PART V, CLOSURE UNIT 2 UNIT-SPECIFIC CONDITIONS

1301-N Liquid Waste Disposal Facility

The 1301-N Liquid Waste Disposal Facility is an inactive Treatment, Storage, and Disposal (TSD) unit that is currently undergoing closure activities. This TSD unit was operated as a liquid waste disposal facility forth dangerous waste. This permit sets forth the closure requirements for this unit.

V.2.A COMPLIANCE WITH PERMIT CONDITIONS

The Permittees shall comply with all requirements set forth in the Hanford Facility RCRA Permit (Permit) as specified in Permit Attachment 3, Permit Applicability Matrix, including all approved modifications. All chapters, subsections, figures, tables, and appendices included in the following unit-specific Permit Conditions are enforceable in their entirety.

In the event that the Part V-Unit-Specific Conditions for Closure Unit 2, 1301-N Liquid Waste Disposal Facility conflict with the Part I-Standard Conditions and/or Part II-General Facility Conditions of the Permit, the unit-specific conditions for Closure Unit 2, 1301-N Liquid Waste Disposal Facility prevail.

CLOSURE UNIT 2:

Chapter 1.0 Part A Form, Revision 8, dated July 2005

Chapter 2.0 Unit Description, dated August 2004

Chapter 3.0 Groundwater Monitoring, dated August 2004

Chapter 4.0 Closure Activities, dated March 31, 2005

Chapter 5.0 Post-Closure Plan, dated August 2004

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Chapter 1.0 Part A Form

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WASHINGTON STATE DEPARTMENT OF ECOLOGY

Dangerous Waste Permit Application Part A Form

Date Received	Reviewed by: JV	Date: 10/10/2005
Month Day Year	Approved by: G.P. Davis	Date: 10/30/2005
0 9 3 0 2 0 0 5		

I. This form is submitted to: (place an "X" in the appropriate box)

☒	Request modification to a final status permit (commonly called a "Part B" permit)
☐	Request a change under interim status
☐	Apply for a final status permit. This includes the application for the initial final status permit for a site or for a permit renewal (i.e., a new permit to replace an expiring permit).
☐	Establish interim status because of the wastes newly regulated on: (Date)
	List waste codes:

II. EPA/State ID Number

W A 7 8 9 0 0 0 8 9 6 7

III. Name of Facility

US Department of Energy – Hanford Facility

IV. Facility Location (Physical address not P.O. Box or Route Number)

A. Street

825 Jadwin

City or Town	State	ZIP Code
Richland	WA	99352

County Code (if known)	County Name
0 0 5	Benton

B. Land Type	C. Geographic Location Latitude (degrees, mins, secs)	Longitude (degrees, mins, secs)	D. Facility Existence Date Month Day Year
F	S E E T O P O	M A P	0 3 2 2 1 9 4 3

V. Facility Mailing Address

Street or P.O. Box		
P.O. Box 550		
City or Town	**State**	**ZIP Code**
Richland	WA	99352

VI. Facility contact (Person to be contacted regarding waste activities at facility)		
Name (last)	**(first)**	
Klein	Keith	
Job Title	**Phone Number (area code and number)**	
Manager	(509) 376-7395*	
Contact Address		
Street or P.O. Box		
P.O. Box 550		
City or Town	**State**	**ZIP Code**
Richland	WA	99352

VII. Facility Operator Information		
A. Name	**Phone Number (area code and number)**	
Department of Energy * Owner/Operator Washington Closure Hanford LLC** Co-Operator for 1301-N Liquid Waste Disposal Facility	(509) 376-7395* (509) 372-9951**	
Street or P.O. Box		
P.O. Box 550 * 3070 George Washington Way**		
City or Town	**State**	**ZIP Code**
Richland	WA	99352
B. Operator Type	F	
C. Does the name in VII.A reflect a proposed change in operator? **If yes, provide the scheduled date for the change:**	☐ Yes ☒ No Month / Day / Year:	
D. Is the name listed in VII.A. also the owner? If yes, skip to Section VIII.C.	☐ Yes ☒ No	

VIII. Facility Owner Information		
A. Name	**Phone Number (area code and number)**	
Keith A. Klein, Operator/Facility-Property Owner*	(509) 376-7395*	
Street or P.O. Box		
P.O. Box 550		
City or Town	**State**	**ZIP Code**
Richland	WA	99352
B. Operator Type	F	
C. Does the name in VII.A reflect a proposed change in operator? **If yes, provide the scheduled date for the change:**	☐ Yes ☒ No Month / Day / Year:	

IX. NAICS Codes (5/6 digit codes)													
A. First							**B. Second**						
5	6	2	2	1		Waste Treatment & Disposal	9	2	4	1	1	0	Administration of Air & Water Resource & Solid Waste Management Programs
C. Third							**D. Fourth**						
9	9	9	9	9	9	Unclassified Establishments	5	6	2	9	1	0	Remediation Services

X. Other Environmental Permits (see instructions)

A. Permit Type	B. Permit Number	C. Description
		None

XI. Nature of Business (provide a brief description that includes both dangerous waste and non-dangerous waste areas and activities)

The 1301-N LWDF was used for the disposal of liquid waste from N reactor. The waste consisted of waste from nonspecific sources and listed waste (F003), toxicity characteristic waste (D006, D007, D008, and D009), characteristic waste (D002), and state-only toxic waste (WT02).

<u>D83</u>

The 1301-N Liquid Waste Disposal Facility (LWDF) was used from 1963 to September 1985. The LWDF received mixed waste process and cooling waste water from N Reactor. The LWDF also received dangerous waste generated from laboratories, and may have received waste from spills within the N Reactor Building, which were discharged through the mixed waste drain system. The dangerous waste discharges consisted of less than 0.002% of the total volume of the waste discharged to the LWDF. The 1301-N LWDF was a percolation unit designed for the disposal of liquid waste through the soil column. The process design capacity for the LWDF was 16,352,900 liters (4,320,000 gallons) a day. The process design capacity reflects the maximum volume of water discharged on a daily basis rather than the physical capacity of the unit. The influent pipes up to the face of the 105-N building facility are considered to be included within the treatment, storage, and disposal unit boundary.

EXAMPLE FOR COMPLETING ITEMS XII and XIII (shown in lines numbered X-1, X-2, and X-3 below): A facility has two storage tanks that hold 1200 gallons and 400 gallons respectively. There is also treatment in tanks at 20 gallons/hr. Finally, a one-quarter acre area that is two meters deep will undergo *in situ vitrification.*

Section XII. Process Codes and Design Capacities								Section XIII. Other Process Codes								
Line Number		A. Process Codes (enter code)			B. Process Design Capacity 1. Amount	B. Process Design Capacity 2. Unit of Measure (enter code)	C. Process Total Number of Units	Line Number		A. Process Codes (enter code)			B. Process Design Capacity 1. Amount	B. Process Design Capacity 2. Unit of Measure (enter code)	C. Process Total Number of Units	D. Process Description
X	1	S	0	2	1,600	G	002	X	1	T	0	4	700	C	001	In situ vitrification
X	2	T	0	3	20	E	001									
X	3	T	0	4	700	C	001									
	1	D	8	3	4,320,000	U	001		1							
	2								2							
	3								3							
	4								4							
	5								5							
	6								6							
	7								7							
	8								8							
	9								9							
1	0							1	0							
1	1							1	1							
1	2							1	2							
1	3							1	3							
1	4							1	4							
1	5							1	5							
1	6							1	6							
1	7							1	7							
1	8							1	8							
1	9							1	9							
2	0							2	0							
2	1							2	1							
2	2							2	2							
2	3							2	3							
2	4							2	4							
2	5							2	5							

XIV. Description of Dangerous Wastes

Example for completing this section: A facility will receive three non-listed wastes, then store and treat them on-site. Two wastes are corrosive only, with the facility receiving and storing the wastes in containers. There will be about 200 pounds per year of each of these two wastes, which will be neutralized in a tank. The other waste is corrosive and ignitable and will be neutralized then blended into hazardous waste fuel. There will be about 100 pounds per year of that waste, which will be received in bulk and put into tanks.

Line Number			A. Dangerous Waste No. (enter code)				B. Estimated Annual Quantity of Waste	C. Unit of Measure (enter code)	D. Processes									
									(1) Process Codes (enter)									(2) Process Description [If a code is not entered in D (1)]
X	**1**		**D**	**0**	**0**	**2**	**400**	**P**	**S**	**0**	**1**	**T**	**0**	**1**				
X	**2**		**D**	**0**	**0**	**1**	**100**	**P**	**S**	**0**	**2**	**T**	**0**	**1**				
X	**3**		**D**	**0**	**0**	**2**												**Included with above**
		1	F	0	0	3	6,200	P	D	8	3							Includes Debris
		2	D	0	0	2	20,600	P	D	8	3							Includes Debris
		3	D	0	0	6	100	P	D	8	3							Includes Debris
		4	D	0	0	7	10,000	P	D	8	3							Includes Debris
		5	D	0	0	8	150	P	D	8	3							Includes Debris
		6	D	0	0	9	6,200	P	D	8	3							Includes Debris
		7	W	T	0	2	15,000	P	D	8	3							Includes Debris
		8																
		9																
	1	**0**																
	1	**1**																
	1	**2**																
	1	**3**																
	1	**4**																
	1	**5**																
	1	**6**																
	1	**7**																
	1	**8**																
	1	**9**																
	2	**0**																
	2	**1**																
	2	**2**																
	2	**3**																
	2	**4**																
	2	**5**																

XV. Map

Attach to this application a topographic map of the area extending to at least one (1) mile beyond property boundaries. The map must show the outline of the facility; the location of each of its existing and proposed intake and discharge structures; each of its dangerous waste treatment, storage, recycling, or disposal units; and each well where fluids are injected underground. Include all springs, rivers, and other surface water bodies in this map area, plus drinking water wells listed in public records or otherwise known to the applicant within ¼ mile of the facility property boundary. The instructions provide additional information on meeting these requirements.

XVI. Facility Drawing

All existing facilities must include a scale drawing of the facility (refer to Instructions for more detail).

XVII. Photographs

All existing facilities must include photographs (aerial or ground-level) that clearly delineate all existing structures; existing storage, treatment, recycling, and disposal areas; and sites of future storage, treatment, recycling, or disposal areas (refer to Instructions for more detail).

XVIII. Certifications

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Operator* Name and Official Title (type or print) Keith A. Klein, Manager U.S. Department of Energy Richland Operations Office	**Signature** [signature]	**Date Signed** 8/25/05
Co-Operator** Name and Official Title (type or print) Patrick L. Pettiette Project Manager Washington Closure Hanford LLC	**Signature** [signature]	**Date Signed** 8-7-05
Co-Operator – Address and Telephone Number** 3070 George Washington Way Richland, WA 99352 (509) 372-9951		
Facility-Property Owner* Name and Official Title (type or print) Keith A. Klein, Manager U.S. Department of Energy Richland Operations Office	**Signature** [signature]	**Date Signed** 8/25/05

Comments
On December 27, 2000, Ecology granted a contained-in determination for F003 (methanol) contaminated soil and debris for the 1301-N Liquid Waste Disposal Facility.

