1 of 2

DOE/RL-90-12
Revision 2

Request for Interim Approval to Operate Trench 94 of the 218-E-12B Burial Ground as a Chemical Waste Landfill for Disposal of Polychlorinated Biphenyl Waste in Submarine Reactor Compartments

Date Published
June 1994

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

This report has been reproduced from the best available copy.
Available in paper copy and microfiche.

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

Available to the public from the U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650

Printed in the United States of America

DISCLM-5.CHP (8-91)

CONTENTS

1.0 INTRODUCTION 1-1

2.0 GENERAL BACKGROUND AND HISTORY 2-1

3.0 SITE CHARACTERISTICS 3-1
3.1 GEOLOGY AND HYDROLOGY 3-1
3.2 TOPOGRAPHY AND LAND USE 3-3
3.3 CLIMATE 3-3
3.4 UNIT DESCRIPTION 3-4

4.0 WASTE RECEIVED FOR DISPOSAL 4-1
4.1 GENERAL DESCRIPTION OF WASTE 4-1
4.2 DESCRIPTION OF POLYCHLORINATED BIPHENYL WASTE 4-2

5.0 OPERATION PLAN 5-1
5.1 RECORDKEEPING 5-1
5.1.1 Disposal and Storage Units 5-1
5.1.2 Chemical Waste Landfill Units 5-2
5.1.3 Retention of Special Records by Storage and Disposal Units 5-3
5.2 SURFACE WATER HANDLING 5-4
5.3 EXCAVATION AND BACKFILL 5-4
5.4 WASTE SEGREGATION BURIAL COORDINATES 5-4
5.5 VEHICLE AND EQUIPMENT MOVEMENT 5-5
5.6 USE OF ROADWAYS 5-5
5.7 LEACHATE COLLECTION SYSTEM 5-5
5.8 SAMPLING AND MONITORING PROCEDURES 5-5
5.9 MONITORING WELLS 5-6
5.10 ENVIRONMENTAL EMERGENCY AND CONTINGENCY PLAN 5-6
5.11 SECURITY MEASURES 5-6

6.0 RISK FROM PROPOSED OPERATION 6-1
6.1 POLYCHLORINATED BIPHENYL RELEASE MODES ASSOCIATED WITH SUBMARINE REACTOR COMPARTMENT DISPOSAL 6-1
6.2 FACTORS AFFECTING RELEASE OF POLYCHLORINATED BIPHENYLS 6-2
6.3 PRACTICES TO MINIMIZE POTENTIAL FOR RELEASE OF POLYCHLORINATED BIPHENYLS 6-3
6.4 RELEASE OF POLYCHLORINATED BIPHENYLS DURING THE INTERIM APPROVAL PERIOD 6-3

7.0 COMPLIANCE WITH TOXIC SUBSTANCE CONTROL ACT OF 1976 7-1
7.1 SOILS 7-1
7.2 SYNTHETIC MEMBRANE LINERS 7-2
7.3 HYDROLOGIC CONDITIONS 7-2
7.4 FLOOD PROTECTION 7-4
7.5 TOPOGRAPHY 7-4
7.6 MONITORING SYSTEMS 7-5
7.7 LEACHATE COLLECTION 7-6

CONTENTS (cont)

7.8 WASTE AND CONTAINER MANAGEMENT 7-7
7.9 OPERATION PLAN 7-7
7.10 IGNITABLE WASTE 7-8
7.11 BURIAL RECORDS 7-8
7.12 SUPPORTING FACILITIES 7-8
7.13 ADDITIONAL REQUIREMENTS THAT INCREASE ENVIRONMENTAL PROTECTION 7-9
7.13.1 Inspections 7-9
7.13.2 Training 7-9
7.13.3 Closure and Postclosure 7-9

8.0 REQUEST FOR INTERIM WAIVER 8-1

9.0 REFERENCES 9-1
9.1 DOCUMENTS 9-1
9.2 CODE OF FEDERAL REGULATIONS 9-2
9.3 FEDERAL AND STATE ACTS 9-2
9.4 WASHINGTON ADMINISTRATIVE CODE 9-3

APPENDICES

A ENGINEERING DRAWINGS . . . . . APP A-i

B SUBMARINE REACTOR COMPARTMENTS IN TRENCH 94 . . . . . APP B-i

C CROSS-REFERENCE OF REGULATORY REQUIREMENTS UNDER 40 CFR 761, WAC 173-303, AND 40 CFR 265 . . . . . APP C-i

D LOW-LEVEL BURIAL GROUNDS RECORDKEEPING . . . . . APP D-i

E CALCULATION OF RUN-OFF AND/OR RUN-ON FROM 24-HOUR, 25-YEAR STORM . . . . . APP E-i

F ENGINEERING REPORT OF LIQUID REMOVAL FROM SUBMARINE REACTOR COMPARTMENT DISPOSAL PACKAGES . . . . . APP F-i

G SECURITY AND ACCESS CONTROL . . . . . APP G-i

H COMPLIANCE AGREEMENT BETWEEN U.S. DEPARTMENT OF ENERGY RICHLAND OPERATIONS OFFICE, RICHLAND, WASHINGTON, AND THE ENVIRONMENTAL PROTECTION AGENCY, REGION 10, SEATTLE, WASHINGTON . . . . . APP H-i

I LETTER FROM PUGET SOUND NAVAL SHIPYARD TO ENVIRONMENTAL PROTECTION AGENCY REGION 10 . . . . . APP I-i

APPENDICES (cont)

J LETTER FROM WASHINGTON STATE DEPARTMENT OF ECOLOGY TO U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION 10 . . . . APP J-i

K LETTER FROM U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION 10 TO U.S. DEPARTMENT OF ENERGY, RICHLAND OPERATIONS OFFICE . . . . APP K-i

FIGURES

3-1. Generalized Stratigraphy for Low-Level Waste Management Areas 1 and 2 . . . . F3-1
3-2. Locations of Geologic Cross-Sections Near Low-Level Waste Management Area-2 . . . . F3-2
3-3. Geologic Cross-Section E-E', Low-Level Waste Management Area-2 . . . . F3-3
3-4. Geologic Cross-Section F-F', Low-Level Waste Management Area-2 . . . . F3-4
3-5. Geologic Cross-Section G-G', Low-Level Waste Management Area-2 . . . . F3-5
3-6. Geologic Cross-Section H-H', Low-Level Waste Management Area-2 . . . . F3-6
3-7. Current Groundwater Well Locations for Low-Level Waste Management Area-2 and Groundwater Flow Direction F3-7

4-1. General Schematic of Submarine Reactor Compartment F4-1

5-1. Hanford Site Roads and Estimated Traffic Volumes F5-1

7-1. Columbia River Floodplain Boundary for the Probable Maximum Flood F7-1
7-2. Yakima River Floodplain Boundary for the 100-Year Flood F7-2
7-3. Cold Creek Floodplain Boundary for the Probable Maximum Flood F7-3
7-4. Monitoring Well Construction Details F7-4

This page intentionally left blank.

940606.0827

ABBREVIATIONS AND ACRONYMS

amsl	above mean sea level
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
DOE-RL	DOE Richland Operations Office
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
in.	inch
LLBG	Low-Level Burial Grounds
LLWMA-2	low-level waste management area-2
PCB	polychlorinated biphenyl
RCRA	*Resource Conservation and Recovery Act of 1976*
rem	roentgen equivalent man
SRC	submarine reactor compartment
Supply System	Washington Public Power Supply System
Trench 94	Trench 94 of the 218-E-12B Burial Ground
TSCA	*Toxic Substances Control Act of 1976*
PNL	Pacific Northwest Laboratory

This page intentionally left blank.

1.0 INTRODUCTION

This request is submitted to seek interim approval to operate a *Toxic Substances Control Act* (TSCA) *of 1976* chemical waste landfill for the disposal of polychlorinated biphenyl (PCB) waste. Operation of a chemical waste landfill for disposal of PCB waste is subject to the TSCA regulations of 40 CFR 761. Interim approval is requested for a period not to exceed 5 years from the date of approval. This request covers only the disposal of small quantities of solid PCB waste contained in decommissioned, defueled submarine reactor compartments (SRC). In addition, the request applies only to disposal of this waste in Trench 94 of the 218-E-12B Burial Ground (Trench 94) in the 200 East Area of the U.S. Department of Energy's (DOE) Hanford Facility. Disposal of this waste will be conducted in accordance with the Compliance Agreement (Appendix H) between the DOE Richland Operations Office (DOE-RL) and the U.S. Environmental Protection Agency (EPA), Region 10. During the 5-year interim approval period, the DOE-RL will submit an application seeking final approval for operation of Trench 94 as a chemical waste landfill, including any necessary waivers, and also will seek a final dangerous waste permit from the Washington State Department of Ecology (Ecology) for disposal of lead shielding contained in the SRCs.

Because Trench 94 is being used for disposal of mixed waste regulated under the *Resource Conservation and Recovery Act* (RCRA) *of 1976*, it is subject to applicable requirements for dangerous and hazardous waste landfills under WAC 173-303 and 40 CFR 265, respectively. In many cases, requirements for dangerous and hazardous waste landfills are identical to or more stringent than the requirements for chemical waste landfills under TSCA. In such cases, compliance with TSCA requirements (40 CFR 761.75) will be satisfied through compliance with WAC 173-303 and 40 CFR 265 requirements. Appendix C lists the comparable regulations for 40 CFR 761, WAC 173-303, and 40 CFR 265.

This request demonstrates how Trench 94 will be operated to comply with the applicable TSCA requirements, specifically the requirements for chemical waste landfills under 40 CFR 761.75. Chapter 2.0 provides general background and history related to operation of Trench 94 for disposal of SRCs. Chapter 3.0 provides information on site characteristics, especially those relevant to compliance with TSCA requirements. A description of the waste received at Trench 94 is given in Chapter 4.0. Chapter 5.0 provides an operation plan for Trench 94, as required under 40 CFR 761.75(b)(8)(ii). Chapter 6.0 addresses the risk associated with operation of Trench 94 for the 5-year interim approval period, in accordance with the operation plan. Chapter 7.0 demonstrates how operation of Trench 94 during the interim approval period will comply with specific requirements under 40 CFR 761.75. This chapter also provides the basis for requesting a waiver from the liner and leachate detection/collection system requirements of 40 CFR 265 because of the high integrity of the SRCs. These requests for waivers are presented in Chapter 8.0. The requests indicate, as demonstrated in Chapter 6.0, that operation of Trench 94 during the interim approval period without a liner and leachate detection/collection system, and with the existing site groundwater monitoring program, will not present an unreasonable risk to human health and the environment.

Revision 2 of this request replaces Revision 1 in its entirety.

2.0 GENERAL BACKGROUND AND HISTORY

The 218-E-12B Burial Ground is in the 200 East Area of the Hanford Facility. The 218-E-12B Burial Ground began receiving waste in 1967 and consists of over 80 existing or planned trenches covering 173 acres (70.01 hectares). Waste contained in the 218-E-12B Burial Ground includes mixed waste, low-level radioactive waste, and transuranic waste. Trench 94 (Drawing H-13-000018 in Appendix A) is used for final disposal of U.S. Department of Navy (Navy) defueled SRCs. The first SRC was placed in Trench 94 in April 1986 and the trench contained 35 SRCs at the end of 1993. Trench 94 should continue to receive approximately six SRCs each year until closure, which is scheduled to begin approximately in 2016.

Each SRC is that section of the submarine hull containing the nuclear reactor plant. The nuclear reactor plant consists of the reactor vessel, steam generators, pumps, valves, wiring, and piping. The compartments are sealed completely to prevent release of the radioactive and hazardous materials contained within the compartments. All nuclear fuel has been removed from the SRCs; therefore, the radioactive materials remaining in the SRCs consist only of activation products from operation of the nuclear reactors. Regulated PCBs are present in the SRCs in minor amounts [about 5 pounds (2.3 kilograms)] in solid form in common industrial components (i.e., electrical cables, insulation, rubber items, and paint). The lead in the SRCs is regulated as dangerous waste by Ecology under the Washington State *Dangerous Waste Regulations* (WAC 173-303). Lead shielding is not considered waste by the EPA.

When the SRCs were first placed in Trench 94, the Navy and the DOE-RL were unaware of the large amount of PCBs present in felt sound damping material. On discovery of the presence of PCBs in the SRCs in 1989, the Navy committed to Ecology and the EPA (Appendix I) to remove the PCB felt from the SRCs. At that time, the Navy also extensively reviewed the materials remaining within the SRCs to identify any other potentially regulated materials (PSNS 1990). The only such materials identified were solid items that contain small amounts of PCBs and the already identified lead shielding.

The DOE-RL currently is seeking a dangerous waste permit for the Low-Level Burial Grounds (LLBG), one of which is the 218-E-12B Burial Ground (DOE-RL 1989a), and is seeking a TSCA permit to operate Trench 94 in the 218-E-12B Burial Ground as a chemical waste landfill for disposal of PCBs. All sound-damping felt that contains PCB has been removed from the SRCs placed in Trench 94 before October 1989. For all SRC shipments subsequent to October 1989, the PCB-laden felt has been, and will continue to be, removed by the Navy before the SRCs are transported to the Hanford Facility. Other solid materials that contain PCBs (i.e., electrical cables, insulation, rubber items, and paint) will remain in the SRCs for disposal.

This page intentionally left blank.

3.0 SITE CHARACTERISTICS

This chapter describes site characteristics of the 218-E-12B Burial Ground in general and Trench 94 in particular. The characteristics described are mainly those important for compliance with TSCA chemical waste landfill requirements. These characteristics include geology, hydrology, topography, land use, climate, and a description of Trench 94.

3.1 GEOLOGY AND HYDROLOGY

The 218-E-12B Burial Ground is located within the 200 East Area. The Hanford Facility is located in the Pasco Basin within the Columbia Plateau. The Pasco Basin was formed by slow continuous subsidence coupled with periodic flooding by basaltic lava flows. As the anticlinal ridges to the south of the basin rose, the ridges obstructed the flow of the Columbia River, flattening the gradient and causing deposition of alluvial deposits known as the Ringold Formation. The Columbia River began to incise a channel through the ridge and lowered its base elevation, subsequently eroding the Ringold Formation. Later, catastrophic floods of glacial meltwater flowed through the Pasco Basin, depositing glaciofluvial sediments known as the Hanford formation.* More recently, the Hanford Facility has received eolian deposits and dunes have formed at some locations.

In the LLBG Dangerous Waste Permit Application (DOE-RL 1989a), the LLBG have been grouped into hydrologic waste management areas to establish groundwater monitoring programs. The 218-E-12B Burial Ground is within low-level waste management area-2 (LLWMA-2). The hydrogeology of the LLWMA-2 is described in more detail by Last et al. (1989). The stratigraphy at LLWMA-2 is summarized in Figure 3-1. Geologic cross-sectional information for LLWMA-2 is presented in Figures 3-2 through 3-6.

As shown in the geologic cross sections, LLWMA-2 is underlain by gravelly sands, sands, and sandy gravels of the Hanford formation. Information on the hydraulic conductivity of saturated portions of the Hanford formation, as determined from aquifer tests, is presented by PNL (1992, p. 2.6). These results show a range of hydraulic conductivity from 0.011 inch (0.029 centimeter) per second to 13 inches (32 centimeters) per second.

The elevation of the water table in the vicinity of Trench 94 is approximately 402 feet (122.53 meters) above mean sea level (amsl). Monitoring wells 299-E34-7 (Figure 3-7) had water table elevations of 401.69 feet (123.48 meters) amsl, on December 10, 1993 (DOE-RL 1994). The depth to the water table below Trench 94 was approximately 143 feet (43.58 meters) on that date. The current generalized groundwater flow direction at LLWMA-2 is shown in Figure 3-7. The general flow direction is

---

*Unlike the Ringold Formation, the Hanford formation is not recognized by the Commission on North American Stratigraphic Nomenclature; hence the difference in capitalization.

interpreted from water level elevations contained in the *Quarterly Report of RCRA Groundwater Monitoring Data for Period October 1, 1993 Through December 31, 1993* (DOE-RL 1994).

The uppermost aquifer beneath the 200 East Area is the unconfined Hanford formation. The flow direction of this aquifer at the 200 East Area is primarily from the west to the east and southeast toward the Columbia River, with lesser amounts flowing to the north and northwest. As shown in Figure 3-7, the flow direction at LLWMA-2 is generally to the west. The water table is almost horizontal in this area so the flow direction only can be generalized. The aquifer is recharged locally by precipitation and by discharges from active liquid waste disposal sites. The largest source of recharge is the 216-B-3 Pond System, an artificial waste water disposal site located approximately 1 mile (1.61 kilometers) southeast of LLWMA-2. The elevation of the groundwater and direction of flow is strongly affected by recharge from the 216-B-3 Pond System. This recharge has raised the water elevation and has overcome the historical fluctuations in groundwater. When the 216-B-3 Pond System ceases to receive water, the groundwater flow direction is expected to change, and new monitoring wells could be required.

The nearest hydrologically downgradient well used to supply drinking water is at the Fast Flux Test Facility. The well is approximately 11 miles (17.70 kilometers) southeast of LLWMA-2. The nearest hydrologically upgradient well is more than 9 miles (14.48 kilometers) west of LLWMA-2 and is near the Yakima Barricade.

The major surface water feature on the Hanford Facility is the Columbia River, which is approximately 8 miles (12.87 kilometers) north and 8 miles (12.87 kilometers) east of the 200 East Area. In the Columbia Basin, the Columbia River is used extensively for irrigation as well as for production of electricity from hydroelectric dams. The Columbia River also is used as a source of drinking water by a number of municipalities, including the city of Richland, whose water intakes are approximately 2 miles (3.28 kilometers) downstream from the southern perimeter of the Hanford Site [20 miles (32.18 kilometers) southeast of the 200 East Area], and the cities of Kennewick and Pasco. The Columbia River, including the reach adjacent to the Hanford Site, is used for recreation.

Two discontinuous ephemeral streams cross the Hanford Facility, Cold Creek and Dry Creek. These streams cross the southwestern part of the Hanford Facility and drain toward the Yakima River. At the closest point, these streams are approximately 4 miles (6.44 kilometers) southwest of the 200 East Area.

Other surface water features near the 200 East Area include West Lake, a natural lake approximately 2 miles (3.28 kilometers) north of the 200 East Area and 216-B-3 Pond System.

3.2 TOPOGRAPHY AND LAND USE

The Pasco Basin forms the physiographic low of the larger Columbia Basin, with the Hanford Facility located over the structural low of the Pasco Basin. The Hanford Facility is bordered to the southwest, west, and north by large anticlinal ridges and to the northeast by the cliffs of the White Bluffs. Elevations range from approximately 345 feet (105.18 meters) amsl in the southeastern portion to 3,586 feet (1,093.29 meters) amsl at the summit of Rattlesnake Hills southwest of the Hanford Facility.

The topography of the 200 East Area is relatively flat. In general, the land surface slopes from the southwest to the northeast. Elevations range from approximately 720 feet (219.51 meters) amsl at the southwest corner to approximately 580 feet (176.83 meters) amsl at the northeast corner. Trench 94 is near the northeast corner of the 200 East Area.

The topographic features at Trench 94 are shown on Drawing H-13-000018 in Appendix A. The land surface at Trench 94 slopes gently to the north at a grade of approximately 2 percent. The surface elevation at the south side of Trench 94 is approximately 600 feet (182.93 meters) amsl. The surface elevation at the north side of the Trench 94 is approximately 595 feet (181.40 meters) amsl. The elevation at the bottom of Trench 94 is approximately 545 feet (166.16 meters) amsl.

Land use within the 200 East Area is for chemical separation reprocessing operations and waste management activities. Land surrounding the 200 East Area is used for waste management activities or is unused. The 200 West Area, another reprocessing and waste management area, is approximately 2.5 miles (4.02 kilometers) west of the 200 East Area. The commercial low-level radioactive waste disposal facility operated by US Ecology, Inc., is immediately southwest of the 200 East Area.

The 200 East Area is a controlled access area of the Hanford Facility. Public access is not allowed. The nearest point of public access is State Highway 240, which is approximately 4 miles (6.44 kilometers) south of the 200 East Area.

3.3 CLIMATE

The climate at the Hanford Facility is characterized by low precipitation, generally mild temperatures, and occasional high winds. The average monthly temperatures for the period 1912 through 1980 range from a low of 29 °F (1.7 °C) in January to 76 °F (24.4 °C) in July. During winter, the highest monthly average temperature at the Hanford Meteorological Station, which is located between the 200 East and 200 West Areas, was 44 °F (6.7 °C), and the record low was 21 °F (-6.1 °C); both occurred during February. During summer, the highest maximum monthly average temperature was 82 °F (27.8 °C) in July, and the record low was 63 °F (17.2 °C) in June. The average annual precipitation measured at the Hanford Meteorological Station is 6.3 inches (16.0 centimeters). Most of the precipitation occurs during the winter; with nearly half the annual amount occurring November through February. Days with greater than 0.5 inch (1.27 centimeters) precipitation occur less than 1 percent of the year. The highest average monthly relative humidity occurs during the winter (approximately 75 percent), and the lowest occurs in the summer (approximately 35 percent) (DOE 1987, p. 4.29).

Mean monthly wind speeds at the Hanford Meteorological Station range from a low of 6 to 7 miles (9.65 to 11.26 kilometers) per hour in the winter months to a high of 9 to 10 miles (14.48 to 16.09 kilometers) per hour in the summer (DOE 1987, p. 4.27). The wind rose for the 200 East Area indicates that predominate wind direction is from the northwest to west. This wind rose is included on Drawing H-13-000018 in Appendix A.

3.4 UNIT DESCRIPTION

The finished rectangular dimensions of Trench 94 are approximately 1,600 feet (488 meters) east-west by 250 feet (76.2 meters) north-south and 50 feet (15.2 meters) deep. Drawing H-2-33276 in Appendix A shows the location and configuration of Trench 94.

The SRCs are placed on columns (refer to Appendix B) to facilitate the unloading of the SRC transporters. Future SRCs might or might not use columns, depending on the method of transport and the procedures for unloading the SRCs.

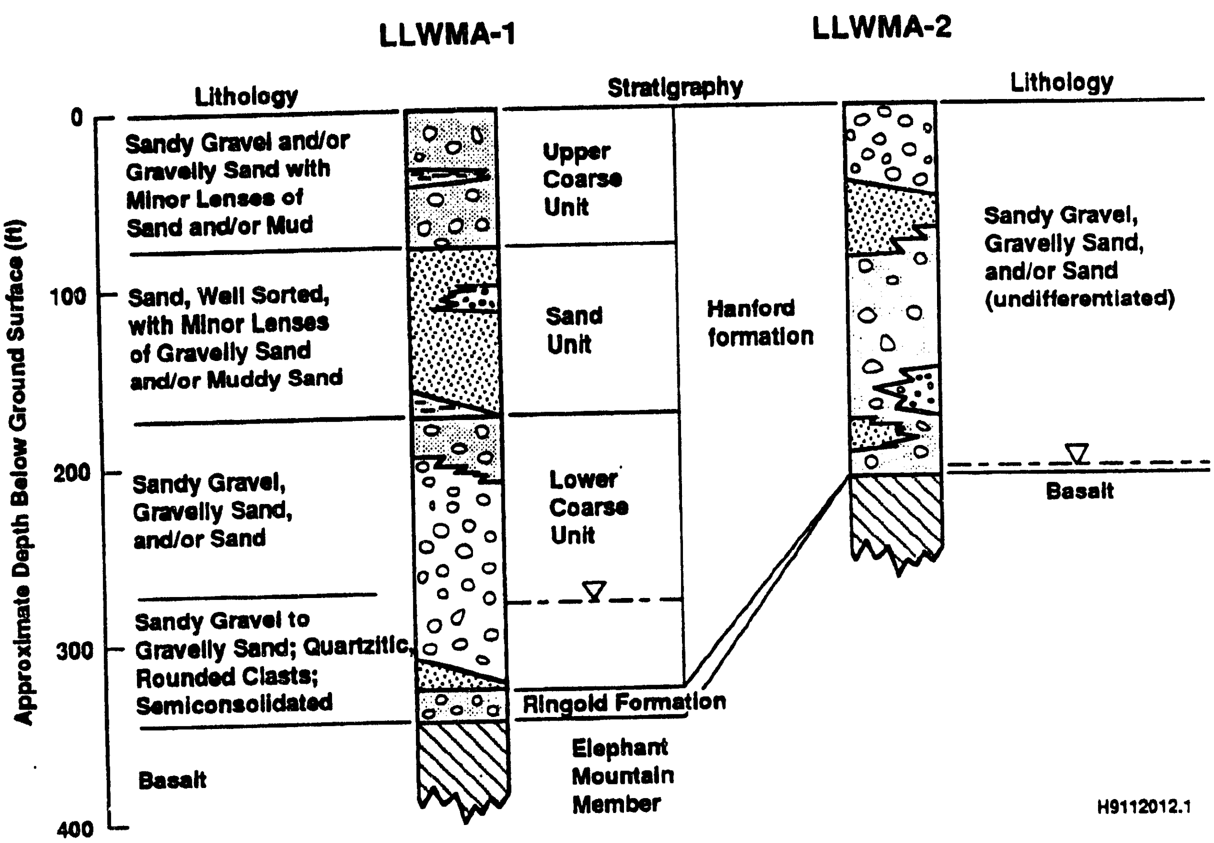


Figure 3-1. Generalized Stratigraphy for Low-Level Waste Management Areas 1 and 2 (Source: Last et al. 1989, p. 5.12).

940604.1954

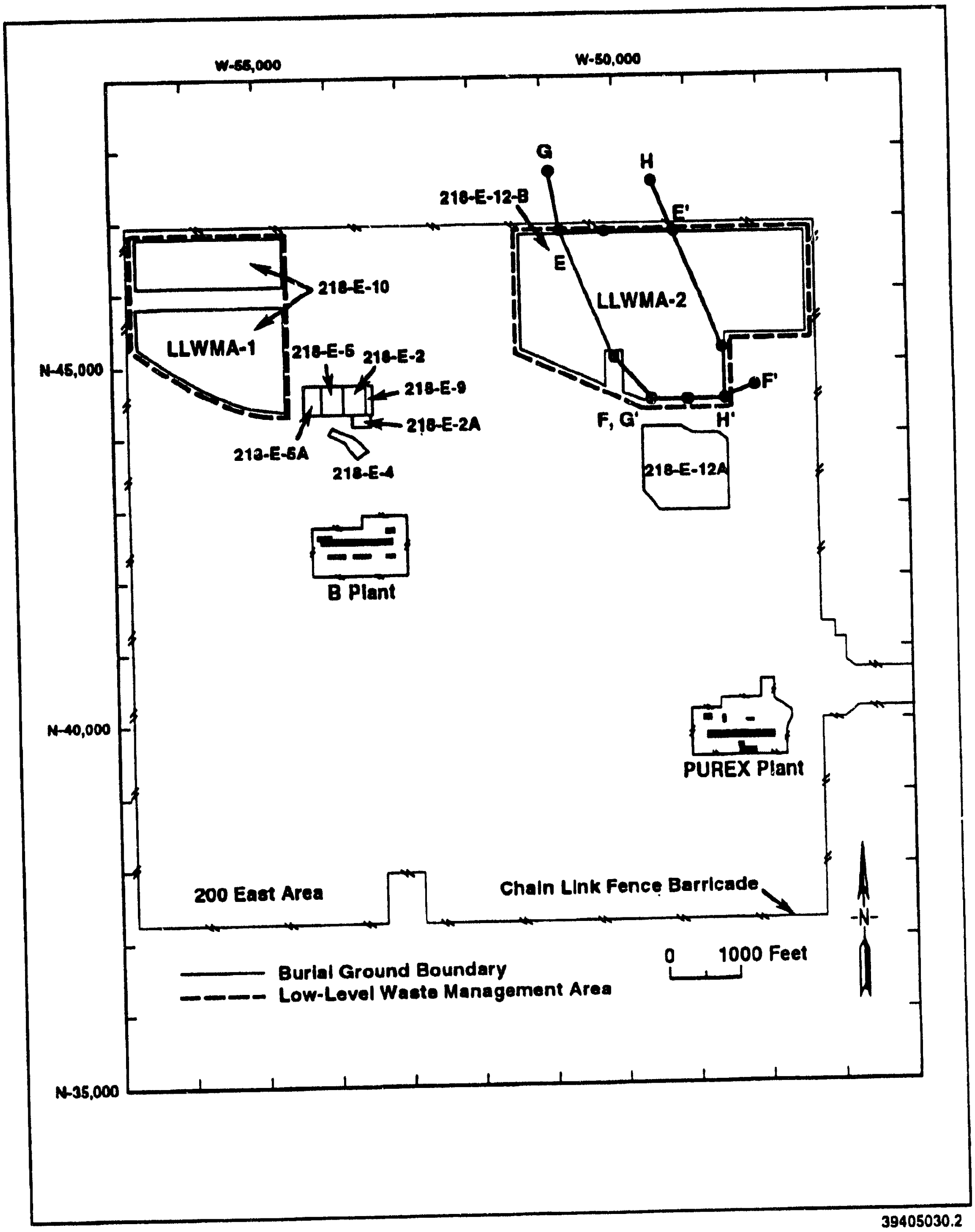


Figure 3-2. Locations of Geologic Cross-Sections Near Low-Level Waste Management Area-2 (Source: Last et al. 1989, p. 5.13).

940604.1954

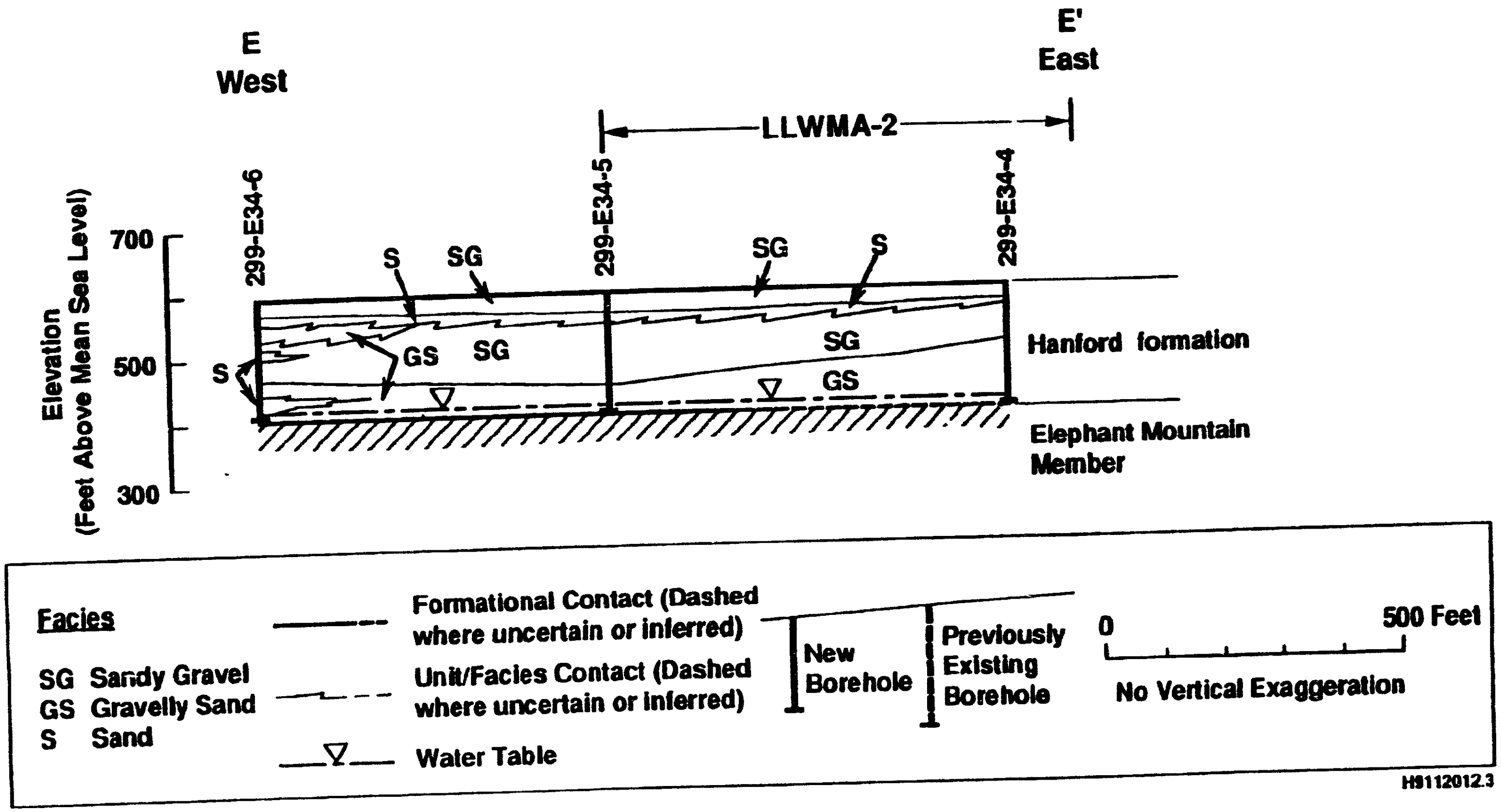


Figure 3-3. Geologic Cross-Section E-E', Low-Level Waste Management Area-2 (Source: Last et al. 1989, p. 5.18).

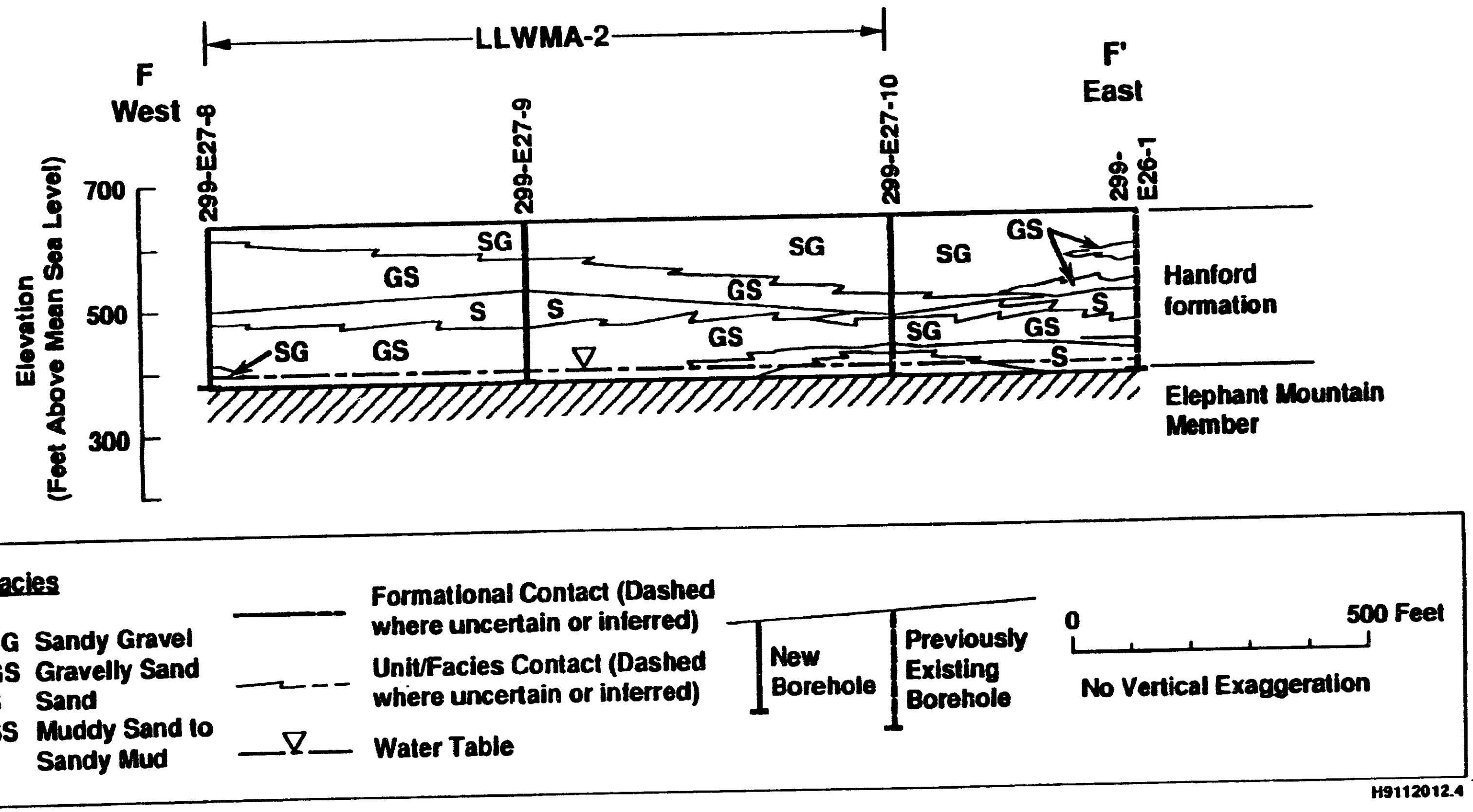


Figure 3-4. Geologic Cross-Section F-F', Low-Level Waste Management Area-2 (Source: Last et al. 1989, p. 5.19).

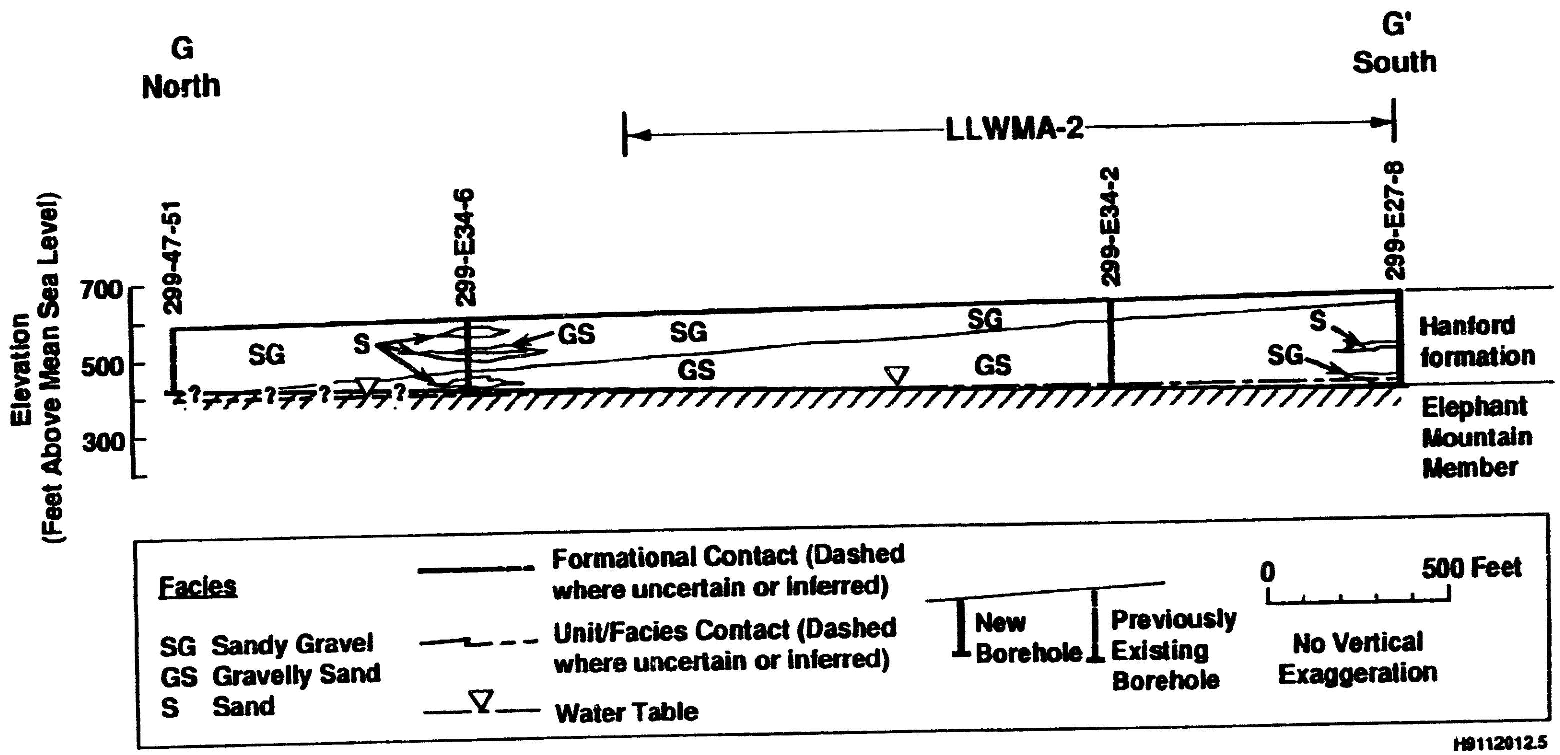


Figure 3-5. Geologic Cross-Section G-G', Low-Level Waste Management Area-2 (Source: Last et al. 1989, p. 5.20).

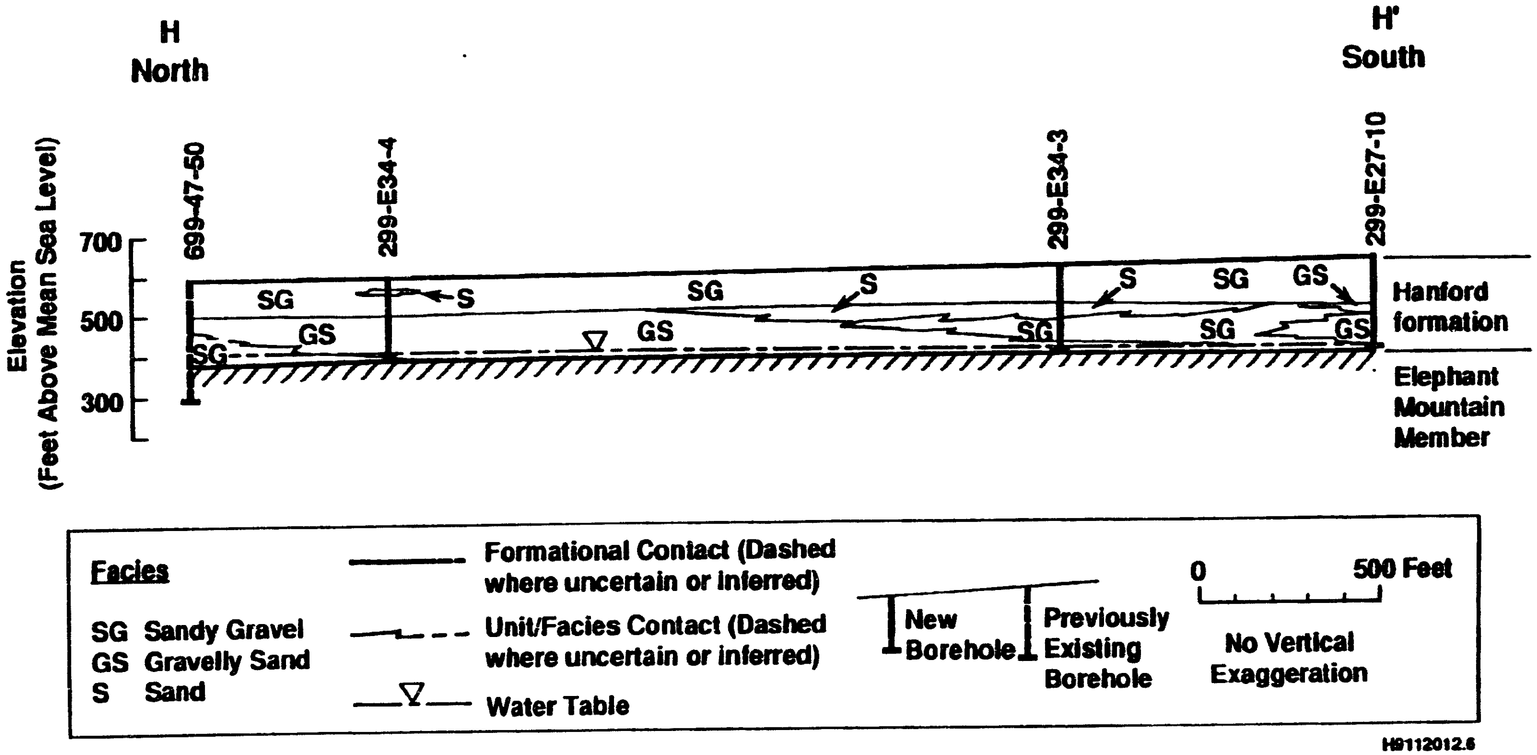


Figure 3-6. Geologic Cross-Section H-H', Low-Level Waste Management Area-2 (Source: Last et al. 1989, p. 5.21).

