**Ground-Water Monitoring
Compliance Projects for Hanford
Site Facilities: Progress Report for
the Period April 1 to June 30, 1988**

Volume 1 — Text

September 1988

**Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830**

**Pacific Northwest Laboratory
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GROUND-WATER MONITORING COMPLIANCE
PROJECTS FOR HANFORD SITE FACILITIES:
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Pacific Northwest Laboratory
Richland, Washington 99352

PREFACE

This is Volume 1 of a two-volume set of documents that describes the progress of 10 Hanford Site ground-water monitoring projects for the period April 1 to June 30, 1988. This volume discusses the projects; Volume 2 provides as-built diagrams, drilling logs, and geophysical logs for wells drilled during this period in the 100-N Area and near the 216-A-36B Crib. This work was supported by the U.S. Department of Energy under Contract DE-AC06-76RLO 1830.

SUMMARY

This report describes the progress of 10 Hanford Site ground-water monitoring projects for the period April 1 to June 30, 1988. The facilities represented by the 10 projects are the 300 Area Process Trenches, 183-H Solar Evaporation Basins, 200 Areas Low-Level Burial Grounds, Nonradioactive Dangerous Waste Landfill, 1301-N Liquid Waste Disposal Facility, 1324-N/NA Surface Impoundment and Percolation Ponds, 1325-N Liquid Waste Disposal Facility, 216-A-29 Ditch, 216-A-36B Crib, and the 2101-M Pond. The 216-A-29 Ditch and the 2101-M Pond projects are included in this series of quarterly reports for the first time. This report is the eighth in a series of periodic status reports; the first seven cover the period from May 1, 1986, through March 31, 1987 (PNL 1986; 1987a,b,c,d; 1988a,b). This report satisfies the requirements of Section 17B(3) of the Consent Agreement and Compliance Order issued by the Washington State Department of Ecology (Ecology 1986a) to the U.S. Department of Energy-Richland Operations Office.

The 10 projects discussed in this report were designed according to the applicable ground-water monitoring requirements specified in the Resource Conservation and Recovery Act of 1976 and in 40 CFR 265 Subpart F (EPA 1984) and in Washington Administrative Code 173-303 (Ecology 1986b).

During the quarter, field activity at the 300 Area Process Trenches, the Nonradioactive Dangerous Waste Landfill, the 183-H Solar Evaporation Basins, and the 1324-N/NA Surface Impoundment and Percolation Ponds consisted of routine ground-water sampling and water-level monitoring. At both the 1301-N and 1325-N Liquid Waste Disposal Facilities, one new well was installed. The results of aquifer testing as well as those of routine ground-water monitoring for these sites are reported. Water-level monitoring data only are reported for the 200 Area Low-Level Burial Grounds.

At the 216-A-29 Ditch, installation of two wells began, and a step drawdown test was performed. Results of this test and of preliminary ground-water analysis are reported. In addition to routine ground-water monitoring at the 216-A-36B Crib, five new wells were completed, and the results of preliminary ground-water analysis for these wells are reported. At the 2101-M Pond, construction started on four wells.

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INTRODUCTION

This report describes recent progress on ground-water monitoring projects for 10 Hanford Site waste disposal facilities: 300 Area Process Trenches, 183-H Solar Evaporation Basins, 200 Areas Low-Level Burial Grounds, Nonradioactive Dangerous Waste Landfill, 1301-N Liquid Waste Disposal Facility, 1324-N/NA Surface Impoundment and Percolation Ponds, 1325-N Liquid Waste Disposal Facility, 216-A-29 Ditch, 216-A-36B Crib, and the 2101-M Pond. Information on the 216-A-29 Ditch and the 2101-M Pond is being provided for the first time. The reporting period is April 1 to June 30, 1988. These projects were designed according to requirements contained in the Resource Conservation and Recovery Act (RCRA) of 1976, and in 40 CFR 265 (EPA 1984) and in Washington Administrative Code (WAC) 173-303 (Ecology 1986b).

Seven previous quarterly reports (PNL 1986; 1987a,b,c,d; 1988a,b) have been issued in this series and cover the period from May 1, 1986, to March 31, 1988. This report includes the second calendar quarter of 1988 (April 1 to June 30, 1988).

300 AREA PROCESS TRENCHES

R. Schalla

Previously issued reports (PNL 1986; 1987a,b,c,d; 1988a,b) contain information on the progress made and the data obtained by the Resource Conservation and Recovery Act (RCRA) Compliance Ground-Water Monitoring Project for the 300 Area Process Trenches during the period from May 1, 1986, through March 31, 1988. This section includes information on subsequent activities through June 30, 1988.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

Drilling

As reported last quarter, construction of five new intermediate-depth monitoring wells, which were scheduled to be installed in April, has been postponed until next fiscal year because the funding is needed for drilling at other higher-priority RCRA sites. Other types of hydrogeologic data collection and analysis activities are discussed below.

Hydrogeologic Characterization

Hydrogeologic characterization efforts were limited to work performed by Washington State University staff and Pacific Northwest Laboratory's (PNL's) W. H. Walters efforts on refinement of the hydrogeologic conceptual model and time-series analysis of surface-water and ground-water data to aid in this year's ground-water modeling effort. The well locations, ground-water flow pattern, and layout of the 300 Area and vicinity is shown in Figure 1.

Work was completed on preliminary models of tracer tests, which were used to determine the feasibility of using potassium bromide and rhodamine-WT as tracers. The tracer test, which is scheduled for the autumn of 1988, will help determine the rate and extent of past and present migration of constituents in the unconfined aquifer, and delineate in greater detail the variability of permeabilities in the upper portion of the unconfined aquifer. The modeling indicates that both tracers will be suitable even at low concentrations.

FIGURE 1. Monitoring Locations for the 300 Area Process Trenches and Ground-Water Flow Pattern (April 30, 1987)

Drill cuttings from the deep 300 Area drill holes were analyzed texturally and prepared for x-ray fluorescence whole rock analysis. Sets of grain-size distribution data from 300 Area drill cuttings were incorporated into the empirical equations of hydraulic conductivity. These estimated hydraulic conductivity values will be used in the modeling and characterization effort.

Nonroutine field data collection is no longer scheduled for this fiscal year; however, existing geologic and hydrostratigraphic data are being evaluated for the 300 Area and areas extending beyond the immediate study area. Routine data collection has included collection of continuous data for surface water and ground water using data loggers and monthly measurement of water levels in the network of 49 wells in the 300 Area.

Frequent water-level monitoring has continued successfully at one (SWS-1) of the two surface-water monitoring stations on the Columbia River, shown in Figure 1 as SWS-1 and SWS-2, and in monitoring wells 399-1-10, 399-1-13, 399-1-15, 399-1-16A, and 399-1-18A. The addition of the second, temporary surface-water station has provided valuable information on the gradient variations along this reach of the Columbia River. Currently, all seven data loggers record measurements every half hour. These data are essential for setting the spatial and temporal boundary conditions for modeling the 300 Area. The goal of this effort is to provide the project with a quantitative description for the stage of the Columbia River as a function of time at the 300 Area. Daily discharge data have been analyzed by using codes for filtering, performing spectral analyses, and computing time-series statistics on the river stage data. Work is progressing well toward examining the bounds of predictability in river stage, and toward quantitatively defining the relationship of river stage to ground-water level.

Ground-water modeling work to redefine and expand the model boundaries for evaluating southerly transient flow and transport from the process trenches began this quarter. Configuration of the network is being evaluated to determine the need for revisions to make it a more comprehensive predictive tool.

ROUTINE SAMPLING AND ANALYSIS OF THE GROUND WATER

The ground water from the 300 Area Process Trenches has been sampled this quarter on a weekly basis from three wells adjacent to the process trenches. A discussion of the results is presented later in this section.

Collection and Analysis

The quarterly sampling network consists of the same 34 monitoring wells used previously. Three wells (399-1-11, 399-1-19, and 399-1-17A) near the process trenches have been sampled weekly for a limited set of specific constituents (i.e., volatile chlorinated hydrocarbons, anions, and uranium). Analyses of field samples by an independent laboratory confirmed the results from United States Testing Company (UST).

Discussion of Results

Analytical data obtained from weekly samples taken in March, April, and May 1988 from wells 399-1-11, 399-1-17A, and 399-1-19 are discussed in the following paragraphs. The results were generally consistent with those obtained previously for these wells. The samples continued to show the presence of uranium, anions, metals, and low concentrations of volatile organics in the ground water near the process trenches.

The samples from the network of 34 monitoring wells were analyzed in May for a list of constituents, which includes the WAC 173-303-9905 (Ecology 1986b) list. The attached monthly tables show both the weekly and monthly results. Uranium and volatile organic chemicals continued to be detected in wells throughout the network. Quarterly samples were analyzed for uranium in May under the site-wide Hanford Ground-Water Monitoring Project to eliminate duplication of effort. Inorganic and organic constituents were collected and analyzed under the RCRA program.

Uranium concentrations (as indicated by uranium and gross alpha analyses) increased in most wells adjacent to and immediately downgradient from the process trenches (Figure 2). Wells upgradient (i.e., north and west several hundred feet) and a considerable distance south and downgradient from the trenches did not display an increase in uranium concentrations

FIGURE 2. Concentrations of Uranium (ppb) in Wells Adjacent to the 300 Area Process Trenches (a) and Wells Immediately Downgradient from the Trenches (b) for June 1985 Through May 1988 (Plotting symbols are abbreviations of well numbers. Horizontal solid line represents detection limit.)

(Figure 3). Uranium concentrations in weekly samples from wells 399-1-11, 399-1-17A, and 399-1-19 have fluctuated in April and May 1988 as discussed previously. Uranium concentrations in well 399-1-19 decreased abruptly in a sample taken during the last week of April. A similar decrease of lesser magnitude in well 399-1-17A also occurred in a sample taken at the same time (Figure 4). The reasons for this abrupt decrease in concentrations have not been identified. Concentrations in well 399-1-17A remained at these lower levels while those in well 399-1-9 increased during May. Uranium concentrations in well 399-1-11 increased significantly in samples taken during the last week of April and the first week of May, but decreased to previous levels in a sample taken during the second week of May. Wells that had gross alpha activities greater than the interim primary drinking water standard (DWS) (15 pCi/L, excluding uranium) were 399-1-1, 399-1-2, 399-1-4, 399-1-6, 399-1-7, 399-1-8, 399-1-10, 399-1-11, 399-1-12, 399-1-13, 399-1-14, 399-1-16A, 399-1-17A, 399-1-19, and 399-4-7. Uranium concentrations for samples collected in May and June are shown in Table 1.

All results obtained for samples collected during March, April and May 1988 are summarized in Table 2. The samples from the network of 34 monitoring wells were analyzed in May for an extensive list of constituents included in the WAC 173-303-9905 list. Table 3 lists those constituents with at least one detected value.

Volatile organic chemicals detected in samples collected in May include chloroform, methylene chloride, perchloroethene (PCE), 1,1,1-tetrachloroethane (TCA), trans-1,2-dichloroethene (DCE), and trichloroethene (TCE). The only volatile organic chemical present in a concentration greater than the DWS was TCE (DWS is 5 ppb) in well 399-1-16B with a concentration of 17 ppb. This concentration is similar to those measured in well 399-1-16B in 1987. Chloroform concentrations remained similar to or less than those reported previously in 1988. Methylene chloride was detected in wells 399-1-4 (43 ppb) and 399-4-1 (13 ppb). The intermediate-depth well 399-1-16B continued to show the presence of DCE with a concentration of 53 ppb, which was down slightly from an average concentration of 67 ppb during 1987. Well 399-8-2 continued to contain PCE and TCA, although concentrations continued to decrease. The concentration of PCE in May was 5 ppb, compared to

FIGURE 3. Concentrations of Uranium (ppb) in Wells Generally North (a) and Wells Generally South (b) of the 300 Area Process Trenches for June 1985 Through May 1988 (Plotting symbols are abbreviations of well numbers. Horizontal solid line is detection limit.)

FIGURE 4. Uranium Concentrations (ppb) in Wells 399-1-11, 399-1-17A, and 399-1-19, October 1987 Through May 1988

TABLE 1. Uranium Concentrations for 300 Area Wells Sampled During May and June 1988

Well Number(a)	Collection Date	Concentration, pCi/L
3-1-1	19MAY88	18.4
3-1-2	10MAY88	29.9
3-1-3	27MAY88	75.0
3-1-4	24MAY88	18.5
3-1-5	31MAY88	36.2
3-1-6	27MAY88	19.5
3-1-7	24MAY88	53.2
3-1-8	25MAY88	30.9
3-1-9	25MAY88	-0.0107(b)
3-1-10	26MAY88	20.0
3-1-12	17MAY88	63.6
3-1-13	01JUN88	15.4
3-1-14	26MAY88	15.9
3-1-15	26MAY88	6.79
3-1-16A	18MAY88	14.9
3-1-16B	18MAY88	2.58
3-1-16C	18MAY88	0.143
3-1-16D	01JUN88	0.0187(b)
3-1-17B	20MAY88	0.220
3-1-17C	20MAY88	0.0138(b)
3-1-18B	23MAY88	0.128
3-1-18C	23MAY88	0.0999(b)
3-2-1	24MAY88	10.9
3-2-2	31MAY88	31.8
3-2-3	31MAY88	7.74
3-3-3	01JUN88	5.31
3-3-6	31MAY88	8.08
3-3-7	27MAY88	14.7
3-3-9	31MAY88	12.2
3-3-10	09MAY88	12.7
3-3-11	01JUN88	32.5
3-3-12	01JUN88	25.6
3-4-1	27MAY88	13.2
3-4-7	16MAY88	29.4
3-4-9	31MAY88	24.1
3-4-10	31MAY88	26.7
3-4-11	25MAY88	8.57
3-5-1	31MAY88	4.27
3-6-1	31MAY88	6.57
3-8-1	10MAY88	3.03
3-8-2	10MAY88	1.84
3-8-3	09MAY88	3.07
3-8-4	31MAY88	1.87
6-S27-E14	04MAY88	3.32

(a) All well numbers prefixed by 399, as represented by the number "3" or 699, as represented by the number "6."

(b) The counting error for this value is greater than the result.

TABLE 2. Sampling Summary for the 300 Area Process Trenches, March, April, and May 1988

----- Constituent List=Contamination Indicators -----

Constituent Code Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded	Full name
191 CONDFLD	umho	1	70	0	700 WDOE	Specific conductance, field
199 PHFIELD		0.1	70	0	8.6-8.6 EPAS	pH, field
C69 TOC	ppb	1000	34	0	.	Total organic carbon
H42 TOXLDL	ppb	20	34	5	.	Total organic halogens, low DL

----- Constituent List=Drinking Water Standards -----

Constituent Code Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded	Full name
109 CDLIFRM	MPN	2.2	34	28	1 EPA	Coliform bacteria
111 BETA	pCi/L	8	36	0	50 EPA	Gross beta
181 RADIUM	pCi/L	1	34	0	5 EPA	Total radium
212 ALPHA	pCi/L	4	36	0	15 EPA	Gross alpha
A06 BARIUM	ppb	6	34	0	1000 EPA	Barium
A07 CADMIUM	ppb	2	34	34 ***	10 EPA	Cadmium
A08 CHROMIUM	ppb	10	34	29	50 EPA	Chromium
A10 SILVER	ppb	10	34	34 ***	50 EPA	Silver
A20 ARSENIC	ppb	5	34	31	50 EPA	Arsenic
A21 MERCURY	ppb	0.1	34	34 ***	2 EPA	Mercury
A22 SELENIUM	ppb	6	34	34 ***	10 EPA	Selenium
A33 ENDRIIN	ppb	0.1	34	34 ***	0.2 EPA	Endrin
A34 METHLDOR	ppb	3	34	34 ***	100 EPA	Methoxychlor
A35 TOXAENE	ppb	1	34	34 ***	5 EPA	Toxaphene
A36 a-BHC	ppb	0.1	34	34 ***	4 EPA	Alpha-BHC
A37 b-BHC	ppb	0.1	34	34 ***	4 EPA	Beta-BHC
A38 g-BHC	ppb	0.1	34	34 ***	4 EPA	Gamma-BHC
A39 d-BHC	ppb	0.1	34	34 ***	4 EPA	Delta-BHC
A61 LEADGF	ppb	5	34	34 ***	50 EPA	Lead (graphite furnace)
A61 TETRANE	ppb	5	72	72 ***	5 EPA	Tetrachloromethane [Carbon Tetrachloride]
A62 BENZENE	ppb	5	36	36 ***	5 EPA	Benzene
A67 1,1,1-T	ppb	5	72	70	200 EPA	1,1,1-Trichloroethane
A69 TRICENE	ppb	5	72	66	5 EPA	Trichloroethylene [1,1,2-Trichloroethene]
A80 CHLFORM	ppb	5	72	13	100 EPA	Chloroform [Trichloromethane]
A90 1,2-DIC	ppb	10	36	36 ***	5 EPA	1,2-Dichloroethane
A92 DICETHY	ppb	10	36	36 ***	7 EPA	1,1-Dichloroethylene
B08 BROMORM	ppb	10	36	36 ***	100 EPA	Bromoform [Tribromomethane]
B13 VINYLIDE	ppb	10	36	36 ***	2 EPA	Vinyl chloride
C72 NITRATE	ppb	500	72	6	45000 EPA	Nitrate
C74 FLUORID	ppb	500	72	59	4000 EPA	Fluoride
H13 2,4-D	ppb	2	34	34 ***	100 EPA	2,4-D [2,4-Dichlorophenoxyacetic acid]
H14 2,4,6TP	ppb	2	34	34 ***	10 EPA	2,4,6-TP silvex
H20 FBARIUM	ppb	6	36	0	1000 EPA	Barium, filtered
H21 FCADMIU	ppb	2	36	34	10 EPA	Cadmium, filtered
H22 FCHRDMI	ppb	10	36	36 ***	50 EPA	Chromium, filtered
H23 FSILVER	ppb	10	36	36 ***	50 EPA	Silver, filtered
H37 FARSENI	ppb	5	36	31	50 EPA	Arsenic, filtered
H38 FMERCUR	ppb	0.1	34	34 ***	2 EPA	Mercury, filtered
H39 FSELENI	ppb	5	36	36 ***	10 EPA	Selenium, filtered
H41 FLEAD	ppb	5	36	36 ***	50 EPA	Lead, filtered

TABLE 2. (contd)

Constituent List=Quality Characteristics								
Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standard	Water Standards Agency Exceeded	Full name
A11	SODIUM	ppb	200	34	0	.		Sodium
A17	MANGESE	ppb	5	34	25	50	EPAS	Manganese
A19	IRON	ppb	30	34	7	300	EPAS	Iron
C57	PHENOL	ppb	10	34	34 ***	.		Phenol
C73	SULFATE	ppb	500	72	2	250000	EPAS	Sulfate
C76	CHLORID	ppb	500	72	0	250000	EPAS	Chloride
H24	FSODIUM	ppb	200	36	0	.		Sodium, filtered
H29	FMANGAN	ppb	5	36	27	50	EPAS	Manganese, filtered
H31	FIRON	ppb	30	36	22	300	EPAS	Iron, filtered

Constituent List=Site Specific								
Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standard	Water Standards Agency Exceeded	Full name
124	U-CHEM	ug/L	0.725	39	0	.		Uranium, chemical
A03	STRONIUM	ppb	20	34	0	.		Strontium
A04	ZINC	ppb	5	34	23	5000	EPAS	Zinc
A05	CALCIUM	ppb	50	34	0	.		Calcium
A12	NICKEL	ppb	10	34	31	.		Nickel
A13	COPPER	ppb	10	34	30	1300	EPAP	Copper
A14	VANADIUM	ppb	5	34	24	.		Vanadium
A16	ALUMINIUM	ppb	150	34	34 ***	.		Aluminum
A18	POTASSIUM	ppb	100	34	0	.		Potassium
A50	MAGNESIUM	ppb	50	34	0	.		Magnesium
A64	METHONE	ppb	10	72	72 ***	.		Methyl ethyl ketone
A68	1,1,2-T	ppb	5	72	72 ***	.		1,1,2-Trichloroethane
A70	PERCENE	ppb	5	72	70	.		Perchloroethylene
A71	OPXYLE	ppb	5	72	72 ***	440	EPAP	Xylene-o,p
A91	TRANDE	ppb	10	36	34	70	EPAP	trans-1,2-Dichloroethane
A93	METHYCH	ppb	10	72	69	.		Methylene chloride
B14	M-XYLE	ppb	5	72	72 ***	440	EPAP	Xylene-m
C70	CYANIDE	ppb	10	34	32	.		Cyanide
C78	PHOSPHA	ppb	1000	72	72 ***	.		Phosphate
C78	SULFIDE	ppb	1000	34	34 ***	.		Sulfide
C80	AMMONIU	ppb	50	36	23	.		Ammonium ion
H18	TC	ppb	1000	34	0	.		Total carbon
H18	FZINC	ppb	5	36	27	5000	EPAS	Zinc, filtered
H19	FCALCIU	ppb	50	36	0	.		Calcium, filtered
H25	FNICKEL	ppb	10	36	32	.		Nickel, filtered
H26	FCOPPER	ppb	10	36	27	1300	EPAP	Copper, filtered
H27	FVANADI	ppb	5	36	26	.		Vanadium, filtered
H28	FALUMIN	ppb	150	36	36 ***	.		Aluminum, filtered
H30	FPOTASS	ppb	100	36	0	.		Potassium, filtered
H32	FMAGNES	ppb	50	36	0	.		Magnesium, filtered
H35	FSTRONT	ppb	20	36	0	.		Strontium, filtered
H68	HEXONE	ppb	10	72	72 ***	.		Hexone

TABLE 2. (contd)

Constituent List=WAC 173-303-9905

Constituent Code Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded	Full name
A01 BERYLUM	ppb	5	34	34 ***	.	Beryllium
A15 ANTIMONY	ppb	100	34	34 ***	.	Antimony
A23 THALLIUM	ppb	5	34	34 ***	.	Thallium
A24 THIUREA	ppb	200	34	34 ***	.	Thiourea
A25 ACETREA	ppb	200	34	34 ***	.	1-Acetyl-2-thiourea
A26 CHLOREA	ppb	200	34	34 ***	.	1-(o-Chlorophenyl) thiourea
A27 DIETROL	ppb	200	34	34 ***	.	Diethylstilbestrol
A28 ETHYREA	ppb	200	34	34 ***	.	Ethylenethiourea
A29 NAPHREA	ppb	200	34	34 ***	.	1-Naphthyl-2-thiourea
A32 PHENREA	ppb	500	34	34 ***	.	N-phenylthiourea
A40 DDD	ppb	0.1	34	34 ***	.	DDD
A41 DDE	ppb	0.1	34	34 ***	.	DDE
A42 DDT	ppb	0.1	34	34 ***	.	DDT
A43 HEPTLOR	ppb	0.1	34	34 ***	0 EPAP	Heptachlor
A44 HEPTIDE	ppb	0.1	34	34 ***	0 EPAP	Heptachlor epoxide
A46 DIELRIN	ppb	0.1	34	34 ***	.	Dieldrin
A47 ALDRIN	ppb	0.1	34	34 ***	.	Aldrin
A48 CHLOANE	ppb	1	34	34 ***	0 EPAP	Chlordane
A49 END01	ppb	0.1	34	34 ***	.	Endosulfan I (alpha)
A52 END02	ppb	0.1	34	34 ***	.	Endosulfan II (beta)
A54 AR1018	ppb	1	34	34 ***	0 EPAP	Arochlor 1018
A55 AR1221	ppb	1	34	34 ***	0 EPAP	Arochlor 1221
A56 AR1232	ppb	1	34	34 ***	0 EPAP	Arochlor 1232
A57 AR1242	ppb	1	34	34 ***	0 EPAP	Arochlor 1242
A58 AR1248	ppb	1	34	34 ***	0 EPAP	Arochlor 1248
A59 AR1254	ppb	1	34	34 ***	0 EPAP	Arochlor 1254
A60 AR1260	ppb	1	34	34 ***	0 EPAP	Arochlor 1260
A63 DIOXANE	ppb	500	36	36 ***	.	Dioxane
A65 PYRIDIN	ppb	500	36	36 ***	.	Pyridine
A66 TOLUENE	ppb	5	36	36 ***	2000 EPAP	Toluene
A72 ACROLIN	ppb	10	36	36 ***	.	Acrolein
A73 ACRYILE	ppb	10	36	36 ***	.	Acrylonitrile
A74 BISTHER	ppb	10	36	36 ***	.	Bis(chloromethyl) ether
A75 BROMONE	ppb	10	36	36 ***	.	Bromoacetone
A76 METHBRO	ppb	10	36	36 ***	.	Methyl bromide
A77 CARBIDE	ppb	10	36	36 ***	.	Carbon disulfide
A78 CHLBENZ	ppb	10	36	36 ***	60 EPAP	Chlorobenzene
A79 CHLTHER	ppb	10	36	36 ***	.	2-Chloroethyl vinyl ether
A81 METHCHL	ppb	10	36	36 ***	.	Methyl chloride [Chloromethane]
A82 CHMTHER	ppb	10	36	36 ***	.	Chloromethyl methyl ether
A83 CROTONA	ppb	10	36	36 ***	.	Crotonaldehyde
A84 DIBRCHL	ppb	10	36	36 ***	0 EPAP	1,2-Dibromo-3-chloropropane
A85 DIBRETH	ppb	10	36	36 ***	.	1,2-Dibromoethane
A86 DIBRMET	ppb	10	36	36 ***	.	Dibromomethane
A87 DIBUTEN	ppb	10	36	36 ***	.	1,4-Dichloro-2-butene
A88 DICDIFM	ppb	10	36	36 ***	.	Dichlorodifluoromethane
A89 1,1-DIC	ppb	10	36	36 ***	.	1,1-Dichloroethane
A94 DICPANE	ppb	10	36	36 ***	6 EPAP	1,2-Dichloropropane
A95 DICPENE	ppb	10	36	36 ***	.	1,3-Dichloropropane
A96 NNDIEHY	ppb	10	36	36 ***	.	N,N-diethylhydrazine

TABLE 2. (contd)

Constituent List=WAC 173-303-9905

Constituent Code Name Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded	Full name
A99 HYDRSUL ppb	10	36	36 ***	.	Hydrogen sulfide
B01 IODOMET ppb	10	36	36 ***	.	Iodomethane
B02 METHACR ppb	10	36	36 ***	.	Methacrylonitrile
B03 METHTHI ppb	10	36	36 ***	.	Methanethiol
B04 PENTACH ppb	10	36	36 ***	.	Pentachloroethane
B06 1112-tc ppb	10	36	36 ***	.	1,1,1,2-Tetrachlorethane
B08 1122-tc ppb	10	36	36 ***	.	1,1,2,2-Tetrachlorethane
B09 TRCMEOL ppb	10	36	36 ***	.	Trichloromethanethiol
B10 TRCMFLM ppb	10	36	36 ***	.	Trichloromonofluoromethane
B11 TRCPANE ppb	10	36	36 ***	.	Trichloropropane
B12 123-trp ppb	10	36	36 ***	.	1,2,3-Trichloropropane
B16 DIETHY ppb	10	36	36 ***	.	Diethylarsine
B19 ACETILE ppb	3000	36	36 ***	.	Acetonitrile
B20 ACETOPH ppb	10	34	34 ***	.	Acetophenone
B21 WARFRIN ppb	10	34	34 ***	.	Warfarin
B22 ACEFENE ppb	10	34	34 ***	.	2-Acetylaminofluorene
B23 AMINOYL ppb	10	34	34 ***	.	4-Aminobiphenyl
B24 AMIISOX ppb	10	34	34 ***	.	5-(Aminomethyl)-3-isoxazolol
B26 AMITROL ppb	10	34	34 ***	.	Amitrole
B28 ANILINE ppb	10	34	34 ***	.	Aniline
B27 ARAMITE ppb	10	34	34 ***	.	Aramite
B28 AURAMIN ppb	10	34	34 ***	.	Auramine
B29 BENZCAC ppb	10	34	34 ***	.	Benz[c]acridine
B30 BENZAAN ppb	10	34	34 ***	.	Benz[a]anthracene
B31 BENDICM ppb	10	34	34 ***	.	Benzene, dichloromethyl
B32 BENTHOL ppb	10	34	34 ***	.	Benzenethiol
B33 BENDINE ppb	10	34	34 ***	.	Benzidine
B34 BENZBFL ppb	10	34	34 ***	.	Benzo[b]fluoranthene
B36 BENZJFL ppb	10	34	34 ***	.	Benzo[j]fluoranthene
B38 PBENZQU ppb	10	34	34 ***	.	p-Benzoquinone
B37 BENZCHL ppb	10	34	34 ***	.	Benzyl chloride
B38 BIS2CHM ppb	10	34	34 ***	.	Bis(2-chloroethoxy) methane
B39 BIS2CHE ppb	10	34	34 ***	.	Bis(2-chloroethyl) ether
B40 BIS2EPH ppb	10	34	34 ***	.	Bis(2-ethylhexyl) phthalate
B41 BROPHEN ppb	10	34	34 ***	.	4-Bromophenyl phenyl ether
B42 BUTBENP ppb	10	34	34 ***	.	Butyl benzyl phthalate
B43 BUTDINP ppb	10	34	34 ***	.	2-sec-Butyl-4,6-dinitrophenol (DNBP)
B44 CHALETH ppb	10	34	34 ***	.	Chloroalkyl ethers
B45 CHLANIL ppb	10	34	34 ***	.	p-Chloroaniline
B46 CHLCRES ppb	10	34	34 ***	.	p-Chloro-m-cresol
B47 CHLEPOX ppb	10	34	34 ***	0 EPAP	1-Chloro-2,3-epoxypropane
B48 CHLNAPH ppb	10	34	34 ***	.	2-Chloronaphthalene
B49 CHLPHEN ppb	10	34	34 ***	.	2-Chlorophenol
B50 CHRYSEN ppb	10	34	34 ***	.	Chrysene
B51 CRESOLS ppb	10	34	34 ***	.	Cresols
B52 CYCHDIN ppb	10	34	34 ***	.	2-Cyclohexyl-4,6-dinitrophenol
B53 DIBAHAC ppb	10	34	34 ***	.	Dibenz[a,h]acridine
B54 DIBAJAC ppb	10	34	34 ***	.	Dibenz[a,j]acridine
B55 DIBAHAN ppb	10	34	34 ***	.	Dibenz[a,h]anthracene
B56 DIBCGCA ppb	10	34	34 ***	.	7H-Dibenzo[c,g]carbazole

TABLE 2. (contd)

----- Constituent List=WAC 173-303-9905 -----

Constituent Code Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded	Full name
B57 DIBAEPY	ppb	10	34	34 ***	.	Dibenzo[a,e]pyrene
B58 DIBAHYP	ppb	10	34	34 ***	.	Dibenzo[a,h]pyrene
B59 DIBAIPY	ppb	10	34	34 ***	.	Dibenzo[a,i]pyrene
B60 DIBPHTH	ppb	10	34	34 ***	.	Di-n-butyl phthalate
B61 12-dben	ppb	10	34	34 ***	.	1,2-Dichlorobenzene
B62 13-dben	ppb	10	34	34 ***	.	1,3-Dichlorobenzene
B63 14-dben	ppb	10	34	34 ***	.	1,4-Dichlorobenzene
B64 DICHBEN	ppb	20	34	34 ***	.	3,3'-Dichlorobenzidine
B65 24-dchp	ppb	10	34	34 ***	.	2,4-Dichlorophenol
B66 26-dchp	ppb	10	34	34 ***	.	2,6-Dichlorophenol
B67 DIEPHTH	ppb	10	34	34 ***	.	Diethyl phthalate
B68 DIHYSAF	ppb	10	34	34 ***	.	Dihydrosafrole
B69 DIMETHB	ppb	10	34	34 ***	.	3,3'-Dimethoxybenzidine
B70 DIMEAMB	ppb	10	34	34 ***	.	p-Dimethylaminobenzene
B71 DIMBENZ	ppb	10	34	34 ***	.	7,12-Dimethylbenz[a]anthracene
B72 DIMEYLB	ppb	10	34	34 ***	.	3,3'-Dimethylbenzidine
B73 THIONOX	ppb	10	34	34 ***	.	Thiofanox
B74 DIMPHAM	ppb	10	34	34 ***	.	alpha,alpha-Dimethylphenethylamine
B75 DIMPHEN	ppb	10	34	34 ***	.	2,4-Dimethylphenol
B76 DIMPHTH	ppb	10	34	34 ***	.	Dimethyl phthalate
B77 DINBENZ	ppb	10	34	34 ***	.	Dinitrobenzene
B78 DINCREB	ppb	10	34	34 ***	.	4,6-Dinitro-o-cresol and salts
B79 DINPHEN	ppb	60	34	34 ***	.	2,4-Dinitrophenol
B80 24-dint	ppb	10	34	34 ***	.	2,4-Dinitrotoluene
B81 26-dint	ppb	10	34	34 ***	.	2,6-Dinitrotoluene
B82 DIOPHTH	ppb	10	34	34 ***	.	Di-n-octyl phthalate
B83 DIPHAMI	ppb	10	34	34 ***	.	Diphenylamine
B84 DIPHHYD	ppb	10	34	34 ***	.	1,2-Diphenylhydrazine
B85 DIPRNIT	ppb	10	34	34 ***	.	Di-n-propylnitrosamine
B86 ETHMINE	ppb	10	34	34 ***	.	Ethyleneimine
B87 ETHMETS	ppb	10	34	34 ***	.	Ethyl methanesulfonate
B88 FLUDRAN	ppb	10	34	34 ***	.	Fluoranthene
B89 HEXCBEN	ppb	10	34	34 ***	.	Hexachlorobenzene
B90 HEXCBUT	ppb	10	34	34 ***	.	Hexachlorobutadiene
B91 HEXCCYC	ppb	10	34	34 ***	.	Hexachlorocyclopentadiene
B92 HEXCETH	ppb	10	34	34 ***	.	Hexachloroethane
B93 INDENOP	ppb	10	34	34 ***	.	Indeno(1,2,3-cd)pyrene
B94 ISOSOLE	ppb	10	34	34 ***	.	Isosafrole
B95 MALOILE	ppb	10	34	34 ***	.	Malononitrile
B96 MELPHAL	ppb	10	34	34 ***	.	Melphalan
B97 METHAPY	ppb	10	34	34 ***	.	Methapyrilene
B98 METHNYL	ppb	10	34	34 ***	.	Metholonyl
B99 METAZIR	ppb	10	34	34 ***	.	2-Methylaziridine
C01 METCHAN	ppb	10	34	34 ***	.	3-Methylcholanthrene
C02 METBISC	ppb	10	34	34 ***	.	4,4'-Methylenebis(2-chloroaniline)
C03 METACTO	ppb	10	34	34 ***	.	2-Methylactonitrile
C04 METACRY	ppb	10	36	36 ***	.	Methyl methacrylate
C05 METMSUL	ppb	10	34	34 ***	.	Methyl methanesulfonate
C06 WETPROP	ppb	10	34	34 ***	.	2-Methyl-2-(methylthio) propionaldehyde
C07 METHIOU	ppb	10	34	34 ***	.	Methylthiouracil

TABLE 2. (contd)

----- Constituent List=WAC 173-303-9905 -----						
Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded Full name
C08	NAPHQUI	ppb	10	34	34 ***	. 1,4-Naphthoquinone
C09	1-napha	ppb	10	34	34 ***	. 1-Naphthylamine
C10	2-napha	ppb	10	34	34 ***	. 2-Naphthylamine
C11	NITRANI	ppb	50	34	34 ***	. p-Nitroaniline
C12	NITBENZ	ppb	10	34	34 ***	. Nitrobenzene
C13	NITPHEN	ppb	50	34	34 ***	. 4-Nitrophenol
C14	NNIBUTY	ppb	10	34	34 ***	. N-nitrosodi-n-butylamine
C15	NNIDIEA	ppb	10	34	34 ***	. N-nitrosodiethanolamine
C16	NNIDIEY	ppb	10	34	34 ***	. N-nitrosodiethylamine
C17	NNIDIME	ppb	10	34	34 ***	. N-nitrosodimethylamine
C18	NNIMETH	ppb	10	34	34 ***	. N-nitrosomethylethylamine
C19	NNIURET	ppb	10	34	34 ***	. N-nitroso-n-methylurethane
C20	NNIVINY	ppb	10	34	34 ***	. N-nitrosomethylvinylamine
C21	NNIMORP	ppb	10	34	34 ***	. N-nitrosomorpholine
C22	NNINICD	ppb	10	34	34 ***	. N-nitrosomornicotine
C23	NNIPIPE	ppb	10	34	34 ***	. N-nitrosopiperidine
C24	NITRPYR	ppb	10	34	34 ***	. Nitrosopyrrolidine
C25	NITRTOL	ppb	10	34	34 ***	. 5-Nitro-o-toluidine
C26	PENTCHB	ppb	10	34	34 ***	. Pentachlorobenzene
C27	PENTCHN	ppb	10	34	34 ***	. Pentachloronitrobenzene
C28	PENTCHP	ppb	50	34	34 ***	220 EPAP Pentachlorophenol
C29	PHENTIN	ppb	10	34	34 ***	. Phenacetin
C30	PHENINE	ppb	10	34	34 ***	. Phenylenediamine
C31	PHTHEST	ppb	10	34	34 ***	. Phthalic acid esters
C32	PICOLIN	ppb	10	34	34 ***	. 2-Picoline
C33	PRONIDE	ppb	10	34	34 ***	. Pronamide
C34	RESERPI	ppb	10	34	34 ***	. Reserpine
C35	RESORCI	ppb	10	34	34 ***	. Resorcinol
C36	SAFROL	ppb	10	34	34 ***	. Safrol
C37	TETRCHB	ppb	10	34	34 ***	. 1,2,4,5-Tetrachlorobenzene
C39	TETRCHP	ppb	10	34	34 ***	. 2,3,4,6-Tetrachlorophenol
C40	THIURAM	ppb	10	34	34 ***	. Thiuram
C41	TOLUDIA	ppb	10	34	34 ***	. Toluenediamine
C42	OTOLHYD	ppb	10	34	34 ***	. o-Toluidine hydrochloride
C43	TRICHLB	ppb	10	34	34 ***	. 1,2,4-Trichlorobenzene
C44	245-trp	ppb	50	34	34 ***	. 2,4,5-Trichlorophenol
C45	246-trp	ppb	10	34	34 ***	. 2,4,6-Trichlorophenol
C46	TRIPHOS	ppb	10	34	34 ***	. O,o,o-triethyl phosphorothioate
C47	SYMTRIN	ppb	10	34	34 ***	. Sym-trinitrobenzene
C48	TRISPHO	ppb	10	34	34 ***	. Tris(2,3-dibromopropyl) phosphate
C49	BENZOPY	ppb	10	34	34 ***	. Benzo[a]pyrene
C50	CHLNAPZ	ppb	10	34	34 ***	. Chlornaphazine
C51	BIS2ETH	ppb	10	34	34 ***	. Bis(2-chloroisopropyl) ether
C52	HEXAENE	ppb	10	34	34 ***	. Hexachloropropene
C53	HYDRAZI	ppb	3000	34	34 ***	. Hydrazine
C54	HEXACHL	ppb	10	34	34 ***	. Hexachlorophene
C55	NAPHTHA	ppb	10	34	34 ***	. Naphthalene
C56	123TRI	ppb	10	34	34 ***	. 1,2,3-Trichlorobenzene
C58	135TRI	ppb	10	34	34 ***	. 1,3,5-Trichlorobenzene
C59	1234TE	ppb	10	34	34 ***	. 1,2,3,4-Tetrachlorobenzene

