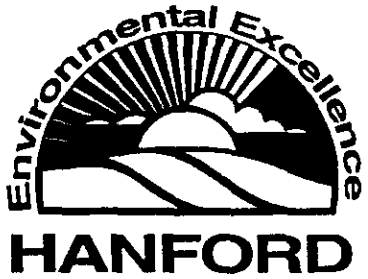
0048491

BHI-00176
Rev. 00

S Plant Aggregate Area Management Study Technical Baseline Report

Authors
D. H. DeFord
R. W. Carpenter

Date Published
May 1995



Prepared for the U.S. Department of Energy
Office of Environmental Restoration and
Waste Management

Bechtel Hanford, Inc.
Richland, Washington

Approved for Public Release

Available to the U.S. Department of Energy
and its contractors from
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831
(615) 576-8401

Printed in the United States of America

DISCLM-3.CHP (1-91)

BHI-00176
REV: 00
OU: N/A
TSD: N/A
ERA: N/A

APPROVAL PAGE

Title of Document: S PLANT AGGREGATE AREA MANAGEMENT STUDY TECHNICAL BASELINE REPORT

Authors: D. H. DeFord
R. W. Carpenter

Approval: W. L. Pamplin, Manager, Natural Resources Section

W. Lewis Pamplin 5/2/95

Signature Date

The approval signatures on this page indicate that this document has been authorized for information release to the public through appropriate channels. No other forms or signatures are required to document this information release.

TOTAL PAGES: ____

BHI-DIS 5-2-95

THIS PAGE INTENTIONALLY
LEFT BLANK

CONTENTS

CONTENTS (Continued)

CONTENTS (Continued)

CONTENTS (Continued)

FIGURES:

TABLES:

ACRONYMS

BHI	Bechtel Hanford, Inc.
c/m	counts per minute
DOE	U.S. Department of Energy
DST	double-shell tank
FIC	flow indicator controller
HNO_3	nitric acid
$KMnO_4$	potassium permanganate
MIBK	methyl isobutyl ketone
NEPA	*National Environmental Policy Act*
PNL	Pacific Northwest Laboratory
PUREX	Plutonium-Uranium Extraction
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
REDOX	reduction and oxidation
RL	U.S. Department of Energy, Richland Operations Office
SST	single-shell tank
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TRU	transuranic
UNH	uranium nitrate hexahydrate
UO_3	uranium oxide
UPR	unplanned release
WHC	Westinghouse Hanford Company
WIDS	waste information data system

1.0 INTRODUCTION

This document is prepared in support of an Aggregate Area Management Study of S Plant, 200 West Area, at the U.S. Department of Energy's (DOE) Hanford Site near Richland, Washington. It provides a technical baseline of the aggregate area and the results from an environmental investigation undertaken by the Technical Baseline Section of the Environmental Engineering Group, Westinghouse Hanford Company (WHC). This document is based on review and evaluation of numerous Hanford Site current and historical reports, drawings and photographs, supplemented with site inspections and employee interviews. No intrusive field investigations or sampling were conducted.

This document was written in 1991 and has been edited for publication as a Bechtel Hanford, Inc. (BHI) document to allow the information to be referenced in current documents. Some information identified as current, as of 1991, may not be current as of 1995 because of changes in mission, scope, plan, or political climate.

Most of the historical documents from which data was extracted for this report provide dimensions in nonmetric units of measure. In the interest of accuracy, data is reported here as it was provided in reference documents and no conversions to metric are provided.

The S Plant Aggregate Area is made up of four operable units; 200-RO-1, 200-RO-2, 200-RO-3, 200-RO-4, and consists of liquid waste disposal sites in the vicinity of, and related to, S Plant operations.

S Plant refers to the 221-S process canyon building, or reduction oxidation (REDOX) facility, a chemical separation facility constructed in 1952 to employ an advanced organic solvent extraction process as a replacement for B and T Plants. The REDOX chemical separation process was chosen to replace the bismuth phosphate process employed at B and T Plants for several reasons including lower cost, improved throughput, recovery of uranium, and more than 98% plutonium recovery (Ballinger and Hall 1989).

This report describes the REDOX facility and its waste sites, including cribs, french drains, septic tanks and drain fields, trenches, catch tanks, settling tanks, diversion boxes, underground tank farms designed for high-level liquid wastes, and the lines and encasements that connect them.

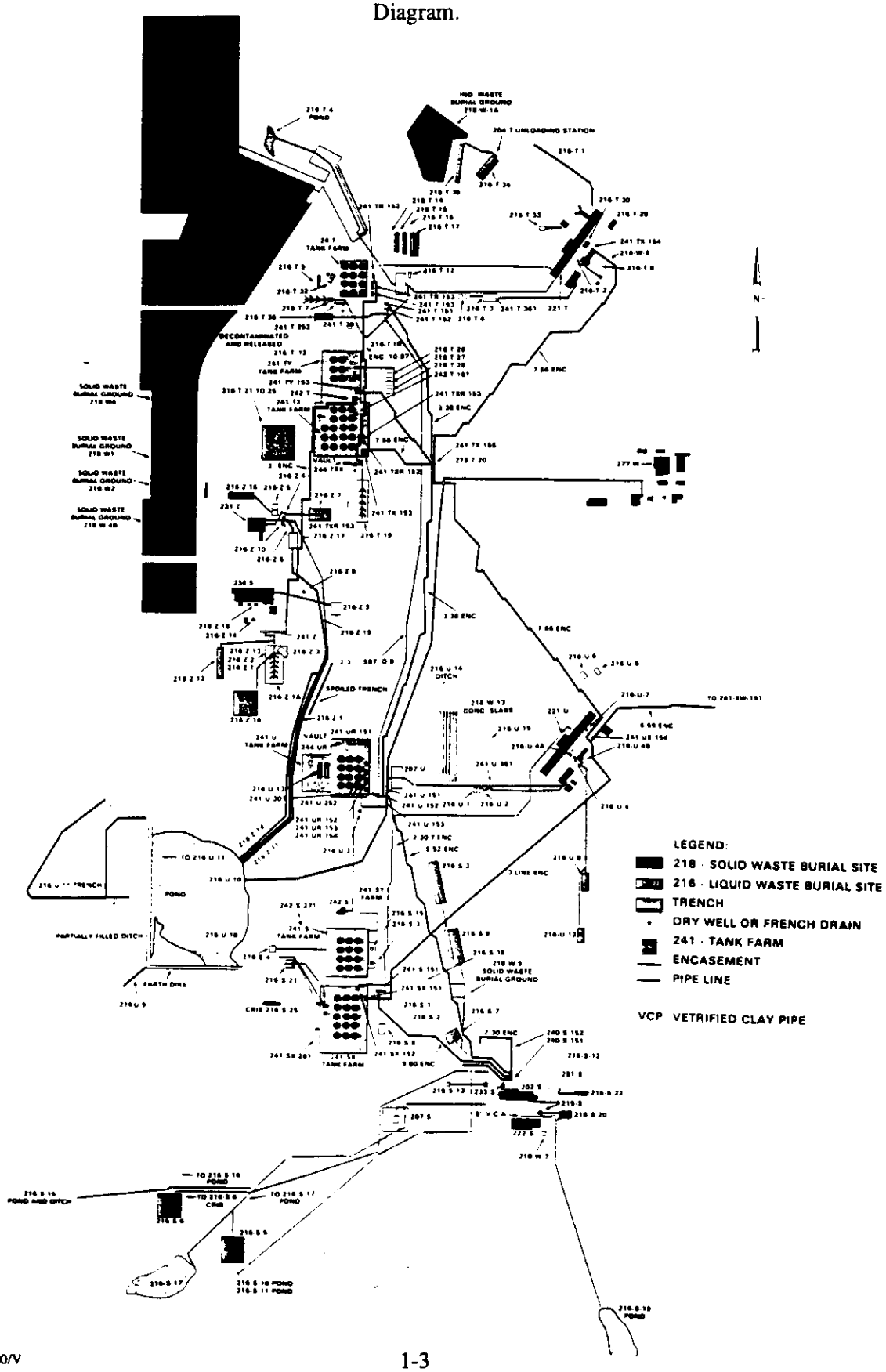
Each waste site in the aggregate area is described separately. Close relationships between waste units, such as overflow from one to another, are also discussed. Photographs are provided in Appendix A.

An environmental summary for this aggregate area is not provided here. An excellent summary may be found in *Hanford Site National Environmental Policy Act (NEPA) Characterization* (Cushing 1990), which describes geology and soils, meteorology, hydrology, land use, population, and air quality.

The Hanford Site is extremely complex and has been operating as a highly compartmentalized facility for almost 50 yr under the supervision of several different operators. In many instances each operator implemented their own numbering scheme to identify physical plant facilities, such as buildings, disposal sites, utilities, and significant operational events such as unplanned releases (UPR).

Therefore, many sites have had more than one designation since the Hanford Site became operational. This practice of renumbering has been discontinued. Past site identification numbers, referred to as aliases, are cross referenced for each site and included in the site summary sheets contained in BHI (1994). These site summary sheets are a portion of the Hanford Site Waste Information Database System (WIDS) (BHI 1994). Photographs of the waste sites, when available, are contained in Appendix A. Figure 1-1 provides a schematic diagram of the 200 West Area facilities, and a list of photographs and drawings by waste site are contained in Appendix B.

Figure 1-1. 200 West Area Waste Management Facilities Schematic Diagram.



2.0 BACKGROUND

The REDOX facility is a central feature and key operational facility of the S Plant Aggregate Area and is therefore described here even though it will not be remediated as part of this aggregate area. Figure 2-1 depicts the general location of facilities discussed in this report.

Uranium-bearing fuel rods were irradiated in one of the several Hanford production reactors; a process that creates plutonium from uranium. The irradiated rods were transferred to the REDOX facility where the plutonium was extracted and transferred as plutonium nitrate to Z Plant for final processing. Residual uranium was also extracted and transferred as uranium nitrate hexahydrate (UNH) to the Uranium Oxide (UO_3) Plant for conversion to uranium metal.

The REDOX facility is one of five Hanford Canyon Buildings; so called because of their monolithic size and the canyon-like appearance of their upper galleries. The building is 467 ft by 161 ft by 82 ft high. As with other canyon buildings, the REDOX facility is constructed entirely of concrete and its process equipment is contained in small rooms, called cells, which are arranged in rows in an area spanned by a traveling crane. The cells are topped with 4-ft-thick concrete blocks that are removable by crane to provide access to the cell beneath. Above the blocks is a space equal in height to the cell depth, thus providing headroom for manipulating the process equipment during maintenance operations. Heavy concrete shielding walls enclose this space up to the level of the crane rails, giving the appearance of a canyon.

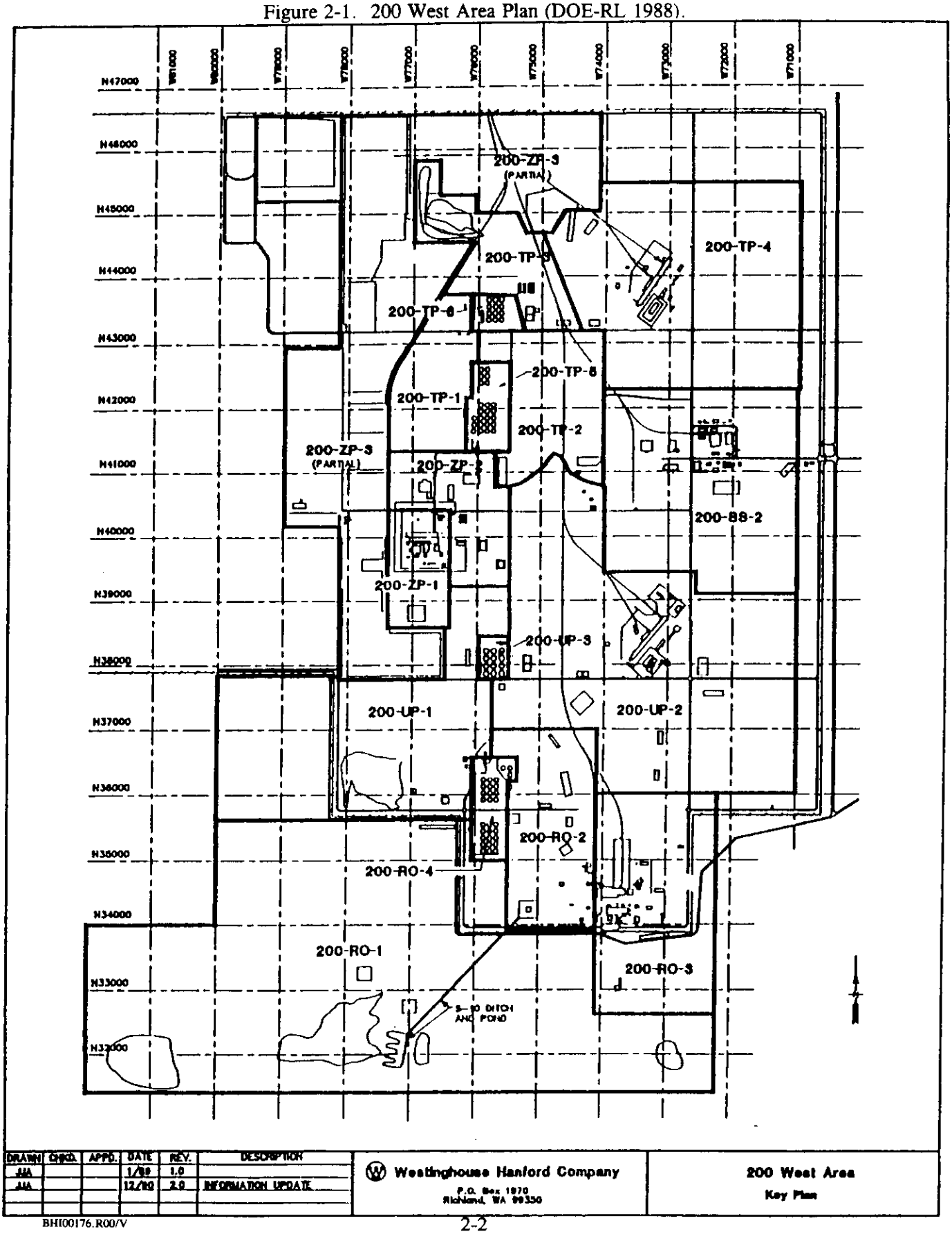
From a process view point, the REDOX facility is divided into a canyon and a silo area. The canyon consists of nine process cells arranged in two parallel rows running east to west and separated by a pipe tunnel. The 5-ft-thick concrete shielding walls protected REDOX workers from the intense radiation found in the process cells. The silo, located on the west end of the building is 84 ft by 41 ft by 132 ft high and contains a process area and an operating area. Its extraction column shaft is 12 ft by 69 ft by 86 ft high and has eight floor levels (AEC-GE 1964).

The REDOX process differs from the B and T Plants bismuth phosphate process in that all steps except metal dissolving and feed preparation were conducted on a continuous basis, whereas all steps at B and T Plants were batch processes.

The REDOX facility was designed to process an average of 2.5 short tons of uranium per day. It generated less high-level waste than its predecessors, provided better decontamination of product, had greater operating rates, and more importantly, extracted uranium as well as plutonium.

The REDOX process employed an organic solvent extraction process that used methyl isobutyl ketone (MIBK) to separate uranium and plutonium from each other and from fission products found in spent fuel rods. The bismuth phosphate process was used to prepare the spent fuel elements for nitric acid dissolution. Sodium dichromate was added to the nitric acid solution to oxidize plutonium to a state suitable for organic extraction. Aluminum nitrate was added to the acid solution as a salting agent for the first extraction column. This salting agent caused the uranium and plutonium to be preferentially extracted by MIBK, leaving the fission products in the aqueous phase.

Figure 2-1. 200 West Area Plan (DOE-RL 1988).



DRAWN	CHKD.	APPD.	DATE	REV.	DESCRIPTION
JAA			1/89	1.0	
JAA			12/90	2.0	INFORMATION UPDATE

Westinghouse Hanford Company
P.O. Box 1970
Richland, WA 99350

200 West Area
Key Plan

BHI00176.R00/V

In a second extraction column, a reducing agent was added to the aqueous phase to reduce the plutonium so it could be removed from the uranium and extracted into the aqueous phase. The organic uranium solution and the aqueous plutonium solution were then processed separately, purified further, and concentrated into their respective products; UNH and plutonium nitrate.

The MIBK was recycled by removing decomposition products and by further decontamination. Aqueous streams were concentrated and then the aluminum nitrate was converted to sodium aluminate by sodium hydroxide treatment before disposal (Harmon 1975).

This plutonium extraction process generates gaseous waste and significant quantities of liquid waste that may contain varying quantities of radionuclides of uranium, plutonium, cesium, ruthenium, strontium, cobalt, and other elements. Additional organic and inorganic compounds could be added to the various waste streams. Chlorinated solvents, phosphates, and various nitrate and sodium compounds are commonly found.

3.0 LIQUID WASTE HANDLING

Chemical and radiological wastes from the various Hanford production facilities have been segregated according to potential radionuclide contamination and stored or disposed of accordingly. High-level wastes are stored in underground tanks while intermediate level wastes were, until 1973, routed to underground cribs for disposal. Low-level wastes such as cooling water were routed to ponds and open ditches for disposal (Smith 1980).

This report describes waste sites that received all levels of waste. REDOX wastes were both chemically and radiologically contaminated, but their disposition was accomplished in accordance with their radiological content. The organic solvent bearing wastes were classified as intermediate level wastes and were disposed to the several cribs that supported REDOX operations.

Two types of cribs were utilized to support REDOX operations. The first is an underground chamber that received liquid wastes into a box-like, open-bottomed structure made of wooden timbers. The second is a drain field, or tile field, which introduced liquid wastes to soil through many yards of perforated underground pipe.

Both types typically rest in a gravel bed to aid in rapid dispersion of liquid to soil. Particulate matter, especially heavy metals such as uranium and plutonium, which were contained in REDOX liquid wastes, tended to be filtered by the first few inches or feet of soil and thus were effectively contained in the soils immediately beneath the crib.

Other intermediate level liquid wastes were disposed to soil through french drains. Low-level liquid wastes were directed to open trenches and ponds. French drains are underground gravel filled encasements, usually concrete or tile pipe, with open bottoms, usually used for disposal of small volumes of low-level waste. Reverse wells, common on the Hanford Site, were not used at the REDOX facility.

Several common methods were used for transporting liquid waste across the site; these include ditches, underground and aboveground pipelines, and trucks. The sites discussed in this report no longer have aboveground pipelines to them. The ditches are addressed, but the pipelines are not specifically discussed as potential waste sites.

4.0 OPERABLE UNIT 200-RO-1

Operable Unit 200-RO-1 encompasses the area south and west of the REDOX facility (Figure 4-1). Sixteen known waste sites are discussed within this operable unit, including five evaporation/ infiltration ponds, three ditches, and three cribs. Table 4-1 lists the waste sites, locations, and operational status. Note that there are three active sites within this operable unit. Table 4-2 lists each site's dimensions, quantity of plutonium contaminated soil (if applicable), quantity of waste disposed, and site ranking according to the Pacific Northwest Laboratory (PNL) Hazard Ranking System. Note that the quantity of material disposed at each site is not necessarily directly proportional to either the migration hazard ranking or the quantity of contaminated soil (Nelson 1980; Stenner et al. 1988).

4.1 216-S-5 CRIB

The 216-S-5 crib is an inactive liquid waste site located 3,000 ft southwest of the 207-S retention basin. Operating from 1954 to 1957, this site received 4,100,000,000 L of acidic process vessel cooling water and steam condensate from the 202-S canyon building via a 24-in. polyvinyl chloride (PVC) waste supply line. Contaminants include cobalt-60, strontium-90, cesium-137, and nitrates (Cruselle and Romano 1982; BHI 1994).

The site was deactivated by valving out and locking the pipeline to the unit when the top of the crib began to cave in. The effluent was rerouted to the 216-S-6 crib and 216-S-16 pond. The unit (originally called an underground swamp) was built as a replacement for the contaminated 216-S-17 pond. About 16,000 yd^3 of gravel fill, 13,000 m^3 of contaminated soil, and 12,000 m^3 of overburden soil are present at this site. The site surface was stabilized on August 24, 1990 (BHI 1994).

Four monitoring wells; 299-W26-1, 299-W26-3, 299-W26-4, and 299-W26-5, have been used to monitor this site. The radionuclides are held high in the sediment beneath the crib, therefore breakthrough to groundwater is unlikely to have occurred in this area (BHI 1994).

This unit has no barricade, but concrete marker posts surround it; each with metal plates labeling the site. The surface is sandy with little or no vegetation. The site has underground radiation contamination warning signs.

4.2 216-S-6 CRIB

The 216-S-6 crib is an inactive liquid waste site located about 2,400 ft southwest of the 202-S canyon building. Operating from 1954 until 1972, it has received a total of 4,470,000,000 L of low-salt waste. Up to June 1967, the site received the process vessel cooling water and steam condensate from the 202-S canyon building. From June 1967 to July 1967, production operations were shut down and the 202-S canyon building was put on standby. After July 1967, the site received the steam condensate from the D-12 and D-14 waste concentrators in the 202-S canyon building. Radionuclides assumed to be present include cesium-137, strontium-90, and uranium-238 (BHI 1994).

Figure 4-1. Operable Unit 200-RO-1 Plan (DOE-RL 1988).

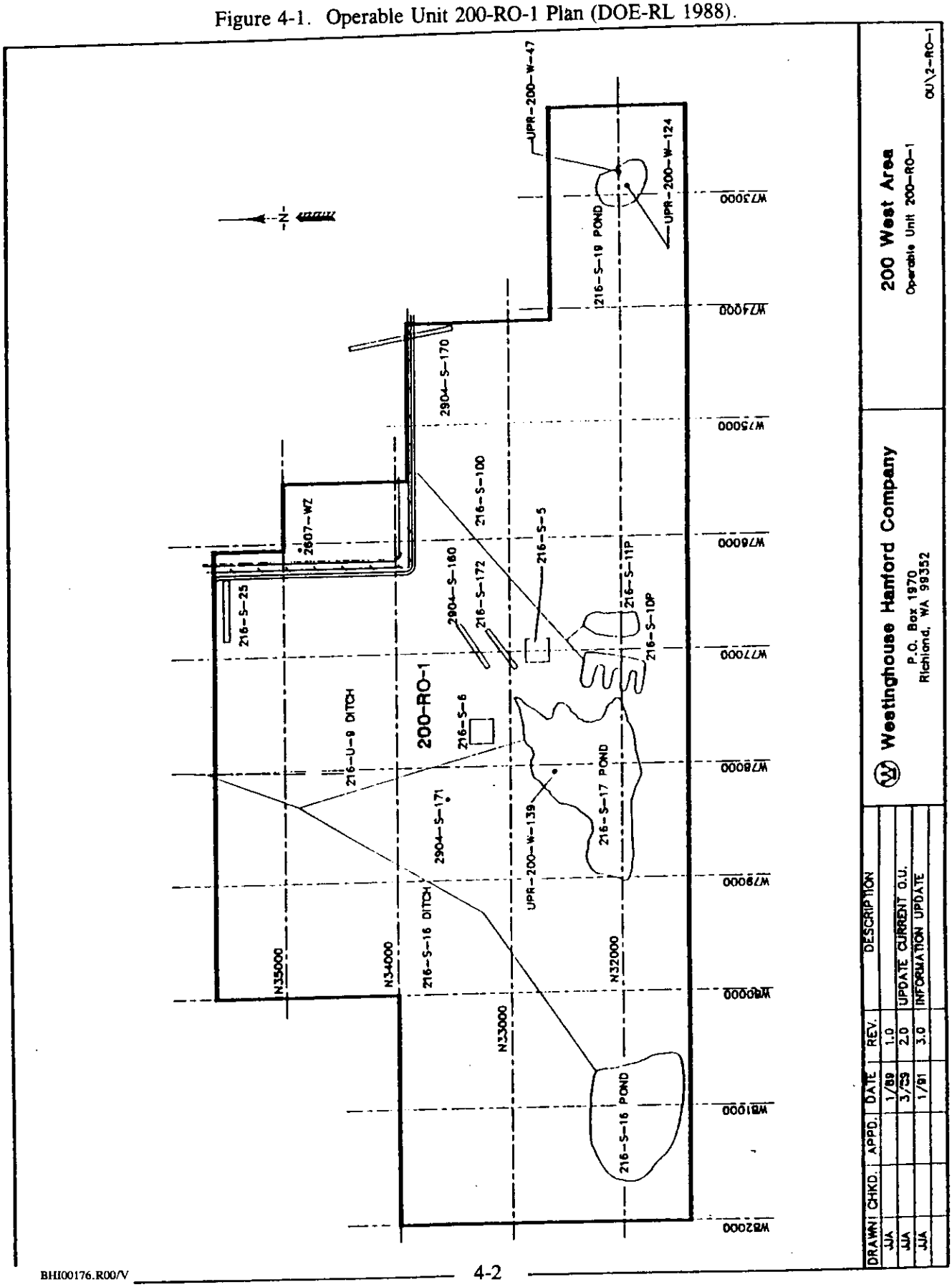


Table 4-1. Site Location and Waste Type Summary Table for Operable Unit 200-RO-1 (BHI 1994).

Site	Type of Site	Status	Coordinates	Type of Waste
216-S-10D	Ditch	Active	N33800 W75475 (head), N31600 W77250 (end)	Mixed Waste
216-S-10P	Pond	Inactive	N31850 W77200	Mixed Waste
216-S-11	Pond	Inactive	N32450 W76725 (center of #1), N32000 W76900 (center of #2)	Mixed Waste
216-S-16D	Ditch	Inactive	N32250 W80900 (west end), N33200 W79400 (east end)	Mixed Waste
216-S-16P	Pond	Inactive	N32250 W81600 (center of pond complex)	Mixed Waste
216-S-17	Pond	Inactive	N32000 W78000 (center)	Mixed Waste
216-S-172	Control Structure	Inactive	N32940 W77150 ?N33200 W76800 [226]?	Mixed Waste
216-S-19	Pond	Inactive	N32000 W72775 (center)	Mixed Waste
216-S-25	Crib	Active	N35520 W76250, N35520 W76825 (centerline)	Low-Level Waste
216-S-5	Crib	Inactive	N32740 W77000 (center)	Mixed Waste
216-S-6	Crib	Inactive	N33250 W77850 (center)	Mixed Waste
216-U-9	Ditch	Inactive	N35810 W78010 (head of ditch), N32590 W78066 (end of ditch)	Mixed Waste
2607-WZ	Septic Tank	Active	N34850 W76050	Nonhazardous/Nonradioactive
2904-S-160	Control Structure	Inactive	N33190 W77140 ?N33450 W76750 [226]?	Mixed Waste
2904-S-170	Control Structure	Inactive	N33490 W74140 ?N34400 W74300 [226]?	Mixed Waste
2904-S-171	Control Structure	Inactive	N35560 W78280	Mixed Waste
UPR-200-W-124	Unplanned Release	Inactive	N32000 W72800	Mixed Waste
UPR-200-W-139	Unplanned Release	Inactive	N35810 W78010 (head) N32590 W78066 (end)	Mixed Waste
UPR-200-W-47	Unplanned Release	Inactive	N32000 W72750	Mixed Waste
UPR-200-W-59	Unplanned Release	Inactive	N34500 W74000	Mixed Waste

Table 4-2. Operational Dates and Status, Site Dimensions, and Waste Volumes Summary Table for Operable Unit 200-RO-1 (BHI 1994).