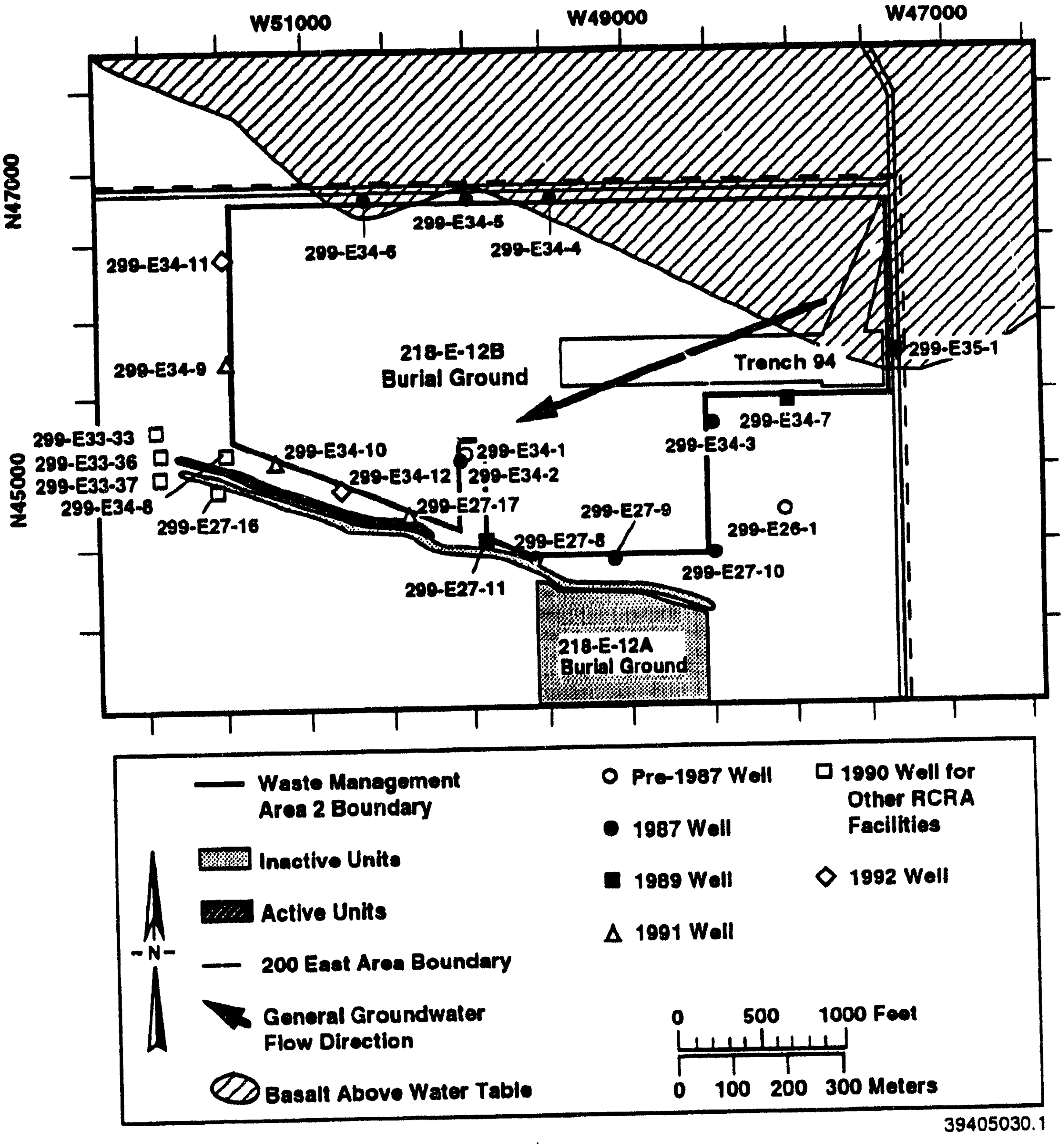


Figure 3-7. Current Groundwater Well Locations for Low-Level Waste Management Area-2 and Groundwater Flow Direction.

4.0 WASTE RECEIVED FOR DISPOSAL

Trench 94 is used for disposal of up to 120 SRCs from defueled nuclear submarines. Trench 94 should continue to receive approximately six SRCs per year until closure begins in 2016.

4.1 GENERAL DESCRIPTION OF WASTE

Each SRC is that section of the submarine containing the nuclear reactor plant, which consists of the reactor vessel, steam generators, piping, pumps, wiring, and valves. Figure 4-1 is a general schematic of a typical SRC.

Before shipment to the Hanford Facility, the defueled SRC is removed from the decommissioned submarine. The process for removing the SRC from the submarine is described in the SRC disposal environmental impact statement (USN 1984, pp. B-3 through B-9) and involves several steps, including the following:

- Removal of spent nuclear fuel from the reactor
- Removal of liquids that can be pumped or drained to the maximum extent practical. Absorption of residual moisture in vessels and tanks is performed using diatomaceous earth in quantities sufficient to absorb two times the liquid volume. A hydrogen-oxygen recombiner is provided in the reactor vessel to reduce the potential for hydrogen generated from hydrolysis of residual water. Up to 230 gallons (870.55 liters) of widely distributed residual liquid might remain in the piping systems and components of each SRC after draining and sealing. The procedures for removing the liquid are described in Chapter 7.0, Section 7.8 and in Appendix F
- Removal of PCB-bearing wool felt sound-damping material
- Cutting and sealing radioactive system piping
- Cutting the SRC from the rest of the submarine
- Sealing the ends of the SRC with welded steel plates
- Testing the SRC to confirm that all penetrations and openings have been permanently closed and sealed.

Once prepared for shipment, the SRC is a completely sealed unit. Containment is provided by the outer hull and bulkheads of the submarine and the heavy shipyard-fabricated steel bulkheads that have been welded to the outer hull. Typically, a SRC is approximately 33 feet (10.06 meters) outside diameter by 40 feet (12.20 meters) long and weighs approximately 1,000 tons (907,185 kilograms).

4.2 DESCRIPTION OF POLYCHLORINATED BIPHENYL WASTE

The SRCs received at Trench 94 contain several materials containing PCBs. Under an agreement (Appendix H) with the Navy and the EPA, all PCB-containing sound-damping felt is removed from the SRCs before disposal. In addition, the DOE-RL requires the Navy to certify PCB cleanup to agreed-upon limits (Appendix I). In June 1990, the Navy removed the PCB-containing felt from the six SRCs already in Trench 94 that still contained this material. Felt will be removed from any additional SRCs before shipment to the Hanford Facility. The only PCBs that will remain in the SRCs at the time of disposal are small amounts tightly bound within the matrix of nonmetallic materials such as insulation, electrical cables, and some rubber items. The Navy has determined that removal of these items would result in significant occupational exposure to radiation and would be extremely difficult.

The Navy investigated the materials that will remain in the SRCs at the time of burial to identify any potentially regulated material (PSNS 1990). This investigation showed that some of the materials remaining in the SRCs contain PCBs as discussed previously. The PCB concentrations were found to be as high as 5,870 parts per million. The total amount of PCBs that will remain in the SRCs at the time of disposal is about 5 pounds (1.36 kilograms) per SRC. All PCBs are contained in the formulation of solid compounds and none of the PCBs can be removed by standard PCB wipe sampling. The remaining PCB materials are considered to be PCB articles, as defined in 40 CFR 761.3. Disposal of these materials in a chemical waste landfill is allowable under 40 CFR 761.60(b)(5).

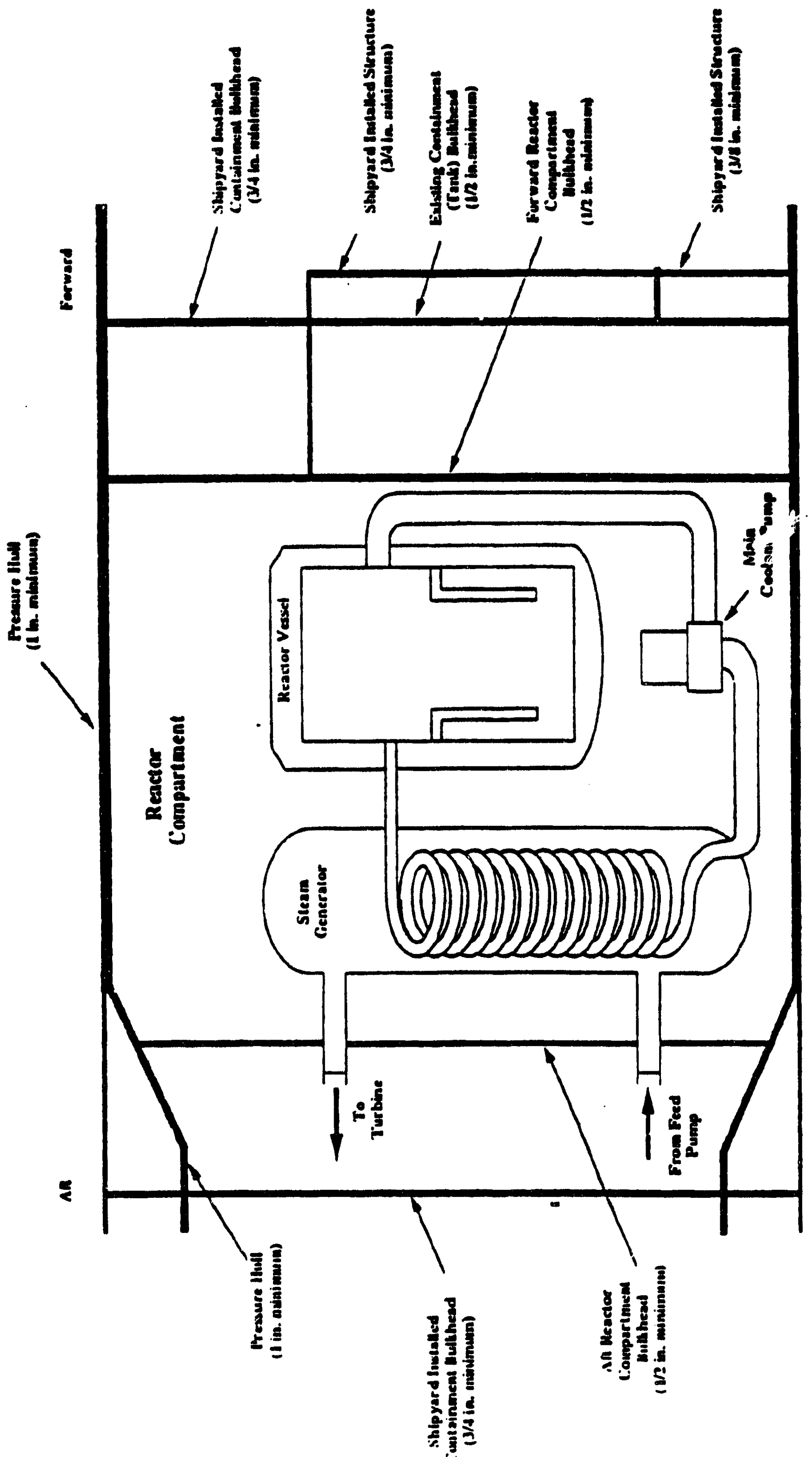


Figure 4-1. General Schematic of Submarine Reactor Compartment.

940604.1956

5.0 OPERATION PLAN

Title 40 CFR 761.75(b)(8)(ii) requires that an operation plan for a chemical waste landfill be developed and submitted to the EPA Regional Administrator for approval. This plan shall include detailed explanations of the procedures to be used for recordkeeping, surface water handling, excavation and backfilling, waste segregation, burial coordinates, vehicle and equipment movement, use of roadways, leachate collection systems, sampling and monitoring, monitoring wells, environmental emergency contingency plans, and security measures to protect against vandalism and unauthorized waste placements. The information contained in this chapter, along with the procedure descriptions contained in Appendices D and G, constitutes an operation plan for Trench 94 for the disposal of SRCs containing solid PCB waste for the 5-year interim approval period. The following sections address the specific requirements for an operation plan under 40 CFR 761.75(b)(8)(ii).

Many of the requirements of an operation plan are met through compliance with similar or more stringent requirements for dangerous waste facilities under WAC 173-303. In such cases, compliance with WAC 173-303 will be used to demonstrate compliance with 40 CFR 761.75. A cross-reference of requirements under 40 CFR 761, WAC 173-303, and 40 CFR 265 is provided in Appendix C.

5.1 RECORDKEEPING

The 218-E-12B Burial Ground must comply with dangerous waste facility recordkeeping requirements under WAC 173-303. Compliance with these requirements satisfies recordkeeping requirements for chemical waste landfills under 40 CFR 761.180(b),(d), and (e). Compliance with specific requirements is discussed in the following sections.

5.1.1 Disposal and Storage Units [40 CFR 761.180(b)]

As required by 40 CFR 761.180(b)(2), each PCB disposal facility must prepare and maintain a written annual document log that includes the following:

- The facility name, address, and EPA identification number

- For each PCB article or PCB article container received for disposal the following is required:

    - The manifest number
    - Name and address of the generator
    - The serial number of the PCB article or the PCB article container number
    - A description of the contents of the PCB article or container, including total weight of PCB waste and date removed from service for disposal.

940606.0827

This information is included in the LLBG operating record, because similar information also is required by WAC 173-303-380. A detailed description of LLBG recordkeeping requirements is contained in Appendix D.

These records are maintained for the DOE-RL at the Washington Public Power Supply System (Supply System) #1, Trailer 57. As required under 40 CFR 761.180(b), records describing the SRCs disposed of at Trench 94 will be maintained for a minimum of 20 years after closure, where closure is defined as the time when a *Resource Conservation and Recovery Act (RCRA) of 1976*-compliant cover is placed over Trench 94.

Title 40 CFR 761.180(b)(3) requires the owner/operator of the facility to prepare and submit an annual report by July 15 of each year, beginning July 15, 1991. The annual report is submitted to the EPA Regional Administrator by the DOE-RL. Each year, the annual document log is used to prepare an annual report containing the following information.

- The name, address, and EPA identification number of the facility
- A list of the numbers of all signed manifests of PCB waste initiated or received by the facility during the year
- Total weight, in kilograms, of PCB waste (by waste category) received or disposed of during the year and remaining in storage for disposal at the end of the year.

5.1.2 Chemical Waste Landfill Units

Title 40 CFR 761.180(d) requires the owner/operator of a chemical waste landfill to maintain records of water analyses from monitoring and records of waste burial coordinates. These requirements are met through compliance with equivalent dangerous waste requirements under WAC 173-303, as discussed in the following paragraphs.

Maintenance of groundwater monitoring records as required under 40 CFR 761.180(d) will be met during the interim approval period. Groundwater will be monitored in compliance with WAC 173-303-645 during the interim approval period with monitoring records maintained to satisfy requirements under this portion of the WAC. Procedures for maintenance of groundwater monitoring records at the LLBG are described in detail in Appendix D. Groundwater monitoring records are maintained and include groundwater quality data, records of groundwater flow rate and direction, and results of statistical analysis of monitoring data. As required by 40 CFR 761.180(d), these records related to Trench 94 of the 218-E-12B Burial Ground will be maintained for a minimum of 20 years after closure.

Levels of contaminants above standards are reported to the EPA in the RCRA quarterly reports as required by 40 CFR 265.94(2).

Historically, groundwater samples from the LLBG have not been analyzed routinely for PCBs. Analyses were performed for 40 CFR 264 Appendix IX constituents at each well during the second or third quarterly sampling event after well installation. No PCBs have been detected. Analysis for PCBs using SW 846 Method 8080 (EPA 1986) has been added to the 1992 contract. Groundwater samples will be collected semiannually at LLWMA-2 (quarterly for the first year for new wells) unless the area commences an assessment monitoring program based on the statistical analysis of the indicator parameters.

The detection-level interim status groundwater monitoring plan for the LLBG (required by WAC-173-303-400(3)(a) and, therefore, 40 CFR 265, Subpart F) defines the reporting requirements for PCBs. This plan, titled *Revised Ground-Water Monitoring Plan for the 200 Areas Low-Level Burial Grounds* (WHC 1989), requires notification of the EPA and Ecology if the burial ground might be affecting groundwater. The determination that the groundwater might be affected is based on a statistically significant change in the concentration of indicator parameters of downgradient wells. The Student's t-test is used to determine significant change. The indicator parameters are specified in 40 CFR 265.92(b)(3) as pH, specific conductance, total organic carbon, and total organic halogen. Ecology and the EPA will be notified within 7 days of confirmation, as specified in 40 CFR 265.93(d)(1), of a statistically significant increase (or pH decrease) in the indicator parameters. Within 15 days of the notification, a groundwater assessment plan for the affected waste management area will be submitted to the EPA that will identify the hazardous constituents that will be analyzed. The plans will include analyses of PCBs, if PCBs are present in the landfill waste management area.

The requirements for groundwater monitoring analysis are not applicable because the requirements for groundwater monitoring have been met (Appendices J and K). However, the groundwater from monitoring wells near Trench 94 are being analyzed for PCBs, and the results will be reported routinely to Ecology and the EPA in the quarterly reports of RCRA groundwater monitoring data.

The operating record for the 218-E-12B Burial Ground includes the location of each waste container disposed of within the burial ground (Appendix D). This record includes the SRCs disposed of in Trench 94. The location data include disposal trench identification as well as the coordinates of burial (with reference to the Hanford Site grid and the Washington State Lambert Coordinates). As required by 40 CFR 761.180(d), these records will be maintained for a minimum of 20 years after closure.

5.1.3 Retention of Special Records by Storage and Disposal Units [40 CFR 761.180(f)]

Title 40 CFR 761.180(f) requires the PCB storage and disposal facility owner/operator to maintain all documents, correspondence, and data pertaining to disposal of PCBs, which are provided by or provided to any state or local government agency. The facility owner/operator also must maintain all applications for federal, state, or local permits and related correspondence.

5.2 SURFACE WATER HANDLING

An engineered surface water handling system to address 40 CFR 761.75(b)(8)(ii) is not part of operations at Trench 94. The flat topography at the site, porous surface soils, and low rainfall minimize the potential for run-on and run-off. As demonstrated in Appendix E, a 24-hour, 25-year storm is not expected to generate surface run-off or run-on. Because Trench 94 is entirely below grade, there is no potential for run-off from the trench in any event. Small pools of water on the surface can be observed after rapid snowmelt, but usually dissipate after 72 hours (DOE-RL 1989a, p. 2-54). All precipitation falling in the trench is returned to the atmosphere through evaporation or infiltrates the soil.

If ponding should occur from heavy snow melt or a worst-case storm [precipitating up to 1.5 inches (3.8 centimeters)], a submersible pump would be used to remove any ponding that occurred in low-lying depressions where water could accumulate to a depth of more than 6 inches (15.2 centimeters). The liquid would be placed in approved containers and would be sampled and discharged to the ground if the liquid were not hazardous or disposed of as hazardous waste if hazardous constituents were found. Additional sampling would be undertaken to determine the source of any hazardous materials.

Ponded water of more than a few inches is considered to be an 'incredible' event. The SRCs are supported above the floor of the trench and, because the bottom of the trench is kept approximately level, ponded water touching the SRC would be a 'credible' event.

5.3 EXCAVATION AND BACKFILL

Trench 94 is designed as an unlined excavation to receive SRCs. The current configuration of Trench 94 is shown in drawing H-2-33276, sheet 6, Rev. 5 (Appendix A). The trench consists of a rectangular excavation approximately 50 feet (15.2 meters) deep. The bottom dimensions of the trench are approximately 250 feet (76.2 meters) north-south by 1,600 feet (488 meters) east-west. Side slopes of the trench are and will continue to be approximately 3:2.

Burial of the SRCs would start with the first 28 reactor compartments in the east end of Trench 94, in accordance with the engineered performance plan. This plan provides a method for confirming the adequacy of submarine reactor compartments for burial without a liner/leachate collection system. Those SRCs in Trench 94 remaining uncovered will be inspected to confirm their integrity and to confirm that there is no release of waste to the environment.

5.4 WASTE SEGREGATION BURIAL COORDINATES

As discussed in Section 5.1.1 and in Appendix D, LLBG records include the burial locations of all waste as required by WAC 173-303-380(b). These records include the location of each SRC placed in Trench 94.

5.5 VEHICLE AND EQUIPMENT MOVEMENT

Vehicle and equipment movement within Trench 94 generally is limited to waste receipt, which occurs only infrequently. The SRCs are transported to the Hanford Facility by barge and are received at the Port of Benton near the 3000 Area. The SRCs then are transported to Trench 94 by tractor and trailer during off-peak traffic hours and are placed in Trench 94. Hanford Site roads and estimated traffic volumes are shown in Figure 5-1 as required by WAC 173-303-806(4)(a)(x).

5.6 USE OF ROADWAYS

As described in Section 5.5, vehicle and equipment movement at Trench 94 is limited. The SRCs are transported to Trench 94 by tractor-trailer using Hanford Site roadways. The only roadway at Trench 94 is the access ramp from the corner of 12th Street and Canton Avenue. This roadway is used for movement of SRCs into the trench. The location and profile of this roadway is shown in Drawing H-2-33276 in Appendix A as required by WAC 173-303-806(4)(a)(x). As noted on Drawing H-2-33276, this roadway is constructed according to the *1988 Standard Specifications for Road, Bridge, and Municipal Construction* (WSDOT 1988).

5.7 LEACHATE COLLECTION SYSTEM

Trench 94 does not employ a leachate collection system. The PCBs are contained fully within the SRC hulls (refer to SRC hull description in Chapter 4.0, Section 4.1). Because of the slow corrosion rate and high structural strength of the SRC hulls (Chapter 6.0), the SRCs will remain intact beyond the 5-year interim approval period. Operation of Trench 94 without a leachate collection system during this period will not pose an unreasonable risk to human health or the environment. Therefore, a waiver from leachate collection system requirements during the interim approval period is requested in Chapter 8.0.

5.8 SAMPLING AND MONITORING PROCEDURES

As discussed in Chapter 6.0, PCBs are contained fully within the SRC hulls. The chemical analysis of the waste that is required by WAC 173-303-300 is provided by the offsite waste generator. Because of the slow corrosion rate and high structural strength of the SRC hulls (Chapter 6.0), the hulls will remain intact beyond the 5-year interim approval period and no release of PCBs to the environment will occur from this effect.

Under Paragraph 9.c of the Compliance Agreement (Appendix H) between the DOE-RL and the EPA Region 10 concerning disposal of SRCs at Trench 94, groundwater monitoring requirements are being met for the interim approval period (Appendices J and K). A groundwater monitoring program is currently in place at the 218-E-12B Burial Ground as required by WAC 173-303-645. This monitoring program is described in Chapter 7.0, Section 7.6.

5.9 MONITORING WELLS

Groundwater monitoring wells already have been installed at the 218-E-12B Burial Ground in response to dangerous waste groundwater monitoring requirements (WAC 173-303-645) as described in Chapter 7.0, Section 7.6.

5.10 ENVIRONMENTAL EMERGENCY AND CONTINGENCY PLAN

The 218-E-12B Burial Ground must comply with the contingency plan and emergency response requirements under WAC 173-303-340, -350 and -360. The 218-E-12B Burial Ground has an emergency plan and procedures (WHC 1990 and WHC 1992) in place addressing proper response to fires, explosions, or unplanned sudden or gradual release of dangerous waste or dangerous waste constituents to air, soil, surface water, or groundwater. The plan identifies all personnel having emergency responsibilities and specifies these responsibilities.

The emergency plan identifies specific procedures for emergency notifications, identification of hazardous/dangerous materials, hazard assessment, emergency control, and responses to specific emergencies. Emergency notification procedures address both internal notifications (i.e., notifying staff that an emergency exists) and external notifications (i.e., notifying the EPA and Ecology). Hazardous/dangerous materials identification procedures are those used to identify the waste or constituents that have been released. Hazard assessment procedures are those used to determine the hazards associated with releases or other emergencies. Emergency control procedures include emergency incident identification and initial response, response to fires and explosions, response to spills or releases to the environment, and monitoring in the event of an emergency.

Reporting of PCB spills is required by 40 CFR 761.125. These requirements are implemented by the DOE-RL procedures, including the *Building Emergency Plan, Low-Level Burial Grounds* (WHC 1990) and the *Environmental Compliance Manual*, "Part B, Releases to the Environment" and "Part Y, Asbestos and Polychlorinated Biphenyls" (WHC 1988).

These procedures direct the building emergency director to report a PCB spill to the Occurrence Notification Center. The Occurrence Notification Center will report the spill to the EPA.

The emergency plan identifies, describes, and states the location of emergency response equipment available to respond to emergencies at the 218-E-12B Burial Ground. This equipment includes fire control equipment, spill response equipment, medical aid equipment, personnel protective equipment, and cleanup support equipment.

5.11 SECURITY MEASURES

The 218-E-12B Burial Ground must comply with security requirements under WAC 173-303-310. Security requirements for the 218-E-12B Burial Ground are met by using a 24-hour surveillance system, a barrier, and warning signs. Additional details regarding security are provided in Appendix G.

The 218-E-12B Burial Ground is in the 200 East Area and, therefore, is included within the continuous surveillance program for the Hanford Facility. The Hanford Patrol maintains a continuous presence of protective force personnel to provide additional security.

The 200 East Area is surrounded by security fencing, consisting of 8-foot- (2.44-meter-) high chain link topped with three strands of barbed wire. Access into the 200 East Area is restricted to personnel having a U.S. Department of Energy-issued security identification badge indicating the appropriate authorization.

Active portions of the 218-E-12B Burial Ground are posted with warning signs. These signs include the "DANGER-UNAUTHORIZED PERSONS KEEP OUT" signs required under WAC 173-303-310(2)(a), printed in English, legible from a distance of at least 25 feet (7.62 meters), and are visible from all angles of approach. In addition, because the SRCs contain low-level radioactive waste, the area immediately around each of the SRCs is posted with radiation warning signs.

This page intentionally left blank.

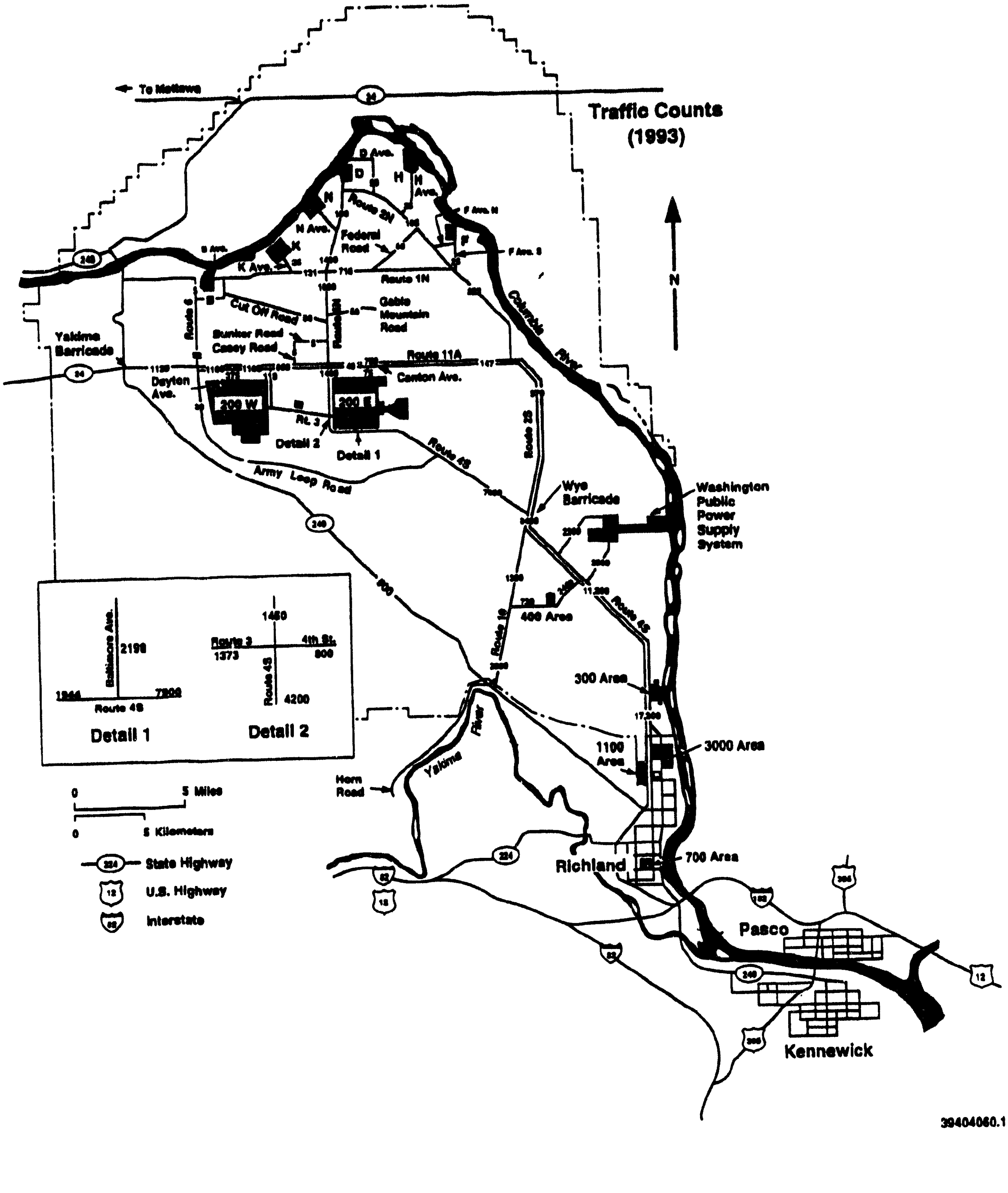


Figure 5-1. Hanford Site Roads and Estimated Traffic Volumes.

6.0 RISK FROM PROPOSED OPERATION

This chapter addresses the risk to human health and the environment from disposal of PCBs in Trench 94 during the 5-year interim approval period as described in the operation plan. A general discussion is given describing how PCBs might be released from the site to pose a risk to human health and the environment. Factors that affect release of PCBs to the environment are identified. Practices and conditions at Trench 94 and their effect on preventing release of PCBs are described. Finally, the risk from release of PCBs from Trench 94 is estimated for the interim approval period.

6.1 POLYCHLORINATED BIPHENYL RELEASE MODES ASSOCIATED WITH SUBMARINE REACTOR COMPARTMENT DISPOSAL

The PCBs are a class of toxic chemicals that might pose a risk to human health or the environment when released to the environment. As described in Chapter 4.0, small amounts of PCBs contained within the SRCs will be disposed of in Trench 94. These PCBs are tightly bound within the solid matrix of materials such as electric cable insulation, thermal insulation, rubber items, and paint.

For the PCBs to be released to the environment, several things must occur. First, the PCBs must be in a form that is mobile in the environment. When disposed of, the PCBs are contained within solid matrices that are not mobile. Mobile* forms of PCBs are as follows:

- In solution
- As a vapor
- As a suspendible particle.

To put PCBs into solution, it is necessary for the PCBs to contact water. For PCBs in the SRCs, the most likely means of contact with water would be the movement of rainwater into the SRC. To be in vapor form, the PCBs must contact air. To be suspended, the PCBs must contact air and must be a particle size small enough (or erodible to a size small enough) to be suspended. In addition, the wind must be able to suspend the particle.

Once mobile, a migration pathway must exist from the PCB source to potential receptors. For dissolved PCBs, this pathway would be either groundwater or surface water. As discussed in Chapter 7.0, Section 7.3, there

---

*'Mobile' is a relative term. The PCBs, as a class of compounds, generally have very low mobility compared to other organic compounds. The PCBs have very low solubility and very low vapor pressure, which are two properties associated with low mobility. For this discussion, 'mobile forms of PCB' means that the PCBs are more mobile than PCBs are in the waste matrices. It does not imply that the PCBs are highly mobile in the environment. The highly chlorinated PCBs typical of those found in the SRCs are actually relatively immobile in the environment.

is no direct connection between Trench 94 and surface water. Therefore, groundwater would be the pathway associated with migration of dissolved PCBs from Trench 94. For PCB vapors and PCB-contaminated particles, migration would occur via the air pathway.

For all of the previously mentioned release modes, a breach in the SRC would be necessary. For dissolved transport, water must move out of the SRC and into the ground. For vapor transport, PCB vapors must be able to move out of the SRC and into the atmosphere. Similarly, for particulate transport, air must be able to move into the SRC, suspend PCB-contaminated particles, and carry those particles out of the SRC into the atmosphere.

6.2 FACTORS AFFECTING RELEASE OF POLYCHLORINATED BIPHENYLS

The groundwater pathway (refer to Chapter 7.0, Section 7.3) in the arid environment consists of a very small natural recharge from rainwater [0.039 to 3.94 inches (0.1 to 10 centimeters) per year]. The tendency of the soil to adsorb PCBs makes it highly unlikely that any PCBs could reach the unconfined aquifer below the site. The very low vapor pressures of the PCBs, their retention in solid matrices, and the absence of any near-term mechanism to reduce them to particulates inhibit any possibility of air pathway migration.

Moreover, as described previously, all modes of PCB release from Trench 94 require a breach in the SRC. Therefore, the most important factors affecting release of PCBs from Trench 94 are those that would cause a breach in the SRC. Breaches in the SRC could be caused by corrosion of the SRC or mechanical failure of the SRC.

The primary factor affecting failure by corrosion is the corrosion rate of the SRC material. The Navy has evaluated the expected lifetime of SRCs following burial of SRCs on the Hanford Facility. The minimum thickness of steel between any PCB contained in an SRC and the environment is 0.5 inch (1.27 centimeters). Using the estimated maximum pitting corrosion rate of 0.0035 inch (0.0089 centimeter) per year, the earliest penetration of the 0.5-inch (1.27-centimeters) thick plates covering small penetrations is 143 years. Using the expected corrosion rate of 0.001 inch (0.0025 centimeter) per year, the covers would not be penetrated for 500 years (NCEL 1992). These calculations do not represent that the PCBs are available to migrate upon corrosion penetration of the outer containment. General failure of the containment must occur before PCBs would have the potential to be leached from materials in which the PCBs are tightly bound and migrate into the environment. In any event, the time needed to corrode through the outer SRC is much greater than the 5-year interim approval period.

The primary factor affecting mechanical failure of the SRCs is the structural strength. The SRCs are constructed of steel at least 1/2 inch (1.27 centimeters) thick and are of high structural strength. The outer surfaces of the SRCs include the outer submarine pressure hull, end bulkheads, and steel end plates (Chapter 4.0, Figure 4-1). The pressure hull has high strength, being designed for diving depths of over 400 feet (121.95 meters) [178 pounds per square inch ($1,227.27 \times 10^3$ pascal)]. The bulkheads sealing the ends of the pressure hull are designed for over 300 feet (91.46 meters) of submergence [133 pounds per square inch (917.00 x 10^3 pascal)]. The SRCs also meet the Nuclear Regulatory Commission packaging requirements in 10 CFR 71 for a Type B container.

Because of the high strength of the SRCs, the chance of mechanical failure is extremely remote. Accidental release of radioactive materials from the disposed SRCs was considered in the environmental impact statement for disposal of the SRCs (USN 1984, pp. 4-6 through 4-8). For example, a transportation accident that would cause breaching of the hull and/or bulkheads was considered and found to be highly unlikely, and could occur only as the result of a hypothetical worst-case sequence of events with the most severe consequences (USN 1984, p. 4-6).

6.3 PRACTICES TO MINIMIZE POTENTIAL FOR RELEASE OF POLYCHLORINATED BIPHENYLS

As indicated in Section 6.2, the high strength and slow corrosion rate of the SRCs minimizes the possibility of a breach and subsequent release of PCBs during the 5-year interim approval period. Several practices are employed at Trench 94 to reduce further the potential for breaching the SRCs. During the 5-year interim approval period, portions of Trench 94 not backfilled will leave SRCs available for inspection. Weekly inspections, as required by WAC 173-303-665(4)(b), will be performed to confirm that the SRCs are in good condition. The inspections also will confirm that a breach of a SRC has not occurred. If the inspections identify any problems (such as surface corrosion), maintenance or corrective actions will be undertaken (e.g., removal of corrosion, painting). If a release from a SRC is observed, corrective actions will be identified and implemented as described in Chapter 5.0, Section 5.10.

6.4 RELEASE OF POLYCHLORINATED BIPHENYLS DURING THE INTERIM APPROVAL PERIOD

The previous sections describe the necessary conditions for release of PCBs from the SRCs and explain why the probability for such a release during the interim approval period is extremely low. As long as the SRCs (i.e., outer hull and end plates) remain intact during the 5-year interim approval period, no release of PCBs to the environment can occur. It is concluded that no release of PCBs to the environment will occur during the 5-year interim approval period for the following reasons.

- The time required for the outer hull and end bulkhead plating to corrode is estimated to be several hundred times longer than the interim approval period.

- The SRC packages are constructed of steel and are of very high strength so that structural failure is very unlikely.

- Those SRC packages remaining uncovered during the 5-year interim approval period will be inspected for any condition that might lead to failure.

7.0 COMPLIANCE WITH TOXIC SUBSTANCE CONTROL ACT OF 1976

Requirements under TSCA for chemical waste landfills used to dispose of PCB waste are contained in 40 CFR 761.75. Because Trench 94 is used to dispose of PCBs contained within SRCs, these requirements are applicable to Trench 94. These chemical waste landfill requirements address nine general areas: soils, synthetic membrane liners, hydrologic conditions, flood protection, topography, monitoring systems, leachate collection, chemical waste landfill operations, and supporting facilities. These requirements include a number of specific technical requirements, as well as general operating requirements. Compliance with these requirements is discussed in the following sections.

Because Trench 94 is being used for disposal of mixed waste, it is subject to applicable requirements for dangerous and hazardous waste landfills under WAC 173-303 and 40 CFR 265, respectively. In many cases, requirements for dangerous and hazardous waste landfills are identical to or more stringent than the requirements for chemical waste landfills under TSCA. In such cases, compliance with 40 CFR 761.75 requirements will be satisfied through compliance with WAC 173-303 and 40 CFR 265 requirements. Appendix C lists the comparable regulations for 40 CFR 761, WAC 173-303, and 40 CFR 265.

7.1 SOILS

Title 40 CFR 761.75(b)(1) requires that chemical waste landfill sites be located in thick, relatively impermeable formations such as large-area clay pans. Where this is not possible, the soil underlying the site must have a high clay and silt content with the following parameters:

- In-place soil thickness of 4 feet (1.22 meters) or compacted soil liner thickness of 3 feet (0.91 meter)
- Permeability equal to or less than 0.39×10^{-7} inch per second (1×10^{-7} centimeter per second)
- Greater than 30 percent by weight soil passing through a No. 200 sieve
- Liquid limit greater than 30
- Plasticity index greater than 15.

The soils underlying LLWMA-2, where Trench 94 is located, are described in Chapter 3.0, Section 3.1. These soils are gravelly sands, sands, and sandy gravels and do not meet the parameters mentioned previously, which are associated with silts and clays. Soils at Trench 94 are generally of very high permeability, large grain size, and low plasticity. However, as discussed in Chapter 6.0, other factors combine to minimize the transport of PCBs from the 218-E-12B Burial Ground regardless of soil type. Specifically, these factors are the long containment life of the package, the immobility of PCBs in the package (due to the PCBs being bound within materials and having a very low solubility in water and a very low vapor pressure in air), the lack of a direct waterborne migration pathway to surface waters, and the low rate of infiltration of water through the burial site.

7.2 SYNTHETIC MEMBRANE LINERS

For sites that are not underlain with soils meeting the requirements stated previously, 40 CFR 761.75(b)(2) requires that the chemical waste landfill have a synthetic membrane liner. The liner must provide a permeability at least equivalent to the soils described previously [i.e., equal to or less than 0.39×10^{-7} inch (1×10^{-7} centimeter) per second]. Whenever a synthetic liner is used at a landfill site, special precautions must be taken to ensure that its integrity is maintained and that it is chemically compatible with PCBs. Adequate soil underlining and soil cover must be provided to prevent excessive stress on the liner and to prevent rupture of the liner. The liner must have a minimum thickness of 30 mils (0.0762 centimeter).

Because soils at Trench 94 do not meet the requirements given in Section 7.1, a synthetic liner would be required. Trench 94 does not have a synthetic liner, however, and the DOE-RL is requesting a waiver (Chapter 8.0) from this requirement for the 5-year interim approval period. The purpose of the synthetic liner is to prevent the migration of contaminants from the landfill by containing leachate so the leachate can be collected. As described in earlier chapters, the SRC hulls will prevent the generation of contaminated leachate by fully containing the PCBs and preventing contact with any potential sources of leachate (e.g., rainwater). As long as the SRC hulls remains intact, generation of contaminated leachate will be prevented and there will be no migration of PCBs from the landfill. As described in Chapter 6.0, the SRC hulls will remain intact much longer than the interim approval period.

7.3 HYDROLOGIC CONDITIONS

Title 40 CFR 761.75(b)(3) specifies certain requirements related to the hydrologic conditions at the landfill site. The bottom of the landfill liner system or natural in-place soil barrier must be at least 50 feet (15.24 meters) above the historical high groundwater table. Location of the landfill in floodplains, shorelands, and groundwater recharge areas must be avoided. In addition, there must be no hydraulic connection between the site and standing or flowing surface water. Also, the site must have monitoring wells and leachate collection.

The location of Trench 94 satisfies the requirement for depth to water table. As discussed in Chapter 3.0, Section 3.1, the current water table elevation at Trench 94 is approximately 402 feet (122.53 meters) amsl. As indicated in Chapter 3.0, Section 3.2, the elevation of the bottom of Trench 94 is approximately 545 feet (166.16 meters) amsl. The depth from the bottom of the trench to the water table is approximately 143 feet (43.58 meters). Water recharge from disposal ponds controls the elevation of the groundwater below Trench 94. The water elevations are within approximately 3 feet (0.91 meter) of their historical highs, based on the data recorded for well 299-E34-1 (Chapter 3.0, Figure 3-7). The highest elevation was recorded in 1969 and dropped approximately 2.5 feet (0.76 meter) by 1991. The recently drilled wells next to Trench 94 have shown the same trend since 1990.

Trench 94 is located in an area of low recharge. Natural recharge rates on the Hanford Facility depend on soil and vegetation characteristics and can vary from less than 0.039 inch (0.1 centimeter) per year to 3.94 inches (10 centimeters) per year. Last et al. (1989, p. 6.2) estimated the natural recharge rate at active burial grounds to be less than 3.94 inches (10 centimeters) per year. Artificial recharge occurs on the Hanford Facility at liquid waste disposal units. No artificial recharge occurs at Trench 94. The major source of artificial recharge near the 200 East Area is the 216-B-3 Pond System, which is approximately 1 mile (1.61 kilometers) southeast of Trench 94. Artificial recharge at the 216-B-3 Pond System does not affect the hydrologic recharge conditions at Trench 94.

Trench 94 is not located in a floodplain. The location of Trench 94 is well beyond the boundaries of the 100-year floodplain of the Columbia River, Yakima River, and Cold Creek and Dry Creek. Floodplains for these streams are shown in Figures 7-1 through 7-3, respectively.

The location of Trench 94 is not within regulated 'shorelines of the state' or 'wetlands' as defined by the *Shoreline Management Act of 1971*. The nearest "shoreline of state-wide significance" is the Columbia River, which is at least 6 miles (9.65 kilometers) from the trench.

There is no direct hydraulic connection between Trench 94 and standing and flowing surface water. Locations of surface water bodies are discussed in Chapter 3.0, Section 3.1. The nearest standing water body is West Lake, which is approximately 2.5 miles (4.02 kilometers) north-northwest of Trench 94. The nearest stream is the Columbia River, located approximately 6 miles (9.65 kilometers) northeast of Trench 94 at its closest point. The nearest ephemeral stream is Cold Creek, which is approximately 6 miles (9.65 kilometers) southwest of Trench 94 at its closest point. As discussed in Chapter 5.0, Section 5.2, there is no surface water run-off at Trench 94 and, therefore, no overland flow connection between Trench 94 and any surface waters.

There is a potential connection between Trench 94 and the Columbia River via the groundwater pathway. Recharge at Trench 94, if it occurs, could reach the unconfined aquifer beneath the site. The unconfined aquifer flows to the north and west toward discharge areas along the Columbia River (Last et al. 1989, pp. 3.27 through 3.28). Therefore, recharge at Trench 94 eventually could reach the Columbia River.