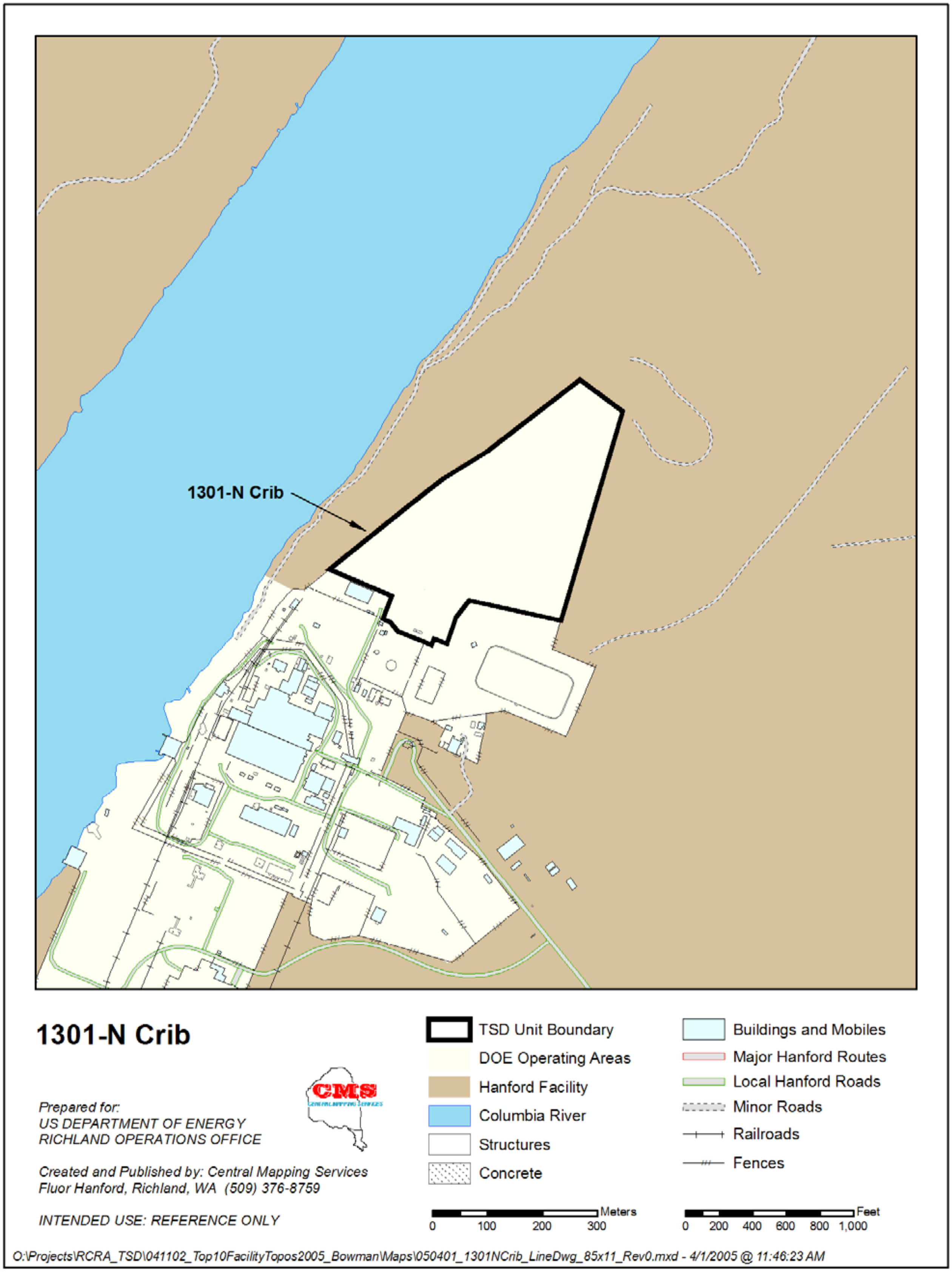
1301-N Liquid Waste Disposal Facility

CRIB OUTFALL

8605087-8CN
(PHOTO TAKEN 1986)

TRENCH CONCRETE COVER

8605087-15CN
(PHOTO TAKEN 1986)


1301-N Crib
1301-N Crib
TSD Unit Boundary
DOE Operating Areas
Hanford Facility
Columbia River
Structures
Concrete
Buildings and Mobiles
Major Hanford Routes
Local Hanford Roads
Minor Roads
Railroads
Fences
Prepared for:
US DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE
Created and Published by: Central Mapping Services
Fluor Hanford, Richland, WA (509) 376-8759
INTENDED USE: REFERENCE ONLY
Meters
0 100 200 300
Feet
0 200 400 600 800 1,000
O:\Projects\RCRA_TSD\041102_Top10FacilityTopos2005_Bowman\Maps\050401_1301NCrib_LineDwg_85x11_Rev0.mxd - 4/1/2005 @ 11:46:23 AM

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Chapter 2.0 Unit Description

Figures

Tables

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2.0 UNIT DESCRIPTION

The closure plan for the 1301-N Liquid Waste Disposal Facility (1301-N), also known by the designation 116-N-1, and for the 1325-N Liquid Waste Disposal Facility (1325-N), also known by the designation 116-N-3. The 1301-N and 1325-N terminology will be used throughout this appendix because the Liquid Waste Disposal Facilities are identified as such in their interim status Part A Permit Applications. These radioactive dangerous waste units operated as soil column disposal units, most recently under the authority of the *Washington Administrative Code* (WAC) 173-303. Closure of these units will commence pursuant to WAC 173-303-610 and the Hanford Facility Dangerous Waste Permit (Permit). Modification of the Permit to include this closure plan is scheduled to occur in calendar year 1999. However, because of the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) milestone that requires one document be submitted to address the four treatment, storage, and disposal units this closure plan will be incorporated into the Permit Modification in December 1998.

This closure plan is part of the 100-NR-1 Treatment, Storage, and Disposal Corrective Measures Study (DOE/RL-96-39, Rev. 1A). Approval of this closure plan will be obtained through the Permit modification process. Contaminated groundwater associated with 1301-N and 1325-N TSD operations is defined as the 100-NR-2 Operable Unit (OU). Remedial alternatives associated with contaminated groundwater are defined in the 100-NR-1/NR-2 Treatment, Storage, and Disposal Corrective Measures Study. Chosen remedial actions for 100-NR-2 groundwater will be defined in a separate ROD and, again, incorporated into the Permit through Permit modification. Actual closure activities necessary to close these units are not known at this time because the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) alternative selection process has not been completed. Therefore, this closure plan contains closure activities that may be required for the range of 1301-N and 1325-N remedial alternatives presented in Permit Attachment 41, Chapter 5.0. This range includes two closure options available to dangerous waste units under WAC 173-303 and the Permit: modified closure or landfill closure.

2.1 REGULATORY BACKGROUND

The 1301-N and 1325-N units are operated by the U.S. Department of Energy (DOE), Richland Operations Office (RL), and co-operated by Bechtel Hanford, Inc. Although the U.S. Government holds legal title to this facility, the RL, for purposes of regulation under WAC 173-303, is considered the legal owner of the facility under existing U.S. Environmental Protection Agency (EPA) interpretive regulations (51 Federal Register 7722).

The Part A, Form 3, dangerous waste permit application documentation for 1301-N originally was submitted to the Washington State Department of Ecology (Ecology) and the EPA in August 1986. Documentation for the 1325-N Liquid Waste Disposal Facility originally was submitted in February 1987.

The Part A identifies the listed waste spent solvent, methanol (F003), as being disposed to 1301-N and 1325-N. Any media or debris that came into contact with wastewaters disposed to these units may also, by definition, be considered to be a listed dangerous waste in lieu of an approved contained-in determination. The reason this is not stated definitively is because, federally, F003 spent solvents are no longer listed if they do not exhibit the characteristic of ignitability (40 CFR 261.3[a][2][iii]), however, a similar 'exclusion' does not exist in State regulation.

Soil samples taken from the 1325-N Trench resulted in non-detectable levels of methanol. The values reported for the nondetects range from 5.0 to 5.4 mg/kg and are well below the Model Toxics Control Act Method B cleanup of 400 mg/kg. Sampling of the 1301-N Crib was not conducted since it is considered to be analogous with the 1325-N Trench. In December 2000, Washington State Department of Ecology granted a contained-in determination for the soils located within the 1325-N and 1301-N Liquid Waste Disposal Facilities.

2.2 CLOSURE PLAN AND CORRECTIVE MEASURES STUDY INTEGRATION

Closure of the 1301-N and 1325-N units will occur under the authority of WAC 173-303. These units are also defined under the 100-NR-1 OU and are part of DOE/RL-96-39, Rev. 1A. Integrated TSD and OU closure actions will be necessary to remediate contaminated soil and groundwater. Actions taken to remediate these TSDs will comply with the provisions of both CERCLA and RCRA. The CERCLA public involvement, including public notice and opportunity to comment, has been enhanced to concurrently satisfy the RCRA closure process. The remedy selected under CERCLA will be incorporated into the Hanford Facility RCRA Permit as the RCRA closure action after issuance of the public notice and comment process.

The CERCLA ROD was issued subsequent to the Hanford Facility RCRA Permit modification. Should the CERCLA ROD contain provisions inconsistent with the approved RCRA modifications, the Hanford Facility RCRA Permit will be again modified to reconcile these differences during the next permit modification cycle.

Closure options available under WAC 173-303-610 and the Permit are as follows:

Clean closure - requires that groundwater be uncontaminated by dangerous waste constituents (as evidenced through compliance with WAC 173-303-645) and that soils contain concentrations of dangerous waste constituents below *Model Toxics Control Act* (MTCA) Method B direct soil exposure and groundwater protection levels (WAC 173-303-610[2][b][I] and Permit Condition II.K.1). This closure option is compatible with both exposure scenarios presented in DOE/RL-96-39, Rev. 1A, rural-residential and the modified CRCIA Ranger/Industrial Scenario because it allows for unrestricted use of the units after closure. Because it is unclear at this time whether the groundwater under 1301-N and 1325-N has been contaminated with dangerous waste constituents from past operation of these units, as defined under WAC 173-303-645, this closure option has not been identified as available to 1301-N and 1325-N in this closure plan. Should a clean soil column be attained and future groundwater monitoring indicate levels of dangerous waste constituents are below MTCA Method B levels, this option will be revisited through Permit modification.

Modified closure - requires that soil concentrations of dangerous waste constituents not exceed MTCA Method C direct soil exposure and groundwater protection levels. Groundwater may or may not be contaminated by dangerous waste constituents (Permit Condition II.K.3). This closure option is only compatible with modified CRCIA ranger/industrial uses of the land (as defined for the purposes of Permit Attachment 41) because institutional controls would be required in order to limit access to the contaminated media.

Landfill closure - required when soils contain concentrations of dangerous waste constituents above MTCA Method C direct soil exposure and groundwater protection levels. Groundwater may or may not be contaminated by dangerous waste constituents (Permit Condition II.K.4). This closure option is only compatible with modified CRCIA ranger/industrial uses of the land because capping and other institutional controls would be required in order to limit access to the contaminated media.

Closure option decisions at 1301-N and 1325-N will be driven by decisions made pursuant to a CERCLA ROD for these units. Remedial alternatives compared in Permit Attachment 41 encompass modified and landfill closure options available under WAC 173-303-610 and the Permit. Therefore, information is contained in Permit Attachment 41 that address compliance with all potential closure options. Remedial alternatives compared are presented below:

- No Action under a rural residential or modified CRCIA ranger/industrial exposure scenario (RRES-1), (MCRIS-1)

- Remove/Treat if Required/Dispose/Backfill under a residential or modified CRCIA ranger/industrial exposure scenario (RRES-6), (MCRIS-6)

- Remove to 3.0 m (10 ft) below ground surface (bgs)/Treat if Required/Dispose/Backfill/Cap for Groundwater Protection under a modified CRCIA ranger/industrial exposure scenario (MCRIS-7)
- Remove to 3.0 m (10 ft) bgs/Treat if Required/Dispose/Vitrify for Groundwater Protection/Backfill under a modified CRCIA ranger/industrial exposure scenario (MCRIS-8).

The RRES-1 and MCRIS-1 Alternatives are presented in DOE/RL-96-39, Rev. 1A for baseline comparison but are not considered viable alternatives for 1301-N and 1325-N. MCRIS-6 and MCRIS-8 Alternatives may result in a modified closure decision, depending upon the concentrations of dangerous waste constituents left in the units after excavation is completed. Landfill closure is precluded by the RRES-6, MCRIS-6, and MCRIS-8 Alternatives because they do not include placement of a final cover over the units. The MCRIS-7 Alternative may result in a modified closure or landfill closure decision depending upon the concentrations of dangerous waste constituents left after excavation. Although unlikely, a modified closure option may still be viable for the MCRIS-7 Alternative because capping of these units may be required for purposes unrelated to closure of these units under WAC 173-303-610, i.e., protection of the groundwater from radiological contaminants remaining in soils below 3.0 m (10 ft).

2.3 CLOSURE PERFORMANCE STANDARDS

The closure performance standards of WAC 173-303-610(2) require that the owner/operator of a TSD unit close the unit in a manner that (1) minimizes the need for further maintenance; (2) controls, minimizes, or eliminates postclosure escape of dangerous waste to the extent necessary to protect human health and the environment; and (3) returns the land to the appearance and use of surrounding land areas.

2.3.1 Minimize the Need for Further Maintenance

The extent of future site maintenance depends on the closure option chosen for 1301-N and 1325-N (i.e., modified, or landfill closure). Maintenance, monitoring, and inspections necessary to minimize the need for further maintenance of the units under a modified or landfill closure option are defined in Permit Attachment 41, Chapter 5.0.

2.3.2 Control Dangerous Waste Escape to Protect Human Health and the Environment

Closure activities defined in Permit Attachment 41, Chapter 4.0 will ensure the control of dangerous waste during closure activities. Because these activities cannot be fully defined until a remedial alternative is chosen through a ROD and remedial design is defined, these activities describe a range of activities that may be undertaken in order to achieve modified or landfill closure. Closure activities will meet the remedial action objectives for soils as defined in Permit Attachment 41, Chapter 3.0. Remedial action objectives for contaminated groundwater associated with 1301-N and 1325-N operations are defined in Permit Attachment 41, Chapter 4.0. These objectives are designed to protect both human health and the environment.