Site	State	Start Date	End Date	UPR Occurrence Date	Dim Ref	Length (ft)	Width (ft)	Dispo. Depth (ft)	Volume of Pu Contam. Soil (cu m)	Volume of Waste Disposed (cu m OR L)	PNL Hazard Ranking	Associated UPR(s)
216-S-10D	Liquid	August 1951			Bot	2250	6	6	2200	4340000000	0.00	
216-S-10P	Liquid	February 1954	October 1984		Top	0	0	0	7100	0	0.00	
216-S-11	Liquid	May 1954	August 1965		Top	0	0	0	2100	2230000000	45.30	
216-S-16D	Liquid	January 1957	February 1975		Top	3000	4	3	2000	400000000	47.82	
216-S-16P	Liquid	January 1957	February 1975		Top	0	0	3	43000	40700000000	32.72	UPR-200-W-47, 59, & 124
216-S-17	Liquid	October 1951	April 1954		Top	958	958	10	24000	6440000000	47.82	
216-S-172	Liquid	1956	1976		Top	0	0	0	0	0	0.00	
216-S-19	Liquid	February 1952	October 1984		Top	0	0	0	5000	1330000000	0.00	
216-S-25	Liquid	November 1973			Bot	575	10	10	1100	288000000	0.00	
216-S-5	Liquid	March 1954	March 1957		Bot	210	210	15	13000	4100000000	47.82	
216-S-6	Liquid	November 1954	July 1972		Bot	210	210	15	13000	4470000000	47.82	
216-U-9	Liquid	December 1952	April 1954		Top	3500	6	6	2800	0	0.00	UPR-200-W-139
2607-WZ	Liquid	1944			Top	0	0	0	0	0	0.00	
2904-S-160	Liquid	1954	1976		Top	0	0	0	0	0	0.00	
2904-S-170	Liquid	1954	1976		Top	15	7	0	0	0	0.00	
2904-S-171	Liquid	1954	1976		Top	13	12	0	0	0	0.00	
UPR-200-W-124	Liquid			Unknown	Top	1000	30	0	0	0	0.00	
UPR-200-W-139	Liquid			September 1953	Top	0	0	0	0	0	0.00	
UPR-200-W-47	Liquid			June 1958	Top	0	0	0	0	0	0.00	
UPR-200-W-59	Liquid			September 26, 1965	Top	0	0	0	0	0	0.00	

The 216-S-6 crib was constructed as part of the segregation project for the segregation of high potential from low potential radioactive contaminated condensates and cooling water. The high potential condensate was sent to this unit and the low potential condensate was sent to the 216-S-5 crib (BHI 1994).

The unit is filled with approximately 116,333 yd^3 of gravel fill. Approximately 13,000 m^3 of contaminated soil and 12,000 m^3 of overburden soil are also contained at this site. Waste distribution lines are 7 ft below the surface. The risers are 2 ft below the surface. The site surface was stabilized in September 1990 (Cruselle and Romano 1982; BHI 1994).

The site has no barricade, but there are concrete monuments surrounding the site with metal plates marking it as the 216-S-6 crib. The unit is labeled with underground radiation contamination warning signs. There is no vegetation and the surface is sand and gravel at grade. The 2904-S-171 control structure is adjacent at the center of the north boundary of the site (Hanford photograph A-1).

4.3 216-S-10D DITCH

The 216-S-10D ditch is an active liquid waste site located about 1,500 ft southwest of the 202-S canyon building. Site operations began in August 1951. In the past, hazardous waste salts ($NaNO_2$ and NaOH) were discharged to the unit. Until 1965, the site received chemical sewer waste from the 202-S canyon building and overflow from the high-water tower. Since October 1984, the site has been used as a trench because the 216-S-10P pond was stabilized. No dangerous wastes have been discharged to this unit since February 1987. A total of 4,340,000,000 L of waste went into this unit (BHI 1994).

This site is unlined and the active part of the unit remains uncovered and is considered a trench. It has been partially stabilized and contains approximately 2,200 m^3 of contaminated soil (BHI 1994).

This site has a light chain barricade and regularly spaced concrete monuments with brass plates that identify the waste sites as 216-S-10, 216-S-11, and 216-S-17. Underground radiation contamination warning signs surround the entire area. The 216-S-10P, 216-S-11, 216-S-17, and part of 216-S-10D ditch have been stabilized with 12 to 24 in. of soil and grass seed. The marker post does not distinguish between the 216-S-10D ditch and 216-S-10P pond (Hanford photograph A-2).

Part of the 216-S-10D ditch has not been stabilized. This portion has approximately 1 ft of standing water with cattails growing in it. There is a stairway at the northeastern end of the ditch leading to the ditch floor. The active part of the 216-S-10D ditch has its own barricade and has surface radiation contamination warning signs and danger signs surrounding it.

4.4 216-S-10P POND

The 216-S-10P pond is an inactive liquid waste site located about 4,400 ft southwest of the 202-S canyon building (BHI 1994).

The 216-S-10P pond received 7,100 m^3 of liquid waste between 1954 and 1984, chemical sewer waste from the 202-S canyon building, and overflow from the high-water tower via the 216-S-10D ditch

until 1965. The pond also received bearing cooling water from the 202-S canyon building in the 1960's (BHI 1994).

The pond includes four finger leader trenches and was backfilled and stabilized in October 1984 (BHI 1994).

The site has a light chain barricade and regularly spaced concrete monuments with brass plates that identify the site as 216-S-10, 216-S-11, and 216-S-17. Underground radiation contamination warning signs surround the entire area. The present surface is 12 to 24 in. above grade and has been seeded with grass. The marker post does not distinguish between the 216-S-10D ditch and 216-S-10P pond.

4.5 216-S-11 POND

The 216-S-11 pond is an inactive liquid waste site located approximately 3,135 ft southwest of the 202-S canyon building. Site operations began in May 1954 and ceased in August 1965. The pond received the waste from air conditioning drains and chemical sewer waste from the 202-S canyon building via the 216-S-10D ditch. In August 1965, the 216-S-10D ditch to this unit was dammed, diverting all building effluent to the 216-S-10P pond. A total of 2,230,000,000 L of liquid waste were discharged to this unit (BHI 1994).

Two small ponds were dug to give additional leaching surface for the disposal of water from the 216-S-10D ditch. The pond inlets from the ditch were cut somewhat above the level of the 216-S-10D ditch bottom so that the ponds would become dry whenever the water in the 216-S-10D ditch receded and would fill again when the 216-S-10D ditch water level became high enough to overflow the ponds. The site pond was covered in the summer of 1975. The south pond area is being used as a root depth penetration study site. It is free from radioactive contamination (Harmon 1975; BHI 1994).

The site contains 2,100 m^3 of contaminated soil and 5,700 m^3 of overburden soil. The total site area is 65,340 ft^2 (BHI 1994).

This site has a light chain barricade and has regularly spaced concrete monuments with brass plates that state waste sites 216-S-10, 216-S-11, 216-S-17 are all contained within the barricade. Underground radiation contamination warning signs surround the entire area. The sites have been stabilized. The present surface is 12 to 24 in. above grade and has been seeded with grass (site visit by author, September 1991).

4.6 216-S-16D DITCH

The 216-S-16D ditch is an inactive waste site located 5,472 ft southwest of the 202-S canyon building. The ditch was constructed in January 1957 and was not used after February 1975. A total of 400,000,000 L of liquid waste was discharged to this unit. Until June 1967, the site received process cooling water and steam condensate from the 202-S canyon building. From June 1967 to July 1967, production operations were shut down, and the 202-S canyon building was put on standby. After July 1967, the site received condenser and vessel cooling water from concentrator boil-down operations in the 202-S canyon building (BHI 1994). Hanford photographs 122440-42CN and 122440-43CN are incorrectly identified as being of this site.

The side slope of the unit was 2:1 and the unit has been backfilled. The site contains 2,000 m^3 of contaminated soil and 770 m^3 of overburden soil (BHI 1994).

This site has a light chain barricade and has regularly spaced concrete monuments with brass plates labeled 216-S-16. Underground radiation contamination warning signs surround the entire area (Hanford photograph A-3). The site has been stabilized. The present surface is 12 to 24 in. above grade and has been seeded with grass. The marker post does not distinguish between the 216-S-16D ditch and 216-S-16P pond (site visit by author, September 1991).

4.7 216-S-16P POND

The 216-S-16P pond is an inactive waste site located approximately 7,000 ft southwest of the 202-S canyon building. The pond began operating in January 1957 and closed in February 1975. Approximately 40,700,000,000 L of liquid waste was discharged to this unit. Until June 1967, the site received process cooling water and steam condensate from the 202-S canyon building. From June 1967 to July 1967, production operations were shut down and the 202-S canyon building was put on standby. After July 1967, the site received condenser and vessel cooling water from the concentrator boil-down operations in the 202-S canyon building (BHI 1994).

Three UPRs have occurred at this site that are not covered in the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1991). These are UPR-200-W-47, UPR-200-W-59, and UPR-200-W-124.

UPR-S-200-W-47 refers to releases in June 1958 and April 1959. A dike broke spreading contamination approximately 150 yd to the west of the 216-S-16P pond and 300 yd from north to south. The ground was contaminated to a maximum of 750 mR/h. In 1959, the contaminated ground was bladed under and the area posted as a radiation zone (BHI 1994).

UPR-200-W-59 occurred on September 26, 1965, when the F-1 process vessel coil in the 202-S canyon building failed allowing process effluent to mix with the cooling water. An unknown beta/gamma source was released to the pond with a maximum dose rate of 190 mR/h measured at the #1 pond inlet. The release was promptly detected (BHI 1994).

UPR-200-W-124 occurred before 1959 (Baldridge 1959). A dike break allowed contamination to be spread over an area 30 ft wide and running approximately 1,000 ft southwest. The ground was turned over by a bulldozer (BHI 1994).

This site is made up of four smaller ponds separated by dikes and a leach trench, 10 ft deep and 1,100 ft long, extending east from the pond. The #4 pond was never used. The total site area is 1,350,360 ft^2. There is approximately 43,000 m^3 of contaminated soil and 77,000 m^3 of overburden at the site (BHI 1994).

In 1975, this area was leveled and backfilled. A root toxin was applied to a number of test plots, which were then sealed with asphalt. Associated with this area are six 6-in. radionuclide monitoring wells, and two 2-in. moisture wells (BHI 1994).

This site has a light chain barricade and has regularly spaced concrete monuments with brass plates labeled 216-S-16. Underground radiation contamination warning signs surround the entire area.

The site has been stabilized. The present surface is 12 to 24 in. above grade and has been seeded with grass. The marker post does not distinguish between the 216-S-16D ditch and 216-S-16P pond (site visit by author, September 1991).

4.8 216-S-17 POND

The 216-S-17 pond is an inactive waste site located approximately 3,743 ft southwest of the 202-S canyon building. The pond was started in October 1951 and closed in April 1954. Approximately 6,440,000,000 L of liquid waste were discharged to this site. Until January 1953, the site received the process cooling water and steam condensate from the 202-S canyon building. After January 1953, the site received the 202-S canyon building effluent and the overflow from 216-U-10 pond via the 216-U-9 ditch (BHI 1994).

The site was retired when the radionuclide inventory in the sediments exceeded prescribed limits. The site was deactivated by plugging the pipeline to the unit north of the 216-S-5 crib and covering the site with clean earth. The effluent was rerouted to the 216-S-5 crib. The site has been stabilized and has 240,000 m^3 of contaminated soil and 85,000 m^3 of overburden soil (BHI 1994).

This site has a light chain barricade and has spaced concrete monuments with brass plates that state that waste sites 216-S-10, 216-S-11, 215-S-17 are all contained within the barricade. Underground radiation contamination warning signs surround the entire area (Hanford photograph A-4). The site has been stabilized. The present surface is 12 to 24 in. above grade and has been seeded with grass (site visit by author, September 1991).

4.9 216-S-19 POND

The 216-S-19 pond is an inactive waste site located 2,432 ft southwest of the 202-S canyon building. The pond was opened in February 1952 and closed in October 1984. A total of 1,330,000,000 L of liquid waste were discharged to the pond. Until December 1954, the site received effluent from the 222-S/SA laboratory ventilation cooling water and miscellaneous wastes from laboratory hoods and decontamination sinks via the 207-SL retention basin. From December 1954 to October 1955, the site was inactive because the radionuclide concentration in the 207-SL retention basin liquid waste was above the prescribed disposal guidelines. The building effluents were rerouted to the 216-S-20 crib. After October 1984, the site received ventilation cooling water and miscellaneous wastes from laboratory hoods and decontamination sinks in the 222-S laboratory building via the 207-SL retention basin. The potential existed for the disposal of hazardous chemicals; however, no documentation exists to substantiate this (BHI 1994).

In December 1953, surface dose rates up to 200 mR/h were detected at the edge of the unit. Over the ensuing years, the beta/gamma radioactivity has decayed off and presently there is no activity detectable with radiation monitoring field instruments (BHI 1994).

The site area is 152,460 ft^2 and contains 5,000 m^3 of contaminated soil. The 216-S-19 pond was stabilized and seeded with grass in October 1984 (BHI 1994). The site has metal posts surrounding it, but no barricade chain. There is a permanent concrete marker with a metal plate labeling it as a crib, when it is actually a pond. The site is marked with underground radiation contamination

warning signs (Hanford photograph A-5). The surface is sandy gravel and is 18 to 24 in. above grade (site visit by author, September 1991).

4.10 216-S-25 CRIB

The 216-S-25 crib is an active waste site located 2,800 ft northwest of the 202-S canyon building. The crib was started in November 1973. Until November 1980, the site received 242-S evaporator process steam condensate. Since November 1980, the 242-S evaporator has been in standby mode, and the crib has only received 241-SX tank farm cooling water (BHI 1994).

A distribution pipe is approximately 7 ft below grade. The site contains 41,000 ft^3 of gravel, 1,100 m^3 of contaminated soil, and 2,600 m^3 of overburden soil (BHI 1994).

The site has three test wells associated with it: 299-W23-9, 299-W23-10, and 299-W23-11 (BHI 1994).

The crib has a light chain barricade posted with underground radiation contamination warning signs. A metal sign on a fence post is labeled " 216-25 -S" [*sic*]. There are three metal vents rising from the crib. There is abundant vegetation growing on the sandy gravel surface (Hanford photograph A-6). The surface is about 12 in. above grade (site visit by author, September 1991).

4.11 216-S-172 CONTROL STRUCTURE

The 216-S-172 control structure is an inactive site located southwest of the 241-SX tank farm. The site operated from 1956 to 1976. The control structure was built to divert 202-S canyon building process vessel cooling water and steam condensate to the 216-S-16 ditch. The unit contains unquantified amounts of low-level radioactive solid waste. The maximum radiation reading is 25 mR/h (BHI 1994).

Waste sites 2904-S-160 and 216-S-172 have been stabilized and they have a light chain outer barricade with underground radiation warning signs surrounding them both, and an inner chain barricade around each of the sites individually. The inner barricade has underground radiation contamination and cave-in potential warning signs. The sites have recently been stabilized. The surface is approximately 24 in. above grade. There is no vegetation (site visit by author, September 1991).

4.12 216-U-9 DITCH/UPR-200-W-139

The 216-U-9 ditch is an inactive site located approximately 2,000 ft west of the 241-S tank farm. The site originally connected the 216-U-10 pond and the 216-S-17 pond. The ditch is now cut into the side of the 216-S-16 ditch, which went to the 216-S-16 pond. This ditch did receive the overflow from the 216-U-10 pond (Cruselle and Romano 1982; BHI 1994).

This unit (what is now the east branch) became contaminated in September 1953 and was covered with 2 ft of clean soil in the spring of 1954. The contamination was designated UPR-200-W-139. There is no known source for the contamination and no mention has been found regarding the level of

contamination. The unit has been released from radiation zone status. A new ditch was dug in the early 1970's incorporating the first 500 ft of the original 216-U-9 ditch and then running somewhat west of the original route (BHI 1994). The west branch was never used (Boyd Shannon, personal communication, 1991).

The 216-U-9 ditch is "Y" shaped with an eastern fork and western fork (Hanford drawing H-2-44511, Sheet 2). The eastern fork has no chain barricades or radiation warning signs and is partially backfilled. There is mature sage brush growing in the ditch. The western fork similarly has no chain barricades or radiation warning signs (Hanford photograph A-7). There has been no obvious backfilling. The ditch is 8 to 10 ft deep with sparse vegetation. Neither fork of the ditch has a permanent monument or other identification (site visit by authors, September 1991).

4.13 2607-WZ SEPTIC TANK

The 2607-WZ septic tank consists of two septic tanks with 1,500-gal capacity each. It is an active waste site located west of the 241-SX tank farm. The site started operating in 1944. The septic tank receives sanitary wastewater and sewage at an estimated rate of 22.6 m^3/d. This site also includes a drain field (BHI 1994).

4.14 2904-S-160 CONTROL STRUCTURE

The 2904-S-160 control structure is an inactive waste site located southwest of the 241-SX tank farm. The site operated from 1954 until its closure in 1976. The unit was built to divert process vessel cooling water and steam condensate from the 202-S canyon building to ponds 216-S-17, 216-S-6, or 216-S-16 (BHI 1994).

The 2904-S-160 control structure is a below grade pentagonal structure consisting of 1-ft-thick reinforced concrete walls, roof, and floor. The structure is 9 ft high and walls about 5 ft long (Cruselle and Romano 1982).

The structure contains low-level contaminated concrete and piping. The quantity of contaminated waste has not been determined. There are 5,000 counts per minute (c/m) beta/gamma in the soil and up to 300 c/m smearable on the surface of the structure (BHI 1994).

Waste sites 2904-S-160 and 216-S-172 have been stabilized and they have a light chain outer barricade with underground radiation warning signs surrounding them both, and an inner chain barricade around each of the sites individually. The inner barricade has underground radiation contamination and cave-in potential warning signs. The sites have recently been stabilized. The surface is approximately 24 in. above grade. There is no vegetation (site visit by author, September 1991).

4.15 2904-S-170 CONTROL STRUCTURE

The 2904-S-170 control structure is an inactive waste site located southwest of the 241-SX tank farm. The site was operated from 1954 to 1976. This unit was built to regulate and measure the process waste flow from S Plant before routing liquid to waste disposal sites (BHI 1994). The structure is

underground and made of concrete. The walls, floor, and roof are 10-in. thick and approximately 16 ft by 5 ft by 11 ft high (Crusselle and Romano 1982).

The 2904-S-170 control structure contains low-level contaminated concrete and piping. The quantity of contaminated waste has not been determined. There is less than 200 c/m beta/gamma smearable contamination and less than 7 mR/h penetrating and nonpenetrating radiation present (BHI 1994).

The site has four metal posts, there is no barricade, no warning signs, and no monument or other identifying label. The site has been stabilized. The surface is a sandy soil and is approximately 24 in. above grade. There is no vegetation on the roughly 4 ft by 4 ft site (site visit by author, September 1991).

4.16 2904-S-171 CONTROL STRUCTURE

The 2904-S-171 control structure is an inactive waste site located southwest of the 241-SX tank farm. The site was operated from 1954 until closing in 1976. The structure was built to measure and regulate flow of process waste being routed to the 216-S-6 crib (BHI 1994). It is a below grade concrete structure roughly 8.5 ft by 13 ft by 10 ft high. The walls, floor, and roof are 10 in. thick (Cruselle and Romano 1982).

The 2904-S-171 control structure contains low-level contaminated concrete and piping. The quantity of contaminated waste has not been determined. There is less than 100 c/m beta/gamma smearable contamination and 20 mR/h reading at contact with an open or closed window cutie pie (BHI 1994).

The unit is a concrete structure at grade with a light chain barricade, and some aboveground valves. The site is marked with both surface and underground radiation contamination warning signs. There is no permanent monument (site visit by author, September 1991).

5.0 OPERABLE UNIT 200-RO-2

Operable Unit 200-RO-2 encompasses the area and is bounded on the east by the S Plant, on the west by the S and SX tank farms, and on the north and south by 16th Street and 10th Street, respectively (Figure 5-1). Fourteen known waste sites are discussed within this operable unit, including a retention basin and a pond, two trenches, two tanks, and five cribs. Table 5-1 lists the waste sites, their location, and operational status. Note that there are two active sites and 15 UPRs known within this operable unit. The retention basin is a low-level waste site, while all other sites and UPRs are mixed waste sites. Table 5-2 lists each site's dimensions, quantity of plutonium contaminated soil (if applicable) (Nelson 1980), quantity of waste disposed, and the site ranking according to the PNL Hazard Ranking System (Stenner et al. 1988). Note that the quantity of material disposed at each site is not necessarily directly proportional to either the hazard ranking or the quantity of contaminated soil.

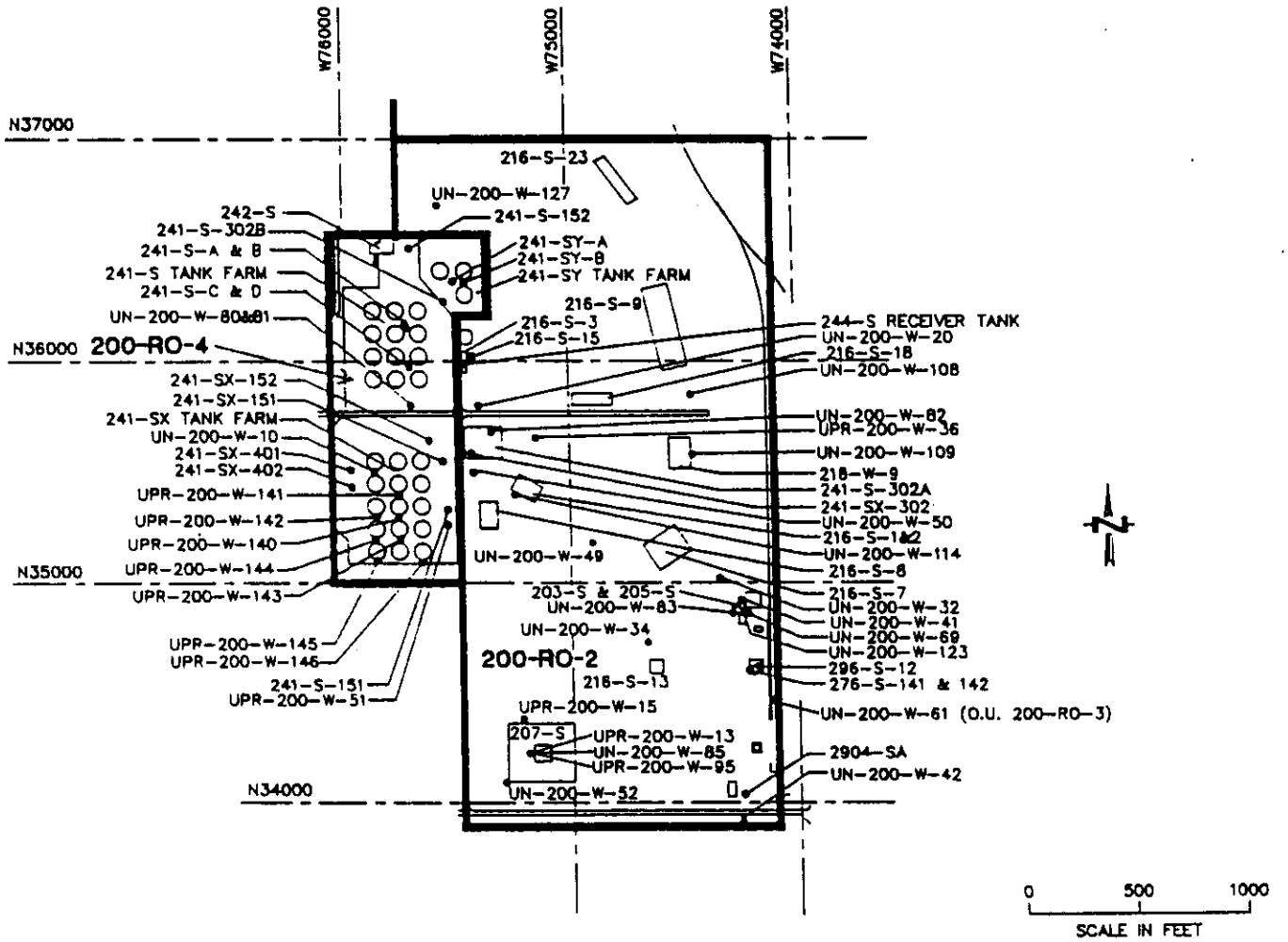
5.1 207-S RETENTION BASIN/UPR-200-W-13, UPR-200-W-15, AND UPR-200-W-95

The 207-S retention basin is a large inactive waste site located west of the 222-S laboratory buildings. The basin was started in October 1951 and was closed in April 1954. The basin received process cooling water and steam condensate from the 202-S canyon building, which then were discharged to the 216-S-17 pond or 216-S-16 pond (BHI 1994).

A number of leaks in process vessel coils in the REDOX facility released radioactivity into the unit in late 1952 until the unit was taken out of service. Weekly sampling and analysis of liquid effluents was performed. These results were compiled monthly during operation. The concrete floors and walls of the basin were filled with dirt to prevent contamination spread. In June 1975, the soil was treated with herbicides and covered with 9 in. of gravel to stop radioactive weed growth. The basin is a concrete structure with a volume of 853,000 gal and a surface area of 4,599 ft^2 (BHI 1994).

Three UPRs are associated with this site: UPR-200-W-13, UPR-200-W-15, and UPR-200-W-95. UPR-200-W-13 involved the failure of the H-4 oxidizer coil at the REDOX facility in December 1952. This released an unknown beta/gamma source that increased from 6 mrep/h to 700 mrep/h over a 30-d period. UPR-200-W-15 dates from November 1952 and was caused by the failure of a steam coil in the REDOX D-12 waste concentrator. This released an unknown beta/gamma source with dose rates up to 2 rem/h and was measured at 35 rem/h at 1 in. from the ground. UPR-200-W-95 was a series of releases from late 1952 until April 1954. These releases were caused by process coil leaks at the REDOX facility. Over this period of time, roughly 10 Ci of mixed fission products were released (BHI 1994).

The site is surrounded by a chain link fence with barbed wire on top, except for an opening large enough to drive a vehicle through. The fence has signs warning of surface and underground radiation contamination. Yellow flags indicating surface radiation are visible on the lowest surface of the basin. The surface is sand and gravel (site visit by author, September 1991).



DRAWN	CHKD.	APPD.	DATE	REV.	DESCRIPTION
JJA			1/89	1.0	
JJA			3/89	2.0	UPDATE CURRENT O.U.
JJA			1/91	3.0	INFORMATION UPDATE

Westinghouse Hanford Company
P.O. Box 1970
Richland, WA 99352

200 West Area
Operable Units 200-RO-2 and 200-RO-4
OU\2-RO-24

Figure 5-1. Operable Units 200-RO-2 and 200-RO-4 Plan (DOE-RL 1988).

Table 5-1. Site Location and Waste Type Summary Table for Operable Unit 200-RO-2 (BHI 1994).

Site	Type of Site	Status	Coordinates	Type of Waste
07-S RB	Retention Basin	Inactive	N34153 W75133, N34287 W75133, N34287 W75267, N34153 W75267	Low-Level Waste
16-S-1 & 2	Crib	Inactive	N35444 W75214 (center of 216-S-1), N35419 W75170 (center of 216-S-2)	TRU-Contaminated Soil Site/Mixed
16-S-13	Crib	Inactive	N34610 W74625 (center)	Mixed Waste
16-S-15	Pond	Inactive	N36066 W75450 (center)	Mixed Waste
16-S-18	Trench	Inactive	N35750 W74910 (center)	Mixed Waste
16-S-23	Crib	Inactive	N36669 W74709, N37020 W74790 (centerline)	Mixed Waste
16-S-3	French Drain	Inactive	N35964 W75480 (drain #1), N36064 W75480 (drain #2)	Mixed Waste
16-S-7	Crib	Inactive	N35152 W74510 (center of site)	Mixed Waste
16-S-8	Trench	Inactive	N35300 W75370 (center)	Mixed Waste
16-S-9	Crib	Inactive	N35920 W74455, N36290 W74550 (centerline)	Mixed Waste
18-W-9	Burial Ground	Inactive	N35647 W74556, N35508 W74555, N35511 W74458, N35648 W74458	Mixed Waste
41-S-151	Diversion Box	Active	N35635 W75410	Mixed Waste
41-S-302A	Catch Tank	Inactive	N35670 W75360	Mixed Waste
41-SX-302	Catch Tank	Inactive	N35590 W75420	Mixed Waste
PR-200-W-108	Unplanned Release	Inactive	N35850 W74450	Mixed Waste
PR-200-W-109	Unplanned Release	Inactive	N35575 W74450	Mixed Waste
PR-200-W-114	Unplanned Release	Inactive	N35400 W75250	Mixed Waste
PR-200-W-123	Unplanned Release	Inactive	N34860 W74235	Mixed Waste
PR-200-W-127	Unplanned Release	Inactive	N36700 W75575	Mixed Waste
PR-200-W-13	Unplanned Release	Inactive	N34380 W75225	Mixed Waste
PR-200-W-15	Unplanned Release	Inactive	N34380 W75225	Mixed Waste
PR-200-W-20	Unplanned Release	Inactive	N35800 W75400	Mixed Waste
PR-200-W-32	Unplanned Release	Inactive	N35020 W74340	Mixed Waste
PR-200-W-34	Unplanned Release	Inactive	N34730 W74650	Mixed Waste
PR-200-W-36	Unplanned Release	Inactive	N35650 W75150	Mixed Waste
PR-200-W-41	Unplanned Release	Inactive	N34920 W74250	Mixed Waste
PR-200-W-42	Unplanned Release	Inactive	N33920 W74250	Mixed Waste
PR-200-W-49	Unplanned Release	Inactive	N35180 W75550	Mixed Waste
PR-200-W-50	Unplanned Release	Inactive	N35500 W75430	Mixed Waste
PR-200-W-51	Unplanned Release	Inactive	N35420 W75570	Mixed Waste
PR-200-W-52	Unplanned Release	Inactive	N34090 W75310	Mixed Waste
PR-200-W-69	Unplanned Release	Inactive	N34860 W74220	Mixed Waste
PR-200-W-82	Unplanned Release	Inactive	N35700 W75450	Mixed Waste
PR-200-W-83	Unplanned Release	Inactive	N34860 W74235	Mixed Waste
PR-200-W-95	Unplanned Release	Inactive	N34220 W75200	Low-Level Waste

Table 5-2. Operational Dates and Status, Site Dimensions, and Waste Volumes Summary Table for Operable Unit 200-RO-2 (BHI 1994).