Although a hydraulic connection does exist, the timeframe associated with this connection is significantly greater than the 5-year interim approval period. The lead study (PNL 1992, page 4.7) presented a vadose zone time of travel of 475 years for a vadose zone thickness of 150 feet (46 meters) and a recharge rate of 0.2 inch (0.5 centimeter) per year. The travel time analysis neglects the affects of retardation in the vadose zone. The PCBs are known to be highly attenuated in soils and the actual travel time for PCBs would be many times greater than the vadose zone travel time.

7.4 FLOOD PROTECTION

Title 40 CFR 761.75(b)(4) establishes flood protection requirements for chemical waste landfills. If the landfill site is below the 100-year floodwater elevation, the operator must provide surface water diversion dikes around the perimeter of the landfill site with a minimum height equal to 2 feet (0.61 meter) above the 100-year floodwater elevation. If the landfill site is above the 100-year floodwater elevation, the operator must provide diversion structures capable of diverting all of the surface water run-off from a 24-hour, 25-year storm. As indicated in Section 7.3, Trench 94 is not located in a 100-year floodplain. Therefore, Trench 94 must have diversion structures capable of diverting run-off from a 24-hour, 25-year storm. As a dangerous waste landfill operating under interim status, Trench 94 is also subject to the run-on and run-off control requirements contained in 40 CFR 265.302(a) and (b). These requirements include control systems capable of preventing flow onto the active portion of the landfill during peak discharge from a 25-year storm. As demonstrated in Appendix E, there will be no run-on or run-off from the 24-hour, 25-year storm. Therefore, the requirement for preventing run-on and run-off is met without the need for these control systems.

7.5 TOPOGRAPHY

Title 40 CFR 761.75(b)(5) requires chemical waste landfill sites to be located in an area of low to moderate relief to minimize erosion and to help prevent landslides or slumping. As discussed in Chapter 3.0, Section 3.2, Trench 94 is located in an area of low relief. The land surface in the vicinity of Trench 94 slopes to the north at a grade of approximately 2 percent. As indicated in Chapter 5.0, Section 5.2, because of this relatively flat slope and the permeable surface soils, run-off does not occur. Therefore, the potential for erosion is minimal.

Surface slopes are also flat enough to prevent landslides and slumping. The steepest slopes (i.e., those with the greatest potential for sliding or slumping) are the Trench 94 sidewalls and the spoil pile. Under WAC 173-303-283(3)(g), the LLBG must be operated so that there are no unstable hillsides or soils as a result of trenches. The Trench 94 sidewalls are excavated at a slope of 3:2 (horizontal:vertical), which is a stable slope for the surface sediments at the site. The slope of the spoil piles is approximately 2:1, which is also stable. There is no visible evidence of sloughing or slumping on either the trench wall or spoil piles.

7.6 MONITORING SYSTEMS

Title 40 CFR 761.75(b)(6) establishes technical requirements for monitoring systems. These requirements include those for water sampling [40 CFR 761.75(b)(6)(i)], groundwater monitoring wells [40 CFR 761.75(b)(6)(ii)], and water analysis [40 CFR 761.75(b)(6)(iii)]. A groundwater monitoring program has been established at the 218-E-12B Burial Ground as required for dangerous waste landfills. The groundwater monitoring program is designed for LLWMA-2 (Figure 3-7). As required by WAC 173-303-645(8), the monitoring wells are located at the line of compliance for LLWMA-2. Two of the wells are at the boundary of Trench 94. The requirements of WAC 173-303-645(8) and the requirements of 40 CFR 761.75 are discussed in the following paragraphs.

Under the TSCA water sampling requirements, the groundwater and surface water at all sites receiving PCBs must be sampled to establish baseline quality before commencing operations under an approval. Groundwater in the area of Trench 94 has been sampled as part of the general groundwater monitoring requirements under WAC 173-303-645(8). Under WAC 173-303-645(8) requirements, a monitoring system is required to be installed that is sufficiently broad to yield samples that represent the quality of groundwater that has not been affected by leakage from a regulated unit. A program of sampling and analysis to determine background groundwater quality has been completed at the 218-E-12B Burial Ground. This program is described in the *Low-Level Burial Ground Dangerous Waste Permit Application* (DOE-RL 1989a, pp. 5-77 through 5-148) and the *Revised Ground-Water Monitoring Plan for the 200 Areas Low-Level Burial Grounds* (WHC 1989).

The water sampling requirements also specify that any surface watercourse designated by the EPA Regional Administrator must be sampled at least monthly when the landfill is being used for disposal operations and at a frequency of no less than once every 6 months after final closure of the disposal area. As described in Chapter 3.0, Section 3.1, there are no natural surface water bodies in the disposal site area. The only surface water bodies in or near the 200 East Area are liquid waste management units (i.e., 216-B-3 Pond System and its associated lakes). As discussed in Section 7.3, no natural or synthetic surface water bodies are impacted by Trench 94 disposal operations because there is no run-off from the trench. Therefore, surface water sampling associated with Trench 94 operations is not performed. Sampling of the liquid waste management units in the 200 East Area does occur, but is not related to Trench 94 operations.

Several requirements exist for groundwater monitoring wells at chemical waste landfills. Under 40 CFR 761.75(b)(6)(ii)(A), if underlying earth materials are homogeneous, impermeable, and uniformly sloping in one direction, only three sampling points will be necessary. These three points must be equally spaced on a line through the center of the disposal area and extend from the area of highest water table elevation to the area of lowest water table elevation on the property. As described in Chapter 3.0, Section 3.1, underlying earth materials are not homogeneous, impermeable, or uniformly sloping in one direction. Therefore, more than three sampling points are needed to comply with monitoring well requirements. Currently, there are 16 groundwater monitoring wells around the perimeter of the 218-E-12B Burial Ground, as shown in Chapter 3.0, Figure 3-7. These wells have been installed as part of the groundwater monitoring program required under WAC 173-303-645 and consist of nine downgradient shallow wells (E27-8, E27-9, E27-11, E27-17, E34-2, E34-9, E34-10, E34-11, and E34-12) and seven upgradient shallow wells (E27-10, E34-3, E34-4, E34-5, E34-6, E34-7, and E35-1) (DOE-RL 1994).

Title 40 CFR 761.75(b)(6)(ii)(B) requires that all monitoring wells be cased and the annular space between the monitoring zone (zone of saturation) and the surface will be completely backfilled with portland cement or an equivalent material and plugged with portland cement to effectively prevent percolation of surface water into the well bore. The well opening at the surface must have a removable cap to provide access and to prevent entrance of rainfall or stormwater run-off. The well must be pumped to remove the volume of liquid initially contained in the well before obtaining a sample for analysis. The discharge must be treated to meet applicable state or federal discharge standards, or it must be recycled to the chemical waste landfill. The 218-E-12B Burial Ground groundwater monitoring wells meet all these requirements. The annular space immediately above the sandpack is sealed with 5 feet (1.52 meters) of bentonite pellets. The remaining annular space is sealed with bentonite grout and/or bentonite crumbles. Each well has a concrete pad at the ground surface and locking well cap. Well construction details are shown in Figure 7-4. Purgewater is handled and disposed of in accordance with guidelines and procedures approved by the DOE-RL, the EPA, and Ecology.

Water analysis requirements under 40 CFR 761.75(b)(6)(iii) specify analysis of groundwater and surface water samples for specific parameters, i.e., PCBs, pH, specific conductance, and chlorinated organics. Groundwater samples are analyzed in the field for pH and specific conductance. Laboratory analysis includes volatile and semivolatile organics, which includes the general categories of PCBs and chlorinated organics.

Title 40 CFR 761.75(b)(6)(iii) requires that analytical procedures comply with those specified in 40 CFR 136. Analytical procedures for 218-E-12B Burial Ground groundwater samples are those given in SW-846 (EPA 1986), which are equivalent to those in 40 CFR 136.
Title 40 CFR 761.75(b)(6)(iii) also requires that monitoring data and records be maintained as required in 40 CFR 761.180(d)(1). As discussed in Chapter 5.0, Section 5.1, recordkeeping at the 218-E-12B Burial Ground complies with these requirements.

7.7 LEACHATE COLLECTION

Title 40 CFR 761.75(b)(7) establishes technical requirements for leachate collection systems for chemical waste landfills. A leachate collection monitoring system must be installed and monitored monthly for quantity and physicochemical characteristics of leachate produced. The leachate should be either treated to acceptable limits for discharge in accordance with a state or federal permit or disposed of by another state or federally approved method. As discussed in Chapter 5.0, Section 5.7, a waiver is being requested from leachate collection system requirements for the 5-year interim approval period.

7.8 WASTE AND CONTAINER MANAGEMENT

Title 40 CFR 761.75(b)(8)(i) establishes technical requirements for chemical waste landfill operations for management of waste and containers. The PCBs and PCB items must be placed in a landfill in a manner that will prevent damage to containers or articles. Other waste forms placed in the landfill that are not chemically compatible with PCBs and PCB items, including organic solvents, must be segregated from the PCBs throughout the waste handling process. This requirement is similar to dangerous waste container handling requirements under WAC 173-303-630 with which the 218-E-12B Burial Ground also must comply. Management of the SRCs in Trench 94 complies with these requirements. The SRCs are placed in the trench in a manner that will not damage containment of the PCBs. No other waste is placed in Trench 94.

Title 40 CFR 761.75(b)(8)(ii) discusses the requirements to eliminate the presence of free liquids before final disposal in a landfill. The *Engineering Report of Liquid Removal from Submarine Reactor Compartment Disposal Packages* (Appendix F) describes the procedures that are used to remove all but up to 230 gallons (870.55 liters) of residual liquid from the SRC package. This amount of liquid is less than 0.1 percent of the 2,000,000 pounds (907,200 kilograms) of the waste per package.

The procedures for removing the liquid from a package specify cutting or drilling to remove the nonradioactive water, where normal system drains were not installed. The radioactive systems are drained using the piping normal drain points, but are not cut or drilled to remove liquid from points not equipped with drains. About 3 rem of personnel radiation exposure is required to drain the package to less than 230 gallons (870.55 kilograms) of residual liquid. The engineering report (Appendix F) evaluates the location of the remaining liquid and the work that would be required to remove the liquid. The evaluation shows that excessive personnel radiation exposure would be required to drain additional radioactive liquid, with up to 68 rem estimated to completely remove all liquid from a package.

7.9 OPERATION PLAN

Title 40 CFR 761.75(b)(8)(ii) requires that an operation plan be developed and submitted to the EPA Regional Administrator for approval. This plan will include detailed explanations of the procedures to be used for recordkeeping, surface-water handling procedures, excavation and backfilling, waste segregation, burial coordinates, vehicle and equipment movement, use of roadways, leachate collection systems, sampling and monitoring procedures, monitoring wells, environmental emergency contingency plans, and security measures to protect against vandalism and unauthorized waste placements. If the facility is used to dispose of liquid waste containing between 50 parts per million and 500 parts per million PCB, the operation plan must include additional procedures to determine that liquid PCBs to be disposed of at the landfill do not exceed 500 parts per million PCB and do not migrate from the landfill. The information contained in Chapter 5.0 is submitted to fulfill the requirements for an operation plan. The residual liquids in the SRC are not in contact with the materials that contain PCB and, therefore, are unlikely to be contaminated with PCB during the interim period. Liquid PCBs are not received at Trench 94; therefore, requirements related to disposal of liquid PCB waste are not addressed.

7.10 IGNITABLE WASTE

Title 40 CFR 761.75(b)(8)(iii) contains requirements that ignitable waste not be disposed of in chemical waste landfills. Liquid ignitable waste is waste that has a flash point less than 140 °F (60 °C). Ignitable waste is not placed in Trench 94.

7.11 BURIAL RECORDS

Title 40 CFR 761.75(b)(8)(iv) requires that records be maintained for all PCB disposal operations and include information on the PCB concentration in liquid waste and the three dimensional burial coordinates for PCBs and PCB items. Additional records must be developed and maintained as required in 40 CFR 761.180. Compliance with these recordkeeping requirements is discussed in Chapter 5.0, Section 5.1.

7.12 SUPPORTING FACILITIES

Title 40 CFR 761.75(b)(9) establishes technical requirements for supporting facilities. These requirements include those for security fencing, roadways, and operations to prevent spilled liquids and windblown materials.

Title 40 CFR 761.75(b)(9)(i) requires that a 6-foot (1.83-meter) woven mesh fence, wall, or similar device be placed around the site to prevent unauthorized persons and animals from entering. This requirement is similar to the dangerous waste unit security requirements under WAC 173-303-310. As discussed in Chapter 5.0, Section 5.11, the 218-E-12B Burial Ground is within the 200 East Area, which is surrounded by security fencing. The security fences are 8-foot- (2.43-meter-) high chain link and are topped with three strands of barbed wire.

Title 40 CFR 761.75(b)(9)(ii) requires that roads be maintained to and within the site in an adequate manner to support the operation and maintenance of the site without causing safety or nuisance problems or hazardous conditions. Currently, no load-bearing capacities of the Hanford Site roads are available; however, loads as large as 140 pounds per square inch (965.27×10^3 pascal) have been transported without observable damage to road surfaces. All roads, including those providing access to Trench 94, meet the requirements of the American Association of State Highway and Transportation Officials HS-20-44 load rating (AASHTO 1983). An HS-20-44 loading represents a two-axle tractor [front axle loading of 8,000 pounds (3,628.8 kilograms) and rear axle loading of 32,000 pounds (14,515.2 kilograms)] plus a single-axle trailer with a 32,000 pounds (14,515.2 kilograms) axle loading.

Title 40 CFR 761.75(b)(9)(iii) requires that chemical waste landfills be operated and maintained in a manner that will prevent safety problems or hazardous conditions resulting from spilled liquids and windblown materials. No free liquid waste, other than the residual liquid in the SRCs, or other liquids are placed in Trench 94. All waste in Trench 94 is contained in the sealed SRCs and cannot be blown by the wind.

7.13 ADDITIONAL REQUIREMENTS THAT INCREASE ENVIRONMENTAL PROTECTION

As a dangerous waste landfill, Trench 94 must be operated in compliance with all applicable requirements under WAC 173-303. These requirements include those that do not have equivalent requirements under 40 CFR 761. The additional requirements under WAC 173-303 increase the environmental protection associated with operation of Trench 94 for the disposal of SRCs. These requirements, which include those for inspections, training, and closure and postclosure, are discussed in the following sections.

7.13.1 Inspections

In accordance with WAC 173-303-320, inspections of the 218-E-12B Burial Ground are conducted weekly. The 218-E-12B Burial Ground trenches are inspected for run-on, run-off, and erosion problems after significant precipitation (25-years, 24-hour storm) or windstorms. Inspections are documented, and records are maintained for a minimum of 5 years from the inspection date. Burial of the SRCs would start with the first 28 reactor compartments in the east end of Trench 94, in accordance with the engineered performance plan. This plan provides a method for confirming the adequacy of submarine reactor compartments for burial without a liner/leachate collection system. Those SRCs in Trench 94 remaining uncovered will be inspected to confirm their integrity and to confirm that there is no release of waste to the environment.

7.13.2 Training

In accordance with WAC 173-303-330, all personnel associated with dangerous waste operations receive adequate training to ensure the performance of dangerous waste duties meets unit compliance with environmental and worker safety regulations (DOE-RL 1989a, Chapter 8.0).

7.13.3 Closure and Postclosure

Trench 94 will be closed and maintained after closure (the postclosure period) in compliance with WAC 173-303-610 and WAC 173-303-665(6). Closure of the 218-E-12B Burial Ground is described in detail in the *Low-Level Burial Ground Dangerous Waste Permit Application* (DOE-RL 1989a, Chapter 11.0). Trench 94 will be closed along with the other trenches in the 218-E-12B Burial Ground. Closure of the 218-E-12B Burial Ground will occur in stages, but no closure activities will be conducted during the 5-year interim approval period. Closure will include installation of a low permeability cover over the trenches. The cover will consist of several layers of soil and geosynthetic materials designed to minimize infiltration of precipitation to the waste.

Postclosure activities will include inspection and maintenance of the cover integrity and security control devices and postclosure groundwater monitoring.

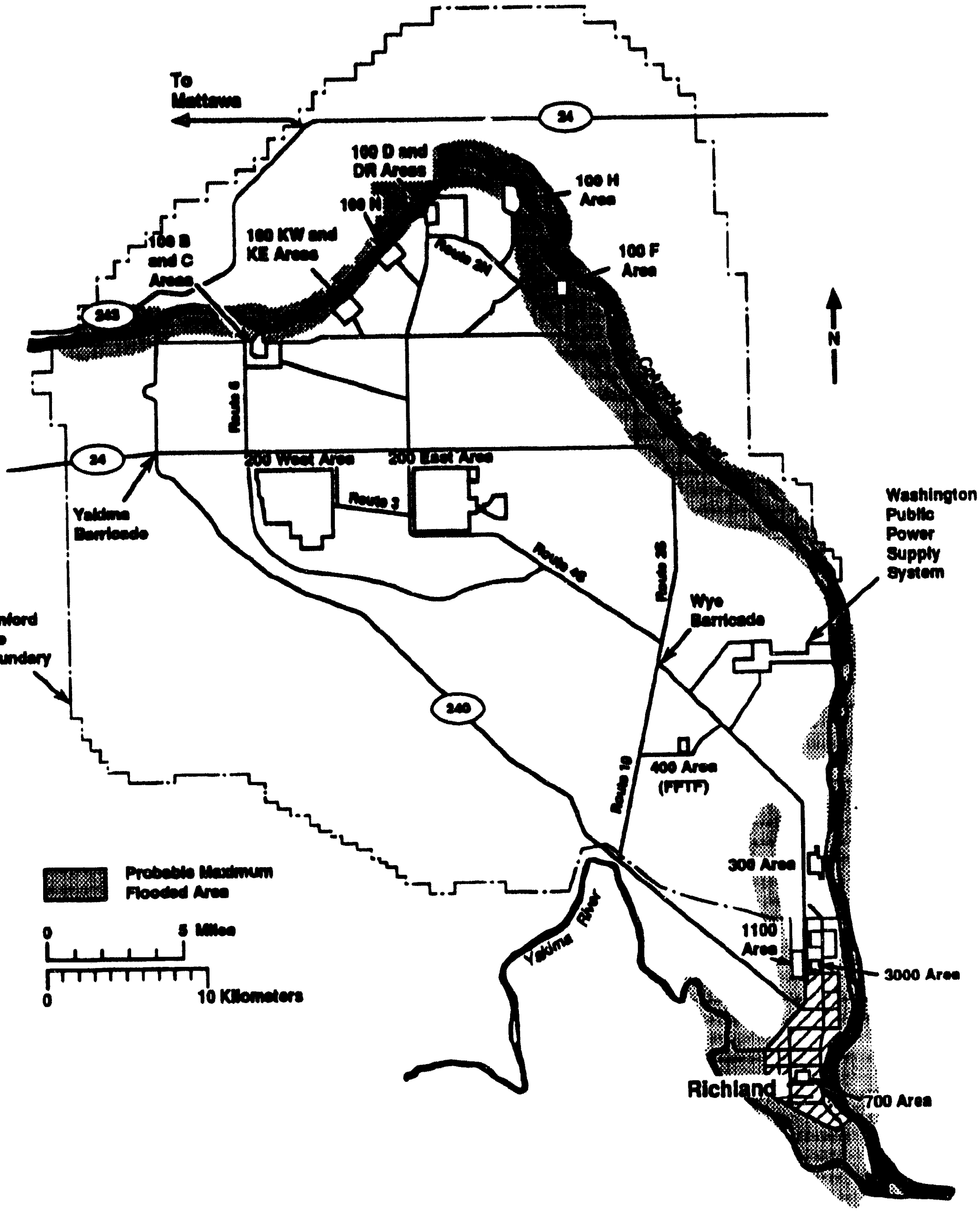


Figure 7-1. Columbia River Floodplain Boundary for the Probable Maximum Flood.

940604.1957

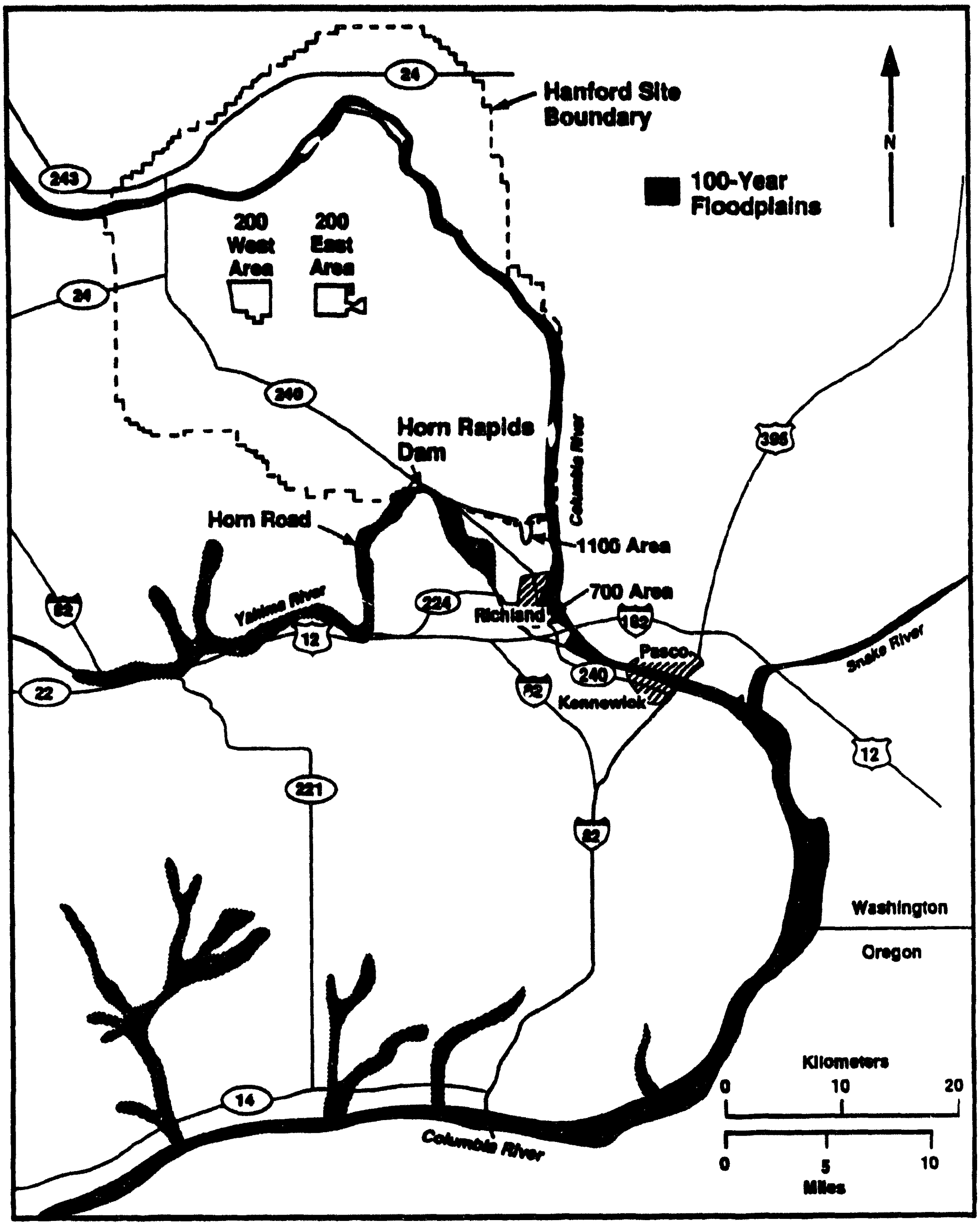


Figure 7-2. Yakima River Floodplain Boundary for the 100-Year Flood.

940604.1957

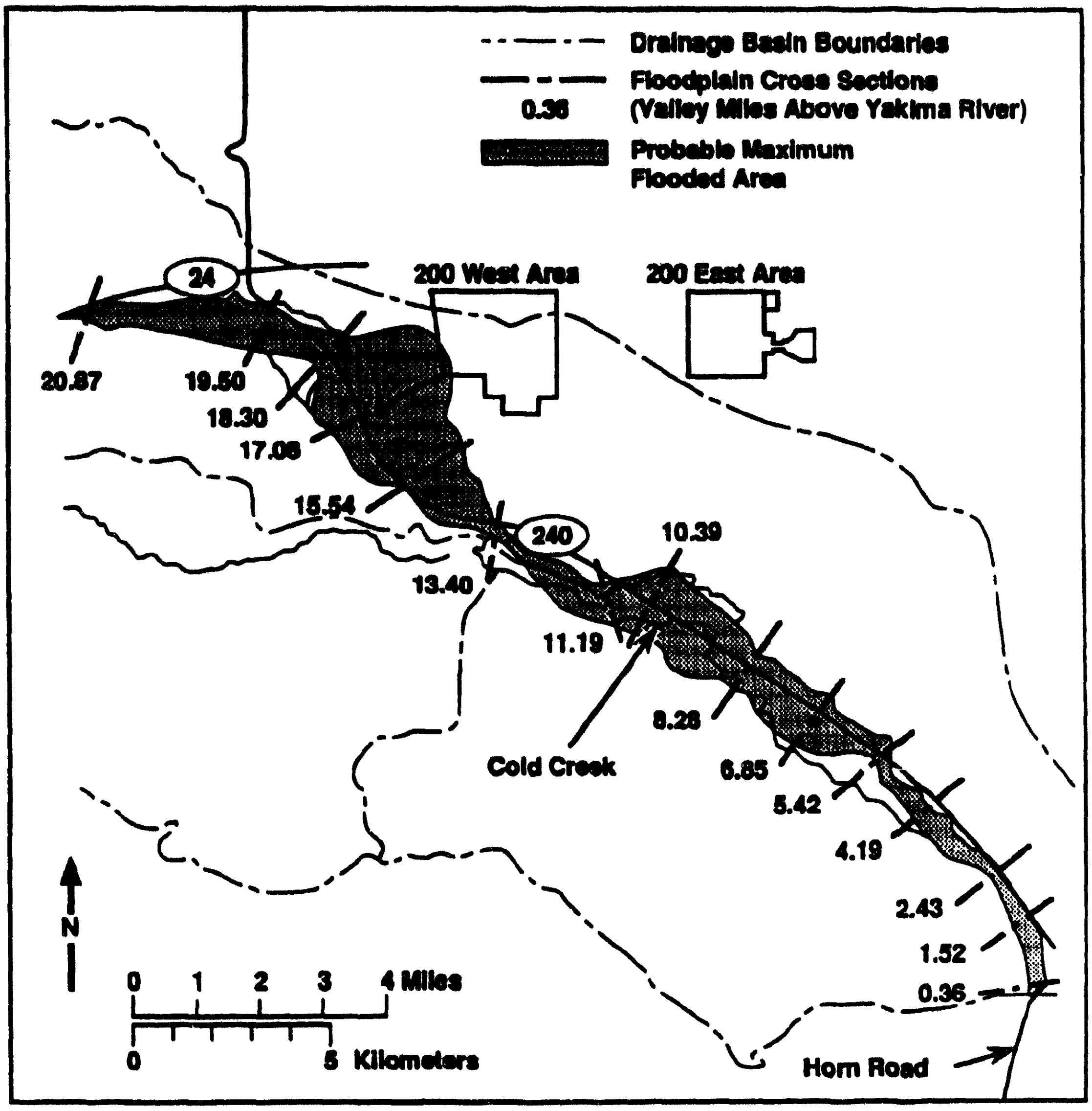


Figure 7-3. Cold Creek Floodplain Boundary for the Probable Maximum Flood.

940604.1957

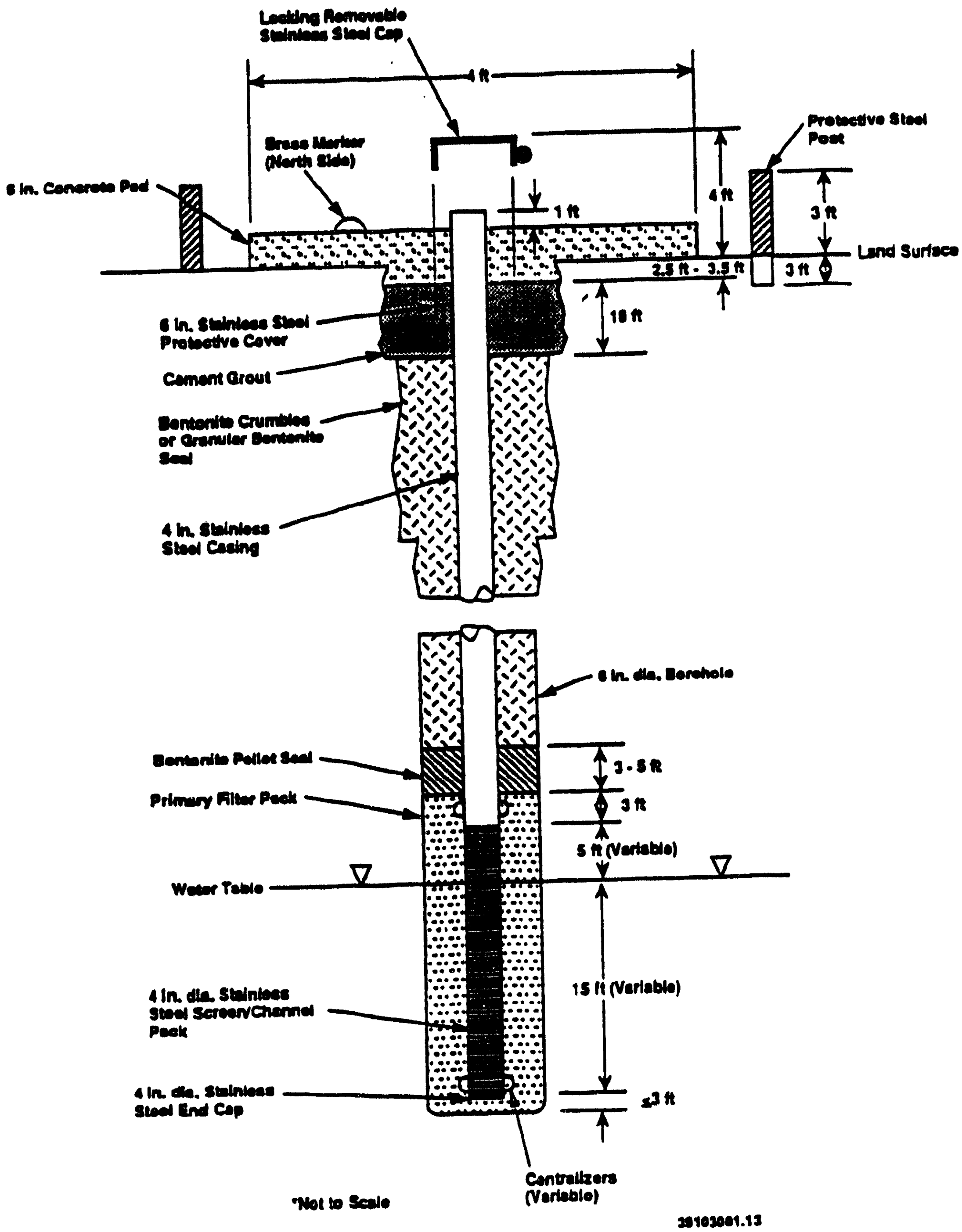


Figure 7-4. Monitoring Well Construction Details.

8.0 REQUEST FOR INTERIM WAIVER

This chapter presents a request for waiver from certain chemical waste landfill requirements under 40 CFR 761.75(b) for Trench 94 for the 5-year interim approval period. Specifically, a waiver is sought for a synthetic liner and leachate collection system.

A request for exemption from lined trench requirements and from land disposal restrictions on residual liquid at the 218-E-12B Burial Ground Trench 94 (Exemption Request) also has been submitted to Ecology (DOE-RL 1989b). This document demonstrates that the hull and bulkheads of the SRCs will outlast, by a considerable margin, the estimated design life of a liner/leachate system.

Ecology has stated that the alternate landfill design as described in the Exemption Request (burial without a liner/leachate system) is protective of human health and the environment, and considers the Exemption Request to be complete and acceptable for incorporation into the LLBG Dangerous Waste Permit Application documentation.

Title 40 CFR 761.75(c)(4) allows the EPA Regional Administrator to waive one or more of the chemical waste landfill requirements under 40 CFR 761.75(b) provided that operation of the landfill will not present an unreasonable risk of injury to health or the environment from PCBs.

Compliance of Trench 94 operations with the requirements under 40 CFR 761.75(b) was addressed in Chapter 7.0. As shown in Chapter 7.0, Trench 94 operations comply with all applicable requirements except for a synthetic membrane liner [40 CFR 761.75(b)(2)] and leachate collection system [40 CFR 761.75(b)(7)].

The risk analysis performed (Chapter 6.0) has shown that there will be no risk to human health or the environment from PCBs as long as the PCBs remain in the SRC. It also was shown that the PCBs will remain in the SRC as long as there is not a breach of the SRC. For the 5-year interim approval period, it was concluded that the probability of a breach of the SRC was extremely remote, given the high structural strength of the SRC package and the slow corrosion rate of the SRC. In addition, operational practices (e.g., inspections) are in place to provide early warning of potential SRC degradation during the 5-year interim approval period. On the basis of this analysis, it is concluded that operation of Trench 94 without a synthetic liner and a leachate collection system during the 5-year interim approval period does not present an unreasonable risk of injury to health or the environment from PCBs. Therefore, a waiver from these requirements is requested.

This page intentionally left blank.

9.0 REFERENCES

9.1 DOCUMENTS

AASHTO, 1983, *Policy for Geometric Design of Highways and Streets*, American Association of State Highway Transportation Officials, Washington, D.C.

DOE, 1987, *Final Environmental Impact Statement, Disposal of Hanford Defense High-Level, Transuranic, and Tank Wastes*, DOE/EIS-0113, Volume 1, U.S. Department of Energy, Washington, D.C.

DOE-RL, 1989a, *Low-Level Burial Grounds Dangerous Waste Permit Application*, DOE/RL 88-20, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1989b, *Low-Level Burial Grounds Dangerous Waste Permit Application Request for Exemption from Lined Trench Requirements for Submarine Reactor Compartments*, DOE/RL-88-20, Supplement 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1994, *Quarterly Report of RCRA Groundwater Monitoring Data for Period October 1, 1993 Through December 31, 1993*, DOE/RL-93-56-4, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

EPA, 1986, *Test Methods for the Evaluation of Solid Waste*, SW-846, 3rd ed., and 1990 Supplement, U.S. Environmental Protection Agency, Washington, D.C.

Last, G. V., B. N. Bjornstad, M. P. Bergeron, D. W. Wallace, D. R. Newcomer, J. A. Schramke, M. A. Chamness, C. S. Cline, S. P. Airhart, and J. S. Wilbur, 1989, *Hydrogeology of the 200 Areas Low-Level Burial Grounds - An Interim Report*, PNL-6820, Pacific Northwest Laboratory, Richland, Washington.

NCEL, 1992, *Prediction of Corrosion Performance of Submarine Reactor Compartments After Burial at Trench 94, Hanford, Washington*, Port Hueneme, California.

PNL, 1992, *Estimation of the Release and Migration of Lead Through Soils and Groundwater at the Hanford Site 218-E-12B Burial Ground*, PNL-8356, Pacific Northwest Laboratory, Richland, Washington.

PSNS, 1990, *Reactor Compartment Disposal Package Hazardous Material Investigation*, Puget Sound Naval Shipyard, Bremerton, Washington.

USN, 1984, *Final Environmental Impact Statement on the Disposal of Decommissioned, Defueled Naval Submarine Reactor Plants*, Volume 1, U.S. Department of the Navy, Washington, D.C.

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

WHC, 1989, *Revised Ground-Water Monitoring Plan for the 200 Areas Low-Level Burial Grounds*, WHC-SD-EN-AP-015, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

WHC, 1990, *Building Emergency Plan, Low-Level Burial Grounds*, WHC-IP-0263-LLBG, Westinghouse Hanford Company, Richland, Washington.

WHC, 1992, *Hanford Facility Contingency Plan*, WHC EP-0564, Westinghouse Hanford Company, Richland, Washington.

WSDOT 1988, *1988 Standard Specifications for Road, Bridge, and Municipal Construction*, Washington State Department of Transportation, Olympia, Washington.

U.S. Bureau of Reclamation, 1977, *Design of Small Dams*, U.S. Government Printing Office, Washington, D.C.

U.S. Weather Bureau, 1961, *Rainfall Frequency Atlas of the United States*, Technical Paper No. 40, U.S. Government Printing Office, Washington, D.C.

9.2 CODE OF FEDERAL REGULATIONS

10 CFR 61, *Licensing Requirements for Land Disposal of Radioactive Waste.*

10 CFR 71, *Packaging and Transportation of Radioactive Material.*

40 CFR 136, *Guidelines Establishing Test Procedures for the Analysis of Pollutants.*

40 CFR 265, *Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.*

40 CFR 761, *Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions.*

9.3 FEDERAL AND STATE ACTS

Toxic Substances Control Act of 1976, 15 USC 2601 et seq.

Shoreline Management Act of 1971, Revised Code of Washington, Chapter 90.58.030(2) et seq., Olympia, Washington.

Resource Conservation and Recovery Act of 1976, 42 USC 6901 et seq.

9.4 WASHINGTON ADMINISTRATIVE CODE

WAC 173-303, *Dangerous Waste Regulations.*

This page intentionally left blank.

APPENDICES

A ENGINEERING DRAWINGS

B SUBMARINE REACTOR COMPARTMENTS IN TRENCH 94

C CROSS-REFERENCE OF REGULATORY REQUIREMENTS UNDER 40 CFR 761, WAC 173-303, AND 40 CFR 265

D LOW-LEVEL BURIAL GROUNDS RECORDKEEPING

E CALCULATION OF RUN-OFF AND/OR RUN-ON FROM 24-HOUR, 25-YEAR STORM

F ENGINEERING REPORT OF LIQUID REMOVAL FROM SUBMARINE REACTOR COMPARTMENT DISPOSAL PACKAGES

G SECURITY AND ACCESS CONTROL

H COMPLIANCE AGREEMENT BETWEEN U.S. DEPARTMENT OF ENERGY RICHLAND OPERATIONS OFFICE, RICHLAND, WASHINGTON, AND THE ENVIRONMENTAL PROTECTION AGENCY, REGION 10, SEATTLE, WASHINGTON

I LETTER FROM PUGET SOUND NAVAL SHIPYARD TO ENVIRONMENTAL PROTECTION AGENCY REGION 10

J LETTER FROM WASHINGTON STATE DEPARTMENT OF ECOLOGY TO U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION 10

K LETTER FROM U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION 10 TO U.S. DEPARTMENT OF ENERGY, RICHLAND OPERATIONS OFFICE

This page intentionally left blank.

APPENDIX A

ENGINEERING DRAWINGS

APPENDIX A

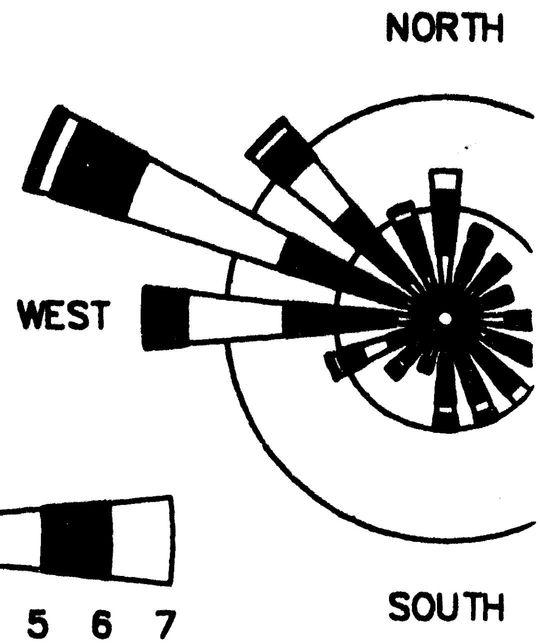
CONTENTS

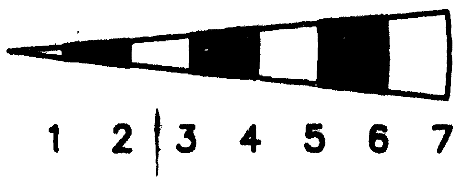
Drawing H-13-000018 Topographic Map, Low Level Burial Grounds

Drawing H-2-33276 Dry Waste Burial Ground 218-E-12B

F

WIND ROSE FOR: 200E AREA
% CALM WINDS = .9





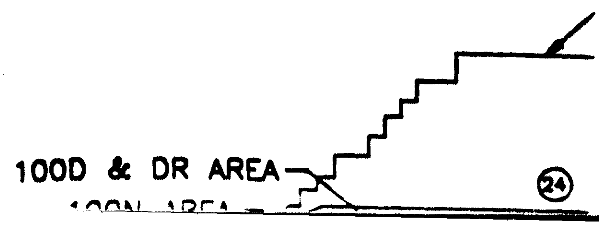
PADDLES INDICATE DIRECTION
RADIAL GRIDS REPRESENT 5.0

E

WIND CLASS

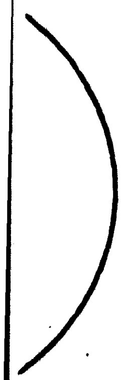
1--------
2--------
3--------
4--------
5--------
6--------
7--------

WIND R

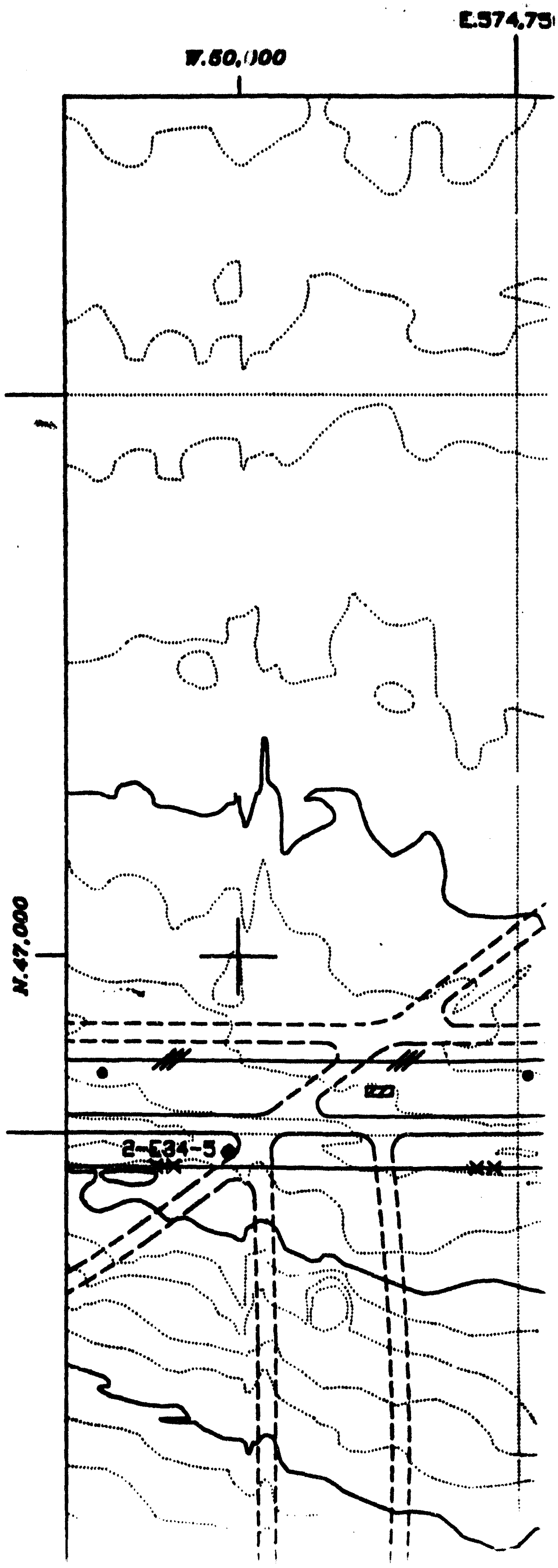


(24)

PERIOD COVERED
12/01/85 – 12/31/87
STATION NO. 6



EAST



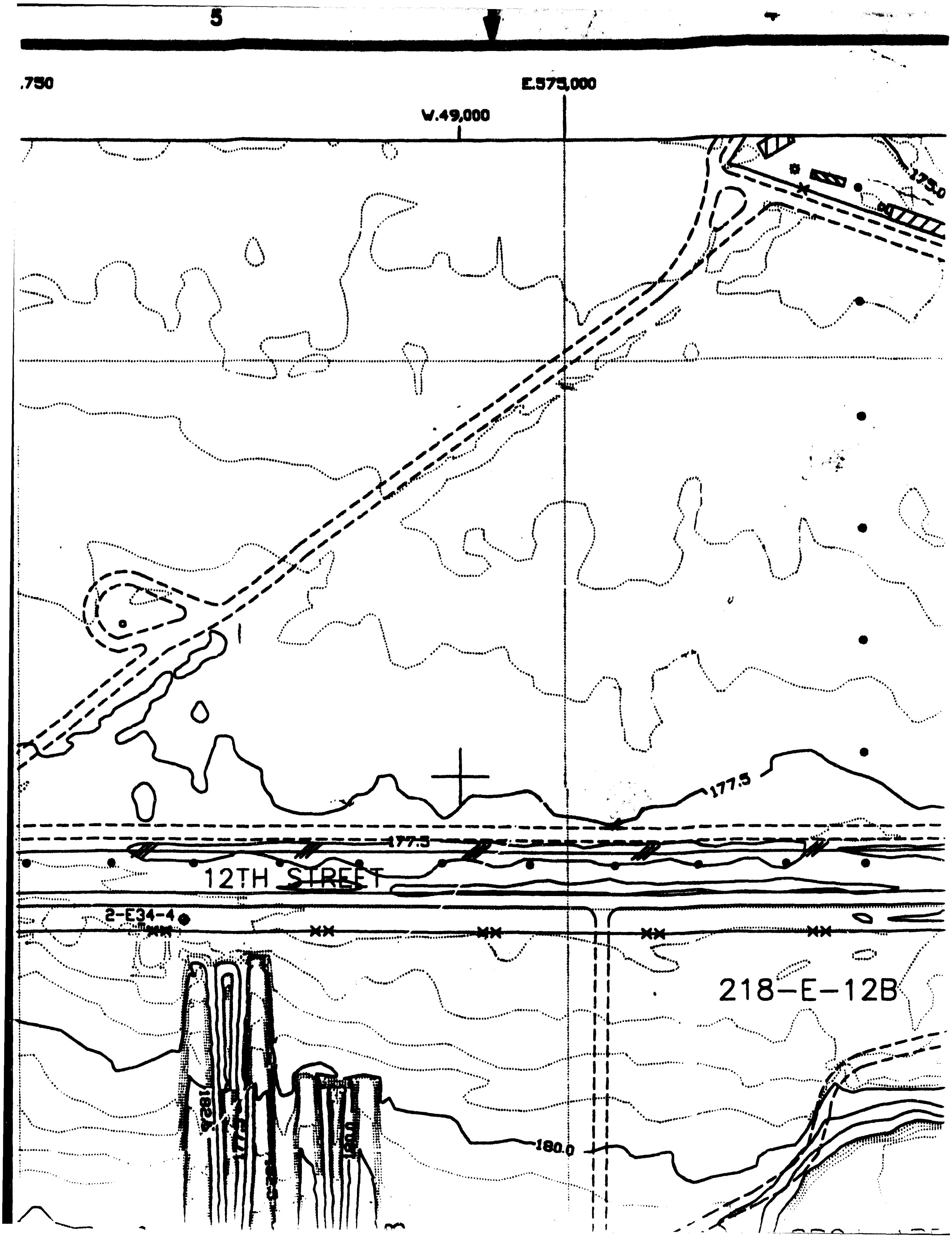
ND IS COMING FROM.
AND 10.0% OCCURRENCE.