2.3.3 Return Land to Appearance and Use of Surrounding Area

The appearance and use of 1301-N and 1325-N after closure will be consistent with the future use of the 100-N Area. Permit Attachment 41 defines two possible exposure scenarios: rural-residential and modified CRCIA ranger/industrial. All alternatives include the commitment to revegetate the surface soils.

2.4 GENERAL DESCRIPTION OF UNITS

This section provides a general description of the 1301-N and 1325-N Liquid Waste Disposal Facilities. This description is Intended to provide an overview of these units.

The 1301-N and 1325-N surface soils and subsoils, including the UPR-100-N-31 spill, and associated structures and piping that have been contaminated by dangerous waste constituents from these units are subject to this WAC 173-303 closure action.

The 1301-N and 1325-N units were the primary Liquid Waste Disposal Facilities for the N Reactor. Wastes disposed included reactor coolant, spent fuel storage basin, and periphery cooling systems bleed off. Also included were reactor primary coolant loop decontamination rinse solution and discharges from building drains containing radioactive wastes generated in reactor support facilities. The 1301-N unit was operated from December 1963 until September 1985. The 1325-N unit was operated from October 1983 until April 1991. From October 1983 to September 1985, both units were in operation.

For a general discussion on the N Reactor facility background and more in-depth description of these units, refer to DOE/RL-96-39, Rev. 1A, Section 2.0.

2.4.1 Topographical Maps

General topographical maps for the area surrounding the 1301-N and 1325-N units are provided in Figures 2.1 and 2.2.

2.4.2 Floodplain

The U.S. Army Corp of Engineers has calculated the probable maximum flood based on the upper limit of precipitation falling on a drainage area and other hydrologic factors such as antecedent moisture conditions, snowmelt, and tributary conditions that could lead to a maximum runoff. The probable maximum flood for the Columbia River below Priest Rapids Dam has been calculated to be 41 million L/s (1.4 million ft^3/s). The floodplain associated with the probable maximum flood is shown in Permit Attachment 33 (DOE/RL-91-28), General Information Portion, §2.2.1.4, Flood Plain Area. The 1301-N and 1325-N units would not be affected by the probable maximum flood.

2.4.3 Traffic

The majority of traffic inside the Hanford Site boundaries consists of light-duty vehicles used to transport employees to work areas. The 1301-N and 1325-N units are located within the Hanford Controlled Access Area where roadways cannot be accessed by the general public. These facilities are isolated from the nearest public highway, State Highway 24, by approximately 6 km (4 mi). Vehicle traffic around the units is restricted and is minimal, as the area is enclosed by a fenced with locked gates and is posted as a radiation zone. DOE/RL-96-39, Rev. 1A, Section 2.4 provides additional details about the current postings on the perimeter fence.

2.4.4 General Hydrogeologic Conditions

DOE/RL-96-39, Rev. 1A, Section 2.3.2 provides information on the geology and hydrogeology underlying the 1301-N and 1325-N units.

2.4.5 Physical Dimensions of the Units

The 1301-N unit consists of a 16-m by 3.7-m (52- by 12-ft) weir box inside a 38- by 88-m (125-by 290-ft) rectangular basin (crib). A zigzag extension trench, approximately 490 m (1,600 ft) long, 15 m (50 ft) wide, and 3.7 m (12 ft) deep, was added to the crib.

The 1325-N unit includes a concrete header box inside a 73- by 76-m (240- by 250-ft) rectangular basin (crib). A straight extension trench, approximately 914 m (3,000 ft) long, 16.8 m (55 ft) wide, and 3.0 m (10 ft) deep, was also added to this crib.

2.4.6 Design Capacity

Both the 1301-N and 1325-N Liquid Waste Disposal Facilities were designed with a discharge capacity of 11,400 L/min (3,000 gal/min). The average flow rate was approximately 6,400 L/min (1,700 gal/min).

2.4.7 Ancillary Equipment

The 1301-N and 1325-N units are passive liquid waste disposal facilities that do not rely on active systems for operations support. The units consist of transfer piping, concrete effluent distribution structures, and soils to distribute liquid wastes.

2.4.8 Containment Systems

The 1301-N and 1325-N units do not include any containment systems.

2.4.9 Structures and Piping Requiring Removal or Characterization as Clean

The structures in the 1301-N and 1325-N Liquid Waste Disposal Facilities include concrete structures and earthen basins and trenches. The 1301-N unit consists of a 16- by 3.7-m (52- by 12-ft) weir box, a 38- by 88-m (125- by 290-ft) rectangular basin (crib), and a zigzag extension trench, approximately 490 m (1,600 ft) long, 15 m (50 ft) wide, and 3.7 m (12 ft) deep.

The 1325-N unit includes a concrete header box, a 73- by 76-m (240- by 250-ft) rectangular basin (crib), a tie-in structure, and a straight extension trench, approximately 914 m (3,000 ft) long, 16.8 m (55 ft) wide, and 3.0 m (10 ft) deep.

Figure 2.1 shows the pipelines to be removed or characterized as clean between the 1722-N Building and 1301-N and between 1310-N and 1301-N. Figure 2.2 shows the piping between the 1301-N Crib and the 1325-N Crib.

Refer to Permit Attachment 41, Chapter 4.0, Closure Activities, for a more in-depth discussion on the removal of structures.

2.4.10 Security

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

Within the Hanford Site are operational areas, including 100-N, to which access is restricted. There is a staffed checkpoint at the Wye Barricade through which access to the 100-N Area is allowed only to authorized personnel. Authorized personnel are those individuals with a DOE-issued security identification badge indicating the appropriate authorization. Such personnel are subject to a search of items carried into or out of controlled areas.

2.5 WASTE CHARACTERISTICS

2.5.1 Liquid Waste Discharges

The wastes disposed in 1301-N and 1325-N were generated from N Reactor operations. The waste streams included the following:

- Reactor coolant system bleed off
- Spent fuel storage basin cooling water overflow
- Reactor periphery cooling systems bleed off
- Reactor primary coolant loop decontamination rinse solution

- Building drains serving reactor support facilities.

The combination of these waste streams resulted in an average flow of approximately 6,400 L/min (1,700 gal/min). Results of influent sampling and analysis (Table 2.1) did not indicate the characteristics of a dangerous waste.

Reactor primary coolant system. The reactor primary coolant system was supplied by demineralized water with chemicals added for water quality control (QC). Ammonium hydroxide was used for pH control and was injected at a concentration of approximately 40 ppm to maintain a pH of 10.2 to 10.4 standard units. Hydrazine was introduced for oxygen control at a concentration of 0.04 ppm.

Fuel storage basin cooling water. The spent fuel storage basin was supplied by filtered water with chlorine added as an algaecide. A trace amount of residual chlorine was maintained to ensure complete treatment.

Reactor periphery cooling systems. Reactor periphery cooling systems that discharged bleed-off wastes to 1301-N and 1325-N include the following:

- Graphite and shield cooling
- Reactor control rod cooling
- Reactor secondary coolant loop.

As with other reactor, cooling systems, bleed off and spillage from the periphery cooling systems resulted in small continuous discharge.

Graphite and Shield Cooling. The graphite and shield cooling system was supplied by demineralized water with chemicals added for water QC. Ammonium hydroxide was injected at a concentration of approximately 40 ppm to maintain a pH of 10.0 to 10.2 standard units. Hydrazine was injected for oxygen control at a concentration of 0.04 ppm.

Reactor Control Rod Cooling. The reactor control rod cooling system was supplied by demineralized water with chemicals added for water QC. Ammonium hydroxide was injected at a concentration of approximately 40 ppm to maintain a pH of 7.0 standard units. Hydrazine is injected for oxygen control at a concentration of 0.15 ppm.

Reactor Secondary Coolant Loop. The reactor secondary coolant loop was supplied by demineralized water with chemicals added for water QC. Morpholine was injected at a concentration of approximately 4 ppm to maintain a pH of 8.6 to 9.2 standard units. Hydrazine was injected for oxygen control at a concentration of 1 ppm or less.

Reactor primary coolant loop decontamination. The reactor primary coolant loop was decontaminated every 2 to 4 years. The decontamination solution consisted of 79,500 L (21,000 gal) TURCO 4512-A™ (70% phosphoric acid) and 136 to 181 kg (300 to 400 lb) of diethylthiourea. This solution was diluted to an 8 wt% phosphoric acid solution as it entered the reactor coolant loop.

After the pH of the rinsate was verified between 6.0 and 9.0 standard units, the final rinse solution containing approximately 378,500 L (100,000 gal) of demineralized water was discharged. The calculated phosphoric acid released per decontamination was 5.7 L (1.5 gal), and the calculated amount of diethylthiourea was 2.3 g (0.0051 lb).

Building drains. The radioactive drain system collected radioactive water from throughout the 109-N and 105-N Buildings. Pump leakage, system bleed off from the reactor primary and periphery cooling systems, laboratories, decontamination activities, and other routine activities were drained to 1301-N and 1325-N via this system.

Three of the waste streams exhibited characteristics of a dangerous waste at the point of generation. These were leaks and spills from the auxiliary power battery lockers, hydrazine mixing spills, and laboratory wastes. Each of these wastes contained contaminants that are designated dangerous wastes under WAC 173-303-090. However, sampling of the 1301-N and 1325-N influent (Table 2.1) did not identify characteristics of a dangerous waste at the point of discharge into 1301-N and 1325-N.

Wastes from Chemical Analyses. Chemical analyses were performed in laboratories to determine hydrazine, ammonia, chloride, and fluoride concentrations in reactor coolant. Waste characterization indicated that approximately 9,800 L/yr (2,600 gal/yr) contained constituents designated as dangerous wastes under WAC 173-303-090.

Auxiliary Power Battery Lockers. Spills and leaks from the auxiliary power battery lockers contributed 300 to 450 L/yr (80 to 120 gal/yr) of waste from nickel-cadmium and lead-acetate batteries. It is estimated that approximately 40% of the spilled material was from nickel-cadmium batteries and 60% from lead-acetate batteries.

Hydrazine Mixing and Injection Area Floor Drains. Hydrazine spills from mixing and injection activities entered the radioactive drain system. Spills were very small in volume and, in the case of the mixed solution, were extremely dilute. Approximately 160 kg (350 lb) of hydrazine was spilled yearly in this manner.

2.5.2 Liquid Waste Discharge Chronology

A chronology of liquid waste discharges to 1301-N and 1325-N is provided in Table 2.2.

Table 2.1. 1301-N and 1325-N Effluent Analysis

Parameter (MDL)	Sample			
	1	2	3	Average
pH (standard units)	6.58	6.56	6.97	6.70
Conductivity (micromhos)	148	155	190	164
Mercury (.001 ppm)	ND	ND	ND	ND
Ethylene glycol (10 ppm)	ND	ND	ND	ND
Enhanced thiourea (.2 ppm)	ND	ND	ND	ND
TOC (1 ppm)	0.0018	0.002	0.002	0.0019
Cyanide (.01 ppm)	ND	ND	ND	ND
Barium (.006 ppm)	0.03	0.027	0.027	0.028
Cadmium (.002 ppm)	ND	ND	ND	ND
Chromium (.01 ppm)	ND	ND	ND	ND
Lead (.03 ppm)	ND	ND	ND	ND
Silver (.01 ppm)	ND	ND	ND	ND
Sodium (.1 ppm)	1.831	1.819	1.781	1.810
Nickel (.01 ppm)	ND	ND	ND	ND
Copper (.01 ppm)	ND	ND	ND	ND
Vanadium (.005 ppm)	ND	ND	ND	ND
Antimony (.1 ppm)	ND	ND	ND	ND
Aluminum (.15 ppm)	ND	ND	ND	ND
Manganese (.005 ppm)	ND	ND	ND	ND
Potassium (.1 ppm)	0.647	0.608	0.606	0.620
Iron (.05 ppm)	0.081	0.077	0.050	0.069
Beryllium (.005 ppm)	ND	ND	ND	ND
Osmium (.3 ppm)	ND	ND	ND	ND
Strontium (.3 ppm)	ND	ND	ND	ND
Zinc (.005 ppm)	ND	ND	ND	ND
Calcium (.05 ppm)	14.40	13.97	14.05	14.14
Nitrate (.5 ppm)	ND	ND	ND	ND
Sulphate (.5 ppm)	12.41	11.53	11.97	11.97
Fluoride (.5 ppm)	ND	ND	ND	ND
Chloride (.5 ppm)	1.57	1.48	1.53	1.53
Phosphate (1 ppm)	ND	ND	ND	ND
Phosphorus Pesticides (.005 ppm)	ND	ND	ND	ND
Chlorinated Pesticides (.001 ppm)	ND	ND	ND	ND
Enhanced ABN List	ND	ND	ND	ND
Citrus Red (1 ppm)	ND	ND	ND	ND
Arsenic (.005 ppm)	ND	ND	ND	ND
Ammonium Ion (.05 ppm)	ND	ND	ND	ND
Coliform (3 MPN)	---	0.023	0.009	0.016
Selenium (.005 ppm)	ND	ND	ND	ND
Thallium (.01 ppm)	ND	ND	ND	ND