Site	State	Start Date	End Date	UPR Occurrence Date	Dim Ref	Length (ft)	Width (ft)	Dispo. Depth (ft)	Volume of Pu Contam. Soil (cu m)	Volume of Waste Disposed (cu m OR L)	PNL Hazard Ranking	Associated UPR(s)
07-S RB	Liquid	October 1951	April 1954		Top	130	130	8	0	0	1.42	UPR-200-W-13, 15, 95
16-S-1 & 2	Liquid	January 1952	January 1956		Bot	90	40	35	1700	160000000	55.37	UPR-200-W-36, 114
16-S-13	Liquid	January 1952	July 1972		Bot	40	40	34	770	5000000	1.45	
16-S-15	Liquid	December 1951	October 1952		Top	35	5	5	0	10000	1.04	UN-216-W-30
16-S-18	Liquid	October 1954	October 1954		Top	125	15	10	0	0	0.00	
16-S-23	Liquid	January 1969	July 1972		Bot	360	10	27	310	34100000	1.04	UN-216-W-30
16-S-3	Liquid	September 1953	August 1956		Top	0	0	6	36	4200000	47.82	UN-216-W-30
16-S-7	Liquid	January 1956	July 1965		Bot	100	50	22	1100	390000000	57.89	
16-S-8	Liquid	November 1951	February 1952		Bot	100	60	25	600	10000000	2.07	UN-200-W-114
16-S-9	Liquid	July 1965	January 1969		Bot	300	30	30	1800	50300000	50.34	
18-W-9	Solid	September 1954	September 1954		Top	140	98	12	4025	486	0.00	
41-S-151	Liquid	1952			Top	56	10	17	0	0	0.00	UPR-51,20 & UN-200-W-82
41-S-302A	Liquid	1952			Top	0	0	0	0	0	0.00	UN-200-W-82
41-SX-302	Liquid	1954	1983		Top	0	0	0	0	0	0.00	
PR-200-W-108	Liquid			January 8, 1969	Top	0	0	0	0	0	0.00	
PR-200-W-109	Liquid			January 24, 1969	Top	0	0	0	0	0	0.00	
PR-200-W-114	Liquid			September 1980	Top	0	0	0	0	0	0.00	
PR-200-W-123	Liquid			January 18, 1979	Top	0	0	0	0	73058	0.00	
PR-200-W-127	Liquid			February 26, 1980	Top	0	0	0	0	0	0.00	
PR-200-W-13	Liquid			December 23, 1952	Top	0	0	0	0	0	0.00	
PR-200-W-15	Liquid			November 1952	Top	0	0	0	0	0	0.00	
PR-200-W-20	Liquid			Jan - Feb 1953	Top	0	0	0	0	0	0.00	
PR-200-W-32	Liquid			1954	Top	0	0	0	0	0	0.00	
PR-200-W-34	Liquid			May 1955	Top	0	0	0	0	0	0.00	
PR-200-W-36	Liquid			August 4, 1955	Top	0	0	0	0	0	0.00	
PR-200-W-41	Solid			July 7, 1956	Top	0	0	0	0	0	0.00	
PR-200-W-42	Solid			February 3, 1957	Top	0	0	0	0	0	0.82	
PR-200-W-49	Liquid			July 31, 1958	Top	0	0	0	0	0	0.91	
PR-200-W-50	Liquid			August 25, 1958	Top	0	0	0	0	0	1.04	
PR-200-W-51	Liquid			September 12, 1958	Top	0	0	0	0	0	0.00	
PR-200-W-52	Liquid			September 15, 1958	Top	0	0	0	0	0	0.00	
PR-200-W-69	Liquid			March 2, 1973	Top	0	0	0	0	0	0.00	
PR-200-W-82	Solid			January 15, 1980	Top	0	0	0	0	0	0.00	
PR-200-W-83	Liquid			November 23, 1981	Top	0	0	0	0	0	0.00	
PR-200-W-95	Liquid			1952-1954	Top	0	0	0	0	0	0.69	

5.2 216-S-1 AND 216-S-2 CRIBS/UPR-200-W-36

The 216-S-1 and 216-S-2 cribs are inactive waste sites located east of the 241-SX tank farm. The cribs were started in January 1952 and were retired in January 1956. The cribs received 160,000,000 L of cell drainage from the D-1 receiver tank and redistilled condensate from the D-2 receiver tank in the 202-S canyon building. The inorganics found at the site include: aluminum nitrate, nitrate, nitric acid, and sodium. The radionuclides found at this site are: cobalt-60, americium-241, cesium-137, uranium, and plutonium (BHI 1994).

The 216-S-2 crib receives the overflow from the 216-S-1 crib. The site was deactivated in January 1956 when acid waste corroded monitoring well casings and penetrated sediments near the water table. The pipeline was capped at the 241-S-151 diversion box. The 202-S canyon building effluent then went to the 216-S-7 crib (Cruselle and Romano 1982; BHI 1994).

The site has a known release associated with it (UPR-200-W-36) where contamination spread downward via a ruptured test well. This UPR is not covered in the Tri-Party Agreement (Ecology et al. 1991). This area is also affected by UN-200-W-114, which was an airborne release and is discussed separately (BHI 1994).

Monitoring wells W22-2, W22-5, W22-6, W22-10, W22-15, W22-16, W22-17, W22-18, W22-29, W22-30, W22-31, W22-36, and W22-67 monitor the two units. The probe profiles show minor redistribution of radionuclides in the soil beneath the units. Breakthrough to groundwater could have occurred at this site (BHI 1994).

This area is not directly accessible because a light weight chain barricade surrounds the area at a considerable distance (UN-200-W-114). This large exclusion zone also encompasses the 216-S-8 trench (Hanford photograph A-8). Surface radiation contamination warning signs surround the area (site visit by author, September 1991).

5.3 216-S-3 FRENCH DRAIN

The 216-S-3 french drain is an inactive waste site located east of the 241-S tank farm. The drain was started in September 1953 and was closed in August 1956. The site consists of two structures, each with 10-ft by 10-ft bottom surface dimensions, spaced 50 ft apart. The french drain received 4,200,000 L of condensate from condensers on the 241-101 and 241-102 tanks in the 241-S tank farm. The waste is low salt. The inorganics found at the site are: nitrate, sodium, sodium aluminate, sodium dichromate, and sodium hydroxide. The radionuclides expected to be present are: cobalt-60, strontium-90, cesium-137, and uranium-238 (BHI 1994).

The site was deactivated by removing the aboveground piping in the 241-S tank farm to the crib because the tank air condensers were reactivated (BHI 1994).

The site is not directly accessible because a light weight chain barricade surrounds the area at some distance. This barricade also surrounds the UN-216-W-30 release, which is discussed separately (Hanford photograph A-9). Surface and underground radiation contamination warning signs mark the area (site visit by author, September 1991).

5.4 216-S-7 CRIB

The 216-S-7 crib is an inactive waste site located northwest of the 202-S canyon building. The crib was started in January 1956 and was retired in July 1965. Until April 1959, the crib received cell drainage from the D-1 receiver tank, process condensate from the D-2 receiver tank, and condensate from H-6 condenser. The unit did not receive H-6 condensate after April 1959. The crib received a total of 390,000,000 L of waste (BHI 1994).

The site was retired when it reached the prescribed radionuclide disposal limit. The D-1 receiver tank waste was rerouted to the 202-S canyon building concentrators for boil down and discharged to underground storage. The D-2 receiver tank waste discharged to the 216-S-9 crib. This site was deactivated by blanking the pipeline to the unit at the northwest corner of the REDOX facility area perimeter fence. The wooden structure may collapse. Prompt remedial action would be required to prevent spread of contamination and correct other hazards (BHI 1994).

Wells W22-12, W22-13, W22-14, W22-32, and W22-33 monitor this unit. No measurable migration of radionuclides has been detected beneath the unit since waste disposal to the site was terminated. Breakthrough to the groundwater could have occurred at this site (BHI 1994).

This site consists of a double layer of light chain barricade, one around the entire area with underground radiation contamination signs, and an inner chain around each of the two riser vents, with underground radiation and potential cave-in warning signs. There is also a concrete marker post at the site (Hanford photograph A-10). The vent risers appear to have cooling fins on them. The surface was stabilized with sand and gravel approximately 24 in. above grade. Five monitoring wells are contained within the outer barricade chain (site visit by author, September 1991).

5.5 216-S-8 TRENCH

The 216-S-8 trench is an inactive waste site located adjacent to the east side of the 241-SX tank farm on the east side. The trench was built in November 1951 and retired in February 1952. The site received unirradiated start-up waste from the 202-S canyon building, a total of 10,000,000 L. The main inorganic waste constituent present was nitrate. The radionuclides present are: cobalt-60, strontium-90, cesium-137, and uranium-238 (BHI 1994).

The site was retired when the discharge of start-up waste to the unit was completed. The site was deactivated by removing the aboveground piping and backfilling the unit (BHI 1994).

The site is surrounded by a light chain barricade, which also encompasses the 216-S-1 and 216-S-2 cribs (UN-200-W-114), allowing no close inspections of the actual site (Hanford photograph A-11). Surface radiation contamination warning signs surround the area (site visit by author, September 1991).

5.6 216-S-9 CRIB

The 216-S-9 crib is an inactive waste site located east of the 241-S and 241-SY tank farms. The crib came into operation in July 1965 and was retired in January 1969. The site received 50,300,000 L of process condensate from the D-2 receiver tank in the 202-S canyon building. The waste is acidic and

mainly composed of nitric acid. The radionuclide constituents present are: tritium, strontium-90, cobalt-60, ruthenium-106, cesium-137, plutonium-239 and -240, and uranium-238 (BHI 1994). UPR UN-200-W-108 is associated with this site and is discussed separately.

The site was retired when it reached prescribed radionuclide limits. The waste was rerouted to the 216-S-13 crib. The site was deactivated by blanking the pipeline at the south end of the unit (BHI 1994).

Wells W22-26A and W22-27A were drilled next to this unit in 1966 to determine the radionuclide distribution below the site. Only low-level strontium-90 was detected in a perched water zone at 140 ft. Data indicate that breakthrough to groundwater could have occurred at this site (BHI 1994).

The site is surrounded by a light chain barricade with both surface and underground radiation contamination warning signs. There are three steel risers in the site and several monitoring wells. There is no permanent marker (Hanford photograph A-12). The surface is sand and gravel with heavy vegetation (site visit by author, September 1991).

5.7 216-S-13 CRIB

The 216-S-13 crib is an inactive waste site located directly west of the 202-S canyon building. The crib was built in January 1952 and was closed in July 1972. Until June 1967, the site received liquid waste from the 203-S decontamination metal storage facility, the 204-S UNH lag storage facility, and the 276-S organic solvent make-up facility. After June 1967, the site received occasional waste from the 204-S UNH facility. The unit received a total of 5,000,000 L of waste. The waste is low salt and mainly composed of nitrate, sodium and sodium dichromate. The radionuclides present are: cobalt-60, strontium-90, and cesium-137 (BHI 1994).

The site has a double layer of light chain barricade, the outer chain barricade is marked with surface radiation contamination warning signs and the inner with cave-in and underground radiation signs. The surface is sand and gravel and is at grade (Hanford photograph A-13). Hanford drawing H-2-5385 indicates an encasement running to the crib from 296-S-12. Monitoring well 22-21 is east of this crib site (site visit by author, September 1991).

5.8 216-S-15 POND

The 216-S-15 pond is an inactive waste site located directly east of the 214-S tank farm. The pond was built in December 1951 and was retired in October 1952. The site received 10,000 L of condenser spray cooling water from the 110-S tank in the 241-S tank farm. The waste is low salt and is mainly composed of nitrate and MIBK. There are no radionuclides expected to be present (BHI 1994).

The site was removed from service when condensed tank vapors were mixed with the normal waste discharged to this unit. The site was deactivated by removing the aboveground piping and backfilling with 2 ft of clean soil (BHI 1994).

The site is not directly accessible because a light weight chain barricade surrounds the area at a considerable distance (UN-216-W-30). Surface and underground radiation contamination warning signs mark the area (site visit by author, September 1991).

5.9 216-S-18 TRENCH

The 216-S-18 trench is an inactive waste site located northeast of the 241-SX tank farm. The trench was built and retired in October 1954. The site received vehicle decontamination waste. The site was retired the same month when vehicle decontamination was complete. The site was deactivated by backfilling (BHI 1994).

In October 1972, this site was dug up and the remaining radioactive objects found were taken to the 200 West Area dry burial ground. The site was then released from radiation zone status (Cruselle and Romano 1982; BHI 1994).

This site was a steam cleaning pit for contaminated equipment. Research strongly suggests that solvents (particularly chlorinated solvents) were used in the cleaning process. There are no barricades, warning signs, or permanent marker. Some concrete debris is present and moderate vegetation. The site is L shaped, composed of sand and gravel, and is 4 to 6 ft below grade (site visit by author, September 1991).

5.10 216-S-23 CRIB

The 216-S-23 crib is an inactive waste site located northeast of the 241-SY tank farm and north of the 216-S-9 crib. The crib became operable in January 1969 and was closed in July 1972. The site received 34,100,000 L of REDOX process condensate from the D-2 receiver tank in the 202-S canyon building. The waste is low salt and mainly composed of nitric acid. The radionuclide isotopes present are: cobalt-60, strontium-90, ruthenium-106, and cesium-137 (BHI 1994).

Wells W19-5, W19-6, W19-7, W22-37, and W22-38 monitor this site. Data indicate breakthrough to groundwater has not occurred at this site (BHI 1994).

A light chain barricade surrounds the area with surface and underground contamination warning signs. The site has two metal risers, several monitoring wells, and a stubbed pipe from the 216-S-9 crib. The surface is sand and gravel at grade and has little vegetation (Hanford photograph A-14). The barricade for the UN-216-W-30 UPR is adjacent to this site (site visit by author, September 1991).

5.11 218-W-9 BURIAL GROUND

The 218-W-9 burial ground is an inactive waste site located directly east of the 241-SX tank farm. The burial ground was started and closed in September 1954. The unit contains an unknown amount of metal scrap, including the 211-S tank taken from the REDOX facility. Waste contains less than 0.1 Ci total beta activity. The radionuclides present are: cesium-137, ruthenium-106, and strontium-90 (Kiser 1988).

There was a UPR (UN-200-W-109) directly above the vault in 1969. This is discussed under its own heading later in this section.

The site is barricaded with a light chain and a concrete marker post. Signs warning of underground radiation contamination also surround the site (Hanford photograph A-15). The area has been stabilized with sand and gravel. The surface is approximately 1.5 ft above grade. There are no vents or vegetation in this area (site visit by author, September 1991).

5.12 241-S-151 DIVERSION BOX

The 241-S-151 diversion box is an active waste site located northeast of the 241-SX tank farm. The site transports waste solutions from processing and decontamination operations. Quantities are variable depending on specific plant operations. Leak detection and air monitoring are performed continuously with the 241-S tank farm. The unit interconnects 240-S-151, 241-SX-151, and the 241-S tank farm (BHI 1994).

There are three or four known releases at this site: UN-200-W-51, UN-200-W-20, UN-200-W-82, (BHI 1994) and possibly one unnamed release (Historical UPR File).

UPR-200-W-20 occurred during January and February 1953. Leakage from the diversion box contaminated about 1,000 ft^2 around the diversion box. The contamination was unidentified and the area was covered with gravel (BHI 1994).

UPR-200-W-51 occurred on September 12, 1958. It involved leakage from the diversion box. The leakage covered a narrow strip of ground south of the diversion box, across 10th Street and about 100 yd beyond the area fence. There were unknown sources of beta and gamma radiation measured at a maximum of 50 mR/h within 100 ft of the box. The contaminated soil was saturated with water and turned over with a bulldozer (BHI 1994). The unnamed UPR has an almost identical description, but is dated September 15, 1958. It is likely that this is the same incident.

UN-200-W-82 involved spots of contamination resulting from routine surveillance traffic. This was detected on January 15, 1980. The specks of contamination outside the zone were removed to the burial ground (BHI 1994).

The site is not directly accessible for inspection because several construction sites surround it (site visit by author, September 1991).

5.13 241-S-302A CATCH TANK

The 241-S-302A catch tank is an inactive waste site located east of the 241-SX tank farm. The tank was placed in service in 1952 and was not officially retired, but is not in service. This unit was used for transfer of waste solutions from processing and contamination operations. Volumes were variable according to specific plant operations. The unit was partially filled with grout in February 1991 (BHI 1994).

This unit is an assumed leaker. Leak detection and air monitoring are performed continuously in the 241-S tank farm (BHI 1994).

The site is not directly accessible for inspection because several construction sites surround it (site visit by author, September 1991).

5.14 241-SX-302 CATCH TANK

The 241-SX-302 catch tank is an inactive waste site located east of the 241-SX tank farm. The tank was placed on line in 1954 and was retired in 1983. The unit was used for transfer of waste solutions from processing and decontamination operations. Volumes were variable according to specific plant operations (BHI 1994).

The unit was isolated in 1985. Leak detection and air monitoring are performed continuously in the 241-SX tank farm (BHI 1994).

The site is not directly accessible for inspection because several construction sites surround it (site visit by author, September 1991).

5.15 UN-200-W-32 UNPLANNED RELEASE

A UNH line that ran from 204-S to the 224-U facility was hanging below a steam line from 1952 to 1967. During this time there was a barricade because of radiation emission. This barricade was taken down when the UNH line was removed, except where there had been leaks from the UNH line (Environmental Protection Files). Current radiation surveys show 7,000 to 30,000 dis/m beta radiation present (Health Physics Surveys Nos. 904771 and 10127).

The UN-200-W-32 UPR occurred in the summer of 1954 in the northwest corner of the REDOX exclusion area. A UNH transfer line enroute to the 224-U facility from the REDOX facility broke, discharging an unknown amount of UNH solution to the ground (BHI 1994).

The contamination was covered with clean soil. The area was removed from radiation zone status in February 1971 (BHI 1994).

5.16 UN-200-W-34 UNPLANNED RELEASE

The UN-200-W-34 UPR was an overflow from an open ditch to REDOX chemical sewer trenches in May 1955. The spill contaminated 1 acre between the open ditch and the REDOX chemical sewer trenches, with a maximum dose rate of 1 R/h at the ground surface (BHI 1994).

The ditch was dredged and the sludge removed, placed in low spots on both sides of the ditch, and covered with 2 ft of soil. The area was removed from radiation zone status in March 1971 (BHI 1994).

5.17 UN-200-W-41 UNPLANNED RELEASE

The UN-200-W-41 UPR resulted from a burial box in transit that provided ground contamination in the S Plant area. The contamination location was the right-of-way from the 202-S railroad cut to the burial ground. There was unknown beta/gamma to 1,000 mR/h (BHI 1994).

5.18 UN-200-W-42 UNPLANNED RELEASE

The UN-200-W-42 UPR was found by two operators on a routine supply check. They discovered a high background in the railroad shack. The shack was evacuated and radiation monitoring was immediately called. A follow-up survey revealed contamination on the papered floor to 3,200 mrad/h. The paper was changed and smears taken of the floor were 2,000 c/m. Spotty contamination to 500 mrad/h was found in the snow outside the shack near the 202-S canyon building. The cause of the contamination is unknown. The floor and ground was cleaned to 2,000 to 5,000 c/m background (Historical UPR Files; BHI 1994).

5.19 UN-200-W-49 UNPLANNED RELEASE

The UN-200-W-49 UPR occurred on July 31, 1958, outside the southeast corner of the 241-SX tank farm. It is believed that wind spread contamination from the 241-SX tank farm to this location. A radiation zone was established because unknown beta/gamma radiation with readings to 150 mR/h and a single spot of 10 R/h was measured (BHI 1994).

5.20 UN-200-W-50 UNPLANNED RELEASE

The UN-200-W-50 UPR occurred on August 25, 1958, in the 241-SX tank farm. The 241-SX-114 tank bumped [*sic*] and steam was observed to escape from the risers of all tanks in the immediate area. Contamination was deposited on the ground around the 241-SX-113 tank and was spread outside the tank farm by high winds. Contamination inside the tank farm covered about 15,000 ft^2 and showed a maximum level of 5 rads/h. An area of about 2 acres east of the tank farm was contaminated generally to 40,000 c/m with spots to 100 mrad/h. This includes a 200 ft stretch of Camden Avenue (BHI 1994).

Camden Avenue was roped off and posted as a radiation zone (BHI 1994).

5.21 UN-200-W-52 UNPLANNED RELEASE

The UN-200-W-52 UPR occurred on September 15, 1958, at an oval shaped area approximately 300 ft wide, lying immediately south of the 241-S-151 diversion box toward 10th Street. The area includes the 207 retention basin at its south end. Leakage from the 241-S diversion box caused ground contamination (BHI 1994). There are discrepancies between the text and the map found in document HW-60807 (Baldridge 1959).

The soil was saturated with water and turned over with a bulldozer (BHI 1994).

5.22 UN-200-W-69 UNPLANNED RELEASE

The UN-200-W-69 UPR occurred on March 2, 1973, north and northeast from the 204-S unloading station and between the 204-S railroad spur and the REDOX railroad cut. Numerous spots of ground contamination of 2,000 to 50,000 c/m were noted with infrequent spots of 20 to 100 mrads/h. Inside of the established radiation zone, the sump pit was found contaminated from 1,000 to 5,000 mrads/h and the grating from the sump stacked nearby to 800 mrads/h. The survey was extended outside the REDOX exclusion fence where several spots of 5,000 to 100,000 c/m were detected between the 204-S railroad spur and the REDOX railroad cut embankment. The cause of the incident is unknown (BHI 1994).

5.23 UN-200-W-82 UNPLANNED RELEASE

The UN-200-W-82 UPR occurred on January 15, 1980, near the 241-S-151 diversion box and the 241-S-302 catch tank. A radiation monitor surveyed the area around the 302-S catch tank after finding contaminated special work permit rubbers on personnel leaving the zone. The survey disclosed high levels of contamination over an area approximately 35 ft by 60 ft. Contamination levels inside the zone were generally from 40,000 to 60,000 dis/m with one spot reading 1,000 window open on a cutie pie. The spots outside the zone were up to 80,000 c/m (BHI 1994).

Apparently a piece of equipment was moved in for 240-S diversion box decontamination and 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 runoff. Specks outside the zone were picked up and removed to the burial ground (BHI 1994).

5.24 UN-200-W-83 UNPLANNED RELEASE

The UN-200-W-83 UPR occurred on November 23, 1981. The unknown amount of radiation contamination was found in the vicinity of the 204-S UNH radiation zone. The cause is thought to be a spill of an unknown liquid waste to the ground (BHI 1994). The 204-S area had been stabilized.

5.25 UN-200-W-108 UNPLANNED RELEASE

The UN-200-W-108 UPR occurred on January 8, 1969, approximately 200 ft north of 13th Street at the south end of the 216-S-9 crib. The site received REDOX process condensate from the D-2 receiver tank in the 202-S canyon building with unknown beta and gamma radiation and dose rate readings of 40 R/h at the bottom of the waste line (BHI 1994).

During the tie-in of the 216-S-9 crib waste line to the new 216-S-23 crib, contaminated water was encountered coming from a break at the junction of the two crib lines. Further excavation disclosed a severe expansion buckle in the line at that point with a similar buckle 6 ft up the line toward the 202-S canyon building. There is no way of determining how long the line had been leaking or how much waste was discharged to the ground (BHI 1994).

Dose rates were shielded with lead to reduce dose rates to personnel to 400 mR/h. Approximately 30 gal of waste solution were discharged into a hole in the ground dug below the opening of the line.

The only isotope thought to be present is plutonium-239 (BHI 1994). Current radioactivity is below detection for alpha and beta, gamma is <0.5 mrem/h (Health Physics Survey No. 904774).

5.26 UN-200-W-109 UNPLANNED RELEASE

The UN-200-W-109 UPR occurred on January 24, 1969, just inside the east perimeter chain of the 218-W-9 burial ground site, south of 13th Street and north of the 216-S-7 crib. The site received REDOX process condensate from the D-2 receiver tank in the 202-S canyon building containing acidic unknown beta/gamma sources. Dose rates of the liquid were 450 mR/h at the surface. As the water sank back into the ground, surface dose rates dropped to 20 mR/h (BHI 1994).

During the tie-in of the 216-S-9 crib waste line to the new 216-S-23 crib, contaminated water was encountered coming from a break at the junction of the two crib lines. This incident is related to the UN-200-W-108 UPR incident. After repairing the buckled portions of the waste line, a pressure test indicated another leak in the line at some point upstream toward the 202-S canyon building. Further excavation and pressure testing finally determined a leak to be somewhere between the first discovered leak and the northwest corner of the REDOX area fence. Additional hydrostatic testing finally forced water to bubble to the ground surface. Excavation of the bubble site disclosed a vertical buckling of the pipeline with a sizable break in the line (BHI 1994).

Surface contamination is now measured at <0.5 mR/h gamma and 3,000 to 60,000 dis/m beta (Health Physics Survey No.10115).

5.27 UN-200-W-114 UNPLANNED RELEASE

The UN-200-W-114 UPR occurred in September 1980 east of the 241-SX tank farm. Radioactive particulate matter resulting from operations activities in the 241-SX tank farm, the 241-SX-151 diversion box, and the 241-S-151 diversion box spread over the ground surface of the subject area during many years of operations. The actual date of occurrence is unknown (BHI 1994).

A number of cleanup campaigns reduced the amount of contamination, but residue of the original remains on the ground. The only isotope thought to be present is plutonium-239. General contamination is from 200 to 450 c/m with specks up to 4 mrem/h (BHI 1994).

The area has a light chain barricade with surface radiation contamination warning signs enclosing an area approximately 350 ft by 450 ft, which contains the 216-S-8 trench, - 1 and - 2 sites (site visit by author, September 1991).

5.28 UN-200-W-123 UNPLANNED RELEASE

The UN-200-W-123 UPR occurred on January 18, 1979, at the 204-S unloading facility area. The cause of the leak was a frozen discharge line. The release consisted of about 1/2 gal of radioactive liquid waste. The contaminated ground beneath the tank car was cleaned up (BHI 1994).

5.29 UN-200-W-127 UNPLANNED RELEASE

The UN-200-W-127 UPR occurred on February 26, 1980, at the east end of the 242-S evaporator building. A pool of an unknown liquid was found on the ground. High levels of radiation existed all around the building. The spill was covered with clean dirt (Historical UPR Files, 1986).

5.30 UN-216-W-30 UNPLANNED RELEASE

The UN-216-W-30 was designated a UPR site in 1985. Its origins are unknown, as is the type of contamination present. It is being monitored by Environmental Protection (Christine Huckfeldt, personal communication, September 1991).

Current levels of radioactivity are 3,500 dis/m beta and <0.5 mrem/h (Health Physics Survey No.904772). The site extends about 900 ft northeast of the 241-SY tank farm and is about 250 ft wide. It crosses the northern portion of the 216-S-23 crib. A light chain barricade is posted with surface radiation contamination warning signs. The site is heavily vegetated and shows no sign of stabilization (site visit by authors, September 1991).