ILES/HOUR

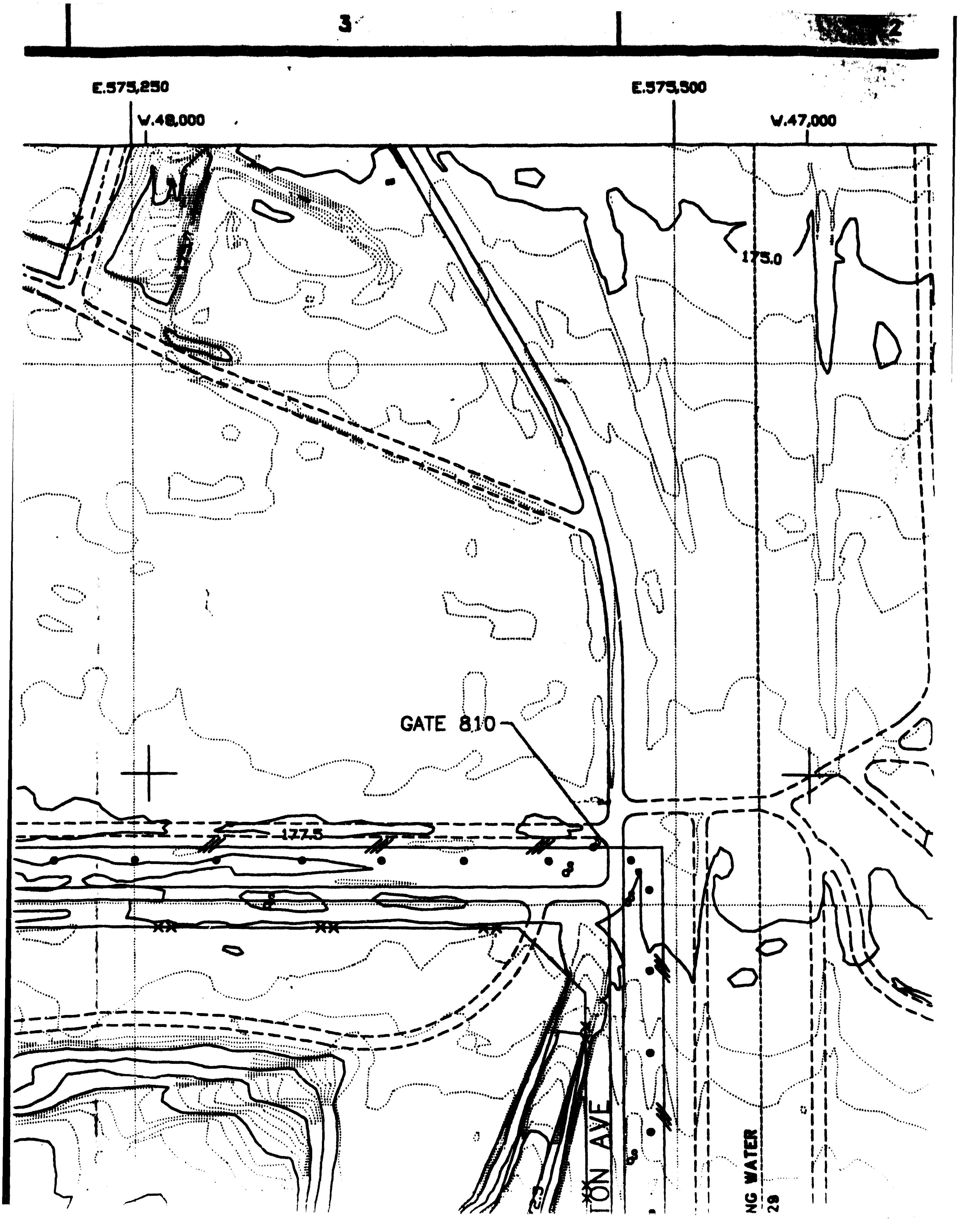
1.0 – 3.0
4.0 – 7.0
8.0 – 12.0
3.0 – 18.0
9.0 – 24.0
5.0 – 31.0
2.0 +

)SE

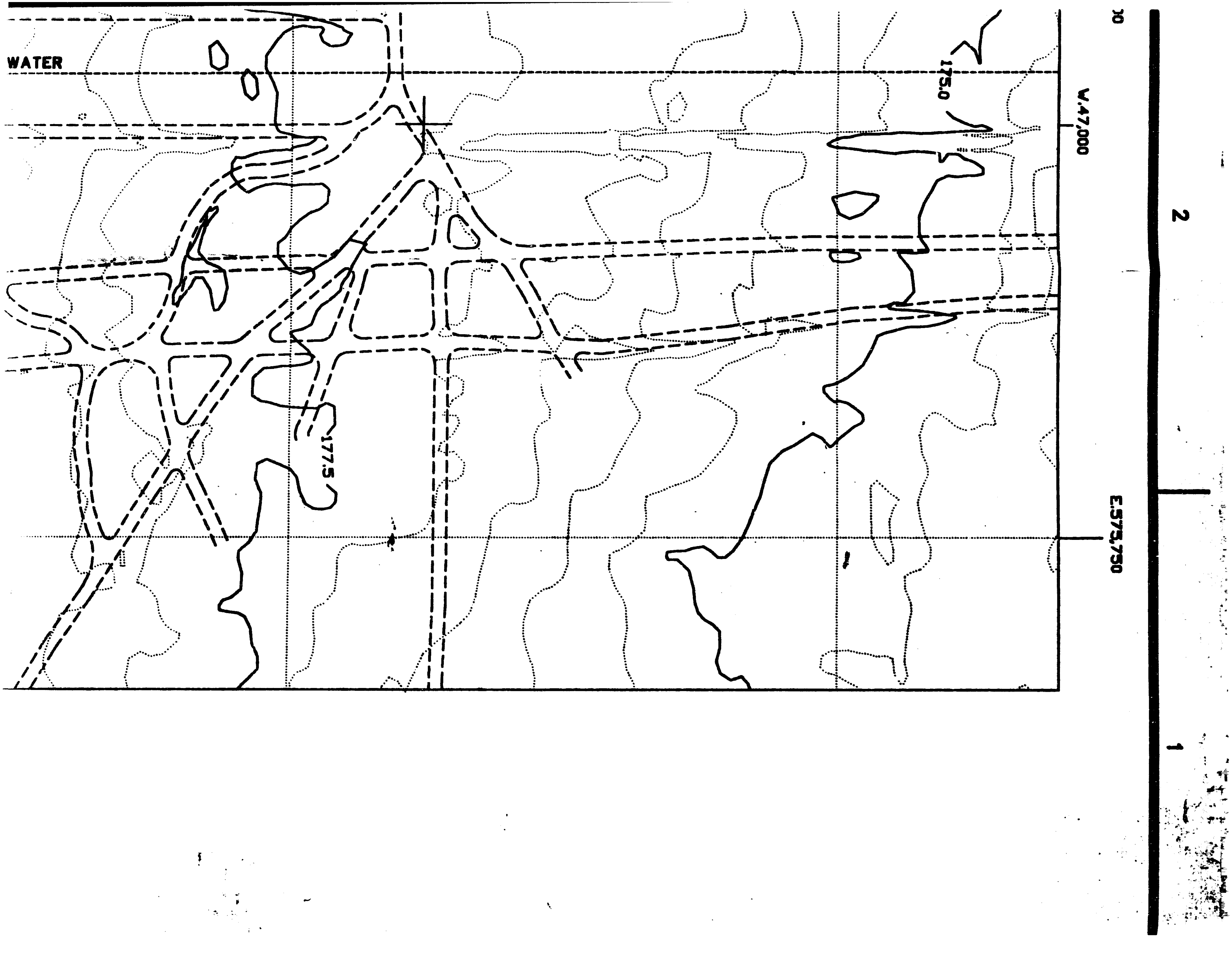
SITE BOUNDARY

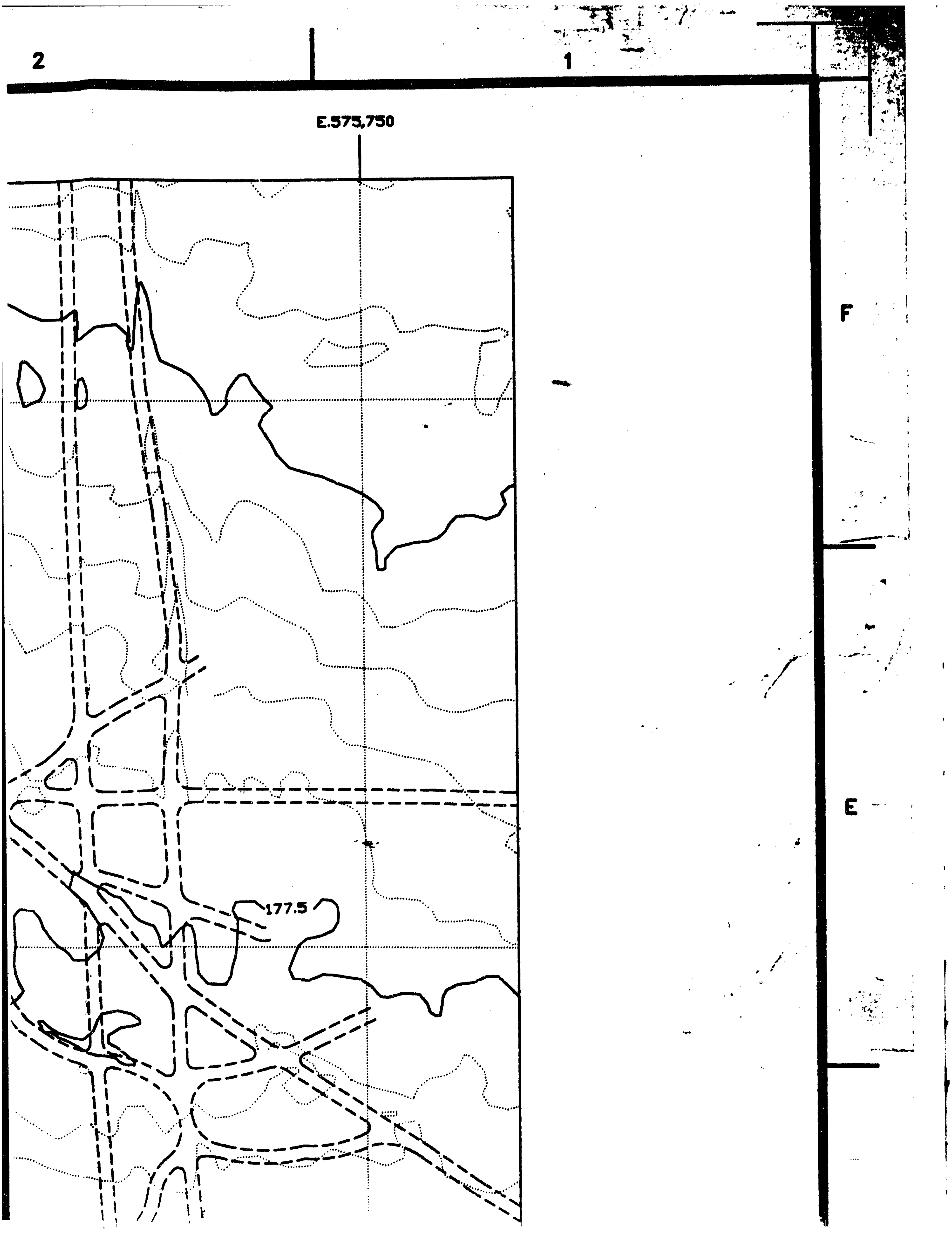


5
.750
E.575,000
W.49,000
175.0
177.5
177.5
12TH STREET
2-E34-4
218-E-12B
180.0



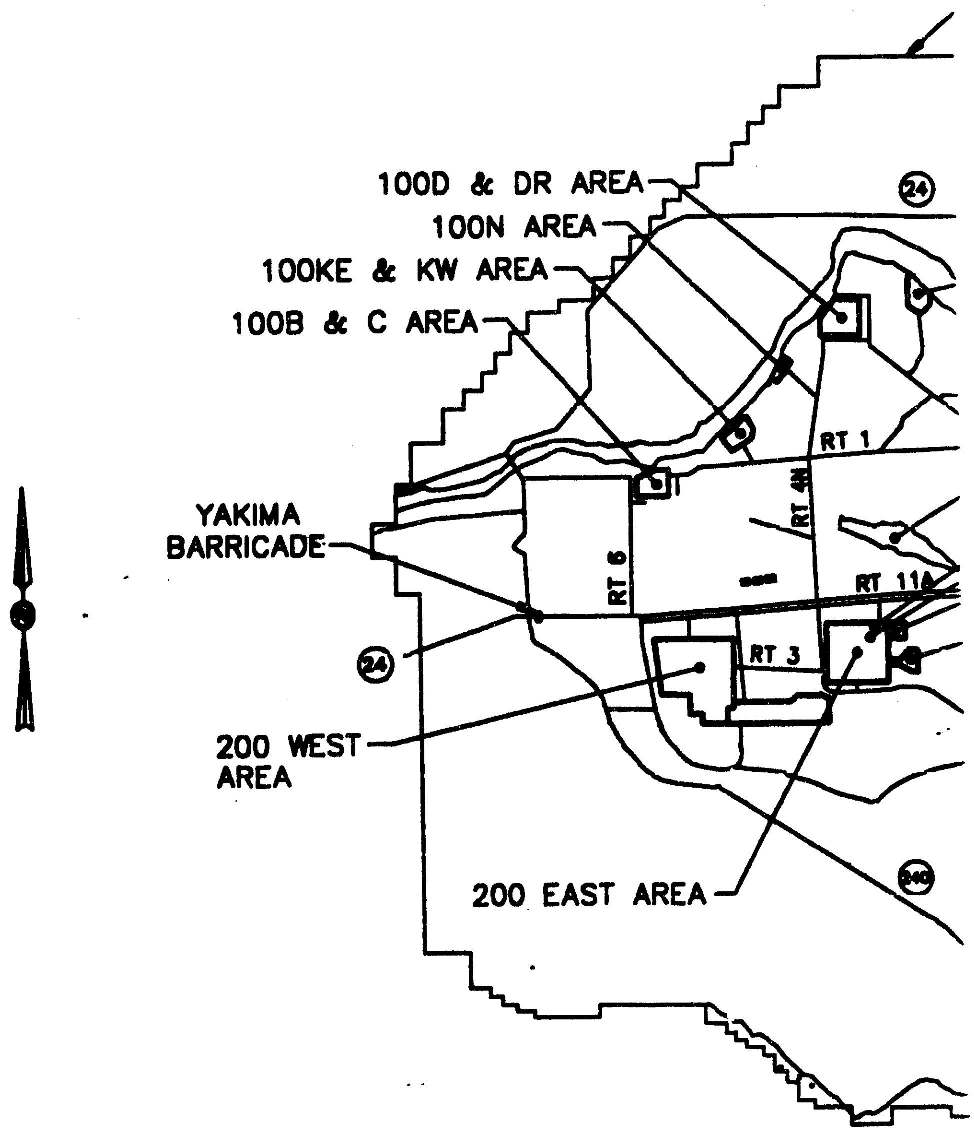
3
2
E.575,250
W.48,000
E.575,500
W.47,000
175.0
GATE 810
177.5
TON AVE
NG WATER
29


WATER
175.0
177.5
N.47,000
E.575,750
2
1



2
1
E.575,750
F
E
177.5

D



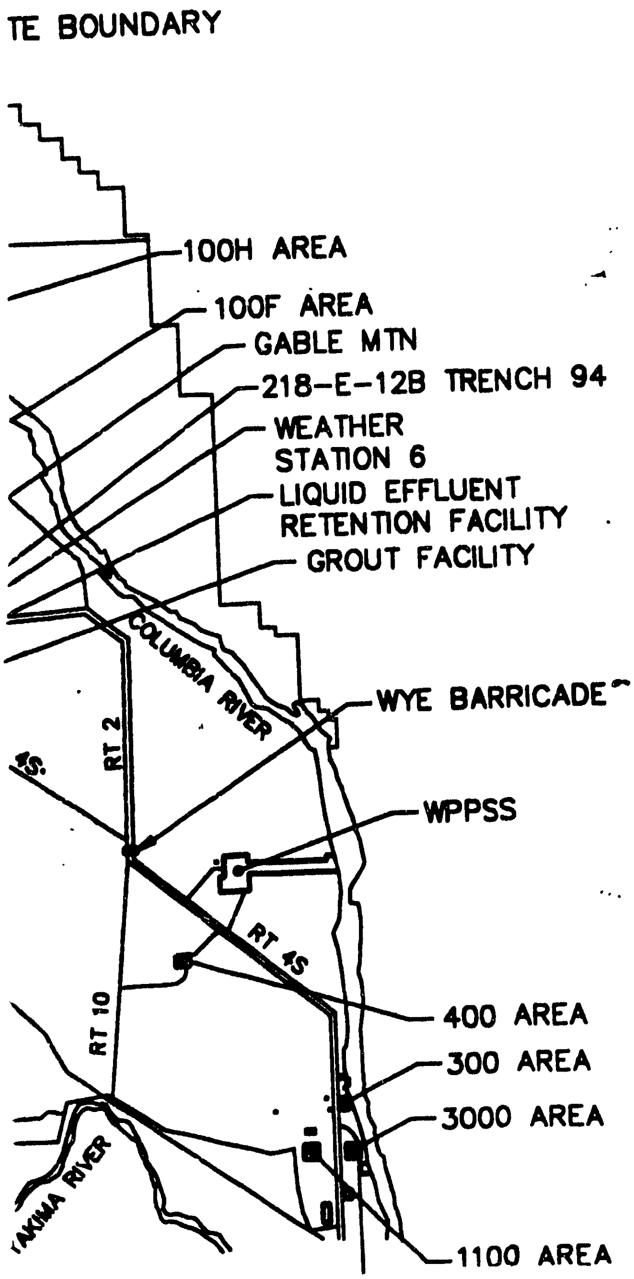
C

HANFORD

SCALE

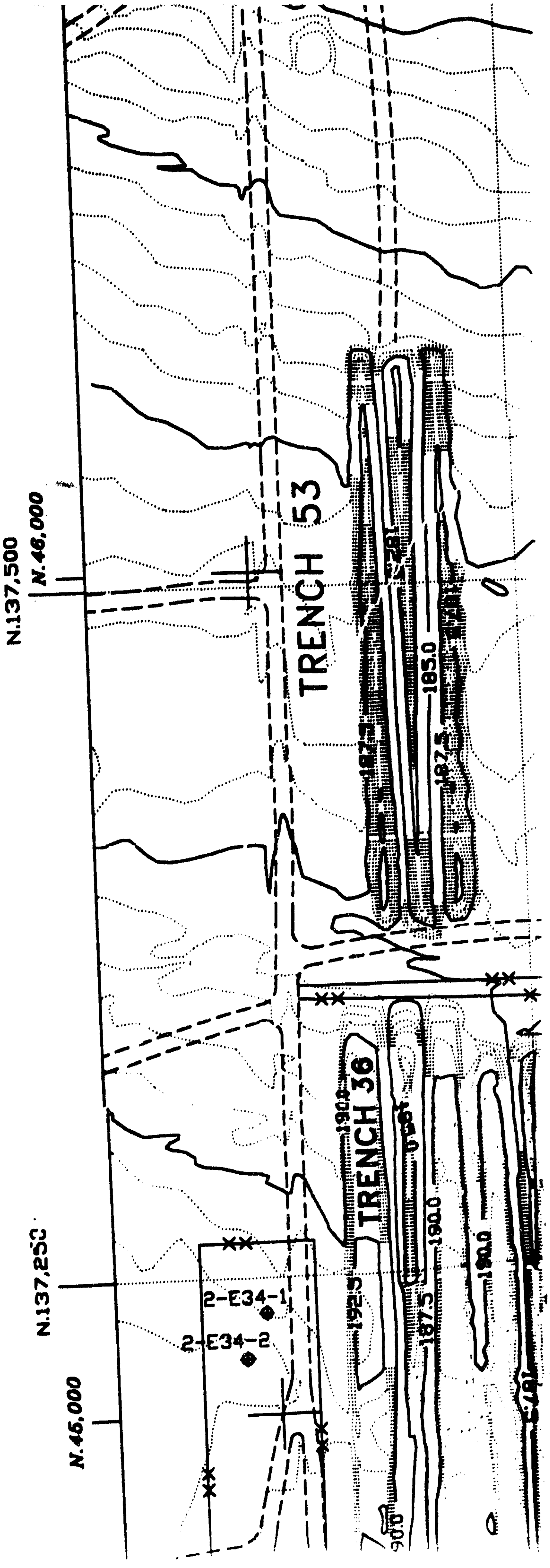
LEGEND

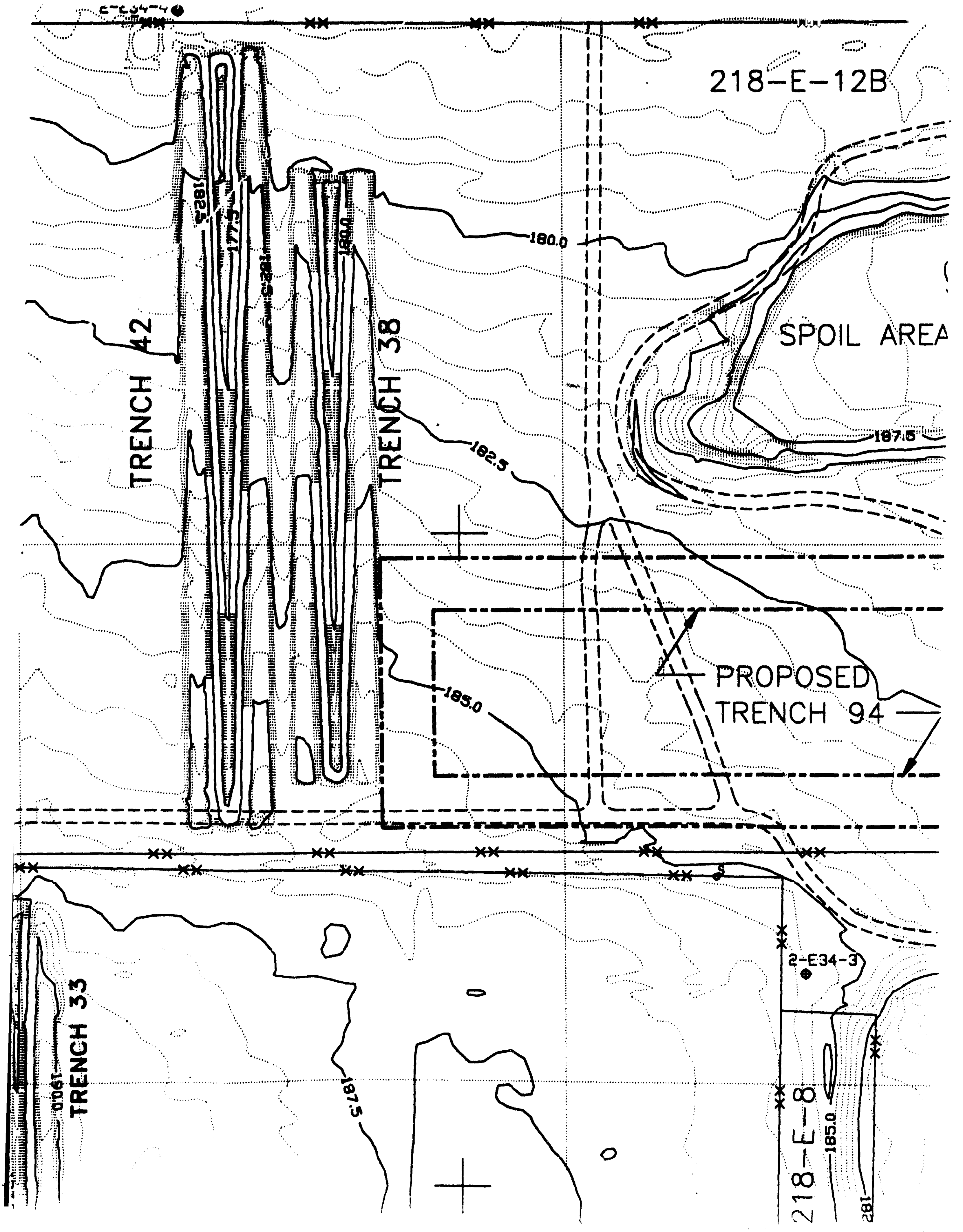
W.47,000 *N.43,000*	HANFORD PLANT COORDINATES (FEET)
E.576,250 N.176,000	WASHINGTON STATE COORDINATES (METERS)

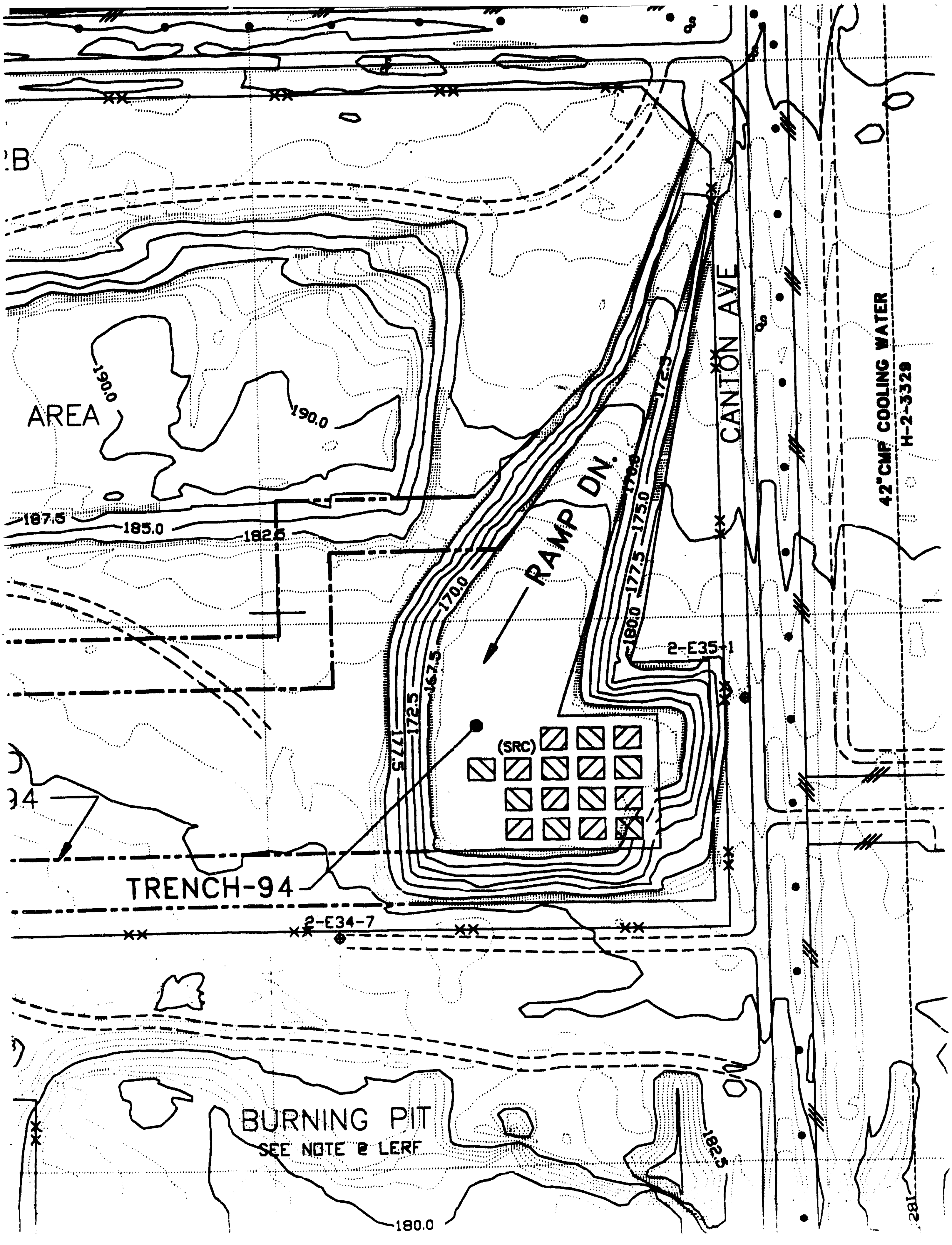


AREA MAP

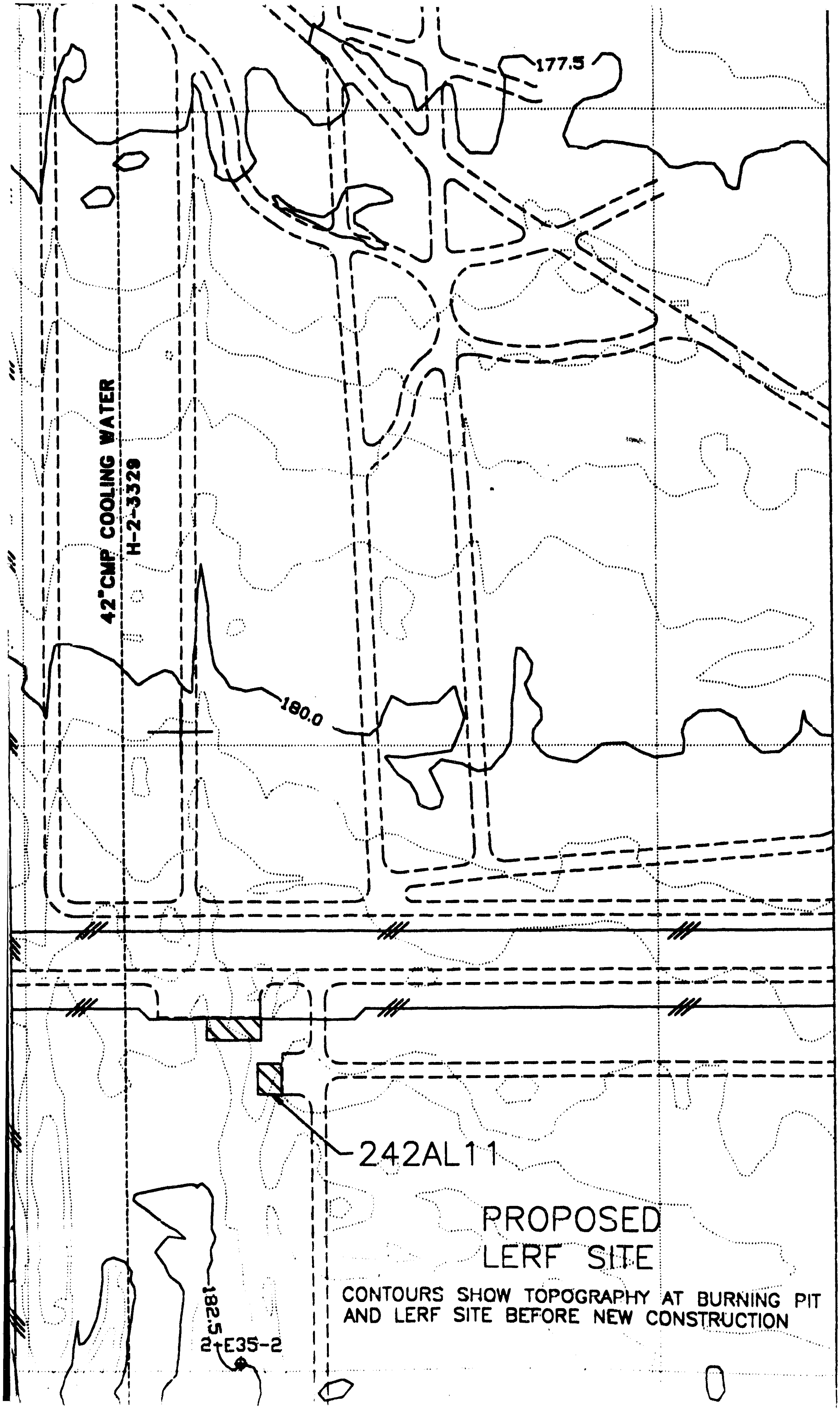
NONE



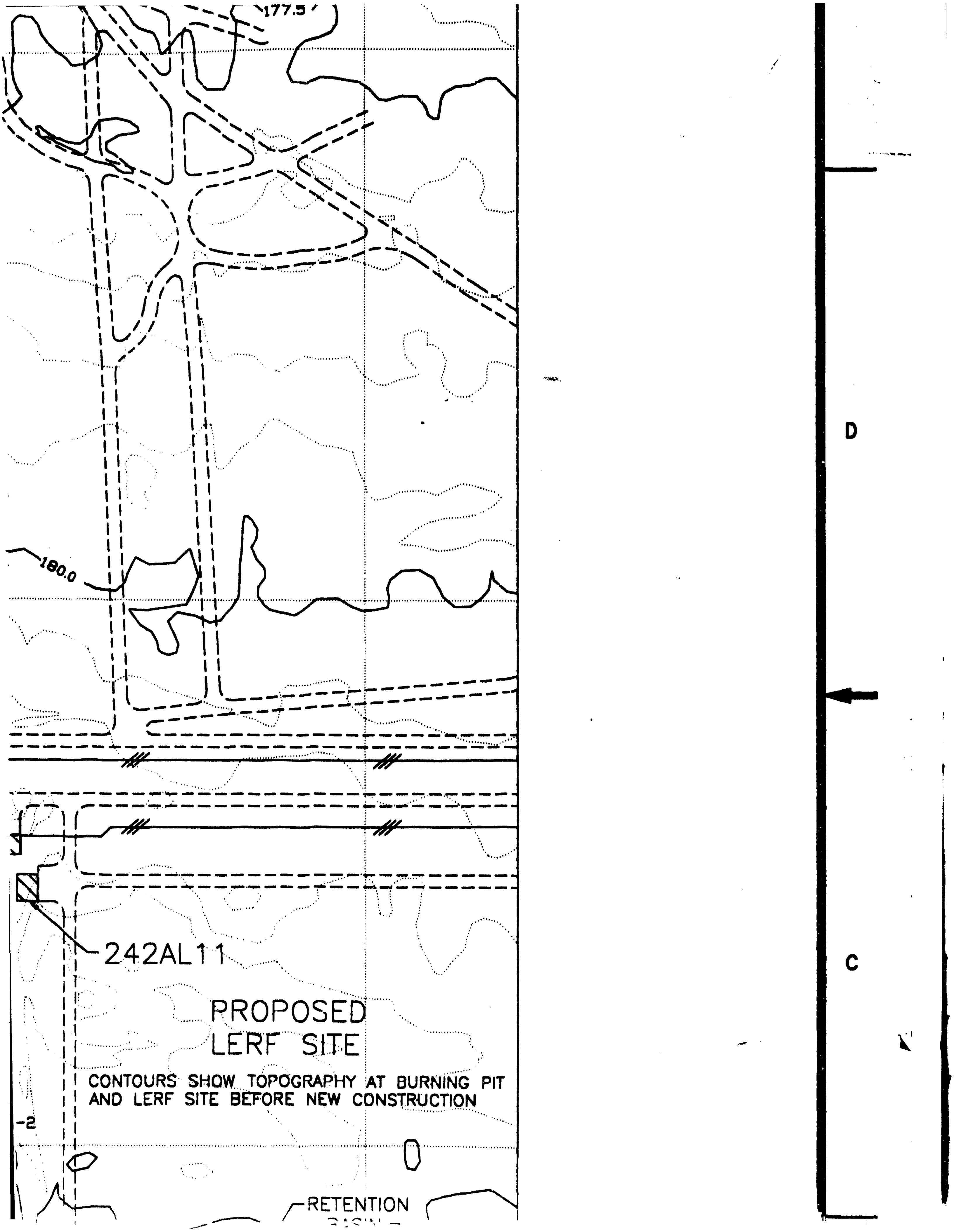

218-E-12B
SPOIL AREA
TRENCH 42
TRENCH 38
180.0
182.5
177.5
185.0
187.5
PROPOSED
TRENCH 94
TRENCH 33
190.0
2-E34-3
218-E-8



2B
AREA
190.0
190.0
187.5
185.0
182.5
RAMP DN.
CANTON AVE
172.5
170.0
175.0
177.5
180.0
170.0
167.5
172.5
177.5
2-E35-1
(SRC)
94
TRENCH-94
2-E34-7
BURNING PIT
SEE NOTE @ LERF
182.5
180.0
42"CMP COOLING WATER
H-2-3329
281



177.5
42"CMP COOLING WATER
H-2-3329
180.0
242AL11
PROPOSED
LERF SITE
CONTOURS SHOW TOPOGRAPHY AT BURNING PIT
AND LERF SITE BEFORE NEW CONSTRUCTION
182.5
2-E35-2



177.5
180.0
242AL11
PROPOSED
LERF SITE
CONTOURS SHOW TOPOGRAPHY AT BURNING PIT
AND LERF SITE BEFORE NEW CONSTRUCTION
-2
RETENTION
D
C

HANFORD AREA

SCALE: NONE

LEGEND

W.47,000 N.43,000	HANFORD PLANT COORDINATES (FEET)
E.576,250 N.136,000	WASHINGTON STATE COORDINATES (METERS)
2 233.2	FIELD CONTROL (METERS)
	INTERMEDIATE CONTOUR
215.0	INDEX CONTOUR (METERS)
	EDGE OF PAVEMENT
	FENCE
	POST & CHAIN FENCE
	PERIMETER FENCE
	DIRT ROAD OR TRAIL
	PAVED ROAD
	UNIMPROVED PAVED ROAD
	BUILDINGS
	TANKS

216-A-42

218-E-10

242-A

2-E25-25

S

MH

CB

24

B

A

54-6000-027(5/89)

8

7

MAP

CRIB

BURIAL GROUND

BUILDING

WELL
299-E25-25

SIGNS

MANHOLE

CATCH BASIN

POWER/
UTILITY POLE

MISCELLANEOUS POST

TREES

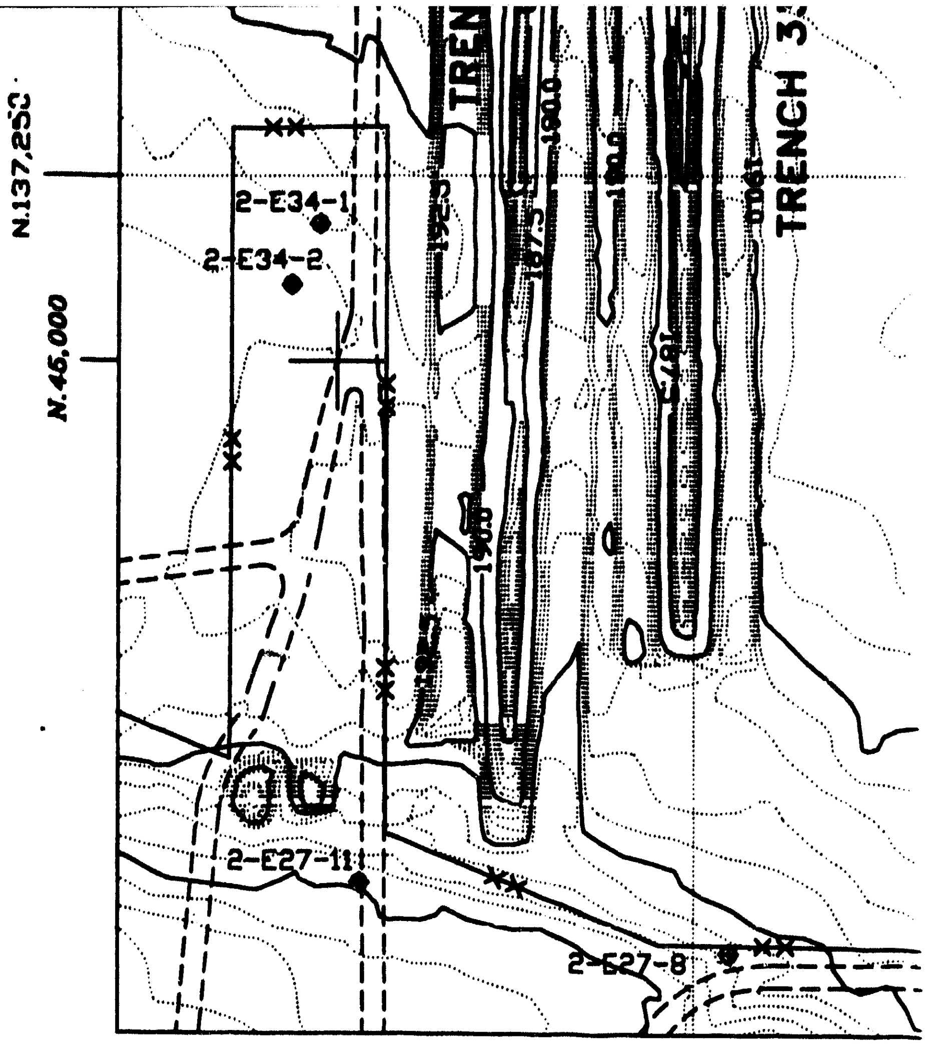
LIGHT POLE

CONCRETE LINE/
SIDEWALK

RAILROAD

STATE HIGHWAY

SUBMARINE REACTOR
COMPARTMENT (SRC)



GENERAL NOT

1. THIS MAP IS BASED ON AERIAL PHOTOGRAPHY FLOWN ON 6-24-8 BY MERRICK & COMPANY AND CERTIFIED TO MEET NATIONAL MAP / OFFICIAL COPIES OF THE MERRICK MAPS THAT SHOW THE CERTIFIC/ ENGINEERING FILES AS DRAWING NUMBERS H-2-79476 SHEET 1 A THE NAMES OF PHYSICAL FEATURES AND THE TITLE BLOCK OF THE MAPS WERE ADDED BY WESTINGHOUSE HANFORD COMPANY.

