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RCRA Ground-Water Monitoring Projects for Hanford Facilities: Annual Progress Report for 1988

R. M. Fruland
R. E. Lundgren

April 1989

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

Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute

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RCRA GROUND-WATER MONITORING PROJECTS FOR HANFORD FACILITIES: ANNUAL PROGRESS REPORT FOR 1988

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Prepared for
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Pacific Northwest Laboratory
Richland, Washington 99352

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PREFACE

Although constituent concentrations are compared to federal drinking water standards throughout this document, no public water supplies are drawn from the aquifer from which the samples for this study were taken. Small quantities of water drawn from the sampled aquifer are used to supply drinking water to a limited number of workers on the Hanford Site. In such cases, that water is mixed with water from uncontaminated sources, and the drinking water delivered to the workers meets all regulatory standards.

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SUMMARY

This report describes the progress during 1988 of 14 Hanford Site ground-water monitoring projects covering 16 hazardous waste facilities and 1 nonhazardous waste facility (the Solid Waste Landfill). Each of the projects is being conducted according to federal regulations based on the Resource Conservation and Recovery Act (RCRA) of 1976 (40 CFR 265 for hazardous wastes and 40 CFR 257 for nonhazardous wastes) and the State of Washington Administrative Code (WAC 173-303 for hazardous wastes and WAC 173-304 for nonhazardous wastes).

The 17 individual facilities covered are the

- 300 Area Process Trenches
- 183-H Solar Evaporation Basins
- 200 Areas Low-Level Burial Grounds--Waste Management Area (WMA) 1, WMA 2, WMA 3, and WMA 4
- Nonradioactive Dangerous Waste Landfill
- Solid Waste Landfill
- 1301-N Liquid Waste Disposal Facility (LWDF)
- 1324-N/NA Surface Impoundment and Percolation Ponds
- 1325-N LWDF
- 216-A-10 Crib
- 216-A-29 Ditch
- 216-A-36B Crib
- 216-B-3 Pond
- 2101-M Pond
- Grout Treatment Facility.

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Under 40 CFR 265.94(b)(2), an annual report containing the results of the assessment monitoring projects is required. Under 40 CFR 265.94(a)(2)(ii), an annual report is required that includes an evaluation of the indicator parameter results for each previous year. An annual report for solid waste landfills is required under WAC 173-304. This report meets those requirements.

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1.0 INTRODUCTION

This report describes the progress during 1988 of 14 Hanford Site ground-water monitoring projects covering 16 hazardous waste facilities and 1 nonhazardous waste facility (the Solid Waste Landfill). Each of the projects is being conducted according to federal regulations based on the Resource Conservation and Recovery Act (RCRA) of 1976 (40 CFR 265 for hazardous wastes and 40 CFR 257 for nonhazardous wastes) and the State of Washington Administrative Code (WAC 173-303 for hazardous wastes and WAC 173-304 for nonhazardous wastes). Under 40 CFR 265.94(b)(2), an annual report containing the results of the assessment monitoring projects is required. Under 40 CFR 265.94(a)(2)(ii), an annual report is required that includes an evaluation of the indicator parameter results for each previous year. An annual report for solid waste landfills is required under WAC 173-304. This report meets those requirements.

The work described in this annual report is being conducted by the Pacific Northwest Laboratory[a] for Westinghouse Hanford Company, both contractors for the U.S. Department of Energy.

The 17 individual facilities covered are the

- 300 Area Process Trenches
- 183-H Solar Evaporation Basins (183-H Basins)
- 200 Areas Low-Level Burial Grounds (LLBGs)--Waste Management Area (WMA) 1, WMA 2, WMA 3, and WMA 4
- Nonradioactive Dangerous Waste Landfill (NRDW)
- Solid Waste Landfill (SWL)
- 1301-N Liquid Waste Disposal Facility (LWDF)
- 1324-N/NA Surface Impoundment and Percolation Ponds (1324-N/NA Facilities)
- 1325-N LWDF

(a) Pacific Northwest Laboratory is operated by Battelle Memorial Institute for the U.S. Department of Energy under Contract DE-AC06-76RLO 1830.

- 216-A-10 Crib
- 216-A-29 Ditch
- 216-A-36B Crib
- 216-B-3 Pond (B Pond)
- 2101-M Pond
- Grout Treatment Facility.

The locations of these facilities on the Hanford Site are shown in Figure 1.1. All of the ground-water monitoring projects are under interim status regulations, and most are in their first year of background ground-water monitoring. Only the 183-H Solar Evaporation Basins and 300 Area Process Trenches are ground-water quality assessment monitoring projects. Table 1.1 provides the status of these programs as of November 30, 1988 (data collection may have occurred for some of the projects in December, but those results are not yet available).

This report provides, for each of the projects, an introduction stating the status of the project and summarizing the work conducted during calendar year 1988. This is followed by evaluation of the water-level elevations available for 1988, and evaluation of the indicator parameters for the one project that has reached this phase. For ground-water quality assessment projects, water-table evaluations are presented, followed by a summary of 1988 analytical results for constituents above drinking water standards and an assessment of the rate and movement of the contamination. In most cases, constituents are compared to primary drinking water standards (PDWS) in 40 CFR 141, which also includes the interim primary drinking water standards in Appendix III of 40 CFR 265. In general, data are not included in this report if they have appeared in previously published annual or quarterly reports (i.e., Hall 1988; PNL 1988a,b; Fruland, Bates, and Lundgren 1989a,b). Instead, the appropriate references are given.

Where appropriate, interpretive remarks (often preliminary) are included to clarify past or future conduct of the projects. Such remarks do not necessarily represent final technical consensus and are subject to modification.

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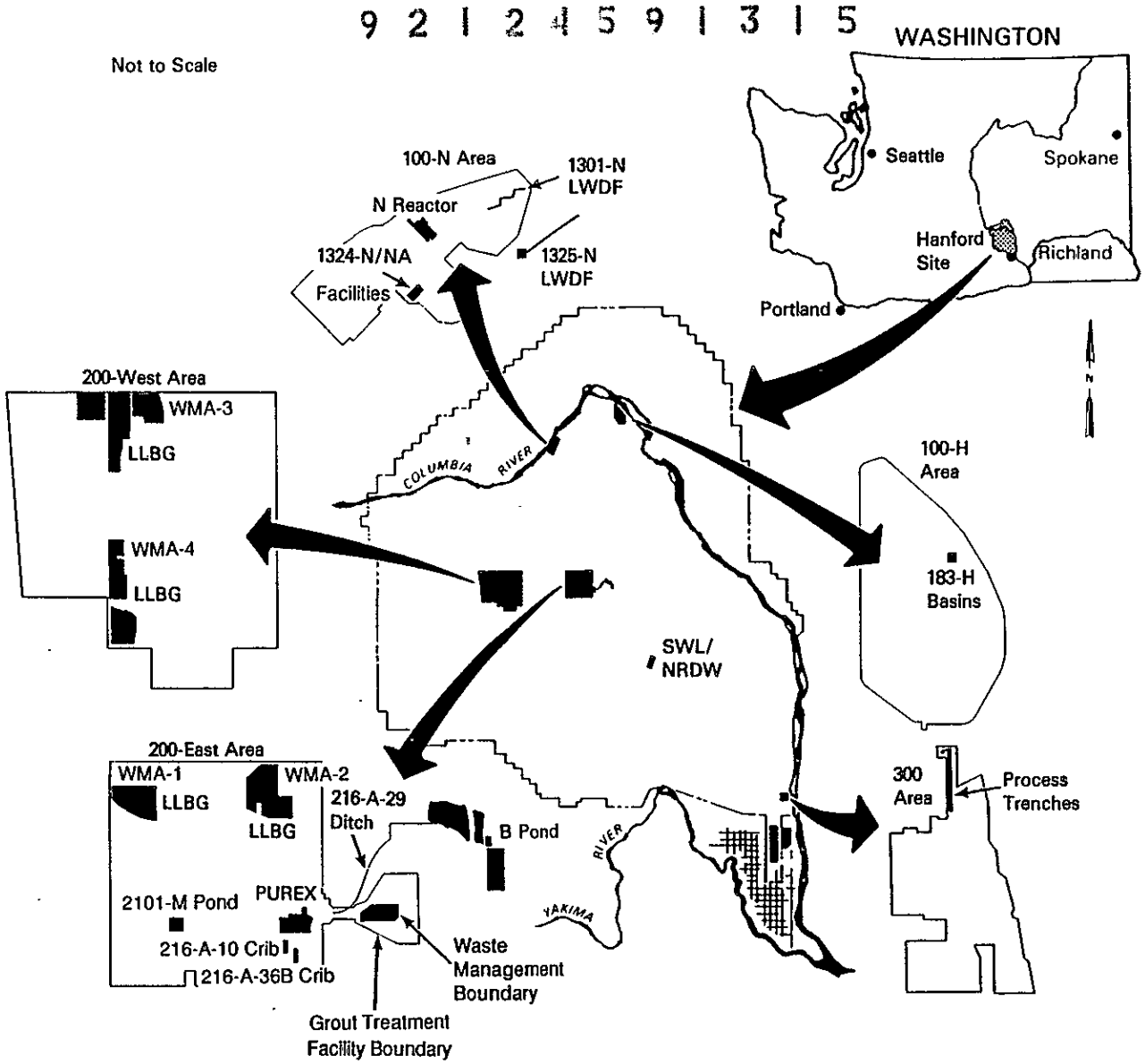

FIGURE 1.1. Map of the Hanford Site

TABLE 1.1. Status of Hanford Site Resource Conservation and Recovery Act Interim-Status Ground-Water Monitoring Projects as of November 30, 1988

Project	Background Monitoring (quarters)	Indicator Parameter Evaluation	Ground-Water Quality Assessment Monitoring
Hazardous Waste Facilities			
300 Area Process Trenches			X
183-H Solar Evaporation Basins			X
LLBG WMA-1	1		
LLBG WMA-2	1		
LLBG WMA-3	1		
LLBG WMA-4	1		
NRDW		X	
1301-N LWDF	4		
1324-N/NA Facilities	4		
1325-N LWDF	4		
216-A-10 Crib	1		
216-A-29 Ditch	1		
216-A-36B Crib	2		
216-B-3 Pond	1		
2101-M Pond	2		
Grout Treatment Facility	2		
Solid Waste Facilities			
Solid Waste Landfill	8 sampling rounds completed		

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NONREPRESENTATIVE CONSTITUENTS

There are two constituents recorded by several projects that are currently suspected of not representing true ground-water conditions. These are methylene chloride (dichloromethane), listed at WAC 173-303-9905 and 40 CFR 261, Appendix VIII, and chromium, listed at 40 CFR 265, Appendix III.

Methylene Chloride

This constituent has been found sporadically in volatile organic compound (VOC) and total organic halogen (TOX) samples since the implementation

of RCRA ground-water monitoring. Early cases were apparently caused by contaminated sample bottles; a few bladder pumps in the 100-H and 300 Area wells may also have been contaminated by methylene chloride. Incidents of methylene chloride detection decreased to only spurious events until the summer of 1988.

Beginning in June and continuing into the fall of 1988, a number of elevated methylene chloride and TOX (as a result of methylene chloride) levels have been detected across the Site. However, the occurrence is random in time and space; thus far, resampling and analysis for each well indicated the absence of methylene chloride. A number of investigations into the problem, including resampling the wells, analysis of some materials and lubricants on field vehicles, and investigation into sampling preparations, have ruled out contamination in the field from two commonly used lubricants, contamination from sample bottles, and contamination during sample preparation. The occurrence of this constituent is being carefully monitored and evaluated to determine its true source.

<u>Chromium</u>

Elevated concentrations, above 50 μg/L, of chromium in unfiltered samples have been observed in a number of newly constructed Hanford ground-water monitoring wells over the past year. These elevated levels have generally <u>not</u> been observed in filtered samples from the same wells. The chromium concentrations are associated with elevated iron and manganese concentrations and are mainly observed in unfiltered samples from recently constructed ground-water monitoring wells. Other elevated species that have been observed in unfiltered samples include barium, nickel, and aluminum. Possible sources of these constituents are natural borehole sediments and well construction materials. Although the source for some constituents may seem obvious (e.g., stainless steel casing for iron and nickel), it is not possible to <u>limit</u> these constituents to one particular source (e.g., iron is also a very common constituent in natural sediments) based on the present data. Field experiments on two new wells have shown that elevated metal concentrations from unfiltered samples decrease rapidly with time as the wells are developed by pumping. This evidence suggests that the

contamination is of a particulate nature that can be readily purged by pumping and may therefore be an artifact of well construction rather than true ground-water contamination. The source of these metals and practical solutions to the problem are the subjects of an ongoing investigation. Meanwhile, chromium concentrations are being carefully monitored and evaluated.

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2.0 300 AREA PROCESS TRENCHES

R. Schalla

The RCRA ground-water monitoring project for the 300 Area Process Trenches is an interim-status ground-water quality assessment monitoring and hydrogeologic characterization effort focused on the process trenches and their vicinity in and near the 300 Area of the Hanford Site (see Figure 1.1). The process trenches consist of two separate 1500-ft-long unlined trenches excavated 12 ft into the subsurface and separated by an earthen berm. The west trench has a natural depression at the north end. Beginning in 1975, the process trenches have been the main liquid waste disposal facility in the 300 Area. About 3 million gal/d of waste water are discharged to the trenches (used alternately for periods of up to 8 months) from fuel fabrication and other 300 Area operations (Schalla 1986). The present RCRA monitoring network of 27 wells is shown in Figure 2.1. The purpose of each well is presented in Table 2.1. Activities conducted during 1988 included the following:

- measurements of water-levels
- installation of a second continuously recording surface-water station
- sampling and analysis of ground-water
- publication of an interim characterization report
- monitoring the changes in ground-water chemistry and water level in adjacent monitoring wells to determine the impact of abandoning well 399-1-16D.