6.0 OPERABLE UNIT 200-RO-3

Operable Unit 200-RO-3 encompasses the area surrounding the S Plant (Figure 6-1). There are 12 waste sites and seven UPRs at this operable unit. These include a retention basin, two trenches, three cribs, and five ponds. Table 6-1 lists the waste sites, their location and operational status. Note that there are five active sites including a septic tank. Table 6-2 lists each site's dimensions, quantity of plutonium contaminated soil (if applicable) (Nelson 1980), quantity of waste disposed, and the site ranking according to the PNL Hazard Ranking System (Stenner et al. 1988). Note that the quantity of material disposed at each site is not necessarily directly proportional to either the hazard ranking or the quantity of contaminated soil.

6.1 207-SL RETENTION BASIN

The 207-SL retention basin is an active waste site located 200 ft east of the 222-S laboratory buildings. The site was placed in service in February 1952. Until 1954, the basin received low-level waste, including ventilation cooling water and miscellaneous wastes from laboratory hoods and sinks in the 222-S laboratory building. These were then discharged to the 216-S-19 pond. From December 1954 to October 1955, the site was inactive because the radioactivity levels of waste exceeded the prescribed limits. Since October 1955, the site has again been receiving the ventilation cooling water and miscellaneous waste from laboratory hoods and sinks in the 222-S laboratory buildings. This unit originally discharged to the 216-S-19 pond and now discharges to the 216-S-26 crib (BHI 1994).

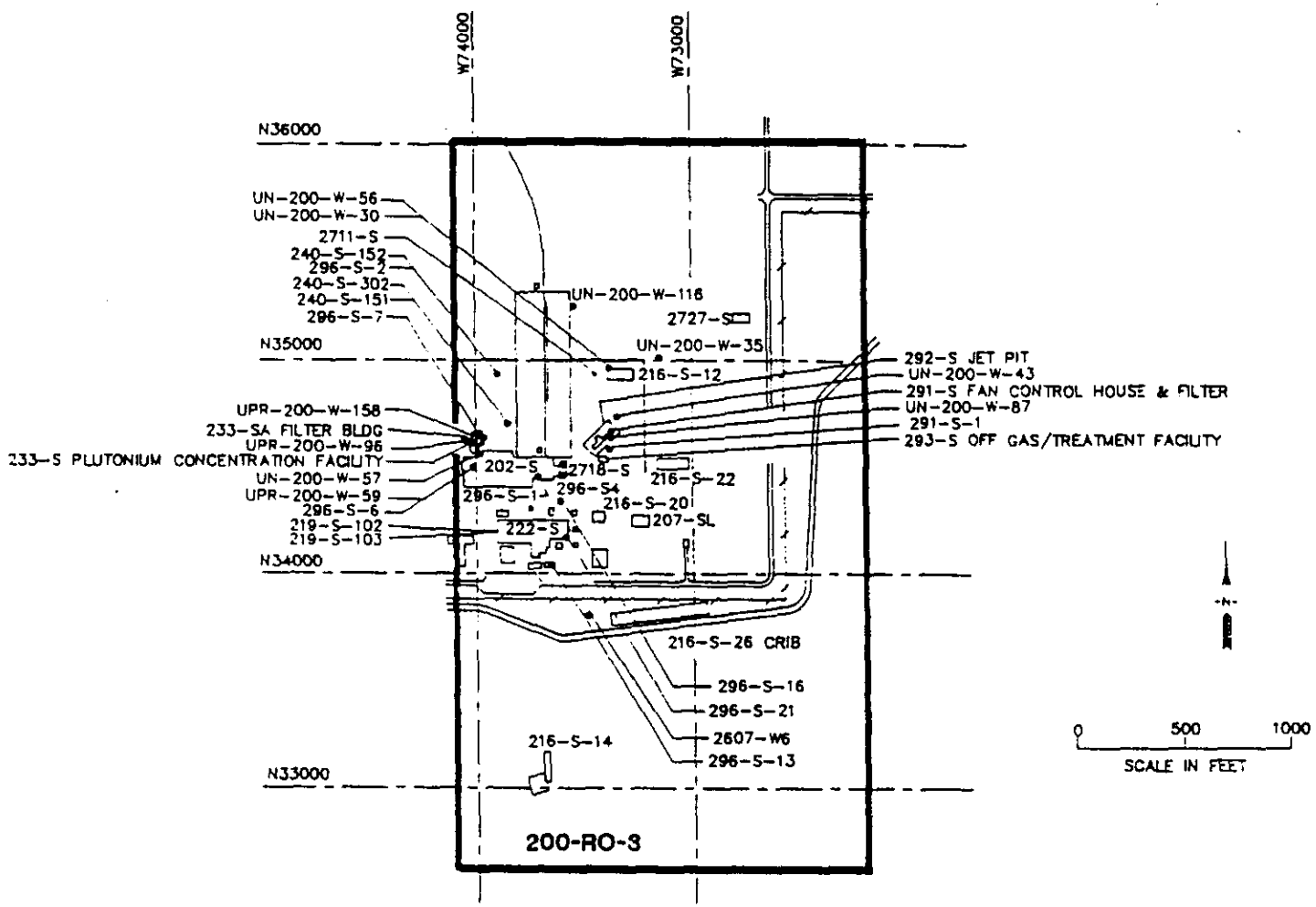
This basin consists of an approximately 50-ft by 50-ft concrete structure at grade with a concrete lid. The area is not roped off, but has signs warning of surface radiation contamination. There appears to be an 8-in. line running from this basin to crib 216-S-20. Also at the basin site are electrical controls and nitrogen gas cylinders (site visit by author, September 1991).

6.2 216-S-12 TRENCH/UN-200-W-30

The 216-S-12 trench is an inactive waste site located northeast of the 202-S canyon building. The unit was constructed in July 1954 to receive approximately 20,000 gal of flush water containing ammonium nitrate from the 291-S stack. The site was retired in July 1954 when the flush of the 291-S stack was complete (BHI 1994).

This unit was deactivated by removing the aboveground piping and backfilling. It has been recommended that this site have core drilling done to determine the extent of the remaining radioactivity. The isotopes thought to have been placed in the trench are: cesium-137, ruthenium-106, and strontium-90. In all probability this site can be removed from the status of a radiation zone (BHI 1994).

The site is barricaded with a light chain with underground radiation contamination signs and a concrete marker post. The surface is sand and gravel with no vents or evidence of subsidence (site visit by author, September 1991).



DRAWN	CHKD.	APPD.	DATE	REV.	DESCRIPTION
JJA			1/89	1.0	
JJA			1/91	2.0	INFORMATION UPDATE

Westinghouse Hanford Company
P.O. Box 1970
Richland, WA 99352

200 West Area
Operable Unit 200-RO-3
OU\2-RO-3

Figure 6-1. Operable Unit 200-RO-3 Plan (DOE-RL 1988).

Table 6-1. Site Location and Waste Type Summary Table for Operable Unit 200-RO-3 (BHI 1994).

Site	Type of Site	Status	Coordinates	Type of Waste
207-SL	Retention Basin	Active	N34263 W732469, N34263 W73415	Mixed Waste
216-S-12	Trench	Inactive	N34965 W73384 (northwest corner)	Mixed Waste
216-S-14	Trench	Inactive	N33100 W73700 (center)	Mixed Waste
216-S-20	Crib	Inactive	N34296 W73312 (center)	Mixed Waste
216-S-22	Crib	Inactive	N34533 W73183, N34533 W73080 (centerline)	Mixed Waste
216-S-26	Crib	Active	N33763 W73415, N33826 W72970 (centerline)	Low-Level Waste
218-W-7	Burial Ground	Inactive	N34129 W73540 (center)	Mixed Waste
240-S-151	Diversion Box	Inactive	N34700 W73860	Mixed Waste
240-S-152	Diversion Box	Inactive	N34940 W73900	Mixed Waste
240-S-302	Catch Tank	Inactive	N34700 W73860	Mixed Waste
2607-W6	Septic Tank	Active	N33800 W73500	Nonhazardous/Nonradioactive
291-S	Sand Filter	Active	N34600 W73400	Low-Level Waste
UPR-200-W-116	Unplanned Release	Inactive	N34465 W74600	Mixed Waste
UPR-200-W-30	Unplanned Release	Inactive	N34965 W73384	Mixed Waste
UPR-200-W-35	Unplanned Release	Inactive	N35015 W73154	Mixed Waste
UPR-200-W-43	Unplanned Release	Inactive	N34740 W73340	Mixed Waste
UPR-200-W-56	Unplanned Release	Inactive	N34965 W73384	Mixed Waste
UPR-200-W-57	Unplanned Release	Inactive	N34575 W74000	Mixed Waste
UPR-200-W-61	Unplanned Release	Inactive	N34460 W74120	Mixed Waste
UPR-200-W-87	Unplanned Release	Inactive	N34799 W73395	Mixed Waste
UPR-200-W-96	Unplanned Release	Inactive	N34625 W74050	Mixed Waste

Table 6-2. Operational Dates and Status, Site Dimensions, and Waste Volumes Summary Table for Operable Unit 200-RO-3 (BHI 1994).

Site	State	Start Date	End Date	UPR Occurrence Date	Dim Ref	Length (ft)	Width (ft)	Dispo. Depth (ft)	Volume of Pu Contam. Soil (cu m)	Volume of Waste Disposed (cu m OR L)	PNL Hazard Ranking	Associated UPR
207-SL	Liquid	February 1952			Top	50	50	12	0	0	0.00	
216-S-12	Liquid	July 1954	July 1954		Bot	90	20	10	66	68100	1.04	UN-200-W-56, 30
216-S-14	Liquid	December 1951	January 1952		Top	100	8	6	0	0	1.04	
216-S-20	Liquid	January 1952	May 1973		Bot	90	40	30	1500	135000000	50.34	
216-S-22	Liquid	October 1957	1967		Bot	100	4	10	170	98400	1.04	
216-S-26	Liquid	October 1984			Bot	420	10	12	0	164000000	0.00	
218-W-7	Solid	1952	1960		Top	0	0	26	4	159	0.65	
240-S-151	Liquid	1950	March 1987		Top	0	0	0	0	0	0.00	
240-S-152	Liquid	1977	1980		Top	0	0	0	0	0	0.00	UN-200-W-116
240-S-302	Liquid	1950	March 1987		Top	0	0	0	0	0	0.00	UN-200-W-116
2607-W6	Liquid	1951			Top	0	0	0	0	0	0.00	
291-S	Solid	1952			Top	200	0	0	0	0	0.00	
UPR-200-W-116	Solid			1968	Top	0	0	0	0	0	0.00	
UPR-200-W-30	Liquid			July 1954	Top	90	20	10	0	0	0.00	
UPR-200-W-35	Liquid			September 1955	Top	0	0	0	0	0	0.00	
UPR-200-W-43	Solid			February 12, 1957	Top	0	0	0	0	0	0.82	
UPR-200-W-56	Liquid			February 6, 1961	Top	0	0	0	0	0	1.04	
UPR-200-W-57	Solid			November 6, 1963	Top	0	0	0	0	0	0.00	
UPR-200-W-61	Liquid			April 24, 1966	Top	0	0	0	0	0	1.04	
UPR-200-W-87	Liquid			January 28, 1982	Top	0	0	0	0	0	0.00	
UPR-200-W-96	Liquid			January 9, 1969	Top	0	0	0	0	0	1.04	

Slightly west of the 216-S-12 trench is a light chain barricade containing two wooden structures approximately 8 ft by 8 ft by 5 ft in size (Hanford photograph A-16). One of the boxes contain a 2.5-in. rubber hose. The area has radiation warning signs indicating surface radiation contamination (site visit by author, September 1991). The contamination is limited to the boxes and is approximately 600 c/m (R.G. Miklecky, personal communication, September 1991).

The UN-200-W-30 UPR is a duplicate of this trench history (BHI 1994).

6.3 216-S-14 TRENCH

The 216-S-14 trench is an inactive waste site located 1,273 ft south of the 202-S canyon building. It is 100 ft by 8 ft. The site was started in December 1951 and closed in January 1952 (BHI 1994). The trench received 20,000 gal of contaminated (unirradiated uranium) hexone from the initial test runs in the 202-S canyon building (Baldridge 1959). 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 (BHI 1994).

The site was investigated by core drilling in February 1971. There was a strong odor of hexone from the samples taken, but no radioactivity was found (BHI 1994).

In one portion of the trench an apparent cave in occurred leaving a 10-ft by 10-ft pit, which has four posts and a weathered rope surrounding it. There are no radiation warning signs. Immediately south of the trench is the hexone liquid crib site, which is not referenced in BHI (1994). The drawings show security fencing around the trench, and currently there is none. Just 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 (Hanford photograph A-17). These pipes appear to be 4 to 6 ft deep. These may be vents. The surface of this area has grass cover (site visit by author, September 1991).

6.4 216-S-20 CRIB

The 216-S-20 crib is an inactive waste site 304 ft southeast of the 222-S laboratory buildings. The crib was placed in operation in January 1952 and retired in May 1973. The unit received 135,000,000 L of waste. Until July 1973, the site received miscellaneous waste from laboratory hoods and decontamination sinks in the 222-S laboratory building via the 219-S retention building. From July 1953 to September 1963, the site received the above effluent via the 207-SL retention basin and 219-S retention building, and 300 Area laboratory waste via a manhole. From September 1963 to January 1969, the site received miscellaneous waste from laboratory hoods and decontamination sinks in the 222-S laboratory buildings via the 219-S retention building. Rerouted 300 Area laboratory wastes were discharged to the 216-T-28 crib. From January 1969 to November 1972, the site was inactive because the ground was caving in above the unit. The pipelines were valved out from the unit in the 219-S building and at the 207-SL retention basin and rerouted the 222-S laboratory buildings effluent to the 202-S canyon building concentrators for boil-down and discharge to the underground storage. After November 1972, the ground was filled in. The site received miscellaneous wastes from laboratory hoods and decontamination sinks in the 222-S laboratory buildings via the 219-S retention building (BHI 1994).

The unit has had a history of sinking. During the past 15 yr, the sink holes have been filled with several cubic yards of fill dirt on three different occasions. It is doubtful that any cavities remain below the ground surface (Cruselle and Romano 1982; BHI 1994).

The unit is monitored by well W22-20. Data indicate breakthrough to groundwater has not occurred. The isotopes thought to have been deposited in the crib are: cesium-137, ruthenium-106, and strontium-90. The main inorganic constituent found in the received waste was nitrate (BHI 1994).

The outer area of the 216-S-20 crib is barricaded with a light chain with surface contamination warning signs and a concrete post marker. The surface is sand and gravel with a slight depression around the riser vents. Within the outer barricade, two inner barricades surround each of the crib metal riser vents. These inner chains have underground radiation contamination and cave-in potential warning signs. A monitoring well is adjacent to this site. This area has a 3-ft natural grade that contains very little vegetation (site visit by author, September 1991).

6.5 216-S-22 CRIB

The 216-S-22 crib is an inactive waste site located 500 ft east of the 202-S canyon building. The unit was started in October 1957 and was closed in 1967. The crib received 98,400 L of liquid waste containing nitrate and sodium from the acid recovery facility in the 293-S building. The site was retired when production operations were shut down at the REDOX facility. The inlet piping in the 293-S building was blanked (BHI 1994).

The crib is monitored by well W22-19. Data indicate breakthrough to groundwater has not occurred at the site. The isotopes present at the site are: cesium-137, ruthenium-106, and strontium-90 (BHI 1994).

The site is surrounded by a single light weight chain with signs warning of underground radiation contamination. Inside the chain are two riser vents, one being capped. The surface is sand and gravel with no obvious signs of subsidence. Southeast of the site is monitoring well W22-19. Hanford photograph 122440-530CN is identified incorrectly as being of this site. It is instead of the 216-S-26 crib.

6.6 216-S-26 CRIB

The 216-S-26 crib is an active waste site located 500 ft southeast of the 222-S laboratory building, which started in October 1984. The site has received 164,000,000 L of steam condensate and sink wastes that are byproduct radioactive wastes from the 222-S laboratory building via the 207-SL retention basin. The wastes contain a variety of chemicals, including: acetone, nitrate, nitric acid, and lesser amounts of sulfuric and hydrofluoric acids (BHI 1994).

During the week of October 20, 1984, an unnamed spill occurred at the 222-S laboratory building resulting in the release of water contaminated with strontium-90 to the 207-SL retention basin. Concentrations averaged two to three times the strontium-90 guide limit, but did not exceed standards. The water was released to the new 216-S-26 crib (BHI 1994).

Data from the 299-W27-01 monitoring well indicates alpha radiation and total uranium remain above the uranium-238 concentration limit (BHI 1994). The isotopes thought to be present at the site are: americium-241, cesium-137, plutonium-239, and strontium-90 (BHI 1994).

The site has a light chain barricade with underground radiation contamination warning signs surrounding it. There are three risers, two of which are 6-in. steel pipes rising about 24 in. above grade. The center riser appears to be a 24-in. concrete pipe, rising 48 in. above grade. Hanford photograph A-18) incorrectly identified the 216-S-22 crib is of this site.

A manhole at the west end appears to be astride the waste line that runs south to the 216-S-19 pond. The site is 10 ft by 10 ft, protected by a light weight chain with steel posts and surface radiation contamination warning signs surrounding it.

6.7 218-W-7 BURIAL GROUND

The 218-W-7 burial ground is an inactive waste site located near the 222-S laboratory buildings. The burial ground was started in 1952 and closed in 1960. The vault is made of carbon steel with one coat of hot coal tar enamel. It received dry, packaged laboratory and sampler waste from the 222-S laboratory building. The isotopes thought to be present are: cesium-137, ruthenium-106, and strontium-90 (BHI 1994).

The site is barricaded by a light chain and four concrete posts with signs warning of underground radiation contamination. The site consists of a 20-ft diameter area with an apparatus with crank on the side. The surface of this site is sand and gravel at grade (site visit by author, September 1991).

6.8 240-S-151 DIVERSION BOX

The 240-S-151 diversion box is an inactive waste site located north of the 202-S canyon building. The site was started in 1950 and closed in March 1987. This diversion box was used for transfer of waste solution from processing and decontamination operations. Volumes were variable according to specific plant operations (BHI 1994).

Diversion boxes and receiving vaults drain to catch tanks. This unit has been isolated and covered. Leak detection and air monitoring are performed continuously within the S tank farm (BHI 1994).

This unit is inaccessible because several construction sites surround it (site visit by author, September 1991)

6.9 240-S-152 DIVERSION BOX

The 240-S-152 diversion box is an inactive waste site located north of the 202-S canyon building. The box was started in 1977 and closed in 1980. This unit was used for the transfer of waste solution from processing and decontamination operations. Volumes were variable according to specific plant operations. Diversion boxes and receiving vaults drain to catch tanks. This unit has been isolated and covered (BHI 1994).

This site is inaccessible because a large exclusion zone surrounds it that does not allow for site inspections at close range (site visit by author, September 1991).

6.10 240-S-302 CATCH TANK

The 240-S-302 catch tank is an inactive waste site located north of the 202-S canyon building. The tanks were placed in service in 1950 and taken out of service in March 1987. This tank receives low-level, dilute laboratory waste containing 0.021 mol/L sodium; greater than 0.01 mol/L; greater than 0.011 mol/L NO_2; and 0.000078 g/L total plutonium. Approximately 50,000 gal/yr of waste are transferred through the 240-S-151 diversion box from the 222-S laboratory building. The unit still contains about 2,380 gal of waste (BHI 1994).

Approximately 600 gal, consisting primarily of rainwater, were released between June 1985 and January 1986. The unit has been taken out of service as a leaker (BHI 1994).

This site is inaccessible because a rather large exclusion zone (UN-200-W-116) surrounds it that does not allow for site inspections at close range (site visit by author, September 1991).

6.11 291-S SAND FILTER

The 291-S complex consists of a sand filter, fan house, and stack (291-S-1). The sand filter is a below grade concrete structure with 1-ft-thick walls and roof. Tar and gravel were placed over the concrete roof. Outside dimensions are 85 ft by 85 ft by 12.5 ft deep. The complex was built in 1952 to provide ventilation for the process building (202-S canyon building). Air is pulled through the building, through the sand filter, then it passes through the fan house, and out through the stack (Kiser 1988). The stack has been the site of many airborne releases that have not been so designated. These releases involved ruthenium and, in at least one case, chlorinated solvents (Historical UPR Files).

The site has a light chain barricade around it and a chain link fence was being erected around the entire 202-S canyon building, 291-S, and 292-S area. Surface radiation contamination warning signs are present. The sand filter has been covered with grout (site visit by authors, September 1991).

6.12 2607-W6 SEPTIC TANK AND TILE FIELD

The 2607-W6 septic tank is an active waste site located south of the 222-S laboratory building. The tank was started in 1951. The unit, including a drain field, receives sanitary wastewater and sewage. The rate of waste generation is 34.8 m^3/d (BHI 1994).

The septic tank is approximately in-line with the west end of the REDOX canyon building. The unit has a sign correctly labeling it. On the surface there is a 5-ft by 25-ft concrete structure with three metal manhole covers. Immediately to the south of the tank is the tile field. The surface is sand and gravel with a light weight chain around the drain field, with wooden and metal posts. The entire area is below original grade, vegetated with grass, tumbleweeds, some sage brush, and some bare sand (site visit by author, September 1991).

6.13 UN-200-W-30 UNPLANNED RELEASED

The designation UN-200-W-30 UPR is scheduled for deletion, because it is a duplicate of the 216-S-12 waste site (BHI 1994).

6.14 UN-200-W-35 UNPLANNED RELEASE

The UN-200-W-35 UPR was a leak that occurred in the UNH process line from the REDOX facility to U Plant in September 1955 at a location just outside and to the north of the REDOX exclusion area (BHI 1994).

The contamination was removed and taken to the 200 West Area solid waste burial ground. The area was removed from radiation zone status in January 1972 (BHI 1994).

At least three sections along the steam line route have light chain barricades. It is not immediately clear which release this is and which is the site of UN-200-W-32 in Operable Unit 200-RO-2. Radioactive material warning signs and surface radiation contamination warning signs are present. There is no evidence of stabilization (site visit by authors, September 1991).

6.15 UN-200-W-43 UNPLANNED RELEASE

The UN-200-W-43 UPR was wind-blown contamination from a nearby radiation zone area east of 223-S. The site area was 1,200 ft^2 with 5 tons of contaminated soil (BHI 1994).

6.16 UN-200-W-56 UNPLANNED RELEASE

The UN-200-W-56 UPR was caused by heavy rainfall that washed contamination away from a radiation zone (216-S-12). The incident occurred in February 1961. The area contaminated was approximately 200 ft^2 of graveled surface (10 tons) and 50 ft^2 of blacktop near the 202-S column carrier trench (BHI 1994).

Unknown beta and gamma contamination with readings of 30,000 c/m in the gravel and 80,000 c/m in the asphalt (BHI 1994).

6.17 UN-200-W-61 UNPLANNED RELEASE

The UN-200-W-61 UPR occurred when a fire hose ruptured while flushing the H-10 to the 241-SX transfer line in April 1966. The incident occurred close to the southwest corner of the 202-S canyon building. The site area is approximately 200 ft^2, and 10 tons of soil (Historical UPR Files 1986; BHI 1994).

The contaminated walkways were washed down and released from radiation zone status. The top 6 in. of soil were removed. Unknown beta/gamma with readings from 4,000 to 100,000 c/m (BHI 1994).

6.18 UN-200-W-116 UNPLANNED RELEASE

The UN-200-W-116 UPR was caused by particulate matter spread by the wind from the 204-S UNH waste storage tank exhaust and the related railroad tanker waste unloading station. The area is still being used as an unloading station; however, the exhaust system from the 204-S tank area was equipped with a high-efficiency filter (BHI 1994). Documentation from the WHC Environmental Protection Group indicates that the releases occurred from 1968 to 1981. A routine radiation survey conducted on October 25, 1990, revealed 4,000 to 250,000 dis/m within the area of the release (Health Physics Survey No.10123).

The site has a light chain barricade and is posted with surface radiation contamination warning signs. There is no monument or other identifying markers and no sign of stabilization. There are railroad cars on the tracks and they are placarded as flammable. The barricaded area runs 345 ft north of the 202-S canyon building on the west side of the west set of railroad tracks and extends about 250 ft to the east (site visit by authors, September 1991).

6.19 UN-216-W-25 RADIATION EMISSIONS

The UN-216-W-25 is not actually a UPR, but it does have that type of designation. There is an encasement containing transfer lines that run from the 242-S evaporator building (inactive) to the U Plant tank farms. Radioactivity emitted from the encasement but there has not been a release of radioactive material (Christine Huckfeldt, personal communication, September 1991). There are a series of 24 clean out boxes that are regularly surveyed for radiation. Current levels range from 2,000 to 40,000 dis/m beta (Health Physics Survey No.904755).

The site has a light chain barricade running the length of the encasement and surface radiation contamination warning signs. There are no monuments or other identification on the site. There does not appear to be any stabilization (site visit by authors, September 1991). These surface contamination signs are referring to potential exposure to radiation, not to a contaminated surface (Christine Huckfeldt, personal communication, September 1991).

6.20 UPR-200-W-96 SPILL

This UPR consisted of 0.01 g of plutonium-239 contaminated water that overflowed from the 233-SA filter house and accumulated on a low spot directly to the north. It formed a pool because the ground was frozen. The site was later covered with gravel (BHI 1994). Current radioactivity has been measured at less than detection for alpha and beta and background for gamma (Health Physics Survey No.902190).

The site was not observed closely as it is well within the UN-200-W-116 site barricade (site visit by authors, September 1991).

7.0 OPERABLE UNIT 200-RO-4

Operable Unit 200-RO-4 encompasses the area of the S and SX tank farms (Figure 7-1). There are 37 waste sites and three UPRs at this operable unit. These include four valve pits, three diversion boxes and 27 single-shell tanks (SST). Table 7-1 lists the waste sites, their location and operational status. Note that all the valve pits are still active sites and that all the sites can be categorized as mixed waste sites. Table 7-2 lists the physical state of the waste, and the start and end dates of each site's usage. Determination of the volume of plutonium contaminated soil is not applicable for storage tanks and the tanks were not included in the PNL hazard ranking study. The radionuclide inventories for the tanks have been removed from BHI (1994). Data is available from the TRAC Summary Report.

The tank farms are surrounded by chain link fence topped with barbed wire. The individual tanks were not approached closely enough to provide specific descriptions. Both underground and surface radiation contamination warning signs are posted on the fence (site visit).

7.1 241-S TANK FARM

The 241-S tank farm is an active waste site located north of the 241-SX tank farm. The site has a chain link fence with barbed wire on top and has surface and underground radiation warning signs. There is little aboveground apparatus associated with the tanks. The area is being used as a temporary storage area for drums and boxes presumably full of monitoring well installation waste from the 241-S tank farm (site visit by author, September 1991).

7.2 241-S-101 SINGLE-SHELL TANK

The 241-S-101 SST started operations in July 1953 and was closed in 1980. This tank received REDOX high-level wastes; REDOX coating waste; and supernatant containing PNL waste, coating waste, PUREX low-level waste, laboratory waste, B Plant high-level waste, terminal liquor and evaporator bottoms, partial neutralization feed, N reactor waste, ion-exchange waste, and double-shell tank (DST) slurry feed from 241-U, 241-S, and 241-SX tank farms. The tank contains a total of 427,000 gal (BHI 1994).

Operating Limit Deviation Report 80-03 was issued in February 1980 because of a liquid level decrease associated with the plummet [*sic*] creating a hole in the soft, moist sludge. Five active monitoring wells are associated with this tank (BHI 1994).

7.3 241-S-102 SINGLE-SHELL TANK

The 241-S-102 SST was put on line in 1953 and taken off line in 1980. The tank received REDOX high-level wastes; nitric acid/potassium permanganate ($HNO_3/KMnO_4$) solution and supernatant containing REDOX high-level waste, evaporator bottoms, noncomplexed waste, DST slurry feed, and partial neutralization feed from the 241-S, 241-SX, 241-SY, and 241-U tank farms. The tank holds a total of 549,000 gal (BHI 1994).

Figure 7-1. Operable Units 200-RO-2 and 200-RO-4 Plan (DOE-RL 1988).