2. WASHINGTON COORDINATE SYSTEM: THE OFFICIAL STATE PLANE CO(VISED CODE OF WASHINGTON (RCW). THE HANFORD SITE LIES WIT SOUTH ZONE. THIS GRID COVERS THE ENTIRE SITE AND USES X (

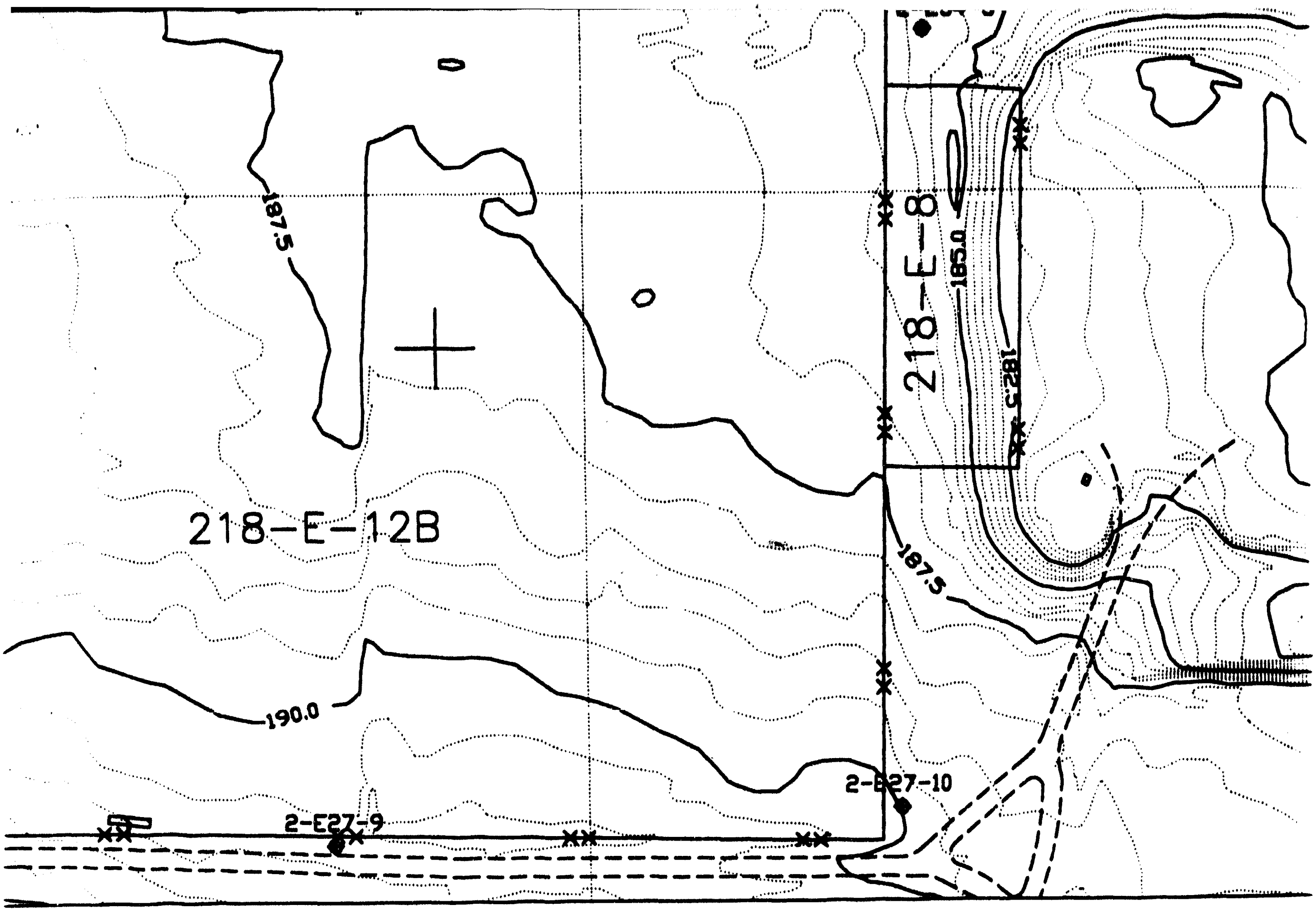
   HORIZONTAL DATUM: NAD-83 LAMBERT PROJECTIONS

   VERTICAL DATUM: NATIONAL GEODETIC SURVEY DATUM AS PROVIDED BY KAISER ENGINEERS - HANFORD.

   COORDINATES ARE SHOWN AS METERS.
   CONTOURS ARE SHOWN AS 1/2 METERS.

3. HANFORD PLANT GRID: A LOCAL GRID SYSTEM WITH ITS INITIAL F COVERS 200 EAST AND 200 WEST AREA AS WELL AS GENERAL SITE GROUNDS. COORDINATES ARE SHOWN AS FEET.

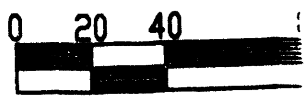
DV



ES

SIT

SCA



39. THE TOPOGRAPHIC MAP WAS PREPARED
ACCURACY STANDARDS.
ATE ARE LOCATED IN THE WESTINGHOUSE
AND H-2-79477 SHEET 1 THRU 37.
E H-13-000201 THROUGH H-13-000237

ORDINATE SYSTEM AS DEFINED BY THE RE-
HIN THE WASHINGTON COORDINATE SYSTEM,
(EASTINGS) AND Y (NORTHINGS) COORDINATES.

1 cm
PHOTO
CONTOUR

POINT NORTHEAST OF THE 400 AREA. IT
TE WORK SUCH AS WELLS AND BURIAL

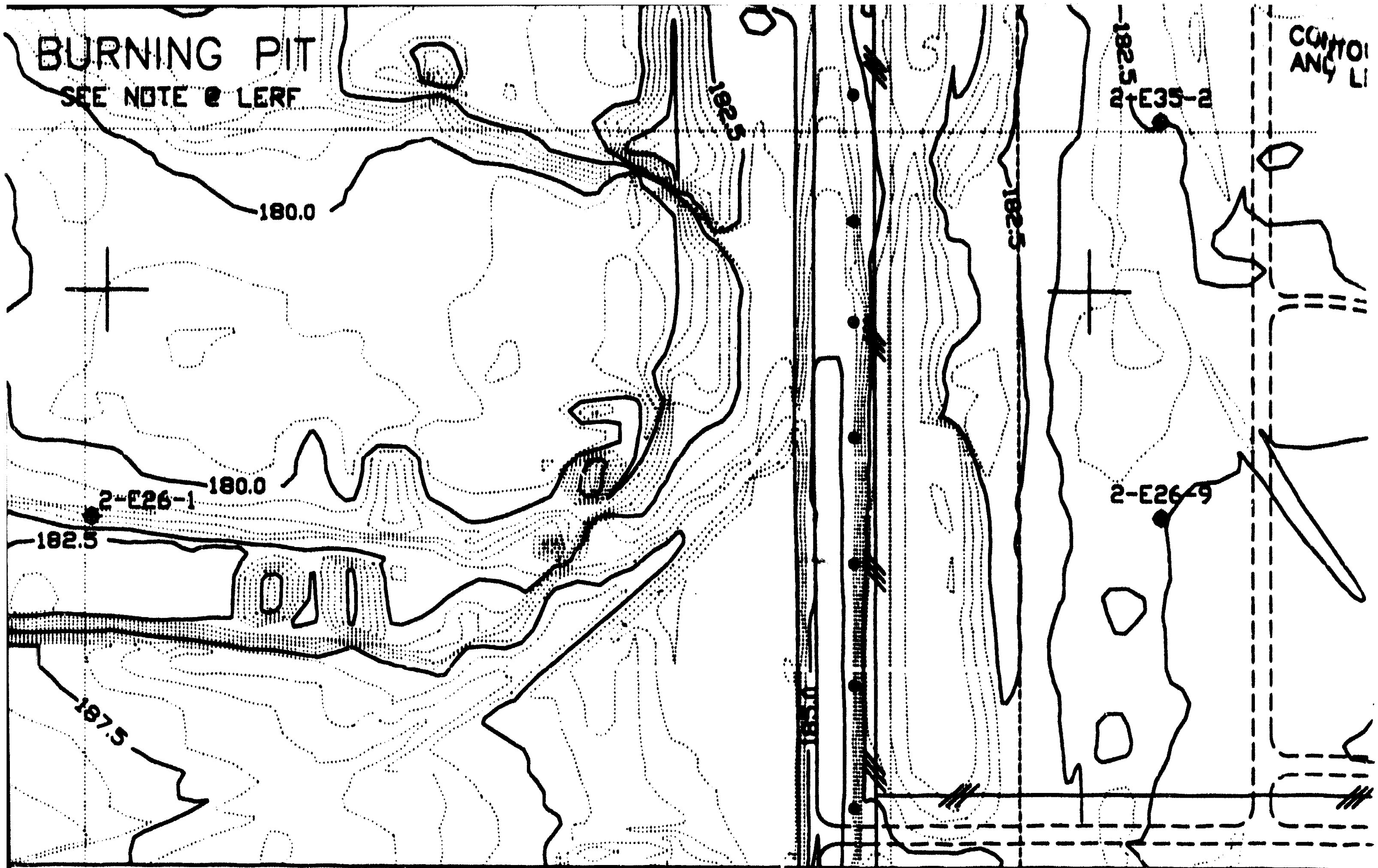
REF NUMBER	TITLE
H-2-81570	TOPOGRAPHIC MAP LIQUID EFFLUENT RETENTION FACILITY
H-2-3329	PUREX COOLING WATER DISPOSAL TO GABLE MT. POND 616-A-25
H-2-33276	DRY WASTE BURIAL GROUND 218-E-12B
H-13-000215	TOPOGRAPHIC MAP 200 AREA
H-13-000207	TOPOGRAPHIC MAP 200E AREA

REFERENCES

DWG NO	TITLE
	DRAWING TRACEABLILITY LIST

NEXT USED ON H-13-000200

5 4



TE PLAN

ALE: 1:2000

80 120 160 METERS

m = 20 meters
O DATE: 6-24-89
R INTERVAL: 0.5 meter

REV NO	DESCRIPTION	REV BY DATE	CHK BY DATE	DFTG APVD DATE	COG ENGR	OTHER	OTHER
1	PER ECN 170553	PAN 11-27-91					

APPROVALS BY/DATE

MFD

REV REL

REVISIONS

CADFILE N000018A

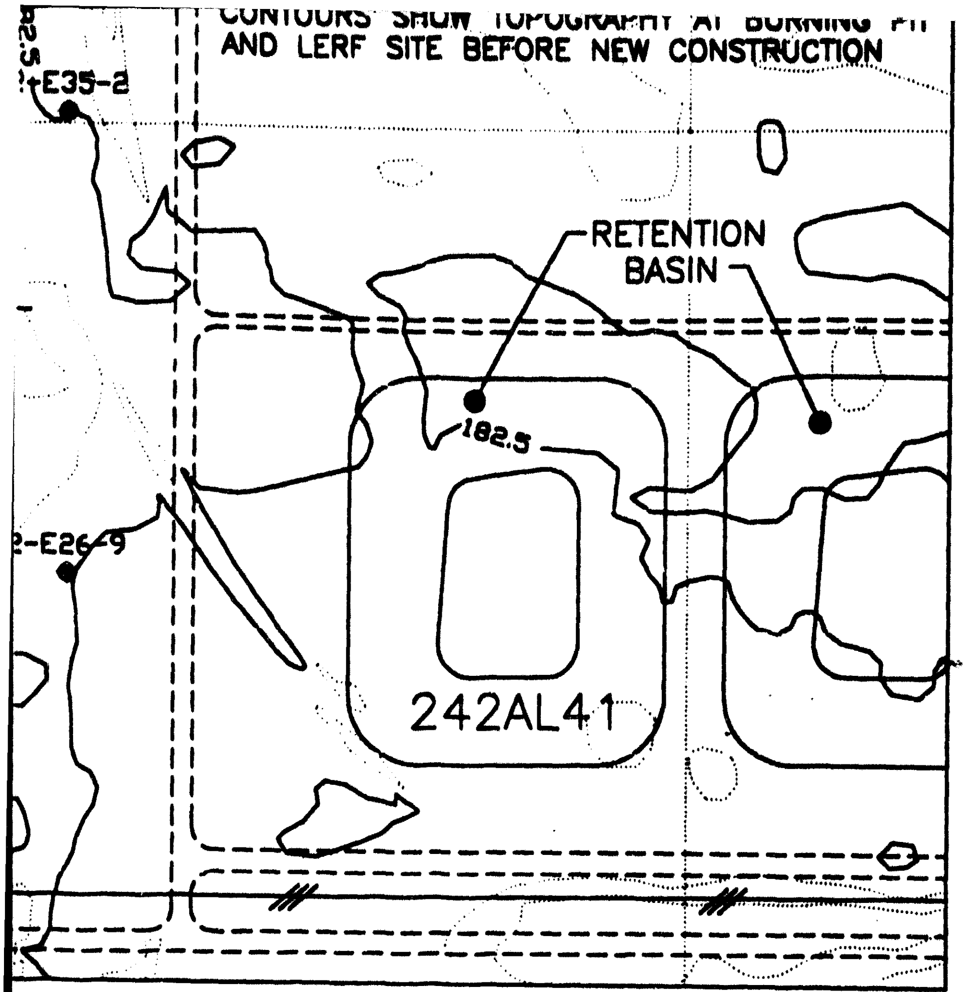
CADCODE 1X:IBM:ACD2:10.0:N

DRAWN PAT A. NASH
CHECKED
DFTG APVD
COG ENGR
QA
OTHER
OTHER
OTHER
APVD FOR IMPLEMENTATION
BY
FOR
DATE

3

2

CHK PRINT



DRAWN PAT A. NASH	DATE 9-16-91
CHECKED	
DFTG APVD	
COG ENGR	
QA	
OTHER	
OTHER	
OTHER	
APVD FOR IMPLEMENTATION	
BY	
FOR	DATE

EDT 145788

U.S. DEPARTMENT OF ENERGY
Richland Operations Office
Westinghouse Hanford Company

TOPOGRAPHIC MAP 218-E-12B TRENCH 94

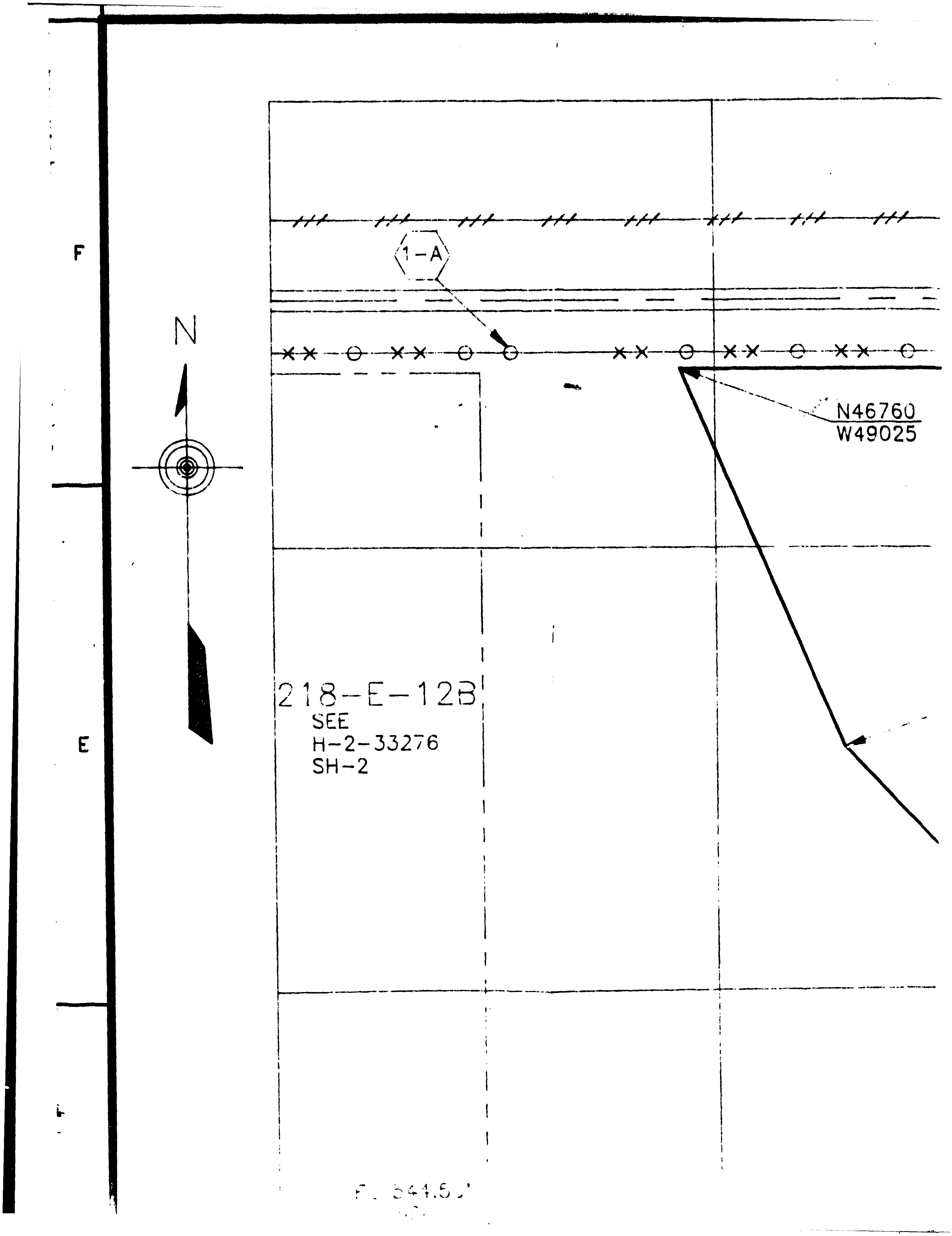
SIZE	BLDG NO	INDEX NO	DWG NO	REV
F	218-E-12B	0103	H-13-000018	1

SCALE 1:2000 SHEET 1 OF 1

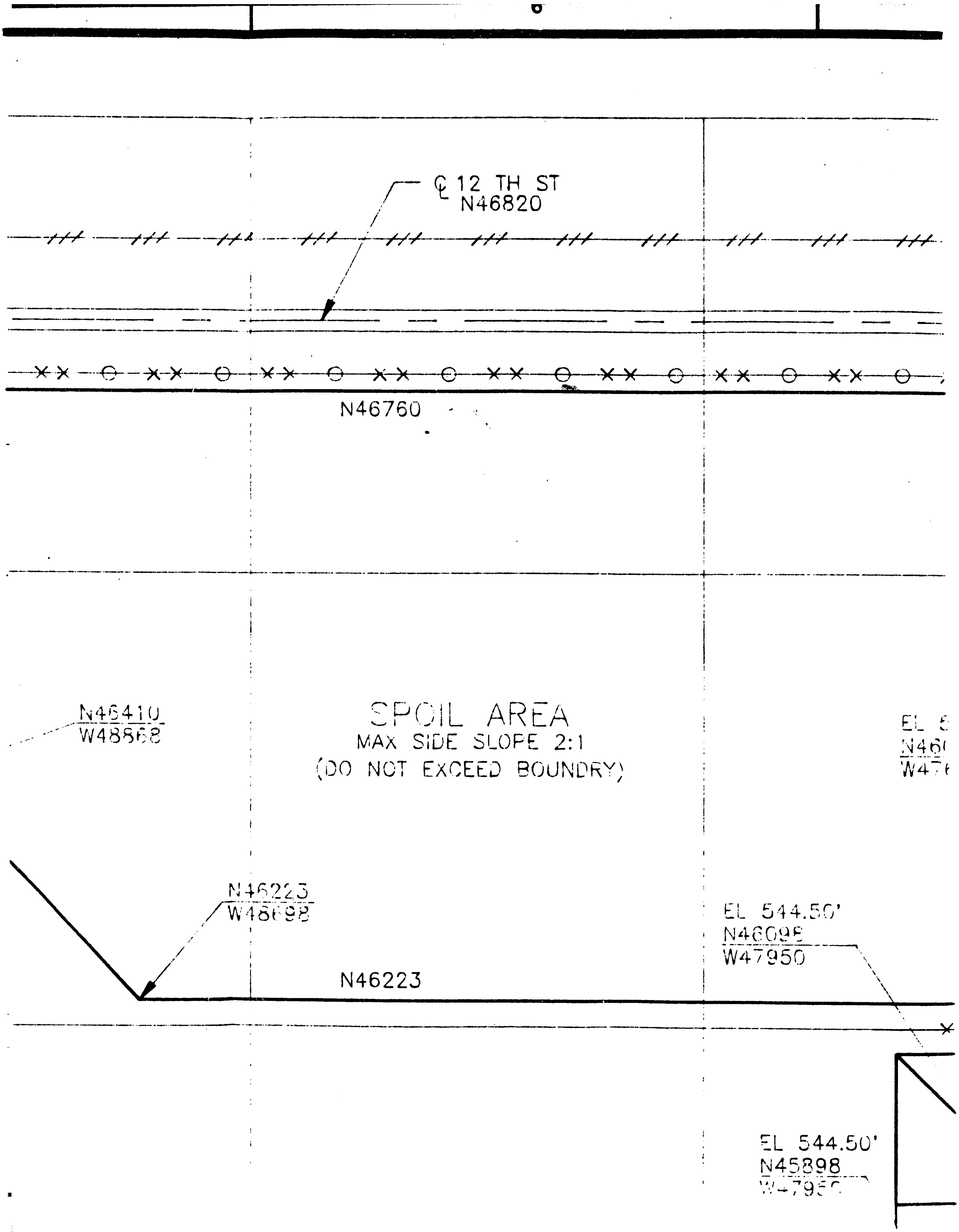
2 CHK PRINT ☐ DATE COMMENT PRINT ☐ DATE 11-27-91 1

DWG NO H-13-000018 SH 1 OF 1 REV 1

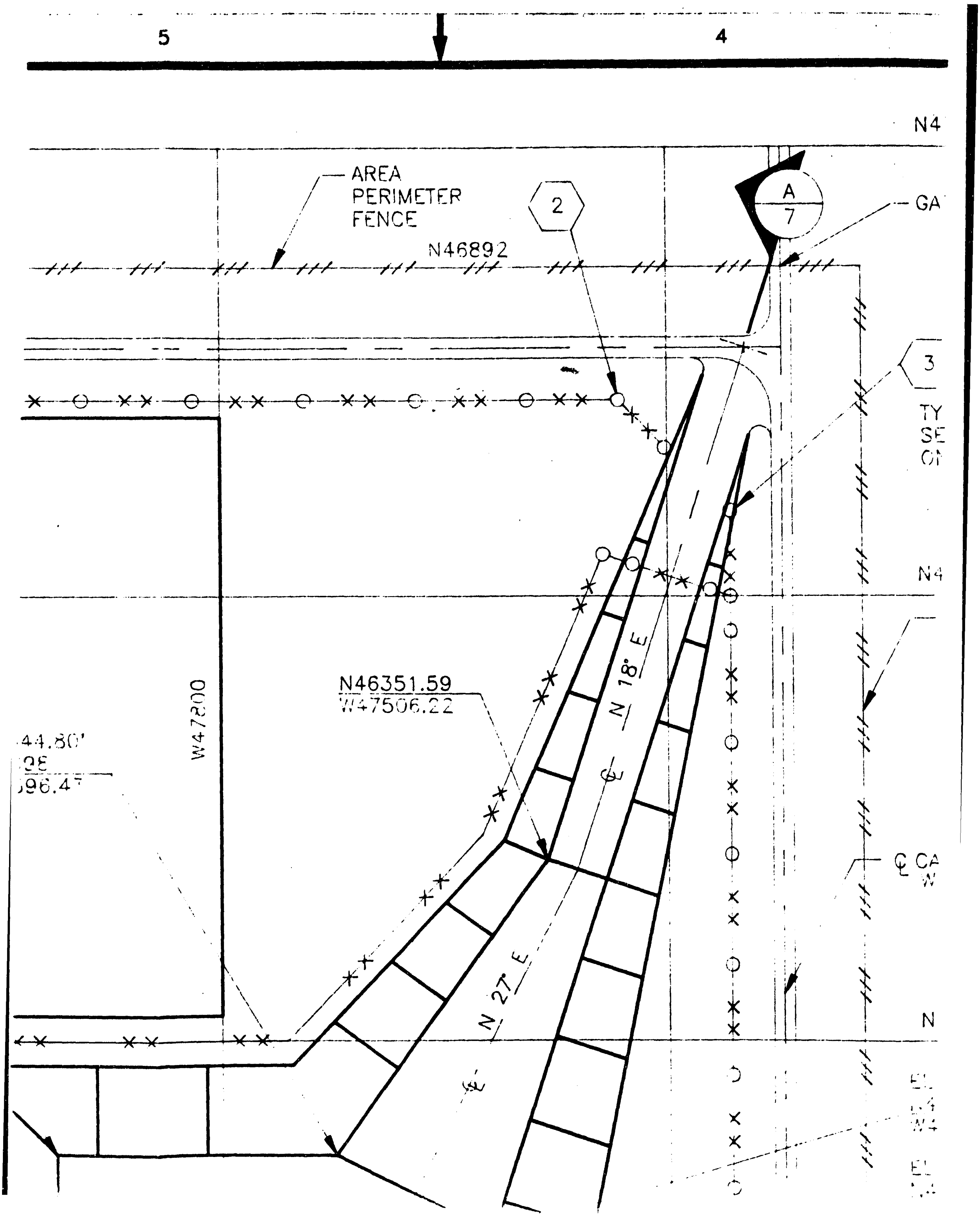
A



F
N
1-A
N46760
W49025
218-E-12B
SEE
H-2-33276
SH-2
E



℄ 12 TH ST
N46820
N46760
N46410
W48868
SPOIL AREA
MAX SIDE SLOPE 2:1
(DO NOT EXCEED BOUNDRY)
N46223
W48698
EL 544.50'
N46095
W47950
N46223
EL 544.50'
N45898



5
4
N4
AREA
PERIMETER
FENCE
2
A
7
GA
N46892
3
TY
SE
N4
N18° E
N46351.59
W47506.22
W47200
44.80'
Ⓒ CA
N 27° E
N

SPECIAL NAVAL DISP

(FOLLOWING NOTES APPLY ONLY TO THIS S

A. THE WASHINGTON STATE DEPARTMENT OF DOCUMENT, M41-10-88, (STANDARD SPE BRIDGE, AND MUNICIPAL CONSTRUCTION) BUILD OR CONSTRUCT ALL ROADWAYS IN

B. TEMPORARY FENCE WITH STEEL POSTS INSTALLED AROUND THE ACTIVE BURIA ACTIVE WORK IS COMPLETED AND BACK GROUND IS STABILIZED WITH PERMANE INSTALLED AROUND THE AREA. THE TE HAVE RADIATION SIGNS PER HPS-AC-3 SPACING.

C. CONSTRUCTION TOLERANCE: EXCAVATIO TOLERANCE OF ± 0.2 FT AND A HORIZO OF ± 1.0 FT. FOUNDATION PLACEMENT TOLERANCE OF ± 0.02 FT AND HAVE A OF ± 0.04 FT.

D. SLOPE 1:1 TRENCH SIDES OR SLOPE AS ANGLE OF REPOSE PER LATEST EXCAVATI STANDARD (REFERENCE CFR TITLE 29 PA HEALTH REGULATION FOR CONSTRUCTION) ENGINEERING MUST BE CONTACTED WHEN 1 1/2:1 ARE NEEDED.

FOUNDATIO			
BURIAL NO.	FOUNDATION DETAIL DWG	NORTH COORDINATE	WEST COOR
1	H-2-96277	N45673.0[illegible]	W474[illegible]
2	H-2-96277	N45720.89	W474[illegible]
3	H-2-96277	N45[illegible]9.9[illegible]	W474[illegible]
4	H-2-96277	N45[illegible]	W474[illegible]

2 | 1

F

E

'AL DISPOSAL NOTES

Y ONLY TO THIS SHEET OF THIS DRAWING)

TE DEPARTMENT OF TRANSPORTATION (WSDOT)
88, (STANDARD SPECIFICATIONS FOR ROAD,
AL CONSTRUCTION) SHALL BE USED TO
ALL ROADWAYS IN ALL OR PART THEREOF.

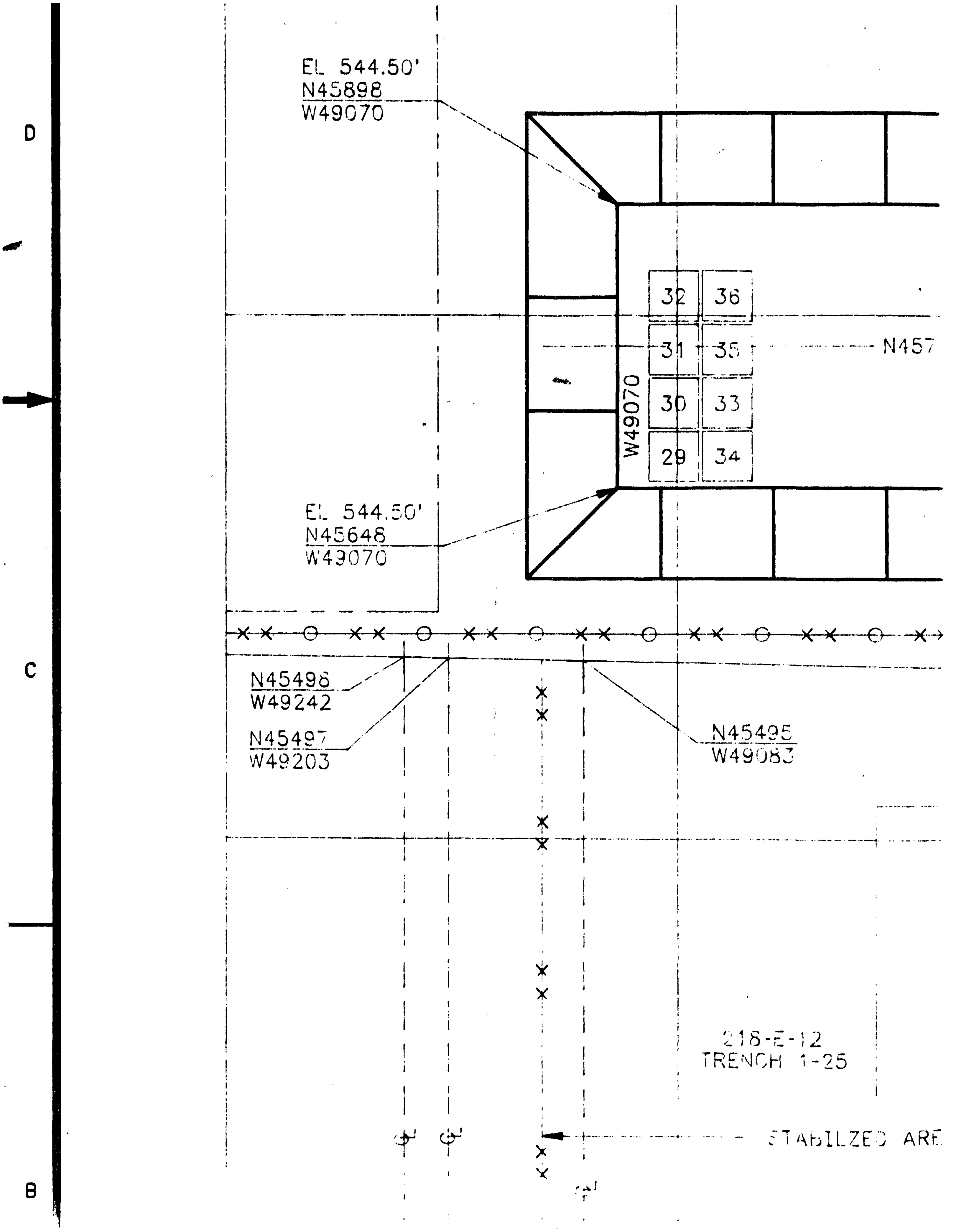
ITH STEEL POSTS AND CHAIN SHALL BE
THE ACTIVE BURIAL SITE UNTIL ALL
MPLETED AND BACKFILLED AND TOP OF
ZED WITH PERMANENT POST AND CHAIN
THE AREA. THE TEMPORARY FENCE SHALL
GNS PER HPS-AC-3-25 AT 100' MAX

RANCE: EXCAVATION SHALL HAVE A VERTICAL
2 FT AND A HORIZONTAL TOLERANCE
ATION PLACEMENT SHALL HAVE VERTICAL
02 FT AND HAVE A HORIZONTAL TOLERANCE

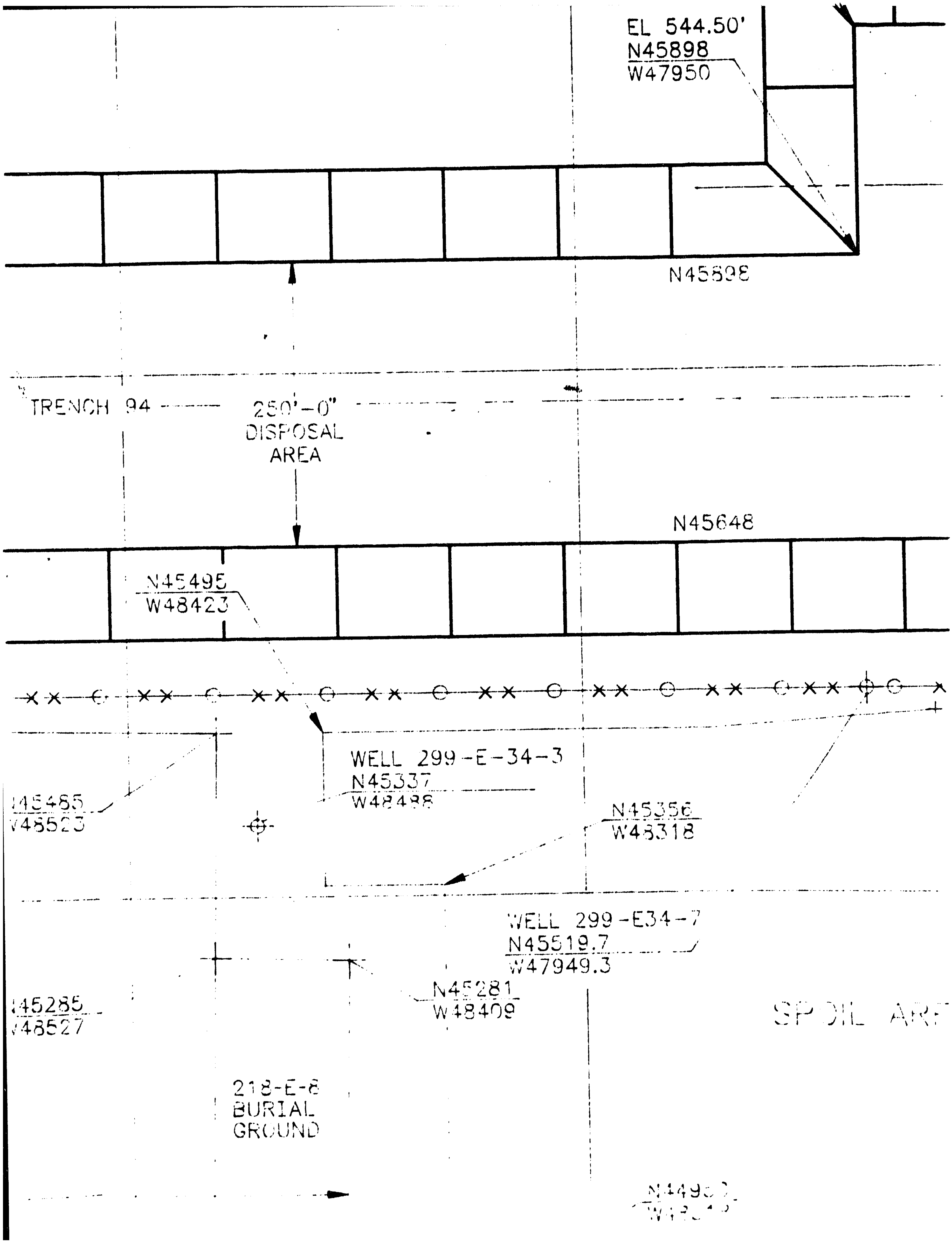
SIDES OR SLOPE AS REQUIRED TO MATCH NATURAL
ER LATEST EXCAVATION, TRENCHING, AND SHORING
E CFR TITLE 29 PART 1926 – SAFETY AND
FOR CONSTRUCTION) SLOPE RANGE 1:1 TO 2:1.
E CONTACTED WHEN SLOPES MORE THAN
.

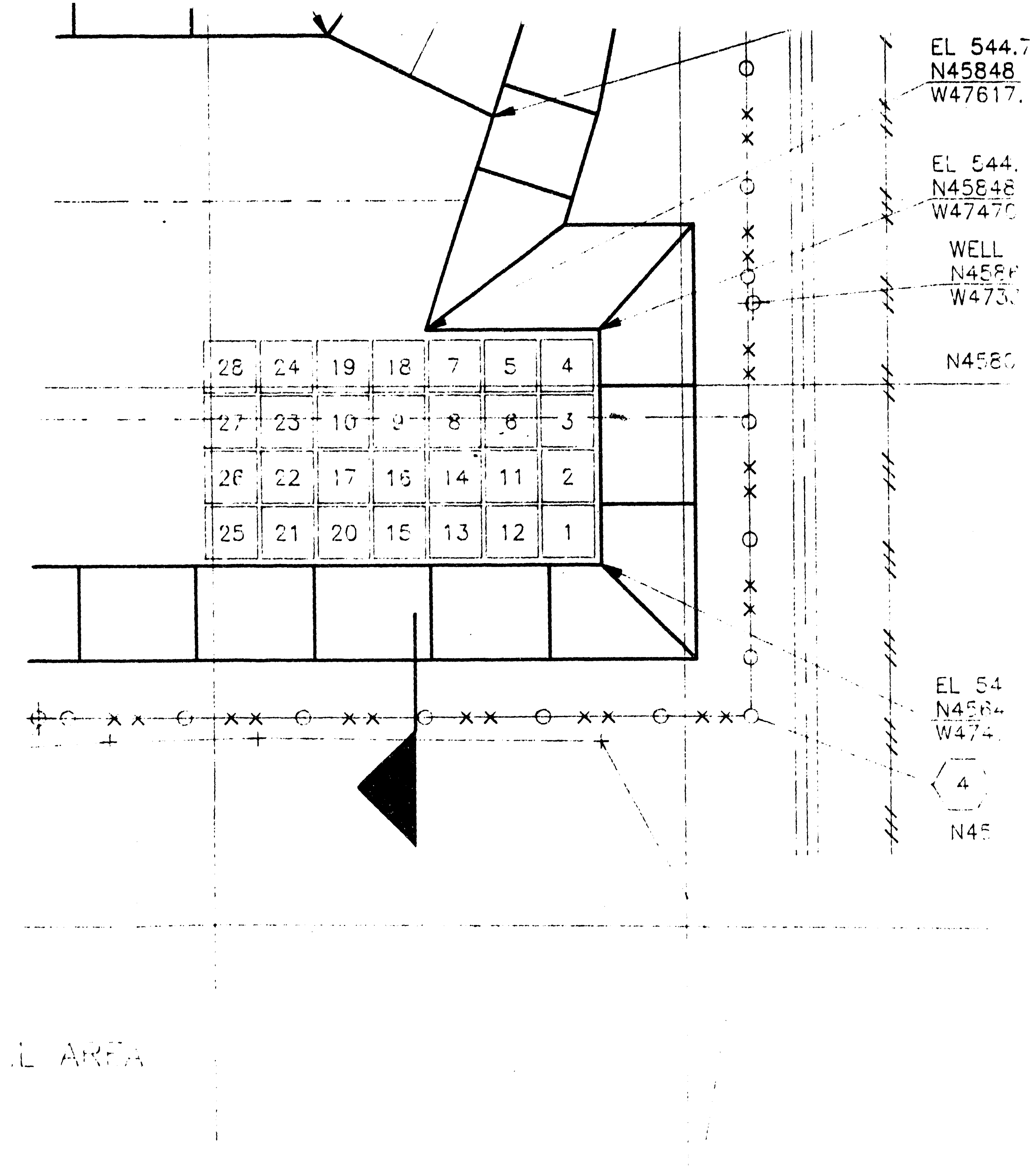
OUNDATION TABLE "A"

TH RDINATE	WEST COORDINATE	T.O.C. ELEV	FDN PLAN NO.	SUBMARINE REACTOR COMPARTMENT
673.00	W47495.00	544.50	A	PATRICK HENRY
720.89	W47495.00	544.50	A	SNOOK
768.89	W47495.00	544.50	A	GEORGE WASHINGTON
[illegible]	W47495.00	544.50	A	SCAMP



D
EL 544.50'
N45898
W49070
32
36
31
35
N457
30
33
29
34
W49070
EL 544.50'
N45648
W49070
C
N45498
W49242
N45497
W49203
N45495
W49083
218-E-12
TRENCH 1-25
STABILZED ARE
B


EL 544.50'
N45898
W47950
N45898
TRENCH 94
250'-0"
DISPOSAL
AREA
N45648
N45495
W48423
WELL 299-E-34-3
N45337
W48488
45485
W48523
N45356
W48318
WELL 299-E34-7
N45519.7
W47949.3
N45281
W48409
45285
48527
SPOIL AR
218-E-8
BURIAL
GROUND



EL 544.7
N45848
W47617.
EL 544.
N45848
W47470
WELL
N458
W473
N4580
EL 54
N4564
W474.
4
N45
28 24 19 18 7 5 4
27 23 10 9 8 6 3
26 22 17 16 14 11 2
25 21 20 15 13 12 1

.L AREA

6	H-2-96277	N45768.86	W47547.04
7	H-2-96277	N45817.0[illegible]	W47601.69
8	H-2-96277	N45768.86	W47604.86
9	H-2-96277	N45765.91	W47652.62
10	H-2-96277	N45768.44	W47700.74
11	H-2-96277	N45720.7[illegible]	W47547.27
12	H-2-96277	N45672.63	W47547.98
13	H-2-96277	N45672.32	W47598.25
14	H-2-96277	N45720.67	W47602.78
15	H-2-96277	N45672.5[illegible]	W47651.15
16	H-2-96277	N45720.61	W47655.71
17	H-2-33276	N45720.6	W47703.4
18	H-2-33276	N45815.24	W47652.45
19	H-2-33276	N458[illegible]6.04	W47700.74
20	H-2-33276	N456[illegible].40	W47698.75
21	H-2-33276	N456[illegible]2.40	W47746.04
22	H-2-33276	N457[illegible].53	W47715.84
23	H-2-33276	N457[illegible]6	W47748.64
24	H-2-33276	N4551[illegible]6	W47748.97
25	H-2-33276	N456[illegible]2.40	W47796.26
26	H-2-33276	N457[illegible].63	W47796.26

768.86	W47547.04	544.50	A	THOMAS JEFFERSON
[illegible]	W47601.69	544.50	A	THEODORE ROOSEVELT
765.86	W47604.36	544.50	A	DACE
765.91	W47652.62	544.50	B	JOHN ADAMS
768.44	W47700.74	544.50	B	ABRAHAM LINCOLN
[illegible]	W47547.27	544.50	A	BARB
672.63	W47547.98	544.50	A	ETHAN ALLEN
[illegible]	W47598.25	544.50	A	THOMAS EDISON
[illegible]	W47602.78	544.50	A	POLLACK
[illegible]	W47651.15	544.50	A	GLENARD LIPSCOMB
[illegible]	W47655.71	544.50	A	JAMES MONROE
[illegible]	W47703.4	544.50	A	SKIPJACK
[illegible]	[illegible]	544.50	B	NATHAN HALE
[illegible]16.94	W47700.74	544.50	B	PLUNGER
[illegible]672.40	W47696.75	544.50	A	SHARK
[illegible]672.40	W47746.94	544.50	A	LAFAYETTE
[illegible]	W47715.84	544.50	A	SAM HOUSTON
[illegible]	W47748.64	544.50	A	JACK
[illegible]	W47748.97	544.50	B	HADDO
[illegible]672.40	[illegible]	544.50	A	TINOSA
[illegible]	[illegible]	544.50	A	GUARDFISH

