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100-NR-2 Streamlined Groundwater Sampling and Analysis Plan

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Office of Environmental Restoration and
Waste Management

Bechtel Hanford, Inc.
Richland, Washington



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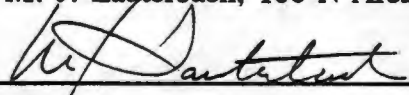
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1.0 INTRODUCTION

This report presents the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) groundwater monitoring plan for the 100-NR-2 Operable Unit. The program presented here is considered a streamlined program because the number of wells have been reduced, the analyte list has been reduced, and the frequency of sampling has been reduced from previous CERCLA sampling. Elements of this report include general background information discussed in Section 1.0, data quality objectives discussed in Section 2.0, identification of other groundwater monitoring programs discussed in Section 3.0, the proposed CERCLA sampling and analysis program discussed in Section 4.0, and quality assurance discussed in Section 5.0.

The 100-NR-2 Operable Unit is located in the north-central part of the Hanford Site along the southern shoreline of the Columbia River, approximately 43 km (27 mi) north-northwest of the City of Richland, Washington (Figure 1). The 100-N Area is bordered by the Columbia River and the 600 Area (the portion of the Hanford Site that surrounds the primary operation areas). The 100-N Area encompasses 2.6 km². Additional information on site hydrogeology can be found in Hartman and Lindsey (1993).

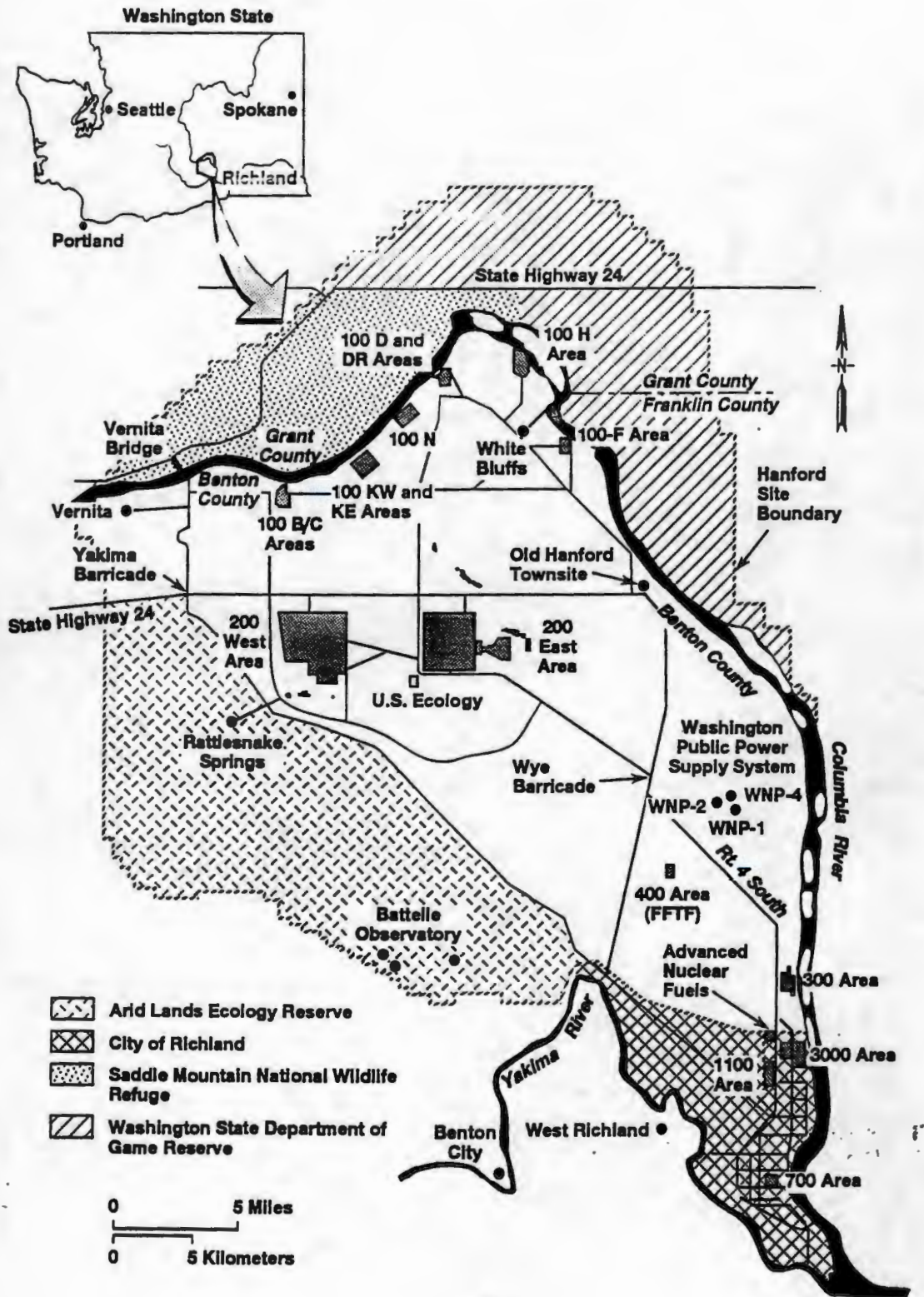
The 100-N Area has been divided into two operable units. The 100-NR-1 Operable Unit is a source operable unit and includes the liquid and sludge disposal site generally associated with operation of the N Reactor and includes the *Resource Conservation and Recovery Act* (RCRA) facilities 1301-N, 1324-N, 1324-NA, and 1325 Liquid Waste Disposal Facilities (LWDF). The 100-NR-2 Operable Unit is a groundwater operable unit and includes the groundwater beneath the 100-N Area source operable unit plus the adjacent groundwater, surface water, sediments, and aquatic biota impacted by the 100-N Area operations.





