (max at 1 ft) 10 to 16 ft: 0.3 to 18 pCi/g (max at 14 ft), 4 pCi/g at 15 ft	None detected	None
C4215	1 to 7 ft: 0.3 to 83.3 pCi/g (max at 3 ft)	None detected	None

Source: D&D-27783, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*, Table 3-2.
DPT = Direct Push Technology

Site: 241-U-361	Area: U Plant	Category: Intermediate – Adequately Characterized

Table 4. Soil Maximum Detection Summary for the 241-U-361 Waste Site

Borehole Identification Number	Sample Interval (ft bgs)	Uranium (mg/kg)	Uranium MDL	Nitrogen as Nitrate/Nitrite (mg/kg)	Nitrogen MDL (mg/kg)	Tc-99 (pCi/g)	Tc-99 MDC/MDA (pCi/g)
C4607	42 to 43.5	2.86	0.15	3.7	0.5	U	0.612

Source: D&D-27783, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*, Table 3-5.

bgs = below ground surface

MDA = minimum detectable activity

MDC = minimum detectable concentration

MDL = method detection limit

U = analyte not detected

Nature and Extent of Contamination: The overall tank content volume has remained consistent over 20 years (D&D-36428), indicating a low leak potential. Previous investigations characterized the tank supernate and sludge, which contain radionuclide, organic, and inorganic constituents of concern. GPL results for multiple locations around the tank identified cesium-137 in shallow soil, with the maximum detections occurring between 0.3 and 1.07 m (1 and 3.5 ft) bgs. No uranium or other manmade radionuclides were detected by GPL. Soil sample results found uranium and technetium-99 at nondetect or low concentrations in the sample collected at 12.8 to 13.3 m (42 to 43.5 ft) bgs. These GPL and soil sample results suggest shallow soil contamination by a surface release, possibly related to unplanned release UPR-200-W-19 from the 216-U1&2 Cribs or from Settling Tank 241-U-361 riser. If a release from the tank itself occurred, elevated concentrations would be expected within the depth interval of the tank (1.8 to 7.6 m [6 to 25 ft] bgs) or deeper.

Existing data do not suggest a subsurface release from the tank. No additional data are needed. Shallow soil contamination from an unplanned release from the 241-U-361 and 216-U-1 &2 crib risers will be characterized as part of UPR-200-W-19. Existing data are sufficient to support future remedy alternative evaluations, as confirmed by a data quality objective performed with U.S. Department of Energy/Richland Operations Office and U.S. Environmental Protection Agency on April 27, 2016.

References:

D&D-27783, 2006, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*, Rev. 0, Fluor, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA01917974.

D&D-36428, 2008, *Characterization Report for the 241-U-361 Settling Tank in the 200-UW-1 Operable Unit*, Rev. 0, Fluor, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0081647H.

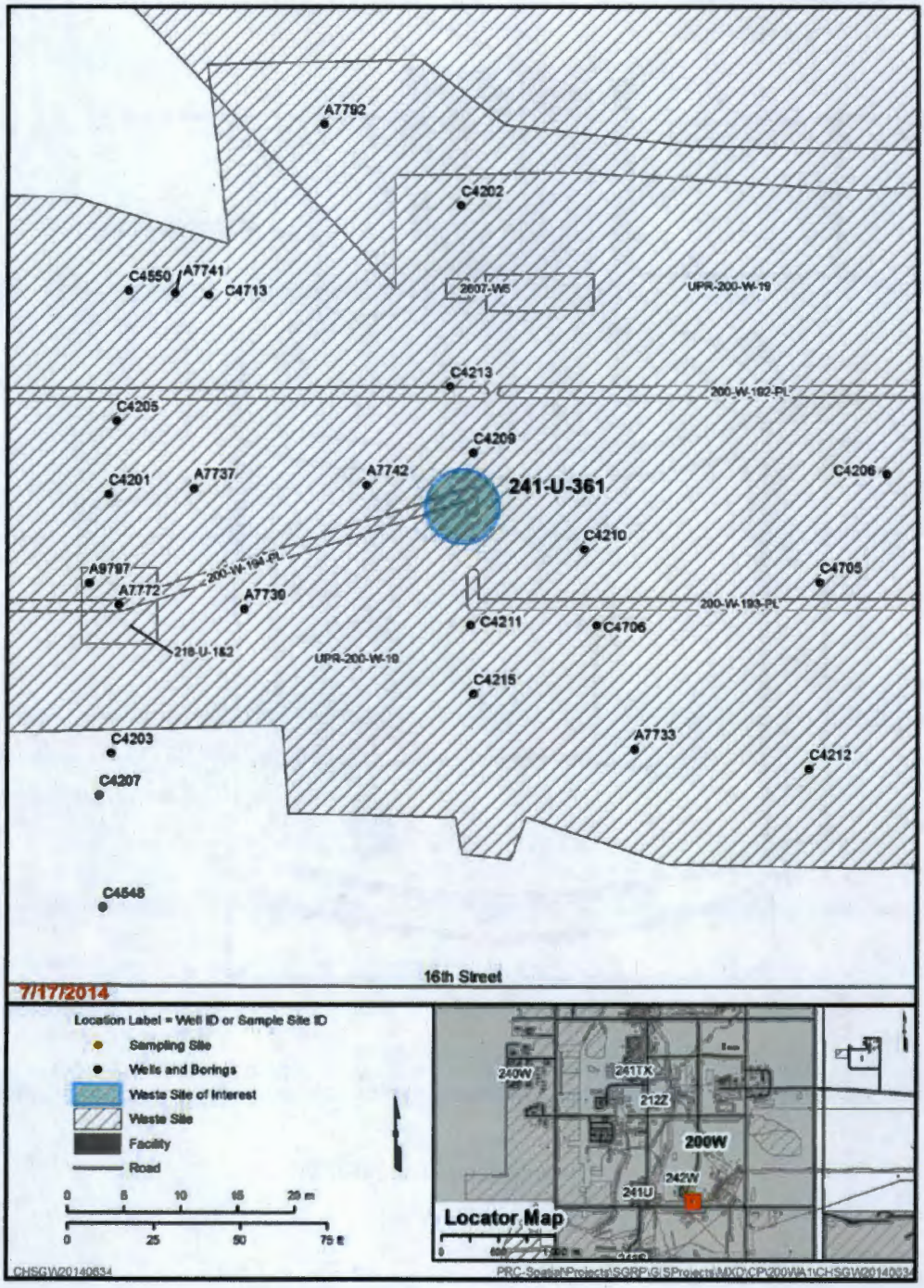
Site: 241-U-361	Area: U Plant	Category: Intermediate – Adequately Characterized

DOE/RL-95-13, 1995, *Limited Field Investigation for the 200-UP-2 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196003069.

H-2-71676 (drawing), 1985, *Piping Plans Tanks 241-U-361 & 241-T-361*, Rev. 1, Vitro Engineering Corporation, Richland, Washington.

Waste Information Data System General Summary Report for the 241-U-361 Waste Site.

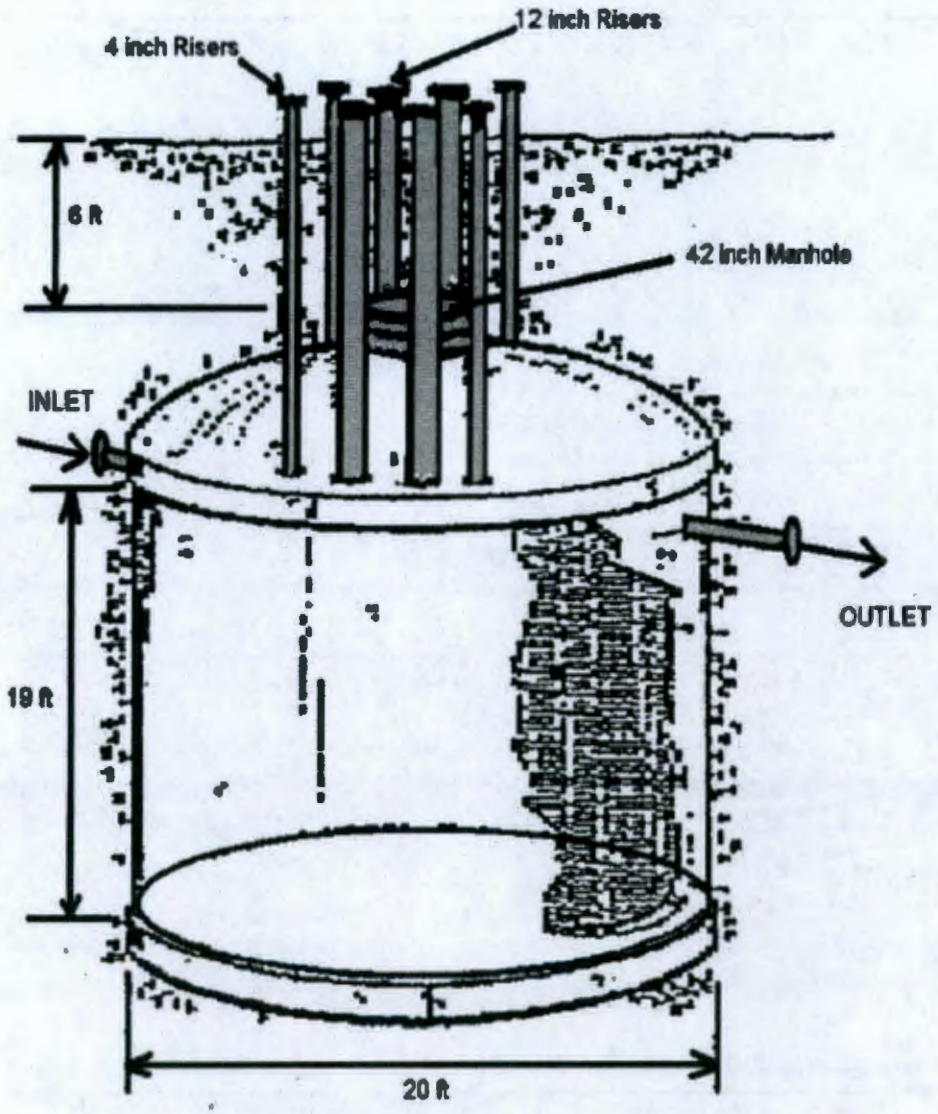
Site: 241-U-361	Area: U Plant	Category: Intermediate – Adequately Characterized



ID = identification

Figure 1. 241-U-361 Waste Site Map and Borehole Locations

Site: 241-U-361	Area: U Plant	Category: Intermediate – Adequately Characterized

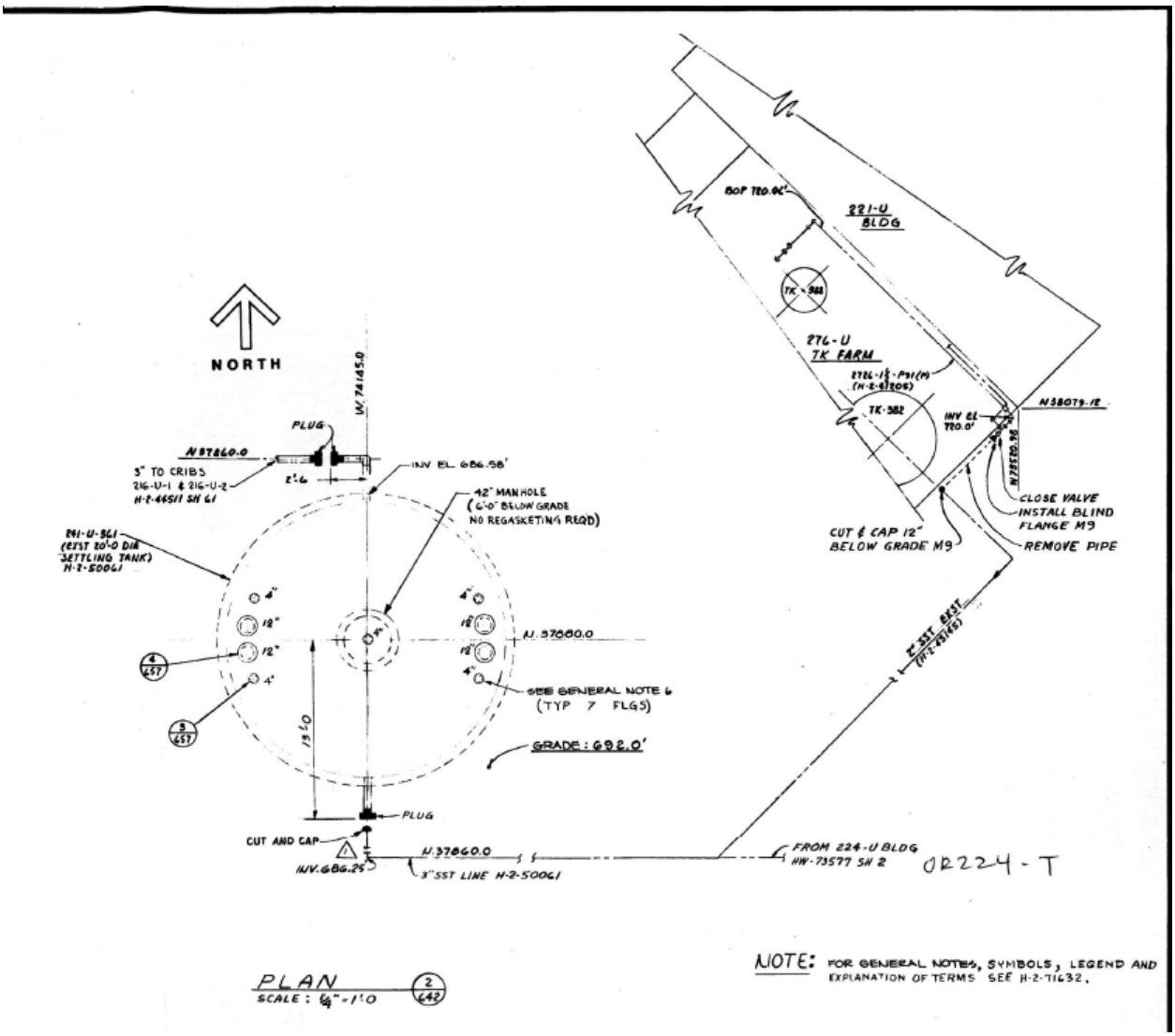


Source: D&D-36428, *Characterization Report for the 241-U-361 Settling Tank in the 200-UW-1 Operable Unit.*

Note: Produced from the best available copy.

Figure 2. Settling Tank 241-U-361

Site: 241-U-361	Area: U Plant	Category: Intermediate – Adequately Characterized



Source: H-2-71676, *Piping Plans Tanks 241-U-361 & 241-T-361*.

Note: Produced from the best available copy.

Figure 3. Piping Plan

Site: 241-U-361	Area: U Plant	Category: Intermediate – Adequately Characterized

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Site: 241-UX-154	Area: U Plant	Category: Intermediate

Site Description

Alternate Site Identification Names:	241-UX-154; 241-UX-154 Diversion Box
Site Type:	Diversion Box
Facility/Geographic Area:	U Plant
Current Operable Unit (OU) Assignment:	200-WA-1
Former OU Assignment:	200-IS-1
Service Dates:	1948 through 2003

The scoping summary in Figure 1 (pages 1 through 4) provides the site history, construction, features of interest, waste streams, site interfaces, relevant characterization, and other relevant information for the 241-UX-154 Diversion Box. The diversion box comprises a pipe pit from 2.1 to 5.1 m (7 to 16.7 ft) below ground surface (bgs) separated by a concrete wall from a nozzle pit from ground surface to 5.1 m (16.7 ft) bgs. The diversion box is connected to 25 7.6 cm (3-in.) stainless steel encased transfer lines and has two drain lines to the 241-UX-302A Catch Tank. This waste site lies within the proposed footprint of the U Plant Canyon Barrier (Figure 2).

The waste site was evaluated as a potential source of liquid intrusion to the 241-UX-302A Catch Tank (RPP-RPT-40344, *241-UX-302A Isolation Investigation Report*). The nozzle pit portion of the 241-UX-154 Diversion Box was weather sealed in 2003.

References:

RPP-RPT-40344, 2009, *241-UX-302A Isolation Investigation Report*, Rev. 0, Washington River Protection Solutions, Richland, Washington.

Waste Information Data System General Summary Report for the 241-UX-154 Waste Site.

Site: 241-UX-154	Area: U Plant	Category: Intermediate

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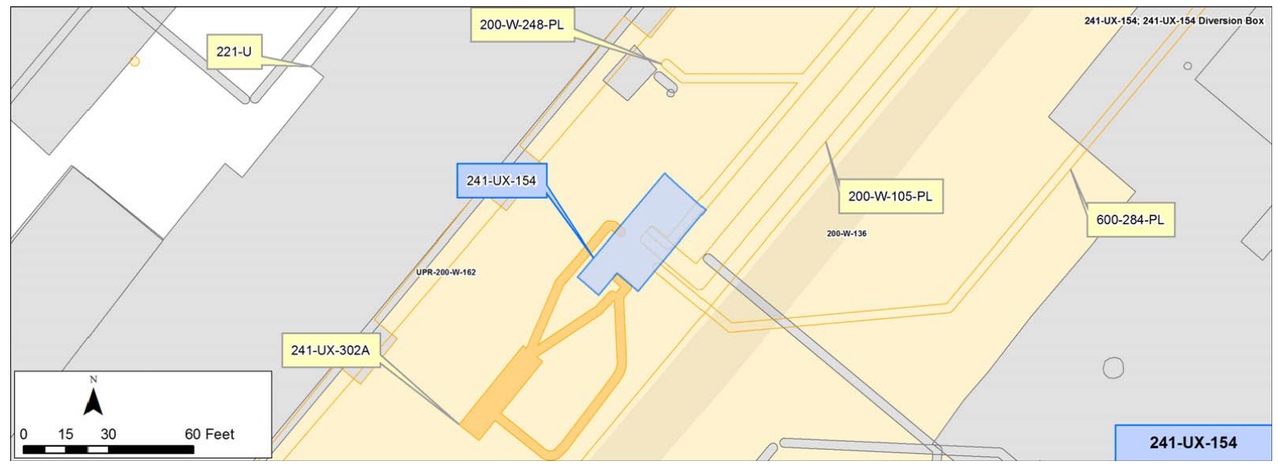
Site: 241-UX-154	Area: U Plant	Category: Intermediate

4/8/2016

Scoping Summary: 241-UX-154

History

The 241-UX-154 waste site is an inactive diversion box used to transfer waste streams from U Plant to the tank farms, and served as the main transfer station connecting the 200 West Area to the 200 East Area via the 600-284-PL until 1995. The 241-UX-154 diversion box and associated pipelines supported U Plant operations from 1948 through 1958. From 1958 to Jan-2003, the diversion box received drainage from cross-site transfer line flushes and drainage from pipeline encasements. The U Plant exhaust stack drained to the diversion box from 1958 to 1985 when the stack drain line was re-routed directly to the 241-UX-302A catch tank. The nozzle pit portion of 241-UX-154 diversion box (northeast segment of structure) was weather sealed in 2003. The 241-UX-154 diversion box has 25 connecting encased lines and two drain lines to the 241-UX-302A catch tank. The 241-UX-154 diversion box connects to the 221-U (lines not mapped), the 241-EW-154 vent station (600-284-PL), the 241-TX-155 diversion box (200-W-105-PL) and the 241-WR vault (200-W-105-PL, 200-W-248-PL).



Construction

The 241-UX-154 diversion box is comprised of two abutting reinforced concrete structures - a pipe pit and a nozzle pit. A common wall separates the pipe pit from the nozzle pit.

Pipe Pit (southeast segment of diversion box)
- 37-ft 4-in. long x 10-ft wide x 9-ft 6-in. deep
- 2-ft thick reinforce concrete walls
- Interior coating: Americoat
- Calculated volume: 972.5-gal
- Top depth: 7-ft bgs
- Bottom depth: 16-ft 8-in. bgs

Nozzle Pit (northeast segment of diversion box)
- 40-ft long x 10-ft wide x 16-ft 8-in deep
- 2-ft thick reinforced concrete walls
- Interior coating: Americoat
- Calculated volume: 1,847.7-gal
- Top at ground surface
- Bottom depth: 16-ft 8-in. bgs

Transfer lines
- 25 3-in. stainless steel transfer lines enter the diversion box from pipeline encasements

Features Of Interest

- Pipe pit roof surface identified as a potential source of infiltration to diversion box
  - 370 sq-ft of surface area, 7-ft bgs where of percolation of precipitation can pond
  - Roof comprised of eight cover blocks with seams seal with 4-in. "mortar cap"

Relevant Characterization

- Evaluated as a potential source of liquid intrusion to 241-UX-302A (RPP-RPT-40344)
  - Roof of pipe pit ~ 7-ft bgs with mortar cap over cover blocks
  - Video inspection of concrete encasements entering 241-UX-154

Infiltration ponding on the pipe pit roof identified as a likely source of inflow to diversion box and catch tank.

Waste Streams

- U-Plant Recovery & Scavenging Waste (URP)
- Infiltration of rain & snow melt from pipeline encasements
- Infiltration from 241-UX-154 pipe and nozzle pit
- U-Plant exhaust stack drainage
- drainage from 241-UX-302A

Misc./Other Relevant Information

- None

Site Interfaces

Origin Points

200-IS-1
- 200-W-105-PL
- 600-284-PL

WA-1
- 200-W-248-PL

Site Intersects

200-WA-1
- 200-W-136 - (footprint of 221-U D&D area)
- UPR-200-W-162 - (associated with 221-U)

Page 1

Figure 1. 241-UX-154 Diversion Box Scoping Summary (page 1)

Site: 241-UX-154	Area: U Plant	Category: Intermediate

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Scoping Summary: 241-UX-154

Figure 1. 241-UX-154 Diversion Box Scoping Summary (page 2)

Site: 241-UX-154	Area: U Plant	Category: Intermediate

4/8/2016

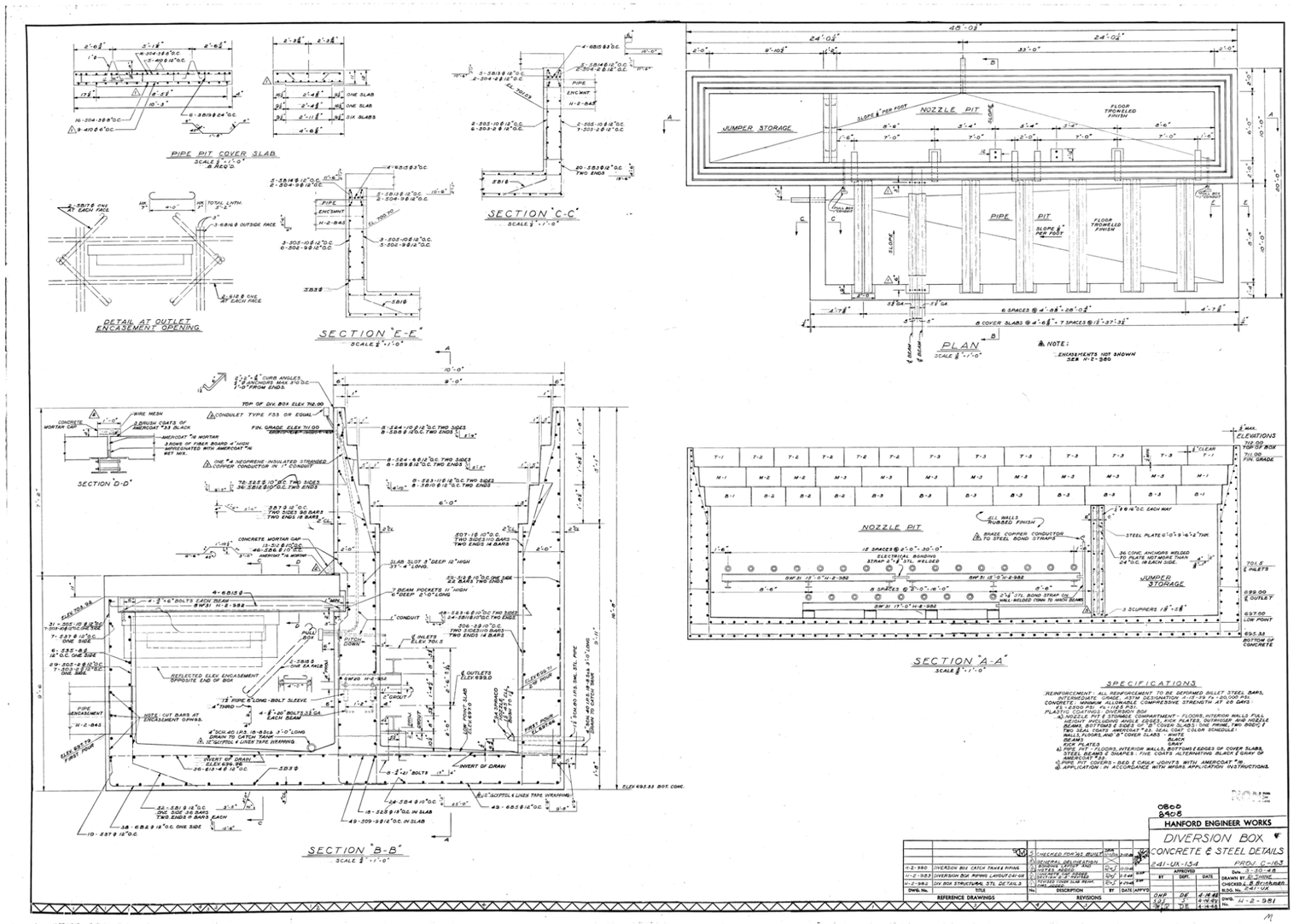


Figure 1. 241-UX-154 Diversion Box Scoping Summary (page 3)

Site: 241-UX-154	Area: U Plant	Category: Intermediate

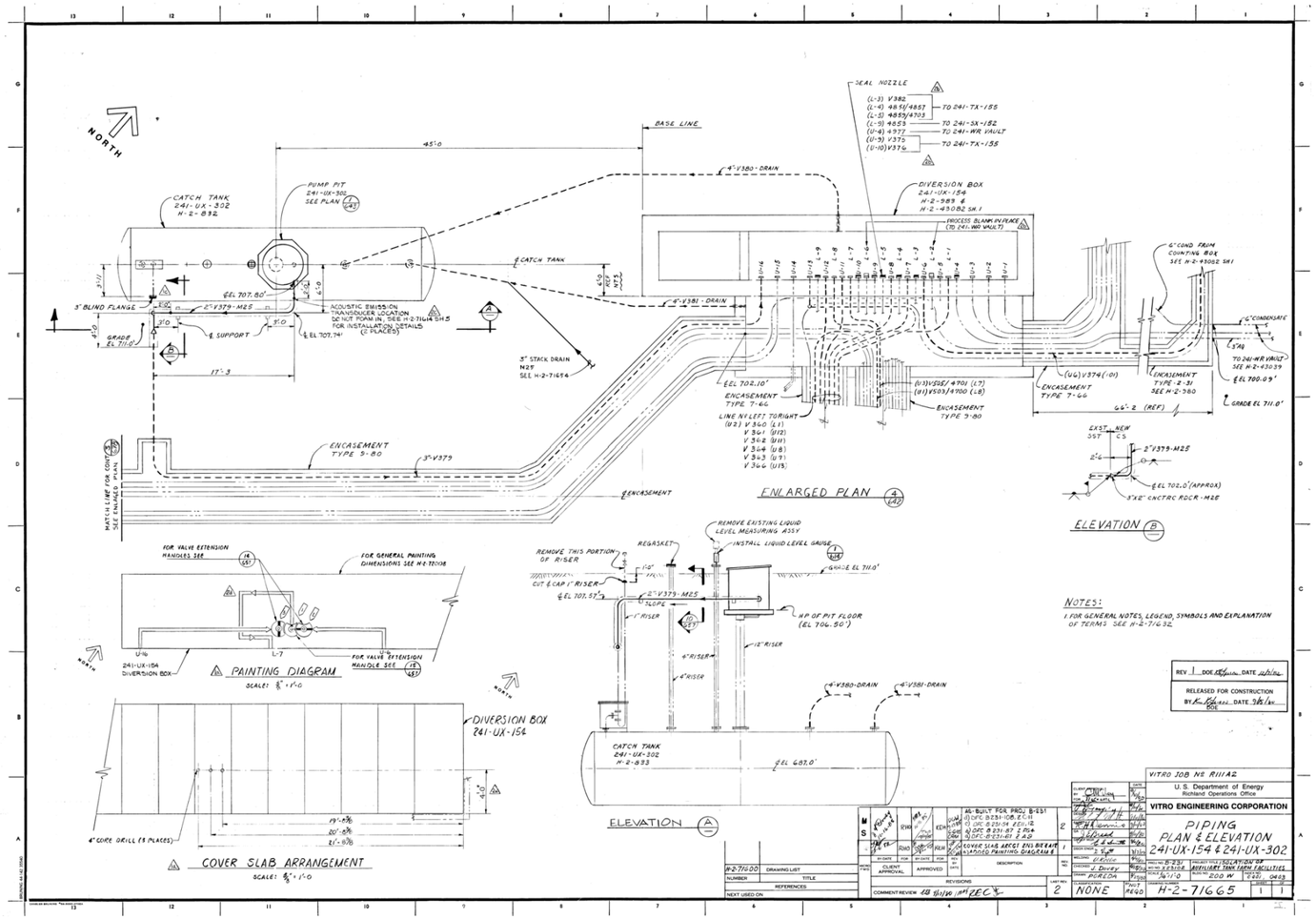
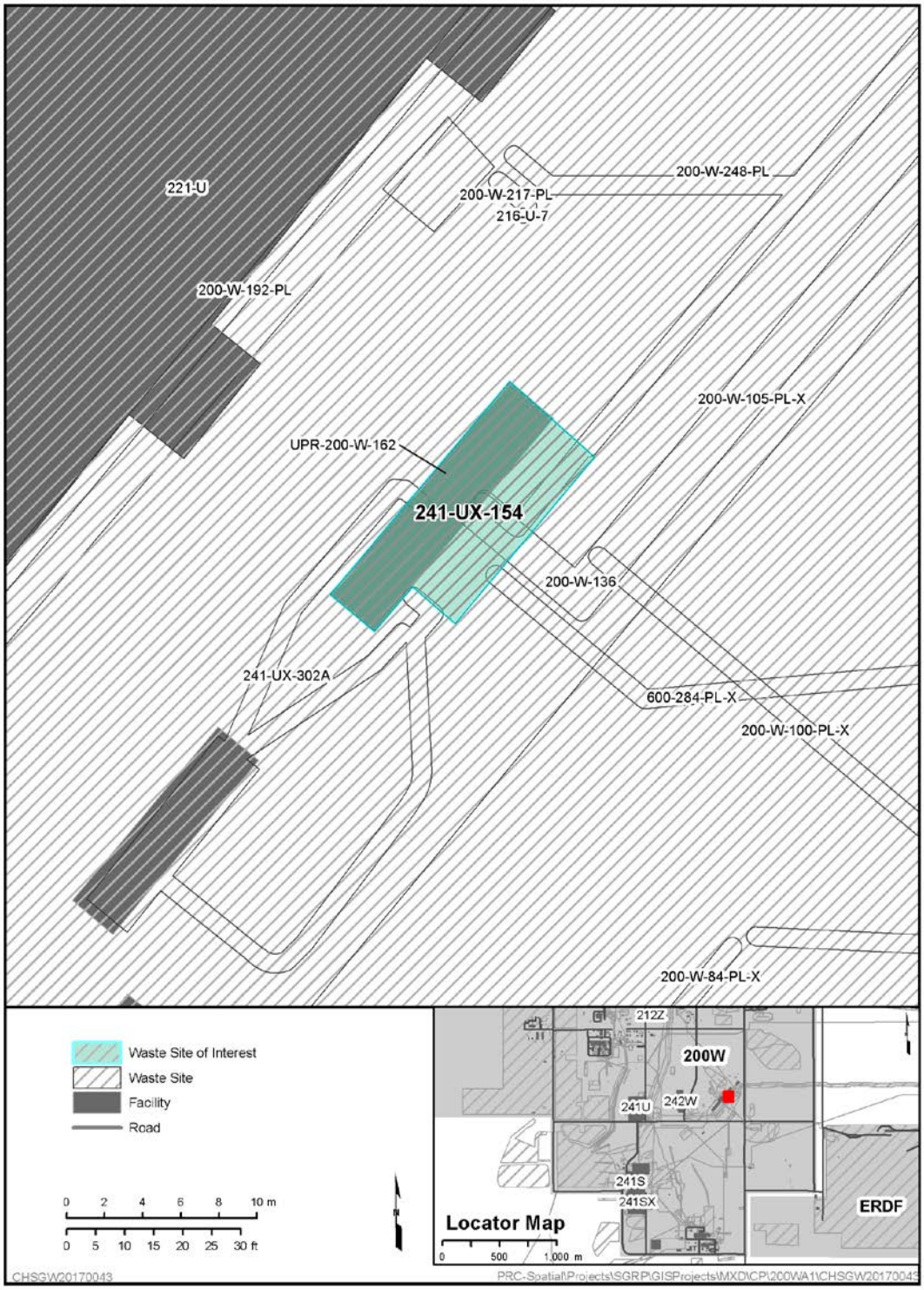


Figure 1. 241-UX-154 Diversion Box Scoping Summary (page 4)

Site: 241-UX-154	Area: U Plant	Category: Intermediate



ERDF = Environmental Restoration Disposal Facility

Figure 2. 241-UX-154 Site Map

Site: 241-UX-154	Area: U Plant	Category: Intermediate

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Site: 241-UX-302A	Area: U Plant	Category: Intermediate

Site Description

Alternate Site Identification Names:	241-UX-302A; Lines V380 and V381; 241-U-302 catch Tank; 241-UX-302; 241-UX-302 Catch Tank
Site Type:	Catch Tank
Facility/Geographic Area:	U Plant
Current Operable Unit (OU) Assignment:	200-WA-1
Former OU Assignment:	200-IS-1
Service Dates:	1947 through 2003

The scoping summary in Figure 1 (pages 1 through 3) provides the site history, construction, features of interest, waste streams, site interfaces, relevant characterization, and other relevant information for the 241-UX-302A Catch Tank. The 241-UX-302A waste site comprises a single, direct-buried, inactive, carbon steel tank and three pipelines to the 241-UX-154 Diversion Box. The 70,030 L (18,500-gal) tank is 5.9 to 8.8 m (19.5 to 28.5 ft) below ground surface (bgs). This waste site lies within the proposed footprint of the U Plant Canyon Barrier (Figure 2).

Grab samples of the tank contents were collected and analyzed for inorganics, organics, and radionuclides in 2002 (letter FH-0203447, "Tank 241-UX-302A FY 2002 Grab Samples Analytical Results for the Final Report"). An integrity assessment of the tank was conducted in 2001, and a leak assessment test was conducted in March 2006. The tank continues to receive inflows from undetermined sources and has been pumped in 2006, 2009, and 2012. A technical evaluation indicates that possible sources of inflow are 291-U exhaust stack drain, drain lines from the 241-UX-154 diversion box nozzle pit and pipe pit, or lateral water intrusion through corrosion sites on the tank.

References:

FH-0203447, 2002, "Tank 241-UX-302A FY 2002 Grab Samples Analytical Results for the Final Report," (letter to G.A. Stanton, CH2M HILL Hanford Group from R.W. Sosa, November 5), Fluor Hanford, Richland, Washington.

Waste Information Data System General Summary Report for the 241-UX-302A Waste Site.

Site: 241-UX-302A	Area: U Plant	Category: Intermediate

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Site: 241-UX-302A	Area: U Plant	Category: Intermediate

4/18/2016

Scoping Summary: 241-UX-302A

History

The 241-UX-302A waste site is a single, direct-buried, inactive, carbon steel tank that formerly collected drainage from the 241-UX-154 Diversion Box and associated pipe encasement. The waste site is located approximately 40-ft southeast of U-Plant and 30-ft southwest of the 241-UX-154 Diversion Box. This catch tank was constructed in 1947 and supported U Plant operations until 1958. From 1958 to Jan-2003, the catch tank received drainage from cross-site transfer line flushes, the U Plant exhaust stack drainage, and infiltration of rain and snow melt from the 241-UX-154 Diversion Box and pipeline encasements. The waste site includes three pipelines associated with the tank. The 241-UX-154 Diversion Box was weather sealed in 2003. Plans to cut and cap the U Plant exhaust stack drain were developed in 2004 but were not implemented. A leak assessment test was conducted in March 2006 and concluded the tank was likely leaking through a pin hole at the 10.5-in. level. The tank continues to receive inflows from undetermined sources and has been pumped in 2006, 2009 and 2012. A technical evaluation of potential inflow sources indicate that possible sources of inflow are: 291-U exhaust stack drain, drain lines from the 241-UX-154 diversion box nozzle pit and pipe pit, or lateral water intrusion through corrosion sites on the tank.

Construction

- Dimensions: 39-ft long x 9-ft diameter
- Orientation: Horizontal
- Capacity: 18,500-gal
- Material: 9/16-in. thick Carbon Steel
- Tank penetrations : 6 penetrations
  - One 3-in. carbon steel riser to abandoned jet box (V379)
  - Two 4-in. stainless steel risers
    - One blanked with 4-in. flange; one equipped with ENRAF liquid level detector
  - Two 4-in. stainless steel drain line connections
  - One 12-in. riser to pump pit weather-sealed
    - Pump manifold includes 2-in. stainless steel line expanding to 3-in. line that terminates at 241-UX-154 U-16 with closed isolation valve
- Buried depth: top 19.5-ft bgs, bottom 28.5-ft bgs

Features Of Interest

- One abandoned jet box line (V379) blanked with 3-in. flange
- Two stainless steel drain line connections, both blanked
  - One (V380) from the 241-UX-154 Diversion Box
  - One (V381) from pipe encasement w/T-connection to U Plant exhaust stack drain

Relevant Characterization

- Integrity assessment conducted in 2001; tank deemed sound
- Tank grab sample in June 2002 (FH-0203447)
- Leak assessment conducted in May 2006
  - Tank presumed to leak - HOLE AT 10.5 -in level
  - Tank pumped to intake level
  - 877-gal waste estimated remaining in tank
- Tank liquid pumped in October 2006 (RPP-RPT-31779)

Waste Streams

- U Plant Recovery & Scavenging Waste (URP)
- Infiltration of rain & snow melt from 241-UX-154 Diversion Box & pipeline encasement
- U Plant exhaust stack drainage

Misc./Other Relevant Information

- Tank liquid pumped in Sep-2009 (RPP-RPT-42789)
- Tank liquid pumped in Jul-2012 (TFC-WO-11-5930)
- Possible Inflow sources identified (RPP-TE-49694)
  - 241-X-154 diversion box drain lines
  - 291-U stack drain line
  - lateral inflows through corrosion sites on tank

Site Interfaces

Origin/Termination	Site Intersects
200-IS-1	TBD
• 241-UX-154 Diversion Box	• 200-W-136 - (footprint of 221-U D&D area)
	200-WA-1
	• UPR-200-W-162 - (associated with 221-U)

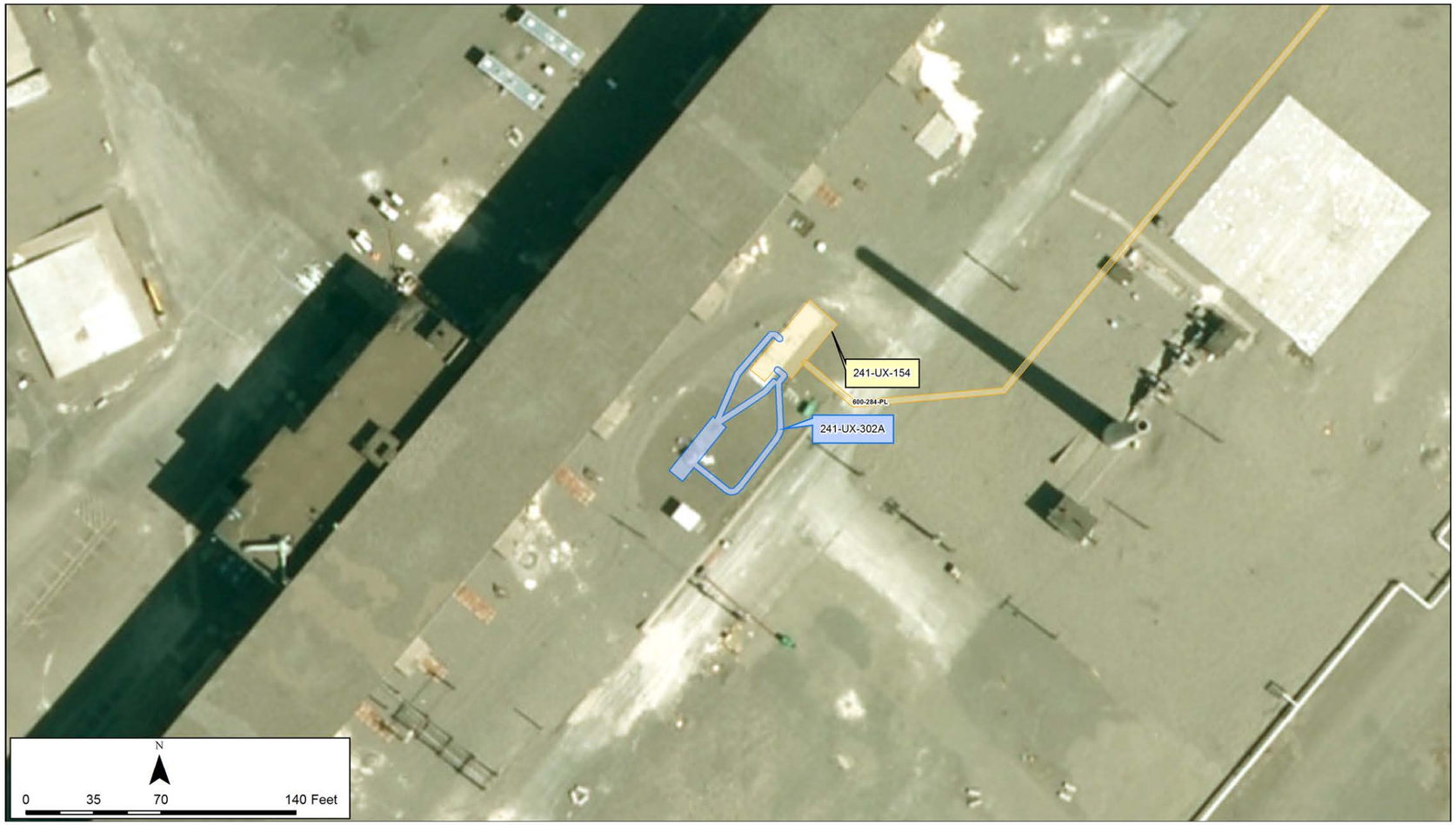
Page 1

Figure 1. 241-UX-302A Catch Tank Scoping Summary (page 1)

Site: 241-UX-302A	Area: U Plant	Category: Intermediate

4/18/2016

Scoping Summary: 241-UX-302A



Page 2

Figure 1. 241-UX-302A Catch Tank Scoping Summary (page 2)

Site: 241-UX-302A	Area: U Plant	Category: Intermediate

4/18/2016

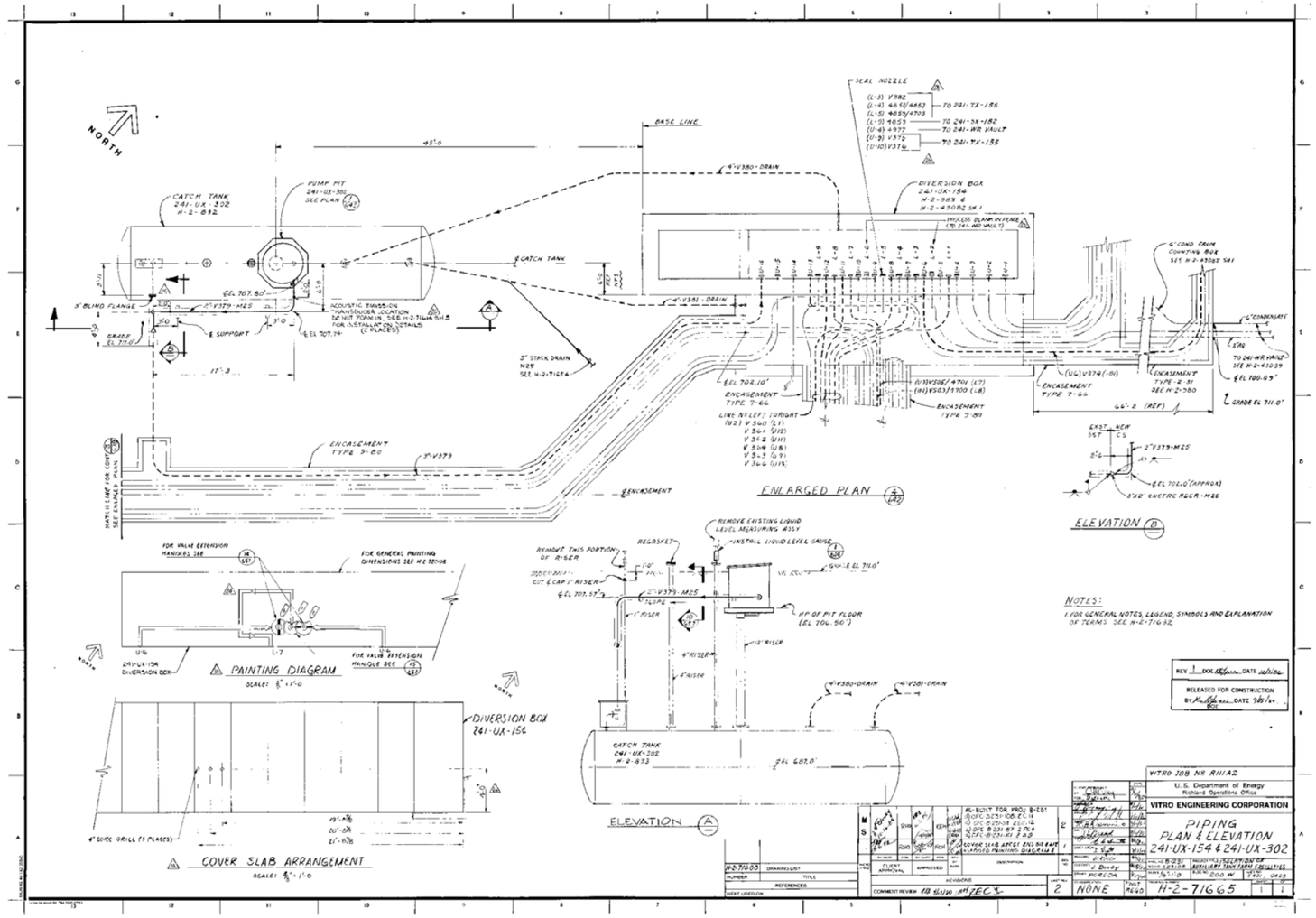


Figure 1. 241-UX-302A Catch Tank Scoping Summary (page 3)

Site: 241-UX-302A	Area: U Plant	Category: Intermediate

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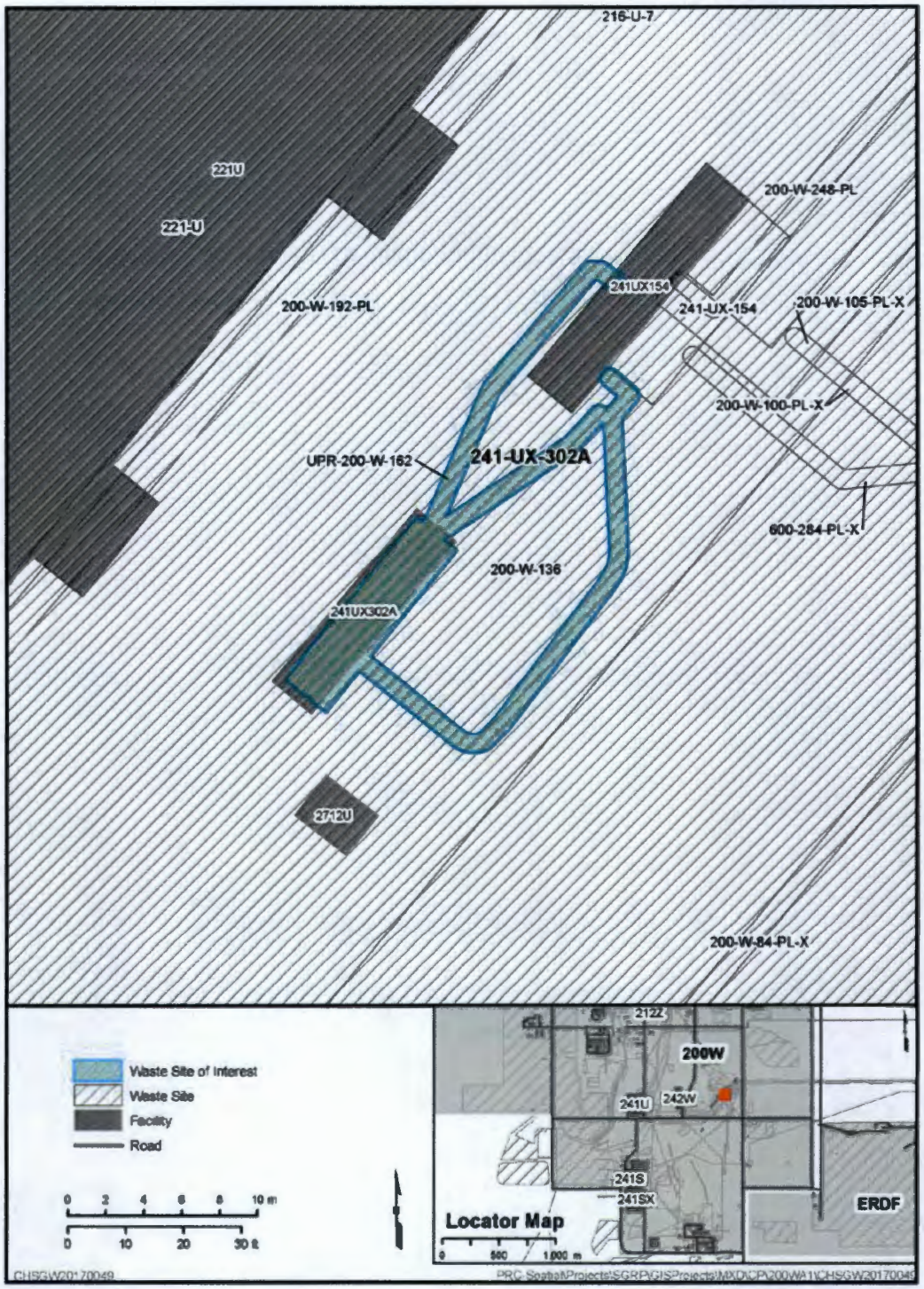
Site: 241-UX-302A	Area: U Plant	Category: Intermediate



ERDF = Environmental Restoration Disposal Facility

Figure 2. 241-UX-302A Site Map

Site: 241-UX-302A	Area: U Plant	Category: Intermediate

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Site: 241-WR	Area: U Plant	Category: Intermediate

Site Description

Site Type: Receiving Vault
Facility/Geographic Area: 200 Inner Area West
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UP-2
Service Dates: January 1952 to January 1976

Waste Site Location and Physical Description: The 241-WR Vault is located northeast of the 221-U Building, west of Beloit Ave (Figure 1). The vault is a two-level, below grade, reinforced concrete structure. There are nine 7.3 m^2 (24 ft^2) compartments arranged in two rows with an 189,000 L (50,000 gal) stainless steel tank in each compartment (Figure 2). The bottom of the eastern row (lower level) of tanks (241-WR-001 through -005) is 14.6 m (48 ft) below ground surface (bgs). The bottom of the western row (upper level) of tanks (241-WR-006 through -009) and a pump pit is 8.8 m (29 ft) bgs. A concrete wall separates the two rows of tanks, and a second wall separates 241-WR-006 through -009 from the pump pit. Each tank compartment (tank pit) has a small 0.6 by 0.9 by 0.2 m (2 by 3 by 0.6 ft) sump (drawing H-2-40228, *Structural-Concrete-Diversion Station-Plan at Base Slabs*). In addition to the tanks, the vault contains miscellaneous agitators, pumps, and valves. The 296-U-6 exhaust stack and a 61 cm (24 in.) diameter dry well are included in this site. The exhaust stack is located 9.1 m (30 ft) northwest of the 241-WR Vault (Figure 3). The exact location of the dry well is unknown, but drawing H-2-40744, *Heat & Vent - Plan & Sections – Ductwork to Fan & Stack*, shows it received drainage via two drains from the exhaust stack and stack fan (Figure 4).

Waste Site Coordinates:
Northing–135305.797097 Easting–567691.434782

Site Dimensions:
Site Length: 39 m (128 ft) Site Depth: 14.6 m (48 ft)
Site Width: 20.1 m (66 ft) Cover Thickness: Not specified
Site Area: 784 m^2 (1,188 ft^2)

Related Site Structure(s): The 241-WR Vault is associated with the 296-U-6 Stack, 221-U Plant Uranium Recovery processes, Thorium Recovery process, 200-W-244-PL, 200-W-248-PL, 200-W-105-PL, 241-UX-154 and BC Cribs and Trenches.

Site Posting: The area around the vault was interim stabilized with washed rock in 1993 and the area is marked with Underground Radioactive Material Area signs.

Site: 241-WR	Area: U Plant	Category: Intermediate

Site History

Records Review: In April, 2016 a records review of the 241-WR Vault process and isolation history was conducted to address data gaps associated with the conditions of the vault interior. The information gathered during this records review was to supplement a Data Quality Objective (DQO) to decide if the 241-WR Vault contents could be accessed and characterized during the Remedial Investigation/ Feasibility Study Characterization for the 200-WA-1 OU.

Process Description: Construction of the 241-WR Vault was completed in 1952, as part of the U Plant modification to the Uranium Recovery Plant. During the vault's active operation, it stored uranyl nitrate hexahydrate, nitric acid, and tributyl phosphate (TBP) wastes transferred into the vault storage tanks via underground pipelines. During U Plant Uranium Recovery Process operations (1952 to 1958), uranyl nitrate hexahydrate was stored and used as feed for 221-U. Recovered nitric acid was temporarily stored in the vault to be reused. Tributyl phosphate wastes were stored in the vault before being routed to the BC Cribs and Trenches via the 241-UX-154 Diversion Box and the Cross Site Transfer line (600-284-PL). Following termination of uranium recovery operations in 1958, the vault was used to store nitric acid and thorium from the Reduction-Oxidation (REDOX) and Plutonium-Uranium Extraction (PUREX) processes.

Tanks 241-WR-001 through -005 were used to contain highly radioactive feed from the Tank Farms and waste return solution and are referred to as the "hot" tanks. These tanks received uranium and thorium slurry solutions (via underground encased pipelines) from the single-shell tanks and prepared the waste to be fed into 221-U Facility to extract the uranium and thorium. At the 241-WR Vault, chemicals were added to the waste and its pH adjusted before transfer to the 221-U canyon to be processed through the TBP extraction columns. Tank 241-WR-001 also received neutralized waste from the 221-U extraction process and stored it until it was transferred back to the Tank Farms. Tanks 241-WR-006 through -009 are referred to as the "cold" tanks. Tank 241-WR-006 received nitric acid from 224-U recovery facilities or from U Plant storage tanks. The acid was routed to the HNO_3 storage tanks in Tank Farms processing vaults. Tanks 241-WR-007, -008, and -009 received condensate from U Plant. The condensate was discharged to the 241-WR-1, -2 and -3 Cribs (later renamed the 216-U-8 Crib and in 1960 replaced by the 216-U-12 Crib). From 1964 to 1979, the 241-WR Vault "cold" side Tanks 241-WR-006 through -009 were used to store Thorium Process Test Solutions from REDOX and PUREX testing and processing operations.

The volume of the waste stream returned to Tank Farms tanks from the 241-WR Vault tanks was significantly greater than the initial volume of the Tank Farms tanks stored metal waste. This was due to sluicing the waste from the Tank Farms tanks and chemical additions. As a result, evaporation could not keep up with the waste return rates to the Tanks Farms tanks.

In 1954, waste scavenging of U Plant wastes with nickel ferrocyanide was proposed to allow cribbing of the scavenged supernatants rather than by disposal via evaporation. The goal of this ferrocyanide precipitate process was to reduce the cesium-137 and strontium-90 content in the supernatant to less

Site: 241-WR	Area: U Plant	Category: Intermediate

0.1 µCi per ml prior to cribbing wastes. This process was scaled up from laboratory studies with initial plans to discharge over 25 million gallons of supernatant with short-lived radionuclides to cribs and trenches.

Adjusting the pH to a range of 8 to 10 allowed optimal decontamination of cesium and strontium in the supernatant. Cesium was found to settle quickly (0.05 µCi per ml in the supernatant), but strontium remained in the supernatant at concentrations above the laboratory studies. Thus, return transfers became time-dependent to prevent settling of cesium and strontium in Tank 241-WR-001. Undissolved solids in the Metal Waste transferred into Tanks 241-WR-002 through -005 required agitation to keep the solids suspended. Cesium could be returned to the supernatant by adjusting the pH to greater than 12 thus dissolving the cesium ferrocyanide precipitate. Strontium return to the supernatant required chemical addition. An agitator was added to Tank 241-WR-001 (after August 2, 1954), to keep the ferrocyanide precipitated soils from settling before solution transfer to Tank Farms.

However, after initiating the ferrocyanide process, problems occurred in Tank 241-WR-001, including pump failures, pH control of the waste, severe corrosion, and high concentrations (5 to 6 µCi per ml) of strontium remained in the supernatant precluding cribbing of the supernatant until additional cribs were available.

Tank 241-WR-002 was converted to the receiver tank for TBP processed waste.

Initial scavenged waste in U Plant had strontium-90 concentrations:

December 1954:	1.1 µCi per ml	(HW-34147, *Monthly Report Hanford Atomic Products Operation for December 1954*)
February 1955:	0.5 µCi per ml	(HW-35530, *Monthly Report Hanford Atomic Products Operation for February 1955*)
March 1955:	0.5 to 1.9 µCi per ml	(HW-35891, *Monthly Report Hanford Atomic Products Operation for March 1955*)

High strontium-90 concentrations in the supernatant were linked to lower than normal ferrous ion concentrations in the solvent extraction wastes. To achieve more stable ferrous ion concentrations in future solvent extraction waste, the sulfamic acid concentration was doubled. Further studies found that reduced levels of phosphate (normally present) in the Tank Farms tanks waste feeds were the primary cause of the high concentrations of strontium-90 in the supernatant. Additional adjustments to the ferrocyanide process (to reduce the strontium-90 concentration to less than 0.05 µCi per ml in the supernatant) included nickel sulfate, calcium nitrate, etc.

In the fall of 1954, two percent of the new feed uranium to U Plant was routinely returned to Tank Farms for each ton of uranium processed. Scavenging was also used in Tank Farms for tanks waste from U Plant that was processed prior to ferrocyanide treatment.

Site: 241-WR	Area: U Plant	Category: Intermediate

In 1957, TBP uranium recovery operations at the U Plant were terminated. Any flushes of U Plant vessels would have been transferred to Tank Farms tanks via the 241-WR Vault Tank 241-WR-002. Tanks 241-WR-002 through -005 were not used for any waste processing or storage after 1957.

In October 1965, contaminated water, including 3.14 kg (7 lb) of thorium, was discharged to the 216-U-12 Crib.

Release Summary: Tanks 241-WR-001, -002, -004, and -005 are suspected to have leaked. Individual specific occurrence reports were not issued. The "hot side" tanks have reportedly contaminated the "cold side" of the vault.

In late December 1954 the motor on the Tank 241-WR-001 process waste pump failed, forcing a U Plant processing shutdown. After a brief restart, the process was again shut down when a flexible jumper (probably a rubber hose) installed on the pump-off line of the replaced Tank 241-WR-001 pump failed on or about the December 24, resulting in the discharge of wastes to the WR Vault cell floor. The liquid level surrounding Tank 241-WR-001 in conjunction with the emptying of the vessel caused the vessel to float loose from its base, rupturing the lines connected to the tank. Solution composed of liquid and solids containing cesium-137 and strontium-90 leaked into the Tank 241-WR-001 pit. Most of the cesium and strontium would have been suspended in the ferrocyanide solids. The solids remaining in the Tank 241-WR-001 pit would contain ferrocyanide precipitated cesium-137 and strontium-90 in concentrations similar to TBP ferrocyanide waste collected in single-shell tanks. After the solids settled, they would be tied up with the ferrocyanide and not dissolve with water flushes. Records indicate that Tank 241-WR-001 was permanently removed from service at that time. Records do not indicate the as-left conditions of Tank 241-WR-001 and sump.

Tank leaks within the vault were noted in the 1960s. Tank 241-WR-001 was reported to have collapsed during the TBP operation (1952-1958) and was observed to be empty in 1965. However, the Tank 241-WR-001 pit contained 51,786 L (13,700 gal) of liquid. Samples taken at that time indicated the liquid to be slightly contaminated water.

All of the sumps and tanks were pumped out in 1965. The liquid was sent to the 216-U-12 Crib. Numerous sources generated in the 1990s indicated that when Tank 241-WR-002 was pumped, it floated loose from its base, rupturing the lines connected to the tank. A significant clean up and repair effort was required to return the facility to service. However, no documentation of this was found to support this claim in records dated around the time period of the incident.

Volume Discharged: Unknown.

Pore Volume Discharged: Unknown.

Site: 241-WR	Area: U Plant	Category: Intermediate

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 241-WR Waste Site

Contaminant	Mass in Vault*
Beta	60 Ci
Alpha	<1 Ci

*BHI-01157, *U Plant Facility Safety Analysis Report*, Table F-2.

Previous Site Characterization

Site Characterization Summary: In 1957, the 241-WR Vault was opened and six inoperable pumps (with high radiation levels) were removed from the "hot" side of the vault's equipment pits and buried. All operable equipment was left in place. All steam lines to the "hot" side of the vault were blanked. The accessible areas of the Vault (this did not included the five pits for the "hot" tanks) were washed with water and the cover blocks replaced, decontaminated (water would have drained into the "hot" tank vault pits) and sealed. The "cold" side of the vault was used for UO_3 Plant HNO_3 acid storage.

In October 1965, the tanks and pit sumps were pumped out and sent to the 216-U-12 Crib. The "hot" vault pits were pumped to within 0.6 m (2 ft) from the bottom of the sump. Muck and slime plugged the screen when pumping to lower levels, indicating that a layer of sludge may still be present near the bottom of the 241-WR Vault tank pits. During pumping, over 100 Ci of strontium were sent to the 216-U-12 Crib. The curies of strontium sent to 216-U-12 is consistent with the ferrocyanide process treated TBP waste that had remained in the supernatant in a typical waste tank transfer to Tank Farms. It is estimated that in order to keep the discharge concentration less than 0.1 µCi per ml of strontium-90 to the 216-U-12 Crib; a volume of 1,000,000 L (254,172 gal) would be required to transfer 100 Ci of strontium-90. The ferrocyanide precipitate would have settled into the Tank 241-WR-001 pit.

The vault ceased operation in 1976. At this time, it was recognized that the thorium nitrate storage tanks at the 241-WR Vault were showing signs of deterioration, prompting the need for a long-term storage alternative (SEC-00201, *SEC Petition Evaluation Report*). A procedure was created in 1978 outlining the general cleanup of the 241-WR Vault cells and flushing of the four thorium-nitrate storage Tanks 241-WR-006 through -009 (SEC-00201). In 1978, measurements were taken for the remaining liquid volume in the "cold" vault tanks and pits. The results are summarized below.

- Tank 241-WR-006 minimum
- Tank 241-WR-006 sump 0 in.
- Tank 241-WR-007 0 in.
- Tank 241-WR-007 sump 0 in.

Site: 241-WR	Area: U Plant	Category: Intermediate

- Tank 241-WR-008 0 in.
- Tank 241-WR-008 sump 0 in.
- Tank 241-WR-009 33 cm (13 in.)
- Tank 241-WR-009 sump 0 in.

In early 1977, shipments of thorium nitrate were sent to Fernald for processing. From 1977 to 1979, a total of 844,147 L (223,000 gal) of solution containing approximately 349.9 metric tons of thorium was shipped to Fernald by tank car (SEC-00201). Thorium was removed from Tanks 241-WR-006 through -009, and the tanks were likely flushed. Flushing of the cold tanks would likely have caused water and sand to drain into the deeper "hot" tank sump pits.

In 1980, Project B-231 Title I design was completed to isolate process systems (vaults) that were deactivated. Measurements of liquid levels in the "hot" tanks and tank pit and sumps were collected in 1981. The results are summarized below:

- Tank 241-WR-001 13 cm (5 in.)
- Tank 241-WR-001 sump and pit 173 cm (68 in.)
- Tank 241-WR-002 0 in.
- Tank 241-WR-002 sump 528.3 cm (208 in.)
- Tank 241-WR-003 0 in.
- Tank 241-WR-003 sump 16.5 cm (6.5 in.)
- Tank 241-WR-004 0 in.
- Tank 241-WR-004 sump 9 cm (3.5 in.)
- Tank 241-WR-005 0 in.
- Tank 241-WR-005 sump 0 in.

While the project scope included the removal of any liquid still remaining in each of the nine WR Vault tanks and sumps, no documentation was found to confirm that any pumping occurred. However, in 1982 an Engineering Order (EO) was issued to provide an adapter to allow over-ground transfer for WR Vault sump pump-out (EO 02179). While no documentation of any pump out was found during the records review, installation of the adapter can be verified through an EO issued in 1987 (EO 43006) to remove the adapter.

According to WHC-SD-EN-ES-040, *Engineering Study of 50 Miscellaneous Inactive Underground Tanks Located at the Hanford Site, Washington*, research and correspondences indicate that in the early 1980s:

- Tank 241-WR-001 was probably empty but the pit and sump contained approximately 53,000 L (14,000 gal) of liquid (probably mildly contaminated water).

- Tank 241-WR-002 was empty but the pit and sump contained 132,500 to 265,000 L (35,000 to 70,000 gal) of liquid.

Site: 241-WR	Area: U Plant	Category: Intermediate

- Tank 241-WR-003 was reported to be empty and the sump contained 15 cm (6.5 in.) of liquid.
- Tank 241-WR-004 was reported to have leaked and to be empty and the sump contained 9 cm (3.5 in.) of liquid.
- Tank 241-WR-005 had no indication of leaks and both the tank and sump are empty.
- Tanks 241-WR-006 through -009 were dry and fairly clean except for some residual thorium nitrate contamination (alpha). However, Di Pietro (1979) reports liquid content of 87,000 L (23,000 gal) in Tank 241-WR-009.

Contents of Tanks 241-WR-006 and -007 were sampled and analyzed in early 1980s. Results are provided in WHC-SD-EN-ES-040.

Samples of the Tank 241-WR-001 and -002 pits or sumps were taken in February 1983 prior to isolation activities. Results of cesium and strontium in the liquid were consistent with supernatant received from U Plant after ferrocyanide treatment.

- Tank WR-001 Pit and Sump:
  - Cs-137 (µCi/L) 1.50
  - Sr-90 (µCi/L) 187
- Tank WR-002 Vault:
  - Cs-137 (µCi/L) 5.27
  - Sr-90 (µCi/L) 57.3

The aboveground structures, entry ports, stack, and vents have been dismantled. All tanks and related equipment remain in place and are estimated to include a contamination burden of 60 Ci beta. In 1986, the Tank Farm organization isolated the vault structure.

According to construction drawings H-2-71667, *HVAC / Process Piping WR Vault Isolation*; H-2-71668, *Instr/Elec/Prcs Piping WR Vault Isolation*; H-2-71669, *Utility Piping WR Vault Isolation*; and SK-2-56952, *Instr Elec & Prcs Piping Modifications*; of planned isolation activities, aboveground structures, the entry port, stack, and vent were dismantled and the vault sealed with expanded urethane foam with an ultraviolet sealant. Below-grade exhaust lines from individual tank cells were cut and plugged with concrete. The surface features of the adjacent 296-U-6 stack were also removed. In 1993, the chain link fencing and steam lines were removed.

The safety evaluation for stabilization of surfaces around the 241-WR Vault (WHC-SD-DD-TI-080, *Safety Evaluation for the Interim Stabilization of Radioactive Surface Contamination at 241-WR Vault, and 216-U-5 and 216-U-6 Waste Sites*) indicated that, in 1984, it was estimated that a 0.6 m (2 ft) heel remained in each tank, and at least two tanks were leaking. However, a completed stabilization evaluation form documenting isolation and stabilization has not been located.

Site: 241-WR	Area: U Plant	Category: Intermediate

Nature and Extent of Contamination: No known releases from the vault have been documented. No assumptions can be made regarding the current condition of the 241 Vault structure.

It is believed that the inside of the vault is contaminated with mildly contaminated water, but the quantity of liquid and contamination levels remaining in the tanks and sumps are uncertain.

Since both Tanks 241-WR-001 and -002 were used to receive ferrocyanide treated waste from U Plant, it is assumed that most of the cesium and strontium spilled to these pits would have been as precipitated ferrocyanide solids. This precipitant would have formed a sludge layer, insoluble to water flushes, which would have remained in the bottom of the pits. Based on typical feed and after two half-lives, the Tank 241-WR-001 pit sludge layer could contain up to 1,000 Ci of cesium and 1,000 Ci of strontium (both have a half-life of approximately 30 years). Tank 241-WR-002 would have had a minimal quantity, because it was used through the completion of U Plant processing in 1957 and process flushing. The sludge would have a transuranic concentration of approximately 50 nCi per g of solids. Tanks (and pits) 241-WR-003 through -005 would have very minimal radioactive material, since the feed from Tank Farms was acidic.