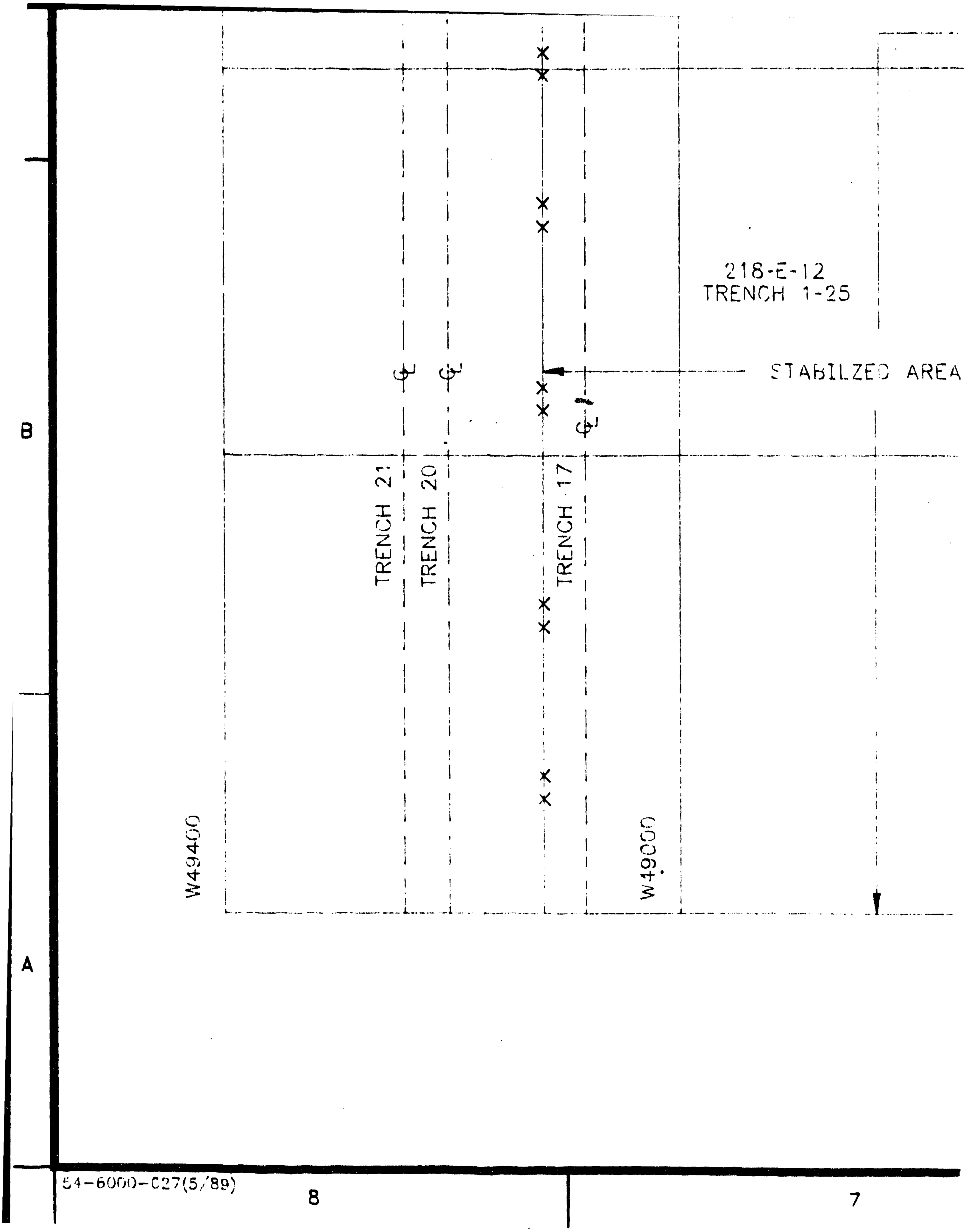
D

C

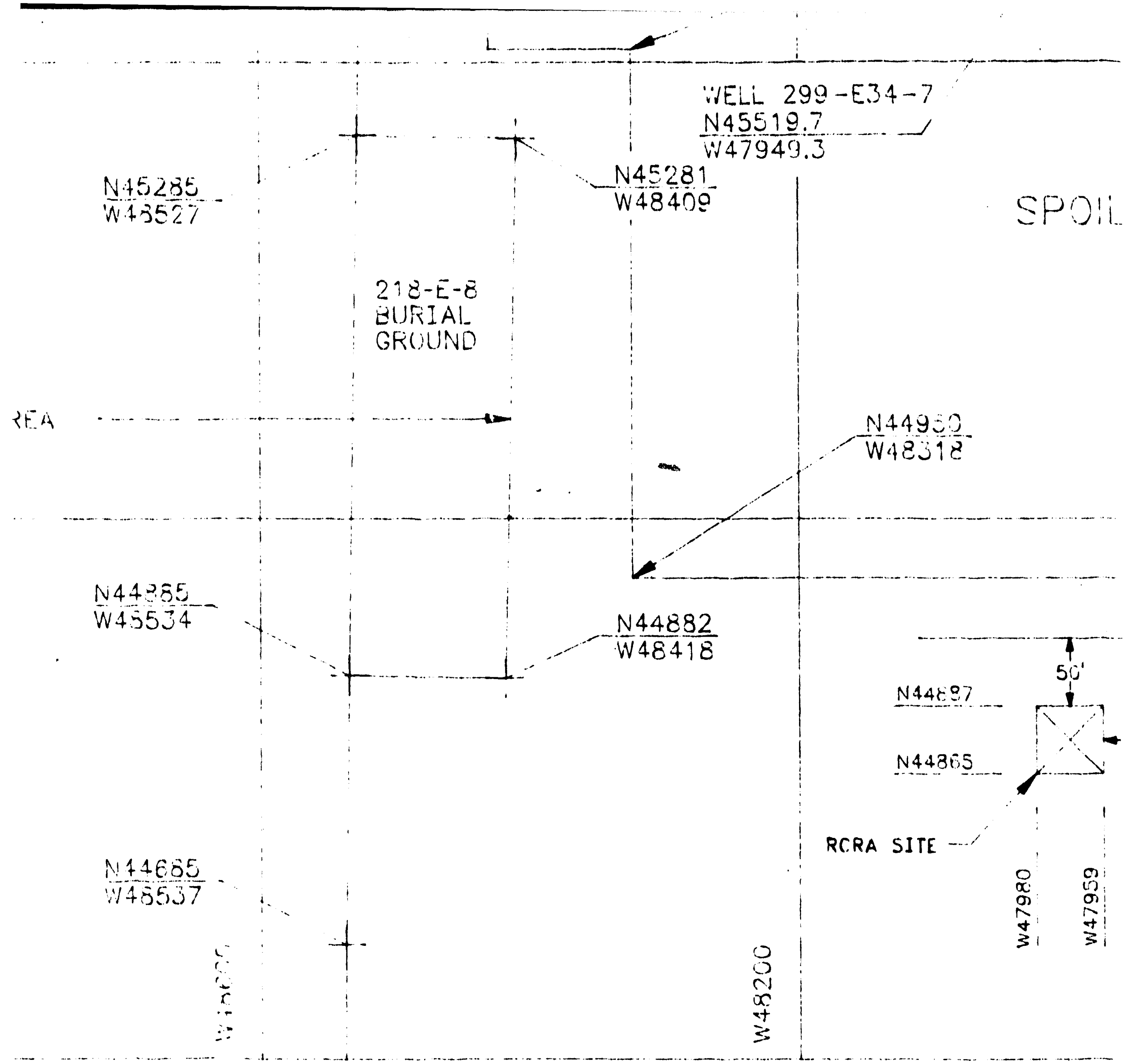
REV 5

SH 6 OF

276

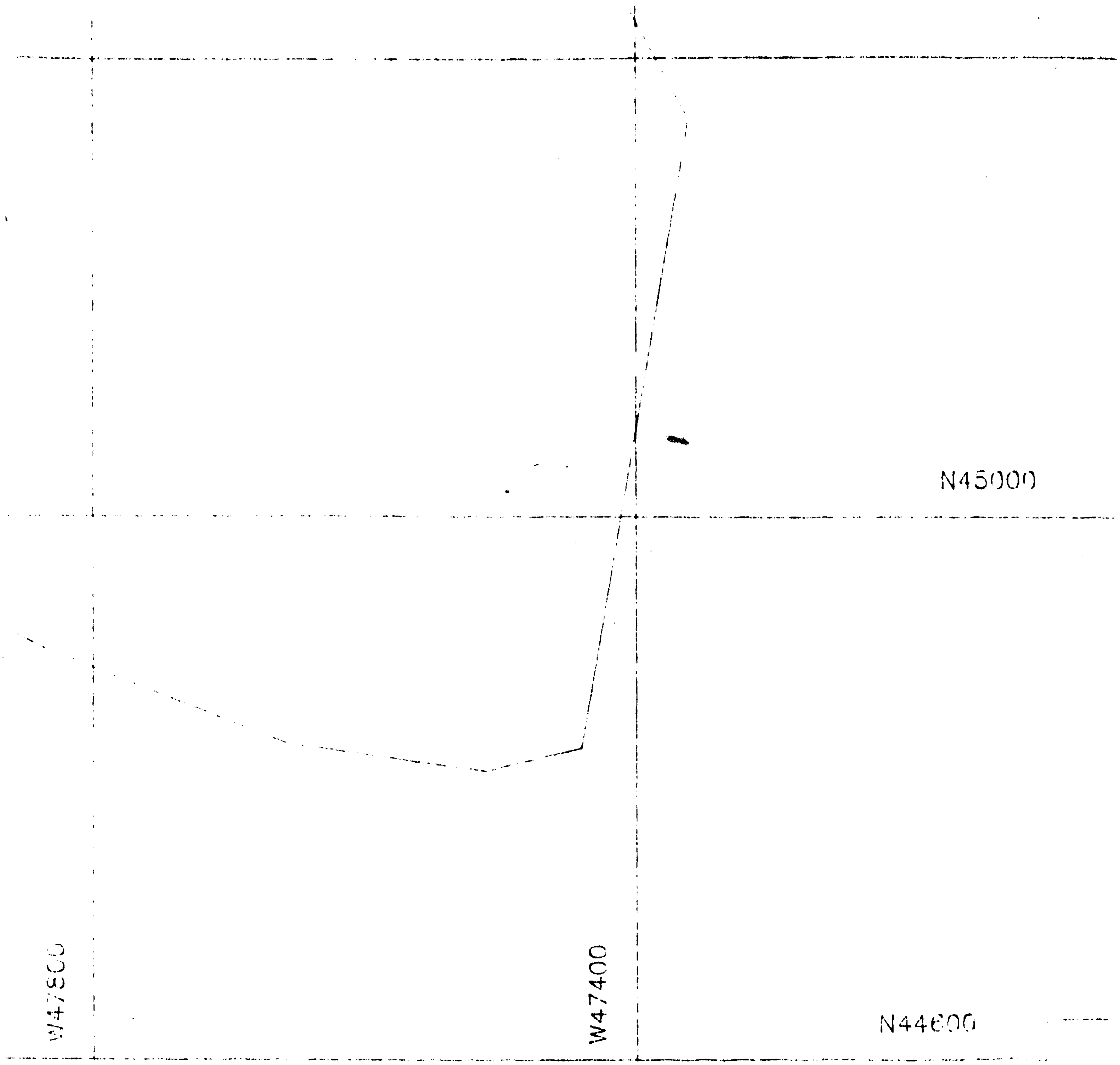


54-6000-027(5/89)



SITE PLAN

SCALE: 1" = 100'-0"



277	PKG FDN PLAN & SECT	WHC-S-0114	EXCAVATION CONSTRUCTION SPEC
251	NAVAL DISPOSAL	REF NUMBER	TITLE
NO	TITLE	REFERENCES	
DRAWING TRACEABILITY LIST		NEXT USED ON	H-2-33276 SH

5 4

19	H-2-33276	N45816.94
20	H-2-33276	N45672.40
21	H-2-33276	N45672.40
22	H-2-33276	N45720.63
23	H-2-33276	N45768.86
24	H-2-33276	N45816.76
25	H-2-33276	N45672.40
26	H-2-33276	N45720.63
27	H-2-33276	N45768.86
28	H-2-33276	N45[illegible].09

(SEE SHEET H-2-33276

000

W475.0

NOTES:

1. FOR FOUNDATION PLANS SEE H-2-33276 SH-

REV/ NO	DESCRIPTION	REV BY DATE	CHK BY DATE	DFTG APVD DATE	COG ENGR	OTHER	OTHER
5	164044,164091,164043,187690 REVISIONS PER ECN'S-187689	BAN 12/93	PCR 1/31/94				MAE 4/9/94

REV/ REL — REVISIONS

CADFILE B033276F — CADCODE DOS:5.0:ACD2:12.0:NN

DRAWN L.
CHECKED G.R.
DFTG APVD
COG ENGR B. F
QA S. DELEON
OTHER H. HUM
OTHER M.M.McC
OTHER S.W. PR
APVD FOR IMPLEMENT
BY FOR

3

2

[illegible]916.04	W47700.74	544.50	B	PLUNGER
[illegible]5672.40	W47698.75	544.50	A	SHARK
[illegible]5672.40	W47746.04	544.50	A	LAFAYETTE
[illegible]5720.68	W47745.64	544.50	A	SAM HOUSTON
[illegible]5768.96	W47748.64	544.50	A	JACK
[illegible]5816.[illegible]	W47[illegible]48.97	544.50	B	HADDO
[illegible]5672.40	W47[illegible]96.26	544.50	A	TINOSA
[illegible]5720.68	W47[illegible]96.26	544.50	A	GUARDFISH
[illegible]5768.96	W47796.26	544.50	A	PERMIT
[illegible]5817.09	W47796.93	544.50	A	QUEENFISH

T H-2-33276 SH-11 FOR CONTINUATION OF TABLE A)

-33276 SH-9 & SH-10.

ECN 121260

DRAWN	L. DAVIES	DATE 1-5-89
CHECKED	G.R.C.	6-15-89
DES APVL		
COG ENGR	R. FOREMBA	6-15-89
QA	S. DELEON	6-15-89
OTHER	H. HUMPHREYS	6-15-89
OTHER	M.M.McCARTHY	6-15-89
OTHER	C.W. PRICE	6-21-89
APVL FOR IMPLEMENTATION		
BY FOR		DATE

U.S. DEPARTMENT OF ENERGY
Richland Operations Office
Westinghouse Hanford Company

DRY WASTE BURIAL GROUND 218-E-12B NAVAL DISPOSAL

SIZE	BLDG NO	INDEX NO	DWG NO	REV
F	218-E-12B	0401	H-2-33276	5

SCALE AS NOTED

SHEET 6 OF

A

CHK PRINT DATE

COMMENT PRINT DATE 5/16/91

2 1

DWG NO H-2-33276 SH 6 OF REV 5

AIIM

Association for Information and Image Management

1100 Wayne Avenue, Suite 1100
Silver Spring, Maryland 20910
301/587-8202

Centimeter

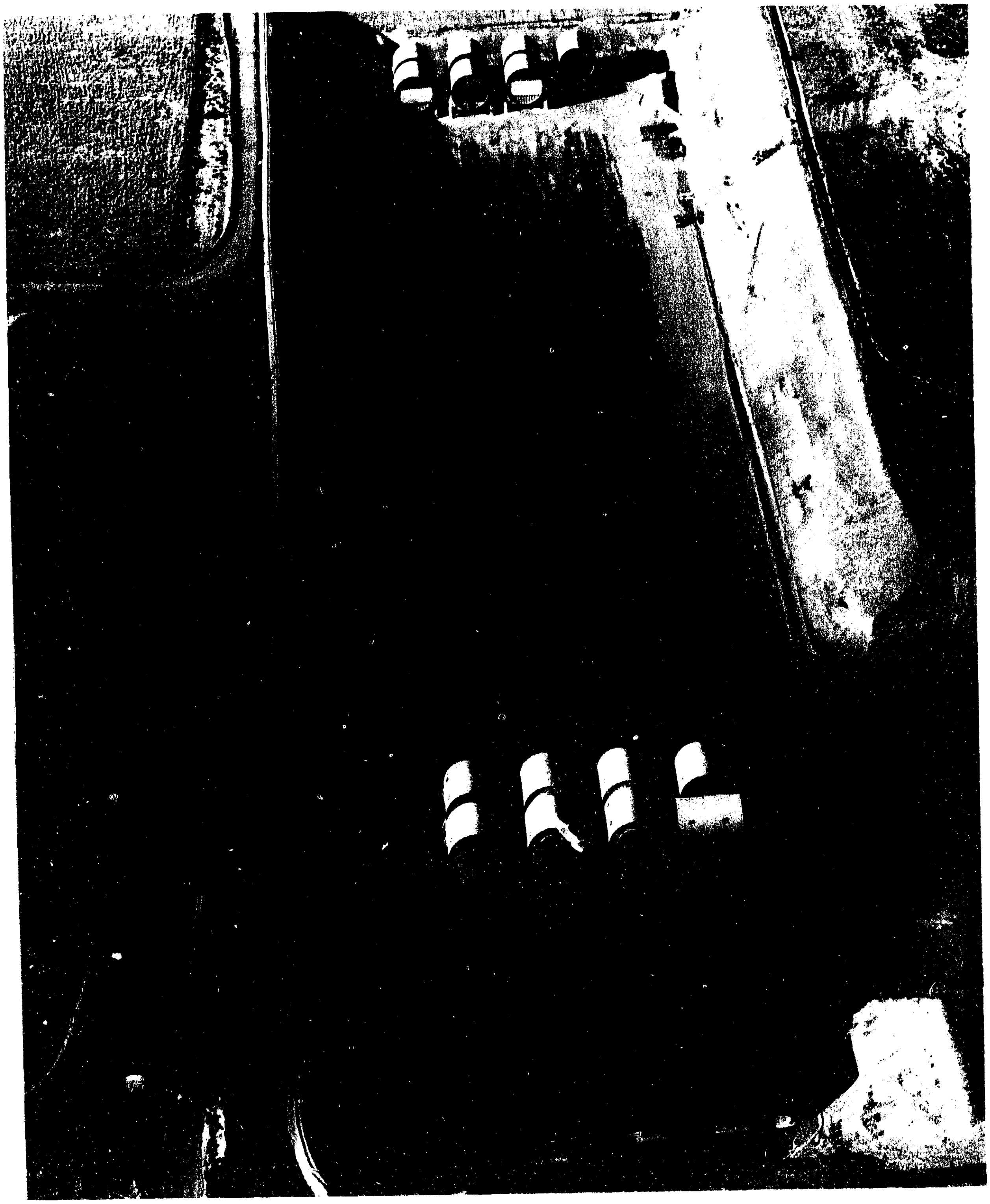
Inches

MANUFACTURED TO AIIM STANDARDS
BY APPLIED IMAGE, INC.

APPENDIX B

SUBMARINE REACTOR COMPARTMENTS IN TRENCH 94

This page intentionally left blank.



Submarine reactor compartments in Trench 94 in October 1993. The submarine reactor compartments are over 5 feet (1.52 meters) above the trench floor. The submarine reactor compartments are approximately 33 feet (10.06 meters) in diameter and 40 feet (12.20 meters) long. The trench is about 50 feet (15.24 meters) deep.

APPENDIX C

CROSS-REFERENCE OF REGULATORY REQUIREMENTS UNDER 40 CFR 761, WAC 173-303, AND 40 CFR 265

This page intentionally left blank.

Cross-Reference of Regulatory Requirements Under 40 CFR 761, WAC 173-303, and 40 CFR 265.
(sheet 1 of 4)

Requirements	40 CFR 761 Citation	WAC 173-303 Citation	40 CFR 265 Citation
Technical Requirements			
• Soils	40 CFR 761.75(b)(1)	No equivalent requirement	No equivalent requirement
• Synthetic membrane liners	40 CFR 761.75(b)(2)	WAC 173-303-665(2)(a)[a]	40 CFR 265.301(a)
• Hydrologic conditions			
- Floodplain	40 CFR 761.75(b)(3)	WAC 173-303-282(6)(c)	No equivalent requirement
- Shoreline	40 CFR 761.75(b)(3)	WAC 173-303-282(6)(c)	No equivalent requirement
- Groundwater recharge areas	40 CFR 761.75(b)(3)	WAC 173-303-282(6)(c)	No equivalent requirement
- Hydraulic connection with groundwater and surface water	40 CFR 761.75(b)(3)	WAC 173-303-282(6)(c)	No equivalent requirement
- Depth to water table	40 CFR 761.75(b)(3)	WAC 173-303-282(6)(c)	No equivalent requirement
• Flood protection	40 CFR 761.75(b)(4)	WAC 173-303-665(2)(c)[a] -665(2)(d)[a]	40 CFR 265.302(a),(b)
• Topography	40 CFR 761.75(b)(5)	WAC 173-303-282(6)(a)	No equivalent requirement
• Monitoring systems			
- Water sampling	40 CFR 761.75(b)(6)(i)	WAC 173-303-645(8)	40 CFR 265.92
- Groundwater monitor wells	40 CFR 761.75(b)(6)(ii)	WAC 173-303-645(8)	40 CFR 265.91

Cross-Reference of Regulatory Requirements Under 40 CFR 761, WAC 173-303, and 40 CFR 265.
(sheet 2 of 4)

Requirements	40 CFR 761 Citation	WAC 173-303 Citation	40 CFR 265 Citation
- Water analysis	40 CFR 761.75(b)(6)(iii)	WAC 173-303-645(9)	40 CFR 265.92
• Leachate collection	40 CFR 761.75(b)(7)	WAC 173-303-665(2)(a)[a]	40 CFR 265.301(a)
• Landfill operations			
- Container management	40 CFR 761.75(b)(8)(i)	WAC 173-303-630	40 CFR 265.31
- Operation plan	40 CFR 761.75(b)(8)(ii)	Refer to following citations	Refer to following citations
. Recordkeeping	40 CFR 761.75(b)(8)(ii) & (iv) 40 CFR 761.180(d)	WAC 173-303-380 WAC 173-303-665(5)	40 CFR 265.309
		The following citations include parts of operation plan	The following citations include parts of operation plan and recordkeeping
. Surface water handling	40 CFR 761.75(b)(8)(ii)	WAC 173-303-665(2)(c)	40 CFR 265.302
. Excavation and backfilling	40 CFR 761.75(b)(8)(ii)	WAC 173-303-665(2)(f)	40 CFR 265.31
. Waste segregation burial coordinates	40 CFR 761.75(b)(8)(ii) 40 CFR 761.180(d)(2)	WAC 173-303-380(1)(b) WAC 173-303-665(5)	40 CFR 265.309
. Vehicle and equipment movement	40 CFR 761.75(b)(8)(ii)	WAC 173-303-806(4)(a)(x)	40 CFR 265.31
. Use of roadways	40 CFR 761.75(b)(8)(ii)	WAC 173-303-806(4)(a)(x)	40 CFR 265.31
. Leachate collection system	40 CFR 761.75(b)(8)(ii)	WAC 173-303-665(2)[a]	40 CFR 265.31

Cross-Reference of Regulatory Requirements Under 40 CFR 761, WAC 173-303, and 40 CFR 265.
(sheet 3 of 4)

Requirements	40 CFR 761 Citation	WAC 173-303 Citation	40 CFR 265 Citation
. Sampling and monitoring procedures	40 CFR 761.75(b)(8)(ii)	WAC 173-303-300 WAC 173-303-110	40 CFR 265.13
. Environmental emergency	40 CFR 761.75(b)(8)(ii)	WAC 173-303-340	40 CFR 265.31-37
. Security procedures	40 CFR 761.75(b)(8)(ii)	WAC 173-303-310	40 CFR 265.14
. Contingency plan	40 CFR 761.75(b)(8)(ii) 40 CFR 761.125	WAC 173-303-350 WAC 173-303-360 WAC 173-303-145	40 CFR 265.50-56
- Management of ignitable/ incompatible waste	40 CFR 761.75(b)(8)(i) & (iii)	WAC 173-303-665(7)[a]	40 CFR 265.312
• Supporting facilities			
- Fence	40 CFR 761.75(b)(9)(i)	WAC 173-303-310(2)	40 CFR 265.14(b)
- Roads	40 CFR 761.75(b)(9)(ii)	No equivalent requirement	No equivalent requirement
- Safety hazards	40 CFR 761.75(b)(9)(iii)	WAC 173-303-283(3)	No equivalent requirement
Recordkeeping Requirements			
. Manifest and certificates of disposal	40 CFR 761.180(b)(1)	WAC 173-303-370(2)(e)	40 CFR 265.71(a)(5)
. Annual document log	40 CFR 761.180(b)(2)	WAC 173-303-380(1)	40 CFR 265.73
. Annual report	40 CFR 761.180(b)(3)	WAC 173-303-390(2)	40 CFR 265.75
. Water analyses	40 CFR 761.180(d)(1)	WAC 173-303-380(1)(f)	40 CFR 265.73(b)(6)

9406Ø4.1951

Cross-Reference of Regulatory Requirements Under 40 CFR 761, WAC 173-303, and 40 CFR 265.
(sheet 4 of 4)

Requirements	40 CFR 761 Citation	WAC 173-303 Citation	40 CFR 265 Citation
. Waste burial coordinates	40 CFR 761.180(d)(2)	WAC 173-303-665(5)[a] WAC 173-303-380(1)(b)	40 CFR 265.309
. Documents, data, correspondence pertaining to PCB disposal	40 CFR 761.180(f)	No equivalent requirement	No equivalent requirement

[a] WAC 173-303-665 standards are final landfill standards that are not applicable to interim status facilities. During interim status, the equivalent requirements set forth in 40 CFR 265 are applicable as required by WAC 173-303-400(3)(a).

APPENDIX D

LOW-LEVEL BURIAL GROUNDS RECORDKEEPING

APPENDIX D

CONTENTS

D.0 RECORDKEEPING . . . . APP D-1

D.1 OPERATING RECORDS . . . . APP D-1

D.2 WASTE DESCRIPTION AND QUANTITY . . . . APP D-1

D.3 WASTE LOCATION . . . . APP D-1

D.4 WASTE ANALYSIS RECORDS . . . . APP D-1

D.5 CONTINGENCY PLAN INCIDENT RECORDS . . . . APP D-2

D.6 INSPECTION RECORDS . . . . APP D-2

D.7 GROUNDWATER MONITORING RECORDS . . . . APP D-2
D.7.1 DETECTION MONITORING RECORDS . . . . APP D-2
D.7.2 COMPLIANCE MONITORING PROGRAM . . . . APP D-2
D.7.3 CORRECTIVE ACTION RECORDS . . . . APP D-3

D.0 RECORDKEEPING

D.1 OPERATING RECORDS

Operating records maintained include the following:

- Description and quantity of each dangerous waste received and the method(s) and date(s) of disposal at the Low-Level Burial Grounds (LLBG) in accordance with 40 CFR 265.73 and WAC 173-303-380
- Location of each dangerous waste stored within the LLBG and the quantity at each location
- Waste analyses results
- Contingency plan incident notifications
- Inspection records
- Groundwater monitoring data.

D.2 WASTE DESCRIPTION AND QUANTITY

The description and quantity of each waste container disposed of in the LLBG will be maintained in LLBG records. Offsite waste manifest records and onsite waste tracking forms describing the types and quantities of waste are maintained as part of the operating record.

D.3 WASTE LOCATION

The location of each mixed waste container disposed of within the LLBG is documented and maintained. Cross-references to the offsite manifests and onsite waste tracking forms are maintained so that the location of the waste package and its contents is readily available in the event of an emergency.

D.4 WASTE ANALYSIS RECORDS

Waste analysis records are developed by the offsite generator and onsite generating unit and will be maintained by the offsite generator and onsite generating unit for a minimum of 5 years after the waste is transferred onsite or offsite [WAC 173-303-210(3)]. Waste analysis records necessary for the treatment, storage, and/or disposal of the waste will be maintained until closure of the LLBG [WAC 173-303-380(1)(c)].

D.5 CONTINGENCY PLAN INCIDENT RECORDS

Records documenting the details of any incidents requiring the implementation of the contingency plan, described in Chapter 5.0, Section 5.10, are maintained as part of the LLBG operating record as required by 40 CFR 265.73 and WAC 173-303-380. In addition to these reports, occurrence notification reports are generated to document incidents. The occurrence notification reports describe all incidents, including those that are judged too minor to require the implementation of the contingency plan.

D.6 INSPECTION RECORDS

Records of the LLBG general inspections are maintained for a period of at least 5 years from the inspection date. The records include the following:

- Date and time of inspection
- Inspector's printed name and handwritten signature
- Notations of observations
- Date and nature of any repairs or other remedial actions.

D.7 GROUNDWATER MONITORING RECORDS

Groundwater monitoring records include records for a detection monitoring program and, if applicable, a compliance monitoring and corrective action program.

D.7.1 DETECTION MONITORING RECORDS

In a detection monitoring program, groundwater quality is determined semiannually at each compliance point monitoring well location. Also, groundwater flow rate and direction are determined annually for the uppermost aquifer. Statistical procedures are employed to determine if concentrations have significantly increased above background levels for any of the indicator parameters. In addition, records of monitoring activities undertaken as a result of a determination of a statistically significant increase are maintained as part of the operating record. These data are maintained for the life of the LLBG.

D.7.2 COMPLIANCE MONITORING PROGRAM

If it becomes necessary to implement a compliance monitoring or corrective-action program, the records of those programs will be maintained likewise for the life of the LLBG.

D.7.3 CORRECTIVE ACTION RECORDS

If a corrective-action program is implemented, records documenting the program will be maintained for the life of the LLBG.

This page intentionally left blank.

APPENDIX E

CALCULATION OF RUN-OFF AND/OR RUN-ON FROM 24-HOUR, 25-YEAR STORM

This page intentionally left blank.

940604.1951

APPENDIX E

CALCULATION OF RUN-OFF AND/OR RUN-ON FROM 24-HOUR, 25-YEAR STORM

The run-off and/or run-on resulting from a 24-hour, 25-year storm was determined using the Soil Conservation Service curve method (U.S. Bureau of Reclamation 1977, pp. 527 through 544). To use this method, it was assumed that the soils in the vicinity of Trench 94 are from soil hydrologic group B (i.e., soils with moderate infiltration rates). This assumption should be conservative given the porous nature of the sandy gravels at the surface near Trench 94. The surface cover was assumed to be sage-grass ground cover in fair condition. This combination of soil group and surface condition yields a run-off curve number of 46. The curve number of 46 was then used to determine the initial abstraction (Ia), which represents the amount of rainfall that occurs before run-off starts. For a curve number of 46, the value of I_a is 2.4 inches (6.10 centimeters). That is, there will be no run-off for precipitation less than 2.4 inches (6.10 centimeters).

Precipitation data were obtained from the U.S. Weather Bureau *Rainfall Frequency Atlas of the United States* (U.S. Weather Bureau 1961, p. 101). The 24-hour, 25-year storm for the Hanford Site is 1.5 inches (3.81 centimeters). Because the 24-hour, 25-year storm is less than 2.4 inches (6.10 centimeters), no run-off is expected from this storm.

REFERENCES

U.S. Bureau of Reclamation, 1977, *Design of Small Dams*, U.S. Government Printing Office, Washington, D.C.

U.S. Weather Bureau, 1961, *Rainfall Frequency Atlas of the United States*, Technical Paper No. 40, U.S. Government Printing Office, Washington, D.C.

This page intentionally left blank.

APPENDIX F

ENGINEERING REPORT OF LIQUID REMOVAL FROM SUBMARINE REACTOR COMPARTMENT DISPOSAL PACKAGES

940604.1951

This page intentionally left blank.

ENGINEERING REPORT

OF

LIQUID REMOVAL

FROM

SUBMARINE REACTOR COMPARTMENT DISPOSAL PACKAGES

PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON

12 DECEMBER, 1990

EXECUTIVE SUMMARY

In the Spring of 1989, water was found in the bilge areas of submarine reactor compartment disposal packages while performing PCB removal work on the packages already shipped by the Navy to the Department of Energy burial grounds at Hanford, Washington. The existence of liquid in the bilges indicated that the Navy was not adequately draining liquids and that action was needed to improve the drain procedures to assure liquid is removed from the packages to the maximum extent practical. The governing criteria for determining the practicality of removing liquids from the packages was keeping personnel radiation exposure As Low As Reasonably Achievable (ALARA), and assuring that residual liquid in the disposal packages is not itself a hazardous material and that its presence does not pose an environmental risk. The volume of radioactive waste generated from liquid removal work, other risks to personnel accomplishing liquid removal, and the cost impact of further liquid removal were also considered. This report demonstrates that improved procedures have been developed which assure that less than 230 gallons, of the over 16,000 gallons that were in the disposal package's systems and tanks initially, remain in the packages for burial. Corrective actions have been initiated to drain the packages at Hanford to less than 230 gallons, and all future submarine packages to be disposed of at Trench 94 will similarly be drained to less than 230 gallons of residual liquid using these procedures.

The improved drain procedures remove essentially all liquid from non-radioactive piping, tanks, and structural void spaces. The procedures specify cutting or drilling to remove the non-radioactive water, where normal system drains are not installed. The radioactive systems are drained using the piping normal drain points, but are not cut or drilled to remove liquid from points not equipped with drains. About 3 rem is required to drain the package to less than 230 gallons of residual liquid. The report evaluates the location of the remaining liquid and the work that would be required to remove it. The evaluation shows that excessive personnel radiation exposure would be required to drain additional radioactive water, with up to 68 rem estimated to completely remove all liquid from a package. Additionally, complete liquid removal would generate several hundred cubic feet of unnecessary radioactive waste, would require working with asbestos, and would add over 5 million dollars to the cost to prepare each package.

Our calculations show that draining to less than 230 gallons removes over 98.5% of the liquid originally present. As the entire disposal package is considered waste, the 230 gallons of residual liquid constitutes less than 0.1% of the 2,000,000 pound weight of the waste, and only 0.12% of a typical 26,000 cubic foot package volume. With the exception of a few gallons of non-radioactive liquid, the residual liquid is radioactive water which is widely distributed throughout the disposal

package. This liquid is non-hazardous and is sealed within welded piping systems. These systems are in turn contained within the strong welded package containment boundary which is pressure tested after it is welded to ensure its integrity. Even if this liquid were to eventually reach the soil, the report shows that there is no identifiable risk to the environment. Since it is generally recognized that exposure to ionizing radiation should only be accepted in return for a greater societal benefit, the report concludes that removal of the remaining liquid is not justified, and indeed would not be in keeping with the Federal requirement for employers to keep radiation exposure as low as reasonably achievable (ALARA).

TABLE OF CONTENTS

	PAGE
PURPOSE	1
BACKGROUND	1
DESCRIPTION OF A SUBMARINE REACTOR PLANT	1
PREPARATION OF A REACTOR COMPARTMENT DISPOSAL PACKAGE FOR SHIPMENT AND BURIAL	2
REMOVAL OF LIQUIDS FROM THE DISPOSAL PACKAGES	3
ENGINEERING REVIEW AND IMPROVED PROCEDURES	5
CURRENT APPROACH TO DRAINING SUBMARINE REACTOR COMPARTMENTS	7
LOCATION AND QUANTITY OF LIQUID REMAINING IN THE PACKAGE AFTER DRAINING	8
CHEMICAL ANALYSIS OF LIQUID REMAINING IN THE REACTOR PLANT	10
POTENTIAL ENVIRONMENTAL CONSEQUENCES OF LEAVING A SMALL AMOUNT OF LIQUID IN THE DISPOSAL PACKAGES	11
PRACTICALITY OF REMOVAL OF ALL LIQUID FROM THE REACTOR COMPARTMENT DISPOSAL PACKAGES	13
TOTAL LIQUID REMOVAL	15
REASONS WHY REMOVAL OF ALL LIQUID IS UNREASONABLE	17
CONCLUSION	18
CURRENT STATUS OF LIQUID REMOVAL OPERATIONS	19

FIGURES

FIGURE I — SUBMARINE REACTOR COMPARTMENT DISPOSAL PACKAGE

FIGURE II.A — SUBMARINE SHOWING REACTOR COMPARTMENT

FIGURE II.B — SUBMARINE SHOWING REACTOR COMPARTMENT REMOVED

FIGURE III — TYPICAL REACTOR PLANT SYSTEMS SHOWING DRAIN PATHS AND RESIDUAL VOLUMES

TABLES

TABLE I — ESTIMATED QUANTITY OF LIQUID REMAINING IN VARIOUS DISPOSAL PACKAGES

TABLE II — ACTIONS REQUIRED TO REMOVE ADDITIONAL LIQUIDS FROM DISPOSAL PACKAGE

ENCLOSURE

(1) Meetings Related to Residual Liquid in Disposal Packages

ENGINEERING REPORT OF LIQUID REMOVAL FROM SUBMARINE REACTOR COMPARTMENT DISPOSAL PACKAGES

Purpose The purpose of this report is to show that liquids are being removed from submarine reactor compartment disposal packages to the maximum extent practical, and that further removal of the small amount of liquid remaining in the packages would result in excessive personnel radiation exposure. Keeping personnel radiation exposure As Low As Reasonably Achievable (ALARA), and assuring that residual liquid in the disposal packages is not itself a hazardous material and that its presence does not pose an environmental risk, were the governing criteria in developing the conclusions of this report. The report also considers the volume of radioactive waste generated from liquid removal work, other risks to personnel accomplishing liquid removal, and the cost impact of further liquid removal.

Background. In 1984 the Navy published an Environmental Impact Statement on the Disposal of Decommissioned, Defueled Naval Submarine Reactor Plants, with land burial at existing Federal sites being the preferred alternative. The Environmental Impact Statement conclusively demonstrated that permanent disposal could be conducted in an environmentally safe manner, and that the "no action" alternative would only delay the decision for permanent disposal and would result in increased costs without significantly changing the environmental impact.

Since 1986, Puget Sound Naval Shipyard has been shipping decommissioned, defueled submarine reactor plants to the Department of Energy site at Hanford, Washington for burial. To date 14 reactor plants have been shipped; the first in 1986, one in 1987, two in 1988, four in 1989, and six in 1990. Six more reactor plants are being prepared for shipment in 1991.

Description of a Submarine Reactor Plant

The type of reactor plant used in nuclear submarines is a pressurized water reactor. This means that water under pressure is the medium used to moderate the nuclear reaction, cool the reactor, and transfer heat to the steam generators (which boil water in a separate system into steam to drive the ship's turbines).

The central component of a submarine reactor plant is a large alloy steel pressure vessel, called the reactor vessel, that holds the nuclear fuel. The reactor vessel itself is surrounded by another large carbon steel tank filled with liquid called the primary shield water tank; the purpose of the primary shield water tank is to provide radiation shielding during reactor operation. There are a total of 17 piping systems that conn... directly to the reactor, or indirectly support the reactor. A "system" is a collection of pipes, valves, pumps, and gages that perform a distinct function associated with reactor operation. For example, in the "main coolant system" pressurized water is pumped through large pipes to cool the reactor and transfer heat to the steam generators as shown in Figure I. Other piping systems are used to add water to the reactor, to discharge water from the reactor, and to sample the water for chemical analysis. Water is also piped through a vessel called the ion exchanger to remove radioactivity from the water and through several heat exchangers to cool the water. Ten of the 17 reactor plant piping systems contain radiologically contaminated fluid.

The majority of the reactor plant systems are contained within a section of the submarine called the reactor compartment. Figure II.a shows the location of the reactor compartment. The reactor compartment contains shielding for personnel radiation protection during reactor operation. This shielding includes over 100 tons of lead which is permanently built into the structure of the reactor compartment. The fore and aft bulkheads of the reactor compartment contain lead shielding.

In a submarine there are also a number of piping systems that support other ship functions. The piping of many of these systems runs through the reactor compartment, or are adjacent to the reactor compartment. For example, portions of steering and diving hydraulic systems, chill water systems for the air cooling coils, and diesel exhaust systems are non–reactor plant systems running through or adjacent to the reactor compartment bulkheads. In total there are typically 30 to 40 non–reactor plant pipes that are included in the reactor compartment disposal package.

<u>Preparation of a Reactor Compartment Disposal Package for Shipment and Burial</u>. Submarine reactor plants are not disassembled for disposal. The Navy's Environmental Impact Statement discussed alternatives for disposal of the submarine reactor plants. The option of dismantling the plant and packaging the components into steel containers was eliminated from consideration because of excessive personnel radiation exposure, cost, and the need for specialized facilities to accomplish the work. Although not identical in design to the submarine reactor plant , total reactor plant disassembly for other reactors has also been considered and determined to result in higher personnel radiation exposure. Specifically, Nuclear Regulation NUREG/CR-0130, written by Battelle Pacific Northwest Laboratory and published by the US Nuclear Regulatory Commission in June 1978 estimated that 1200 rem of radiation exposure would be required for dismantlement of a large commercial nuclear reactor plant immediately following decommissioning. In another example, the one piece disposal of the Shippingport Atomic Power Station's reactor vessel and shield tank saved 150 rem of the exposure that would have been required to cut the vessel and tank into segments for packaging and disposal (source: American Nuclear Society Transactions, 56, 72-81, 1988. Shippingport Station Decommissioning Project).

The Navy's EIS identified that the existing ship's high strength pressure hull and bulkhead structure comprising the reactor compartment, would provide the strong tight "container" required for transportation and land burial of the reactor plant. This structure, with its HY-80 alloy hull which is designed to withstand submarine submergence, meets the requirements for a Type B container for transporting radioactive material, and significantly exceeds the design criteria of burial containers normally used to dispose of low level radioactive or hazardous waste.

The first step in disposal of a submarine reactor is to defuel the reactor by removing all the nuclear fuel cells from the reactor vessel. Defueling of a submarine is a complex process that takes several months and several million dollars to accomplish. As part of defueling/inactivation operations, most of the liquid is removed from the reactor plant piping systems. After defueling, a number of actions are then required to prepare the reactor compartment disposal package for shipment and burial.

The entire section of the submarine containing the reactor plant and its associated systems is cut out of the ship and moved on high capacity rollers to one side for preparation for shipment. Figure II.b shows the section of the submarine that is removed. Heavy shipyard fabricated steel bulkheads are then welded on the ends of the package as shown in Figure I. These bulkheads are 3/4 inch thick. As can be seen in Figure I, the reactor plant is now contained within the existing ship's reactor compartment bulkheads, the ship's HY–80 steel pressure hull, and the new 3/4–inch bulkheads added on the end of the package. When prepared for shipment the disposal package meets all U.S. Department of Transportation regulations for shipment of low level radioactive waste on both land and water, including the hypothetical accidents described in the Federal regulations.

The radioactive liquid in the disposal packages is contained in welded piping systems (although a few of the components in these systems have mechanical seals such as valve stem packing). Nearly all of the connections joining pipes and components in these systems are welded joints and not mechanical joints. These welded joints are subject to rigorous nondestructive testing. Typically, the root layer weld in reactor plant piping systems is visually inspected and liquid penetrant inspected for cracks, and the final weld is visually inspected, liquid penetrant inspected and radiographed (x–rayed). Following construction, the systems are hydrostatically tested to verify their integrity. The few mechanical seals present in systems containing radioactive liquid are proven designs and are also subjected to visual inspections and hydrostatic testing to verify their integrity. When the reactor compartment disposal package is prepared for shipment, after radioactively contaminated water has been removed, all reactor plant contaminated piping system open ends are sealed by welding or brazing using pipe caps or corrosion resistant steel plugs.

The result of the above actions is that by design there are two welded barriers between any unabsorbed residual radioactive liquid in the disposal package and the environment (i.e., the welded piping system and the disposal package outer bulkheads).

In addition to defueling and draining the reactor plant, there are a number of other actions taken to prepare the package for burial. The non–reactor plant systems are totally drained (only liquid clinging to pipe walls remains). A hazardous material review is accomplished. With the exception of lead (primarily over 100 tons of shielding) and solid materials with low levels of PCBs (e.g. thermal insulation, electrical cable, and rubber items), hazardous materials are either removed or verified to be within the applicable regulatory limits of the Washington Administrative Code (WAC 173-303), the Resource Conservation and Recovery Act (RCRA), and the Toxic Substances Control Act (TSCA). Sound damping felt material which contains high levels of PCBs is removed from machinery foundations, bulkheads and the inner hull of the submarine. The lead meets the macroencapsulation treatment standard of the hazardous and solid waste amendments (HSWA) to RCRA by being fully contained within the welded steel structure of the disposal package hull and bulkheads. After all these preparations are complete, the personnel entry points into the package are welded shut, the package is air pressure tested to verify integrity, and radiation surveys are accomplished to ensure radiation levels meet shipment requirements. Where it is necessary to re-enter the package after air testing, the access plating is rewelded and the integrity of the welds verified by repeating the air test or by other non-destructive testing methods.