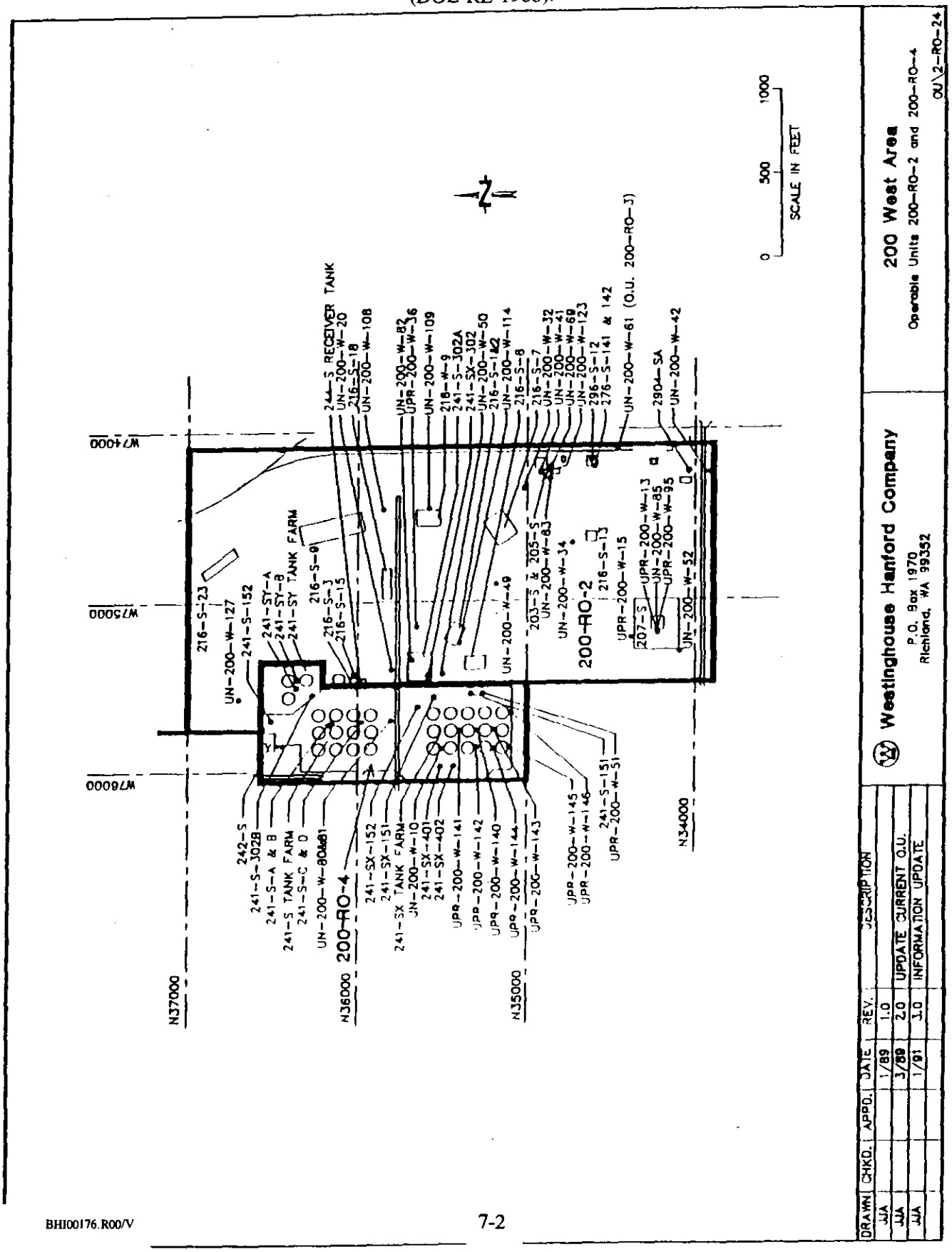


Table 7-1. Site Location and Waste Type Summary Table for Operable Unit 200-RO-4 (BHI 1994).

Site	Type of Site	Status	Coordinates	Type of Waste
241-S-101	Single-Shell Tank	Inactive	N36226 W75665	Mixed Waste
241-S-102	Single-Shell Tank	Inactive	N36226 W75767	Mixed Waste
241-S-103	Single-Shell Tank	Inactive	N36226 W75869	Mixed Waste
241-S-104	Single-Shell Tank	Inactive	N36124 W75665	Mixed Waste
241-S-105	Single-Shell Tank	Inactive	N36124 W75767	Mixed Waste
241-S-106	Single-Shell Tank	Inactive	N36124 W75869	Mixed Waste
241-S-107	Single-Shell Tank	Inactive	N36022 W75665	Mixed Waste
241-S-108	Single-Shell Tank	Inactive	N36022 W75767	Mixed Waste
241-S-109	Single-Shell Tank	Inactive	N36022 W75869	Mixed Waste
241-S-110	Single-Shell Tank	Inactive	N35920 W75869	Mixed Waste
241-S-111	Single-Shell Tank	Inactive	N35920 W75767	Mixed Waste
241-S-112	Single-Shell Tank	Inactive	N35920 W75665	Mixed Waste
241-S-152	Diversion Box	Inactive	N36500 W75700	Mixed Waste
241-S-302B	Catch Tank	Inactive	N36265 W75550	Mixed Waste
241-S-A	Valve Pit	Active	N36170 W75724	Mixed Waste
241-S-B	Valve Pit	Active	N36170 W75720	Mixed Waste
241-S-C	Valve Pit	Active	N35975 W75724	Mixed Waste
241-S-D	Valve Pit	Active	N35975 W75720	Mixed Waste
241-SX-101	Single-Shell Tank	Inactive	N35552 W75665	Mixed Waste
241-SX-102	Single-Shell Tank	Inactive	N35552 W75767	Mixed Waste
241-SX-103	Single-Shell Tank	Inactive	N35552 W75869	Mixed Waste
241-SX-104	Single-Shell Tank	Inactive	N35450 W75665	Mixed Waste
241-SX-105	Single-Shell Tank	Inactive	N35450 W75767	Mixed Waste
241-SX-106	Single-Shell Tank	Inactive	N35450 W75869	Mixed Waste
241-SX-107	Single-Shell Tank	Inactive	N35348 W75665	Mixed Waste
241-SX-108	Single-Shell Tank	Inactive	N35348 W75767	Mixed Waste
241-SX-109	Single-Shell Tank	Inactive	N35348 W75869	Mixed Waste
241-SX-110	Single-Shell Tank	Inactive	N35246 W75665	Mixed Waste
241-SX-111	Single-Shell Tank	Inactive	N35246 W75767	Mixed Waste
241-SX-112	Single-Shell Tank	Inactive	N35246 W75869	Mixed Waste
241-SX-113	Single-Shell Tank	Inactive	N35144 W75665	Mixed Waste
241-SX-114	Single-Shell Tank	Inactive	N35144 W75767	Mixed Waste
241-SX-115	Single-Shell Tank	Inactive	N35144 W75869	Mixed Waste
241-SX-151	Diversion Box	Inactive	N35580 W75535	Mixed Waste
241-SX-152	Diversion Box	Inactive	N35655 W75620	Mixed Waste
UPR-200-W-10	Unplanned Release	Inactive	N35500 W75870	Mixed Waste
UPR-200-W-140	Unplanned Release	Inactive	N35348 W75665	Mixed Waste
UPR-200-W-141	Unplanned Release	Inactive	N35348 W75767	Mixed Waste
UPR-200-W-142	Unplanned Release	Inactive	N35348 W75869	Mixed Waste
UPR-200-W-143	Unplanned Release	Inactive	N35246 W75767	Mixed Waste
UPR-200-W-144	Unplanned Release	Inactive	N35246 W75869	Mixed Waste
UPR-200-W-145	Unplanned Release	Inactive	N35144 W75665	Mixed Waste
UPR-200-W-146	Unplanned Release	Inactive	N35144 W75869	Mixed Waste
UPR-200-W-80	Unplanned Release	Inactive	N35800 W75700	Mixed Waste
UPR-200-W-81	Unplanned Release	Inactive	N35800 W75700	Mixed Waste

Table 7-2. Operational Dates and Status, Site Dimensions, and Waste Volumes Summary Table for Operable Unit 200-RO-4.

Site	State	Start Date	End Date	UPR Occurrence Date	Dim Ref	Length (ft)	Width (ft)	Dispo. Depth (ft)	Volume of Pu Contam. Soil (cu m)	Volume of Waste Disposed (cu m OR L)	PNL Hazard Ranking	Associated UPR(s)
241-S-101	Liquid	July 17, 1953	1980		Top	0	0	0	0	0	0.00	
241-S-102	Liquid	1953	1980		Top	0	0	0	0	0	0.00	
241-S-103	Liquid	November 1, 1953	1980		Top	0	0	0	0	0	0.00	
241-S-104	Liquid	February 9, 1953	1968		Top	0	0	0	0	0	0.00	
241-S-105	Liquid	1953	1974		Top	0	0	0	0	0	0.00	
241-S-106	Liquid	1953	1979		Top	0	0	0	0	0	0.00	
241-S-107	Liquid	August 25, 1952	1980		Top	0	0	0	0	0	0.00	
241-S-108	Liquid	October 30, 1952	1979		Top	0	0	0	0	0	0.00	
241-S-109	Liquid	December 23, 1952	1979		Top	0	0	0	0	0	0.00	
241-S-110	Liquid	1952	1979		Top	0	0	0	0	0	0.00	
241-S-111	Liquid	1952	1975		Top	0	0	0	0	0	0.00	
241-S-112	Liquid	July 27, 1952	1974		Top	0	0	0	0	0	0.00	
241-S-152	Liquid	1977	November 1980		Top	0	0	0	0	0	0.00	
241-S-302B	Liquid	1952			Top	0	0	0	0	0	0.00	
241-S-A	Liquid	1952			Top	0	0	0	0	0	0.00	
241-S-B	Liquid	1952			Top	0	0	0	0	0	0.00	
241-S-C	Liquid	1952			Top	0	0	0	0	0	0.00	
241-S-D	Liquid	1952			Top	0	0	0	0	0	0.00	
241-SX-101	Liquid	May 1954	1980		Top	0	0	0	0	0	0.00	
241-SX-102	Liquid	May 1954	1980		Top	0	0	0	0	0	0.00	
241-SX-103	Liquid	May 1954	1980		Top	0	0	0	0	0	0.00	
241-SX-104	Liquid	February 1955	1980		Top	0	0	0	0	0	0.00	
241-SX-105	Liquid	February 1955	1980		Top	0	0	0	0	0	0.00	
241-SX-106	Liquid	1954	1980		Top	0	0	0	0	0	0.00	
241-SX-107	Liquid	April 1956	1964		Top	0	0	0	0	0	0.00	
241-SX-108	Liquid	November 1955	1962		Top	0	0	0	0	0	0.00	
241-SX-109	Liquid	September 1955	1965		Top	0	0	0	0	0	0.00	
241-SX-110	Liquid	November 1960	1976		Top	0	0	0	0	0	0.00	
241-SX-111	Liquid	6/56 ?1958 [544]?	May 1974		Top	0	0	0	0	0	0.00	
241-SX-112	Liquid	2/56 ?1959 [544]?	1969		Top	0	0	0	0	0	0.00	
241-SX-113	Liquid	February 1958	June 1958		Top	0	0	0	0	0	0.00	
241-SX-114	Liquid	November 1956	1972		Top	0	0	0	0	0	0.00	
241-SX-115	Liquid	September 1958	1965		Top	0	0	0	0	0	0.00	
241-SX-151	Liquid	1954	October 1983		Top	0	0	0	0	0	0.00	
241-SX-152	Liquid	1954	May 1981		Top	0	0	0	0	0	0.00	
UPR-200-W-10	Liquid			Summer 1952	Top	0	0	0	0	0	0.00	
UPR-200-W-140	Liquid			1964	Top	0	0	0	0	0	0.00	
UPR-200-W-141	Liquid			1962	Top	0	0	0	0	0	0.00	
UPR-200-W-142	Liquid			1965	Top	0	0	0	0	0	0.00	
UPR-200-W-143	Liquid			1974	Top	0	0	0	0	0	0.00	
UPR-200-W-144	Liquid			1969	Top	0	0	0	0	0	0.00	
UPR-200-W-145	Liquid			1962	Top	0	0	0	0	0	0.00	
UPR-200-W-146	Liquid			1965	Top	0	0	0	0	0	0.00	
UPR-200-W-80	Liquid			October 24, 1978	Top	0	0	0	0	0	1.20	
UPR-200-W-81	Solid			January 2, 1979	Top	0	0	0	0	0	1.09	

The Operating Limit Deviation Report 80-15 was issued in November 1980 because of a liquid level increase. The cause of the increase was the failure of a water valve in the SA valve pit. This unit has the potential for hydrogen or other flammable gas generation. Its maximum temperature reading on February 24, 1991, was 107 °F. This unit contains potentially high concentrations of organic salts (BHI 1994).

This tank has eight active monitoring wells associated with it, and several dry wells for leak detection (BHI 1994).

7.4 241-S-103 SINGLE-SHELL TANK

The 241-S-103 SST was placed in service in 1953 and taken out in 1980. The tank received REDOX high-level waste; REDOX coating waste, $HNO_3/KMnO_4$ solution, and a supernatant containing REDOX high-level waste, evaporator bottoms, noncomplexed waste, partial neutralization feed, and DST slurry feed from the 241-S, 241-SX, 241-SY, and 241-U tank farms. The tank holds approximately 248,000 gal (BHI 1994).

The Operating Limit Deviation Report 80-5 was issued in March 1980 because of a 0.60-in. liquid level decrease. The cause of the decrease was attributed to the loss of material buildup on the FIC plummet [*sic*] (BHI 1994).

This tank has seven active monitoring wells associated with it as well as several dry wells used for leak detection (BHI 1994).

7.5 241-S-104 SINGLE-SHELL TANK

The 241-S-104 SST became active in February 1953 and closed in 1968. This tank received REDOX coating waste, REDOX high-level waste, and supernatant containing REDOX high-level waste from the 241-S tank farm. The tank currently holds 294,000 gal (BHI 1994).

This unit was removed from service and categorized "Questionable Integrity" because of a liquid level decrease. Dry wells have remained stable during the review period and are the only means of leak detection since the unit contains solids (BHI 1994).

There are four active monitoring wells associated with this tank and several dry wells for leak detection (BHI 1994).

7.6 241-S-105 SINGLE-SHELL TANK

The 241-S-105 SST was put in service in 1953 and taken out of service in 1974. The tank received REDOX coating waste and REDOX high-level waste. The tank currently contains 456,000 gal of waste (BHI 1994).

The only cleanup action initiated thus far is the placement of a jet pump saltwell system in August 1978 to remove interstitial liquid. Past liquid level increases were attributed to drying out of the buoyant surface crust (BHI 1994).

The tank has five active monitoring wells associated with it as well as dry wells as the only means of leak detection (BHI 1994).

7.7 241-S-106 SINGLE-SHELL TANK

The 241-S-106 SST started accepting waste in 1953 and was taken out of service in 1979. The tank received REDOX high-level waste, supernatant containing REDOX high-level wastes and evaporator bottoms from the 241-S tank farm. The tank currently holds 543,000 gal of waste (BHI 1994).

The Operating Limit Deviation Report 82-13 was issued in October 1982 because of a liquid level increase. An evaluation attributed the 1.80 in. increase to slumping of exposed solids and displacement of liquid. The only cleanup action taken is the placement of a jet pump saltwell system in August 1978 (BHI 1994).

The tank has six active monitoring wells associated with it as well as dry wells used for leak detection purposes (BHI 1994).

7.8 241-S-107 SINGLE-SHELL TANK

The 241-S-107 SST was put on line in August 1952 and taken off line in 1980. The tank received REDOX high-level waste, REDOX coating waste, supernatant containing REDOX high-level waste, decontamination waste, B Plant high-level and low-level waste, PNL waste, laboratory waste, N reactor waste, PUREX low-level waste, ion-exchange waste, fractionization waste, evaporator bottoms, DST slurry feed, and partial neutralization feed and complexed concentrate from the 241-BX, 241-C, 241-S, 241-SX, 241-SY, and 241-U tank farms. The tank currently holds approximately 368,000 gal of waste (BHI 1994).

Dry well readings remained stable during the review period. Past liquid level increases have not been satisfactorily explained. Intermittent liquid level increases since July 1981 have been attributed to decontamination work or precipitation (via the SD valve pit). Although the unit was partially isolated in December 1982, liquid level measurements continue to show a slow increase (BHI 1994).

The tank has six active monitoring wells associated with it (BHI 1994).

7.9 241-S-108 SINGLE-SHELL TANK

The 241-S-108 SST was put on line in October of 1952 and was taken out of service in 1979. The tank received REDOX high-level waste and supernatant containing REDOX high-level waste and evaporator bottoms from the 241-S and 241-SX tank farms. The tank currently holds 604,000 gal of waste (BHI 1994).

Past liquid level increases are attributed to drying out of the buoyant surface crust. Dry well readings have remained stable during the review period and are the only means of leak detection as the flow indicator controller (FIC) and manual tape plummet are contacting solids (BHI 1994).

The tank has five active monitoring wells associated with it (BHI 1994).

7.10 241-S-109 SINGLE-SHELL TANK

The 241-S-109 SST was placed in service in December 1952 and taken out of service in 1979. The tank received REDOX high-level and supernatant containing evaporator bottoms from the 241-S-102 tank. The tank currently holds 568,000 gal of waste (BHI 1994).

The tank has six active monitoring wells associated with it (BHI 1994).

7.11 241-S-110 SINGLE-SHELL TANK

The 241-S-110 SST was placed in service in 1952 and taken out of service in 1979. The tank received REDOX high-level waste, REDOX coating waste, supernatant containing REDOX ion-exchange waste, 224-U waste, coating waste, decontamination waste, B Plant low-level waste, and organic wash waste from the 241-BX, 241-S, 241-SX, 241-T, 241-TX, and 241-U tank farms. The tank currently holds 692,000 gal of waste (BHI 1994).

Past increases of surface level had caused considerable operational problems, and special pumping was necessary in October 1975 to lower levels below maximum operating limits. The increase was attributed to drying of the buoyant crust layer. Dry well readings have remained stable during the review period and are the only means of leak detection since the unit contains solids (BHI 1994).

The only cleanup action taken is the placement of a jet pump saltwell system in August 1978. The tank has eight active monitoring wells associated with it (BHI 1994).

7.12 241-S-111 SINGLE-SHELL TANK

The 241-S-111 SST was started in 1952 and closed in 1975. The tank received REDOX high-level waste and supernatant containing evaporator bottoms from the 241-S tank farm. The tank currently holds 596,000 gal of waste (BHI 1994).

Past liquid level increases have not been satisfactorily explained. Dry well readings have remained stable during the review period and are the primary means of leak detection since the unit contains solids. This tank has the potential for hydrogen or other flammable gas generation. Its maximum temperature reading was 95 °F in February 1991 (BHI 1994).

The unit has six active monitoring wells associated with it (BHI 1994).

7.13 241-S-112 SINGLE-SHELL TANK

The 241-S-112 SST was placed in service in July 1952 and taken out of service in 1974. The tank received REDOX high-level waste and supernatant containing REDOX high-level wastes and evaporator bottoms from the 241-S tank farm. The tank currently hold 637,000 gal of waste (BHI 1994).

This unit has a potential for hydrogen or flammable gas generation. Its maximum temperature reading was 93 °F in February 1988. Past liquid level increases are attributed to drying out of a

buoyant surface crust. Dry wells have remained stable during the review period and are the only means of leak detection as the unit contains solids (BHI 1994).

The only cleanup actions taken are the installation of a jet pump saltwell in August 1978. This unit has five active monitoring wells associated with it (BHI 1994).

The 241-SX tank farm is an active waste site located directly south of the 241-S tank farm. The tank farm has a chain link fence surrounding it with barbed wire on top. There is considerable apparatus associated with the site on the surface. There are two aboveground water tanks in the area also. The surface is sand and gravel at grade with little vegetation. Two caissons are located in the southeast corner of the 241-SX tank farm. Located nearby the 241-SX tank farm is the 241-SX sanitary crib, which is located in a gravel parking lot. The crib is vented with no marker and no barricade (site visit by author, September 1991).

7.14 241-S-152 DIVERSION BOX

The 241-S-152 diversion box is an inactive waste site located 90 ft northwest of the 241-SY-102 tank. The tank was placed in service in 1977 and taken out of service in November 1980. This unit was used for transfer of waste solutions from processing and decontamination operations. Volumes were variable according to specific plant operations (BHI 1994).

Diversion boxes and receiving vaults drain to catch tanks. They are designed to contain leaks from transfers and drainage from operations within the unit. This unit has been isolated and covered. Leak detection and air monitoring are performed continuously within the 241-S tank farm (BHI 1994).

7.15 241-S-302B CATCH TANK

The 241-S-302B catch tank is an inactive waste site located west of the 241-S tank farm. This unit was used for transfer of waste solutions from processing and decontamination operations. Volumes were variable according to specific plant operations. The tank currently holds 3,240 gal of waste (BHI 1994).

Leak detection and air monitoring are performed continuously within the 241-S and 241-SY tank farms. This unit was isolated in 1985 (BHI 1994).

7.16 241-S-A VALVE PIT

The 241-S-A valve pit is an active facility that began operations in 1952 and is located between the 241-S-101 and 241-S-102 tanks. The unit transports waste solutions from processing and decontamination operations. Quantities are variable according to specific plant operations. This unit drains to a DST or SST (BHI 1994).

Leak detection and air monitoring are performed continuously with the 241-S tank farm (BHI 1994).

7.17 241-S-B VALVE PIT

The 241-S-A valve pit is an active facility that began operations in 1952 and is located between the 241-S-101 and 241-S-102 tanks. The unit transports waste solutions from processing and decontamination operations. Quantities are variable according to specific plant operations. This valve pit drains to either a DST or SST (BHI 1994).

Leak detection and air monitoring are performed continuously within the 241-S tank farm (BHI 1994).

7.18 241-S-C VALVE PIT

The 241-S-C valve pit is an active waste site located between the 241-S-107 and 241-S-108 tanks. This pit was placed in service in 1952. This unit transports waste solutions from processing and decontamination operations. Quantities are variable depending on plant operations. This unit drains to either a DST or SST (BHI 1994).

Leak detection and air monitoring are performed continuously within the 241-S tank farm (BHI 1994).

7.19 241-S-D VALVE PIT

The 241-S-D valve pit is an active waste site located between tanks 241-S-107 and 241-S-108. This site became active in 1952. The unit transports waste solutions from processing and decontamination operations. Quantities are variable depending on specific plant operations. The pit drains to either a DST or SST (BHI 1994).

Leak detection and air monitoring are performed continuously (BHI 1994).

7.20 241-SX TANK FARM

The 241-SX tank farm is an active waste site located directly south of the 241-S tank farm. The tank farm has a chain link fence surrounding it with barbed wire on top. There is considerable apparatus associated with the site on the surface. Two aboveground water tanks are also in the area. The surface is sand and gravel at grade with little vegetation (site visit by author, September 1991).

7.21 241-SX-101 SINGLE-SHELL TANK

The 241-SX-101 SST is an inactive waste site located approximately 2,000 ft northwest of the 202-S canyon building. The tank was placed in service in May 1954 and taken out of service in 1980. The tank received REDOX high-level waste, supernatant containing REDOX ion-exchange waste, evaporator bottoms, partial neutralization feed, and complexed waste from the 241-S, 241-BX, 241-SX, and 241-U tank farms. The tank currently holds 456,000 gal of waste (BHI 1994).

The SST was connected to the 241-SX sludge cooler in April 1976. Temperatures in this unit range from 190 °F in the sludge to 145 °F in the bulk solution. Operating Limit Deviation Reports 81-06 and 82-06 were issued because surface level measurements exceeded the decrease criterion. The measurement anomalies were attributed to FIC plummet contacting surface solids exposed from evaporation. This was confirmed by photographs taken in February 1982. This unit has the potential for hydrogen or flammable gas generation (BHI 1994).

The site has eight active monitoring wells associated with it. Dry wells, the primary means of leak detection, have remained stable during the review period (BHI 1994).

7.22 241-SX-102 SINGLE-SHELL TANK

The 241-SX-102 SST is an inactive waste site located in the 241-SX tank farm, approximately 2,000 ft northwest of the 202-S canyon building. The tank was placed in service in May 1954 and retired in 1980. The tank received REDOX high-level waste, carbonate waste, concrete, supernatant containing REDOX high-level waste, REDOX ion-exchange waste, evaporator bottoms, and partial neutralization feed from the 241-BX, 241-SX, 241-TX, and 241-U tank farms. The tank currently holds approximately 543,000 gal of waste (BHI 1994).

Future plans include installing a jet pump saltwell system to remove as much of the remaining interstitial liquid as is permitted by the existing technology. The unit is connected to the 241-SX sludge cooler facility, as temperatures in the bulk waste range to above 200 °F. Operating Limit Deviation Report 80-12 was issued because of an apparent liquid level decrease. The liquid level decease was attributed to movement of surface solids. The unit has the potential for hydrogen or other flammable gas generation (BHI 1994).

This unit has five active monitoring wells associated with it. Dry wells have remained stable during the review period. The only cleanup action is that the waste has been pumped to a minimum supernatant heel (BHI 1994).

7.23 241-SX-103 SINGLE-SHELL TANK

The 241-SX-103 SST is an inactive waste site located in the 241-SX tank farm. The tank was placed in service in May 1954 and taken out of service in 1980. This tank received REDOX high-level waste, concrete, and supernatant containing REDOX high-level waste, coating waste, evaporator bottoms, organic wash waste, and partial neutralization feed from 241-BX, 241-SX, and 241-S tank farms. The tank currently holds 667,000 gal of waste (BHI 1994).

Future plans include installing a jet pump saltwell system to remove as much of the remaining interstitial liquid as is permitted by technology. The unit is connected to the 241-SX sludge cooler facility, as temperatures in the bulk waste range to above 200 °F. Occurrence Report 80-25 was issued in February 1980 because of a liquid level decrease following a transfer into the unit. The cause of the decrease was attributed to the FIC plummet measuring an irregular material surface. This unit has the potential for hydrogen or flammable gas generation (BHI 1994).

This tank has six active monitoring wells associated with it. Dry well readings have remained stable during the review period. The only cleanup action initiated at this site is that the waste has been pumped to a minimum supernatant heel (BHI 1994).

7.24 241-SX-104 SINGLE-SHELL TANK

The 241-SX-104 SST is an inactive waste site located in the 241-SX tank farm, approximately 2,000 ft northwest of the 202-S canyon building. The tank came on line in February 1955 and was retired in 1980. The tank received REDOX high-level waste and supernatant containing REDOX ion-exchange waste, DST slurry feed, and evaporator bottoms from the 241-S and 241-SX tank farms. The tank currently holds approximately 614,000 gal of waste (BHI 1994).

An Operating Limit Deviation Report was issued in January 1980 because of an apparent liquid level decrease. The liquid level decrease was attributed to a defective liquid level tape and localized slumping of the solids in the vicinity of the FIC plummet. This unit has the potential for hydrogen or other flammable gas generation (BHI 1994).

The tank has seven active monitoring wells associated with it. Dry well readings have remained stable during the review periods. Because of the surface solids, the dry wells are the primary means of leak detection. For cleanup actions the waste has been pumped to a supernatant heel (BHI 1994).

7.25 241-SX-105 SINGLE-SHELL TANK

The 241-SX-105 SST is an inactive waste site located in the 241-SX tank farm. The tank came on line in February 1955 and was retired in 1980. The tank received REDOX high-level waste and supernatant containing REDOX high-level waste, REDOX ion-exchange waste, DST slurry feed, evaporator bottoms, and partial neutralization feed from the 241-BX, 241-S, 241-TX, and 241-U tank farms. The tank currently holds 683,000 gal of waste (BHI 1994).

Future plans include installing a jet pump saltwell system to remove as much of the remaining interstitial liquid as the current technology allows. The unit is connected to the 241-SX sludge cooler facility, as temperature in the bulk waste range to above 200 °F. Occurrence Report 79-125 was issued in December 1979 because of a liquid level decrease. The cause of the observed decrease was attributed to the FIC plummet contacting surface solids. The unit has the potential for hydrogen or other flammable gas generation (BHI 1994).

The site has seven active monitoring wells associated with it. Readings from dry wells and laterals have remained stable during the review period. Because of surface solids, dry wells and laterals are the primary means of leak detection. The only cleanup action to have taken place at this unit is that the waste was pumped to a supernatant heel (BHI 1994).