EVALUATION OF WATER-LEVEL ELEVATIONS

Ground-water elevation data collected during the year continue to show the pattern described in the interim characterization report for this project (Schalla et al. 1988). That is, near the trenches ground water generally flows toward the river to the southeast and east. The exact direction of ground-water flow at any given time is determined by both natural and manmade influences (Schalla et al. 1988). Routine data collection includes

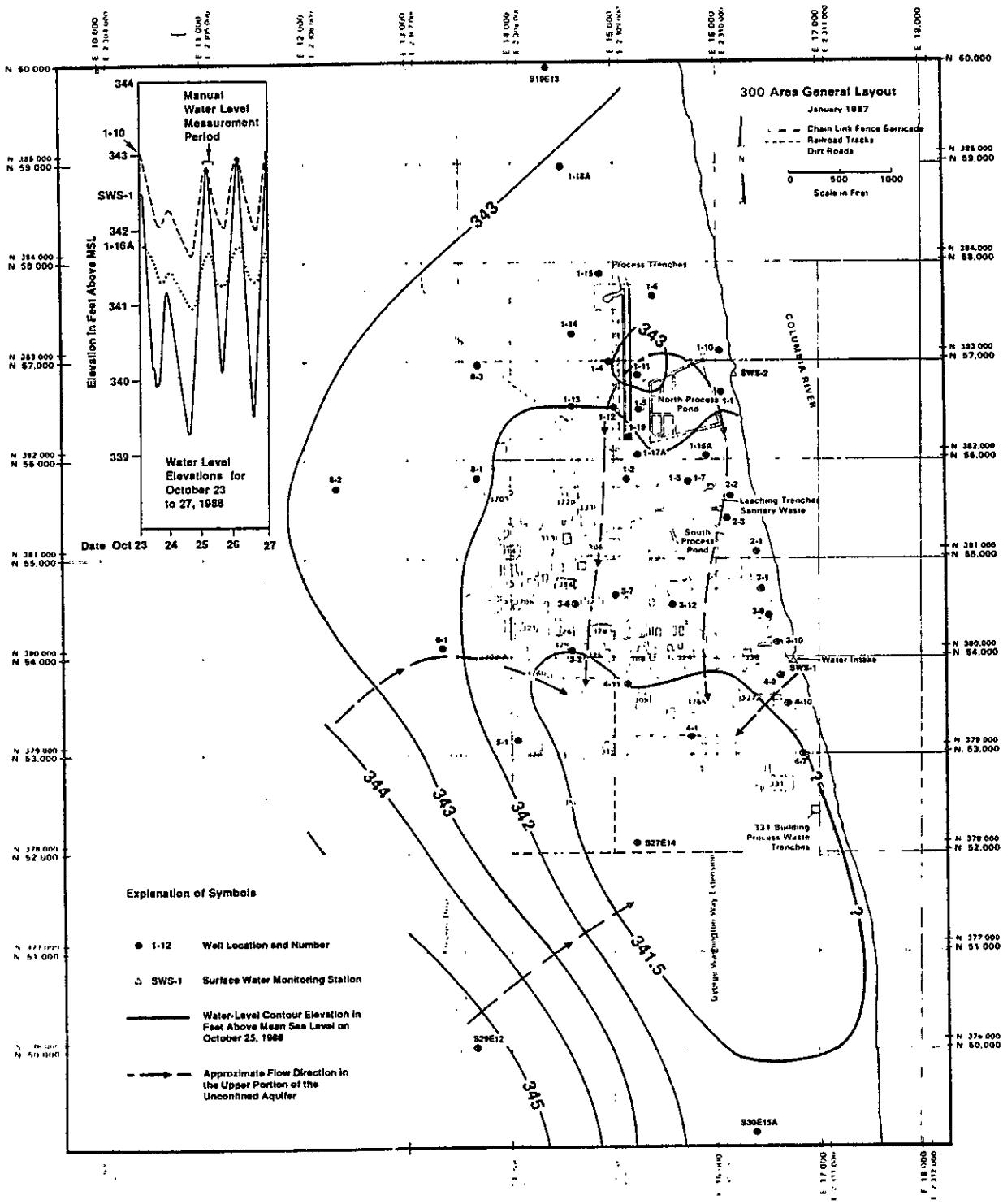

FIGURE 2.1. Monitoring Well Locations for the 300 Area Process Trenches and Water-Table Contour Map (October 25, 1988)

TABLE 2.1. Planned 300 Area Sampling and Analysis Schedule

Well	Well Name	1988 Oct	1988 Nov	1988 Dec	1989 Jan	1989 Feb	1989 Mar	1989 Apr	1989 May	1989 Jun	1989 Jul	1989 Aug	1989 Sep
Wells for Point of Compliance													
4931	3-1-11	W	W	W/R	W	W	W	W	W/R	W	W	W	W
4939	3-1-17A	W	W	W/R	W	W	W	W	W/R	W	W	W	W
4953	3-1-19	W	W	W/R	W	W	W	W	W/R	W	W	W	W
Background Wells													
4942	3-1-18A	W	W	W/R	W	W	W	W	W/R	W	W	W	W
4943	3-1-18B			R			L		R			R	
4408	3-8-2			R					R				
Wells to Define the Horizontal Extent of Contamination													
4400	3-1-7			R					R				
4930	3-1-10			R					R				
4932	3-1-12			R					R				
4933	3-1-13			R					R				
4934	3-1-14			R					R				
4935	3-1-15			R					R				
4936	3-1-16A			R					R				
4402	3-2-1			R					R				
4633	3-2-2			R					R				
4839	3-3-7			R					R				
4626	3-3-9			R					R				
4627	3-3-10			R					R				
4410	3-4-1			R					R				
4568	3-4-7			R					R				
4928	3-4-11			R					R				
4405	3-8-1			R					R				
4412	3-8-3			R					R				
Wells to Define the Vertical Extent of Contamination													
4937	3-1-16B			R			L		R			R	
4938	3-1-16C			R					R				
4940	3-1-17B			R			L		R			R	
4941	3-1-17C			R					R				

L = wells analyzed for long list of constituents on WAC 173-303-9905 hazardous chemicals list
W = biweekly analysis for selected parameters on four wells
R = regular analytical list
3 = 399

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collection of continuous surface-water and ground-water level data using pressure transducers and data loggers, and monthly measurement of water levels in a network of 49 wells in the 300 Area. Continuous water-level monitoring occurs at the two surface-water monitoring stations on the Columbia River, SWS-1 and SWS-2 shown in Figure 2.1, and in monitoring wells 399-1-10, 399-1-13, 399-1-16A, 399-1-16C, 399-1-17A, and 399-1-18A. Currently, all eight data loggers record measurements every half hour. These data are essential for setting the spatial and temporal boundary conditions for models of the 300 Area and for interpreting water chemistry data. The second surface-water station, SWS-2, provides information on the variation in the surface-water gradient with respect to river stage and serves as a backup in the event the primary river stage recorder malfunctions. Water-level data collection during the year is discussed in semiannual reports or special characterization reports (Evans et al. 1988; Schalla et al. 1988).

Broken casing that caused communication between the unconfined and confined aquifer required abandonment of well 399-1-16D, beginning December 1, 1988. Water levels and chemistry are being monitored to assess the impact of the abandonment and determine when hydraulic isolation between the confined and unconfined aquifers is restored. Water-level data indicate that hydraulic isolation has not yet been achieved between the confined and unconfined aquifers that normally have differences in hydraulic head of about 30 ft. Based on water-level data obtained during the last 2 years, the hydraulic interconnection between the two aquifers at well 399-1-16D began to affect water levels in well 399-1-16C, which is screened in the confined aquifer and only 20 ft from well 399-1-16D. The water-level elevation in well 399-1-16C declined from what must have been about 372 ft above mean sea level (MSL) in late 1986 to about 360 ft above MSL in late February 1987 and finally equilibrated with the unconfined aquifer water levels of wells 399-1-16A and 399-1-16C (343 ft above MSL) by July 1987 (Figure 2.2). As fluids continued to be lost from the confined aquifer through well 399-1-16D during 1987 and 1988, water levels in the confined aquifer farther from well 399-1-16D continued to decline. By July 1988, the water level in well 399-1-9, which is also screened in the confined aquifer, began to decline steadily (Figure 2.3). Based on these data, the cone of depression, which is a depression

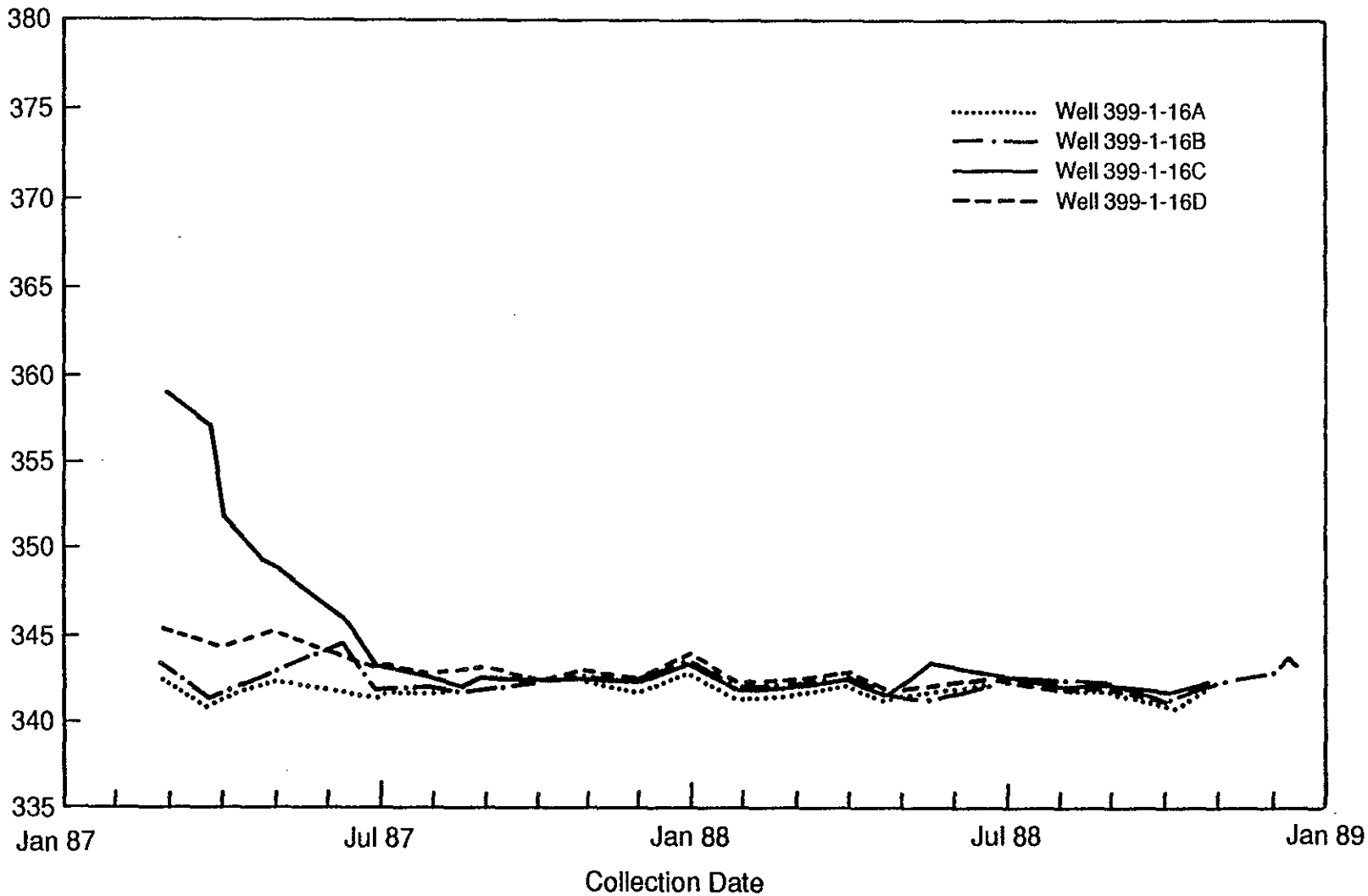

FIGURE 2.2. Water Levels in Wells 399-1-16A, 399-1-16B, 399-1-16C, and 399-1-16D, January 1987 to December 1988. (Units are in feet above mean sea level.)

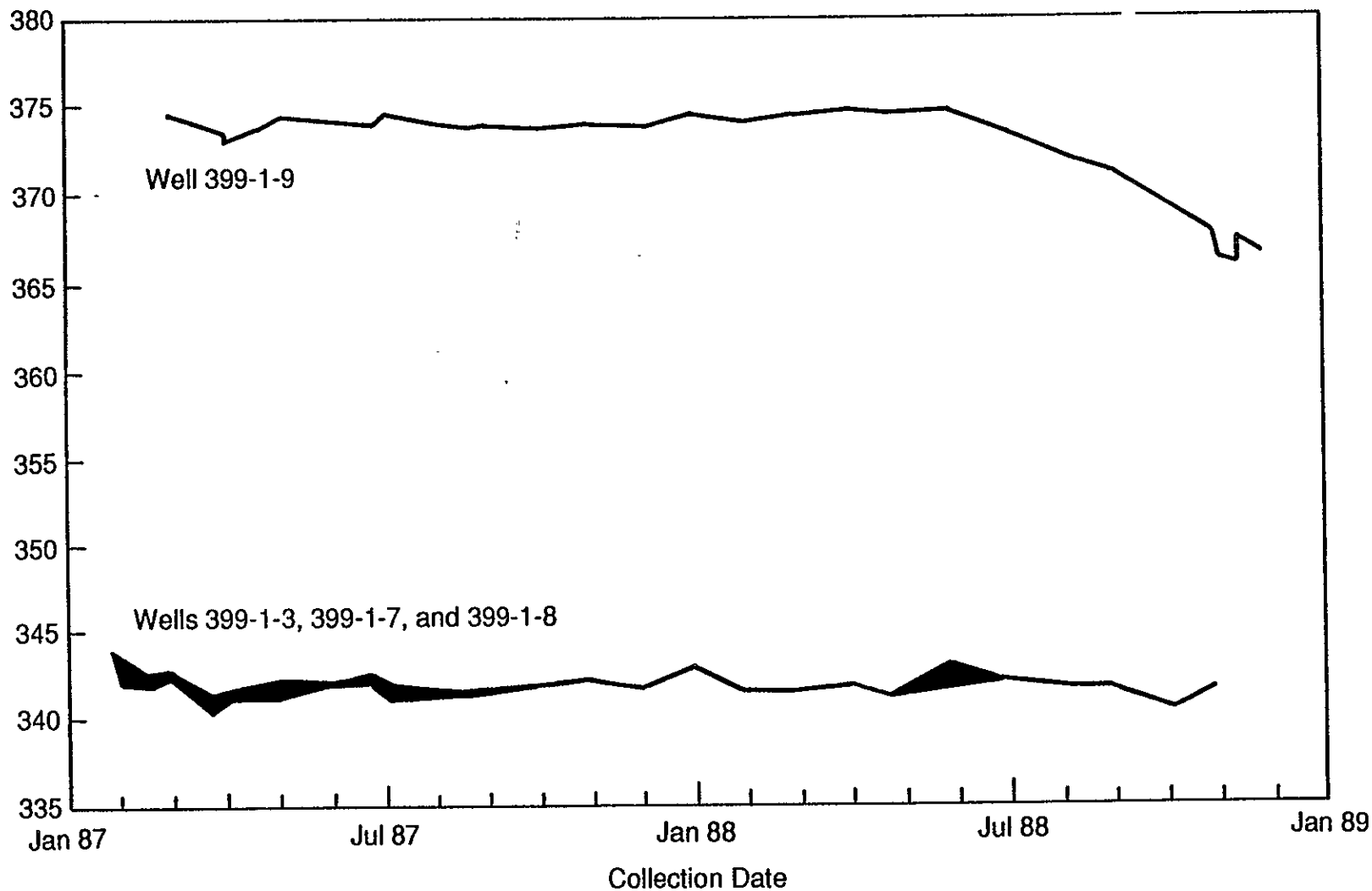

FIGURE 2.3. Water Levels in Wells 399-1-3, 399-1-7, 399-1-8, and 399-1-9, January 1987 to December 1988. (Units are in feet above mean sea level.)

of the piezometric surface with the lowest elevation at well 399-1-16D, had extended its radius to about 300 ft by July. Water levels have continued to decline in well 399-1-9 as the radius of the cone of depression increases. To date, water levels have not declined in nearby well 399-1-17C (Figure 2.4).

Temporary hydraulic interconnection of the two aquifers also occurred near well 399-1-9 during installation of a Westbay multiport system, which was being installed as part of the Hanford Site-Wide Ground-Water Monitoring Project. The borehole for the Westbay system was drilled within 20 ft of well 399-1-9. The period of hydraulic interconnection in the Westbay borehole was short, beginning on October 25, 1988, and ending on November 15, 1988. Therefore, the decline and recovery caused by the Westbay borehole was abrupt and small (less than 2 ft, see Figure 2.3). The more gradual decline in water level in well 399-1-9, which is caused by well 399-1-16D, is continuing. Abandonment activities will continue into 1989.

For the purposes of this project, the existing water-level monitoring network is considered adequate for monitoring the 300 Area Process Trenches.

EVALUATION OF WATER CHEMISTRY AND PARAMETERS

This is a ground-water quality assessment project that, since June 1985, has monitored the contaminants from process water discharged to the trenches or accountable to other sources. The impact on ground-water quality has also been assessed since 1985, and the monitoring system has been continually upgraded for more effective monitoring. This year, the 34-well quarterly monitoring network changed in October to a semiannual sampling network consisting of 27 wells. Although fewer wells are used, the network is spatially more comprehensive than the 34 monitoring wells used previously. Nine of the quarterly sampling wells used previously were providing essentially duplicate data or did not provide adequate information for differentiating contaminants from sources other than the process trenches. Two wells were substituted among the remaining 25 wells, and two additional wells were added to the monitoring network to more fully differentiate and define the distribution of contaminants. The wells in the old and current network are shown in Table 2.2.