TABLE 2. (contd)

Constituent List=WAC 173-303-9905

Constituent Code Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded	Full name
C60 1235TE	ppb	10	34	34 ***	.	1,2,3,5-Tetrachlorobenzene
C61 TETEPYR	ppb	2	34	33	.	Tetraethylpyrophosphate
C62 CHLLATE	ppb	30	34	34 ***	.	Chlorobenzilate
C63 CARBPHT	ppb	2	34	34 ***	.	Carbophenothion
C64 DISULFO	ppb	2	34	34 ***	.	Disulfoton
C65 DIMETHO	ppb	2	34	34 ***	.	Dimethoate
C66 METHPAR	ppb	2	34	34 ***	.	Methyl parathion
C67 PARATHI	ppb	2	34	34 ***	.	Parathion
C71 FORMALN	ppb	500	36	36 ***	.	Formalin
C77 PERCHLO	ppb	1000	36	36 ***	.	Perchlorate
C79 KEROSEN	ppb	10000	34	34 ***	.	Kerosene
C81 ETHYGLY	ppb	10000	34	34 ***	.	Ethylene glycol
C86 DIOXIN	ppb	0.1	34	34 ***	.	Dioxin
C67 CITRUSR	ppb	1000	34	34 ***	.	Citrus red
C90 PARALDE	ppb	2000	34	34 ***	.	Paraaldehyde
C91 STRYCHN	ppb	50	34	34 ***	.	Strychnine
C92 MALHYDR	ppb	500	34	34 ***	.	Maleic hydrazide
C93 NICOTIN	ppb	100	34	34 ***	.	Nicotinic acid
C94 ACRYIDE	ppb	10000	34	34 ***	0 EPAP	Acrylamide
C95 ALLYLAL	ppb	2500	34	34 ***	.	Allyl alcohol
C97 CHLACET	ppb	16000	34	34 ***	.	Chloroacetaldehyde
C98 CHLPROP	ppb	4000	34	34 ***	.	3-Chloropropionitrile
H03 ETHCARB	ppb	5000	34	34 ***	.	Ethyl carbamate
H04 ETHCYAN	ppb	2000	34	34 ***	.	Ethyl cyanide
H05 ETHOXID	ppb	3000	36	36 ***	.	Ethylene oxide
H08 ETHMETH	ppb	10	36	36 ***	.	Ethyl methacrylate
H09 ISOBUTY	ppb	1000	34	34 ***	.	Isobutyl alcohol
H11 PROPYLA	ppb	10000	34	34 ***	.	n-Propylamine
H12 PROPYNO	ppb	8000	34	34 ***	.	2-Propyn-1-ol
H15 2,4,5-T	ppb	2	34	34 ***	.	2,4,5-T
H33 FBERYLL	ppb	5	36	36 ***	.	Beryllium, filtered
H36 FANTIMO	ppb	100	36	36 ***	.	Antimony, filtered
H40 FTHALLI	ppb	5	36	36 ***	.	Thallium, filtered
I21 TRIBUPH	ppb	10	34	34 ***	.	Tributylphosphoric acid

*** - Indicates all samples were below detection limits

xxx - Indicates that Drinking Water Standards were exceeded

EPA - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July, 1987)
National Primary Drinking Water Regulations as amended by 52 FR 25690EPAR - based on National Interim Primary Drinking Water Regulations,
Appendix IV, EPA-570/9-76-003

EPAP - based on proposed Maximum Contaminant Level Goals in 50 FR 46936

EPAS - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143
National Secondary Drinking Water RegulationsWDOE - based on additional Secondary Maximum Contaminant Levels given in
WAC 248-54, Public Water Supplies

TABLE 3. Constituents with at Least One Detected Value for the 300 Area Process Trenches, March, April, and May 1988

Weekly Samples

Well name	Collection Date	Duplicate sample number	CHLFORM ppb 5/100	CHLORID ppb 500/250000s	CDNDFLD umho 1/700w	NITRATE ppb 500/45000	PERCENE ppb 5/.	PHFIELD 0.1/0.5s	SULFATE ppb 500/250000s	U-CHEM ug/L 0.725/.
3-1-11	03MAR88		12	18,800	174	2,420	<5	7.9	17,800	86.2
	10MAR88		10	21,500	206	3,840	<5	7.7	19,300	86.9
	17MAR88		12	9,210	173	1,450	<5	8.1	20,000	80.0
	25MAR88		10	6,140	157	1,390	<5	7.7	15,600	55.5
	31MAR88		12	4,000	134	1,970	<5	7.6	16,700	54.3
	08APR88		10	5,610	184	2,290	<5	7.4	17,500	47.2
	15APR88		12	4,620	178	2,520	<5	7.7	17,000	55.3
	21APR88		14	24,400	293	2,080	<5	7.4	17,500	59.0
	28APR88		15	5,600	204	1,010	<5	7.4	17,800	232.0
	05MAY88		18	9,180	198	1,220	<5	7.9	18,700	249.0
	12MAY88		17	10,700	189	2,480	<5	7.2	20,700	51.2
	28MAY88		21	4,720	136	1,700	<5	7.5	19,000	40.8
3-1-17A	03MAR88		10	17,600	175	2,160	<5	7.6	18,300	161.0
	10MAR88		10	26,200	183	2,460	<5	7.5	19,400	171.0
	17MAR88		11	6,890	168	<500	<5	7.6	18,500	212.0
	25MAR88		11	8,290	169	1,340	<5	7.2	15,800	221.0
	31MAR88		10	14,100	166	1,450	<5	7.3	16,100	220.0
	08APR88		9	8,560	187	1,940	<5	7.0	15,900	287.0
	15APR88		10	9,280	181	1,740	<5	7.4	15,700	392.0
	21APR88		12	5,230	231	1,840	<5	7.6	16,400	376.0
	28APR88		12	14,800	230	1,050	<5	7.3	16,400	221.0
	05MAY88		15	27,800	270	1,220	<5	7.5	17,600	246.0
	12MAY88		17	10,800	239	1,860	<5	7.0	19,900	225.0
	28MAY88		18	8,030	156	1,740	<5	7.3	20,500	178.0
3-1-19	03MAR88		10	19,600	184	2,250	<5	7.7	16,300	204.0
	10MAR88		10	19,900	205	2,770	#2	7.6	18,800	251.0
	17MAR88		11	9,580	198	901	<5	7.8	18,300	351.0
	25MAR88		11	15,300	189	1,380	<5	7.3	15,800	244.0
	31MAR88		11	11,900	181	1,500	<5	7.1	17,000	237.0
	08APR88		10	8,950	312	2,120	<5	8.5	16,900	253.0
	15APR88		10	8,170	180	1,840	<5	7.6	16,700	274.0
	21APR88		12	13,200	267	1,890	<5	7.4	17,400	281.0
	28APR88		13	8,680	212	1,170	<5	7.2	16,600	50.9
	05MAY88		14	18,300	229	1,350	<5	7.5	17,700	124.0
	12MAY88		16	17,500	259	1,740	<5	6.8	19,800	187.0
	28MAY88		17	7,960	160	1,710	<5	7.4	18,100	213.0

TABLE 3. (contd)

Well name	Collection Date	Duplicate sample number	1,1,1-T ppb 5/200	ALPHA pCi/L 4/15	AMMONIU ppb 50/.	ARSENIC ppb 5/50	FARSEN ppb 5/50	BARIUM ppb 5/1000	FBARIUM ppb 5/1000	BETA pCi/L 8/50	FCADMIU ppb 2/10
3-1-1	19MAY88		<5	17.700	58	<5	<5	35	35	8.39	<2
3-1-2	10MAY88		<5	34.200	58	<5	<5	31	30	22.90	<2
3-1-4	24MAY88		<5	21.000	<50	<5	<5	16	16	12.00	<2
3-1-6	27MAY88		<5	27.700	<50	<5	<5	20	20	14.40	<2
3-1-7	24MAY88		<5	84.700	<50	<5	<5	24	22	33.80	<2
3-1-8	25MAY88		<5	47.300	<50	<5	<5	33	31	18.60	<2
3-1-9	25MAY88		<5	*-0.525	140	<5	<5	119	115	8.52	<2
3-1-10	28MAY88		<5	25.800	<50	<5	<5	29	28	11.80	<2
3-1-11	17MAY88		<5	40.000	68	<5	<5	18	19	9.77	<2
3-1-12	17MAY88		<5	87.900	58	<5	<5	20	20	26.40	<2
3-1-13	27MAY88		<5	18.700	<50	<5	<5	25	25	11.10	<2
	27MAY88	1	<5	19.800	<50	.	<5	.	24	9.53	<2
3-1-14	28MAY88		<5	22.300	<50	<5	<5	20	20	9.39	<2
3-1-15	28MAY88		<5	8.800	<50	<5	<5	40	43	12.20	<2
3-1-16A	18MAY88		<5	16.500	<50	<5	<5	31	31	9.72	<2
	18MAY88	1	<5	17.000	<50	.	<5	.	32	7.64	<2
3-1-16B	18MAY88		<5	1.530	125	<5	<5	50	53	4.83	2
3-1-16C	18MAY88		<5	*-0.075	150	<5	<5	61	65	8.69	<2
3-1-17A	20MAY88		<5	171.000	<50	<5	<5	20	20	58.40	<2
3-1-17B	20MAY88		<5	*-0.165	105	<5	<5	68	69	11.10	<2
3-1-17C	20MAY88		<5	*0.181	155	<5	<5	80	80	12.80	<2
3-1-18A	23MAY88		<5	3.730	<50	8	7	50	48	9.88	<2
3-1-18B	23MAY88		<5	*-0.284	90	<5	<5	40	40	9.40	<2
3-1-18C	23MAY88		<5	*0.159	115	<5	<5	71	70	8.81	<2
3-1-19	17MAY88		<5	135.000	60	<5	<5	20	20	44.10	<2
3-2-1	24MAY88		#3	7.930	<50	<5	<5	43	46	8.50	<2
3-3-7	27MAY88		<5	12.000	<50	<5	<5	43	38	12.40	<2
3-3-10	09MAY88		<5	14.600	52	<5	<5	35	40	11.80	<2
3-4-1	27MAY88		<5	8.830	<50	<5	<5	34	34	8.29	2
3-4-7	16MAY88		<5	22.200	<50	<5	<5	42	39	14.70	<2
3-4-11	25MAY88		<5	7.460	<50	<5	<5	33	33	11.30	<2
3-8-1	10MAY88		<5	2.080	<50	5	5	39	39	11.10	<2
3-8-2	10MAY88		10	*0.833	<50	5	5	48	45	8.79	<2
3-8-3	09MAY88		<5	1.320	<50	<5	5	38	37	7.01	<2
6-S30-E15A	05MAY88		<5	*0.776	<50	<5	<5	55	57	5.19	<2
8-S19-E13	27MAY88		<5	3.800	<50	<5	8	49	49	11.20	<2

TABLE 3. (contd)

Well name	Collection Date	Duplicate sample number	FCALCIU ppb 50/.	CALCIUM ppb 50/.	CHLFORM ppb 5/100	CHLORID ppb 500/250000s	CHROMIUM ppb 10/50	COLIFRM MPN 2.2/1	CONDFLD umho 1/700w	COPPER ppb 10/1300p
3-1-1	19MAY88		22,300	22,700	7	10,800	<10	18.0	179	<10
3-1-2	10MAY88		34,200	33,900	6	14,800	<10	<2.2	239	<10
3-1-4	24MAY88		18,900	17,800	22	4,890	<10	9.2	126	<10
3-1-6	27MAY88		23,300	22,300	16	6,800	<10	<2.2	164	<10
3-1-7	24MAY88		23,300	24,200	14	16,100	<10	<2.2	152	14
3-1-8	25MAY88		18,600	19,300	7	13,600	<10	<2.2	243	<10
3-1-9	25MAY88		18,000	18,900	<5	11,300	84	<2.2	343	<10
3-1-10	26MAY88		22,900	23,700	15	11,200	<10	<2.2	177	<10
3-1-11	17MAY88		21,600	20,600	18	5,470	<10	<2.2	168	<10
3-1-12	17MAY88		23,300	22,900	17	13,700	<10	<2.2	195	11
3-1-13	27MAY88		28,300	28,400	13	16,200	<10	<2.2	203	13
	27MAY88	1	25,700	.	13	16,300	.	.	.	.
3-1-14	28MAY88		24,900	25,600	16	12,300	<10	2.2	155	12
3-1-15	26MAY88		41,400	39,400	3	16,300	<10	<2.2	312	<10
3-1-16A	18MAY88		24,600	23,700	10	15,100	<10	<2.2	183	<10
	18MAY88	1	24,700	.	10	15,100	.	.	.	.
3-1-16B	18MAY88		19,000	18,200	<5	11,300	11	<2.2	303	<10
3-1-16C	18MAY88		14,900	13,100	<5	10,900	<10	<2.2	337	<10
3-1-17A	20MAY88		20,000	20,000	11	6,730	<10	<2.2	191	<10
3-1-17B	20MAY88		19,200	18,800	<5	10,600	<10	<2.2	370	<10
3-1-17C	20MAY88		10,900	10,200	<5	11,700	<10	<2.2	398	<10
3-1-18A	23MAY88		46,000	46,900	<5	19,300	10	<2.2	404	<10
3-1-18B	23MAY88		12,000	11,600	<5	11,100	12	<2.2	354	<10
3-1-18C	23MAY88		13,000	12,100	<5	11,000	31	<2.2	359	<10
3-1-19	17MAY88		20,800	19,900	14	12,300	<10	<2.2	174	<10
3-2-1	24MAY88		22,300	21,300	5	11,200	<10	5.1	168	<10
3-3-7	27MAY88		40,100	42,400	4	17,400	<10	<2.2	398	<10
3-3-10	09MAY88		27,800	24,000	10	9,510	<10	<2.2	238	<10
3-4-1	27MAY88		37,600	37,300	3	9,840	<10	<2.2	317	<10
3-4-7	16MAY88		37,000	37,900	4	11,400	<10	9.2	327	<10
3-4-11	25MAY88		34,900	35,600	9	8,970	<10	<2.2	316	<10
3-8-1	10MAY88		44,300	43,300	<5	10,600	<10	<2.2	344	<10
3-8-2	10MAY88		44,900	46,600	<5	11,200	<10	<2.2	332	<10
3-8-3	09MAY88		40,200	39,200	<5	10,200	<10	<2.2	361	<10
6-S30-E16A	05MAY88		68,600	69,900	<5	5,690	<10	<2.2	609	<10
6-S19-E13	27MAY88		45,100	44,300	<5	18,300	<10	2.2	413	<10

TABLE 3. (contd)

Well name	Collection Date	Duplicate sample number	FCOPPER ppb 10/1300p	CYANIDE ppb 10/.	FLUORID ppb 500/4000	IRON ppb 30/300s	FIRON ppb 30/300s	MAGNES ppb 50/.	FMAGNES ppb 50/.	FMANGAN ppb 5/50s
3-1-1	19MAY88		<10	<10	595	<30	<30	4,360	4,330	<5
3-1-2	10MAY88		<10	<10	<500	51	<30	8,680	8,820	<5
3-1-4	24MAY88		<10	<10	<500	61	62	3,810	3,850	<5
3-1-6	27MAY88		10	<10	<500	135	81	4,760	4,980	<5
3-1-7	24MAY88		10	<10	558	108	58	4,820	4,710	<5
3-1-8	25MAY88		<10	<10	811	86	<30	8,120	5,830	17
3-1-9	25MAY88		<10	<10	1300	544	115	7,860	7,550	62
3-1-10	26MAY88		<10	<10	<500	128	<30	4,920	4,860	<5
3-1-11	17MAY88		10	<10	<500	<30	<30	4,700	4,930	<5
3-1-12	17MAY88		11	<10	<500	<30	<30	4,880	5,010	<5
3-1-13	27MAY88		13	<10	<500	53	<30	8,090	5,990	<5
	27MAY88	1	18	.	<500	.	<30	.	5,840	<5
3-1-14	26MAY88		10	<10	<500	40	<30	5,140	5,020	<5
3-1-15	26MAY88		<10	<10	<500	55	<30	9,870	10,400	<5
3-1-16A	18MAY88		10	<10	<500	<30	<30	4,510	4,800	<5
	18MAY88	1	18	.	<500	.	<30	.	4,780	<5
3-1-16B	18MAY88		<10	<10	1530	114	84	8,130	8,430	80
3-1-16C	18MAY88		<10	<10	1900	83	64	5,250	5,880	55
3-1-17A	20MAY88		<10	<10	<500	<30	<30	4,270	4,190	<5
3-1-17B	20MAY88		<10	<10	1180	159	139	8,940	8,980	88
3-1-17C	20MAY88		<10	<10	1780	85	71	4,830	4,810	23
3-1-18A	23MAY88		<10	<10	581	40	<30	13,000	12,400	<5
3-1-18B	23MAY88		<10	<10	1790	222	172	5,180	5,150	40
3-1-18C	23MAY88		<10	<10	1790	203	74	5,310	5,380	48
3-1-19	17MAY88		<10	<10	<500	198	33	4,400	4,820	<5
3-2-1	24MAY88		<10	<10	570	45	35	4,520	4,850	<5
3-3-7	27MAY88		<10	<10	<500	96	<30	9,270	8,480	<5
3-3-10	09MAY88		<10	<10	508	225	95	5,100	5,890	10
3-4-1	27MAY88		<10	18	<500	102	<30	7,390	7,570	<5
3-4-7	18MAY88		<10	<10	<500	33	<30	7,290	7,250	<5
3-4-11	25MAY88		<10	13	<500	<30	<30	7,520	7,410	<5
3-8-1	10MAY88		<10	<10	<500	34	<30	8,990	9,110	<5
3-8-2	10MAY88		<10	<10	<500	<30	<30	9,580	9,400	<5
3-8-3	09MAY88		<10	<10	<500	124	<30	8,300	8,440	<5
6-S30-E15A	05MAY88		<10	<10	<500	488	51	11,300	12,000	<5
6-S19-E13	27MAY88		<10	<10	<500	189	<30	12,900	13,300	<5

TABLE 3. (contd)

Well name	Collection Date	Duplicate sample number	MANGESE ppb 5/50s	METHYCH ppb 10/.	NICKEL ppb 10/.	FNICKEL ppb 10/.	NITRATE ppb 500/45000	PHFIELD 0.1/8.5s	FPOTASS ppb 100/.	POTASUM ppb 100/.
3-1-1	19MAY88		<5	<10	<10	<10	1,570	7.2	2,250	2,390
3-1-2	10MAY88		<5	<10	<10	<10	6,900	7.2	3,370	3,150
3-1-4	24MAY88		<5	43	<10	<10	781	7.2	1,850	1,840
3-1-6	27MAY88		<5	<10	<10	<10	1,810	6.6	2,000	1,980
3-1-7	24MAY88		<5	<10	<10	<10	2,720	7.0	2,280	2,200
3-1-8	25MAY88		17	<10	<10	<10	1,180	7.7	5,070	5,830
3-1-9	25MAY88		73	<10	32	<10	0	8.2	5,880	6,330
3-1-10	26MAY88		<5	<10	<10	<10	4,410	7.2	2,190	2,300
3-1-11	17MAY88		<5	<10	<10	<10	1,570	7.5	1,840	1,560
3-1-12	17MAY88		<5	<10	<10	15	1,910	7.5	1,890	1,940
3-1-13	27MAY88		<5	<10	<10	<10	2,690	6.9	3,310	3,500
	27MAY88	1	.	<10	.	<10	2,750	.	3,370	.
3-1-14	26MAY88		<5	<10	<10	<10	2,000	7.7	2,340	2,530
3-1-15	26MAY88		<5	<10	<10	<10	13,300	8.0	5,500	5,580
3-1-16A	18MAY88		<5	<10	34	37	2,580	7.2	2,500	2,500
	18MAY88	1	.	<10	.	39	2,310	.	2,680	.
3-1-16B	18MAY88		78	<10	<10	<10	<500	8.2	5,270	5,090
3-1-16C	18MAY88		53	<10	<10	<10	<500	8.0	6,910	6,810
3-1-17A	20MAY88		<5	<10	<10	<10	1,850	7.1	1,770	1,830
3-1-17B	20MAY88		88	<10	<10	<10	<500	7.9	6,120	6,150
3-1-17C	20MAY88		23	<10	<10	<10	581	8.2	10,300	9,980
3-1-18A	23MAY88		<5	<10	<10	<10	20,900	7.8	6,080	6,290
3-1-18B	23MAY88		40	<10	<10	<10	<500	8.2	6,360	6,080
3-1-18C	23MAY88		48	<10	13	<10	<500	8.1	6,460	6,640
3-1-19	17MAY88		7	<10	<10	10	1,470	7.2	2,150	1,920
3-2-1	24MAY88		<5	<10	<10	<10	6,730	6.7	3,140	2,830
3-3-7	27MAY88		<5	<10	<10	<10	14,600	7.7	4,170	5,120
3-3-10	09MAY88		<5	<10	<10	<10	8,630	7.1	3,210	2,720
3-4-1	27MAY88		<5	13	<10	<10	12,200	7.6	4,440	4,380
3-4-7	16MAY88		<5	<10	<10	<10	10,900	7.6	4,090	4,090
3-4-11	25MAY88		<5	<10	<10	<10	11,500	7.9	4,250	4,590
3-8-1	10MAY88		<5	<10	<10	<10	21,900	7.9	4,890	4,830
3-8-2	10MAY88		<5	<10	<10	<10	21,500	7.4	5,500	5,400
3-8-3	09MAY88		<5	<10	<10	<10	10,400	7.8	5,130	5,010
6-S30-E15A	05MAY88		<5	<10	<10	<10	14,600	7.2	5,870	5,580
6-S19-E13	27MAY88		<5	#4	<10	<10	21,600	7.7	6,310	6,180

TABLE 3. (contd)

Well name	Collection Date	Duplicate sample number	RADIUM pCi/L 1/5	SODIUM ppb 200/.	FSODIUM ppb 200/.	FSTRONT ppb 20/.	STRONTUM ppb 20/.	SULFATE ppb 500/25000*	TC ppb 1000/.	TETEPYR ppb 2/.
3-1-1	19MAY88		*0.030	10,200	9,900	97	98	15,900	16,800	<2.00
3-1-2	10MAY88		*-0.030	10,300	11,000	136	137	26,100	21,300	<2.00
3-1-4	24MAY88		*0.006	7,610	7,260	74	79	20,100	13,300	<2.00
3-1-6	27MAY88		*-0.066	7,060	7,330	103	103	20,400	15,800	<2.00
3-1-7	24MAY88		*0.061	14,700	14,700	99	106	17,500	17,200	3.12
3-1-8	26MAY88		*0.066	27,600	25,600	104	109	11,200	22,900	<2.00
3-1-9	26MAY88		*-0.039	59,800	55,200	114	121	533	40,300	<2.00
3-1-10	26MAY88		0.580	9,490	9,310	101	103	18,600	16,700	<2.00
3-1-11	17MAY88		*-0.036	9,220	9,580	102	95	19,800	16,200	<2.00
3-1-12	17MAY88		*0.063	12,900	12,500	104	101	19,700	17,300	<2.00
3-1-13	27MAY88		*-0.017	10,300	9,920	113	120	20,000	16,400	<2.00
	27MAY88	1	.	.	9,580	109	.	20,100	.	.
3-1-14	26MAY88		*0.020	8,810	8,650	101	103	19,000	16,600	<2.00
3-1-15	26MAY88		*-0.033	19,800	20,200	182	176	37,300	26,700	<2.00
3-1-16A	18MAY88		*0.109	12,000	12,000	104	102	17,200	16,500	<2.00
	18MAY88	1	.	.	12,600	108	.	16,900	.	.
3-1-16B	18MAY88		*0.145	51,000	53,000	106	99	7,200	40,600	<2.00
3-1-16C	18MAY88		0.460	61,900	62,100	91	82	711	45,400	<2.00
3-1-17A	20MAY88		*-0.067	10,800	10,400	95	98	18,700	15,900	<2.00
3-1-17B	20MAY88		*0.079	52,000	51,200	110	108	1,110	40,700	<2.00
3-1-17C	20MAY88		*0.090	67,100	66,900	74	72	<500	42,900	<2.00
3-1-18A	23MAY88		*0.056	23,900	21,800	218	226	48,900	29,500	<2.00
3-1-18B	23MAY88		*0.018	65,500	62,000	77	77	<500	42,400	<2.00
3-1-18C	23MAY88		0.168	67,900	66,800	80	80	1,740	40,800	<2.00
3-1-19	17MAY88		*-0.032	12,400	13,400	100	95	18,200	16,200	<2.00
3-2-1	24MAY88		*0.063	12,000	12,900	99	93	14,000	18,600	<2.00
3-3-7	27MAY88		*-0.022	21,000	17,200	157	176	42,600	27,700	<2.00
3-3-10	09MAY88		*-0.014	9,210	10,600	137	120	19,500	19,200	<2.00
3-4-1	27MAY88		*-0.025	15,000	15,700	144	145	26,900	26,800	<2.00
3-4-7	16MAY88		*0.084	17,100	17,100	160	160	34,600	24,900	<2.00
3-4-11	26MAY88		0.174	15,600	15,000	136	140	26,300	25,500	<2.00
3-8-1	10MAY88		*0.014	13,000	13,100	169	173	28,400	27,500	<2.00
3-8-2	10MAY88		*0.019	19,100	19,300	189	197	29,900	30,900	<2.00
3-8-3	09MAY88		*0.115	19,400	19,600	156	160	29,600	29,800	<2.00
8-S30-E15A	06MAY88		0.233	11,600	12,100	247	242	17,500	49,700	<2.00
8-S19-E13	27MAY88		*-0.006	21,300	22,400	229	224	48,700	29,400	<2.00

TABLE 3. (contd)

Well name	Collection Date	Duplicate sample number	TOC ppb 1000/.	TOXLDL ppb 20/.	TRANSDCE ppb 10/70p	TRICENE ppb 5/5	U-CHEM ug/L 0.725/.	FVANADI ppb 5/.	VANADUM ppb 5/.	ZINC ppb 5/5000s	FZINC ppb 5/5000s
3-1-1	19MAY88		#772	<20.0	<10	<5	.	<5	<5	8	<5
3-1-2	10MAY88		#492	<20.0	<10	<5	.	7	<5	8	5
3-1-4	24MAY88		1,040	78.0	<10	<5	.	<5	<5	8	5
3-1-6	27MAY88		#608	25.9	<10	<5	.	<5	<5	15	13
3-1-7	24MAY88		#596	27.0	<10	#4	.	<5	<5	8	6
3-1-8	25MAY88		#516	#16.1	<10	#3	.	<5	<5	<5	<5
3-1-9	25MAY88		#380	#3.1	<10	<5	.	<5	<5	6	<5
3-1-10	26MAY88		#554	#15.2	<10	<5	.	<5	<5	<5	8
3-1-11	17MAY88		#940	46.6	<10	<5	41	<5	<5	<5	<5
3-1-12	17MAY88		#796	41.0	<10	<5	.	<5	<5	<5	<5
3-1-13	27MAY88		#751	27.2	<10	<5	.	<5	<5	<5	<5
	27MAY88	1	.	.	<10	<5	.	<5	.	.	<5
3-1-14	26MAY88		#691	29.6	<10	<5	.	<5	<5	6	<5
3-1-15	26MAY88		#390	#11.4	<10	<5	.	9	7	<5	<5
3-1-16A	18MAY88		#562	26.0	<10	<5	.	<5	<5	11	11
	18MAY88	1	.	.	<10	<5	.	<5	.	.	12
3-1-16B	18MAY88		#757	49.0	53	17	.	<5	<5	<5	<5
3-1-16C	18MAY88		#284	<20.0	<10	<5	.	<5	<5	<5	<5
3-1-17A	20MAY88		1,090	46.0	<10	<5	192	<5	<5	<5	<5
3-1-17B	20MAY88		#487	<20.0	#7	<5	.	<5	<5	<5	<5
3-1-17C	20MAY88		#205	#2.0	<10	<5	.	<5	<5	<5	<5
3-1-18A	23MAY88		#772	#5.8	<10	<5	.	12	13	<5	<5
3-1-18B	23MAY88		#327	#0.8	<10	<5	.	<5	<5	<5	<5
3-1-18C	23MAY88		#308	#11.0	<10	<5	.	<5	<5	<5	<5
3-1-19	17MAY88		#776	44.0	<10	<5	149	<5	5	<5	<5
3-2-1	24MAY88		#720	#13.0	<10	<5	.	<5	<5	12	<5
3-3-7	27MAY88		#563	#8.8	<10	#3	.	8	7	<5	<5
3-3-10	09MAY88		#453	38.0	<10	<5	.	<5	<5	7	7
3-4-1	27MAY88		#344	#10.2	<10	<5	.	8	7	<5	<5
3-4-7	16MAY88		#482	<20.0	<10	#3	.	<5	<5	<5	<5
3-4-11	25MAY88		#466	23.3	<10	#3	.	8	7	<5	<5
3-8-1	10MAY88		#404	#12.0	<10	<5	.	14	8	<5	<5
3-8-2	10MAY88		#561	#15.0	<10	<5	.	10	11	<5	<5
3-8-3	09MAY88		#656	#7.0	<10	<5	.	14	9	<5	<5
6-S30-E15A	05MAY88		#816	#2.0	<10	<5	.	<5	<5	137	106
6-S19-E13	27MAY88		#342	#2.3	<10	<5	.	17	16	<5	<5

TABLE 3. (contd)

The column headers consist of : Constituent Name
Analysis Units
Contractual Detection Limit/Drinking Water Standard(suffix)

Suffix

- none - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July,1987)
National Primary Drinking Water Regulations as amended by 52 FR 25690
- r - based on National Interim Primary Drinking Water Regulations,
Appendix IV, EPA-570/9-78-003
- p - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
- s - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143
(July, 1987) National Secondary Drinking Water Regulations
- w - based on additional Secondary Maximum Contaminant Levels given in
WAC 248-64, Public Water Supplies

Data flags

- # - Less than Contractual Detection Limit, reported as Limit
- # - Less than Contractual Detection Limit, measured value reported
- * - For radioactive constituents, reported value is less than 2-sigma
counting error

concentrations of 6 ppb and 42 ppb in November 1987 and March 1988, respectively. Concentrations of TCA decreased to 10 ppb in May from 19 ppb in November 1987 and 83 ppb in March 1988.

Methyl ethyl ketone (MEK), which had been detected in six wells including upgradient wells 399-1-18A, B, and C in November 1987 at concentrations ranging from 11 ppb to 45 ppb, was not detected in May. This was the first observation of MEK in samples from more than one 300 Area well. Circumstances associated with the detection of MEK in these samples suggest possible contamination of the samples from an unknown source. The presence of MEK in upgradient wells suggest that the source of the contaminant is also upgradient of the process trenches. MEK is a potential biological or radiological degradation product of hexone (methyl isobutyl ketone). Large quantities of hexone were disposed of in two areas that are potential sources for the MEK observed in the ground-water samples. Three tons of hexone were disposed of in the 300 North crib (316-4) located north of the 300 Area. Five thousand gallons of solvent in 55-gal drums were placed in the 300 West Burial Ground (618-9). The drums are believed to contain hexone and may be a source of the contamination after 30 years of burial. However, the validity of the detection of MEK in the November samples is questionable because UST reported high MEK values for water blanks during the same day these samples were analyzed. As a result of that finding, the analyst concluded that there was no conclusive evidence for the presence of MEK in the ground water taken from these wells. No maximum contaminant level (MCL) is in effect for MEK.

Other compounds of interest detected in the quarterly sampling were cyanide and the insecticide tetraethylpyrophosphate. Cyanide was detected in wells 399-4-1 and 399-4-11 in concentrations of 16 ppb and 13 ppb, respectively. Well 399-1-7 contained 3 ppb of tetraethylpyrophosphate.

183-H SOLAR EVAPORATION BASINS

T. L. Liikala

The previous quarterly report (PNL 1988b) focused on resurveying the casing elevations for two wells, preparing to install a permanent river stage recorder, preparing Section E of the Final Status Post-Closure Application for the 183-H Solar Evaporation Basins (183-H Basins), and routine monitoring of the ground water. This section focuses on subsequent activities and data collected from April 1 to June 30, 1988.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

Drilling

No drilling was conducted during this quarter.

Hydrogeologic Characterization

Progress was made on obtaining the various permits required to install the river stage recorder. Modification permits for concurrence by both PNL and Westinghouse Hanford Company (WHC) were routed. A Washington State Department of Fisheries permit was issued. Effective June 2, 1988, a 30-day public notice was issued for the U.S. Army Corps of Engineers' (Corps) Dredge and Fill permit. This will be followed by a 30-day comment period. A National Environmental Policy Act Environmental Evaluation is also being processed by PNL.

Other highlights this quarter included

- a site inspection that was performed by a representative of the Yakima Indian Nation as part of the public comment period for the Corps' permit
- a bill that is currently before Congress to designate the Hanford Reach of the Columbia River as wild and scenic
- a field construction estimate of \$180K, received from Kaiser Engineers Hanford (KEH). This high cost is primarily a result of

the amount of material to be excavated during construction. Alternative construction methods and designs are now being investigated.

The Final Status Post-Closure Application for the 183-H Basins was submitted to the Washington State Department of Ecology (hereafter called Ecology) on June 10, 1988. Preparation of this application affected the completion schedule for the final characterization report. A draft of the final report was completed on June 30, 1988. The final report is in progress.

Water levels measured on June 2, 1988 (Table 4). These measurements were used to construct a water-table map for the unconfined aquifer at the 100-H Area, shown in Figure 5.

ROUTINE SAMPLING AND ANALYSIS OF THE GROUND WATER

The ground water around the 183-H Basins has been sampled and analyzed routinely since June 1985. The results of ground-water monitoring activities for this quarter are discussed below.

Collection and Analysis

Twenty-three wells were sampled in March. Ten wells were scheduled to be sampled in April, and nine wells were scheduled to be sampled in May. However, because of the decreased flow rates of the Columbia River, the water levels in wells 199-H4-9 (April and May) and 199-H4-17 (May) dropped below the pump intakes, and no samples could be collected. These wells were completed with relatively short water columns because of the erosional unconformity between the Ringold and Hanford formations in this area. Both pump intakes are set near the bottom of the wells.

Purge water continues to be discharged into galvanized storage drums and disposed of in the 200 Area Tank Farms.

Discussion of Results

During this reporting period, 12 constituents were reported above the applicable standards. These include specific conductance (field) from the list of contamination indicators; gross beta, gross alpha, filtered and

TABLE 4. Water-Level Measurements for the 100-H Area Wells

Well Number	Measurement Data	Depth to Water from Top of Casing, ft	Water-Table Elevation, ft above MSL ^(a)
199-H3-1	6/2/88	No Measurement	No Measurement
199-H3-2A	6/2/88	42.38	375.45
199-H3-2B	6/2/88	42.98	375.44
199-H4-3	6/2/88	45.61	374.68
199-H4-4	6/2/88	38.66	375.04
199-H4-5	6/2/88	41.38	374.83
199-H4-6	6/2/88	44.10	375.48
199-H4-7	6/2/88	45.63	374.96
199-H4-8	6/2/88	45.18	374.82
199-H4-9	6/2/88	43.38	374.70
199-H4-10	6/2/88	29.22	375.22
199-H4-11	6/2/88	41.91	374.93
199-H4-12A	6/2/88	38.40	375.10
199-H4-12B	6/2/88	38.45	375.07
199-H4-13	6/2/88	43.55	374.65
199-H4-14	6/2/88	45.37	375.22
199-H4-15A	6/2/88	32.01	375.20
199-H4-15B	6/2/88	31.73	375.19
199-H4-16	6/2/88	49.46	374.77
199-H4-17	6/2/88	44.16	374.93
199-H4-18	6/2/88	47.02	374.80
699-99-42	6/2/88	Dry	<376.88

(a) MSL = mean sea level.

unfiltered chromium, and nitrate from the list of primary drinking water standards; filtered and unfiltered manganese and iron from the list of water quality parameters; and technetium-99 and total dissolved solids from the list of site-specific constituents. Table 5 summarizes all sample analyses from March through May 1988. Table 6 contains the analytical data for constituents that were found to be above detection limits in at least one analysis.