ND = Not Detected MDL = Minimum Detection Limit Data obtained from samples taken August 1985 Diediker and Hall. (1987)

Table 2.2. Chronology of Liquid Waste Discharges

Year	**Liquid Waste Discharge to 1301-N** Liquid Waste Disposal Facility **(L/day)**	**Liquid Waste Discharge to 1325-N** Liquid Waste Disposal Facility **(L/day)**
1964	9,462,500*	0
1965	9,462,500*	0
1966	9,462,500*	0
1967	9,462,500*	0
1968	9,462,500*	0
1969	9,462,500*	0
1970	9,462,500*	0
1971	9,462,500*	0
1972	9,462,500*	0
1973	8,702,000	0
1974	9,500,000	0
1975	9,500,000	0
1976	9,900,000	0
1977	14,500,000	0
1978	12,500,000	0
1979	13,500,000	0
1980	12,500,000	0
1981	10,500,000	0
1982	10,500,000	0
1983	6,942,000	1,960,000
1984	8,100,000	1,900,000
1985	7,200,000	2,800,000
1986	0	7,250,000
1987	0	2,100,000
1988	0	1,660,000
1989	0	1,660,000
1990	0	1,660,000
1991+	0	0

[1]WHC-SD-ER-TA-001, Rev. 0 (WHC 1991).*There are no reliable data available for average flow rates and effluent discharge rates for 1301-N. Estimates based on discharge volumes from 1973 to 1976 were used for 1964 through 1972. Data for 1973 through 1989 were taken from the yearly effluent release reports. LWDF = liquid waste disposal facility

1 **Figure 2.1. 116-N-1 Crib Influent Piping to be Rescheduled for Remediation**

2

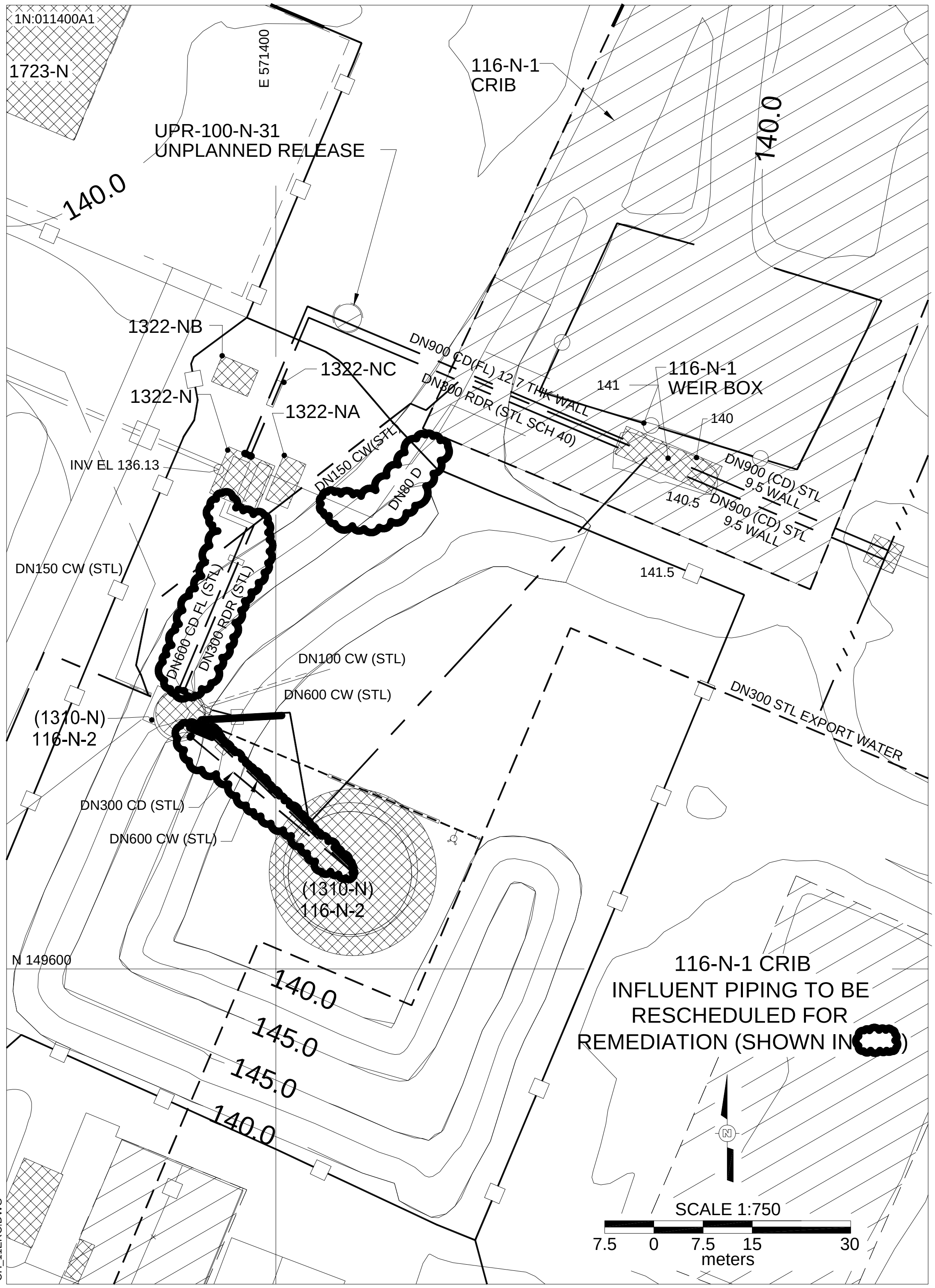
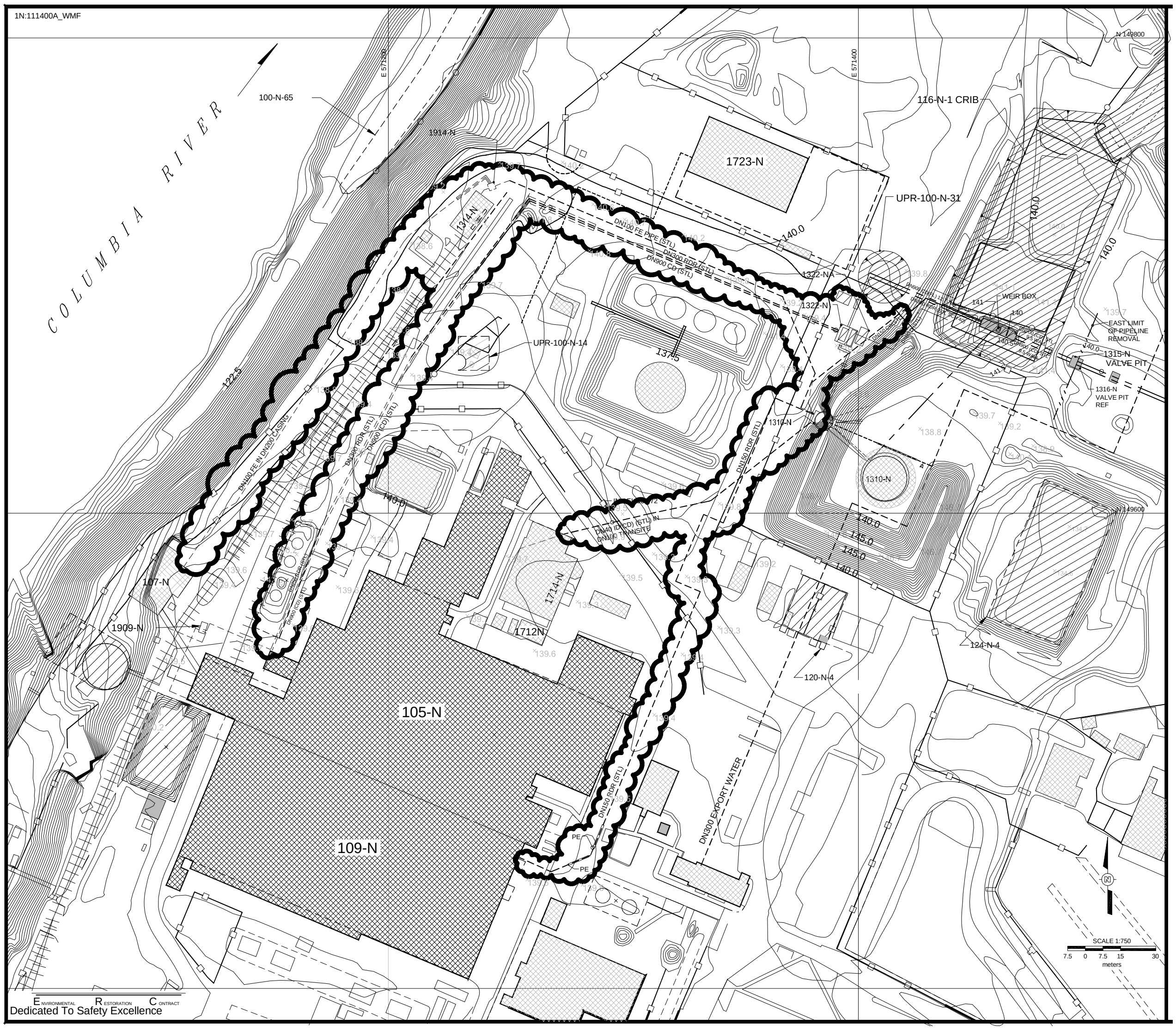


Figure 2.2. 116-N-1 Crib Influent Piping to be Rescheduled for Remediation



Legend

116-N-1 Crib influent piping to be rescheduled for remediation

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Chapter 3.0 Groundwater Monitoring

Figures

Tables

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3.0 GROUNDWATER MONITORING

3.1 AQUIFER IDENTIFICATION

The unconfined aquifer in the 100-N Area is located primarily in the upper part of the Ringold Formation (sands and gravels) and is approximately 12 to 15 m (40 to 50 ft) thick. The base of the aquifer is believed to be a laterally continuous clay-rich unit containing a series of paleosols. Lithologies in this unit range from clay and silt to sand. Most of the wells in the 100-N Area did not penetrate through the clay layer; therefore, the thickness of the clay-rich unit is unknown at most locations.

The water table is approximately 21 to 23 m (69 to 75 ft) below land surface near 1301-N and approximately 23 m (75 ft) below land surface near 1325-N. Water levels have returned to these "pre-Hanford" levels after years of groundwater mounding caused by artificial recharge from the units and other effluent disposal in the 100-N Area.

A representative range of transmissivity estimates for the unconfined aquifer in the 100-N Area is 93 to 560 m2/day (1,000 to 6,030 ft2/day) throughout most of that area. Wells in the northwest portion seem to show a higher transmissivity (up to 1,900 m2/day [20,500 ft2/day]). These values correspond to horizontal hydraulic conductivity of 6 to 37 m/day (20 to 121 ft/day), and 120 m/day (394 ft/day) in the northwest portion. Specific yield is estimated at 0.1 to 0.3.

Hartman and Lindsey (1993) describe the hydrogeology of the 100-N Area in more detail.

3.2 INTERIM STATUS GROUNDWATER MONITORING

Groundwater monitoring began at 1301-N and 1325-N in December 1987. The original monitoring networks were modified over the years as water levels declined and new wells were installed to replace dry wells.

After the first year of groundwater monitoring at 1301-N, specific conductance in one downgradient well was found to be elevated above background (i.e., upgradient) levels. A groundwater quality assessment program was initiated (Gilmore and Jensen 1989). The assessment program found no evidence that dangerous waste or dangerous waste constituents from 1301-N had entered the groundwater (Hartman 1992). Rather, the elevated specific conductance was caused by sulfate/sodium-contaminated groundwater coming from the nearby 1324-N/NA site. In 1992, the groundwater monitoring program at 1301-N reverted to an indicator parameter monitoring program, as described in 40 CFR 265.93(d)(6). An additional upgradient well was added to the network to reflect the influence of 1324-N/NA. New critical mean values were established for indicator parameters, and the site remains in indicator evaluation status.