The 241-WR Vault Process Timeline, as summarized above, was used to produce a conservative estimate of the inventories that remain in the 241-WR Vault pits and tanks. Pits would contain sand from decades of water intrusion through cover blocks into the vault tank pits. Based on construction drawings, these stepped cover blocks were situated approximately 0.6 cm (0.25 in.) apart. Presently, the 241-WR-001 pit sludge layer, estimated about 0.6 m (2 ft) thick from the bottom of the pit, could contain up to 1,000 Ci of cesium and 1,000 Ci of strontium. The Tank 241-WR-001 heel could contain a small portion of this inventory. The 241-WR-002 pit would have minimal sludge from washing of contamination in the equipment pit from 1955 to 1957. Sludge would have a transuranic concentration of less than 50 nCi/g. Less than 0.2 tons of uranium would be in the sludge in the "hot" side. Tanks and pits 241-WR-003 through -005 would have minimal radioactive material since the feed from the Tank Farms was acidic and very soluble for flushing. Tanks and pits 241-WR-006 through -009 would have minimal radioactive material after thorium transfer and flushing in the late 1970s.

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Site: 241-WR	Area: U Plant	Category: Intermediate

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Site: 241-WR	Area: U Plant	Category: Intermediate

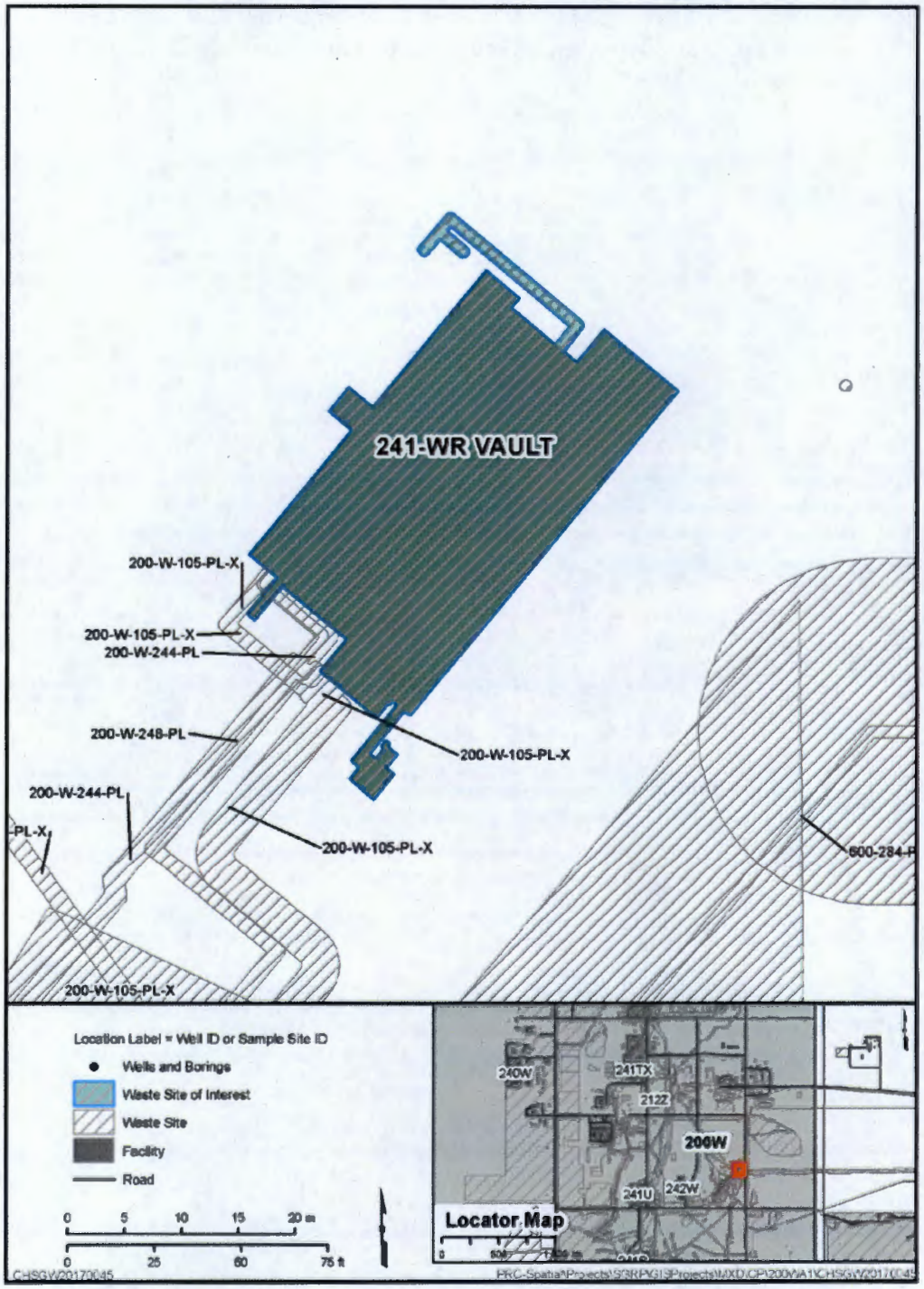

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Figure 1. 241-WR Vault Site Map

Site: 241-WR	Area: U Plant	Category: Intermediate

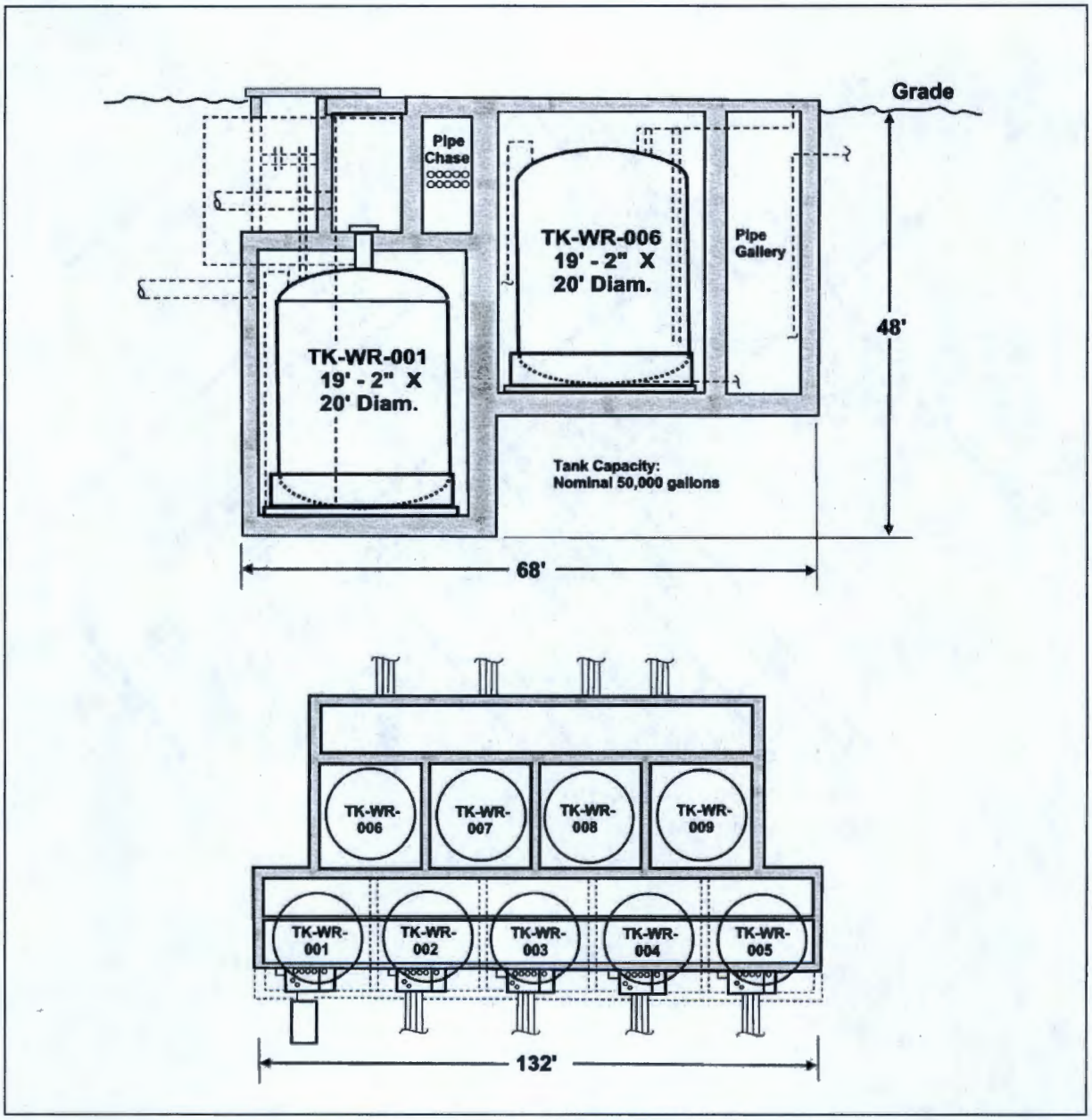
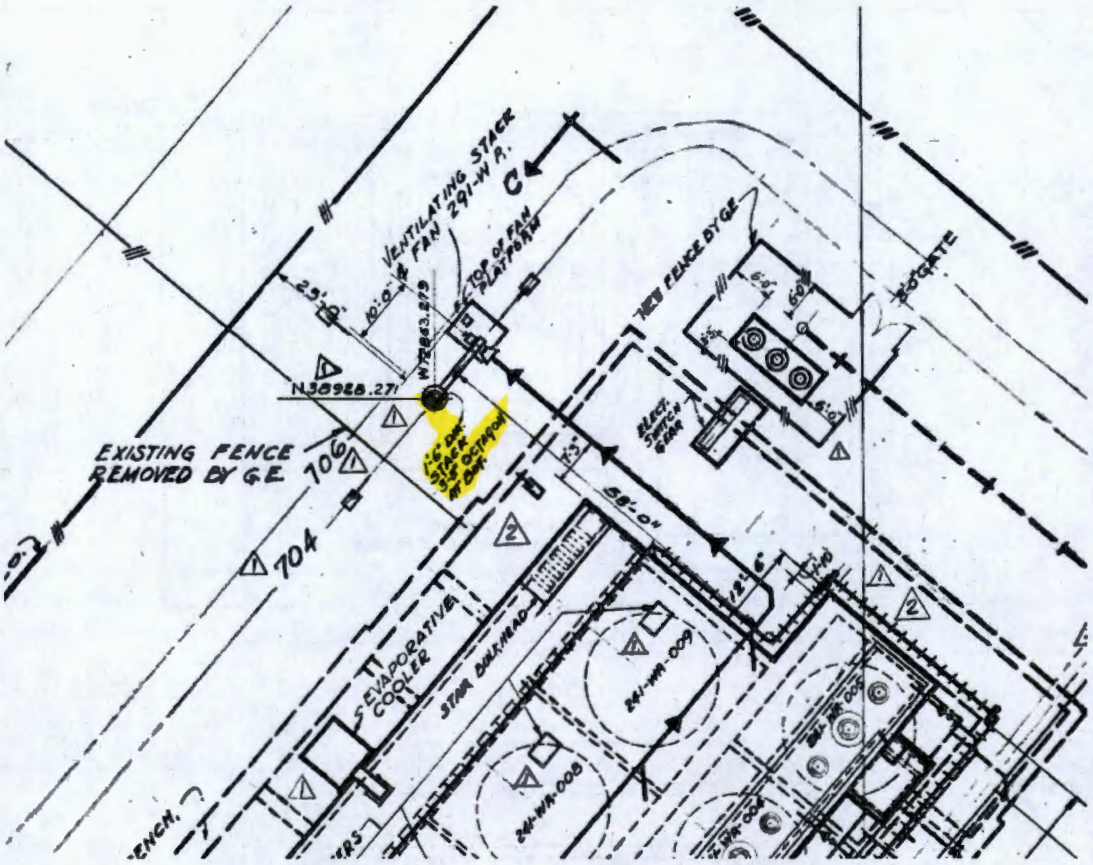


Figure 2. 241-WR Vault Section and Plan Views

Site: 241-WR	Area: U Plant	Category: Intermediate

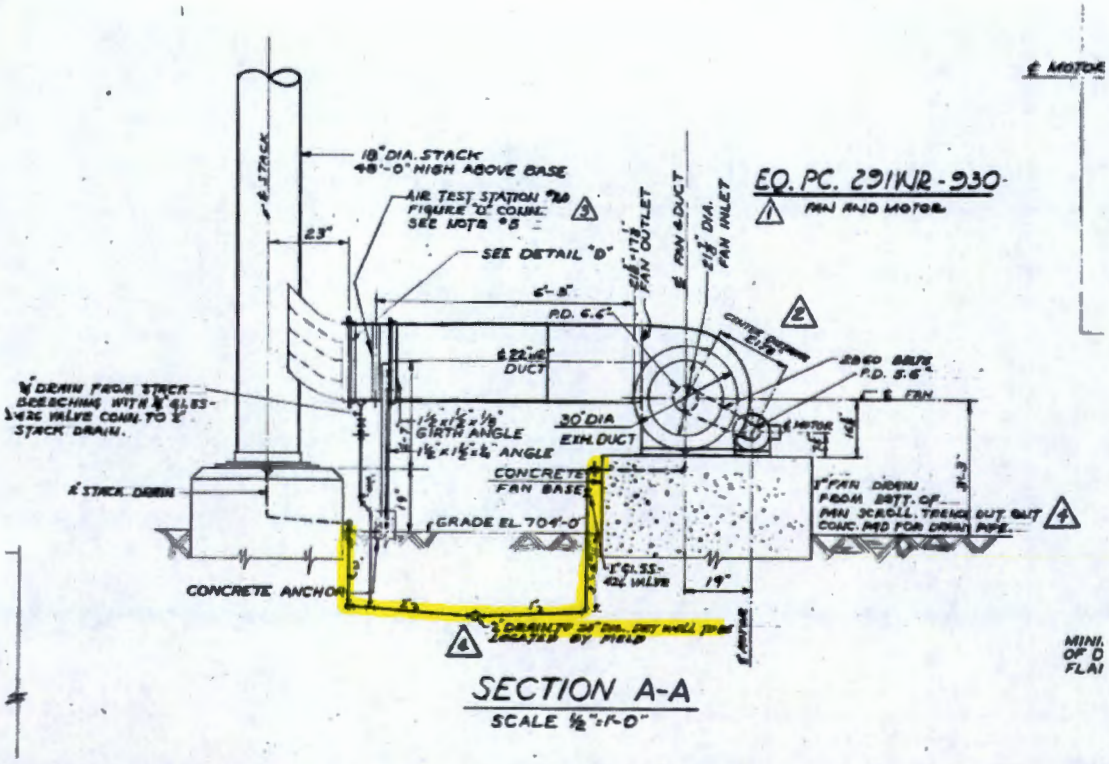


Source: H-2-40061, ***Arch. Plot Plan-Diversion Station***, Sheet 1.

Note: Produced from the best available copy.

Figure 3. Location of 241-WR Vault Exhaust Stack

Site: 241-WR	Area: U Plant	Category: Intermediate



Source: H-2-40744, *Heat & Vent - Plan & Sections – Ductwork to Fan & Stack*, Sheet 1.

Note: Produced from the best available copy.

Figure 4. Location of Drains from Exhaust Stack and Ventilation Stack Fan to Drywell (Section A-A Facing Northwest)

Site: 241-WR	Area: U Plant	Category: Intermediate

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Site: 270-W	Area: U Plant	Category: Intermediate

Site Description

Site Type: Neutralization Tank
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-PW-2
Service Dates: 1952 to 1960

Waste Site Location and Physical Description: The unit (Figure 1) was located under the northeast end of the 2715-UA Building, inside the 224-U Facility fence. There is no visual evidence for this tank. The tank is located beneath the concrete foundation of the 2715-UA Building (Figure 2). The tank was abandoned and blanked off in 1970. The 2715-UA Building was removed in August 2005, leaving the foundation slab in place. The 270-W tank risers are protected with a cement block. The 270-W waste site consists of an underground, stainless-steel tank that is 2.7 m (9 ft) tall and 2.7 m (9 ft) in diameter. The nominal capacity of the tank is 14,300 L (3,780 gal). The tank was filled with limestone and used to neutralize acidic process condensate generated from the 224-U Building. Following the pH adjustment, the waste was released to the 216-U-8 Crib via a 15 cm (6 in) vitrified clay pipe.

Waste Site Coordinates:

270-W	N38042/W73100	Neilsen 1992
	N380452.5/W73100.00	H-2-71678

Source: WHC-SD-EN-ES-040, *Engineering Study of 50 Miscellaneous Inactive Underground Radioactive Waste Tanks Located at the Hanford Site, Washington.*

Site Dimensions:
Site Length: 2.74 m (9 ft)
Site Area: 7.51 m^2 (81 ft^2)
Site Diameter: 2.74 m (9 ft)
Cover Thickness: Not applicable

Related Site Structure(s): Neutralization Tank 270-W is associated with the 224-U Facility and pipeline site 200-W-42.

Site Posting: Not applicable.

Site History

Release Summary: The unit was filled with limestone and used to neutralize acidic 224-U process condensate from the UO_3 Plant operation. Contributors to the process condensate included feed uranyl nitrate hexahydrate concentrator offgas, calciner offgas, phosphoric acid, and potassium hydroxide.

Volume/Mass Discharged: Not applicable.

Site: 270-W	Area: U Plant	Category: Intermediate

Pore Volume Discharged: Unknown.

Waste Inventory: Not available

Previous Site Characterization

Site Characterization Summary: Analyses of process condensate samples have revealed trace amounts of hydrogen fluoride, mercury, acetone, 1-butanol, 2-butanone, and n-nitrosodiumethylamine. Analysis of the last liquid to flow through the tank revealed beta emitters, uranium, and plutonium. The tank contains an unknown amount of spent limestone sludge. No analyses were found of this sludge, but it could contain uranium, uranium oxides, and other wastes.

The tank is located beneath former 2715-U Building foundation. The building was removed but the slab remains. Records indicate that the tank was blanked off in 1970, but no indication is given whether tank contents were sampled or removed.

No soil or geophysical log data are available.

Nature and Extent of Contamination: The process condensate stream from 221 U and 224 U/UA flowed through the tank, neutralizing the waste stream. The tank was removed from service for neutralization (i.e., limestone was no longer added) but remained in place as part of the waste conveyance pipeline following removal of the 216 U 8 Crib from service. The contents of the tank are not specified, and the tank (if intact) may contain a heel of several thousand liters of acidic process condensate. It is speculated that the bottom of this tank may have corroded and the underlying vadose zone may be contaminated.

Vadose conditions associated with Tank 270-W have not been characterized. However, potential contributions from this tank to observed groundwater contamination have been speculated.

No data are available to evaluate for the presence or absence of shallow or intermediate depth soil contamination. The bottom of tank located at 6.1 m (20 ft0 below ground surface (bgs). Based on existing information, the shallow and intermediate depth soil could be contaminated if the tank leaked. The quantity of liquid discharged to the tanks is unknown. The approximate depth to groundwater is 81 m (266 ft) bgs.

Site: 270-W	Area: U Plant	Category: Intermediate

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Site: 270-W	Area: U Plant	Category: Intermediate

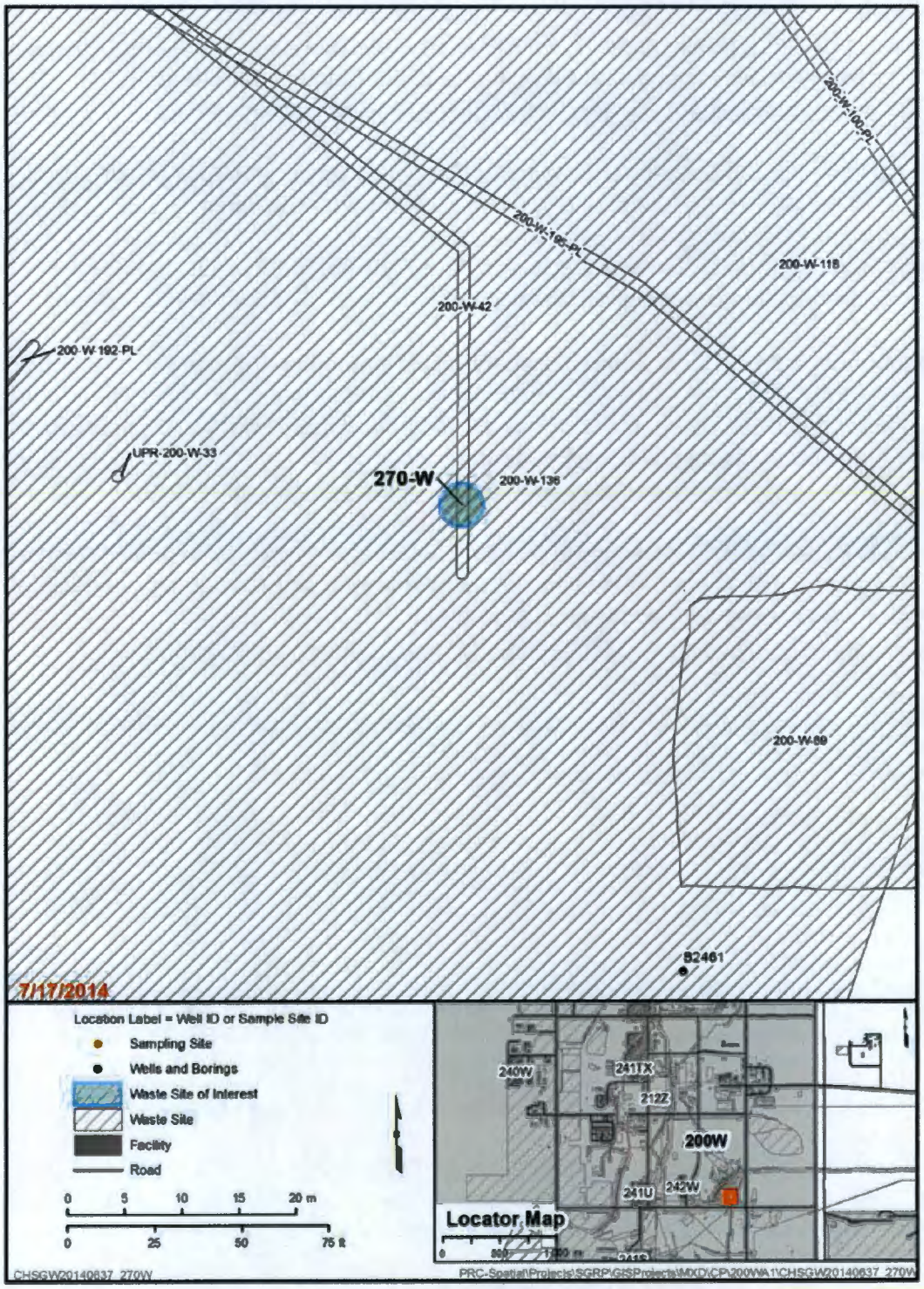
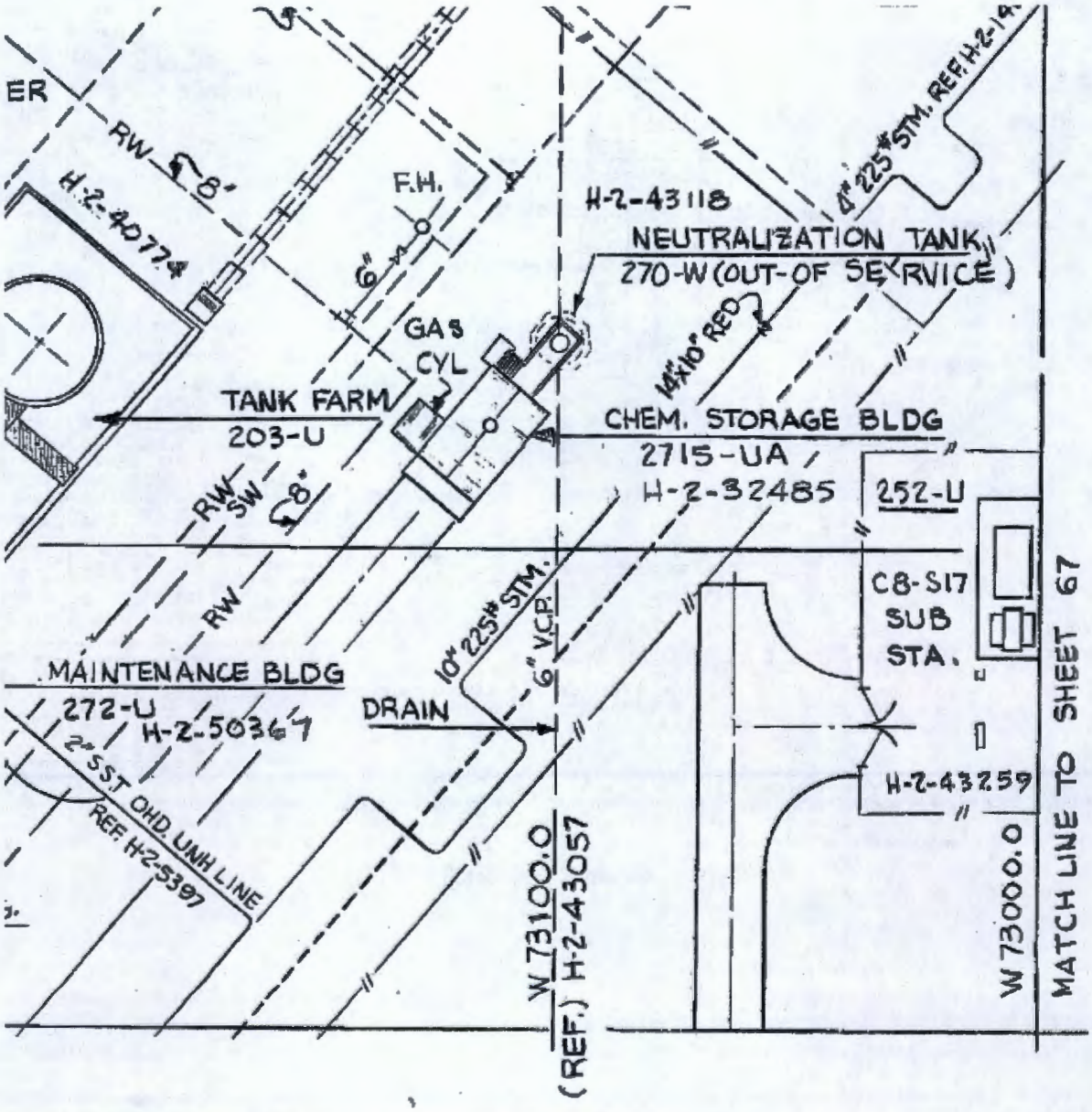


Figure 1. 270-W Waste Site Map

Site: 270-W	Area: U Plant	Category: Intermediate



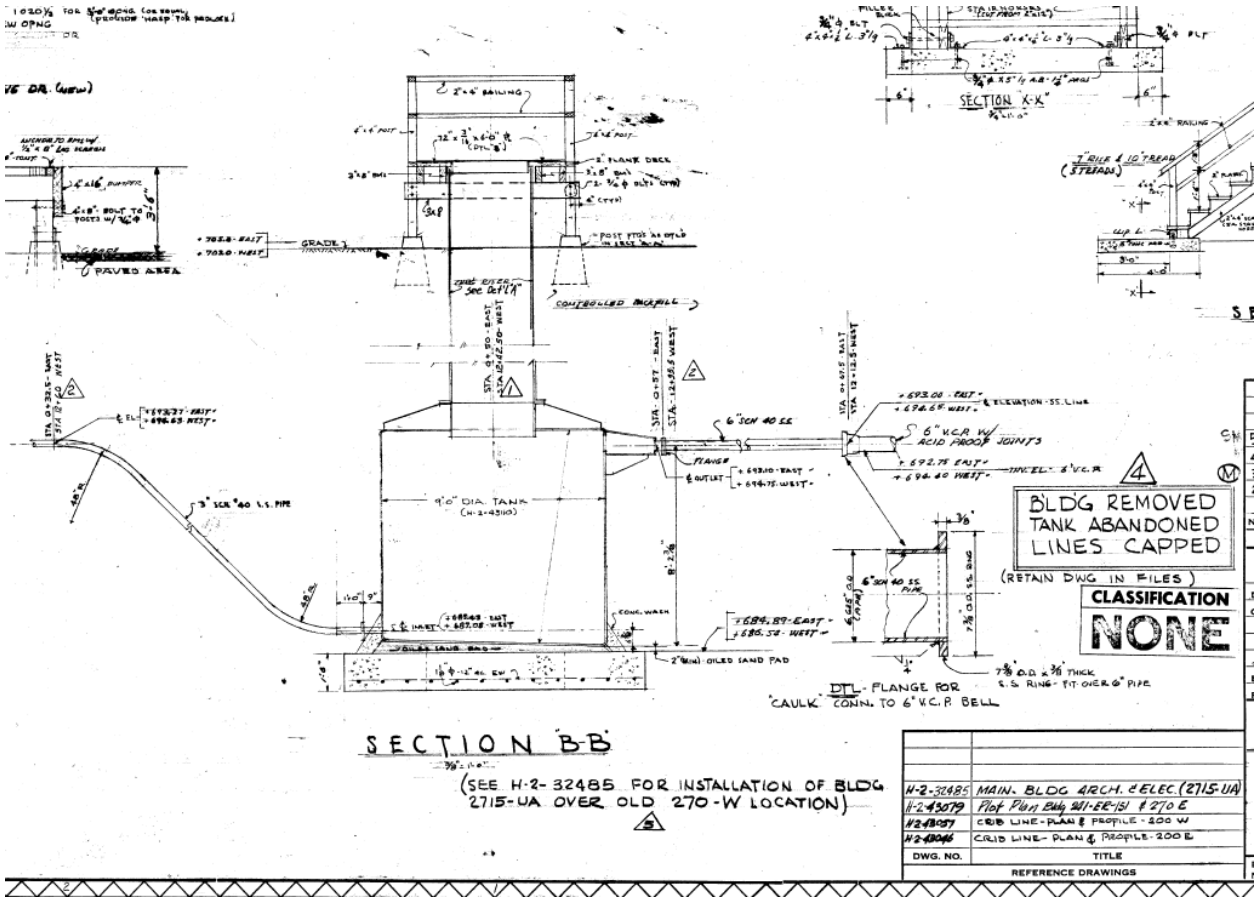
Source: H-2-44511, *Area Map 200 West U Plant Facilities*, Sheet 68.

Note: Produced from the best available copy.

ID = identification

Figure 2. Location of Neutralization Tank 270-W under Building 2715-UA

Site: 270-W	Area: U Plant	Category: Intermediate

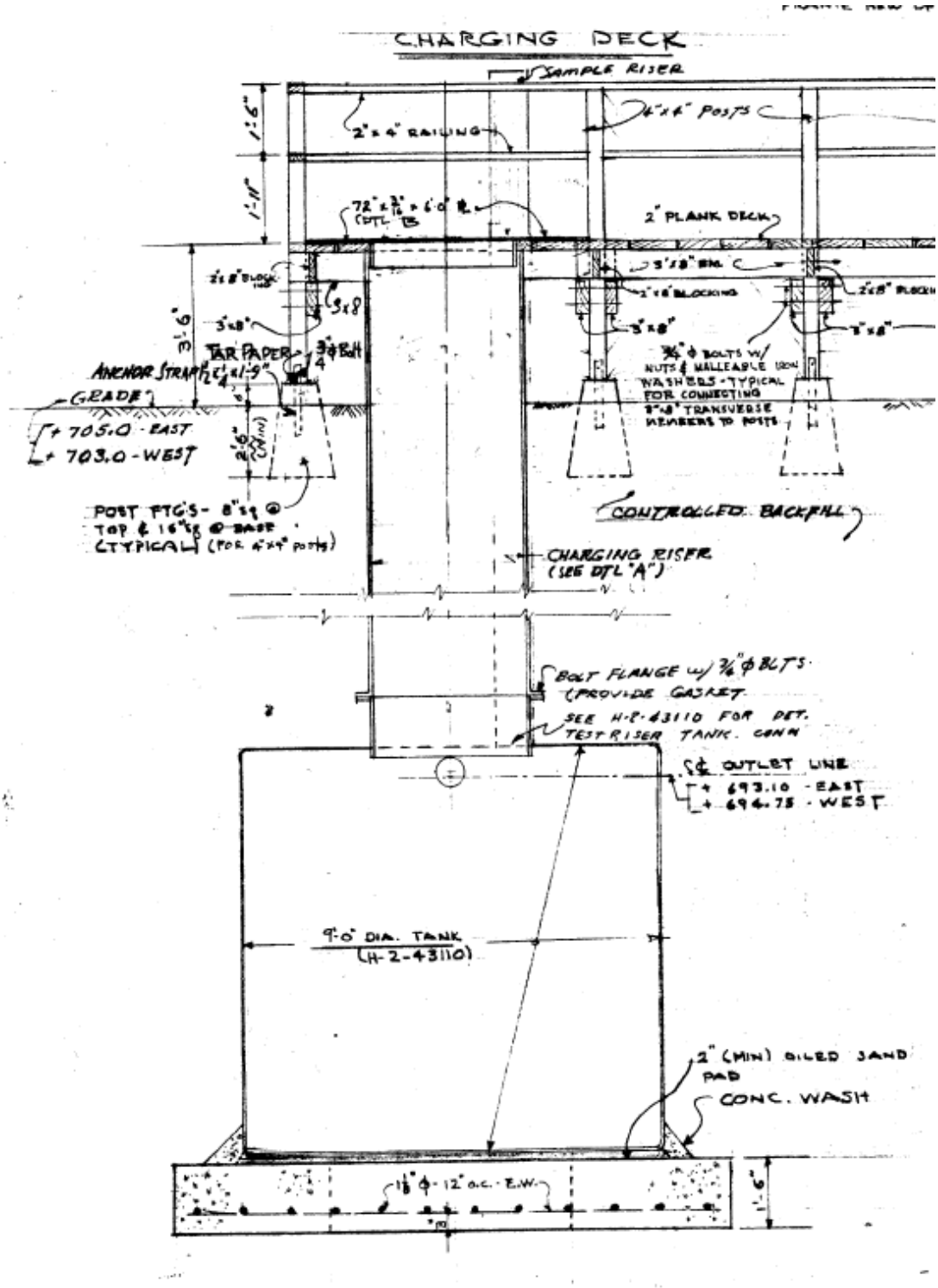


Source: H-2-43118, *Condensate Neutralization Tank & Chemical Storage Facilities Arrangement & Details*.

Note: Produced from the best available copy.

Figure 3. Tank Detail

Site: 270-W	Area: U Plant	Category: Intermediate

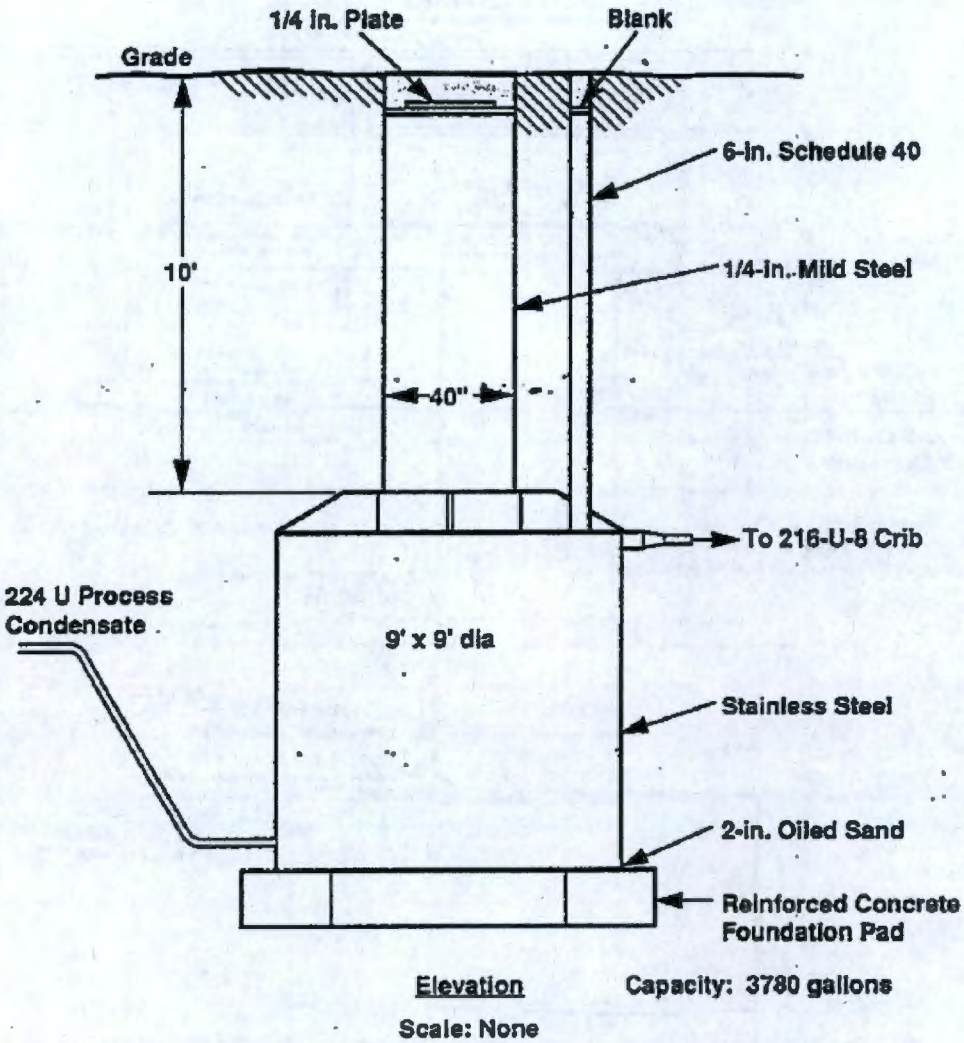


Source: H-2-43118, *Condensate Neutralization Tank & Chemical Storage Facilities Arrangement & Details*.

Note: Produced from the best available copy.

Figure 4. Tank Cross Section

Site: 270-W	Area: U Plant	Category: Intermediate



Source: WHC-EP-0560, *Miscellaneous Underground Radioactive Waste Tanks,* Figure 3-1.

Note: Produced from the best available copy.

Figure 5. Tank Detail

Site: 270-W	Area: U Plant	Category: Intermediate

Source: DOE/RL-2011-04, *U Plant Ancillary Facilities Removal Action Report.*

Note: Tank risers are located under yellow concrete box with sign (center of photograph).

Figure 6. Tank Riser Location after 2715-UA Demolition

Site: 270-W	Area: U Plant	Category: Intermediate

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Site: 600-284-PL	Area: U Plant	Category: Intermediate

Site Description

Alternate Site Identifications:	600-284-PL; Cross Site Transfer Pipeline; Lines V360, V361, V362, V363, V364 and V366; Old Cross Site Transfer Line; Original Cross Site Transfer Pipeline; Piping Associated with UPR-600-20, Cross Site Transfer Line
Site Type:	Encased Tank Farm Pipeline
Facility/Geographic Area:	U Plant
Current Operable Unit (OU) Assignment:	200-WA-1
Former OU Assignment:	200-IS-1
Service Dates:	1952 through 1995

The scoping summary in Figure 1 provides a summary of the site history, construction, features of interest, waste streams, site interfaces, relevant characterization and other relevant information. The scoping summary includes information relevant to the complete length of the 600-284-PL pipeline. The western-most portion of this waste site within the U Plant area has been segmented into waste site 600-284-PL-X, for inclusion in the 200-WA-1 OU. 600-284-PL-X represents the portion of the original site located within the proposed footprint of the U Plant Canyon Barrier. The balance of the 600-284-PL site is assigned to the 200-IS-1 OU. Figure 2 provides the limits of the 600-284-PL-X waste site included in the 200-WA-1 OU.

References:

Waste Information Data System General Summary Report for the 600-284-PL Waste Site.

Site: 600-284-PL	Area: U Plant	Category: Intermediate

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Site: 600-284-PL	Area: U Plant	Category: Intermediate

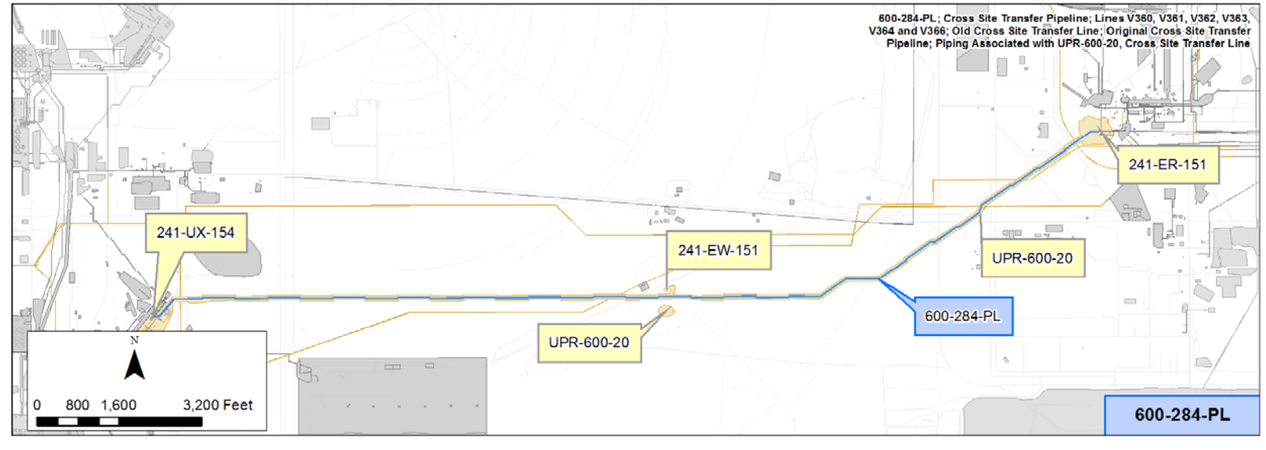
Scoping Summary: 600-284-PL

History

The 600-284-PL waste site is the old cross-site transfer line, considered part of the single-shell tank (SST) system. It includes six pipelines (V360, V361, V362, V363, V364, V366), a concrete encasement, pipe supports, test risers, 241-EW-151 vent station and its associated catch tank, and soils within the pipeline right-of-way. Two of the lines are plugged, two are either plugged or considered to be of questionable integrity, and two lines are considered to be open.

600-284-PL was constructed in 1952 to support the Uranium Metal Recovery operations in the 221-U building and was used to transport various process and tank farm waste between the 200 East and 200 West areas. The end of active site operation can be correlated to site replacement with another cross-site pipeline (600-269-PL) in 1995.

In Mar-1988, surface contamination was identified near the 241-EW-151 vent station (UPR-600-20). Documentation indicates the catch tank overflowed and spilled into the pipe encasement. No evidence indicates that the encasement leaked but bio intrusion by sagebrush was indicated. Other sources of contamination have been attributed to windblown particulate releases.



Construction

Pipeline

- Length Per Pipe: 19,767 ft
- Diameter: Six pipes, 3 in. each
- Composition: Stainless Steel
- Flow Method: Bi-directional
  - Gravity or pressurized not located
- Depth: Varies 5 ft - 15 ft, line nozzles at 241-ER-151 diversion box approx. 8 ft, line nozzles at 241-UX-154 approx. 12 ft, at 241-EW-151 vent station approx. 8 ft
- Cathodic Protection: None
- Total Calculated Volume: 43,548 gal
  - Calculated Volume Per Pipe: 7,258 gal

Encasement

- Type: 6-59
- Width: 5 ft
- Height: 2 ft
- Walls: Approx. 6 in. - 9 in. thick
- Length: 21,107 ft
- Calculated Concrete Volume: Approx. 5,600 cubic yards
- The encasement is a heavily reinforced steel concrete box with a void space in which the six pipelines rest

Features of Interest

- 241-EW-151 vent station located at the high point of the cross-country pipelines ~1,500 ft south of Bldg. 609-A
- Each site line has a 1 in. stainless steel vent line with a valve for air bleeding connecting it with the 800 gal vent station catch tank
- The vent station drains to a sump, the catch tank and sump overflow to the pipeline encasement
- 58 encasement test risers provide access to encasement void space, spaced as a pair of risers approximately 50 ft apart with approximately 700 ft between pairs
- The encasement slopes in both directions from the vent station (min. .4%) and drains to the pipe chase of each diversion box.

Relevant Characterization

- 9 boreholes drilled, four pairs and one control (indicated with circles on pg. 3)
  - Each pair was one borehole from the surface to the encasement and one borehole outside the right-of-way from the surface to below the encasement depth
  - All soil samples were determined free of contamination with the highest readings being .47 pCi/g of Cs-137, .80 pCi/g of C0-60 and 19.4 pCi/g of K-40

Waste Streams

- 1952-1958 Site transported dissolved metal waste (bismuth phosphate process) from 200 East Area vaults to U Plant for uranium recovery and to returned the recovery waste (tributyl phosphate process) to the 200 East Area for disposal
- Post 1958 site was used to transfer REDOX supernates to B Plant for cesium recovery operations and to return depleted wastes to the 200 West Area for waste evaporation

Misc./Other Relevant Information

- UPR-600-20 represents all soil and surface contamination (1988-2010) associated with the site. The surface has been stabilized and posted as Underground Radioactive Material
- There is no evidence that the encasement leaked, but evidence indicates of bio intrusion by sagebrush

Site Interfaces

Origin/Termination

200-IS-1
- 241-UX-154
- 241-ER-151

Site Intersects

200-IS-1
- 200-E-215-PL
- 200-E-228-PL
- 241-EW-151

200-WA-1
- 200-W-100-PL
- 200-W-136

Site Intersects Con't

200-CU-1
- 291-U

200-EA-1
- UPR-200-E-11

200-WA-1
- UPR-200-W-162

200-OA-1
- UPR-600-20

- 600-269-PL (active)
- 600-291-PL (active)
- 600-399-PL (active)

REDOX = Reduction Oxidation (Facility)

Figure 1. 600-284-PL Pipeline Scoping Summary (page 1)

Site: 600-284-PL	Area: U Plant	Category: Intermediate

Figure 1. 600-284-PL Pipeline Scoping Summary (page 2)

Site: 600-284-PL	Area: U Plant	Category: Intermediate

Page 3 of 4

Scoping Summary: 600-284-PL

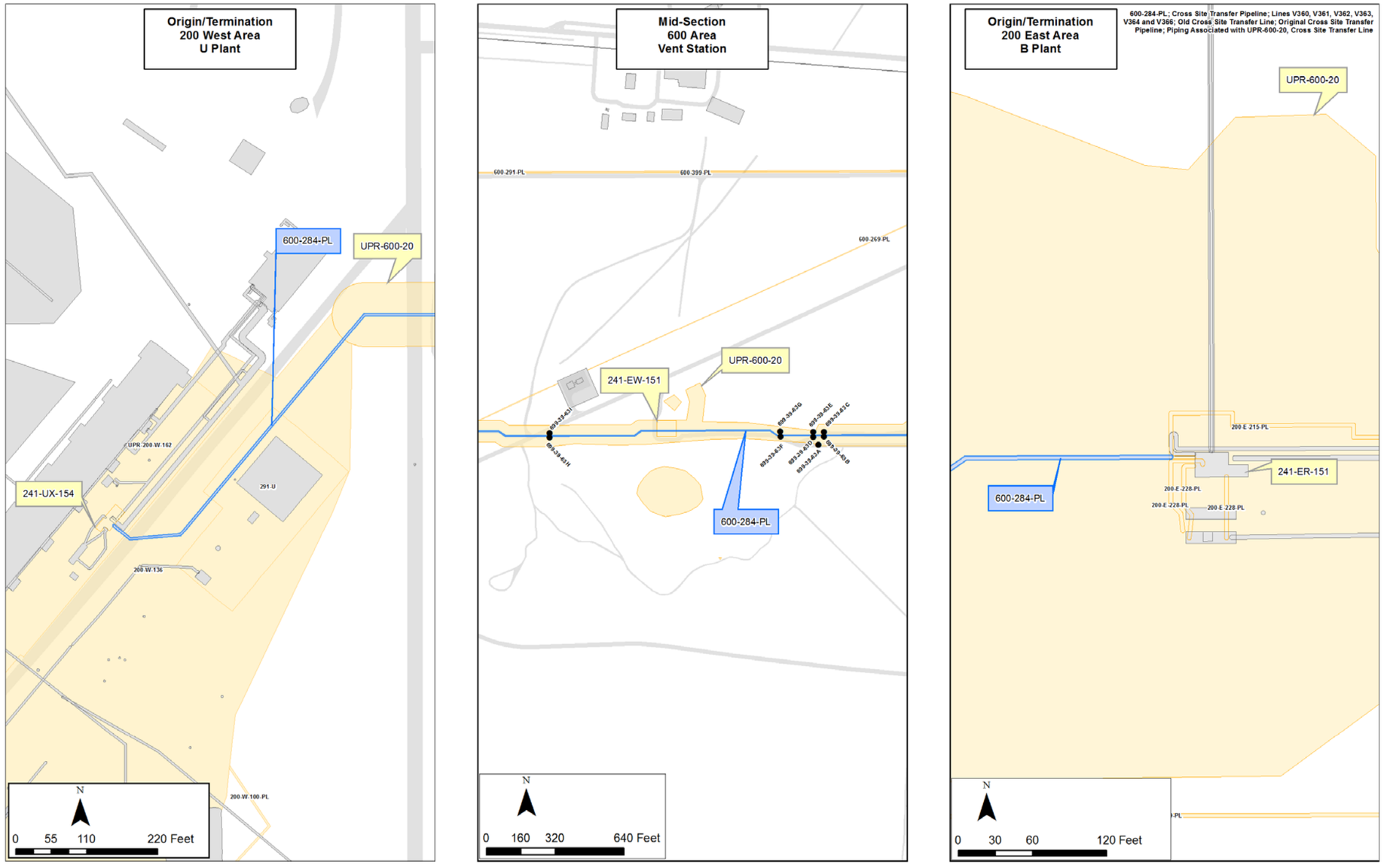


Figure 1. 600-284-PL Pipeline Scoping Summary (page 3)

Site: 600-284-PL	Area: U Plant	Category: Intermediate

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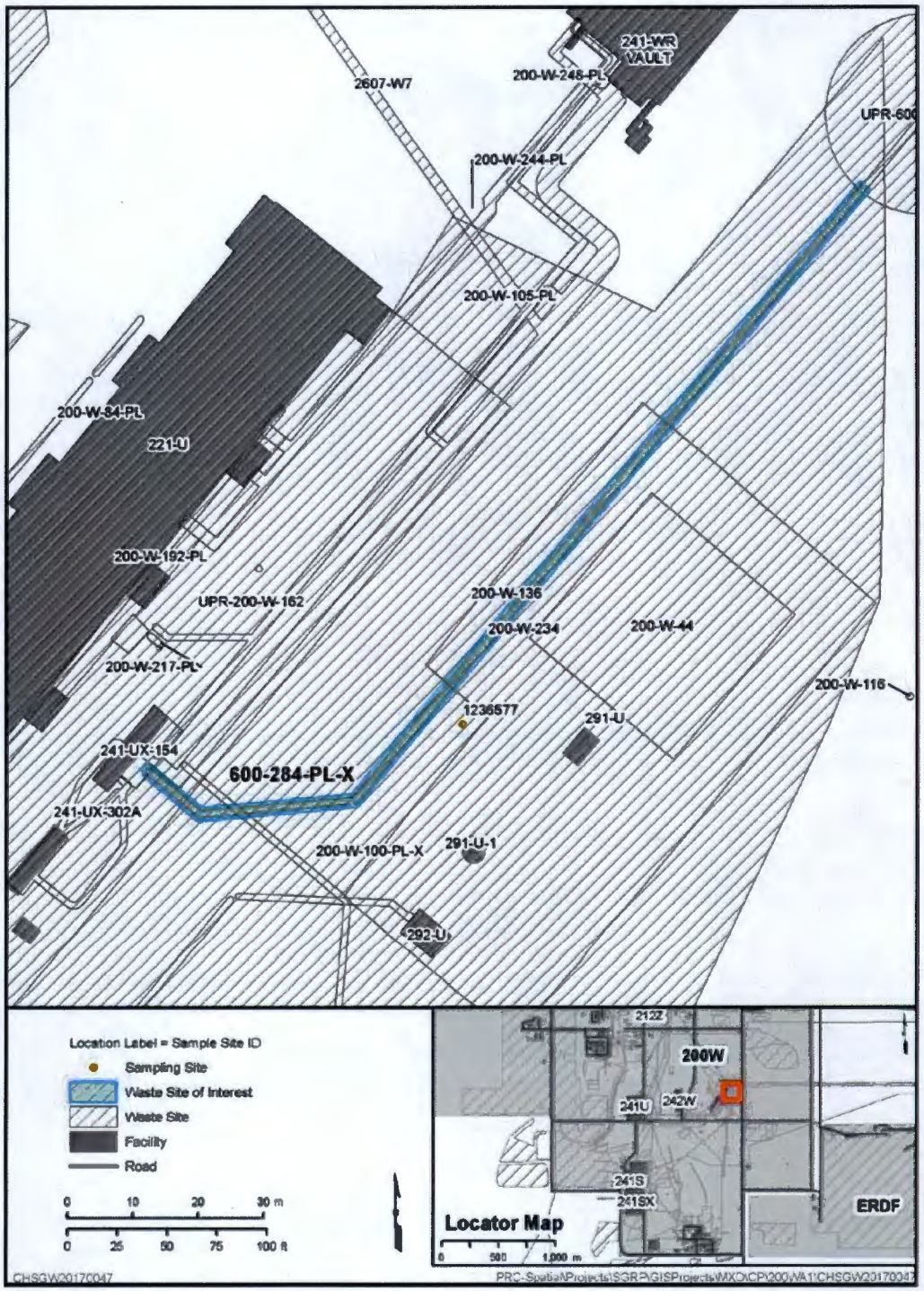
Figure 1. 600-284-PL Pipeline Scoping Summary (page 4)

Site: 600-284-PL	Area: U Plant	Category: Intermediate



ERDF = Environmental Restoration Disposal Facility

ID = identification

Figure 2. 600-284-PL-X Pipeline Segment

Site: 600-284-PL	Area: U Plant	Category: Intermediate

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Site: 2607-W5	Area: U Plant	Category: Intermediate

Site Description

Alternate Site Identification: 2607-W5
Site Type: Septic Tank and Drain Field
Facility/Geographic Area: U Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1
Service Dates: 1944-Unknown

Waste Site Location and Physical Description: The 2607-W5 waste site is located southwest of the 221-U Canyon Building and east of the 207-U Retention Basin. It is north of Settling Tank 241-U-361 (Figure 1). The waste site is a single-compartment tank constructed of concrete and has three entry openings on the top, each protected by a wooden cover. A pipe connects the septic tank to a concrete diversion box, and then to a second concrete diversion box before entering the drain field.

The septic tank and diversion box are currently located within an Underground Radioactive Material Area (URMA) related to stabilization of the 216-U-1 and 216-U-2 and 241-U-361 waste sites. The septic system has two drain fields. The original drain field (Figure 2) is located west and north of the septic tank, outside the URMA boundary. The replacement tile field (Figure 3) is located north and east of the septic tank.

Waste Site Coordinates:
E- 567299.43557 N-135064.590141

Site Dimensions:
Site Length: 9.1 m (30 ft) Site Depth: 3.35 m (11 ft)
Site Width: 4.0 m (13 ft) Cover Thickness: 0.15 m (0.5 ft)
Site Area: 36.4 m^2 (390 ft^2) Capacity: 41,445.8 L (10,948.8 gal)
Dimensions of the septic tank.

Site Length: 70.2 m (231.5 ft) Site Depth: Not specified
Site Width: 31.5 m (103.35 ft) Cover Thickness: Not specified
Dimensions of the original drain field.

Site Length: 41.5 m (136 ft) Site Depth: Approximately 0.76 m (2.5 ft)
Site Width: 30.5 m (100 ft) Cover Thickness: 0.15 m (0.5 ft)
Dimensions of the replacement drain field from BHI-00174, Plant Aggregate Area Management Study Technical Baseline Report.

Site Length: 1.5 m (5 ft) Site Depth: 0.76 m (9 ft)
Site Width: 1.2 m (4 ft)
Dimensions of the diversion boxes from BHI-00174.

Site: 2607-W5	Area: U Plant	Category: Intermediate

Related Site Structure(s): Septic Tank 2607-W5 is associated with the 221-U Canyon Building, the 222-U Laboratory, 224-U Facility, 271-U Building, and UPR-200-W-19.

Site Posting: The septic tank and diversion box are currently located within an URMA related to the 216-U-1 and 216-U-2 and 241-U-361 waste sites.

Site History

Release Summary: Septic Tank 2607-W5 and associated drain fields were designed to receive sanitary sewer effluent from U Plant facilities. The original drain field was built in 1944. A replacement drain field was built east of the original drain field in 1954. This system received sanitary sewer effluent at an estimated rate of 12.2 m^3 (431 ft^3) per day in 1987. The 2607-W5 septic system received sanitary sewer effluent at an estimated rate of 1,741 L (460 gal) per day in 1995. In 1998, the system was being used by MO-107 and MO-419.

UPR-200-W-19 occurred in 1953 where Tank 241-U-361 overflowed and caused the ground to become contaminated. The URMA, located adjacent to the 2607-W5 waste site, is the result of the surface stabilization of this unplanned release.

Volume/Mass Discharged: Not specified.

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: In April 2007, fixed contamination on the septic tank was backfilled with approximately 15 cm (6 in.) of clean dirt and the area posting was changed to an URMA. The extent of characterization data available for the 2607-W-5 waste site consists of one surface soil sample, geophysical logging at one borehole, and soil sampling data from one borehole (Table 1).

Site: 2607-W5	Area: U Plant	Category: Intermediate

Table 1. Borehole Summary for the 2607-W Waste Site

Year	Borehole/Well ID	Location with respect to site	Depth (ft)
1993	A7792/299-W19-97	South, inside the original drain field	177 (172 soil samples)
1994	2371	South, inside the replacement drain field	Surface soil
2004	C4202	South, outside site boundary	50.1 (GPL)

GPL = geophysical log
ID = identification

Nature and Extent of Contamination:
Surface soil sample 2371 is located at the east boundary of the replacement drain field. Low levels of cesium-137 and potassium-40 were detected in this sample. The maximum detected concentrations were 83.4 pCi/g and 14 pCi/g for cesium-137 and potassium-40 respectively. Concentrations of other radionuclides were near or less than 1 pCi/g.

Borehole A7792 (299-W19-97) was installed in the southern portion of the 2607-W5 septic drain field; however, it also lies within the limits of UPR-200-W-19. The maximum detected concentration of cesium-137 was 22 pCi/g in the 1.2 – 1.8 m (4 – 6 ft) below ground surface (bgs) sample interval (Table 2). The maximum detected concentration of potassium-40 was 17.1 pCi/g in the 30.8 – 31.4 m (101 – 103.3 ft) bgs sample interval.

Borehole C4202 (geophysical log) detected cesium-137 within the top 3.7 m (12 ft) bgs with a maximum concentration estimated at 341 pCi/g at 2.1 m (7 ft) bgs (Table 3 and Figure 4). Cesium-137 was the only detected manmade radionuclide. The borehole was located between Septic Tank 2607-W5 and drain fields; however, it also lies within the limits of UPR-200-W-19.

Table 2. Soil Maximum Detection Summary (Soil Borehole A7792)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
1,4-Dichlorobenzene	20	µg/kg	12.5	–	–	–
2-Butanone	–	–	–	3	µg/kg	103.3
2-Chlorophenol	31	µg/kg	12.5	–	–	–
2-Methylnaphthalene	–	–	–	70	µg/kg	103.3
4-Chloro-3-methylphenol	27	µg/kg	12.5	–	–	–

Site: 2607-W5	Area: U Plant	Category: Intermediate

Table 2. Soil Maximum Detection Summary (Soil Borehole A7792)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Acenaphthene	23	µg/kg	12.5	26	µg/kg	103.3
Acenaphthylene	–	–	–	60	µg/kg	103.3
Acetone	–	–	–	16	µg/kg	72.5
Aluminum	6,160,000	µg/kg	6	9,490,000	µg/kg	158.5
Anthracene	–	–	–	58	µg/kg	103.3
Arsenic	5,400	µg/kg	6	3,900	µg/kg	103.3
Barium	77,900	µg/kg	6	153,000	µg/kg	177
Benzo(a)anthracene	–	–	–	59	µg/kg	103.3
Benzo(a)pyrene	–	–	–	48	µg/kg	103.3
Benzo(b)fluoranthene	–	–	–	42	µg/kg	103.3
Benzo(ghi)perylene	–	–	–	19	µg/kg	103.3
Benzo(k)fluoranthene	–	–	–	45	µg/kg	103.3
Calcium	11,300,000	µg/kg	6	117,000,000	µg/kg	170
Carbazole	–	–	–	45	µg/kg	103.3
Cesium-137	22	pCi/g	6	–	–	–
Chloride	7,200	µg/kg	12.5	16,100	µg/kg	103.3
Chromium	8,400	µg/kg	6	1,500	µg/kg	177
Chrysene	–	–	–	60	µg/kg	103.3
Cobalt	10,500	µg/kg	6	11,900	µg/kg	177
Copper	15,300	µg/kg	6	22,000	µg/kg	170
Dibenzofuran	–	–	–	73	µg/kg	103.3
Di-n-butylphthalate	–	–	–	230	µg/kg	148.5
Europium-155	–	–	–	0.15	pCi/g	158.5
Fluorene	–	–	–	84	µg/kg	103.3
Fluroide	2,400	µg/kg	6	4,700	µg/kg	177

Site: 2607-W5	Area: U Plant	Category: Intermediate

Table 2. Soil Maximum Detection Summary (Soil Borehole A7792)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Gross alpha	5.5	pCi/g	6	14	pCi/g	158.5
Gross beta	38	pCi/g	6	33	pCi/g	103.3
Indeno(1,2,3-cd)pyrene	–	–	–	27	µg/kg	103.3
Iron	19,400,000	µg/kg	6	21,200,000	µg/kg	177
Lead	4,800	µg/kg	6	9,500	µg/kg	158.5
Magnesium	5,020,000	µg/kg	6	7,360,000	µg/kg	170
Manganese	321,000	µg/kg	6	433,000	µg/kg	170
Naphthalene	–	–	–	550	µg/kg	103.3
Neptunium-237	–	–	–	0.031	pCi/g	103.3
Nickel	10,000	µg/kg	6	13,500	µg/kg	158.5
Nitrogen in nitrite and nitrate	9540	µg/kg	6	7,430	µg/kg	52.5
Phenol	–	–	–	18	µg/kg	103.3
Potassium	1,060,000	µg/kg	6	2,290,000	µg/kg	158.5
Potassium-40	11	pCi/g	12.5	17.1	pCi/g	103.3
Pyrene	–	–	–	140	µg/kg	103.3
Radium-226	0.44	pCi/g	12.5	1	pCi/g	170
Radium-228	0.74	pCi/g	12.5	0.97	pCi/g	158.5
Selenium-79	–	–	–	5.5	pCi/g	148.5
Strontium-90	3.3	pCi/g	6	–	–	–
Sulfate	26,000	µg/kg	12.5	47,000	µg/kg	177
Technetium-99	0.43	pCi/g	12.5	5.7	pCi/g	72.5
Thorium-228	0.85	pCi/g	12.5	1.1	pCi/g	158.5
Thorium-232	0.74	pCi/g	12.5	0.97	pCi/g	158.5
Thorium-234	–	–	–	1.16	pCi/g	103.3

Site: 2607-W5	Area: U Plant	Category: Intermediate

Table 2. Soil Maximum Detection Summary (Soil Borehole A7792)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Titanium	1,380,000	µg/kg	12.5	2,070,000	µg/kg	177
Toluene	–	–	–	1	µg/kg	32
Uranium	2,000	µg/kg	6	3,600	µg/kg	170
Uranium-233/234	0.69	pCi/g	6	1.3	pCi/g	170
Uranium-234	–	–	–	0.11	pCi/g	103.3
Uranium-238	0.64	pCi/g	6	1.3	pCi/g	170
Vanadium	44,000	µg/kg	6	61,900	µg/kg	177
Zinc	38,800	µg/kg	6	54,700	µg/kg	158.5

Table 3. Geophysical Log Data Summary for Borehole C4202

DPT Casing/ Well Number	Cesium-137	Uranium-238/Uranium-235	Other man-made contaminants detected
C4202 (UPR-200-W-19)	1 to 12 ft: 0.4 to 341 pCi/g (max at 7 ft)	None detected	None

Source: D&D-27783, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*, Table 3-2.

References:

BHI-00174. 1995, *U Plant Aggregate Area Management Study Technical Baseline Report*, Rev. 00, Bechtel Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D198038132.

D&D-27783, 2006, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*, Rev. 0, Fluor Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA01917974.

H-2-2590, 1955, *Replacement of Tile Field for Septic Tank 2607W-5*, Rev. 2, General Electric Company, Richland, Washington.

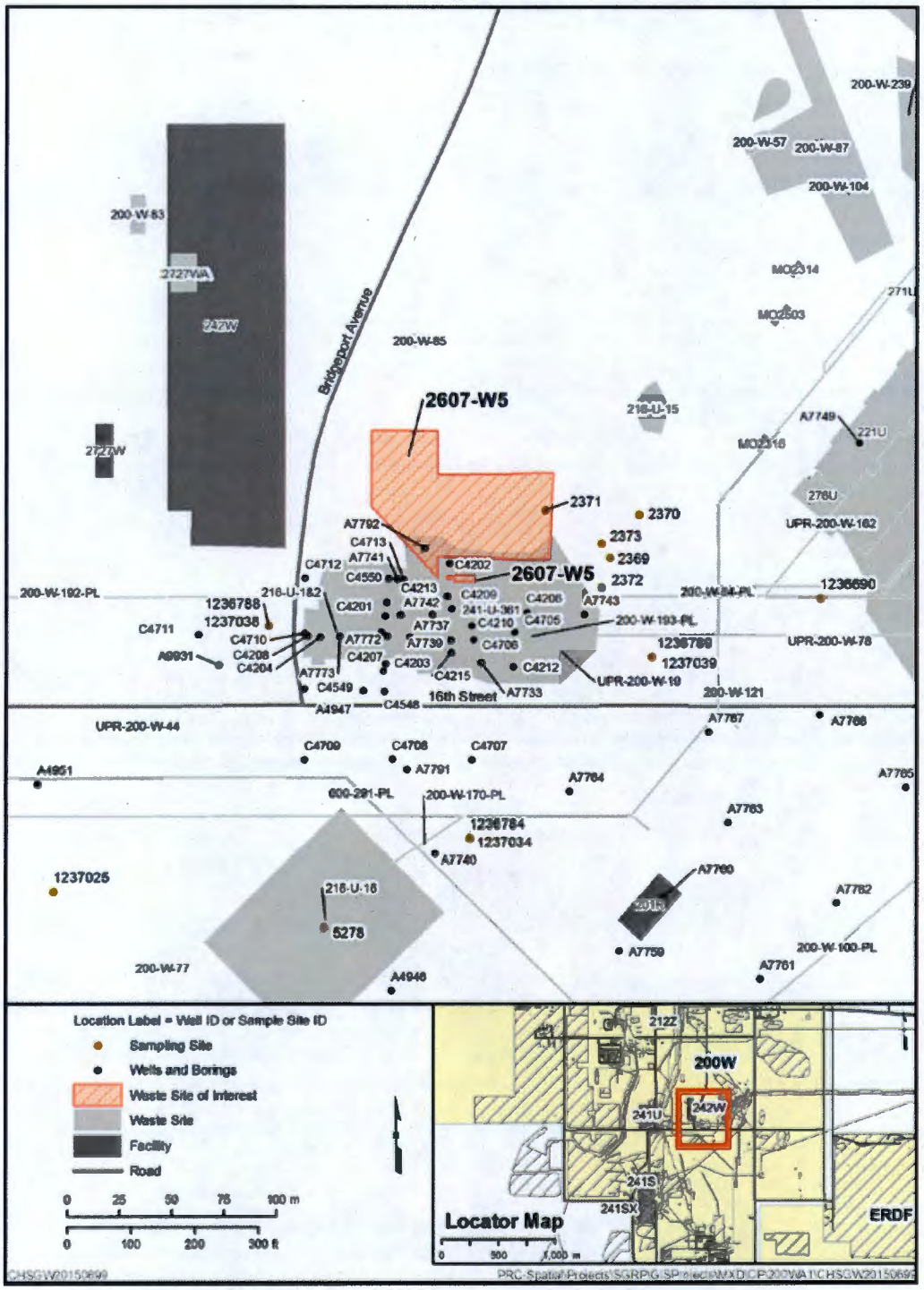
H-2-44511 (drawing), 1994, *Area Map 200 West U-Plant Facilities*, Sh. 69 of 186, Rev. 4, Westinghouse Hanford Company, Richland, Washington

Site: 2607-W5	Area: U Plant	Category: Intermediate

W-71192, Rev 31, Septic Tanks Plan and Sections

WIDS General Summary Report for site 2607-W5

Site: 2607-W5	Area: U Plant	Category: Intermediate

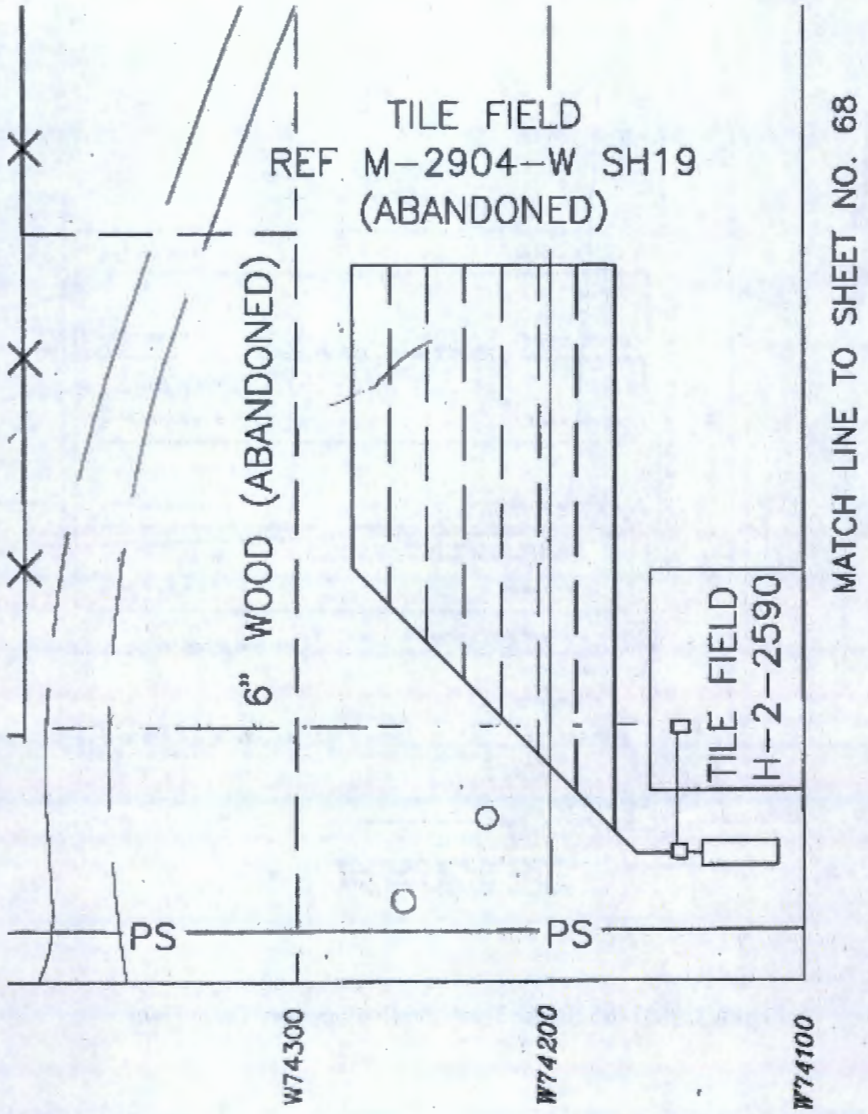


ERDF = Environmental Restoration Disposal Facility

ID = identification

Figure 1. 2607-W5 Waste Site Map

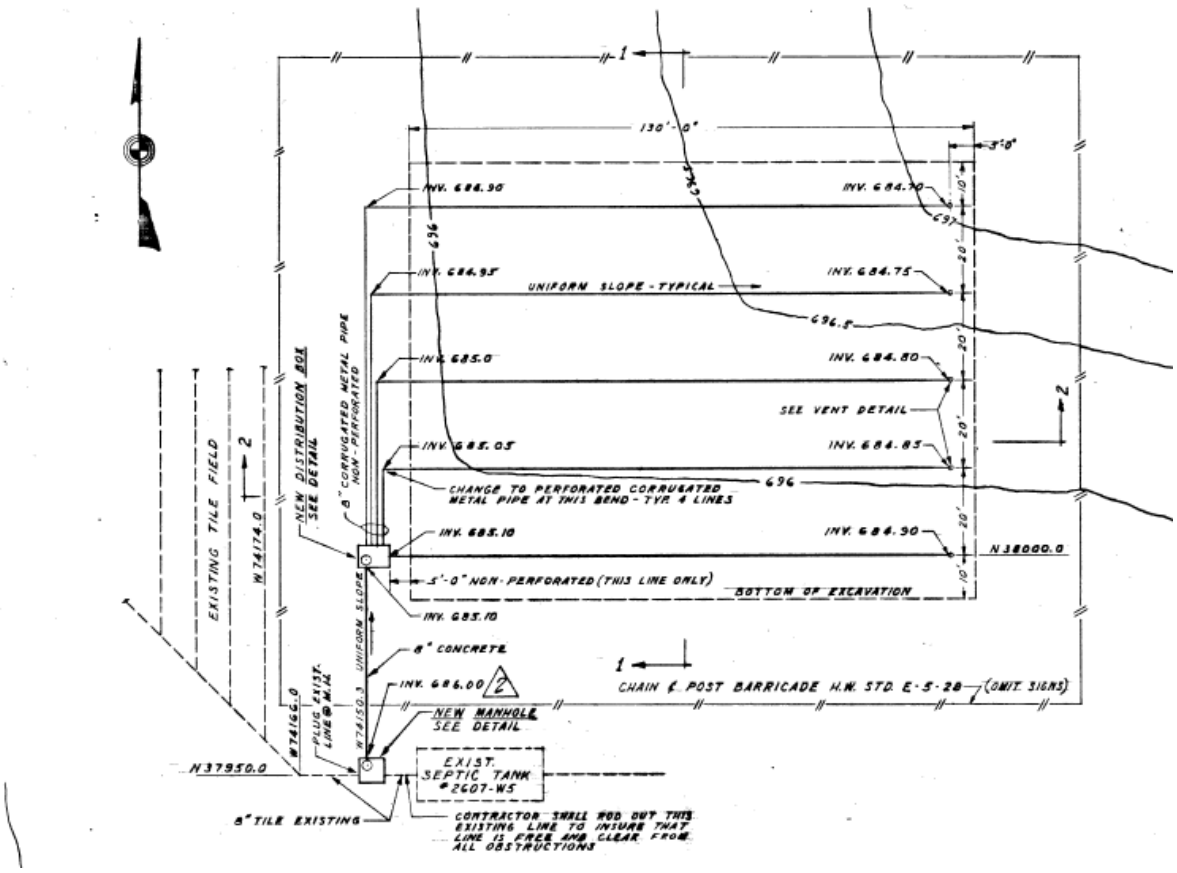
Site: 2607-W5	Area: U Plant	Category: Intermediate



Source: H-2-44511, *Area Map 200 West U-Plant Facilities*, Sheet 69.