Groundwater within the 100-NR-2 Operable Unit has been monitored under the CERCLA program since December 1992. The wells sampled and constituents monitored were established in a National Priorities List (NPL) agreement between Westinghouse Hanford Company (WHC) Environmental Engineering, the U.S. Department of Energy (DOE), and the Washington State Department of Ecology. The NPL Agreement Number 33 is dated September 23, 1992 (Attachment 1). Other programs also monitor the groundwater in the 100-N Area; these include RCRA, Pacific Northwest Laboratory (PNL) Sitewide, and the Washington State Department of Health. In addition to groundwater samples, a riverbank spring sampling point is sampled for the National Pollutant Discharge Elimination System (NPDES) permit by WHC effluent monitoring.

2.0 DATA QUALITY OBJECTIVES

The data quality objectives and the process of their development are discussed in the 100-NR-2 work plan (DOE-RL 1994b). The groundwater investigation within the 100-NR-2 Operable Unit was designed to describe the nature and extent of contaminants in the groundwater and to better understand the fate and transport of these contaminants in the aquifer(s) underlying the

Figure 1. Location of the 100-N Area.



-  Arid Lands Ecology Reserve
-  City of Richland
-  Saddle Mountain National Wildlife Refuge
-  Washington State Department of Game Reserve

0 5 Miles
0 5 Kilometers

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100-NR-2 Operable Unit. The results of these studies will also be used to support selection of remediation activities. General objectives met by monitoring each well in the proposed CERCLA streamlined program are relisted in Table 1. Since the contamination has been identified with the use of data from previous sampling rounds and collected for the RCRA program, the CERCLA program now can be modified. The streamlined CERCLA program attempts to collect the necessary information to track plume configuration and constituents of concern in areas where contamination is known.

3.0 MONITORING PROGRAMS

Monitoring within the 100-N Area occurs under different groundwater programs: CERCLA, RCRA, PNL Environmental Surveillance, and others. Sampling has been integrated between the RCRA program since the initiation of CERCLA sampling in December 1992. Hartman (1995) describes the 1994 RCRA groundwater program and interprets the results. The integration consists of the sharing of well trips and the nonduplication of shared analytes. The programs can be integrated because the analytical methods are the same between the programs as agreed to by the regulators in the NPL Agreement Number 33. CERCLA sampling in the 100-N Area follows SW-846 sampling methods as stated in the NPL agreement. These methods are the same analytical methods that the RCRA program is required to follow.