FIGURE 5. Water-Table Map for the Unconfined Aquifer in the 100-H Area, June 1988

TABLE 5. Ground-Water Chemistry Summary for the 183-H Basins, March Through May 1988

----- Constituent List=Contamination Indicators -----								
Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standard	Agency Exceeded	Full name
191	CONDFLD	umho	1	40	0	700	WDOE	xxx Specific conductance, field
199	PHFIELD		0.1	40	0	6.5-8.5	EPAS	pH, field
207	PH-LAB		0.01	40	0	6.5-8.5	EPAS	pH, laboratory
C68	TOX	ppb	100	40	2	.		Total organic halogen
C69	TOC	ppb	1000	40	0	.		Total organic carbon
----- Constituent List=Drinking Water Standards -----								
Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standard	Agency Exceeded	Full name
109	COLIFRM	MPN	2.2	40	40 ***	1	EPA	Coliform bacteria
111	BETA	pCi/L	8	44	0	50	EPA	Gross beta
121	SR-90	pCi/L	5	2	0	8	EPA	Strontium-90
181	RADIUM	pCi/L	1	40	0	5	EPA	Total radium
212	ALPHA	pCi/L	4	44	0	15	EPA	Gross alpha
A08	BARIUM	ppb	8	40	0	1000	EPA	Barium
A07	CADMIUM	ppb	2	40	39	10	EPA	Cadmium
A08	CHROMIUM	ppb	10	40	2	60	EPA	Chromium
A10	SILVER	ppb	10	40	40 ***	60	EPA	Silver
A20	ARSENIC	ppb	5	40	32	60	EPA	Arsenic
A21	MERCURY	ppb	0.1	40	40 ***	2	EPA	Mercury
A22	SELENIUM	ppb	5	40	39	10	EPA	Selenium
A33	ENDRIN	ppb	0.1	22	22 ***	0.2	EPA	Endrin
A34	METHLOR	ppb	3	22	22 ***	100	EPA	Methoxychlor
A36	TOXAENE	ppb	1	22	22 ***	5	EPA	Toxaphene
A38	a-BHC	ppb	0.1	22	22 ***	4	EPA	Alpha-BHC
A37	b-BHC	ppb	0.1	22	22 ***	4	EPA	Beta-BHC
A38	g-BHC	ppb	0.1	22	22 ***	4	EPA	Gamma-BHC
A39	d-BHC	ppb	0.1	22	22 ***	4	EPA	Delta-BHC
A51	LEADGF	ppb	5	40	39	50	EPA	Lead (graphite furnace)
A61	TETRANE	ppb	5	45	45 ***	5	EPA	Tetrachloromethane [Carbon Tetrachloride]
A62	BENZENE	ppb	5	2	2 ***	5	EPA	Benzene
A87	1,1,1-T	ppb	5	45	45 ***	200	EPA	1,1,1-Trichloroethane
A89	TRICENE	ppb	5	45	45 ***	5	EPA	Trichloroethylene [1,1,2-Trichloroethene]
A90	1,2-DIC	ppb	10	2	2 ***	5	EPA	1,2-Dichloroethane
A92	DICETHY	ppb	10	2	2 ***	7	EPA	1,1-Dichloroethylene
B08	BROMORM	ppb	10	2	2 ***	100	EPA	Bromoform [Tribromomethane]
B13	VINYIDE	ppb	10	2	2 ***	2	EPA	Vinyl chloride
C72	NITRATE	ppb	500	44	0	45000	EPA	Nitrate
C74	FLUORID	ppb	500	44	34	4000	EPA	Fluoride
H13	2,4-D	ppb	2	22	22 ***	100	EPA	2,4-D [2,4-Dichlorophenoxyacetic acid]
H14	2,4,5TP	ppb	2	22	22 ***	10	EPA	2,4,5-TP silvex
H20	FBIARIUM	ppb	8	44	1	1000	EPA	Barium, filtered
H21	FCADMIU	ppb	2	44	44 ***	10	EPA	Cadmium, filtered
H22	FCHROMI	ppb	10	44	3	60	EPA	Chromium, filtered
H23	FSILVER	ppb	10	44	44 ***	60	EPA	Silver, filtered
H37	FARSENI	ppb	5	44	33	60	EPA	Arsenic, filtered
H38	FMERCUR	ppb	0.1	40	40 ***	2	EPA	Mercury, filtered
H39	FSELENI	ppb	5	44	44 ***	10	EPA	Selenium, filtered
H41	FLEAD	ppb	5	44	43	60	EPA	Lead, filtered
H83	LFLUORD	ppb	20	19	0	4000	EPA	Fluoride, low DL

TABLE 5. (contd)

----- Constituent List=Quality Characteristics -----

Constituent Code Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded	Full name
A11 SODIUM	ppb	200	40	0	.	Sodium
A17 MANGESE	ppb	5	40	30	50 EPAS	Manganese
A19 IRON	ppb	30	40	15	300 EPAS	Iron
C57 PHENOL	ppb	10	2	2 ***	.	Phenol
C73 SULFATE	ppb	500	44	0	250000 EPAS	Sulfate
C75 CHLORID	ppb	500	44	0	250000 EPAS	Chloride
H24 FSODIUM	ppb	200	44	0	.	Sodium, filtered
H29 FMANGAN	ppb	5	44	38	50 EPAS	Manganese, filtered
H31 FIRON	ppb	30	44	28	300 EPAS	Iron, filtered
H57 LPHENOL	ppb	10	21	21 ***	.	Phenol, low DL

----- Constituent List=Site Specific -----

Constituent Code Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded	Full name
010 CO-60	pCi/L	22.5	2	0	100 EPAR	Cobalt-60
024 CS-137	pCi/L	20	2	0	200 EPAR	Cesium-137
034 RU-106	pCi/L	172.5	2	0	30 EPAR	Ruthenium-106
124 U-CHEM	ug/L	0.725	44	0	.	Uranium, chemical
197 TC-99	pCi/L	15	40	0	900 EPAR	Technetium-99
A01 BERYLIUM	ppb	5	40	40 ***	.	Beryllium
A03 STRONTIUM	ppb	20	40	0	.	Strontium
A04 ZINC	ppb	5	40	12	5000 EPAS	Zinc
A05 CALCIUM	ppb	50	40	0	.	Calcium
A12 NICKEL	ppb	10	40	28	.	Nickel
A13 COPPER	ppb	10	40	32	1300 EPAP	Copper
A14 VANADIUM	ppb	5	40	17	.	Vanadium
A15 ANTIMONY	ppb	100	40	40 ***	.	Antimony
A16 ALUMINUM	ppb	150	40	35	.	Aluminum
A18 POTASSIUM	ppb	100	40	0	.	Potassium
A50 MAGNESIUM	ppb	50	40	0	.	Magnesium
A64 METHONE	ppb	10	45	45 ***	.	Methyl ethyl ketone
A68 1,1,2-T	ppb	5	45	45 ***	.	1,1,2-Trichloroethane
A70 PERCENE	ppb	5	45	45 ***	.	Perchloroethylene
A71 OPXYLE	ppb	5	45	45 ***	440 EPAP	Xylene-o,p
A80 CHLFORM	ppb	5	45	2	100 EPA	Chloroform [Trichloromethane]
A93 METHYCH	ppb	10	45	44	.	Methylene chloride
B14 M-XYLE	ppb	5	45	45 ***	440 EPAP	Xylene-m
C76 PHOSPHA	ppb	1000	44	44 ***	.	Phosphate
C80 AMMONIUM	ppb	50	44	44 ***	.	Ammonium ion
H16 TC	ppb	1000	40	0	.	Total carbon
H17 TDS	ppb	5000	40	0	500000 EPAS	Total dissolved solids
H18 FZINC	ppb	5	44	21	5000 EPAS	Zinc, filtered
H19 FCALCIUM	ppb	50	44	0	.	Calcium, filtered
H25 FNICKEL	ppb	10	44	31	.	Nickel, filtered
H26 FCOPPER	ppb	10	44	41	1300 EPAP	Copper, filtered
H27 FVANADIUM	ppb	5	44	23	.	Vanadium, filtered
H28 FALUMIN	ppb	150	44	43	.	Aluminum, filtered
H30 FPOTASSIUM	ppb	100	44	0	.	Potassium, filtered
H32 FMAGNESIUM	ppb	50	44	0	.	Magnesium, filtered
H33 FBERYLLIUM	ppb	5	44	44 ***	.	Beryllium, filtered
H35 FSTRONTIUM	ppb	20	44	0	.	Strontium, filtered
H36 FANTIMONY	ppb	100	44	44 ***	.	Antimony, filtered
H58 HEXONE	ppb	10	45	45 ***	.	Hexone

TABLE 5. (contd)

----- Constituent List=WAC 173-303-9905 -----							
Constituent Code	Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Agency Exceeded	Full name
A23	THALIUM	ppb	5	2	2 ***	.	Thallium
A24	THIOURA	ppb	200	2	2 ***	.	Thiourea
A26	ACETREA	ppb	200	2	2 ***	.	1-Acetyl-2-thiourea
A28	CHLOREA	ppb	200	2	2 ***	.	1-(o-Chlorophenyl) thiourea
A27	DIETROL	ppb	200	2	2 ***	.	Diethylstilbesterol
A28	ETHYREA	ppb	200	2	2 ***	.	Ethylenethiourea
A29	NAPHREA	ppb	200	2	2 ***	.	1-Naphthyl-2-thiourea
A32	PHENREA	ppb	500	2	2 ***	.	N-phenylthiourea
A40	DDD	ppb	0.1	2	2 ***	.	DDD
A41	DDE	ppb	0.1	2	2 ***	.	DDE
A42	DDT	ppb	0.1	2	2 ***	.	DDT
A43	HEPTLOR	ppb	0.1	2	2 ***	0 EPAP	Heptachlor
A44	HEPTIDE	ppb	0.1	2	2 ***	0 EPAP	Heptachlor epoxide
A48	DIELRIN	ppb	0.1	2	2 ***	.	Dieldrin
A47	ALDRIN	ppb	0.1	2	2 ***	.	Aldrin
A48	CHLDANE	ppb	1	2	2 ***	0 EPAP	Chlordane
A49	END01	ppb	0.1	2	2 ***	.	Endosulfan I (alpha)
A62	END02	ppb	0.1	2	2 ***	.	Endosulfan II (beta)
A83	DIOXANE	ppb	500	2	2 ***	.	Dioxane
A86	PYRIDIN	ppb	500	2	2 ***	.	Pyridine
A88	TOLUENE	ppb	5	2	2 ***	2000 EPAP	Toluene
A72	ACROLIN	ppb	10	2	2 ***	.	Acrolein
A73	ACRYILE	ppb	10	2	2 ***	.	Acrylonitrile
A74	BISTHER	ppb	10	2	2 ***	.	Bis(chloromethyl) ether
A76	BROMONE	ppb	10	2	2 ***	.	Bromoacetone
A78	METHBRO	ppb	10	2	2 ***	.	Methyl bromide
A77	CARBIDE	ppb	10	2	2 ***	.	Carbon disulfide
A78	CHLBENZ	ppb	10	2	2 ***	80 EPAP	Chlorobenzene
A79	CHLTHER	ppb	10	2	2 ***	.	2-Chloroethyl vinyl ether
A81	METHCHL	ppb	10	2	2 ***	.	Methyl chloride [Chloromethane]
A82	CHMTHER	ppb	10	2	2 ***	.	Chloromethyl methyl ether
A83	CROTONA	ppb	10	2	2 ***	.	Crotonaldehyde
A84	DIBRCHL	ppb	10	2	2 ***	0 EPAP	1,2-Dibromo-3-chloropropane
A85	DIBRETH	ppb	10	2	2 ***	.	1,2-Dibromoethane
A86	DIBRMET	ppb	10	2	2 ***	.	Dibromomethane
A87	DIBUTEN	ppb	10	2	2 ***	.	1,4-Dichloro-2-butene
A88	DICDIFM	ppb	10	2	2 ***	.	Dichlorodifluoromethane
A89	1,1-DIC	ppb	10	2	2 ***	.	1,1-Dichloroethane
A91	TRANDCE	ppb	10	2	2 ***	70 EPAP	trans-1,2-Dichloroethane
A94	DICPANE	ppb	10	2	2 ***	8 EPAP	1,2-Dichloropropane
A95	DICPENE	ppb	10	2	2 ***	.	1,3-Dichloropropene
A96	NNDIEHY	ppb	10	2	2 ***	.	N,N-diethylhydrazine
A99	HYDRSUL	ppb	10	2	2 ***	.	Hydrogen sulfide
B01	IODOMET	ppb	10	2	2 ***	.	Iodomethane
B02	METHACR	ppb	10	2	2 ***	.	Methacrylonitrile
B03	METHTHI	ppb	10	2	2 ***	.	Methanethiol
B04	PENTACH	ppb	10	2	2 ***	.	Pentachloroethane
B06	1112-tc	ppb	10	2	2 ***	.	1,1,1,2-Tetrachloroethane
B08	1122-tc	ppb	10	2	2 ***	.	1,1,2,2-Tetrachloroethane
B09	TRCMEOL	ppb	10	2	2 ***	.	Trichloromethanethiol

TABLE 5. (contd)

Constituent List=WAC 173-303-9905

Constituent Code Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded	Full name
B10 TRCMFLM	ppb	10	2	2 ***	.	Trichloromonofluoromethane
B11 TRCPANE	ppb	10	2	2 ***	.	Trichloropropane
B12 123-trp	ppb	10	2	2 ***	.	1,2,3-Trichloropropane
B15 DIETHY	ppb	10	2	2 ***	.	Diethylarsine
B19 ACETILE	ppb	3000	2	2 ***	.	Acetonitrile
B20 ACETOPH	ppb	10	2	2 ***	.	Acetophenone
B21 WARFRIN	ppb	10	2	2 ***	.	Warfarin
B22 ACEFENE	ppb	10	2	2 ***	.	2-Acetylamino fluorene
B23 AMINDYL	ppb	10	2	2 ***	.	4-Aminobiphenyl
B24 AMIISOX	ppb	10	2	2 ***	.	5-(Aminomethyl)-3-isoxazolol
B25 AMITROL	ppb	10	2	2 ***	.	Amitrole
B26 ANILINE	ppb	10	2	2 ***	.	Aniline
B27 ARAMITE	ppb	10	2	2 ***	.	Aramite
B28 AURAMIN	ppb	10	2	2 ***	.	Auramine
B29 BENZCAC	ppb	10	2	2 ***	.	Benz[c]acridine
B30 BENZAN	ppb	10	2	2 ***	.	Benz[a]anthracene
B31 BENDICM	ppb	10	2	2 ***	.	Benzene, dichloromethyl
B32 BENTHOL	ppb	10	2	2 ***	.	Benzenethiol
B33 BENDINE	ppb	10	2	2 ***	.	Benzidine
B34 BENZBFL	ppb	10	2	2 ***	.	Benzo[b]fluoranthene
B35 BENZJFL	ppb	10	2	2 ***	.	Benzo[j]fluoranthene
B36 PBENZQU	ppb	10	2	2 ***	.	p-Benzoquinone
B37 BENZCHL	ppb	10	2	2 ***	.	Benzyl chloride
B38 BIS2CHM	ppb	10	2	2 ***	.	Bis(2-chloroethoxy) methane
B39 BIS2CHE	ppb	10	2	2 ***	.	Bis(2-chloroethyl) ether
B40 BIS2EPH	ppb	10	2	2 ***	.	Bis(2-ethylhexyl) phthalate
B41 BROPHEN	ppb	10	2	2 ***	.	4-Bromophenyl phenyl ether
B42 BUTBENP	ppb	10	2	2 ***	.	Butyl benzyl phthalate
B43 BUTDINP	ppb	10	2	2 ***	.	2-sec-Butyl-4,6-dinitrophenol (DNBP)
B44 CHALETH	ppb	10	2	2 ***	.	Chloroalkyl ethers
B45 CHLANIL	ppb	10	2	2 ***	.	p-Chloroaniline
B46 CHLCRES	ppb	10	2	2 ***	.	p-Chloro-m-cresol
B47 CHLEPOX	ppb	10	2	2 ***	0 EPAP	1-Chloro-2,3-epoxypropane
B48 CHLNAPH	ppb	10	2	2 ***	.	2-Chloronaphthalene
B49 CHLPHEN	ppb	10	2	2 ***	.	2-Chlorophenol
B50 CHRYSEN	ppb	10	2	2 ***	.	Chrysene
B51 CRESOLS	ppb	10	2	2 ***	.	Cresols
B52 CYCHDIN	ppb	10	2	2 ***	.	2-Cyclohexyl-4,6-dinitrophenol
B53 DIBAHAC	ppb	10	2	2 ***	.	Dibenz[a,h]acridine
B54 DIBAJAC	ppb	10	2	2 ***	.	Dibenz[a,j]acridine
B55 DIBAHAN	ppb	10	2	2 ***	.	Dibenz[a,h]anthracene
B56 DIBCGCA	ppb	10	2	2 ***	.	7H-Dibenzo[c,g]carbazole
B57 DIBAEPY	ppb	10	2	2 ***	.	Dibenzo[a,e]pyrene
B58 DIBAHFY	ppb	10	2	2 ***	.	Dibenzo[a,h]pyrene
B59 DIBAIKY	ppb	10	2	2 ***	.	Dibenzo[a,i]pyrene
B60 DIBPHTH	ppb	10	2	2 ***	.	Di-n-butyl phthalate
B61 12-dben	ppb	10	2	2 ***	.	1,2-Dichlorobenzene
B62 13-dben	ppb	10	2	2 ***	.	1,3-Dichlorobenzene
B63 14-dben	ppb	10	2	2 ***	.	1,4-Dichlorobenzene
B64 DICHBEN	ppb	20	2	2 ***	.	3,3'-Dichlorobenzidine

TABLE 5. (contd)

Constituent List=WAC 173-303-9905

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded	Full name
B85	24-dchp	ppb	10	2	2 ***	.	2,4-Dichlorophenol
B86	26-dchp	ppb	10	2	2 ***	.	2,6-Dichlorophenol
B87	DIEPHTH	ppb	10	2	2 ***	.	Diethyl phthalate
B88	DIHYSAF	ppb	10	2	2 ***	.	Dihydrosafrole
B89	DIMETHB	ppb	10	2	2 ***	.	3,3'-Dimethoxybenzidine
B70	DIMEAMB	ppb	10	2	2 ***	.	p-Dimethylaminoazobenzene
B71	DIMBENZ	ppb	10	2	2 ***	.	7,12-Dimethylbenz[a]anthracene
B72	DIMEYLB	ppb	10	2	2 ***	.	3,3'-Dimethylbenzidine
B73	THIONOX	ppb	10	2	2 ***	.	Thiofanox
B74	DIMPHAM	ppb	10	2	2 ***	.	alpha, alpha-Dimethylphenethylamine
B75	DIMPHEH	ppb	10	2	2 ***	.	2,4-Dimethylphenol
B76	DIMPHTH	ppb	10	2	2 ***	.	Dimethyl phthalate
B77	DINBENZ	ppb	10	2	2 ***	.	Dinitrobenzene
B78	DINCRES	ppb	10	2	2 ***	.	4,6-Dinitro-o-cresol and salts
B79	DINPHEN	ppb	60	2	2 ***	.	2,4-Dinitrophenol
B80	24-dint	ppb	10	2	2 ***	.	2,4-Dinitrotoluene
B81	26-dint	ppb	10	2	2 ***	.	2,6-Dinitrotoluene
B82	DIOPHTH	ppb	10	2	2 ***	.	Di-n-octyl phthalate
B83	DIPHAMI	ppb	10	2	2 ***	.	Diphenylamine
B84	DIPHHDY	ppb	10	2	2 ***	.	1,2-Diphenylhydrazine
B85	DIPRNT	ppb	10	2	2 ***	.	Di-n-propylnitrosamine
B86	ETHMINE	ppb	10	2	2 ***	.	Ethyleneimine
B87	ETHMETS	ppb	10	2	2 ***	.	Ethyl methanesulfonate
B88	FLUORAN	ppb	10	2	2 ***	.	Fluoranthene
B89	HEXC8EN	ppb	10	2	2 ***	.	Hexachlorobenzene
B90	HEXC8UT	ppb	10	2	2 ***	.	Hexachlorobutadiene
B91	HEXC8CYC	ppb	10	2	2 ***	.	Hexachlorocyclopentadiene
B92	HEXC8ETH	ppb	10	2	2 ***	.	Hexachloroethane
B93	INDENOP	ppb	10	2	2 ***	.	Indeno(1,2,3-cd)pyrene
B94	ISOSOLE	ppb	10	2	2 ***	.	Isosafrole
B95	MALOILE	ppb	10	2	2 ***	.	Malononitrile
B96	MELPHAL	ppb	10	2	2 ***	.	Melphalan
B97	METHAPY	ppb	10	2	2 ***	.	Methapyrilene
B98	METHNYL	ppb	10	2	2 ***	.	Metholonyl
B99	METAZIR	ppb	10	2	2 ***	.	2-Methylaziridine
C01	METCHAN	ppb	10	2	2 ***	.	3-Methylcholanthrene
C02	METBISC	ppb	10	2	2 ***	.	4,4'-Methylenebis(2-chloroaniline)
C03	METACTO	ppb	10	2	2 ***	.	2-Methylactonitrile
C04	METACRY	ppb	10	2	2 ***	.	Methyl methacrylate
C05	METMSUL	ppb	10	2	2 ***	.	Methyl methanesulfonate
C06	METPROP	ppb	10	2	2 ***	.	2-Methyl-2-(methylthio) propionaldehyde
C07	METHIOU	ppb	10	2	2 ***	.	Methylthiouracil
C08	NAPHQUI	ppb	10	2	2 ***	.	1,4-Naphthoquinone
C09	1-napha	ppb	10	2	2 ***	.	1-Naphthylamine
C10	2-napha	ppb	10	2	2 ***	.	2-Naphthylamine
C11	NITRANI	ppb	60	2	2 ***	.	p-Nitroaniline
C12	NITBENZ	ppb	10	2	2 ***	.	Nitrobenzene
C13	NITPHEN	ppb	60	2	2 ***	.	4-Nitrophenol
C14	NNIBUTY	ppb	10	2	2 ***	.	N-nitrosodi-n-butylamine
C15	NNIDIEA	ppb	10	2	2 ***	.	N-nitrosodiethanolamine

TABLE 5. (contd)

Constituent List=WAC 173-303-9905

Constituent Code Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded	Full name
C16 NNIDIEY	ppb	10	2	2 ***	.	N-nitrosodiethylamine
C17 NNIDIME	ppb	10	2	2 ***	.	N-nitrosodimethylamine
C18 NNIMETH	ppb	10	2	2 ***	.	N-nitrosomethylethylamine
C19 NNIURET	ppb	10	2	2 ***	.	N-nitroso-n-methylurethane
C20 NNIVINY	ppb	10	2	2 ***	.	N-nitrosomethylvinylamine
C21 NNIMORP	ppb	10	2	2 ***	.	N-nitrosomorpholine
C22 NNINICO	ppb	10	2	2 ***	.	N-nitrosomorpholine
C23 NNPIPE	ppb	10	2	2 ***	.	N-nitrosopiperidine
C24 NITRPYR	ppb	10	2	2 ***	.	Nitrosopyrrolidine
C25 NITRTOL	ppb	10	2	2 ***	.	5-Nitro-o-toluidine
C26 PENTCHB	ppb	10	2	2 ***	.	Pentachlorobenzene
C27 PENTCHN	ppb	10	2	2 ***	.	Pentachloronitrobenzene
C28 PENTCHP	ppb	50	2	2 ***	220 EPAP	Pentachlorophenol
C29 PHENTIN	ppb	10	2	2 ***	.	Phenacetin
C30 PHENINE	ppb	10	2	2 ***	.	Phenylenediamine
C31 PHTHEST	ppb	10	2	2 ***	.	Phthalic acid esters
C32 PICOLIN	ppb	10	2	2 ***	.	2-Picoline
C33 PRONIDE	ppb	10	2	2 ***	.	Pronamide
C34 RESERPI	ppb	10	2	2 ***	.	Reserpine
C35 RESORCI	ppb	10	2	2 ***	.	Resorcinol
C36 SAFROL	ppb	10	2	2 ***	.	Safrol
C37 TETRCHB	ppb	10	2	2 ***	.	1,2,4,5-Tetrachlorobenzene
C38 TETRCHP	ppb	10	2	2 ***	.	2,3,4,6-Tetrachlorophenol
C40 THIURAM	ppb	10	2	2 ***	.	Thiuram
C41 TOLUDIA	ppb	10	2	2 ***	.	Toluenediamine
C42 OTOLHYD	ppb	10	2	2 ***	.	o-Toluidine hydrochloride
C43 TRICHLB	ppb	10	2	2 ***	.	1,2,4-Trichlorobenzene
C44 245-trp	ppb	50	2	2 ***	.	2,4,5-Trichlorophenol
C45 246-trp	ppb	10	2	2 ***	.	2,4,6-Trichlorophenol
C46 TRIPHOS	ppb	10	2	2 ***	.	O,O,O-triethyl phosphorothioate
C47 SYMTRIN	ppb	10	2	2 ***	.	Sym-trinitrobenzene
C48 TRISPHO	ppb	10	2	2 ***	.	Tris(2,3-dibromopropyl) phosphate
C49 BENZOPY	ppb	10	2	2 ***	.	Benzo[a]pyrene
C50 CHLNAPZ	ppb	10	2	2 ***	.	Chlornaphazine
C51 BIS2ETH	ppb	10	2	2 ***	.	Bis(2-chloroisopropyl) ether
C52 HEXAENE	ppb	10	2	2 ***	.	Hexachloropropene
C53 HYDRAZI	ppb	3000	2	2 ***	.	Hydrazine
C54 HEXACHL	ppb	10	2	2 ***	.	Hexachlorophene
C55 NAPHTHA	ppb	10	2	2 ***	.	Naphthalene
C56 123TRI	ppb	10	2	2 ***	.	1,2,3-Trichlorobenzene
C57 135TRI	ppb	10	2	2 ***	.	1,3,5-Trichlorobenzene
C58 1234TE	ppb	10	2	2 ***	.	1,2,3,4-Tetrachlorobenzene
C59 1235TE	ppb	10	2	2 ***	.	1,2,3,5-Tetrachlorobenzene
C60 TETEPYR	ppb	2	2	2 ***	.	Tetraethylpyrophosphate
C61 CHLLATE	ppb	30	2	2 ***	.	Chlorobenzilate
C62 CARBPHT	ppb	2	2	2 ***	.	Carbophenothion
C63 DISULFO	ppb	2	2	2 ***	.	Disulfoton
C64 DTMETHO	ppb	2	2	2 ***	.	Dimethoate
C65 METHPAR	ppb	2	2	2 ***	.	Methyl parathion
C66 PARATHI	ppb	2	2	2 ***	.	Parathion

TABLE 5. (contd)

----- Constituent List=WAC 173-303-9905 -----							
Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded	Full name
C70	CYANIDE	ppb	10	2	2 ***	.	Cyanide
C71	FORMALN	ppb	500	2	2 ***	.	Formalin
C77	PERCHLO	ppb	1000	2	2 ***	.	Perchlorate
C79	KEROSEN	ppb	10000	2	2 ***	.	Kerosene
C87	CITRUSR	ppb	1000	2	2 ***	.	Citrus red
C90	PARALDE	ppb	2000	2	2 ***	.	Paraldehyde
C91	STRYCHN	ppb	50	2	2 ***	.	Strychnine
C92	MALHYDR	ppb	500	2	2 ***	.	Maleic hydrazide
C93	NICOTIN	ppb	100	2	2 ***	.	Nicotinic acid
C94	ACRYIDE	ppb	10000	2	2 ***	0 EPAP	Acrylamide
C96	ALLYLAL	ppb	2500	2	2 ***	.	Allyl alcohol
C97	CHLACET	ppb	18000	2	2 ***	.	Chloroacetaldehyde
C98	CHLPROP	ppb	4000	2	2 ***	.	3-Chloropropionitrile
H03	ETHCARB	ppb	5000	2	2 ***	.	Ethyl carbamate
H04	ETHCYAN	ppb	2000	2	2 ***	.	Ethyl cyanide
H06	ETHOXID	ppb	3000	2	2 ***	.	Ethylene oxide
H08	ETHMETH	ppb	10	2	2 ***	.	Ethyl methacrylate
H09	ISOBUTY	ppb	1000	2	2 ***	.	Isobutyl alcohol
H11	PROPYLA	ppb	10000	2	2 ***	.	n-Propylamine
H12	PROPYNO	ppb	8000	2	2 ***	.	2-Propyn-1-ol
H16	2,4,6-T	ppb	2	2	2 ***	.	2,4,6-T
H40	FTHALLI	ppb	6	2	2 ***	.	Thallium, filtered
I21	TRIBUPH	ppb	10	2	2 ***	.	Tributylphosphoric acid

*** - Indicates all samples were below detection limits

xxx - Indicates that Drinking Water Standards were exceeded

EPA - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July, 1987)
National Primary Drinking Water Regulations as amended by 62 FR 25690

EPAR - based on National Interim Primary Drinking Water Regulations,
Appendix IV, EPA-570/9-78-003

EPAP - based on proposed Maximum Contaminant Level Goals in 60 FR 46938

EPAS - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143
National Secondary Drinking Water Regulations

WDOE - based on additional Secondary Maximum Contaminant Levels given in
WAC 248-54, Public Water Supplies

TABLE 6. Ground-Water Analyses for Constituents with at Least One Analysis Above Detection Limits for the 183-H Basins, March Through May 1988

Well name	Collection Date	Duplicate sample number	ALPHA pCi/L 4/16	FALUMIN ppb 150/.	ALUMNUM ppb 150/.	ARSENIC ppb 5/50	FARSENI ppb 5/50	BARIUM ppb 6/1000	FBARIUM ppb 6/1000	BETA pCi/L 8/50	CADMIUM ppb 2/10
1-H3-1	11MAR88		2.120	<150	<150	<5	<5	54	51	10.60	<2
1-H3-2A	08MAR88		1.680	<150	<150	<5	<5	28	29	6.72	<2
1-H3-2B	08MAR88		1.690	<150	<150	<5	<5	32	33	5.21	<2
1-H3-2C	08MAR88		1.050	<150	<150	6	8	19	20	4.13	2
1-H4-3	09MAR88		148.000	<150	236	<5	<5	59	55	733.00	<2
	14APR88		162.000	<150	4120	<5	<5	61	45	230.00	<2
	04MAY88		128.000	<150	1090	<5	<5	32	23	198.00	<2
1-H4-4	10MAR88		118.000	<150	<150	5	<5	73	72	272.00	<2
	10MAR88	1	105.000	<150	.	.	5	.	70	248.00	.
	13APR88		101.000	<150	<150	5	5	85	61	253.00	<2
	13APR88	1	108.000	<150	.	.	6	.	73	257.00	.
	13APR88	2	.	.	.	.	.	.	.	.	.
	03MAY88		78.800	<150	<150	<5	<5	87	59	252.00	<2
	03MAY88	1	97.600	<150	.	.	<5	.	65	246.00	.
1-H4-5	16MAR88		*0.938	<150	<150	5	7	89	70	5.81	<2
1-H4-6	16MAR88		3.980	<150	<150	<5	<5	60	46	7.90	<2
1-H4-7	14MAR88		3.120	<150	<150	<5	<5	41	40	7.16	<2
1-H4-8	11MAR88		3.170	<150	<150	<5	<5	50	44	4.28	<2
1-H4-9	11MAR88		8.700	<150	<150	6	6	105	93	227.00	<2
	11MAR88	1	3.540	<150	.	.	6	.	92	203.00	.
1-H4-10	09MAR88		*0.858	<150	<150	<5	<5	72	68	5.86	<2
1-H4-11	07MAR88		1.290	<150	<150	<5	<5	35	38	60.40	<2
	14APR88		1.550	<150	<150	<5	<5	36	36	85.10	<2
	03MAY88		4.070	<150	<150	<5	<5	36	37	70.30	<2
1-H4-12A	07MAR88		41.300	<150	<150	<5	5	84	83	110.00	<2
	13APR88		31.400	<150	<150	<5	<5	87	68	123.00	<2
	02MAY88		9.190	<150	<150	<5	<5	74	75	54.30	<2
1-H4-12B	07MAR88		11.400	<150	<150	<5	<5	125	128	77.80	<2
	13APR88		9.350	<150	<150	<5	<5	135	131	77.50	<2
	02MAY88		6.530	<150	<150	<5	<5	116	78	37.20	<2
1-H4-12C	07MAR88		0.931	<150	<150	6	8	9	9	6.27	<2
	12APR88		2.240	<150	<150	5	5	8	<6	6.80	<2
	02MAY88		1.430	<150	<150	5	5	8	8	5.52	<2
1-H4-13	25MAR88		2.270	<150	<150	<5	<5	25	24	71.80	<2
1-H4-14	15MAR88		1.690	<150	<150	<5	<5	26	25	5.38	<2
1-H4-15A	10MAR88		*0.788	<150	<150	<5	<5	99	94	5.00	<2
1-H4-15B	10MAR88		2.170	<150	<150	<5	<5	130	128	7.95	<2
1-H4-16	15MAR88		1.690	<150	<150	<5	<5	23	19	16.50	<2
	11APR88		*0.741	<150	<150	<5	<5	25	23	19.30	<2
	04MAY88		1.130	<150	<150	<5	<5	23	24	20.00	<2
1-H4-17	14MAR88		3.780	<150	1990	<5	<5	80	63	6.31	<2
	12APR88		3.290	342	244	<5	<5	70	70	12.80	<2
1-H4-18	14MAR88		1.420	<150	<150	<5	<5	35	29	15.90	<2
	11APR88		1.640	<150	<150	<5	<5	31	31	11.90	<2
	03MAY88		1.750	<150	<150	<5	<5	32	32	13.30	<2

TABLE 6. (contd)

Well name	Collection Date	Duplicate sample number	FCALCIU ppb 50/.	CALCIUM ppb 50/.	CHLFORM ppb 5/100	CHLORID ppb 500/250000a	FCHROMI ppb 10/50	CHROMUM ppb 10/50	CO-60 pCi/L 22.5/100r	CONDFLD umho 1/700w
1-H3-1	11MAR88		79,800	87,200	6	12,000	80	88	*2.02	563
1-H3-2A	08MAR88		44,900	43,700	21	5,850	38	37	.	219
1-H3-2B	08MAR88		47,100	46,500	20	6,330	32	31	.	210
1-H3-2C	08MAR88		29,000	28,700	<6	2,880	<10	<10	.	177
1-H4-3	09MAR88		40,100	36,400	14	10,300	252	354	*-4.73	977
	14APR88		36,000	26,000	12	9,400	243	232	.	1200
	04MAY88		18,900	18,400	#3	9,200	186	197	.	749
1-H4-4	10MAR88		45,200	53,000	14	7,080	245	284	.	868
	10MAR88	1	46,800	.	15	7,080	252	.	.	.
	13APR88		40,200	44,300	14	7,000	247	277	.	1028
	13APR88	1	46,700	.	14	7,100	286	.	.	.
	13APR88	2	.	.	14	.	.	.	.	.
	03MAY88		40,300	46,800	12	7,050	212	291	.	827
	03MAY88	1	45,000	.	12	7,060	235	.	.	.
1-H4-5	16MAR88		76,500	76,700	13	6,850	135	143	.	458
1-H4-6	16MAR88		71,700	72,500	#4	14,800	90	89	.	492
1-H4-7	14MAR88		86,600	67,900	14	8,130	113	121	.	431
1-H4-8	11MAR88		74,600	83,800	10	9,800	93	107	.	433
1-H4-9	11MAR88		124,000	146,000	12	11,800	96	112	.	847
	11MAR88	1	127,000	.	12	11,600	92	.	.	.
1-H4-10	09MAR88		42,600	45,000	<6	6,020	84	88	.	214
1-H4-11	07MAR88		53,600	50,400	24	5,630	103	100	.	291
	14APR88		54,800	51,100	21	5,220	80	77	.	389
	03MAY88		52,800	50,000	23	5,400	129	122	.	332
1-H4-12A	07MAR88		84,800	85,000	14	8,490	164	181	.	568
	13APR88		89,800	94,100	12	8,870	144	156	.	758
	02MAY88		83,100	84,800	13	10,400	133	136	.	574
1-H4-12B	07MAR88		83,000	82,800	16	10,100	133	133	.	525
	13APR88		88,600	93,900	12	9,710	124	140	.	660
	02MAY88		85,200	81,500	14	9,150	138	133	.	556
1-H4-12C	07MAR88		31,800	32,100	8	2,470	262	287	.	234
	12APR88		33,900	33,700	7	2,610	298	312	.	218
	02MAY88		31,600	33,400	7	2,780	272	293	.	265
1-H4-13	25MAR88		42,200	42,100	27	4,910	33	33	.	261
1-H4-14	15MAR88		42,100	44,900	29	5,460	385	385	.	292
1-H4-15A	10MAR88		59,200	63,200	10	5,890	151	157	.	363
1-H4-15B	10MAR88		52,700	57,400	8	6,250	142	161	.	340
1-H4-16	15MAR88		44,500	48,500	31	6,170	<10	16	.	279
	11APR88		51,900	51,400	23	6,680	12	21	.	313
	04MAY88		50,800	47,700	26	6,170	<10	<10	.	224
1-H4-17	14MAR88		74,400	73,700	9	9,360	90	182	.	502
	12APR88		84,500	83,500	8	9,910	78	97	.	535
1-H4-18	14MAR88		47,200	48,100	27	5,050	254	284	.	333
	11APR88		52,900	49,400	25	6,090	279	269	.	352
	03MAY88		47,200	48,600	24	6,010	252	255	.	334

TABLE 6. (contd)