Figure 2. Location of 2607-W5 Septic Tank and Original Drain Field

Site: 2607-W5	Area: U Plant	Category: Intermediate

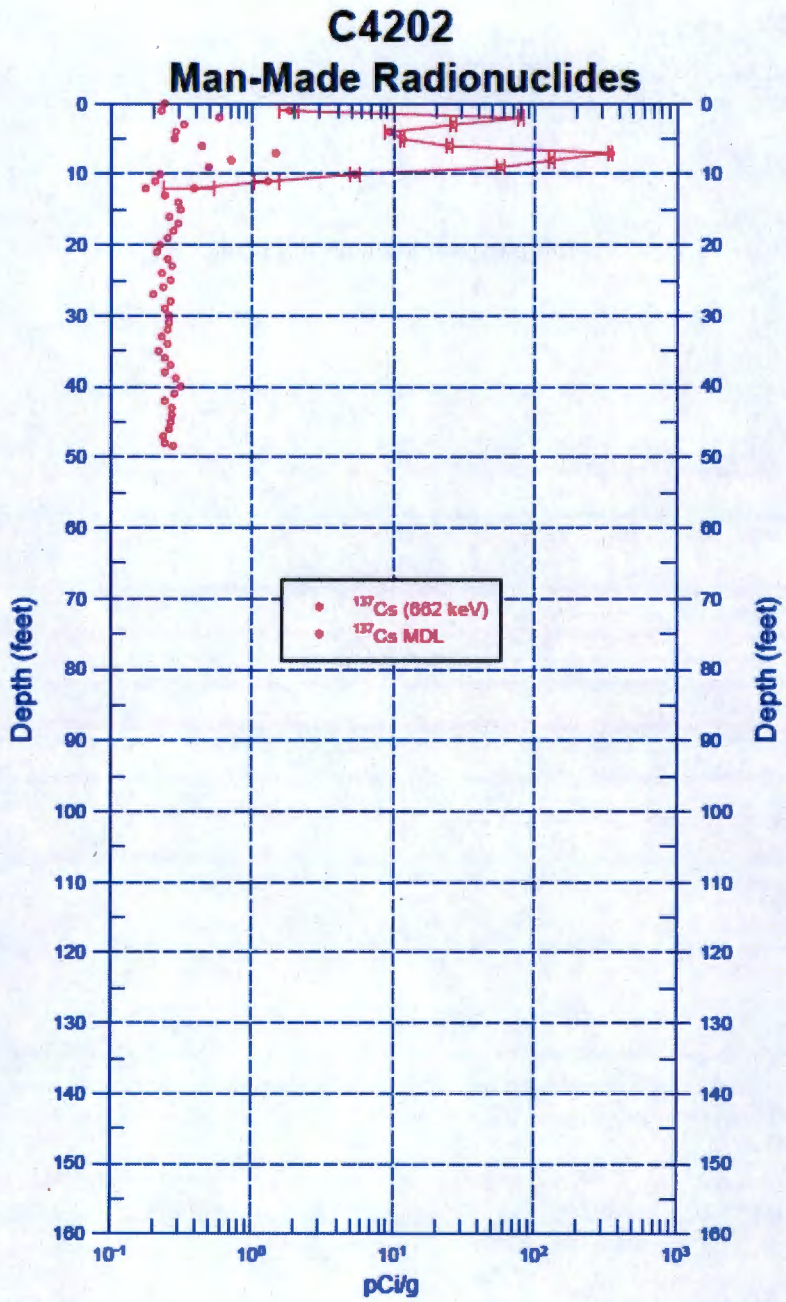


Source: H-2-2590, *Replacement of Tile Field for Septic Tank 2607W-5*.

Note: Produced from the best available copy.

Figure 3. 2607-W5 Septic Tank and Replacement Drain Field

Site: 2607-W5	Area: U Plant	Category: Intermediate



Zero Reference = Ground Surface

Date of Last Logging Run
2/24/2004

Figure 4. Geophysical Log for Sample Location C4202

Site: 2607-W5	Area: U Plant	Category: Intermediate

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Site: 2607-W7	Area: U Plant	Category: Intermediate

Site Description

Site Identification: 2607-W7
Site Type: Septic Tank
Facility/Geographic Area: U Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1
Service Dates: 1954 to 1990s

Waste Site Location and Physical Description: The 2607-W7 waste site is an inactive septic system located 14 m (45.9 ft) north of the northernmost corner of the 221-U Building (Figure 1). The location of the drain field is not shown on any known engineering drawing. A site map in HNF-SD-LL-SP-001, *200 and 600 Areas Sanitary Wastewater Master Plan*, shows the drain field is located northwest of the septic tank (Figure 2). Drawing M-2904-W, *Outside Lines Sewers*, Sheet 19, shows the location of the septic tank but includes the note: "irrigation field to be laid out by field in accordance with specification #1909." The septic tank was constructed of reinforced concrete (Figure 3). Drawing W-71192, *Septic Tanks Plan and Sections*, indicates Septic Tank 2607-W7 was added in December 1943, although the Waste Information Data System (WIDS) indicates the septic system was used beginning in 1954. DOE/RL-91-52, *U Plant Source Aggregate Area Management Study Report*, indicates the septic system was active at the time of the report (September 1992). The tank location is marked with four posts and a WIDS site sign.

Waste Site Coordinates:
Lon-567645.27 Lat-135289.47

Site Dimensions*:
Site Length: 1.22 m (4 ft)
Site Depth: Bottom of tank 2.75 m (9 ft), Fluid level above tank bottom 1.22 m (4 ft)
Site Width: 0.61 m (2 ft)
Cover Thickness: Approximately 0.16 m (0.5 ft)
Site Area: 0.74 m^2 (8 ft^2)
Capacity: 908.4 L (240 gal)
*Information is for the septic tank. Dimensions for the drain field are not specified.

Related Site Structure(s): Septic Tank 2607-W7 is associated with the 221-U Building.

Site Posting: A site visit in 1999 found the septic system lies between two Underground Radioactive Material Areas (URMAs).

Site History

Release Summary: Septic Tank 2607-W7 and associated drain field accepted sanitary waste from a single restroom in the 221-U Canyon Building.

Site: 2607-W7	Area: U Plant	Category: Intermediate

Volume/Mass Discharged: Unspecified volume of liquid (assumed to be sanitary sewage). The system received effluent at an estimated rate of 1.02 m^3 (36 ft^3) per day in 1987.

Pore Volume Discharged: L/ (vadose zone thickness ft x area ft^2 / 35.3 m^3/ft^3 * 1000 L/m^3 * 0.3) = Unknown

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: The operational history of Septic Tank 2607-W7 is unknown.

A site visit in 1999 found the septic system lies between two URMAs; however, no radionuclides or hazardous substances are known to have been associated with this system. The location of the drain field was visually not apparent.

The tank was decommissioned in 1999 in accordance with WAC246-272-18501, "Wastewater and Reclaimed Water Use Fees," "Abandonment". All septage inside the tank was removed and the empty tank was filled to eliminate void spaces. Per an agreement with the Washington State Department of Health (WDOH), the septic system lids were left in place. The U.S. Department of Energy, Richland Operations Office, notified the WDOH of the septic system abandonment in July 1999 (99-EAP-392).

No site characterization information is available for the 2607-W7 waste site. The site is not routinely surveyed or monitored.

Nature and Extent of Contamination: Insufficient data are available to evaluate shallow or intermediate depth soil contamination.

References:

99-EAP-392, 1999, "Notice of Septic System Abandonment" (letter to L.A. Brown, Washington State Department of Health, from J.E. Rasmussen, July 8), U.S. Department of Energy, Richland Operations Office, Richland, Washington.

BHI-00174, 1995, *U Plant Aggregate Area Management Study Technical Baseline Report*, Rev. 00, Bechtel Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D198038132.

DOE/RL-91-52, 1992, *U Plant Source Aggregate Area Management Study Report*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196110688.

Site: 2607-W7	Area: U Plant	Category: Intermediate

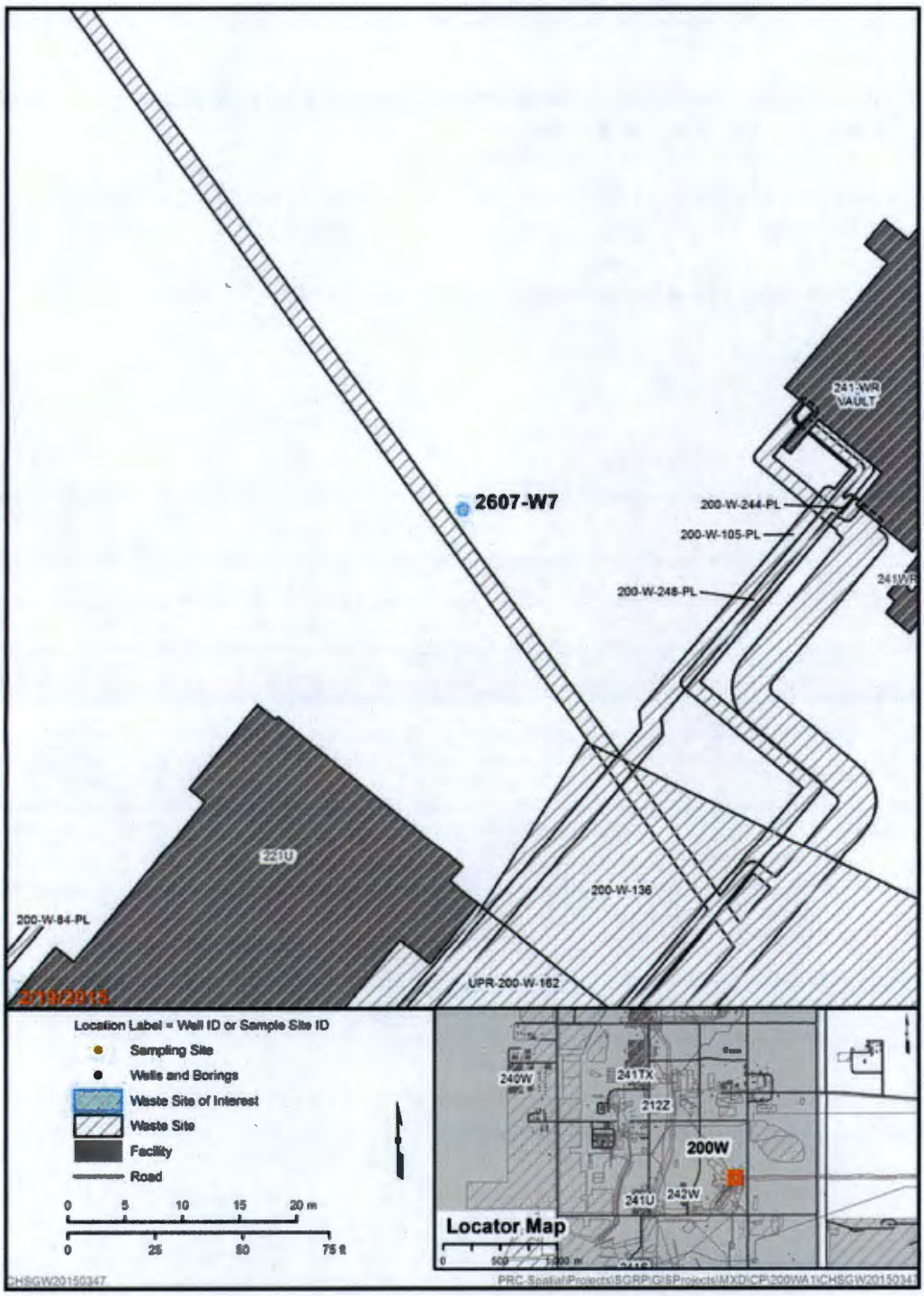
M-2904-W (drawing), *Outside Lines Sewers*, Sh. 19, Rev. 5, General Electric Company, Richland, Washington.

HNF-SD-LL-SP-001, 1998, *200 and 600 Areas Sanitary Wastewater Master Plan*, Rev. 1, Fluor Daniel Northwest, Inc., Richland, Washington.

W-71192 (drawing), 1943, *Septic Tanks Plan and Sections*, Rev. 31, General Electric Company, Richland, Washington.

Waste Information Data System General Summary Report for the 2607-W7 Waste Site.

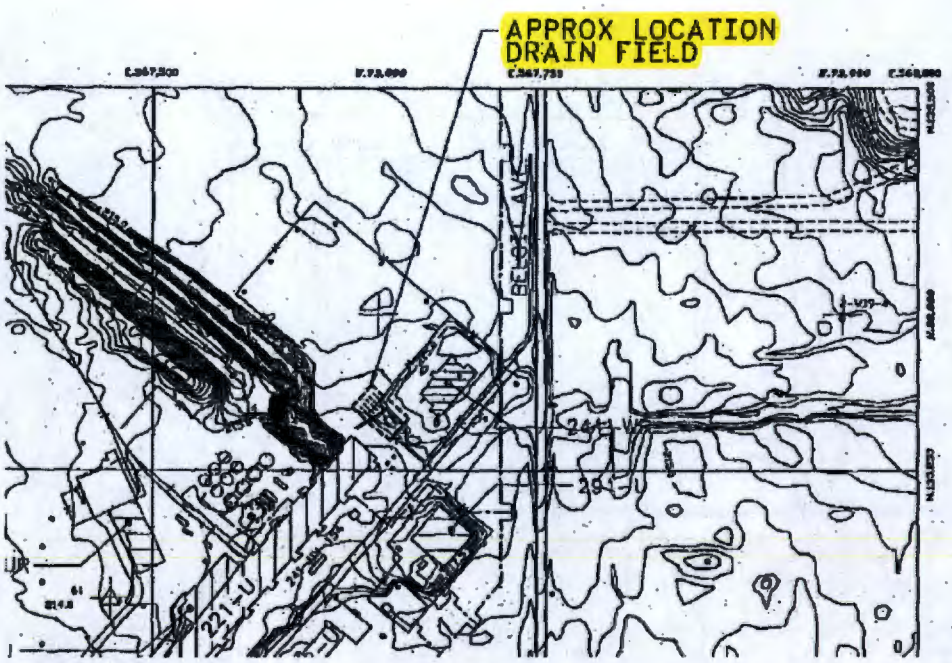
Site: 2607-W7	Area: U Plant	Category: Intermediate



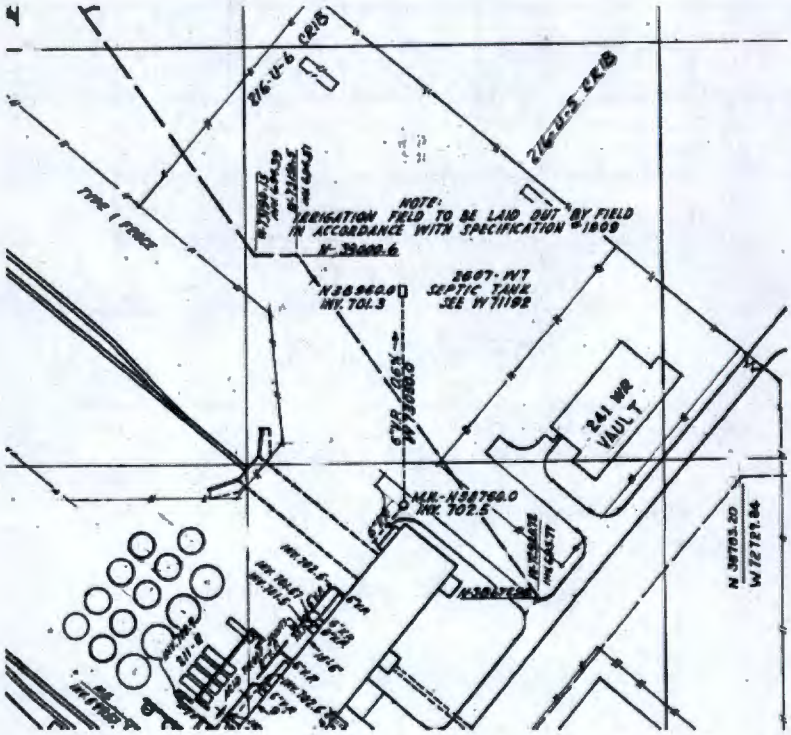
ID = identification

Figure 1. 2607-W7 Waste Site Map

Site: 2607-W7	Area: U Plant	Category: Intermediate



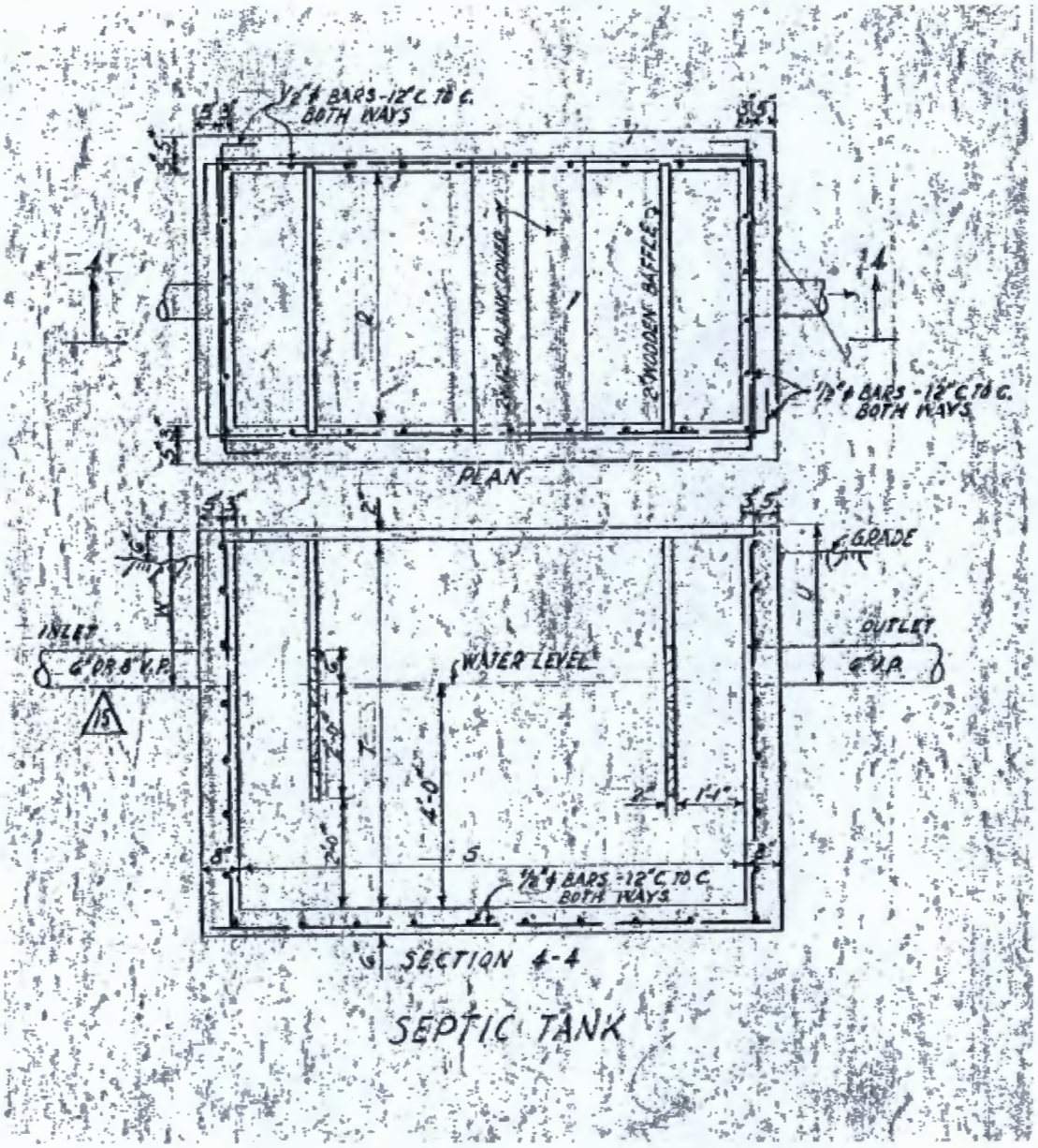
Source: HNF-SD-LL-SP-001, *200 and 600 Areas Sanitary Wastewater Master Plan.*



Source: M-2904-W, *Outside Lines Sewers*, Sheet 19.

Figure 2. Approximate Location of the 2607-W7 Waste Site Drain Field

Site: 2607-W7	Area: U Plant	Category: Intermediate



Source: W-71192, *Septic Tanks Plan and Sections.*

Note: Produced from the best available copy.

Figure 3. Septic Tank Construction

Site: UPR-200-W-19	Area: U Plant	Category: Shallow - Subsurface

Site Description

Site Type: Unplanned Release
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1
Service Dates: 1953

Waste Site Location and Physical Description: The release occurred north of 16th Street, near Settling Tank 361-U and the 216-U-1&2 Cribs (Figure 1). The area where the release occurred is currently marked as an Underground Radioactive Material Area (URMA) that also contains the 216-U-1 Crib, 216-U-2 Crib, and Settling Tank 241-U-361. A portion of the 2607-W5 tile field is also included in the URMA. In 1953, decontamination was attempted, the area was backfilled and delineated by a wooden fence, and posted with Radiation Zone signs. In 1992, contaminated soil in the vicinity of the 216-U-1&2 Cribs was scraped and consolidated near Tank 241-U-361. In addition, the surface surrounding Tank 241-U-361 was surface stabilized with shotcrete.

Waste Site Coordinates:
E-567299.82733 N-135012.63585

Site Dimensions (original release area):
Site Length: Not applicable Site Depth: Not applicable
Site Width: Not applicable Cover Thickness: Not applicable
Site Area: 4.65 m2 (50 ft2)*
*Subsequent evaluations have increased the waste site footprint to an irregular shape measuring approximately 137 m (450 ft) by 61 m (200 ft).

Related Site Structure(s): The release is associated with the 221-U Facility, 224-U facility, 241-U-361 Settling Tank and the 216-U-1&2 Cribs.

Site Posting: The area is posted as an URMA.

Site History

Release Summary: In the spring of 1953, an unknown quantity of organic wastes and cell drainage from the Tributyl Phosphate process in 221-U and waste from 224-U (UO_3) overflowed to the ground by way of the tank (241-U-361) and crib vents (216-U-1 and 216-U-2). Contamination readings of 11.5 rads/hr at a distance of 7.6 cm (3 in.) were reported over the unplanned release site area.

Volume Discharged: Not applicable.

Pore Volume Discharged: Unknown

Site: UPR-200-W-19	Area: U Plant	Category: Shallow - Subsurface

Previous Site Characterization

Site Characterization Summary: In 1995, a Limited Field Investigation was done of the 200-UP-2 OU. The 216-U-1&2 Cribs, Settling Tank 241-U-361, and the UPR-200-W-19 waste site were included in the field investigation. A radiological survey the area was done with the ultrasonic ranging and data system. At the time of the survey (1995), the 216-U-1&2 Cribs were posted as a Soil Contamination Areas. Settling Tank 241-U-361 was posted as an URMA. Septic Tank 2607-W5 and Drain Field had no radiological posting. Due to borehole drilling activities at the 216-U-1&2 Cribs, a portion of the crib surface had been stabilized with gravel. Roughly 25,000 m^2 (269,000 ft^2) of surface area was surveyed. The highest concentration of contamination points above established radiological background levels were located in the northwest and northeast corners of the survey area. Other high concentrations were identified along the eastern border of Septic Tank 2607-W5 and Drain Field, in the area adjacent to the 216-U-1 and 216-U-2 Cribs, and in the vicinity of Settling Tank 241-U-361. As a result of this and other radiological surveys, the radiologically posted area was increased. In 1993, characterization boreholes 299-W19-96 /A9797 and 299-W19-97/A7792 were installed and sampled. Two shallow soil samples associated with these boreholes were collected. Shallow soil sampling results at borehole 299-W19-96 (located within the 216-U-1 footprint) detected Cs-137 a concentration of 320 pCi/g in the sample from 1.2 – 1.8 m (4 – 6 ft) below ground surface (bgs). Since the crib discharge depth is 6.1 m (20 ft) bgs, shallower soil contamination is likely due to the overflow of process condensate from crib vent risers documented as UPR-200-W-19.

In 2004/2005, during investigation of the 216-U-1&2 Cribs and Settling Tank 241-U-361, a total of 13 direct-push boreholes were installed within the limits of the UPR-200-W-19 waste site. Geophysical logging of each borehole was performed to depth of approximately 14.9 m (49 ft) bgs to identify manmade radionuclides. Cs-137 was detected above background concentration in 11 of these boreholes, with the maximum concentration of 341 pCi/g detected at 2.1 m (7 ft) bgs in borehole C4202, located near the north boundary of the UPR-200-W-19 waste site. However, at 10 locations, the maximum concentrations (1.9 to 83 pCi/g) were detected between 0.3 and 0.9 m (1 and 3.5 ft) bgs (see Table 2). Geophysical logging was completed at two locations within the 216-U-1&2 Cribs (299-W19-72/A7772 and 299-W19-73/A7773) to 25.6 m (74 ft) bgs. At these locations, Cs-137 concentrations in shallow soil (0 – 4.6 m [0 – 15 ft] bgs) were 18 to 31,756 pCi/g, and concentrations below the cribs at approximately 7.6 m (25 ft) bgs exceeded 4 million pCi/g (see Table 3). Four auger borings were installed to approximately 14 m (45 ft) bgs and soil samples collected at the bottom of each borehole. No shallow soil samples were collected.

A visual inspection is done tri-annually and a routine radiological survey is done annually.

Well and borehole locations are shown on Figure 1, and sample data summaries are provided in Tables 1 through 7.

Site: UPR-200-W-19	Area: U Plant	Category: Shallow - Subsurface

Table 1. Borehole Summary for the UPR-200-W-19 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2004	C4201	Inside	0.5 – 48.9 (GPL)
2004	C4202	Inside	0 – 48.4 (GPL)
2004	C4204	Inside	1 – 49.1 (GPL)
2004	C4205	Inside	0.5 – 48.9 (GPL)
2004	C4206	Inside	0 – 49.3 (GPL)
2004	C4208	Inside	0 – 49.4 (GPL)
2004	C4209	Inside	0.5 – 48.8 (GPL)
2004	C4210	Inside	0.5 – 48.8 (GPL)
2004	C4211	Inside	0.5 – 49.5 (GPL)
2004	C4212	Inside	0.5 – 48.6 (GPL)
2004	C4213	Inside	0 – 49.1 (GPL)
2004	C4215	Inside	0 – 48.5 (GPL)
2004	C4550	Inside	0 – 49.1 (GPL)
2005	C4705	Inside	44 – 45.5 (1 soil sample)
2005	C4706	Inside	42 – 43.5 (1 soil sample)
2005	C4710	Inside	44.5 – 46 (1 soil sample)
2005	C4713	Inside	40 – 41.5 (1 soil sample)
2005	A7772/299-W19-72	Inside	1 - 74 (GPL)
2005	A7773/299-W19-73	Inside	1 - 74 (GPL)

GPL = geophysical log
ID = identification

Site: UPR-200-W-19	Area: U Plant	Category: Shallow - Subsurface

Table 2. Geophysical Log Data Summary

DPT Casing/ Well Number	Cesium-137	Uranium-238/Uranium-235	Other man-made contaminants detected
C4201	1.5 to 6.5 ft: 0.3 to 20.8 pCi/g (max at 2.5 ft) 30.5 to 40.5 ft: 0.4 to 60 pCi/g (max at 31.5 ft)	U-238: 35.5 to 44.5 ft, 22 to 155 pCi/g (max at 43.5 ft) No U-235 detected	None
C4202 (UPR-200-W-19)	1 to 12 ft: 0.4 to 341 pCi/g (max at 7 ft)	None detected	None
C4204	2 to 7 ft: 0.3 to 21.9 pCi/g (max at 3 ft)	U-238: 26 and 44 to 46 ft (max of 34 pCi/g at 26 ft) No U-235 detected	None
C4205	1.5 to 9.5 ft: 0.3 to 42.9 pCi/g (max at 2.5 ft) 39.5 ft: near its minimum detection level (MDL) of 0.2 pCi/g	U-238: 41.5 to 42.5 ft, 19 to 32 pCi/g (max at 42.5 ft) No U-235 detected	None
C4206 (UPR-200-W-19)	1 to 4 ft: 0.2 to 15.7 pCi/g (max at 2 ft)	None detected	None
C4208	2 to 7 ft: 0.2 to 45 pCi/g (max at 3 ft)	None detected	None
C4209	0.5 to 16.5 ft: 0.2 to 42.9 pCi/g (max at 3.5 ft)	None detected	None
C4210	1.5 to 3.5 ft: 0.3 to 01.87 pCi/g (max at 2.5 ft)	None detected	None
C4211	1.5 to 10.5 ft: 0.2 to 9.69 pCi/g (max at 2.5 ft)	None detected	None
C4212 (UPR-200W-19)	None detected	None detected	None
C4213	0 to 8 ft: 0.3 to 44.1 pCi/g (max at 1 ft) 10 to 16 ft: 0.3 to 18 pCi/g (max at 14 ft), 4 pCi at 15 ft	None detected	None
C4215	1 to 7 ft: 0.3 to 83.3 pCi/g (max at 3 ft)	None detected	None
C4550	1 to 6 ft: 0.3 to 0.886 pCi/g (max at 2 ft)	None detected	None

Source: D&D-27783*200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*, Table 3-2.

Note: Produced from the best available copy.

DPT = Direct Push Technology

Site: UPR-200-W-19	Area: U Plant	Category: Shallow - Subsurface

Table 3. Geophysical Log Summary for Boreholes A7772 and A7773 in the UPR-200-W-19 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A7772	0 – 5	31,755.8	pCi/g	4.0	715,578	cpm	2
	5 – 10	449.9	pCi/g	6.0	141,614	cpm	7
	10 – 15	940.8	pCi/g	11	601,572	cpm	14
	>15	4,260,128.9	pCi/g	25	4,709,490	cpm	25
A7773	0 – 5	197.4	pCi/g	5	467,156	cpm	5
	5 – 10	310	pCi/g	6	606,264	cpm	6
	10 – 15	17.95	pCi/g	12	212,618	cpm	15
	>15	4,325,663.4	pCi/g	27	3,276,100	cpm	24

ID = identification

Table 4. Soil Maximum Detection Summary (Soil Borehole A9797)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
2-Hexanone	–	–	–	3	µg/kg	122
Acetone	6	µg/kg	6	–	–	–
Aluminum	6,940,000	µg/kg	6	9,860,000	µg/kg	24
Americium-241	–	–	–	33	pCi/g	24
Arsenic	4,500	µg/kg	6	7300	µg/kg	161
Barium	80,100	µg/kg	6	121,000	µg/kg	142
Bis(2-ethylhexyl) phthalate	39	µg/kg	6	750	µg/kg	27
Cadmium	–	–	–	1,590	µg/kg	24
Calcium	–	–	–	74,000,000	µg/kg	170
Cesium-134	–	–	–	4.93	pCi/g	168
Cesium-137	320	pCi/g	6	1,758,000	pCi/g	27
Chloride	9,500	µg/kg	6	21,000	µg/kg	24
Chromium	7,500	µg/kg	6	48,100	µg/kg	24
Cobalt-60	–	–	–	10.6	pCi/g	24

Site: UPR-200-W-19	Area: U Plant	Category: Shallow - Subsurface

Table 4. Soil Maximum Detection Summary (Soil Borehole A9797)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Copper	13,300	µg/kg	6	58,500	µg/kg	27
Curium-244	–	–	–	0.067	pCi/g	24
Europium-154	–	–	–	2	pCi/g	42.5
Fluoride	1,900	µg/kg	6	12,500	µg/kg	24
Gross alpha	9.2	pCi/g	6	20,600	pCi/g	29.5
Gross beta	360	pCi/g	6	4,800,000	pCi/g	32
Iodine-129	–	–	–	1.6	pCi/g	122
Iron	18,600,000	µg/kg	6	36,200,000	µg/kg	32
Lead	4,300	µg/kg	6	215,320	µg/kg	27
Magnesium	4,530,000	µg/kg	6	6,760,000	µg/kg	161
Manganese	316,000	µg/kg	6	1,390,000	µg/kg	24
Mercury	–	–	–	120	µg/kg	42.5
Neptunium-237	–	–	–	2.41	pCi/g	24
Nickel	7,800	µg/kg	6	34,000	µg/kg	24
Nitrate	–	–	–	64,000	µg/kg	32
Nitrite	–	–	–	5,000	µg/kg	27
Nitrogen in nitrite and nitrate	11,400	µg/kg	6	14,300	µg/kg	82
Phenol	–	–	–	88	µg/kg	122
Phosphate	–	–	–	262,000	µg/kg	17
Plutonium-238	–	–	–	4.79	pCi/g	27
Plutonium-239/240	–	–	–	436	pCi/g	27
Potassium	1,270,000	µg/kg	6	2,130,000	µg/kg	24
Potassium-40	12	pCi/g	6	19	pCi/g	177
Radium-226	0.69	pCi/g	6	4.99	pCi/g	168
Radium-228	0.75	pCi/g	6	1.3	pCi/g	177
Selenium-79	–	–	–	3.9	pCi/g	170
Silver	–	–	–	21,820	µg/kg	29.5
Sodium	–	–	–	2,100,000	µg/kg	24

Site: UPR-200-W-19	Area: U Plant	Category: Shallow - Subsurface

Table 4. Soil Maximum Detection Summary (Soil Borehole A9797)

Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Sodium-22	–	–	–	2	pCi/g	32
Strontium	–	–	–	134,000	µg/kg	32
Strontium-90	42	pCi/g	6	2,380,000	pCi/g	32
Sulfate	14,000	µg/kg	6	54,400	µg/kg	168
Technetium-99	–	–	–	350	pCi/g	42.5
Tetrachloroethene	–	–	–	7	µg/kg	27
Thallium	–	–	–	3,460	µg/kg	27
Thorium-228	1	pCi/g	6	7.88	pCi/g	168
Thorium-232	0.75	pCi/g	6	1.3	pCi/g	177
Thorium-234	–	–	–	6.04	pCi/g	168
Titanium	1,430,000	µg/kg	6	3,260,000	µg/kg	32
Toluene	–	–	–	2	µg/kg	24
Total petroleum hydrocarbons kerosene	–	–	–	11,000,000	µg/kg	42.5
Uranium	2,000	µg/kg	6	32,700,000	µg/kg	29.5
Uranium-233/234	0.69	pCi/g	6	1,400	pCi/g	42.5
Uranium-234	–	–	–	8.8	pCi/g	168
Uranium-235	–	–	–	148	pCi/g	29.5
Uranium-238	0.64	pCi/g	6	10,080	pCi/g	29.5
Vanadium	46,300	µg/kg	6	103,000	µg/kg	32
Yttrium	–	–	–	13,300	µg/kg	32
Zinc	40,700	µg/kg	6	104,000	µg/kg	32
Zirconium	–	–	–	41,500	µg/kg	24

Site: UPR-200-W-19	Area: U Plant	Category: Shallow - Subsurface

Table 5. Soil Maximum Detection Summary (Soil Borehole A7792)

Chemical	Sample Interval: 0 – 5 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
1,4-Dichlorobenzene	20	µg/kg	12.5	–	–	–
2-Butanone	–	–	–	3	µg/kg	103.3
2-Chlorophenol	31	µg/kg	12.5	–	–	–
2-Methylnaphthalene	–	–	–	70	µg/kg	103.3
4-Chloro-3-methylphenol	27	µg/kg	12.5	–	–	–
Acenaphthene	23	µg/kg	12.5	26	µg/kg	103.3
Acenaphthylene	–	–	–	60	µg/kg	103.3
Acetone	–	–	–	16	µg/kg	72.5
Aluminum	6,160,000	µg/kg	6	9,490,000	µg/kg	158.5
Anthracene	–	–	–	58	µg/kg	103.3
Arsenic	5,400	µg/kg	6	3,900	µg/kg	103.3
Barium	77,900	µg/kg	6	153,000	µg/kg	177
Benzo(a)anthracene	–	–	–	59	µg/kg	103.3
Benzo(a)pyrene	–	–	–	48	µg/kg	103.3
Benzo(b)fluoranthene	–	–	–	42	µg/kg	103.3
Benzo(ghi)perylene	–	–	–	19	µg/kg	103.3
Benzo(k)fluoranthene	–	–	–	45	µg/kg	103.3
Calcium	11,300,000	µg/kg	6	117,000,000	µg/kg	170
Carbazole	–	–	–	45	µg/kg	103.3
Cesium-137	22	pCi/g	6	–	–	–
Chloride	7,200	µg/kg	12.5	16,100	µg/kg	103.3
Chromium	8,400	µg/kg	6	1,500	µg/kg	177
Chrysene	–	–	–	60	µg/kg	103.3
Cobalt	10,500	µg/kg	6	11,900	µg/kg	177
Copper	15,300	µg/kg	6	22,000	µg/kg	170

Site: UPR-200-W-19	Area: U Plant	Category: Shallow - Subsurface

Table 5. Soil Maximum Detection Summary (Soil Borehole A7792)

Chemical	Sample Interval: 0 – 5 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Dibenzofuran	–	–	–	73	µg/kg	103.3
Di-n-butylphthalate	–	–	–	230	µg/kg	148.5
Europium-155	–	–	–	0.15	pCi/g	158.5
Fluorene	–	–	–	84	µg/kg	103.3
Fluoride	2,400	µg/kg	6	4,700	µg/kg	177
Gross alpha	5.5	pCi/g	6	14	pCi/g	158.5
Gross beta	38	pCi/g	6	33	pCi/g	103.3
Indeno(1,2,3-cd)pyrene	–	–	–	27	µg/kg	103.3
Iron	19,400,000	µg/kg	6	21,200,000	µg/kg	177
Lead	4,800	µg/kg	6	9,500	µg/kg	158.5
Magnesium	5,020,000	µg/kg	6	7,360,000	µg/kg	170
Manganese	321,000	µg/kg	6	433,000	µg/kg	170
Naphthalene	–	–	–	550	µg/kg	103.3
Neptunium-237	–	–	–	0.031	pCi/g	103.3
Nickel	10,000	µg/kg	6	13,500	µg/kg	158.5
Nitrogen in nitrite and nitrate	9,540	µg/kg	6	7,430	µg/kg	52.5
Phenol	–	–	–	18	µg/kg	103.3
Potassium	1,060,000	µg/kg	6	2,290,000	µg/kg	158.5
Potassium-40	11	pCi/g	12.5	17.1	pCi/g	103.3
Pyrene	–	–	–	140	µg/kg	103.3
Radium-226	0.44	pCi/g	12.5	1	pCi/g	170
Radium-228	0.74	pCi/g	12.5	0.97	pCi/g	158.5
Selenium-79	–	–	–	5.5	pCi/g	148.5
Strontium-90	3.3	pCi/g	6	–	–	–

Site: UPR-200-W-19	Area: U Plant	Category: Shallow - Subsurface

Table 5. Soil Maximum Detection Summary (Soil Borehole A7792)

Chemical	Sample Interval: 0 – 5 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Sulfate	26,000	µg/kg	12.5	47,000	µg/kg	177
Technetium-99	0.43	pCi/g	12.5	5.7	pCi/g	72.5
Thorium-228	0.85	pCi/g	12.5	1.1	pCi/g	158.5
Thorium-232	0.74	pCi/g	12.5	0.97	pCi/g	158.5
Thorium-234	–	–	–	1.16	pCi/g	103.3
Titanium	1,380,000	µg/kg	12.5	2,070,000	µg/kg	177
Toluene	–	–	–	1	µg/kg	32
Uranium	2,000	µg/kg	6	3,600	µg/kg	170
Uranium-233/234	0.69	pCi/g	6	1.3	pCi/g	170
Uranium-234	–	–	–	0.11	pCi/g	103.3
Uranium-238	0.64	pCi/g	6	1.3	pCi/g	170
Vanadium	44,000	µg/kg	6	61,900	µg/kg	177
Zinc	38,800	µg/kg	6	54,700	µg/kg	158.5

Table 6. Soil Maximum Detection Summary for Soil Boreholes C4705, C4706, and C4710

Chemical	C4705			C4706			C4710		
	Sample Interval: >15 ft			Sample Interval: >15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Arsenic	6,520	µg/kg	46	5,900	µg/kg	46	3,260	µg/kg	46
Barium	83,600	µg/kg	46	93,400	µg/kg	46	60,000	µg/kg	46
Cadmium	–	–	–	35	µg/kg	46	398	µg/kg	46
Chromium	9,200	µg/kg	46	13,000	µg/kg	46	7,630	µg/kg	46
Cobalt	7,080	µg/kg	46	7,580	µg/kg	46	6,850	µg/kg	46
Copper	13,600	µg/kg	46	14,500	µg/kg	46	16,300	µg/kg	46
Lead	–	–	–	4,560	µg/kg	46	3,130	µg/kg	46
Magnesium	5,600,000	µg/kg	46	5,210,000	µg/kg	46	5,960,000	µg/kg	46
Manganese	403,000	µg/kg	46	380,000	µg/kg	46	220,000	µg/kg	46
Mercury	1,070	µg/kg	46	1,640	µg/kg	46	457	µg/kg	46
Nickel	9,660	µg/kg	46	13,000	µg/kg	46	7,690	µg/kg	46
Nitrogen in Nitrite and Nitrate	6,100	µg/kg	46	3,700	µg/kg	46	800	µg/kg	46
Silver	–	–	–	51	µg/kg	46	150	µg/kg	46
Strontium	33,300	µg/kg	46	34,800	µg/kg	46	29,600	µg/kg	46
Thallium	–	–	–	605	µg/kg	46	938	µg/kg	46
Titanium	1,220,000	µg/kg	46	1,280,000	µg/kg	46	2,080,000	µg/kg	46
Uranium	–	–	–	2,860	µg/kg	46	3,900	µg/kg	46

Table 6. Soil Maximum Detection Summary for Soil Boreholes C4705, C4706, and C4710

Chemical	C4705			C4706			C4710		
	Sample Interval: >15 ft			Sample Interval: >15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Uranium-234	0.777	pCi/g	46	1.23	pCi/g	46	0.722	pCi/g	46
Uranium-235	0.026	pCi/g	46	0.045	pCi/g	46	0.039	pCi/g	46
Uranium-238	0.766	pCi/g	46	1.06	pCi/g	46	0.76	pCi/g	46
Vanadium	33,400	µg/kg	46	47,700	µg/kg	46	59,900	µg/kg	46
Zinc	49,600	µg/kg	46	54,600	µg/kg	46	71,000	µg/kg	46

Site: UPR-200-W-19	Area: U Plant	Category: Shallow - Subsurface

Table 7. Soil Maximum Detection Summary for Soil Borehole C4713

Chemical	Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)
Barium	76,000	µg/kg	42
Chromium	10,300	µg/kg	42
Cobalt	7,340	µg/kg	42
Copper	13,700	µg/kg	42
Lead	5,200	µg/kg	42
Magnesium	4,950,000	µg/kg	42
Manganese	339,000	µg/kg	42
Mercury	2,250	µg/kg	42
Nickel	10,600	µg/kg	42
Nitrogen in Nitrite and Nitrate	2,600	µg/kg	42
Silver	103	µg/kg	42
Strontium	34,600	µg/kg	42
Thallium	934	µg/kg	42
Titanium	1,060,000	µg/kg	42
Uranium	2,560	µg/kg	42
Uranium-234	0.925	pCi/g	42
Uranium-235	0.028	pCi/g	42
Uranium-238	0.864	pCi/g	42
Vanadium	44,800	µg/kg	42
Zinc	52,900	µg/kg	42

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Geophysical logging results detected contamination between 0.3 and 4.6 m (1 and 15 ft) bgs (see Table 2), with maximum detections occurring between 0.3 to 1 m (1 to 3.5 ft) bgs at most locations.

Site: UPR-200-W-19	Area: U Plant	Category: Shallow - Subsurface

References:

D&D-27783, 2006, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*, Rev. 0, Fluor Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA01917974.

Waste Information Data System General Summary Report for the UPR-200-W-19 Waste Site.

Site: UPR-200-W-19	Area: U Plant	Category: Shallow - Subsurface

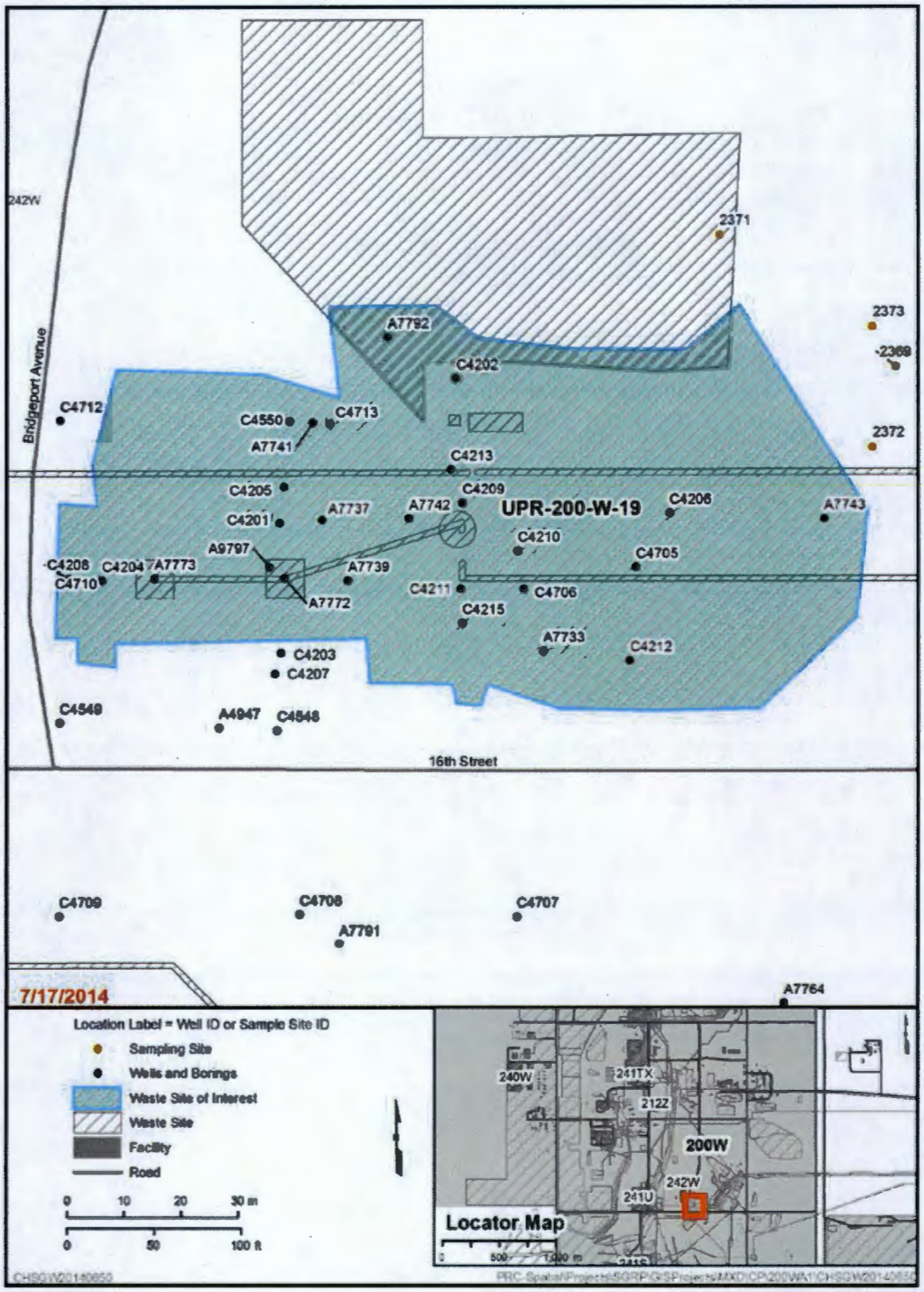


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Figure 1. UPR-200-W-19 Waste Site Map and Existing Borehole Locations

Site: UPR-200-W-19	Area: U Plant	Category: Shallow - Subsurface

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Site: UPR-200-W-33	Area: U Plant	Category: Shallow – Subsurface

Site Description

Site Type: Unplanned Release
Facility/Geographic Area: U Plant Area
Current OU Assignment: 200-WA-1
Former OU Assignment: 200-UW-1
Service Dates: 1955

Waste Site Location and Physical Description: The UPR-200-W-33 waste site is located approximately 28 m (90 ft) east of the 224-U Building (Figure 1). The release site occurred inside the fenced 224-U Facility boundary. In 1955, the top 0.1 m (4 in.) of contaminated soil was removed and clean material was used to fill in the excavation.

Waste Site Coordinates:
E-567584.93748 N-135060.76560

Site Dimensions:
Site Length: 0.91 m (3 ft) Site Depth: Not applicable
Site Width: 0.91 m (3 ft) Cover Thickness: Not applicable
Site Area: 0.84 m^2 (9 ft^2)
Dimensions of original spill. Contaminated area is 10 ft by 15 ft = 150 ft^2.

Related Site Structure(s): The release is associated with the Uranium Recovery process at the 224-U facility.

Site Posting: Not applicable.

Site History

Release Summary: In March 1955, a leaking flange of the C-5 Condensate Line from the 224-U Building caused a small area 3 by 4.5 m (10 by 15 ft) of ground to become contaminated. The radiation zone surrounding the contamination measured 10 ft by 15 ft.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Site: UPR-200-W-33	Area: U Plant	Category: Shallow – Subsurface

Previous Site Characterization

Site Characterization Summary: No visible evidence of the release was observed during the site walkdown conducted in February 1998. A Ground Penetrating Radar scan was done of the area in March 2005.

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Potential radiological contamination in the subsurface, below the surface cover.

References:
Waste Information Data System General Summary Report for the UPR-200-W-33 waste site.

Site: UPR-200-W-33	Area: U Plant	Category: Shallow – Subsurface

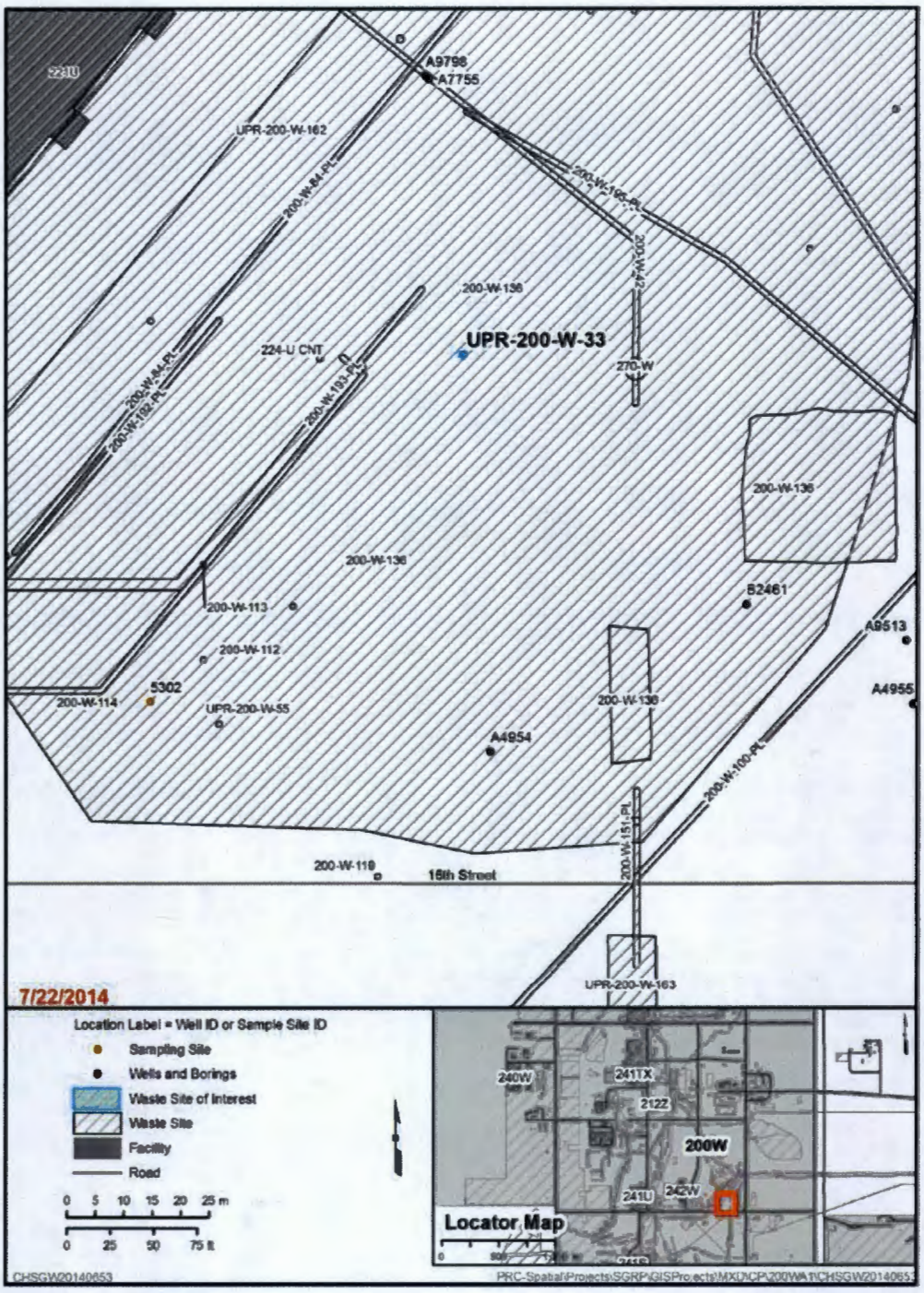

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Figure 1. UPR-200-W-33 Waste Site Map

Site: UPR-200-W-33	Area: U Plant	Category: Shallow – Subsurface

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Site: UPR-200-W-39	Area: U Plant	Category: Shallow – Subsurface

Site Description

Site Type: Unplanned Release
Facility/Geographic Area: U Plant Area
Current OU Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Service Dates: 1954

Waste Site Location and Physical Description: The unplanned release occurred on the southeast side of the 224-U Building (Figure 1). The soil affected by the release was moved to a nearby trench and covered with 1.9 m (3 ft) of clean soil. The disposal trench was covered by the 224-UA (UO_3 Calciner Building) addition. The 224-UA Building was demolished and removed to the top of the slab in 2010.

Waste Site Coordinates:
E-567555.12499 N-135016.71876

Site Dimensions:
Site Length: 15.24 m (50 ft)
Site Width: 3.05 m (10.00 ft)
Site Area: 46.5 m^2 (500 ft^2)
Site Depth: Not applicable
Cover Thickness: Not applicable

Related Site Structure(s): The release is associated with the 224-U Facility, and is located beneath the 224-UA Building foundation.

Site Posting: The release site is not marked because the 224-UA Building was built over the release location.

Site History

Release Summary: During May 1954, an unknown quantity of waste was leaked from the 224-U Building to an area southeast of the 224-U Building. The contamination was placed in a trench that measured 3 m (10 ft) wide by 15.2 m (50 ft) long. The contamination was covered with 0.9 m (3 ft) of clean soil. In a later reference the contamination is described as Uranium, less than 10 nanocuries/gram; however, no volume estimate is provided. The 224-UA $U0_3$ Calciner Building has been demolished with only the concrete slab remaining.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Site: UPR-200-W-39	Area: U Plant	Category: Shallow – Subsurface

Previous Site Characterization

Site Characterization Summary: The UPR-200-W-39 waste site was removed from radiation zone status in June 1972. A site walkdown was conducted in February 1998 and there is no visible evidence of the release.

Nature and Extent of Contamination:
Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Potential radiological contamination in the subsurface, below the clean backfill and concrete slab.

References:
Waste Information Data System General Summary Report for the UPR-200-W-39 Waste Site.

Site: UPR-200-W-39	Area: U Plant	Category: Shallow – Subsurface

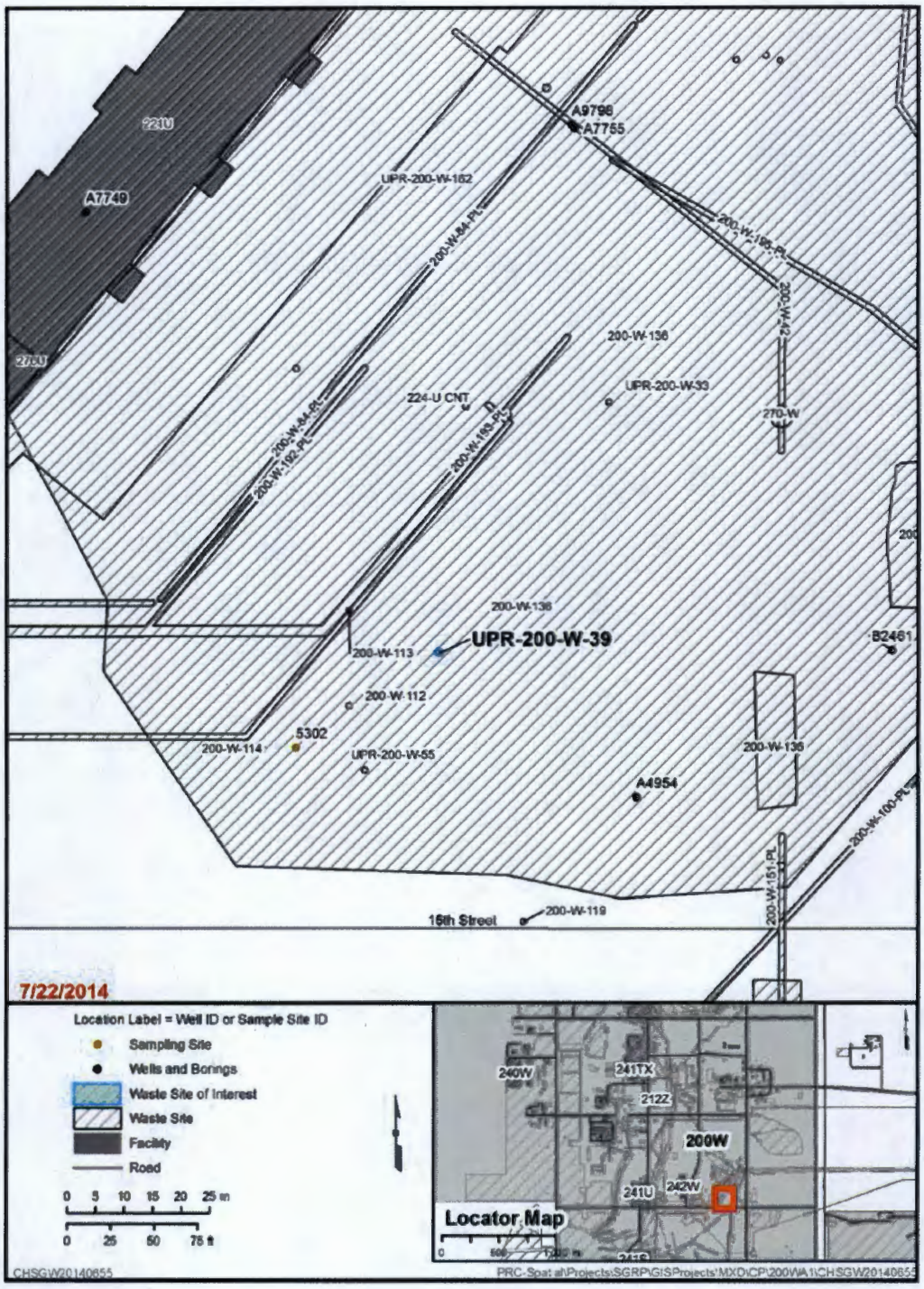

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Figure 1. UPR-200-W-39 Waste Site Map

Site: UPR-200-W-39	Area: U Plant	Category: Shallow – Subsurface

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Site: UPR-200-W-48	Area: U Plant	Category: Shallow – Subsurface

Site Description

Alternate Site Identification: UPR-200-W-48; Contaminated Railroad Track Near 221-U; UN-200-W-48
Site Type: Unplanned Release
Facility/Geographic Area: U Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1
Service Dates: 1958

Waste Site Location and Physical Description: The UPR-200-W-48 waste site is a contamination spread that occurred at the west end of the 221-U railroad cut at Bridgeport Avenue, west of 221-U (Figure 1). The area is no longer marked or posted. The waste site was a spread of radioactive contamination in 1958.

Waste Site Coordinates:
E- 567333.525944 N-135491.934868

Site Dimensions:
Site Length: 9.63 m (31.6 ft) Site Depth: Not specified
Site Width: 9.63 m (31.6 ft) Cover Thickness: Not specified
Site Area: 92.9 m^2 (998.5 ft^2)
Length and width estimated from the square area reported.

Related Site Structure(s): 221-U railroad track, 221-U Canyon Building.

Site Posting: The UPR-200-W-48 waste site is not posted or marked.

Site History

Release Summary: On July 9, 1958, a survey of the railroad area revealed a spread of contamination in the vicinity of the road intersection with the 221-U railroad. The incident occurred when a jumper, wrapped in plastic, was transferred from a flat-bed truck to a railroad flat-car at the railroad crossing. The jumper was transferred from the truck to the railroad car by a crane and moved into the 221-U railroad tunnel. Dose rates up to 9 rad/hr over an area of about 93 m^2 (1,000 ft^2) were detected. The contamination spread was caused by the plastic wrapping on the jumper being damaged during transfer.

Volume/Mass Discharged: Not specified.

Pore Volume Discharged: Unknown.

Site: UPR-200-W-48	Area: U Plant	Category: Shallow – Subsurface

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: No soil or geophysical data are available within or near the UPR-200-W-48 waste site boundary.

Nature and Extent of Contamination:
Shallow (0 – 4.6 m [0 – 15 ft] below ground surface): Potential radiological contamination at the surface.

References:
Waste Information Data System General Summary Report for the UPR-200-W-48 Waste Site.

Site: UPR-200-W-48	Area: U Plant	Category: Shallow – Subsurface

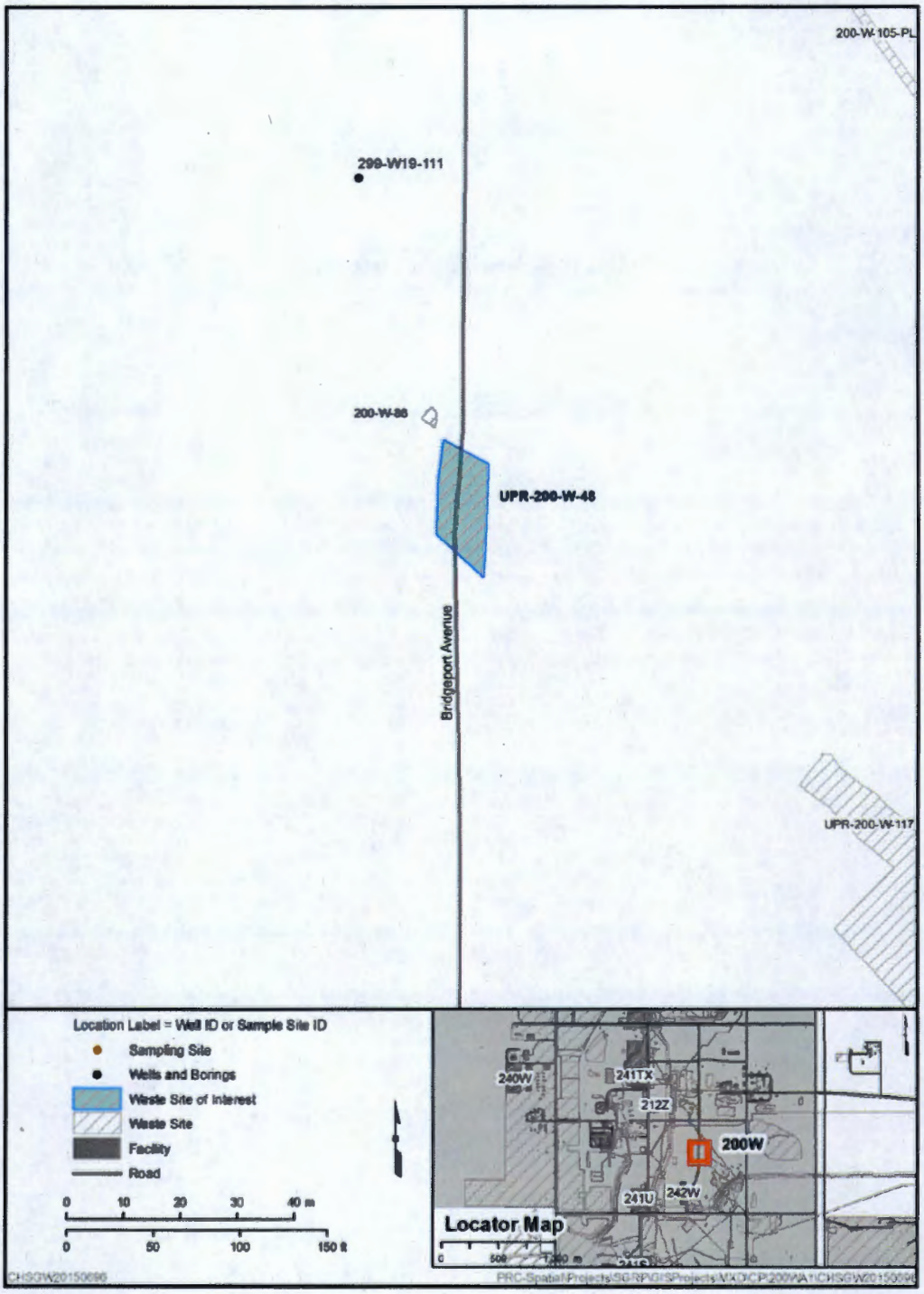

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Figure 1. UPR-200-W-48 Waste Site Map

Site: UPR-200-W-48	Area: U Plant	Category: Shallow – Subsurface

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Site: UPR-200-W-55	Area: U Plant	Category: Shallow-Subsurface

Site Description

Alternate Site ID: Uranium Powder Spill at 224-U, UN-200-W-55
Site Type: Unplanned Release
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MW-1, 200-UP-2
Service Dates: 1960

Waste Site Location and Physical Description: The spill site is located at the on the southwestern side of the former 224-UA Building on the Loadout Room asphalt loading ramp (Figure 1). The nearby roadway and ground surface around the ramp were contaminated. Figure 2 is a photograph of the rollup door leading to the Loadout Room.