Some contamination has been detected in the groundwater under or near the 1301-N and 1325-N units. Two dangerous waste constituents, nitrate and chromium, were found to be at levels above the MCL (Hartman and Dresel, 1997). Nitrate levels above the MCL of 44 mg/L were observed in well 199-N-3 and 199-N-32 in 1996. Well 199-N-3 monitors the 1301-N unit and well 199-N-32 monitors the 1325-N unit. Nitrate values from nearby wells monitoring the same interval are not above the MCL. Chromium concentrations above the MCL of 0.1 mg/L have been observed in wells 199-N-33 and well 199-N-80 in 1996. Well 199-N-33 monitors the 1325-N unit. The 1996 data from well 199-N-33 is considered anomalous. Well 199-N-80 monitors the bottom zone of the unconfined aquifer and is located downgradient from 1301-N. Wells monitoring the upper part of the unconfined aquifer for 1301-N do not have values of chromium above the MCLs. Although contamination has been detected as described, the interim status groundwater monitoring configuration did not identify these constituents as releases attributable to operation of, or residual contamination in, the 1301-N and 1325-N units through statistical analysis of upgradient versus downgradient wells.

The 1325-N unit has been monitored under an indicator evaluation program throughout its history of *Resource Conservation and Recovery Act of 1976* (RCRA) monitoring. Wells were added or deleted from the network to reflect changing conditions.

Groundwater is monitored under several programs in addition to the RCRA in the 100-N Area. The most significant programs in terms of numbers of wells and analytes are those of the RCRA, sitewide surveillance, and CERCLA. Sampling and analysis for RCRA, CERCLA, and sitewide surveillance monitoring have been coordinated for several years to avoid duplication. However, this coordination did not include the planning stages of the monitoring programs.

In an attempt to reduce redundancy further and make monitoring more efficient, representatives of the various contractors involved in 100-N groundwater monitoring held a series of workshops to consolidate and streamline monitoring. Monitoring networks were redesigned to disseminate information for all programs as efficiently as possible, and constituent lists were trimmed to the constituents of concern. Sampling frequency also decreased in some cases. Sampling trips and analytical costs are divided among data users. Borghese et al. (1996) describe the well and constituent lists for the combined program. That document does not include requirements for sampling and analysis protocols, QC, or statistical evaluations. Hartman (1996a) presents a revised groundwater-monitoring plan for the RCRA program, and this is summarized in the following section.

3.2.1 Well Location and Design

The monitoring network for 1301-N includes two upgradient wells and three downgradient wells (Figure 3.1, Table 3.1). All of the wells monitor the unconfined aquifer. As-built diagrams are included in Hartman (1996a). One of the downgradient wells, 199-N-105A, is an extraction well for the CERCLA pump-and-treat system. This well is screened across the entire thickness of the uppermost aquifer (7.3 m [24 ft]) instead of just the top 3.0 to 4.6 m (10 to 15 ft) of the aquifer like the other wells. Because it is an extraction well, 199-N-105A will pull in water from beneath a large area of the 1301-N Trench, making it a useful monitoring well

The construction of some of the 1301-N wells does not meet WAC requirements (Table 3.1). Wells 199-N-2 and 199-N-3 have perforated, carbon steel casing and no annular seals. However, these wells appear to yield representative data, and installing new wells is not warranted. Ecology has accepted the data from these and other wells since RCRA monitoring began at the 100-N Area in 1987.

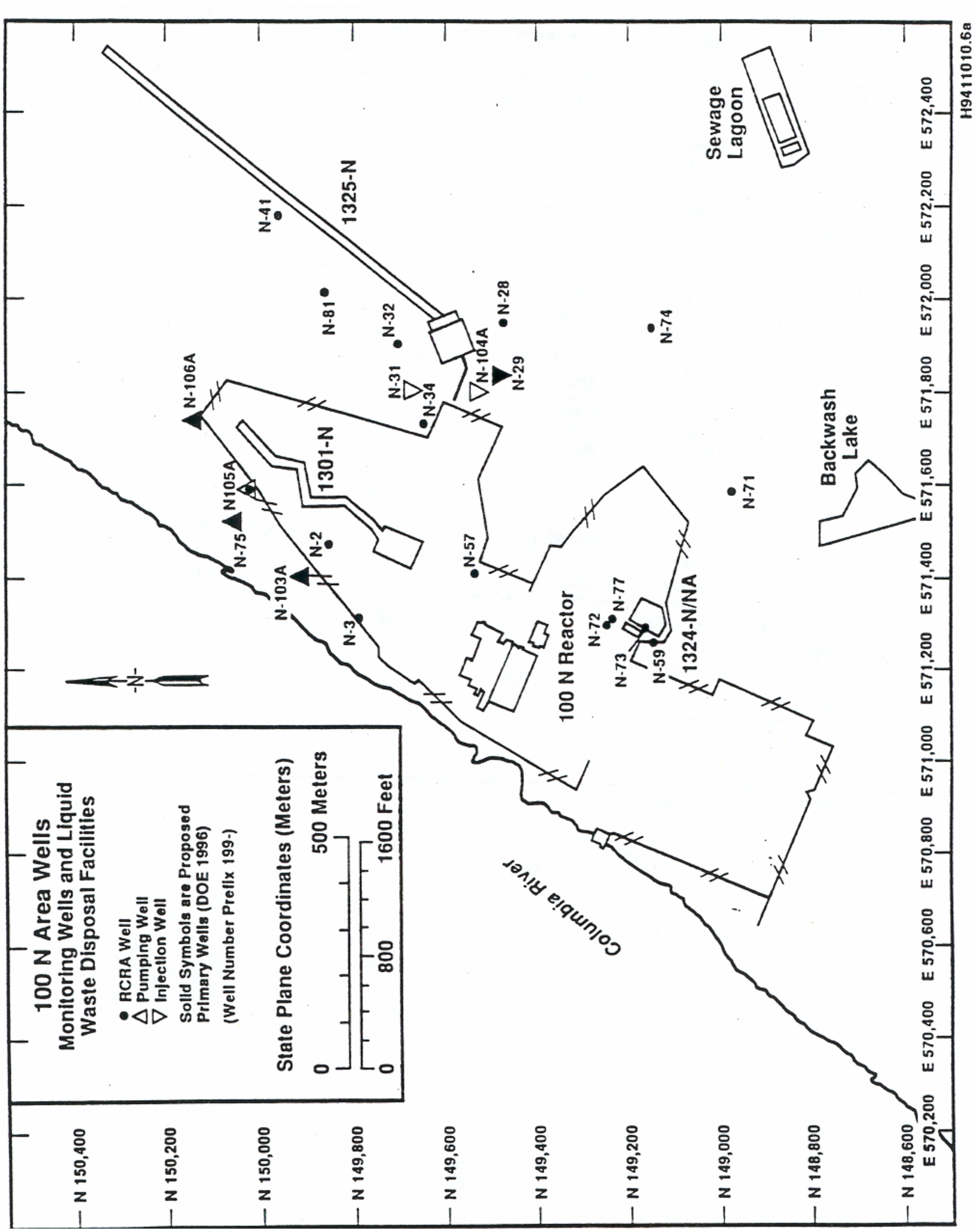
The monitoring network for 1325-N will include one upgradient and three downgradient wells (refer to Figure 3.1 and Table 3.1). Treated water from the CERCLA pump-and-treat system is injected into well 199-N-29 near the 1325-N. Well 199-N-28 is used by the RCRA program to monitor potential effects of injected water; it is not being used in statistical evaluations.

3.2.2 Sampling and Analysis Plan

The *Groundwater Monitoring Plan for the 1301-N,1325-N, and 1324-N/NA Sites* (Hartman 1996b) describes the sampling and analysis plan for RCRA monitoring. Groundwater is sampled for the constituents listed in Table 3.2. Indicator parameters are analyzed semiannually; additional parameters are analyzed annually.

Groundwater sampling procedures, sample collection documentation, and chain-of-custody requirements are described in *Environmental Investigation Instructions (EII)* (WHC-CM-7-7), The *Environmental Activities Procedural Manual* (WHC-CM-7-8), and in the *Quality Assurance Project Plan for Groundwater Monitoring Activities Managed by Westinghouse Hanford Company* (WHC 1995). Work by other contractors is conducted to their equivalent approved standard operating procedures. Procedures for field measurements (pH, conductivity, turbidity) are specified in WHC-CM-7-8 and in the user's manuals for the meters used. Analytical methods are selected from those provided in *Test Methods for Evaluating Solid Wastes* (EPA 1990) as specified by WHC (1995) or its most recent revision.

Figure 3.1. Proposed RCRA Groundwater Monitoring Network for the 1324-N and 1324-NA Units



3.2.3 Quality Assurance and Quality Control

Quality assurance (QA) requirements are defined in the *Westinghouse Hanford Company Quality Assurance Manual* (WHC-CM-4-2) or equivalent procedures, and Article 31 of the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1994). Additional requirements for QA and QC are included in WHC (1995) or its' most recent revision.

Table 3.1. Proposed RCRA Groundwater Monitoring Networks for the 1301 N and 1325-N Liquid Waste Disposal Facilities

Well Number	Proposed Network	Drill Date	Elev. T.O.C.[a] (m)	Casing/Screen Materials	Screened or perf'd depth[b] (m)	Depth to Water[c] (m)
199-N-2	1301-N	1964	140.129	Carbon steel/ perf'd casing; no annular seal	10.7 - 28.0	21.010(6/96)
199-N-3	1301-N	1964	140.015	Carbon steel/ perf'd casing; no annular seal	10.4 - 27.7	20.793(6/96)
199-N-28	1325-N[d]	1983	141.647	Carbon steel/ stainless steel w/ packer; surface seal	14.32 - 25.3	23.311(9/94)
199-N-32	1325-N	1983	140.990	Carbon steel/ stainless steel w/ packer; surface seal	13.4 - 24.1	22.357(3/96)
199-N-34	1301-N	1983	140.247	Carbon steel/ stainless steel w/ packer; surface seal	10.4 - 23.5	21.732(3/96)
199-N-41	1325-N	1984	139.626	Carbon steel/ stainless steel w/ packer; surface seal	16.2 - 22.3	21.193(3/96)
199-N-57	1301-N	1987	139.671	Stainless steel/ stainless steel; full annular seal	17.7 - 22.3	20.708(3/96)
199-N-74	1325-N	1991	139.482	Stainless steel/ stainless steel; full annular seal	18.0 - 24.4	20.537(6/96)
199-N-81	1325-N	1993	142.067	Stainless steel/stainless steel	21.3 - 27.4	22.552(3/96)
199-N-105A	1301-N	1995	140.655	Stainless steel/ stainless steel; full annular seal	21.0 - 28.7	21.220(7/95)

a Surveyed to North American Vertical Datum of 1988.
b Approximate depth below land surface; converted from feet.
c Depth below top of casing; converted from feet.
d Well 199-N-28 to be used for supplemental information; no statistical evaluations.

Figure 3.2. Proposed RCRA Groundwater Monitoring Network for the 1301 N and 1325 N Units

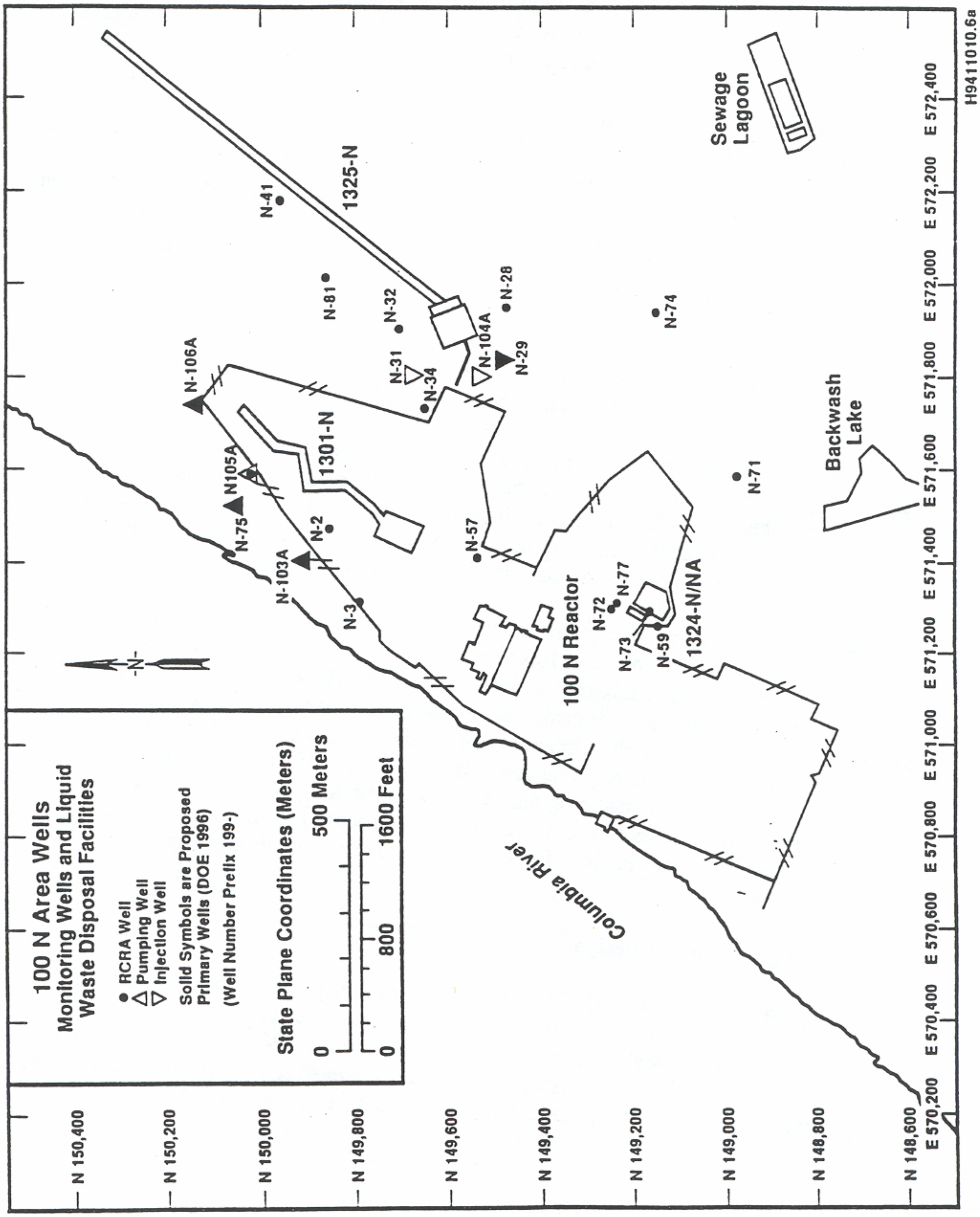


Table 3.2. Constituent List for 1301-N and 1325-N

Analyzed Semiannually	Analyzed Annually
Contamination Indicator Parameters (Quadruplicate samples): Specific conductance (field) pH (field) Total Organic Carbon Total Organic Halogen Turbidity (field)	ICP Metals (filtered) Anions Alkalinity