In addition to the CERCLA groundwater monitoring program, monitoring is also being done to assess the performance of the N Springs Expedited Response Action. These two programs will be integrated where applicable.

Additional groundwater monitoring within the 100-N Area occurs with the PNL Environmental Surveillance Sitewide groundwater program and the Washington State Department of Health. PNL coordinates and collects the samples for the Department of Health. Wells monitored by the PNL Sitewide program are identified in Bisping (1994).

4.0 SAMPLING AND ANALYSIS

The proposed streamlined groundwater sampling and analysis plan samples 16 wells compared to the original number of 25 wells (Attachment 1). A summary of wells used for groundwater sampling and the associated constituent lists are shown in Tables 1 and 2. Locations of all 100-N Area wells are shown in Figure 2. Figure 3 shows the wells used for the CERCLA program. Analytes will continue to be analyzed following SW-846 procedures as stated in the NPL agreement (Attachment 1). Changes to wells sampled or analyte may occur after data have been reviewed and prior to the next sampling event.

Table 1. Monitoring Wells.

Well no. (199-) ^a	Monitoring network other than NR-2 ^{b,c}	Objective of monitoring	Analyte list ^d	Comments
N-2 ⁶⁴	RCRA 1995	⁹⁰ Sr plume near 1301N, track inorganic COPC ^e	A, B, E	
N-3 ⁶⁴	RCRA 1995	⁹⁰ Sr plume near 1301N, H3 plume near river, track inorganic COPC	A, B, C, E	
N-14 ⁶⁹	RCRA 1995	⁹⁰ Sr plume near 1301N, H3 plume near river, track inorganic COPC	A, B, C, E	Potential extraction well
N-16 ⁸¹		South end of ⁹⁰ Sr plume, diesel hits, track inorganic COPC	A, B, D, E	
N-17 ⁸¹		Diesel hits	A, D	
N-18 ⁸¹		Diesel hits	A, D	
N-29 ⁸³	RCRA 1995	⁹⁰ Sr plume near 1325N, track inorganic COPC	A, B, E	Potential injection well
N-32 ⁸³	RCRA 1995	⁹⁰ Sr plume near 1325N, H3 plume near 1325N, track inorganic COPC	A, B, C, E	
N-50 ⁸⁵		North end of H3 plume	A, C	
N-51 ⁸⁵		H3 plume near river	A, C	
N-54 ⁸⁷		⁹⁰ Sr plume near 1301N, diesel hits, track inorganic COPC	A, B, D, E	RCRA construction, low water in well
N-64 ⁸⁷		⁹⁰ Sr and H3 plume between 1301N and 1325N, track inorganic COPC	A, B, D, E	RCRA construction, low water in well
N-67 ⁸⁸	RCRA 1995	⁹⁰ Sr plume near 1301N, track inorganic COPC	A, B, E	RCRA construction, low water in well
N-75 ⁹²	RCRA 1995	⁹⁰ Sr plume near 1301N, H3 plume near river, track inorganic COPC	A, B, C, E	RCRA construction, potential extraction well
N-76 ⁹²	RCRA 1995	⁹⁰ Sr plume near 1301N, H3 plume near river, track inorganic COPC	A, B, C, E	RCRA construction
N-81 ⁹³	RCRA 1995	⁹⁰ Sr plume near 1325N, H3 plume near 1325N, track inorganic COPC	A, B, C, E	RCRA construction

^aSuperscript numbers following well number indicate year of construction.

^bSchedules for other programs were not available.