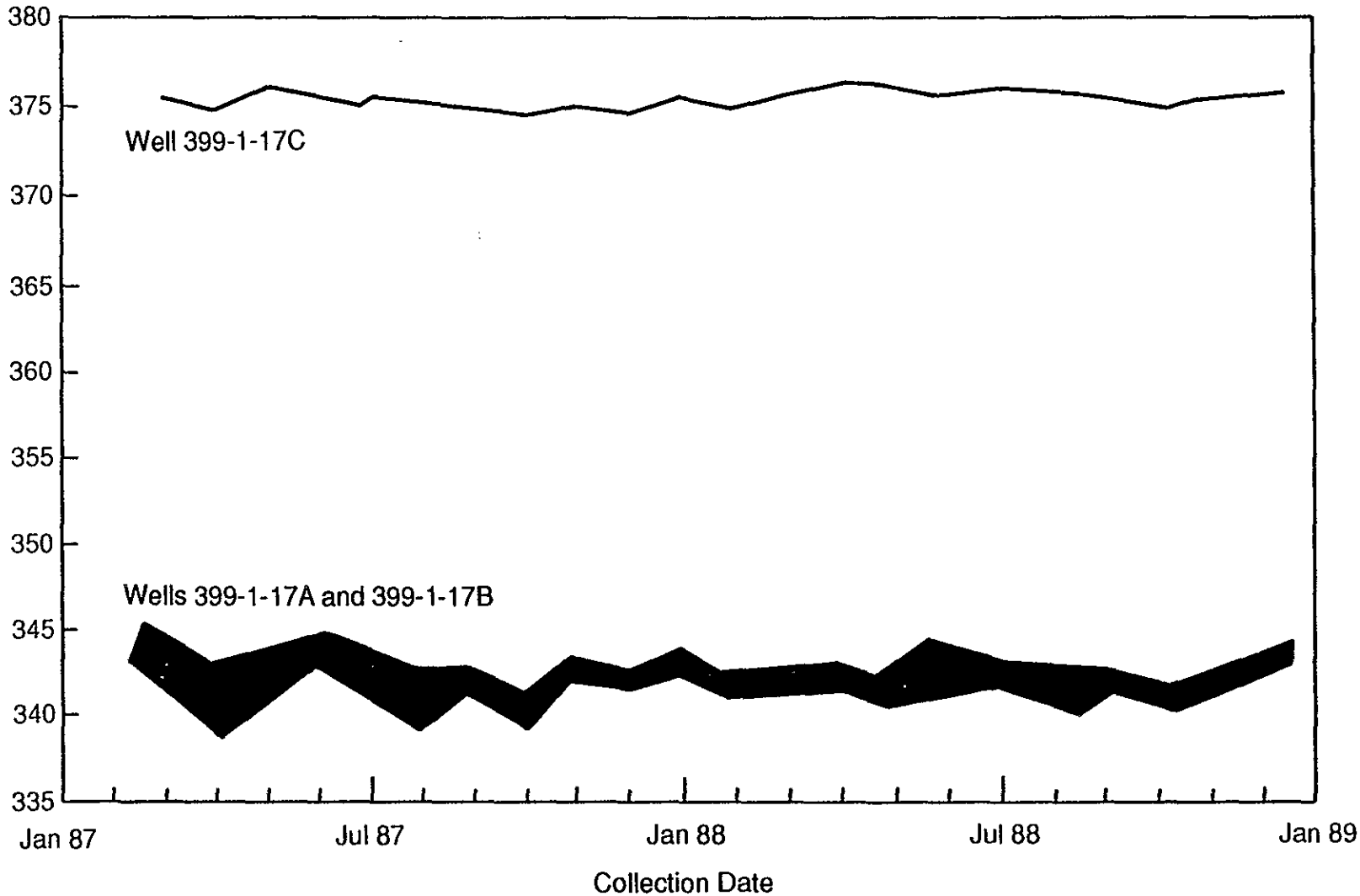

FIGURE 2.4. Water Levels in Wells 399-1-17A, 399-1-17B, and 399-1-17C, January 1987 to December 1988. (Units are in feet above mean sea level.)

TABLE 2.2. Changes to 300 Area Process Trenches RCRA Interim-Status Ground-Water Quality Assessment Monitoring Network

Hanford Well Name	Phase III Quarterly, Oct 87-Aug 88	Phase IV Semiannually, Start Oct 88	Reason for Change
399-1-1	x[a]		Dropped[b]
399-1-2	x		Dropped[b]
399-1-4	x		Dropped[b]
399-1-6	x		Dropped[b]
399-1-7	x	x	
399-1-8	x		Dropped[b]
399-1-9	x		Dropped[b]
399-1-10	x	x	
399-1-11	W[c]	B[d]	
399-1-12	x	x	
399-1-13	x	x	
399-1-14	x	x	
399-1-15	x	x	
399-1-16A	x	x	
399-1-16B	x	x	
399-1-16C	x	x	
399-1-17A	W	B	
399-1-17B	x	x	
399-1-17C	x	x	
399-1-18A	x	B	
399-1-18B	x	x	
399-1-18C	x		Dropped[e]
399-1-19	W	B	
399-2-1	x	x	
399-2-2		x	Added[f]
399-3-7	x	x	
399-3-9		x	Added[f]
399-3-10	x	x	
399-4-1	x	x	
399-4-7	x	x	
399-4-11	x	x	
399-8-1	x	x	
399-8-2	x	x	
399-8-3	x	x	
699-S30-E15A	x		Dropped[g]
699-S19-E13	x		Dropped[h]
	--	--	
	34	27	

(a) x - Sampled for regular (quarterly or semiannual) monitoring.
(b) Data indicate wells not needed for semiannual monitoring.
(c) W - Sampled for regular and weekly (October 1987 to July 1988) monitoring.
(d) B - Sampled for regular and bi-weekly (initiated October 1988) monitoring.
(e) Well not screened in the confined aquifer and duplicates data from well 399-1-18B.
(f) New location better allows detection and definition of constituents migrating to the Columbia River.
(g) Well too far south to monitor trends.
(h) Well 399-1-18A provides better background data.

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Between October 1987 and July 1988, three wells (399-1-11, 399-1-17A, and 399-1-19) near the process trenches had been sampled weekly for a limited set of specific constituents (i.e., volatile organic constituents, anions, and uranium). Weekly sampling was deemed necessary as a result of the high ground-water velocities near the 300 Area. Biweekly sampling began in October 1988 in lieu of weekly sampling; based on analyses and last year's weekly sampling data, sampling this set of wells every 2 weeks would detect releases of even the most mobile contaminants (e.g., nitrate) migrating from the process trenches. To help differentiate between contamination emanating from the process trenches and upgradient sources, a background well (399-1-18A) was added to the biweekly network.

Several volatile organic compounds were reported in samples collected in 1988. Chloroform is consistently found in most wells near the trenches. Trichloroethylene (TCE) is consistently found in well 399-1-16B in the lower portion of the unconfined aquifer, and cis-1,2-dichloroethene (DCE) is consistently found in wells 399-1-16B and 399-1-17B, also in the lower portion of the unconfined aquifer. Methylene chloride has been reported sporadically in different wells over the past year with no apparent pattern. The methylene chloride results are currently being investigated on a Hanford Site-wide basis, as occurrences similar to the 300 Area process trenches have been observed in many other RCRA projects (see Section 1.0). Perchloroethene, 1,1,1-trichloroethane, and carbon tetrachloride have also been reported, but not always consistently in the same wells, and at levels that are typically slightly above or slightly below the analytical laboratory contractual detection limit of 5 ppb. Carbon tetracholride was detected in two distant upgradient wells (i.e., 399-1-18A and 399-8-2), which suggests a source upgradient of the process trenches.

Concentrations Above Primary Drinking Water Standards

Trichloroethane, with a maximum contaminant level (MCL) of 5 ppb, was reported at about 20 ppb throughout the year in well 399-1-16B, and reported to 21 ppb for the first time in the December sample for well 399-1-16C, (Fruland, Bates, and Lundgren 1989b). Carbon tetrachloride (tetrachloromethane), with an MCL of 5 ppb, was reported at 5 ppb once in background well

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399-8-2 and once at 6 ppb in background well 399-1-18A. The analytical laboratory's contractual detection limit for carbon tetrachloride is 5 ppb.

The intermediate-depth well 399-1-16B continued to show the presence of cis-1,2-DCE in concentrations similar to those of the August 1988 sampling (59 ppb). This was down slightly from an average concentration of 67 ppb during 1987. However, the December 13, 1988, sample for that well showed a concentration of 75 ppb for cis-1,2-DCE [the proposed MCL goal (50 FR 46936) is 70 ppb]. The December results for cis-1,2-DCE in well 399-1-16C were also higher than those reported in August.

The chemistry results for volatile organic constituents indicate that these constituents have possibly entered the confined aquifer from the unconfined aquifer. Communication between the unconfined and confined aquifers, which may be occurring because of a section of broken steel casing in well 399-1-16D, is being investigated. Abandonment of well 399-1-16D is scheduled to be completed in early 1989, and when successfully completed, contaminants should no longer directly enter the confined aquifer, if the well indeed provided a pathway.

Rate of Migration of Contaminants

The rate and extent of uranium migration have been previously reported (Hall 1988), but it was not determined whether the process trenches were the only significant source. Data collected for the Hanford Site-Wide Ground-Water Monitoring Project indicated a distinct difference in the isotopic ratios of uranium-238 and -235 between wells in the northern and southern portions of the 300 Area. Future determination of the contribution and the uranium plumes' areal extent will be described in subsequent reports.

Trichloroethene and dichloroethene are below the MCLs in the upper portion of the unconfined aquifer, while only trichloroethane is above the MCLs in the bottom portion of the unconfined aquifer in the vicinity of well 399-1-16B. The flow rate in the top of the unconfined aquifer is believed to be about 35 ft/d, but the rate of migration in the bottom of the unconfined aquifer is unknown. Five new intermediate-depth monitoring wells to define the extent of TCE and DCE in the bottom of the unconfined aquifer were postponed until 1989.

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3.0 183-H SOLAR EVAPORATION BASINS

S. H. Hall

The RCRA ground-water monitoring project for the 183-H Solar Evaporation Basins is an interim-status ground-water quality assessment monitoring and hydrogeologic characterization effort focused on the basins and their vicinity in the 100-H Area of the Hanford Site (see Figures 1.1 and 3.1). The 183-H Solar Evaporation Basins consist of four concrete basins in the 100-H Area that were used for solar evaporation and storage of aqueous chemical wastes from nuclear fuel processing operations elsewhere on the Site (Liikala et al. 1988). The wastes discharged to the basins consisted primarily of nitric, sulfuric, and hydrofluoric acids, contaminated by heavy metals and radionuclides, and neutralized by sodium hydroxide. Originally, the basins were used for water treatment for the 100-H plutonium production reactor, which was retired in 1965. Each basin has a capacity of approximately 450,000 gal. Until August 1978, only basin #1 was in use. In 1973, it received 8000 gal, and from January 1975 to August 1978, it received wastes at the rate of about 145,000 gal/yr. Elevated nitrate concentrations were detected in well 199-H4-3 in mid-1977, indicating that the basin was leaking. Basins #2 and #3 were coated with urethane to receive wastes and were ready for service by August 1978. At that time, the waste stream was redirected to basins #2 and #3, and the liquid fraction of the waste remaining in basin #1 was pumped to the newly prepared basins, leaving a slurry. The slurry remained in basin #1 until July 1985. There is no evidence of leakage from basin #2 or #3 (or from basin #4, later put into service with a butyl and hypolon coating). A Final Status Post-Closure Permit Application for this facility was submitted to the Washington State Department of Ecology in June 1988 (WHC 1988a).

Activities for this RCRA project during 1988 included the following:

- monthly, quarterly, and annual ground-water sampling and analysis
- monthly water-level measurement
- installation of a continuous river-stage recorder
- publication of a hydrogeologic characterization report.

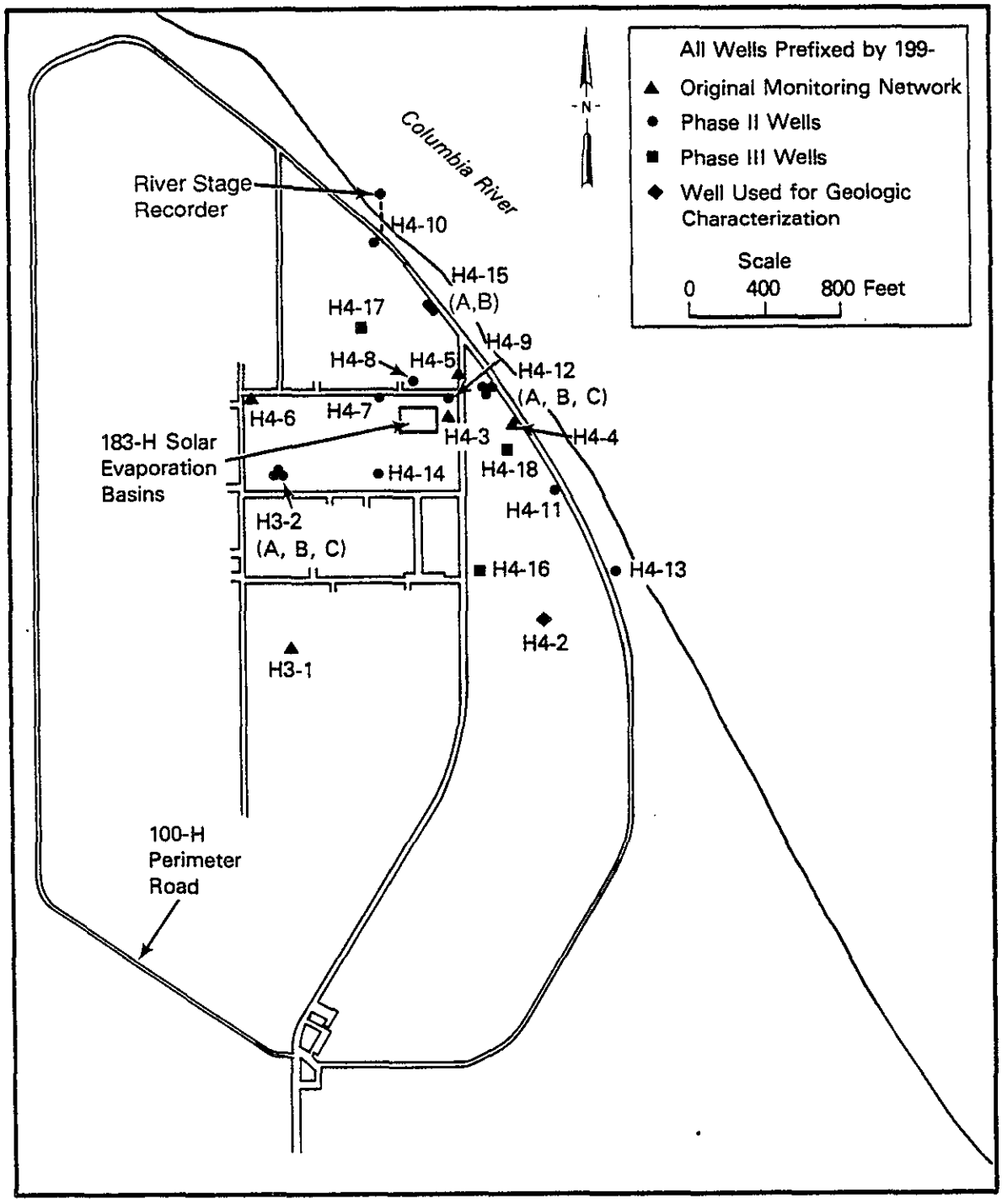

FIGURE 3.1. Monitoring Well Locations for the 183-H Basins

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EVALUATION OF WATER-LEVEL ELEVATIONS

Ground-water elevation data have been collected during the year before sample collection and at other times. The data continue to show the pattern described in the hydrogeologic characterization report for this project (Liikala et al. 1988). That is, net annual flow is toward the Columbia River, but seasonal gradient reversals occur, corresponding to high-river stage. Water-level data collected during the year (including river stage data since September 23, 1988) are presented in the quarterly reports (PNL 1988a,b; Fruland, Bates, and Lundgren 1989a,b).