Well name	Collection Date	Duplicate sample number	COPPER ppb 10/1300p	FCOPPER ppb 10/1300p	CS-137 pCi/L 20/200r	FLUORID ppb 500/4000	LFLUORID ppb 20/4000	IRON ppb 30/300s	FIRON ppb 30/300s	FLEAD ppb 5/50
1-H3-1	11MAR88		<10	<10	*2.85	<500	.	87	47	<5
1-H3-2A	08MAR88		18	<10	.	<500	.	<30	<30	<5
1-H3-2B	08MAR88		<10	<10	.	<500	.	<30	<30	<5
1-H3-2C	08MAR88		11	<10	.	<500	.	<30	<30	<5
1-H4-3	09MAR88		29	23	*2.97	<500	.	2210	54	<5
	14APR88		<10	11	.	904	240	5850	<30	<5
	04MAY88		<10	<10	.	743	220	1750	<30	<5
1-H4-4	10MAR88		<10	<10	.	1300	.	94	<30	<5
	10MAR88	1	.	<10	.	1310	.	.	31	<5
	13APR88		<10	<10	.	741	359	411	32	<5
	13APR88	1	.	<10	.	825	352	.	<30	<5
	13APR88	2	.	.	.	.	.	.	.	.
	03MAY88		<10	<10	.	893	248	448	<30	<5
	03MAY88	1	.	<10	.	888	258	.	<30	<5
1-H4-5	18MAR88		<10	<10	.	<500	.	700	42	<5
1-H4-6	18MAR88		<10	<10	.	<500	.	234	84	<5
1-H4-7	14MAR88		11	<10	.	<500	.	44	80	28
1-H4-8	11MAR88		<10	<10	.	<500	.	50	44	<5
1-H4-9	11MAR88		<10	<10	.	880	.	<30	44	<5
	11MAR88	1	.	<10	.	943	.	.	31	<5
1-H4-10	09MAR88		28	<10	.	<500	.	<30	<30	<5
1-H4-11	07MAR88		<10	<10	.	<500	.	<30	<30	<5
	14APR88		<10	<10	.	<500	180	151	<30	<5
	03MAY88		<10	<10	.	<500	144	<30	70	<5
1-H4-12A	07MAR88		<10	<10	.	<500	.	<30	<30	<5
	13APR88		<10	<10	.	<500	185	248	<30	<5
	02MAY88		<10	<10	.	<500	128	<30	<30	<5
1-H4-12B	07MAR88		<10	<10	.	<500	.	<30	<30	<5
	13APR88		<10	<10	.	<500	188	<30	<30	<5
	02MAY88		<10	<10	.	<500	122	33	<30	<5
1-H4-12C	07MAR88		<10	<10	.	<500	.	41	30	<5
	12APR88		<10	<10	.	<500	179	80	<30	<5
	02MAY88		<10	<10	.	<500	183	58	<30	<5
1-H4-13	26MAR88		<10	<10	.	<500	.	35	<30	<5
1-H4-14	16MAR88		<10	<10	.	<500	.	<30	39	<5
1-H4-15A	10MAR88		10	<10	.	<500	.	<30	<30	<5
1-H4-15B	10MAR88		<10	<10	.	<500	.	48	78	<5
1-H4-16	16MAR88		<10	<10	.	<500	.	31	83	<5
	11APR88		<10	12	.	<500	135	185	<30	<5
	04MAY88		<10	<10	.	<500	118	<30	<30	<5
1-H4-17	14MAR88		<10	<10	.	<500	.	3700	59	<5
	12APR88		14	<10	.	<500	220	819	857	<5
1-H4-18	14MAR88		11	<10	.	<500	.	119	34	<5
	11APR88		<10	<10	.	<500	198	53	<30	<5
	03MAY88		<10	<10	.	<500	185	<30	<30	<5

TABLE 6. (contd)

Well name	Collection Date	Duplicate sample number	LEADGF ppb 5/50	MAGNES ppb 50/.	FMAGNES ppb 50/.	FMANGAN ppb 5/50s	MANGESE ppb 5/50s	METHYCH ppb 10/.	NICKEL ppb 10/.	FNICKEL ppb 10/.
1-H3-1	11MAR88		<5	19,800	19,300	<5	<5	#8	<10	<10
1-H3-2A	08MAR88		<5	9,520	10,100	<5	<5	<10	<10	<10
1-H3-2B	08MAR88		<5	10,100	10,300	27	27	<10	<10	<10
1-H3-2C	08MAR88		<5	9,070	9,090	8	8	<10	<10	<10
1-H4-3	09MAR88		<5	5,980	6,890	7	18	<10	28	27
	14APR88		<5	5,580	5,830	<5	60	<10	18	23
	04MAY88		<5	3,410	2,910	<5	17	<10	16	<10
1-H4-4	10MAR88		<5	7,640	7,120	<5	<5	<10	16	13
	10MAR88	1	.	.	7,240	<5	.	<10	.	16
	13APR88		<5	8,490	8,150	<5	<5	<10	12	13
	13APR88	1	.	.	8,800	<5	.	<10	.	11
	13APR88	2	.	.	.	.	.	<10	.	.
	03MAY88		<5	8,790	8,160	<5	<5	<10	13	10
	03MAY88	1	.	.	8,890	<5	.	<10	.	11
1-H4-5	18MAR88		5	12,300	12,800	<5	<5	<10	<10	<10
1-H4-6	18MAR88		<5	15,400	15,400	83	102	<10	<10	<10
1-H4-7	14MAR88		<5	13,000	12,900	<5	<5	<10	<10	<10
1-H4-8	11MAR88		<5	13,400	12,500	<5	<5	<10	<10	<10
1-H4-9	11MAR88		<5	28,800	23,800	<5	<5	<10	<10	<10
	11MAR88	1	.	.	24,100	<5	.	<10	.	<10
1-H4-10	09MAR88		<5	10,100	9,860	<5	<5	<10	<10	<10
1-H4-11	07MAR88		<5	7,240	7,590	<5	<5	<10	<10	<10
	14APR88		<5	7,080	7,520	<5	<5	<10	<10	<10
	03MAY88		<5	7,230	7,750	<5	<5	<10	<10	<10
1-H4-12A	07MAR88		<5	12,400	12,500	<5	<5	<10	<10	<10
	13APR88		<5	13,300	13,300	<5	8	<10	<10	<10
	02MAY88		<5	12,300	12,500	<5	<5	<10	<10	<10
1-H4-12B	07MAR88		<5	13,200	13,200	<5	<5	<10	<10	<10
	13APR88		<5	14,500	13,900	<5	<5	<10	<10	<10
	02MAY88		<5	12,700	12,900	<5	<5	<10	<10	<10
1-H4-12C	07MAR88		<5	11,400	11,300	<5	<5	<10	24	25
	12APR88		<5	11,900	11,500	<5	<5	<10	29	23
	02MAY88		<5	11,600	11,500	<5	<5	<10	29	22
1-H4-13	25MAR88		<5	8,980	7,070	<5	<5	<10	<10	<10
1-H4-14	15MAR88		<5	8,450	8,480	<5	<5	<10	<10	<10
1-H4-15A	10MAR88		<5	11,800	11,700	<5	<5	<10	<10	<10
1-H4-15B	10MAR88		<5	12,500	12,200	19	18	<10	11	14
1-H4-16	15MAR88		<5	5,730	5,510	<5	<5	<10	<10	<10
	11APR88		<5	8,170	8,030	<5	<5	<10	<10	<10
	04MAY88		<5	5,740	8,110	<5	<5	<10	<10	<10
1-H4-17	14MAR88		<5	14,000	14,100	<5	85	<10	59	<10
	12APR88		<5	15,200	14,900	17	14	<10	12	14
1-H4-18	14MAR88		<5	8,220	8,210	<5	<5	<10	<10	<10
	11APR88		<5	8,390	8,890	<5	<5	<10	<10	<10
	03MAY88		<5	8,180	8,240	<5	<5	<10	<10	<10

TABLE 6. (contd)

Well name	Collection Date	Duplicate sample number	NITRATE ppb 500/45000	PH-LAB 0.01/8.5s	PHFIELD 0.1/8.5s	FPOTASS ppb 100/.	POTASUM ppb 100/.	RADIUM pCi/L 1/5	RU-108 pCi/L 172.5/30r	SELENIUM ppb 5/10
1-H3-1	11MAR88		63,100	7.65	7.7	6,490	6,320	*-0.02630	*-39.30	<5
1-H3-2A	08MAR88		19,200	8.03	7.9	4,680	4,340	0.33100	.	<5
1-H3-2B	08MAR88		17,400	8.18	8.0	4,920	4,790	*0.11900	.	<5
1-H3-2C	08MAR88		3,660	8.10	8.0	4,650	4,680	0.23400	.	<5
1-H4-3	09MAR88		663,000	8.15	8.1	6,450	6,040	*-0.01560	*9.86	<5
	14APR88		302,000	8.20	8.4	5,470	5,070	*0.06960	.	7
	04MAY88		227,000	8.10	8.3	3,940	4,120	*0.07220	.	<5
1-H4-4	10MAR88		320,000	8.02	8.0	6,030	5,910	*0.06390	.	<5
	10MAR88	1	305,000	.	.	6,000	.	.	.	.
	13APR88		297,000	7.99	7.8	5,630	5,670	*-0.03030	.	<5
	13APR88	1	299,000	.	.	5,670	.	.	.	.
	13APR88	2	.	.	.	.	.	.	.	.
	03MAY88		274,000	8.00	7.9	5,540	5,750	*0.00880	.	<5
	03MAY88	1	278,000	.	.	6,020	.	.	.	.
1-H4-5	16MAR88		40,800	7.87	7.8	5,420	4,440	*0.01420	.	<5
1-H4-6	16MAR88		40,000	8.05	8.1	6,600	5,890	*-0.04640	.	<5
1-H4-7	14MAR88		30,300	7.87	8.2	5,790	5,380	0.24800	.	<5
1-H4-8	11MAR88		37,100	7.84	7.7	5,200	5,240	*0.09180	.	<5
1-H4-9	11MAR88		256,000	7.78	8.0	6,920	7,460	*0.02460	.	<5
	11MAR88	1	256,000	.	.	6,930	.	.	.	.
1-H4-10	09MAR88		17,000	7.59	7.3	4,330	4,450	*-0.01340	.	<5
1-H4-11	07MAR88		25,800	7.89	8.0	2,790	2,710	*0.08940	.	<5
	14APR88		25,400	7.99	8.0	2,460	2,420	*-0.04100	.	<5
	03MAY88		22,900	7.90	7.7	2,920	2,790	*0.01630	.	<5
1-H4-12A	07MAR88		132,000	7.91	8.1	5,980	6,140	0.16900	.	<5
	13APR88		138,000	7.97	7.7	6,330	5,960	0.24100	.	<5
	02MAY88		73,100	8.00	7.4	5,650	5,770	0.36100	.	<5
1-H4-12B	07MAR88		101,000	7.90	8.2	5,470	5,630	0.66600	.	<5
	13APR88		94,200	7.94	8.1	5,950	6,030	*0.08510	.	<5
	02MAY88		59,200	8.10	7.7	5,670	5,540	0.81500	.	<5
1-H4-12C	07MAR88		6,420	7.94	8.2	4,690	4,810	*-0.01750	.	<5
	12APR88		6,000	8.07	7.8	4,730	4,830	*-0.00291	.	<5
	02MAY88		6,110	8.10	7.9	4,870	4,800	*0.13700	.	<5
1-H4-13	25MAR88		16,300	7.70	7.3	2,240	2,200	*-0.02150	.	<5
1-H4-14	15MAR88		21,100	8.10	8.1	4,390	3,770	*0.13200	.	<5
1-H4-15A	10MAR88		31,700	7.57	7.5	5,650	5,800	0.28200	.	<5
1-H4-15B	10MAR88		28,200	7.77	7.7	5,610	5,460	0.22000	.	<5
1-H4-16	15MAR88		17,300	8.16	8.0	2,910	2,580	0.16900	.	<5
	11APR88		21,400	7.99	8.0	2,900	2,920	*0.13800	.	<5
	04MAY88		17,400	8.00	8.0	3,050	2,810	*-0.04900	.	<5
1-H4-17	14MAR88		44,700	7.27	8.2	6,630	6,050	0.36800	.	<5
	12APR88		45,300	7.56	7.2	6,690	6,660	0.37500	.	<5
1-H4-18	14MAR88		23,000	7.91	8.3	4,030	3,880	0.51100	.	<5
	11APR88		20,900	7.78	7.8	4,180	4,030	*0.11300	.	<5
	03MAY88		18,600	7.90	8.0	3,990	4,010	0.19500	.	<5

TABLE 6. (contd)

Well name	Collection Date	Duplicate sample number	SODIUM ppb 200/.	FSODIUM ppb 200/.	SR-90 pCi/L 5/8	FSTRONT ppb 20/.	STRONUM ppb 20/.	SULFATE ppb 500/250000s	TC ppb 1000/.	TC-99 pCi/L 15/900r
1-H3-1	11MAR88		21,200	21,400	*-0.143	479	487	89,300	47300	*0.92
1-H3-2A	08MAR88		12,200	12,800	.	239	224	41,200	19400	*-1.57
1-H3-2B	08MAR88		10,000	10,100	.	243	239	42,500	27500	*4.77
1-H3-2C	08MAR88		14,500	13,900	.	178	180	25,600	26700	*-0.30
1-H4-3	09MAR88		310,000	323,000	1.820	218	201	119,000	38100	4430.00
	14APR88		209,000	574,000	.	193	141	87,200	36800	1940.00
	04MAY88		188,000	178,000	.	87	95	77,800	37100	.
1-H4-4	10MAR88		169,000	165,000	.	259	269	81,800	34800	2320.00
	10MAR88	1	.	168,000	.	280	.	81,900	.	.
	13APR88	1	157,000	161,000	.	218	230	70,600	32800	2110.00
	13APR88	1	.	184,000	.	248	.	71,200	.	.
	13APR88	2	.	.	.	.	.	.	.	.
	03MAY88		144,000	137,000	.	211	233	61,600	31600	.
	03MAY88	1	.	146,000	.	228	.	61,200	.	.
1-H4-5	18MAR88		10,800	12,900	.	355	343	78,100	34900	*4.08
1-H4-6	18MAR88		23,300	26,200	.	371	378	98,400	34900	*-1.39
1-H4-7	14MAR88		12,600	13,200	.	318	321	73,300	31900	*-2.99
1-H4-8	11MAR88		13,700	13,400	.	335	353	77,600	38700	*1.42
1-H4-9	11MAR88		49,000	43,800	.	578	844	111,000	45500	2020.00
	11MAR88	1	.	43,800	.	572	.	108,000	.	.
1-H4-10	09MAR88		14,800	13,800	.	206	216	42,200	31700	*-0.94
1-H4-11	07MAR88		7,330	7,400	.	237	230	40,900	28300	*2.91
	14APR88		8,550	8,590	.	241	221	37,000	26300	*2.58
	03MAY88		9,100	9,830	.	231	221	35,000	26800	.
1-H4-12A	07MAR88		34,800	31,100	.	387	394	67,100	39100	697.00
	13APR88		31,800	33,900	.	413	412	65,400	35700	907.00
	02MAY88		18,100	18,000	.	357	357	65,800	34400	.
1-H4-12B	07MAR88		18,400	15,700	.	388	394	67,700	37100	555.00
	13APR88		18,900	18,900	.	407	424	84,100	34800	581.00
	02MAY88		14,600	18,400	.	389	357	61,400	34200	.
1-H4-12C	07MAR88		4,370	4,210	.	213	218	25,000	25800	*1.09
	12APR88		4,380	4,210	.	220	225	23,500	24200	*0.51
	02MAY88		4,220	4,580	.	213	218	23,900	23900	.
1-H4-13	25MAR88		6,840	6,810	.	187	186	31,400	22000	*-0.40
1-H4-14	15MAR88		7,290	8,360	.	220	220	38,800	23600	*-1.25
1-H4-15A	10MAR88		11,400	11,100	.	283	286	57,200	34500	*-1.16
1-H4-15B	10MAR88		10,800	10,900	.	282	286	53,900	33700	*0.74
1-H4-16	15MAR88		4,230	4,710	.	202	213	28,600	23700	*1.61
	11APR88		4,890	4,610	.	221	225	31,300	24000	*0.10
	04MAY88		4,450	4,930	.	214	205	29,200	23300	.
1-H4-17	14MAR88		13,900	15,400	.	344	340	94,400	22900	*-2.88
	12APR88		15,700	15,400	.	357	365	84,100	36200	*0.59
1-H4-18	14MAR88		9,420	9,570	.	223	228	35,700	28700	17.70
	11APR88		9,350	9,480	.	235	226	37,100	27500	19.50
	03MAY88		8,810	9,140	.	217	214	33,000	27700	.

TABLE 6. (contd)

Well name	Collection Date	Duplicate sample number	TDS ppb 5000/50000s	TOC ppb 1000/.	TOX ppb 100/.	U-CHEM ug/L 0.725/.	FVANADI ppb 5/.	VANADUM ppb 5/.	ZINC ppb 5/5000s	FZINC ppb 5/5000s
1-H3-1	11MAR88		425,000	1120	#10.0	7.830	11	9	<5	<5
1-H3-2A	08MAR88		213,000	#638	#22.0	2.090	9	7	12	<5
1-H3-2B	08MAR88		206,000	#666	#22.8	2.610	5	7	<5	20
1-H3-2C	08MAR88		174,000	#333	#2.3	1.280	18	18	10	5
1-H4-3	08MAR88		1,190,000	1100	617.0	237.000	<5	8	<5	<5
	14APR88		759,000	1280	#22.0	126.000	<5	16	8	<5
	04MAY88		902,000	1060	<100.0	114.000	8	13	8	<5
1-H4-4	10MAR88		730,000	#814	#24.0	118.000	<5	<5	138	173
	10MAR88	1	.	.	.	124.000	8	.	.	138
	13APR88		707,000	1040	#18.0	128.000	7	<5	104	80
	13APR88	1	.	.	.	118.000	<5	.	.	91
	13APR88	2	.	.	.	.	.	.	.	.
	03MAY88		649,000	#770	#22.0	88.200	<5	<5	149	122
	03MAY88	1	.	.	.	81.900	<5	.	.	137
1-H4-5	16MAR88		327,000	#984	#13.0	4.780	<5	8	148	99
1-H4-6	16MAR88		360,000	1200	#7.0	4.430	<5	8	177	171
1-H4-7	14MAR88		301,000	#896	#17.0	5.490	8	9	12	9
1-H4-8	11MAR88		335,000	#808	#20.0	4.000	7	<5	8	8
1-H4-9	11MAR88		686,000	1200	#15.0	9.600	<5	<5	5	10
	11MAR88	1	.	.	.	9.830	<5	.	.	8
1-H4-10	09MAR88		218,000	#493	#19.5	2.470	7	7	20	<5
1-H4-11	07MAR88		226,000	#600	#29.0	3.430	<5	<5	<5	13
	14APR88		223,000	#674	#15.0	4.130	<5	<5	<5	<5
	03MAY88		233,000	#829	#44.0	4.480	<5	7	<5	<5
1-H4-12A	07MAR88		436,000	#847	#19.2	49.100	<5	8	<5	<5
	13APR88		462,000	#896	#24.0	40.900	<5	<5	<5	<5
	02MAY88		393,000	#861	#11.0	14.200	<5	<5	8	<5
1-H4-12B	07MAR88		387,000	1000	#39.9	12.300	<5	8	7	<5
	13APR88		409,000	#846	#19.0	11.700	<5	<5	8	5
	02MAY88		366,000	#819	#19.0	7.830	<5	<5	10	<5
1-H4-12C	07MAR88		122,000	#408	#10.4	1.740	25	25	13	8
	12APR88		183,000	#252	#7.0	12.000	24	23	11	14
	02MAY88		191,000	#313	#3.0	1.550	23	25	9	<5
1-H4-13	25MAR88		192,000	#780	#29.0	1.290	5	<5	5	8
1-H4-14	15MAR88		207,000	#628	#30.0	2.040	8	8	<5	<5
1-H4-15A	10MAR88		272,000	#624	#10.0	2.180	9	9	12	<5
1-H4-15B	10MAR88		262,000	#492	#13.0	2.180	13	10	22	22
1-H4-16	15MAR88		181,000	#775	#38.0	1.910	5	<5	<5	9
	11APR88		212,000	#715	#32.0	1.650	8	<5	<5	<5
	04MAY88		184,000	#790	<100.0	*0.118	8	8	<5	<5
1-H4-17	14MAR88		370,000	#828	#12.0	3.290	<5	9	11	<5
	12APR88		384,000	#938	#26.0	4.220	<5	<5	15	8
1-H4-18	14MAR88		211,000	#751	#43.0	2.660	7	5	13	8
	11APR88		229,000	#658	#28.0	17.000	<5	<5	5	<5
	03MAY88		220,000	#663	#31.0	2.440	<5	<5	7	<5

TABLE 6. (contd)

The column headers consist of : Constituent Name
Analysis Units
Contractual Detection Limit/Drinking Water Standard

Suffix

- none - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July, 1987)
National Primary Drinking Water Regulations as amended by 52 FR 25890
- r - based on National Interim Primary Drinking Water Regulations,
Appendix IV, EPA-570/9-78-003
- p - based on proposed Maximum Contaminant Level Goals in 50 FR 48938
- s - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143
(July, 1987) National Secondary Drinking Water Regulations
- w - based on additional Secondary Maximum Contaminant Levels given in
WAC 248-54, Public Water Supplies

Data flags

- < - Less than Contractual Detection Limit, reported as Limit
- # - Less than Contractual Detection Limit, measured value reported
- * - For radioactive constituents, reported value is less than 2-sigma
counting error

Gross beta exceeded the primary drinking water standard of 50 pCi/L in seven wells. With the exception of wells 199-H4-11 and 199-H4-13, these values correlate to the same wells in which technetium-99 exceeds the national interim primary drinking water standard of 900 pCi/L. Technetium-99 was found in significant concentrations in solutions collected from the 183-H Basins and is expected to be a primary contributor to the high concentrations of gross beta.

Gross alpha exceeded the primary drinking water standard of 15 pCi/L in three wells. Table 7 contains a comparison of gross alpha and uranium results for March 1988. This comparison was made using the March data because all 23 wells were sampled during this month. These results indicate that uranium is the primary contributor to the gross alpha values.

As shown in Figure 6, chromium concentrations continue to increase in well 199-H4-14. This well now has the highest chromium concentration (400 ppb) of any well in the 100-H Area network. Concentrations in this well have surpassed the levels of chromium in well 199-H4-3, which have been decreasing. Monthly sampling of well 199-H4-14 will be resumed for the remainder of fiscal year 1988.

As shown in Figures 6 and 7, respectively, chromium concentrations also continue to increase in wells 199-H4-6 and 199-H4-12C. The most recent measurements in these wells were 89 and 298 ppb, respectively. Well 199-H4-12C is completed within the Ringold Formation. Concentrations of chromium are decreasing in wells 199-H4-12A and 199-H4-12B, both of which are completed within the Hanford formation.

Elevated concentrations of total dissolved solids (TDS) were reported in wells 199-H4-3, 199-H4-4, and 199-H4-9. These results reflect the combined concentrations of filtered calcium, filtered magnesium, filtered potassium, filtered sodium, chloride, nitrate, and sulfate, with nitrate accounting for over half of the TDS concentrations.

As reported previously, concentrations of filtered zinc, ranging from 184 to 1400 ppb, were reported for wells 199-H4-3, 199-H4-10, and 199-H4-12C in October 1987. In addition, concentrations of phosphate, ranging from 6240 to 13,100 ppb, were reported in wells 199-H4-3, 199-H4-4, and 199-H4-9 in

TABLE 7. Comparison of Gross Alpha and Uranium Results for March 1988

Well Name	Sample Date	Rep	Gross Alpha, pCi/L ^(a)	Chemical ^(b) Uranium, μ g/L	Radioactive Uranium, pCi/L	Gross Alpha, Corrected for ^(c) Uranium, pCi/L
1-H3-1 ^(d)	11MAR88		2.12 + 1.55	7.83+ 2.21	5.47 + 1.54	-3.35 + 2.19
1-H3-2A	08MAR88		1.68 + 1.18	2.09+ 0.678	1.46 + 0.474	0.219 + 1.27
1-H3-2B	08MAR88		1.69 + 1.15	2.51+ 0.795	1.75 + 0.556	-0.065 + 1.28
1-H3-2C	08MAR88		1.05 + 0.973	1.26+ 0.461	0.881+ 0.322	0.169 + 1.02
1-H4-3	09MAR88		148 +21.0	237 +61.3	166 +42.8	-17.7 +47.7
1-H4-4	10MAR88		118 +20.0	118 +32.6	82.5 +22.8	35.5 +30.3
1-H4-4	10MAR88	1	105 +17.7	124 +33.7	86.7 +23.6	18.3 +29.5
1-H4-5	16MAR88		0.836+ 1.08	4.78+ 1.43	3.34 + 1.00	-2.51 + 1.47
1-H4-6	16MAR88		3.98 + 2.06	4.43+ 1.32	3.10 + 0.923	0.883+ 2.26
1-H4-7	14MAR88		3.12 + 1.70	5.49+ 1.61	3.84 + 1.13	-0.718+ 2.04
1-H4-8	11MAR88		3.17 + 1.72	4.00+ 1.21	2.80 + 0.846	0.374+ 1.92
1-H4-9	11MAR88		8.70 + 3.75	9.60+ 2.68	6.71 + 1.87	1.99 + 4.19
1-H4-9	11MAR88	1	3.54 + 2.38	9.83+ 2.70	6.87 + 1.89	-3.33 + 3.04
1-H4-10	09MAR88		0.856+ 0.969	2.47+ 0.783	1.73 + 0.547	-0.871+ 1.11
1-H4-11	07MAR88		1.29 + 1.14	3.43+ 1.05	2.40 + 0.734	-1.11 + 1.36
1-H4-12A	07MAR88		41.3 + 6.98	49.1 +12.8	34.3 + 8.95	6.98 +11.3
1-H4-12B	07MAR88		11.4 + 3.27	12.3 + 3.35	8.60 + 2.34	2.80 + 4.02
1-H4-12C	07MAR88		0.931+ 0.814	1.74+ 0.604	1.22 + 0.422	-0.285+ 0.917
1-H4-13	25MAR88		2.27 + 1.31	1.29+ 0.471	0.902+ 0.329	1.37 + 1.35
1-H4-14	15MAR88		1.69 + 1.18	2.04+ 0.699	1.43 + 0.489	0.264+ 1.28
1-H4-15A	10MAR88		0.788+ 1.03	2.18+ 0.696	1.52 + 0.487	-0.736+ 1.14
1-H4-15B	10MAR88		2.17 + 1.39	2.18+ 0.702	1.52 + 0.491	0.646+ 1.47
1-H4-16	15MAR88		1.69 + 1.03	1.91+ 0.653	1.34 + 0.456	0.355+ 1.13
1-H4-17	14MAR88		3.76 + 1.98	3.29+ 1.03	2.30 + 0.720	1.46 + 2.11
1-H4-18	14MAR88		1.42 + 1.12	2.66+ 0.865	1.86 + 0.605	-0.439+ 1.27

(a) Gross alpha and chemical uranium data are reported as value + 2-sigma uncertainty.

(b) Uranium data are reported by the laboratory as μ g/L. The chemical uranium value (and its uncertainty) has been multiplied by 0.699 to express it as radioactive uranium (pCi/L), assuming the uranium is natural. (A different multiplier might be needed, depending on the actual isotopic composition of the uranium.)

(c) The uranium value, expressed in pCi/L, is subtracted from the gross alpha and the resulting 2-sigma uncertainty calculated as $2 \times \sqrt{[(\text{gross alpha uncertainty}/2)^2 + (\text{uranium uncertainty}/2)^2]}$.

(d) All wells prefixed by 199. Only the "1" is shown.

FIGURE 6. Chromium Concentrations in Wells 199-H3-1, 199-H3-2A, 199-H3-2B, 199-H3-2C, 199-H4-6, 199-H4-7, 199-H4-14, and 199-H4-17 (Numbers shown are abbreviations of well names.)

December 1987 and January 1988. The original samples submitted to United States Testing Company (UST) for these wells were reanalyzed by PNL. No zinc or phosphate was found in these samples.

Elevated concentrations of 1,1,1-trichloroethane (31 ppb) and perchloroethylene (31 ppb) were reported in well 199-H4-3 in February 1988. No volatile organic compounds (VOCs) were found in the ground-water samples for March or April. These concentrations continue to be random in both time and well location. Therefore, duplicate VOC samples will be collected in June, with one sample to be analyzed by PNL and the other by UST.

FIGURE 7. Chromium Concentrations in Wells 199-H4-4, 199-H4-9, 199-H4-12A, 199-H4-12B, and 199-H4-12C (Numbers shown are abbreviations of well names.)

Quality Assurance/Quality Control

Results of interlaboratory comparisons include VOCs, anions and ammonium, metals, and radiological constituents for February, March, and April. All results, with the exception of pH, gross alpha, and gross beta, were consistent between UST and PNL. The analytical procedure for pH used by PNL will now include pH measurement and laboratory adjustment, if necessary. PNL examined the UST procedures for gross beta analysis and noted that the allowed weight of residue could absorb some of the beta particles before they reach the detector, resulting in the observed differences. There was no immediate explanation for the differences in the gross alpha analyses.

200 AREA LOW-LEVEL BURIAL GROUNDS

G. V. Last

Work discussed in the previous quarterly report (PNL 1988b) focused on activities associated with hydrogeologic characterization of the Low-Level Burial Grounds (LLBGs). This report describes subsequent activities associated with the hydrogeologic characterization.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

Drilling

No well drilling or construction activities were conducted during this quarter.

Hydrogeologic Characterization

Calcium carbonate analyses of sediment samples from all 200-West Area wells have been completed. No analyses were performed on the 200-East Area wells. Fifty-four sediment samples from both 200 Areas were selected for water retention, saturated hydraulic conductivity, cation exchange capacity, bulk mineralogy, and/or petrographic analyses.

Water levels are being measured at each new well on a monthly schedule. Three sets of measurements were collected during this quarter and are listed in Tables 8 and 9. Water-table maps from measurements made on June 29 and 30, 1988, are shown in Figures 8 and 9.

ROUTINE SAMPLING AND ANALYSIS OF GROUND WATER

Purging/sampling pumps were received for the new monitoring wells. Prior commitment of staff to other programs and mechanical failure of pump setting equipment have led to delays in installing the pumps. To date, four of the pumps have been installed in the 200-East Area wells. Routine sampling was scheduled to start in June but now may not be initiated until late July or August. Because of these problems, there are no results to report.

**TABLE 8. Water-Level Data for Monitoring Wells in the 200-East Area
LLBG (samples collected during the second quarter of 1988)**

<u>Well Number</u>	<u>Measurement Date</u>	<u>Depth to Water from Top of Casing, ft</u>	<u>Water-Table Elevation, ft above MSL</u>
299-E27-8	5/4/88	232.71	405.12
	5/25/88	232.72	405.11
	8/29/88	232.51	405.32
299-E27-9	5/4/88	223.96	405.25
	5/25/88	223.98	405.25
	8/29/88	223.73	405.48
299-E27-10	5/4/88	218.87	405.80
	5/25/88	218.86	405.81
	8/29/88	218.47	406.00
299-E28-26	5/4/88	282.37	404.89
	5/25/88	282.42	404.84
	8/29/88	282.28	404.98
299-E28-27	5/4/88	275.55	404.82
	5/25/88	275.56	404.81
	8/29/88	275.36	405.01
299-E32-2	5/4/88	265.43	404.63
	5/25/88	265.45	404.61
	8/29/88	265.29	404.77
299-E32-3	5/4/88	271.83	404.88
	5/25/88	271.82	404.89
	8/29/88	271.67	404.84
299-E32-4	5/4/88	281.28	404.62
	5/25/88	281.31	404.57
	8/29/88	281.19	404.89
299-E33-28	5/4/88	259.37	404.86
	5/25/88	259.38	404.85
	8/29/88	259.19	405.04
299-E33-29	5/4/88	268.91	404.86
	5/25/88	268.93	404.84
	8/29/88	268.78	404.99
299-E33-30	5/4/88	258.87	404.83
	5/25/88	258.91	404.79
	8/29/88	258.76	404.94
299-E34-2	5/4/88	225.69	405.11
	5/25/88	225.70	405.10
	8/29/88	225.53	405.27
299-E34-3	5/4/88	205.89	405.63
	5/25/88	205.87	405.65
	8/29/88	205.48	406.06
299-E34-4	5/4/88	(a)	(a)
	5/25/88	(a)	(a)
	8/29/88	(a)	(a)
299-E34-5	5/4/88	184.85	405.94
	5/25/88	184.85	405.94
	8/29/88	184.82	405.97
299-E34-6	5/4/88	192.77	405.08
	5/25/88	192.78	405.05
	8/29/88	192.62	405.21

(a) Well was dry

TABLE 9. Water-Level Data for Monitoring Wells in the 200-West Area
LLBG (samples collected during the second quarter of 1988)

<u>Well Number</u>	<u>Measurement Date</u>	<u>Depth to Water from Top of Casing, ft</u>	<u>Water-Table Elevation, ft above MSL</u>
299-W6-2	5/4/88	230.41	482.04
	5/26/88	230.31	482.14
	8/30/88	230.35	482.10
299-W7-1	5/4/88	228.68	482.03
	5/26/88	228.64	482.07
	8/30/88	228.73	481.98
299-W7-2	5/4/88	214.56	481.03
	5/26/88	214.51	481.08
	8/30/88	214.55	481.04
299-W7-3	5/4/88	216.38	459.78
	5/26/88	216.31	459.83
	8/30/88	216.42	459.72
299-W7-4	5/4/88	208.39	483.30
	5/26/88	208.34	483.35
	8/30/88	208.33	483.36
299-W7-5	5/4/88	210.55	480.59
	5/26/88	210.49	480.65
	8/30/88	210.54	480.60
299-W7-6	5/4/88	218.25	480.39
	5/26/88	218.18	480.46
	8/30/88	218.27	480.37
299-W8-1	5/4/88	238.89	482.44
	5/26/88	238.85	482.48
	8/30/88	238.98	482.35
299-W9-1	5/4/88	272.17	485.56
	5/26/88	272.17	485.56
	8/30/88	272.29	485.44
299-W10-13	5/4/88	232.05	486.99
	5/26/88	232.06	486.98
	8/30/88	232.14	486.90
299-W10-14	5/4/88	232.80	486.63
	5/26/88	232.81	486.62
	8/30/88	232.93	486.50
299-W15-15	5/5/88	228.02	489.94
	5/26/88	228.10	489.86
	8/30/88	228.22	489.74
299-W15-16	5/5/88	214.01	470.88
	5/26/88	214.10	470.79
	8/30/88	214.25	470.64
299-W15-17	5/5/88	214.48	470.18
	5/26/88	214.39	470.25
	8/30/88	214.42	470.22
299-W15-18	5/5/88	214.43	471.28
	5/26/88	214.55	471.16
	8/30/88	214.68	471.03
299-W18-21	5/5/88	198.29	470.33
	5/26/88	198.42	470.20
	8/30/88	198.55	470.07
299-W18-22	5/5/88	199.08	469.41
	5/26/88	199.22	469.27
	8/30/88	199.45	469.04
299-W18-23	5/5/88	226.49	470.32
	5/26/88	226.63	470.18
	8/30/88	226.77	470.04
299-W18-24	5/5/88	212.79	471.58
	5/26/88	212.89	471.46
	8/30/88	213.04	471.31

FIGURE 8. Water-Table Map for the 200-East Area, June 29, 1988

FIGURE 9. Water-Table Map for the 200-West Area, June 30, 1988

FIGURE 3. Water-Table Map for the 500 West Area, June 30, 1966

NONRADIOACTIVE DANGEROUS WASTE LANDFILL

R. M. Fruland

Activities conducted in this reporting period include completion of quarterly sampling and analysis at the Nonradioactive Dangerous Waste Landfill (NRDW). This is the seventh quarterly sampling for the five shallow wells completed in the top of the unconfined aquifer and the sixth quarterly sampling for the two deep monitoring wells, completed just above the first confining layer. The data presented here have been statistically analyzed in accordance with 40 CFR 265.93(b) (EPA 1984) to determine if significant chemical differences exist between upgradient and downgradient positions. The NRDW, together with the Solid Waste Landfill (SWL), composes the Hanford Site Central Landfill (CLF). The locations of the wells monitoring the CLF are shown in Figure 10.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

No additional drilling was conducted during this quarter. However beginning in April, water-level measurements have been taken on a monthly basis in an effort to more accurately determine the direction of ground-water flow. This effort will continue through the fourth quarter of fiscal year 1988 and include all six SWL wells, four NRDW wells, and six nearby Hanford Site wells. To date, the CLF data show an extremely flat gradient in the vicinity of the CLF and continue to support the previously determined general ground-water flow direction of northwest to southeast. Water-level measurements being collected at six nearby Hanford Site wells will be needed to determine the direction of ground-water flow more accurately. However, these are older wells; their elevations and coordinates may not be as accurate or precise as those of the newer SWL and NRDW wells. Therefore, all of the ground-water elevation data will be reported after the Hanford wells have been resurveyed.

FIGURE 10. Well Locations for the Hanford Site Central Landfill that Includes the Solid Waste Landfill and the Nonradioactive Dangerous Waste Landfill

ROUTINE SAMPLING AND ANALYSIS OF GROUND WATER

All seven ground-water monitoring wells at the NRDW were sampled in April 1988. Field measurements, including water-table elevation, temperature, conductivity, and pH, were made immediately before sample collection.

Collection and Analysis

Table 10 summarizes the analytical data collected this quarter, including field and laboratory measurements of pH and conductivity. The field and laboratory measurements for pH and conductivity are being evaluated, but the results are not yet available. Only manganese has a reported value exceeding a regulatory standard, but that standard is based on Secondary Maximum Contaminant levels given in 40 CFR 143 (National Secondary Drinking Water Regulations) and is related to staining by manganese. Table 11 contains the raw data for constituents that had at least one value reported above the detection limit. The downgradient well data are given first, with the deep downgradient well data at the top of the list. The last three wells listed are the upgradient wells, with the deep upgradient well listed last. The chemical data generally agree with previously reported data. Coliform bacteria continues to display a random occurrence, this time in one shallow upgradient well. No volatile organic constituents were detected in any NRDW wells this quarter.