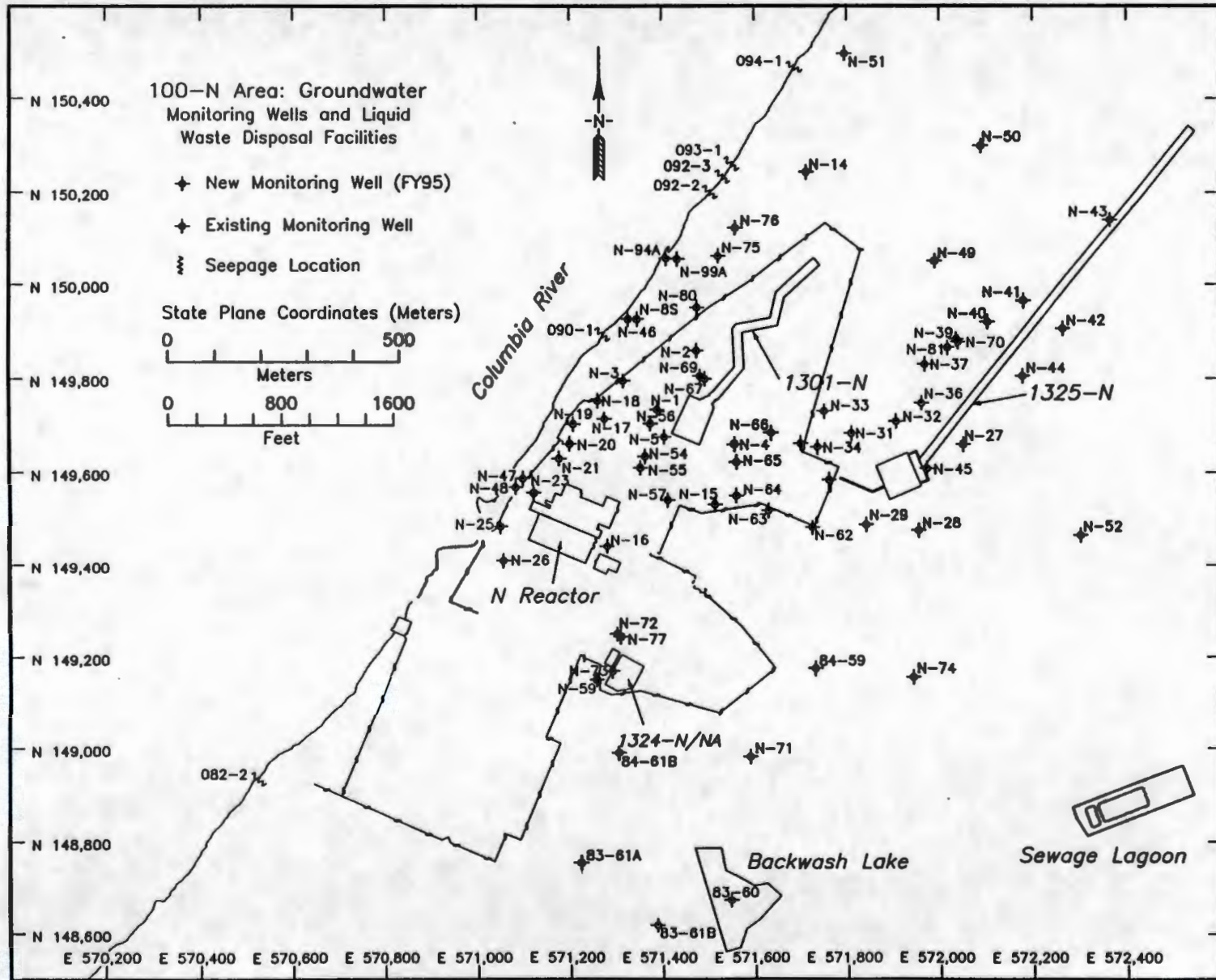
^cRCRA 1995, scheduled to be sampled for the RCRA project in FY 1995.

^dConstituents are listed in Table 2.

^eContaminants of potential concern (COPC) identified in DOE-RL (1994c).

Table 2. Constituent List.