7.26 241-SX-106 SINGLE-SHELL TANK

The 241-SX-106 SST is an inactive waste site located in the 241-SX tank farm. The tank was placed in service in 1954 and was retired in 1980. The tank received Hanford laboratory wastes, PNL waste, $HNO_3/KMnO_4$ solution, supernatant containing REDOX and waste fractionization

ion-exchange waste, evaporator bottoms, B Plant low-level waste, PUREX low-level waste, coating waste, REDOX high-level waste, and complexed and noncomplexed waste and partial neutralization feed from the 241-B, 241-BX, 241-C, 241-S, 241-SX, 241-SY, 241-TX, and 241-U tank farms. The tank currently holds 538,000 gal of waste (BHI 1994).

The unit is connected to the 241-SX sludge cooler because temperatures range from 140 °F in the bottom solids and 120 °F in the bulk solution. Test augerings in 1974 at locations adjacent to the earlier suspect well (41-06-09) were inconclusive, and no further studies are planned. In November 1980, Operating Limit Deviation Report 80-16 was issued because of a liquid level increase. The cause of the increase was attributed to a leaking 241-SX sludge cooler steam coil and failure of a valve to the steam coil. Operational Limit Deviation Report 82-12 was issued in July 1982 because of a surface level increase. An evaluation attributed the increase to water vapor condensing in the 241-SX sludge cooler ducting and draining to this unit. This unit has the potential for hydrogen or other flammable gas generation. This unit also contains potentially high concentrations of organic salts (BHI 1994).

This tank has six active monitoring wells associated it. Dry well readings have remained stable during the review period and are primary means of leak detection because of surface solids (BHI 1994).

7.27 241-SX-107 SINGLE-SHELL TANK

The 241-SX-107 SST is an inactive waste site located in the 241-S tank farm. The tank was started in April 1956 and was closed in 1964. The tank received REDOX high-level waste, REDOX coating waste, concrete, and supernatant containing REDOX high-level waste from 241-SX tank farm. The unit contains 41 smaller bottles of neutralized waste (100-F), each containing less than 1 g of plutonium-239. The tank currently contains 104,000 gal of waste (BHI 1994).

The only known release is UPR-200-W-140 where contamination spread laterally in a stratum 55 to 60 ft below grade. Approximately 5,000 gal of waste spilled (BHI 1994).

The unit is connected to the 241-SX sludge cooler. The estimated heat generation rate of the solid waste is 53,000 BTU/h, and the current average bulk solids temperature is 150 °F. The maximum temperature recorded by any of the sludge thermocouples is 208 °F. The unit is considered to have high heat load of 42,000 BTU/h (BHI 1994).

The unit was removed from service as a "confirmed leaker." Because of a caked surface, dry wells and laterals are the only means of leak detection. All dry wells except 41-07-08 have remained stable during the review period. Well 41-07-08 continues to slowly increase, and past directional probe data indicate the activity is coming from the northeast, which is the direction of this unit.

7.28 214-SX-108 SINGLE-SHELL TANK

The 241-SX-108 SST is an inactive waste site located in the 241-SX tank farm. The tank was put in service in November 1955 and retired in 1962. The tank received REDOX high-level waste, concrete, and supernatant containing REDOX high-level waste from 241-SX tank farm. The tank currently holds approximately 115,000 gal of waste (BHI 1994).

The tank site has a known release (UPR-200-W-141) where approximately 2,400 gal of waste leaked (BHI 1994).

This unit is considered to have a high heat load of 45,000 BTU/h. Photographs have indicated no surface liquid. The dry well and lateral radiation readings have remained stable during the past review period, and since the unit contains solids, are the only means of leak detection. Radiation levels in dry well 41-08-04 were substantially reduced in November 1981 when a caisson located between this unit and dry well 41-08-04 was filled with dirt (BHI 1994).

The tank has six active monitoring wells associated with it (BHI 1994).

7.29 241-SX-109 SINGLE-SHELL TANK

The 241-SX-109 SST is an inactive waste site located in the 241-SX tank farm. The tank became active in September 1955 and was retired in 1965. The tank received REDOX high-level waste and supernatant containing REDOX high-level waste from the 241-SX tank farm. The tank currently holds 250,000 gal of waste (BHI 1994).

This site has a known release associated with it (UPR-200-W-142) where approximately 5,000 gal of waste leaked (BHI 1994).

The unit is connected to the 241-SX sludge cooler and was interim stabilized in May 1981. The estimated heat generation of the solids is 35,000 BTU/h, and the average temperature of the sludge is 163 °F. The unit is considered to have a high heat potential for flammable gas accumulation because other SX tanks vent through it (BHI 1994).

The unit was removed from service as a "confirmed leaker." Dry wells and laterals are monitored to track the migration of existing radionuclides in the soil. During the review period, radiation levels in dry wells and laterals remained stable with the exception of dry well 41-09-09, which continues to show a steady increase at the 74-ft level. The unit has eight active monitoring wells associated with it (BHI 1994).

7.30 241-SX-110 SINGLE-SHELL TANK

The 241-SX-110 SST is an inactive waste site located in the 241-SX tank farm. The tank was put on line in November 1960 and was retired in 1976. The tank received REDOX high-level waste, concrete, supernatant containing REDOX high-level waste, PNL waste, B Plant low-level waste, ion-exchange waste, evaporator bottoms, and 244-U waste from the 241-B, 241-BX, and 241-SX tank farms.

Sixteen plastic bottles containing the following were added to this unit: natural uranium, depleted uranium, enriched uranium, and plutonium-239. The tank currently contains 62,000 gal of waste (BHI 1994).

The unit was classified "questionable integrity" in 1976 because of an unexplained liquid level decrease. The unit was connected to the 241-SX sludge cooler in July 1972. The solids have an

estimated heat generation rate of 56,000 BTU/h, and an average bulk temperature of 150 °F (BHI 1994).

This unit has nine active monitoring wells associated with it. The dry well and lateral radiation readings remained stable during the review period and are the only means of leak detection because of solids (BHI 1994).

7.31 241-SX-111 SINGLE-SHELL TANK

The 241-SX-111 SST is an inactive waste site located in the 241-SX tank farm. The tank was placed in service in 1956 and was retired in May 1974 (Anderson 1990). The tank received REDOX high-level waste and supernatant containing REDOX high-level waste and REDOX ion-exchange waste from 241-SX tanks. The tank currently holds 125,000 gal of waste (BHI 1994).

The site has a known release (UPR-200-W-143) where 2,000 gal of waste spilled (BHI 1994).

The unit was removed from service as a "confirmed leaker" in May 1974 on the basis of an increase in radiation reading for the center leak detection lateral. Neither the other two laterals nor the dry wells indicated an increase in radiation. The heat generation rate of the solids is estimated at 78,000 BTU/h, and the average temperature of this material is 145 °F (BHI 1994).

The unit has seven active monitoring wells associated with it. The only cleanup actions taken was a pump out of the supernatant that began in May 1974 and completed 2 wk later. A saltwell system was then installed for final removal of interstitial liquor (BHI 1994).

7.32 241-SX-112 SINGLE-SHELL TANK

The 241-SX-112 SST is an inactive waste site located in the 241-SX tank Farm. The tank was put in place in 1959 and closed in 1969. The tank received REDOX high-level waste and supernatant containing REDOX high-level waste from the 241-SX tanks. The tank currently holds 92,000 gal of waste (BHI 1994).

There is a known release associated with this site (UPR-200-W-144) where approximately 30,000 gal of waste spilled (BHI 1994).

The unit is connected to the 241-SX sludge cooler. The estimated heat generation rate of the sludge is 61,000 BTU/h, and the average temperature of the material is 140 °F (BHI 1994).

The tank was removed from service as a "confirmed leaker." The dry well and lateral leak detection radiation readings appeared to be stable during the review period. The tank has seven active monitoring wells associated with it (BHI 1994).

7.33 241-SX-113 SINGLE-SHELL TANK

The 241-SX-113 SST is an inactive waste site located in the 214-SX tank Farm. The tank was placed in service in February 1958 and taken out of service in June 1958. The tank received REDOX

high-level waste with diatomaceous earth added also. The tank currently holds approximately 26,000 gal of waste (BHI 1994).

This unit had a known release (UPR-200-W-145) where approximately 15,000 gal of waste spilled (BHI 1994).

This unit was removed from service as a "confirmed leaker" in 1962. The dry well readings remained stable during the review period. The unit was equipped with five prototype laterals. They have been dissembled and are not serviceable. The unit was stabilized with diatomaceous earth, and photographs indicate that no liquid is present. The tank has three active monitoring wells associated with it (BHI 1994).

7.34 241-SX-114 SINGLE-SHELL TANK

The 241-SX-114 SST is an inactive waste site located in the 241-SX tank farm. The tank was placed in service in November 1956 and was closed in 1972. The tank received REDOX high-level waste and supernatant containing REDOX high-level waste, REDOX ion-exchange waste, and evaporator bottoms from 241-SX tanks. The tank currently holds 181,000 gal of waste (BHI 1994).

The unit is now on the sludge cooler. The estimated heat generated rate of the solids remaining is 86,999 BTU/h and the average temperature of this material is 190 °F. The unit was categorized "questionable integrity" because of dry well activity. The dry well and lateral radiation readings have remained stable during the review period (BHI 1994).

This unit has seven active monitoring wells associated with it (BHI 1994).

7.35 241-SX-115 SINGLE-SHELL TANKS

The 241-SX-115 SST is an inactive waste site located in the 241-SX tank farm area. The tank was placed in service in September 1958 and was closed in 1965. The tank received REDOX high-level waste and supernatant containing REDOX high-level waste. The tank currently holds 12,000 gal of waste (BHI 1994).

There was a known release at this site (UPR-200-W-146) where approximately 50,000 gal of waste spilled (BHI 1994).

The unit was removed from service as a "confirmed leaker." Photographs taken in 1974 indicate that no liquid is present. The dry wells and laterals data indicate no changes during the review period. The site has seven active monitoring wells associated with it (BHI 1994).

7.36 241-SX-151 DIVERSION BOX

The 241-SX-151 diversion box is an inactive waste site located east of the 241-SX tank farm. This unit interconnects with 241-S-151, 241-SX-152, and 241-SX tank farms. The diversion box was placed in service in 1954 and closed in October 1983. The unit was used for transfer of waste solutions from processing and decontamination operations. Volumes were variable according to

specific plant operations. Diversion boxes and receiving vaults drain to catch tanks. They are designed to contain leaks from transfers and drainage from operations from within the unit. This unit has been isolated and covered (BHI 1994).

Leak detection and air monitoring are performed continuously within the 241-SX tank farm. The unit has no radionuclides associated with it (BHI 1994).

7.37 241-SX-152 DIVERSION BOX

The 241-SX-152 diversion box is an inactive waste site located northeast of the 241-SX tank farm. This unit interconnects with the 241-SX-151, 241-U-151, and 241-SX tank farms. This unit was placed in service in 1954 and retired in May 1981. The unit was used to transfer waste solutions from processing and decontamination operations. Volumes are variable according to specific plant operations. Diversion boxes and receiving vaults drain to catch tanks. They are designed to contain leaks from transfers and drainage from operations from within the unit (BHI 1994).

Leak detection and air monitoring are performed continuously within the 241-SX tank farm. The unit has been covered and isolated. The unit has no radioisotopes associated with it (BHI 1994).

7.38 SANITARY CRIB

The sanitary crib is approximately 80 ft west of the southwest corner of the 241-SX tank farm. The crib is about 75 ft by 25 ft and is oriented north-south (Hanford drawing H-2-44511, Sheet 30). The crib lies under the entrance to a gravel parking area, which has two vents from the crib rising through it. There are no barricades or warning signs (site visit by authors, September 1991).

7.39 UN-200-W-10 UNPLANNED RELEASE

The UN-200-W-10 UPR is a location that had spotty contamination on it from an unknown source. The location is around the 203-S uranium storage tanks (BHI 1994).

The contamination area was covered with asphalt and posted with radiation zone signs (BHI 1994).

7.40 UN-200-W-80 UNPLANNED RELEASE

The UN-200-W-80 UPR occurred at the 244-S catch station construction site and other areas adjacent to the 241-S and 241-SX tank farms on October 24, 1978. The 241-S and 241-SX tank farms contaminated the 244-S catch station construction site and other areas adjacent to the two tank farms. The radionuclides known to be present are strontium-90 and cesium-137 with readings to 60,000 c/m (BHI 1994).

7.41 UN-200-W-81 UNPLANNED RELEASE

The UN-200-W-81 UPR was airborne migration of contamination from the 241-S and 241-SX tank farms. The actual location is between the 241-S and 241-SX tank farms. There is unknown beta/gamma source with readings from 500 to over 100,000 c/m. The area was found to be contaminated in November 1978, and was cleaned and released (BHI 1994).

8.0 REFERENCES/BIBLIOGRAPHY

8.1 REFERENCES

AEC-GE, 1964, *Catalog of Hanford Buildings and Facilities*, GEH-26434, 3 Vol., Atomic Energy Commission - General Electric.

Anderson, J. D., 1990, *History of the 200 Area Tank Farms*, WHC-MR-0132, Westinghouse Hanford Company, Richland, Washington.

Ballinger, M. Y. and R. B. Hall, 1989, *A History of Major Hanford Operations Involving Radioactive Materials*, PNL-6964, Pacific Northwest Laboratory, Richland, Washington.

Baldridge, K. F., 1959, *Unconfined Underground Waste and Contamination in the 200 Area - 1959*, HW-60807, General Electric, Richland, Washington.

BHI, 1994, *Waste Information Data System*, Bechtel Hanford, Inc., Richland, Washington.

Cruselle, A. A., and T. Romano, 1982, *Rockwell Retired Contaminated Facility Listing and Description*, SD-DD-FL-001, Rockwell Hanford Operations, Richland, Washington.

Cushing, C. E., 1990, *Hazard Site National Environmental Policy Act (NEPA) Characterization*, PNL-6456, Rev. 3, Pacific Northwest Laboratory, Richland, Washington.

DOE-RL, 1988, *Hanford Site Waste Management Units Report*, DOE/RL-88-30, Rev. 3, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, DOE, EPA, 1991, *Hanford Federal Facility Agreement and Consent Order*, U.S. Department of Energy, U.S. Environmental Protection Agency, Washington State Department of Ecology, Olympia, Washington.

Environmental Protection Files (unpublished), various dates and authors, stored at the Environmental Protection Building in the 200 West Area.

Harmon, K. M., 1975, *Deposition (D&D) of Retired Contaminated Facilities at Hanford (Retention Basin Systems)*, PNL-MA-588, Pacific Northwest Laboratory, Richland, Washington.

Health Physics Scheduled and Supplemental Radiation Survey Forms (unpublished), 1990, stored at Health Physics Building in the 200 West Area.

Historical UPR Files (Draft), Rockwell Hanford Operations Environmental Compliance Unit, 1986.

Kiser, S. K., 1988, *Hanford Surplus Facilities: Programs Facilities Listings and Descriptions*, WHC-SP-0331, Westinghouse Hanford Company, Richland, Washington.

Nelson, M. A., 1980, *Estimated Volume of Contaminated Soil in TRU/LLW at Hanford*, RHO-CD-827, Rockwell Hanford Operations, Richland, Washington.

Smith, R. M., 1980, *216-B-5 Reverse Well Characterization Study*, RHO-ST-37, Rockwell Hanford Operations, Richland, Washington.

Stenner, R. D., K. H. Cramer, K. A. Higley, S. J. Jette, D. A. Lamar, T. J. McLaughlin, D. R. Sherwood, and N. C. Van Houten, 1988, *Inactive Waste Sites at Hanford*, PNL 6456, Pacific Northwest Laboratory, Richland, Washington.

Table 8-1 provides a list of key documents used in preparing this report.

Table 8-1. Key References Containing Supporting Data. (sheet 1 of 2)

Environmental Protection Files (unpublished), various dates and authors, stored at the Environmental Protection Building in the 200 West Area. These files contain extensive information on UPRs and remedial action taken (if any) at the time of the release. These files can only be accessed in person and there is very limited help available for file searches.

Health Physics Scheduled and Supplemental Radiation Survey Forms (unpublished), 1990, stored at Health Physics Building in the 200 West Area. These files contain extensive radiological data for annual, periodic, and special request surveys. Additional surveys of site-specific areas can be performed on short notice based on an informal request.

WIDS Database Field Definitions, BHI (1994). The WIDS database is an extensive database that contains specific data on almost all sites and UPRs for each operable unit at Hanford. Data include site dimensions, aliases, waste type, quantity of waste, waste composition. In addition, WIDS may contain information on environmental monitoring and other historical information. The database has undergone extensive quality assurance/quality control (QA/QC) and was developed from at least two preceding databases. As a result of QA/QC questionable data and nonpublished data has been excluded and there are some other limitations to the quantity of data included in the database. All pertinent data from WIDS pertaining to the S Plant operable units is incorporated in this report.

Fecht, K. R., Last, G. V., and Price, K. R., 1977, Evaluation of scintillation probe profiles from 200 Area crib monitoring wells: ARH-ST-156 or UC-70, 3 volumes. This reports presents the detailed results of extensive scintillation surveys performed in 1967. Individual plots of logging runs and detailed well location maps, including boundaries of disposal sites, are included. The purpose of these surveys is to quantify the distribution, redistribution, and decay of radionuclides beneath crib facilities in the 200 Area.

Annual report for RCRA groundwater monitoring projects at Hanford Site facilities for 1990: DOE/RL-91-03. This is an excellent report summarizing groundwater monitoring at the Hanford Site.

Hanford Site Environmental Report for Calendar Year 1989: PNL-7346. This report presents a good overview of the environmental monitoring programs at Hanford and includes summaries of soil, water, air, flora and fauna monitoring data.

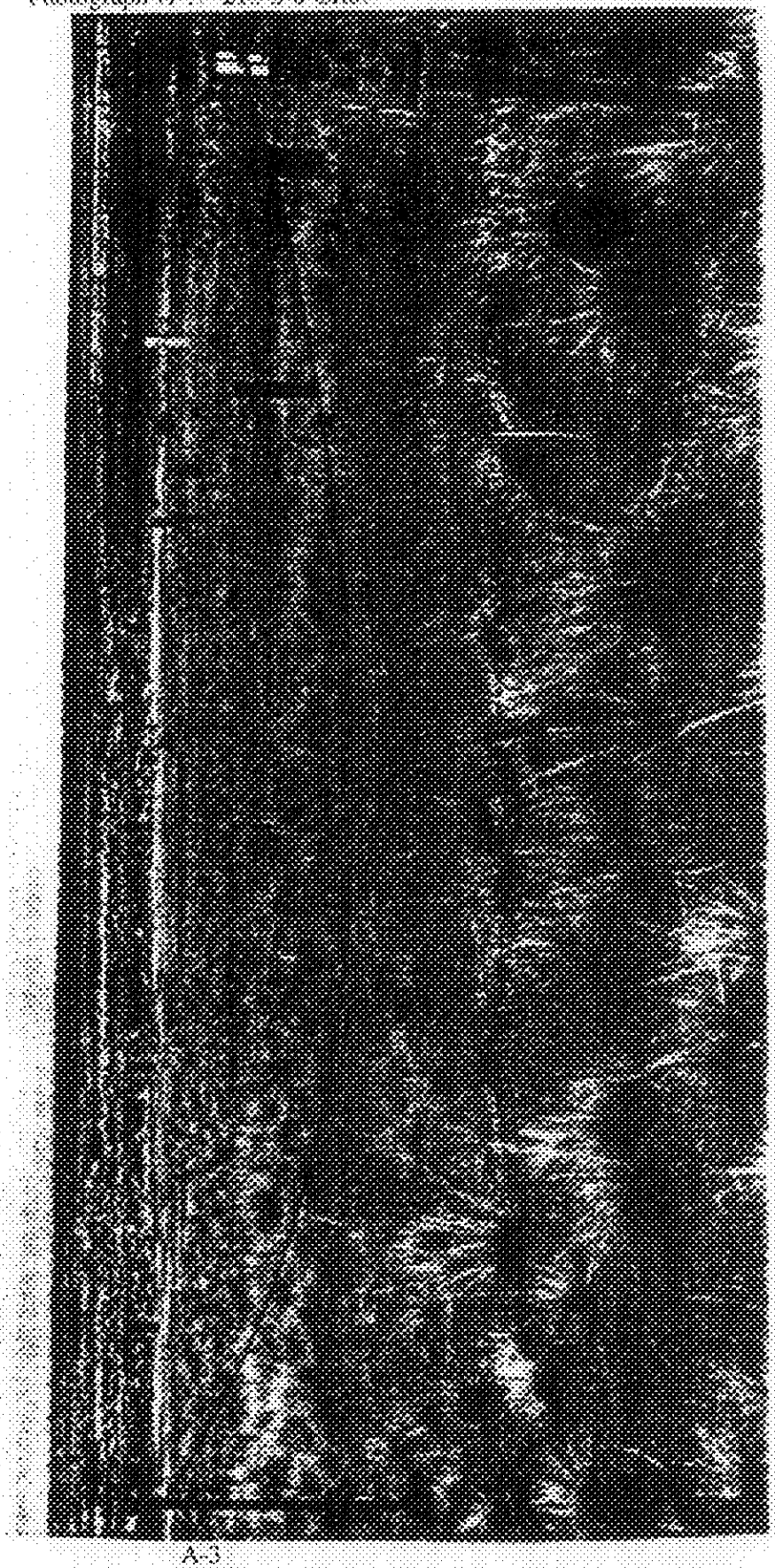
Table 8-1. Key References Containing Supporting Data. (sheet 2 of 2)

Jungfleisch, F. M., 1983, Supplemental Information for Preliminary Evaluation of the Waste Inventory in Hanford Tanks through 1980: SD-WM-TI-058 RO. This is a tabulation of the radioactive waste material in the tank farms by isotope with quantities listed in moles and activities in curies.