The deep downgradient (east-side) well continues to show a pattern of lower beta and nitrate concentrations compared with all the other NRDW wells, indicating that vertical mixing of the tritium and nitrate plumes from the 200-East Area has not occurred by the time the plumes reach the east side of the CLF (Table 10). Ground-water composition of the deep downgradient well also has lower calcium and higher sodium concentrations compared to the shallow wells that are completed in the top of the unconfined aquifer: the top of the unconfined aquifer at the CLF is in Hanford sediments; the deep wells are completed in Ringold sediments (Weekes, Luttrell, and Fuchs 1987).

Discussion of Results

Statistical analysis is provided for the contamination indicator parameters that include conductivity (both field and laboratory measurements), pH

TABLE 10. Sample Summary for the Nonradioactive Dangerous Waste Landfill, April 1988

----- Constituent List=Contamination Indicator Parameters -----							
Constituent Code Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded	Full name	
088 CONDLAB	umho	.	28	0	700 WDOE	Specific conductance, laboratory	
191 CONDFLD	umho	1	28	0	700 WDOE	Specific conductance, field	
199 PHFIELD		0.1	28	0	6.5-8.5 EPAS	pH, field	
207 PH-LAB		0.01	28	0	6.5-8.5 EPAS	pH, laboratory	
C69 TOC	ppb	1000	28	0	.	Total organic carbon	
H42 TOXLDL	ppb	20	28	0	.	Total organic halogens, low DL	

----- Constituent List=Drinking Water Parameters -----							
Constituent Code Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded	Full name	
109 COLIFRM	MPN	2.2	7	6	1 EPA	Coliform bacteria	
111 BETA	pCi/L	8	7	0	50 EPA	Gross beta	
212 ALPHA	pCi/L	4	7	0	15 EPA	Gross alpha	
A06 BARIUM	ppb	8	7	0	1000 EPA	Barium	
A07 CADMIUM	ppb	2	7	7 ***	10 EPA	Cadmium	
A08 CHROMIUM	ppb	10	7	7 ***	50 EPA	Chromium	
A10 SILVER	ppb	10	7	7 ***	50 EPA	Silver	
A20 ARSENIC	ppb	5	7	4	50 EPA	Arsenic	
A21 MERCURY	ppb	0.1	7	7 ***	2 EPA	Mercury	
A22 SELENIUM	ppb	5	7	7 ***	10 EPA	Selenium	
A51 LEADGF	ppb	5	7	7 ***	50 EPA	Lead (graphite furnace)	
C72 NITRATE	ppb	500	7	0	45000 EPA	Nitrate	
C74 FLUORID	ppb	500	7	2	4000 EPA	Fluoride	
H20 FBARIUM	ppb	8	7	0	1000 EPA	Barium, filtered	
H21 FCADMIU	ppb	2	7	7 ***	10 EPA	Cadmium, filtered	
H22 FCHROMI	ppb	10	7	7 ***	50 EPA	Chromium, filtered	
H23 FSILVER	ppb	10	7	7 ***	50 EPA	Silver, filtered	
H37 FARSENI	ppb	5	7	3	50 EPA	Arsenic, filtered	
H38 FMERCUR	ppb	0.1	7	7 ***	2 EPA	Mercury, filtered	
H39 FSELENI	ppb	5	7	7 ***	10 EPA	Selenium, filtered	
H41 FLEAD	ppb	5	7	7 ***	50 EPA	Lead, filtered	
H63 LFLUORD	ppb	20	7	0	4000 EPA	Fluoride, low DL	

----- Constituent List=Water Quality Parameters -----							
Constituent Code Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded	Full name	
A11 SODIUM	ppb	200	7	0	.	Sodium	
A17 MANGESE	ppb	5	7	4	50 EPAS	Manganese	xxx
A19 IRON	ppb	30	7	2	300 EPAS	Iron	
C73 SULFATE	ppb	500	7	0	250000 EPAS	Sulfate	
C75 CHLORID	ppb	500	7	0	250000 EPAS	Chloride	
H24 FSODIUM	ppb	200	7	0	.	Sodium, filtered	
H29 FMANGAN	ppb	5	7	5	50 EPAS	Manganese, filtered	xxx
H31 FIIRON	ppb	30	7	7 ***	300 EPAS	Iron, filtered	
H57 LPHENOL	ppb	10	7	7 ***	.	Phenol, low DL	

TABLE 10. (contd)

----- Constituent List=Site Specific and Other Parameters -----

Constituent Code Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded	Full name
A01 BERYLUM	ppb	5	7	7 ***	.	Beryllium
A03 STRONUM	ppb	20	7	0	.	Strontium
A04 ZINC	ppb	5	7	6	5000 EPAS	Zinc
A05 CALCIUM	ppb	50	7	0	.	Calcium
A12 NICKEL	ppb	10	7	7 ***	.	Nickel
A13 COPPER	ppb	10	7	7 ***	1300 EPAP	Copper
A14 VANADUM	ppb	5	7	0	.	Vanadium
A15 ANTIONY	ppb	100	7	7 ***	.	Antimony
A16 ALUMNUM	ppb	150	7	7 ***	.	Aluminum
A18 POTASUM	ppb	100	7	0	.	Potassium
A50 MAGNES	ppb	50	7	0	.	Magnesium
A61 TETRANE	ppb	5	7	7 ***	5 EPA	Tetrachloromethane [Carbon Tetrachloride]
A62 BENZENE	ppb	5	7	7 ***	5 EPA	Benzene
A63 DIOXANE	ppb	500	7	7 ***	.	Dioxane
A84 METHONE	ppb	10	7	7 ***	.	Methyl ethyl ketone
A85 PYRIDIN	ppb	500	7	7 ***	.	Pyridine
A66 TOLUENE	ppb	5	7	7 ***	2000 EPAP	Toluene
A67 1,1,1-T	ppb	5	7	7 ***	200 EPA	1,1,1-Trichloroethane
A68 1,1,2-T	ppb	5	7	7 ***	.	1,1,2-Trichloroethane
A69 TRICENE	ppb	5	7	7 ***	5 EPA	Trichloroethylene [1,1,2-Trichloroethene]
A70 PERCENE	ppb	5	7	7 ***	.	Perchloroethylene
A71 OPXYLE	ppb	5	7	7 ***	440 EPAP	Xylene-o,p
A72 ACROLIN	ppb	10	7	7 ***	.	Acrolein
A73 ACRYILE	ppb	10	7	7 ***	.	Acrylonitrile
A74 BISTHER	ppb	10	7	7 ***	.	Bis(chloromethyl) ether
A75 BROMONE	ppb	10	7	7 ***	.	Bromoacetone
A76 METHBRO	ppb	10	7	7 ***	.	Methyl bromide
A77 CARBIDE	ppb	10	7	7 ***	.	Carbon disulfide
A78 CHLBENZ	ppb	10	7	7 ***	60 EPAP	Chlorobenzene
A79 CHLTHER	ppb	10	7	7 ***	.	2-Chloroethyl vinyl ether
A80 CHLFORM	ppb	5	7	7 ***	100 EPA	Chloroform [Trichloromethane]
A81 METHCHL	ppb	10	7	7 ***	.	Methyl chloride [Chloromethane]
A82 CHMTHER	ppb	10	7	7 ***	.	Chloromethyl methyl ether
A83 CROTONA	ppb	10	7	7 ***	.	Crotonaldehyde
A84 DIBRCHL	ppb	10	7	7 ***	0 EPAP	1,2-Dibromo-3-chloropropane
A85 DIBRETH	ppb	10	7	7 ***	.	1,2-Dibromoethane
A86 DIBRMET	ppb	10	7	7 ***	.	Dibromomethane
A87 DIBUTEN	ppb	10	7	7 ***	.	1,4-Dichloro-2-butene
A88 DICDIFM	ppb	10	7	7 ***	.	Dichlorodifluoromethane
A89 1,1-DIC	ppb	10	7	7 ***	.	1,1-Dichloroethane
A90 1,2-DIC	ppb	10	7	7 ***	5 EPA	1,2-Dichloroethane
A91 TRANDC	ppb	10	7	7 ***	70 EPAP	trans-1,2-Dichloroethene
A92 DICETHY	ppb	10	7	7 ***	7 EPA	1,1-Dichloroethylene
A93 METHYCH	ppb	10	7	7 ***	.	Methylene chloride
A94 DICPANE	ppb	10	7	7 ***	6 EPAP	1,2-Dichloropropane
A95 DICPENE	ppb	10	7	7 ***	.	1,3-Dichloropropene
A96 NNDIEHY	ppb	10	7	7 ***	.	N,N-diethylhydrazine
A99 HYDRSUL	ppb	10	7	7 ***	.	Hydrogen sulfide
B01 IODOMET	ppb	10	7	7 ***	.	Iodomethane
B02 METHACR	ppb	10	7	7 ***	.	Methacrylonitrile
B03 METHTHI	ppb	10	7	7 ***	.	Methanethiol

TABLE 10. (contd)

----- Constituent List=Site Specific and Other Parameters -----

Constituent Code Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded	Full name
B04 PENTACH	ppb	10	7	7 ***	.	Pentachloroethane
B05 1112-tc	ppb	10	7	7 ***	.	1,1,1,2-Tetrachlorethane
B06 1122-tc	ppb	10	7	7 ***	.	1,1,2,2-Tetrachlorethane
B08 BROMORM	ppb	10	7	7 ***	100 EPA	Bromoform [Tribromomethane]
B09 TRCMEOL	ppb	10	7	7 ***	.	Trichloromethanethiol
B10 TRCMFLM	ppb	10	7	7 ***	.	Trichloromonofluoromethane
B11 TRCPANE	ppb	10	7	7 ***	.	Trichloropropane
B12 123-trp	ppb	10	7	7 ***	.	1,2,3-Trichloropropane
B13 VINYIDE	ppb	10	7	7 ***	2 EPA	Vinyl chloride
B14 M-XYLE	ppb	5	7	7 ***	440 EPAP	Xylene-m
B16 DIETHY	ppb	10	7	7 ***	.	Diethylarsine
B19 ACETILE	ppb	3000	7	7 ***	.	Acetonitrile
C04 METACRY	ppb	10	7	7 ***	.	Methyl methacrylate
C71 FORMALN	ppb	500	7	7 ***	.	Formalin
C76 PHOSPHA	ppb	1000	7	7 ***	.	Phosphate
H05 ETHOXID	ppb	3000	7	7 ***	.	Ethylene oxide
H06 ETHMETH	ppb	10	7	7 ***	.	Ethyl methacrylate
H16 TC	ppb	1000	7	0	.	Total carbon
H17 TDS	ppb	5000	7	0	500000 EPAS	Total dissolved solids
H18 FZINC	ppb	5	7	8	5000 EPAS	Zinc, filtered
H19 FCALCIU	ppb	50	7	0	.	Calcium, filtered
H25 FNICKEL	ppb	10	7	7 ***	.	Nickel, filtered
H26 FCOPPER	ppb	10	7	7 ***	1300 EPAP	Copper, filtered
H27 FVANADI	ppb	5	7	0	.	Vanadium, filtered
H28 FALUMIN	ppb	150	7	7 ***	.	Aluminum, filtered
H30 FPOTASS	ppb	100	7	0	.	Potassium, filtered
H32 FMAGNES	ppb	50	7	0	.	Magnesium, filtered
H33 FBERYLL	ppb	5	7	7 ***	.	Beryllium, filtered
H35 FSTRONT	ppb	20	7	0	.	Strontium, filtered
H36 FANTIMO	ppb	100	7	7 ***	.	Antimony, filtered
H58 ALKALIN	ppb	20000	7	0	.	Total alkalinity, as CaCO3
H66 BROMIDE	ppb	1000	7	7 ***	.	Bromide
H67 NITRITE	ppb	1000	7	8	.	Nitrite
H68 HEXONE	ppb	10	7	7 ***	.	Hexone

*** - Indicates all samples were below detection limits

xxx - Indicates that Drinking Water Standards were exceeded

EPA - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July, 1987)

National Primary Drinking Water Regulations as amended by 52 FR 25690

EPAR - based on National Interim Primary Drinking Water Regulations,

Appendix IV, EPA-570/9-76-003

EPAP - based on proposed Maximum Contaminant Level Goals in 50 FR 48936

EPAS - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143

National Secondary Drinking Water Regulations

WDOE - based on additional Secondary Maximum Contaminant Levels given in

WAC 248-54, Public Water Supplies

(field and laboratory measurements), total organic carbon (TOC), and total halogen content (TOXLDL). Table 11 provides the raw data for these parameters, all of which are collected in quadruplicate. (Note that "#" signifies reported data that is beneath the analytical laboratory's contractual detection limit.) The data for TOXLDL for two of the four samples collected from downgradient shallow well 699-25-34B are very high, as shown in Table 11. Table 12 presents the statistical analyses for the quadruplicate data sets of the indicator parameters. The standard deviation for well 699-25-34B TOXLDL data is 124. No constituents related to TOXLDL were detected in this well; no other differences were observed. However, the TOXLDL results required immediate resampling to confirm the analyses.

Well 699-25-34B was resampled on June 10, 1988; four quadruplicate samples were taken for TOX. The results are presented in Table 13. The mean of these samples is 10.05, which is below the critical mean (based on a year's work of background data). Therefore, the conclusion is that this is not a significant deviation from background, and no further action is required.

TABLE 11. Constituents with at Least One Detected Value for the Nonradioactive Dangerous Waste Landfill, April 1988

Well name	Collection Date	Duplicate sample number	ALKALIN ppb 20000/.	ALPHA pCi/L 4/15	ARSENIC ppb 5/50	FARSENI ppb 5/50	BARIUM ppb 6/1000	FBARIUM ppb 6/1000	BETA pCi/L 8/50	FCALCIU ppb 50/.	CALCIUM ppb 50/.
6-25-33A	22APR88		132,000	2.500	<5	<5	23	28	7.23	31,100	34,500
6-25-34A	25APR88		115,000	2.420	5	8	38	38	30.70	35,700	38,200
6-25-34B	22APR88		122,000	1.490	<5	<5	33	35	24.40	39,800	40,900
6-26-33	25APR88		110,000	2.580	5	5	34	36	31.30	35,800	36,100
6-26-34	25APR88		108,000	2.150	5	5	28	29	34.40	35,400	33,700
6-26-35A	25APR88		117,000	1.830	<5	5	35	34	30.60	38,500	39,700
6-26-35C	25APR88		118,000	*0.917	<5	<5	45	47	19.40	43,900	44,700
Well name	Collection Date	Duplicate sample number	CHLORID ppb 500/250000s	COLIFRM MPN 2.2/1	FLUORID ppb 500/4000	LFLUORD ppb 20/4000	IRON ppb 30/300s	MAGNES ppb 50/.	FMAGNES ppb 50/.	FMANGAN ppb 5/50s	
6-25-33A	22APR88		6,750	<2.2	<500	395	94	9,350	8,990	8	
6-25-34A	25APR88		8,900	<2.2	585	478	<30	10,700	10,600	<5	
6-25-34B	22APR88		6,750	<2.2	617	482	53	11,300	10,800	<5	
6-26-33	25APR88		6,750	<2.2	843	478	71	10,200	10,500	<5	
6-26-34	25APR88		6,640	2.2	580	498	<30	9,980	10,500	<5	
6-26-35A	25APR88		7,800	<2.2	538	457	263	11,200	11,300	<5	
6-26-35C	25APR88		9,780	<2.2	<500	341	164	11,600	11,700	68	
Well name	Collection Date	Duplicate sample number	MANGESE ppb 5/50s	NITRATE ppb 500/45000	NITRITE ppb 1000/.	FPOTASS ppb 100/.	POTASUM ppb 100/.	SODIUM ppb 200/.	FSODIUM ppb 200/.	FSTRONT ppb 20/.	
6-25-33A	22APR88		6	5,580	<1000	5,320	5,180	29,700	28,300	197	
6-25-34A	25APR88		<5	32,900	<1000	6,100	6,090	22,700	20,300	171	
6-25-34B	22APR88		<5	32,700	<1000	5,210	6,100	22,800	20,200	173	
6-26-33	25APR88		<5	33,100	<1000	6,100	5,900	22,500	20,700	170	
6-26-34	25APR88		<5	35,200	<1000	6,240	5,880	22,900	21,200	161	
6-26-35A	25APR88		7	31,900	<1000	6,450	6,440	23,300	20,900	179	
6-26-35C	25APR88		62	18,500	1400	5,930	5,940	19,900	17,700	221	
Well name	Collection Date	Duplicate sample number	STRONUM ppb 20/.	SULFATE ppb 500/250000s	TC ppb 1000/.	TDS ppb 5000/500000s	FVANADI ppb 5/.	VANADUM ppb 5/.	ZINC ppb 5/5000s	FZINC ppb 5/5000s	
6-25-33A	22APR88		203	48,800	29,800	259,000	8	7	<5	8	
6-25-34A	25APR88		172	42,200	27,100	284,000	25	25	5	<5	
6-25-34B	22APR88		180	38,900	27,800	278,000	24	23	<5	<5	
6-26-33	25APR88		163	40,600	25,800	268,000	26	23	<5	<5	
6-26-34	25APR88		155	36,500	25,500	260,000	26	25	<5	<5	
6-26-35A	25APR88		175	41,400	27,200	269,000	26	23	<5	<5	
6-26-35C	25APR88		218	55,700	27,100	255,000	12	9	<5	<5	

TABLE 11. (contd)

The column headers consist of : Constituent Name
Analysis Units
Contractual Detection Limit/Drinking Water Standard(suffix)

Suffix

- none - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July, 1987)
National Primary Drinking Water Regulations as amended by 52 FR 25690
- r - based on National Interim Primary Drinking Water Regulations,
Appendix IV, EPA-570/9-76-003
- p - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
- s - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143
(July, 1987) National Secondary Drinking Water Regulations
- w - based on additional Secondary Maximum Contaminant Levels given in
WAC 248-54, Public Water Supplies

Data flags

- < - Less than Contractual Detection Limit, reported as Limit
- # - Less than Contractual Detection Limit, measured value reported
- * - For radioactive constituents, reported value is less than 2-sigma
counting error

TABLE 12. Quadruplicate Contamination Indicators for Constituents with at Least One Detected Value for April 1988

Well name	Collection Date	Duplicate sample number	CONDLFD umho 1/700w	CONDLAB umho ./700w	PH-LAB 0.01/8.5s	PHFIELD 0.1/8.5s	TOC ppb 1000/.	TOXLDL ppb 20/.
6-25-33A	22APR88		469	313	8.2	7.8	#225	#6
		1	469	297	8.2	7.9	#248	#18
		2	471	297	8.2	7.9	#202	#4
		3	470	313	8.2	8.0	#226	#13
6-25-34A	25APR88		390	375	8.0	8.4	#402	#12
		1	391	375	8.0	8.3	#684	#12
		2	393	375	8.0	8.4	#521	#13
		3	393	375	8.0	8.4	#367	#2
6-25-34B	22APR88		521	323	8.0	7.5	#378	#15
		1	522	313	8.1	7.5	#318	#14
		2	520	313	8.0	7.6	#288	232
		3	520	313	8.0	7.5	#308	228
6-26-33	25APR88		419	375	8.1	8.2	#330	#5
		1	418	375	8.1	8.3	#429	#12
		2	418	375	8.1	8.5	#455	#7
		3	419	365	8.1	8.3	#303	#7
6-26-34	25APR88		413	375	8.0	8.5	#362	#3
		1	413	375	8.0	8.3	#380	#4.5
		2	413	375	8.0	8.5	#422	#1
		3	414	375	8.0	8.4	#477	#2
6-26-35A	25APR88		382	386	8.0	8.2	#373	#4
		1	384	386	8.0	8.3	#346	#5
		2	385	386	8.0	8.3	#344	#4
		3	385	386	8.0	8.3	#324	#3
6-26-35C	25APR88		441	408	8.1	8.2	#240	#2
		1	442	408	8.1	8.2	#388	#2
		2	443	408	8.1	8.2	#296	#5
		3	443	408	8.1	8.2	#235	#4

TABLE 13. TOX Results for NRDW Well 699-25-34B

<u>Replicate No.</u>	<u>ppb</u>
Blank	23.5
1	13.0(a)
2	4.2(a)
3	-0.5(a)

(a) Beneath contractual
detection limit.

TABLE 1. Results for WOV Vol 1 593-25-346

Reflector No.	Reflector No.
Blank	Blank
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
15	15
16	16
17	17
18	18
19	19
20	20
21	21
22	22
23	23
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41	41
42	42
43	43
44	44
45	45
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47	47
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62	62
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67	67
68	68
69	69
70	70
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72	72
73	73
74	74
75	75
76	76
77	77
78	78
79	79
80	80
81	81
82	82
83	83
84	84
85	85
86	86
87	87
88	88
89	89
90	90
91	91
92	92
93	93
94	94
95	95
96	96
97	97
98	98
99	99
100	100

(a) Strength contrast
Detection limit

1301-N LIQUID WASTE DISPOSAL FACILITY

E. J. Jensen

Progress made and data obtained from April 1 to June 30, 1988, by the RCRA Compliance Ground-Water Monitoring Project for the 1301-N Liquid Waste Disposal Facility (LWDF) is contained in this section. The Westinghouse Hanford is in the process of reviewing a draft copy of the Interim Status Detection-Level Ground-Water Monitoring Plan for the 1301-N Liquid Waste Disposal Facility.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

One well was drilled and installed during this reporting period, and the results of several aquifer tests were analyzed. Details of these activities are described below.

Drilling

The installation of well 199-N-69 was completed during this reporting period. The purpose of this well is to monitor the bottom of the uppermost aquifer, which extends upward from the top of the Ringold clay into the sands and gravels. This well is located within 35 ft of well 199-N-67 on the downgradient side of the 1301-N LWDF. The well location map in Figure 11 illustrates the proximity of these wells to the 1301-N LWDF. A Site Safety and Health Plan was developed before drilling began. The well construction specifications were developed by Westinghouse Hanford, and KEH provided the drilling services.

The cable-tool drilling progressed slowly because of the location within a radiation zone, and some of the drill cuttings had to be placed in drums. The sediments in the borehole were mostly gravels, which also reduced the drilling rate. The contact between the Hanford and the Ringold formations was encountered at 42 ft below the land surface. This contact is distinct in the 100-N Area because the overlying Hanford formation is olive gray and the Ringold Formation is dark brown. The water table was encountered at 67.5 ft below the land surface on May 13, 1988. The Ringold clay was determined to exist at 100 ft below the land surface, and the hole was drilled a short

FIGURE 11. Well Location Map for the 100-N Area

distance into the Ringold clay layer to 104 ft. At this point, drilling was halted, and the geophysical probes were run in the borehole. The borehole was then backfilled with sand to the top of the clay layer. A 10-slot stainless steel screen was set on this sand pack from 100 to 90 ft below the land surface. The well was completed by June 7, 1988. The casing elevation and coordinates will be surveyed when the remaining two wells have been completed. The Well Completion/Inspection Report is provided in Figure 12. The as-built diagram and geologic column can be examined in Figure 13. The geologist and driller's logs are presented in Appendix A.

Hydrogeologic Characterization

Several important characterization studies were conducted during the reporting period. These studies, which include collection of sediment samples during drilling, borehole geophysical logging, water-level measurements, and analysis of several aquifer tests, are described below.

Sediment samples were collected at regular 5-ft intervals during drilling, as stipulated in the draft compliance plan. The grain-size distribution, color, and mineralogic content of the samples were studied in the field by the geologist and recorded on log forms (Appendix A). The samples were also tested with hydrochloric acid in the field to obtain an indication of the calcium carbonate content.

Three borehole geophysical probes were run in well 199-N-69 after it had been drilled and before the well completion was started. The probes used were the neutron epithermal neutron, gamma gamma (density), and natural gamma. These three logs were used because of their ability to provide meaningful data through the carbon steel casing and in the unsaturated zone. Copies of these logs are included in Appendix A.

The water table in the 100-N Area was defined by a series of monthly water-level measurements taken from 44 nearby wells. The water-table maps for April, May, and June 1988 can be examined in Figures 14, 15, and 16, respectively.

Aquifer testing and development were performed on wells 199-N-64, 199-N-67, and 199-N-69. A step-drawdown test was followed by a constant-discharge test in two of the three wells. Well 199-N-67 pumped dry because

WELL COMPLETION/INSPECTION REPORT									
Specification No. <u>10-014-01</u> Rev. No. <u>0</u>				Well No. <u>199-N-69</u> Temp. Well No. <u>N/A</u>					
Project <u>u-014</u>				Coordinates _____					
Location <u>1301-N Grib</u>				Casing Elevation _____					
Driller <u>Louis Watkins</u>				Ground Elevation _____					
Drilling Co. <u>Quisier Drilling (K&H)</u>				DRILLING METHOD					
Geologist <u>Karen R. Oster</u>				Rotary Air <u>N/A</u> Mud <u>N/A</u>					
COMPLETION DATA				Cable Tool <u>D</u> <u>N/A</u> H <u>0'-104'</u>					
Drilled Depth <u>104' L.L.S.</u> Compl Depth <u>100' b.l.s.</u>				Drilling Fluid <u>100-N Drilling Supply Water</u>					
Date Started <u>4/29/EE</u> Completed <u>6/7/EE</u>				Other _____					
Static Water Level/Date <u>67.5' b.l.s. / 5/13/EE</u>									
GEOPHYSICAL LOGGING			PERFORATIONS			AQUIFER TESTING			
Sondes	Interval	Date	Type	N/A	Type <u>Step drawdown / Constant Discharge</u>				
Density	<u>102'-2'</u>	<u>5/17/EE</u>	Depth	Schedule	Length of test <u>5 hours</u>				
Neutron	<u>102'-4'</u>	<u>5/17/EE</u>	-	<u>N/A</u>	Volume Pumped <u>13900 gallons</u>				
Nat. Gamma	<u>102'-3'</u>	<u>5/17/EE</u>	-	<u>N/A</u>	Drawdown <u>18.55'</u>				
			-	<u>N/A</u>					
INSPECTION RESULTS									
CLEANING					MATERIAL STORAGE/PACKING				
Inspection Method <u>visual</u>					Inspection Method <u>visual</u>				
Acceptance Criteria <u>spec 4.1.4.2.7.1</u>					Acceptance Criteria <u>spec 4.0.7.3</u>				
Drilling Tools/Rig <u>KRO</u> Accept <u>KRO</u> Reject _____					Material Handling/Storage <u>KRO</u> Accept <u>KRO</u> Reject _____				
Temporary Materials <u>KRO</u> Accept <u>KRO</u> Reject _____					Material Packing <u>KRO</u> Accept <u>KRO</u> Reject _____				
Permanent Materials <u>KRO</u> Accept <u>KRO</u> Reject _____					Performed by <u>Karen R. Oster</u> Date <u>5/19/EE</u>				
Performed by <u>Karen R. Oster</u> Date <u>5/19/EE</u>					LUBRICANTS/ADDITIVES				
SCREEN					Inspection Method <u>visual</u>				
Type <u>6 in. type 304 stainless steel</u> Length <u>10 2 1/2'</u>					Acceptance Criteria <u>spec 7.2</u>				
Slot Size <u>10 mesh (0.010-inch)</u>					Identify _____ Accept _____ Reject _____				
Depth(s) <u>100' - 90'</u>					Tool Lubricant <u>Crude</u> <u>KRO</u> Accept <u>KRO</u> Reject _____				
Inspection Method <u>visual</u> as per spec #s. <u>4.2.3</u>					Additives <u>Drilling Water</u> <u>KRO</u> Accept <u>KRO</u> Reject _____				
Acceptance Criteria <u>4.2.3</u>					Performed by <u>Karen R. Oster</u> Date <u>5/19/EE</u>				
M&TE/ID <u>KRO</u> Accept <u>KRO</u> Reject _____					ANNULAR SEAL				
Performed by <u>Karen R. Oster</u> Date <u>5/19/EE</u>					Inspection Method <u>visual</u>				
CASING					Acceptance Criteria <u>4.2.6.4.2.7.4.2.8.4.2.9</u>				
Type	Size	Placement	Type		Interval	Volume	Accept	Reject	
6" Sch 10S, ASTM A312	12"	90' - +2.5'	Sand (60-40/40)	104' - 78.5'	10.5 FT ³	KRO	KRO	KRO	
304 Stainless Steel	-	-	Ben. Peilers	78.5' - 74'	1.24 FT ³	KRO	KRO	KRO	
			Ben. Slurry	74' - 21'	39.26 FT ³	KRO	KRO	KRO	
			Cement Grout	21' - 2'	212.7 FT ³	KRO	KRO	KRO	
Inspection Method <u>visual</u>					M&TE/ID _____				
Acceptance Criteria <u>spec 4.2.4</u>					Performed by <u>Karen R. Oster</u> Date <u>6/3/EE</u>				
M&TE/ID <u>KRO</u> Accept <u>KRO</u> Reject _____					WELL PROTECTION				
Performed by <u>Karen R. Oster</u> Date <u>5/20/EE</u>					Inspection Method <u>visual</u>				
STRAIGHTNESS TEST					Acceptance Criteria <u>4.2.10 5.3.2</u>				
Inspection Method <u>visual</u>					Protective Posts <u>KRO</u> Accept <u>KRO</u> Reject _____				
Acceptance Criteria <u>Shinco Screenlogs to bottom</u>					Locks <u>KRO</u> Accept <u>KRO</u> Reject _____				
Accept <u>KRO</u> Reject _____					Performed by <u>Karen R. Oster</u> Date <u>5/3/EE</u>				
Performed by <u>Karen R. Oster</u> Date <u>5/20/EE</u>					OTHER (check if performed) (mark N/A if not applicable)				
<u>N/A</u> Well Abandonment <u>N/A</u> Downhole TV Inspection <u>KRO</u> Complete As-Built Diagram, Driller's/Geologist's Logs					Performed by <u>Karen R. Oster</u> Date <u>6/7/EE</u>				
<u>KRO</u> Well Development									

KR Oster 7/10/EE J.L. Matheson 7-13-77

FIGURE 12. Completion/Inspection Report for Well 199-N-69

A-1800-186 (3/87)

FIGURE 13. As-Built Diagram and Geologic Column for Well 199-N-69

FIGURE 14. Water-Table Map for the 100-N Area, April 1988

FIGURE 15. Water-Table Map for the 100-N Area, May 1988

FIGURE 16. Water-Table Map for the 100-N Area, June 1988

of the large pump that was used, and therefore a constant-discharge test was not performed. Table 14 lists some of the information about each test. Data from the tests were plotted on a residual-drawdown plot to calculate the transmissivity of the aquifer. The calculated transmissivity values are shown in Table 15.

Initial Water Quality Analyses

A ground-water sample was taken from well 199-N-69 shortly after it was completed to obtain information about the water quality before aquifer testing is performed. After the well was developed with the bailer from the drill rig, the sample was taken until the water was relatively clear. Then the sample was obtained with a Teflon^(a) bailer and taken to the UST for analysis. The sample was analyzed for gross beta; gross alpha; cobalt-60; cesium-137; ruthenium-106; tritium; strontium-90; plutonium-238, 239, 240; and volatile organic chemicals. The results of these analysis are shown in Table 16.

A composite ground-water sample was taken from wells 199-N-67 and 199-N-69 during pumping for aquifer testing and well development. These samples will be analyzed during the next quarter.

TABLE 14. Aquifer Tests on the New Wells at the 1301-N LWDF

<u>Well Number</u>	<u>Date</u>	<u>Length of Constant Discharge, h</u>	<u>Observation Well Used</u>
199-N-64	05/10/88, 05/11/88	6	None
199-N-67	05/16/88	--	None
199-N-69	06/09/88	5	199-N-67

TABLE 15. Transmissivity Values for Wells at the 1301-N LWDF

<u>Well Number</u>	<u>Transmissivity (ft²/d)</u>
199-N-64	7751
199-N-67	8366

(a) Teflon® is a registered tradename of E. I. du Pont de Nemours and Company, Wilmington, Delaware.

TABLE 16. Initial Ground-Water Analysis from Well 199-N-69
(sample taken during drilling)

Constituent (unit)	Result	Overall Counting Error
Plutonium-239, 240 (pCi/L)	-0.00016	0.0407(a)
Plutonium-238 (pCi/L)	-0.00361	0.00338(a)
Tritium (pCi/L)	75,500.00	5,760.00
Gross Beta (pCi/L)	64.1	14.3
Gross Alpha (pCi/L)	10.6	3.03
Strontium-90 (pCi/L)	6.90	2.94
Cobalt-60 (pCi/L)	32.3	11.9
Cesium-137 (pCi/L)	3.49	5.17(a)
Ruthenium-106 (pCi/L)	-17.5	60.8(a)
Chloroform (ppb)	3	
1,1,1,Trichlorethane (ppb)	<5	

(a) Denotes less than overall counting error.

ROUTINE SAMPLING AND ANALYSIS OF THE GROUND WATER

The ground water around the 1301-N LWDF has been sampled and analyzed quarterly since December 1987. The results of the ground-water monitoring activities from this quarter are discussed below.

Collection and Analysis

Sampling and analysis were conducted on five wells surrounding the 1301-N LWDF in March 1988. The wells around the facility are sampled quarterly. Table 17 shows the sample collection schedule for 1988. An "X" under an individual month indicates that the quarterly samples were collected during that month. Although the schedule indicates that the new wells 199-N-67 and 199-N-69 are going to be sampled on a routine basis, pumps have not yet been installed to allow sampling of these wells.

Analyses performed on each sample include those for the interim primary drinking water standards given in 40 CFR 265 (EPA 1984), water quality parameters, contamination indicators, and specific dangerous waste

TABLE 17. Sample Collection Schedule for the 1301-N LWDF

<u>Well Number</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>
199-N-2			X			X			X			X
199-N-3			X			X			X			X
199-N-4			X			X			X			X
199-N-14			X			X			X			X
199-N-49			X			X			X			X
199-N-67									X			X
199-N-69												X

constituents known to have been discharged to the facility. Tritium, strontium-90, natural uranium, cobalt-60, cesium-137, and ruthenium-106 were added to the list of analyses to be performed for the June 1988 sampling. Phenols, ammonia, and hydrazine were also added at this time. These radioactive and hazardous constituents may have been discharged to the facility in the past. In addition, selected samples were collected for analysis in June 1988 for those waste constituents defined as dangerous under WAC 173-303-9905 (Ecology 1986b) for which an adequate analytical method is available. An analytical method using a lower detection limit for total organic halogen will be used on the next set of samples collected.

Discussion of Results

All analyses from March 1987 are summarized in Table 18. Table 19 contains the analytical data for constituents that were found to be above detection limits in at least one analysis. The nitrate concentration of 55,400 ppb in well 199-N-49 exceeded the U.S. Environmental Protection Agency (EPA) DWS of 45,000 ppb. Gross beta exceeded the DWS of 50 pCi/L in the five wells sampled during March 1988. The additional radionuclides added to the list of analyses for the June 1988 sampling should help identify which specific radionuclides are causing the elevated beta levels.