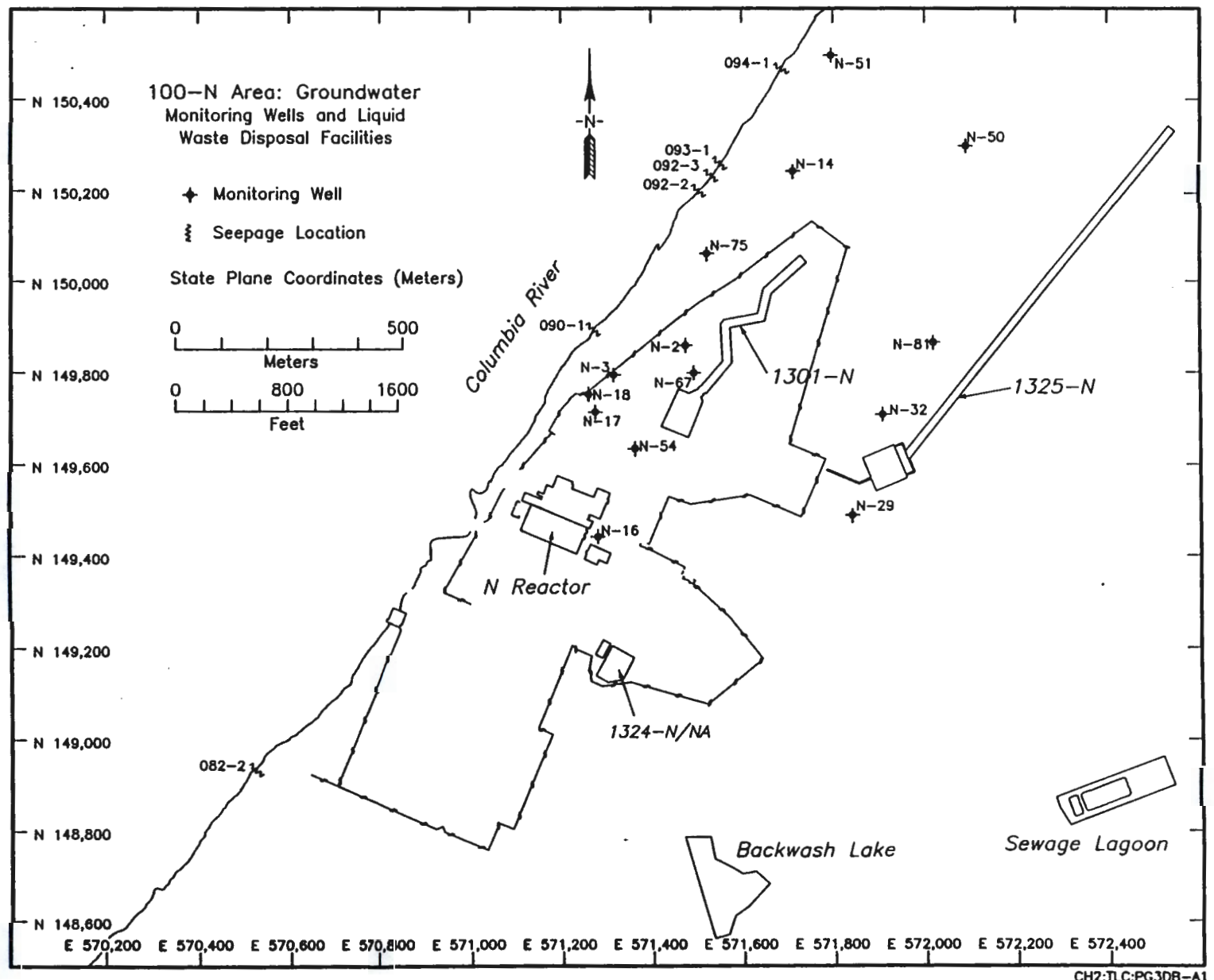
List	Constituents
A	Field parameters: pH, specific conductivity, and temperature
B	Strontium-90, gross beta
C	Tritium, gross beta
D	Total Petroleum Hydrocarbons, Oil and Grease
E	Turbidity, ICP metals (filtered), Anions



ITH:JJA:WELLMAPS:1N-REGN

Figure 2. 100-N Area Well Location Map.

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Figure 3. CERCLA Groundwater Monitoring Program Well Location Map.

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Frequency of sampling is based on how the constituents change with time. Interpretation of sampling results, as discussed in annual RCRA reports (DOE-RL 1994a) and the 100-NR-2 groundwater summary report (BHI 1995), indicates that concentrations and plume configuration do not change considerably during the year. Because the changes are not rapid, frequency of sampling for the streamlined plan is proposed to occur on an annual basis.

Hydraulic head measurements are used to describe the rate and direction of contaminant movement. Table 3 lists wells where monthly and quarterly measurements will be taken. The more frequent measurements are made in wells nearer to the river or those that have shown variability in water level within a month. This variability is caused by river stage fluctuations. Hourly water level measurements are made in numerous wells as part of the performance monitoring effort.