Removal of Liquids From the Disposal Packages

As discussed above, the procedure the Navy has used to prepare the reactor compartments for shipment have always included provisions for removing residual liquid from the packages. However, in the spring of 1990 while the Shipyard was performing PCB removal work on previous packages shipped to Hanford, liquid was discovered in the bilges of some packages (the bilges in a ship are low points in the ship's hull specifically designed to collect drain water during normal ship operations). The initial determination was that the liquid in the bilges resulted from several possible sources, including water sprayed for cleaning and fire protection during the work at the Shipyard, liquid leaking from unsealed non–contaminated systems during shipment, and evaporation/condensation cycles at Hanford. None of the liquid found in the bilges was from the sealed reactor plant systems. In addition to finding liquid in the bilges, liquid was also discovered in two non–reactor plant system tanks.

The existence of liquid in the bilges indicated that the Navy was not adequately draining liquids from the disposal packages prior to shipment. Liquid in the bilges was of particular concern since there was up to 140 gallons found in some packages and there was only one containment boundary between this liquid and the environment.

Following discovery of the liquid in the bilges, the regulatory agencies were orally notified of the liquids by the Department of Energy, Richland Operations (DOE–RL) on 9 July 1990. The presence of liquid, the circumstances causing it, the actions to deal with it, and the regulatory implications were subsequently delineated in correspondence between the Navy and DOE–RL (copies of the letters were provided to the regulating agencies by DOE–RL). This issue was further discussed in conference calls between the Navy and DOE–RL, and was the focus of several meetings attended by the Navy, DOE–RL, the Environmental Protection Agency (EPA), and the State of Washington Department of Ecology during the month of August 1990. These meetings were conducted for the purpose of assuring there were no misunderstandings or regulatory problems with the course of action the Shipyard was pursuing to resolve the issue of liquid in the packages. A summary of the key meetings is attached as enclosure (1) to this report.

Engineering Review and Improved Procedures.

In parallel with the above discussed meetings, the Shipyard embarked on a significant effort to review its procedures for removing liquids from the disposal packages. The conclusion of this review was that the existing procedures were in some cases not sufficient for preparing the reactor compartment packages for disposal. The procedures used for package preparation were based on drain procedures for normal maintenance and were not designed specifically for preparing the reactor compartment for disposal. They did not recognize that in some cases drain procedures sequenced operations in such a manner that water entered previously drained areas. Some procedures relied upon tradesmen to follow general guidelines to drain from low points, cutting or drilling as necessary, rather than using system specific instructions. This resulted in some systems not being effectively drained. The documentation of what draining had been performed, also was insufficient. Finally, it was not possible to determine from these procedures what quantity of liquid remained in the disposal packages.

Action was immediately initiated to develop improved disposal package drain procedures, and to develop a method of accounting for all potential remaining liquid in the packages. The goal in this development was to be able to demonstrate that liquids were removed from the packages to the maximum extent practical, with all but a very small amount of the remaining liquid contained within sealed piping systems and components. The improved procedures were designed to be specific for each system, and to include certification signatures verifying work was complete. The specific actions taken to review and improve the disposal package drain procedures were the following:

a. Engineers from the Shipyard's Nuclear Test Engineering Division reviewed drain procedures on all fourteen reactor plants prepared for disposal to date. The purpose of these reviews was to determine if these procedures would accomplish system draining of the reactor plant systems as was intended. Certification signatures and test data were reviewed to determine if objective quality evidence supported proper system draining. These reviews found some errors that were taken into account during subsequent water removal operations, but in general, confirmed that procedures were followed, and that this, with the addition of some ultrasonic testing and visual examination, could validate that systems were properly drained.

b. A series of ultrasonic tests were accomplished on piping systems and components in the last four packages shipped to Hanford to validate liquid was in fact removed from systems as expected. (Note: Ultrasonic testing will be accomplished on all future packages, and the ten packages previously shipped to Hanford, to validate liquid removal conclusions.)

c. Shipyard Quality Assurance inspectors conducted a visual inspection of the radioactive reactor plant systems in each compartment to validate that the disposal configurations of the reactor plant matched the system diagrams used as the basis for liquid volume calculations.

d. A group of Shipyard engineers reviewed system and component drawings and analyzed ultrasonic test results to calculate the volume of residual liquid remaining in each system. Conservative assumptions and calculations were made which would overestimate rather than underestimate residual liquid quantities.

e. A team of independent Quality Assurance engineers conducted a review of the above work, repeating the engineering analysis and calculations for approximately 20 ship's systems on two different packages to validate the accuracy of the engineering analysis. This audit was conducted by independent personnel, i.e. engineers who work in a different organization and report to different management than the engineers who performed the original engineering calculations.

f. Engineers inspected the actual shipboard configuration of the non-reactor plant piping systems passing through the reactor compartments to determine system low points. Specific engineering instructions were issued to cut and drain each identified low point.

g. The instructions for removing non-contaminated components and piping outside the reactor compartment bulkheads (but inside the Shipyard installed containment bulkheads) were revised to maximize removal, including cutting the ends of piping systems passing through the reactor compartment to eliminate places where liquid could be trapped.

h. To supplement the Puget Sound Naval Shipyard review, an independent team of engineers assembled from other naval shipyards reviewed the overall methodology as well as the specific calculations and documentation. The independent review confirmed the accuracy of the approach being taken.

The above actions involved about 14 engineers per day from June through October 1990, and during peak periods as many as 30 engineers. This was in excess of 12,000 manhours of effort. During this period, the independent reviews of the initial Shipyard effort identified areas where additional instructions or documentation was needed. The necessary changes were made and the systems redrained where appropriate. The end result of this effort was a methodology that provides correct drain procedures, documents the work performed, and allows tabulation of the total residual liquid potentially remaining in each disposal package.

Current Approach to Draining Submarine Reactor Compartments. Whereas previous methods for draining reactor compartment disposal packages were not structured to provide positive assurance that all liquids had been removed to the maximum extent practical, current drain methodology now provides this assurance. The actions now taken to drain a package for shipment consist of the following:

a. **Reactor plant systems.** Prior to defueling, the reactor plant fluid systems within the package boundary contain about 16,000 gallons of liquid. This liquid is removed as follows:

- Large fluid systems are typically drained by blowing down to a liquid collection facility. Individual locations are then drained. This process typically involves the installation and removal of radiologically controlled bottles, radiological containments, pumpdown equipment, cutting of seal welds to access vent and drain valves, and the operation of numerous valves to effect the draining. This work is usually accomplished in radiation and high-radiation areas. These drain procedures, when completed for all the reactor plant systems, remove all but a small portion of the 16,000 gallons of liquid originally present.

- The reactor vessel and primary shield water tank are pumped-down using a lance inserted into the vessels to remove liquid to the maximum extent practical. These components originally contain several thousand gallons of liquid. Following pumpdown the reactor vessel typically contains less than 50 gallons of liquid and the primary shield water tank typically contains less than 14 gallons (actual quantities depend on the class of ship). A catalytic recombiner is added to the reactor vessel to assure recombination of hydrogen and oxygen potentially generated from water subject to radiolysis (a similar catalytic recombiner is added to the ion exchanger when resin is retained). Absorbent is added to the primary shield tank, and to the reactor vessel (when the vessel's internal configuration permits).

- Ultrasonic tests are then conducted on the reactor plant radioactively contaminated piping systems. The purpose of these ultrasonic tests is to confirm that water is in fact not present in selected pipes following draining. In other words, sufficient ultrasonic testing is conducted to provide representative physical evidence that the plant has been drained as expected.

• Engineers then analyze the drain procedures, drain data and ultrasonic test data, and using ship's system diagrams identify the quantity and location of any remaining liquid. The locations where liquid remains in the radioactively contaminated systems are then analyzed to determine if further draining is then practical.

b. **The non-reactor plant systems**, including pipes and tanks, and all non-radioactively contaminated systems are completely drained. By "completely drained" this means that the only liquid remaining in these systems is a small amount clinging to the surface of pipes. Liquid removal from these non-contaminated systems is a relatively straightforward process, because the stringent controls for personnel protection when working on radiologically contaminated systems are not required. Additionally, much of this work is outside the reactor compartment in low radiation areas. Draining involves the following:

• The non-contaminated and non-reactor plant systems are first drained from installed drain points

• To completely drain the systems, components are removed and pipes are cut or drilled at low points as needed to remove the remaining liquid. All the open pipe ends on the non-contaminated systems are sealed or capped after draining by re-making mechanical joints or taping covers over open pipe ends.

• Shipyard engineers then verify by visual inspection or review of drain documentation that all the non-contaminated and non-reactor plant piping system and tanks are drained.

Removing and preparing a reactor plant for shipment, including defueling and draining to the maximum extent practical as the Shipyard is currently doing, typically takes approximately 50 rem of personnel exposure and 300,000 manhours. Of the 50 rem, the amount of exposure solely required for draining the systems is estimated to be approximately 3 rem.

Location and quantity of liquid remaining in the package after draining:

The liquid in a reactor plant disposal package, following the normal drain procedures associated with package preparation, is widely distributed throughout the package and the amount of liquid remaining in the package following draining is less than 230 gallons. An analysis of a typical ship showed that this liquid would be distributed in over 300 discrete locations in the 17 reactor plant systems in the package. Each system was examined to determine where liquid could remain trapped, and calculations were performed to determine the maximum amount in each individual location. Table I shows the actual distribution of the liquid throughout the reactor plant systems on six previously drained disposal packages (specific system designations and nomenclature have been deleted from Table I because this information is classified). It can be seen from Table I that the amount of liquid remaining in each system is very small.

This remaining liquid is trapped in pockets within components and in piping low points. A schematic diagram, Figure III was prepared to show where these small amounts of liquid remaining in the reactor plant systems are typically located and is a schematic diagram of two actual interconnected reactor plant systems (Systems number 5 and 6 of Table I). The volume of liquid initially contained in these two systems is approximately 650 gallons. After removal of the bulk liquid by "blowing down" using compressed gas, and draining from the low points shown on the figure, only about 10 gallons of liquid remained in the systems. These ten gallons are trapped in the internal pockets of valves and pressure detector bodies, and trapped in piping system low points or dead legs that do not have drain valves installed. Figure III illustrates that these small quantities of liquid are widely distributed throughout the systems. The areas and quantities where residual liquid remains in the system are circled on the figure. The liquid distribution shown on the figure is representative of all seventeen reactor plant systems in the package.

As noted above, the liquid remaining in the reactor plant is trapped in the internals of valves, strainers, and pressure detector bodies, or trapped in piping system low points or dead legs that can not be drained via conventional methods. That is, to drain these areas it is necessary to cut out the component or drill a hole in the pipe. Drilling holes in contaminated pipe or cutting components out of radioactively contaminated systems, as will be discussed in detail later, is not a simple task. Such radiological work subjects personnel to unnecessary radiation exposure, considering that no apparent environmental benefit is derived, as discussed below.

As noted, the amount of liquid remaining in the plant following draining is less than 230 gallons. For the disposal packages already sent to Hanford, the Navy's calculations show that the total amount of liquid remaining in these packages will also be less than 230 gallons upon completion of the work to remove liquid from these packages. Additionally, all future submarine reactor compartment packages to be disposed of in Trench 94 at Hanford will also contain less than 230 gallons of liquid. The actual amount of liquid left in different packages varies depending on the class of ship, configuration of the reactor vessel and primary shield water tank, whether or not resin was discharged from ion exchangers prior to disposal, methods used by other shipyards to drain the packages, size of individual components, and location of normal drain connections. As previously discussed, the Shipyard performs ultrasonic tests and calculations to verify that the maximum amount of liquid remaining in the package, regardless of the plant configuration, is never more than 230 gallons. The calculations performed make conservative assumptions for all liquid locations; for example, if liquid is pumped or blown down in a piping system, the low point is assumed to have liquid unless otherwise physically verified to be empty.

As previously discussed, the liquid remaining in the package is widely distributed throughout the plant. The locations where water remains are shown on Table I. This table shows the following:

• Approximately 100 to 150 gallons remain in over 300 discrete locations within the sealed reactor plant piping systems low points, dead legs and pockets in component internals.

• Approximately 50 to 75 gallons of liquid remains as absorbed liquid, or liquid trapped within solid materials, specifically:

- 35 – 50 gallons of water in the reactor vessel (one early vessel contained 70 gallons).
- 6 – 14 gallons of water containing a potassium chromate corrosion inhibitor in the primary shield water tank (two early tanks contained 50 gallons).
- An estimated 12 gallons of water is trapped in solid material deposited in the secondary side of the steam generators.

• Less than 2 - 5 gallons of liquid (total) remains in the non-radioactive systems, (including liquid clinging to the walls and laying in low points of the pipes, tanks, and other components of both the non-radioactive reactor plant systems and the non-reactor plant systems).

Although the liquid remaining within the packages is well contained within system boundaries, absorbent is added to the bilges of the ship to immobilize any liquid in the unlikely event that it escapes for any reason from sealed piping systems.

Chemical Analysis of Liquid Remaining in the Reactor Plant:

During normal operation of a submarine reactor plant the only liquid added to the plant is demineralized water. Every day the water is analyzed to verify that pH is within specification, that conductivity is consistent with pH, and that chlorides are less than 0.1 ppm. Shipyard analysis of reactor plant water after the reactor is shut down for long periods shows that pH drops to between 5 and 6 because of carbon dioxide absorption, and the chlorides stay less than 0.1 ppm. The chemistry of the water combined with the corrosion resisting materials containing this water should not allow significant amounts of metals in solution, even after long periods of time. Thus, except for radioactivity, this water is not a hazardous or toxic material.

The only other liquid remaining in the reactor plant after preparation for disposal is 6 to 14 gallons of residual water containing potassium chromate corrosion inhibitor in the primary shield water tank. This material is not present in regulated quantity, and the small amount will actually contribute to the integrity of the containing steel.

The Shipyard conducted an extensive review of hazardous materials in reactor disposal packages in 1989 and copies of this review were provided to the regulatory agencies. This report is the basis for designation of the reactor compartment disposal package waste, and the Shipyard has a review program that assures each package shipped complies with the established designation. Regulated quantities of lead (primarily over 100 tons of shielding) and widely distributed low level PCBs (in the composition of solid components such as thermal insulation and electrical cable insulation) are contained in disposal packages. The review also showed small non–regulated quantities of several hazardous materials including cadmium, silver, and chromium, in some piping system components. Although the demineralized water in the reactor plant is not in contact with these materials, it is possible that this material along with the plant piping, could over very long periods of time be subject to general corrosion and come into contact with the water in the reactor plant systems. The potential environmental consequences of this are discussed below.

Potential Environmental Consequences of Leaving a Small Amount of Liquid in the Disposal Packages

From the above discussion it can be seen that following normal draining of a reactor compartment disposal package, there will be less than 230 gallons of non–corrosive, non-hazardous liquid widely disbursed throughout the package. All but a few gallons of this liquid is in radioactively contaminated systems. The liquid is contained in high strength, welded, corrosion resisting piping systems. The piping systems and components are themselves contained within a structural containment consisting of the ship's HY–80 pressure hull and the ship's or shipyard installed high–strength bulkhead as shown in Figure I. There is no unabsorbed liquid in the bilges, where there is only a single boundary to the environment.

The types of components and pipes in which this liquid is trapped are designed and fabricated for reactor plant and submarine operations. This means that in addition to temperatures and pressures encountered during operation, the components are designed to withstand imposed forces including battle shock from depth charges. The piping is typically made of corrosion resisting alloys. Other than the very thick reactor vessel, the only areas of the plant containing liquid that are not made of corrosion resisting material are portions of the steam generators and the primary shield water tank. These vessels are made from carbon steel but also have thick walls. The ship's HY–80 hull, which is over one inch thick, forms the bottom of the primary shield water tank. The normal thickness of the corrosion resistant pipes used in submarine reactor plant construction are between schedule 40 and schedule 80. The reactor plant is hydrostatically tested to 110 to 150% of operating pressure at every overhaul of the ship to verify the integrity of the pipe and components.

The point of the above discussion, is that the liquid that remains in the reactor plant following draining is contained within systems designed for at least 30 years of reactor plant operating lifetime, and which have an extremely long life when not subjected to the pressure and temperatures of reactor operation. When the reactor compartment is disposed of, these high integrity systems are at atmospheric temperatures and pressures. Because of their corrosion resisting construction, their placement within the welded containment of the reactor compartment package, and the arid low-corrosive environment of the Hanford burial grounds, further deterioration is unlikely for a period of time significantly exceeding the active life and post closure care period of the burial grounds, a period of over 100 years. The ability of the packages to resist corrosion was analyzed and documented in the July 1990 Request for Exemption from Lined Trench Requirements for Submarine Reactor Compartments, submitted by DOE-Richland as part of the Part B permit application for the Hanford low level burial grounds.

For the liquid to reach the environment, a number of actions would have to occur. First, the hull or bulkhead structure would need to be breached by corrosion. As noted above, package corrosion potential is discussed in the DOE's Request for Exemption from Lined Trench Requirements, submitted as part of the Part B permit application. The arid, slightly alkaline soils at Hanford are not conducive to corrosion, and it is unlikely that the containment structure would be breached by external corrosion mechanisms for hundreds of years. A cathodic protection system will be installed which will provide positive assurance that no corrosion of the containment boundary will occur during the burial trench active life as well as the post closure care period, a time of over 100 years.

Internal corrosion of the package structural containment boundary is unlikely. Even were the small amount of liquid to escape from the sealed corrosion resisting piping and components and make it to low pockets (bilges) inside the pressure hull, it would be absorbed by absorbent material in the bilges or might cause small amounts of localized corrosion that would not affect overall container integrity or accelerate the point at which external corroding factors would breach the package.

In order to leach waste and allow migration to the environment, the small amount of available liquid discussed above, would then have to come into contact with the lead or PCB waste constituents of concern. It is probable that most of this liquid would not find any hazardous material on its way to the environment, and even if it did, it would not remain in contact for the very long time frames necessary to leach metallic lead or PCB containing solids. The more probable scenario is that the released liquid would go directly to the bilge and be absorbed by the absorbent material placed there for this purpose. If any liquid was able to exit the compartment hull, it would be quickly absorbed by the surrounding soil. Over very long time frames this liquid volume would be negligible in comparison to the portion of precipitation which does not evaporate, but continues to percolate slowly downward in the Hanford soil.

The potential for waste constituents to migrate under these conditions at Hanford is very limited. The Shipyard report to the State of Washington on the feasibility of removing lead shielding, as well as the Request for Exemption from Lined Trench Requirements, shows that even after the extremely long times which are required to corrode and breach these structures, the Hanford site soil characteristics will retard transport of the lead and PCB constituents (there will be virtually no radioactivity remaining by this time). These documents indicate that the very small amount of moisture present in the soil, after tens of thousands of years, could potentially leach contaminants into the soil. However the soil has excellent ability to absorb the leached waste, and a long term soil saturation process allows only very limited migration. The studies and modeling of mobility mechanisms for reactor compartment disposal package waste, indicate the release of contaminants to surface water or to the ground water will not occur until after long periods (65,000 to 650,000 years) and that even after reaching groundwater or surface water, contaminants will not be in excess of regulatory limits, such as drinking water standards.

From the above it can be seen that the small amount of residual liquid trapped in the packages does not result in adverse environmental consequences.

Practicality of Removal of all Liquid From the Reactor Compartment Disposal Packages.
The Navy has concluded that to remove the small amount of liquid (less than 230 gallons) remaining in the disposal packages is not a practical or reasonable alternative.

For the disposal packages, our calculations show that draining to less than 230 gallons removes over 98.5% of the liquid originally present. As the entire disposal package is considered waste, the 230 gallons of residual liquid constitutes less than 0.1% of the 2,000,000 pound weight of the waste, and only 0.12% of a typical 26,000 cubic foot package volume.

It could be argued that the actual volume of liquid could be reduced to some arbitrary amount less than 230 gallons. However, allowing any specific amount of liquid less than 230 gallons, does not affect the technical basis for acceptability of the liquid. That is, the amount of liquid remaining is in any case a very small amount compared to the original volume present. If less than 230 gallons remain, this is about 1.5% of the original liquid in the package; if 100 gallons remained this would be about 0.75%. In either case, a small number. The potential risk to the environment, which the Navy maintains is negligible, is thus unaffected, whether the amount of water is 230 gallons or some arbitrary number less than 230 gallons.

As noted, the procedures to remove liquid in the package to less than 230 gallons are relatively straightforward, using existing system drain connections and established procedures. In any case, the major quantity of liquid under discussion is removed in support of operations to defuel the submarine, and would be accomplished regardless of the disposal requirements.

Further removal is not straightforward and requires special drilling or component removal work on radioactive systems. Because the liquid is so widely distributed throughout the reactor plant, each of the individual drilling or alternative draining operations would only collect a small amount of liquid, typically less than 1 to 3 gallons, as shown on Figure III. Achieving some residual liquid value much less than 230 gallons means entering the radiation areas to cut out components, or drill and drain pipe, using stringent radiological contamination control methods when accomplishing the work. Experience as discussed below, shows that the additional radiation exposure and cost are not reasonable or practical for the quantities of liquid that can be obtained.

On the four most recent packages shipped to Hanford the Navy committed to reducing the volume of liquid to less than 140 gallons. When the work was accomplished, the Navy found that a 140 gallon limit could not be achieved without excessive radiation exposure or labor costs. In fact, reducing the volume of liquid in these packages to a nominal 140 gallons (rather than 230 gallons), cost in excess of 6 rem for one package, and a total of 16 rem for all four packages. To put the amount of work in perspective, the cost of the labor to accomplish this additional draining was in excess of one million dollars for the four packages.

The actual amount of liquid removed from these four packages to achieve the self–imposed 140 gallon limit was different for different packages. That is, different system configurations, differences in the amount of liquid originally removed during defueling operations, different amounts of liquid remaining in the reactor vessel and primary shield water tank and ion exchanger, all combine to cause variances in the amount of liquid that needed to be removed from a specific package to achieve less than 140 gallons. To reduce the amount of liquid to less than 140 gallons, required on the average about 40 additional gallons of radioactive water to be removed from each of the four packages above and beyond that drained via the initial plant drain down. As stated above, to remove this average of about 40 gallons per package cost about 16 rem in personnel exposure, or about 1 rem for every 10 gallons removed. Considering the lack of environmental benefit derived, this is not considered to conform with the principle of reducing radiation exposure as low as reasonably achievable (ALARA).

The reason it is so difficult to remove additional liquid following normal system drain procedures is because the liquid is radioactive. In order to remove non–radioactive liquid it is only necessary to cut pipes and drain the water into suitable containers. To remove radioactive liquid a number of additional actions are necessary. First, specially qualified trade personnel must be used. These personnel are specially trained for radioactive work, and are the same personnel who already receive the bulk of the radiation exposure received by Navy employees. To cut out a contaminated component, a special watertight glove bag or containment must be designed to suit the particular location or component configuration. Special protective clothing must be worn by personnel. Filtered ventilation systems must be installed. After the component is cut out, any liquid removed must be handled as radioactive waste. All clothing, tools, and scrap from the work must be handled as radioactive waste (which conflicts with the policy of minimizing radioactive waste volumes). Following cut out of the component, a plug must be welded into the system under similar radiological controls.

Thus, from a practical standpoint, removing additional liquid beyond that volume achievable during current drain operations subjects personnel to a considerable amount of radiation exposure and generates significant quantities of radioactive waste.

Since the impracticality of removing liquid below 230 gallons is primarily based on current radiation exposure regulations including ALARA, it should be understood that changes in these regulations could change the amount of water that it is practical to drain in the future,

Total Liquid Removal

The Navy conducted a study to determine what actions would be required to remove all the liquid from a disposal package. To conduct this review, the Shipyard specifically analyzed one of the recent packages sent to Hanford, the Ex-SSN 596. Analysis showed that following normal system draining, the remaining liquid would be distributed throughout the package in approximately 300 discrete locations.

Each of these locations was analyzed to determine the following:

a. Action required to remove remaining liquid

b. Method for restoring the system after water removal

c. Amount of radioactive waste generated

d. Amount of manhours to accomplish the work

e. Amount of radiation exposure to accomplish liquid removal

This detailed review, which is summarized on Table II, shows that removal of the remaining liquid would cost approximately 68 additional rem of personnel radiation exposure and over five million additional dollars per package. This radiation exposure estimate includes the installation of temporary lead shielding;

since without temporary shielding, approximately 110 rem could be received by personnel. These radiation exposure estimates are for a package currently known to have higher than average radiation levels. At the other extreme, a package known to have a low radiation level would, with the installation of temporary lead shielding, involve radiation exposure of approximately 26 rem. The the radiation estimates and cost estimates are based on historically accurate Shipyard estimating techniques.

The reason for the high personnel radiation exposure and cost becomes clear when the actual effort involved in removing this liquid is examined in detail. As stated above, there are over 300 areas containing water that would have to be drained or otherwise dried, involving about 68 rem of radiation exposure. In order to remove all the remaining unabsorbed liquid, the following actions would be necessary:

a. About 100 radioactively contaminated valves and 200 non–radioactively contaminated valves would have to be removed to drain water from component internals. For the contaminated valves this entails installation of glove bags for containing contaminated liquid, work in a radiologically controlled area, and at least two pipe cuts per component to remove each of the valves. Pipe size is from 1/4–inch to 5 inch.

b. To restore the contaminated systems to a sealed condition, it would be necessary to install approximately 180 welded plugs in cut pipe ends.

c. Approximately 420 feet of pipe would have to be removed, of which approximately 130 feet is from radioactively contaminated systems.

d. Several hundred cubic feet of low level radioactive waste would be generated that would have to be appropriately controlled and disposed of. This includes the 100 contaminated valves, 130 feet of pipe, 6 strainers, 12 pressure detectors or switches, and the rags and other contaminated disposable waste associated with such work. This does not minimize radioactive waste volumes, and results in less efficient use of the limited space available in low level radioactive waste burial grounds.

e. The Shipyard would have to develop procedures and assemble equipment to dehumidify the secondary side of the steam generators to remove the estimated 12 gallons of water trapped within deposited solid materials. The estimate for this work is approximately 3.3 rem of personnel radiation exposure and 3200 manhours.

f. There is approximately 3.5 gallons of water (total) distributed among the several large reactor coolant pumps. To remove this water it would be necessary to physically remove and dry the large radiologically contaminated pump components. The estimate for this work is in excess of 6 rem of personnel radiation exposure and over 25,000 manhours.

g. To remove water contained in the ion exchange resin it is necessary to accomplish a resin discharge. This is an extremely complex evolution involving the blowdown of the ion exchanger. Based on actual costs from previous projects, the discharge of resin involves approximately 1.15 rem and 12,000 manhours.

In addition to the above actions to completely drain the package, action may be necessary to deal with the residual liquid in the reactor vessel and the primary shield water tank. The Shipyard normally adds absorbent, however, in some cases the physical configurations of the internals of the vessel and tank interfere with the addition of absorbent. While it would be technically possible to cut the hull and drill into the bottom of the reactor vessel, the Navy considers it unwise to reduce the integrity of this component which otherwise would remain intact for a period of time much longer than the external package boundaries. An estimate of the radiation exposure and effort to remove liquid from the reactor vessel and shield tank has not been performed, however, it would be considerably more difficult than for other sources of liquid.

Following all the above actions there would still be some amount of liquid clinging to the surfaces of pipes and remaining components, and the entire plant would have to be dehumidified.

Reasons why removal of all liquid is unreasonable: The previous sections of this report discussed the current procedures for removing liquid from the reactor compartment disposal packages to the maximum extent practical, which assures there is no more than 230 gallons remaining in any package. The report further discussed the impact of further liquid removal. Keeping personnel radiation exposure As Low As Reasonably Achievable (ALARA), and assuring that residual liquid in the disposal packages is not itself a hazardous material and that its presence does not pose an environmental risk, were the governing criteria in developing the conclusions of this report. The report also considers the volume of radioactive waste generated from liquid removal work, other risks to personnel accomplishing liquid removal, and the cost impact of further liquid removal. The following discussion evaluates additional draining against these criteria, and considers associated risks and impacts.

- **Radiation exposure**. Additional draining would expose personnel to unnecessary radiation exposure. Agencies, including the Environmental Protection Agency, the National Council on Radiation Protection and Measurements, the International Commission on Radiological Protection, and the U.S. Nuclear Regulator Commission, have all recognized that exposure to ionizing radiation should be as low as reasonably achievable and should only be accepted in return for a greater societal benefit. The Federal standards for protection against radiation establish limits for occupational exposure to radiation and additionally, since any radiation exposure involves some risk, requires employers to keep radiation exposures as low as reasonably achievable (ALARA).

As shown above, draining the last liquid involves greatly increased radiation exposure. The first 16,000 gallons requires only about 3 rem of exposure. Experience on four packages showed that 4 additional rem were required to drain an additional 60 gallons (from about 200 gallons down to about 140 gallons), and that total draining would involve over 60 additional rem of exposure. The risk to personnel from the additional radiation exposure to remove water beyond the normal draining is considered to be unnecessary and unjustifiable in view of the requirement to keep personnel exposure as low as reasonably achievable (ALARA).

• **Environmental risk.** As previously discussed, the liquid is noncorrosive and, except for about 14 gallons of absorbed water containing potassium chromate, the liquid is radioactive water with no other hazardous constituents. The liquid is contained in welded corrosion resistant piping systems, which are in turn contained within the strong tight welded boundaries of the disposal package. The liquid poses no threat to the environment, and even were it to escape from the package after several thousand years, there would be little if any detectable adverse impact to the environment.

• **Other risks to personnel.** In addition to exposing personnel to unnecessary radiation, personnel also have to work with the asbestos covering some of the piping. The asbestos containing lagging or insulation on the reactor plant piping systems is not removed for disposal except as needed to support disposal work. To accomplish removal of remaining liquid would require additional asbestos insulation to be removed to gain access to components. Although asbestos removal would be handled in accordance with all current health protection measures, it is undesirable to work with this material.

• **Volume of radioactive waste generated.** A considerable amount of radioactive waste (several hundred cubic feet) will be generated accomplishing removal of all the liquid. In addition to contaminated clothing, tools, rags, and containments, the pipe and components removed will have to be disposed of as radioactive waste. This radioactive waste would be placed in containers, but these containers would not be as substantial as the reactor compartment disposal package itself. The generation of this unnecessary waste volume results in less efficient use of the burial grounds for radioactive materials.

• **Cost Impact.** The additional work to remove all liquid would cost over five million dollars. For comparison, the current total cost of removing, preparing, and disposing of a previously defueled reactor compartment is about seven and a half million dollars, including draining to the maximun extent practical.

Conclusion. When comparing the risks associated with leaving a small amount of residual liquid in the disposal packages, to the risks associated with removing some or all of that residual liquid, the Navy concludes that not removing the liquid is clearly the better course of action. Leaving a small amount of noncorrosive water within a double containment (the pipes and components plus the package boundary) poses no identifiable adverse impact to the environment. Conversely, removing this water exposes personnel to significant amounts of ionizing radiation which is not only opposed to ALARA principles, but additionally results in generation of unnecessary radioactive waste and requires unnecessary handling of asbestos.

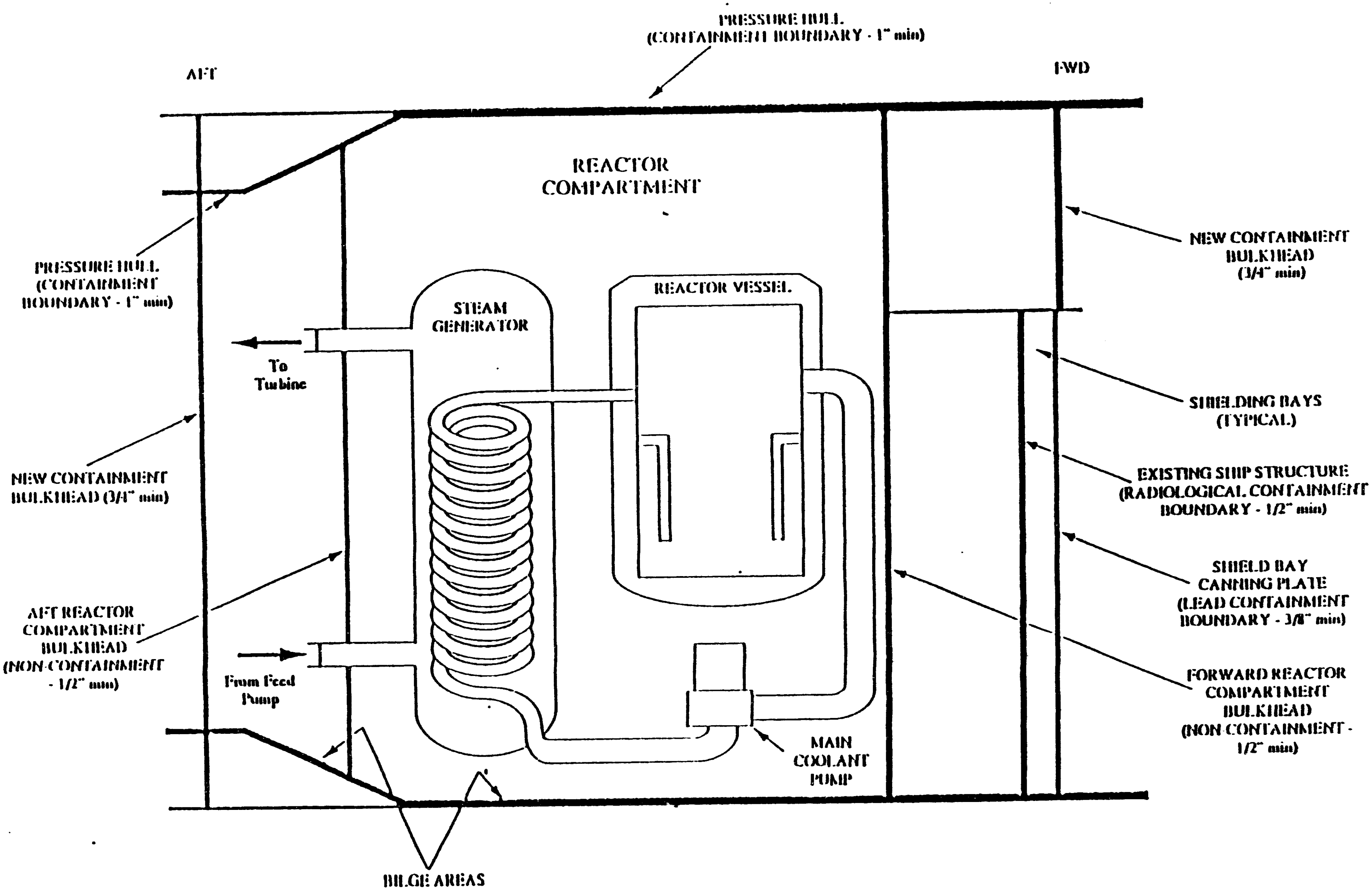
In summary, the Navy considers that this report demonstrates the following:

a. The current actions the Navy is taking assures that liquid is removed from the reactor compartment disposal packages to the maximum extent practical.

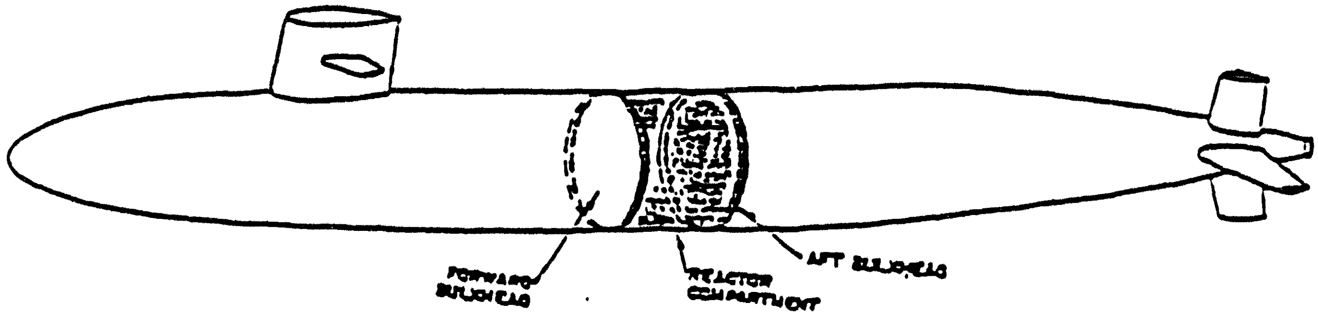
b. Leaving a small quantity of nonhazardous liquid does not pose an identifiable risk to the environment.

c. Removing liquid in excess of that which can be practically removed via normal drain procedures does indeed pose unnecessary and unjustifiable risk to personnel. The risk associated with the additional occupational radiation exposure is of particular concern, since it is in conflict with the requirement to keep radiation exposures as low as reasonably achievable (ALARA).

Current Status of Liquid Removal Operations: As previously stated, the Navy has shipped 14 reactor compartment disposal packages to Hanford, and is in the process of preparing six more packages for disposal in 1991. Four of the packages shipped to Hanford in 1990 were drained to less than 230 gallons of liquid prior to shipment. The Shipyard is currently working on the previous 10 packages sent to Hanford to assure the packages are drained to the maximum extent practical. This work is expected to be completed in January 1991. The six packages being prepared for shipment in 1991 are being drained to less than 230 gallons as discussed in this report. The shipment of these six packages will commence in March 1991.

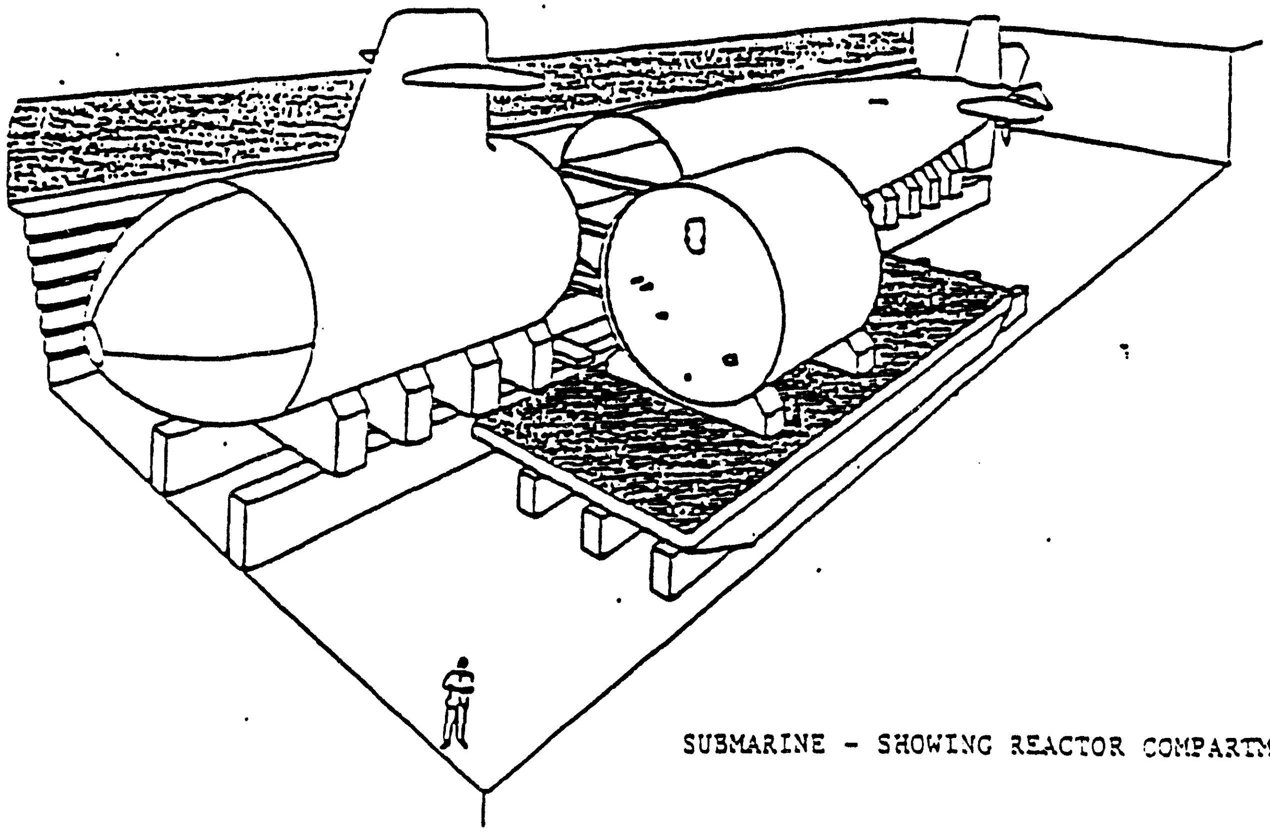


SUBMARINE REACTOR COMPARTMENT DISPOSAL PACKAGE
FIGURE 1



SUBMARINE - SHOWING REACTOR COMPARTMENT

FIGURE IIa



SUBMARINE - SHOWING REACTOR COMPARTMENT REMOVED

FIGURE IIb

TYPICAL REACTOR PLANT SYSTEMS SHOWING DRAIN PATHS AND RESIDUAL VOLUMES

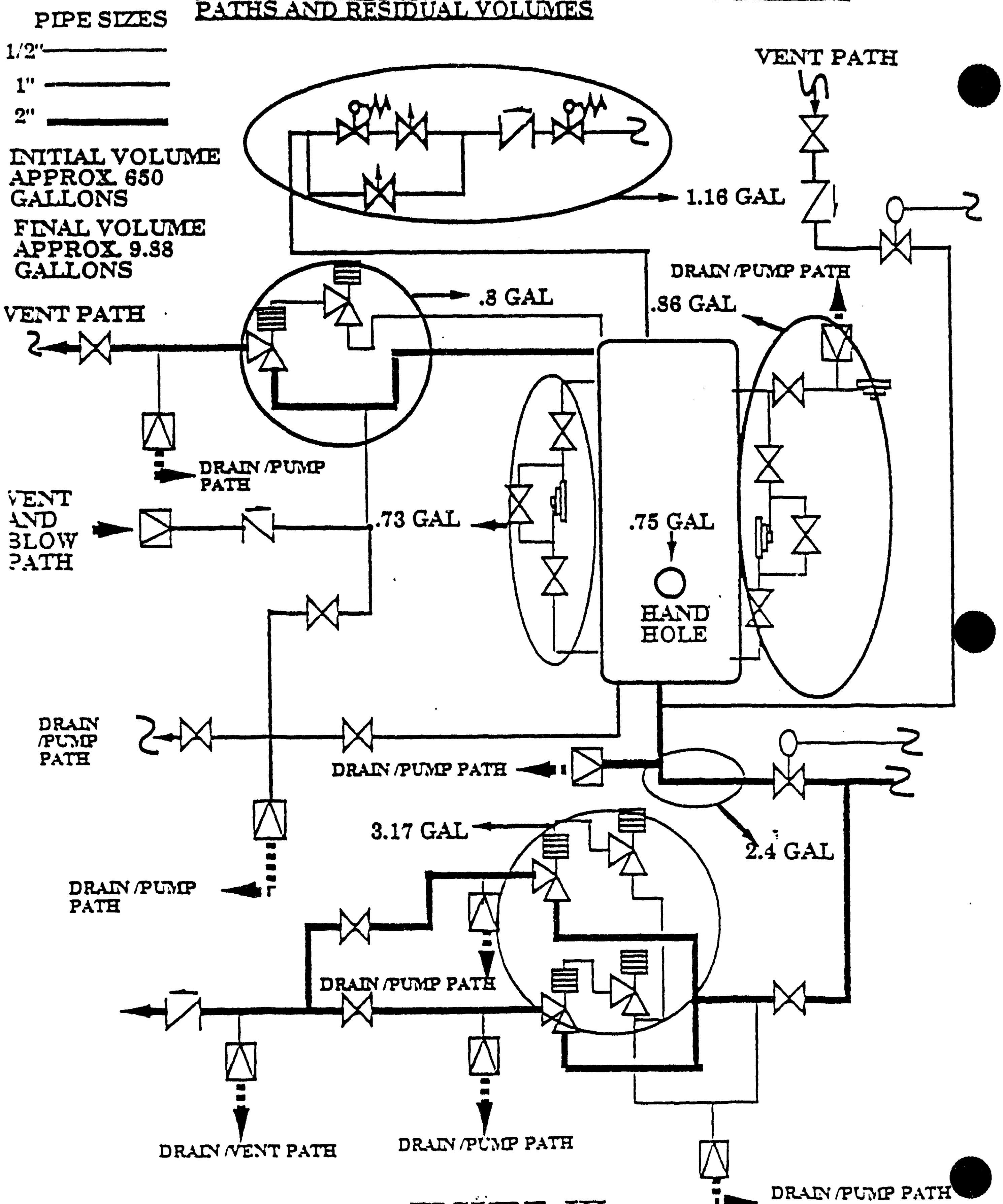


FIGURE III

ESTIMATED QUANTITY OF LIQUID (IN GALLONS) REMAINING IN VARIOUS DISPOSAL PACKAGES

	SSN 596	SSN 606	SSN 610	SSN 603	SSN 601	SSN 607
NON-NUCLEAR COGNIZANT PIPING						
NON-NUCLEAR WATER REMAINING AFTER DRAIN	2.00	2.00	2.00	2.00	2.00	2.00

NUCLEAR COGNIZANT PIPING (PRIMARY SIDE)

SYSTEM NO. 1

UPSTREAM OF VALVE	0.00	0.00	0.00	0.00	0.00	0.00
DOWNSTREAM OF VALVE	0.00	0.00	0.00	0.00	0.00	0.00
DOWNSTREAM OF VALVE	0.00	0.00	0.00	0.00	0.00	0.00
UPSTREAM OF VALVE	0.00	0.00	0.00	0.00	0.00	0.00
COOLING COILS	0.25	0.25	0.25	0.25	0.24	0.24
INSTRUMENT TUBING	0.02	0.02	0.02	0.02	0.00	0.00
FW SIDE OF PUMPS INCLUDED WITH SYSTEM #12	N/A	N/A	N/A	N/A	N/A	N/A
VALVE RESIDUAL	0.43	0.43	0.43	0.43	0.82	0.82
HEAT EXCHANGER (SW)	0.00	0.00	0.00	0.00	0.00	0.00
HEAT EXCHANGER AND PIPING (FW)	0.00	0.00	0.00	0.00	0.00	0.00
MC PUMPS	0.00	0.00	0.00	0.00	0.00	0.00
SUPPLY AND RETURN HEADERS	0.00	0.00	0.00	0.00	0.00	0.00
SUB TOTAL	0.70	0.70	0.70	0.70	0.86	0.36

SYSTEM NO. 2

DOWNSTREAM OF VALVE	0.00	0.00	0.00	0.00	0.00	0.00
PIPING LOW POINT	0.00	0.00	0.00	0.00	1.75	1.75
ADJACENT TO VALVE	0.00	0.00	0.00	0.03	1.56	1.56
SUCTION PIPING	0.00	0.00	0.00	0.00	1.29	1.29
VALVE RESIDUAL	0.00	0.00	0.00	0.00	0.08	0.08
SUMP/DRAIN LINE	0.00	0.00	0.00	0.00	0.55	0.55
SUB TOTAL	0.00	0.00	0.00	0.03	5.23	5.23
	Less Than 1oz.					