TABLE 18. Sample Summary for the 1301-N Liquid Waste Disposal Facility, March 1988

----- Constituent List=Contamination Indicators -----									
Constituent Code Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded			Full name	
191 CONDFLD	umho	1	40	0	700	WDOE	xxx	Specific conductance, field	
199 PHFIELD		0.1	40	0	6.5-8.6	EPAS		pH, field	
207 PH-LAB		0.01	40	0	6.5-8.6	EPAS		pH, laboratory	
C68 TOX	ppb	100	40	2	.			Total organic halogen	
C69 TOC	ppb	1000	40	0	.			Total organic carbon	
----- Constituent List=Drinking Water Standards -----									
Constituent Code Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded			Full name	
109 COLIFRM	MPN	2.2	40	40 ***	1	EPA		Coliform bacteria	
111 BETA	pCi/L	8	44	0	50	EPA	xxx	Gross beta	
121 SR-90	pCi/L	5	2	0	8	EPA		Strontium-90	
181 RADIUM	pCi/L	1	40	0	5	EPA		Total radium	
212 ALPHA	pCi/L	4	44	0	15	EPA	xxx	Gross alpha	
A08 BARIUM	ppb	8	40	0	1000	EPA		Barium	
A07 CADMIUM	ppb	2	40	39	10	EPA		Cadmium	
A08 CHROMIUM	ppb	10	40	2	50	EPA	xxx	Chromium	
A10 SILVER	ppb	10	40	40 ***	50	EPA		Silver	
A20 ARSENIC	ppb	5	40	32	50	EPA		Arsenic	
A21 MERCURY	ppb	0.1	40	40 ***	2	EPA		Mercury	
A22 SELENIUM	ppb	5	40	39	10	EPA		Selenium	
A33 ENDRIN	ppb	0.1	22	22 ***	0.2	EPA		Endrin	
A34 METHLOR	ppb	3	22	22 ***	100	EPA		Methoxychlor	
A35 TOXAENE	ppb	1	22	22 ***	5	EPA		Toxaphene	
A36 a-BHC	ppb	0.1	22	22 ***	4	EPA		Alpha-BHC	
A37 b-BHC	ppb	0.1	22	22 ***	4	EPA		Beta-BHC	
A38 g-BHC	ppb	0.1	22	22 ***	4	EPA		Gamma-BHC	
A39 d-BHC	ppb	0.1	22	22 ***	4	EPA		Delta-BHC	
A51 LEADGF	ppb	5	40	39	50	EPA		Lead (graphite furnace)	
A61 TETRANE	ppb	5	45	45 ***	5	EPA		Tetrachloromethane [Carbon Tetrachloride]	
A62 BENZENE	ppb	5	2	2 ***	5	EPA		Benzene	
A67 1,1,1-T	ppb	5	45	45 ***	200	EPA		1,1,1-Trichloroethane	
A89 TRICENE	ppb	5	45	45 ***	5	EPA		Trichloroethylene [1,1,2-Trichloroethene]	
A90 1,2-DIC	ppb	10	2	2 ***	5	EPA		1,2-Dichloroethane	
A92 DICETHY	ppb	10	2	2 ***	7	EPA		1,1-Dichloroethylene	
B08 BROMORM	ppb	10	2	2 ***	100	EPA		Bromoform [Tribromomethane]	
B13 VINYLIDE	ppb	10	2	2 ***	2	EPA		Vinyl chloride	
C72 NITRATE	ppb	600	44	0	45000	EPA	xxx	Nitrate	
C74 FLUORID	ppb	500	44	34	4000	EPA		Fluoride	
H13 2,4-D	ppb	2	22	22 ***	100	EPA		2,4-D [2,4-Dichlorophenoxyacetic acid]	
H14 2,4,6TP	ppb	2	22	22 ***	10	EPA		2,4,6-TP silvex	
H20 FBARIUM	ppb	8	44	1	1000	EPA		Barium, filtered	
H21 FCADMIU	ppb	2	44	44 ***	10	EPA		Cadmium, filtered	
H22 FCHROMI	ppb	10	44	3	50	EPA	xxx	Chromium, filtered	
H23 FSILVER	ppb	10	44	44 ***	50	EPA		Silver, filtered	
H37 FARSENI	ppb	5	44	33	50	EPA		Arsenic, filtered	
H38 FMERCUR	ppb	0.1	40	40 ***	2	EPA		Mercury, filtered	
H39 FSELENI	ppb	5	44	44 ***	10	EPA		Selenium, filtered	
H41 FLEAD	ppb	5	44	43	50	EPA		Lead, filtered	
H83 LFLUORD	ppb	20	19	0	4000	EPA		Fluoride, low DL	

TABLE 18. (contd)

Constituent List=Quality Characteristics								
Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standard	Agency Exceeded	Full name
A11	SODIUM	ppb	200	40	0	.		Sodium
A17	MANGESE	ppb	5	40	30	50	EPAS	Manganese
A19	IRON	ppb	30	40	15	300	EPAS	Iron
C67	PHENOL	ppb	10	2	2 ***	.		Phenol
C73	SULFATE	ppb	500	44	0	250000	EPAS	Sulfate
C75	CHLORID	ppb	500	44	0	250000	EPAS	Chloride
H24	FSODIUM	ppb	200	44	0	.		Sodium, filtered
H29	FMANGAN	ppb	5	44	38	50	EPAS	Manganese, filtered
H31	FIRON	ppb	30	44	28	300	EPAS	Iron, filtered
H67	LPHENOL	ppb	10	21	21 ***	.		Phenol, low DL
Constituent List=Site Specific								
Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standard	Agency Exceeded	Full name
010	CO-80	pCi/L	22.5	2	0	100	EPAR	Cobalt-80
024	CS-137	pCi/L	20	2	0	200	EPAR	Cesium-137
034	RU-106	pCi/L	172.5	2	0	30	EPAR	Ruthenium-106
124	U-CHEM	ug/L	0.725	44	0	.		Uranium, chemical
197	TC-99	pCi/L	15	40	0	900	EPAR	Technetium-99
A01	BERYLLUM	ppb	5	40	40 ***	.		Beryllium
A03	STRONTIUM	ppb	20	40	0	.		Strontium
A04	ZINC	ppb	5	40	12	5000	EPAS	Zinc
A05	CALCIUM	ppb	50	40	0	.		Calcium
A12	NICKEL	ppb	10	40	28	.		Nickel
A13	COPPER	ppb	10	40	32	1300	EPAP	Copper
A14	VANADIUM	ppb	5	40	17	.		Vanadium
A16	ANTIMONY	ppb	100	40	40 ***	.		Antimony
A18	ALUMINUM	ppb	150	40	35	.		Aluminum
A18	POTASSIUM	ppb	100	40	0	.		Potassium
A50	MAGNESIUM	ppb	50	40	0	.		Magnesium
A84	METHONE	ppb	10	45	45 ***	.		Methyl ethyl ketone
A88	1,1,2-T	ppb	5	45	45 ***	.		1,1,2-Trichloroethane
A70	PERCENE	ppb	5	45	45 ***	.		Perchloroethylene
A71	OPXYLE	ppb	5	45	45 ***	440	EPAP	Xylene-o,p
A80	CHLFORM	ppb	5	45	2	100	EPA	Chloroform [Trichloromethane]
A93	METHYCH	ppb	10	45	44	.		Methylene chloride
B14	M-XYLE	ppb	5	45	45 ***	440	EPAP	Xylene-m
C76	PHOSPHA	ppb	1000	44	44 ***	.		Phosphate
C80	AMMONIU	ppb	50	44	44 ***	.		Ammonium ion
H16	TC	ppb	1000	40	0	.		Total carbon
H17	TDS	ppb	5000	40	0	500000	EPAS	Total dissolved solids
H18	FZINC	ppb	5	44	21	5000	EPAS	Zinc, filtered
H19	FCALCIU	ppb	50	44	0	.		Calcium, filtered
H25	FNICKEL	ppb	10	44	31	.		Nickel, filtered
H26	FCOPPER	ppb	10	44	41	1300	EPAP	Copper, filtered
H27	FVANADI	ppb	5	44	23	.		Vanadium, filtered
H28	FALUMIN	ppb	150	44	43	.		Aluminum, filtered
H30	FPOTASS	ppb	100	44	0	.		Potassium, filtered
H32	FMAGNES	ppb	50	44	0	.		Magnesium, filtered
H33	FBERYLL	ppb	5	44	44 ***	.		Beryllium, filtered
H35	FSTRONT	ppb	20	44	0	.		Strontium, filtered
H36	FANTIMO	ppb	100	44	44 ***	.		Antimony, filtered
H68	HEXONE	ppb	10	45	45 ***	.		Hexone

TABLE 19. Constituents with at Least One Detected Value for the 1301-N Liquid Waste Disposal Facility, March 1988

Well name	Collection Date	Duplicate sample number	ALPHA pCi/L 4/15	ALUMNUM ppb 150/.	ARSENIC ppb 5/50	FARSENI ppb 5/50	BARIUM ppb 8/1000	FBARIUM ppb 8/1000	BETA pCi/L 8/50	FCALCIU ppb 50/.	CALCIUM ppb 50/.
1-N-2	18MAR88		*0.588	<150	<5	<5	25	20	3,920	28,300	28,800
1-N-3	18MAR88		*-0.049	209	<5	<5	117	111	5,020	102,000	104,000
1-N-4	18MAR88		*-0.293	853	8	<5	32	18	112	28,200	28,800
1-N-14	18MAR88		*0.297	<150	<5	<5	18	15	2,440	29,800	27,700
1-N-49	15MAR88		*-0.488	<150	<5	8	23	20	150	30,700	30,800

Well name	Collection Date	Duplicate sample number	CHLFORM ppb 5/100	CHLORID ppb 500/250000s	CONDFLD umho 1/700w	FLUORID ppb 500/4000	IRON ppb 30/300s	FIRON ppb 30/300s	LEADGF ppb 5/50	MAGNES ppb 50/.
1-N-2	18MAR88		#4	1,280	223	<500	119	<30	<5	5,010
1-N-3	18MAR88		#4	7,020	888	1810	2160	72	<5	18,800
1-N-4	18MAR88		<5	1,080	224	<500	5010	<30	<5	4,870
1-N-14	18MAR88		#3	940	230	<500	850	<30	<5	4,500
1-N-49	15MAR88		<5	1,000	204	<500	1180	<30	8	5,950

Well name	Collection Date	Duplicate sample number	FMAGNES ppb 50/.	FMANGAN ppb 5/50s	MANGESE ppb 5/50s	METHYCH ppb 10/.	NITRATE ppb 500/45000	PHFIELD 0.1/8.5s	FPOTASS ppb 100/.	POTASUM ppb 100/.
1-N-2	18MAR88		4,880	<5	8	<10	38,700	8.0	1,830	1,890
1-N-3	18MAR88		18,400	10	91	#8	28,400	7.7	3,190	3,250
1-N-4	18MAR88		4,480	8	120	<10	32,000	5.7	2,620	2,870
1-N-14	18MAR88		4,820	<5	18	#3	39,700	8.0	1,890	1,580
1-N-49	15MAR88		6,140	<5	<5	<10	55,400	8.3	2,910	2,870

Well name	Collection Date	Duplicate sample number	RADIUM pCi/L 1/5	SODIUM ppb 200/.	FSODIUM ppb 200/.	SULFATE ppb 500/250000s	FVANADI ppb 5/.	VANADUM ppb 5/.	ZINC ppb 5/5000s	FZINC ppb 5/5000s
1-N-2	18MAR88		*0.0531	2,750	2,710	12,800	<5	<5	9	8
1-N-3	18MAR88		*0.0761	13,000	13,000	248,000	<5	<5	8	<5
1-N-4	18MAR88		*0.1800	3,530	3,820	10,800	8	13	77	11
1-N-14	18MAR88		*-0.0336	3,200	3,550	9,770	8	7	38	12
1-N-49	15MAR88		*0.0224	4,360	4,320	9,580	15	18	17	<5

The column headers consist of : Constituent Name
Analysis Units
Contractual Detection Limit/Drinking Water Standard

Suffix

- none - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July, 1987) National Primary Drinking Water Regulations as amended by 52 FR 25890
- r - based on National Interim Primary Drinking Water Regulations, Appendix IV, EPA-570/9-78-003
- p - based on proposed Maximum Contaminant Level Goals in 50 FR 48938
- s - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143 (July, 1987) National Secondary Drinking Water Regulations
- w - based on additional Secondary Maximum Contaminant Levels given in WAC 248-54, Public Water Supplies

Data flags

- < - Less than Contractual Detection Limit, reported as Limit
- # - Less than Contractual Detection Limit, measured value reported
- * - For radioactive constituents, reported value is less than 2-sigma counting error

1324-N/NA SURFACE IMPOUNDMENT AND PERCOLATION PONDS

E. J. Jensen

This section discusses information on the progress made and the data obtained by the RCRA Compliance Ground-Water Monitoring Project for the 1324-N/NA Surface Impoundment and Percolation Ponds for this quarter.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

Drilling

No well drilling activities were performed during this reporting period.

Hydrogeologic Characterization

Hydrogeologic characterization activities conducted during the reporting period include collection of monthly water-level measurements taken from 44 wells around the 100-N Area. The water-table maps for April, May, and June were constructed using these measurements. These maps are shown in Figures 14, 15, and 16, respectively.

ROUTINE SAMPLING AND ANALYSIS OF THE GROUND WATER

The ground water around the 1324-N/NA Ponds was sampled and analyzed monthly for the first quarter starting in December 1987 and sampled quarterly thereafter. The results of the ground-water monitoring activities from this quarter are discussed below.

Collection and Analysis

Sampling and analysis was conducted on four wells surrounding the 1324-N/NA Ponds during March 1988. Table 20 shows the sample collection schedule for 1988. An "X" under an individual month indicates that the quarterly sample was collected during that month. Because sampling was rescheduled at the 1301-N/1325-N LWDF, the 1324-N Ponds will have to be sampled in early July instead of June.

Analyses performed on each sample includes those for the interim primary drinking water standards given in 40 CFR 265 (EPA 1984), water quality parameters, contamination indicators, and specific dangerous waste constituents

TABLE 20. Sample Collection Schedule for the 1324-N/NA Ponds

<u>Well Number</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>
199-N-58			X	X	X	X			X			X
199-N-59			X	X	X	X			X			X
199-N-60			X	X	X	X			X			X
199-N-61			X	X	X	X			X			X

known to have been discharged to the facility. Cobalt-60, cesium-137, ruthenium-106, and beta are being added to the list of analyses to be performed for the June 1988 sampling. Phenols, ammonia, and hydrazine will also be added at this time. These radioactive and hazardous constituents were not discharged to this facility in the past, but were probably discharged to other facilities in the 100-N Area. In addition, selected samples were analyzed in June 1988 for those waste constituents defined as dangerous under WAC 173-303-9905 (Ecology 1986b) for which an adequate analytical method is available.

Discussion of Results

All analyses from this reporting period are summarized in Table 21. Table 22 contains the analytical data for constituents that were found to be above detection limits in at least one analysis. No constituent in the samples analyzed during March 1988 exceeded the DWSs.

TABLE 21. Sample Summary for the 1324-N/NA Ponds, March 1988

----- Constituent List=Contamination Indicator Parameters -----									
Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Standard	Drinking Water Standards Agency Exceeded	Full name	
088	CONDLAB	umho	.	18	0	700	WDOE xxx	Specific conductance, laboratory	
191	CONDFLD	umho	1	18	0	700	WDOE xxx	Specific conductance, field	
199	PHFIELD		0.1	18	0	8.5-8.5	EPAS xxx	pH, field	
207	PH-LAB		0.01	18	0	8.5-8.5	EPAS xxx	pH, laboratory	
C68	TOX	ppb	100	18	0	.		Total organic halogen	
C69	TOC	ppb	1000	18	0	.		Total organic carbon	
----- Constituent List=Drinking Water Parameters -----									
Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Standard	Drinking Water Standards Agency Exceeded	Full name	
109	COLIFRM	MPN	2.2	4	4 ***	1	EPA	Coliform bacteria	
111	BETA	pCi/L	8	6	0	50	EPA	Gross beta	
181	RADIUM	pCi/L	1	4	0	5	EPA	Total radium	
212	ALPHA	pCi/L	4	6	0	15	EPA	Gross alpha	
A06	BARIUM	ppb	8	4	0	1000	EPA	Barium	
A07	CADMIUM	ppb	2	4	4 ***	10	EPA	Cadmium	
A08	CHROMIUM	ppb	10	4	2	60	EPA	Chromium	
A10	SILVER	ppb	10	4	4 ***	60	EPA	Silver	
A20	ARSENIC	ppb	5	4	4 ***	60	EPA	Arsenic	
A21	MERCURY	ppb	0.1	4	4 ***	2	EPA	Mercury	
A22	SELENIUM	ppb	5	4	4 ***	10	EPA	Selenium	
A33	ENDRIN	ppb	0.1	4	4 ***	0.2	EPA	Endrin	
A34	METHLOR	ppb	3	4	4 ***	100	EPA	Methoxychlor	
A35	TOXAENE	ppb	1	4	4 ***	5	EPA	Toxaphene	
A36	a-BHC	ppb	0.1	4	4 ***	4	EPA	Alpha-BHC	
A37	b-BHC	ppb	0.1	4	4 ***	4	EPA	Beta-BHC	
A38	g-BHC	ppb	0.1	4	4 ***	4	EPA	Gamma-BHC	
A39	d-BHC	ppb	0.1	4	4 ***	4	EPA	Delta-BHC	
A51	LEADGF	ppb	5	4	4 ***	50	EPA	Lead (graphite furnace)	
C72	NITRATE	ppb	500	5	0	45000	EPA	Nitrate	
C74	FLUORID	ppb	500	5	0	4000	EPA	Fluoride	
H13	2,4-D	ppb	2	4	4 ***	100	EPA	2,4-D [2,4-Dichlorophenoxyacetic acid]	
H14	2,4,5-TP	ppb	2	4	4 ***	10	EPA	2,4,5-TP silvex	
H20	FBARIUM	ppb	8	5	0	1000	EPA	Barium, filtered	
H21	FCADMIUM	ppb	2	5	5 ***	10	EPA	Cadmium, filtered	
H22	FCHROMIUM	ppb	10	5	5 ***	60	EPA	Chromium, filtered	
H23	FSILVER	ppb	10	5	5 ***	60	EPA	Silver, filtered	
H37	FARSENIC	ppb	5	5	5 ***	50	EPA	Arsenic, filtered	
H38	FMERCURY	ppb	0.1	4	4 ***	2	EPA	Mercury, filtered	
H39	FSELENIUM	ppb	5	5	5 ***	10	EPA	Selenium, filtered	
H41	FLEAD	ppb	5	5	5 ***	50	EPA	Lead, filtered	

TABLE 21. (contd)

----- Constituent List=Water Quality Parameters -----									
Constituent Code Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards			Full name	
					Standard	Agency	Exceeded		
A11 SODIUM	ppb	200	4	0	.			Sodium	
A17 MANGESE	ppb	5	4	2	50	EPAS	xxx	Manganese	
A19 IRON	ppb	30	4	1	300	EPAS		Iron	
C73 SULFATE	ppb	500	5	0	250000	EPAS	xxx	Sulfate	
C75 CHLORID	ppb	500	5	0	250000	EPAS		Chloride	
H24 FSODIUM	ppb	200	5	0	.			Sodium, filtered	
H29 FMANGAN	ppb	5	5	3	50	EPAS	xxx	Manganese, filtered	
H31 FIRON	ppb	30	5	4	300	EPAS		Iron, filtered	
H57 LPHENOL	ppb	10	4	4 ***	.			Phenol, low DL	

----- Constituent List=Site Specific and Other Parameters -----									
Constituent Code Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards			Full name	
					Standard	Agency	Exceeded		
A04 ZINC	ppb	5	4	0	5000	EPAS		Zinc	
A06 CALCIUM	ppb	50	4	0	.			Calcium	
A12 NICKEL	ppb	10	4	4 ***	.			Nickel	
A13 COPPER	ppb	10	4	4 ***	1300	EPAP		Copper	
A14 VANADIUM	ppb	5	4	3	.			Vanadium	
A16 ALUMNUM	ppb	150	4	4 ***	.			Aluminum	
A18 POTASUM	ppb	100	4	0	.			Potassium	
A50 MAGNES	ppb	50	4	0	.			Magnesium	
C78 PHDSPHA	ppb	1000	5	5 ***	.			Phosphate	
H18 FZINC	ppb	5	5	1	5000	EPAS		Zinc, filtered	
H19 FCALCIU	ppb	50	5	0	.			Calcium, filtered	
H25 FNICKEL	ppb	10	5	5 ***	.			Nickel, filtered	
H26 FCOPPER	ppb	10	5	5 ***	1300	EPAP		Copper, filtered	
H27 FVANADI	ppb	5	5	4	.			Vanadium, filtered	
H28 FALUMIN	ppb	150	5	5 ***	.			Aluminum, filtered	
H30 FPOTASS	ppb	100	5	0	.			Potassium, filtered	
H32 FMAGNES	ppb	50	5	0	.			Magnesium, filtered	

*** - Indicates all samples were below detection limits

xxx - Indicates that Drinking Water Standards were exceeded

EPA - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July, 1987)
National Primary Drinking Water Regulations as amended by 52 FR 25690

EPAR - based on National Interim Primary Drinking Water Regulations,
Appendix IV, EPA-570/9-78-003

EPAP - based on proposed Maximum Contaminant Level Goals in 50 FR 48938

EPAS - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143
National Secondary Drinking Water Regulations

WDOE - based on additional Secondary Maximum Contaminant Levels given in
WAC 248-54, Public Water Supplies

TABLE 22. Constituents with at Least One Detected Value for the 1324-N/NA Ponds, March 1988

Quadruplicate Contamination Indicator Parameters

Well name	Collection Date	Duplicate sample number	CONDFLD umho 1/700w	CONDLAB umho /700w	PH-LAB 0.01/8.5s	PHFIELD 0.1/8.5s	TOC ppb 1000/.	TOX ppb 100/.
1-N-58	23MAR88		1058	1040	7.89	7.9	#973	#11
		1	1054	1040	7.88	7.9	#904	#5
		2	1052	1040	7.88	7.9	#821	#12
		3	1051	1040	7.88	7.9	#859	#12
1-N-59	23MAR88		1289	1250	8.84	8.8	#888	#9
		1	1288	1250	8.71	8.8	#858	#11
		2	1259	1250	8.89	8.8	#704	#10
		3	1270	1250	8.71	8.8	#859	#4
1-N-60	23MAR88		1379	1250	7.77	8.2	#881	#11
		1	1378	1250	7.73	8.1	#727	#8
		2	1382	1250	7.88	8.1	#747	#11
		3		1250	7.74	8.1	#888	#8
1-N-61	23MAR88		1865	1870	8.41	8.4	1210	#17
		1	1873	1870	8.41	8.4	1190	#15
		2	1868	1870	8.48	8.4	1270	#18
		3	1862	1870	8.64	8.4	1280	#15

Well name	Collection Date	Duplicate sample number	ALPHA pCi/L 4/15	BARIUM ppb 8/1000	FBARIUM ppb 8/1000	BETA pCi/L 8/50	FCALCIU ppb 50/.	CALCIUM ppb 50/.	CHLORID ppb 500/25000s	CHROMIUM ppb 10/50	
1-N-58	23MAR88	1	*2.7900	18	18	*1.81	29,100	30,800	3,380	13	
	23MAR88		*-0.0501	.	18	*2.70	32,100	.	3,340	.	
1-N-59	23MAR88		*0.3180	17	16	4.43	35,100	31,400	4,090	<10	
1-N-60	23MAR88		*1.3500	23	21	5.98	47,500	45,500	3,720	<10	
1-N-61	23MAR88		*-0.0267	42	41	*3.31	75,800	78,700	8,050	10	
Well name	Collection Date	Duplicate sample number	FLUORID ppb 500/4000	IRON ppb 30/300s	FIRON ppb 30/300s	MAGNES ppb 50/.	FMAGNES ppb 50/.	FMANGAN ppb 5/50s	MANGESE ppb 5/50s	NITRATE ppb 500/45000	FPOTASS ppb 100/.
1-N-58	23MAR88	1	1050	111	<30	5,890	5,650	<5	<5	1,800	2,410
	23MAR88		1090	.	<30	.	6,110	<5	.	1,880	2,590
1-N-59	23MAR88		1030	<30	<30	6,660	7,370	42	43	2,120	3,340
1-N-60	23MAR88		1110	47	<30	8,880	9,080	<5	<5	1,980	4,380
1-N-61	23MAR88		1580	195	88	16,000	15,700	82	64	2,340	2,400
Well name	Collection Date	Duplicate sample number	POTASUM ppb 100/.	RADIUM pCi/L 1/5	SODIUM ppb 200/.	FSODIUM ppb 200/.	SULFATE ppb 500/25000s	FVANADI ppb 5/.	VANADUM ppb 5/.	ZINC ppb 5/5000s	FZINC ppb 5/5000s
1-N-58	23MAR88	1	2,550	*0.0249	193,000	190,000	412,000	<5	<5	5	5
	23MAR88		.	.	.	213,000	382,000	<5	.	.	5
1-N-59	23MAR88		3,020	*0.0521	234,000	237,000	534,000	<5	<5	7	8
1-N-60	23MAR88		4,250	*0.0647	247,000	258,000	519,000	9	8	28	<5
1-N-61	23MAR88		2,430	0.1580	347,000	322,000	910,000	<5	<5	10	9

TABLE 22. (contd)

RCRA Compliance Ground-Water Monitoring Project
1324-N/NA Surface Impoundment and Percolation Ponds
Interim Status Detection Level Program
Constituents with at least one detected value for March, 1988

The column headers consist of : Constituent Name
Analysis Units
Contractual Detection Limit/Drinking Water Standard

Suffix

- none - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July, 1987)
National Primary Drinking Water Regulations as amended by 52 FR 25690
- r - based on National Interim Primary Drinking Water Regulations,
Appendix IV, EPA-670/9-76-003
- p - based on proposed Maximum Contaminant Level Goals in 50 FR 48938
- s - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143
(July, 1987) National Secondary Drinking Water Regulations
- w - based on additional Secondary Maximum Contaminant Levels given in
WAC 248-54, Public Water Supplies

Data flags

- < - Less than Contractual Detection Limit, reported as Limit
- # - Less than Contractual Detection Limit, measured value reported
- * - For radioactive constituents, reported value is less than 2-sigma
counting error

1325-N LIQUID WASTE DISPOSAL FACILITY

E. J. Jensen

Progress made and the data obtained from April 1 to June 30, 1988, by the RCRA Compliance Ground-Water Monitoring Project for the 1325-N LWDF is contained below. A draft copy of the Interim Status Detection-Level Ground-Water Monitoring Plan for the 1325-N Liquid Waste Disposal Facility is now being reviewed by Westinghouse Hanford.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

One well was drilled and installed during this reporting period, and the results of one aquifer test were analyzed. Details of these activities are described below.

Drilling

The installation of well 199-N-70 was completed during this reporting period. The purpose of this well is to monitor the bottom of the uppermost aquifer, which extends upward from the top of the Ringold clay into the sands and gravels. This well is located within 30 ft of well 199-N-39 on the down-gradient side of the 1325-N LWDF. The well was originally planned for installation near well 199-N-32, but later examination of the sediments and contamination made it clear that the 199-N-39 site is a better choice. The well location map in Figure 11 illustrates the proximity of these wells to the 1325-N LWDF. A Site Safety and Health Plan was developed before drilling began. The well construction specifications for this well were developed by Westinghouse Hanford, and KEH provided the drilling services.

The cable-tool drilling progressed slowly because the sediments were mostly gravels. The contact between the Hanford and Ringold formations was encountered at 37 ft below the land surface. This contact is distinct in the 100-N Area because the overlying Hanford formation is olive gray and the Ringold Formation is dark brown. The water table was encountered at 58.8 ft below the land surface. The borehole contacted with the Ringold clay at 102 ft below the land surface. The hole was then drilled a short distance into the Ringold clay to 104 ft. At this point, drilling was halted, and the geophysical probes were run in the borehole. The borehole was then

back-filled with sand to just above the top of the clay layer. A 10-slot stainless steel screen was set on this sand pack from 99 to 89 ft below the land surface. The well was completed by June 1, 1988. The well completion/inspection report is shown in Figure 17. The as-built diagram and geologic column can be examined in Figure 18. The geologist and driller's logs are presented in Appendix A.

Hydrogeologic Characterization

Several important characterization studies were conducted during the reporting period. These studies included collection of sediment samples during drilling, borehole geophysical logging, water-level measurements, and aquifer testing and development.

Sediment samples were collected at regular 5-ft intervals during drilling, as stipulated in the draft compliance plan. The grain-size distribution, color, and mineralogic content of the samples were studied in the field by the geologist and recorded on log forms (Appendix A). The samples were also tested with hydrochloric acid in the field to obtain an indication of the calcium carbonate content.

Three borehole geophysical probes were run in well 199-N-70 after it had been drilled and before the well completion was started. The probes used were the neutron epithermal neutron, gamma gamma (density), and natural gamma. These three logs were used because of their ability to provide meaningful data through the carbon steel casing and in the unsaturated zone. Copies of these logs are included in Appendix A.

The water table in the 100-N Area was defined by a series of monthly water-level measurements taken from 44 nearby wells. The water-table maps for April, May, and June 1988 can be examined in Figures 14, 15, and 16, respectively.

Aquifer testing and development was performed on well 199-N-70. A step-drawdown test was followed by a constant-discharge test. Data from the test were plotted on a residual-drawdown plot to calculate the transmissivity of the aquifer. The calculated transmissivity value was 6,900 ft²/d.

WELL COMPLETION/INSPECTION REPORT																																					
Specification No. <u>W-014-CL</u> Rev. No. <u>0</u> Project <u>W-014 / DEF. WASTE MGT. PROTS.</u> Location <u>100N AREA</u> Driller <u>CRAIG WAMSLEY FELIX MURPHY</u> Drilling Co. <u>KATSKA ENGINEERING</u> Geologist <u>S. M. GOODWIN, M.A. CHAINNESS</u>		Well No. <u>199-N-70</u> Temp. Well No. <u>N/A</u> Coordinates _____ Casing Elevation _____ Ground Elevation _____																																			
COMPLETION DATA Drilled Depth <u>104.39'</u> Compl Depth <u>99.08'</u> Date Started <u>4/18/88</u> Completed <u>6/1/88</u> Static Water Level/Date <u>58.85' / 6/1/88</u>		DRILLING METHOD Rotary Air <u>N/A</u> Mud <u>N/A</u> Cable Tool <u>0</u> <u>N/A</u> <u>H</u> <u>✓</u> Drilling Fluid <u>100-N DRILL SUPPLY WATER</u> Other <u>N/A</u>																																			
GEOPHYSICAL LOGGING <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Sondes</th> <th>Interval</th> <th>Date</th> </tr> </thead> <tbody> <tr> <td>NAT. γ</td> <td>103' - 2'</td> <td>5/17/88</td> </tr> <tr> <td>NEUTRON</td> <td>103' - 4'</td> <td>5/17/88</td> </tr> <tr> <td>DENSITY</td> <td>103' - 2'</td> <td>5/17/88</td> </tr> </tbody> </table>		Sondes	Interval	Date	NAT. γ	103' - 2'	5/17/88	NEUTRON	103' - 4'	5/17/88	DENSITY	103' - 2'	5/17/88	PERFORATIONS <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Type</th> <th>N/A</th> </tr> </thead> <tbody> <tr> <td>Depth</td> <td>Schedule</td> </tr> <tr> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> </tr> </tbody> </table>		Type	N/A	Depth	Schedule																		
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AQUIFER TESTING Type <u>CONSTANT Q - STEP DRAWDOWN</u> Length of Test <u>6 HRS. ; 1 HR.</u> Volume Pumped <u>16,900 GALLONS</u> Drawdown <u>13 FT.</u>		INSPECTION RESULTS																																			
CLEANING Inspection Method <u>VISUAL</u> Acceptance Criteria <u>SECT. 4.1</u> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Accept</th> <th>Reject</th> </tr> </thead> <tbody> <tr> <td>Drilling Tools/Rig</td> <td><u>SMG</u></td> <td> </td> </tr> <tr> <td>Temporary Materials</td> <td><u>SMG</u></td> <td> </td> </tr> <tr> <td>Permanent Materials</td> <td><u>SMG</u></td> <td> </td> </tr> </tbody> </table> Performed by <u>S. M. GOODWIN</u> Date <u>4/18/88</u>			Accept	Reject	Drilling Tools/Rig	<u>SMG</u>		Temporary Materials	<u>SMG</u>		Permanent Materials	<u>SMG</u>		MATERIAL STORAGE/PACKING Inspection Method <u>VISUAL</u> Acceptance Criteria <u>SECT. 7.3</u> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Accept</th> <th>Reject</th> </tr> </thead> <tbody> <tr> <td>Material Handling/Storage</td> <td><u>SMG</u></td> <td> </td> </tr> <tr> <td>Material Packing</td> <td><u>SMG</u></td> <td> </td> </tr> </tbody> </table> Performed by <u>S. M. GOODWIN</u> Date <u>4/18/88</u>			Accept	Reject	Material Handling/Storage	<u>SMG</u>		Material Packing	<u>SMG</u>														
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SCREEN Type <u>6" 304 STAINLESS STEEL</u> Length <u>10'</u> Slot Size <u>10</u> Depth(s) <u>99.08' - 89.08'</u> Inspection Method <u>VISUAL</u> Acceptance Criteria <u>SECT. 4.2.3</u> M&TE/ID <u>PUL 300" L300-07</u> Accept <u>SMG</u> Reject <u> </u> Performed by <u>S. M. GOODWIN</u> Date <u>5/16/88</u>		LUBRICANTS/ADDITIVES Inspection Method <u>VISUAL</u> Acceptance Criteria <u>SECT. 7.2</u> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Identify</th> <th>Accept</th> <th>Reject</th> </tr> </thead> <tbody> <tr> <td>Tool Lubricant <u>NONE</u></td> <td><u>SMG</u></td> <td> </td> </tr> <tr> <td>Additives <u>NONE</u></td> <td><u>SMG</u></td> <td> </td> </tr> </tbody> </table> Performed by <u>S. M. GOODWIN</u> Date <u>4/18/88</u>		Identify	Accept	Reject	Tool Lubricant <u>NONE</u>	<u>SMG</u>		Additives <u>NONE</u>	<u>SMG</u>																										
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<u>STAINLESS STEEL</u>	<u> </u>	<u> </u>																																			
Type	Interval	Volume	Accept	Reject																																	
<u>20-40 SIFT SAND</u>	<u>104.39' - 83.4'</u>	<u>9000.0 BAGS</u>	<u>SMG</u>																																		
<u>1/2" GEN. PELLETS</u>	<u>83.4' - 78.4'</u>	<u>4500.0 BAGS</u>	<u>SMG</u>																																		
<u>GRAVULAR GENT.</u>	<u>78.4' - 18.88'</u>	<u>3550.0 BAGS</u>	<u>SMG</u>																																		
<u>CEMENT GRANT</u>	<u>18.88' - 1.35'</u>	<u>4040.0 BAGS</u>	<u>SMG</u>																																		
STRAIGHTNESS TEST Inspection Method <u>9" BALLER DOWN HOIF (11' LWS)</u> Acceptance Criteria <u>SECT. 9.3</u> Accept <u>SMG</u> Reject <u> </u> Performed by <u>F. MURPHY</u> Date <u>6/17/88</u>		WELL PROTECTION Inspection Method <u>VISUAL</u> Acceptance Criteria <u>4.2.10</u> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Accept</th> <th>Reject</th> </tr> </thead> <tbody> <tr> <td>Protective Posts</td> <td><u>SMG</u></td> <td> </td> </tr> <tr> <td>Locks</td> <td><u>SMG</u></td> <td> </td> </tr> </tbody> </table> Performed by <u>S. S. TEEL</u> Date <u>6/14/88</u>			Accept	Reject	Protective Posts	<u>SMG</u>		Locks	<u>SMG</u>																										
	Accept	Reject																																			
Protective Posts	<u>SMG</u>																																				
Locks	<u>SMG</u>																																				
OTHER (check if performed) (mark N/A if not applicable) <u>N/A</u> Well Abandonment <u>N/A</u> Downhole TV Inspection <u>SMG</u> Complete As-Built Diagram, <u>SMG</u> Well Development <u> </u> Driller's/Geologist's Logs Performed by _____ Date _____																																					

DL DALL 7/12/88 *D.L. Mathan 7-13-88*

FIGURE 17. Completion/Inspection Report for Well 199-N-70

Initial Water Quality Analyses

A ground-water sample was taken from well 199-N-70 shortly after it was completed to obtain information about the water quality before aquifer testing was performed. After the well was developed with the bailer from the drill rig, the sample was taken until the water was relatively clear. Then the sample was obtained with a Teflon bailer and taken to the UST for analysis. The sample was analyzed for gross beta; gross alpha; cobalt-60; cesium-137; ruthenium-106; tritium; strontium-90; plutonium-238, 239, 240; and volatile organic chemicals. The results of these analyses are shown in Table 23.

A composite ground-water sample was taken from well 199-N-70 during pumping for aquifer testing and well development. The analysis of these samples will be completed during the next quarter.

TABLE 23. Initial Ground-Water Analysis from Well 199-N-70
(sample taken during drilling)

<u>Constituent (unit)</u>	<u>Result</u>	<u>Overall Counting Error</u>
Plutonium-239,240 (pCi/L)	-0.00016	0.0802(a)
Plutonium-238 (pCi/L)	-0.00144	0.0802(a)
Tritium (pCi/L)	99,300.00	7,450.00
Gross Beta (pCi/L)	96.4	23.8
Gross Alpha (pCi/L)	2.73	1.86
Strontium-90 (pCi/L)	.806	.737
Cobalt-60 (pCi/L)	80.6	16.2
Cesium-137 (pCi/L)	-1.49	4.51(a)
Ruthenium-106 (pCi/L)	32.9	42.6(a)
Chloroform (ppb)	<5	
1,1,1,Trichloroethane (ppb)	<5	

(a) Denotes less than overall counting error.

ROUTINE SAMPLING AND ANALYSIS OF THE GROUND WATER

The ground water around the 1325-N LWDF has been sampled and analyzed quarterly since December 1987. The results of the ground-water monitoring activities from this quarter are discussed in the following sections.

Collection and Analysis

Sampling and analysis was conducted on 11 wells surrounding the 1325-N LWDF during March 1988. Table 24 shows the sample collection schedule for fiscal year 1988. An "X" under the individual month indicates that the quarterly sample was collected during that month. Although the schedule indicates that the new well 199-N-70 will be sampled on a routine basis, the pump has not yet been installed to allow sampling of this well.

Analyses performed on each sample includes the interim primary drinking water standards given in 40 CFR 265 (EPA 1984), water quality parameters, contamination indicators, and specific dangerous waste constituents known to have been discharged to the facility. Tritium, strontium-90, natural uranium, cobalt-60, cesium-137, and ruthenium-106 were added to the list of analysis for the June 1988 sampling. Phenols, ammonia, and hydrazine were

TABLE 24. Sample Collection Schedule for the 1325-N Liquid Waste Disposal Facility

<u>Well Number</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>
199-N-27			X			X			X			X
199-N-29		X				X			X			X
199-N-31			X			X			X			X
199-N-32			X			X			X			X
199-N-33			X			X			X			X
199-N-36			X			X			X			X
199-N-39			X			X			X			X
199-N-41			X			X			X			X
199-N-42			X			X			X			X
199-N-52			X			X			X			X
199-N-70												X
699-81-58			X			X			X			X

also added at that time. These radioactive and hazardous constituents may have been discharged to the facility in the past. In addition, selected samples will be analyzed in June 1988 for those waste constituents defined as dangerous under WAC 173-303-9905 (Ecology 1986b) for which an adequate analytical method is available. An analytical method using a lower detection limit for total organic halogens will be used on the next set of samples collected.

Discussion of Results

All analyses from March 1988 are summarized in Table 25. Table 26 contains the analytical data for constituents that were found to be above detection limits in at least one analysis. The nitrate concentration of 49,000 in well 199-N-39 exceeded the of 45,000 ppb. The coliform count was 5.1 mpn (most probable number) in well 199-N-32, which exceeds the DWS of 1 mpn. Gross beta exceeded the DWS of 50 pCi/L in the 10 wells sampled during March 1988, except for well 699-81-58, which had 0 pCi/L. The additional radionuclides added to the list of analyses for the June 1988 sampling should help to identify which specific radionuclides are causing the elevated beta levels.

During the analyses for pesticides in the ground water from well 199-N-33, the presence of a polychlorinated biphenyl (PCB) on the gas chromatograph was detected. The detection limit for PCBs by this method is not known because the instrument was calibrated for pesticides. A method to quantify the PCBs with a detection limit of 1 ppb was run on May 26, 1988. These results indicated the presence of a PCB identified as Arochlor 1016 at a concentration of 23.3 ppb. The results of PCB analyses for all wells sampled in early July have been received at the time of writing this report; no samples had PCB concentrations above the detection level of 1 ppb.