5.0 QUALITY ASSURANCE AND QUALITY CONTROL

The Quality Control Program is described in DOE (1994b). Samples collected and analyzed using SW-846 procedures will follow quality assurance (QA) and quality control (QC) defined by RCRA protocol. QA and QC for the groundwater sampling and analysis are described by WHC (1992). The purpose of the QC activities is to document that samples were properly collected and transferred to an analytical laboratory, that the quality of the analytical results being produced by the laboratory are defensible, and to see that corrective action will be taken as necessary. QC results will be published in the RCRA quarterly reports.

All groundwater data for 100-NR-2 will be verified and validated according to Procedure 2.6 of *Environmental Engineering and Geotechnology Function Procedures* (WHC 1991). The procedure involves evaluating results of QC sample analyses, laboratory holding times, data completeness, and representativeness. The data are then evaluated to determine whether they are "reasonable" and if they appear spurious.

Table 3. Wells for Water Level Measurements.

Wells measured monthly	Wells measured quarterly
199-N-3	199-N-27
199-N-19	199-N-42
199-N-21	199-N-49
199-N-23	199-N-52
199-N-26	199-N-57
199-N-54	199-N-59
	199-N-65
	199-N-67
	199-N-69
	199-N-70
	199-N-76
	199-N-80

6.0 REPORTING AND DATA MANAGEMENT

A sampling report for each round of sampling will be submitted to the DOE. This report will publish the data analysis for the sampling event. The submittal of the report will occur after the data have been validated.

The data will be stored in the Hanford Environmental Information System (HEIS) database.

7.0 REFERENCES

- Bisping, L. E., 1994, *Environmental Surveillance Master Sampling Schedule*, PNL-9215, Pacific Northwest Laboratory, Richland, Washington.
- BHI, 1995, *100-NR-2 Groundwater Summary Report*, BHI-00168, Rev. 00, Bechtel Hanford Company, Richland, Washington.
- DOE-RL, 1994a, *Annual Report for RCRA Groundwater Monitoring Projects at Hanford Site Facilities for 1993*, DOE/RL-93-88, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE-RL, 1994b, *RCRA Facility Investigation/Corrective Measures Study Work Plan for the 100-NR-2 Operable Unit, Hanford Site, Richland, Washington*, DOE/RL-91-46, Draft E, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE-RL, 1994c, *Limited Field Investigation Report for the 100-NR-2 Operable Unit*, DOE/RL-93-81, Draft A, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- Hartman, M. J., 1995, "100-N RCRA Sites," in *Annual Report for RCRA Groundwater Monitoring Projects at Hanford Site Facilities for 1994*, DOE/RL-94-136, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- Hartman, M.J. and K.A. Lindsey, 1993, *Hydrogeology of the 100-N Area*, WHC-SD-EN-EV-027, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1991, *Environmental Engineering and Geotechnology Function Procedures*, WHC-SD-EN-AP-070, Rev. 0, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1992, *Quality Assurance Project Plan for RCRA Groundwater Monitoring Activities*, WHC-SD-ED-QAPP-001, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

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ATTACHMENT 1

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Control Number 33	100 NPL Agreement/Change Control Form Change <input checked="" type="checkbox"/> Agreement <input type="checkbox"/> Information Operable Unit(s) _____	Date Submitted 9-23-92 Date Approved
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Document Number & Title: 100-NR-2 Operable Unit Groundwater Monitoring Network	Date Document Last Issued 1st Issue
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Originator S. E. Vukelich	Phone 376-5158
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Summary Description

100-NR-2 Monitoring Network

Justification and Impact of Change

R. P. Henckel _____	_____ 9/23/92 _____
WHC 100 Area Rem. Investigation Mgr. E. D. Goller _____	Date 9-23-92 _____
DOE Unit Manager	Date
ERA Ecology _____	_____ 9/24/92 _____ Date

Per Action Plan for Implementation of the Hanford Consent Order and Compliance Agreement Section 9.3

September 23, 1992

100 NR-2 OPERABLE UNIT GROUNDWATER MONITORING NETWORK

This 100 NR-2 monitoring network coordinates the CERCLA and the RCRA groundwater sampling programs and consists of the following wells. Their locations are shown on the attached map.