Waste Site Coordinates:
E-567542.13 (m) N-13499.02 (m)

Site Dimensions:
Site Length: Not applicable Site Depth: Not applicable
Site Width: Not applicable Cover Thickness: Not applicable
Site Area: Not applicable (areas flushed with water, site boundaries indeterminate).

Related Site Structure(s): None.

Site Posting: The site is not marked or posted.

Site History

Release Summary: The spill occurred at the loading ramp, where calcined uranium trioxide powder was loaded into large shipping containers through a flexible hose connection between the hopper and the container. On April 12, 1960, a break in a loading hose resulted in a container overrun and spill of 1.36 metric tons (1.5 tons) of uranium powder onto the asphalt loading ramp. The powder spread into several rooms. Most of the powder was swept up and put in drums for recovery. However, during cleanup, the rest was washed off the asphalt onto the adjacent ground surface.

Volume Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Site: UPR-200-W-55	Area: U Plant	Category: Shallow-Subsurface

Previous Site Characterization

Site Characterization Summary: No characterization has been done at the site.

A geophysical survey to locate subsurface utilities was completed in March 2005. The survey results indicated disturbed soil, reinforced concrete, and numerous underground utilities were present in the loading ramp area.

The 224-UA Building was demolished to slab-on-grade in 2010. A minimum of 15 cm (6 in.) of surface material was placed over the slab and the area was posted as an Underground Radioactive Materials Area based on post-demolition radiological surveys (DOE/RL-2011-04, *U Plant Ancillary Facilities Removal Action Report*).

Nature and Extent of Contamination:
No data are available to evaluate shallow soil contamination. Approximate location of waste site is shown in Figure 1.

References:

D&D-27783, 2006, *200-UW-1 Field Summary Report for Fiscal Years 2004 and 2005*, Rev. 0, Fluor Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA01917974.

DOE/RL-2011-04, 2011, *U Plant Ancillary Facilities Removal Action Report*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0088389.

Hudson, B. and M. Galgoul, 2005, "200-UW-1 Operable Unit Geophysical Surveys - Draft," (technical memorandum to R. Jackson, Fluor Hanford Inc., March 24), CH2M HILL, Richland, Washington.

PNL-6456, 1988, *Hazard Ranking System Evaluation of CERCLA Inactive Waste Sites at Hanford: Volume 3 – Unplanned-Release Sites (HISS Data Base)*, Vol. 3, Pacific Northwest Laboratory, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196007000.

Radiation Occurrence Report, April 14, 1960.

Waste Information Data System Summary Report for the UPR-200-W-55 Waste Site.

Site: UPR-200-W-55	Area: U Plant	Category: Shallow-Subsurface

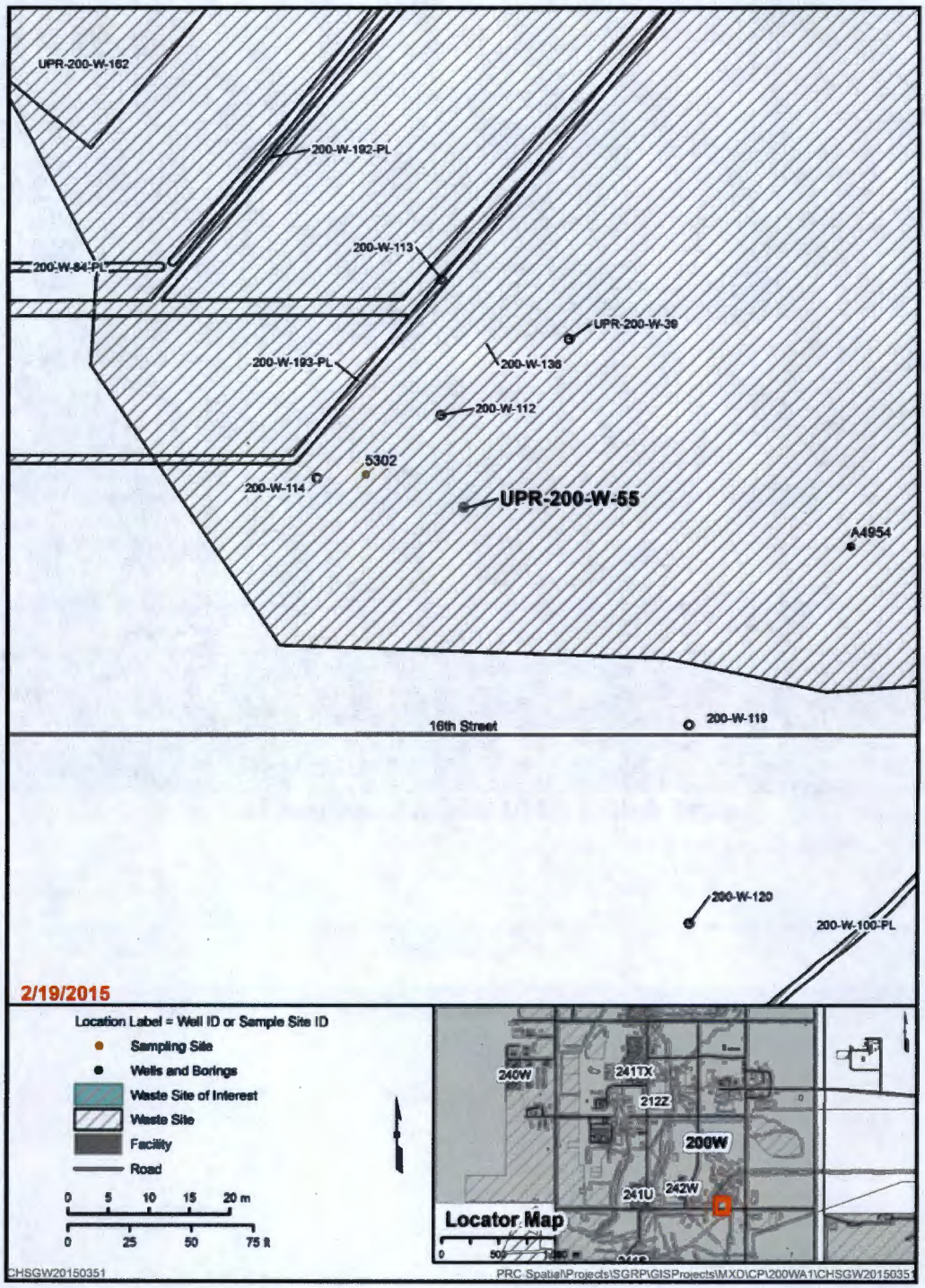

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Figure 1. UPR-200-W-55 Waste Site Map

Site: UPR-200-W-55	Area: U Plant	Category: Shallow-Subsurface

Figure 2. Building 224-UA Loadout Room Rollup Door

Site: UPR-200-W-60	Area: U Plant	Category: Shallow – Subsurface

Site Description

Site Type: Unplanned Release
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1
Service Dates: 1966

Waste Site Location and Physical Description: The unplanned release site consists of spotty contamination extending from the 221-U tunnel door along the railroad tracks (Figure 1). The U Plant Railroad had been surrounded with soil berms on the north and south sides of the track and posted with Contamination Area signs. The area (including the UPR-200-W-60 area) was surface stabilized in 2001 by pushing soil from the berms into the railroad cut. The entire area, including the railroad tracks, is now covered with clean soil.

Waste Site Coordinates:
E-567551.28126 N-135316.32030

Site Dimensions:
Site Length: 68.58 m (225 ft) Site Depth: Not applicable
Site Width: 6.1 m (20.00 ft) Cover Thickness: Not applicable
Site Area: Not applicable

Related Site Structure(s): The site is associated with the 221-U Building and UPR-200-W-117.

Site Posting: The site is posted with Underground Radioactive Material Area signs.

Site History

Release Summary: On February 25, 1966, Plutonium Uranium Extraction (Plant) (PUREX) equipment was transferred to U Plant in a rail car filled with water (for shielding). Contaminated water dripped from a hole in the bottom of the PUREX equipment transfer box as the box was being pulled from the 221-U Building tunnel. The release affected approximately 69 m (225 ft) of railroad track. The box was returned to the tunnel. Radiation monitoring conducted at the site following the release indicates radioactivity along the railroad track ranged from a few thousand counts per minute to a maximum of 1 rad/hr.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Site: UPR-200-W-60	Area: U Plant	Category: Shallow – Subsurface

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: In 1966, the contamination was isolated and cleaned. In 2001, the U Plant Railroad Cut was stabilized by covering the contamination with up to 5 ft clean soil from the adjacent berms (BHI-01612, *Final Report for Interim Stabilization of U Plant Railroad Cut Contamination Area*).

Nature and Extent of Contamination:
Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Potential radiological contamination at the surface, below the stabilization cover.

References:
BHI-01612, 2002, *Final Report for Interim Stabilization of U Plant Railroad Cut Contamination Area*, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

Waste Information Data System General Summary Report for the UPR-200-W-60 Waste Site.

Site: UPR-200-W-60	Area: U Plant	Category: Shallow – Subsurface

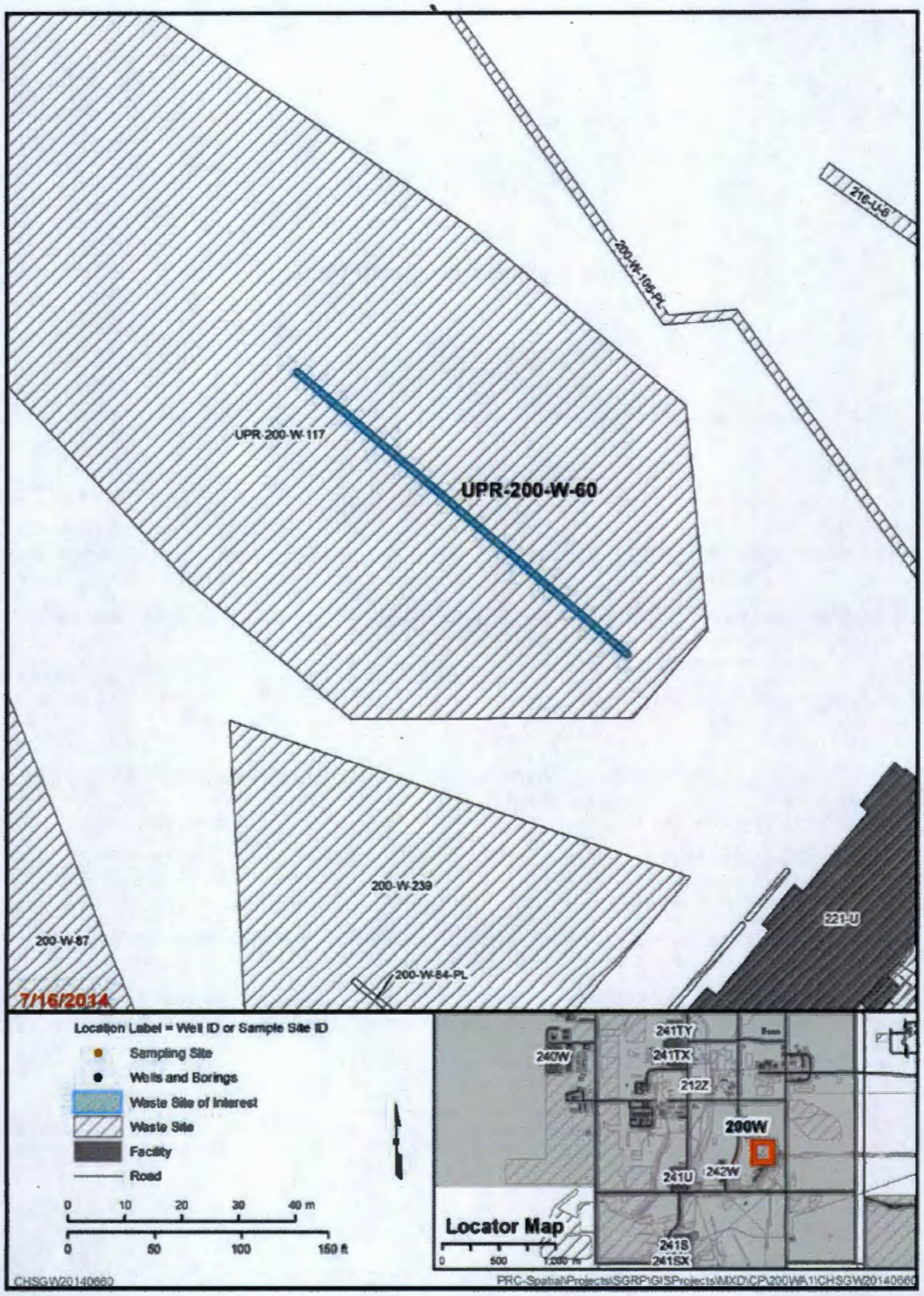

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Figure 1. UPR-200-W-60 Waste Site Map

Site: UPR-200-W-60	Area: U Plant	Category: Shallow – Subsurface

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Site: UPR-200-W-78	Area: U Plant	Category: Shallow – Surface Only

Site Description

Site Type: Unplanned Release
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1
Service Dates: 1970

Waste Site Location and Physical Description: The release caused an area, located 36 m (118.1 ft) south of the Uranium trioxide barrel storage area, to become contaminated (Figure 1). An operator was immediately dispatched with a bucket and shovel to pick up the contaminated soil. No other contamination was detected.

Waste Site Coordinates:
E-567478.43749 N-134999.56252

Site Dimensions:
Site Length: Not applicable
Site Width: Not applicable
Site Area: 3.7 m^2 (40 ft^2)
Site Depth: Not applicable
Cover Thickness: Not applicable

Related Site Structure(s): Not applicable.

Site Posting: The site is no longer marked or posted.

Site History

Release Summary: On August 21, 1970, a radiation survey was conducted with a truck-mounted road monitor. The equipment detected an area measuring approximately 3.72 m^2 (40 ft^2) contaminated with levels up to 20,000 cpm. It is assumed that some uranium powder spilled prior to March 1969, when the last pallets were moved from 224-U Facility.

Volume Discharged: N/A.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown quantity of uranium trioxide powder.

Site: UPR-200-W-78	Area: U Plant	Category: Shallow – Surface Only

Previous Site Characterization

Site Characterization Summary: With the exception of the radiological survey conducted immediately following the site discovery, no additional characterization information is available for this site.

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Potential radiological contamination at the surface.

References:
Waste Information Data System General Summary Report for the UPR-200-W-78 Waste Site.

Site: UPR-200-W-78	Area: U Plant	Category: Shallow – Surface Only

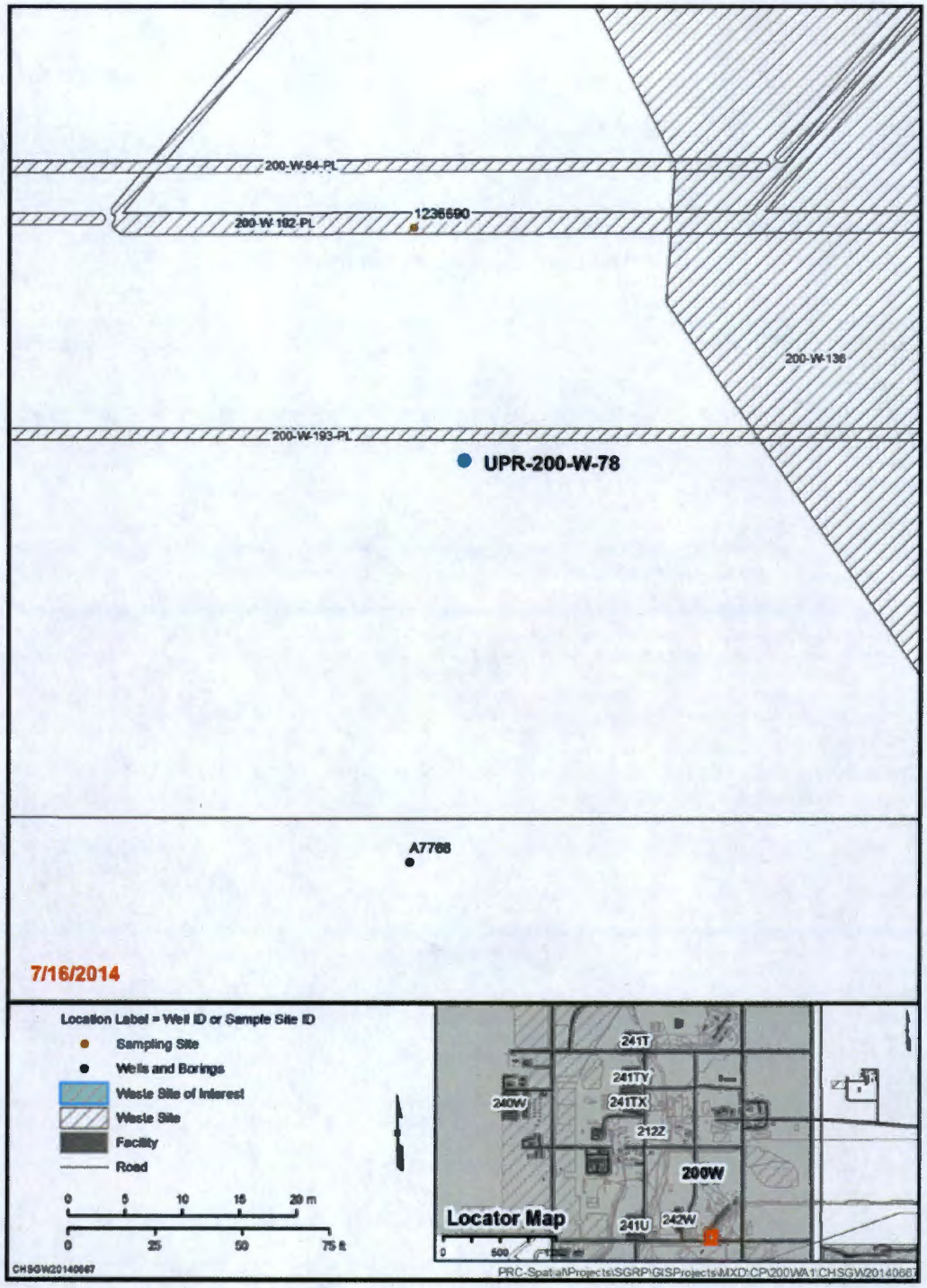

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Figure 1. UPR-200-W-78 Waste Site Map (2014)

Site: UPR-200-W-78	Area: U Plant	Category: Shallow – Surface Only

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Site: UPR-200-W-101	Area: U Plant	Category: Shallow - Subsurface

Site Description

Site Type: Unplanned Release
Facility/Geographic Area: U Plant Area
Current OU Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Service Dates: 1957

Waste Site Location and Physical Description: The UPR-200-W-101 unplanned release occurred at the northeast end of the 221-U Building (sections R-1 through R-9) in the 200 West Area (Figure 1). The contaminated area of approximately 19.8 m (65 ft) by 27.5 m (90 ft) was covered with 7.6 cm (3 in.) of sand and gravel after the occurrence.

A larger contaminated area on the east side of 221-U was surface stabilized in 1998 (UPR-200-W-162). In 1998, the contaminated areas on the rear side of 221-U were covered with clean backfill material. The area around the 241-UX-154 Diversion Box was not covered with backfill material.

In 1967, a Radiation Monitoring Management Report stated that approximately 1,900 m^2 (20,000 ft^2) of ground surface at the rear of the 221-U Building was resealed. The original tar surface over an old radioactive spill area had decomposed and allowed weeds to grow and bring contamination to the surface. The resealed area extended from section R-1 through section R-9 and out to the road east of the building. All weeds were removed, soil sterilizing agent was then sprayed over the ground, a hot tar base was applied, and this was capped with fine mesh chipped gravel.

Waste Site Coordinates:
E-567617.84347 N-135224.20283

Site Dimensions:
Site Length: 27.43 m (90 ft) Cover Thickness: Not applicable
Site Width: 19.81 m (65 ft) Site Depth: 0.91 m (3 ft)

Related Site Structure(s): The UPR-200-W-101 waste site was associated with sections R-1 through R-9 of the 221-U Building and UPR-200-W-162.

Site Posting: The release site was posted with Surface Contamination warning signs. This unplanned release area was located within the UPR-200-W-162 posted area. After being covered with clean material, the posting was changed to an Underground Radioactive Material Area. UPR-200-W-101 is not separately marked or posted within the area.

Site: UPR-200-W-101	Area: U Plant	Category: Shallow - Subsurface

Site History

Release Summary Reclaimed acid was distributed via overhead pipelines between 224-U and 211-U. UPR-200-W-101 occurred in March 1957, when reclaimed acid was spilled onto the ground at the northeast end of the 221-U Building. Approximately 1 Ci of fission products was released. At the time of discharge, the reclaimed acid contained approximately 1 Ci of strontium-90.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Potential release of 1 Ci of strontium-90.

Previous Site Characterization

Site Characterization Summary: During a radiological survey in September 1976, surface contamination to 300 cpm was detected.

Nature and Extent of Contamination:
Shallow (0 – 4.6 m [0 – 15 ft] bgs): Potential radiological contamination in the surface and/or subsurface.

References:
Waste Information Data System General Summary Report for the UPR-200-W-101 Waste Site.

Site: UPR-200-W-101	Area: U Plant	Category: Shallow - Subsurface

WIDS = Waste Information Data System

Figure 1. UPR-200-W-101 Waste Site Map

Site: UPR-200-W-101	Area: U Plant	Category: Shallow - Subsurface

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Site: UPR-200-W-111	Area: U Plant	Category: Shallow - Subsurface

Site Description

Alternate Site Identification: Sludge Trench at 207-U, UN-216-W-21
Site Type: Unplanned Release
Facility/Geographic Area: U Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: Not Specified

Waste Site Location and Physical Description: The UPR-200-W-111 waste site was an unplanned release (UPR) into a disposal trench roughly 3 m (10 ft) from the concrete wall on the south side of the 207-U South Retention Basin in the 200 West Area (Figure 1). The site was posted with Soil Contamination Area (SCA) warning signs until 1997; when contaminated soils in the area surrounding the 207-U Retention Basin were scraped and compiled along the basin boundary. The consolidated piles were covered with a layer of clean backfill, and the posting was changed to an Underground Radioactive Material Area (URMA). No reference drawings are available for this site.

Waste Site Coordinates:
Lon-566972.24999 Lat-134984.20318

Site Dimensions:
Site Length: 12.2 m (40.0 ft) Site Depth: 3.1 m (10.0 ft)
Site Width: 4.6 m (15.0 ft) Cover Thickness: 1.2 m (4.0 ft)
Site Area: Not specified

Related Site Structure(s): The UPR-200-W-111 waste site was associated with the 207-U South Retention Basin.

Site Posting: The UPR-200-W-111 waste site was originally posted as an SCA. Currently, the site is posted as an URMA following surface stabilization work in 1997.

Site History

Release Summary: It is believed the UPR-200-W-111 waste site was constructed in the 1960s as a single-use disposal trench. The trench received an estimated 21 m^3 (27 yd^3) of sludge from the 207-U South Retention Basin. Until 1972, the retention basin received steam condensate and cooling water from the 224-U Building and chemical sewer waste from the 221-U Building. The exact date the trench was excavated is unknown.

On an unspecified date, sludge was scraped from the floor of the South 207-U Retention Basin and deposited into the UPR-200-W-111 Trench. The trench is next to the south basin wall. After deposition,

Site: UPR-200-W-111	Area: U Plant	Category: Shallow - Subsurface

the sludge was buried beneath 1.2 m (4.0 ft) of clean backfill material. The trench was provided a UPR label, despite the sludge removal being a planned activity. The exact date the contaminated soil was scraped and consolidated is uncertain.

In 1997, the area was surface stabilized by scraping and consolidated areas of contamination surrounding the 207-U Retention Basin. Once the contamination was consolidated, a layer of clean soil was placed over the site. The site was downposted from an SCA to an URMA following the stabilization work.

Volume/Mass Discharged: 21 m^3 (27 yd^3) of sludge.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: A site walkdown for surveillance purposes occurred on February 25, 1998; however, the results of the survey are not presented.

A Global Positioning System (GPS) survey mapped a significant portion of the outer boundary of the 207-U Retention Basin from October 25 to November 14, 1995. However, the southern boundary edge was not mapped due to a loss of lock by the GPS unit. In addition, the boundaries between UPR-200-24 and UPR-200-W-111 were not mapped due to access issues. When surveyed, UPR-200-W-111's perimeter was determined based on signs posted around its boundary. In March 1998, it was discovered that the site may have been labeled incorrectly.

Additional GPS mapping surveys occurred from February 13 to February 15, 1996, and on September 12, 1997. The 1996 surveys mapped the southern portion of the site. On September 12, 1997, the GPS survey mapped the perimeter of the post-stabilization area. In addition, the long boundary that UPR-200-W-111 shares with UPR-200-W-24 was mapped. As with the initial fall 1995 survey, the boundaries for UPR-200-W-111 were based on existing postings at the site; thus the site may have been labeled incorrectly.

No radiological survey information is presented for the site. Thus, it is unclear what the radiological conditions are within the site. It is also unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided. If surveys do occur, their frequency is not specified.

Site: UPR-200-W-111	Area: U Plant	Category: Shallow - Subsurface

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Potential radiological contamination in the subsurface (1.2 m [4 ft] bgs), below the stabilization cover.

References:

Waste Information Data System General Summary Report for the UPR-200-W-111 Waste Site.

Site: UPR-200-W-111	Area: U Plant	Category: Shallow - Subsurface

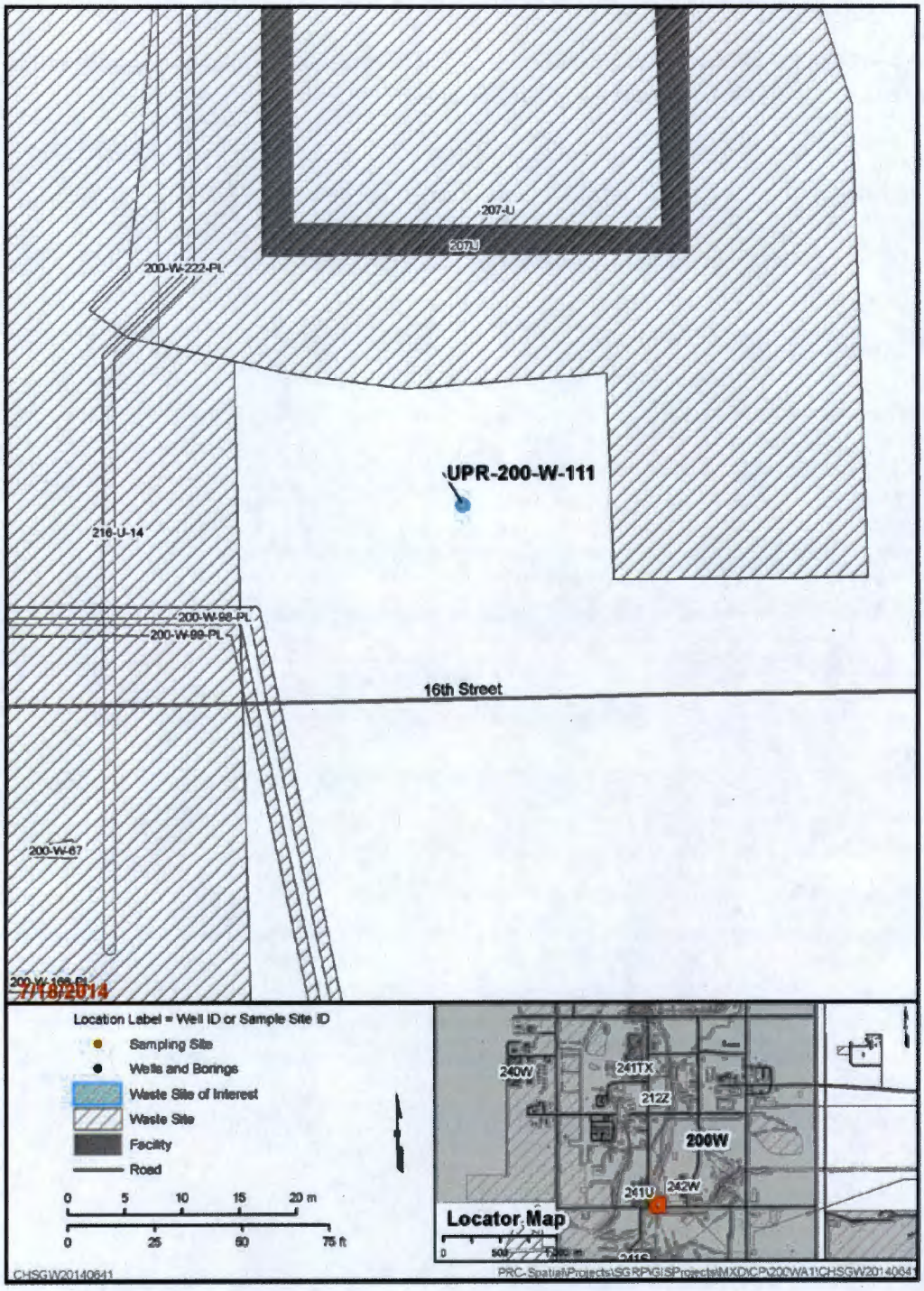

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Figure 1. UPR-200-W-111 Waste Site Map

Site: UPR-200-W-112	Area: U Plant	Category: Shallow - Subsurface

Site Description

Alternate Site Identification: Sludge Trench at 207-U, UN-216-W-22
Site Type: Unplanned Release
Facility/Geographic Area: U Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: Not Specified

Waste Site Location and Physical Description: The UPR-200-W-112 waste site is an unplanned release (UPR) into a disposal trench roughly 3 m (10 ft) from the concrete wall on the north side of the 207-U North Retention Basin (Figure 1). The site was posted with Soil Contamination Area (SCA) warning signs until 1997, when the contaminated area was scraped and consolidated. The site was then covered with a layer of clean soil and downposted to an Underground Radioactive Material Area (URMA). No reference drawings are available for this site.

Waste Site Coordinates:
E-566970.93750 N-135087.86715

Site Dimensions:
Site Length: 12.2 m (40.0 ft) Site Depth: 3.05 m (10.0 ft.)
Site Width: 4.6 m (15.0 ft) Cover Thickness: 1.2 m (4.0 ft)
Site Area: Not specified

Related Site Structure(s): The UPR-200-W-112 waste site was associated with the 207-U North Retention Basin.

Site Posting: The UPR-200-W-112 waste site was originally posted as an SCA. Currently, the site is posted as an URMA following surface stabilization work in 1997.

Site History

Release Summary: It is believed the UPR-200-W-112 waste site was constructed in the 1960s as a single-use disposal trench. The trench received an estimated 21 m^3 (27 yd^3) of sludge from the 207-U North Retention Basin. Until 1972, the Retention Basin received steam condensate and cooling water from the 224-U Building and chemical sewer waste from the 221-U Building. The exact date the trench was excavated is unknown.

On an unspecified date, sludge was scraped from the floor of the North 207-U Retention Basin and deposited into the UPR-200-W-112 Trench, which is located next to the north basin wall. After deposition, the sludge was buried beneath 1.2 m (4.0 ft) of clean soil. The trench was provided an

Site: UPR-200-W-112	Area: U Plant	Category: Shallow - Subsurface

UPR label, despite the sludge disposal being a planned activity. The exact date the contaminated soil was scraped and consolidated is uncertain.

In 1997, the area was surface stabilized by scraping and consolidating areas of contamination. Once the contamination was consolidated, a layer of clean soil was placed over the site. The site was downposted from an SCA to an URMA following stabilization work.

Volume/Mass Discharged: 21 m^3 (27 yd^3) of sludge.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: A site walkdown for surveillance purposes occurred on February 25, 1998; however, the results of the survey are not presented. In addition, no radiological survey or site characterization information is presented for the site. Thus, it is unclear what the radiological conditions are within the site. It is also unclear if the site is routinely surveyed or monitored, as no survey results or sample data analyses are provided. If surveys do occur, their frequency is not specified.

Nature and Extent of Contamination:
Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Potential radiological contamination in the subsurface (1.2 m [4 ft] bgs), below the stabilization cover.

References:
Waste Information Data System General Summary Report for the UPR-200-W-112 Waste Site.

Site: UPR-200-W-112	Area: U Plant	Category: Shallow - Subsurface

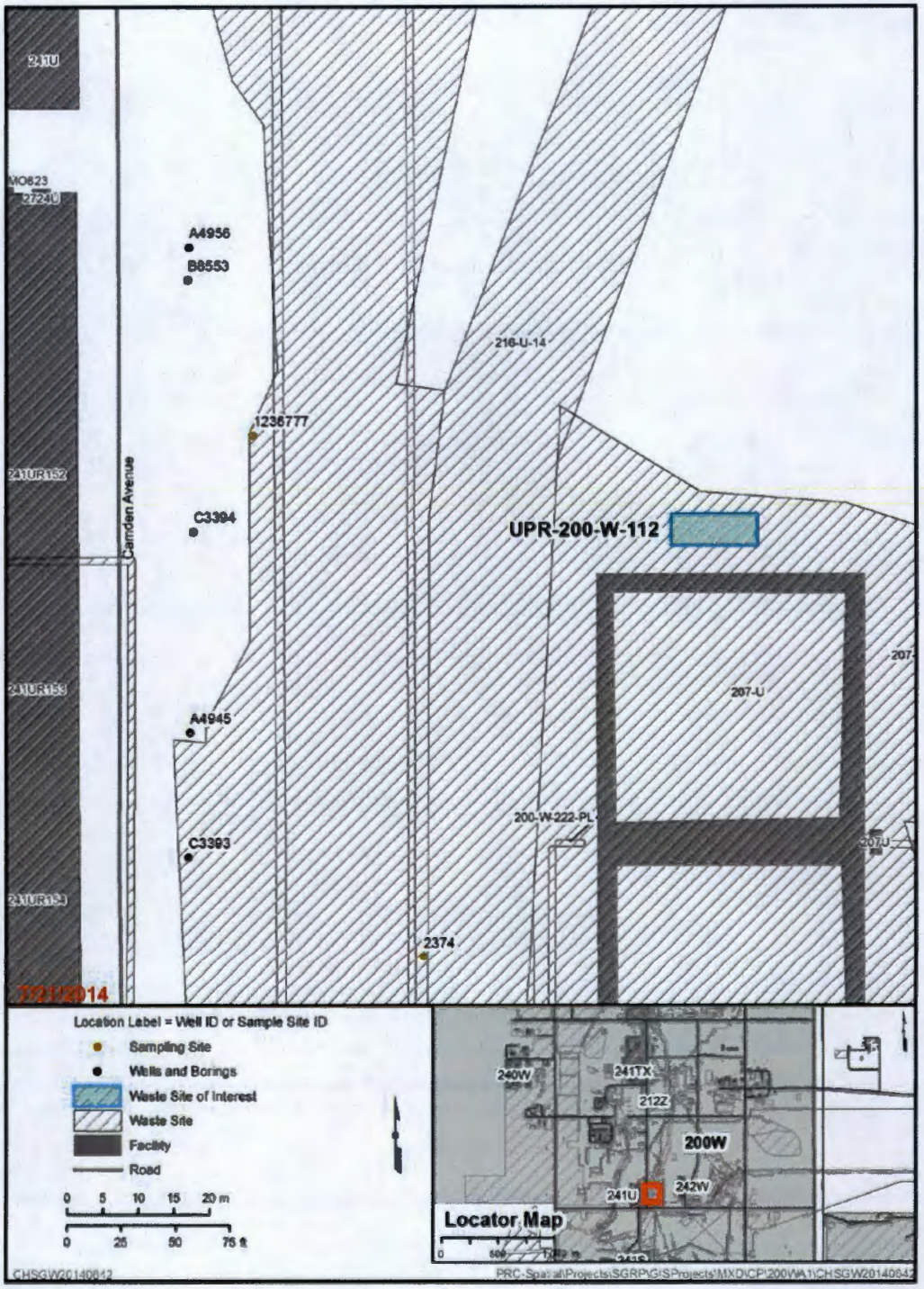

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Figure 1. UPR-200-W-112 Waste Site Map

Site: UPR-200-W-112	Area: U Plant	Category: Shallow - Subsurface

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Site: UPR-200-W-117	Area: U Plant	Category: Shallow – Subsurface

Site Description

Site Type: Unplanned Release
Facility/Geographic Area: U Plant Area
Current OU Assignment: 200-WA-1
Former OU Assignment: 200-UW-1
Service Dates: Not Applicable

Waste Site Location and Physical Description: The release site was the ground around the railroad cut northwest of the 221-U Building in the 200 West Area (Figure 1). In 2001, the posted area was graded and covered with a minimum of 30 cm (12 in.) of clean soil pushed in from the adjacent berm.

Waste Site Coordinates:
Lon-567502.74618 Lat-135357.67996

Site Dimensions:
Site Length: 250 m (820 ft) Site Depth: Not applicable
Site Width: 80 m (262 ft) Cover Thickness: Not applicable

Related Site Structure(s): The UPR-200-W-117 waste site was associated with the 221-U Building and the railroad cars servicing that facility.

Site Posting: The UPR-200-W-117 waste site is posted as an Underground Radioactive Material Area.

Site History

Release Summary: The UPR-200-W-117 waste site is the result of contaminated liquid and particulate matter dropping from railroad cars moving equipment and waste into and out of the 221-U Facility over time. The contamination was primarily fission products and uranium from chemical processing operations.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Site: UPR-200-W-117	Area: U Plant	Category: Shallow – Subsurface

Previous Site Characterization

Site Characterization Summary: It is documented that the UPR-200-W-117 waste site was released from radiological posting in 1983. Site walkdowns occurred in 1998 and 2000. In 2001, the U Plant Railroad Cut was stabilized by covering the contamination with up to 1.5 m (5 ft) of clean soil that was pushed in from the adjacent berms (BHI-01612, *Final Report for Interim Stabilization of U Plant Railroad Cut Contamination Area*).

Nature and Extent of Contamination:
Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Potential radiological contamination in the subsurface, below the stabilization cover.

References:
BHI-01612, 2002, *Final Report for Interim Stabilization of U Plant Railroad Cut Contamination Area*, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

Waste Information Data System General Summary Report for the UPR-200-W-117 Waste Site.

Site: UPR-200-W-117	Area: U Plant	Category: Shallow – Subsurface

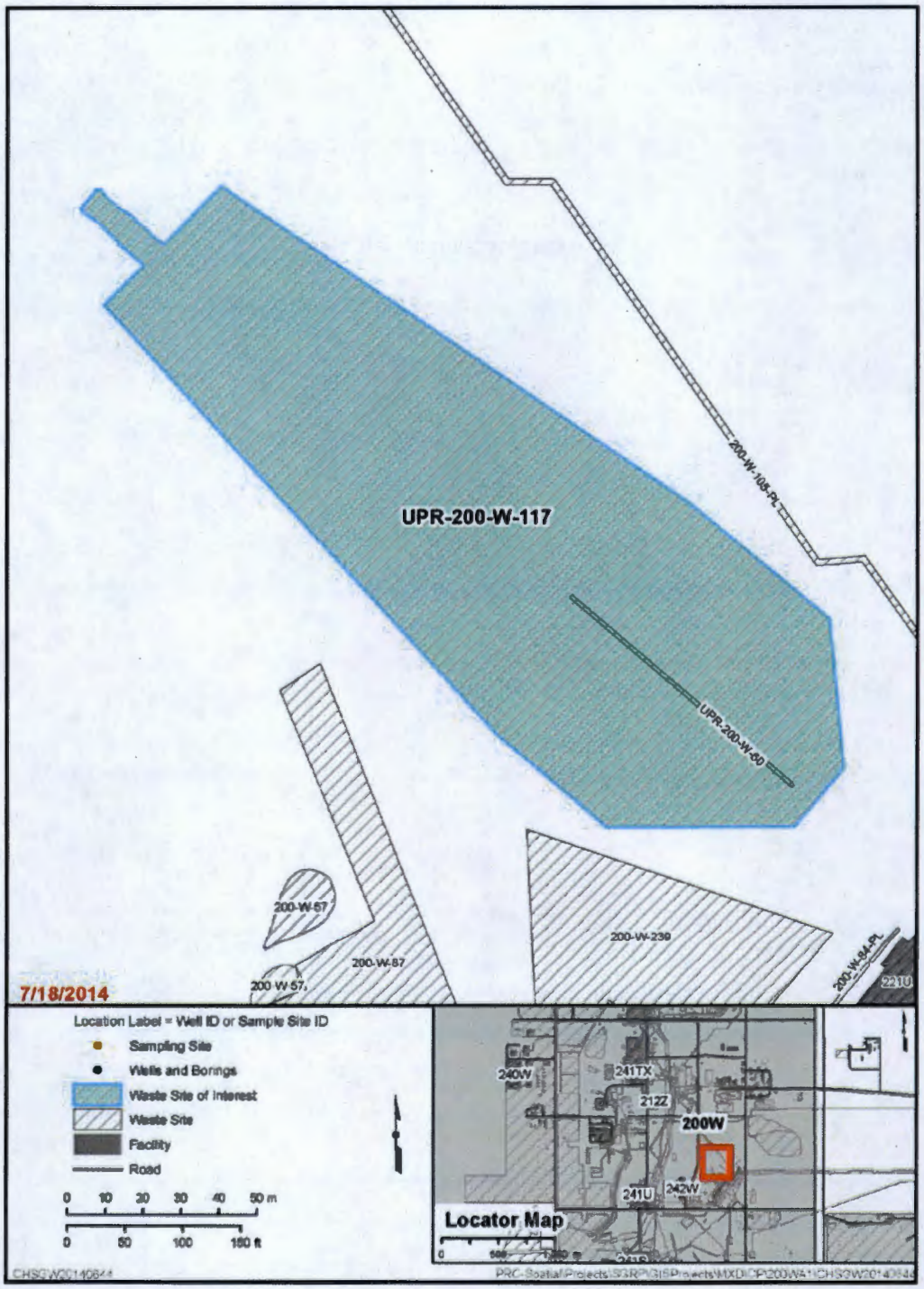

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Figure 1. UPR-200-W-117 Waste Site Map

Site: UPR-200-W-117	Area: U Plant	Category: Shallow – Subsurface

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Site: UPR-200-W-118	Area: U Plant	Category: Shallow - Subsurface

Site Description

Site Type: Unplanned Release
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-UW-1
Service Dates: 1960 to 1972

Waste Site Location and Physical Description: The UPR-200-W-118 waste site was located on the railroad spur northwest of the 221-U Building, adjacent to the 211-U Chemical Tank Farm (Figure 1). The release site consisted of the ground outside the concrete unloading station at the 211-U Tank Farm. The area around the 211-U tanks and railroad spur has been stabilized with gravel and is posted as an Underground Radioactive Material Area (URMA). The 211-U area was decontaminated and decommissioned in May 1998 and 2002. In 1998, the pump pit and lines were flushed and cleaned. The chemical rail car unloading station was removed and the section of railroad track near 221-U was covered with gravel.

Waste Site Coordinates:
E-567553.12499 N-135206.92189

Site Dimensions:
Site Length: Not applicable
Site Width: Not applicable
Site Area: Not applicable
Site Depth: Not applicable
Cover Thickness: Not applicable

Related Site Structure(s): The UPR-200-W-118 waste site is associated with the 211-U and 211-UA Chemical Tank Farms.

Site Posting: The UPR-200-W-118 waste site is posted as an URMA.

Site History

Release Summary: The Uranium Recovery Process at 224-U received uranyl nitrate hexahydrate from the Reduction-Oxidation (REDOX) Facility and the Plutonium Uranium Extraction (PUREX) Plant. After the uranium was removed, the reclaimed nitric acid was stored in the 211-UA tanks. It was transferred from 224-U to 211-UA via overhead lines. The slightly radioactive nitric acid was recycled back to REDOX and PUREX. In the 1960s and 1970s the nitric acid was returned to the separations facilities in railcars and was pumped out of the 211-UA tanks into the railcars via underground lines and a pump pit. Some leakage was associated with the pumping process and caused low-level radioactive contamination around the area.

Site: UPR-200-W-118	Area: U Plant	Category: Shallow - Subsurface

The reclaimed nitric acid storage was moved from 211-UA to a holding tank within the 224-U facility in the 1980's and the railcar unloading platform was abandoned. Some residual acid and waste water, contaminated above crib release limits, continued to be stored in the 211-UA tanks. All the acid and waste water was removed from the tanks prior to being transitioned to the new Environmental Restoration Contractor in 1994. Although the tanks were emptied, the acid pump pit and underground lines had not been flushed. Leaking valves and seals and residual contamination in the pump pit caused low level radioactive contamination to spread around the tanks and railcar unloading platform. The area was posted as a Contamination Area again in the early 1990s. The lines and pump pit were flushed in 1998 and the surface contamination was covered with gravel. The area was changed to an URMA. Wind-borne particulate matter spread to the ground surface outside the concrete unloading station, contaminating approximately 0.4 hectares (1 acre) of ground. The waste consisted of radioactive reclaimed nitric acid that spilled to the soil.

Volume Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: A site walkdown was conducted on August 8, 1981, for the purpose of status verification. It is noted that the ground around the concrete unloading platform was posted with Soil Contamination Area signs.

On August 20, 1982, a routine survey of the railroad track north of 211-U found only one speck of contamination reading 80,000 cpm. No other detectable contamination was found on the track. It was also reported that there were no radiation zone signs.

On February 25, 1998, another site walkdown was conducted for surveillance purposes.

On November 15, 2000, a site walkdown was conducted and it was reported that the area is covered with gravel and posted with URMA signs. The railcar unloading platform has been removed, and it is also noted that the area was stabilized with gravel and posted as an URMA in May 1998.

Nature and Extent of Contamination:
Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Potential radiological and/or inorganic contamination in the subsurface.

References:
Waste Information Data System General Summary Report for the UPR-200-W-118 Waste Site.

Site: UPR-200-W-118	Area: U Plant	Category: Shallow - Subsurface

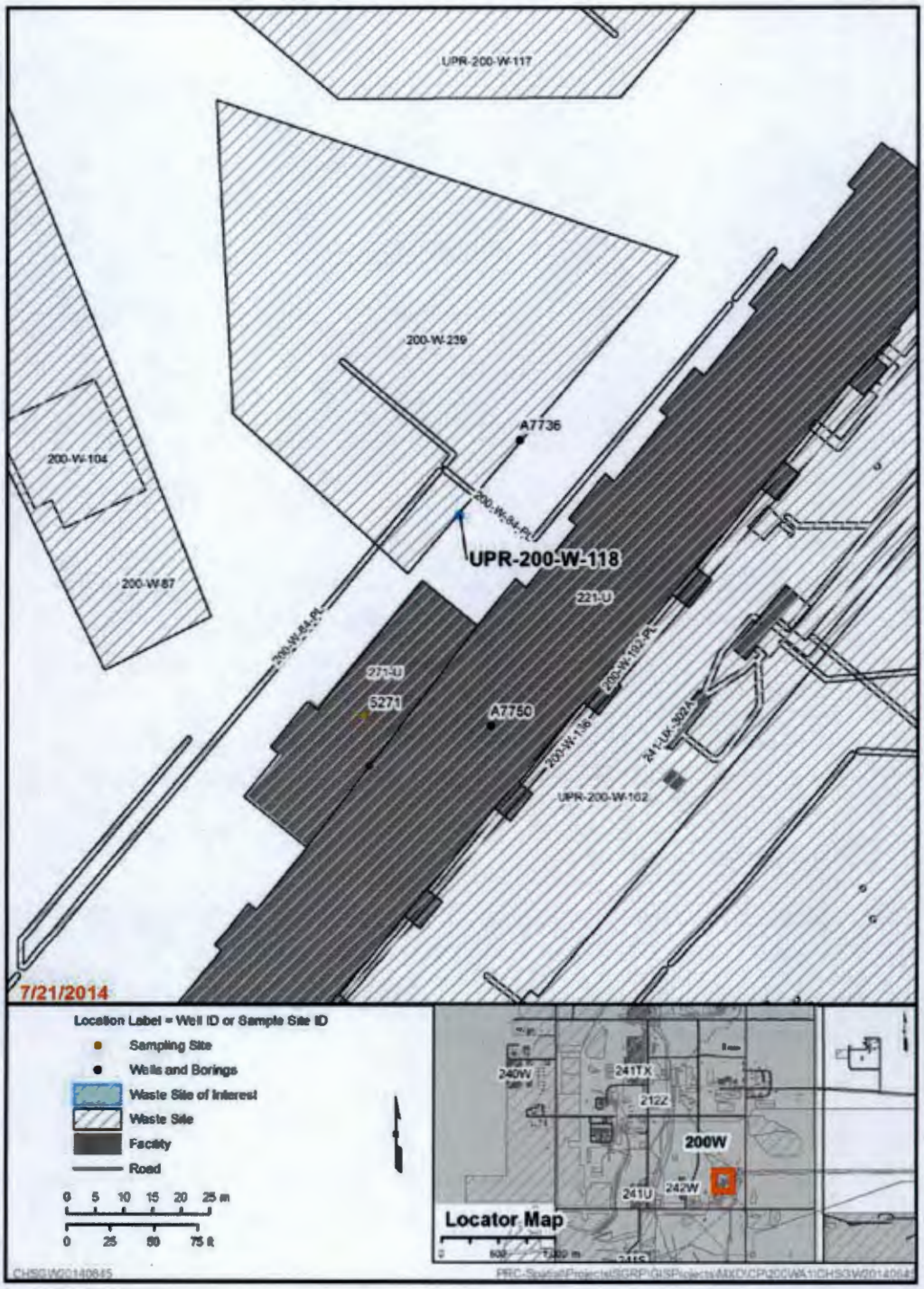

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Figure 1. UPR-200-W-118 Waste Site Map

Site: UPR-200-W-118	Area: U Plant	Category: Shallow - Subsurface

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Site: UPR-200-W-138	Area: U Plant	Category: Shallow-Subsurface

Site Description

Site Type: Unplanned Release
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: 1953

Waste Site Location and Physical Description: UPR-200-W-138 occurred at the northwest corner of the 221-U Building, near the R-3 entrance (Figure 1). It is located inside the larger, surface stabilized area, UPR-200-W-162. The site was described as the ground near the R-3 entrance to the 221-U Building. The unplanned release is not separately marked or posted. In 1998, the contaminated areas on the east side of 221-U were covered with clean backfill material (see UPR-200-W-162). The area around the 241-UX-154 diversion box was not covered with backfill material.

Waste Site Coordinates:
E-567626.49997 N-135215.54691

Site Dimensions:
Site Length: Not applicable
Site Width: Not applicable
Site Area: Not applicable
Site Depth: Not applicable
Cover Thickness: Not applicable

Related Site Structure(s): The UPR-200-W-138 waste site was associated with the 221-U Building Vessel Vent Blower Pit and the larger surface stabilized area UPR-200-W-162. It may also be associated with the 216-U-7 French Drain.

Site Posting: The site is located within an area posted as an Underground Radioactive Material Area.

Site History

Release Summary: It should be assumed that 136 kg (300 lb) of uranyl nitrate hexahydrate (UNH) solution, containing 14 kg (30 lb) of uranium, were introduced to the soil through the 216-U-7 French Drain. The information for this release is vague. Some documentation indicates the French Drain involved was the 216-U-7, but drawing reviews indicate the blower pit is located north of 216-U-7. The blower pit drained to the 241-WR Vault. If the event involved surface liquid being released, it is possible it flowed southward and could have affected the 216-U-7 French Drain.

Volume/Mass Discharged: 136 kg (300 lb) of UNH is assumed to have been released.

Pore Volume Discharged: Unknown.

Site: UPR-200-W-138	Area: U Plant	Category: Shallow-Subsurface

Waste Inventory: See release summary.

Previous Site Characterization

Site Characterization Summary: A radiation survey done in September 1976 detected surface contamination up to 300 cpm in this area. From February 1 to February 15, 1998, a Ground Penetrating Radar Survey was conducted prior to surface stabilization activities for the purpose of characterization. On February 25, 1998, a site walkdown was performed for surveillance purposes.

Nature and Extent of Contamination:

Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Potential radiological contamination in the subsurface, below the stabilization cover.

References:
Waste Information Data System General Summary Report for the UPR-200-W-138 Waste Site.

Site: UPR-200-W-138	Area: U Plant	Category: Shallow-Subsurface

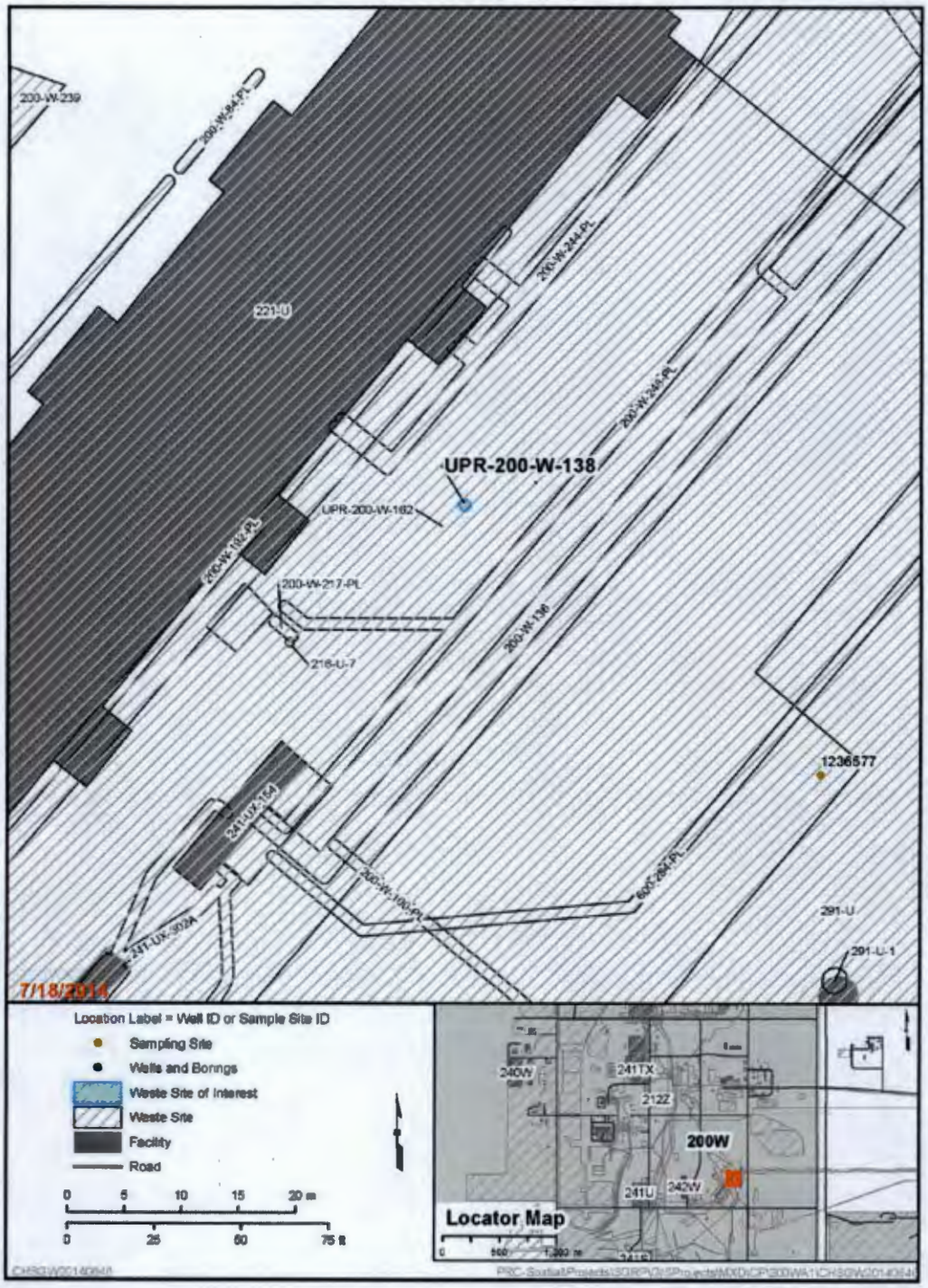

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Figure 1. UPR-200-W-138 Waste Site Map

Site: UPR-200-W-138	Area: U Plant	Category: Shallow-Subsurface

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Site: UPR-200-W-162	Area: U Plant	Category: Shallow – Surface Only

Site Description

Site Type: Unplanned Release
Facility/Geographic Area: U Plant Area
Current Operable Unit (OU) Assignment: 00-WA-1
Former OU Assignment: 200-UR-1
Service Dates: 1991

Waste Site Location and Physical Description: The release site is the area adjacent to and east of the 221-U Canyon Building from Section R-1 to R-19 in the 200 West Area (Figure 1). The area has been backfilled with clean material from the 200 Area Ash Pit. The new unplanned release site encompasses two previously identified spill areas (UPR-200-W-101 and UPR-200-W-138), the 216-U-7 french drain, and the 241-UX-154 diversion Box. Some contamination was removed (using buckets and shovels) by tank farm operations in March and October 1991. In 1998, the area was surface stabilized with material from the 200 Area Ash Pit.

Waste Site Coordinates:
E-567571.34756 N-135148.77131

Site Dimensions:
Site Length: 260 m (853 ft) Site Depth: Not applicable
Site Width: 25 m (82.02 ft) Cover Thickness: Not applicable
Site Area: 3,716 m^2 (40,000 ft^2)

Related Site Structure(s): The UPR-200-W-162 waste site was associated with the 221-U Canyon Building. UPR-200-W-101 and UPR-200-138 are located inside this larger Underground Radioactive Material Area (URMA).

Site Posting: The site is posted as an URMA.

Site History

Release Summary: The UPR-200-W-162 waste site consists of surface radiological speck contamination.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Site: UPR-200-W-162	Area: U Plant	Category: Shallow – Surface Only

Previous Site Characterization

Site Characterization Summary: In 1991 a radiological survey identified contamination specks extending from section R-1 to R-19 on the east side of 221-U. This survey resulted in the radiologically posted area being enlarged and a request for a new waste site number for the larger Surface Contamination Area. The site requires quarterly surveillance, annual radiological surveys, annual herbicide applications, removal of deep-rooted vegetation, and occasional corrective action for small areas of surface contamination that may appear.

Nature and Extent of Contamination:
Shallow (0 – 4.6 m [0 – 15 ft] below ground surface [bgs]): Potential radiological contamination at the surface.

References:
Waste Information Data System General Summary Report for the UPR-200-W-162 Waste Site.

Site: UPR-200-W-162	Area: U Plant	Category: Shallow – Surface Only

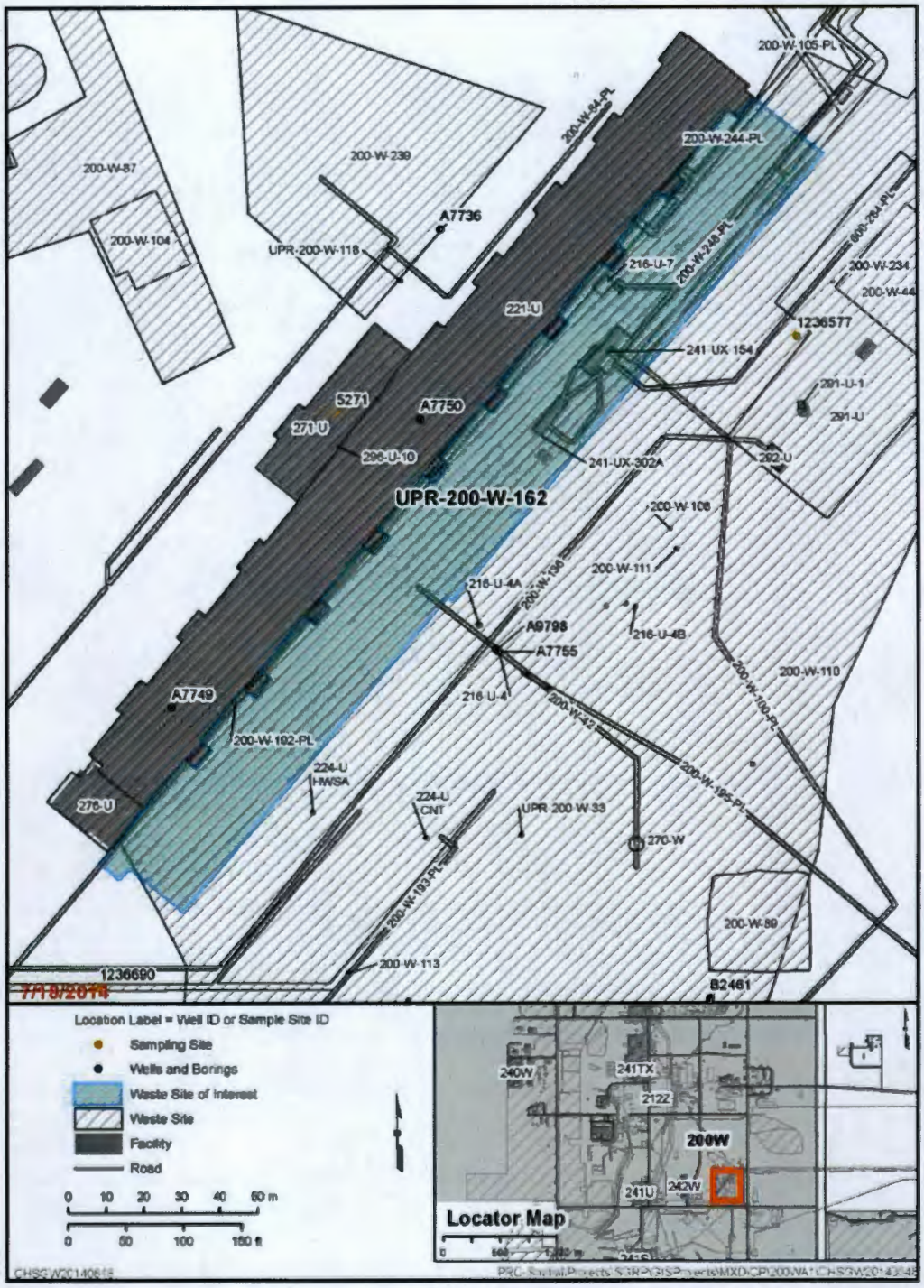

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Figure 1. UPR-200-W-162 Waste Site Map

Site: UPR-200-W-162	Area: U Plant	Category: Shallow – Surface Only

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Site: 200-W-249	Plant: Z Plant	Category: Shallow-Subsurface

Site Description

Alternate Site Identification: 200-W-249, 2736-ZB, and 2736-ZC Concrete Slabs
Site Type: Structures and Foundations
Facility/Geographic Area: 200W
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: Not Applicable
Service Dates: Not Specified

Waste Site Location and Physical Description: The 200-W-249 waste site is the concrete building foundations that remain after the demolition of the 2736-ZB (Plutonium Storage Support Building) and adjacent 2736-ZC (Cargo Restraint Transport Dock) buildings. The 2736-Z complex included buildings 2721-Z, 2731-ZA, 2736, 2736-ZA, 2736-ZB, and 2736-ZC. This Waste Information Data System (WIDS) site consists of the two, adjacent concrete slab building foundations where contamination was found. The 2736-ZB slab is 40.5 m (133 ft) long by 27 m (89 ft) wide with a 9.8 by 3.3 m (32 by 11 ft) extension on the southwest corner. The adjacent 2736-ZC slab is 14.6 by 9.8 m (48 by 32 ft) wide. The two slabs form an "L" shape. The 2736-Z Complex was located southwest of the 234-5Z building (Plutonium Finishing Plant) in the 200 West Area.

Waste Site Coordinates:
E-566451.398568 N-135592.451342

Site Dimensions:
Site Length: 45.4 m (149 ft) Site Width: 39.6 m (130 ft)

Related Site Structures: The 200-W-249 waste site is associated with the former structures of the 2736-Z complex and the 232-Z Complex. 200-W-49 is located southwest of the Plutonium Finishing Plant (234-5Z Building).

Site Posting: The area is posted as Underground Radioactive Material Area (URMA). The posted URMA extends beyond the contaminated concrete slabs as a precaution only. The URMA extension is not considered part of this site.

Site History

The 2736-ZB Building was used to ship, receive, examine, sample, measure, sort, and repackage plutonium material. Plutonium material included plutonium oxide powder, plutonium metal, and miscellaneous scrap metal. Two exhaust stacks, 296-Z-7 and 296-Z-5, were located on the east wall and northwest corner of 2736-ZB, respectively. A liquid nitrogen tank and aluminum gas generator were located immediately west of 2736-ZB.

Site: 200-W-249	Plant: Z Plant	Category: Shallow-Subsurface

2736-ZC was used as an enclosed loading and unloading dock and corridor to the shipping and receiving areas of the 2736-ZB Building. The dock primarily processed containers of waste, but also processed containers of plutonium oxide powder, plutonium metal, and miscellaneous scrap materials from various onsite and offsite sources. Containers of plutonium material were not opened in 2736-ZC but were moved into 2736-ZB before being opened.

Release Summary:
Post demolition radiological surveys identified contamination on the 2736-ZB and 2736-ZC concrete floor slabs. The spots of contamination were fixed to the concrete with paint and were covered with metal plates and a room temperature vulcanization (RTV) silicone sealant. The slabs were covered with approximately 15.2 cm (6 in.) of gravel.

The primary hazardous constituents of concern for 234-5Z and the associated ancillary processing and support buildings are plutonium isotopes (plutonium-238 through plutonium-240) and their decay products (americium-241, uranium-234 through uranium-239, and neptunium-237) and associated mixed fission products (cobalt-60, strontium-90, and cesium-137). The majority of contamination is in the form of adherent films and residues on process equipment that has been removed and other surfaces such as concrete. The volume of waste released at 200-W-249 is not specified. Therefore, no volume estimates can be ascertained for this site.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Not Available.

Previous Site Characterization

Site Characterization Summary: In 2011, soil samples from four boreholes approximately 7.6 m (25 ft) from 200-W-249 were analyzed for gross alpha, gross beta, and hydrocarbons. Borehole locations are summarized in Table 1 and shown on Figure 1. The results of the 2011 soil sampling are summarized in Table 2. A radiation survey was performed in 2012.

Table 1. Borehole Summary for the 200-W-249 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2003	C4064	Outside, approximately 113 ft east	29
2003	C4065	Outside, approximately 38 ft north of northeast site corner	44
2003	C4066	Outside, 20 ft east	40

Site: 200-W-249	Plant: Z Plant	Category: Shallow-Subsurface

Table 1. Borehole Summary for the 200-W-249 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2003	C4067	Outside, approximately 125 ft south	39
2011	C8431	Outside, approximately 25 ft south	13
2011	C8432	Outside, approximately 25 ft south	13
2011	C8433	Outside, approximately 25 ft south	13
2011	C8434	Outside, approximately 25 ft south	13
2011	C8435	Outside, approximately 25 ft south	13

ID = identification

Table 2. Soil Maximum Concentration for the 200-W-249 Waste Site

Borehole ID	Chemical	Sample Interval: 0 – 15 ft			Sample Interval: >15 ft		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
C8431	Gross Alpha	1.7	pCi/g	13	–	–	–
	Gross Beta	2.9	pCi/g	13	–	–	–
C8432	Gross Alpha	2.1	pCi/g	13	–	–	–
	Gross Beta	2.1	pCi/g	13	–	–	–
C8433	Gross Alpha	1.1	pCi/g	13	–	–	–
	Gross Beta	–	pCi/g	13	–	–	–

Note: C8431, C8432, C8433, C8434, C8435 were sampled in 2011 for 1,1-dichloroethene, benzene, chlorobenzene, ethylbenzene, toluene, total petroleum hydrocarbons – diesel range, trichloroethene, and xylenes (total). All results were below the minimum reporting limit (i.e., non-detect).

ID = identification

Soil gas samples were collected for chloroform and carbon tetrachloride at wells C4063, C4064, C4065, C4066, and C4067 in 2003. Based on the special distribution of these boreholes, it is not believed that this sampling data is associated with or representative of contaminant releases from the 200-W-249 waste site.

Site: 200-W-249	Plant: Z Plant	Category: Shallow-Subsurface

Nature and Extent of Contamination: The radiation survey performed in 2012 documented two areas of contamination, with the maximum contamination was 4,000 dpm/100 cm^2 (4,000 dpm/15.5 in^2)(Survey numbers BP-1200105 and BP-1200109 provided in Attachments 1 and 2, respectively).

Shallow (0 to 4.6 m (0 to 15 ft) below ground surface [bgs]): Potential radiological contamination in the surface and/or subsurface of the foundation.