ICP = Inductively Coupled Plasma

3.3 RESULTS OF GROUNDWATER MONITORING

3.3.1 Potentiometric Level

At various times in the history of waste disposal at the 100-N Area, groundwater mounds formed beneath 1301-N and 1325-N. Changes in water levels are illustrated in Figure 3.2. Water levels have returned to "pre-Hanford" levels in the 100-N Area but are still affected by changes in river stage and, recently, by the operation of pumping and injection wells.

Water levels are measured in all wells before sampling. Many of the wells in the 100-N Area are also measured as part of the site-wide semiannual water level program (Serkowski et al. 1995). The Environmental Restoration Contractor has equipped about 20 wells with pressure transducers and data loggers. Any of the data described above can be used to construct water table maps to aid in determining groundwater flow directions.

During average or low river stage, natural groundwater flow is toward the northwest beneath 1301-N. When river stage is high, the gradient is reversed, and there is a potential for water to flow out of the river into the aquifer. Groundwater flow beneath 1325-N is toward the north regardless of river stage.

A groundwater pump-and-treat system has been in operation in the 100-N Area since August 1995. DOE-RL (1996b) reports the results of an evaluation of the first phase of the system's operation. Data from a network of transducers were used to construct water table maps and estimate capture zones.

Pumping of wells between 1301-N and the Columbia River has created a groundwater depression. Groundwater flows toward the pumping wells from the river and from beneath 1301-N. Treated water is injected into a well near 1325-N.

Vertical groundwater gradients are not well defined in the 100-N Area. There is no significant difference in head between wells completed at the top and bottom of the unconfined aquifer. There does appear to be an upward gradient immediately adjacent to the river. Water levels in deeper wells were consistently higher than shallow wells or the river, indicating an upward gradient (Gilmore et al. 1991).

3.3.2 Groundwater Quality

Groundwater quality in the unconfined aquifer beneath the 100-N Area has been affected by 1301-N, 1325-N, and the 1324-NA Percolation Pond. In addition, various leaks and spills may have affected soil or groundwater chemistry (DOE-RL 1991). Data from RCRA sampling and analysis are reported electronically in the Hanford Environmental Information System database. Interpretation of the data is included in annual reports (Hartman 1996a).

The indicator parameters at the 1301-N and 1325-N units are specific conductance, pH, total organic carbon (TOC), and total organic halogens (TOX) (40 CFR 265.92[b][3]). Groundwater is also analyzed for other constituents that were discharged to the 1301-N and 1325-N units during their use. These analytes include nitrate, chromium, phosphate, lead, and cadmium. Samples have also been analyzed for mercury and volatile organics in the past. Chromium, lead, and cadmium (in filtered samples), phosphate, or volatile organics have not been detected in 1301-N or 1325-N groundwater in significant concentrations. Nitrate increased in some wells near 1301-N and 1325-N during 1995, exceeding the drinking water standard in wells 199-N-2 and 199-N-3. One well southwest (upgradient) of 1301-N also had nitrate above the standard. Concentrations decreased in wells 199-N-2 and 199-N-3 in early 1996, but increased in excess of the drinking water standard in well 199-N-32. The source of nitrate is unknown.

While the 1301-N and 1325-N units were in use, they introduced radioactive constituents, primarily tritium and strontium-90, to the groundwater. These are not considered dangerous waste constituents under interim status RCRA regulations, but were monitored by RCRA in the past because they are the primary contaminants originating from the units.

3.4 GROUNDWATER MONITORING DURING CLOSURE

3.4.1 Monitoring Program

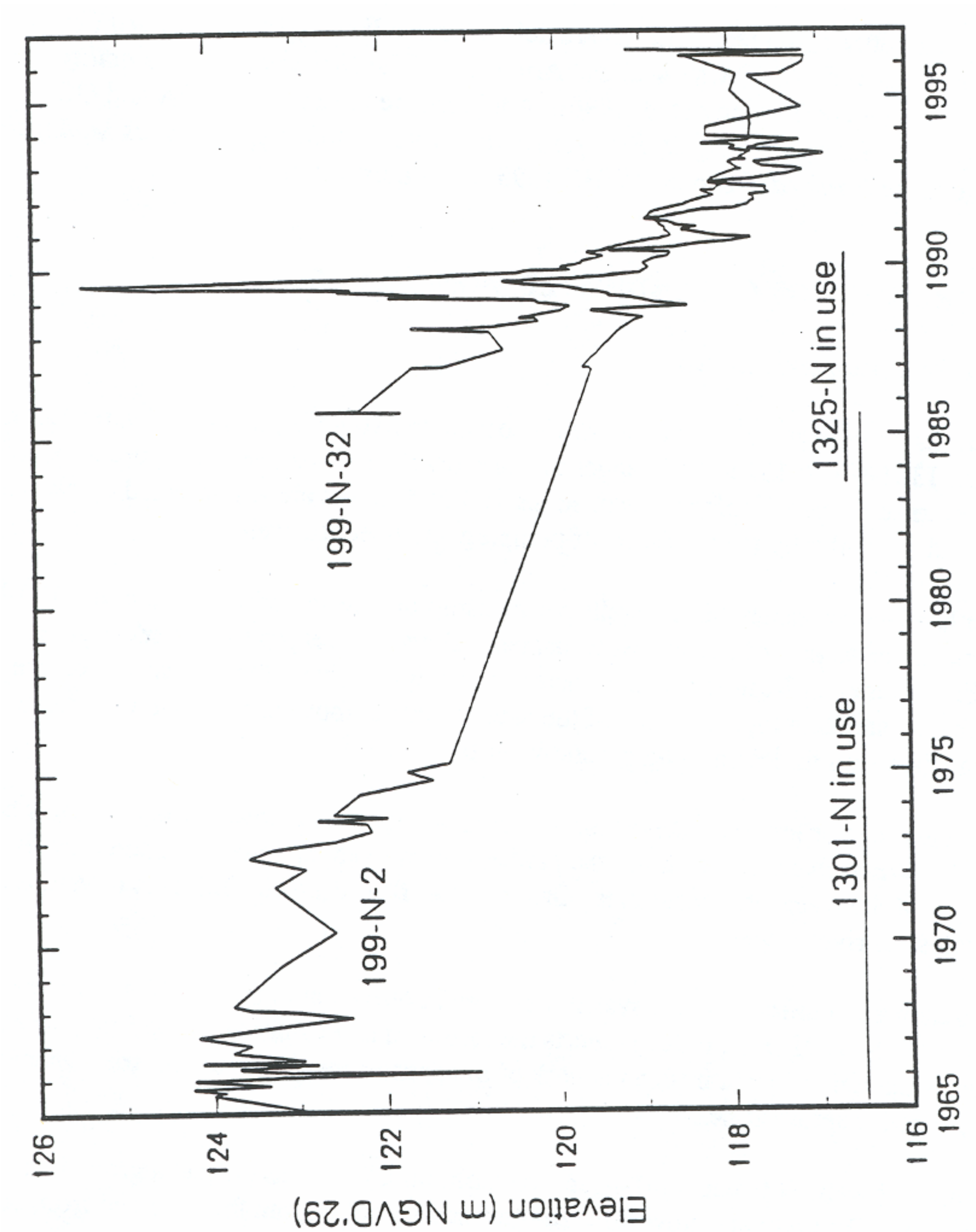
Groundwater monitoring will be done in accordance with the existing groundwater-monitoring program (Borghese, et. al 1996).

3.4.2 Inspection, Maintenance, and Replacement of Wells

Each time a well is sampled, the wellhead and associated structures are inspected. Problems with the pump or with the sample (e.g., excessive turbidity) are also noted. Repairs are made according to approved contractor procedures. Subsurface inspection and maintenance is performed on a 3- to 5-year schedule, or as needed to repair problems identified during sampling.

If a monitoring well becomes unsuitable for use, the monitoring program will be reevaluated to determine if a new or existing well should be substituted.

Figure 3.3. Water Level Changes in Groundwater Below 1301-N and 1325-N



Chapter 4.0 Closure Activities

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4.0 CLOSURE ACTIVITIES

The physical activities required to close 1301-N and 1325-N Liquid Waste Disposal Facilities in accordance with WAC 173-303-610 and the Permit will be integrated with the ROD for DOE/RL 96-39, Rev. 1A. The ROD and the remedial design for the selected alternative will specify further the closure activities that will be required for CERCLA remedial action. Closure activities necessary to comply with dangerous waste regulations and the Permit will need to be consistent with CERCLA activities. CERCLA activities will be required to include elements necessary for closure of a dangerous waste unit. The Closure Plan presents the physical remedial activities and the sampling and analysis required to comply with WAC 173-303-610 and the Permit for each of the remedial alternatives presented in Attachment 41, Chapter 2.0, §2.2.

The closure activities are discussed in this section to highlight the site-specific elements of removal or characterization as clean of structures and piping for the 1301-N and 1325-N Liquid Waste Disposal Facilities. The other closure activities are not well defined for these sites at present but will be developed during the remedial design phase. Additional details about the alternatives can be found in DOE/RL-96-39, Rev. 1A, Section 5.2.

4.1 REMOVAL OF STRUCTURES

The structures in 1301-N and 1325-N Liquid Waste Disposal Facilities include concrete structures and earthen basins, trenches, fencing and signage surrounding the units, and ancillary surface structures such as valve houses associated with piping. The 1301-N and 1325-N Liquid Waste Disposal Facilities structures are discussed in Permit Attachment 41, Chapter 2.0

4.1.1 Earthen Structures

The contaminated soil in the earthen structures will be excavated by conventional earthmoving techniques. Removal technologies are described in DOE/RL-96-39, Rev. 1A, Section 5.1.3. Differing amounts of contaminated soils will be generated depending upon the remedial alternative selected for 1301 N and 1325 N. Alternatives that include soil removal are described in DOE/RL-96-39, Rev. 1A, Sections 5.2.1.5 through 5.2.1.8 for a residential exposure scenario and in DOE/RL-96-39, Rev. 1A, Sections 5.2.2.5 through 5.2.2.8 for a modified CRCIA ranger/industrial exposure scenario. After loading into containers, contaminated soils will be treated if necessary and/or disposed in an approved disposal facility on the Hanford Site. Particular attention will be given to the protection of workers and the environment from exposure to airborne contaminants during excavation and container loading. Dust mitigating measures, such as water sprays and chemical fixatives, may be employed to control fugitive dust emissions. The as low as reasonably achievable review will consider the use of shielding and/or remote handling techniques to reduce worker exposures from direct ionizing radiation.

The 1301-N Liquid Waste Disposal Facility demolition waste volumes are discussed in DOE/RL-96-39, Rev. 1A, Sections 4.5.1.1 and 4.5.1.2 for the earthen crib structure and DOE/RL-96-39, Rev. 1A, Sections 4.5.2.1 and 4.5.2.2 for the trench. The 1325-N unit demolition volumes are presented in DOE/RL-96-39, Rev. 1A, Sections 4.5.3.1 and 4.5.3.2 for the crib, and in Sections 4.5.4.1 and 4.5.4.2 for the trench. Waste volume tabulations are provided in DOE/RL-96-39, Rev. 1A, Appendix D.