SYSTEM NO. 3

ION EXCHANGER	25.00	0.00	0.00	0.00	8.30	8.30
LOW POINT BELOW VALVE	0.32	0.55	0.55	0.55	0.45	0.45
RESIDUAL IN HEAT EXCHANGER	2.45	2.45	2.45	2.45	2.15	2.15
PIPING	0.20	0.20	0.20	0.20	0.20	0.20
LOW POINT AT VALVE	0.16	N/A	N/A	N/A	N/A	N/A
LOW POINT AT VALVES	1.53	1.53	1.53	1.53	1.53	1.53
LOW POINT	1.30	1.30	1.30	1.30	1.33	1.33
VALVE RESIDUAL	N/A	0.07	0.07	0.07	0.07	0.07
PIPING	0.24	0.24	0.24	0.24	0.24	0.24
SUB TOTAL	31.30	6.44	6.44	6.44	14.37	14.37

SYSTEM NO. 4

GAGE TUBING	0.02	0.02	0.02	0.02	0.02	0.02
GAGE	<.01	<.01	<.01	<.01	0.01	0.01
PIPE TO VALVE	<.01	<.01	<.01	<.01	0.01	0.01
LOW POINT AT VALVE	0.01	0.01	0.01	0.01	0.01	0.01
VALVE RESIDUAL	0.05	0.05	0.05	0.05	0.06	0.06
LOW POINT AT VALVE	0.01	0.12	0.12	0.12	0.01	0.01
SUB TOTAL	0.11	0.20	0.20	0.20	0.12	0.12

SYSTEM NO. 5

UPSTREAM OF VALVES	0.32	0.57	0.29	0.38	2.94	2.94
UPSTREAM OF VALVES	2.26	2.26	2.26	2.26	2.24	2.24
VALVE RESIDUAL	N/A	0.02	1.39	0.02	0.02	0.02
VALVE INTERNALS	1.39	1.39	0.02	1.39	1.39	1.39
SUB TOTAL	3.97	4.24	3.96	4.05	6.59	6.59

SYSTEM NO. 6

PIPING	2.40	2.40	2.40	6.70	6.59	6.59
PIPING	1.10	1.10	1.10	1.10	1.16	1.16
PRESSURE DETECTORS AND PIPING	1.50	0.70	0.70	1.50	1.59	1.59
VALVE RESIDUAL	N/A	0.30	0.30	0.30	0.37	0.37
LOWER HAND HOLE	0.30	0.80	0.80	0.80	0.75	0.75
SUB TOTAL	5.30	5.30	5.30	10.40	10.56	10.56

TABLE 1

ESTIMATED QUANTITY OF LIQUID (IN GALLONS) REMAINING IN VARIOUS DISPOSAL PACKAGES

	SSN 598	SSN 608	SSN 610	SSN 603	SSN 601	SSN 607
SYSTEM NO. 7						
RESIN DISCHARGE LINE	3.30	0.50	0.35	0.68	4.12	4.12
DOWNSTREAM OF VALVES	0.00	0.00	0.77	0.00	11.78	11.79
DOWNSTREAM OF VALVE	2.91	0.06	0.06	0.06	2.91	2.91
MISCELLANEOUS LOW POINTS	3.52	2.06	2.08	2.67	1.94	3.03
LOOP DRAINS	2.35	2.35	2.35	2.35	2.34	2.34
COVERED BILGE WELL	0.00	0.00	0.00	0.00	0.00	0.00
VALVE RESIDUAL	N/A	0.26	0.28	0.28	0.79	0.79
PUMP	0.00	0.00	0.00	0.00	0.00	0.41
SUB TOTAL	12.06	5.27	5.89	6.04	23.88	25.38
SYSTEM NO. 8						
ANNULUS	0.13	0.13	0.02	0.00	0.00	0.00
RESIDUAL	0.00	0.00	0.00	0.00	0.02	0.02
VENTS	0.06	0.06	0.06	0.06	0.05	0.05
SUB TOTAL	0.19	0.19	0.08	0.06	0.07	0.07
SYSTEM NO. 9						
PIPING SYSTEM	N/A	N/A	N/A	N/A	0.10	0.10
SYSTEM NO. 10						
AIR SYSTEM	0.00	0.00	0.00	0.00	0.00	0.00
SYSTEM NO. 11						
EQUALIZING LINE	0.00	0.92	0.92	0.92	1.15	1.15
WARMUP LINE	0.00	1.30	1.30	1.30	1.30	1.30
PIPING	0.60	4.52	4.36	4.36	7.99	7.99
HX RESIDUAL	0.10	0.10	0.10	0.10	0.22	0.22
VALVE RESIDUAL	0.47	0.47	0.47	0.47	0.42	0.42
SUB TOTAL	1.17	7.31	7.15	7.15	11.08	11.08
SYSTEM NO.12						
DETECTORS AND PIPING	2.25	1.38	1.38	2.25	2.25	2.25
RECIRCULATION LINES	0.40	0.40	0.40	0.40	0.44	0.44
PUMP RESIDUAL (INCLUDES SYSTEM # 1)	3.50	3.50	3.50	3.50	3.50	3.50
VALVE RESIDUAL	0.50	0.50	0.50	0.50	0.50	0.50
VALVE RESIDUAL	3.80	3.80	3.80	3.80	3.98	3.98
PIPING	0.00	0.00	0.03	0.01	0.25	0.25
STEAM GENERATORS	1.60	1.60	1.60	1.50	1.59	1.30
SUB TOTAL	12.05	11.18	11.21	12.06	12.53	12.74
SYSTEM NO. 13						
RESERVOIRS	0.00	0.00	0.00	4.77	12.50	15.00
PUMP RESIDUAL	0.50	0.00	0.00	0.50	0.00	0.50
MISCELLANEOUS LOW POINTS	2.10	3.01	4.25	4.44	3.78	3.33
VALVE RESIDUAL	N/A	0.59	0.59	0.59	0.95	0.95
TANK MANWAYS/DRAINS LINES	N/A	N/A	N/A	N/A	2.50	4.10
OP LINES	0.00	N/A	N/A	N/A	1.32	1.25
SUB TOTAL	2.60	3.60	4.84	10.30	21.53	25.14
NUCLEAR COGNIZANT PIPING (SECONDARY SIDE)						
SYSTEMS NO. 14, NO. 15, NO. 16 AND NO. 17						
STEAM GENREATOR	11.56	11.56	11.56	11.56	11.56	11.56
OIL IN GEAR OPERATORS	0.00	0.00	0.00	0.00	0.00	0.00
VALVE RESIDUALS	0.00	0.00	0.00	0.00	0.00	0.00
MISCELLANEOUS LOW POINTS	0.89	0.61	0.61	0.16	0.01	0.00
LOW POINTS	0.00	0.00	0.00	0.00	0.00	0.00
VALVE RESIDUAL	N/A	0.34	0.40	0.50	0.63	0.63
TUBES	0.00	0.00	0.00	0.00	0.00	0.00
SUB TOTAL	12.45	12.51	12.57	12.22	12.20	12.19
ALLOWANCE FOR PIPING DIFFERENCES	0.00	0.00	0.00	0.00	8.00	8.00
TOTAL OF NUCLEAR PIPING	81.92	56.94	58.34	69.65	127.22	132.43

TABLE I

ESTIMATED QUANTITY OF LIQUID (IN GALLONS) REMAINING IN VARIOUS DISPOSAL PACKAGES

	SSN 596	SSN 608	SSN 610	SSN 603	SSN 601	SSN 607
MISCELLANEOUS NON-STRUCTURAL VOIDS						
SHIELDING BAYS	0.13	3.10	3.30	2.10	2.10	2.10
FOAM FILLED VOIDS	0.00	0.00	0.00	0.00	0.00	0.00
FOAM FILLED PIPING TRUNK VOID	0.00	0.00	0.00	0.00	0.00	0.00
SUB TOTAL	0.13	3.10	3.30	2.10	2.10	2.10
TOTAL OF UNABSORBED LIQUIDS	84.05	62.04	63.64	73.75	131.32	136.53
ABSORBED LIQUIDS						
PRESSURE VESSEL (NOTE 1)	35.00	50.00	50.00	35.00	50.00	50.00
PSW TANK (NOTE 2)	14.00	13.00	13.00	14.00	6.00	14.00
MISCELLANEOUS TANKS						
FUEL OIL COLLECTING TANK (FWD)	NA	NA	NA	NA	0.00	NA
NORMAL FUEL OIL #2 TANK (FWD)	NA	0.00	0.00	NA	0.00	NA
NORMAL FUEL OIL #3 TANK (FWD)	0.00	NA	NA	0.00	NA	0.00
FUEL OIL EXPANSION TANK (FWD)	0.00	NA	NA	0.00	0.00	0.00
AUXILIARY TANK #1 (FWD-PARTIAL)	0.00	NA	NA	0.00	NA	0.00
AUXILIARY TANK #2 (FWD-PARTIAL)	0.00	NA	NA	0.00	NA	0.00
AUXILIARY TANK #3 (FWD)	NA	NA	NA	NA	0.00	NA
MAIN BALLAST TANK 5A (AFT)	NA	NA	NA	NA	0.00	NA
MAIN BALLAST TANK 5B (AFT)	NA	NA	NA	NA	0.00	NA
MAIN BALLSAT TANK 4A (AFT)	0.00	0.00	0.00	0.00	NA	0.00
MAIN BALLAST TANK 4B (AFT)	0.00	0.00	0.00	0.00	NA	0.00
NORMAL FUEL OIL #3 TANK (AFT)	NA	NA	NA	NA	0.00	NA
FUEL OIL EXPANSION TANK (AFT)	NA	NA	NA	NA	0.00	NA
PUMP ROOM #4 SUMP	NA	NA	NA	NA	0.00	NA
DEPTH CONTROL TANK #2 (FWD-PARTIAL)	NA	0.00	0.00	NA	NA	NA
DEPTH CONTROL TANK TOP SUMP DRAINS	NA	0.00	0.00	NA	NA	NA
SUB TOTAL	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL OF ABSORBED LIQUIDS	49.00	63.00	63.00	49.00	56.00	64.00
GRAND TOTAL OF ALL LIQUIDS (NOTE 3 and 4)	133.05	125.04	126.64	122.75	187.32	200.53
					SEE NOTE 5	SEE NOTE 5

NOTE 1: ONE DISPOSAL PACKAGE REACTOR VESSEL AT HANFORD CONTAINS 70 GALLONS.

NOTE 2: TWO DISPOSAL PACKAGE PRIMARY SHIELD TANKS AT HANFORD CONTAIN 50 GALLONS EACH.

NOTE 3: IT SHOULD BE NOTED THAT THIS TABLE PROVIDES WATER QUANTITIES IN VALUES TO TWO DECIMAL PLACES. THIS DEGREE OF ACCURACY IS A RESULT OF THE MATHEMATICAL CALCULATIONS ACCOMPLISHED, BUT SHOULD NOT BE INTERPETED TO MEAN THAT THE SHIPYARD IS ABLE TO DETERMINE THE ACTUAL VOLUMES IN THE PIPING SYSTEMS TO THIS DEGREE OF PRECISION. AS STATED IN THIS REPORT, THE SHIPYARD USED EXTREMELY CONSERVATIVE ASSUMPTIONS WHEN CALCULATING THE WATER VOLUME REMAINING IN THE PACKAGE TO ASSURE THE REMAINING VOLUME WOULD BE LESS THAN 230 GALLONS.

NOTE 4: AS DISCUSSED ON PAGE 14, FOUR DISPOSAL PACKAGES SHIPPED TO HANFORD IN 1990 WERE DRAINED TO LESS THAN 140 GALLONS INSTEAD OF LESS THAN 230 GALLONS. THE SSN 596, 608, 610, AND 603 ARE THESE FOUR DISPOSAL PACKAGES.

NOTE 5: WORK AT HANFORD TO DRAIN THE SSN 601 AND SSN 607 COMPARTMENTS WAS NOT COMPLETE AT THE TIME THIS REPORT WAS ISSUED, THUS THESE TOTALS ARE EXPECTED TO BE SLIGHTLY LOWER UPON COMPLETION.

TABLE 1

ACTIONS REQUIRED TO REMOVE ADDITIONAL LIQUID FROM DISPOSAL PACKAGE

RADIOACTIVE SYSTEMS AND COMPONENTS

	NUMBER	REM	MANHOURS
REMOVE VALVES	106	20.84	6544
REMOVE PIPING	127 FT	31.37	14152
REMOVE DETECTORS	12	9.64	1600
REMOVE STRAINERS	6	2.01	560
DRILL HOLES	66	27.63	21322
DISASSEMBLE PUMPS	2	0.01	152
REMOVE PUMPS	CLASSIFIED	6.97	25184
DISCHARGE RESIN	CLASSIFIED	1.15	11840
REMOVE SHIELD BAYS	20	0.00	4688
DRAIN OPERATIONS	10	7.17	1554
DRY STEAM GENERATORS	CLASSIFIED	3.32	3136
RADIOACTIVE TOTAL		110.1	90732

NON RADIOACTIVE SYSTEMS AND COMPONENTS

	NUMBER	REM	MANHOURS
DRAIN OPERATIONS	5	0.00	324
REMOVE VALVES	201	0.18	2616
REMOVE/CUT PIPING	294	7.15	2784
REMOVE COMPONENTS	30	1.50	792
NON RADIOACTIVE TOTAL		8.8	6516

INSTALL AND REMOVE TEMPORARY SHIELDING	18 TONS	6.13	4752
MANREM SAVINGS ON SHIELDING		-57.00	
GRAND TOTAL		68.1	102000

NOTE 1: THIS TABLE DOES NOT INCLUDE THE LIQUIDS ABSORBED IN THE REACTOR VESSEL AND PRIMARY SHIELD TANK.

TABLE II

Meetings related to Residual Liquid in Disposal Packages

(1) 9 Aug 90, 9:30 A.M., WA Dept. of Ecology, Lacey, Wa. This meeting attended by Ecology, EPA Region X, DOE-RL, WHC, Shipyard, and Naval Reactors, was to present the DOE-RL request for exemption of trench liner requirements. At the end of the presentation, the Shipyard answered questions from both the EPA and State on the water found in the packages at Hanford and agreed to schedule a meeting on this issue at the Shipyard. No issues were identified that would interfere with the scheduled disposal package shipments.

(2) 17 Aug 90, Puget Sound Naval Shipyard, Bremerton, Wa. This meeting attended by the Department of Ecology, EPA, Region X, DOE-RL, WHC, NR-PUGET, and the Shipyard, was to provide a detailed brief on the residual liquid including touring a disposal package to view the bilge and other areas related to residual liquid discovery. At the end of this meeting Ecology and EPA raised no further concerns.

(3) 29 Aug 90, Puget Sound Naval Shipyard, Bremerton, Wa. This meeting attended by DOE-RL, WHC, NR-PUGET and the Shipyard, was to brief attendees on the engineering evaluation conducted by the Shipyard to evaluate draining sequences and procedures, and additional actions taken to ensure necessary draining with proper certification documentation.

(4) 10 Dec 90, Lacey, Wa. At this meeting attended by Wa. Dept. of Ecology, EPA Region X, DOE-RL, WHC, Shipyard, and Naval Reactors, the Navy orally presented the conclusions of the Disposal Package Liquid Removal Report. Specifically, the Navy discussed the impracticability of reducing residual liquid in disposal packages to less than 230 gallons. Both DOE-RL and the Navy stated that leaving this amount of residual liquid was not considered contrary to Federal and State hazardous waste disposal requirements. EPA and State written concurrence regarding the acceptability of leaving residual liquid in the disposal packages was requested as this concurrence was considered necessary because of the unique nature of the disposal packages.

ENCLOSURE (1)

APPENDIX G

SECURITY AND ACCESS CONTROL

APPENDIX G

CONTENTS

G.0 SECURITY AND ACCESS CONTROL . . . . APP G-1

G.1 24-HOUR SURVEILLANCE SYSTEM . . . . APP G-1

G.2 BARRIER AND MEANS TO CONTROL ENTRY . . . . APP G-1

G.3 WARNING SIGNS . . . . APP G-1

G.0 SECURITY AND ACCESS CONTROL

The following sections describe the 24-hour surveillance system, barrier, and warning signs used to provide security and control access to the LLBG.

G.1 24-HOUR SURVEILLANCE SYSTEM

The entire Hanford Facility is a controlled-access area. The Hanford Facility maintains around-the-clock surveillance for the protection of government property, classified information, and special nuclear materials. The Hanford Patrol maintains a continuous presence of protective force personnel to provide additional security.

G.2 BARRIER AND MEANS TO CONTROL ENTRY

Manned barricades are maintained around the clock at checkpoints on vehicular access roads leading to the 200 Areas of the Hanford Site. All personnel accessing the 200 Areas must have a U.S. Department of Energy-issued security identification badge indicating the appropriate authorization. Personnel also might be subject to a search of items carried into or out of these areas. Additional entrance procedures must be followed to enter designated radiation zones.

The LLBG are completely surrounded by security fencing in both the 200 East and 200 West Areas. The security fences are 8-foot-high chain link and are topped with three strands of barbed wire. In addition, each active burial ground is a designated radiation zone and is isolated from other portions of the area by (at a minimum) a chain fence with radiation warning signs.

G.3 WARNING SIGNS

The active portions of the LLBG are within chained radiation zones with radiation signs every 100 feet (30.48 meters) along the chain. The signs, printed in English, are visible from all angles of approach, and are legible from a distance of at least 25 feet (7.62 meters). Each active area used for mixed waste storage is posted with a sign, in English, reading, "DANGER-UNAUTHORIZED PERSONS KEEP OUT," in red and black letters on a white background. In addition to these signs, the fences around the 200 East and 200 West Areas LLBG are posted with signs warning against unauthorized entry. The signs are visible from all angles of approach.

This page intentionally left blank.

APPENDIX H

COMPLIANCE AGREEMENT BETWEEN U.S. DEPARTMENT OF ENERGY RICHLAND OPERATIONS OFFICE, RICHLAND, WASHINGTON, AND THE ENVIRONMENTAL PROTECTION AGENCY, REGION 10, SEATTLE, WASHINGTON

This page intentionally left blank.

COMPLIANCE AGREEMENT

BETWEEN

UNITED STATES DEPARTMENT OF ENERGY

RICHLAND OPERATIONS OFFICE

RICHLAND, WASHINGTON

AND

THE ENVIRONMENTAL PROTECTION AGENCY

REGION 10, SEATTLE, WASHINGTON

I.

AUTHORITY

1. Region 10 of the United States Environmental Protection Agency (EPA) and the United States Department of Energy, Richland Operations Office (DOE-RL), are parties to this agreement which is entered into under the authority of Executive Order (E.O.) 12088, October 13, 1978 (43 Federal Register 47707). It is being entered into to bring burial ground 218-E-12B, Trench 94, located on the Hanford site managed by the DOE-RL, Richland, Washington, into compliance with the Toxic Substances Control Act (TSCA), 15 U.S.C. § 2601 et seq., and the PCB (polychlorinated biphenyl) Regulations promulgated thereunder; and, is consistent with E.O. 12088 and Agency policy which favor interagency settlement over more formal enforcement action. Nothing in this agreement shall be construed to require a violation of the Anti-Deficiency Act, 31 U.S.C. § 1341. Trench 94 is that area set aside for disposal of submarine reactor compartments in the 200 East Area 218-E-12B burial ground. It is more specifically depicted in Hanford Engineering drawing "Dry Waste Burial Ground 218-E-12B Naval Disposal," H-2-33276 Rev. 0, sheet 6 of 6, which is contained in the Low Level Burial Grounds Dangerous Waste Permit Application (DOE/RL 88-20).

II.

PURPOSE

2. EPA and DOE-RL are entering into this agreement to clarify each Agency's responsibilities and commitments for conducting actions required and/or authorized by TSCA, 15 U.S.C. § 2601 et seq., the PCB Regulations at 40 C.F.R. Part 761, and applicable portions of E.O. 12088.

3. It is the goal of this Compliance Plan and Schedule to have the DOE-RL bring conditions at Trench 94 into full compliance with Section 15 of TSCA, 15 U.S.C. § 2614. Full compliance with Section 15 would be attained by EPA's granting of approval pursuant to TSCA to the DOE-RL to operate a chemical waste landfill at Trench 94 for the sole purpose of landfilling submarine reactor compartments containing PCB-contaminated components. The compartments, which have a low level of radioactivity, were and will continue to be removed from obsolete submarines decommissioned by the U.S. Department of the Navy. The primary purpose of this agreement is to identify the time-frames by which DOE-RL will submit applications for interim and full approval to operate a TSCA chemical waste landfill, and the

conditions, in the interim, under which DOE-RL will store submarine reactor compartments prior to receipt of such EPA TSCA approval.

III.

SCOPE

4. This agreement is entered into by the parties to assure compliance with the federal PCB Regulations, promulgated under Section 6 of TSCA, 15 U.S.C.§ 2605, at DOE-RL's Trench 94.

5. This agreement is not and shall not be construed to be a vehicle to relieve the DOE-RL, or its contractors, of any legal obligations under TSCA which are in addition to or different from matters covered in this agreement. Neither does the agreement relieve DOE-RL of the responsibility to comply with any other environmental laws or regulations.

6. The disposal of submarine reactor compartments which contain small amounts of PCB-contaminated materials, such as electrical cable and thermal insulation, is regulated by the TSCA PCB Regulations at 40 C.F.R. § 761.60. The materials regulated

for disposal under TSCA in Trench 94 shall be limited to those which are allowed to be disposed of in a chemical waste landfill as described in 40 C.F.R. § 761.75. The storage of such compartments, prior to disposal, is regulated by the TSCA PCB Regulations at 40 C.F.R. § 761.65. EPA recognizes that noncompliance with the storage requirements will exist prior to disposal of the compartments because of the inability of the DOE-RL to meet the requirements of PCB storage for disposal facilities pursuant to 40 C.F.R. § 761.65(b). EPA additionally recognizes that the submarine reactor compartments presently in Trench 94, and additional compartments which are to be shipped there during the term of this agreement, may be stored for more than one year prior to interim approval of Trench 94 as a TSCA chemical waste landfill. It is EPA's assessment that the most effective environmental controls can be implemented at DOE-RL's Trench 94 and EPA, therefore, has determined that the shipment of additional submarine reactor compartments from the Puget Sound Naval Shipyard and the subsequent storage of those units in Trench 94 is appropriate and consistent with achievement of environmental protection and compliance, provided that all of the terms of this agreement are complied with by DOE-RL.

7. This agreement contains a "plan," as described in section 1-601 of E.O. 12088, to achieve and maintain compliance with the PCB Regulations at 40 C.F.R. Part 761. This plan is described

and entered into by the signatories under the presumption and expectation that approval applications submitted for Trench 94 by DOE-RL to EPA and the State of Washington Department of Ecology will support final approval of a Low Level Burial Grounds Dangerous Waste Permit and interim and final approval of a TSCA chemical waste landfill permit for that site.

IV.

COMPLIANCE PLAN AND SCHEDULE

8. DOE-RL agrees to perform the following activities and to adhere to dates and timeframes specified below:

a. No later than two weeks after the effective date of this agreement, the DOE-RL will have submitted an application for interim approval of a chemical waste landfill located at Trench 94, pursuant to the TSCA PCB Regulations at 40 C.F.R. § 761.75. The application will serve as an "initial report" under 40 C.F.R. § 761.75(c)(2). The application will request interim approval for the landfill for a period not to exceed five (5) years. All required items as identified in 40 C.F.R. § 761.75, including any waivers that are requested, will be addressed for the period covered by the interim approval application. In addition, the TSCA application will address plans for a proposed closure and post-closure of Trench 94 in compliance with WAC (Washington Administrative Code) Chapter 173-303 requirements.

b. Prior to accepting any additional submarine reactor compartment shipment from the U.S. Department of the Navy, Puget Sound Naval Shipyard, DOE-RL will notify EPA, in writing, of such anticipated acceptance. Normally, such notification should occur at least two weeks prior to acceptance. No additional submarine compartment will be accepted by DOE-RL for storage in Trench 94 without DOE-RL having received confirmation from the U.S. Department of the Navy that all PCB-contaminated felt sound damping material has been removed from the compartment. Within two weeks of having accepted any additional submarine reactor compartment, DOE-RL will notify EPA of such acceptance.

c. Within 180 days of issuance of the final permit by the State of Washington Department of Ecology for its

Low Level Burial Grounds Dangerous Waste Permit application, DOE-RL will submit an additional application to EPA Region 10 for approval to operate a chemical waste landfill at Trench 94 pursuant to the TSCA PCB Regulations at 40 C.F.R. § 761.75. The application will address the long-term disposal of the submarine reactor compartments at a chemical waste landfill located at Trench 94. The application will be limited in scope to the disposal of the submarine reactor compartments and will specify that no other TSCA regulated wastes besides those already contained within the compartments as internal parts of those compartments are proposed to be disposed of in Trench 94.

9. EPA agrees to review DOE-RL's applications for interim and final approval in a timely manner. EPA intends to apply the following principles when reviewing the TSCA interim and final approval requests:

   a. To the degree that requirements for the TSCA chemical waste landfill are identical to (or less stringent than) those of WAC Chapter 173-303 (equivalent to or more stringent than 40 C.F.R. Parts 264 and 270 for the final approval) and have been addressed in the Low Level

Burial Grounds Dangerous Waste Permit application to the State of Washington Department of Ecology for Trench 94 for the final approval, or in DOE-RL plans and procedures for operation of Trench 94 as a state dangerous waste landfill under WAC 173-303-400 (equivalent to or more stringent than 40 C.F.R. Part 265 for the interim approval), documentation of compliance with state requirements will be sufficient to show compliance with these requirements.

b. EPA agrees that DOE-RL's interim and final approval requests for a chemical waste landfill need only address PCB wastes that will remain in place after the planned removal of PCB-contaminated felt from the reactor compartments currently in place.

c. EPA agrees that groundwater monitoring requirements will be waived for the interim approval period of up to five (5) years if DOE-RL demonstrates that PCBs will not reach groundwater during this period. This may be based on a demonstration of submarine outer hull and closing plate integrity in conjunction with a DOE-RL commitment not to backfill reactor compartments during the interim approval period, so that submarine outer hull and closing plate integrity can be verified and maintained.

10. All documentation required shall be sent to:

Charles Findley, Director
Hazardous Waste Division
U.S. Environmental Protection Agency
M/S HW-111
1200 Sixth Avenue
Seattle, Washington 98101

V.

CONFLICT RESOLUTION

11. EPA and DOE-RL will each use a single point of contact for implementing this agreement and coordinating TSCA PCB compliance matters. The point of contact for EPA will be William Hedgebeth, Air and Toxics Division, telephone (206) 442-7369. The point of contact for DOE-RL will be Ronald Gerton, Waste Management Division, telephone (509) 376-1366. Either party may make a redesignation of its point of contact upon written notification to the other party.

12. At either EPA's or DOE-RL's request, the points of contact will meet or confer by telephone to discuss any questions or problems that arise.

13. DOE-RL shall notify the EPA contact person identified above at least 14 days prior to the required completion date in

all cases where DOE-RL will not or anticipates it will not meet a deadline in the Compliance Plan and Schedule section of this agreement.

14. Both parties to this agreement shall make reasonable efforts to informally resolve, at the project manager or immediate supervisor level, all anticipated noncompliance with, or violations of, this agreement. If resolution of the dispute cannot be achieved, it will be elevated to the signatories for resolution. If resolution of the dispute cannot be achieved at the signatory level, it will be elevated to the Administrator of the EPA or his designee and the Secretary of the Department of Energy or his designee for resolution. Finally, if necessary, the Director, Office of Management and Budget, shall be notified pursuant to Sections 1-602 and 1-603 of E.O. 12088. In this event, the Director, Office of Management and Budget, will consider such steps as necessary to resolve any conflicts and remedy any violations.

VI.

ENFORCEMENT

15. While this agreement is in effect, and upon successful compliance by the DOE-RL with all the terms of this agreement, EPA shall not initiate enforcement action against DOE-RL or its contractors for violations of TSCA regulations involving matters which are the subject of this agreement. This does not preclude EPA enforcement actions for subsequent or other violations of TSCA regulations by either the DOE-RL or its contractor(s).

16. The provisions of this agreement shall constitute requirements which are enforceable against DOE pursuant to the citizen suit provision of TSCA Section 20, 15 U.S.C. § 2619.

VII.

EXPIRATION

17. This agreement will expire when compliance is reached as mutually agreed between EPA and DOE-RL but in no case will the agreement remain in effect should DOE-RL receive approval to operate a TSCA chemical waste landfill in Trench 94, as described in 40 C.F.R. § 761.75(8)(c).

Randall F. Smith
for THOMAS P. DUNNE
Acting Regional Administrator
Environmental Protection Agency
Region 10

3-27-90
DATE

Michael L. Lawrence
MICHAEL LAWRENCE
Manager
U.S. Department of Energy
Richland Operations Office

3-26-90
DATE

APPENDIX I

LETTER FROM PUGET SOUND NAVAL SHIPYARD TO ENVIRONMENTAL PROTECTION AGENCY REGION 10

This page intentionally left blank.

DEPARTMENT OF THE NAVY
PUGET SOUND NAVAL SHIPYARD
BREMERTON, WASHINGTON 98314-5000

IN REPLY REFER TO:

5090
445/363-89:GES
26 September 1989

U.S. Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, Wa. 98101

Attn: Mr. Gary L. O'Neal
Director, Air and Toxics Division, AT-083

Gentlemen:

This is in response to your letter of September 13, 1989 which requested information related to the discovery of PCB's in the six reactor compartment disposal packages at Hanford.

The Puget Sound Naval Shipyard provided information on the discovery of the PCB bearing felt material in the disposal packages in a 30 August, 1989 letter to the Department of Energy, Richland Operations Office. This letter was previously provided to your office. On 14 September, 1989, Mr. Haselberger and Ms. Massimino of your organization, along with representatives from the States of Washington and Oregon and the Department of Energy Richland Operations Office, met with officials from the Puget Sound Naval Shipyard and the Naval Nuclear Propulsion Program to review the discovery of the PCB containing material and to address the actions being taken by the Navy as a result of the discovery. In this meeting the Navy indicated the PCB containing material will be removed from the interior and exterior of the disposal packages at Hanford. In this meeting Navy representatives also described the extensive review and sampling program initiated by the Shipyard to identify and evaluate all constituent materials in the reactor compartment disposal packages. This program is intended to assure that after removal of the PCB containing material, there are no other hazardous or toxic materials that would prevent the disposal packages from being in full compliance with regulatory requirements. This material evaluation is nearing completion and as soon as it is finished the Navy will schedule a meeting to allow your office to review the results.

In the 14 September meeting it was indicated that the Shipyard is moving swiftly with preparations to remove the PCB material from the exterior of the packages at Hanford. The Navy indicated that your concurrence would be obtained on the cleanup standards to be used, prior to beginning the work. Accordingly, the following standards are proposed:

a. All PCB bearing felt will be removed from the exterior of the packages. The paint will be removed from these surfaces and from surfaces where drawings show the PCB bearing felt could have been previously installed. We plan to clean to bare metal where the paint was removed. When the PCB level is less than 10µg/100cm^2, the surfaces will be repainted.

b. All PCB bearing felt will be removed from the interior of the packages. The paint will be removed from these surfaces. We propose to clean to bare metal where the paint was removed, to a PCB level of less than 100µg/100cm^2. This work will be done by mid-1990.

c. Removal of the PCB's will also assure removal of the chromates, which are in the felt matrix. The surfaces cleaned free of PCB's will also be surveyed to assure they are clean to a level of less than 5ppm extractable hexavalant chrome.

The Shipyard is already removing the PCB bearing felt from all reactor compartment disposal packages being prepared for shipment, and cleaning the affected surfaces to the above mentioned standards. This approach will be taken on all future packages.

The Navy has also evaluated whether there is a need to sample for Dioxins and Dibenzofurans in the disposal packages at Hanford. Based on the absence of these compounds in samples taken from the areas where the PCB felt was burned on the ex-USS JOHN ADAMS earlier this year, which represents a worst case situation, we do not believe that sampling the packages at Hanford is necessary.

Although there is no expectation that the disposal packages in the Hanford burial trench will ever be entered again after the PCB's are removed and the packages are rewelded shut, the Navy will post a sign in each internal area that contained the PCB's, indicating the PCB levels after cleanup.

Your letter asked when the six packages were taken to the Hanford Site. The Ship the disposal package was taken from, and the date the package was placed in the burial trench are as follows:

ex-USS PATRICK HENRY (SSN599)	April 8, 1986
ex-USS SNOOK (SSN592)	September 26, 1987
ex-USS GEORGE WASHINGTON (SSN598)	August 27, 1988
ex-USS SCAMP (SSN588)	September 24, 1988
ex-USS ROBERT E. LEE (SSN601	May 7, 1989
ex-USS THOMAS JEFFERSON (SSN618)	May 14, 1989

You also asked how the Shipyard arrived at the estimate that workers would receive a total of ten REM exposure during operations to remove PCB contained within the sealed packages at Hanford. There are nine Shipyard crafts involved in PCB cleanup. For each package there are seven identifiable spaces in which work will be performed. Based on typical known radiation levels in these spaces, and a knowledge of the work to be performed, average radiation exposure levels (mrem/hr) were estimated for each craft. The manhours were estimated for each of the crafts involved in the PCB removal and the REM exposure was then calculated. It is noted that the radiation fields in the majority of the spaces are quite low, in most cases less than one millirem per hour; however, the large number of manhours involved in the cleanup results in a total estimated exposure of 9.6 REM (rounded off to 10 REM).

You asked how the cost of over one million dollars was arrived at for the removal of the PCB material from within each disposal package at Hanford. The PCB cleanup on the USS THEODORE ROOSEVELT was used as a baseline. The effort to cut and reweld the hulls at Hanford and the need to work in more confined spaces were taken into account, and the number of manhours for each of the nine crafts was estimated. This was multiplied by a standard manday rate. The estimated cost of obtaining the necessary support services and Westinghouse-Hanford support was then added. This resulted in a total of approximately seven million dollars for removing the PCB's from the six packages.

You asked about the feasibility of moving the six disposal packages from Hanford back to the Shipyard for removal of the PCB's. The Shipyard considers this to be unnecessary. To do so would require considerable effort and expense which the Navy does not believe is necessary. Since it costs nearly a half million dollars to move one package from the Shipyard to the Hanford burial trench, the cost of moving the six packages to the shipyard and back to Hanford would be about six million dollars, which would be added to the cost of the actual PCB removal. The added cost is not warranted since the work can be accomplished in an environmentally safe manner at Hanford.

I hope that this letter has answered your questions. Your prompt concurrence with the above proposed PCB and chromate cleanup standards would be greatly appreciated as we are prepared to mobilize manpower and equipment at Hanford starting October 2nd, to support removing PCB's from the exterior of the six disposal packages.

Sincerely,

A. Clark

A. Clark
Captain, USN
Shipyard Commander

5090
445/363-89

Copy to:
D. Silver, State of Washington Governor's Office
R. Stanley, State of Washington Department of Ecology
J. Breckel, State of Oregon Governor's Office
M. Lawrence,, Department of Energy, Richland Operations Office

APPENDIX J

LETTER FROM WASHINGTON STATE DEPARTMENT OF ECOLOGY TO U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION 10

940606.0848

This page intentionally left blank.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Mail Stop PV-11 • Olympia, Washington 98504-8711 • (206) 459-6000

April 28, 1993

Ms. Catherine Massimino
EPA Region 10
1200 Sixth Avenue
Seattle, WA 98101-3188

Dear Ms. Massimino:

Pertaining to the Low-Level Burial Grounds on the Hanford Reservation, the Washington State Department of Ecology has determined that groundwater monitoring wells are in compliance with requirements of the Resource Conservation and Recovery Act and the Washington State Dangerous Waste Regulations (Chapter 173-303 WAC). As you know, Washinton State is an "authorized" state for purposes of administering a hazardous waste management program in lieu of the federal program under Subtitle C of the Resource Conservation and Recovery Act. The area of the Low-Level Burial Grounds includes the space identified for placement of the U. S. Navy's submarine reactor compartments.

Even though the requirements under Chapter 173-303 WAC are currently met, that will not preclude the Department of Ecology from requiring additional monitoring capabilities in the future. If I can be of further assistance, please do not hesitate to contact me at (206) 459-6863.

Sincerely,

Robert E Cordts

Robert E. Cordts, Unit Manager
Low-Level Burial Grounds

REC:lj

cc: Cliff Clark, DOE-RL
George Evans, WHC
Tim Baltz, PSNS

APPENDIX K

LETTER FROM U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION 10 TO U.S. DEPARTMENT OF ENERGY, RICHLAND OPERATIONS OFFICE

This page intentionally left blank.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

Reply to
Attn of: HW-106

MAR 17 1994

James D. Bauer, Program Manager
Office of Environmental Assurance,
Permits and Policy
U. S. Department of Energy
P.O. Box 550-A5-15
Richland, Washington 99352

Dear Mr. Bauer:

The purpose of this letter is to provide clarification of the Compliance Agreement between the U.S. Environmental Protection Agency Region 10 (EPA), and the United States Department of Energy, Richland Operations Office (DOE-RL), dated March 26, 1990. This agreement was entered into to bring burial ground 218-E-12B, Trench 94, located on the Hanford site, managed by the DOE-RL, Richland, Washington, into compliance with the Toxic Substances Control Act (TSCA) and the Polychlorinated Biphenyl (PCB) regulations promulgated pursuant to TSCA.

Specifically, this letter provides clarification of Part IV, Section 9(c), of the agreement. This section of the agreement addresses waiver of groundwater monitoring requirements for Trench 94 for an interim period of up to five years, if DOE-RL demonstrates that PCBs will not reach groundwater during this period.

Part IV, Section 9(a), of the agreement states that DOE-RL's documentation of compliance with Washington State Dangerous Waste Requirements (Chapter 173-303 WAC), which are equivalent to or more stringent than TSCA chemical landfill requirements, would be sufficient to show compliance with these TSCA requirements.

On April 28, 1993, Washington State Department of Ecology (Ecology) apprised EPA that it had determined that groundwater monitoring wells for the Low-Level Burial Grounds, including Trench 94, on the Hanford Reservation, were in compliance with the Resource Conservation and Recovery Act and the Washington State Dangerous Waste Regulations (Chapter 173-303 WAC).

Based on the above determination, it is EPA's position that the waiver of the groundwater monitoring requirements, under Part IV, Section 9(a), of the agreement is not invoked since groundwater monitoring requirements are being complied with. It is also EPA's position that DOE-RL is thus not required to demonstrate that PCBs will not reach groundwater during this period.

EPA fully supports Ecology's desire for DOE-RL to gather long-term data to support its request for approval of the exemption from lined trench requirements, and from land disposal restrictions for residual liquid at Trench 94, as stated in Ecology's letter dated September 2, 1993. There is nothing in the compliance agreement based on the above determination of not invoking the groundwater monitoring waiver that should preclude DOE-RL from proceeding with burial of submarine reactor compartments in the trench.

If you have any questions regarding this matter, please contact Ms. Catherine Massimino at (206) 553-4153.

Sincerely,

Gil Haselberger, Chief
Toxic Substances Section

DISTRIBUTION

Number of copies

OFFSITE		MSIN
1	U.S. Department of Energy-Headquarters R. Campbell EM-322, HQ	
1	U.S. Environmental Protection Agency-Region 10 Hazardous Waste Division D. L. Duncan 1200 Sixth Avenue Mail Stop HW-111 Seattle, WA 98101	
1	Golder Associates Incorporated S. Eipert, Librarian 4104 148th Avenue N.E. Redmond, WA 98052	
2	U.S. Navy J. Steele (2) Naval Sea Systems Command, Code 08R, James K. Polk Bldg., Room 3W 62 2521 Jefferson Davis Highway, Bldg. NC2 Arlington, VA 22202	
5	U.S. Navy T. Baltz, Code 2300.1 (5) Puget Sound Naval Ship Yard Bremerton, WA 98314-5000	
2	Washington State Department of Ecology D. C. Nylander (Kennewick)	B5-18
	R. E. Cordts P. O. Box 47600 Lacey, Washington 98504-7600	

DISTRIBUTION (cont)

Number of copies		MSIN
ONSITE		
10	U.S. Department of Energy, Richland Operations Office	
	R. M. Carosino	A4-52
	C. E. Clark	A5-19
	A. K. Crowell	S7-55
	R. M. Gordon (3)	S7-55
	R. F. Guercia	S7-55
	R. N. Krekel	A5-15
	Public Reading Room (2)	H2-53
1	Pacific Northwest Laboratory	
	Hanford Technical Library	P8-55
23	Westinghouse Hanford Company	
	B. J. Broomfield	N3-13
	G. D. Cummins (5)	H6-24
	N. P. Emerson	T4-03
	R. J. Giroir	R2-97
	W. H. Hamilton	N3-13
	P. L. Hapke	T4-05
	G. H. Landeen	H6-23
	P. J. Mackey	B3-15
	B. K. Olson	T3-02
	R. D. Pierce	N3-13
	S. M. Price	H6-23
	R. J. Roberts	N3-13
	G. S. Robinson	B2-19
	EDC	H6-07
	EPIC (2)	H6-08
	Information Release Administration (3)	H4-17

DATE FILMED

7 /27/94

END