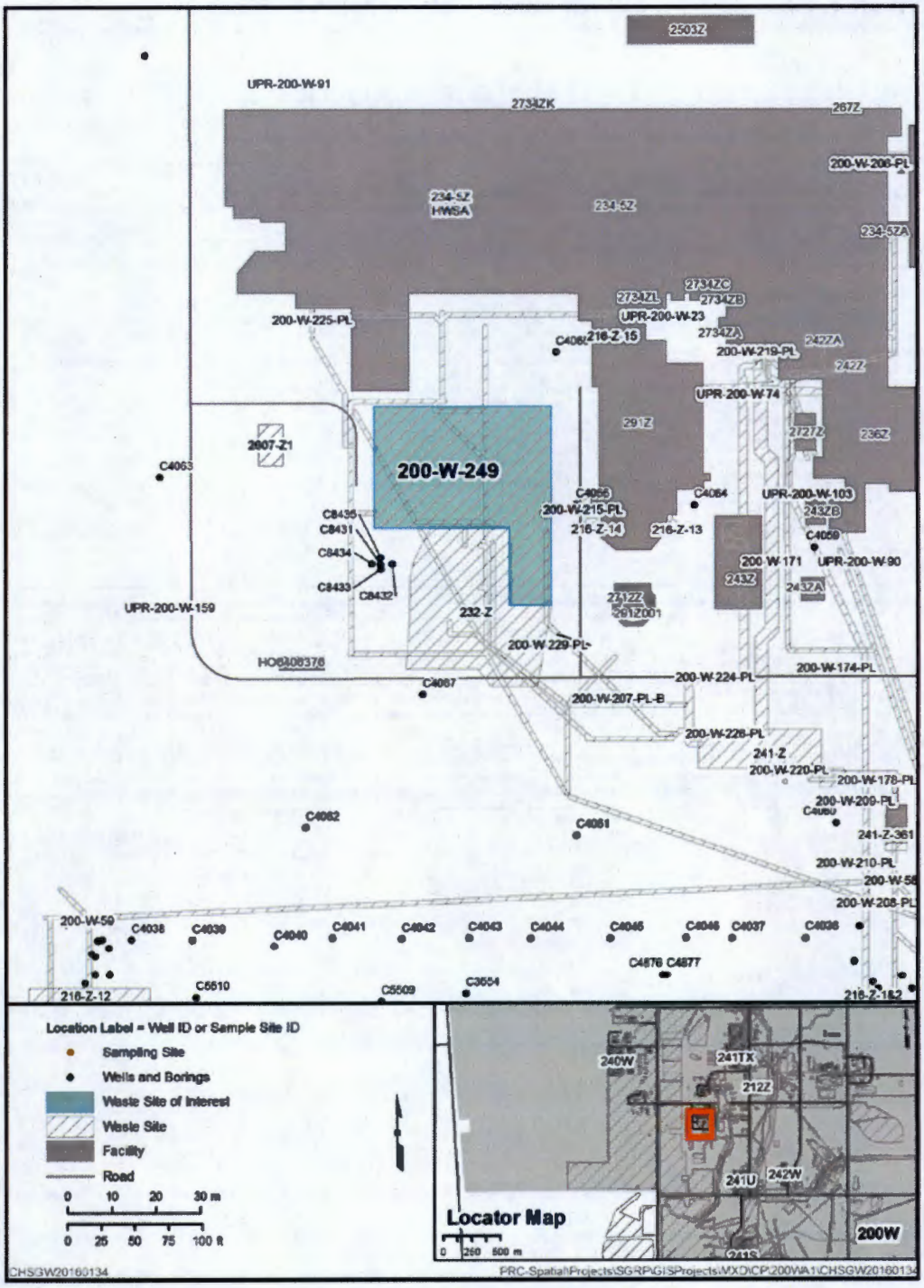
References:

DOE/RL-2004-05, 2004, *Engineering Evaluation/Cost Analysis for the Plutonium Finishing Plant Above-Grade Structures*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D5706574

PNNL-10656, 2006, *Mitigation of Selected Hanford Site Manhattan Project and Cold War Era Artifacts*, Pacific Northwest National Laboratory, Richland, Washington. Available at: http://www.pnl.gov/main/publications/external/technical_reports/PNNL-16056.pdf

WIDS General Summary Report for the 200-W-249 Waste Site.

Site: 200-W-249	Plant: Z Plant	Category: Shallow-Subsurface



ID = identification

Figure 1. 200-W-249 Waste Site Map

Site: 200-W-249	Plant: Z Plant	Category: Shallow-Subsurface

Attachment 1: Radiological Survey Report BP-1200105 (Page 1 of 4)

CH2M HILL PLATEAU REMEDIATION COMPANY
RADIOLOGICAL SURVEY REPORT (Submitted for Approval)

RSR No. BP-1200105

Page 1 of 4

Date	Start/Stop Time	Area/Location	RWP/Rev.
5/8/2012	1230 / 1500	200W / 2736Z / ZA / ZB / 641, 642 / Demolition Zone	BP-12-888 /Rev. 3

Purpose of Survey:

- [ ] Material Release
  - Number: N/A
  - Released to: N/A
- [ ] Rem Shipment: N/A
- [ ] Required Task: N/A
- [ ] Job Coverage: N/A
- [x] Verification survey α = <D
  - <D=No increase in audible count rate

1	Inches/Sec.	1/4	Inches Away
N/A	Count Time (Sec.)	90	% Surveyed
N/A	# of Static Counts	N/A	Square Feet

- [x] Verification survey βγ = <D
  - <D=No increase in audible count rate

1	Inches/Sec.	1/4	Inches Away
N/A	Count Time (Sec.)	90	% Surveyed
N/A	# of Static Counts	N/A	Square Feet

- [x] Other: Verification of radiological conditions

Description of Work / Comments:

Performed survey for the verification of radiological conditions on portions of the 2736Z / ZA / ZB concrete foundation.

Comments: Performed survey for the verification of radiological conditions on portions of the 2736Z / ZA / ZB concrete foundation.
Performed direct scan surveys for Beta-Gamma and Alpha over 90% of the accessible areas of the Green surveyed area on Map 1.
Performed one minute static counts and smears on all above background locations encountered during this survey.
Static counts and swears performed for Beta-Gamma and Alpha.
Concrete slab was dusty with areas that were chalky.

Contamination Measurements

† Manually Calculated by RCT

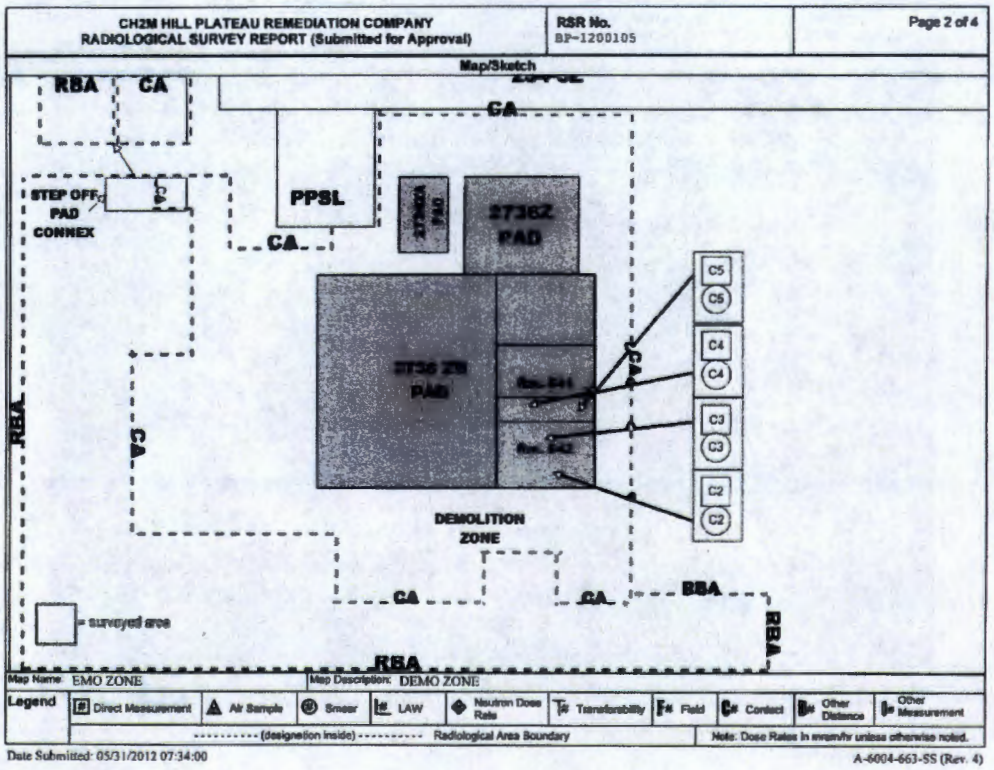
		Background cpm		Direct Gross cpm/100 cm²		Total dpm/100 cm²		Correction Factor		Removable				
											Gross (cpm)		dpm/100 cm²	
No.	Description	βγ	α	βγ	α	βγ	α	βγ	α	Type	βγ	α	βγ	α
C1	General Area	400	1	400	1	<5000	<500	10	10	N/A	N/A	N/A	N/A	N/A
C2	Contamination found above Bkg.	400	1	400	25	<5000	250	10	10	Smear	400	1	<1000	<20
C3	Contamination found above Bkg.	400	1	800	451	4000	4500	10	10	Smear	550	11	1500	100
C4	Contamination found above Bkg.	400	1	400	7	<5000	60	10	10	Smear	400	5	<1000	40
C5	Contamination found above Bkg.	400	1	400	21	<5000	200	10	10	Smear	400	21	<1000	200

Date Submitted: 05/31/2012 07:34:00

A-6004-663-SS (Rev. 4)

Site: 200-W-249	Plant: Z Plant	Category: Shallow-Subsurface

Attachment 1: Radiological Survey Report BP-1200105 (Page 2 of 4)

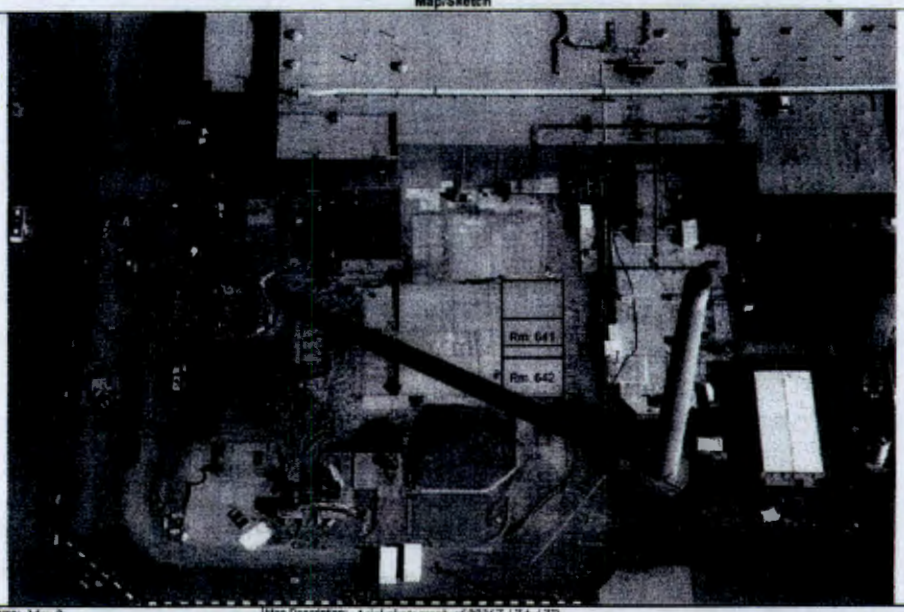


Site: 200-W-249	Plant: Z Plant	Category: Shallow-Subsurface

Attachment 1: Radiological Survey Report BP-1200105 (Page 3 of 4)

CH2M HILL PLATEAU REMEDIATION COMPANY RADIOLOGICAL SURVEY REPORT (Submitted for Approval)	RSR No. BP-1200105	Page 3 of 4

Map/Sketch



Map Name: Map 2	Map Description: Arial photograph of 271-Z / ZA / ZB

Legend: Direct Measurement | Air Sample | Smear | LAW | Neutron Dose Rate | Transferability | Field | Contact | Other Distance | Other Measurement

---------- (designation inside) ---------- Radiological Area Boundary

Note: Dose Rates in mrem/hr unless otherwise noted.

Date Submitted: 05/31/2012 07:34:00

A-6004-663-SS (Rev. 4)

Site: 200-W-249	Plant: Z Plant	Category: Shallow-Subsurface

Attachment 1: Radiological Survey Report BP-1200105 (Page 4 of 4)

CH2M HILL PLATEAU REMEDIATION COMPANY RADIOLOGICAL SURVEY REPORT (Submitted for Approval)	RSR No. BP-1200105	Page 4 of 4

Instruments

Instrument Type	Bar Code No.	Probe Bar Code No.	Efficiency (Used)
Ludlum 2360 / 43-93	SCLL8-0758	DTLLP-0844	β0.1 α0.1
Ludlum 2360 / 43-93	SCLL8-0221	DTLLP-0317	β0.1 α0.1
Ludlum 2360 / 43-93	SCLL8-0568	DTLLP-0989	β0.1 α0.1

Unless stated otherwise in the "Comments" section, contamination levels for C-14, Fe-55, Ni-59, Ni-63, Se-79, Tc-99, Pd-107, and Eu-155 are ≤ 10 times the b-g contamination levels shown above (see CHPRC-00073, Table 2-2).

History

2012-05-22 09:35:58 - Ellingson, Brian - Submitted
2012-05-23 09:20:34 - Adamson, Kerry - Rejected: Couldn't find any of the Ludlum instruments on the daily source check list. Did these come from D&D?
2012-06-04 16:06:39 - Ellingson, Brian - Submitted: Changed <90% to 90%. Removed "for information use only" from coments section.

Date Submitted: 05/31/2012 07:34:00

A-6004-663-SS (Rev. 4)

Site: 200-W-249	Plant: Z Plant	Category: Shallow-Subsurface

Attachment 2: Radiological Survey Report BP-1200109 (Page 1 of 4)

CH2M HILL PLATEAU REMEDIATION COMPANY
RADIOLOGICAL SURVEY REPORT (Submitted for Approval)

RSR No. BP-1200109

Page 1 of 4

Date	Start/Stop Time	Area/Location	RWP/Rev.
5/9/2012	0800 / 1500	200W / 2736Z / ZA / ZB / 641, 642 / Demolition Zone	BP-12-888 /Rev. 3

Purpose of Survey:

- [ ] Material Release
  - Number: N/A
  - Released to: N/A
- [ ] Rail Shipment: N/A
- [ ] Required Task: N/A
- [ ] Job Coverage: N/A
- [x] Verification survey α = <D
  <D=No increase in audible count rate

1	Inches/Sec.	1/4	Inches Away
N/A	Count Time (Sec.)	90	% Surveyed
N/A	# of Static Counts	N/A	Square Feet

- [x] Verification survey βγ = <D
  <D=No increase in audible count rate

1	Inches/Sec.	1/4	Inches Away
N/A	Count Time (Sec.)	90	% Surveyed
N/A	# of Static Counts	N/A	Square Feet

- [x] Other: Verification of radiological conditions

Description of Work / Comments:

Performed survey for the verification of radiological conditions on portions of the 2736Z / ZA / ZB concrete foundation.

Comments: Performed survey for the verification of radiological conditions on portions of the 2736Z / ZA / ZB concrete foundation.
Performed direct scan surveys for Beta-Gamma and Alpha over 90% of the accessible areas of the Green surveyed area on Map 1.
Performed one minute static counts and smears on all above background locations encountered during this survey.
Static counts and smears performed for Beta-Gamma and Alpha.
Concrete slab was dusty with areas that were chalky.

Contamination Measurements

† Manually Calculated by RCT

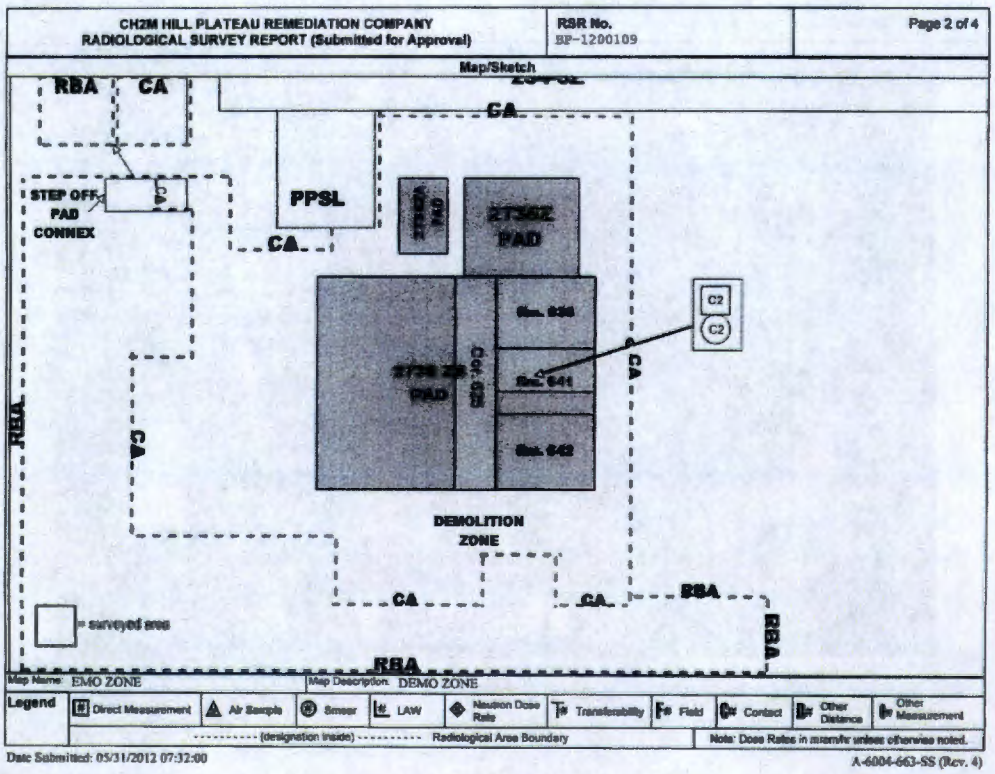
		Background cpm		Direct Gross cpm/100 cm²		Total dpm/100 cm²		Correction Factor		Removable				
											Gross (cpm)		dpm/100 cm²	
No.	Description	βγ	α	βγ	α	βγ	α	βγ	α	Type	βγ	α	βγ	α
C1	General Area	100	0	100	0	<5000	<500	10	6	N/A	N/A	N/A	N/A	N/A
C2	Contamination found above Bkg.	100	0	100	10	<5000	60	10	6	Smear	100	0	<1000	<20

Date Submitted: 05/31/2012 07:32:00

A-6004-663-SS (Rev. 4)

Site: 200-W-249	Plant: Z Plant	Category: Shallow-Subsurface

Attachment 2: Radiological Survey Report BP-1200109 (Page 2 of 4)

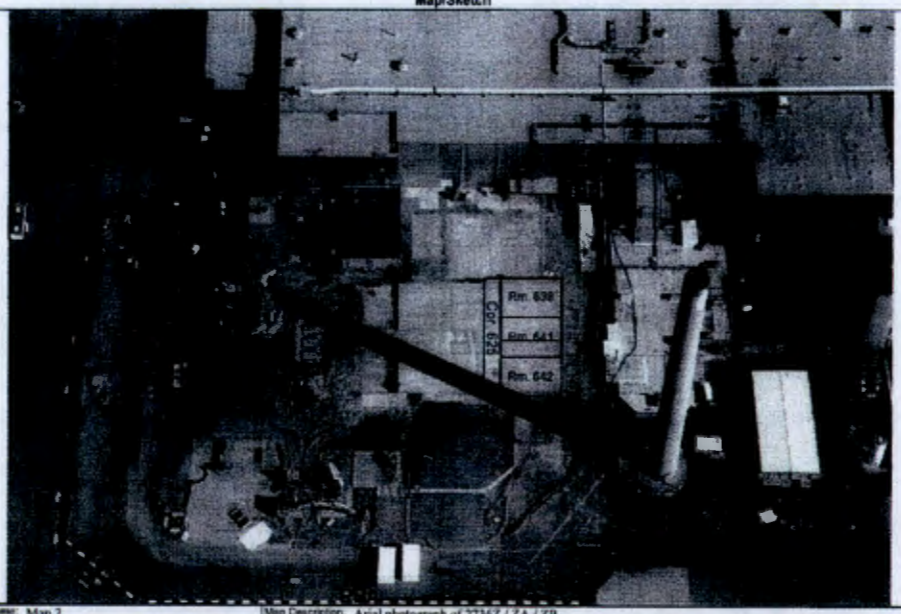


Site: 200-W-249	Plant: Z Plant	Category: Shallow-Subsurface

Attachment 2: Radiological Survey Report BP-1200109 (Page 3 of 4)

CH2M HILL PLATEAU REMEDIATION COMPANY RADIOLOGICAL SURVEY REPORT (Submitted for Approval)	RSR No. BP-1200109	Page 3 of 4

Map/Sketch



Map Name: Map 2 | Map Description: Arial photograph of 2736Z / ZA / ZB

Legend: Direct Measurement | Air Sample | Smear | LAW | Neutron Dose Rate | Transferability | Field | Contact | Other Distance | Other Measurement

----------(designation inside)---------- Radiological Area Boundary

Note: Dose Rates in mrem/hr unless otherwise noted.

Date Submitted: 05/31/2012 07:32:00

A-6004-663-SS (Rev. 4)

Site: 200-W-249	Plant: Z Plant	Category: Shallow-Subsurface

Attachment 2: Radiological Survey Report BP-1200109 (Page 4 of 4)

CH2M HILL PLATEAU REMEDIATION COMPANY RADIOLOGICAL SURVEY REPORT (Submitted for Approval)	RSR No. BP-1200109	Page 4 of 4

Instruments

Instrument Type	Bar Code No.	Probe Bar Code No.	Efficiency (Used)
PAM / 50 cm2	ACHN2-0208	DTHN3-0986	α0.16
PAM / 50 cm2	ACHN2-0331	DTHN3-0468	α0.16
PAM / 50 cm2	ACHN2-0007	DTHN3-0331	α0.16
GM / Pancake	CMEB3-0271	DTEB9-0526	β0.1

Unless stated otherwise in the "Comments" section, contamination levels for C-14, Fe-55, Ni-59, Ni-63, Se-79, Tc-99, Pd-107, and Eu-155 are ≤ 10 times the b-g contamination levels shown above (see CHPRC-00073, Table 2-2).

History

2012-05-22 09:36:15 - Ellingson, Brian - Submitted
2012-05-23 09:17:33 - Adamson, Kerry - Rejected: PAM instruments are 0.16 efficient not 0.1 and the GM listed cannot be found on the daily source check list. Please fix. Thanks.
2012-06-04 16:06:12 - Ellingson, Brian - Submitted: Changed <90% to 90%. Removed "for information use only" from coments section.

Date Submitted: 05/31/2012 07:32:00

A-6004-663-SS (Rev. 4)

Site: 200-W-249	Plant: Z Plant	Category: Shallow-Subsurface

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Site: 207-Z	Area: Z Plant	Category: Intermediate

Site Description

Alternate Site Identification: 207-Z Retention Basin, 241-Z Retention Basin, 241-Z-RB
Site Type: Retention Basin
Facility/Geographic Area: Z Plant (Plutonium Finishing Plant [PFP] Area)
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-SC-1, 200-MG-2
Service Dates: 1949 to 1959

Waste Site Location and Physical Description: The 207-Z waste site is located inside the Z Plant Exclusion Area fence, south of 236-Z Building, and inside the PFP fence (Figure 1). The site consists of a concrete basin that is split into two half sections. The two sections were separated by a 0.3 m (1.0 ft) thick concrete wall. Each section contained a sump with a sump pump. A 1.8 m (6 ft) tall chain link fence encompasses the basins. Both basins were filled with high density grout. Reference drawing H-2-16022 describes the basin as being about 15.2 x 12 x 3 m (50 x 40 x 10 ft) deep.

Waste Site Coordinates:
E-566574.67115 N-135522.57778

Site Dimensions:
Site Length: 15.2 m (50.0 ft) Site Depth: 3.0 m (10.0 ft)
Site Width: 12.2 m (40.0 ft) Cover Thickness: None
Site Area: 186 m^2 (2,000 ft^2)

Related Site Structure(s): The site is associated with the 241-Z and 234-5Z facilities. The 200-W-209-PL pipeline is associated with this site. Additional pipelines linked to the 207-Z Basin are discussed further under site code 200-W-209-PL.

Site Posting: The posting for the site is not specified.

Site History

Release Summary: The 207-Z Basins were constructed in 1949 for use as a holding facility for potentially contaminated waste. The waste consisted of steam condensate and cooling water, and was conveyed through the D-3 piping system into the basins. From the basins, the condensate and cooling water were sent to the 216-Z-1 and 216-Z-11 ditches for disposal.

No estimates are presented for the volume of wastes sent to 207-Z Basins. However, estimates indicate that roughly 152,000 L (40,000 gal) of steam condensate potentially leaked from the 241-Z Basins. It is not specified to where the waste was released, or when the leak occurred.

Site: 207-Z	Area: Z Plant	Category: Intermediate

Volume/Mass Discharged: 152,000 L (40,000 gal) may have leaked from the 241-Z Basins.

Pore Volume Discharged: 152,000 L/ (230 ft x 2,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.04

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: The 207-Z Basin was occasionally confused with the 216-Z-21 Seepage Pond; however, both are separate waste sites and are located in different locations within the Z Plant facility. The 216-Z-21 Seepage Pond was constructed east of the Z Plant Exclusion Area, while the 207-Z Basin is inside the PFP fence. The 216-Z-21 depression was originally named the 207-Basin. The 207-Basin was renamed in 1987 to 216-Z-21, which more accurately reflects its basin usage, and resolves any misidentification with its original name.

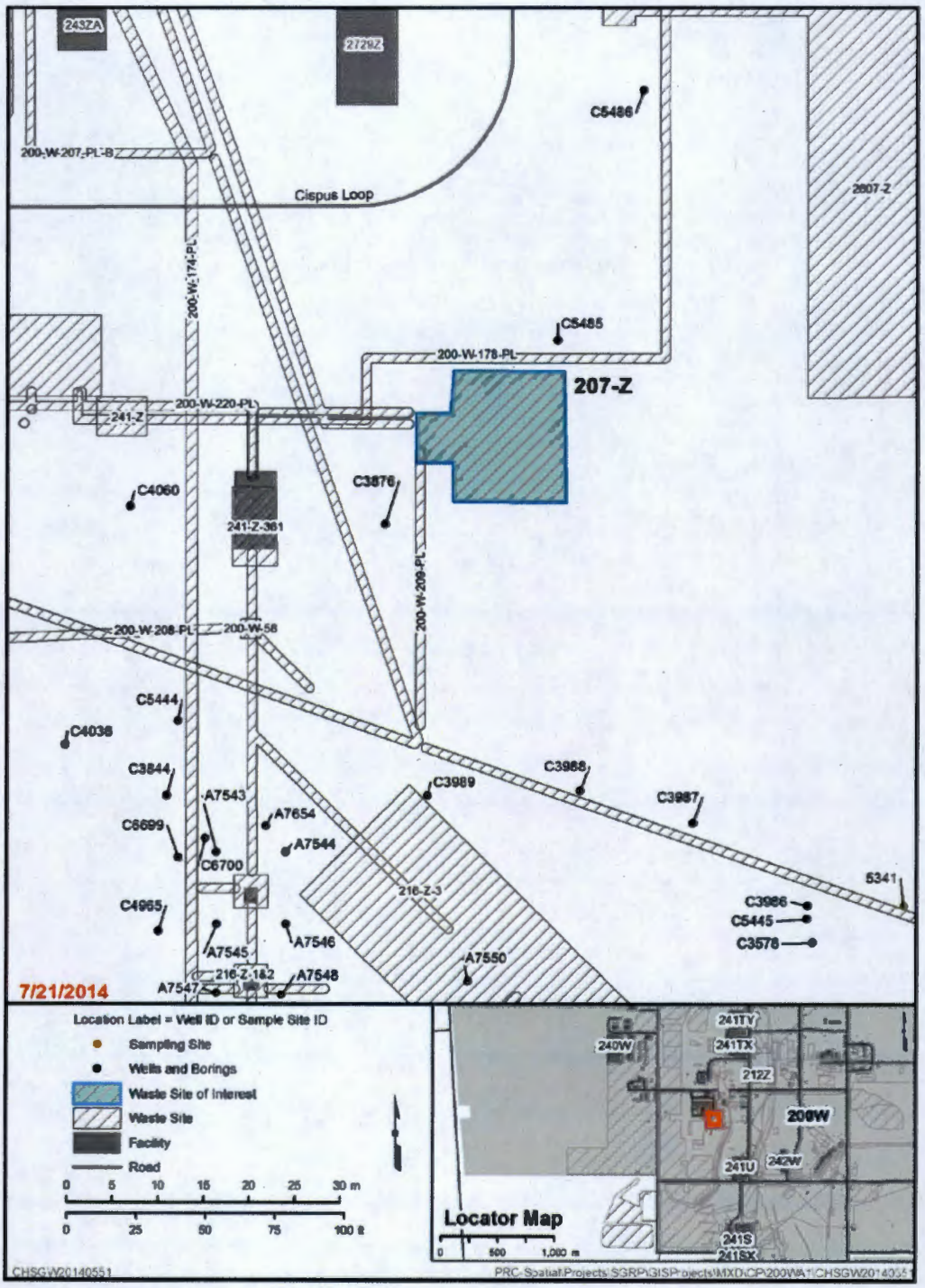
The site was retired in 1959. In 2006, both basins were filled with high density grout as part of a site clean-up. No further information regarding the clean-up and/or deactivation process are presented.

A radiation survey was performed on April 4, 2006, as part of a routine annual survey of the site. No contamination was identified within the 207-Z Basin. A Micro/R Meter and a Portable Alpha Meter unit were used to detect micro-rads/hour and alpha contamination. The results from any prior or subsequent radiological surveys are not provided.

Nature and Extent of Contamination: The basin is filled with grout. Shallow and vadose zone soil could be contaminated if contaminated liquids leaked from the basin to the soil underlying the basin floor (>3 m [>10 ft] below ground surface [bgs]). The total amount of effluent discharged to the retention basin has been approximated; therefore, the depth to which soil could potentially be affected could not be estimated. The approximate depth to groundwater is 70 m (230 ft) bgs.

References:
Waste Information Data System General Summary Report for the 207-Z Waste Site.

Site: 207-Z	Area: Z Plant	Category: Intermediate



ID = identification

Figure 1. 207-Z Waste Site Map

Site: 207-Z	Area: Z Plant	Category: Intermediate

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Site: 216-Z-4	Area: Z Plant	Category: Intermediate – Similar Site

Site Description

Alternate Site Identification: 231-W-3 Pit 231-W-3 Sump, 231-W-3 Crib, 216-Z-3, 216-Z-4 Crib
Site Type: Trench
Facility/Geographic Area: Z Plant (Plutonium Finishing Plant Area)
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1, 200-PW-6
Service Dates: June 1945 to July 1945

Waste Site Location and Physical Description: The 216-Z-4 waste site is located east of 231-Z and north of the 216-Z-17 Crib (Figure 1). The 216-Z-4 trench is a large, unlined excavation located in an inactive waste management unit (Figure 2). It is believed an aboveground pipeline conveyed waste to the site from the 231-Z Building for disposal. Between 0.3 to 0.6 m (1 to 2 ft) of backfill cover the trench.

Waste Site Coordinates:
Lon-566586.28125 Lat-135920.69525

Site Dimensions:
Site Length: 3.1 m (10.0 ft) Site Depth: 4.6 m (15.0 ft)
Site Width: 3.1 m (10.0 ft) Cover Thickness: 0.3 to 0.6 m (1 to 2 ft)
Site Area: 9.1m^2 (100 ft^2)

Related Site Structure(s): The 216-Z-4 waste site is associated with the 216-Z-6 Crib, the pipeline that ran from the 231-Z Building to the site's trench, and with the 231-W-151 Vault Sump.

Site Posting: The posting for the site is not specified. Underground radiological contamination is present; however, the risk of release is low.

Site History

Release Summary: The 216-Z-4 Trench was excavated in June 1945 for use as a temporary disposal site for liquid laboratory waste from the 231-Z Building. The trench was active for a one-month period, and received an estimated 11,000 L (2,906 gal) of liquid laboratory waste during its operational lifetime. The waste was neutral to basic in character. The trench was deactivated in July 1945, when it was determined the volume of waste being sent to the site exceeded the trench's infiltration capacity.

Volume/Mass Discharged: 11,000 L (2,906 gal)

Pore Volume Discharged: 11,000 L/ (215 ft x 100 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.06

Site: 216-Z-4	Area: Z Plant	Category: Intermediate – Similar Site

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-Z-4 Waste Site

Contaminant	Mass Discharged
Pu	2 g
Beta	2.6 Ci
Sr-90	<0.1 Ci
Ru-160	1 Ci
Cs-137	<0.1 Ci
Co-60	<0.1 Ci
U	<0.05 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: The site was deactivated by backfilling the trench and capping the pipeline west of the 231-W-151 Vault. The waste was redirected to the 216-Z-6 Crib.

Interim stabilization occurred in February 1990. However, no routine monitoring is performed. There are no monitoring wells located near the trench.

Nature and Extent of Contamination: Shallow soil within the basin is likely contaminated from historical discharges to the trench, starting at the bottom of the trench (3 m [10 ft] below ground surface [bgs]). Within the trench, soil beneath the backfill (0.6 m [2 ft] bgs and below) could be contaminated. Because the trench was backfilled after use, the soil from 0 to 0.6 m (0 to 2 ft) bgs within the trench has a low potential for contamination. The potential for contamination to extend to groundwater (approximately 65.5 m [215 ft] bgs) is low based on the estimated pore volume of 0.06.

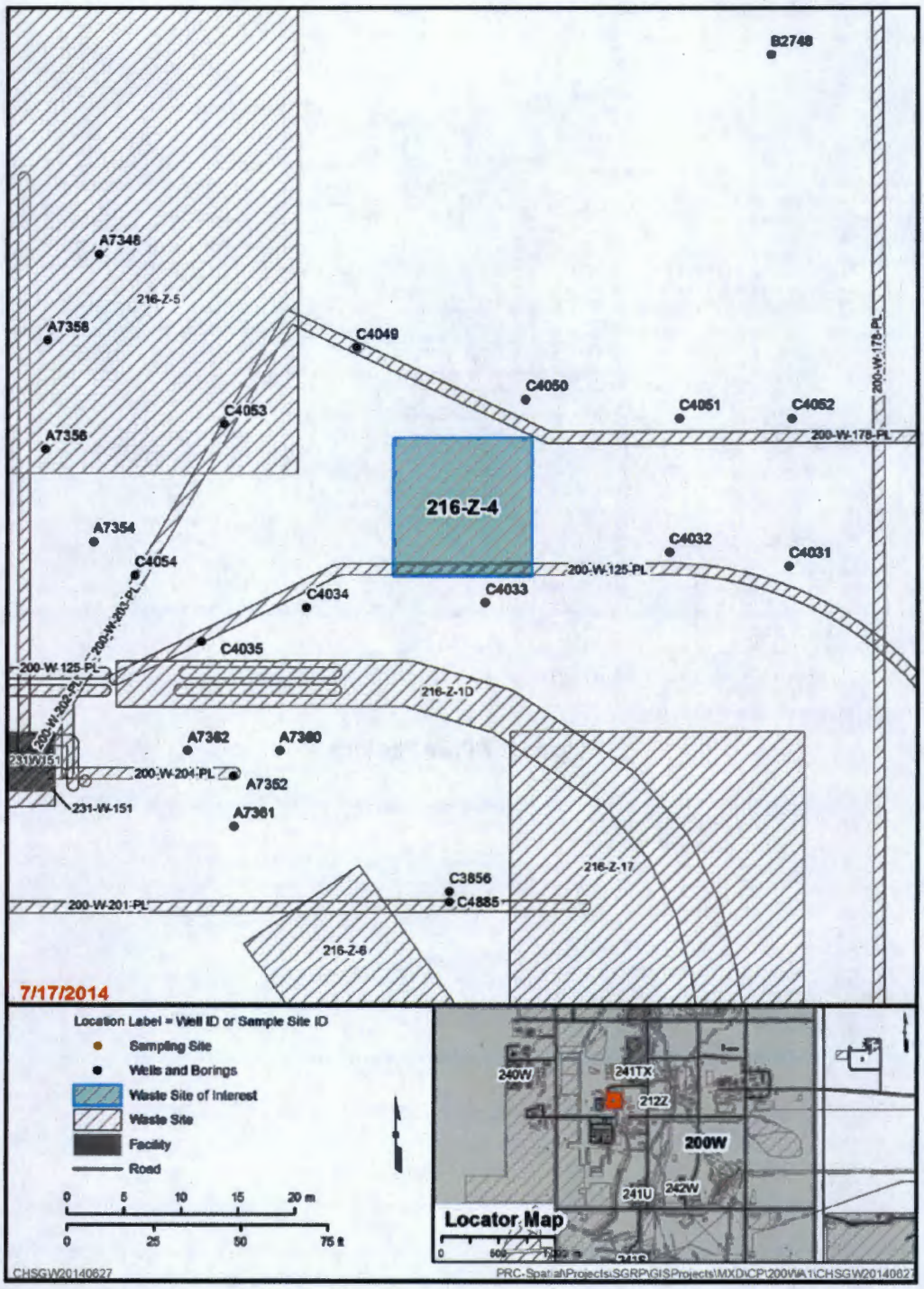
References:

H-2-44511 (drawing), 1995, *Area Map 200 West Z Plant Facilities*, Sh. 103, Rev. 5, Atlantic Richfield Hanford Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

Waste Information Data System General Summary Report for the 216-Z-4 Waste Site.

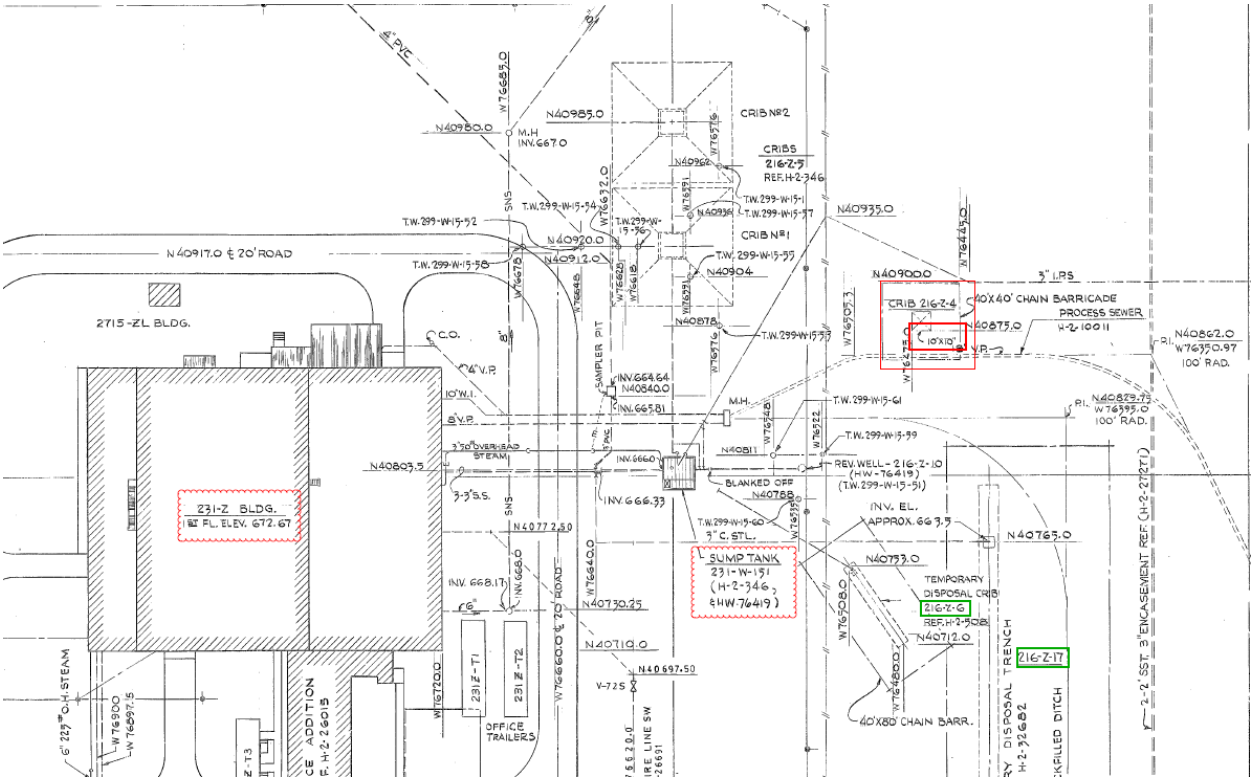
Site: 216-Z-4	Area: Z Plant	Category: Intermediate – Similar Site



ID = identification

Figure 1. 216-Z-4 Waste Site Map

Site: 216-Z-4	Area: Z Plant	Category: Intermediate – Similar Site



Source: H-2-44511, *Area Map 200 West Z Plant Facilities*, Sheet 103.

Note: Produced from the best available copy.

Figure 2. Z Plant Plot Plan

Site: 216-Z-6	Area: Z Plant	Category: Intermediate – Representative Site

Site Description

Alternate Site Identification: 231-W-4 Crib 231-Z-6, 216-W-4, 231-W-Crib, 216-Z-4, 216-Z-6 and 6A Crib
Site Type: Crib
Facility/Geographic Area: Z Plant (Plutonium Finishing Plant Area)
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1, 200-PW-6
Service Dates: 1945 to 1945

Waste Site Location and Physical Description: The 216-Z-6 waste site (Figure 1) is located east of 231-Z and north of Nineteenth Street. The 216-Z-6 Crib is a rectangular, wooden box set in the bottom of an excavation (Figures 1 and 2). The crib received 231-Z Building process waste via an aboveground pipeline, from the 231-W-151 Sump. The crib is located in an inactive waste management unit (Figure 3). From 0.3 to 0.6 m (1 to 2 ft) of backfill cover the crib.

Waste Site Coordinates:
Lon-566579.05313 Lat-135875.76359

Site Dimensions:
Site Length: 15.9 m (52.0 ft)
Site Width: 2.6 m (8.6 ft)
Site Area: 208.3 m^2 (2,244.8 ft^2)
Site Depth: 2.4 m (8.0 ft)
Cover Thickness: 0.3-0.6 m (1.0-2.0 ft)
Overburden depth: 1.8 m (6.0 ft)

Related Site Structure(s): The 216-Z-6 waste site is associated with the pipeline that ran from the 231-Z Building to the site's crib, the 216-Z-4 Trench, and the 231-W-151 Vault sump.

Site Posting: The radiological posting for the site is not specified. Underground radiological contamination is present; however, the risk of release is low. The site was posted with Cave-In Potential signs on July 22, 1998.

Site History

Release Summary: The 216-Z-6 Crib was brought online in 1945 for use as a subsurface disposal site for liquid process waste from the 231-Z Building. The waste was sent to the crib via an aboveground pipeline from the 231-W-151 Sump to the north end of the crib. The crib was active for a one-month period, and received an estimated 98,000 L (25,889 gal) of liquid waste during its operational lifetime. The crib was deactivated due to process sludge and precipitates clogging the surrounding soil and reducing the Site's infiltration ability.

Volume/Mass Discharged: 98,000 L (25,889 gal)

Site: 216-Z-6	Area: Z Plant	Category: Intermediate – Representative Site

Pore Volume Discharged: 98,000 L/ (216 ft x 447 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 0.12

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-Z-6 Waste Site

Contaminant	Mass Discharged
Pu	5 g
Beta	2.6 Ci
Sr-90	<0.1 Ci
Ru-106	1 Ci
Cs-137	<0.1 Ci
Co-60	<0.1 Ci
U	<0.05 kg

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: The site was deactivated by capping the transfer line west of the 231-Z-151 Sump, and removing the over ground piping.

Interim surface stabilization occurred in February 1990. Routine radiological surveys are performed; however, no specific chemical data are available for this crib. Several monitoring wells are located around the 216-Z-5, 216-Z-6, and 216-Z-7 Cribs. Site sampling indicates radionuclides are present in the vadose zone. The potential for release to the surface is low, and the site is currently not rated as a high priority. The site has a history of cave-ins, and there is a possibility the site will continue to collapse.

Nature and Extent of Contamination: Shallow soil within the basin is likely contaminated from historical discharges to the basin. Within the crib, soil beneath the backfill (0.6 m [2 ft] below ground surface (bgs) and below) could be contaminated. Because the crib was backfilled after use, the soil from 0 to 0.6 m (0 to 2 ft) bgs within the crib has a low potential for contamination. The potential for contamination to extend to groundwater (approximately 65.8 m [216 ft] bgs) is low based on the estimated pore volume of 0.12.

Site: 216-Z-6	Area: Z Plant	Category: Intermediate – Representative Site

References:

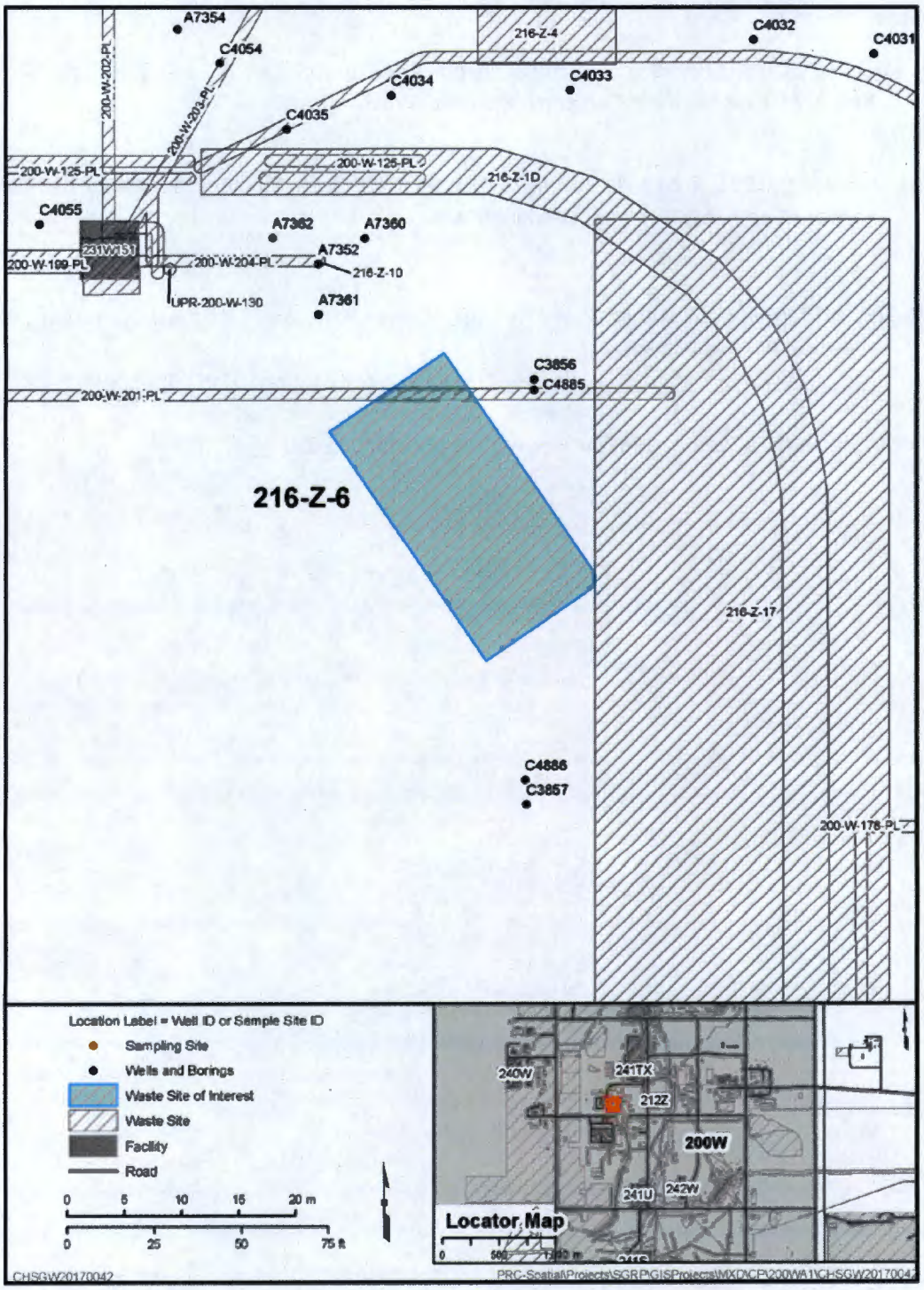
H-2-508 (drawing), 1973, *216-Z-6 Crib – Temporary Effluent Disposal Trench – 231-Z Building*, Sh. 1, Rev. 2, Atlantic Richfield Company, Richland, Washington.

H-2-44511 (drawing), 1995, *Area Map 200 West Z Plant Facilities*, Sh. 103, Rev. 5, Atlantic Richfield Hanford Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

Waste Information Data System General Summary Report for 216-Z-6

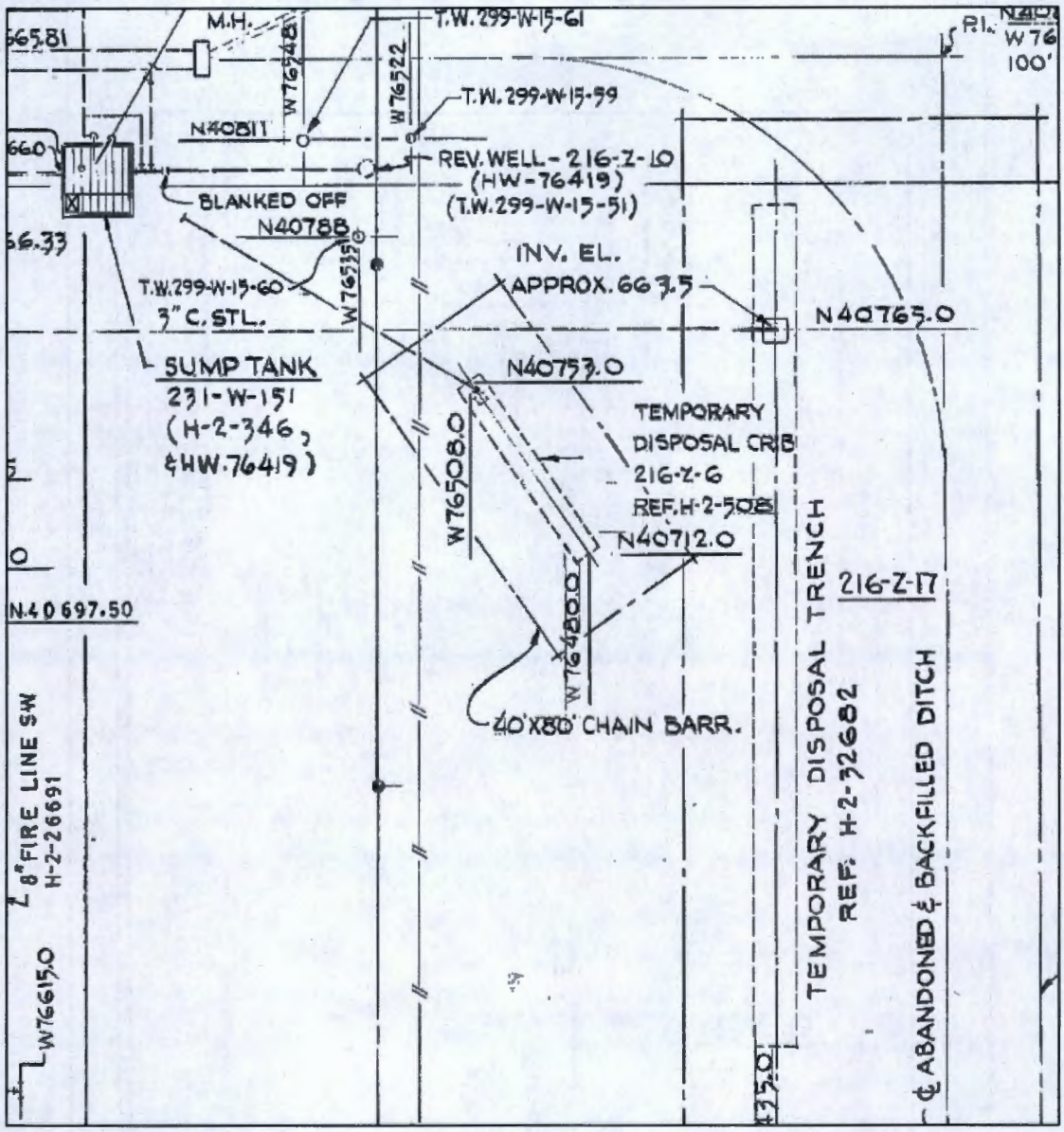
Site: 216-Z-6	Area: Z Plant	Category: Intermediate – Representative Site



ID = identification

Figure 1. 216-Z-6 Waste Site Map

Site: 216-Z-6	Area: Z Plant	Category: Intermediate – Representative Site

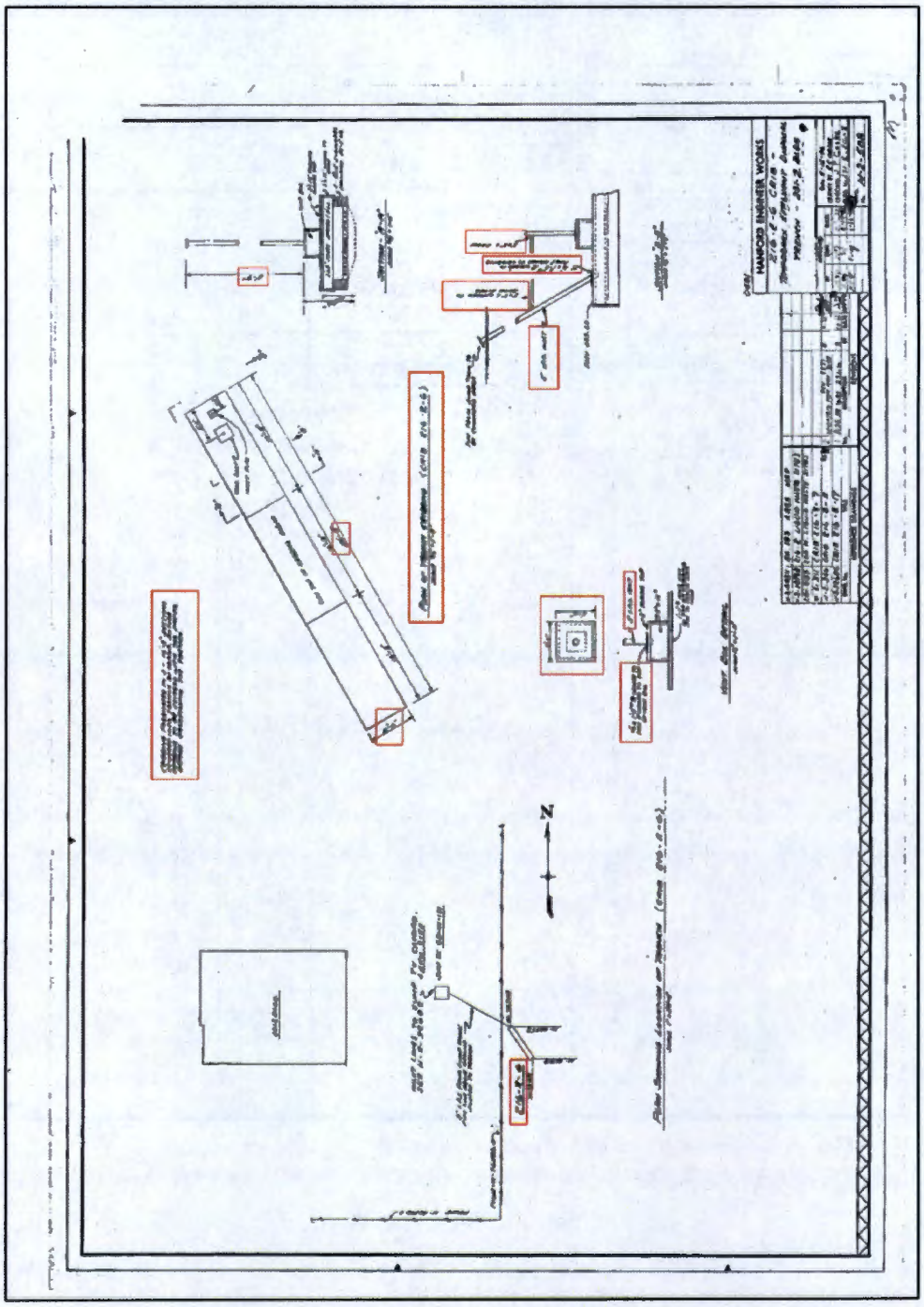


Source: H-2-44511, *Area Map 200 West Z Plant Facilities*, Sheet 103.

Note: Produced from the best available copy.

Figure 2. 216-Z-6 Plan View

Site: 216-Z-6	Area: Z Plant	Category: Intermediate – Representative Site



Source: H-2-508, *216-Z-6 Crib – Temporary Effluent Disposal Trench – 231-Z Building*, Sheet 1.

Note: Produced from the best available copy.

Figure 3. 216-Z-6 Construction

Site: 216-Z-7	Area: Z Plant	Category: Deep – Adequately Characterized

Site Description

Alternate Site Identification: 231-W Crib 216-Z-6, 231-W Trench
Site Type: Crib
Facility/Geographic Area: Z Plant (Plutonium Finishing Plant Area)
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1, 200-LW-2
Service Dates: 1947 to 1967

Waste Site Location and Physical Description: The 216-Z-7 waste site (Figure 1) is located east of 231-Z and north of Nineteenth Street. The 216-Z-7 cribbed trench is an inactive, below grade waste management unit. The cribs were constructed of two parallel wooden boxes, set in two shallow parallel trenches in a single terraced excavation (Figure 2). Within each box are three timber tiers, with a perforated distribution box running the length of the second tier. The inner trenches were backfilled and covered with wooden planks.

Waste Site Coordinates:
Lon-566700.53125 Lat-135926.88280

Site Dimensions:
Site Length: 64 m (210 ft)
Site Width: 13.4 m (44 ft)
Site Area: 858 m^2 (9,240 ft^2)
Crib Length: 46 m (150 ft)
Crib Width: 1.5 m (5 ft)
Site Depth: 2.1 m (7.0 ft)
Cover Thickness: Not Specified
Overburden depth: 1.5 m (5.0 ft), placed after service dates
Crib Depth during Operation: 0.6 m (2 ft)
Crib Area (Both): 139 m^2 (1,500 ft^2)
Crib dimensions based on reference drawing H-2-511, *Vicinity 202-S Outside Electric Framing Details*, Sheet 1.

Related Site Structure(s): Site 216-Z-7 is associated with the 231-Z-151 Sump and distribution piping (site code 200-W-203-PL). In addition, other features associated with this site include four vent boxes and vent risers, transfer pipes, and two waste unloading stations west of the center line of the crib.

Site Posting: The radiological posting for the site is not specified. Underground radiological contamination is present; however, the risk of release is low. The site was posted with Cave-In Potential signs on July 22, 1998.

Site History

Release Summary: The 216-Z-7 Crib was built to replace the 216-Z-5 Trench. From 1947 to 1953, the crib was used as a subsurface disposal site for liquid processing waste from the 231-Z Building.

Site: 216-Z-7	Area: Z Plant	Category: Deep – Adequately Characterized

The waste from the 231-Z Building was sent to the 216-Z-7 Crib via the 231-W-151 Sump. From 1953 to 1965, 216-Z-7 was used for the disposal of Hanford laboratory waste from the 231-Z Building.
From 1965 to 1967, the site received waste from two sources: laboratory waste generated by the Pacific Northwest Laboratory from within the 231-Z Building, and waste transported from the 340 Building via tanker truck. The tanker trucks delivered the waste to the riser on the west side of the crib for disposal.

Volume/Mass Discharged: 8.0E+07 L (2.1E+ 07gal)

Pore Volume Discharged: 8.0E+07 L/ (217 ft x 1,500 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 29

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-Z-7 Waste Site*

Contaminant	Mass Discharged
Pu	2,000 g
Beta	2,500 Ci
Sr-90	370 Ci
Ru-106	100 Ci
Cs-137	360 Ci
Co-60	1 Ci
U	4.5 kg

Source: RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: The site was deactivated in 1967 by blanking the pipeline west of the 231-Z-151 Sump, and backfilling the pit the crib sits in. The location the waste was redirected to is not specified. Interim surface stabilization occurred in 1990.

Site 216-Z-7 ranks as a high priority site, as there is a high release risk. The site is monitored by six characterization cone penetrometer push holes (C4177, C4178, C4179, C4180, C4181, C4192) and one characterization borehole (C4183), which were drilled through the crib in January, February, and March 2005. Monitoring results from these seven wells indicate there is possible radionuclide contamination within the vadose zone. The samples taken during the drilling of borehole C4183 were submitted to the Hanford Environmental Information System database.

Site: 216-Z-7	Area: Z Plant	Category: Deep – Adequately Characterized

Well and borehole locations are shown on Figures 1, 3, and 4. Borehole and data summaries are presented in Tables 2 through 4. More complete summaries of site characterization data associated with the 216-Z-7 waste site is provided in D&D-25461, *200-LW-1 and 200-LW-2 Operable Units – Borehole Summary Report for Boreholes in the 216-S-20, 216-T-28, and 216-Z-7 Cribs* and DOE/RL-2005-61, *Remedial Investigation Report for the 200-LW-1 (300 Area Chemical Laboratory Waste Group) and 200-LW-2 (200 Area Chemical Laboratory Waste Group) Operable Units.*

Groundwater well 299-W15-7, associated with Site 216-Z-7, had detections above drinking water standards for volatile organic compounds (VOCs), nitrate, cesium-137, and strontium-90. Very low levels of plutonium-239/240 (0.1 pCi/L) also were detected. VOCs included carbon tetrachloride (CTET) and trichloroethene (TCE). CTET was detected at 2,310 µg/L in 1988, was as high as 4,900 in 1999, and was last measured at 546 µg/L in 2014. TCE was detected at 12 µg/L in 1988, was as high as 33 µg/L in 1999, and was last measured at 1.06J µg/L in 2014. Nitrate concentrations were first measured at 31,000 µg/L in 1969, were as high as 195,000 µg/L in 1985, and were last measured at 47,800 µg/L in 2014. Cesium-137 ranged from 640 pCi/L in 1969 to 4.07 pCi/L in 1995. Strontium-90 was initially measured at 25 pCi/L in 1967, was as high as 73 pCi/L in 1969, and was not detected (0.0702 U pCi/L) when it was last sampled in 1988.

Table 2. Borehole Summary for the 216-Z-7 Waste Site

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2004	299-W15-62/A7363	North of site boundary	194
2004	299-W15-63/A7364	North of site boundary	148
2004	299-W15-64/A7365	East of site boundary	181
2005	299-W15-7/A5476	Within site boundary	273
2004	299-W15-76/A7377	West of site boundary	104
2005	C4183	Within site boundary	12.5 – 222.5 (10 samples)

ID = identification

Site: 216-Z-7	Area: Z Plant	Category: Deep – Adequately Characterized

Table 3. Geophysical Log Summary for the 216-Z-7 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A5476	0 to 5	1.2	pCi/g	3.0	15,359.3	cpm	3
	5 to 10	–	pCi/g	–	14,505.2	cpm	10
	10 to 15	0.31	pCi/g	13	13,766.5	cpm	13
	>15	0.24	pCi/g	47	65,345.4	cpm	225
A7363	0 to 5	0.74	pCi/g	4.0	10,723.9	cpm	5
	5 to 10	–	pCi/g	–	11,030	cpm	8
	10 to 15	–	pCi/g	–	9,371.9	cpm	11
	>15	0.23	pCi/g	96	24,643.5	cpm	102
A7364	0 to 5	0.46	pCi/g	2.0	16,108.6	cpm	3
	5 to 10	–	pCi/g	–	16,371.8	cpm	6
	10 to 15	–	pCi/g	–	12,567.4	cpm	11
	>15	0.18	pCi/g	69	531,50.9	cpm	96
A7365	0 to 5	–	pCi/g	–	10,499	cpm	5
	5 to 10	0.22	pCi/g	9.0	11,050.1	cpm	10
	10 to 15	0.4	pCi/g	12	10,850.8	cpm	13
	>15	0.65	pCi/g	156	14,868.1	cpm	179
A7377	0 to 5	1.9	pCi/g	5.0	15,780.2	cpm	5
	5 to 10	–	pCi/g	–	15,443.9	cpm	6
	10 to 15	–	pCi/g	–	14,549.8	cpm	11
	>15	0.14	pCi/g	42	27,004.3	cpm	70

bgs = below ground surface
cpm = counts per minute
ID = identification

Site: 216-Z-7	Area: Z Plant	Category: Deep – Adequately Characterized

Table 4. Soil Maximum Detection Summary (Soil Borehole C4183)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
1,2,3-Trichlorobenzene	–	–	–	7.5	µg/kg	25
Americium-241	–	–	–	60,600	pCi/g	20
Ammonium ion	304	µg/kg	15	649	µg/kg	200
Antimony	–	–	–	2,800	µg/kg	20
Arsenic	13,400	µg/kg	15	5,530	µg/kg	120
Barium	72,100	µg/kg	15	80,500	µg/kg	99
Beryllium	–	–	–	380	µg/kg	42.5
Bismuth	–	–	–	123,000	µg/kg	30
Bromomethane	–	–	–	1.1	µg/kg	20
Cadmium	–	–	–	321	µg/kg	42.5
Cesium-137	0.084	pCi/g	15	2,800	pCi/g	20
Chloride	–	–	–	5,340	µg/kg	200
Chromium	7380	µg/kg	15	193,000	µg/kg	20
Cobalt-60	–	–	–	58.3	pCi/g	20
Copper	13,000	µg/kg	15	18,200	µg/kg	25
Cyanide	3,950	µg/kg	15	–	–	–
Diethylphthalate	–	–	–	460	µg/kg	222.5
Di-n-butylphthalate	–	–	–	2,100	µg/kg	99
Ethyl acetate	–	–	–	5.5	µg/kg	30
Europium-154	–	–	–	10.5	pCi/g	20
Europium-155	0.073	pCi/g	15	0.083	pCi/g	60
Hexavalent Chromium	–	–	–	2,050	µg/kg	200
Lead	–	–	–	14,300	µg/kg	20
Mercury	–	–	–	5,600	µg/kg	20
Methylene chloride	–	–	–	4.3	µg/kg	20

Site: 216-Z-7	Area: Z Plant	Category: Deep – Adequately Characterized

Table 4. Soil Maximum Detection Summary (Soil Borehole C4183)

Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
	Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
Neptunium-237	0.059	pCi/g	15	–	–	–
Nickel	11,600	µg/kg	15	23,400	µg/kg	200
Nitrate	–	–	–	5,310	µg/kg	20
Nitrogen in nitrite and nitrate	2,000	µg/kg	15	2,500	µg/kg	42.5
Nonadecane	–	–	–	1,500	µg/kg	200
Phosphate	–	–	–	13,000	µg/kg	25
Plutonium-238	–	–	–	5,770	pCi/g	20
Plutonium-239/240	1.2	pCi/g	15	472,000	pCi/g	20
Potassium-40	14.2	pCi/g	15	14.9	pCi/g	60
Radium-226	0.41	pCi/g	15	0.807	pCi/g	120
Radium-228	0.58	pCi/g	15	0.729	pCi/g	99
Silver	–	–	–	249	µg/kg	42.5
Technetium-99	–	–	–	11	pCi/g	25
Thorium-228	1.16	pCi/g	15	1.18	pCi/g	60
Thorium-230	–	–		0.998	pCi/g	120
Thorium-232	0.734	pCi/g	15	1.22	pCi/g	60
Total beta radiostrontium	–	–	–	437,000	pCi/g	20
Trichloroethene	–	–	–	2	µg/kg	20
Tritium	–	–	–	9.54	pCi/g	120
Uranium	1,310	µg/kg	15	27,900	µg/kg	20
Uranium-233/234	0.506	pCi/g	15	0.32	pCi/g	120
Uranium-235	–	–	–	0.053	pCi/g	200
Uranium-238	0.696	pCi/g	15	0.24	pCi/g	120

pCi/g = picocurie per gram
µg/kg = microgram per kilogram

Site: 216-Z-7	Area: Z Plant	Category: Deep – Adequately Characterized

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] below ground surface [bgs]): The depth of the maximum cesium-137 concentration (1.9 pCi/g) measured by geophysical log in the one borehole within the 216-Z-7 floor footprint (299-W15-76/A7377) is 1.52 m (5 ft). Within 0 to 4.6 m (0 to 15 ft) bgs, the site soil is above site background levels for arsenic.

Deep (>4.6 m [>15 ft] bgs): The depth of the maximum cesium-137 concentration in the one borehole within the 216-Z-7 Crib floor footprint is 47.5 m (156 ft). Below 1.52 m (5 ft) bgs, the site soil is above site background levels for total chromium, lead, mercury, nickel, uranium, cesium-137, cobalt-60, europium-154, europium-155, plutonium-238, and plutonium-239/240.