4.1.2 Concrete Structures

Alternatives that include removal of concrete structures are described in the DOE/RL-96-39, Rev. 1A, Sections 5.2.1.3 through 5.2.1.8, for a residential exposure scenario, and in Sections 5.2.2.3 through 5.2.2.8 for a modified CRCIA ranger/industrial exposure scenario. The concrete weir box in the 1301-N Crib will be removed as contaminated waste. Demolition of the structure may be necessary or advantageous prior to removal. Dust controls will be employed to control fugitive emissions during any demolition. The demolition waste volume of the weir box is discussed in DOE/RL-96-39, Rev. 1A, Section 4.5.1.3.

The concrete cover support beams and cover panels over the 1301-N Trench and 1325-N Crib and trench will be removed as intact components, if possible. Demolition activities, if required, will be minimized to maintain control of airborne releases and to simplify soil excavation in the trench. As with the earthen structure removal, particular attention will be given to the control of fugitive dusts and worker exposures to direct ionizing radiation. The demolition waste volume of the cover system is discussed in DOE/RL-96-39, Rev. 1A, Section 4.5.2.3for 1301-N Liquid Waste Disposal Facility, and in DOE/RL-96-39, Rev. 1A, Section 4.5.4.3 for 1325 N. Waste volume tabulations are provided in DOE/RL-96-39, Rev. 1A, Appendix D.

Demolition debris and solid wastes in the cribs and trenches potentially include demolished concrete, wooden poles, and netting. These materials will be removed during crib and trench excavation operations and disposed with the contaminated soils.

4.2 PIPING REMOVAL OR CHARACTERIZATION AS CLEAN

The remediation of 1301-N and 1325-N Liquid Waste Disposal Facilities includes the excavation and removal of the contaminated piping systems that have not been characterized and determined to be clean (i.e., contain no dangerous waste constituents above residential MTCA B concentrations) between N Reactor and the cribs. Alternatives that include removal of piping are described in DOE/RL-96-39, Rev. 1A, Sections 5.2.1.3 through 5.2.1.8, for a residential exposure scenario, and in DOE/RL-96-39, Rev. 1A, Sections 5.2.2.3 through 5.2.2.8 for a modified CRCIA ranger/industrial exposure scenario. Two figures illustrate the potential extent of piping removal. Permit Attachment 41, Chapter 2.0, Figure 2.1 shows the pipelines to be removed between the 1722-N Building and 1301-N and between 1310-N and 1301-N. Permit Attachment 41, Chapter 2.0, Figure 2.2 shows the piping between the 1301-N Crib and the 1325-N Crib. Pipe lengths and map references are provided in DOE/RL-96-39, Rev. 1A, Appendix D.

The buried pipelines will be unearthed by conventional excavation equipment. The exposed piping may be segmented for removal manually or by remote methods, depending on contact radiation exposures. Contamination controls will focus on the drainage of residual fluids in the piping prior to, and during, segmentation and on the control of airborne contamination during cutting and pipe handling operations. After the piping has been removed, the pipe bedding soil will be surveyed for residual contamination, excavated, and disposed as necessary.

4.3 SAMPLING AND ANALYSIS ACTIVITIES

4.3.1 Past Soil Characterization Data

Data used to characterize the vadose zone soils were obtained from six boreholes drilled and sampled to support the 1301-N and 1325-N Liquid Waste Disposal Facilities limited field investigation (DOE/RL-96-39, Rev. 1A). DOE/RL-96-39, Rev. 1A, Figure 2-32 shows the locations of these boreholes. Two of the boreholes are adjacent to 1301-N Liquid Waste Disposal Facility (199-N-107A and 199-N-108A), one is next to 1325-N Liquid Waste Disposal Facility (199-N-109A), and three are located northwest of 1301-N Liquid Waste Disposal Facility (199-N-75, 199-N-76, and 199-N-80) between that facility and the river. Samples were obtained from near the surface to a depth of up to 30.2 m (99 ft). All of these data are presented in the limited field investigation.

In addition to the boreholes, sediment samples were collected from the 116-N-1 Crib. Data from these samples were not used in this evaluation because of insufficient QC associated with the sample collection process. Other soil samples have been collected from this vicinity, but most have only been analyzed for radionuclides.

Data from the characterization samples are summarized in Appendix A of the 1301-N and 1325-N limited field investigation. These data indicate that chromium is the only metal of concern in vadose zone soils at 1301-N Liquid Waste Disposal Facility below 3.0/4.6 m (10/15 ft). Chromium exceeded background concentrations in data associated with 1301-N Liquid Waste Disposal Facility. Mercury is the only other metal that is included in the contaminants of concern (COCs), but no data from the boreholes at 1301-N and 1325-N Liquid Waste Disposal Facilities are available to evaluate the presence or absence of this analyte in vadose zone soils. Therefore, it is retained as a COC in surface soils (0 to 3.0/4.6 m [10/15 ft]). In DOE/RL-96-39, Rev. 1A, Appendix G, mercury will not reach groundwater in 1,000 years. Therefore is not considered to be a constituent of concern for groundwater protection below 3.0/4.6 m (10/15 ft). Evaluation of nitrate concentrations in the soil is similarly limited because of a paucity of data, so that substance has been retained as a COC. Nitrate is a mobile constituent, and a nitrate plume exists in the groundwater. Therefore, nitrate is considered a COC for both surface and subsurface soils.

Data from the three boreholes located outside of these facilities indicate that no metals are above background values. One sample from the 150- to 180-cm (5- to 6-ft) interval in borehole 199-N-76 was analyzed for mercury, and its value is well below typical background concentrations. These data indicate that metals deposited in the TSDs did not migrate laterally in the vadose zone any substantial distance.

Sampling during remediation did not detect the presence of methanol in the soil. The Washington State Department of Ecology granted a contained-in determination for methanol in December 2000. The limited field investigation sampling was not analyzed for the presence of methanol, and methanol was not listed as detected in any other sampling efforts. Acetone, however, was detected in three samples collected from boreholes outside of the facilities, at concentrations up to 51 ppb. Organic analytes were not analyzed in samples collected within and adjacent to the TSD units; however, field screening using an organic vapor monitor did not detect any organic compounds. Acetone is a common laboratory contaminant, and most of the data reported by the laboratory either are at detection limit or are associated with a blank that contained detectable amounts of acetone. These circumstances cast doubt on the presence of detectable quantities of acetone in the wells outside the bounds of the TSD unit.

Additional sampling was performed in 1998 and is documented in the *Data Summary Report* (BHI 1999). Characterization of the sites was conducted through sampling in accordance with the *Sampling Analysis Plan for the 100-NR-1 Treatment, Storage, and Disposal Units During Remediation Closeout* (DOE 2000a).

4.3.2 Characterization Activities to Determine Closure Option

A s*ampling and analysis plan* (DOE 2000a) has been developed to support site closure. As presented in Section 4.3 and in DOE/RL-96-39, Rev. 1A, Table 4-17, dangerous waste constituents are retained as constituents of concern in both surface soils and subsurface soils. All alternatives (other than the No-Action Alternative) will result in the removal of dangerous waste constituents above 3.0 m (10 ft) bgs for the modified CRCIA ranger/industrial exposure scenario and 4.6 m (15 ft) bgs for the rural-residential scenario. This will result in removal of all soils that could be contaminated at levels that present a direct exposure hazard as defined in MTCA. Verification sampling to determine MTCA direct soil exposure standard compliance will therefore not be required unless some areas around the units are not excavated and removed to the 3.0m and 4.6m level. Verification sampling will be performed on contaminants that may be present below 3.0 m or 4.6 m for the purposes of determining compliance with groundwater protection standards.

The Data Quality Objectives process was used (BHI 2000) to define the extent and type of sampling and analysis required during excavation and closure. This effort will define sampling issues, which may include analytes of interest, sample location, number of samples, number and frequency of field QC samples (i.e., trip blanks, equipment blanks, splits, and duplicates), sampling methodology, analytical methods, laboratory protocols, laboratory validation, data error tolerances, and data evaluation methods. This DQO effort will culminate in an Ecology-approved sampling and analysis plan.

Alternative-specific sampling and analysis activities are as follows:

RRES-6 and MCRIS-6 - The Remove/Treat if Required/Dispose/Backfill (Removal) alternatives will require sampling and analysis at the end of excavation to determine that, at a minimum, a modified closure option has been attained. Dangerous waste constituents must be below MTCA Method C direct soil exposure and groundwater protection standards in order to preclude landfill closure and placement of a cover. Dangerous waste constituents must be below MTCA B direct soil exposure and groundwater protection standards in order to achieve remediation under RRES-6.

MCRIS-7 - The Remove 3.0 m (10 ft) bgs/Treat if Required/Dispose/Backfill/Capping alternative will result in the placement of a WAC 173-303-compliant cover should dangerous waste constituents be left in place above MTCA Method C levels. Concentrations of dangerous waste constituents remaining under the units would be irrelevant to the need for placement of a landfill cover; however, to determine whether other landfill postclosure requirements should be imposed at one or both units, concentrations of constituent would need to be defined. Sampling would be required after excavation and/or prior to backfilling and placement of the cap for this alternative.

MCRIS-8 - Sampling and analysis would be required for the Remove 3.0 m (10 ft) bgs/Treat if Required/Dispose/Vitrify (Vitrification) alternative to define the extent of contamination of the dangerous waste constituents needing treatment. Sampling after vitrification may be required in order to determine the effectiveness of the treatment for dangerous waste constituents.

In addition to the sampling described above, sampling may be performed during excavation to help define extent of contamination, to guide field activities, and for waste characterization to determine ex situ treatment and disposal requirements.

4.3.3 Piping Characterization

Should a determination be made that piping associated with the 1301-N and 1325-N Liquid Waste Disposal Facilities may be able to meet clean closure standards and be left in place, such a determination will be submitted to Ecology for their concurrence. This determination may be based on process knowledge, sampling, or both.

4.4 WASTE MANAGEMENT

Closure of the 1301-N and 1325-N Liquid Waste Disposal Facilities in accordance with the remedial alternatives identified will generate low-level radioactive or mixed waste in the form of contaminated soils and debris. Disposal of these wastes will be performed at the Environmental Restoration Disposal Facility or the W-025 Trench, both located on the 200 Area Plateau of the Hanford Site, in compliance with WAC 173-303 for any dangerous or mixed waste that will be generated. If generated wastes do not meet the acceptance criteria for these units, such as compliance with land disposal restrictions (40 CFR 268), a disposal plan will be developed to determine appropriate treatment or disposal options for these wastes. Waste generated as part of this remediation activity will be managed and disposed of in such a way as to ensure protection of human health and the environment.

Waste generation, management, and disposal will be conducted in accordance with operational procedures and with all State, Federal, and DOE Orders and regulations dealing with waste, including agreements with the public and stakeholders.

4.5 MODIFIED CLOSURE INSTITUTIONAL CONTROL REQUIREMENTS

Should a modified closure option be determined for 1301-N and/or 1325-N Liquid Waste Disposal Facilities, institutional controls in accordance with Permit Condition II.K.3.a and WAC 173-340-440 shall be adhered to. Institutional controls consist of physical measures and administrative and legal mechanisms. Possible methods of controlling access to contaminated sites include placement of signs, entry control such as locked fencing, artificial or natural barriers, and active surveillance. Measures to be used depend on specific site conditions and degree of hazard associated with contamination left at the end of remediation activities. Because of this, specific institutional controls cannot be detailed until after selection of an alternative and incorporation of design elements during the remedial design phase.

A notice in deed and survey plat will be submitted to the Benton County Auditor as described in Section 4.12.

4.6 FINAL COVER REQUIREMENTS FOR LANDFILL CLOSURE

Should dangerous waste contaminants be left within the soil column above MTCA Method C levels, a landfill cover would need to be designed and constructed over the unit(s). Specific design aspects associated with a landfill cover would require development after the ROD and during the remedial design phase associated with 1301-N and 1325-N Liquid Waste Disposal Facilities.

4.7 PERSONNEL TRAINING

Training will be provided to site personnel in accordance with the 1301-N and 1325-N Liquid Waste Disposal Facilities training plan contained in DOE/RL-96-39, Rev. 1A, Attachment A-4. This training will be effective until the postclosure period. At that point, the personnel training information contained in Attachment 41, Chapter 5.0, §5.4 will supplement training of personnel for postclosure care activities.

4.8 CLOSURE CONTACT

The DOE-RL will be the official contact for 1301-N and 1325-N Liquid Waste Disposal Facilities during the postclosure period at the following address:

Director, Office of Environmental Services *
U.S. Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

*or its equivalent should there be a future reorganization at DOE-RL

4.9 CLOSURE SCHEDULE

Closure activities (actual cleanup) for 116-N-3 will begin in July 2000.