TABLE 25. Sample Summary of the 1325-N Liquid Waste Disposal Facility, March 1988

----- Constituent List=Contamination Indicator Parameters -----								
Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standard	Agency Exceeded	Full name
191	CONDFLD	umho	1	11	0	700	WDOE	Specific conductance, field
199	PHFIELD		0.1	11	0	8.6-8.6	EPAS	pH, field
207	PH-LAB		0.01	1	0	8.6-8.6	EPAS	pH, laboratory
C89	TOC	ppb	1000	1	0	.		Total organic carbon
H42	TOXLDL	ppb	20	1	0	.		Total organic halogens, low DL
----- Constituent List=Drinking Water Parameters -----								
Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standard	Agency Exceeded	Full name
109	COLIFRM	MPN	2.2	10	9	1	EPA	Coliform bacteria
111	BETA	pCi/L	8	12	0	50	EPA	Gross beta
181	RADIUM	pCi/L	1	10	0	5	EPA	Total radium
212	ALPHA	pCi/L	4	12	0	15	EPA	Gross alpha
A06	BARIUM	ppb	8	10	0	1000	EPA	Barium
A07	CADMIUM	ppb	2	10	10 ***	10	EPA	Cadmium
A08	CHROMIUM	ppb	10	10	10 ***	50	EPA	Chromium
A10	SILVER	ppb	10	10	10 ***	50	EPA	Silver
A20	ARSENIC	ppb	5	10	7	50	EPA	Arsenic
A21	MERCURY	ppb	0.1	10	10 ***	2	EPA	Mercury
A22	SELENIUM	ppb	5	10	10 ***	10	EPA	Selenium
A33	ENDRIN	ppb	0.1	10	10 ***	0.2	EPA	Endrin
A34	METHLOR	ppb	3	10	10 ***	100	EPA	Methoxychlor
A35	TOXAENE	ppb	1	10	10 ***	5	EPA	Toxaphene
A36	a-BHC	ppb	0.1	10	10 ***	4	EPA	Alpha-BHC
A37	b-BHC	ppb	0.1	10	10 ***	4	EPA	Beta-BHC
A38	g-BHC	ppb	0.1	10	10 ***	4	EPA	Gamma-BHC
A39	d-BHC	ppb	0.1	10	10 ***	4	EPA	Delta-BHC
A51	LEADGF	ppb	5	10	10 ***	50	EPA	Lead (graphite furnace)
C72	NITRATE	ppb	500	12	0	45000	EPA	Nitrate
C74	FLUORID	ppb	500	12	12 ***	4000	EPA	Fluoride
H13	2,4-D	ppb	2	10	10 ***	100	EPA	2,4-D [2,4-Dichlorophenoxyacetic acid]
H14	2,4,5TP	ppb	2	10	10 ***	10	EPA	2,4,5-TP silvex
H20	FBARIUM	ppb	8	12	0	1000	EPA	Barium, filtered
H21	FCADMIU	ppb	2	12	12 ***	10	EPA	Cadmium, filtered
H22	FCHROMI	ppb	10	12	11	50	EPA	Chromium, filtered
H23	FSILVER	ppb	10	12	12 ***	50	EPA	Silver, filtered
H37	FARSENI	ppb	5	12	9	50	EPA	Arsenic, filtered
H38	FMERCUR	ppb	0.1	11	11 ***	2	EPA	Mercury, filtered
H39	FSELENI	ppb	5	12	12 ***	10	EPA	Selenium, filtered
H41	FLEAD	ppb	5	12	12 ***	50	EPA	Lead, filtered
H83	LFLUORD	ppb	20	1	0	4000	EPA	Fluoride, low DL,

TABLE 25. (contd)

Constituent List=Water Quality Parameters								
Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standard	Agency Exceeded	Full name
A11	SODIUM	ppb	200	10	0	.		Sodium
A17	MANGENESE	ppb	5	10	9	50	EPAS	Manganese
A19	IRON	ppb	30	10	2	300	EPAS	Iron
C57	PHENOL	ppb	10	1	1 ***	.	xxx	Phenol
C73	SULFATE	ppb	500	12	0	250000	EPAS	Sulfate
C75	CHLORIDE	ppb	600	12	0	260000	EPAS	Chloride
H24	FSODIUM	ppb	200	12	0	.		Sodium, filtered
H29	FMANGAN	ppb	5	12	12 ***	50	EPAS	Manganese, filtered
H31	FIRON	ppb	30	12	12 ***	300	EPAS	Iron, filtered
Constituent List=Site Specific and Other Parameters								
Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standard	Agency Exceeded	Full name
A04	ZINC	ppb	5	10	8	5000	EPAS	Zinc
A06	CALCIUM	ppb	50	10	0	.		Calcium
A12	NICKEL	ppb	10	10	10 ***	.		Nickel
A13	COPPER	ppb	10	10	9	1300	EPAP	Copper
A14	VANADIUM	ppb	5	10	1	.		Vanadium
A16	ALUMINUM	ppb	150	10	9	.		Aluminum
A18	POTASSIUM	ppb	100	10	0	.		Potassium
A50	MAGNESIUM	ppb	50	10	0	.		Magnesium
A54	AR1016	ppb	1	1	0	0	EPAP	Arochlor 1016
A55	AR1221	ppb	1	1	1 ***	0	EPAP	Arochlor 1221
A56	AR1232	ppb	1	1	1 ***	0	EPAP	Arochlor 1232
A57	AR1242	ppb	1	1	1 ***	0	EPAP	Arochlor 1242
A58	AR1248	ppb	1	1	1 ***	0	EPAP	Arochlor 1248
A59	AR1254	ppb	1	1	1 ***	0	EPAP	Arochlor 1254
A60	AR1260	ppb	1	1	1 ***	0	EPAP	Arochlor 1260
A61	TETRANE	ppb	5	12	12 ***	5	EPA	Tetrachloromethane [Carbon Tetrachloride]
A62	BENZENE	ppb	5	1	1 ***	5	EPA	Benzene
A63	DIOXANE	ppb	500	1	1 ***	.		Dioxane
A64	METHONE	ppb	10	12	12 ***	.		Methyl ethyl ketone
A65	PYRIDINE	ppb	500	1	1 ***	.		Pyridine
A66	TOLUENE	ppb	5	1	1 ***	2000	EPAP	Toluene
A67	1,1,1-T	ppb	5	12	12 ***	200	EPA	1,1,1-Trichloroethane
A68	1,1,2-T	ppb	5	12	12 ***	.		1,1,2-Trichloroethane
A69	TRICENE	ppb	5	12	12 ***	5	EPA	Trichloroethylene [1,1,2-Trichloroethene]
A70	PERCENE	ppb	5	12	12 ***	.		Perchloroethylene
A71	OPXYLE	ppb	5	12	12 ***	440	EPAP	Xylene-o,p
A72	ACROLIN	ppb	10	1	1 ***	.		Acrolein
A73	ACRYILE	ppb	10	1	1 ***	.		Acrylonitrile
A74	BISTHER	ppb	10	1	1 ***	.		Bis(chloromethyl) ether
A75	BROMONE	ppb	10	1	1 ***	.		Bromoacetone
A76	METHBRO	ppb	10	1	1 ***	.		Methyl bromide
A77	CARBIDE	ppb	10	1	1 ***	.		Carbon disulfide
A78	CHLBENZ	ppb	10	1	1 ***	60	EPAP	Chlorobenzene

TABLE 25. (contd)

----- Constituent List=Site Specific and Other Parameters -----

Constituent Code Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded	Full name
A79 CHLTHL	ppb	10	1	1 ***	.	2-Chloroethyl vinyl ether
A80 CHLFORM	ppb	6	12	7	100 EPA	Chloroform [Trichloromethane]
A81 METHCHL	ppb	10	1	1 ***	.	Methyl chloride [Chloromethane]
A82 CHWTHL	ppb	10	1	1 ***	.	Chloromethyl methyl ether
A83 CROTONA	ppb	10	1	1 ***	.	Crotonaldehyde
A84 DIBRCHL	ppb	10	1	1 ***	0 EPAP	1,2-Dibromo-3-chloropropane
A85 DIBRETH	ppb	10	1	1 ***	.	1,2-Dibromoethane
A86 DIBRMET	ppb	10	1	1 ***	.	Dibromomethane
A87 DIBUTEN	ppb	10	1	1 ***	.	1,4-Dichloro-2-butene
A88 DICDIFM	ppb	10	1	1 ***	.	Dichlorodifluoromethane
A89 1,1-DIC	ppb	10	1	1 ***	.	1,1-Dichloroethane
A90 1,2-DIC	ppb	10	1	1 ***	5 EPA	1,2-Dichloroethane
A91 TRANDCE	ppb	10	1	1 ***	70 EPAP	trans-1,2-Dichloroethane
A92 DICETHY	ppb	10	1	1 ***	7 EPA	1,1-Dichloroethylene
A93 METHYCH	ppb	10	12	12 ***	.	Methylene chloride
A94 DICPANE	ppb	10	1	1 ***	6 EPAP	1,2-Dichloropropane
A95 DICPENE	ppb	10	1	1 ***	.	1,3-Dichloropropane
A96 NNDIEHY	ppb	10	1	1 ***	.	N,N-diethylhydrazine
A99 HYDRSUL	ppb	10	1	1 ***	.	Hydrogen sulfide
B01 IODOMET	ppb	10	1	1 ***	.	Iodomethane
B02 METHACR	ppb	10	1	1 ***	.	Methacrylonitrile
B03 METHTHI	ppb	10	1	1 ***	.	Methanethiol
B04 PENTACH	ppb	10	1	1 ***	.	Pentachloroethane
B05 1112-tc	ppb	10	1	1 ***	.	1,1,1,2-Tetrachloroethane
B06 1122-tc	ppb	10	1	1 ***	.	1,1,2,2-Tetrachloroethane
B08 BROMORM	ppb	10	1	1 ***	100 EPA	Bromoform [Tribromomethane]
B09 TRCMEOL	ppb	10	1	1 ***	.	Trichloromethanethiol
B10 TRCMFLM	ppb	10	1	1 ***	.	Trichloromonofluoromethane
B11 TRCPANE	ppb	10	1	1 ***	.	Trichloropropane
B12 123-trp	ppb	10	1	1 ***	.	1,2,3-Trichloropropane
B13 VINYLIDE	ppb	10	1	1 ***	2 EPA	Vinyl chloride
B14 M-XYLE	ppb	6	12	12 ***	440 EPAP	Xylene-m
B16 DIETHY	ppb	10	1	1 ***	.	Diethylarsine
B19 ACETILE	ppb	3000	1	1 ***	.	Acetonitrile
B61 12-dben	ppb	10	1	1 ***	.	1,2-Dichlorobenzene
B62 13-dben	ppb	10	1	1 ***	.	1,3-Dichlorobenzene
B63 14-dben	ppb	10	1	1 ***	.	1,4-Dichlorobenzene
B89 HEXCBEN	ppb	10	1	1 ***	.	Hexachlorobenzene
C04 METACRY	ppb	10	1	1 ***	.	Methyl methacrylate
C28 PENTCHB	ppb	10	1	1 ***	.	Pentachlorobenzene
C37 TETRCHB	ppb	10	1	1 ***	.	1,2,4,6-Tetrachlorobenzene
C43 TRICHLB	ppb	10	1	1 ***	.	1,2,4-Trichlorobenzene
C64 HEXACHL	ppb	10	1	1 ***	.	Hexachlorophene
C65 NAPHTHA	ppb	10	1	1 ***	.	Naphthalene
C68 123TRI	ppb	10	1	1 ***	.	1,2,3-Trichlorobenzene
C68 135TRI	ppb	10	1	1 ***	.	1,3,5-Trichlorobenzene
C69 1234TE	ppb	10	1	1 ***	.	1,2,3,4-Tetrachlorobenzene
C60 1235TE	ppb	10	1	1 ***	.	1,2,3,5-Tetrachlorobenzene
C70 CYANIDE	ppb	10	1	1 ***	.	Cyanide
C71 FORMALN	ppb	500	1	1 ***	.	Formalin
C78 PHOSPHA	ppb	1000	12	12 ***	.	Phosphate
C79 KEROLEN	ppb	10000	1	1 ***	.	Kerosene

TABLE 25. (contd)

----- Constituent List=Site Specific and Other Parameters -----							
Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded	Full name
C80	AMMONIU	ppb	50	1	1 ***	.	Ammonium ion
H05	ETHOXIO	ppb	3000	1	1 ***	.	Ethylene oxide
H08	ETHMETH	ppb	10	1	1 ***	.	Ethyl methacrylate
H16	TC	ppb	1000	1	0	.	Total carbon
H18	FZINC	ppb	5	12	11	5000 EPAS	Zinc, filtered
H19	FCALCIU	ppb	60	12	0	.	Calcium, filtered
H25	FNICKEL	ppb	10	12	12 ***	.	Nickel, filtered
H26	FCOPPER	ppb	10	12	12 ***	1300 EPAP	Copper, filtered
H27	FVANADI	ppb	5	12	1	.	Vanadium, filtered
H28	FALUMIN	ppb	150	12	12 ***	.	Aluminum, filtered
H30	FPQTASS	ppb	100	12	0	.	Potassium, filtered
H32	FMAGNES	ppb	50	12	0	.	Magnesium, filtered
H33	FBERYLL	ppb	5	1	1 ***	.	Beryllium, filtered
H35	FSTRONT	ppb	20	1	0	.	Strontium, filtered
H38	FANTIMO	ppb	100	1	1 ***	.	Antimony, filtered
H58	ALKALIN	ppb	20000	1	0	.	Total alkalinity, as CaCO3
H68	HEXONE	ppb	10	12	12 ***	.	Hexone
I21	TRIBUPH	ppb	10	1	1 ***	.	Tributylphosphoric acid

*** - Indicates all samples were below detection limits

xxx - Indicates that Drinking Water Standards were exceeded

EPA - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July, 1987)
National Primary Drinking Water Regulations as amended by 52 FR 25890

EPAR - based on National Interim Primary Drinking Water Regulations,
Appendix IV, EPA-570/9-78-003

EPAP - based on proposed Maximum Contaminant Level Goals in 50 FR 46938

EPAS - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143
National Secondary Drinking Water Regulations

WDOE - based on additional Secondary Maximum Contaminant Levels given in
WAC 248-54, Public Water Supplies

TABLE 26. Constituents with at Least One Value Above Detection Limits
for the 1325-N Liquid Waste Disposal Facility, March 1988

Well name	Collection Date	Duplicate sample number	ALKALIN ppb 20000/.	ALPHA pCi/L 4/15	ALUMNUM ppb 150/.	AR1016 ppb 1/0p	ARSENIC ppb 5/50	FARSENI ppb 5/50	BARIUM ppb 6/1000	FBARIUM ppb 6/1000
1-N-27	18MAR88		.	*0.481	<150	.	<5	<5	19	15
1-N-29	18MAR88		.	*0.868	<150	.	<5	<5	15	14
1-N-31	11MAR88		.	2.050	<150	.	<5	<5	18	21
1-N-32	11MAR88		.	1.880	<150	.	<5	<5	20	21
1-N-33	18MAR88		.	*0.882	<150	23.3	<5	<5	18	17
1-N-36	11MAR88		.	0.916	<150	.	<5	<5	20	20
	11MAR88	1	.	0.945	.	.	.	<5	.	20
1-N-39	11MAR88		.	0.878	<150	.	<5	<5	25	25
1-N-41	15MAR88		.	*0.572	<150	.	7	8	20	20
1-N-42	15MAR88		.	1.060	227	.	7	8	19	14
1-N-52	15MAR88		.	*0.339	<150	.	8	8	24	21
6-81-58	02MAR88		93,200	1.020	.	.	.	<5	.	19
Well name	Collection Date	Duplicate sample number	BETA pCi/L 8/50	FCALCIU ppb 50/.	CALCIUM ppb 50/.	CHLFORM ppb 5/100	CHLORID ppb 500/250000s	FCHROMI ppb 10/50	COLIFRM MPN 2.2/1	CONDFLD umho 1/700w
1-N-27	18MAR88		881.00	29,100	31,700	<5	1,740	<10	<2.2	190
1-N-29	18MAR88		2060.00	25,400	30,100	<5	885	<10	<2.2	164
1-N-31	11MAR88		145.00	27,500	25,400	#3	913	<10	<2.2	113
1-N-32	11MAR88		144.00	28,400	29,500	<5	1,200	<10	5.1	136
1-N-33	18MAR88		1100.00	25,400	26,800	<5	872	<10	<2.2	176
1-N-36	11MAR88		477.00	25,800	27,000	#2	1,130	<10	<2.2	105
	11MAR88	1	436.00	25,300	.	#2	1,120	<10	.	.
1-N-39	11MAR88		2040.00	30,800	31,300	<5	1,030	<10	<2.2	161
1-N-41	15MAR88		121.00	26,300	26,700	<5	1,030	<10	<2.2	191
1-N-42	15MAR88		93.10	22,500	24,000	#3	1,080	<10	<2.2	172
1-N-52	15MAR88		89.40	21,800	22,700	#3	1,250	<10	<2.2	171
6-81-58	02MAR88		*0.12	27,000	.	<5	1,320	18	.	112
Well name	Collection Date	Duplicate sample number	COPPER ppb 10/1300p	LFLUORD ppb 20/4000	IRON ppb 30/300s	MAGNES ppb 50/.	FMAGNES ppb 50/.	MANGESE ppb 5/50s	NITRATE ppb 500/45000	
1-N-27	18MAR88		<10	.	70	5,880	5,820	<5	20,800	
1-N-29	18MAR88		<10	.	32	4,850	4,390	<5	24,200	
1-N-31	11MAR88		<10	.	40	4,280	4,820	<5	15,800	
1-N-32	11MAR88		<10	.	<30	5,580	5,820	<5	29,700	
1-N-33	18MAR88		<10	.	49	4,510	4,220	<5	23,800	
1-N-36	11MAR88		<10	.	37	5,030	4,880	<5	14,800	
	11MAR88	1	.	.	.	.	4,780	.	17,900	
1-N-39	11MAR88		10	.	675	5,970	5,980	<5	49,000	
1-N-41	15MAR88		<10	.	122	5,780	5,830	<5	40,100	
1-N-42	15MAR88		<10	.	3010	5,810	5,410	19	27,000	
1-N-52	15MAR88		<10	.	<30	6,020	5,920	<5	23,700	
6-81-58	02MAR88		.	163	.	.	7,860	.	2,630	

TABLE 26. (contd)

Well name	Collection Date	Duplicate sample number	PH-LAB 0.01/8.5s	PHFIELD 0.1/8.5s	FPOTASS ppb 100/.	POTASUM ppb 100/.	RADIUM pCi/L 1/5	SODIUM ppb 200/.	FSODIUM ppb 200/.	FSTRONT ppb 20/.
1-N-27	18MAR88		.	8.6	2,780	2,780	0.1960	4,080	3,980	.
1-N-29	18MAR88		.	8.8	1,880	1,970	*-0.0135	1,580	1,470	.
1-N-31	11MAR88		.	8.5	2,480	2,250	*0.0850	1,730	1,870	.
1-N-32	11MAR88		.	8.5	3,280	3,020	*-0.0197	2,800	2,960	.
1-N-33	18MAR88		.	8.4	2,240	2,390	*-0.0384	2,780	2,580	.
1-N-38	11MAR88		.	8.2	2,190	2,270	*-0.0528	2,370	2,400	.
	11MAR88	1	.	.	2,140	.	.	.	2,340	.
1-N-39	11MAR88		.	8.2	3,030	3,150	*0.1430	3,800	3,810	.
1-N-41	15MAR88		.	8.2	3,190	3,110	*0.0168	5,520	5,560	.
1-N-42	15MAR88		.	8.4	3,130	3,100	*-0.0774	6,350	6,380	.
1-N-52	15MAR88		.	8.4	3,290	3,280	*0.0240	5,850	5,820	.
8-81-58	02MAR88		7.91	8.4	2,650	.	.	.	4,580	170

Well name	Collection Date	Duplicate sample number	SULFATE ppb 500/250000s	TC ppb 1000/.	TDC ppb 1000/.	TOXLDL ppb 20/.	FVANADI ppb 5/.	VANADUM ppb 5/.	ZINC ppb 5/5000s	FZINC ppb 5/5000s
1-N-27	18MAR88		15,700	.	.	.	8	7	8	<5
1-N-29	18MAR88		12,300	.	.	.	<5	<5	<5	<5
1-N-31	11MAR88		12,200	.	.	.	5	5	<5	<5
1-N-32	11MAR88		11,200	.	.	.	12	11	<5	<5
1-N-33	18MAR88		10,400	.	.	.	8	8	<5	<5
1-N-38	11MAR88		12,900	.	.	.	7	8	<5	<5
	11MAR88	1	13,100	.	.	.	7	.	.	<5
1-N-39	11MAR88		11,200	.	.	.	8	10	5	<5
1-N-41	15MAR88		9,910	.	.	.	22	23	68	48
1-N-42	15MAR88		10,300	.	.	.	24	33	41	<5
1-N-52	15MAR88		11,200	.	.	.	28	29	<5	<5
8-81-58	02MAR88		16,100	23,300	#213	#3	7	.	.	<5

The column headers consist of : Constituent Name
Analysis Units
Contractual Detection Limit/Drinking Water Standard

Suffix

- none - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July, 1987)
National Primary Drinking Water Regulations as amended by 52 FR 25690
- r - based on National Interim Primary Drinking Water Regulations,
Appendix IV, EPA-570/9-76-003
- p - based on proposed Maximum Contaminant Level Goals in 50 FR 46938
- s - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143
(July, 1987) National Secondary Drinking Water Regulations
- w - based on additional Secondary Maximum Contaminant Levels given in
WAC 248-54, Public Water Supplies

Data flags

- < - Less than Contractual Detection Limit, reported as Limit
- # - Less than Contractual Detection Limit, measured value reported
- * - For radioactive constituents, reported value is less than 2-sigma
counting error

216-A-29 DITCH

S. P. Luttrell

Westinghouse Hanford determined that the 216-A-29 Ditch has received hazardous constituents in the past and is regulated under RCRA. Therefore, a detection-level ground-water monitoring system will be installed in accordance with 40 CFR 265, Subpart F. Two new wells are being installed at the 216-A-29 Ditch in this fiscal year.

Activities conducted during this reporting period include drilling, aquifer testing, and partial completion of one well. A second well was also partially drilled.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

Four new wells will be drilled and constructed at the 216-A-29 Ditch (Figure 19). Drilling started on May 3, 1988, on the first of two wells to be constructed in this fiscal year.

Drilling

The status of the two new wells as of June 30, 1988, is indicated below.

Well 299-E25-34

Drilling began on June 3, 1988. The borehole was drilled to approximately 196 ft by June 30, at which point drilling became difficult. The 8-in. drive casing was removed, and the bottom section of pipe was replaced because it was dented.

Samples were collected every 5 ft. Samples were collected for moisture content determinations at 25 ft, most 5-ft intervals between 65 ft and 160 ft, and at 87 ft.

Well 299-E25-35

Drilling began on May 3, 1988. A total depth of approximately 285 ft was reached on May 31. The depth to water was approximately 264 ft. The final 4-in. screen was placed from approximately 261 to 281 ft below the land

FIGURE 19. Planned and Existing Well Locations

surface. Annular seal materials were installed up to 20 ft from the land surface by June 24. The 10- and 12-in. surface casings were temporarily left in the borehole until a surface cement seal can be installed.

Samples were collected every 5 ft. Samples were collected for moisture content determinations every 5 ft between 10 and 75 ft, between 90 and 120 ft, and at most 5-ft intervals between 195 and 220 ft. Geophysical logs were run on May 31.

Hydrogeologic Characterization

The hydrogeologic characterization effort included the collection and field description of geologic samples during drilling and conducting a hydrologic test by pumping from well 299-E25-35. According to the field descriptions, the sediments consist primarily of slightly silty sand to silty sandy gravel. Some well-defined silt lenses were present in well 299-E25-34.

A step-drawdown test was conducted to develop the well, determine the maximum discharge rate, and estimate drawdowns. The constant-discharge test was conducted afterward, on June 17. The average discharge was approximately 210 gpm, and the well was pumped for a duration of 5 h (water was discharged to the 216-A-29 Ditch at a point several hundred feet downgradient of the well location). The maximum drawdown was approximately 2.4 ft in the well 299-E25-34. Transmissivity has been estimated to be approximately 20,000 ft²/d.

ROUTINE SAMPLING AND ANALYSIS OF THE GROUND WATER

Routine sampling and analysis have not yet been initiated.

...the ... were installed at 20 ft from the land surface by June 24. The 10- and 15-ft surface casing was subsequently left in the borehole until a surface cement seal was installed.

Samples were collected every 5 ft. Samples were collected for ... between 10 and 25 ft, between 30 and 40 ft, and at most 5-ft intervals between 125 and 150 ft. (Geophysical logs were made on May 31.)

Geological Description

The hydrogeologic characteristics of the aquifer were determined by a series of geologic logs during drilling and completion. The geologic logs, ranging from well 222-125-01 to 222-125-05, indicate that the aquifer consists primarily of fine-grained sand and silt. Some well-defined silt lenses were present in well 222-125-01.

A step-down test was conducted to develop the well. The test was conducted at a constant rate, and the constant discharge rate was maintained throughout the test. The average discharge was approximately 1.5 gpm, and the well was pumped for a duration of 2 hours. The test results indicated that the maximum drawdown was approximately 2.4 ft in the well. The test results have been retained for approximately 10,000 ft.

WATER QUALITY AND ANALYSIS OF THE AQUIFER

Water sampling and analysis have not yet been initiated.

216-A-36B CRIB

S. P. Luttrell

The Washington State Department of Ecology (Ecology) imposed a Compliance Order (DE87-295) on November 2, 1987, requiring that the 216-A-36B Crib be in physical compliance with 40 CFR 265, Subpart F. The Compliance Order stated that wells must be in place, that ground-water sampling plans and procedures must be finalized, and that quarterly sampling of the monitoring system must be initiated by June 1, 1988.

This section discusses the status of activities and observations to date with regard to drilling and constructing ground-water monitoring wells, conducting hydrogeologic characterization, and routinely sampling and analyzing the ground water at the 216-A-36B Crib.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

Five new wells were drilled and constructed at the 216-A-36B Crib (Figure 20). The new wells (299-E17-14, 299-E17-15, 299-E17-16, 299-E17-17, and 299-E17-18) are discussed below. The wells were essentially completed by May 16. The wells were pumped to obtain preliminary hydrologic information; however, the data have not been analyzed. Personnel from Ecology visited the 216-A-36B site on May 3 to observe one of the tests.

Drilling

The wells were drilled with cable-tool drilling rigs. Temporary drive casing was installed during drilling and was withdrawn while the filter pack and annular seal materials were installed. The final wells consist of 4-in.-dia 20-slot (0.020-in.) stainless steel screens and casings. The 4-in.-dia screens extend approximately 18 ft below and approximately 2 ft above the water table. The screened portions of the completed wells were constructed within 8-in. telescoping screens. The 8-in. telescoping screens were placed in each well before pumping to obtain preliminary hydrologic information.

Lithologic samples were collected at a minimum of every 5 ft. Moisture content analyses were conducted by PNL on samples collected by drive barrel

FIGURE 20. Locations of Ground-Water Monitoring Wells at the 216-A-36B Crib (New locations are indicated by solid bullets.)

from intervals in which no water had been added. Samples were also collected at selected intervals for chemical analyses, which were coordinated and performed by Westinghouse Hanford. Borehole geophysical logs (gamma, neutron, and density) were run in each borehole before well construction.

Radiation protection technicians surveyed samples and equipment for radiological contamination. Four samples were analyzed for carbon-14 and tritium to confirm that the samples were not radioactive and could be handled in PNL's facilities. Ammonia was detected in some wells at concentrations that warranted respiratory protection.

The new wells were developed by bailing after construction was complete. Development water was contained in drums. Hydrostar sampling pumps^(a) were installed. It was found during sampling that well development in some of the wells had been inadequate, as discussed below.

One existing well was inspected with a borehole camera and evaluated for installation of a sampling pump.

The status of each well and other observations associated with drilling as of June 30, 1988, are indicated below. Driller's logs, geologist's logs, geophysical logs, and preliminary as-built summary diagrams for each of the new wells are presented in Appendix B.

Existing wells

Well 299-E17-10 was visually evaluated with a downhole camera for suitability for sampling pump installation. The well has debris in it that will have to be removed prior to installation of a pump.

Well 299-E17-14

The borehole was drilled from a depth of approximately 245 ft to the total depth of approximately 331 ft from April 1 to 7, 1988. Placement of the final well screen, casing, and annular seal was essentially completed by May 12. The concrete pad was installed on May 16, and guardposts were installed on May 19. Final caps and locks were placed on the well on June 15.

(a) Hydrostar™ is a tradename of Instrumentation Northwest, Inc., Redmond, Washington.

During drilling, ammonia was detected early on April 4 when the borehole was at a depth of 243 ft. Respiratory protection personnel from Westinghouse Hanford measured approximately 1000 ppm ammonia later that day when the borehole was at a depth of approximately 250 ft. No ammonia was detected that same day when the borehole was at a depth of approximately 275 ft. Ammonia was measured to be about 50 and 150 ppm on April 6, when the borehole was at depths of approximately 300 and 305 ft, respectively. No ammonia was detected while drilling the rest of the borehole.

Sediment samples were collected every 5 ft. Samples were collected and analyzed for moisture content every 5 ft to a depth of 295 ft. Samples from depths of 100 and 140 ft were analyzed for carbon-14 and tritium concentrations. The results are presented in Table 27.

The depth to water is approximately 313 ft below the land surface. The 4-in. screen extends from approximately 310 to 330 ft below the land surface. The elevations of the casing and a brass cap in the concrete pad were measured on June 10; the measurements are given in Table 28.

The well was initially bailed on May 17 to develop it. A sampling pump was set in the well on May 20; however, the pump did not work, so a new pump was installed on May 25. The new pump also did not work when the wells were sampled (see section on "Routine Sampling and Analysis of the Ground Water"). The well was to be further developed on June 6; however, the pump-setting rig that was to be used to bail the well broke down after one trip down and out of the well. A downhole video inspection of the well on June 15 revealed

TABLE 27. Concentrations of Carbon-14 and Tritium in Selected Sediments Collected from Wells Drilled at the 216-A-36B Crib. (Results are in pCi/g.)

<u>Depth, ft</u>	<u>Well Number</u>	<u>Carbon-14</u>	<u>Tritium</u>
90	299-E17-16	5.98 $\pm$ 25%	1.78 X 10 ² $\pm$ 1.84
95	299-E17-16	4.00 $\pm$ 25%	1.23 X 10 ² $\pm$ 1.54
100	299-E17-14	2.14 $\pm$ 25%	4.97 X 10 ¹ $\pm$ 1.09
140	299-E17-14	5.77 $\pm$ 25%	1.29 X 10 ² $\pm$ 1.57

TABLE 28. Surveyed Elevations of Wells, and Water-Level Measurements and Elevations Around the 216-A-36B Crib. (Water-level measurements were made on June 22, 1988.)

<u>Well Number</u>	<u>Surface Elevation, ft above MSL</u>	<u>Casing Elevation, ft above MSL</u>	<u>Depth to Water, ft</u>	<u>Water-Level Elevation, above MSL</u>
299-E17-05	--(a)	718.69	313.86	404.83
299-E17-06	--(a)	720.10	314.84	405.26
299-E17-14	719.10	722.18	316.82	405.36
299-E17-15	718.70	721.78	317.28	404.50
299-E17-16	717.78	720.58	315.47	405.11
299-E17-17	716.97	719.92	314.68	405.24
299-E17-18	717.65	720.65	315.39	405.2

(a) Not known.

debris and a mouse carcass in the water. The well was again bailed on June 16. The debris and approximately 120 gal of water were removed. The water was very turbid, and it was decided that bailing would not accomplish adequate development. A hydraulic line on the pump-setting rig broke, and hydraulic fluid was sprayed around and into the well. The upper 30 ft of the well was swabbed with clean towels to remove hydraulic fluid. A submersible pump was set in the well on June 30 to further develop the well by "over-pumping" and to clean out any hydraulic fluid that may have entered the well. The turbidity in the well was reduced to an acceptable level after 150 gal had been pumped; however, an oil film was present on the water. No oil film was present after 700 gal had been pumped.

Well 299-E17-15

The borehole was drilled from a depth of approximately 150 ft to the total depth of approximately 330 ft from April 1 to 12, 1988. Placement of the final well screen, casing, and annular seal was essentially completed by May 12. The concrete pad and guardposts were installed on May 16. Final caps and locks were placed on the well on June 15.

Ammonia was measured by Westinghouse Hanford respiratory protection personnel at approximately 700 ppm on April 1, when the borehole was at a depth of approximately 146 ft. Ammonia was not detected again in this borehole.

Sediment samples were collected every 5 ft. Samples were collected and analyzed for moisture content every 5 ft to a depth of 300 ft. Samples were also collected for selected chemical analyses every 10 ft from 150 to 190 ft and at 210 ft.

The 8-in. drive shoe came off the casing at an unknown depth in the borehole. It likely hung up on the bottom of the 10-in. casing, at a depth of approximately 147 ft.

The depth to water is approximately 314 ft below the land surface. The 4-in. screen extends from approximately 310 to 330 ft below the land surface. The elevations of the casing and a brass cap in the concrete pad were measured on June 10; the measurements are given in Table 28.

Some filter pack sand was inadvertently placed inside the 4-in. screen during construction. Before development, a sand pump was used to remove the sand. The well was bailed on May 23 and 24 to develop it. The bailing rate was approximately 3 gpm, and the duration of bailing was approximately 2 h. The development water was put into barrels. A sampling pump was installed on May 25.

Well 299-E17-16

The total depth of 337 ft was reached on March 27, 1988. Placement of the final well screen, casing, and annular seal was essentially completed by May 12. The concrete pad and guardposts were installed on May 16. Final caps and locks were placed on the well on June 15.

Samples from depths of 90 and 95 ft were analyzed for carbon-14 and tritium concentrations. The results are presented in Table 27.

The depth to water is approximately 312 ft below the land surface. The 4-in. screen extends from approximately 310 to 330 ft below the land surface. The elevations of the casing and a brass cap in the concrete pad were measured on June 10; the measurements are given in Table 28.

The well was developed by bailing on May 15. The bailing rate was approximately 2.5 to 3 gpm, and the duration of bailing was approximately 3 h. The development water was placed in barrels. A sampling pump was installed in the well on May 18.

Well 299-E17-17

The borehole was drilled from approximately 270 ft to the total depth of approximately 331 ft between April 1 and 7, 1988. Placement of the final well screen, casing, and annular seal was essentially completed by May 12. The concrete pad and guardposts were installed on May 16. Final caps and locks were placed on the well on June 15.

Sediment samples were collected every 5 ft. Samples were collected and analyzed for moisture content every 5 ft to a depth of 310 ft.

The depth to water is approximately 312 ft below the land surface. The 4-in. screen extends from approximately 310 to 330 ft below the land surface. The elevations of the casing and a brass cap in the concrete pad were measured on June 10; the measurements are given in Table 28.

The 4-in. bailer would not go past a depth of approximately 180 ft, possibly because of a dent in the casing; therefore, a 3-in. bailer was used to develop the well. The well was developed by bailing on May 18, 19, and 20. The bailing rate was approximately 1 gpm, and the duration of bailing was approximately 8 h. The site geologist noted that there was a slight oil film on the water and that the water was still murky after development. The development water was placed in barrels. A sampling pump was installed in the well on May 23.

Well 299-E17-18

The borehole was drilled from approximately 110 ft to the total depth of approximately 331 ft between April 1 and 25, 1988. Placement of the final well screen, casing, and annular seal was essentially completed by May 12. The concrete pad and guardposts were installed on May 16. Final caps and locks were placed on the well on June 15.

Sediment samples were collected every 5 ft. Samples were collected and analyzed for moisture content every 5 ft to a depth of 180 ft.

Drilling became difficult at a depth of approximately 286 ft. The 8-in. drive casing was removed on April 15. The bottom 7 to 8 ft of the casing was bent so it was replaced, and the casing was reset.

The depth to water is approximately 313 ft below the land surface. The 4-in screen extends from approximately 309 to 329 ft below the land surface. The elevations of the casing and a brass cap in the concrete pad were surveyed on June 10; the measurements are given in Table 28.

The well was developed by bailing on May 17. The bailing rate was approximately 3 gpm, and the duration of bailing was approximately 2 h. The development water was placed in barrels. A sampling pump was installed in the well on May 18.

Hydrogeologic Characterization

The hydrogeologic characterization effort included the collection and field description of geologic samples during drilling, moisture content determinations, hydrologic testing, water-chemistry analyses to determine ground-water discharge locations, and water-level measurements. The geologist's logs, which document field descriptions of geologic samples, are presented in Appendix B. Moisture content determinations are presented in Table 29.

As reported in the previous quarterly report (PNL 1988b), the sediments consist primarily of medium-to-coarse, well-sorted sand to a depth of approximately 230 ft. A prominent well-defined silt layer approximately 1-ft thick occurs at depths of from 102 to 110 ft. A lithology change to sandy gravels with a silty matrix occurs at approximately 235 ft. A series of well-developed silt layers occurs at a depth ranging from approximately 285 to 289 ft. Silty sandy gravel predominates at the water table.

Telescoping screens (8-in. dia) were set in wells 299-E17-14, 299-E17-15, 299-E17-17, and 299-E17-18. Borehole geophysical logs (gamma, neutron, and density) were run in these wells after the 8-in. screens were set (Appendix B). Ground-water samples were collected from these wells before and/or during hydrologic testing. The constituents analyzed for and the results are given in Table 30.