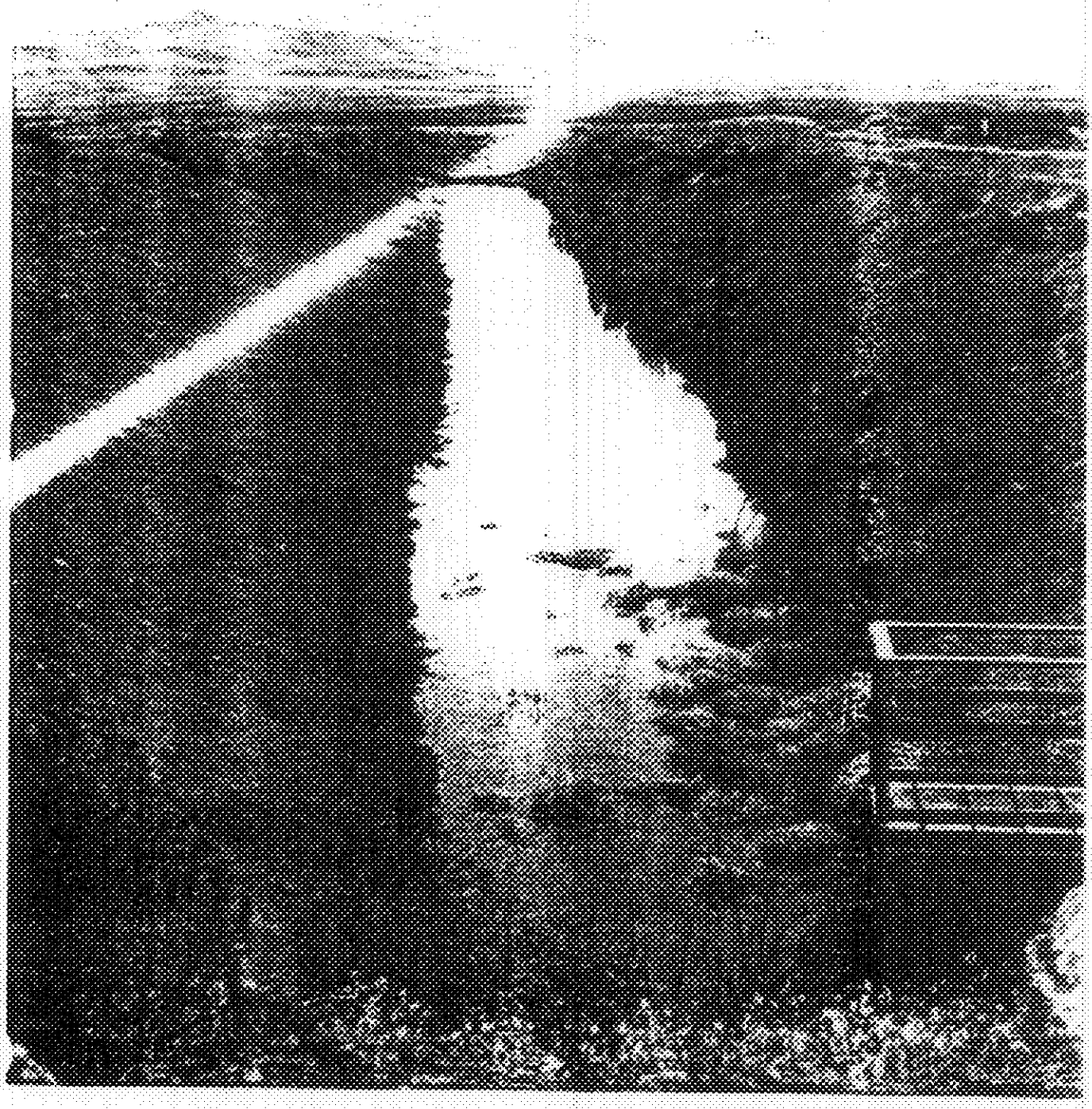
APPENDIX A

PHOTOGRAPHS

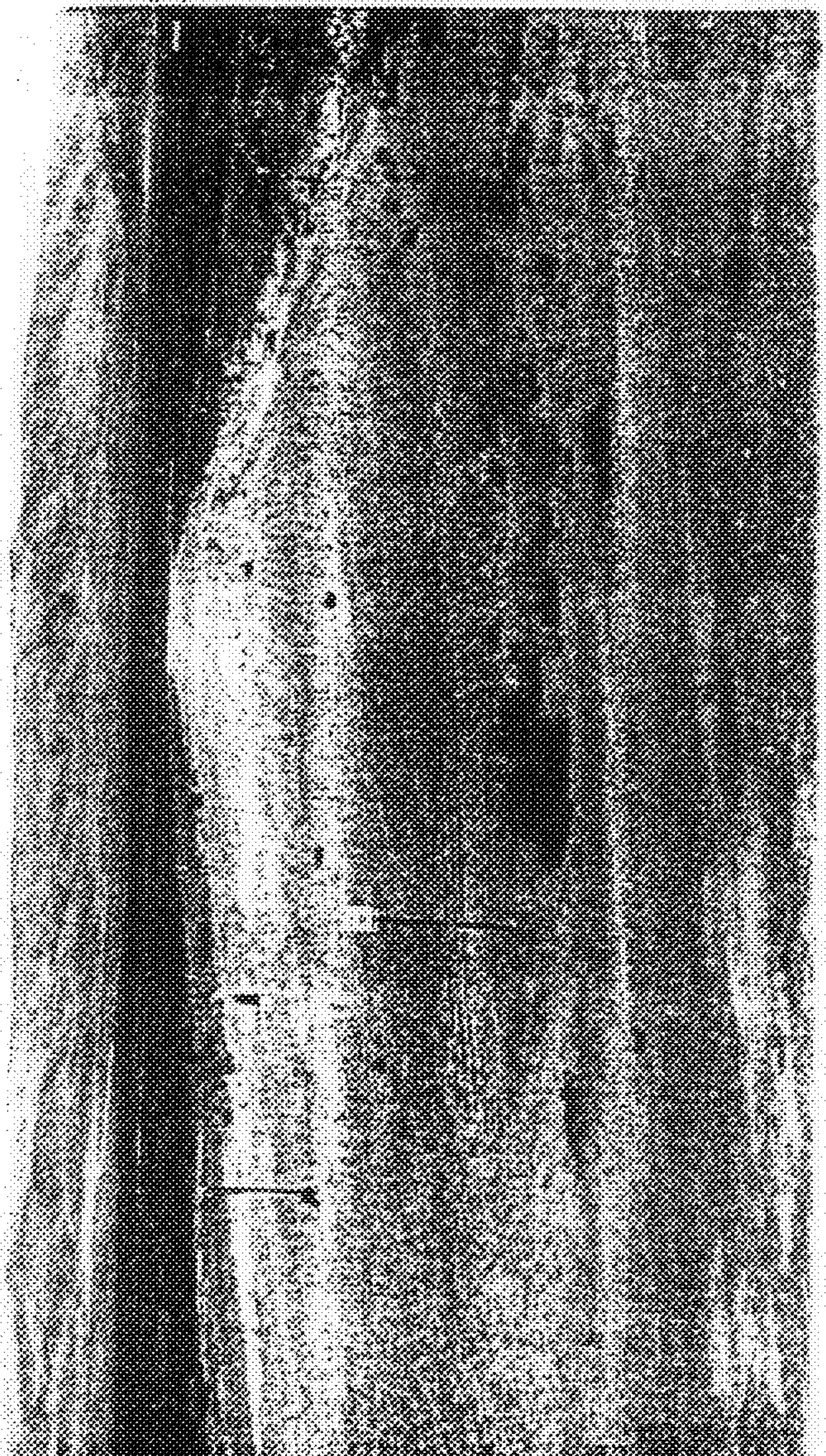
Photograph A-1 216-S-6 Crib



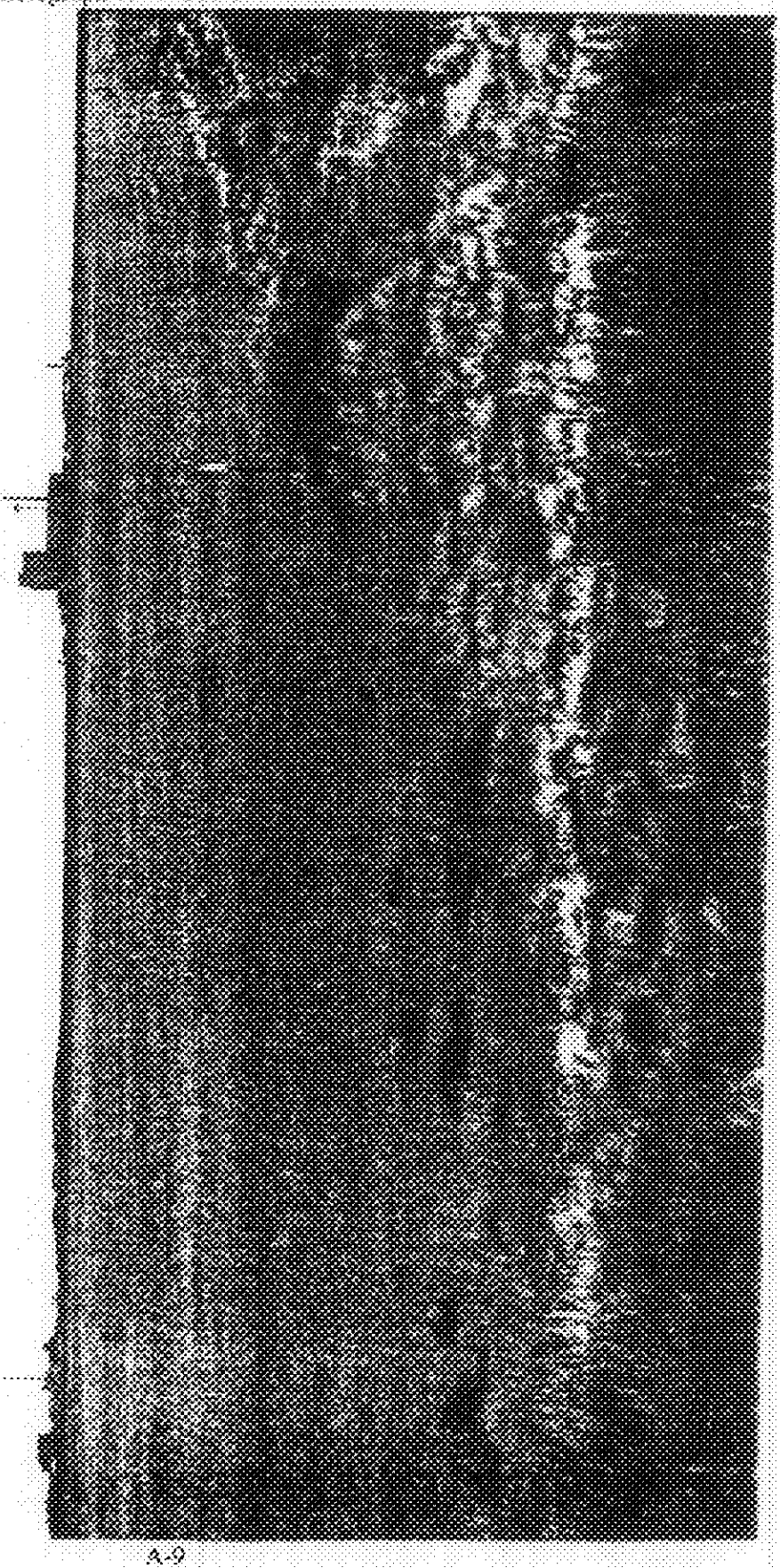
Photograph A-3. 216-S-10D Ditch.



Photograph A-3. 216-S-16D Ditch.

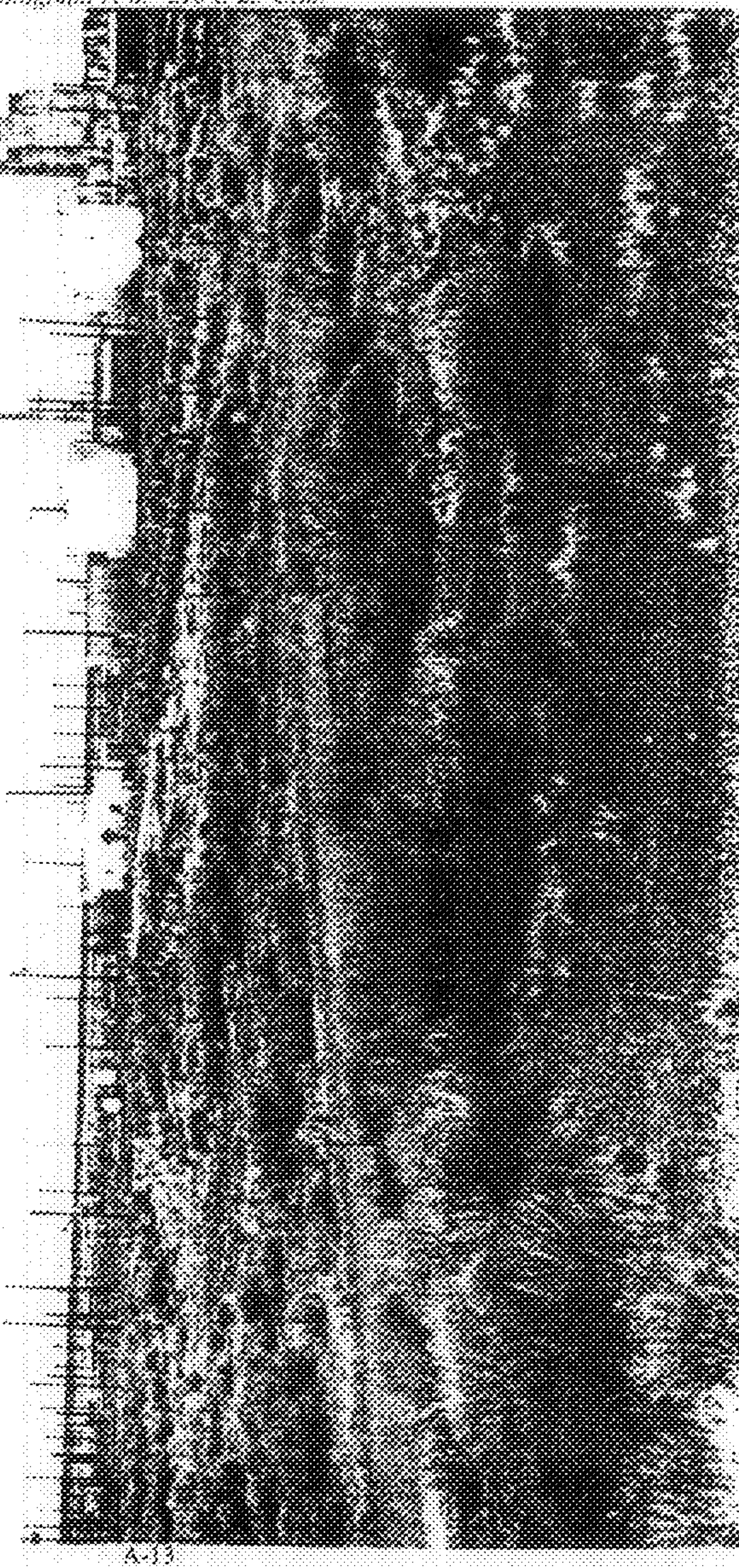


Photograph A-4. 216-S-17 Pond.

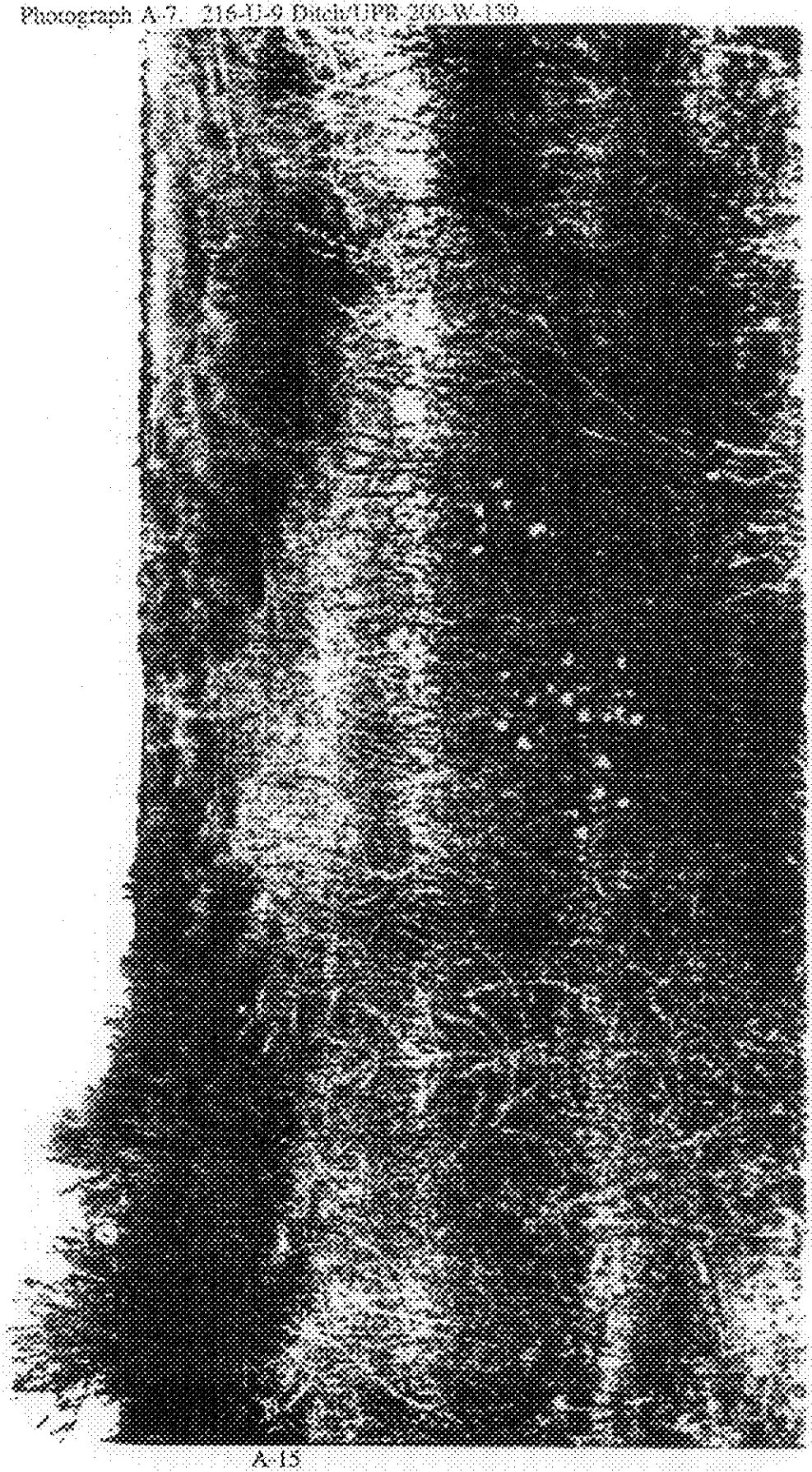


Photograph A-S. 216-S-19 Pond.

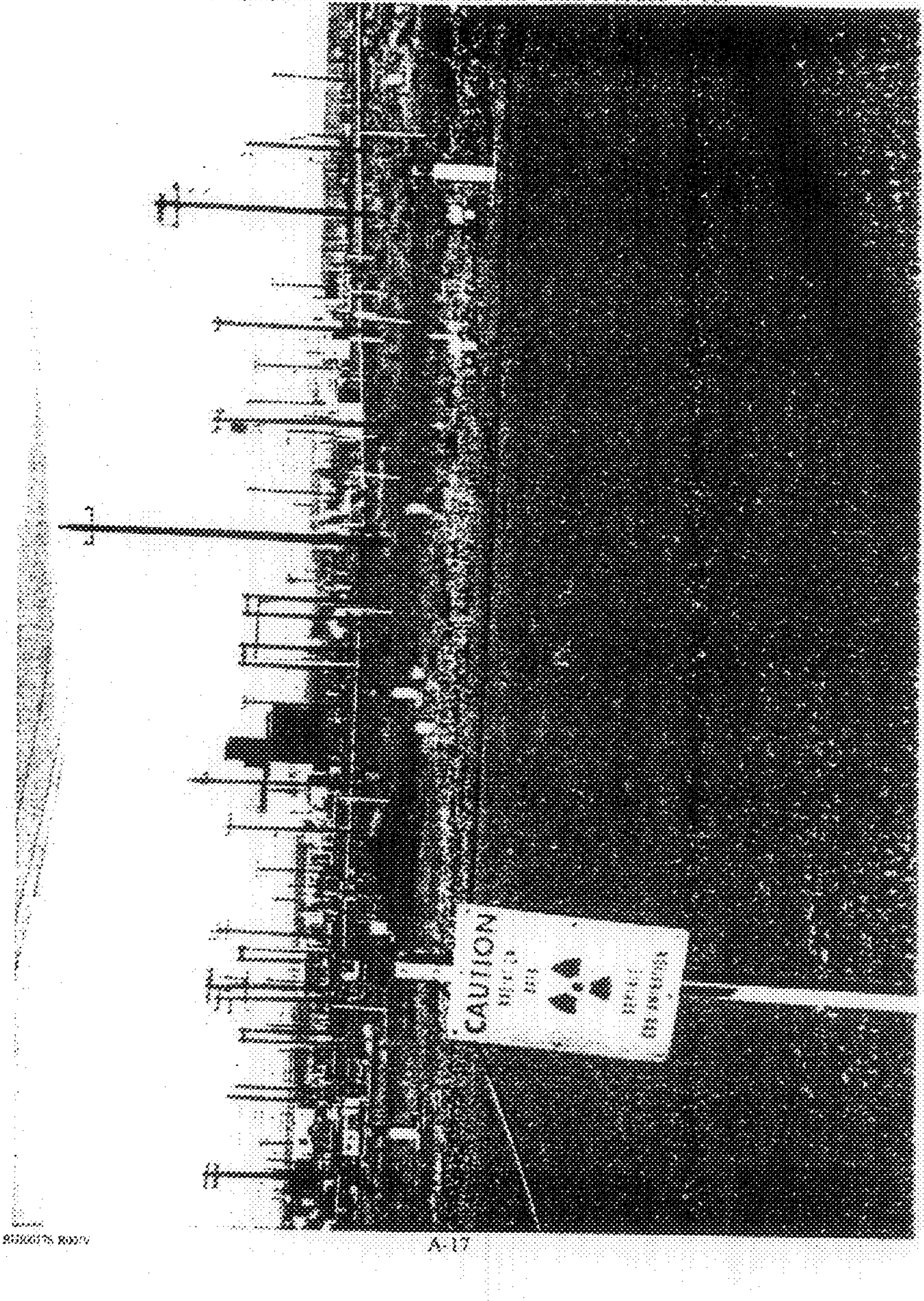
Photograph A-6. 216-S-25 Crib



Photograph A-7. 216-U-9 Ditch/UPR-200-W-139

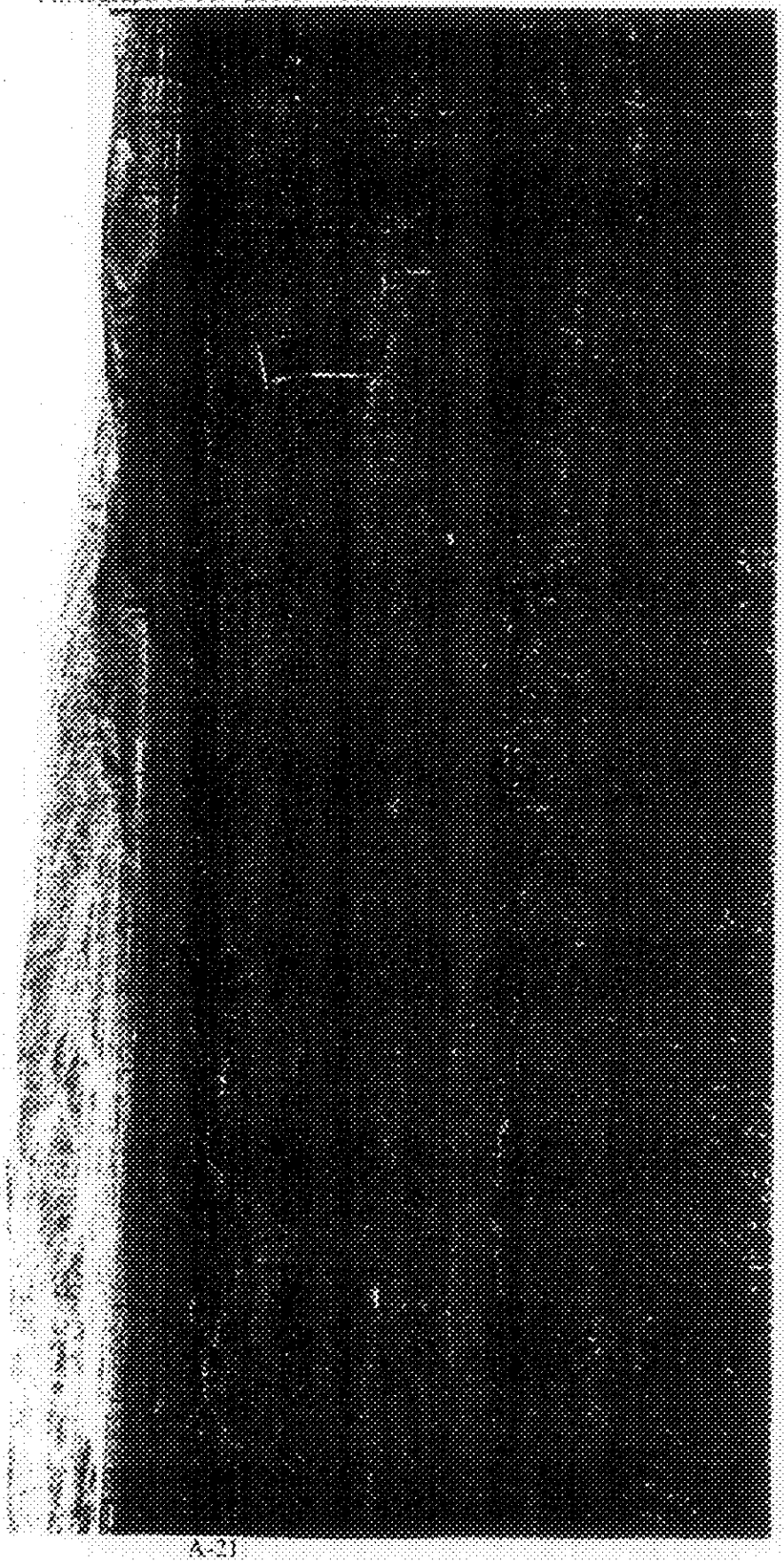


Photograph A-8. 216-S-1 and 216-S-2 Cribs/UPR-200-W-36.

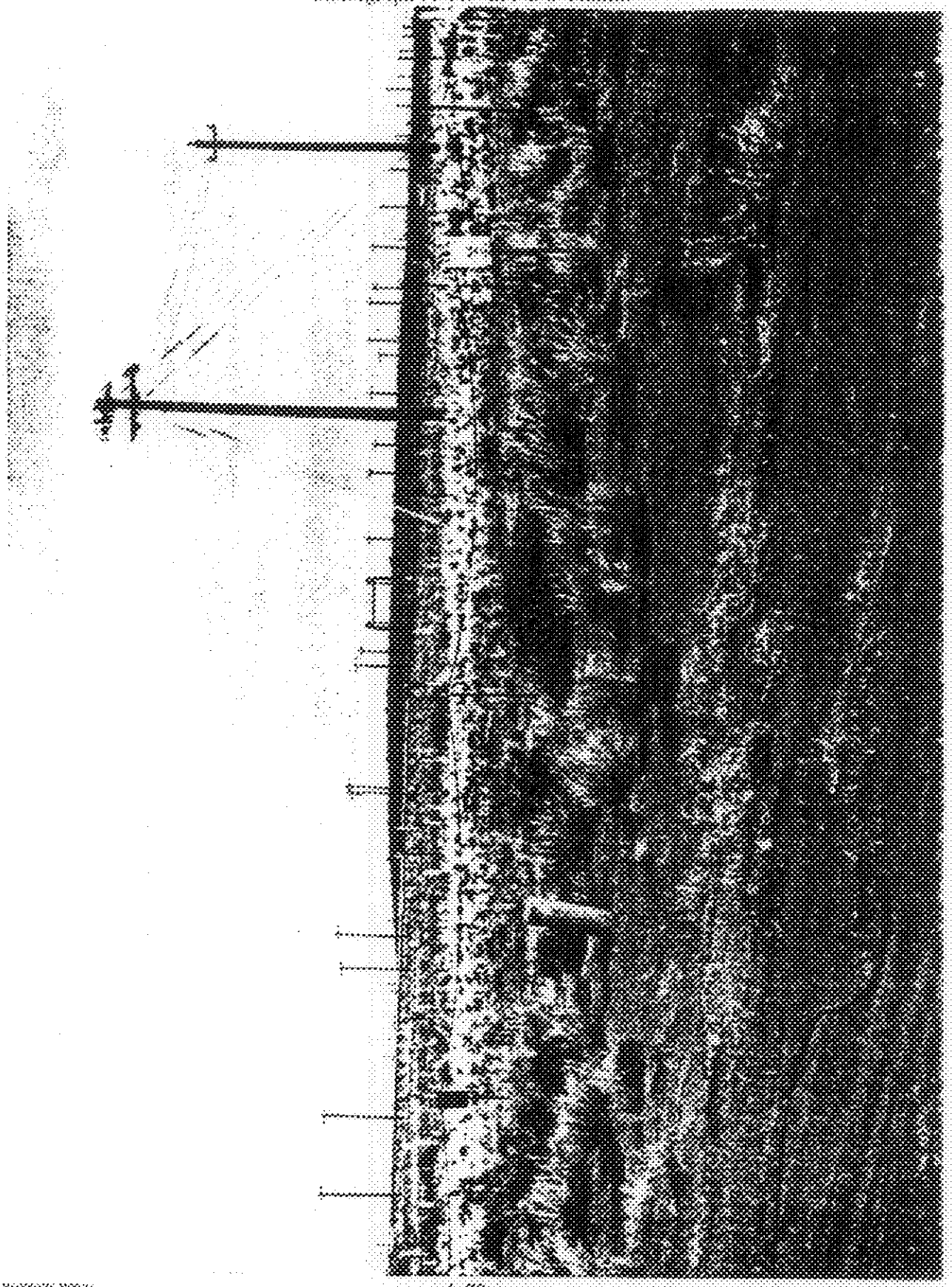


Photograph A-9 216-S-3 French Drain

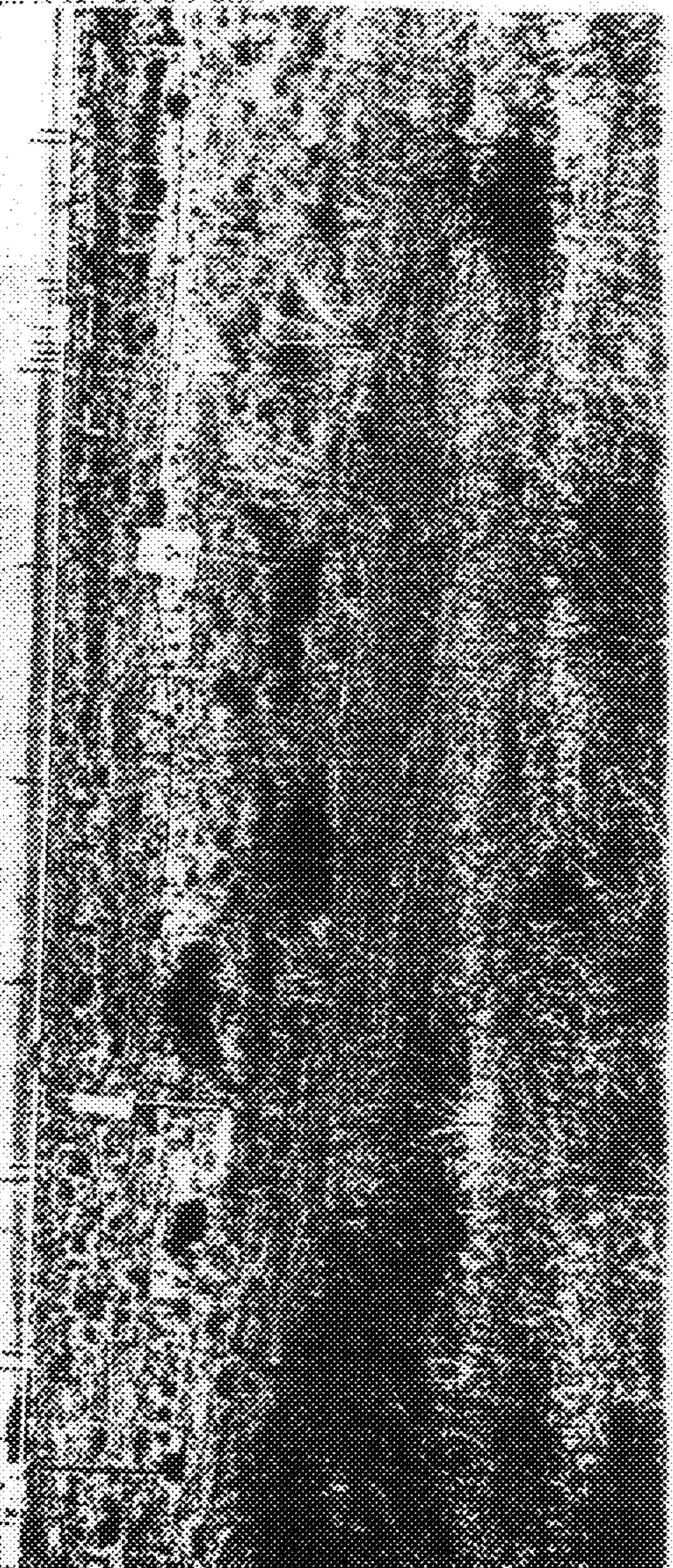
Photograph A-10. 216-S-7 Crib.