For the purposes of this project, the existing well network is considered adequate for monitoring ground-water quality at the 183-H basins.

EVALUATION OF WATER CHEMISTRY AND PARAMETERS

This ground-water quality assessment project has, since 1985, monitored the contaminant plume caused by the leakage of process wastes from the basins and the resulting effect on ground-water quality. Data related to the following discussions have been previously reported (PNL 1988a,b; Fruland, Bates, and Lundgren 1989a,b).

Concentrations Above the Primary Drinking Water Standards

The plume from the basins (Liikala et al. 1988) is principally characterized by elevated concentrations, relative to background concentrations, of nitrate, sulfate, sodium, technetium-99, and uranium. The waste liquid that escaped from the basins to the ground water also contained hexavalent chromium. However, the plume appears to be superimposed on one or more larger, pre-existing hexavalent chromium plumes that extend from liquid waste disposal sites near the upgradient decommissioned 100-H Reactor. Therefore, samples from monitoring wells upgradient from the basins have shown chromium in concentrations comparable to, and sometimes in excess of, concentrations found in samples from downgradient wells. Similarly, these larger chromium plumes show occasional nitrate concentrations in excess of PDWS, but these nitrate concentrations are distinctly lower than those found within the plume extending from the solar evaporation basins. Elevated gross beta measured in samples from wells 199-H4-11 and 199-H4-13 appears to be emanating from the

107-H Retention Basin, but is not associated with technetium-99, while technetium-99 appears to be the principal source of beta radiation within the plume from the 183-H basins.

Table 3.1 lists, by well, those contaminants found to be in excess of drinking water standards in samples collected during 1988. Inspection of the table shows that only concentrations in well 199-H4-16 and the 199-H3-2 well cluster were entirely below drinking water standards throughout the year. However, a review of all water chemistry evidence suggests that only those wells which show excess technetium-99 in Table 3.1 are actually affected by the 183-H Solar Evaporation Basins plume. Results of analysis of groundwater samples are included in Fruland, Bates, and Lundgren (1989a,b).

Rate of Migration of Contaminants

The plume extending from the basins is truncated by the Columbia River. Further, none of the downgradient monitoring wells were installed before the plume reached the river. Therefore, determination of the rate of plume migration has never been possible by "direct" observation. Computer modeling results presented by Liikala et al. (1988) show a net flow rate of 0.7 ft/d from the basins to the Columbia River. Data now being gathered with the river-stage recorder, along with data to be collected from eight planned continuous water-level recorders in monitoring wells, could be used to provide a more refined estimate of the flow and mass transport rate. In addition, water chemistry data are being examined for evidence that may lead to an estimate of the net mass transport rate.

OTHER ACTIVITIES

A river-stage recorder was installed in August 1988 (see Figure 3.1). It began operation September 23.

A hydrogeologic characterization report was published in 1988 (Liikala et al. 1988).

TABLE 3.1. Contaminants in Excess of Drinking Water Standards During 1988 for the 183-H Solar Evaporation Basins

Well Number	Gross Alpha	Gross Beta	Chromium	Nitrate	Coliform Bacteria	Technetium-99[a]
199-H3-1			X	X		
199-H3-2A						
199-H3-2B						
199-H3-2C						
199-H4-3	X	X	X	X		X
199-H4-4	X	X	X	X		X
199-H4-5			X			
199-H4-6			X			
199-H4-7			X			
199-H4-8			X			
199-H4-9		X	X	X		X
199-H4-10			X			
199-H4-11		X	X	X		
199-H4-12A	X	X	X	X		X
199-H4-12B		X	X	X		
199-H4-12C			X			
199-H4-13		X				
199-H4-14			X			
199-H4-15A			X			
199-H4-15B			X			
199-H4-16						
199-H4-17			X	X	X	
199-H4-18			X			
Primary Drinking Water Standard	15 pCi/L	50 pCi/L	0.05 mg/L	45 mg/L	1 mpn[b]	900 pCi/L

(a) The 900-pCi/L for technetium-99 is taken from EPA (1976).
(b) mpn = most probable number.

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4.0 200 AREAS LOW-LEVEL BURIAL GROUNDS

G. V. Last

The RCRA ground-water monitoring project for the 200 Areas Low-Level Burial Grounds (LLBGs) is under interim status and is in the first year of background monitoring. The LLBGs encompass four waste management areas (WMAs) covering all or portions of six low-level burial grounds located in the 200-East and 200-West Areas of the Hanford Site (Figure 1.1). A diverse range of mixed radioactive/hazardous waste types from Hanford operations (e.g., miscellaneous dry waste, failed equipment, vehicles, contaminated soil, 183-H cleanup wastes, etc.) and other offsite wastes (submarine reactor core barrels, Three-Mile Island cleanup wastes, etc.) are buried in unlined trenches and pits from 12 to 60 ft deep (Last et al. 1989). Disposal to these LLBGs has been ongoing since 1960. This project includes 16 ground-water monitoring wells in the 200-East Area and 19 in the 200-West Area.

Work performed during 1988 included

- monthly water-level measurements
- initiation of ground-water sampling
- preparation of a draft interim characterization report.

EVALUATION OF WATER-LEVEL ELEVATIONS

Water levels have been measured at least once per month over the past year, with the exception of November 1988. Water levels have risen approximately 0.5 ft beneath WMA-1 and WMA-2, fallen approximately 0.5 ft beneath WMA-3, and fallen approximately 1.0 ft beneath WMA-4. However, the ground-water flow directions have remained essentially constant. Representative flow directions are shown in Figures 4.1 and 4.2. These flow directions are interpreted from water-level data collected on December 27 and 28, 1988. Interpretation of the latest water-level data suggests that at least three monitoring wells are located downgradient and at least one monitoring well is located upgradient from each WMA. A revised ground-water monitoring plan is being prepared to address the need for additional monitoring systems at each WMA.

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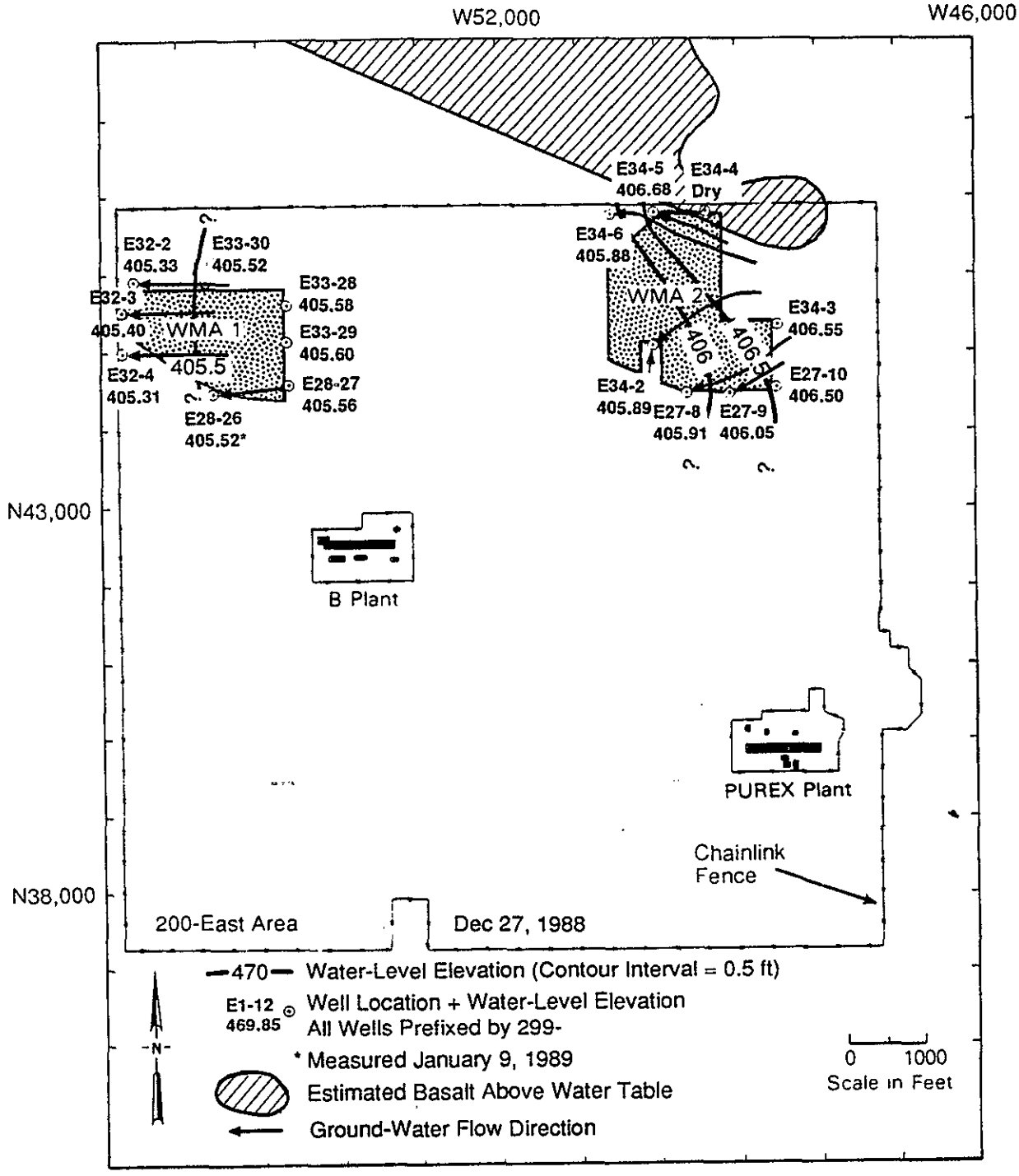

FIGURE 4.1. Water-Table Contour Map for the 200-East Area Low-Level Burial Grounds, December 27, 1988

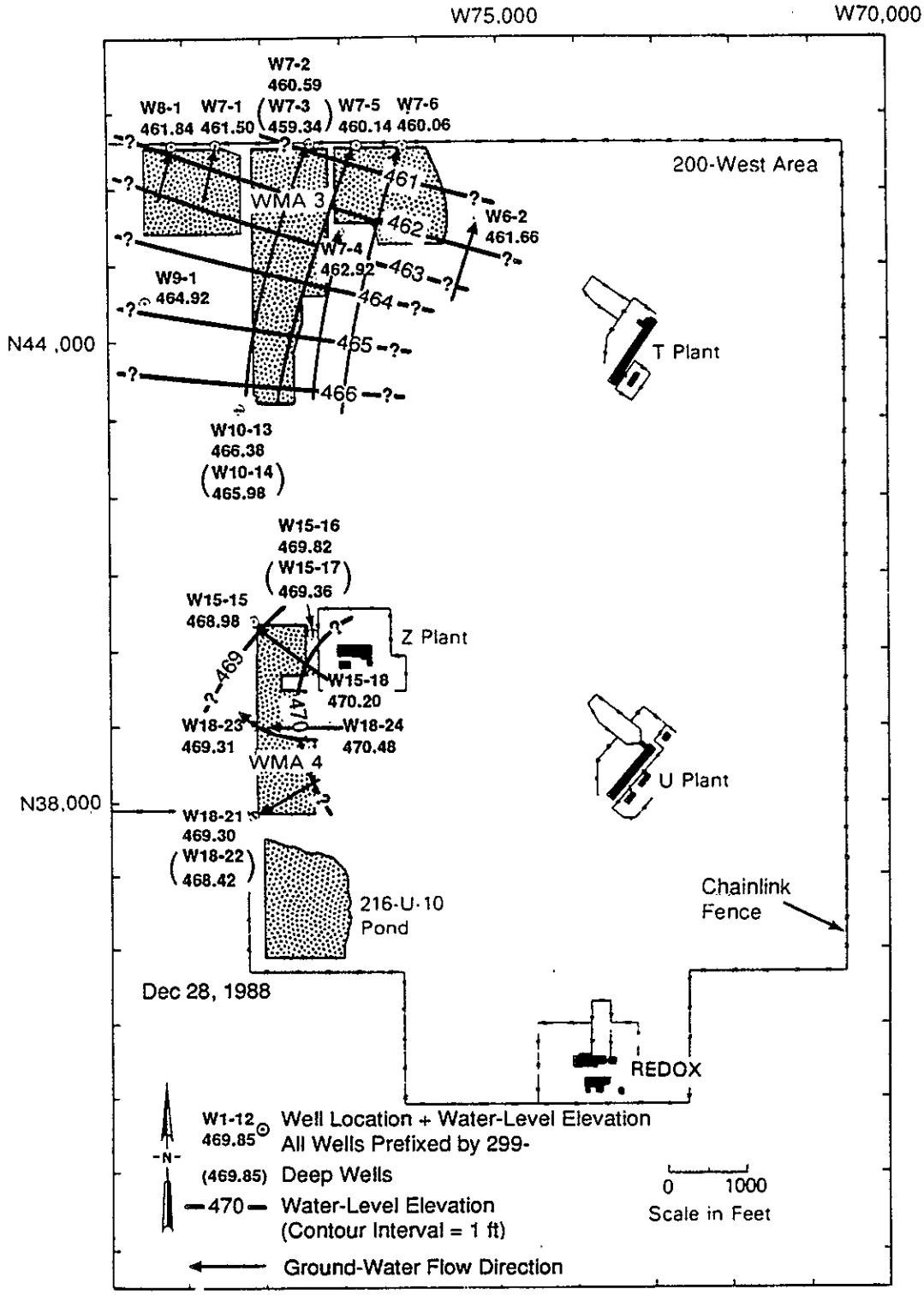

FIGURE 4.2. Water-Table Contour Map for the 200-West Area Low-Level Burial Grounds, December 28, 1988

EVALUATION OF WATER CHEMISTRY AND PARAMETERS

This project is currently performing quarterly background monitoring. Thus far, two sets of quarterly ground-water samples have been collected (September/October, and December 1988). The results of the first set were published in Fruland, Bates, and Lundgren (1989b). These data show that PDWS were exceeded for the following contaminants, by WMA:

- WMA-1: gross alpha, nitrate, and tritium
- WMA-2: none
- WMA-3: nitrate, chromium, and carbon tetrachloride
- WMA-4: gross alpha, nitrate, chromium, carbon tetrachloride, and trichloroethene.

A draft interim characterization report for the LLBGs was prepared and will be published in 1989.

An additional two quarters of water chemistry data are needed before determining background levels. Until these levels have been established, water chemistry and parameters will not be statistically evaluated.

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5.0 NONRADIOACTIVE DANGEROUS WASTE LANDFILL

R. M. Fruland

The RCRA ground-water monitoring project at the Nonradioactive Dangerous Waste Landfill (NRDW) is an interim-status project in the indicator parameter phase of monitoring. The NRDW and Solid Waste Landfill (SWL) are adjacent facilities centrally located on the Hanford Site, approximately 6 miles west of the Columbia River (Figure 1.1). The NRDW occupies approximately 11.5 acres next to the SWL, which covers about 65 acres. The only physical facilities serving the landfills are a perimeter fence and a mobile field office. Wastes were discharged to unlined trenches constructed 46 ft wide at the top, 14 ft wide at the base, and 15 ft deep. The NRDW received wastes (e.g., containerized liquids, asbestos) beginning in 1975 until 1985. Each facility has its own ground-water monitoring project. The NRDW project is based on 40 CFR 265 and WAC 173-303 covering hazardous waste facilities. The proximity of the two facilities (Figure 5.1) warrants data relating to both facilities be included in discussions for each facility.