N-16	*N-54
*N-17	N-64
N-18	*N-66
N-19	*N-67
N-20	*N-70
*N-21	*N-71
N-25	*N-73
N-26	*N-74
*N-3	*N-75
*N-32	*N-76
N-49	*N-77
N-50	N-80
N-51	

* denotes wells currently sampled by the RCRA program.

This network addresses: well fitness-for-use, sample methods, analytes of interest, sample frequency, QA/QC requirements and data validation.

FITNESS-FOR-USE

WHC will evaluate all wells in the network, then clean and redevelop suitable wells as part of a WHC fitness-for-use program.

SAMPLE METHODS

All wells will be tested using SW-846 methods. The RCRA program has extensive data using SW-846 methods and analyzing all wells using SW-846 methods will provide consistency.

ANALYTES OF INTEREST

Analytes that have not been detected in the N Area are not included on the three network sample lists outlined below. Note that the RCRA program will sample additional analytes not on these lists to meet data requirements specific to the RCRA program.

LIST 1

The wells on List 1 monitor the 1301-N, 1324-N/NA and the 1325-N sites. Volatiles, semi-volatiles and pesticides/PCB's have previously been analyzed for but not detected in wells monitoring these sites, therefore they will not be analyzed in these wells.

LIST 1.

WELLS	ANALYTES
N-51	pH (field and laboratory)
N-50	specific conductance (field and laboratory)
N-49	turbidity
N-70	temperature (field)
N-32	
N-67	ICP Metals
N-64	Anions.
N-66	
N-71	Gross Alpha
N-73	Gross Beta
N-74	Sr-90
N-75	Tritium
N-76	Gamma Spec
N-77	

LIST 2

The wells on List 2 generally monitor wells from the 100 N Reactor Area. Diesel fuel contamination has been detected throughout the 100 N Reactor Area and therefore total petroleum hydrocarbons and oil and grease analyses have been added to the list. Wells N-18, N-19 and N-20 will also be sampled, but only for total petroleum hydrocarbons and oil & grease. If floating product is found in any well, total petroleum hydrocarbons and oil and grease analyses will not be conducted.

LIST 2.

WELLS	ANALYTES
N-3	pH (field and laboratory)
N-17	specific conductance (field and laboratory)
N-21	turbidity
N-25	temperature (field)
N-26	
N-16	Total Petroleum Hydrocarbons (418.1)
N-54	Oil & Grease (413.2)
	ICP Metals
	Anions
	Gross Alpha
	Gross Beta
	Sr-90
	Tritium
	Gamma Spec

LIST 3

Well N-80 monitors the first confined aquifer in the 100 N Area. Because this aquifer has never been monitored in the 100 N Area, a full list of analytes will be sampled for two quarters. If compounds are not detected in either round, the compounds will be eliminated from the list.

LIST 3.

WELLS	ANALYTES
N-80	pH (field and laboratory) specific conductance (field and laboratory) total organic carbon total organic halogen phenols turbidity temperature (field) alkalinity chemical oxygen demand dissolved oxygen total dissolved solids ICP Metals Other metals (Pb, Hg, Se, As,Cn) Anions VOA's/Semi-VOA's Pesticides/PCB's Gross Alpha Gross Beta Sr-90 Tc-99 C-14 Tritium Gamma Spec Alpha Spec (U-235, U-238, Pu-239, Pu-240 & Am-241) Hydrazine

SAMPLE FREQUENCY

All wells will be sampled quarterly.

QA/QC REQUIREMENTS

The following QA/QC samples will be taken from the above wells.

1. Three duplicates.
2. One split sample.
3. Three field blanks.
4. Three equipment blanks.

DATA VALIDATION

All groundwater data and QA/QC data from the above wells will be validated according to WHC-SD-EN-QAPP-001 Rev. 1 "Quality Assurance Project Plan for RCRA Groundwater Monitoring Activities". Well N-80 will be validated to Level C and all other wells will be validated to Level B. After data from the 300 Area is validated, the validation of 100 N Area data will be reevaluated.

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