Hydrologic tests were conducted in all the new wells before setting the 4-in. screens and casings. Water was pumped from each well and drawdown was measured in the pumped well. Preliminary "step-drawdown" tests were

TABLE 29. Moisture Content (by weight) Data for Wells
at the 216-A-36B Crib

Depth, ft	Well Number				
	299-E17-14	299-E17-15	299-E17-16	299-E17-17	299-E17-18
5	9.6	7.1	2.6	4.4	2.9
10		4.9	3.4	4.1	2.5
15	2.8	4.3	4.8	2.0	2.0
20	7.5	2.8	1.9	1.7	1.4
25	2.9	4.0	1.7	1.4	1.3
30	2.9	2.5	1.9	1.4	1.5
35	3.4	4.3	2.2	1.5	1.5
40	9.7	3.9	4.4	1.6	1.5
45	3.3	2.9	2.8	1.4	1.6
50	3.6	3.0	2.7	1.4	1.3
55	3.0	2.9	3.1	1.7	1.6
60	3.4	2.7	3.9	1.5	1.6
65		4.2	4.8	1.8	1.9
70	6.3	3.8	6.0	1.9	1.8
75	6.3	5.0	5.8	1.7	2.1
80	7.2	3.2	4.2	2.4	
85	2.5	6.8	5.7	2.0	1.7
90	3.7	2.7	5.6	1.8	1.7
95	3.1	4.3	5.2	1.6	1.8
100	3.5	4.7	5.5	1.9	
105	4.8	6.3	5.4	1.6	2.0
110	4.4		4.6	1.5	1.9
115	4.7	4.6	3.5	1.8	2.0
120	5.9	5.5	4.9	1.8	1.9
125	5.8	6.3	3.8	1.5	1.8
130	4.9	5.3	5.1	1.8	1.6
135	5.7	6.1	4.2	2.0	1.9
140	12.2	5.6	5.2	1.7	2.1
145	6.1	6.1	3.7	1.8	1.9
150	5.9	6.0	5.1		2.2
155	6.6	7.3	5.2	1.9	2.0
160	5.3	6.2	4.9	1.7	2.6
165	5.2	6.0	4.6	2.3	1.7
170	4.8	5.3	4.5	1.6	1.5
175	4.8	5.8	4.5	1.6	1.6
180	5.0	6.1	4.5	1.6	1.7
185	6.1	5.4	4.7		
190	5.0	5.8	4.8	1.8	
195	5.2	5.9	4.9	1.8	
200	6.3	5.6	5.4	1.8	
205	5.5	5.7	4.2	3.7	
210	4.6	4.8	5.1	1.9	
215	4.9	4.8	4.6	1.9	
220	4.9	3.0	4.7	1.8	
225	5.2	5.0	6.1	1.9	

TABLE 29. (contd)

Depth, ft	Well Number				
	299-E17-14	299-E17-15	299-E17-16	299-E17-17	299-E17-18
230	5.3	5.3	6.5	2.7	
235	5.3	5.0	4.9	2.0	
240	5.8	4.7		2.0	
245	5.8	5.1	4.1	2.5	
250	5.5	3.9	4.4	2.4	
255	5.1	4.0	4.4	2.0	
260	4.4	3.9	4.2	2.2	
265	5.1	3.7		2.2	
270	4.7	3.7	4.8	2.1	
275	5.2	3.8	4.8	2.0	
280	4.2	4.3		2.1	
285	25.6	3.4	5.0	10.9	
285			4.9(a)		
290	5.5	16.6	4.9	2.7	
295	4.3		5.5		
300		5.9	5.1	3.5	
305			5.1	4.2	
310				3.8	

(a) Two samples were taken at this depth in this well.

TABLE 30. Analytic Results of Ground-Water Samples Collected Before and/or During Hydrologic Testing at the 216-A-36B Crib

Constituent, unit	Well Number			
	299-E17-14	299-E17-15	299-E17-17	299-E17-18
Total alpha, pCi/L	8.1 ± 1.5	7.9 ± 1.4	2.5 ± 0.7	3.1 ± 0.74
Total beta, pCi/L	1630 ± 180	2610 ± 280	34.7 ± 3.0	26 ± 8
Gamma scan				
Cobalt-60, pCi/L	54 ± 8.3	56 ± 9.7	5.7 ± 2.7	
Cesium-137, pCi/L	-1.3 ± 2.8	5.0 ± 4.2		-0.64 ± 2.9
Ruthenium-106, pCi/L	690 ± 73	1404 ± 110		
Tritium, pCi/L	6.4E+5 ± 2.3E+4	4.5E+5 ± 1.7E+4	1.96E+6 ± 7.2E+3	6.9E+4 ± 2600
Iodine-129, pCi/L	180 ± 12	18 ± 2.2	32.3 ± 4.2	2.4 ± 1.1
Technetium-99, pCi/L	13 ± 1.8	268 ± 17	78.6 ± 6.9	41 ± 5.0
Strontium-90, pCi/L	24.8 ± 1.3	14.1 ± 0.7	0.47 ± 0.3	0.57 ± 0.3
Volatile organics	none detected	none detected		
Acetone, ppm			0.026	
Hexone, ppm				0.005
Nitrate (NO ₃), ppm	265	220	57.5	16.8
Ammonium, ppm	<0.05	<0.05	0.18	0.07
Fluoride, ppm	0.51	0.53	0.53	0.56

conducted before the constant-discharge tests to develop the well and to predict maximum discharge rates and drawdowns. Discharge rates for the constant-discharge tests averaged from approximately 155 to approximately 175 gpm for durations of approximately 3 h. All water discharged during the tests was put in the 216-A-45 Crib. Drawdown was very small (less than 0.10 ft) in every well except 299-E17-17, in which drawdown was approximately 0.4 ft. Drawdown was not observed in observation wells because of the highly transmissive characteristics of the aquifer. The specific capacity data were used to obtain preliminary estimates of transmissivity. The transmissivity was estimated to be approximately 500,000 ft²/d at wells 299-E17-14, 299-E17-15, 299-E17-16, and 299-E17-18; and approximately 100,000 ft²/d at well 299-E17-17.

Depth-to-water measurements were made in the new wells and in two existing wells on June 22, and water-level elevations were calculated from the well elevations, which had been surveyed. The measurements, well elevations, and water-level elevations are presented in Table 28. Water-level elevations in wells at the 216-A-36B Crib and a preliminary water-table map beneath the crib are shown on Figure 21.

ROUTINE SAMPLING AND ANALYSIS OF THE GROUND WATER

A Sampling and Analysis Plan for the 216-A-36B Crib meeting the requirements of 40 CFR 265.92(a) was prepared before sampling.

Collection and Analysis

Routine sampling and analysis of ground water was initiated on May 24, with the sampling of existing wells 299-E17-5 and 299-E17-6. (It has not yet been determined whether well 299-E17-5 will be included in the detection-level monitoring system; well 299-E17-6 will not be included in the system.) Wells 299-E17-16 and 299-E17-18 were sampled on May 25, well 299-E17-17 on May 26, well 299-E17-15 on May 31, and well 299-E17-14 on June 8. Two existing wells were not sampled. These are well 299-E17-9, which has a broken pump column, and well 299-E17-10, which does not yet have a pump.

FIGURE 21. Water-Level Elevations in Wells at the 216-A-36B Crib and a Preliminary Water-Table Map Beneath the Crib, June 1988

These two wells and well 299-E17-5 are tentatively planned to be part of the ground-water monitoring system and will be evaluated before use in that system.

Water-level measurements were not made during sampling; however, the measurements were made on June 22. The water-level data are presented in Table 28.

A summary of the analytical data from wells at the 216-A-36B Crib is presented in Table 31. The data for constituents that had at least one value reported above the detection limit are presented in Table 32. The samples from some of the wells at the 216-A-36B Crib may be questionable with respect to their representativeness of ground-water conditions, as discussed below. The samples collected from well 299-E17-14 are considered not representative for the reasons indicated.

The field record forms and actual subsamples from most of the wells discussed below have been evaluated to determine whether these samples can be considered representative. The purge rates and volumes and pH and conductivity measurements were noted from the field record forms to evaluate, if possible, whether purging was adequate before collecting samples. The recommended purge volume before sampling is approximately 30 gal for these wells, based on the "three borehole volumes" guidance from the EPA Technical Enforcement Guidance Document (EPA 1986).

Subsamples were taken from the acid/base/neutral, or semivolatile samples, which are not filtered or preserved. Turbidity was measured in nephelometric turbidity units (NTU) on these subsamples. The EPA recommends in the TEGD that monitoring wells produce water with a turbidity of no more than 5 NTU in order to minimize biochemical activity and possible interference with ground-water sample quality.

Well 299-E17-14

A Hydrostar sampling pump was set in well 299-E17-14 on May 20; no water could be pumped from the well. The pump was removed, and a new pump was set on May 25. No water could be obtained by the sample collection team on May 31. The pump was removed from the well on June 6. Arrangements were made for KEH to bail water from the well as a means of purging. They

TABLE 31. Sample Analyses for the 216-A-36B Crib, May and June 1988

----- Constituent List=Contamination Indicator Parameters -----								
Constituent Code Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded			Full name
191 CONDFLD	umho	1	28	0	700	WDOE	xxx	Specific conductance, field
199 PHFIELD		0.1	28	0	6.5-8.5	EPAS		pH, field
C69 TOC	ppb	1000	25	0	.			Total organic carbon
H42 TOXLDL	ppb	20	25	0	.			Total organic halogens, low DL
----- Constituent List=Drinking Water Parameters -----								
Constituent Code Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded			Full name
109 COLIFRM	MPN	2.2	7	4	1	EPA	xxx	Coliform bacteria
111 BETA	pCi/L	8	7	0	50	EPA	xxx	Gross beta
181 RADIUM	pCi/L	1	6	0	5	EPA		Total radium
212 ALPHA	pCi/L	4	7	0	15	EPA		Gross alpha
A06 BARIUM	ppb	8	7	0	1000	EPA		Barium
A07 CADMIUM	ppb	2	7	6	10	EPA	xxx	Cadmium
A08 CHROMIUM	ppb	10	7	2	50	EPA	xxx	Chromium
A10 SILVER	ppb	10	7	7	50	EPA		Silver
A20 ARSENIC	ppb	5	7	3	50	EPA		Arsenic
A21 MERCURY	ppb	0.1	7	7	2	EPA		Mercury
A22 SELENIUM	ppb	5	7	6	10	EPA		Selenium
A33 ENDRIN	ppb	0.1	6	6	0.2	EPA		Endrin
A34 METHLOR	ppb	3	6	6	100	EPA		Methoxychlor
A35 TOXAENE	ppb	1	6	6	5	EPA		Toxaphene
A36 a-BHC	ppb	0.1	6	6	4	EPA		Alpha-BHC
A37 b-BHC	ppb	0.1	6	6	4	EPA		Beta-BHC
A38 g-BHC	ppb	0.1	6	6	4	EPA		Gamma-BHC
A39 d-BHC	ppb	0.1	6	6	4	EPA		Delta-BHC
A51 LEADGF	ppb	5	7	5	50	EPA		Lead (graphite furnace)
C72 NITRATE	ppb	500	7	0	45000	EPA	xxx	Nitrate
C74 FLUORID	ppb	500	7	0	4000	EPA		Fluoride
H13 2,4-D	ppb	2	6	6	100	EPA		2,4-D [2,4-Dichlorophenoxyacetic acid]
H14 2,4,5TP	ppb	2	6	6	10	EPA		2,4,5-TP silvex
H20 FBARIUM	ppb	8	6	0	1000	EPA		Barium, filtered
H21 FCADMIU	ppb	2	6	5	10	EPA	xxx	Cadmium, filtered
H22 FCHROMI	ppb	10	6	4	50	EPA	xxx	Chromium, filtered
H23 FSILVER	ppb	10	6	6	50	EPA		Silver, filtered
H37 FARSENI	ppb	5	6	2	50	EPA		Arsenic, filtered
H38 FMERCUR	ppb	0.1	6	6	2	EPA		Mercury, filtered
H39 FSELENI	ppb	5	6	5	10	EPA		Selenium, filtered
H41 FLEAD	ppb	5	6	5	50	EPA		Lead, filtered

TABLE 31. (contd)

Constituent List=Water Quality Parameters									
Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Standard	Agency	Exceeded	Full name
A11	SODIUM	ppb	200	7	0	.			Sodium
A17	MANGESE	ppb	5	7	1	50	EPAS	xxx	Manganese
A19	IRON	ppb	30	7	1	300	EPAS	xxx	Iron
C67	PHENOL	ppb	10	6	6 ***	.			Phenol
C73	SULFATE	ppb	500	7	0	250000	EPAS		Sulfate
C75	CHLORID	ppb	500	7	0	250000	EPAS		Chloride
H24	FSODIUM	ppb	200	6	0	.			Sodium, filtered
H29	FMANGAN	ppb	5	6	1	50	EPAS	xxx	Manganese, filtered
H31	FIRON	ppb	30	6	1	300	EPAS	xxx	Iron, filtered
H67	LPHENOL	ppb	10	1	1 ***	.			Phenol, low DL

Constituent List=Site Specific and Other Parameters									
Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Standard	Agency	Exceeded	Full name
A01	BERYLUM	ppb	5	7	7 ***	.			Beryllium
A03	STRONUM	ppb	20	7	0	.			Strontium
A04	ZINC	ppb	5	7	2	5000	EPAS		Zinc
A05	CALCIUM	ppb	50	7	0	.			Calcium
A12	NICKEL	ppb	10	7	2	.			Nickel
A13	COPPER	ppb	10	7	6	1300	EPAP		Copper
A14	VANADUM	ppb	5	7	0	.			Vanadium
A15	ANTIONY	ppb	100	7	7 ***	.			Antimony
A16	ALUMNUM	ppb	150	7	6	.			Aluminum
A18	POTASUM	ppb	100	7	0	.			Potassium
A50	MAGNES	ppb	50	7	0	.			Magnesium
A61	TETRANE	ppb	5	6	6 ***	5	EPA		Tetrachloromethane [Carbon Tetrachloride]
A62	BENZENE	ppb	5	6	6 ***	5	EPA		Benzene
A63	DIOXANE	ppb	500	6	6 ***	.			Dioxane
A64	METHONE	ppb	10	6	6 ***	.			Methyl ethyl ketone
A65	PYRIDIN	ppb	500	6	6 ***	.			Pyridine
A66	TOLUENE	ppb	5	6	6 ***	2000	EPAP		Toluene
A67	1,1,1-T	ppb	5	6	6 ***	200	EPA		1,1,1-Trichloroethane
A68	1,1,2-T	ppb	5	6	6 ***	.			1,1,2-Trichloroethane
A69	TRICENE	ppb	5	6	6 ***	5	EPA		Trichloroethylene [1,1,2-Trichloroethene]
A70	PERCENE	ppb	5	6	6 ***	.			Perchloroethylene
A71	OPXYLE	ppb	5	6	6 ***	440	EPAP		Xylene-o,p
A72	ACROLIN	ppb	10	6	6 ***	.			Acrolein
A73	ACRYILE	ppb	10	6	6 ***	.			Acrylonitrile
A74	BISTHER	ppb	10	6	6 ***	.			Bis(chloromethyl) ether
A75	BROMONE	ppb	10	6	6 ***	.			Bromoacetone
A76	METHBRO	ppb	10	6	6 ***	.			Methyl bromide
A77	CARBIDE	ppb	10	6	6 ***	.			Carbon disulfide
A78	CHLBENZ	ppb	10	6	6 ***	60	EPAP		Chlorobenzene
A79	CHLTHER	ppb	10	6	6 ***	.			2-Chloroethyl vinyl ether
A80	CHLFORM	ppb	5	6	6 ***	100	EPA		Chloroform [Trichloromethane]
A81	METHCHL	ppb	10	6	6 ***	.			Methyl chloride [Chloromethane]
A82	CHMTHER	ppb	10	6	6 ***	.			Chloromethyl methyl ether

TABLE 31. (contd)

----- Constituent List=Site Specific and Other Parameters -----								
Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards		Full name
						Standard	Agency Exceeded	
A83	CROTONA	ppb	10	6	6 ***	.		Crotonaldehyde
A84	DIBRCHL	ppb	10	6	6 ***	0	EPAP	1,2-Dibromo-3-chloropropane
A85	DIBRETH	ppb	10	6	6 ***	.		1,2-Dibromoethane
A86	DIBRMET	ppb	10	6	6 ***	.		Dibromomethane
A87	DIBUTEN	ppb	10	6	6 ***	.		1,4-Dichloro-2-butene
A88	DICDIFM	ppb	10	6	6 ***	.		Dichlorodifluoromethane
A89	1,1-DIC	ppb	10	6	6 ***	.		1,1-Dichloroethane
A90	1,2-DIC	ppb	10	6	6 ***	5	EPA	1,2-Dichloroethane
A91	TRANDE	ppb	10	6	6 ***	70	EPAP	trans-1,2-Dichloroethene
A92	DICETHY	ppb	10	6	6 ***	7	EPA	1,1-Dichloroethylene
A93	METHYCH	ppb	10	6	6 ***	.		Methylene chloride
A94	DICPANE	ppb	10	6	6 ***	6	EPAP	1,2-Dichloropropane
A95	DICPENE	ppb	10	6	6 ***	.		1,3-Dichloropropane
A96	NNDIEHY	ppb	10	6	6 ***	.		N,N-diethylhydrazine
A99	HYDRSUL	ppb	10	6	6 ***	.		Hydrogen sulfide
B01	IODOMET	ppb	10	6	6 ***	.		Iodomethane
B02	METHACR	ppb	10	6	6 ***	.		Methacrylonitrile
B03	METHTHI	ppb	10	6	6 ***	.		Methanethiol
B04	PENTACH	ppb	10	6	6 ***	.		Pentachloroethane
B05	1112-tc	ppb	10	6	6 ***	.		1,1,1,2-Tetrachloroethane
B06	1122-tc	ppb	10	6	6 ***	.		1,1,2,2-Tetrachloroethane
B08	BROMORM	ppb	10	6	6 ***	100	EPA	Bromoform [Tribromomethane]
B09	TRCMEOL	ppb	10	6	6 ***	.		Trichloromethanethiol
B10	TRCMFLM	ppb	10	6	6 ***	.		Trichloromonofluoromethane
B11	TRCPANE	ppb	10	6	6 ***	.		Trichloropropane
B12	123-trp	ppb	10	6	6 ***	.		1,2,3-Trichloropropane
B13	VINYIDE	ppb	10	6	6 ***	2	EPA	Vinyl chloride
B14	M-XYLE	ppb	5	6	6 ***	440	EPAP	Xylene-m
B15	DIETHY	ppb	10	6	6 ***	.		Diethylarsine
B19	ACETILE	ppb	3000	6	6 ***	.		Acetonitrile
B61	12-dben	ppb	10	6	6 ***	.		1,2-Dichlorobenzene
B62	13-dben	ppb	10	6	6 ***	.		1,3-Dichlorobenzene
B63	14-dben	ppb	10	6	6 ***	.		1,4-Dichlorobenzene
B89	HEXCBEN	ppb	10	6	6 ***	.		Hexachlorobenzene
C04	METACRY	ppb	10	6	6 ***	.		Methyl methacrylate
C26	PENTCHB	ppb	10	6	6 ***	.		Pentachlorobenzene
C37	TETRCHB	ppb	10	6	6 ***	.		1,2,4,5-Tetrachlorobenzene
C43	TRICHLB	ppb	10	6	6 ***	.		1,2,4-Trichlorobenzene
C54	HEXACHL	ppb	10	6	6 ***	.		Hexachlorophene
C55	NAPHTHA	ppb	10	6	6 ***	.		Naphthalene
C56	123TRI	ppb	10	6	6 ***	.		1,2,3-Trichlorobenzene
C58	135TRI	ppb	10	6	6 ***	.		1,3,5-Trichlorobenzene
C59	1234TE	ppb	10	6	6 ***	.		1,2,3,4-Tetrachlorobenzene
C60	1235TE	ppb	10	6	6 ***	.		1,2,3,5-Tetrachlorobenzene
C71	FORMALN	ppb	500	6	6 ***	.		Formalin
C78	PHOSPHA	ppb	1000	7	7 ***	.		Phosphate
C79	KEROSEN	ppb	10000	6	6 ***	.		Kerosene
C80	AMMONIU	ppb	50	7	5 ***	.		Ammonium ion
H05	ETHOXID	ppb	3000	6	6 ***	.		Ethylene oxide
H06	ETHMETH	ppb	10	6	6 ***	.		Ethyl methacrylate

TABLE 31. (contd)

----- Constituent List=Site Specific and Other Parameters -----								
Constituent Code Name	Units	Detection Limit	Samples	Below Detection	Drinking Water Standards Standard Agency Exceeded		Full name	
H18 TC	ppb	1000	7	0	.		Total carbon	
H18 FZINC	ppb	5	8	4	5000	EPAS	Zinc, filtered	
H19 FCALCIU	ppb	50	8	0	.		Calcium, filtered	
H25 FNICKE	ppb	10	8	3	.		Nickel, filtered	
H26 FCOPPER	ppb	10	8	8 ***	1300	EPAP	Copper, filtered	
H27 FVANADI	ppb	5	8	0	.		Vanadium, filtered	
H28 FALUMIN	ppb	150	8	5	.		Aluminum, filtered	
H30 FPOTASS	ppb	100	8	0	.		Potassium, filtered	
H32 FMAGNES	ppb	50	8	0	.		Magnesium, filtered	
H33 FBERYLL	ppb	5	8	8 ***	.		Beryllium, filtered	
H35 FSTRONT	ppb	20	8	0	.		Strontium, filtered	
H36 FANTIMO	ppb	100	8	8 ***	.		Antimony, filtered	
H66 BROMIDE	ppb	1000	7	7 ***	.		Bromide	
H67 NITRITE	ppb	1000	7	7 ***	.		Nitrite	
H68 HEXONE	ppb	10	8	8 ***	.		Hexone	
I21 TRIBUPH	ppb	10	8	8 ***	.		Tributylphosphoric acid	

*** - Indicates all samples were below detection limits

xxx - Indicates that Drinking Water Standards were exceeded

EPA - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July, 1987)
National Primary Drinking Water Regulations as amended by 52 FR 25690

EPAR - based on National Interim Primary Drinking Water Regulations,
Appendix IV, EPA-570/9-78-003

EPAP - based on proposed Maximum Contaminant Level Goals in 50 FR 46936

EPAS - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143
National Secondary Drinking Water Regulations

WDOIE - based on additional Secondary Maximum Contaminant Levels given in
WAC 248-54, Public Water Supplies

TABLE 32. Constituents with at Least One Detected Value from Wells at the 216-A-36B Crib, May and June 1988

Quadruplicate Contamination Indicator Parameters

Well name	Collection Date	Duplicate sample number	CONDFO umho 1/700w	PHFIELD 0.1/8.5s	TOC ppb 1000/.	TOXLDL ppb 20/.
2-E17-5	24MAY88		438	7.7	#580	#8.0
		1	438	7.7	#444	<20.0
		2	438	7.8	#549	#9.0
		3	438	7.7	#540	#4.6
2-E17-6	24MAY88		282	7.6	#364	#8.0
		1	280	7.6	.	.
		2	280	7.6	.	.
		3	280	7.6	.	.
2-E17-14	08JUN88		918	7.9	#825	#9.4
		1	923	7.9	1,130	#9.6
		2	926	8.0	#832	#7.2
		3	924	8.0	#851	#19.9
2-E17-15	31MAY88		749	7.9	#878	87.1
		1	749	7.9	#628	87.2
		2	749	7.8	#830	81.6
		3	750	7.9	1,110	88.9
2-E17-16	26MAY88		500	8.2	#631	#-1.7
		1	500	8.2	#596	#4.8
		2	500	8.3	#806	#7.8
		3	499	8.3	#602	#-1.4
2-E17-17	26MAY88		390	8.3	#502	#0.5
		1	390	8.3	#505	#1.8
		2	390	8.3	#480	#2.0
		3	390	8.4	#654	#-2.6
2-E17-18	26MAY88		236	7.6	#534	#15.9
		1	236	7.6	#500	#0.8
		2	236	7.6	#482	#8.7
		3	236	7.6	#509	#5.6

TABLE 32. (contd)

Well name	Collection Date	Duplicate sample number	ALPHA pCi/L 4/15	FALUMIN ppb 150/.	ALUMNUM ppb 150/.	AMMONIU ppb 50/.	ARSENIC ppb 5/50	FARSENI ppb 5/50	BARIUM ppb 6/1000	FBARIUM ppb 6/1000	BETA pCi/L 8/50
2-E17-5	24MAY88		6.49	<150	<150	<50	<5	5	60	59	781.0
2-E17-6	24MAY88		1.45	<150	<150	62	<5	<5	83	76	148.0
2-E17-14	08JUN88		14.50	377	1010	110	6	6	82	76	781.0
2-E17-15	31MAY88		5.18	<150	<150	<50	5	<5	59	58	2,840.0
2-E17-16	25MAY88		3.47	<150	<150	<50	5	6	53	51	302.0
2-E17-17	26MAY88		2.69	.	<150	<50	<5	.	48	.	83.0
2-E17-18	25MAY88		3.66	<150	<150	<50	8	8	39	38	96.8

Well name	Collection Date	Duplicate sample number	FCADMIU ppb 2/10	CADMIUM ppb 2/10	FCALCIU ppb 50/.	CALCIUM ppb 50/.	CHLORID ppb 500/250000s	FCHROMI ppb 10/50	CHROMUM ppb 10/50	COLIFRM MPN 2.2/1	COPPER ppb 10/1300p
2-E17-5	24MAY88		<2	<2	58,100	63,000	4,970	<10	<10	2.2	<10
2-E17-6	24MAY88		<2	<2	35,200	38,200	4,010	<10	<10	<2.2	<10
2-E17-14	08JUN88		12	14	74,500	77,800	5,030	18	28	16.0	10
2-E17-15	31MAY88		<2	<2	77,500	79,300	4,470	55	225	<2.2	<10
2-E17-16	25MAY88		<2	<2	49,200	52,400	10,900	<10	223	<2.2	<10
2-E17-17	26MAY88		.	<2	.	38,300	5,360	.	203	<2.2	<10
2-E17-18	25MAY88		<2	<2	26,500	26,400	4,820	<10	121	16.0	<10

Well name	Collection Date	Duplicate sample number	FLUORID ppb 500/4000	IRON ppb 30/300s	FIRON ppb 30/300s	FLEAD ppb 5/50	LEADGF ppb 5/50	MAGNES ppb 50/.	FMAGNES ppb 50/.	FMANGAN ppb 5/50s	MANGESE ppb 5/50s
2-E17-5	24MAY88		679	<30	<30	<5	<5	18,400	18,400	<5	<5
2-E17-6	24MAY88		563	168	103	<5	<5	13,800	13,000	58	53
2-E17-14	08JUN88		509	5630	2470	8	13	24,500	22,800	28	55
2-E17-15	31MAY88		739	1080	411	<5	<5	19,800	18,800	30	40
2-E17-16	25MAY88		834	1040	48	<5	<5	15,500	15,000	17	34
2-E17-17	26MAY88		528	1190	.	.	6	11,700	.	.	41
2-E17-18	25MAY88		510	615	41	<5	<5	8,290	8,290	13	21

Well name	Collection Date	Duplicate sample number	NICKEL ppb 10/.	FNICKEL ppb 10/.	NITRATE ppb 500/45000	FPOTASS ppb 100/.	POTASUM ppb 100/.	RADIUM pCi/L 1/5	FSELENI ppb 5/10	SELENIUM ppb 5/10	SODIUM ppb 200/.
2-E17-5	24MAY88		<10	<10	172,000	7,660	7,660	0.1780	<5	<5	26,400
2-E17-6	24MAY88		<10	<10	46,600	6,530	6,640	.	<5	<5	20,800
2-E17-14	08JUN88		19	<10	225,000	7,440	7,010	0.2100	<5	<5	26,900
2-E17-15	31MAY88		108	49	203,000	7,460	7,440	*0.0487	<5	<5	30,400
2-E17-16	25MAY88		113	19	74,100	6,810	7,390	*0.0578	6	6	27,100
2-E17-17	26MAY88		102	.	80,800	.	6,660	*0.0886	.	<5	24,100
2-E17-18	25MAY88		62	17	27,700	5,040	5,340	*0.0899	<5	<5	19,300

TABLE 32. (contd)

Well name	Collection Date	Duplicate sample number	FSODIUM ppb 200/.	FSTRONT ppb 20/.	STRONUM ppb 20/.	SULFATE ppb 500/250000s	TC ppb 1000/.	FVANADI ppb 5/.	VANADUM ppb 5/.	ZINC ppb 5/5000s	FZINC ppb 5/5000s
2-E17-5	24MAY88		26,000	323	327	35,400	23,000	20	19	<5	<5
2-E17-6	24MAY88		20,100	217	238	23,400	29,800	6	7	<5	<5
2-E17-14	08JUN88		28,800	395	399	34,500	23,500	19	20	42	14
2-E17-15	31MAY88		29,600	360	377	37,000	24,100	14	14	9	6
2-E17-16	25MAY88		26,100	251	261	92,700	19,500	17	15	14	<5
2-E17-17	26MAY88		.	.	201	33,400	20,900	.	17	9	.
2-E17-18	25MAY88		18,800	136	139	27,100	20,800	24	17	6	<5

The column headers consist of : Constituent Name
Analysis Units
Contractual Detection Limit/Drinking Water Standard

Suffix

- none - based on Maximum Contaminant Levels given in 40 CFR Part 141 (July, 1987)
National Primary Drinking Water Regulations as amended by 52 FR 25890
- r - based on National Interim Primary Drinking Water Regulations,
Appendix IV, EPA-570/9-76-003
- p - based on proposed Maximum Contaminant Level Goals in 50 FR 46936
- s - based on Secondary Maximum Contaminant Levels given in 40 CFR Part 143
(July, 1987) National Secondary Drinking Water Regulations
- w - based on additional Secondary Maximum Contaminant Levels given in
WAC 248-64, Public Water Supplies

Data flags

- < - Less than Contractual Detection Limit, reported as Limit
- # - Less than Contractual Detection Limit, measured value reported
- * - For radioactive constituents, reported value is less than 2-sigma
counting error

attempted bailing on June 6, but their bailing rig broke down after one bail had been removed. Samples were collected from the well on June 9. The sample collection coordinator indicated that there had been debris, such as grass and tumbleweeds, in the well. The KEH drilling supervisor indicated in a conversation on June 13 that the bailer likely had debris in it because it had been sitting out for some time after having been cleaned (see previous section on "Drilling and Hydrogeologic Characterization"). The samples collected from the well are not considered representative because of these factors.

Well 299-E17-15

Approximately 20 gal were purged from well 299-E17-15 before sample collection. Both pH and conductivity appear to have stabilized before sampling, indicating that formation water may have been discharging from the pump by the time of sampling. The turbidity of the water was measured to be 3.0 NTU on a turbidimeter. This sample may be representative of ground-water conditions.

Well 299-E17-16

Approximately 5 gal were purged from this well before sampling. The pH and conductivity appear to have stabilized before the samples were collected. The sampling technicians indicated they used the high-volume filter for collecting filtered samples. The turbidity was measured to be 5.2 NTU. This sample may not be representative because of the very small purge volume.

Well 299-E17-17

Approximately 8 gal were purged from this well before sampling. The pH and conductivity appear to have stabilized before the samples were collected. The sampling technicians indicated the high-volume filter plugged up while collecting filtered samples, and they were unable to collect these samples. The turbidity was measured to be 7.0 NTU. This sample may not be representative both because of the small purge volume and the high turbidity.

Well 299-E17-18

Approximately 40 gal were purged from this well before sampling. The pH and conductivity appear to have stabilized before the samples were

collected. The sampling technicians indicated they used the high-volume filter for collecting filtered samples. The sampling pump quit operating while they were filling the last sample bottle. The turbidity was measured to be 6.4 NTU. This sample may not be representative because of the high turbidity.

Discussion of Results

The analytical results in Table 32, although preliminary, show that filtered samples exceed the DWS for chromium in well 299-E17-15. The result is 55 ppb, compared to the DWS of 50 ppb for chromium. However, chromium does not exceed EPA's proposed MCL for chromium, which is 100 ppb.

The results in Table 32 also show that cadmium exceeds both the DWS of 10 ppb and the proposed MCL of 5 ppb in well 299-E17-14, in which filtered cadmium was 12 ppb.

The results also show that nitrate exceeds the DWS of 45,000 ppb in wells 299-E17-5, 299-E17-6, 299-E17-14, 299-E17-15, 299-E17-16, and 299-E17-17. Nitrate is clearly highest in wells 299-E17-5, 299-E17-14, and 299-E17-15 with concentrations of 172,000; 225,000; and 203,000 ppb, respectively.

A comparison of filtered and unfiltered samples for metals (especially iron and chromium) shows much higher concentrations in unfiltered samples. These results further indicate the inadequacy of development in some of the wells.

Statistical analyses of the data are not warranted because only one set of data has been collected.

2101-M POND
M. A. Chamness

This section discusses the status and findings to date for drilling and constructing ground-water monitoring wells and hydrogeologic characterization at the 2101-M Pond.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

Construction of four wells began May 23, 1988, at the 2101-M Pond (Figure 22). The new wells (299-E18-1, 299-E18-2, 299-E18-3, and 299-E18-4) are discussed below. The ground-water monitoring plan for the 2101-M Pond provides the plans for drilling and constructing the wells, preliminary hydrogeologic characterization, and ground-water monitoring at the site.

Drilling

The well specifications for constructing the four wells are similar to those for other RCRA wells in the 200-East and 200-West Areas. Specific information is given below in the description of each well. Soil pH was measured using an Orion Research SA 250 Portable Meter. The status of each well as of June 30, 1988, is indicated below.

Well 299-E18-1

Drilling began on June 13, 1988. The borehole was drilled to approximately 305 ft by June 31. The water table had not yet been encountered. Samples were collected every 5 ft. Samples were analyzed for moisture content when appropriate and for soil pH from 80 to 215 ft. Results of the soil pH tests are given in Table 33. One sample was taken for heavy metal and volatile organics analysis from a depth of 195 ft.

Well 299-E18-2

Drilling began on June 2, 1988. The borehole was drilled to 330 ft, and the depth to water was 312.45 ft on June 21, 1988. Sand has since heaved into the hole and will have to be drilled out before installation of the telescoping screen. Samples were collected every 5 ft. When appropriate,

FIGURE 22. Location of Ground-Water Monitoring Wells at the 2101-M Pond

TABLE 33. Sediment pH for Samples Taken from Wells near the 2101-M Pond

<u>Well Number</u>	<u>Depth, ft</u>	<u>pH</u>	<u>Well Number</u>	<u>Depth, ft</u>	<u>pH</u>
299-E18-1	80	8.3	299-E18-2	40	7.7
	85	8.0		45	8.4
	90	8.2		50	8.3
	95	8.2		55	8.2
	100	8.3		60	8.3
	105	8.0		65	8.1
	110	8.4		70	8.1
	115	8.1		75	8.1
	120	8.5		80	8.2
	125	8.2		85	8.5
	130	8.2		90	8.1
	135	8.0		95	7.7
	140	8.1		96	7.9
	145	8.3		99	7.9
	150	7.9		100	7.9
	155	8.0		105	8.1
	160	8.2		109	8.0
	165	8.1		110	8.1
	170	8.1		115	8.8
	175	8.3		120	8.6
	180	8.0		125	8.2
	186.5	8.3		130	8.3
	190	8.4		135	8.2
	195	8.2		140	8.1
	200	8.3		145	8.8
	205	8.1		150	8.0
	210	8.1		155	8.7
	215	8.2		160	8.4
				165	8.6
				170	8.2
				175	8.4
				180	8.3
				185	8.3
				190	8.5
				193	8.3
				195	9.0
				200	9.0
				202	8.8
				205	8.3
				210	8.4
				215	9.0
				220	8.9
				221	8.5
				225	8.7
				230	8.8
				234	8.3
				235	8.6

TABLE 33. (contd)

<u>Well Number</u>	<u>Depth, ft</u>	<u>pH</u>	<u>Well Number</u>	<u>Depth, ft</u>	<u>pH</u>
299-E18-3	20	8.4	299-E18-4	160	8.8
	25	8.3		220	7.9
	30	8.6			
	35	8.0			
	40	8.0			
	45	8.3			
	50	8.3			
	55	8.2			
	60	9.1			
	62	8.1			
	65	8.4			
	70	9.1			
	75	9.1			
	84	8.0			
	85	8.0			
	90	8.0			
	95	8.2			
	97	8.6			
	100	8.4			
	105	8.4			
	110	8.8			
	120	8.8			
	125	8.8			
	130	8.9			
	135	8.9			
	140	9.1			
	145	9.1			
	150	9.0			
	155	9.2			
	160	9.0			
	165	9.0			
	170	8.9			
	175	9.2			
	180	9.1			
	185	9.1			
	194	8.1			
	195	8.1			
	200	8.3			
	205	8.3			
	210	8.3			
	225	7.5			
	230	8.7			
	235	8.0			

samples were analyzed for moisture content, and soil pH was measured from 40 to 235 ft. Soil pH results are given in Table 33.

Well 299-E18-3

Drilling began on June 7, 1988. The borehole was drilled to 331.4 ft, and depth to water was 311.52 on June 29, 1988. The 20-slot telescoping screen was installed, but the well could not be satisfactorily developed. The 20-slot screen was removed and will be replaced with a 10-slot screen. Samples were collected every 5 ft. Moisture content was analyzed when appropriate, and soil pH was measured from 20 to 235 ft. Results of the soil pH are given in Table 33. Samples were collected for analysis of heavy metals and volatile organics from depths of 45, 62, 84, 97, and 195 ft.

Well 299-E18-4

Drilling began on May 23, 1988. The borehole was drilled to 331.4 ft, and depth to water was 312.25 on June 10, 1988. Samples were collected every 5 ft. When appropriate, moisture content was measured. Soil pH was measured on only a few samples in this well. The results are given in Table 33.

Hydrogeologic Characterization

The hydrogeologic characterization effort was primarily limited to the collection and field description of geologic samples during drilling. Water levels were measured once in existing wells for background information. As built diagrams, geologist's logs, and results of geophysical logging will be included as a data package in a future report.

ROUTINE SAMPLING AND ANALYSIS OF THE GROUND WATER

Routine sampling and analysis of the ground water have not yet been initiated as part of this detection-level ground-water monitoring system.

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