References:

DOE/RL-2005-61, 2006, *Remedial Investigation Report for the 200-LW-1 (300 Area Chemical Laboratory Waste Group) and 200-LW-2 (200 Area Chemical Laboratory Waste Group) Operable Units* Draft A, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA02009333 and http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA02009967

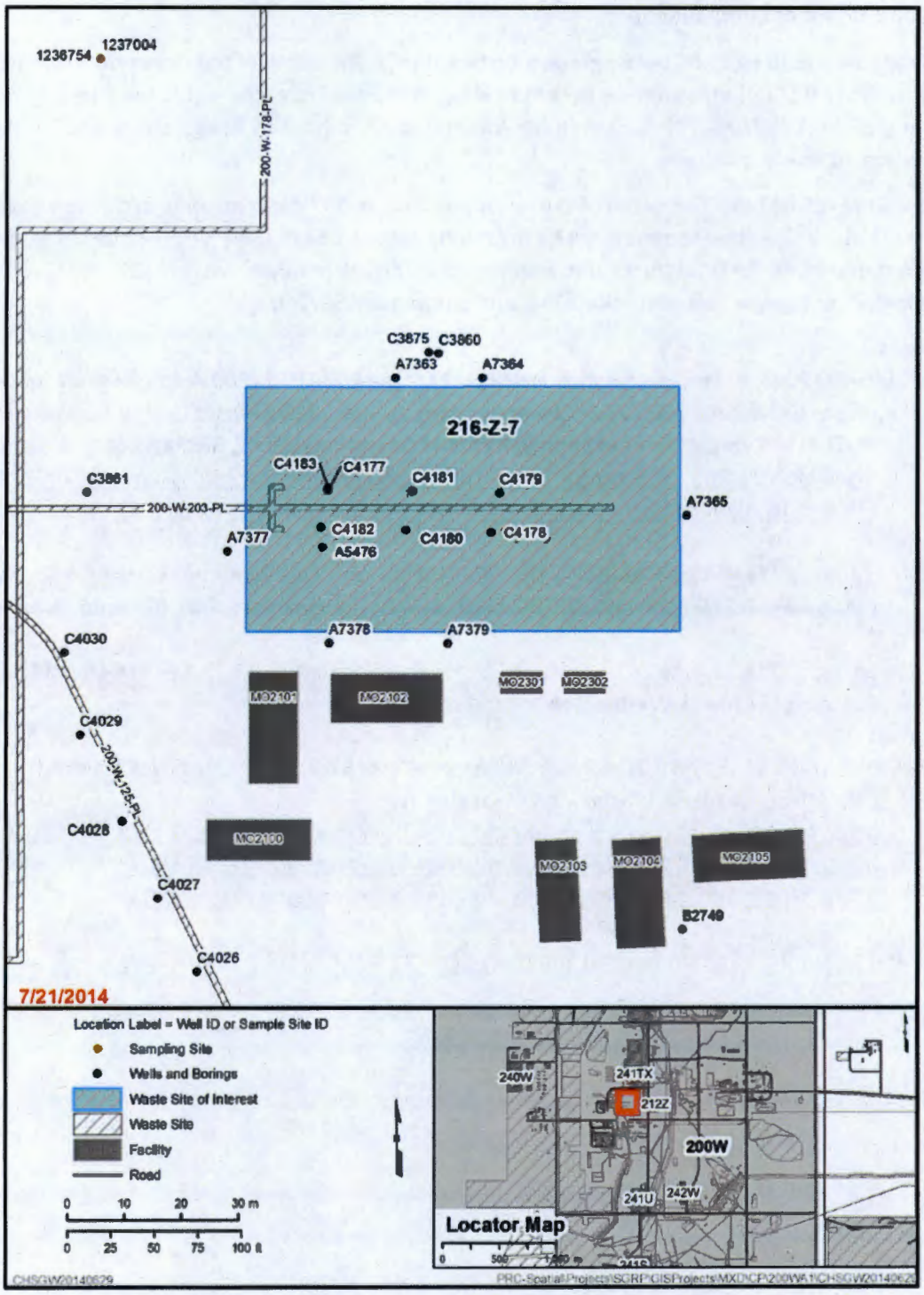
D&D-25461, 2005, *200-LW-1 and 200-LW-2 Operable Units – Borehole Summary Report for Boreholes in the 216-S-20, 216-T-28, and 216-Z-7 Cribs,* Rev. 0, Fluor Hanford, Inc., Richland, Washington.

H-2-511 (drawing), 1973, *Vicinity 202-S Outside Electric Framing Details*, Sh. 1, Rev 4, General Electric Company, Richland, Washington.

RHO-CD-673, Part II S-200E, 1979, *Handbook 200 Areas Waste Sites*, 3 vols., Rockwell Hanford Operations, Richland, Washington. Available at:
http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039027.
http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.
http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039029

Waste Information Data System General Summary Report for the 216-Z-7 Waste Site.

Site: 216-Z-7	Area: Z Plant	Category: Deep – Adequately Characterized



ID = identification

Figure 1. 216-Z-7 Waste Site Map

Site: 216-Z-7	Area: Z Plant	Category: Deep – Adequately Characterized

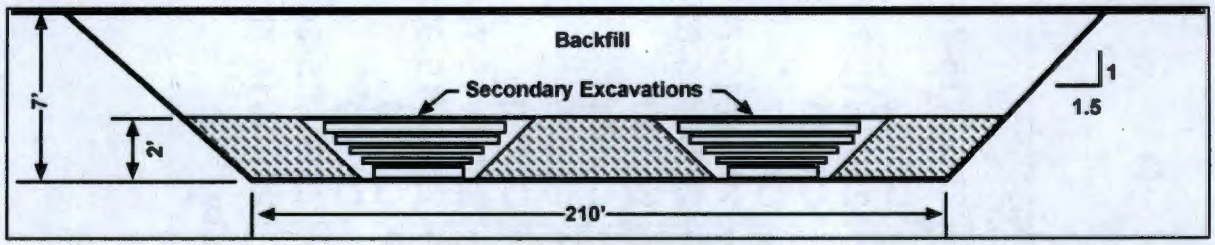


Figure 2. 216-Z-7 Cross Section

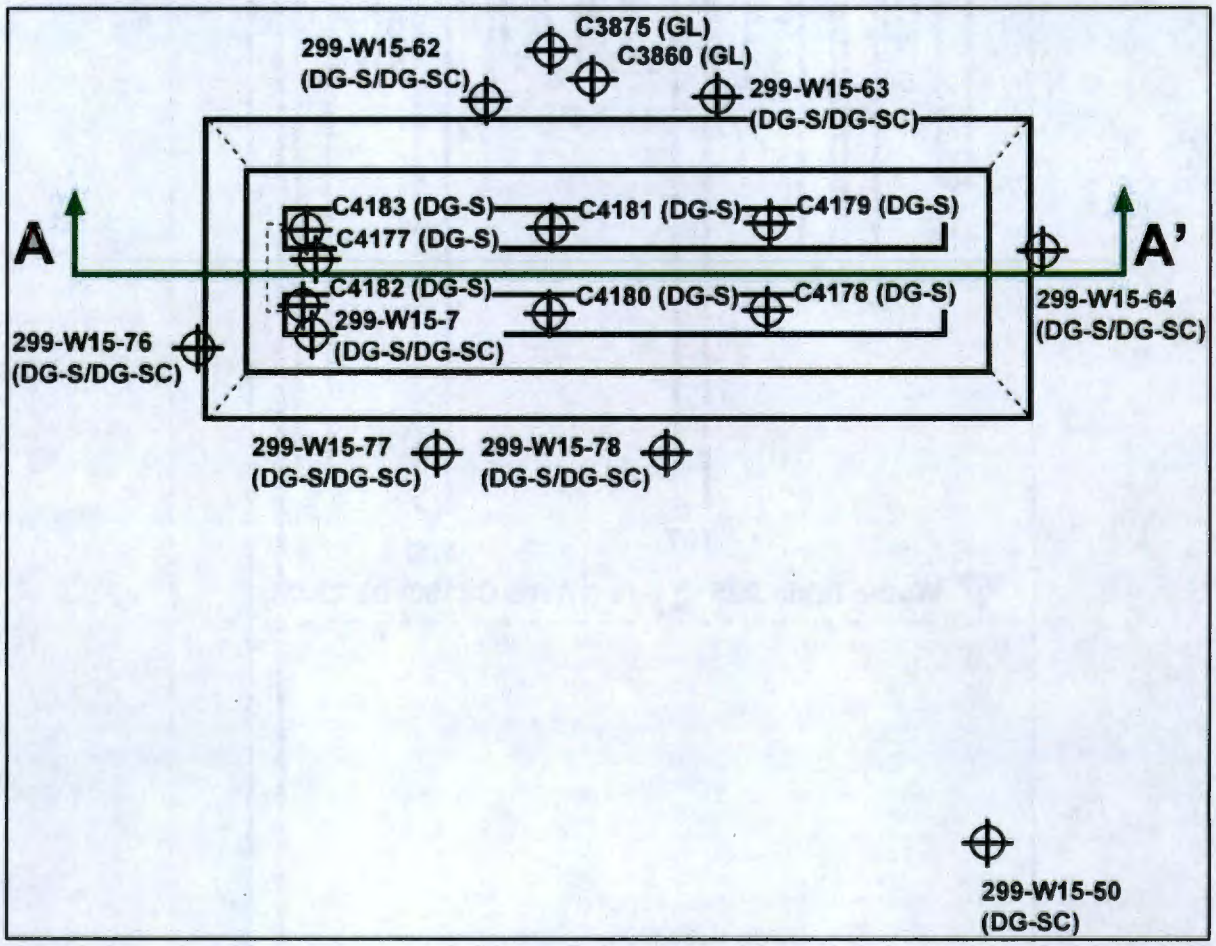


Figure 3. 216-Z-7 Plan View

Site: 216-Z-7	Area: Z Plant	Category: Deep – Adequately Characterized

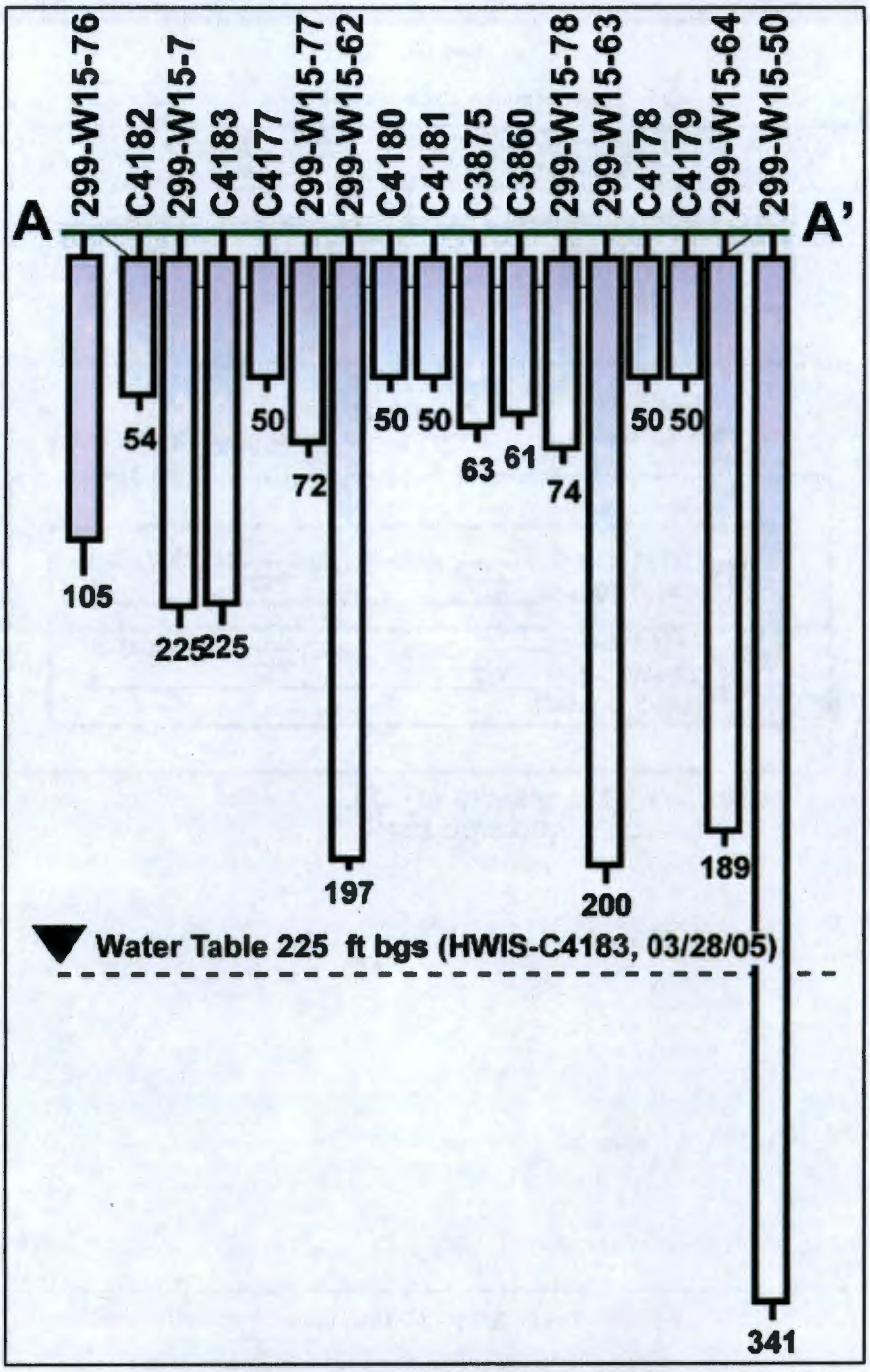


Figure 4. Previous Site Well/Borehole Depths for 216-Z-7

Site: 216-Z-13	Area: Z Plant	Category: Intermediate

Site Description

Alternate Site Identification: 216-Z-13; 216-Z-13 A and B; 216-Z-13 Dry Well; 234-5 Dry Well #1; Miscellaneous Stream #261
Site Type: French Drain
Facility/Geographic Area: Z Plant (Plutonium Finishing Plant Area)
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: Still active since 1949

Waste Site Location and Physical Description: The 216-Z-13 waste site (Figure 1) is located northeast of 291-Z stack. The site consists of a two-part drain system. The covered top of the upper French drain is visible on the surface, adjacent to a single cement marker post with a metal plate labeled 216-Z-13 (Figure 2).

The lower French drain is constructed of two tile culverts placed end-to-end, and backfilled beneath 2.7 m (9 ft) of gravel. It is located approximately 6 m (20 ft) south of the drain structure visible on the surface. Two pipes discharged to the lower French drain (Figure 3).

Waste Site Coordinates:
Northing: 135581.532996 Easting:-566497.948009

Site Dimensions:
Site Diameter: 0.9 m (3 ft) Site Depth: 4.6 m (15 ft)
Site Area: 0.8 m^2 (9 ft^2) Overburden Depth: 2.7 m (9 ft)

Related Site Structure(s): The 216-Z-13 waste site is associated with two effluent discharge pipes, the ET-8 exhaust fan turbine, and the 291-Z Building. The pipeline to the French drain is 200-W-214-PL.

Site Posting: The radiological posting for the site is not specified. Underground radiological contamination is expected.

Site History

Release Summary: The lower French drain received cooling water and steam condensate from the 291-Z ET-8 exhaust fan turbine, building steam condensate, and drainage from the S-13 and S-14 coolers. The upper portion of the drain receives steam condensate from the 291-Z turbine exhaust stack and 291-Z Building steam condensate and floor drainage. Due to the common nature of the discharge to the upper and lower drain systems, there is a potential for historical documentation related to the drains to be confusing. Due to the common nature of the waste discharged to the drains, the drains are treated as a single waste site. The miscellaneous stream (#261) to the drain has been eliminated.

Site: 216-Z-13	Area: Z Plant	Category: Intermediate

Volume/Mass Discharged: Not specified.

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: The 216-Z-13 French drain received cooling water and steam condensate from the 291-Z ET-8 exhaust fan turbine, building steam condensate and drainage from the S-13 and S-14 coolers, steam condensate from the 291-Z turbine exhaust stack, and 291-Z Building steam condensate and floor drainage. Due to the French drain's location, low levels of vadose zone contamination are assumed.

Nature and Extent of Contamination: No data are available to evaluate for the presence or absence of shallow or intermediate depth soil contamination. Based on existing information, the soil could be contaminated by former discharge of waste. Shallow soil beneath the surface cover could be contaminated if the well backed up and overflowed. The quantity of liquid discharged to the French drain is unknown and it continues to receive effluent from the turbine exhaust stack.

References:

H-2-16412 (drawing), 1973, *Exhaust Fans, Ventilation Piping & Drainage*, Rev. 19, Giffels & Vallet Inc., Engineers, Detroit, Michigan.

Waste Information Data System General Summary Report for the 216-Z-13 Waste Site.

Site: 216-Z-13	Area: Z Plant	Category: Intermediate

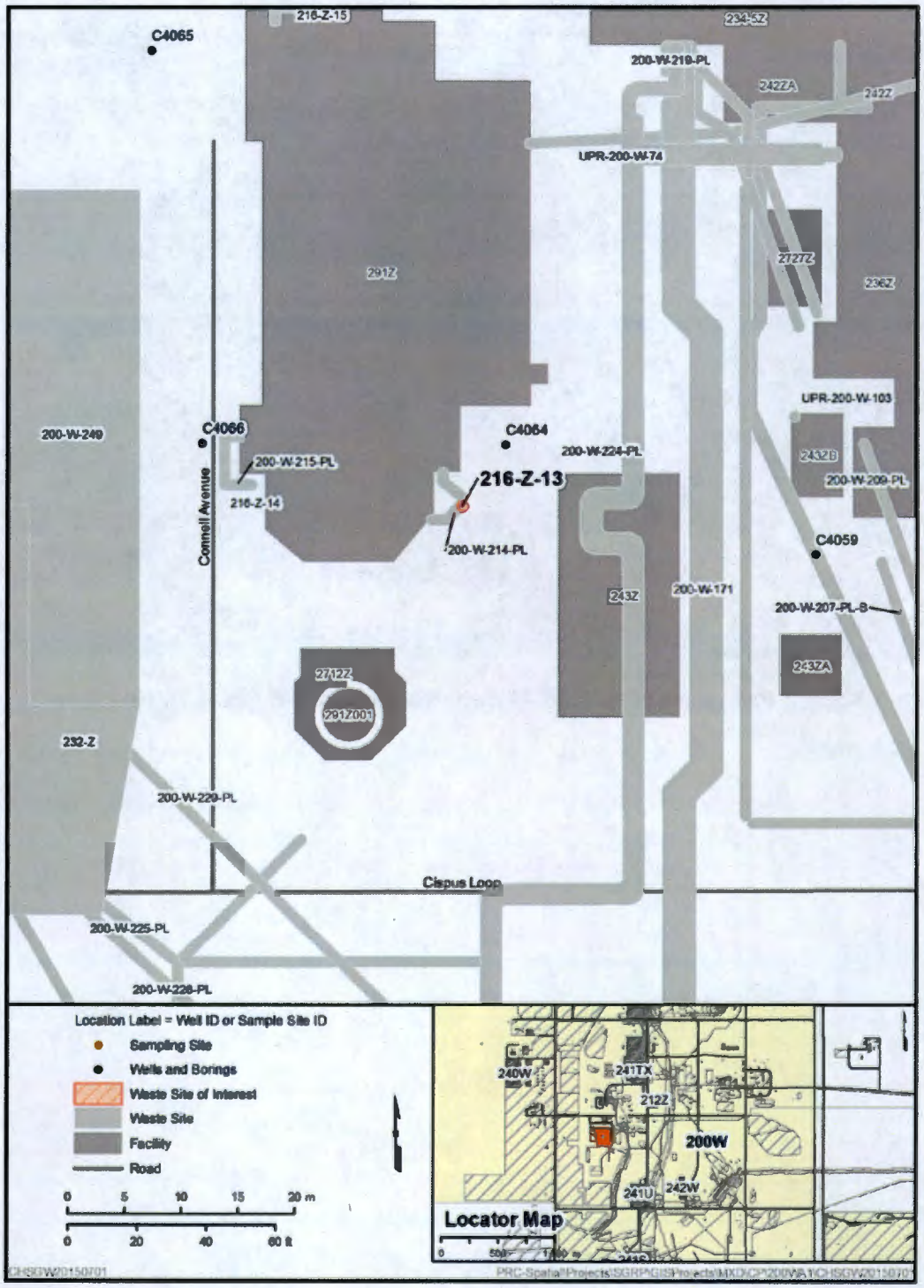


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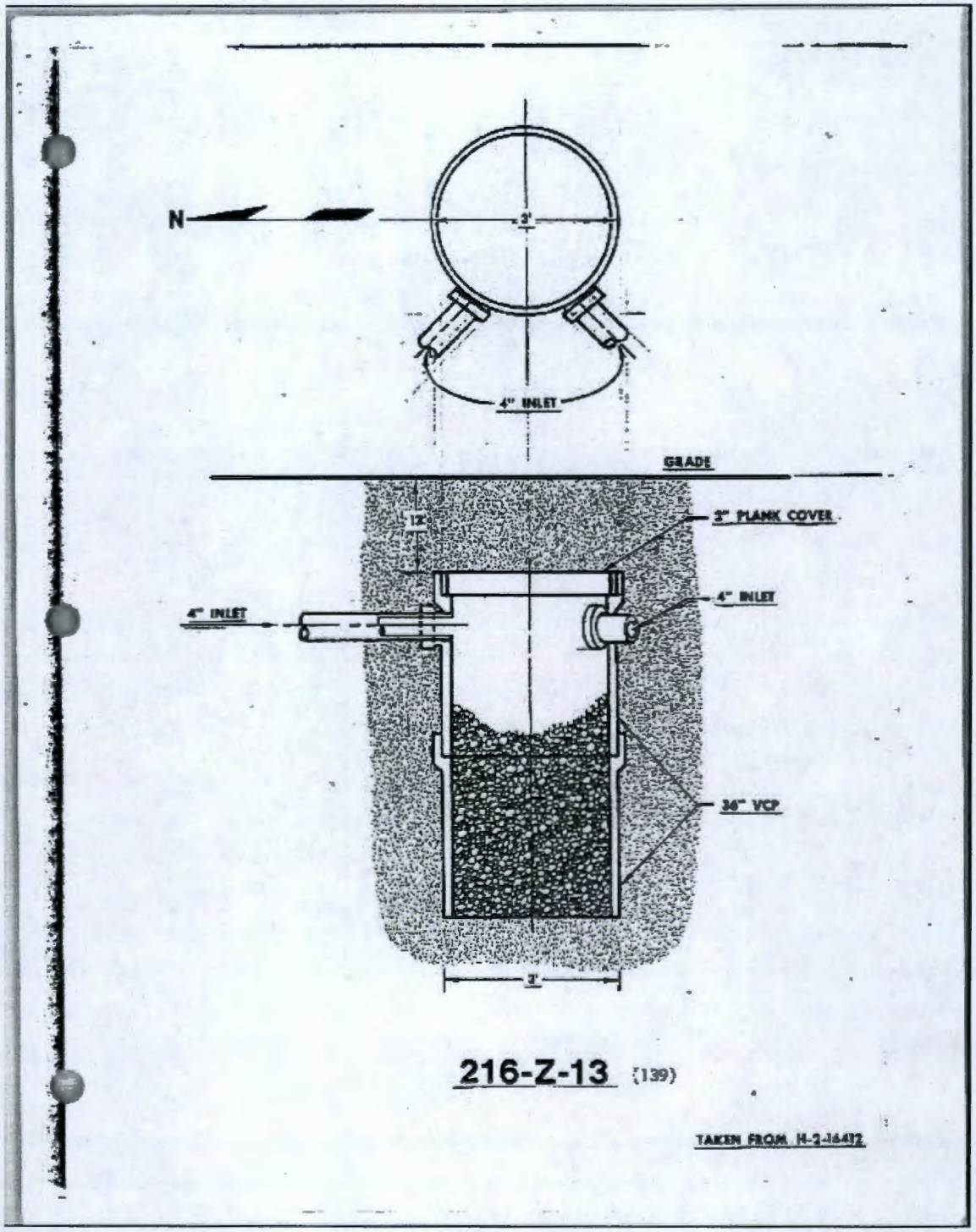
Figure 1. 216-Z-13 Waste Site Map

Site: 216-Z-13	Area: Z Plant	Category: Intermediate

Figure 2. Photograph of the 216-Z-13 Waste Site taken in 1985 (photo 122440-250cn)

Site: 216-Z-13	Area: Z Plant	Category: Intermediate



Source: H-2-16412, *Exhaust Fans, Ventilation Piping & Drainage.*

Note: Produced from the best available copy.

Figure 3. Plan View and Cross Section of the 216-Z-13 Waste Site

Site: 216-Z-13	Area: Z Plant	Category: Intermediate

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Site: 216-Z-14	Area: Z Plant	Category: Intermediate

Site Description

Alternate Site Identification: 216-Z-14; 216-Z-14 A and B; 216-Z-14 Dry Well; 234-5 Dry Well #2; Miscellaneous Stream #262
Site Type: French Drain
Facility/Geographic Area: Z Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: 1949 to present

Waste Site Location and Physical Description: The 216-Z-14 waste site (Figure 1) is located northwest of 291-Z stack. The site is a French drain that consists of two drain systems. The upper drain is marked with a single cement marker post, but the top of the drain has been paved over. The lower drain system is not visible from the surface. It is located approximately 6 m (20 ft) southeast of the cement marker post. The lower French drain is constructed of two 91.4 cm (36 in.) diameter tile culverts placed end to end vertically (Figure 2), covered with a 5 cm (2 in.) thick wooden plank, and backfilled beneath 2.7 m (9 ft) of gravel. Two pipes discharge to the French drain. The culvert is filled with cobble.

Waste Site Coordinates:
N- 135581.768 E- 566479.746991

Site Dimensions:
Site Diameter: 0.9 m (3 ft) Site Depth: 4.6 m (15 ft)
Site Area: 0.8 m^2 (9 ft^2) Overburden Depth: 2.7 m (9 ft)

Related Site Structure(s): The lower French drain is associated with two effluent discharge pipes: the ET-9 exhaust fan turbine and the 291-Z Building. The pipeline to the French drain is 200-W-215-PL.

Site Posting: A cement marker posts where the French drain is located. The drain cover has been paved over and is not visible.

Site History

Release Summary: The French drain receives emergency condensate and steam condensate from the turbine of the ET-9 exhaust fan along with 291-Z Building steam condensate and floor drainage.
The condensate discharged to the upper drain system has been disconnected and now discharges to the ground. Due to the common nature of the discharge to the upper and lower drain systems, there is a potential for historical documentation related to the drains to be confusing. The site is addressed in the Miscellaneous Streams Best Management Practices Report, as a "b" stream (stream discharging in a surface contaminated area). Due to the French drain's location, low levels of vadose zone contamination are assumed.

Site: 216-Z-14	Area: Z Plant	Category: Intermediate

Volume/Mass Discharged: Not specified.

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: The French drain receives emergency condensate and steam condensate from the turbine of the ET-9 exhaust fan along with 291-Z Building steam condensate and floor drainage. Due to the French drain's location, low levels of vadose zone contamination are assumed.

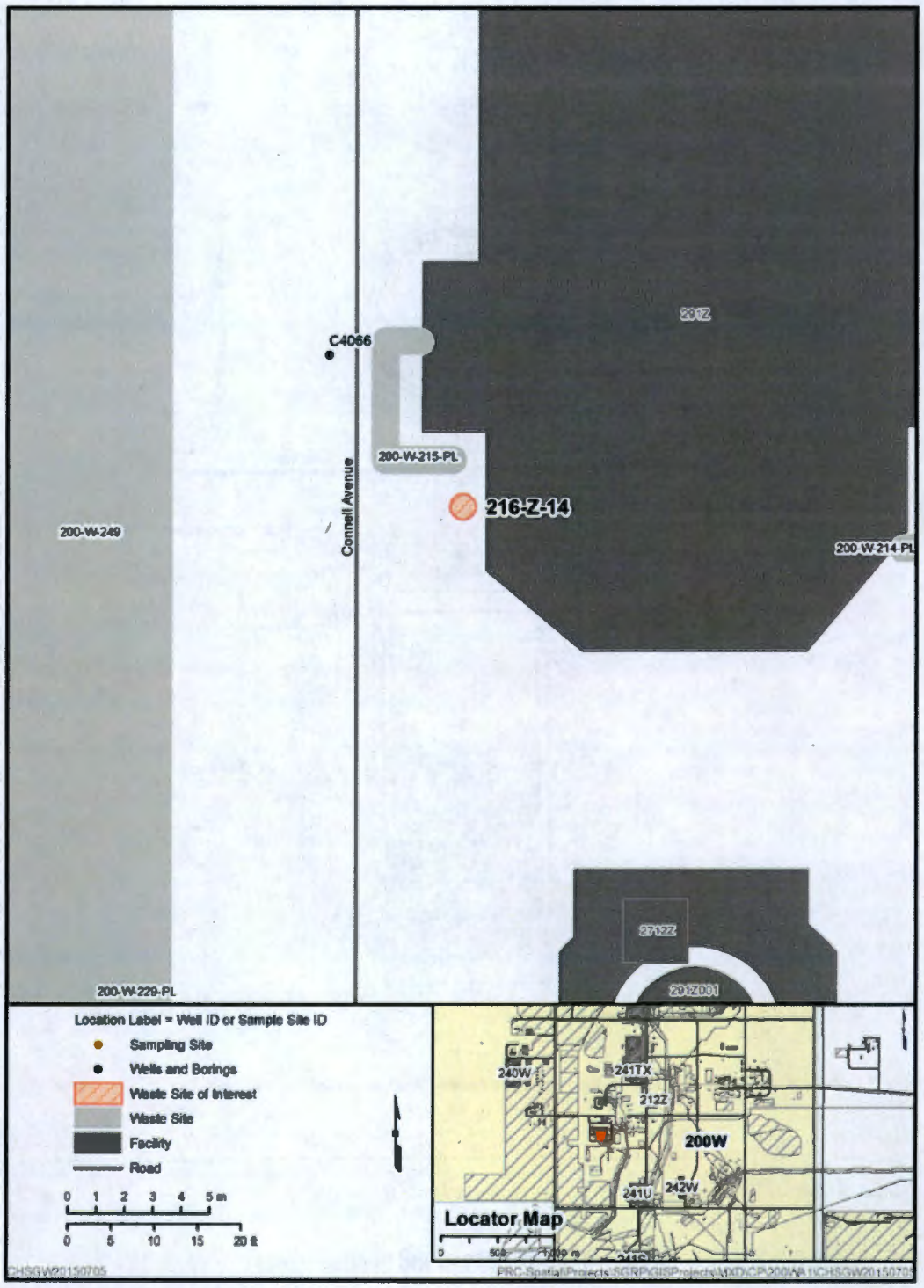
Nature and Extent of Contamination: No data are available to evaluate for the presence or absence of shallow or intermediate depth soil contamination. Based on existing information, the soil could be contaminated by former discharge of waste. Shallow soil beneath the surface cover could be contaminated if the well backed up and overflowed. The quantity of liquid discharged to the French drain is unknown.

References:

H-2-16412 (drawing), 1973, *Exhaust Fans, Ventilation Piping & Drainage*, Rev. 19, Giffels & Vallet Inc., Engineers, Detroit, Michigan.

Waste Information Data System General Summary Report for the 216-Z-14 Waste Site.

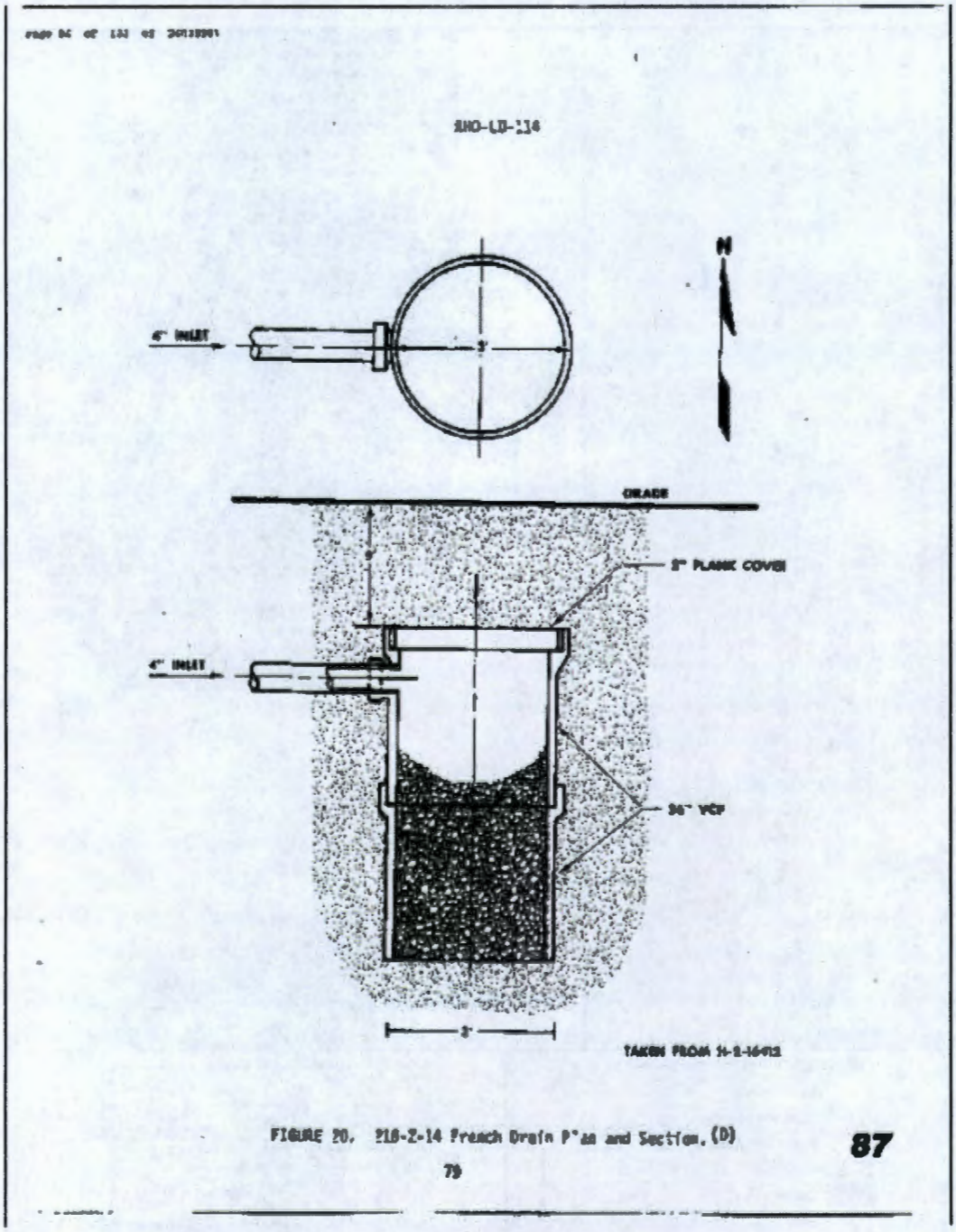
Site: 216-Z-14	Area: Z Plant	Category: Intermediate



ID = identification

Figure 1. 216-Z-14 Waste Site Map

Site: 216-Z-14	Area: Z Plant	Category: Intermediate



Source: H-2-16412, *Exhaust Fans, Ventilation Piping & Drainage.*

Note: Produced from the best available copy.

Figure 2. 216-Z-14 Plan and Section Views

Site: 216-Z-15	Area: Z Plant	Category: Intermediate

Site Description

Alternate Site Identification: 216-Z-15; 216-Z-15 Dry Well; 234-5 Dry Well #3; Miscellaneous Stream #263
Site Type: French Drain
Facility/Geographic Area: Z Plant (Plutonium Finishing Plant [PFP] area)
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2
Service Dates: 1949 to 1997

Waste Site Location and Physical Description: The 216-Z-15 waste site (Figure 1) is adjacent to the southeast corner of the 2731-Z Building and north of the 291-Z Ventilation Building. The 216-Z-15 dry well is an inactive, below-grade French drain. The unit is composed of two sections of vitrified clay pipe in a vertical configuration. There is one inlet pipe (Figure 2). The pipe is filled with cobbles and the upper end is covered with a wood plank. The French drain used to receive condensate drainage from the 291-Z Building S-12 Evaporator Cooler, but that source was re-routed to the 291-Z Sump, which is batch discharged to the PFP Low Level Waste Treatment Facility. The drain is listed as number 263 in some revisions of the Inventory of Miscellaneous Streams report (DOE/RL-95-82, *Inventory of Miscellaneous Streams*) and number 262 in other revisions.

Waste Site Coordinates:
N-135625.111998 E-566483.330991

Site Dimensions:
Site Diameter: 0.9 m (3 ft) Site Depth: 4.6 m (15 ft)
Site Area: 0.8 m^2 (9 ft^2) Overburden Depth: 2.7 m (9 ft)

Related Site Structure(s): The 216-Z-15 waste site is associated with the 291-Z Building. The pipeline to the French drain is 200-W-216-PL.

Site Posting: The site is marked with a single concrete marker post that reads "Buried Radioactivity - Do Not Excavate." The marker post is believed to be located directly above the drain structure.

Site History

Release Summary: The site used to receive the drainage from the 291-Z Building S-12 Evaporator Cooler. That source was eliminated in May 1997. Low levels of contamination are assumed, due to the possibility of accidents or unusual events in nearby areas.

Volume/Mass Discharged: Not specified.

Site: 216-Z-15	Area: Z Plant	Category: Intermediate

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: The French drain received condensate drainage from the 291-Z Building S-12 Evaporator Cooler via a floor drain in the northwest corner of the 291-Z Building. The piping to this drain was plugged in 1997 and the source was re-routed in 1997 to the 291-Z Sump and batch discharged to the PFP Low Level Waste Treatment Facility.

Nature and Extent of Contamination: Low levels of contamination are assumed, due to the possibility of accidents or unusual events in nearby areas. Contamination would affect vadose zone soils.

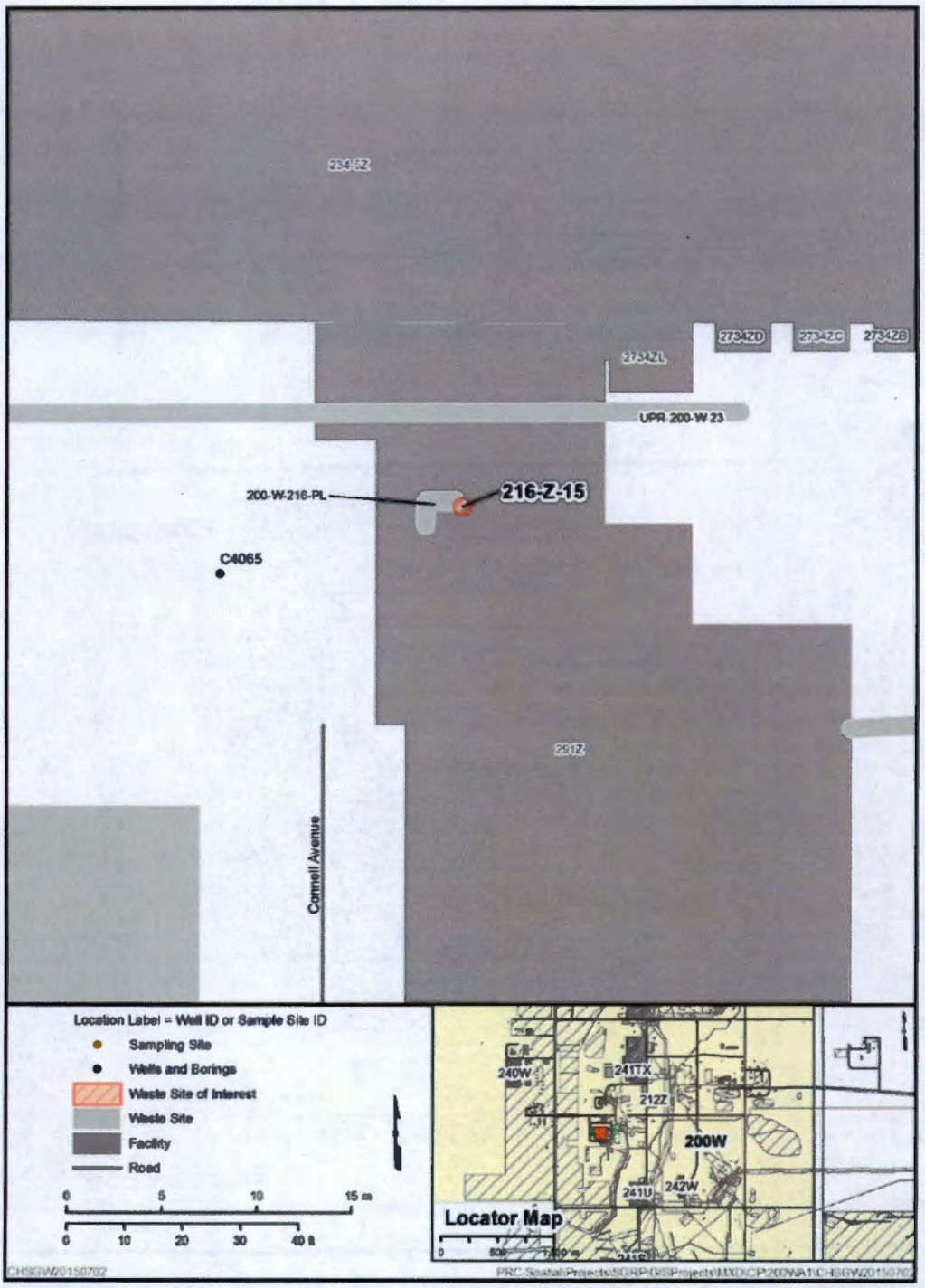
References:

DOE/RL-95-82, 1998, *Inventory of Miscellaneous Streams*, Rev. 3, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D198195181.

H-2-16412 (drawing), 1973, *Exhaust Fans, Ventilation Piping & Drainage*, Rev. 19, Giffels & Vallet Inc., Engineers, Detroit, Michigan.

Waste Information Data System General Summary Report for the 216-Z-15 Waste Site.

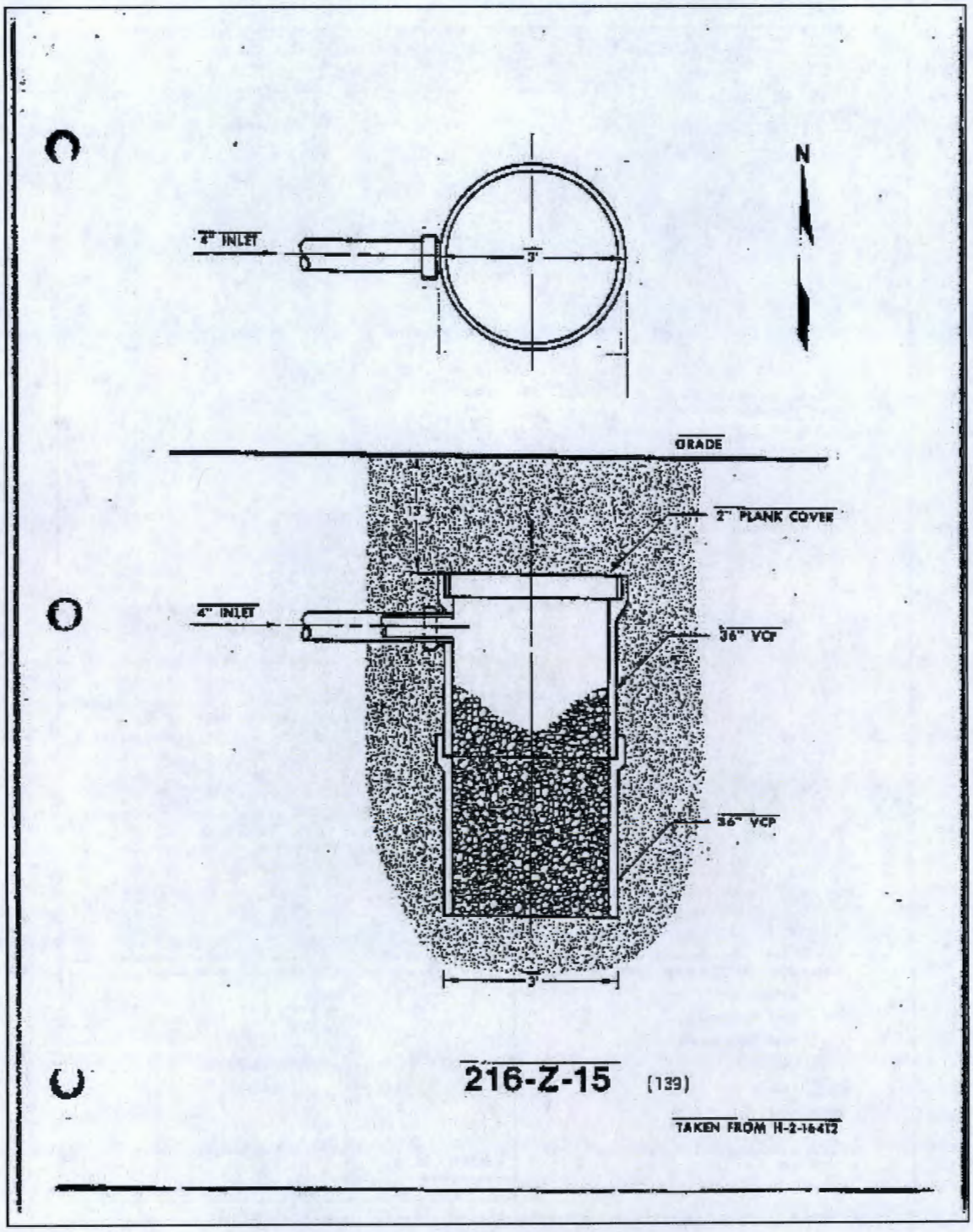
Site: 216-Z-15	Area: Z Plant	Category: Intermediate



ID = identification

Figure 1. 216-Z-15 Waste Site Map

Site: 216-Z-15	Area: Z Plant	Category: Intermediate



Source: H-2-16412, *Exhaust Fans, Ventilation Piping & Drainage.*

Note: Produced from the best available copy.

Figure 2. 216-Z-15 Plan and Section Views

Site: 216-Z-16	Area: Z Plant	Category: Deep – Representative

Site Description

Site Type: Crib
Facility/Geographic Area: Z Plant (Plutonium Finishing Plant Area)
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1, 200-LW-2
Service Dates: 1968 to 1977

Waste Site Location and Physical Description: The 216-Z-16 waste site is located northwest of the 231-Z Building (Figure 1). The site is a rectangular excavation with a gravel floor covering the bottom third of the hole. The gravel is covered with a polyethylene barrier. A perforated pipe runs the across the excavation (Figures 2 through 4). The excavation has been backfilled and the site now sits at grade with its surroundings. Approximately 2.7 m (9.0 ft) of overburden covers the site.

Waste Site Coordinates:
Lon-566430.07815 Lat-135991.34242

Site Dimensions:
Site Length: 55.0 m (180.0 ft)
Site Width: 3.0 m (10.0 ft)
Site Area: 167 m^2 (1,800 ft^2)
Site Depth: 4.8 m (16.0 ft)
Cover Thickness: Not Specified
Overburden depth: 2.7 m (9.0 ft)

Related Site Structure(s): Structures associated with the 216-Z-16 Crib include 11 crib penetrating monitoring wells, one gage well, two monitoring wells adjacent to the crib, a vent riser, and the waste transfer line from the 231-Z Building. The site code for the crib pipeline is 200-W-200-PL.

Site Posting: The 216-Z-16 Crib is marked and posted as an Underground Radioactive Material Area.

Site History

Release Summary: The 216-Z-16 Crib was constructed for use as a subsurface disposal site for liquid laboratory waste from the 231-Z Building. The waste was neutral to basic, and included an estimated 0.08 kg (0.16 lb) of plutonium. The crib was operational from 1968 to 1977, and received approximately 1.0E+08 L (2.7E+07 gal) of laboratory waste.

Volume/Mass Discharged: 1.0E+08 L (2.7E+07 gal) of laboratory waste (Figure 5 provides further information).

Pore Volume Discharged: 1.0E+08 L/ (217 ft x 1,800 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 30

Site: 216-Z-16	Area: Z Plant	Category: Deep – Representative

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-Z-16 Waste Site

Contaminant	Mass Discharged
Pu	<70.8 g
Beta	<1 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: The crib was backfilled to grade upon its deactivation. Any additional actions taken in 1977 during the deactivation process are not specified. A site walkdown for photo documentation purposes occurred on May 18, 2000. In July 2000, the vent risers were sealed as a preventive measure for the potential passive release of radioactive emissions. The potential of a release occurring from this site is deemed low. The site is monitored by two monitoring wells adjacent to the 216-Z-16 Crib. Research indicates that the real extent of the contamination appears to be limited to the crib boundaries. No further information is presented regarding any visual or radiological surveys or results at this Site.

In 2003, geophysical logging was completed to a depth of 70.4 m (231 ft) below ground surface (bgs) at borehole 299-W15-10 (A4916) located at the southeast boundary of the waste site.

Boreholes C6827 and C6828 (Figure 1) were planned in DOE/RL-2007-02, *Supplemental Remedial Investigation/Feasibility Study Work Plan for the 200 Areas Central Plateau Operable Units, Volume II: Site-Specific Field-Sampling Plan Addenda,* but were not installed.

Borehole and data summaries are presented in Tables 2 and 3. Borehole locations are shown on Figures 1 and 2.

Groundwater wells associated with 216-Z-16 (299-W15-10, 299-W15-11, 299-W15-25, and 299-W15-33) had detections above drinking water standards for volatile organic compounds (VOCs), nitrate, and tritium. Detected VOCs included carbon tetrachloride (CTET), tetrachloroethene (PCE), and trichloroethene (TCE). CTET ranged from 4,520 µg/L in 1987 to as high as 7,200 µg/L in 1998 and was last measured at 120 µg/L in 2014. PCE was initially measured at 1.2 µg/L in 1987, reached a maximum concentration of 15 µg/L in 2005, and was not detected (1U µg/L) in 2014. TCE was initially measured at 11 µg/L in 1987, reached a maximum concentration of 17.8 µg/L in 1997, and was not detected (0.5U µg/L) in 2014. Nitrate concentrations were first measured at 1,000 µg/L in 1972, were as high as 354,000 µg/L in 1983 and were 100,000 µg/L in 2014. Tritium concentrations were highest

Site: 216-Z-16	Area: Z Plant	Category: Deep – Representative

(20,300 pCi/L) when first measured in 1987 and had decreased to 930 pCi/L in 2013. Cesium-137 and strontium-90 were detected below drinking water standards.

Table 2. Borehole Summary for the 216-Z-16 Waste Site

Year	Borehole/Well ID	Location with respect to site	Depth (ft)
2003	A4916/299-W15-10	Southeast boundary of the site	231 (GPL)

GPL = geophysical log
ID = identification

Table 3. Geophysical Log Summary for the 216-Z-16 Waste Site

Borehole ID	Depth Interval (ft bgs)	Cs-137			Total Gamma		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
A4916	0 to 5	0.23	pCi/g	3.0	15,416.2	cpm	5
	5 to 10	–	pCi/g	–	16,542.4	cpm	9
	10 to 15	–	pCi/g	–	14,852.3	cpm	12
	>15	0.17	pCi/g	18	21,242.9	cpm	126

ID = identification

Nature and Extent of Contamination: Based on existing information, the shallow and deep depth soil could be contaminated by former disposal of liquids into the crib. Within the crib, soil below the membrane barrier could be contaminated by discharge of waste. Soil above this barrier (0 to 2.7 m [0 to 9 ft] bgs) may not be contaminated. An estimated 30 pore volumes of liquid laboratory waste, potentially containing plutonium, were discharged to the crib, indicating contamination could extend to groundwater (66.1 m [217 ft] bgs). The stratigraphy at the crib is shown on Figure 6.

References:

DOE/RL-2007-02, 2007, *Supplemental Remedial Investigation/Feasibility Study Work Plan for the 200 Areas Central Plateau Operable Units: Volume II: Site-Specific Field-Sampling Plan Addenda*, Rev. 0, Vol. II, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA06294555.

Site: 216-Z-16	Area: Z Plant	Category: Deep – Representative

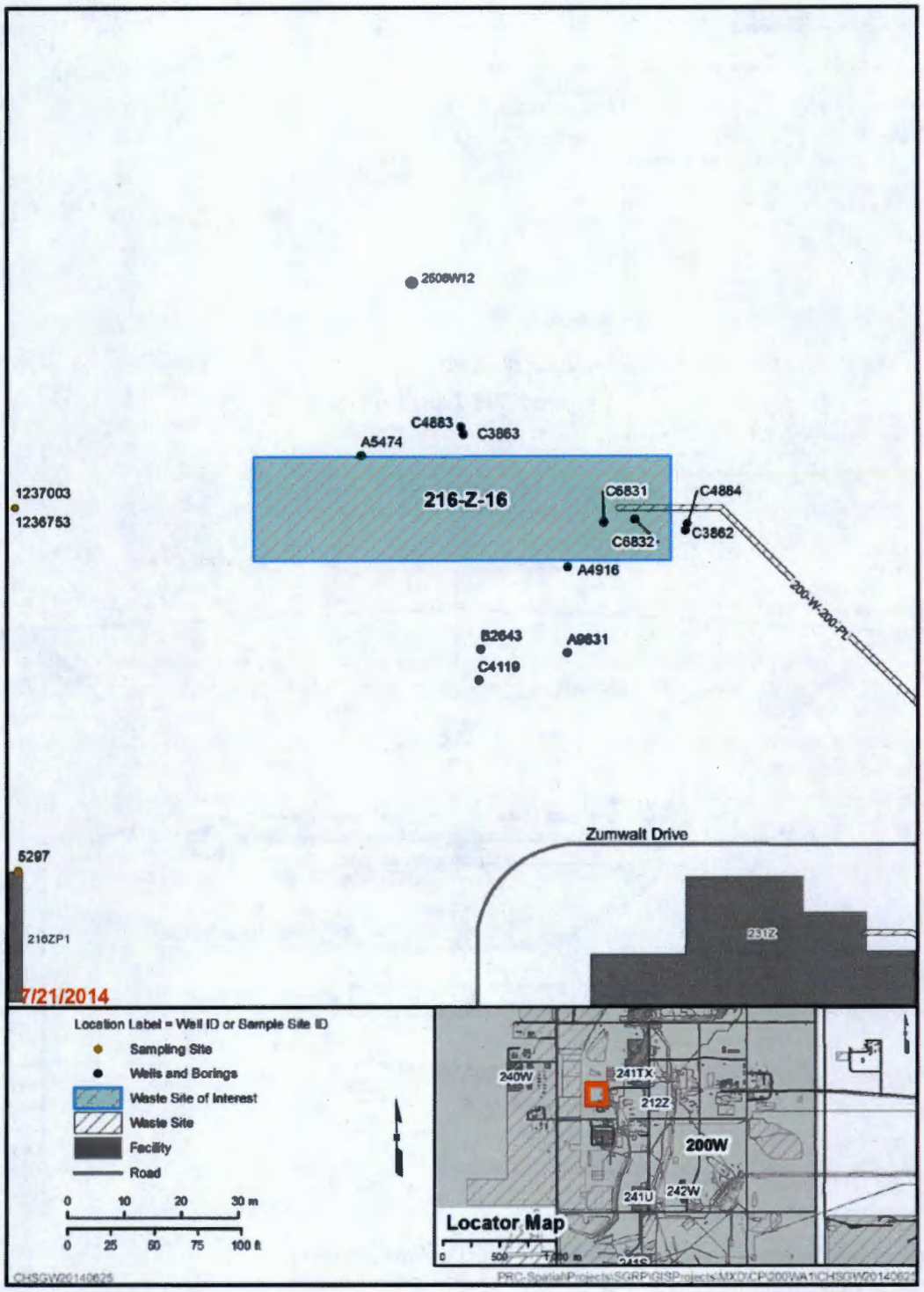
DOE/RL-2007-02-VOL II-ADD 2, 2008, *Site-Specific Field-Sampling Plans for 216-T-34, 216-T-8, 216-T-B-10A&B, and 216-Z-16 Cribs (Addendum 2)*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0807140234

H-2-26074 (drawing), 1973, *Pan and Profile Crib 216-Z-16*, Rev. 1, Isochem, Inc., Richland, Washington.

H-2-44511 (drawing), 1995, *Area Map 200 West Z Plant Facilities*, Sh. 103, Rev. 5, Atlantic Richfield Hanford Company, Richland, Washington.

Waste Information Data System General Summary for the 216-Z-16 Waste Site.

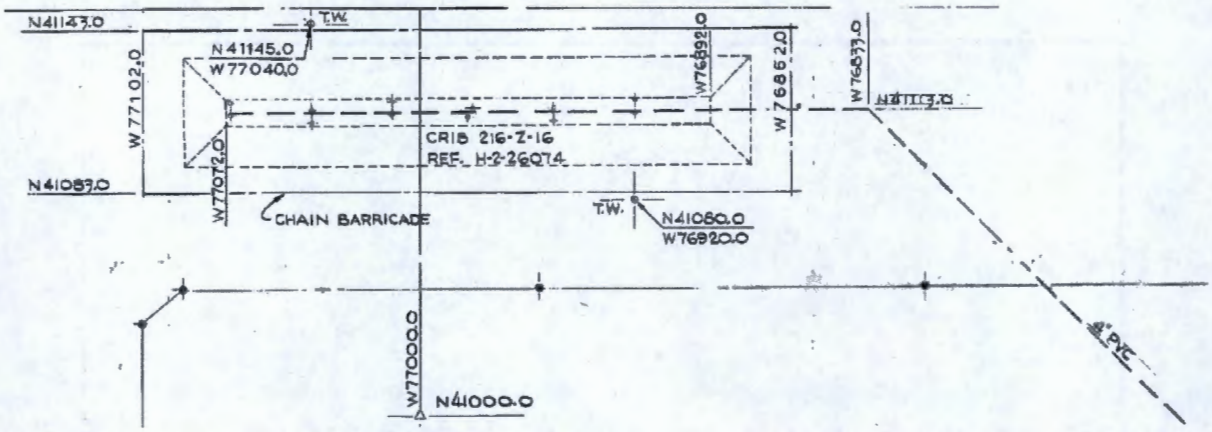
Site: 216-Z-16	Area: Z Plant	Category: Deep – Representative



ID = identification

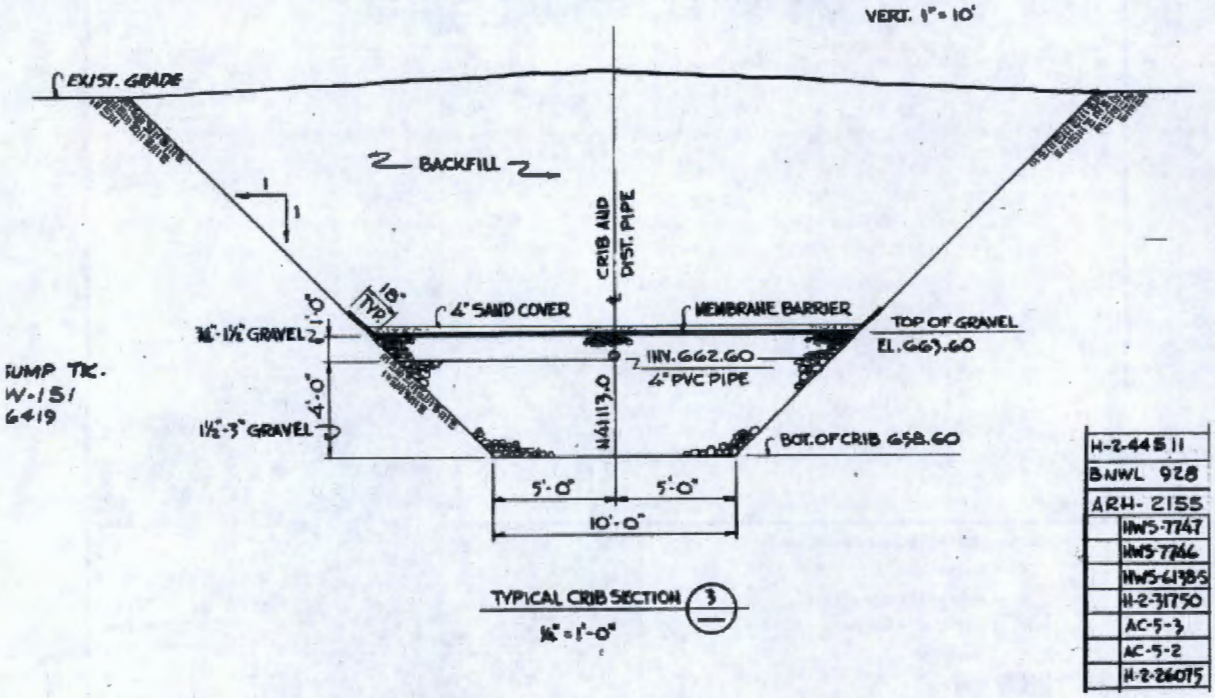
Figure 1. 216-Z-16 Waste Site Map

Site: 216-Z-16	Area: Z Plant	Category: Deep – Representative



Source: H-44511, *Area Map 200 West Z Plant Facilities*, Sheet 103.

Figure 2. 216-Z-16 Plan View

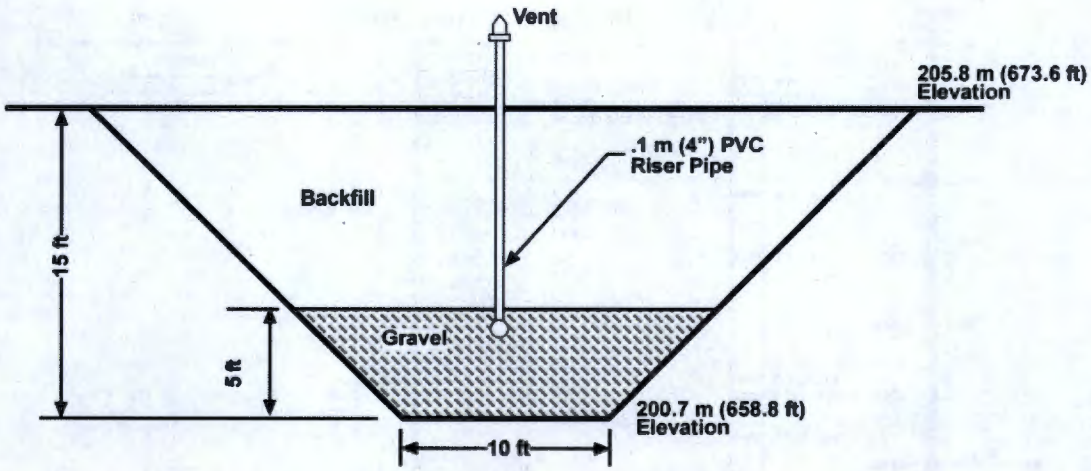


Source: H-2-26074, *Pan and Profile Crib 216-Z-16.*

Note: Produced from the best available copy.

Figure 3. 216-Z-16 Cross Section

Site: 216-Z-16	Area: Z Plant	Category: Deep – Representative



Source: DOE/RL-2007-02, *Supplemental Remedial Investigation/Feasibility Study Work Plan for the 200 Areas Central Plateau Operable Units, Volume II: Site-Specific Field-Sampling Plan Addenda*

Figure 4. 216-Z-16 Cross Section

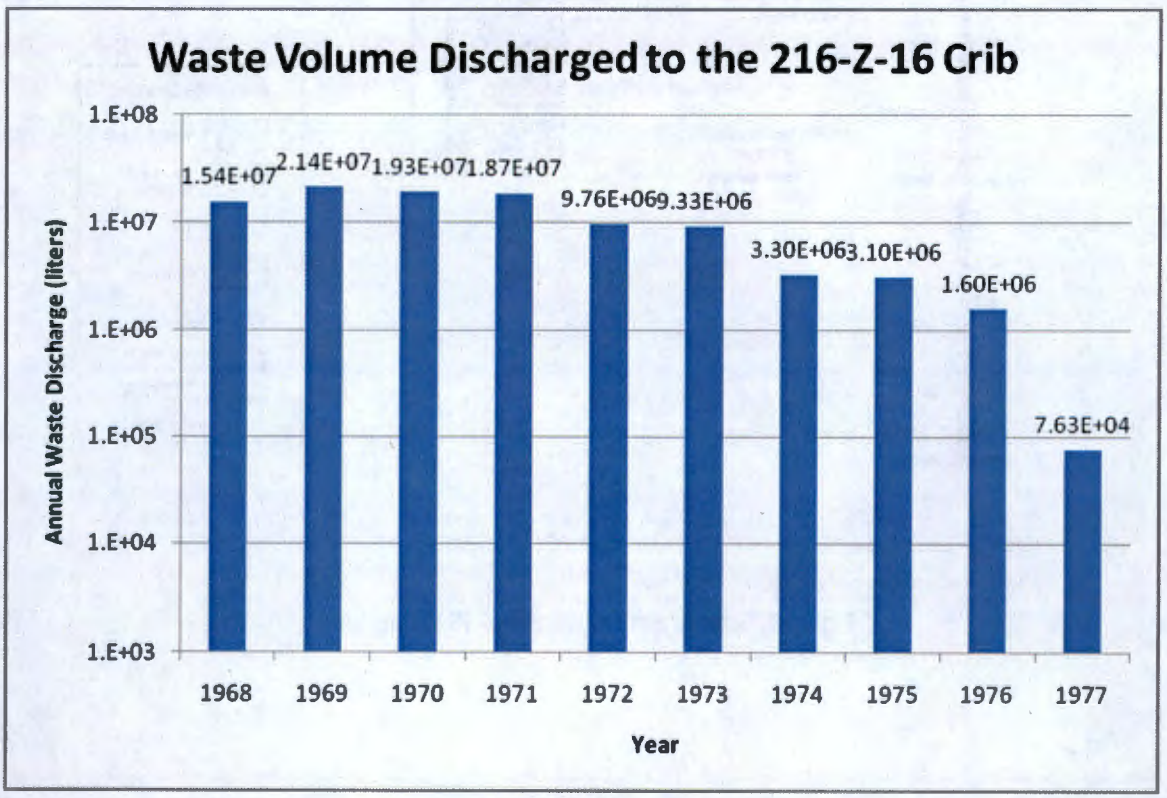
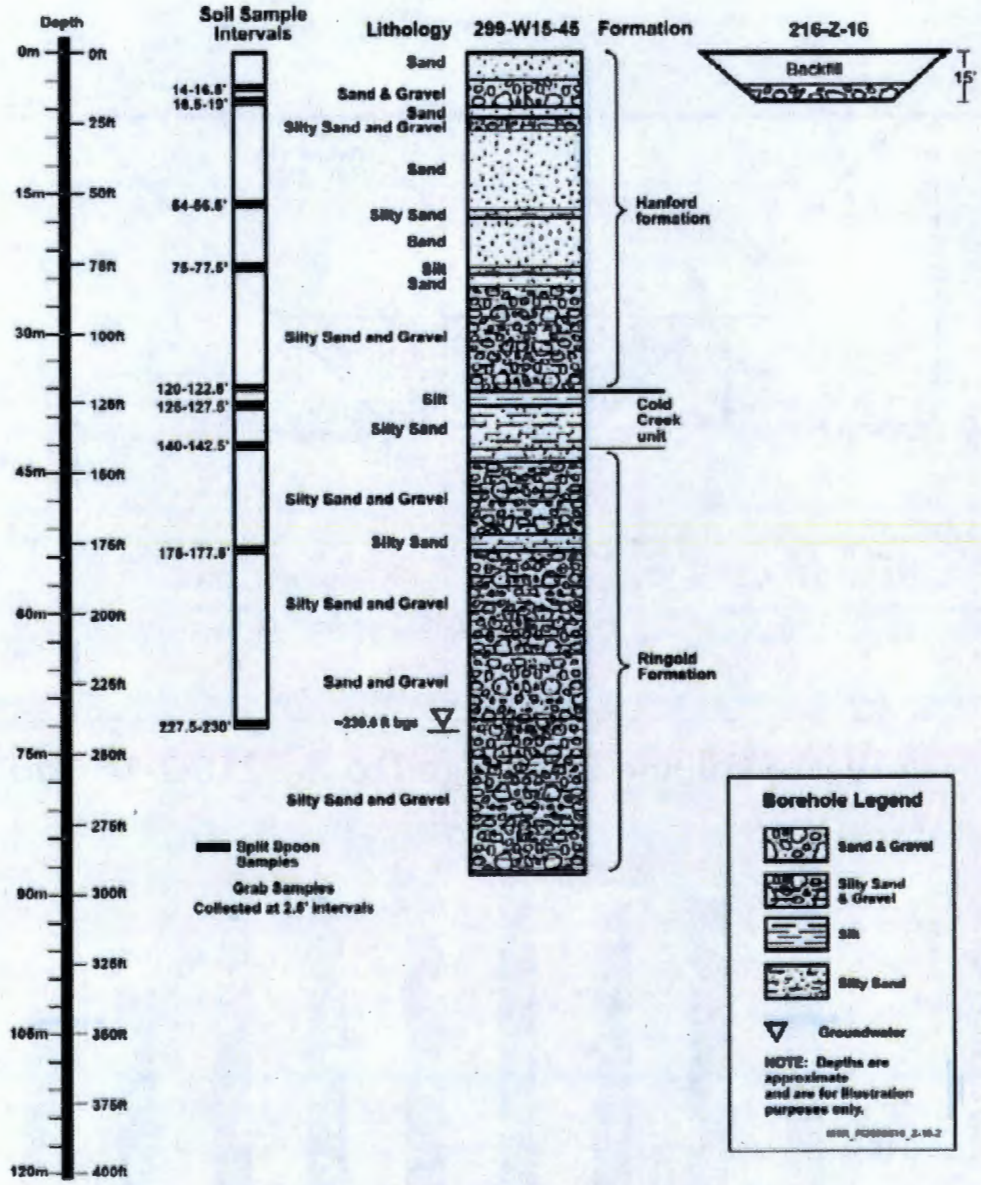


Figure 5. Waste Volume Discharged by Liters per Year

Site: 216-Z-16	Area: Z Plant	Category: Deep – Representative



Source: DOE/RL-2007-02-VOL II-ADD 2, *Site-Specific Field-Sampling Plans for 216-T-34, 216-T-8, 216-T-B-10A&B, and 216-Z-16 Cribs (Addendum 2)*, Figure AD2-8.

Note: Produced from the best available copy.