The compliance plan for an interim-status background and indicator parameter ground-water monitoring project at the NRDW was sent to the Washington State Department of Ecology (Ecology) in 1986, and well installation was completed in January 1987. After the first year's background data collection was completed, contamination indicator parameter background evaluation was initiated in October 1987. Quarterly monitoring for a comprehensive constituent suite was continued throughout calendar year 1988. Continuation of indicator parameter monitoring and one sampling round for a comprehensive constituent suite (WAC 173-303-9905) are planned beginning in 1989.

Major activities during calendar year 1988 include the following:

- monthly water-level measurements at NRDW, SWL, and nearby Hanford Site wells conducted over a 6-month period
- background water quality evaluation
- quarterly sampling at the seven NRDW wells for a comprehensive constituent suite.

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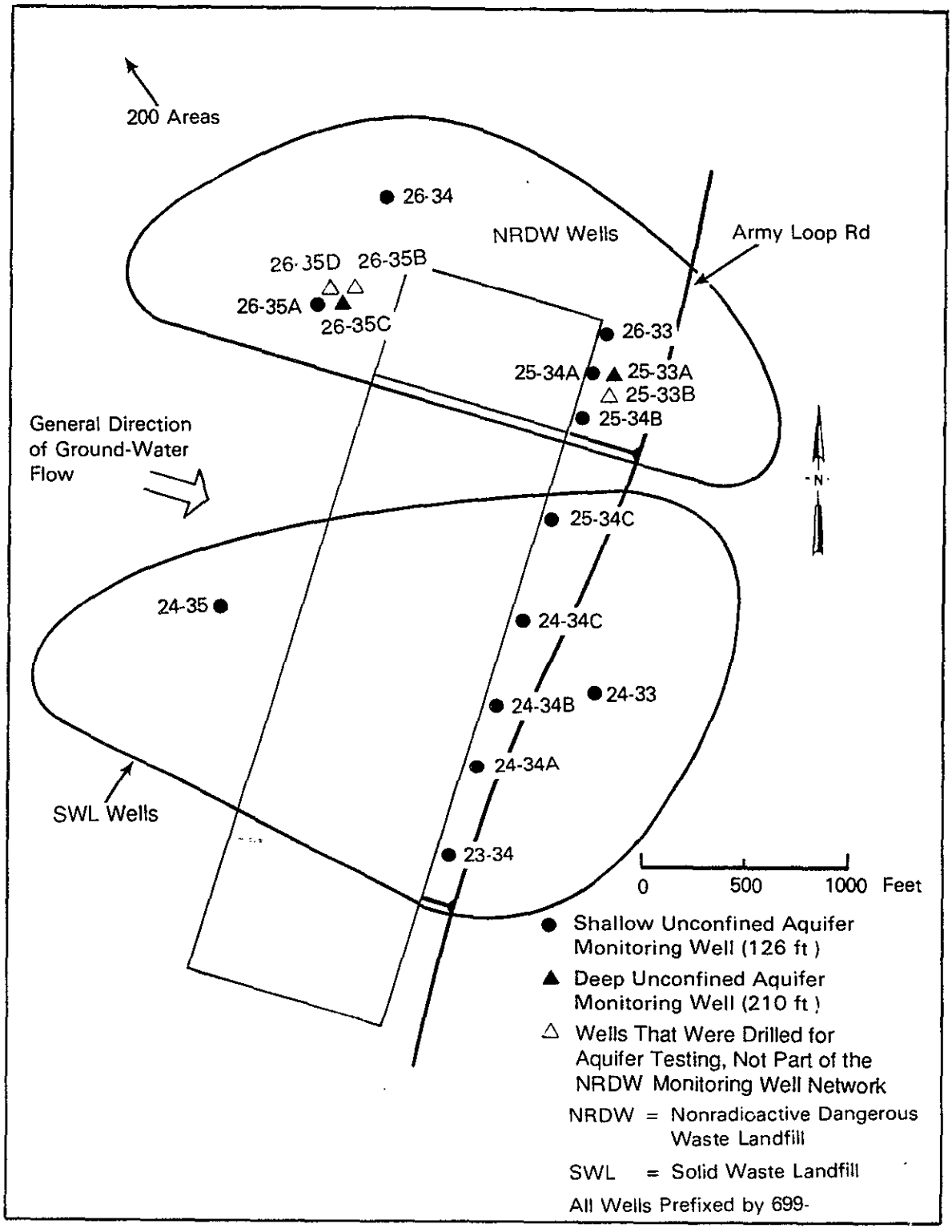

FIGURE 5.1. Monitoring Well Locations for the Solid Waste Landfill and the Nonradioactive Dangerous Waste Landfill

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EVALUATION OF WATER-LEVEL ELEVATIONS

A very flat gradient of approximately 0.0001 underlies the NRDW (PNL 1988a,b; Fruland, Bates, and Lundgren 1989a,b) and SWL (Fruland et al. 1989). Quarterly water-level measurements were collected before sample collection and monthly April through September 1988. Figure 5.1 shows the locations of the two local ground-water monitoring networks, and Figure 5.2 shows nearby Hanford Site wells used to collect water-level measurements to augment the landfill networks.

The water table in the vicinity of the NRDW and SWL has risen about 15 ft since Hanford began operation in the 1940s, but has been relatively stable in the landfill area during the 1980s (Fruland et al. 1989). Figure 5.2 shows the local water-table contour map based on water-table elevations collected from NRDW, SWL, and Hanford Site wells. The contour interval is in tenths of feet. The direction of ground-water flow is northwest to southeast, and is essentially perpendicular to the long axis of the landfills. However, there appear to be minor inconsistencies in some of the casing elevations from which water levels are calculated. These small inconsistencies cause problems in data interpretation for this low ground-water gradient.

EVALUATION OF INDICATOR PARAMETERS

The NRDW ground-water monitoring for calendar year 1988 included the indicator evaluation and a comprehensive analytical suite of constituents. The results of the background water quality determination for the NRDW were reported in the annual report for calendar year 1987 (Hall 1988). Analytical results for the 1988 quarterly monitoring activities at the NRDW have been reported in quarterly reports (PNL 1988a,b; Fruland, Bates, and Lundgren 1989a,b). The April sampling showed a high total organic halogen (TOX) level for two of the four quadruplicate samples for downgradient well 699-25-34B; no constituents related to TOX were detected. Resampling found no elevated TOX levels. July total organic carbon data for downgradient well 699-25-34A showed one high value out of the quadruplicate suite; resampling showed no

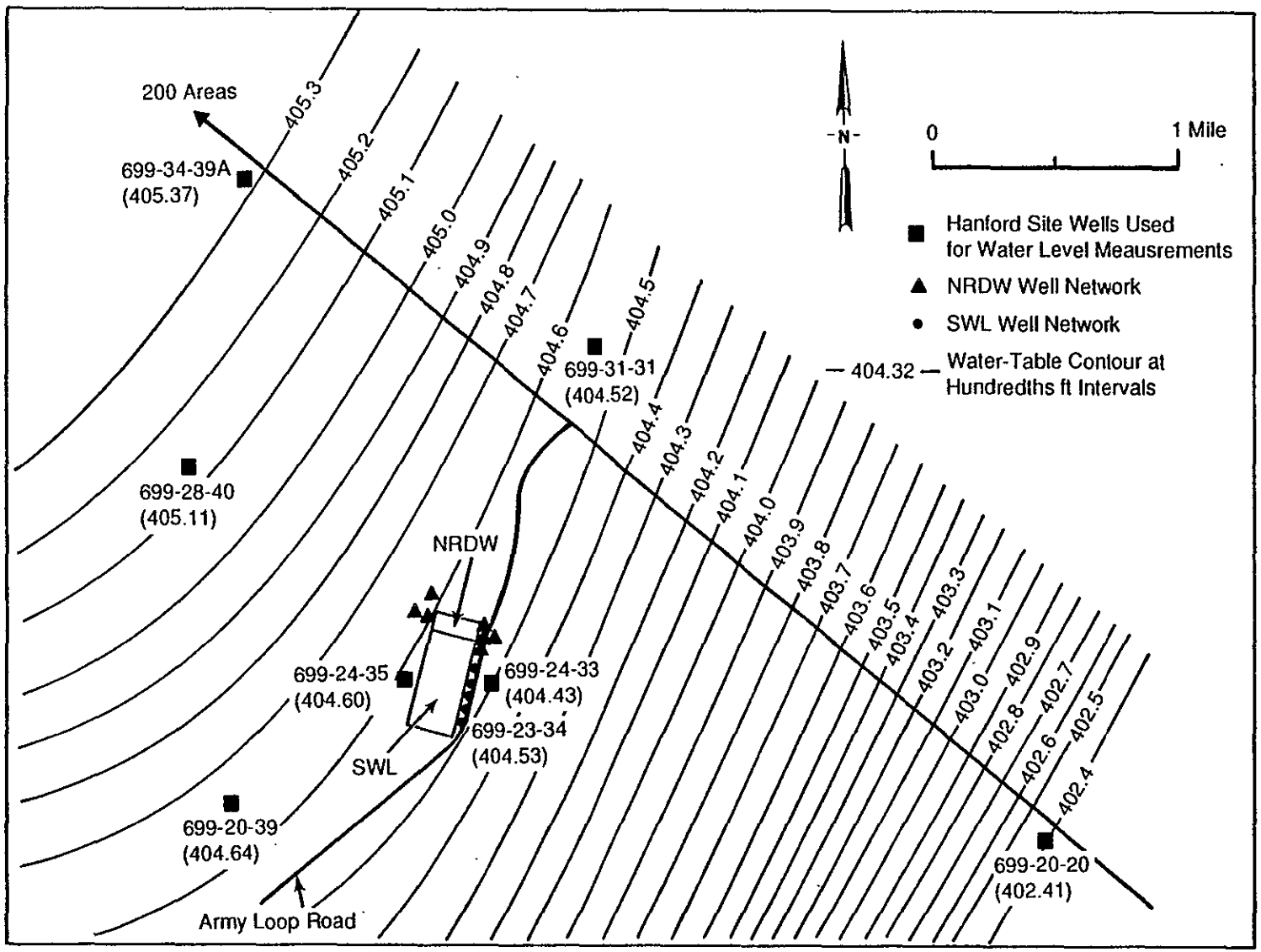

FIGURE 5.2. Water-Table Contour Map for the Area Surrounding the Nonradioactive Dangerous Waste Landfill and Solid Waste Landfill, July 1988. (Contours are in tenths of ft.)

elevated levels. Over the last year there have been no impacts detected to the ground water under the NRDW from past or present landfill activities. The RCRA ground-water monitoring network at the NRDW appears to be adequate.

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6.0 SOLID WASTE LANDFILL

R. M. Fruland

The RCRA ground-water monitoring project at the Solid Waste Landfill (SWL) has completed eight sampling and analysis rounds through 1988. The SWL and the NRDW are adjacent facilities centrally located on the Hanford Site and approximately 6 miles west of the Columbia River (Figure 1.1). The SWL occupies approximately 65 acres next to the NRDW, which covers about 11.5 acres, The only physical facilities are a perimeter fence and a mobile field office. Wastes are discharged to unlined trenches either 46 ft wide at the top, 14 ft wide at the base, and 15 ft deep; or 106 ft wide at the top, 65 ft wide at the base, and 20 ft deep. The SWL has operated continuously from 1973 to the present. Currently the SWL receives office and lunchroom trash and construction debris. Sewage was discharged to the SWL from 1975 through April 1987, and washwater from the 1100 Area bus maintenance facility between January 1985 and January 1987. Both the SWL and NRDW are under RCRA ground-water monitoring requirements. The SWL project is based on Washington State regulations WAC 173-304 covering solid waste landfills. Each facility has a separate ground-water monitoring project. However, their physical proximity warrants data relating to both facilities be included in discussions for each facility.

The compliance plan for a detection-level ground-water monitoring project at the SWL was sent to the Washington State Department of Ecology (Ecology) in the fall of 1986. The ground-water monitoring project began in May 1987. Chlorinated hydrocarbons were detected in the first round of sampling and analysis (Hall 1988), and have been detected each subsequent sampling cycle. Concentration distributions among the SWL wells have shown a distinctive and consistent pattern through time; absolute concentrations appear to have decreased, but relative to each other have remained the same (Fruland et al. 1989). The three southernmost downgradient SWL wells (699-23-34, 699-24-34A, and 699-24-34B) have consistently shown the highest concentrations of trichloroethylene (TCE), trichloroethane (TCA), perchloroethylene (PCE) and dichloroethane (DCA). Of these constituents, only TCE is at or above PDWS in these three wells.

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Major activities during calendar year 1988 included the following:

- quarterly samplings at the six SWL ground-water monitoring wells
- monthly water-level measurements at SWL, NRDW, and nearby Hanford Site wells over a 6-month period
- initiation of a soil-gas survey at the SWL
- addition to the SWL monitoring network of one Hanford Site well downgradient from the SWL (volatile organic analysis data have been collected for this well beginning in January 1986)
- completion of the interim site characterization report.

EVALUATION OF WATER-LEVEL ELEVATIONS

A very flat gradient (approximately 0.0001) underlies the SWL and NRDW, based on water-level measurements collected at the two monitoring network wells (Hall 1988). Figure 5.1 shows the locations of the two local ground-water monitoring networks. Figure 5.2 shows the six nearby Hanford Site wells also used to collect water-level measurements to augment the landfill networks because of the low local gradient. Four quarterly measurements at SWL and NRDW wells were required at the time of sampling. Six monthly water-level measurements (April-September 1988) at SWL, NRDW, and the six nearby Hanford Site wells were accomplished in 1988.

Well 699-24-33 is about 500 ft downgradient from the SWL and is the Hanford Site well that was formally added to the SWL monitoring network in 1988 (Figure 5.2). The water table in the vicinity of the SWL and NRDW has risen more than 15 ft since Hanford began operations in the 1940s, but has been relatively stable in the area of the landfills during the 1980s (Fruland et al. 1989).

Figure 5.2 shows the local water-table map based on water-table elevations collected from SWL and NRDW wells only. The contour interval is in tenths of feet. The direction of ground-water flow is northwest to southeast and is essentially perpendicular to the long axis of the landfills. However, there appear to be minor inconsistencies in some of the casing elevations from which water levels are calculated. These small inconsistencies cause problems in data interpretation for this low ground-water gradient.

EVALUATION OF WATER CHEMISTRY AND PARAMETERS

A number of activities have been initiated to determine the source and assess the extent of contamination at the facility. These activities are discussed below.

Sampling and Analysis

The results of the ground-water monitoring project at the SWL continue to indicate contamination in downgradient wells (Hall 1988). Results also indicate a trend of decreasing concentration for the volatile organic constituents: for example, from 10 ppb TCE (May 1987) in wells 699-23-34 and 699-24-34B to 5 ppb TCE for the same wells in the third quarter of 1988 (Fruland et al. 1989; Fruland, Bates, and Lundgren 1989).

Expanded Network

Hanford well 699-24-33 (Figure 5.1) has been part of the Hanford Site-wide Ground-Water Monitoring Project for DOE until the fall of 1988. Then it became part of the SWL monitoring network to enable more comparable results and better determine the extent of the chlorinated hydrocarbon contamination downgradient of the SWL. This well has consistently shown TCE levels at 3 ppb (Fruland et al. 1989), beginning in January 1986. Although this is a very low concentration, TCE has been reported every time this well has been sampled.

Soil-Gas Survey

A soil-gas survey began in the fall of 1988 and is still under way. It is designed to determine the source of the chlorinated hydrocarbons, currently thought to be three trenches on the west side of the SWL, and provide evidence as to the extent of the contamination in the vadose zone and perhaps in the ground water. Preliminary results indicate that the three trenches are the source of the contamination, and that the chlorinated hydrocarbons have traveled some distance from the source through the vadose zone. However, the highest concentrations in the vadose zone are still within the facility perimeter fence. The survey will be completed in 1989, and the

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results will be reported when they are available. Results from the soil-gas survey will also be used to help determine the adequacy of the SWL ground-water monitoring network.