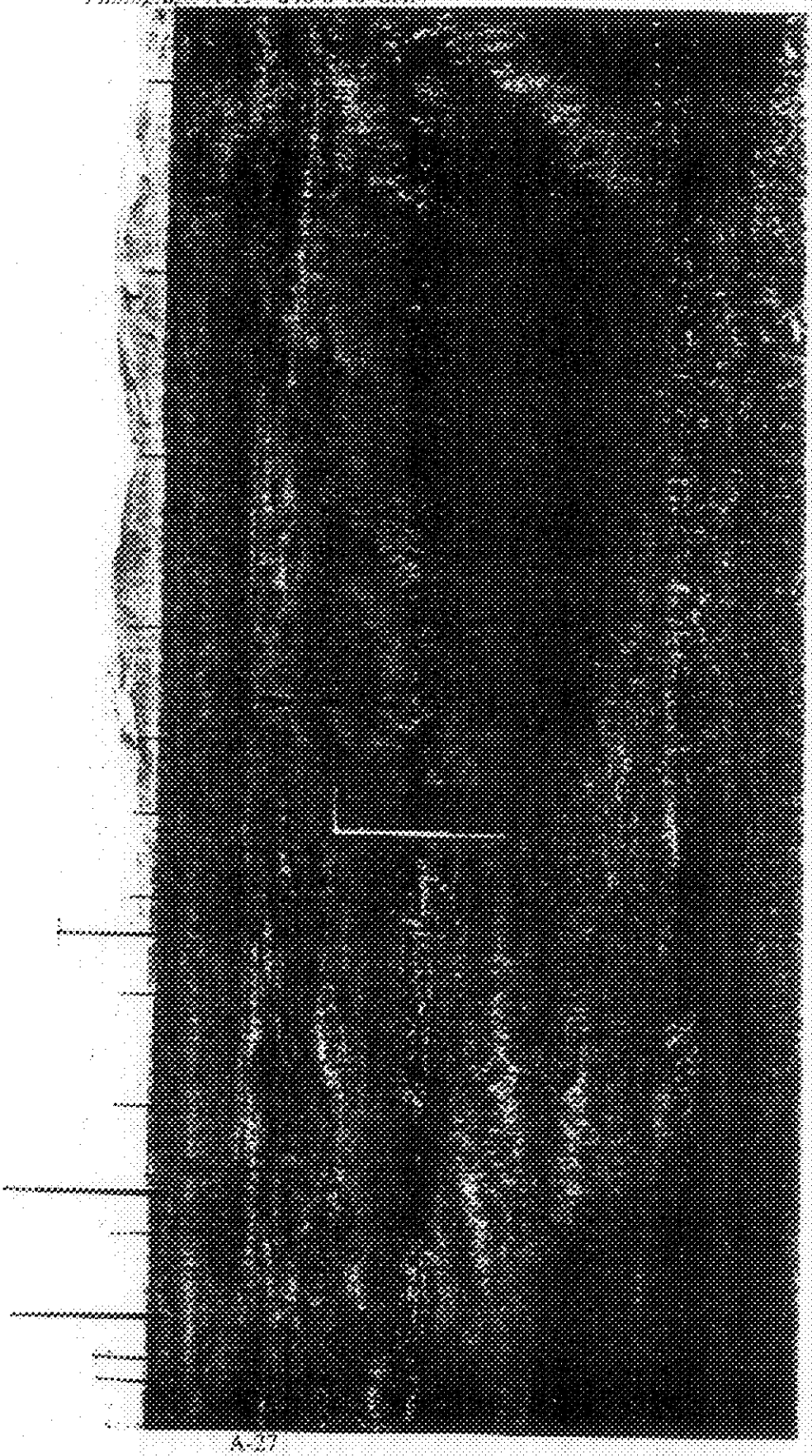
Photograph A-11. 216-S-8 Trench



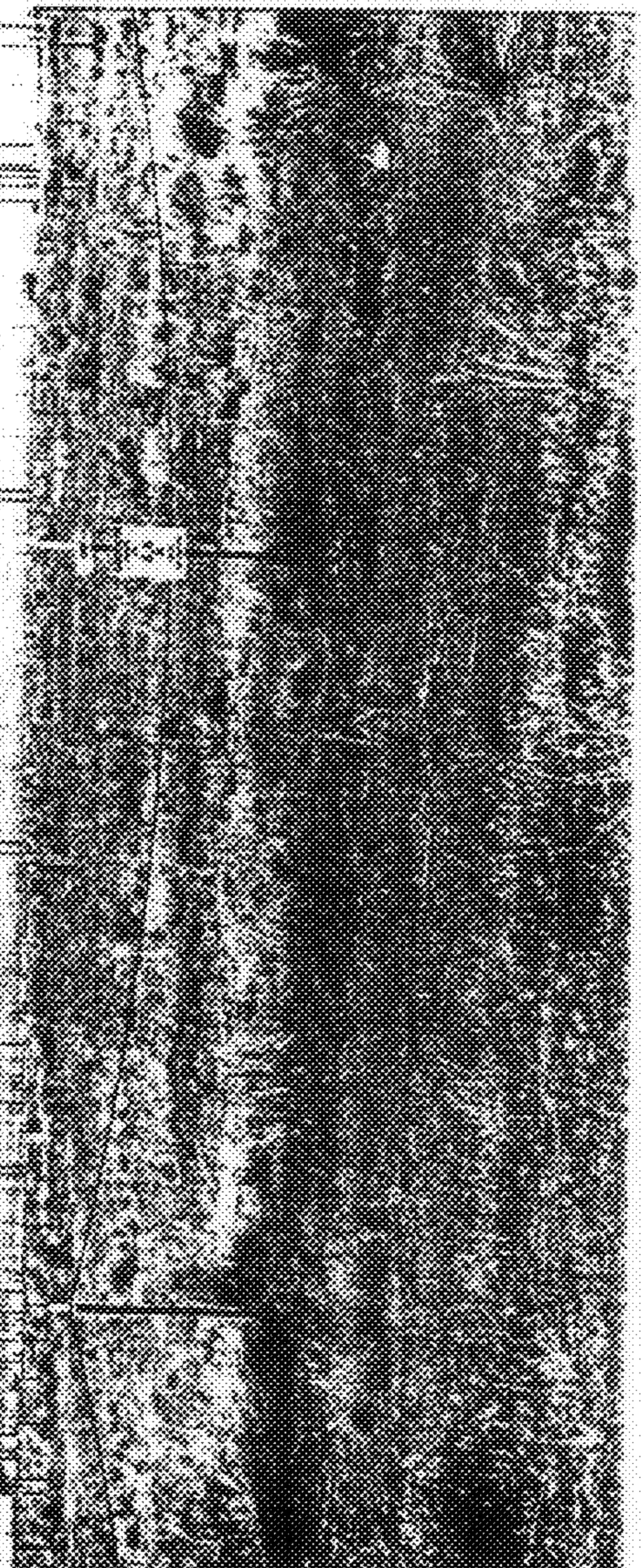
Photograph A-12. 216-S-9 Crib



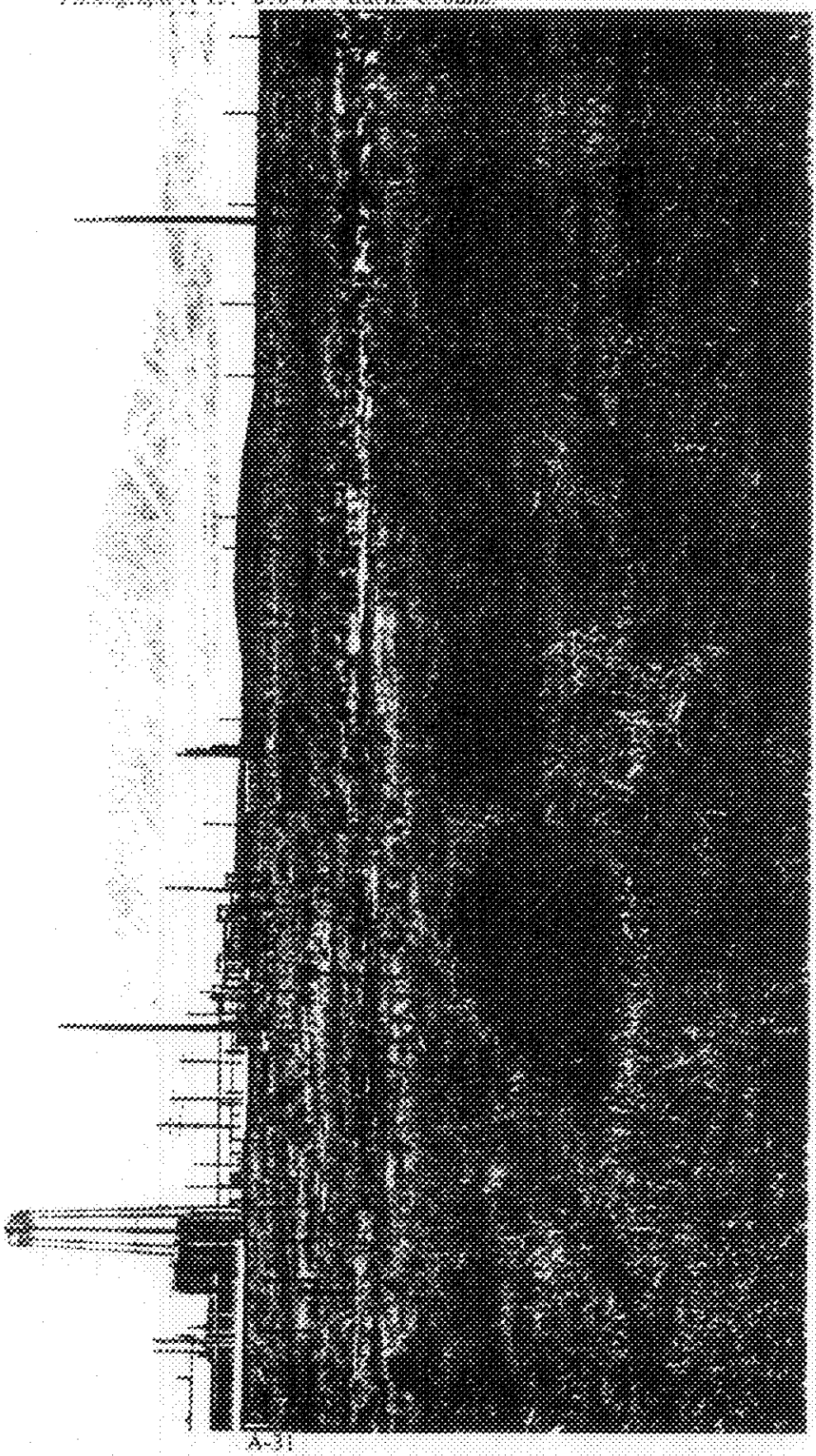
Photogram A-13 216-S-13 Crib



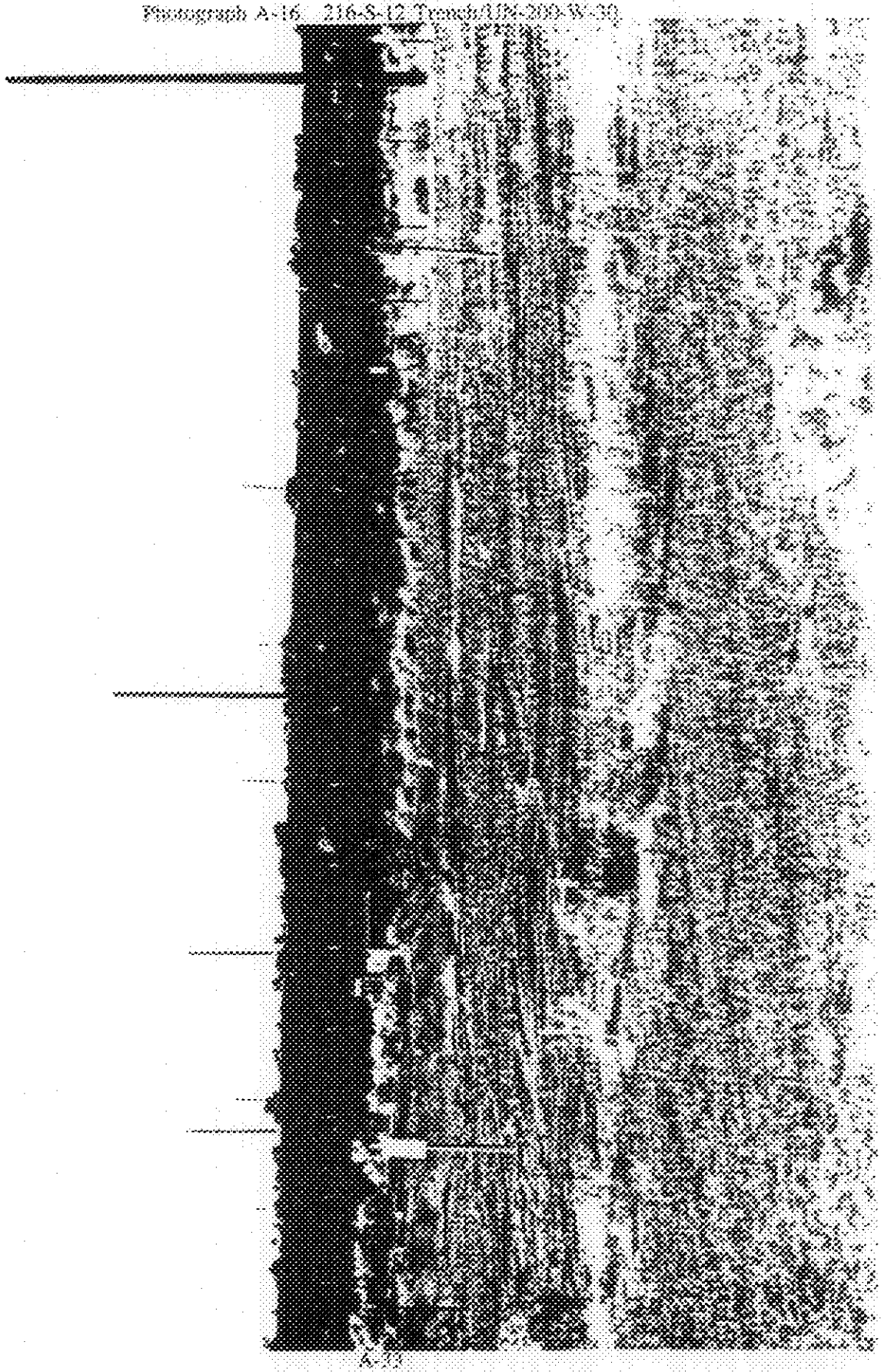
Photograph A-14. 216-S-23 Crib.



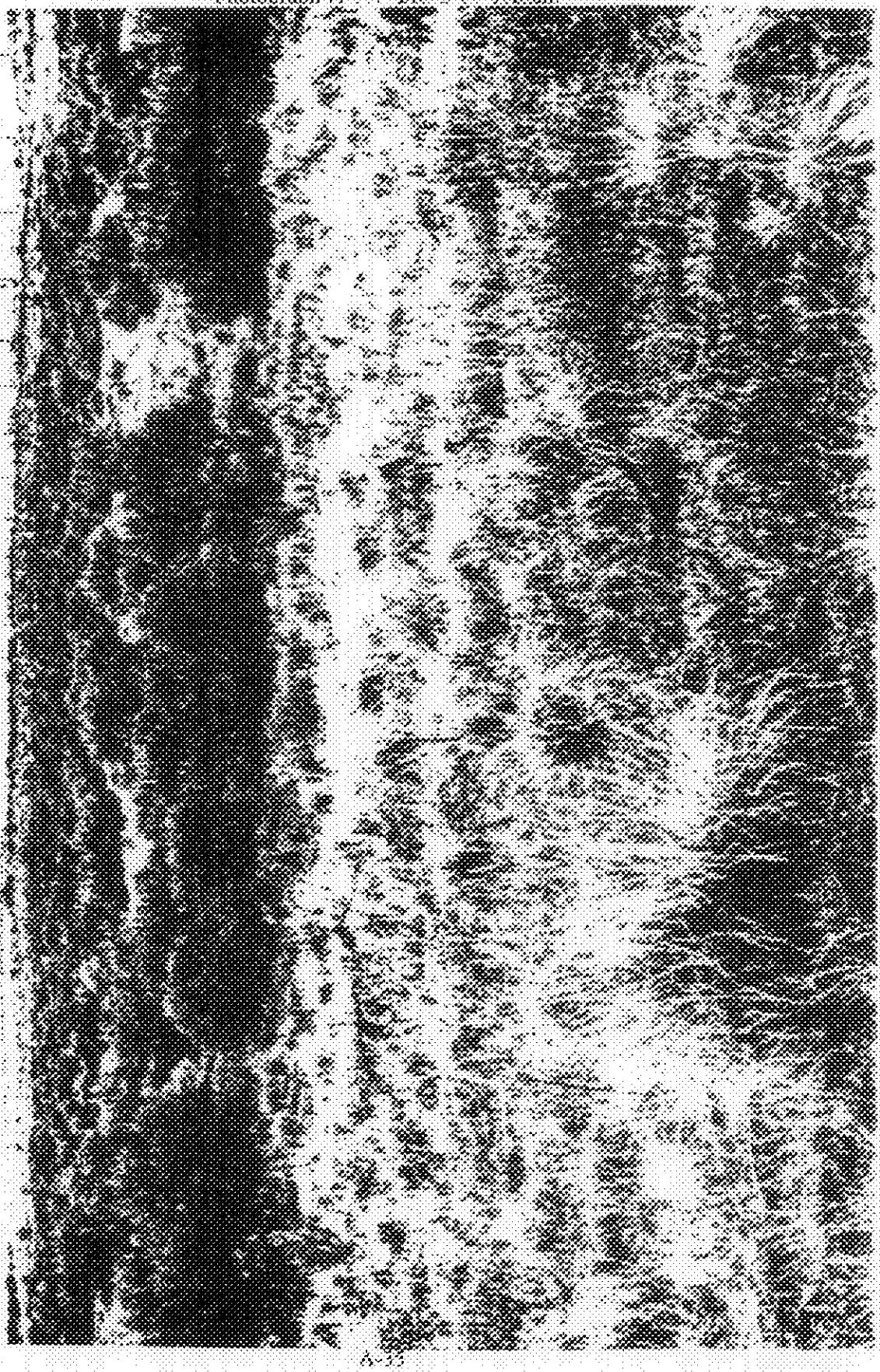
Photograph A-15. 218-W-9 Burial Ground.



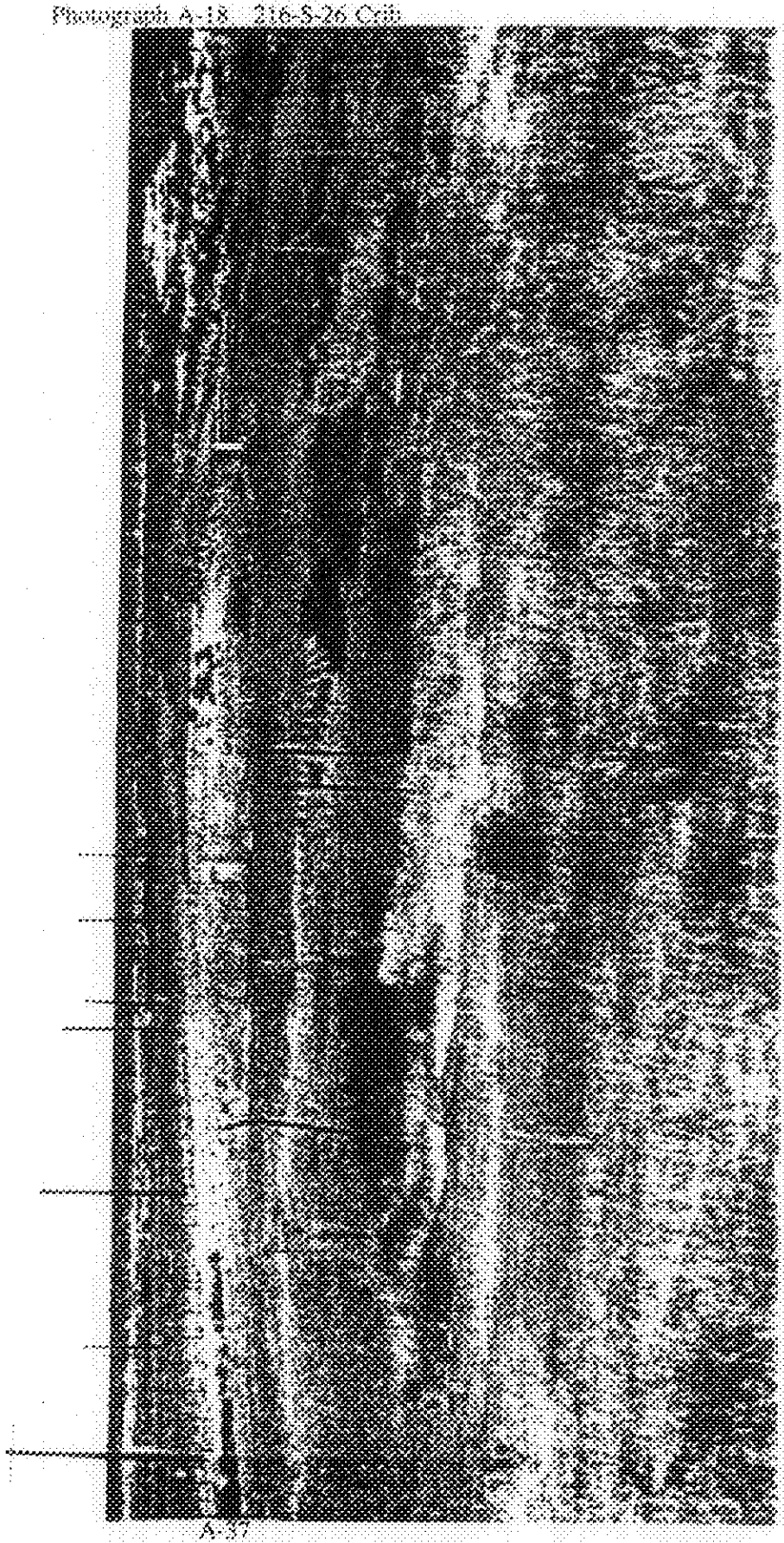
Photograph A-16 216-S-12 Trench (UN-209-W-30)



Photograph A-17, 216-S-1a Trench



Photograph A-18. 216-S-26 Crib.



APPENDIX B

HANFORD SITE PHOTOGRAPHS AND DRAWINGS LIST

Table B-1. List of Photographs and Selected Technical Drawings for Operable Unit 200-RO-1.

Site	Photograph	Key Drawing	Other Selected Drawings							
216-S-10D	122440-45-CN	H-2-5962	H-2-32525	H-2-34762	H-2-44510	H-2-2594				
216-S-10P	122440-45-CN									
216-S-11	* none ident.	H-2-5962	H-2-2430	H-2-34762						
216-S-16D	122440-38-CN	H-2-37998	H-2-30264	H-2-30266	H-2-5224	H-2-46019	H-2-46020	H-6-362	H-2-46263	
216-S-16P	122440-38-CN	H-2-37998	H-2-30264							
216-S-17	122440-40-CN	H-2-30264	H-2-5962	H-5326 #2	H-6-466 #8	H-2-34762	H-2-5962	H-2-5326 #1	H-2-5542	H-2-2594
216-S-172	* none ident.	H-2-30268								
216-S-19	122440-51-CN	H-2-32525	H-2-5224	H-2-5101	H-2-34762	H-2-44510 #1	H-6-466 #3			
216-S-25	122440-48-CN	H-2-46112	H-2-46286	H-2-34762	H-2-44510	H-2-46292				
216-S-5	* none ident.	H-2-5963	H-2-32525							
216-S-6	122440-47-CN	H-2-2595	H-2-1813	H-2-2594	H-2-1774	H-2-2596	H-2-32525			
216-U-9	122440-50-CN	H-2-44510 #2	H-2-32527	H-2-36824	H-2-43027	H-2-43028	H-2-2430			
2607-WZ	* none ident.									
2904-S-160	* none ident.	H-2-2599								
2904-S-170	* none ident.									
2904-S-171	* none ident.									

Table B-2. List of Photographs and Selected Technical Drawings for Operable Unit 200-RO-2.

Site	Photograph	Key Drawing	Other Selected Drawings	
207-S	* none ident.			
216-S-1 & 2	122440-240-CN	H-2-1813	H-2-1776	H-2-5326 #2
216-S-13	122440-247-CN	H-2-5385		
216-S-15	* none ident.			
216-S-18	* none ident.			
216-S-23	122440-244-CN			
216-S-3	122440-242-CN	H-2-39574		
216-S-7	122440-246-CN	H-2-30135		
216-S-8	122440-239-CN			
216-S-9	122440-243-CN	H-2-32362		
218-W-9	122440-245-CN			
241-S-151	* none ident.	H-2-1774	H-2-1794	
241-S-302A	* none ident.	H-2-1774		
241-SX-302	* none ident.	H-2-1795		
UN-200-W-108	* none ident.			
UN-200-W-109	* none ident.			
UN-200-W-114	* none ident.			
UN-200-W-116	* none ident.			
UN-200-W-123	* none ident.			
UN-200-W-127	* none ident.			
UN-200-W-32	* none ident.			
UN-200-W-34	* none ident.			
UN-200-W-41	* none ident.			
UN-200-W-42	* none ident.			
UN-200-W-49	* none ident.			
UN-200-W-50	* none ident.			
UN-200-W-52	* none ident.			
UN-200-W-69	* none ident.			
UN-200-W-82	* none ident.			
UN-200-W-83	* none ident.			

Table B-3. List of Photographs and Selected Technical Drawings for Operable Unit 200-RO-3.

Site	Photograph	Key Drawing	Other Selected Drawings
207-SL	* none ident.		
216-S-12	122440-256-CN		
216-S-14	122440-52-CN		
216-S-20	* none ident.	H-2-5224	H-2-5229
216-S-22	* none ident.	H-2-31047	
216-S-26	* none ident.		
218-W-7	* none ident.	H-2-5170	
240-S-151	* none ident.	H-2-5200	H-2-5775
240-S-152	* none ident.		
240-S-302	* none ident.		
2607-W6	* none ident.		
UN-200-W-30	* none ident.		
UN-200-W-35	* none ident.		
UN-200-W-43	* none ident.		
UN-200-W-56	* none ident.		
UN-200-W-61	* none ident.		

Table B-4. List of Photographs and Selected Technical Drawings for Operable Unit 200-RO-4.

Site	Photograph	Key Drawing	Other Selected Drawings		
241-S-101	* none ident.	H-2-1774	H-2-1783	H-2-1775	
241-S-102	* none ident.	H-2-1774	H-2-1794	H-2-1776	
241-S-103	* none ident.	H-2-1774	H-2-37381	H-2-3402	
241-S-104	* none ident.	H-2-1774	H-2-1794		
241-S-105	* none ident.	H-2-1774	H-2-1794		
241-S-106	* none ident.	H-2-1774	H-2-1794		
241-S-107	* none ident.	H-2-1774	H-2-1794		
241-S-108	* none ident.	H-2-1774	H-2-1794		
241-S-109	* none ident.	H-2-1774	H-2-1794		
241-S-110	* none ident.	H-2-1774	H-2-1794		
241-S-111	* none ident.	H-2-1774	H-2-1794		
241-S-112	* none ident.	H-2-1774	H-2-1794		
241-S-152	* none ident.	H-2-1774	H-2-1794	H-2-5204	
241-S-302B	* none ident.	H-2-1774			
241-S-A	* none ident.	H-2-39948			
241-S-B	* none ident.	H-2-39948			
241-S-C	* none ident.	H-2-39948			
241-S-D	* none ident.	H-2-39948			
241-SX-101	* none ident.	H-2-31881	H-2-1794	H-2-1783	
241-SX-102	* none ident.	H-2-39501	H-2-1794	H-2-1783	
241-SX-103	* none ident.	H-2-39574	H-2-1794	H-2-1783	
241-SX-104	* none ident.	H-2-1783	H-2-1794		
241-SX-105	* none ident.	H-2-1783	H-2-1794		
241-SX-106	* none ident.	H-2-1783	H-2-1794		
241-SX-107	* none ident.	H-2-1783	H-2-1794		
241-SX-108	* none ident.	H-2-1783	H-2-1794		
241-SX-109	* none ident.	H-2-1783	H-2-1794		
241-SX-110	* none ident.	H-2-1783	H-2-1794		
241-SX-111	* none ident.	H-2-1783	H-2-1794		
241-SX-112	* none ident.	H-2-1783	H-2-1794		
241-SX-113	* none ident.	H-2-35590	H-2-1794		
241-SX-114	* none ident.	H-2-1783	H-2-1794		
241-SX-115	* none ident.	H-2-35591	H-2-1794		
241-SX-151	* none ident.	H-2-39548	H-2-5204		
241-SX-152	* none ident.	H-2-3406	H-2-3411	H-2-5204	H-2-35858
UN-200-W-10	* none ident.				
UN-200-W-80	* none ident.				
UN-200-W-81	* none ident.				

DISTRIBUTION

Number of Copies

ONSITE

12	R. W. Carpenter (BHI) (4)	H6-03
	W. L. Pamplin (BHI)	H6-07
	BHI Document Control (3)	H4-79
	BHI Project File (3)	H6-08
	Environmental Resource Center	H6-07

THIS PAGE INTENTIONALLY
LEFT BLANK