At the completion of 116-N-3, closure activities at 116-N-1 will begin. Approximately 600 feet (Permit Attachment 41, Chapter 2.0, Figure 2.1) of piping that is associated with the 116-N-1 TSD Waste Site and the 116-N-2 Facility and support facilities (1322-NA, NB, NC) will be deferred until decontamination and decommissioning (D&D) of these facilities. This deferral is due to safety concerns with remediating the piping and the radiological dose exposure to remedial action workers. Remediation will require excavation of the earthen berm at the 116-N-2 Facility, which provides radiological shielding.

Additionally, approximately 5,600 feet (Permit Attachment 41, Chapter 2.0, Figure 2.2) of piping that is associated with 116-N-1, 105-N and 109-N Facilities (part of the N Reactor Facility Complex) will be deferred until D&D activities of the 105-N Reactor Facility Complex. This deferral is also due to safety concerns with remediating the piping. Remediation will require excavation up to foundation walls of these facilities, thus, jeopardizing the integrity of the facilities. The pipelines intersect and/or follow active underground power lines and potable water lines. Finally, remediation will block the access routes to the ongoing pump-and-treat operations at the 100-N Springs and other active facilities in the 100-N Area.

The approximate duration of completion for both TSD units is 6 years, not including for the piping that will be deferred. The D&D of the 116-N-2 Facility and support facilities and removal of the deferred piping is planned for startup in the fiscal year 2004. The deferred piping associated with the 105-N and 109-N Facilities will be remediated as part of D&D of the 105-N Reactor Facility Complex in accordance with Tri-Party Agreement Milestone M-093-20.

The corrective action schedule of compliance for UPR-100-N-31 will be the same as the closure schedule.

4.10 AMENDMENT OF CLOSURE PLAN

The 1301-N and 1325-N Liquid Waste Disposal Facilities closure plan will be amended whenever changes in closure activities or postclosure requirements occur and prior to certification of closure and postclosure, respectively, that would constitute a Class 1, 2, or 3 modification to the Permit (WAC 173-303-830).

4.11 CERTIFICATION OF CLOSURE

In accordance with WAC 173-303-610(6), within 60 days of closure of 1301-N and 1325-N Liquid Waste Disposal Facilities, RL will submit to Ecology a certification of closure signed by both RL and an independent registered professional engineer. The certification will specify that the units have been closed in accordance with specifications contained within the approved closure plan, as amended, and as contained in the Permit.

4.12 SURVEY PLAT AND NOTICE IN DEED

A survey plat will be submitted by RL to the Benton County Planning Department no later than 60 days after certification of closure of each unit in accordance with WAC 173-303-610(10). Also, a notice in deed will be submitted by RL to the Auditor of the Benton County no later than 60 days after certification of closure of each unit in accordance with WAC 173-303-610(10). After submitting this notice, a certification signed by the Permittees will be submitted to Ecology stating that notification has been recorded along with a copy of the notice in deed. The notice in deed will specify the type, location, and quantity of dangerous wastes remaining after closure actions have been completed.

Chapter 5.0 Postclosure Plan

Table

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5.0 POSTCLOSURE PLAN

Postclosure requirements will be applicable to 1301-N and 1325-N. Because it is uncertain, whether postclosure requirements would involve modified closure requirements or landfill requirements, actions necessary to comply with both closure options are presented.

5.1 MODIFIED POSTCLOSURE INSTITUTIONAL CONTROLS AND PERIODIC ASSESSMENTS

Institutional controls under a modified closure option will consist of continued restrictions to access and use of groundwater and may consist of access controls to surface soils or deeper soils such as a fence. Institutional controls will be defined after remedial alternative selection. Inspections and maintenance of institutional controls and monitoring will be requirements of postclosure under a modified closure option.

5.1.1 Periodic Assessments

Periodic assessments shall include a compliance-monitoring plan in accordance with Permit Condition II.K.3.b and WAC 173-340-410. The compliance-monitoring plan will address the assessment requirements, which include protection and confirmation monitoring. This will include at least one assessment activity that is to take place after a period of five years from the completion of closure. The assessment activity will demonstrate whether the soils and groundwater have been maintained at or below the allowed concentrations for a modified closure as defined in Permit Condition II.K.3. The compliance plan will identify the nature and date of the assessment activities and will include a timetable for performance of these activities. This information will be contained in the CERCLA Operation and Maintenance Plan and its supporting documents.

Should the required assessment activities identify contamination above the allowable limits (i.e., landfill closure levels specified in Permit Condition II.K.4.), the unit must be further remediated or the postclosure plan must be modified to include activities to be undertaken at the unit to meet landfill closure and postclosure requirements. Should the required assessment activities demonstrate that contamination has diminished or remained the same, the Permittees may request that Ecology reduce or eliminate the assessment activities and/or institutional controls.

As allowed by WAC 173-340-410, such monitoring may be combined with other plans. It is the intention that protection and confirmation sampling of groundwater be achieved through implementation of the dangerous waste final status groundwater monitoring plan to be written prior to, and implemented upon, the effective date of the Permit modification adding 1301-N and 1325-N to the Permit (anticipated to occur in 1999).

In addition to groundwater monitoring, compliance monitoring for institutional controls will include routine visual inspections and evaluations. Visual inspections shall consist of examinations of soil cover surfaces for signs of deterioration and improper usage of the surface area (e.g., buildings, impervious surfaces such as concrete or asphalt). An evaluation of existing data from the groundwater monitoring system should also be performed, as well as any other activities that would help assess the integrity of the cover.

5.1.2 Inspections

Inspections of institutional controls and groundwater monitoring systems under a modified closure option will be required. Groundwater monitoring postclosure inspection requirements will be identical to those under a landfill closure option and are contained in Section 5.2. Because the exact nature of institutional controls that may be utilized at 1301-N and 1325-N depend upon the remedial alternative chosen, site conditions, further characterization efforts, and the success of remedial actions taken, a list of potential inspection items is contained in Table 5.5. Frequency of inspection of these potential items is also contained in this table. These inspections may be implemented in checklist form. Such a checklist could specify entering checklist performance and results in the appropriate inspection logbook.

5.1.2.1 Inspection logbook

Inspectors will be trained in accordance with the postclosure personnel training plan contained in Section 5.4. The inspector will record any damage to the area and/or maintenance needs as well as the weather conditions at the time of inspection. Separate logbook entries will be signed and dated. Performance of any related inspection checklists will be documented in the logbook. Maintenance actions will be started and should be completed within 90 days. Logbook entries will document the correction of the problem or the status of corrective actions. Entries should also uniquely identify, where possible, work documents that actually performed the activities.

5.1.2.2 Security control devices

The 1301-N and 1325-N units are currently surrounded by a fence with locked gate access. If fences are removed to accommodate remedial activities, they will be replaced with an appropriate physical barrier, if required, in accordance with institutional controls defined after remedial alternative selection.

Table 5.1. Minimum Inspection Schedule for 1301 N and 1325 N

Item(s)	Inspection Frequency		
	Monthly	Quarterly	Annually
Security control devices			X
Erosion damage	X (until vegetative cover is established)	X (thereafter)	
Cover settlement and displacement		X	
Condition of vegetative cover	X (first 2-3 years)	X (thereafter)	
Well condition and purge water collection system		X	
Benchmark integrity			X

5.1.2.3 Erosion damage and general integrity

Should surface ground covers or other earthen barriers be utilized as part of the modified closure institutional controls for 1301-N and 1325-N, inspection of these systems for erosion control and general integrity will be performed. Inspection frequency will be quarterly and will be performed by physically walking over the site to check visually for wind and water erosion, subsidence, displacement, and general site integrity. Any site damage noted during inspections will be recorded in the field logbook and reported to the appropriate maintenance authority.

5.2 LANDFILL POSTCLOSURE REQUIREMENTS

Should a landfill cover be required, an inspection and maintenance plan will be developed during remedial design for the 1301-N and 1325-N cover systems.

5.3 GROUNDWATER MONITORING POSTCLOSURE REQUIREMENTS

5.3.1 Postclosure Groundwater Monitoring

During the postclosure period, monitoring of groundwater will continue according to the existing groundwater-monitoring program (Borghese et. al., 1996). The detection-monitoring program in accordance with WAC 173-303-645(9) is scheduled for implementation when the 1301-N and 1325-N units are incorporated in the Permit.

5.3.2 Inspection, Maintenance, and Replacement of Wells

Each time a well is sampled, the wellhead and associated structures are inspected. Problems with the pump or with the sample (e.g., excessive turbidity) are also noted. Repairs are made according to approved contractor procedures. Subsurface inspection and maintenance is performed on a 3- to 5-year schedule, or as needed to repair problems identified during sampling.

If a monitoring well becomes unsuitable for use, the monitoring program will be reevaluated to determine if a new or existing well should be substituted.

5.4 PERSONNEL TRAINING DURING POSTCLOSURE

This section describes the training of personnel required to complete postclosure care requirements contained in this closure plan and the Permit. It is intended to supplement the training plan currently in place and identified in DOE/RL 96-39, Rev. 1A, Attachment A-4. A brief description of how training will be designed to meet job tasks is presented below.

5.4.1 Surveillance Personnel

The following outline provides potential information on classroom or on-the-job training that surveillance personnel will complete before conducting independent site surveillance at 1301-N and 1325-N during a postclosure period. Only those that are applicable to the selected closure option will be used:

- Site surface inspections (water and wind erosion, settlement and displacement, vegetative cover)
- Security inspections
- Location, integrity, and inspection of benchmarks, if appropriate
- Location, integrity, and inspection of groundwater wells
- Erosion damage
- Cover settlement and displacement
- Vegetative cover condition.

5.4.2 Groundwater Sampling and Analysis Task Leader and Sampling Personnel

After closure of 1301-N and 1325-N, the sampling and analysis task leader or delegate (samplers) will be responsible for:

- Monitoring and reporting on groundwater well security and maintenance
- Collecting groundwater level data
- Collecting , packaging, and shipping groundwater samples to field and offsite laboratories
- Sampling and monitoring equipment operation and maintenance
- Providing sample chain of custody to the laboratory.

The training of the sampling and analysis task leader and sampling personnel will receive either classroom instruction or on-the-job training. Sampling and analysis personnel will be trained to perform these functions in accordance with the *Hanford Analytical Services Quality Assurance Requirements Documents* (DOE-RL 1996d). A person successfully completing the required training courses will be qualified as a groundwater sampler and/or task leader. All personnel will undergo training and at least an annual review for required courses.

5.4.3 Additional Training Descriptions for Landfill Closure

Training descriptions for additional tasks associated with a landfill closure are as follows:

- Site Cover Inspections – This on-the-job training program is established to ensure that the surveillance personnel know what to inspect after the closure of 1301-N and 1325-N. It will include how to inspect for obvious signs of erosion, proper drainage, settlement, and sedimentation. In addition, personnel will be informed as to what constitutes proper vegetation coverage.

Additional on-the-job or classroom training under a landfill closure option includes the following:

- Site Security Inspections – Personnel will be instructed on how to inspect for obvious signs of a security breach. Signs may include cut fencing, unlocked gates, or cut chains.
- Location, Integrity, and Inspection of Benchmarks – Personnel will be shown the location of benchmarks and report any obvious signs of destruction or deterioration.

5.5 SECURITY

5.5.1 24-Hour Surveillance System

The 1301-N and 1325-N units are located within the 100 Area of the Hanford Site. The 100 Area will remain an area controlled by RL for the near future due to the decommissioning and deactivation of facilities associated with and including the 100-N Reactor. These areas will be under 24-hour surveillance by Hanford Patrol Protective Force personnel.

5.5.2 Barrier, Means to Control Entry, and Warning Signs

Roadways to the unit and site access will remain administratively restricted to use by authorized personnel only. Posted federal warning signs restrict access to the 100-N Area from the Columbia River. Further institutional and administrative measures controlling TSD unit site access may be initiated for the site commensurate with the future use of the property.

5.6 POSTCLOSURE CONTACT

The RL will be the official contact for the 1301-N and/or 1325-N units during the postclosure period at the following address:

Director, Office of Environmental Services*
U.S. Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

*or its equivalent should there be a future reorganization at DOE-RL

5.7 CERTIFICATION OF POSTCLOSURE

No later than 60 days after completion of the postclosure care period, RL will submit to Ecology a certification of completion of postclosure care. This certification, stating that postclosure care for the unit was performed in accordance with the approved closure plan, will be signed by RL and an independent registered professional engineer. The certification will be submitted by registered mail or an equivalent delivery service. Documentation supporting the independent registered professional engineer's certification will be supplied upon request of the regulatory authority.