Interim Characterization Report

The Interim Site Characterization Report and Ground-Water Monitoring Program for the Hanford Site Solid Waste Landfill (Fruland et al. 1989) has been completed and will be formally transmitted to Ecology by DOE early in 1989.

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7.0 1301-N AND 1325-N LIQUID WASTE DISPOSAL FACILITIES

T. J. Gilmore

The RCRA ground-water monitoring projects for the 1301-N and 1325-N Liquid Waste Disposal Facilities (LWDF) are monitoring and hydrogeologic characterization efforts focused on the 100-N Area of the Hanford Site (Figure 1.1). Both LWDFs are shown in Figure 7.1.

The 1301-N LWDF was used to dispose of waste streams that were generated in the N Reactor and associated facilities from the start up of the N Reactor in 1963 until September 1985. The facility is located approximately 200 ft east of the Columbia River. It consists of a 52- by 12-ft concrete trough connected to a 125- by 250-ft rectangular basin. The basin bottom is covered with a 3-ft-thick layer of large stones. Adjacent to the basin is an excavated ditch 1600 ft long, 50 ft wide, and 12 ft deep, which extends to the north in a zigzag pattern and is intended to handle the overflow from the basin.

The 1325-N LWDF was the primary liquid waste disposal system for the N Reactor and began operation in 1983. In early 1988 the facility received substantially less volumes of effluent following the closure of the N Reactor. The facility is located approximately 900 ft east of the Columbia River. It consists of an unlined 240- by 250-ft basin with an extension trench that is approximately 3000 ft long, 55 ft wide, and 7 ft deep.

One year of interim-status background ground-water monitoring for both LWDFs was completed in December 1988, and representative background levels can now be determined. Progress on the projects during 1988 included

- ground-water sampling of wells
- monthly water-level measurements
- expansion of the ground-water monitoring networks.

EVALUATION OF WATER-LEVEL ELEVATIONS

In addition to those required at the time of sampling, water-levels were measured monthly using a graduated steel tape in most of the usable wells in

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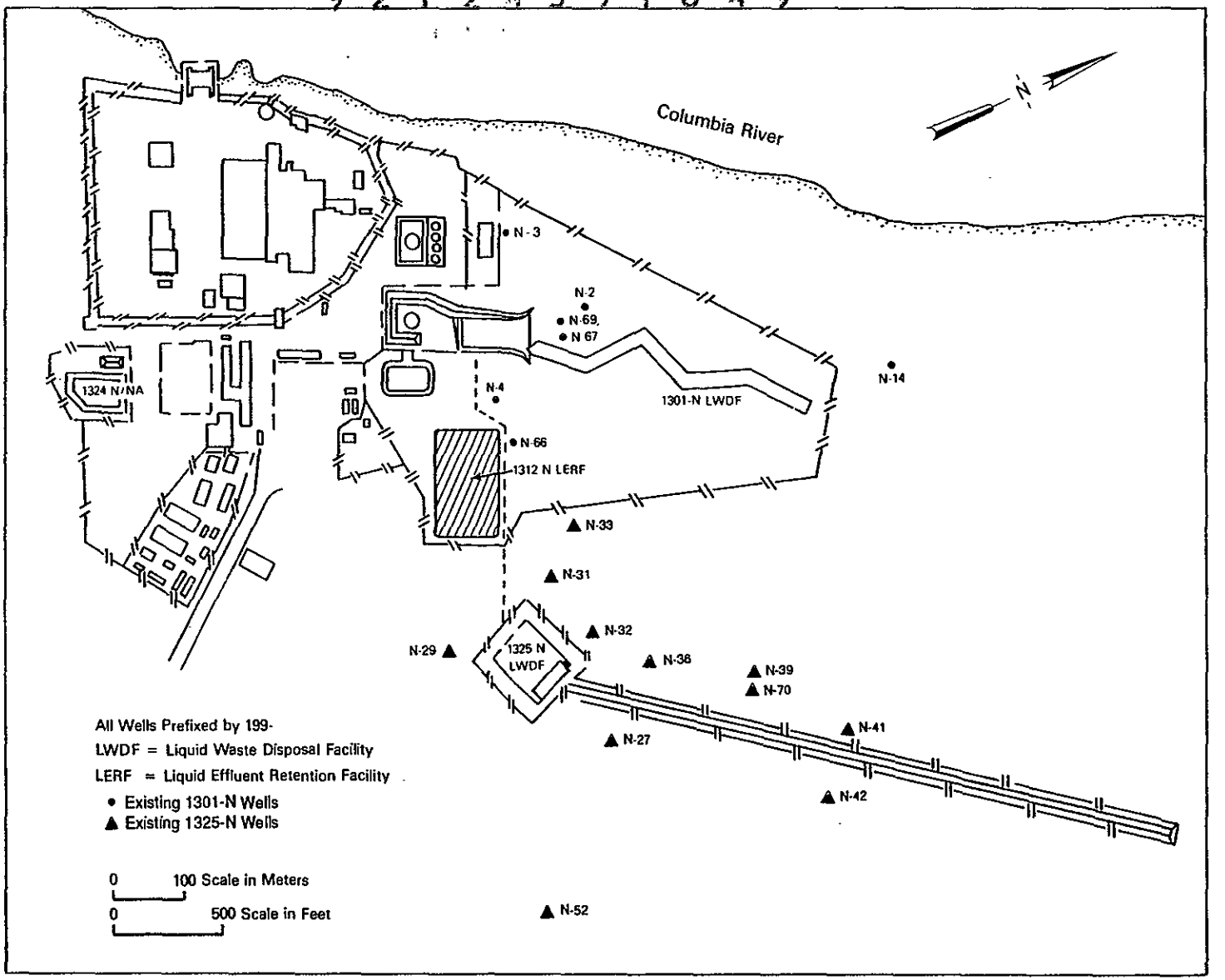

FIGURE 7.1. Monitoring Well Locations for the 1301-N and 1325-N Facilities (Well 699-81-58 is also part of the 1325-N network and is shown in Figure 8.1.)

the 100-N Area. The number of wells in which water levels were obtained each month was dependent on the accessibility and condition of each well and ranged between approximately 30 and 44 wells. Columbia River elevations were measured as part of a separate project (the Hanford Generating Project) in the 100-N Area and are available for comparison with the ground-water monitoring data reported here.

With the closure of the N Reactor in early 1988, the 1325-N LWDF stopped receiving large volumes of liquid wastes; however, smaller volumes of liquid wastes continued to be discharged to the 1325-N LWDF. This decrease in artificial recharge to the ground-water has caused a decline in the water table of approximately 5 ft near the 1325-N LWDF. The water-table contour map for February (PNL 1988) showed a ground-water mound under the 1325-N LWDF with an elevation high of 399.92 ft. This ground-water mound dissipated rapidly in March and April (PNL 1988a,b) and continued to drop at a slower rate in the following months to a low of 394.15 ft in November (Fruland, Bates, and Lundgren 1989b).

Ground-water flow direction determined by the water-table gradient indicates ground-water flow west to northwest toward the Columbia River. Although the Columbia River elevation fluctuates as much as 5 ft seasonally (based on monthly data from the 100-N Area river-stage recorders), this seasonal fluctuation does not cause a reverse gradient in the 100-N Area wells.

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EVALUATION OF WATER CHEMISTRY AND PARAMETERS

The decline of the water table near the 1301-N and 1325-N facilities as a result of the decrease in the artificial recharge to these facilities has significantly decreased water levels in several network wells to the point where they could no longer be sampled. This has necessitated using other wells for sample collection to maintain an adequate network coverage. The list of constituents sampled for are included in Fruland, Bates, and Lundgren (1989b).

Concentrations Above the Primary Drinking Water Standards

During 1988, six ground-water constituents were reported above U.S. Environmental Protection Agency standards. These include nitrate, coliform, gross beta, tritium, and strontium-90 (PNL 1988a,b; Fruland, Bates, and Lundgren 1989a). Cobalt-60 exceeded the standards in EPA (1976). One year of data has been collected as of December 1988, and the background levels of the ground-water chemistry are now being determined.

1301-N Monitoring Network

Originally the monitoring network was composed of five wells: 199-N-2, 199-N-3, 199-N-4, 199-N-14, and 199-N-49 (Figure 7.1). Two new wells, 199-N-67 and 199-N-69, were drilled in spring 1988. Both wells 199-N-67 and 199-N-69 were added to the network in the December sampling. Upgradient well 199-N-49 has been removed from the network because of low water levels and replaced with existing well 199-N-66. Wells 199-N-2, 199-N-3, 199-N-67, 199-N-69, and 199-N-14 are downgradient wells. Upgradient and downgradient positions were determined from the evaluation of ground-water elevations over the past year (PNL 1988a,b; Fruland, Bates, and Lundgren 1989a,b). The monitoring network meets the minimum requirement of one upgradient well and contains five downgradient wells.

1325-N Monitoring Network

Originally 12 ground-water wells composed the monitoring network for the 1325-N LWDF. These wells were 199-N-27, 199-N-29, 199-N-31, 199-N-32, 199-N-33, 199-N-36, 199-N-39, 199-N-41, 199-N-42, 199-N-52, and 699-81-58 (Figure 7.1). One new well, 199-N-70, was completed in spring 1988 and added to the network for the September sampling. Well 199-N-39 was eliminated from the monitoring network because of its low water levels. The present monitoring network for establishing background ground-water chemistry is considered adequate.

8.0 THE 1324-N/NA SURFACE IMPOUNDMENT AND PERCOLATION PONDS

T. J. Gilmore

The RCRA ground-water monitoring project for the 1324-N/NA Surface Impoundment and Percolation Ponds is a monitoring and characterization effort focused on the 100-N Area of the Hanford Site (Figure 1.1).

The 1324-NA percolation pond is an unlined pond that was used to treat corrosive hazardous wastes from August 1977 to May 1986. In May 1986, the 1324-N surface impoundment was put into service to treat the corrosive wastes. The wastes treated in 1324-NA were first transferred to two small settling ponds to settle solids from the filter backwash. The settling ponds were removed from service in 1983, and the south pond backfilled. The north pond was modified to provide the foundation for the 1324-N surface impoundment.

The 1324-N surface impoundment is a double-lined pond with a leachate collection system used to neutralize the wastes before discharge into the 1324-NA percolation pond (Figure 8.1). The 1324-N surface impoundment was taken out of service in November 1988. Discharge to these facilities included effluents from cation and anion regeneration cycles, process and cooling waters, and filter backwash wastes. The 1324-NA percolation pond is still used for disposal of nondangerous wastes.

One year of interim-status background ground-water monitoring was completed in December 1988, and representative background levels can now be determined. Progress on the project during 1988 included

- ground-water sampling of wells
- monthly water-level measurements
- expansion of the ground-water monitoring network.

EVALUATION OF WATER-LEVEL ELEVATIONS

In addition to those measured before sample collection, water-levels were measured monthly using a graduated steel tape in most of the usable

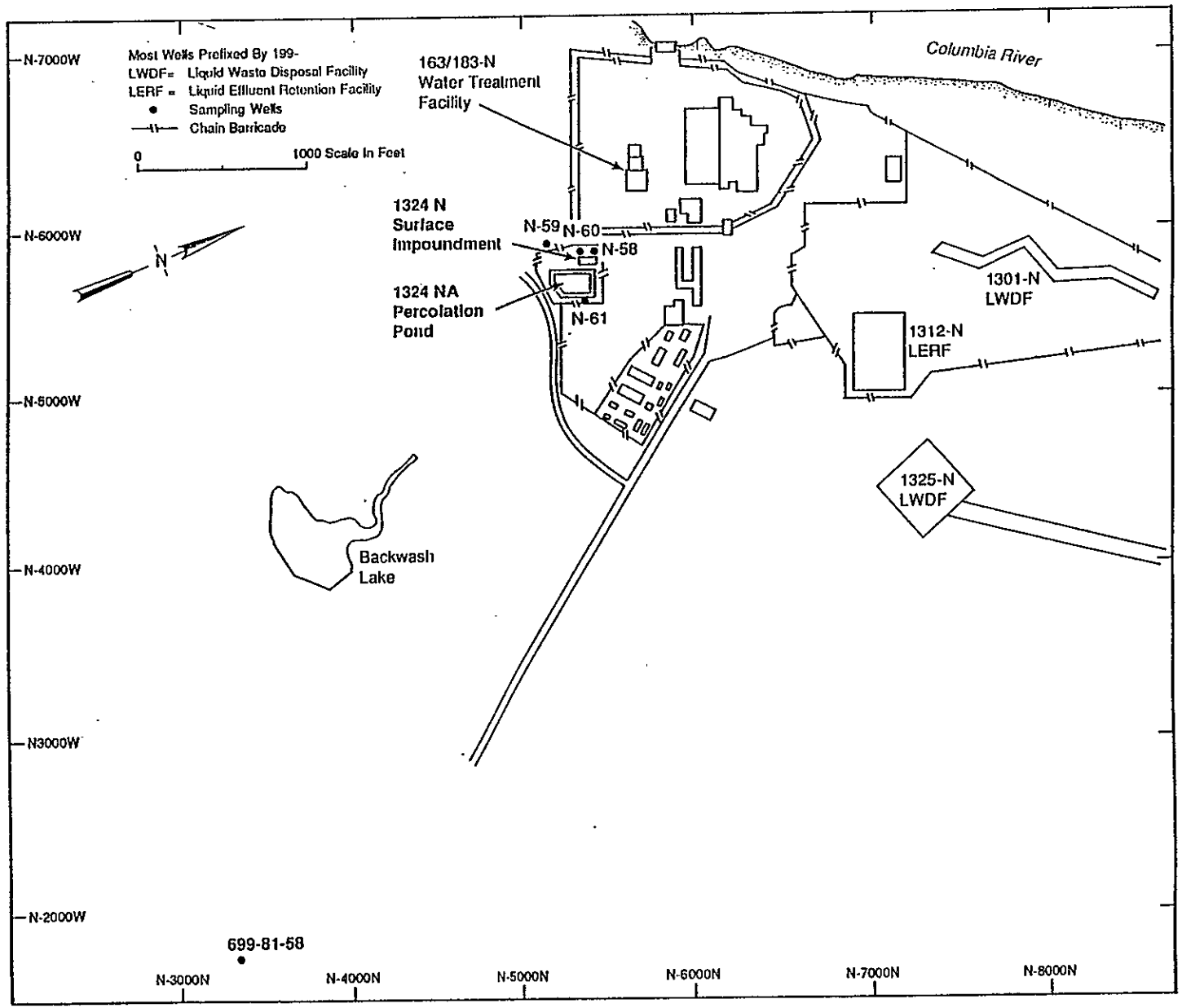

FIGURE 8.1. Monitoring Well Locations for the 1324-N/NA Facilities

wells in the 100-N Area. The number of wells in which water levels were obtained each month was dependent on the accessibility and condition of each well and ranged between approximately 30 and 44 wells. Columbia River elevations measured as part of a separate project (Hanford Generating Project) in the 100-N Area are available for comparison with the water-level measurements reported under this project.

Although closure of the N Reactor reduced waste stream discharges to many facilities in the 100-N Area, the 1324-NA facility continues to receive liquid waste discharges (as described on page 8.1). As a result, the ground-water mound under the 1324-N/NA facilities was still present in December 1988 (PNL 1988a,b; Fruland, Bates, and Lundgren 1989a,b).

The ground-water flows radially outward from the 1324-N/NA facilities. Regionally, however, the ground-water flows toward the Columbia River west of the facility (PNL 1988a,b; Fruland, Bates, and Lundgren 1989a,b).