Figure 6. Stratigraphy at the 216-Z-16 Waste Site

Site: 216-Z-17	Area: Z Plant	Category: Deep – Similar Site

Site Description

Alternate Site Identification: 216-Z-17 Ditch
Site Type: Trench
Facility/Geographic Area: Z Plant (Plutonium Finishing Plant Area)
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1, 200-LW-2
Service Dates: 1967 to 1968

Waste Site Location and Physical Description: The 216-Z-17 waste site is located east of the 231-Z Building, and is east of and adjacent to the 216-Z-6 Crib (Figure 1). The 216-Z-17 Trench is within an inactive waste management unit that has been deactivated and backfilled. When it was active, the site was an open trench excavated lengthwise, with sloped sides. A carbon steel effluent discharge pipe was connected to a metering box that deposited waste into the trench (Figure 2). Approximately 2.4 m (8.0 ft) of backfill cover the trench (Figure 3).

Waste Site Coordinates:
Lon-566603.43750 Lat-135862.59380

Site Dimensions:
Site Length: 61.0 m (200.0 ft) Site Depth: 2.4 m (8.0 ft)
Site Width: 3.0 m (10.0 ft) Cover Thickness: Not specified
Site Area: Not specified Overburden Depth: 2.4 m (8.0 ft)
Note: These are bottom dimensions for the trench.

Related Site Structure(s): Structures associated with the 216-Z-17 Trench include the 231-W-151 Sump Tank, waste transfer lines, the metering box, and the effluent discharge pipe that conveyed waste to the site. The pipeline that fed into the site is site code 200-W-201-PL.

Site Posting: The posting for 216-Z-17 is not specified.

Site History

Release Summary: The 216-Z-17 Trench was excavated for use as a subsurface disposal site for liquid laboratory waste generated within the 231-Z Building. The trench was deactivated in 1968 when it was determined the volume of waste being sent to the site surpassed the trench's infiltration capacity. The trench received an estimated 3.7E+07 L (9.8E+06 gal) of waste during its operational lifetime. The waste was neutral to basic in character, and contained an estimated 0.05 kg (0.11 lb) of plutonium.

Volume Discharged: 3.7E+07 L (9.8E+06 gal) of liquid laboratory waste

Site: 216-Z-17	Area: Z Plant	Category: Deep – Similar Site

Pore Volume Discharged: 3.7E+07 L/ (222 ft x 2,000 ft^2 / 35.3 m^3/ft^3 * 1,000 L/m^3 * 0.3) = 9.8

Waste Inventory:

Table 1. Waste Inventory Radionuclide Content for the 216-Z-17 Waste Site

Contaminant	Mass Discharged
Pu	50.2 g
Beta	1.04 Ci

Source: RHO-CD-673, *Handbook 200 Areas Waste Sites*, Volume II.

Previous Site Characterization

Site Characterization Summary: The site was deactivated by capping the pipeline at the trench and valving out the line west of the 231-W-151 Sump Tank. The site was backfilled in 1975. The metering box may have been removed before the trench was backfilled. It is not specified where the waste was redirected following the site's retirement.

Surface stabilization work occurred in 1990. While no routine monitoring or sampling occurs at this site, there is a solitary monitoring well west of the trench.

Borehole locations are shown on Figure 1.

Nature and Extent of Contamination: Based on existing information, the shallow and deep depth soil could be contaminated by former disposal of liquids into the trench. Within the trench, soil 1.8 m (6 ft) below ground surface (bgs) and below could be contaminated by discharge of waste though the bottom of the open trench. An estimated 9.8 pore volumes of liquid laboratory waste, potentially containing plutonium were discharged to the trench, indicating contamination could extend to groundwater (67.7 m [222 ft] bgs).

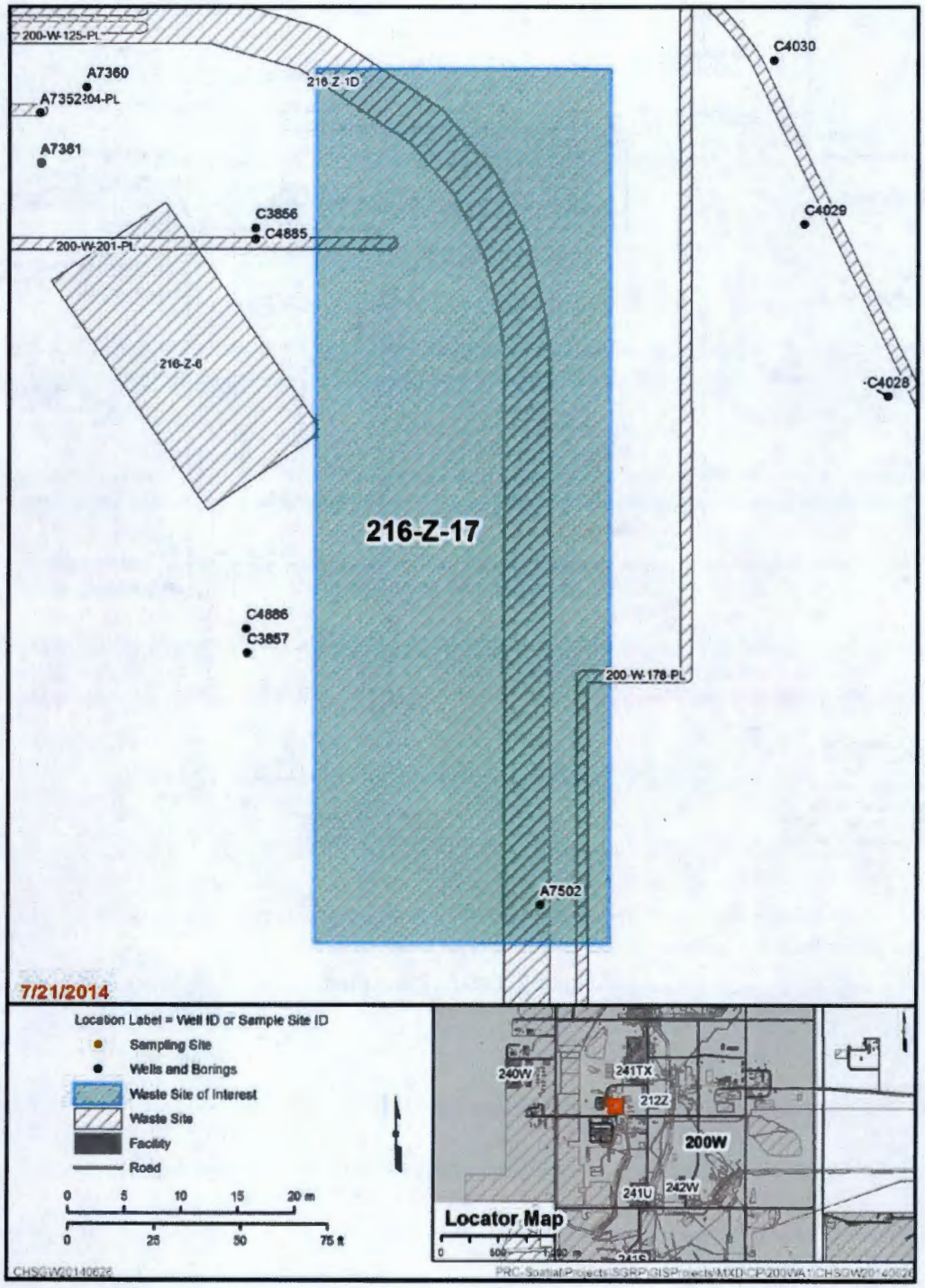
References:

H-2-32682 (drawing), 1973, *216-Z-17 Crib – Disposal Trench for 231-Z Wastes & 216-Z-10 Reverse Well*, Rev. 1, Atlantic Richfield Hanford Company, Richland, Washington.

RHO-CD-673, 1979, *Handbook 200 Areas Waste Sites*, Volume II, Rockwell Hanford Operations, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196039028.

Waste Information Data System General Summary Report for the 216-Z-17 Waste Site.

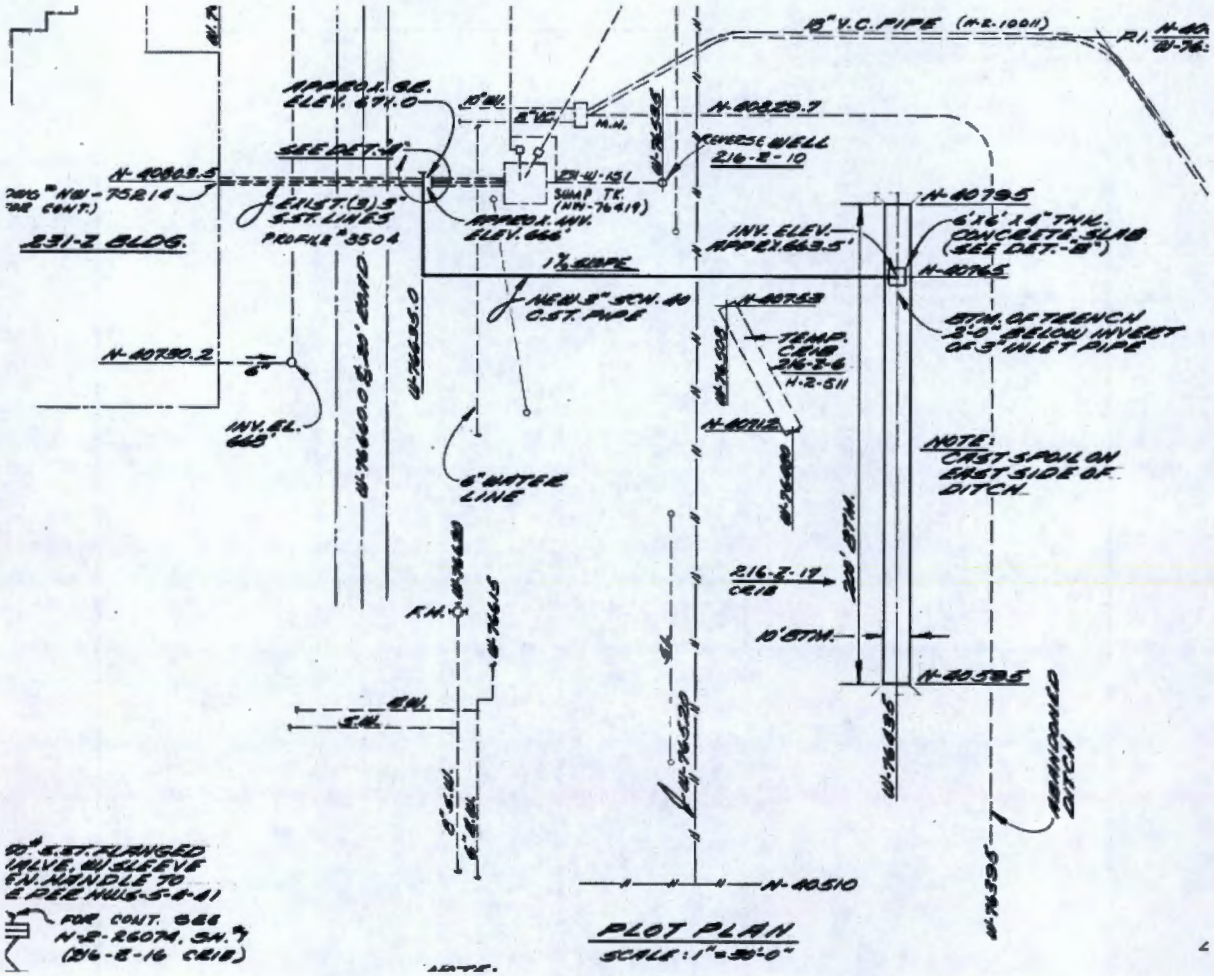
Site: 216-Z-17	Area: Z Plant	Category: Deep – Similar Site



ID = identification

Figure 1. 216-Z-17 Waste Site Map

Site: 216-Z-17	Area: Z Plant	Category: Deep – Similar Site

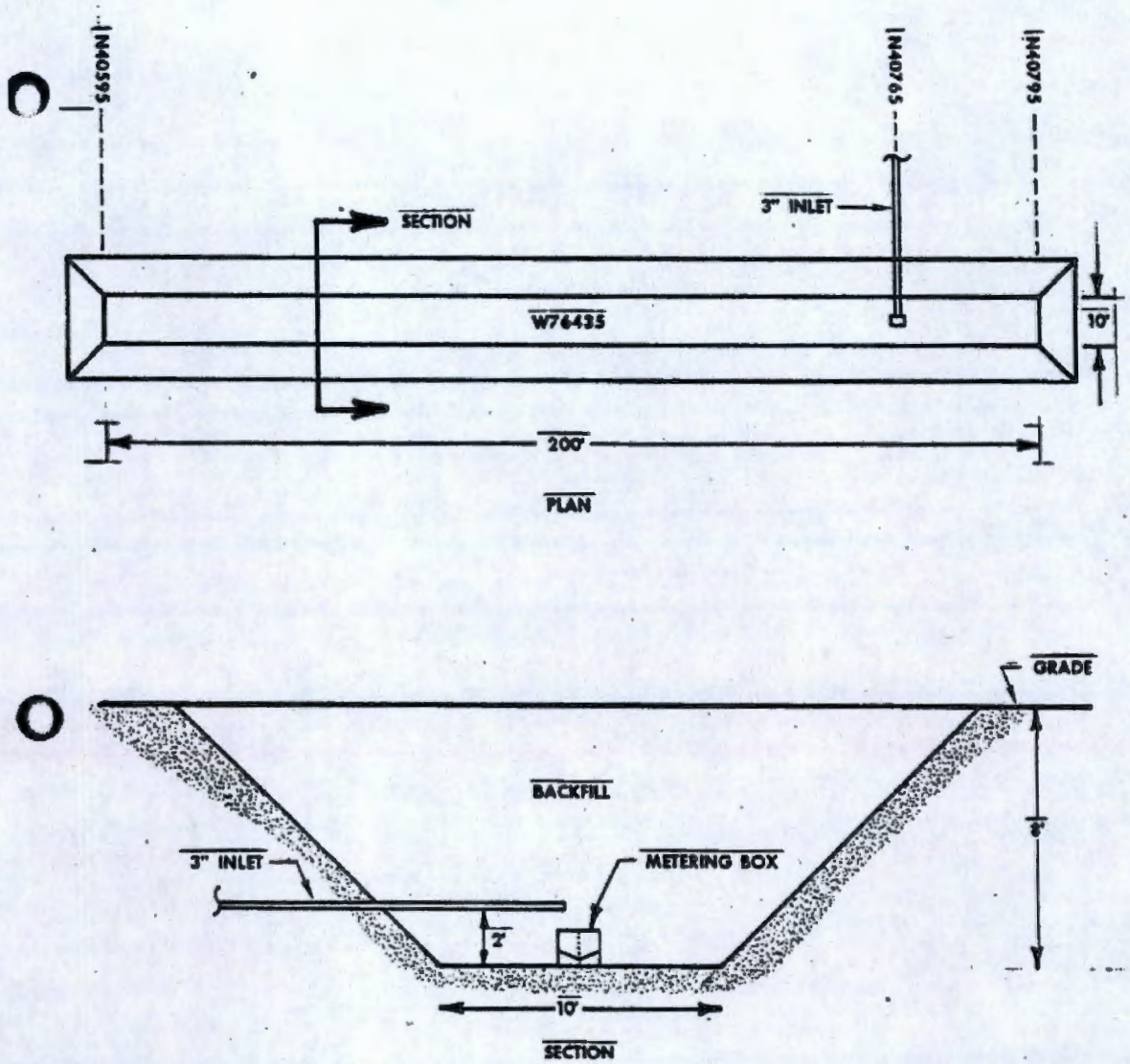


Source: H-2-32682, *216-Z-17 Crib – Disposal Trench for 231-Z Wastes & 216-Z-10 Reverse Well.*

Note: Produced from the best available copy.

Figure 2. 216-Z-17 Plot Plan

Site: 216-Z-17	Area: Z Plant	Category: Deep – Similar Site



Note: Produced from the best available copy.

Figure 3. Plan View and Cross Section for 216-Z-17

Site: 216-Z-17	Area: Z Plant	Category: Deep – Similar Site

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Site: 231-W-151	Area: Z Plant	Category: Intermediate

Site Description

Alternate Site Identification: 231-W-151 Vault, 231-W-151-001 (Tank), 231-W-151-002 (Tank), 231-W-151 Sump, 231-Z-151 Sump, Inactive Miscellaneous Underground Storage Tank (IMUST)
Site Type: Receiving Vault
Facility/Geographic Area: Z Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1, 200-UR-1
Service Dates: 1948 to 1974

Waste Site Location and Physical Description: The 231-W-151 waste site is located approximately 36.6 m (120 ft) east of 231-Z Building (Figures 1 and 2). The site consists of a concrete vault with two inner tanks. A portion of the vault structure is buried below ground. Three steel risers and one vent structure extend above the surface from holes in the vault's ceiling (Figure 3). The site is posted with "Contamination Area/Radiation Area," "Restricted Access Unsafe Structure. Confined Space," and IMUST signs.

The vault contains two tanks: tank 231-W-151-001 and tank 231-W-151-002 (Figure 4). Both tanks are situated inside the 231-W-151 Vault and received drainage from the 231-Z Building floor drains prior to disposal into associated cribs. Tank 231-W-151-001 is a 15,140 L (4,000 gal) stainless steel tank, while 231-W-151-002 is a 3,596 L (950 gal) stainless steel tank. The inlet pipelines leading to the tanks have been blanked off.

Waste Site Coordinates:
Lon-566547.96877 Lat-135896.88277

Site Dimensions:
Site Length: 5.2 m (17.0 ft) Site Depth: 4.0 m (13.0 ft)
Site Width: 5.2 m (17.0 ft) Cover Thickness: Not specified
Dimensions of the cement vault.

Site Area: Not specified

Dimensions of the 231-W-151-001 tank:
Site Length: 2.7 m (9.0 ft) Diameter: 2.7 m (9.0 ft)

Dimensions of the 231-W-151-002 tank:
Site Length: 2.1 m (7.0 ft) Diameter: 1.5 m (5.0 ft)

Related Site Structure(s): The 200-W-9 waste site is associated with the 231-Z Building and the 216-Z-5, 216-Z-6, 216-Z-7, 216-Z-10, and UPR-200-W-130 waste sites. The pipelines from 231-Z to the

Site: 231-W-151	Area: Z Plant	Category: Intermediate

231-W-141 Vault are labeled as site code 200-W-199-PL. The pipeline from the vault to the 216-Z is site code 200-W-202-PL. The pipeline from the vault to 216-Z-7 is site code 200-W-203-PL. The pipeline from the vault to 216-Z-10 is 200-W-204-PL.

Site Posting: The-231-W-151 waste site is posted with Contamination Area/Radiation Area, Restricted Access Unsafe Structure. Confined Space, and IMUST signs.

Site History

Release Summary: The 231-W-151 Vault Tanks were constructed to collect drainage from approximately 75 floor drains in Building 231-Z. The 231-Z Building drainage was conveyed to the 231-W-151-002 Tank, which overflowed to the 231-W-151-001 Tank when filled. Solids in the floor drainage would settle out, leaving behind sludge and sediment particles on the tank floor. Waste was transferred to the 216-Z-5, 216-Z-6, 216-Z-7 Cribs, and the 216-Z-10 Reverse Well through this vault.

The tanks were used to defuse 231-Z Building wastes before conveyance to a crib. As the 231-Z Building was used to finish plutonium, any wastes or chemicals produced or used in the process may have potentially been added to the 231-W-151 Vault Tanks.

In addition, on January 20, 1967, an unplanned release consisting of contaminated soil was discovered during efforts to uncover a waste line adjacent to the 231-W-151 Diversion Box. The soil next to the waste line was found to contain 40,000 dpm alpha contamination, and 150 millirem per hour beta/gamma contamination. The unplanned release was the result of a leaking flange. The dose rate on the waste line was 1.5 rad per hour.

It is unclear when the release occurred that resulted in the smear contamination. The volume of wastes released is not specified. Therefore, no volume estimates can be ascertained for this site.

Volume Discharged: Unknown

Pore Volume Discharged: Unknown

Waste Inventory:

Radioactive: Tank 231-W-151-001 was found to contain 5,413 L (1,430 gal) of supernate with (0.001 g [0.00003 oz]) of plutonium. Tank 231-W-152-002 was found to contain 3,615 L (955 gal) of supernate with less than 0.001 g [0.00003 oz] of plutonium in the supernate, and 45 L (12 gal) of sludge with 228 g (8 oz) of plutonium in the sludge. In addition, cesium-137, strontium-89, strontium-90, and uranium were detected in the 231-W-151-001 sample, while cesium-137, strontium-89, strontium-90, uranium, plutonium-238, plutonium-239, plutonium-240, and americium-241 were detected in the 231-W-151 sample.

Site: 231-W-151	Area: Z Plant	Category: Intermediate

Previous Site Characterization

Site Characterization Summary: The site was operable from 1948 to 1974. The specific date the site was deactivated is not clear. However, the inlet pipelines that fed the tanks were blanked off prior to 1974. The risk for hydrogen concentration, organic salts, vapor releases, radiological risk, and heat creation was deemed low to minimal for 231-W-151-001. The rating was similar for 231-W-151-002, except radiological risk was determined to be moderate, as over 15 curies of transuranics were identified in the sludge. In addition, Tank 231-W-151-001 was found to contain 5,413 L (1,430 gal) of supernate with (0.001 g [0.00003 oz]) of plutonium, no sludge, and little or no ferrocyanide. Tank 231-W-152-002 was found to contain 3,615 L (955 gal) of supernate with less than 0.001 g (0.00003 oz) of plutonium in the supernate, and 45 L (12 gal) of sludge with 228 g (8 oz) of plutonium in the sludge.

Analyses of water samples taken on May 9, 1974, showed cesium-137, strontium-89, strontium-90, and uranium in the 231-W-151-001 sample. Analysis of the water sample taken from 231-W-002 on May 9, 1974, showed cesium-137, strontium-89, strontium-90, uranium, plutonium-238, plutonium-239, plutonium-240, and americium-241.

In September 2002, alpha contamination was detected on the concrete vault's surface, near the riser. Contamination levels up to 210,000 dpm with 420 dpm removable were detected. In September 2003, the vault was covered with a foam seal to stop intrusion and inhibit the possible spread of contamination.

Investigations stated that in 1974, no evidence of leaks were reported during liquid sampling. The sludge and sediment were determined not to be corrosive. However, due to the extended operational life of the tanks, there is some risk of leakage. In addition, information is presented regarding a leaking flange that created a contamination spread during an excavation in 1967.

Nature and Extent of Contamination: Contamination was detected on the vault surface.

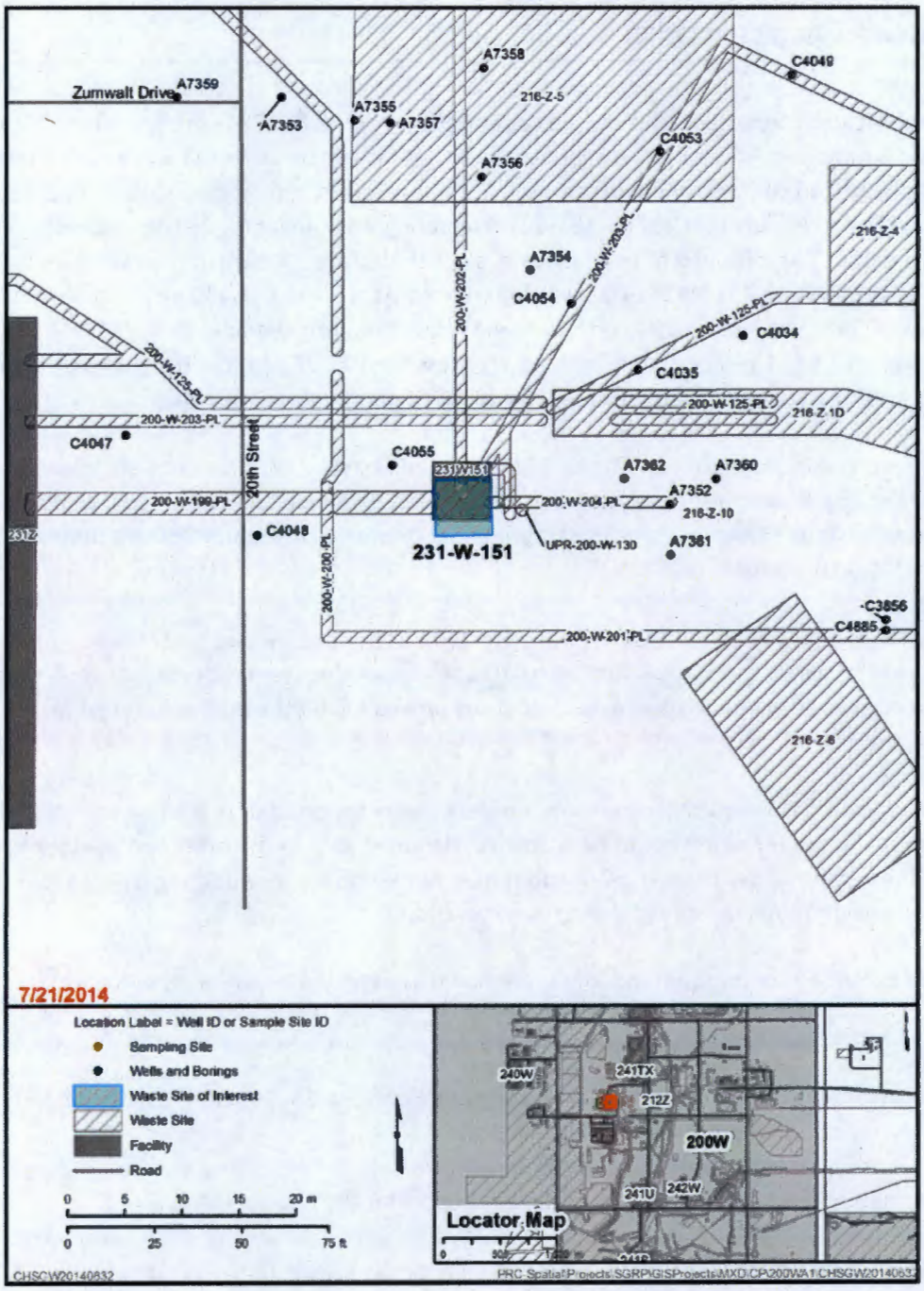
References:

H-2-44511 (drawing), 1995, *Area Map 200 West Z Plant Facilities*, Sh. 103, Rev. 5, Atlantic Richfield Hanford Company, Richland, Washington.

Waste Information Data System General Summary Report for the 231-W-151 Waste Site.

WHC-EP-0560, 1992, *Miscellaneous Underground Radioactive Waste Tanks*, Westinghouse Hanford Company, Richland, Washington.

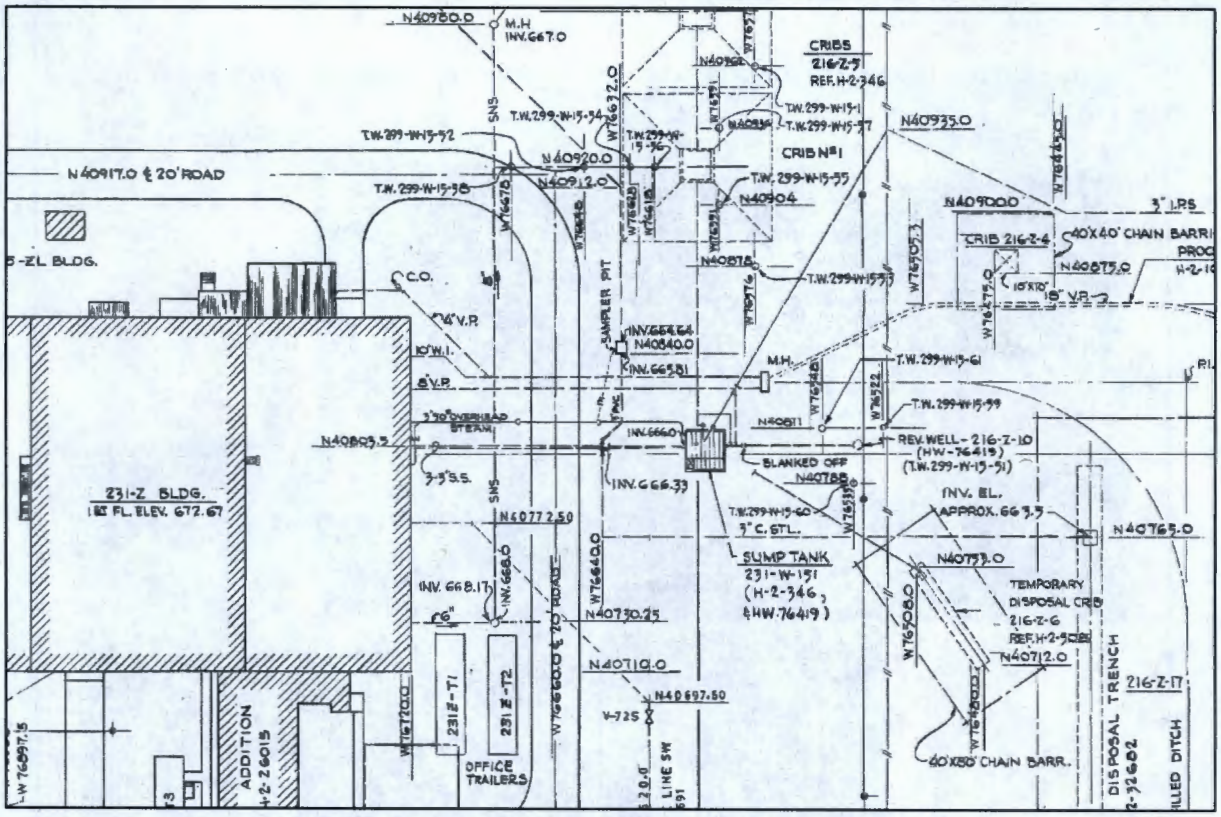
Site: 231-W-151	Area: Z Plant	Category: Intermediate



ID = identification

Figure 1. 231-W-151 Waste Site Map

Site: 231-W-151	Area: Z Plant	Category: Intermediate



Source: H-2-44511, *Area Map 200 West Z Plant Facilities*, Sheet 103.

Note: Produced from the best available copy.

Figure 2. 231-W-151 Layout

Site: 231-W-151	Area: Z Plant	Category: Intermediate

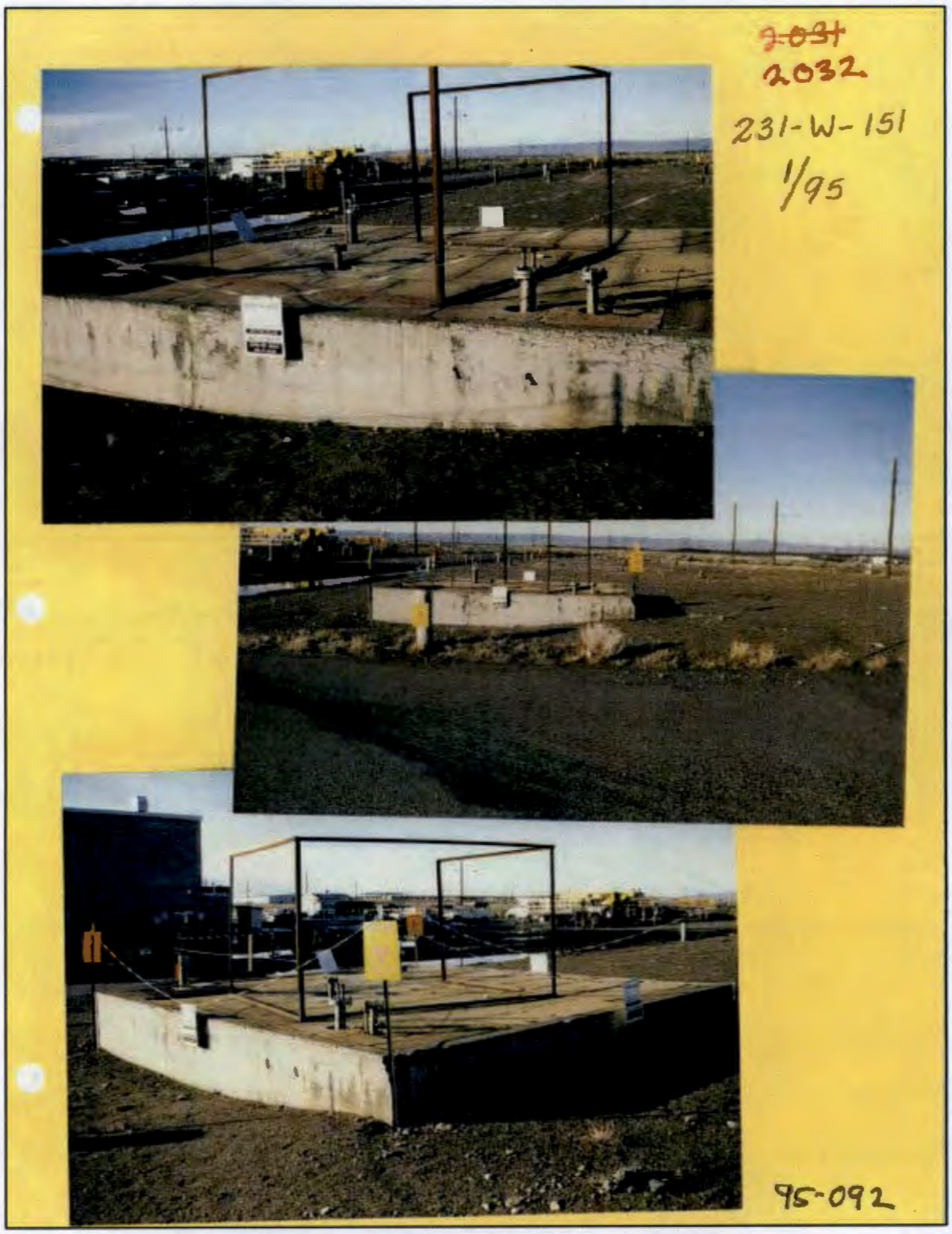
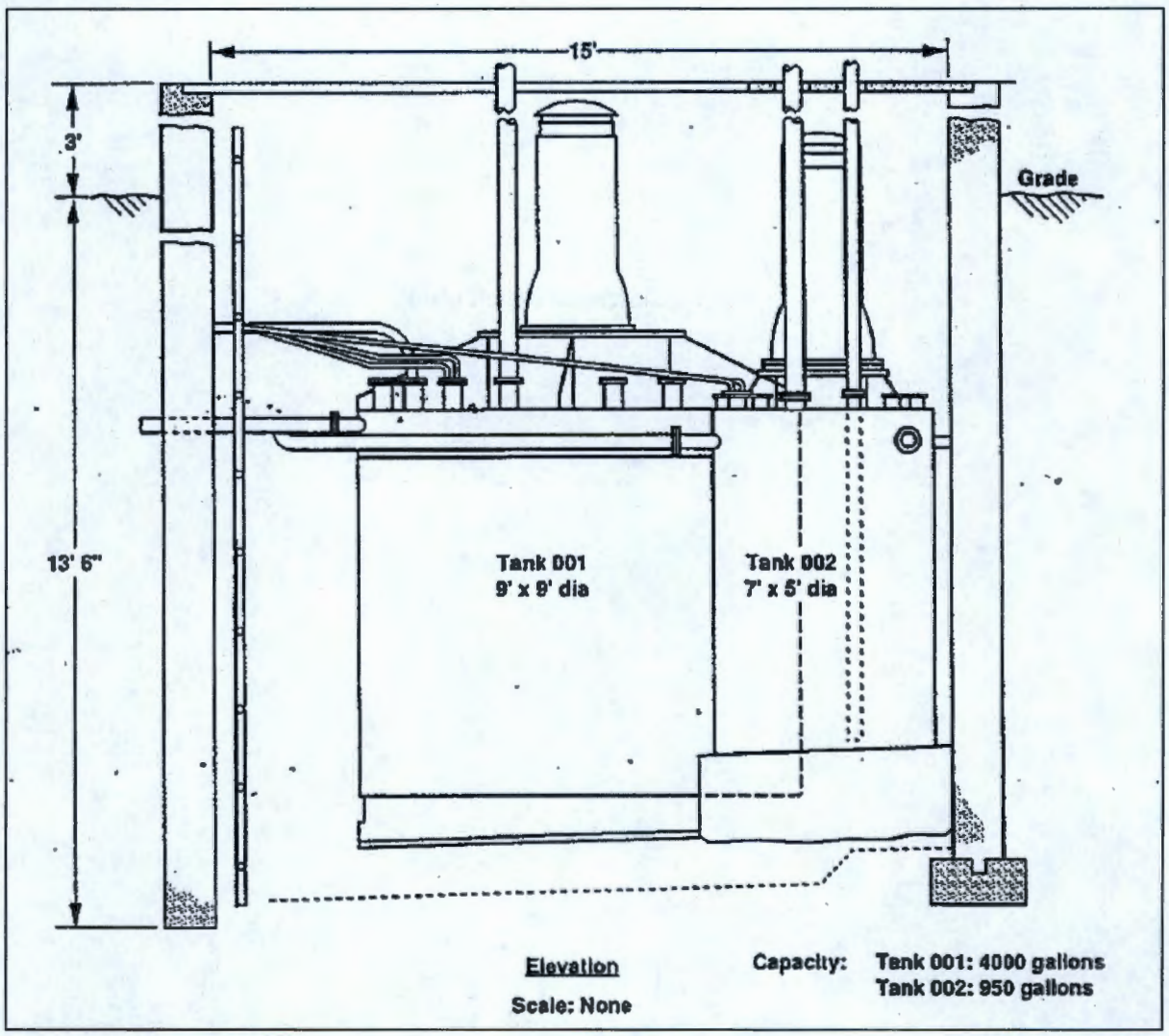


Figure 3. Photographs of the 231-W-151 Waste Site

Site: 231-W-151	Area: Z Plant	Category: Intermediate



Source: WHC-EP-0560, *Miscellaneous Underground Radioactive Waste Tanks*

Figure 4. 231-W-151 Vault and Tanks

Site: 231-W-151	Area: Z Plant	Category: Intermediate

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Site: 232-Z	Plant: Z Plant	Category: Shallow - Subsurface

Site Description

Alternate Site Identification: 232-Z, 232-Z Building Foundation, 232-Z Incineration Facility, 232-Z Incinerator, 232-Z Waste
Site Type: Process Unit/Plant
Facility/Geographic Area: 200W
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: Not assigned
Service Dates: 1959-1976

Waste Site Location and Physical Description: The 232-Z waste site is located adjacent to the south side of 2736-ZB. The 232-Z abovegrade structures were demolished to slab-on-grade in July 2006. All penetrations through the floor slab were plugged with grout or a fire block material (low-density silicone elastomer) prior to building demolition. After building demolition, the floor slab was painted with polymeric barrier system (PBS) fixative and then covered with a minimum of 15 cm (6 in.) of gravel. Contaminated soil surrounding the slab was removed down to at least 15 cm (6 in.) and disposed at Environmental Restoration Disposal Facility.

The underground ventilation ducting from the 232-Z Building and the 291-Z Building was filled with a controlled density fill (i.e., grout) (Figure 2). The D-6 drain line was isolated from the 241-Z Facility (Figure 3). The 232-Z incinerator building had been a concrete block structure with a slightly sloped roof. The building was divided into areas devoted to processing, storage, change rooms, chemical preparation, ventilation, and utility distribution. The building had two stories at the north end and a single story over the remaining portions.

Waste Site Coordinates:
E-566451.555377 N-135563.011691

Site Dimensions:
Site Length: 17.4 m (57 ft) Site Depth/Height: 5.79 m (19 ft)
Site Width: 11.3 m (37 ft)

Related Site Structures: Structures associated with the facility include internal glove boxes, incinerators, and leaching equipment. Subsites include 232-Z: 1, 232-Z: 2, and 232-Z: 3. The 232-Z Building is related to other plutonium recovery and processing facilities at Z Plant.

Site Posting: The gravel-covered slab is posted with Underground Radioactive Material Area signs.

Site: 232-Z	Plant: Z Plant	Category: Shallow - Subsurface

Site History

The 232-Z waste site was designed and built to house a combustible waste incinerator known as the Contaminated Waste Recovery Process Facility or the Plutonium Finishing Plant Incinerator Building. Plutonium was recovered in 232-Z through incineration of plutonium-contaminated combustible scrap materials and leaching of non-combustible materials. Nitric acid and aluminum nitrate nonahydrate were used in the leaching process. Off-gases produced were routed to scrubber equipment and a high-efficiency particulate air filter system before exiting the building through multiple inlet/exhaust air ducts below the slab that tie into a single underground duct to 291-Z. The underground ductwork is approximately 0.9 m to 7.1 m (3 ft to 7 ft) belowgrade. A new ventilation system was installed in 1990 on the east wall of the 232-Z Building. The incinerator was shut down in 1973 and from 1973 to 1983 the facility was used for waste segregation activities.

Release Summary: Releases that are the most likely to have contaminated the 232-Z slab or surrounding soil are noted as follows:

- In 1962, the scrubber cell pump failed and spilled contamination in a significant percentage of the facility. Radionuclides leached into the southwest corner of the floor and through the wall to the exterior southwest corner and contaminated soils immediately adjacent to the building. Based on similar spills in the Hanford site, it is assumed that a majority of the contamination is contained in the top 0.6 cm (0.25 in.) of the concrete. A gravel cover was placed over the contaminated area to prevent potential exposure and dispersion. Contamination on the wall was fixed by painting over the affected area.
- On January 25, 1963, a routine radiation survey of the incinerator glove box revealed loose contamination on an electrical junction box. An investigation found that vertical furnace flues were cracked where they were welded to the burning chamber and contaminated the process room.
- Pressurization of the ash-discharge chamber resulted in ashes and clinkers being discharged onto the glovebox floor.
- On July 5, 1965, a fire involved four gloveboxes and the plastic bag port, spreading contamination within the building and into exhaust filters, contaminating the process room.
- In July 1965, vertical flues broke loose from the burning chambers resulting in virtually complete separation of flues from the chambers, contaminating the process room.
- Unspecified releases have been associated with the change out of floor filters that have contaminated the underground ductwork to 291-Z.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Site: 232-Z	Plant: Z Plant	Category: Shallow - Subsurface

Waste Inventory: Not Available.

Previous Site Characterization

Site Characterization Summary: Prior to the demolition of the 232-Z building, the floor drains, floors, and the underground duct were sampled. Sediment samples from the drains were analyzed for metals and radionuclides. No significant radiological activity was detected in the samples, and lead was found to be 44 mg/L in the change room drain and chemical mix drain samples. liquid samples from the process room drain and the scrubber cell drains were sampled for radionuclides, metals, corrosivity, and polychlorinated biphenyls (PCBs). Liquid sample results detected minimal plutonium but americium-241 was detected at 2.85E-04 µCi/mL. The pH range of the liquid samples were 7.94 to 8.27, no metals were detected in regulated concentrations, and there was approximately 23 µg/L of PCB contamination in the liquid samples.

During demolition of the 232-Z facility, a sample was collected from water removed from the buried 7.6 cm (3 in.) diameter drain line that drained into the 241-Z Facility Tank D-6. The water generally measured at less than 10^{-3} µCi/mL alpha.

After the fixative was applied to the foundation and contaminated soil was removed, a post-demolition radiological survey was performed. More soil was removed and contamination found on the north sheetmetal wall (found to be 24 dpm and 151 dpm/100 cm^2 alpha) was decontaminated. The highest contamination found on the slab was 240 dpm/100 cm^2 removable alpha. No contamination was found on the 2736-ZC west side wall.

In 2011, soil samples from four boreholes approximately 6.7 m (22 ft) from 232-Z site boundary were analyzed for gross alpha, gross beta, and hydrocarbons. Borehole locations are summarized in Table 1 and shown on Figure 1. The results of the 2011 soil sampling are summarized in Table 2. The site was mapped using Global Positioning System equipment on July 13, 2006. Because these boreholes are outside the site boundary, the data are not believed to be representative of potential subsurface contamination closer to the 232-Z foundation, but may help bound the lateral extent of contamination.

Table 1. Borehole Summary—232-Z

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2003	C4063	Outside, approximately 209 ft west	42
2003	C4064	Outside, approximately 140 ft northeast	29
2003	C4065	Outside, approximately 134 ft north	44
2003	C4066	Outside, approximately 53 ft northeast	40
2003	C4067	Outside, approximately 22 ft south	39
2011	C8431	Outside, approximately 22 ft west	13

Site: 232-Z	Plant: Z Plant	Category: Shallow - Subsurface

Table 1. Borehole Summary—232-Z

Year	Borehole/Well ID	Location with Respect to Site	Depth (ft)
2011	C8432	Outside, approximately 22 ft west	13
2011	C8433	Outside, approximately 22 ft west	13
2011	C8434	Outside, approximately 22 ft west	13
2011	C8435	Outside, approximately 22 ft west	13

Table 2. Soil Maximum Concentration—232-Z

Borehole ID	Chemical	Sample Interval: 0-15 ft			Sample Interval: >15 ft		
		Maximum Detected Concentration	Units	Sample Depth (ft)	Maximum Detected Concentration	Units	Sample Depth (ft)
C8431	Gross Alpha	1.7	pCi/g	13	–	–	–
	Gross Beta	2.9	pCi/g	13	–	–	–
C8432	Gross Alpha	2.1	pCi/g	13	–	–	–
	Gross Beta	2.1	pCi/g	13	–	–	–
C8433	Gross Alpha	1.1	pCi/g	13	–	–	–
	Gross Beta	–	pCi/g	13	–	–	–

Notes:

C8431, C8432, C8433, C8434, C8435 were sampled in 2011 for 1,1-dichloroethene, benzene, chlorobenzene, ethylbenzene, toluene, total petroleum hydrocarbons – diesel range, trichloroethene, and xylenes (total). All results were below the minimum reporting limit (i.e., non-detect).

ID = identification

Nature and Extent of Contamination: Radiological contaminants of concern include americium-241, plutonium-238 through plutonium-242, neptunium-237, uranium-233 through uranium-238, strontium-90, cesium-137, and cobalt-60. The estimated legacy slab contamination that was fixed with a PBS fixative was 1 g (0.035 oz) plutonium at a 95 percent confidence level, with most of the plutonium assumed to be on the former scrubber cell floor. An estimated 11 g (0.39 oz) total content plutonium (20 g [0.7 oz] extrapolated criticality value) is distributed throughout the underground ducting to 291-Z.

Fixed contamination was identified on the sidewalk between 232-Z and 2731-ZA. The sidewalk was sprayed with a vinyl material and painted yellow. A section of asphalt south of 2736-ZC (adjacent to 232-Z) was found to be contaminated. This area was resurfaced with asphalt.

Shallow (0 to 4.6 m [0 to 15 ft] belowground surface [bgs]): Potential radiological contamination in the surface and/or subsurface of the foundation.

Site: 232-Z	Plant: Z Plant	Category: Shallow - Subsurface

References:

Cox, W.G., 2012, WIDS Site Information Form for 232-Z/232-Z Building Foundation.

DOE/RL-2004-22, 2004, *Sampling and Analysis Plan for the Contaminated Waste Recovery Process Facility, Building 232-Z*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D5452472.

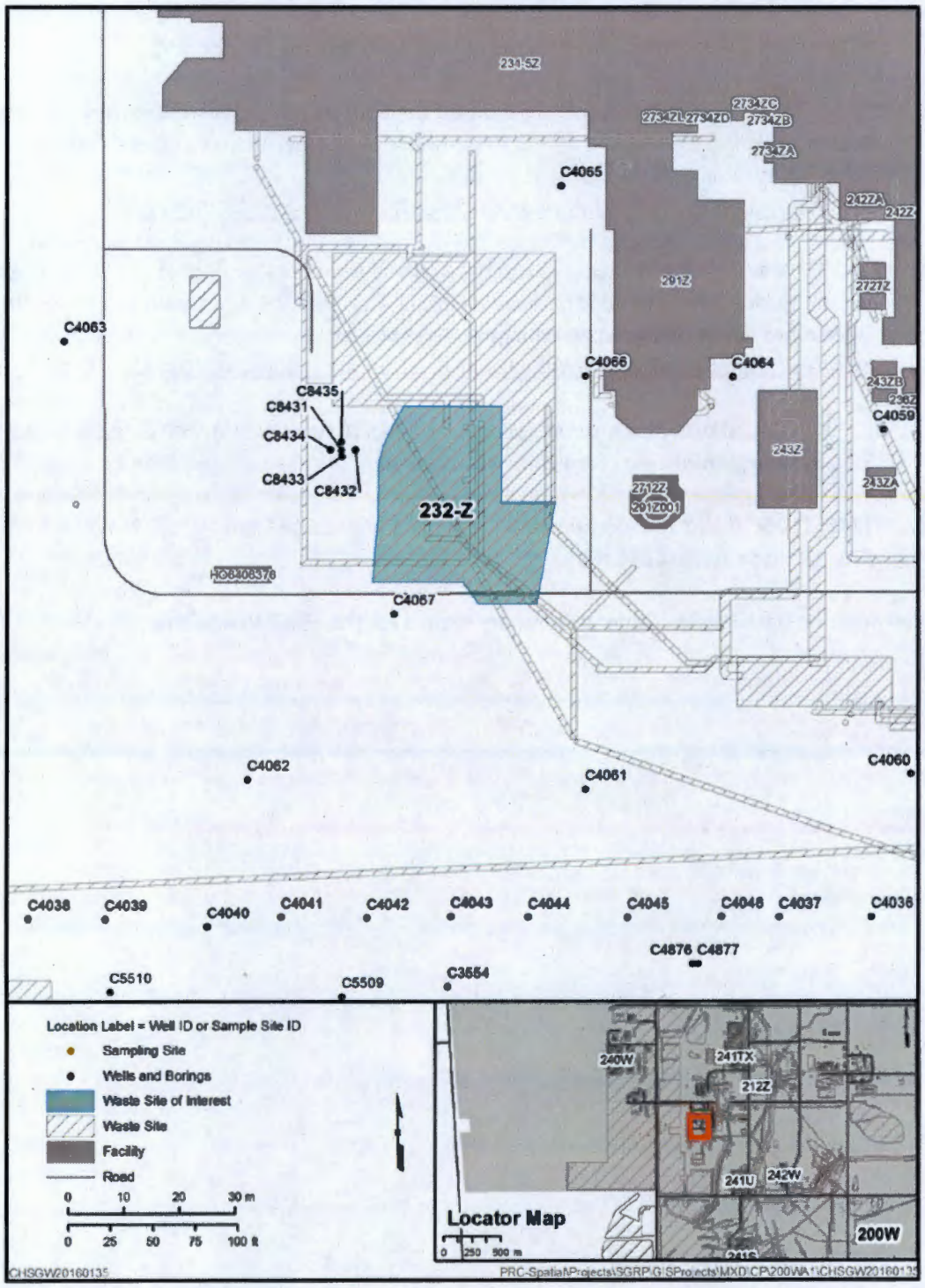
DOE/RL-2003-29, 2004, *Engineering Evaluation/Cost Analysis from the Removal of the Contaminated Waste Recovery Process Facility, Building 232-Z*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA236741.

HNF-31158, 2007, *232-Z Waste Incineration Building Removal Action Construction Completion Report*, Rev. 0, Fluor Hanford Inc., Richland, Washington.

NA-1011191149, 2006, "FW: 232-Z Certification as Inactive Waste Site," (email to C.R. Webb from R.W. Oldham, August 8).

Waste Information Data System General Summary Report for the 232-Z Waste Site.

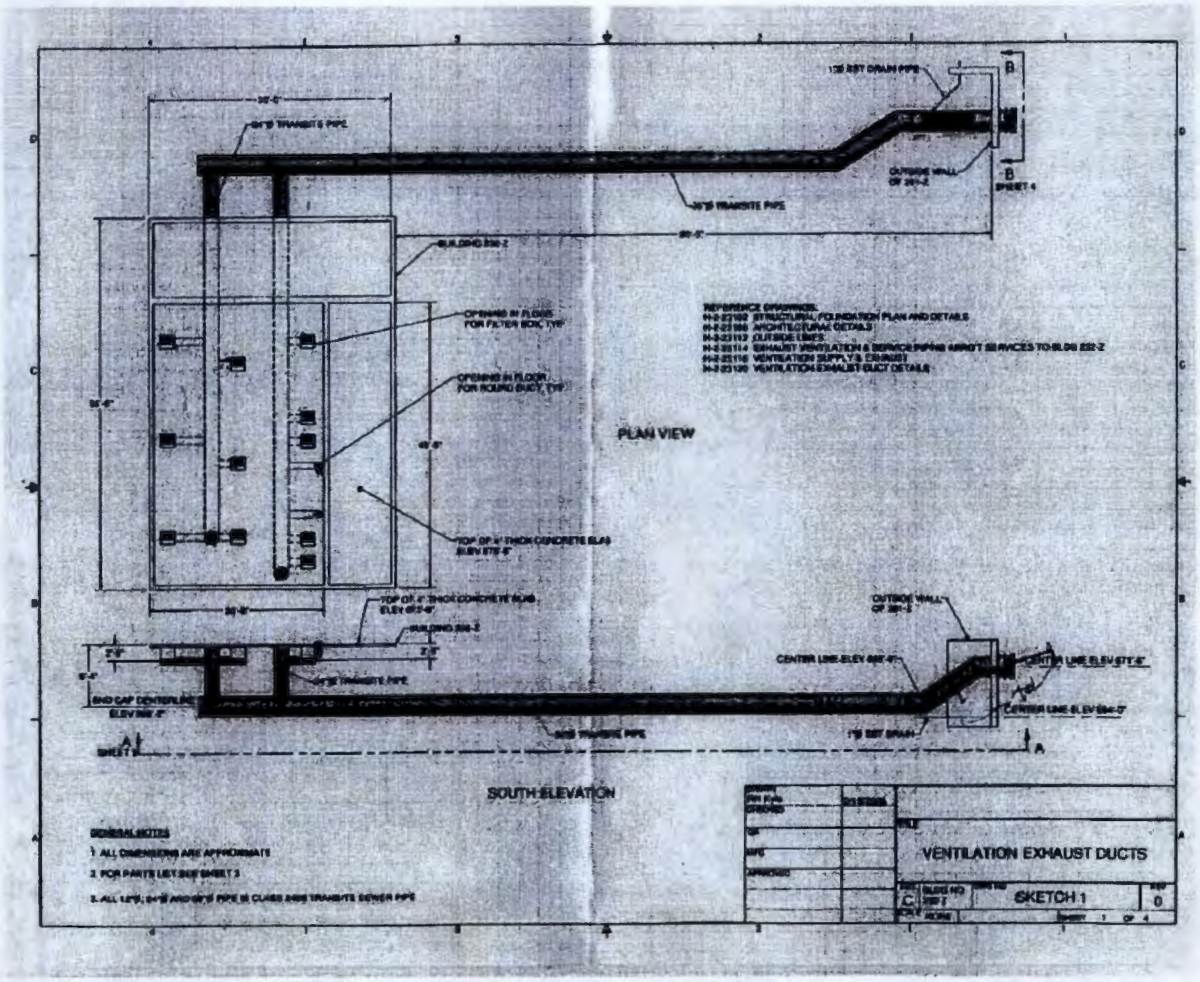
Site: 232-Z	Plant: Z Plant	Category: Shallow - Subsurface



ID = identification

Figure 1. 232-Z Waste Site Map and Existing Borehole Locations

Site: 232-Z	Plant: Z Plant	Category: Shallow - Subsurface

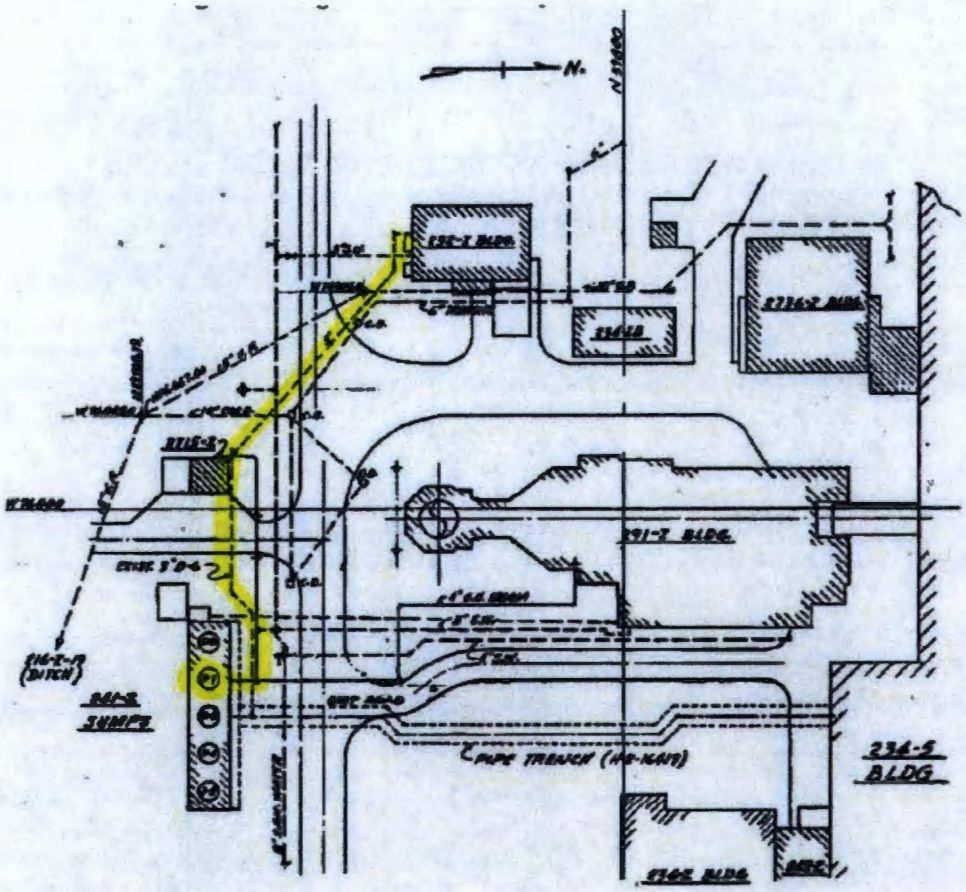


Source: Oldham, 2006, *232-Z Certification as Inactive Waste Site.*

Note: Produced from the best available copy.

Figure 2. Diagram of 232-Z Slab and Underground Ducting

Site: 232-Z	Plant: Z Plant	Category: Shallow - Subsurface

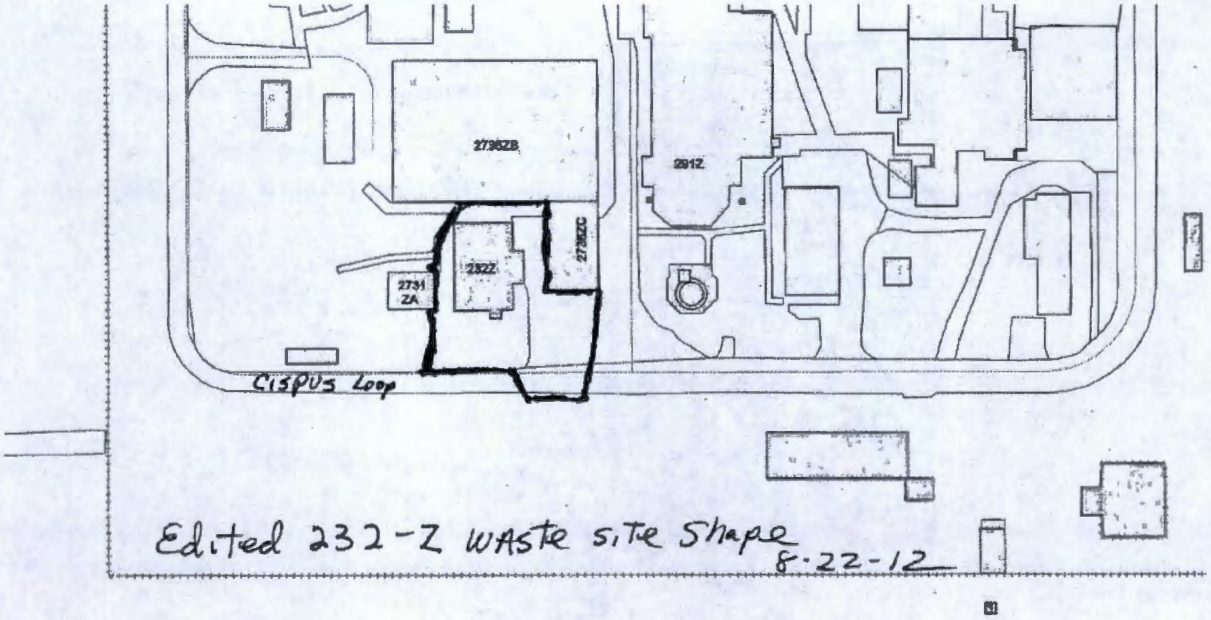


Source: Oldham, 2006, *232-Z Certification as Inactive Waste Site*.

Note: Produced from the best available copy.

Figure 3. Diagram of 232-Z Facility D-6 Drain Line

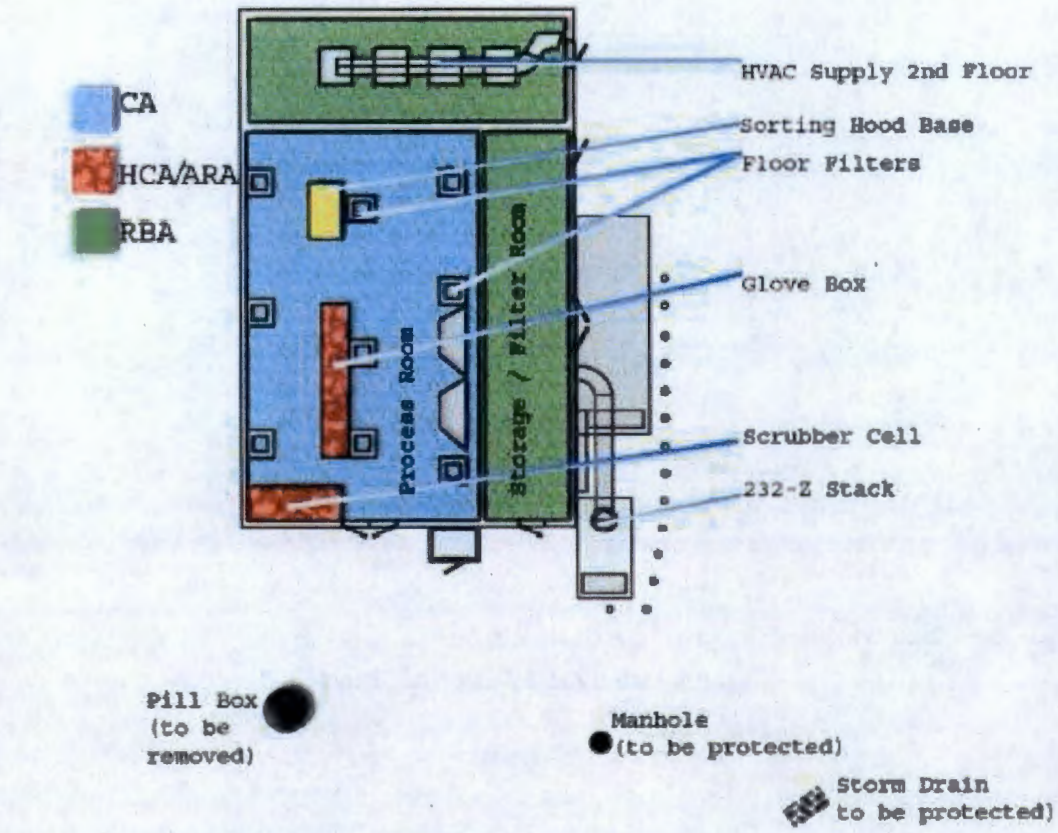
Site: 232-Z	Plant: Z Plant	Category: Shallow - Subsurface



Source: Cox, 2006, WIDS Site Information Form for 232-Z/232-Z Building Foundation.

Figure 4. Edited 232-Z Waste Site Shape

Site: 232-Z	Plant: Z Plant	Category: Shallow - Subsurface



CA – contamination area
HCA/ARA – high-contamination area/airborne radioactivity area
HVAC – heating, ventilation, and air conditioning
RBA – radiological buffer area

Source: HNF-31158, *232-Z Waste Incineration Building Removal Action Construction Completion Report.*

Note: Produced from the best available copy.

Figure 5. 232-Z Layout with Identified Contamination Areas

Site: 2607-W8	Area: Z Plant	Category: Intermediate

Site Description

Site Identification: 2607-W8
Site Type: Septic Tank
Facility/Geographic Area: Z Plant (Plutonium Finishing Plant Area)
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1, 200-ST-1
Service Dates: 1944 to 1998

Waste Site Location and Physical Description: The 2607-W8 waste site is located northeast of the 2231-Z Building, and east of the 216-Z-16 Crib (Figure 1). The posted radiation zone containing the 216-Z-5 and Z-4 Cribs is adjacent and to the south of the 2607-W8 System. The 2607-W8 System consists of a septic tank and an associated tile field (Figure 2). The septic tank is made of reinforced concrete and has one chamber. A dosing siphon is connected to the single tank chamber. Three manholes on the surface of the tank gave employees access. The site is marked with a sign that reads "Septic Tank – 2607-W8."

Waste Site Coordinates:
Lon-566582.18405 Lat-136010.75849

Site Dimensions:
Site Length: 5.9 m (19.6 ft) Site Depth: 3.7 m (12.0 ft)
Site Width: 1.8 m (6.0 ft) Cover Thickness: Not specified
Site Area: 140 m^2 (150 ft^2) Capacity: 19,190 L (5,070 gal)
Dimensions of the septic tank.

Related Site Structure(s): The 2607-W8 Septic Tank and Tile Field are associated with the 231-Z Building.

Site Posting: No site posting is specified for 2607-W8. The site is located outside the posted Radiation Area for the 216-Z-4 and 216-Z-5 Cribs.

Site History

Release Summary: The 2607-W8 Septic Tank and Tile Field were built in 1944 for the treatment of nondangerous and nonradioactive sanitary sewer effluent from the 231-Z Building.

The 231-Z Building was associated with the plutonium product finishing process.

Despite the site being associated with the 231-Z Building, it is stated that no radionuclides or hazardous substances are associated with this system.

Site: 2607-W8	Area: Z Plant	Category: Intermediate

The 2607-W8 Septic Tank was constructed with a 19,190 L (5,070 gal) per day holding capacity. The System received sanitary sewer effluent at an estimated rate of 5,015 L (1,325 gal) per day in 1992. The estimated rate was 5.45 m^3 (192 ft^3) per day in 1987.

Volume/Mass Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Unknown.

Previous Site Characterization

Site Characterization Summary: The septic system was deactivated following established Washington Administrative Code guidelines in 1998. All waste inside the tank was removed and the empty tank was filled to eliminate void space. No sampling records from the deactivation period are available.

A site walkdown on July 3, 2000, verified that the 2607-W8 Septic Tank and Tile Field are not inside the posted radiation area of the 216-Z-4 and 216-Z-5 Cribs as previously thought. Instead, they are located just north of the cribs.

No site characterization information is presented for 2607-W8. The site is not routinely surveyed or monitored.

Nature and Extent of Contamination: Insufficient data are available to evaluate shallow or intermediate depth soil contamination.

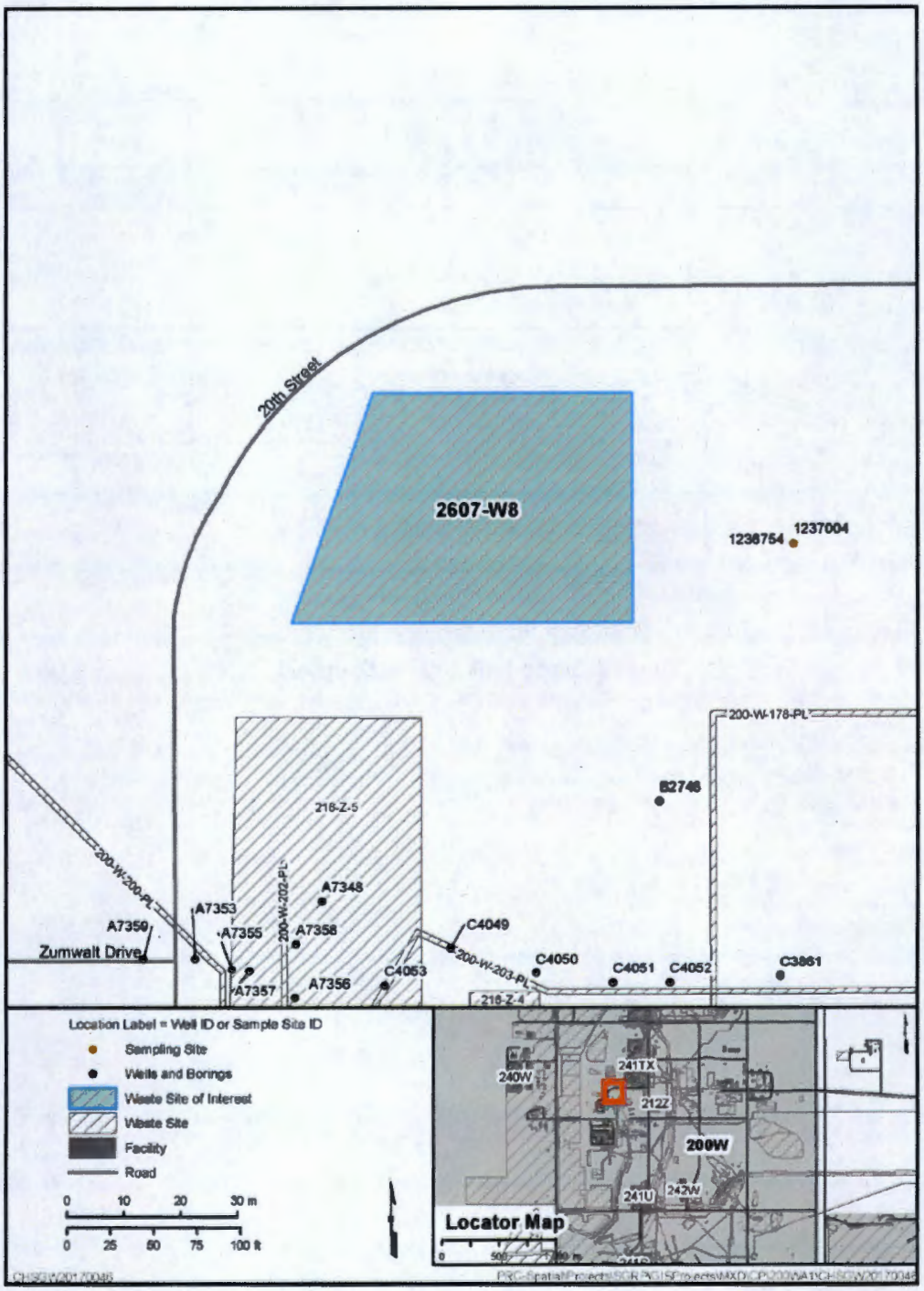
References:

H-2-44511 (drawing), 1995, *Area Map 200 West Z Plant Facilities*, Sh. 103, Rev. 5, Atlantic Richfield Hanford Company, Richland, Washington.

H-2-44511 (drawing), 1984, *Area Map – 200 West "T" Plant Facilities*, Sh. 111, Rev. 5, Rockwell Hanford Operations, Richland, Washington.

Waste Information Data System General Summary Report for the 2607-W8 Waste Site.

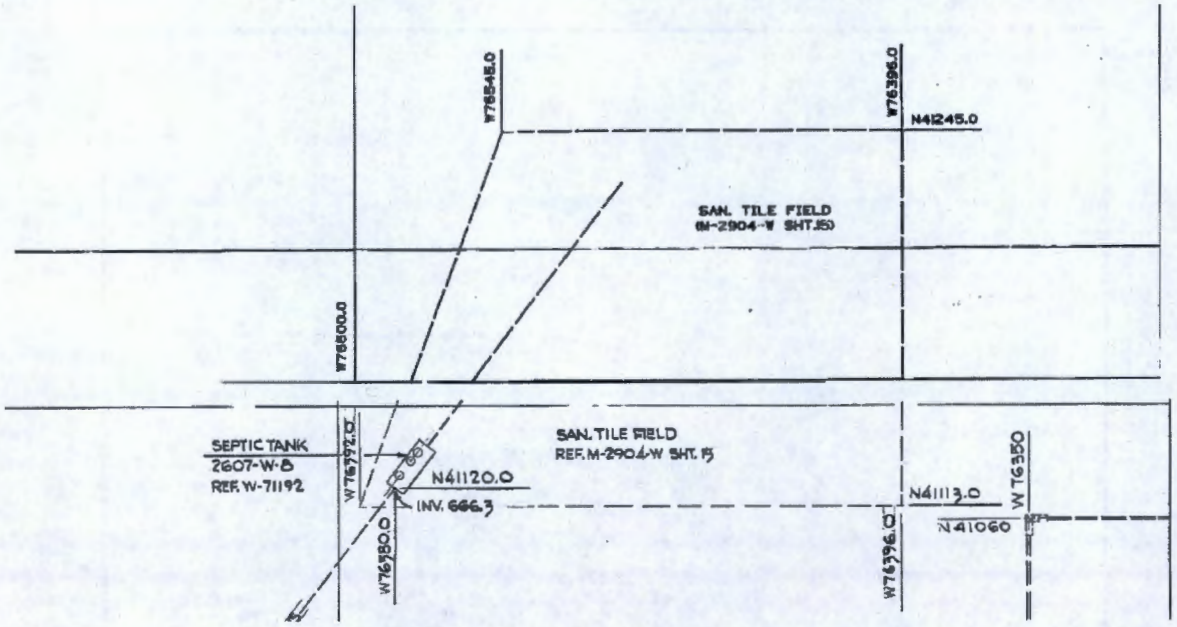
Site: 2607-W8	Area: Z Plant	Category: Intermediate



ID = identification

Figure 1. 2607-W8 Waste Site Map

Site: 2607-W8	Area: Z Plant	Category: Intermediate



Sources: H-2-44511, *Area Map – 200 West "T" Plant Facilities*, Sheet 111 (top figure).
H-2-44511, *Area Map 200 West Z Plant Facilities*, Sheet 103 (bottom figure).

Figure 2. Septic Tank and Tile Drainfield

Site: 2607-Z	Area: Z Plant	Category: Intermediate

Site Description

Site Identification: 2607-Z
Site Type: Septic Tank
Facility/Geographic Area: Z Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Service Dates: 1949 to June 1, 1999

Waste Site Location and Physical Description: The 2607-Z waste site is an inactive septic system located in a fenced area approximately 33.6 m (110 ft) east of the 236-Z Building and southeast of the 234-5Z Building (Figures 1, 2, and 3). The septic system consists of a tank and a tile drain field. As shown on Figure 4, the septic tank is reinforced concrete, and has two chambers with three 76.2 cm (30-in.) diameter access holes. A 20.3 cm (8 in.) diameter pipe, with an automatic sewage siphon, enters the septic tank and a 15.2 cm (6 in.) diameter pipe exits the tank to the tile drain field. The drain field is located approximately 18.6 m (61 ft) east of the septic tank (Figures 2 and 3). The drain field consists of 36 rows of 15 cm (6-in.) drain tile spaced at 2.4 m (8-ft) intervals. It lies in a gravel bed that extends a minimum of 45.7 cm (18 in.) below the drain pipe and is recessed below the original grade.

Waste Site Coordinates (estimated from QMap):

Location	Easting	Northing
Drain field – NW Corner	566608.21	135612.47
Drain field – NE Corner	566653.85	135612.60
Drain field – SW Corner	566608.37	135526.83
Drain field – SE Corner	566653.94	135527.4
Septic Tank – NW Corner	566585.82	135578.83
Septic Tank – NE Corner	566589.31	135578.65
Septic Tank – SW Corner	566585.82	135567.72
Septic Tank – SE Corner	566589.37	135567.72

Site Dimensions:

Septic Tank

Site Length: 10.97 m (36 ft)
Site Depth: Bottom of tank 5.33 m (17.5 ft),
Fluid level (belowground surface): 2.5 m (8.2 ft)
Site Width: 3.35 m (11 ft)
Cover Thickness: 0.16 m (0.5 ft)
Site Area: 36.75 m^2 (396 ft^2)
Capacity: 94,635.3 L (25,000 gal)

Source: DOE/RL-91-58, *Z Plant Source Aggregate Area Management Study Report*, and H-2-16457, *Septic Tank & Tile Field Details*.

Site: 2607-Z	Area: Z Plant	Category: Intermediate

Drain Field

Site Length: 86 m (282.15 ft)
Site Width: 47 m (154.2 ft)
Site Area: 4,042 m^2 (43,508 ft^2)
Site Depth*: 4.6 m (15.2 ft)
Cover Thickness: 4.2 m (13.7 ft)

*Approximately 0.46 m (1.5 ft) below drain pipe (ground surface = 205.3 m [673.5 ft] [H-2-44511, *Area Map 200 West "Z" Plant Facilities*, Sheet 87]. Pipe = 201.1 m [659.8 ft] [H-2-16457]).

Related Site Structure(s): The 2607-Z Septic Tank is associated with 234-5Z, 2704-Z, 270-Z, 236-Z, 2701-ZA, 2701-ZD, and 2750-Z Buildings (Waste Information Data System [WIDS]).

Site Posting: Not specified.

Site History

Release Summary: The 2607-Z Septic Tank and associated drain field accepted sanitary wastewater and septic waste from the 234-5Z and 2704-Z Buildings. This septic system was a non-permitted system. DOE/RL-91-58 reports that no radionuclides or hazardous substances have been associated with this waste site. The 2607-Z septic system was replaced by a new regional system (2607-W1) in 1999.

Volume/Mass Discharged: The system received effluent at an estimated rate of 23,000 L (6,000 gal) per day (DOE/RL-91-58).

Pore Volume Discharged: Unknown

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: The 2607-Z Septic Tank and associated drain field accepted sanitary wastewater and septic waste from the 234-5Z and 2704-Z Buildings.

The tank was decommissioned in 1999 in accordance with *Washington Administrative Code* 246-272-18501, "Wastewater and Reclaimed Water Use Fees," "Abandonment". All septage inside the tank was removed and the empty tank was filled with a sand slurry. Per an agreement with the Washington State Department of Health, the septic system lids were left in place. The U.S. Department of Energy (DOE) notified the Washington State Department of Health of the septic system abandonment (99-EAP-392) on July 8, 1999.

No site characterization information is available for 2607-Z. The site is not routinely surveyed or monitored. It should be noted that there has been confusion regarding analytical sampling at this site.

Site: 2607-Z	Area: Z Plant	Category: Intermediate

WIDS associates sample W99DC00121 with the septic tank. However, the analysis date for this sample (October 5, 1999) is well after the tank was reportedly abandoned and filled with sand.

Nature and Extent of Contamination: Insufficient data are available to evaluate shallow or deep soil contamination.

References:

99-EAP-392, 1999, "Notice of Septic System Abandonment" (letter to L.A. Brown, Washington State Department of Health, from J.E. Rasmussen, July 8), U.S. Department of Energy, Richland Operations Office, Richland, Washington.

BHI-00175, 1995, *Z Plant Aggregate Area Management Study Technical Baseline Report*, Rev. 00, Bechtel Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D198038137.

DOE/RL-91-58, 1992, *Z Plant Source Aggregate Area Management Study Report*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

H-2-14035 (drawing), 1973, *Permanent Plot Plan 234-5 Building 200 W Area*, Rev. 16, General Electric Company, Richland, Washington.

H-2-16421 (drawing), 1973, *Underground Services Sewer and Water*, Rev. 21, General Electric Company, Richland, Washington.

H-2-16457 (drawing), 1949, *Septic Tank & Tile Field Details*, Sh. 1, Rev. 2, General Electric Company, Richland, Washington.

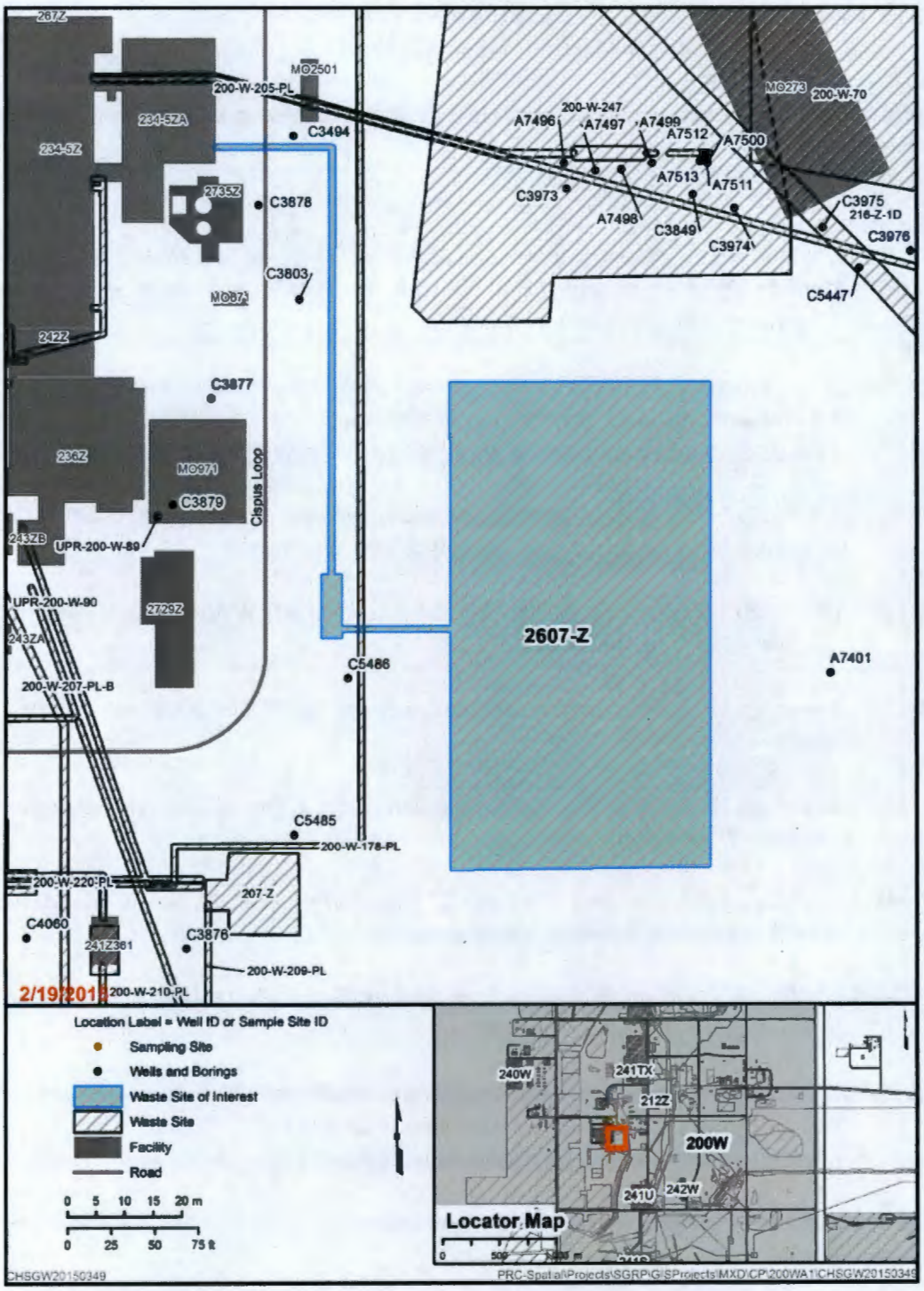
H-2-44511 (drawing), 1983, *Area Map 200 West "Z" Plant Facilities*, Sh. 87, Rev. 6, Atlantic Richfield Hanford Company, Richland, Washington.

HNF-SD-LL-SP-001, 1998, *200 and 600 Areas Sanitary Wastewater Master Plan*, Rev. 1, Fluor Daniel Northwest, Inc., Richland, Washington.

WAC 246-272-18501, "Wastewater and Reclaimed Water Use Fees," "Abandonment," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=246-272.

WIDS General Summary Report for the 607-Z Waste Site.

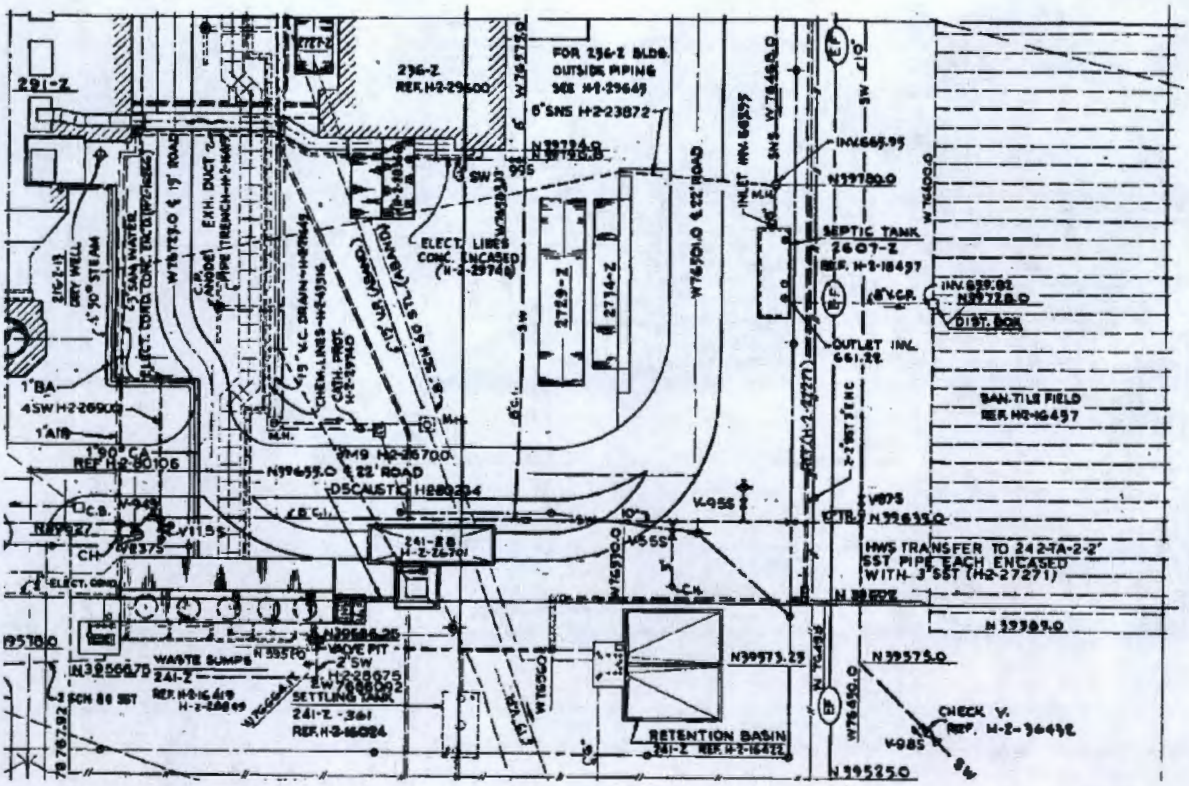
Site: 2607-Z	Area: Z Plant	Category: Intermediate



ID = identification

Figure 1. 2607-Z Waste Site Map

Site: 2607-Z	Area: Z Plant	Category: Intermediate

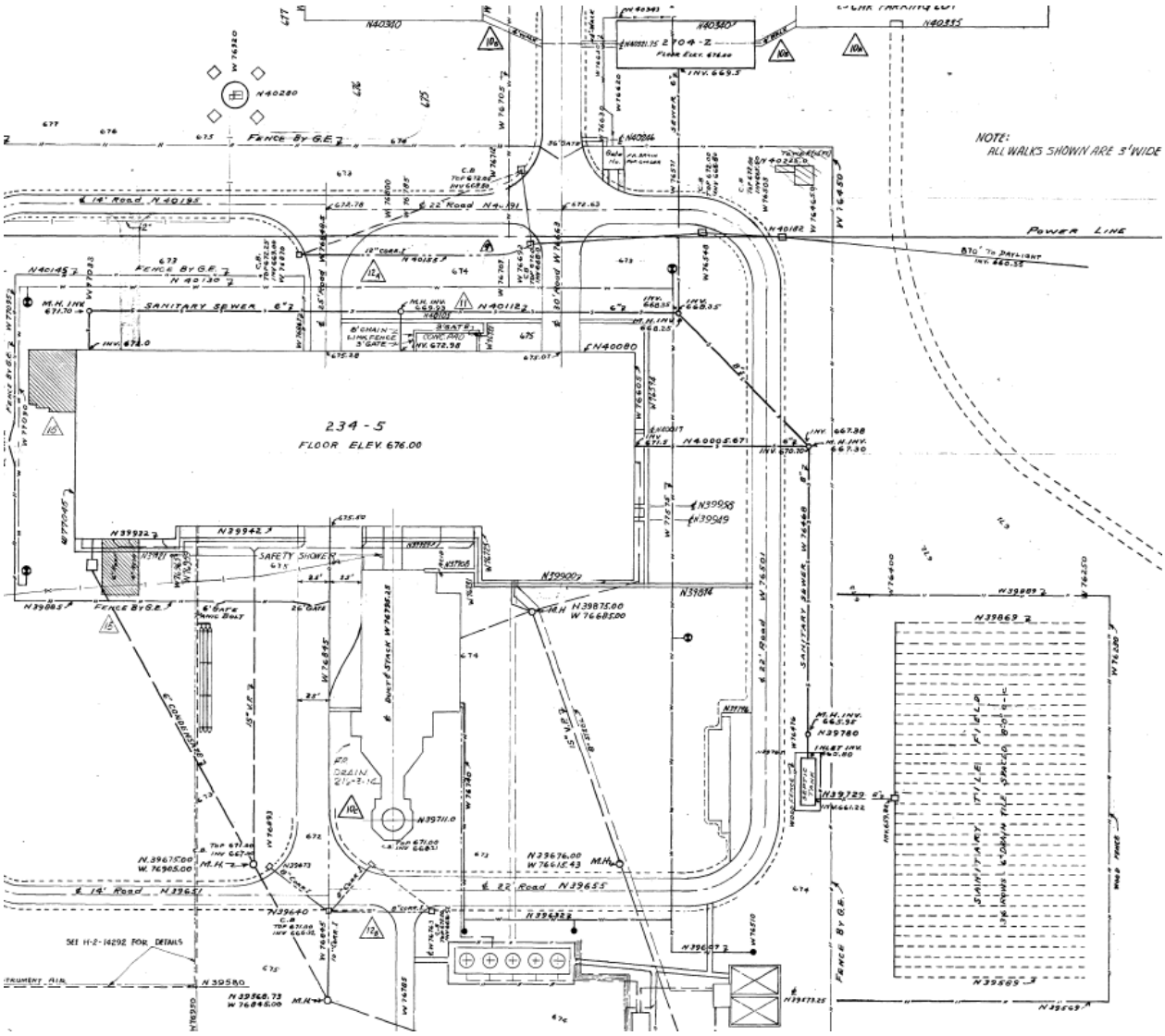


Source: H-2-44511, *Area Map 200 West "Z" Plant Facilities*, Sheet 87.

Note: Produced from the best available copy.

Figure 2. Location of THE 2607-Z Waste Site

Site: 2607-Z	Area: Z Plant	Category: Intermediate

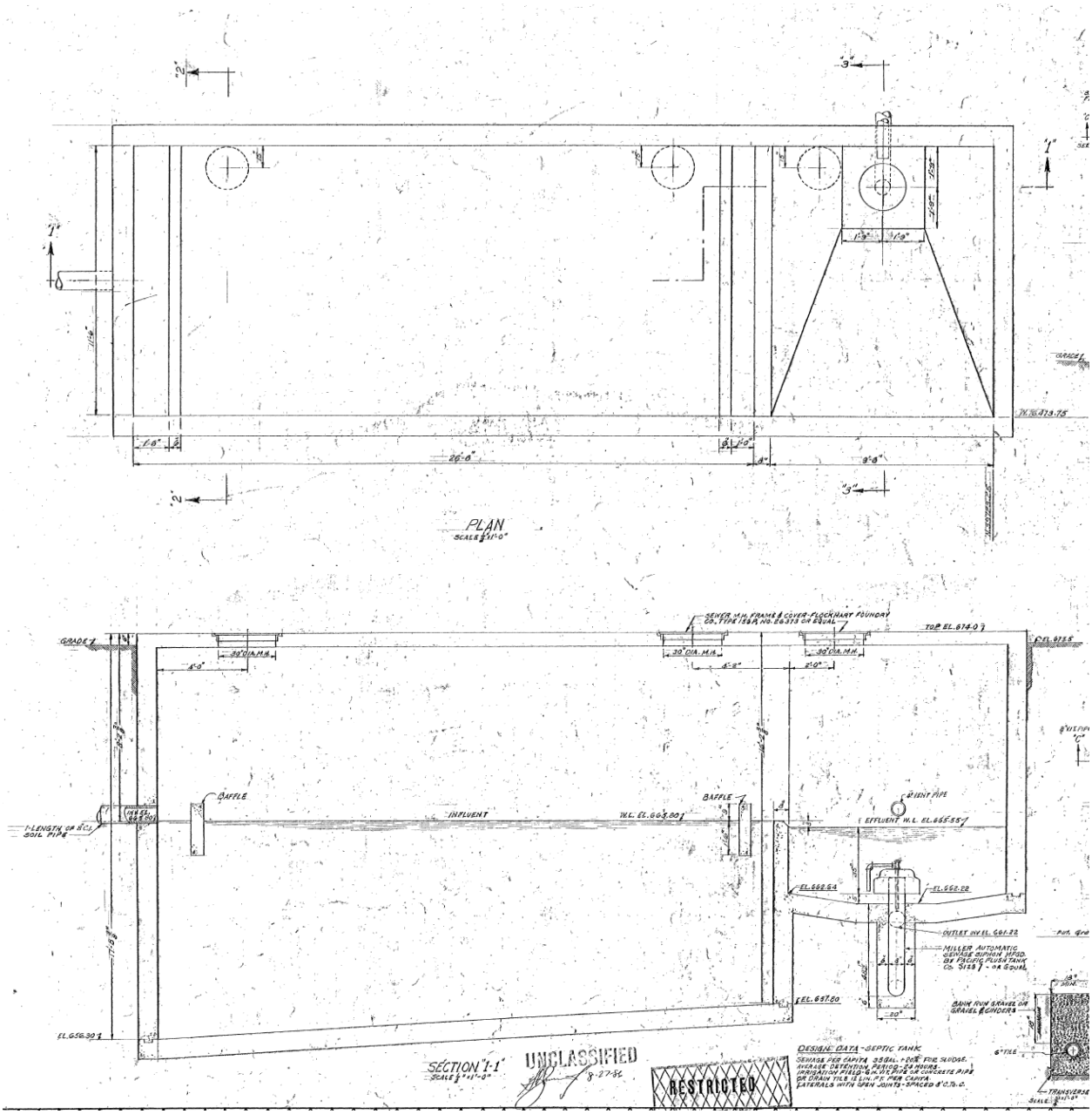


Source: H-2-14035, *Permanent Plot Plan 234-5 Building 200 W Area*.

Note: Produced from the best available copy.

Figure 3. Location of the 2607-Z Waste Site and Piping

Site: 2607-Z	Area: Z Plant	Category: Intermediate



Source: H-2-16457, *Septic Tank & Tile Field Details.*

Note: Produced from the best available copy.

Figure 4. Septic Tank Construction

Site: 2607-Z	Area: Z Plant	Category: Intermediate

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Site: 2607-Z1	Area: Z Plant	Category: Intermediate

Site Description

Site Identification: 2607-Z1
Site Type: Septic Tank
Facility/Geographic Area: Z Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Service Dates: 1958 to 1999

Waste Site Location and Physical Description: Site 2607-Z1 is an inactive septic system located west of the 2721-Z Building, southwest of the 234-5Z Facility (Figure 1). The septic system consists of a tank, distribution box, and drain field. The 2607-Z1 septic system, piping, and associated buildings are shown on Figures 2 and 3. The waste site boundaries in QMap are inconsistent with the boundaries shown on engineering drawings from 1959 through 1999 (H-2-23112, *Outside Lines*; H-2-80115, *Civil Site Plan*; H-2-44511, *Area Map 200 West "Z" Plant Facilities*, Sheet 87; and H-2-829506, *Civil Alignment A & B Plan*, Sheet 2). Both boundaries are shown on Figure 1. It is assumed that the engineering drawings show the correct location.

As shown on Figures 2 and 3, effluent was transported from the 234-5Z Annex via a 15.2 cm (6-in.) diameter transite pipe to the septic tank 30.48 m (100 ft) southwest of the building. Effluent was transported from the 232-Z and 2736-ZB buildings to the septic tank via a 10.2 cm (4-in.) diameter transite pipe. From the septic tank, effluent was distributed to thee drain pipes via the distribution box at the head (north end) of the drain field.

Figure 4 shows construction details for the septic tank and drain field. The 2,839 L (750-gal) septic tank is reinforced concrete with an asphaltic seal. The drain field consists of three 30.48 m (100 ft) pipes spaced 2.29 m (7.5 ft) apart and buried 0.61 m (2 ft) in a gravel bed. The gravel bed is covered with asphalt treated roofing paper, untreated building paper, and backfill.

Waste Site Coordinates (estimated from engineering drawings):

Location	Easting	Northing
Drain field – NW Corner	566402.04	135570.34
Drain field – NE Corner	566406.66	135570.32
Drain field – SW Corner	566401.90	135600.93
Drain field – SE Corner	566406.52	135601.01
Septic Tank – Center	135604.70	135604.70

Waste Site Coordinates (estimated from QMap):

Location	Easting	Northing
NW Corner	566403.30	135605.30
NE Corner	566408.74	135605.30
SW Corner	566403.30	135595.80
SE Corner	566408.74	135595.78

Site: 2607-Z1	Area: Z Plant	Category: Intermediate

Site Dimensions:

Septic Tank

Site Length: 2.29 m (7.5 ft)

Site Depth: Bottom of tank 1.83 m (6 ft),
Fluid level (below ground surface): 0.46 m (1.5 ft)

Site Width: 1.07 m (3.5 ft)

Cover Thickness: 0.16 m (0.5 ft)

Site Area: 2.44 m^2 (26.25 ft^2)

Capacity: 2,839 L (750 gal)

Source: H-2-20938, *Addition to the 234-5 Building*

Drain Field

Site Length: 30.48 m (100 ft)

Site Depth: 1.07 m (3.5 ft)

Site Width: 4.57 m (15 ft)

Cover Thickness: 0.46 m (1.5 ft)

Site Area: 139.35 m^2 (1,500 ft^2)

Source: H-2-20938

Related Site Structure(s): The 2607-Z1 septic system is associated with the 234-5Z Annex and 2736-ZB Building (WIDS [Waste Information Data System]). Based on engineering drawings, the site is also with the 232-Z Building.

Site Posting: Not available.

Site History

Release Summary: The 2607-Z1 Septic Tank and associated drain field received sanitary waste from restrooms in the 234-5Z Building Annex and the 232-Z Building beginning in 1958. The 2736-ZB building restrooms were tied into the septic system when the building was constructed in 1981. In 1999, the 2607-Z1 septic system was replaced by a new regional system (2607-W1) under project L-281.

Volume/Mass Discharged: Unspecified volume of liquid (assumed to be sanitary sewage). The septic system failed in the 1990s. Damage to the drain field laterals may have occurred when the ground surface over the drain field was used as a construction lay-down area. After the system failed, the tank was pumped weekly until it was decommissioned in 1999.

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: The 2607-Z1 Septic Tank and associated drain field accepted sanitary wastewater and septic waste from the 234-5Z, 232-Z, and 2736-ZB Buildings.

Site: 2607-Z1	Area: Z Plant	Category: Intermediate

The tank was decommissioned in 1999 in accordance with *Washington Administrative Code* 246-272-18501, "Wastewater and Reclaimed Water Use Fees," "Abandonment." All septage inside the tank was removed and the empty tank was filled with a sand slurry. Per an agreement with the Washington State Department of Health, the septic system lids were left in place. The U.S. Department of Energy notified the Washington State Department of Health of the septic system abandonment (99-EAP-392) on July 8, 1999.

No site characterization information is available for 2607-Z1. The site is not routinely surveyed or monitored. It should be noted that there has been confusion regarding analytical sampling at this site. Sample W99DC00114 was mistakenly associated with the septic tank (Curt Clement, November 22, 2003, WIDS. However, the analysis date for this sample (September 21, 1999) is well after the tank was reportedly abandoned and filled with sand. It appears that this confusion occurred as a result of the new pump station associated with the new regional system having a name (pump station 2607-Z1) and location (Figure 5) similar to waste site 2607-Z1.

Nature and Extent of Contamination: Insufficient data are available to evaluate shallow or intermediate depth soil contamination.

References:

99-EAP-392, 1999, "Notice of Septic System Abandonment" (letter to L.A. Brown, Washington State Department of Health, from J.E. Rasmussen, July 8), U.S. Department of Energy, Richland Operations Office, Richland, Washington.

BHI-00175, 1995, *Z Plant Aggregate Area Management Study Technical Baseline Report*, Rev. 00, Bechtel Hanford, Inc., Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D198038137.

DOE/RL-91-58, 1992, *Z Plant Source Aggregate Area Management Study Report*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

H-2-20938 (drawing), 1999, *Addition to the 234-5 Building*, Sh. 1, Rev. 1, General Electric Company, Richland, Washington.

H-2-23112 (drawing), 1959, *Outside Lines*, Rev. 3, General Electric Company, Richland, Washington.

H-2-44511 (drawing), 1983, *Area Map 200 West "Z" Plant Facilities*, Sh. 87, Rev. 6, Atlantic Richfield Hanford Company, Richland, Washington.

H-2-80115 (drawing), 1995, *Civil Site Plan*, Rev. 4, Vitro Engineering Corporation, Richland, Washington.

H-2-829506 (drawing), 1999, *Civil Alignment A & B Plan*, Sh. 2, Rev. 1, Fluor Daniel Northwest, Inc., Richland, Washington.

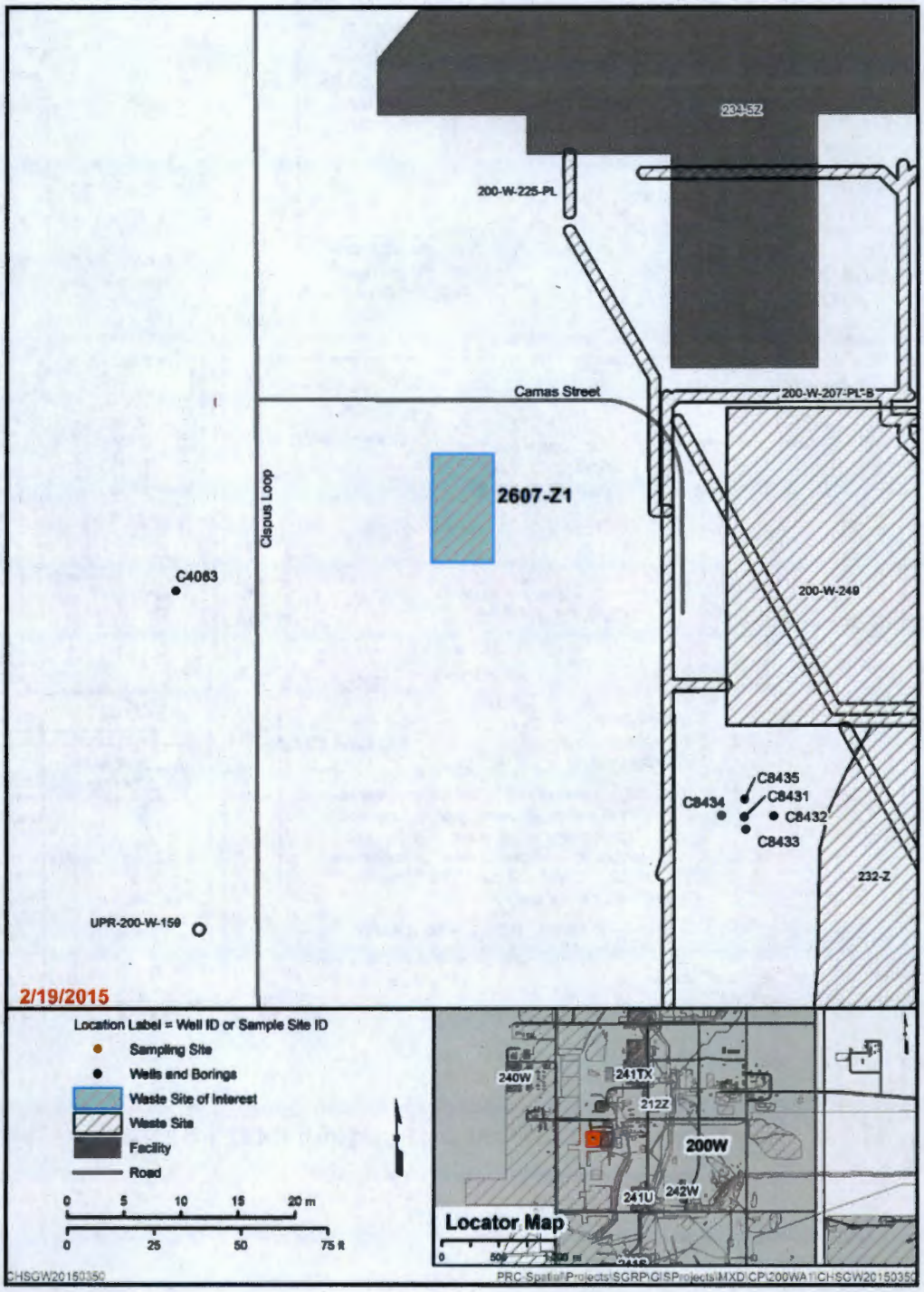
Site: 2607-Z1	Area: Z Plant	Category: Intermediate

HNF-SD-LL-SP-001, 1998, *200 and 600 Areas Sanitary Wastewater Master Plan*, Rev. 1, Fluor Daniel Northwest, Inc., Richland, Washington.

WIDS General Summary Report for the 2607-Z1 Waste Site.

WAC 246-272-18501, "Wastewater and Reclaimed Water Use Fees," "Abandonment," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=246-272.

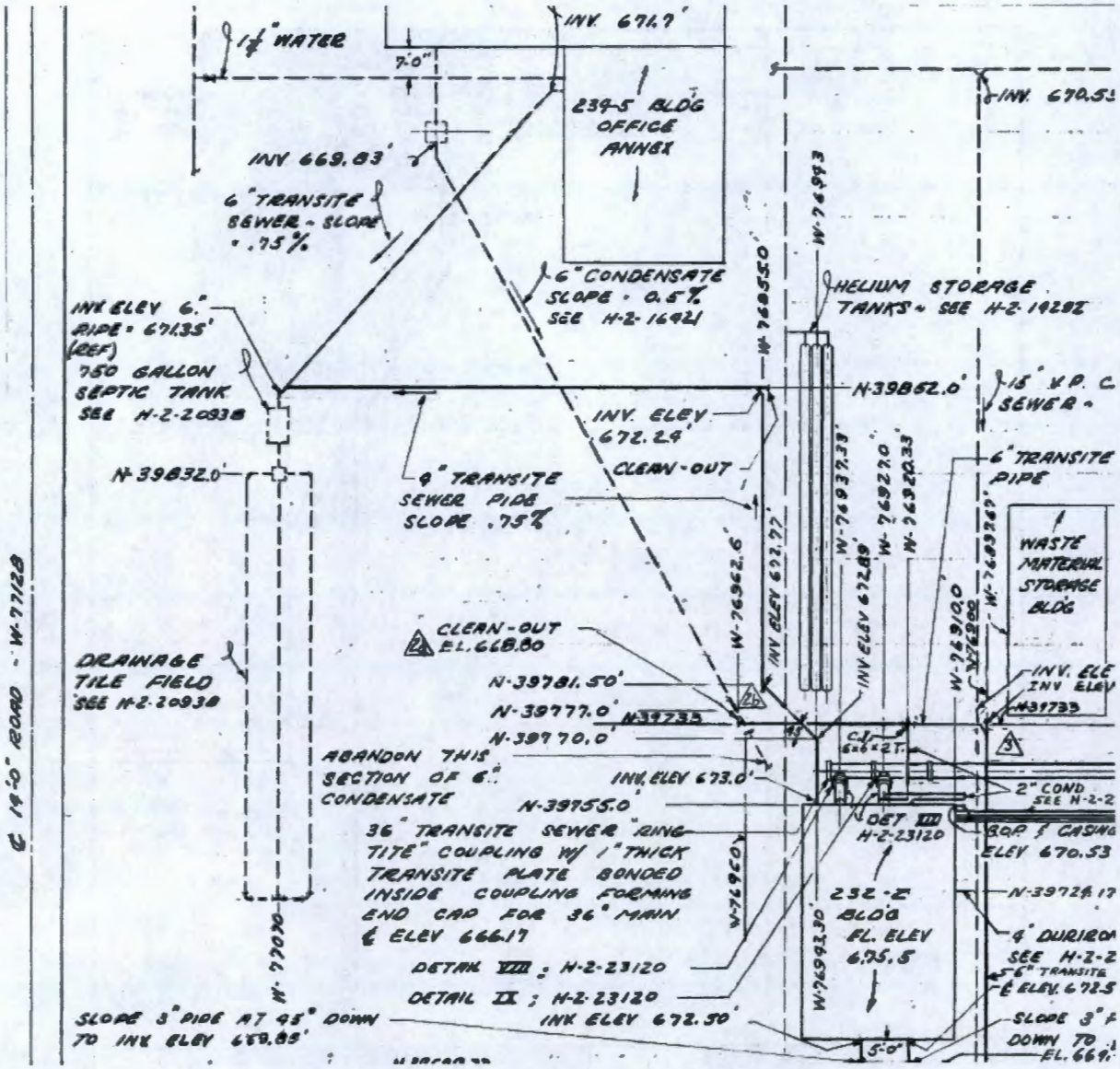
Site: 2607-Z1	Area: Z Plant	Category: Intermediate



ID = identification

Figure 1. 2607-Z1 Waste Site Map

Site: 2607-Z1	Area: Z Plant	Category: Intermediate

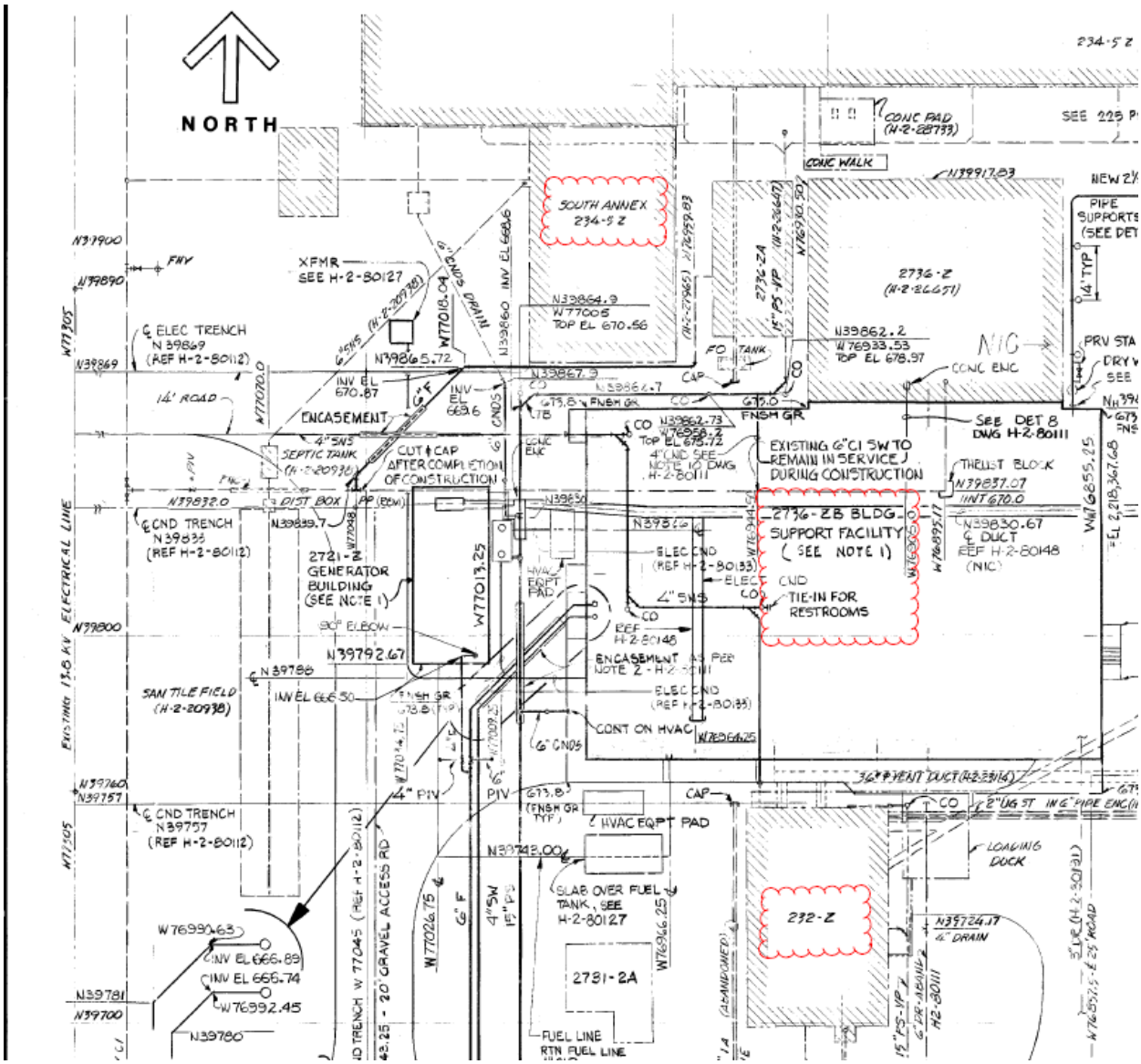


Source: H-2-23112, *Outside Lines*.

Note: Produced from the best available copy.

Figure 2. Septic Tank, Drain Field, and Piping from 234-5Z and 232-Z

Site: 2607-Z1	Area: Z Plant	Category: Intermediate

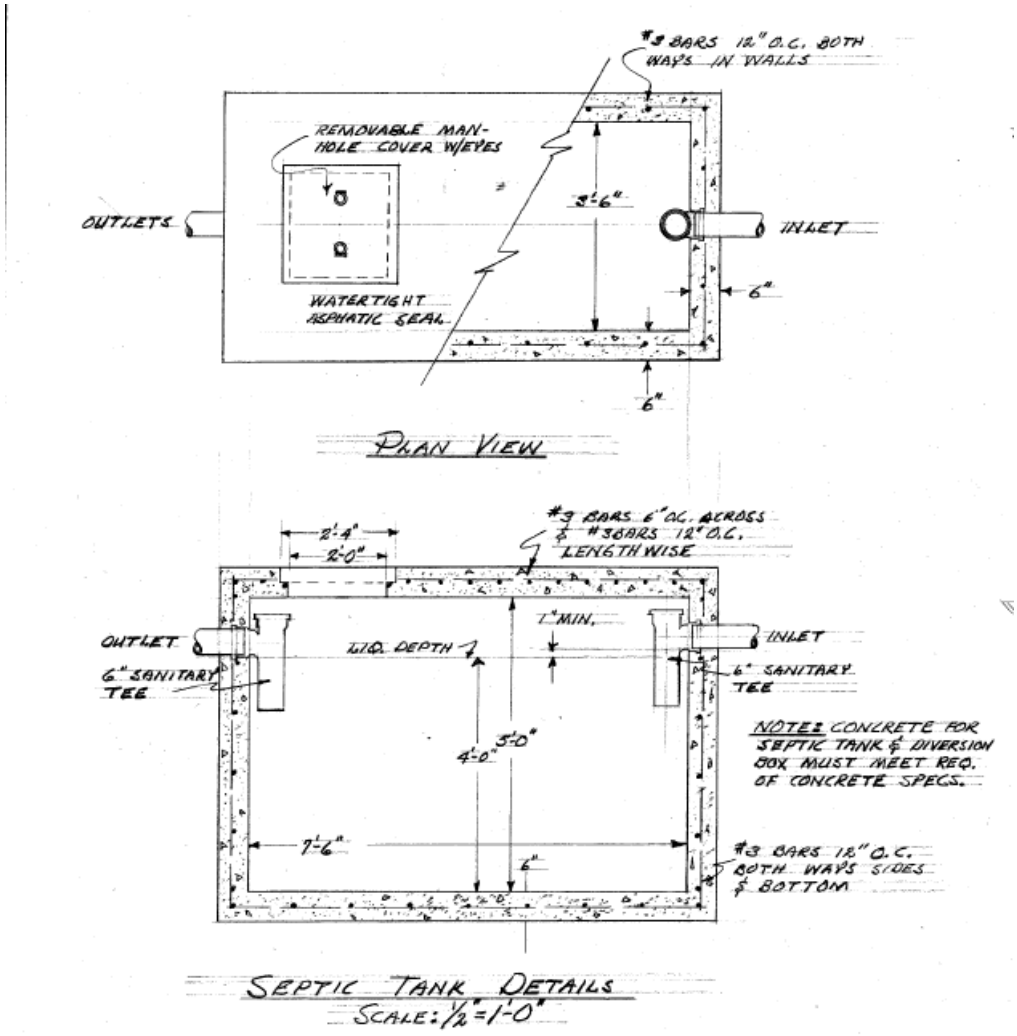


Source: H-2-80115, *Civil Site Plan*.

Note: Produced from the best available copy.

Figure 3. Septic Tank, Drain Field, and Piping from 234-5Z, 232-Z, and 2736-ZB

Site: 2607-Z1	Area: Z Plant	Category: Intermediate

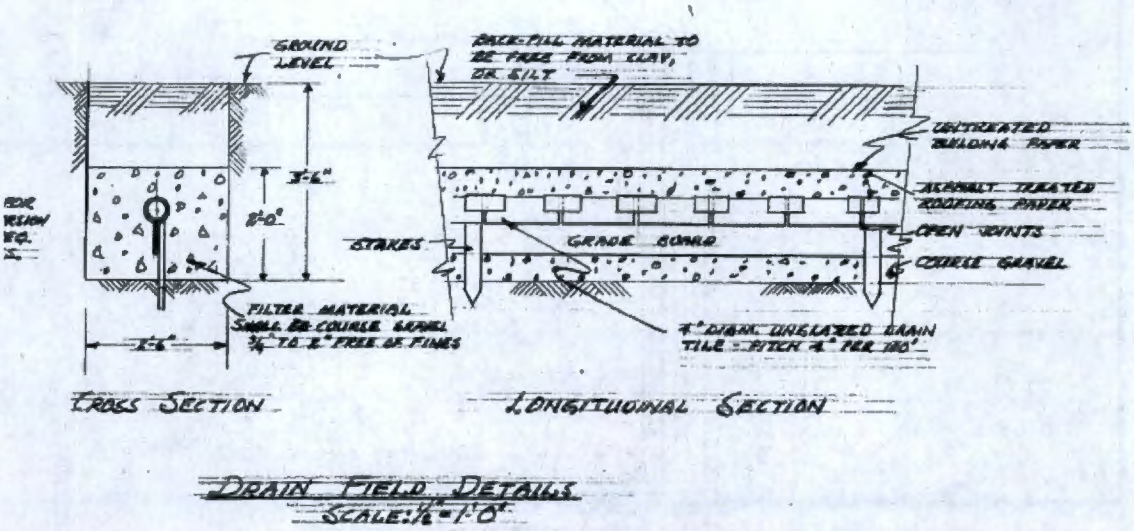


Source: H-2-20938, *Addition to the 234-5 Building*.

Note: Produced from the best available copy.

Figure 4. Septic Tank As-Built

Site: 2607-Z1	Area: Z Plant	Category: Intermediate

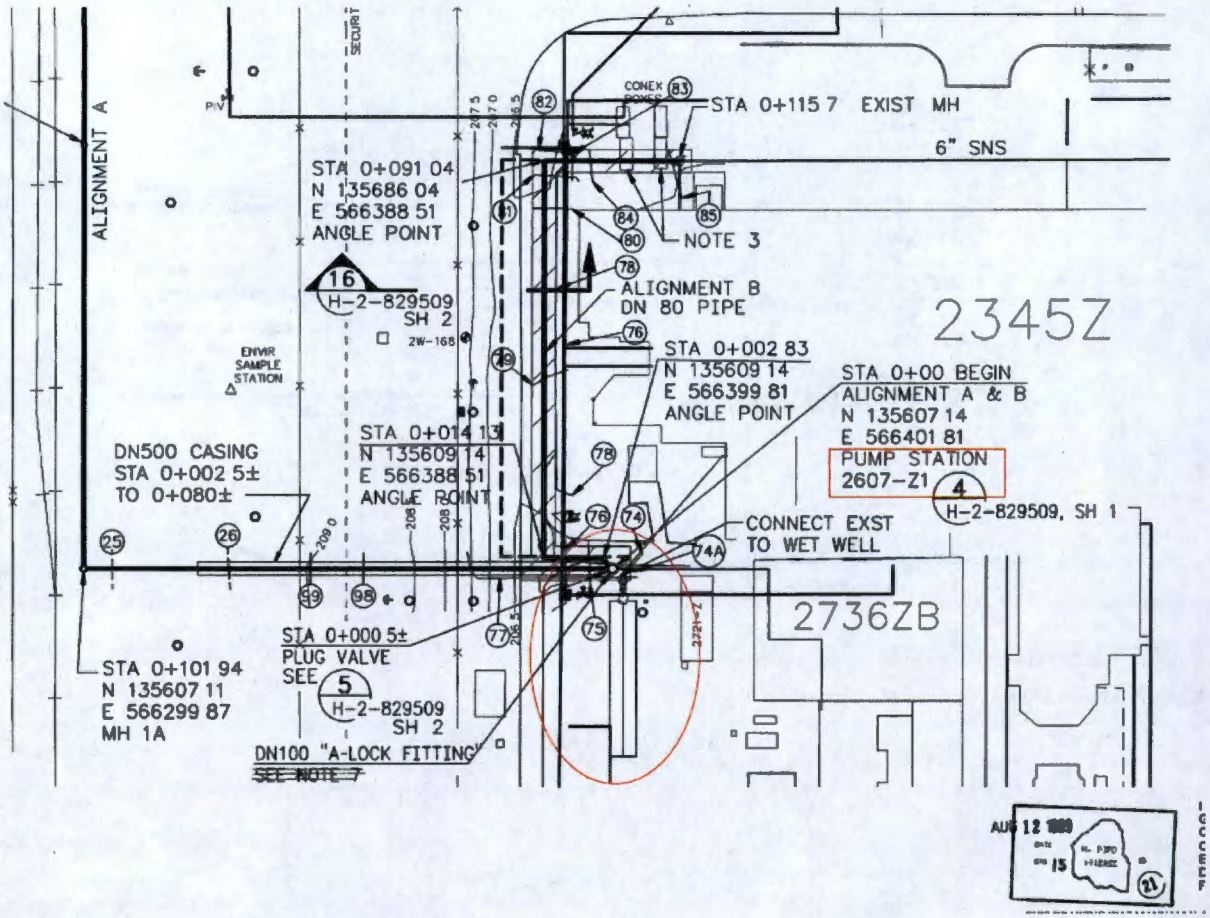


Source: H-2-20938, *Addition to the 234-5 Building.*

Note: Produced from the best available copy.

Figure 5. Drain Field As-Built

Site: 2607-Z1	Area: Z Plant	Category: Intermediate



Source: H-2-829506, *Civil Alignment A & B Plan*, Sheet 2.

Note: Produced from the best available copy.

Figure 6. Pump Station 2607-Z1 (Installed for Replacement System 2607-W1) Located near the 2607-Z1 Septic System Waste Site

Site: UPR-200-W-23	Area: Z Plant	Category: Shallow – Surface Only

Site Description

Alternate Site Identification: 200-W-23; Waste Box Fire at 234-5Z; UN-200-W-23
Site Type: Unplanned Release
Facility/Geographic Area: Z Plant
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-1
Service Dates: 1953

Waste Site Location and Physical Description: A sketch included in HW-60807, *Unconfined Underground Radioactive Waste and Contamination in the 200 Areas 1959*, places 200-W-23 near the south wall of 234-5Z, approximately 61 m (200 ft) north of the 291-Z Stack (Figures 1 and 2). A 1999 facility walk down could not locate this unplanned release site. The event occurred in June 1953. Following the release in 1953, the contaminated area was covered with blacktop and posted with "DANGER—DO NOT EXCAVATE IN THIS AREA WITHOUT SWP PERMISSION" signs. During the 1980s, the 2734G building was built in the general vicinity of this Unplanned Release. It is possible the actual location is beneath the building. No reference drawings are available for this site.

Waste Site Coordinates:
E- 566494.9375 N- 135629.875

Site Dimensions:
Site Length: 5.3 m (17.4 ft)
Site Width: 5.3 m (17.4 ft)
Site Area: 27.9 m^2 (300 ft^2)
Dimensions are approximate

Site Depth: Not specified
Cover Thickness: Not specified

Related Site Structure(s): The UPR-200-W-23 waste site is not currently associated with any other waste sites or site facilities.

Site Posting: The approximate area is marked with a Waste Information Data System (WIDS) sign painted on the asphalt.

Site History

Release Summary: In June 1953, a fire in a waste box resulted in approximately 28 m^2 (300 ft^2) of ground contamination. The fire caused a spread of plutonium contamination with readings up to 10,000 disintegrations per minute.

Volume/Mass Discharged: Not specified.

Site: UPR-200-W-23	Area: Z Plant	Category: Shallow – Surface Only

Pore Volume Discharged: Unknown.

Waste Inventory: Not available.

Previous Site Characterization

Site Characterization Summary: Characterization information is not available for this site.

Nature and Extent of Contamination:

Shallow (0 to 4.6 m [0 to 15 ft] belowground surface [bgs]): Potential radiological contamination at the surface.

References:

HW-60807, 1959, *Unconfined Underground Radioactive Waste and Contamination in the 200 Areas 1959*, Hanford Atomic Products Operation, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0081555H.

WIDS General Summary Report for the UPR-200-W-23 Waste Site.

Site: UPR-200-W-23	Area: Z Plant	Category: Shallow – Surface Only

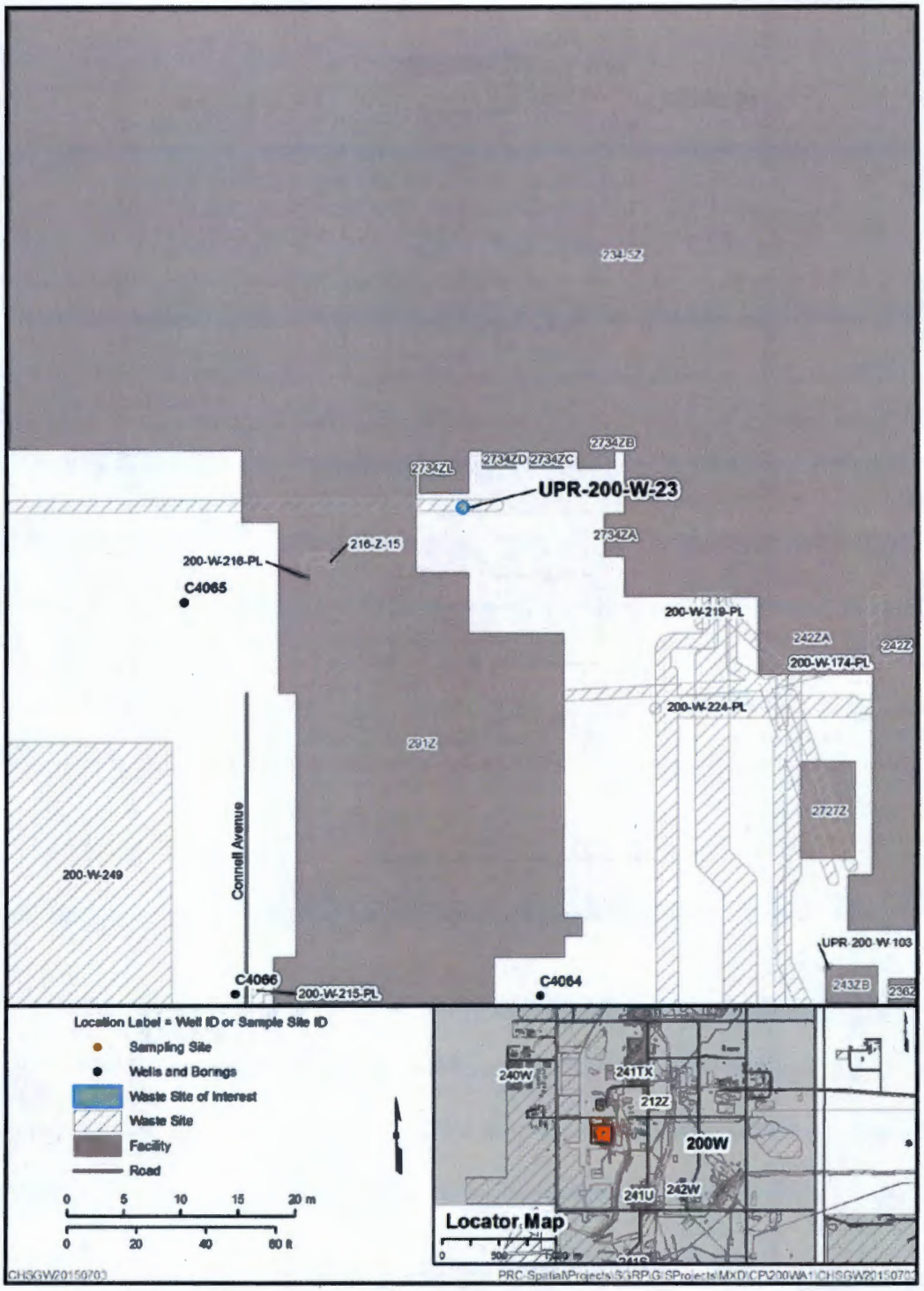
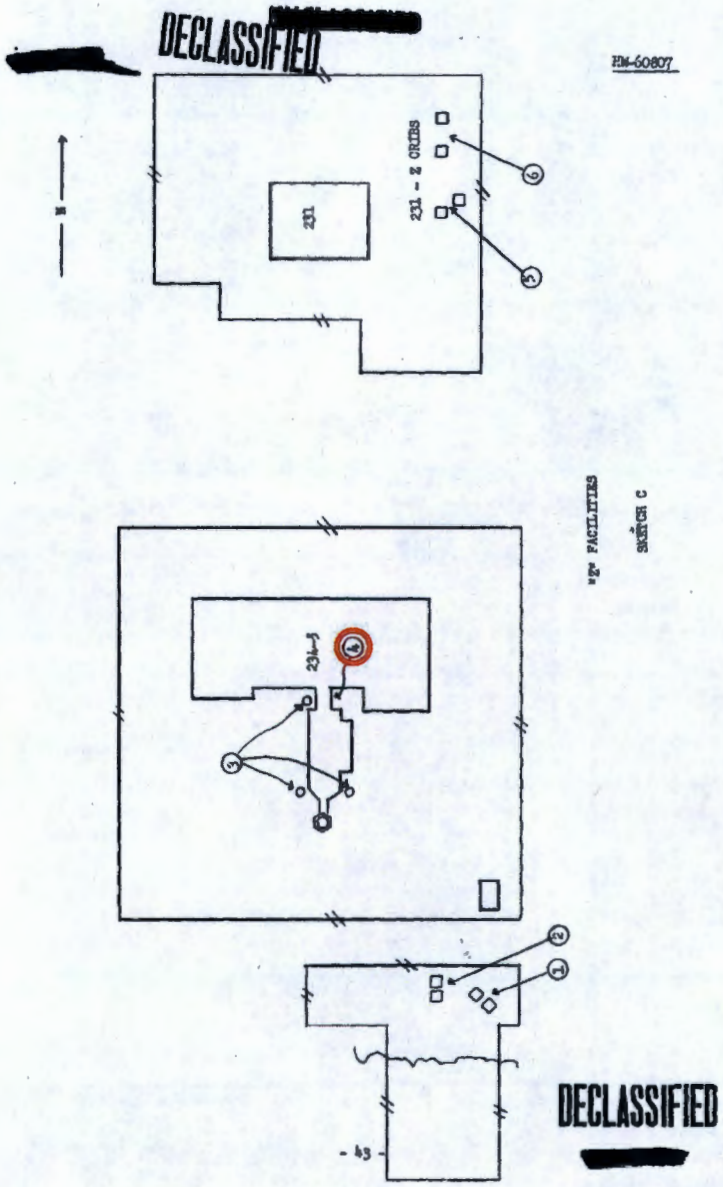


Figure 1. UPR-200-W-23 Waste Site Map

Site: UPR-200-W-23	Area: Z Plant	Category: Shallow – Surface Only



Source: HW-60807, *Unconfined Underground Radioactive Waste and Contamination in the 200 Areas 1959*, Sketch C, Drawing Reference 4.

Figure 2. Approximate Location of 200-W-23

Site: UPR-200-W-103	Area: Z Plant	Category: Intermediate

Site Description

Alternate Site Identification: UN-216-W-13, 216-Z-18 Line Break, UN-326-W-13, UN-200-W-103, Pipe Line Leak.
Site Type: Unplanned Release
Facility/Geographic Area: Z Plant (Plutonium Finishing Plant [PFP] Area)
Current Operable Unit (OU) Assignment: 200-WA-1
Former OU Assignment: 200-MG-2, 200-PW-1
Service Dates: April 1971

Waste Site Location and Physical Description: The UPR-200-W-103 waste site was an unplanned release (UPR) in April 1971 inside the Z Plant exclusion area. The UPR is approximately 1.8 m (6 ft) south and 3.7 m (12 ft) west of the southwest corner of the 236-Z Building (Figure 1). The UPR occurred when the 216-Z-18 Crib pipeline broke near the southwest corner of the 236-Z Building. An excavation of the area led to the discovery of a 7.6 m (25 ft) long and 1.8 m (6 ft) wide contaminated area of soil. The site is covered by an unspecified amount of clean backfill. No reference drawings are available for this site, as it is an unplanned release.

Waste Site Coordinates:
Lon-566527.18743 Lat-135589.32818

Site Dimensions:
Site Length: 7.6 m (25.0 ft) Site Depth: 2.1 m (7.0 ft)
Site Width: 1.8 m (6.0 ft) Cover Thickness: Not specified
Site Area: 13.9 m^2 (150.0 ft^2)

Related Site Structure(s): UPR-200-W-103 is associated with the 216-Z-18 Crib line (site code 200-W-174-PL), the 234-5 Building, and the 236-Z Building.

Site Posting: The UPR site is posted with Underground Radioactive Material Area (URMA) warning signs. Contamination still remains beneath the clean backfill. A Waste Identification Data System number sign inside the posted URMA area marks the estimated release point.

Site History

Release Summary: The pipeline break released an estimated 10 g (0.35 oz) of plutonium in liquid form, with gross alpha contamination in excess of 6 million dpm. A 2.1 m (7 ft) area was excavated around the line break, and approximately one hundred 55-gallon barrels of contaminated soil were removed and buried in the 200 West Area Plutonium "Storage for Recovery" Burial Ground. The site was covered with an unspecified amount of clean backfill following cleanup activities. However, a significant portion of the contaminated soil was left behind in the excavation after the site was backfilled. 200-W-174-PL carried

Site: UPR-200-W-103	Area: Z Plant	Category: Intermediate

Plutonium Finishing Plant (PFP) process wastes from Buildings 242-Z and 234-5Z, described as aqueous and organic wastes containing carbon tetrachloride, tributyl phosphate, nitrate, americium, plutonium, and uranium.

Volume Discharged: Unknown.

Pore Volume Discharged: Unknown.

Waste Inventory: Estimated 10 g (0.35 oz) of liquid plutonium.

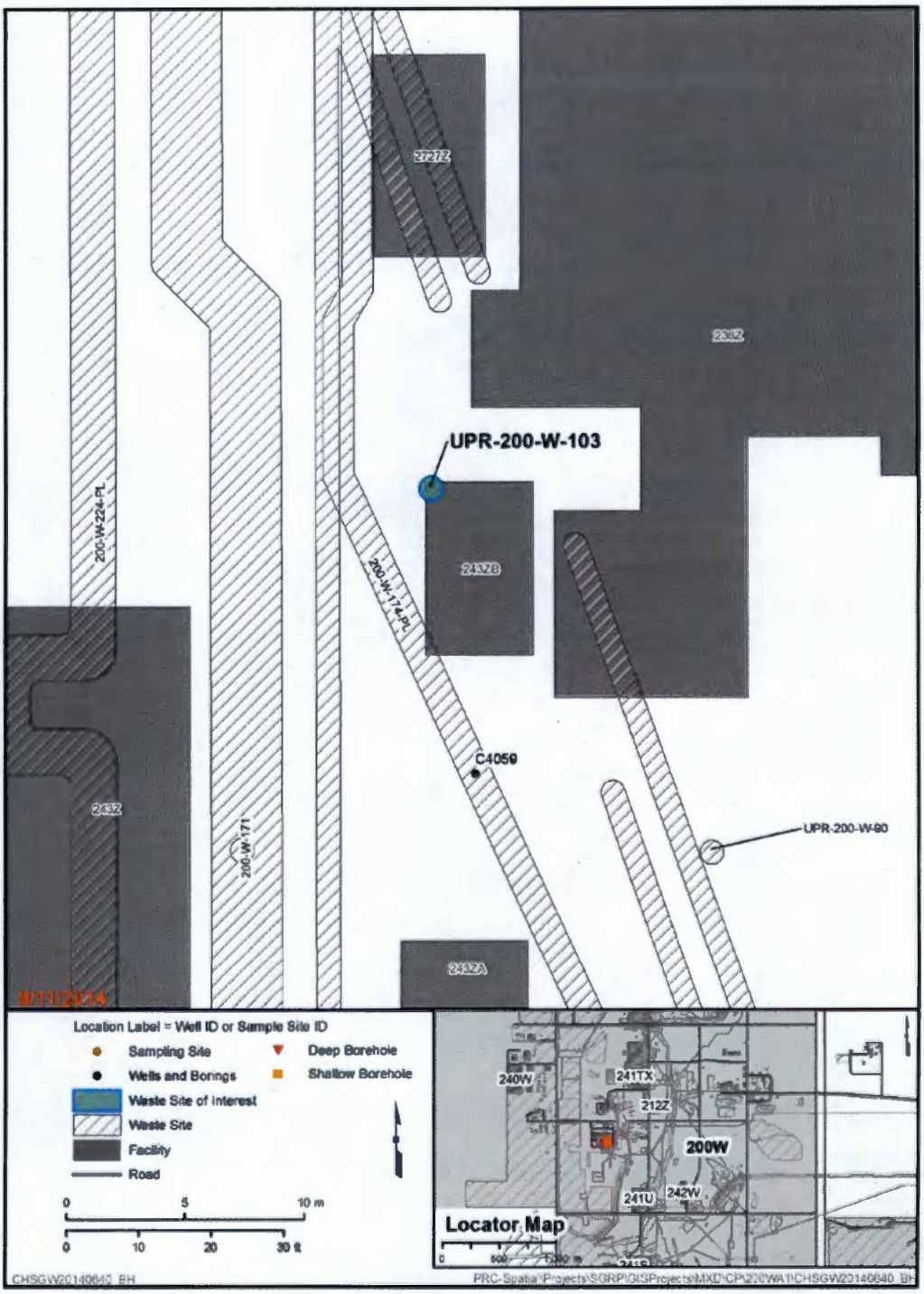
Previous Site Characterization

Site Characterization Summary: No site characterization information is presented for this UPR.

Nature and Extent of Contamination: The exact location of the release is unknown. Some contaminated soil has been removed, but it is likely that contaminated soil is still present at the site.

References:
Waste Information Data System General Summary Report for the UPR-200-W-103 Waste Site.

Site: UPR-200-W-103	Area: Z Plant	Category: Intermediate



ID = identification

Figure 1. UPR-200-W-103 Waste Site Map

Site: UPR-200-W-103	Area: Z Plant	Category: Intermediate

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