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EVALUATION OF WATER CHEMISTRY AND PARAMETERS

Originally, the monitoring network was composed of four wells, 199-N-58, 199-N-59, 199-N-60, and 199-N-61. Well 199-N-61 was designated the upgradient well and the other three wells downgradient. Existing well 699-81-58 was added to the network in December 1988 as the upgradient well because it was determined well 199-N-61 is under the influence of the facility as indicated by ground-water analysis and water-table elevation maps (PNL 1988a,b; Fruland, Bates, and Lundgren 1989a,b). Well 699-81-58 is the nearest upgradient existing well that is not influenced by the facility. With the current five wells, the monitoring network is adequate for determining the facility's influence on the ground water.

Concentrations Above the Primary Drinking Water Standards

No ground-water constituents exceeded PDWSs. One year of data has been collected as of December 1988, and the background levels of the ground-water chemistry are now being determined.

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9.0 216-A-10 CRIB

S. P. Luttrell

The RCRA ground-water monitoring project for the 216-A-10 crib is an interim-status, background monitoring and characterization effort in the 200-East Area (Figures 1.1 and 9.1). The 216-A-10 crib is a cross-sectionally v-shaped crib approximately 45 ft deep and 275 ft long. It received startup wastes from the Plutonium Uranium Extraction (PUREX) Plant 400 ft to the north during a 4-month period in 1956, but did not begin continuous service until 1961 when it replaced the retired 216-A-5 crib. The crib operated continuously from 1961 to 1973, sporadically in 1977, 1978, and 1981, then continuously until 1987.

Progress during 1988 included installing six wells and collecting and analyzing the first set of quarterly background ground-water samples from these wells.

Wells 299-E25-36 and 299-E24-18 are the background wells, and wells 299-E17-1, 299-E17-19, 299-E17-20, 299-E24-2, 299-E24-16, and 299-E24-17 are the downgradient monitoring wells.

EVALUATION OF WATER-LEVEL ELEVATIONS

Casing elevation, depth-to-water, and water-level elevation data were presented in Fruland, Bates, and Lundgren (1989b). The measurements made on November 23, 1988, are shown on Figure 9.2. These data have been inconclusive for determining the ground-water flow direction because of the very small gradient (less than 10^{-4}), difficulties in making measurements, and uncertainties in the data. Water-level measurements were made before sample collection, and supplemental measurements were also made at other times.

Of the wells installed in 1988, two were located on each side of the crib because of the lack of understanding of the ground-water flow direction. These four wells and the two existing wells ring the facility to ensure that wells are located hydraulically downgradient. An upgradient well was installed on each side of the facility to ensure that one will provide samples that are representative of background conditions.

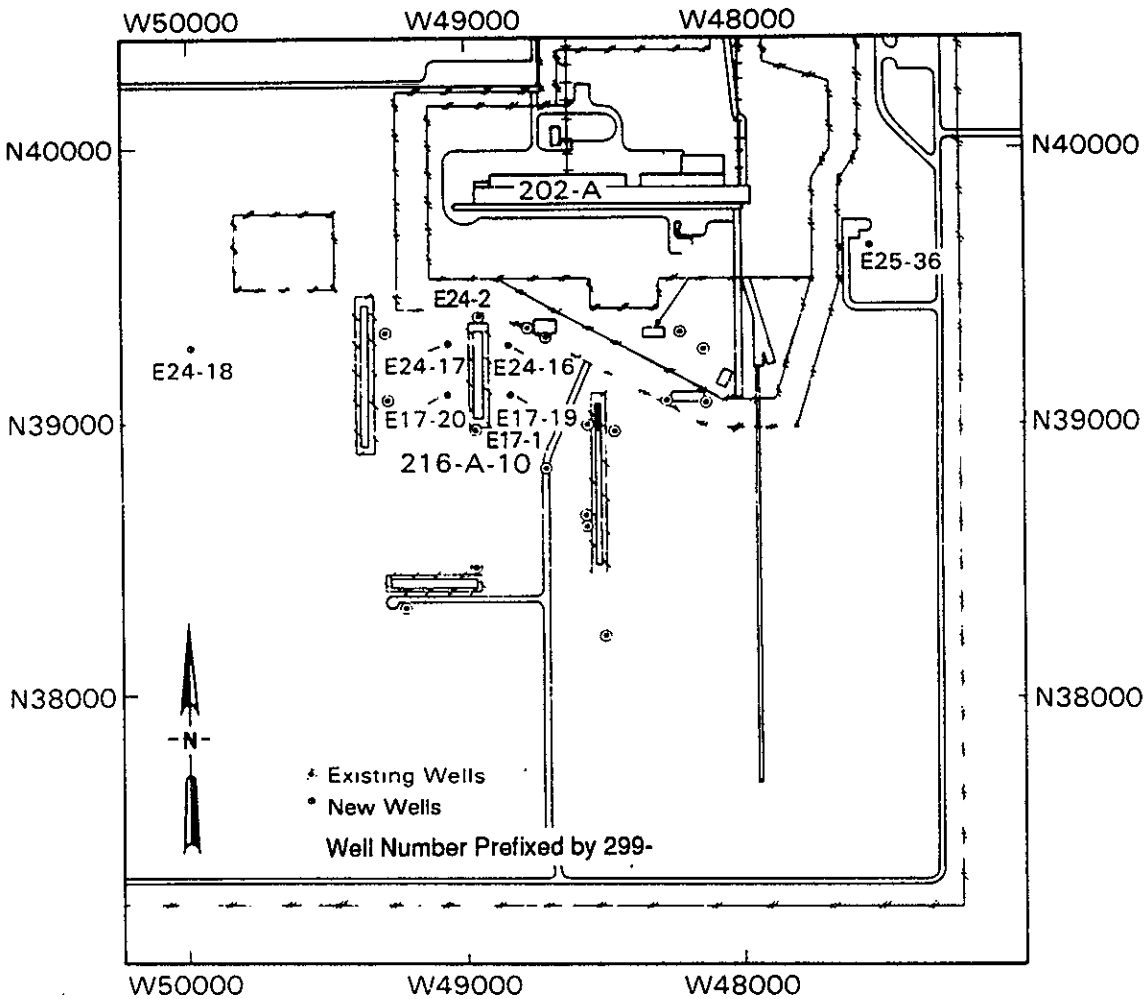

FIGURE 9.1. Monitoring Well Locations for the 216-A-10 Crib

EVALUATION OF WATER CHEMISTRY AND PARAMETERS

Data are currently being collected to establish background levels at the 216-A-10 crib. One quarterly set of data is available. Ground-water samples from wells at the 216-A-10 crib have exceeded the PDWSs for gross beta, chromium (unfiltered sample), and nitrate. Indicator parameters will not be statistically evaluated until the background levels have been established.

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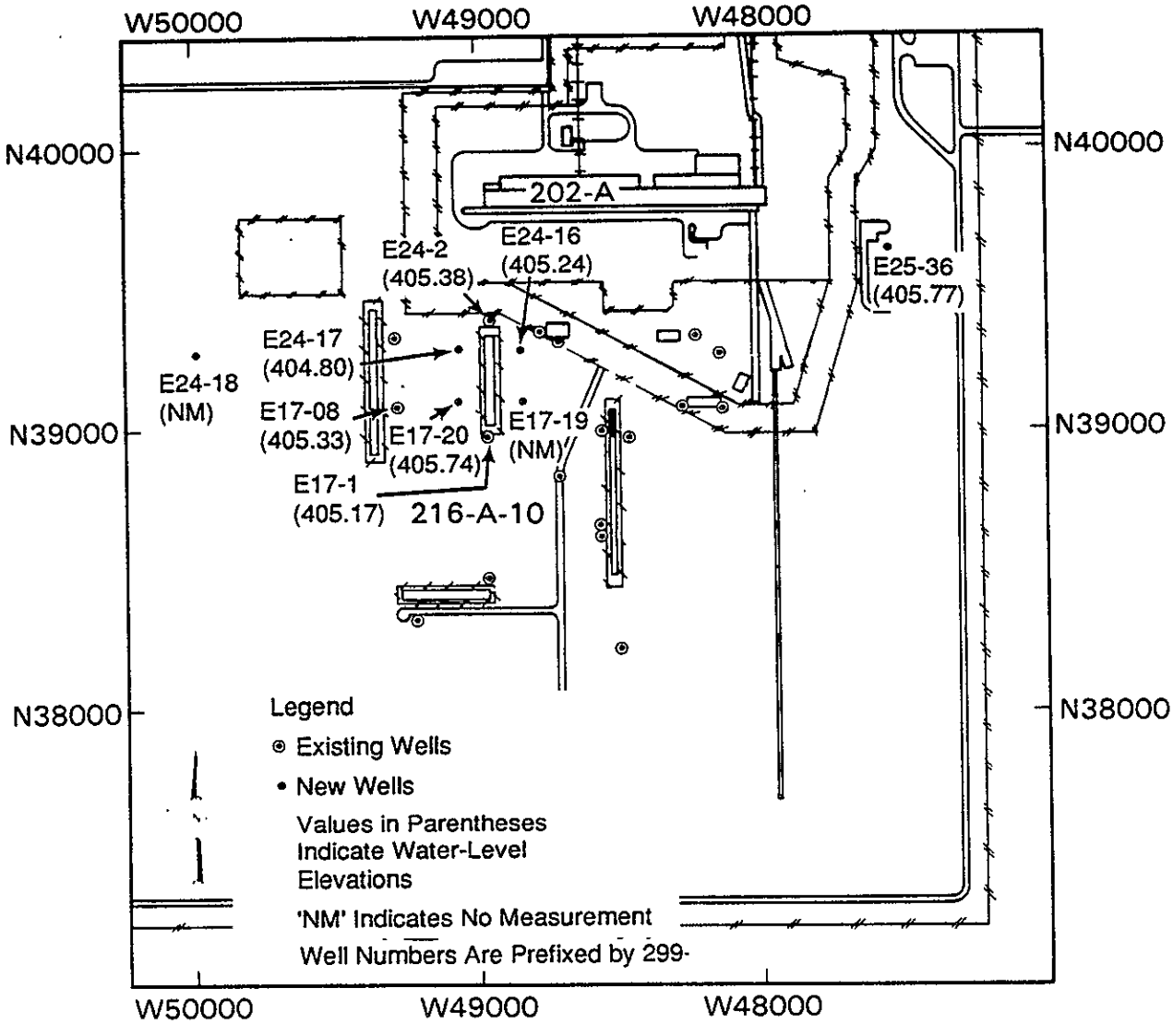

FIGURE 9.2. Water-Level Elevations in Wells at the 216-A-10 Crib, November 23, 1988

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10.0 216-A-29 DITCH

S. P. Luttrell

The RCRA ground-water monitoring project for the 216-A-29 ditch is a interim-status, background monitoring and characterization effort near the 200-East Area (Figure 1.1). The 216-A-29 ditch (Figure 10.1) is a manmade earthen ditch approximately 6 ft wide and 6500 ft long that has been in use since 1955. It receives discharge from the PUREX Plant chemical sewer line.

Progress during 1988 included installing two new wells (Figure 10.1) and collecting and analyzing the first set of quarterly background ground-water samples.

Well 299-E25-32 and well 1 (to be constructed in 1989) will be the background wells, and wells 299-E25-26, 299-E25-28, 299-E25-34, and 299-E25-35 are the downgradient monitoring wells. Well 2 (to be constructed in 1989) will also be a downgradient well.

EVALUATION OF WATER-LEVEL ELEVATIONS

Casing elevations, water-level measurements, and water-level elevations for wells at the 216-A-29 ditch were provided in Fruland, Bates, and Lundgren (1989b). Water levels were measured before sample collection and supplemental measurements were also made at other times. Water-level elevations in wells measured December 6, 1988 (except well 299-E25-28, which is completed at the bottom of the aquifer), are plotted on Figure 10.2. A surface trend that was constructed from the water-level elevations in wells 299-E25-32A, 299-E25-34, and 299-E25-35 is also shown on Figure 10.2. The water-level elevation for well 299-E25-26 is anomalous in relation to this surface, indicating either the presence of a mound in the vicinity of well 299-E25-26 or an error in the determination of the water-level elevation in that well. There has been some question on the correct measuring point and the casing elevation of well 299-E25-26; therefore, the latter explanation seems more reasonable. The water-level elevation for that well measured December 15 is much closer to the surface trend. Water-level measurements will continue to

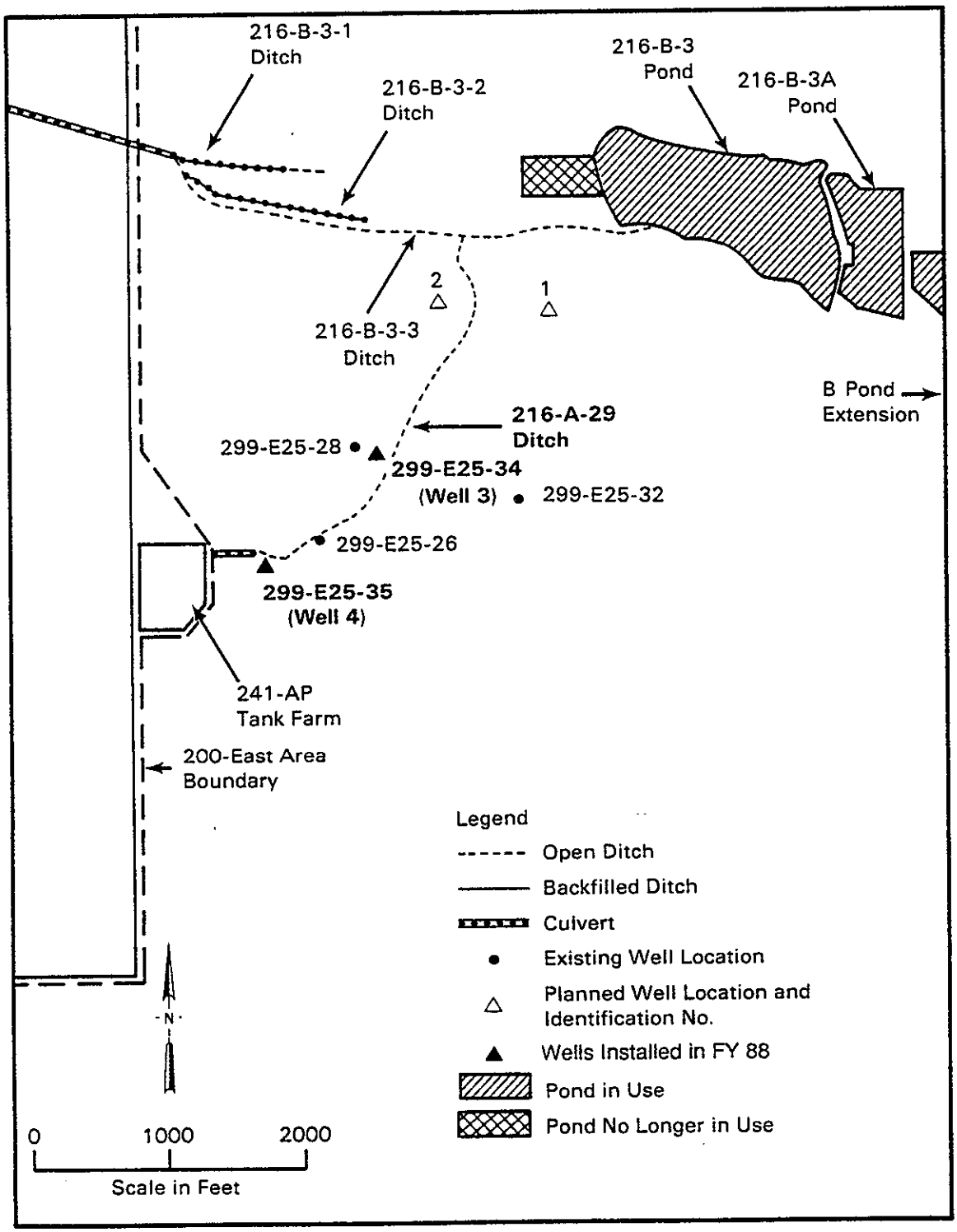

FIGURE 10.1. Monitoring Well Locations for the 216-A-29 Ditch

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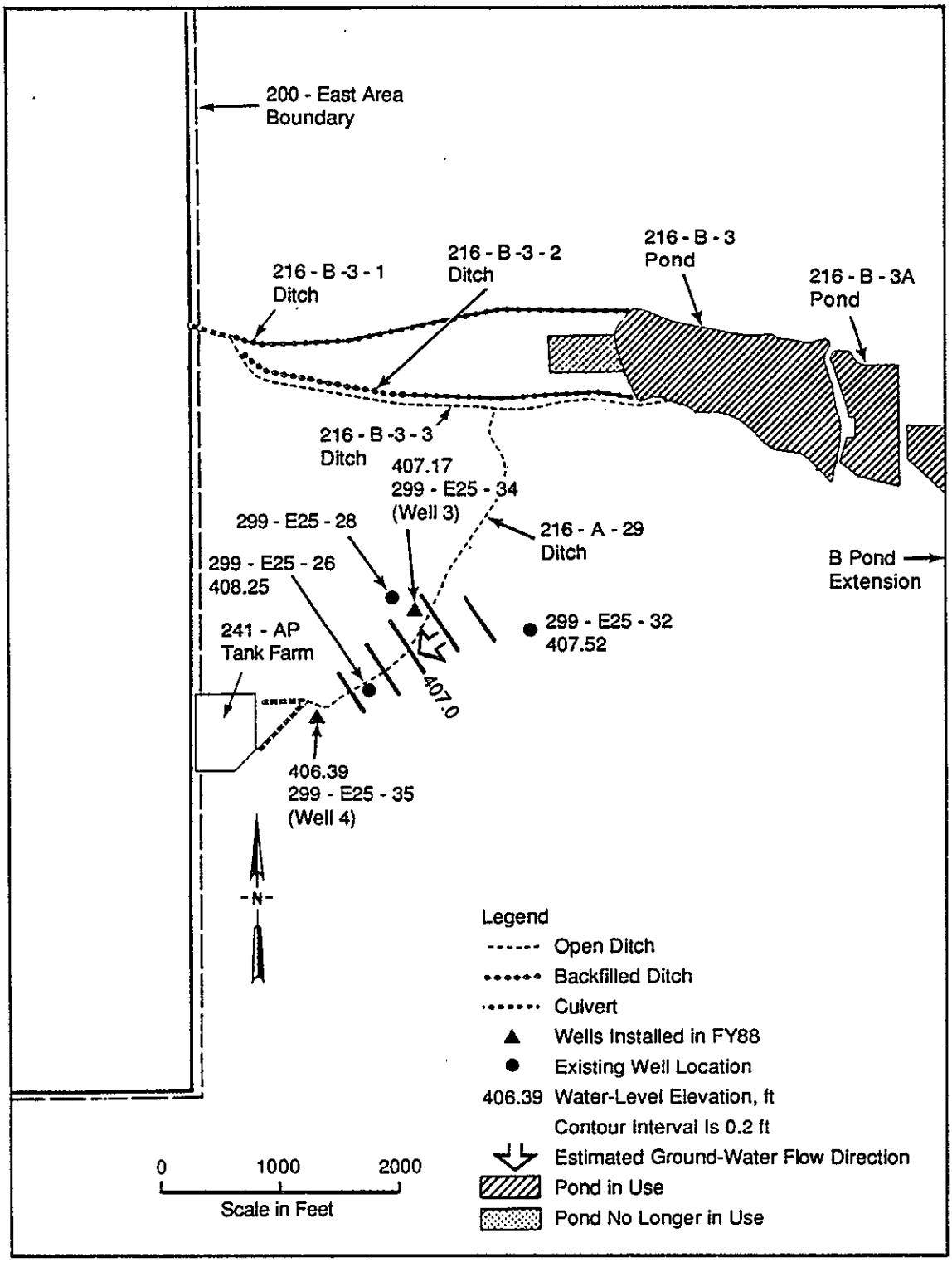

FIGURE 10.2. Water-Level Elevations in Wells at the 216-A-29 Ditch and a Preliminary Water-Table Map Indicating the Inferred Direction of Ground-Water Flow, December 6, 1988

be made from these and other existing wells near the 216-A-29 ditch to determine the ground-water flow direction.

EVALUATION OF WATER CHEMISTRY AND PARAMETERS

Data are currently being collected to establish background levels at the 216-A-29 ditch. The first quarterly set of data is available in Fruland, Bates, and Lundgren (1989b). Ground-water samples from wells at the 216-A-29 ditch did not exceed PDWSs for any constituents analyzed. Indicator parameters will not be statistically evaluated until the background levels have been established.

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11.0 216-A-36B CRIB

S. P. Luttrell

The RCRA ground-water monitoring project for the 216-A-36B crib is an interim-status, background monitoring and characterization effort in the 200-East Area (Figure 1.1). The 216-A-36B crib is the southern 500-ft section of a 600-ft-long crib (Figure 11.1). It is 12 ft wide and 12 ft deep, and was separated from the 216-A-36A crib in 1966 by a grout curtain. The 216-A-36B crib received ammonia scrubber distillate from the PUREX Plant from September 1965 to 1972, then was reactivated from November 1982 until October 1987. The crib has been unused since that time.

Progress during 1988 included installing five new monitoring wells and collecting and analyzing two quarterly sets of background ground-water samples. The five new monitoring wells combined with three existing wells near the crib (Figure 11.1), make up the ground-water monitoring system for the crib. Wells 299-E17-17 and 299-E17-10 (not yet being sampled) are the background wells, and wells 299-E17-5, 299-E17-9, 299-E17-14, 299-E17-15, 299-E17-16, and 299-E17-18 are the downgradient monitoring wells. Well 299-E17-10 will be rehabilitated before sampling for the first time. The ninth well on Figure 11.1, 299-E17-6, is sampled for qualitative water chemistry data; no statistical evaluations will be made with data from this well. Two quarterly sets of background ground-water samples have been collected and analyzed from wells at the 216-A-36B crib.

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EVALUATION OF WATER-LEVEL ELEVATIONS

Casing elevations, water-level measurements, and water-level elevations for wells at the 216-A-36B crib were provided in PNL (1988b), and Fruland, Bates, and Lundgren (1989a,b). Water levels have been measured before sample collection and supplemental measurements have also been made at other times. A preliminary water-table map beneath the 216-A-36B crib was presented in PNL (1988b). Water-level elevations and an inferred water-table map for data collected November 22, 1988, are shown in Figure 11.2. Some difficulties in determining the ground-water flow direction from the data are a result of the very small gradient, difficulties in making measurements, and uncertainties

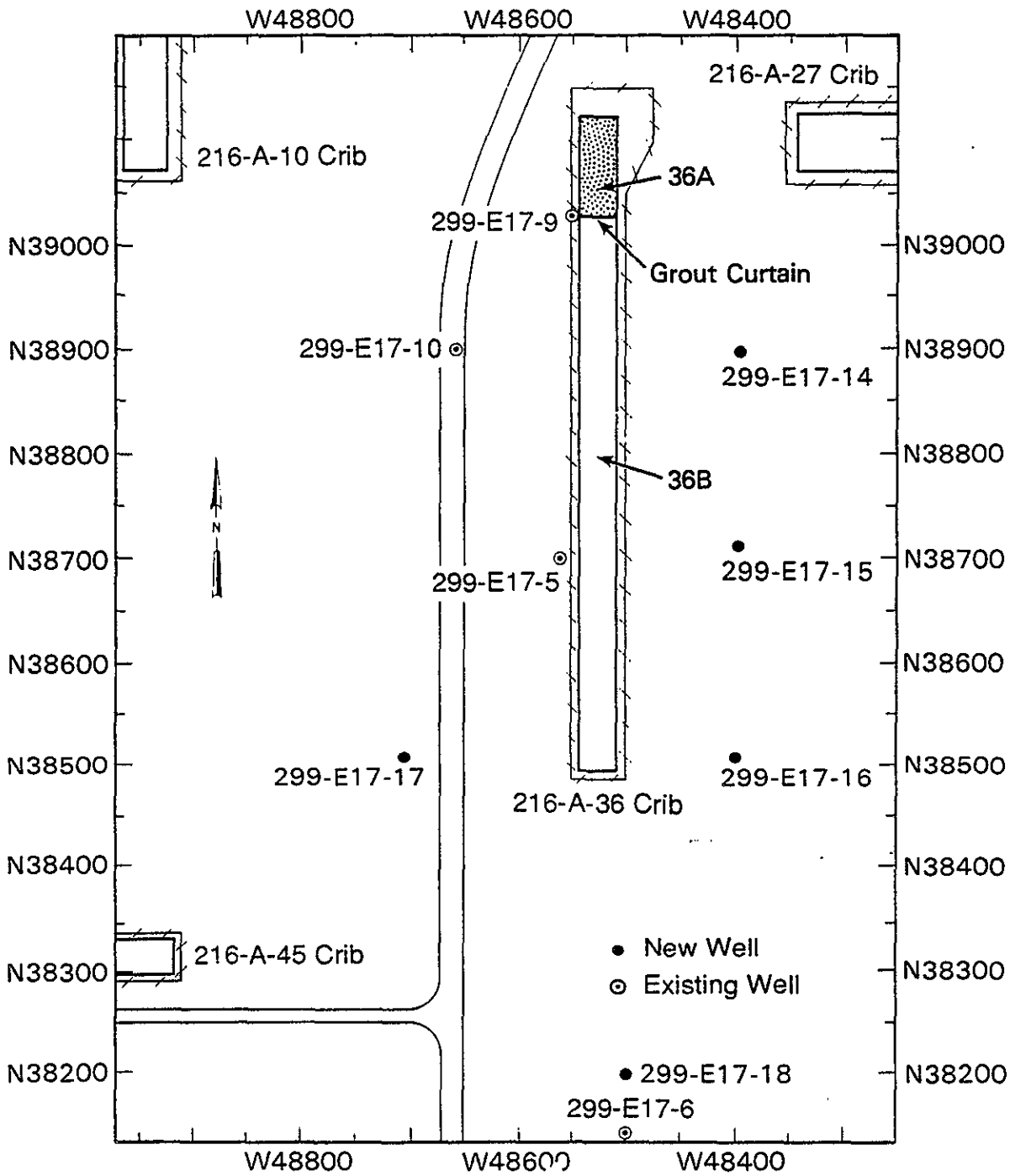

FIGURE 11.1. Monitoring Well Locations for the 216-A-36B Crib

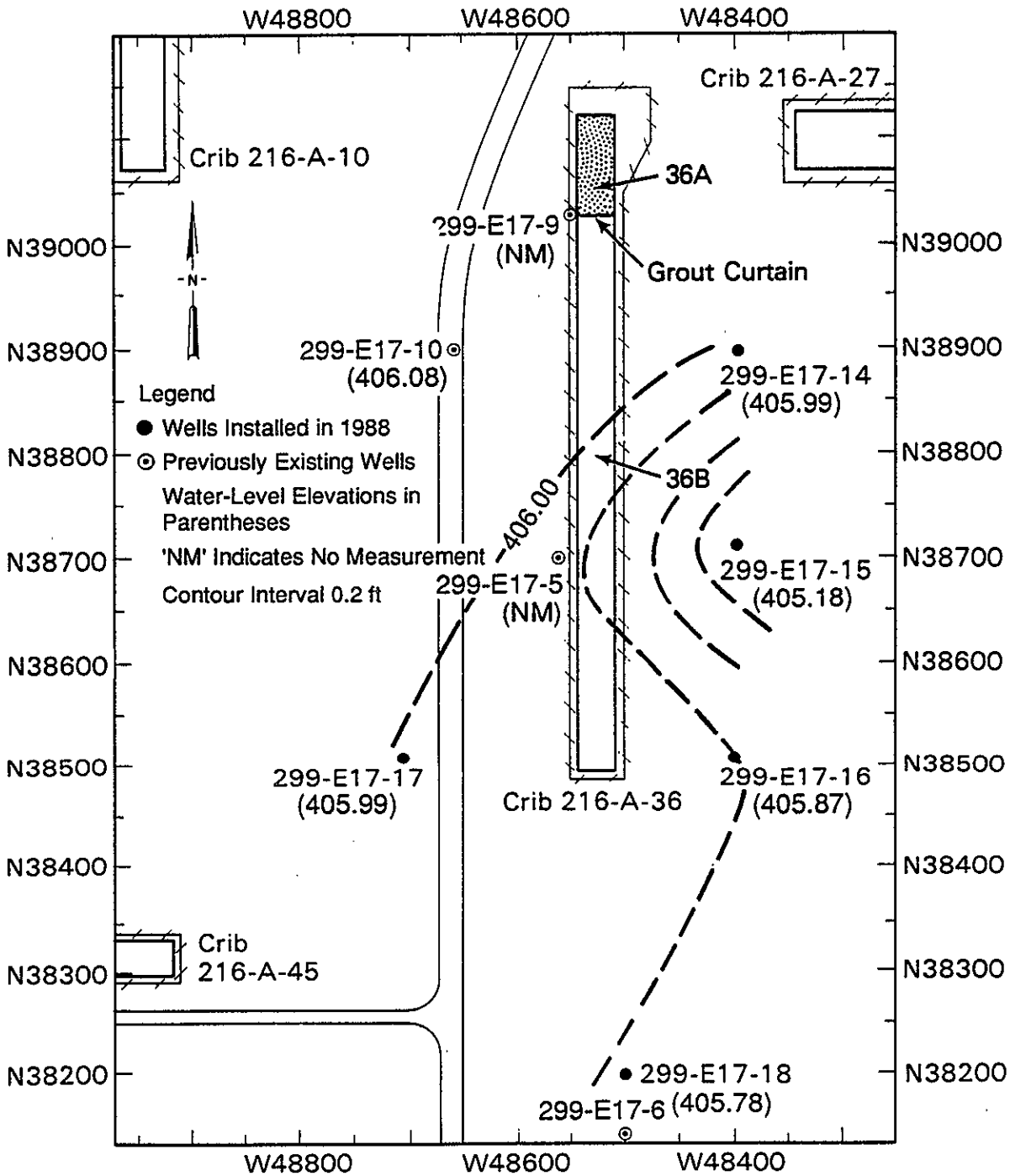

FIGURE 11.2. Water-Level Elevations in Wells at the 216-A-36B Crib and an Inferred Water-Table Map Beneath the Crib, November 22, 1988

in the data. The general trend of the water-table map in Figure 11.2 corroborates that given in PNL (1988b); however, the data are inconclusive for determining whether the wells are adequately located.

EVALUATION OF WATER CHEMISTRY AND PARAMETERS

Data are currently being collected to establish background levels at the 216-A-36B crib. Two quarterly sets of data are available (PNL 1988b; Fruland, Bates, and Lundgren 1989b); however, it is questionable whether the first set of data accurately represents ground-water chemistry conditions because the wells had not been adequately developed (PNL 1988b). Ground-water samples from wells at the 216-A-36B crib have exceeded the PDWSs for gross beta, cadmium (unfiltered and filtered), chromium (unfiltered and filtered), and nitrate. Cadmium and chromium analyses exceeded the PDWSs for the first quarterly set of samples only, indicating the possibility that elevated levels of these constituents were a result of well construction or drilling. Water chemistry and indicator parameters will not be statistically evaluated until the background levels have been established.

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12.0 216-B-3 POND

S. P. Luttrell

The 216-B-3 Pond (B Pond) is actually a series of interconnected ponds covering 102 acres to the east of the 200-East Area (Figure 1.1). The pond receives large volumes (approximately 6 x 10^9 gal in 1987) of waste water from facilities in the 200-East Area. The pond is currently under RCRA interim status.

Four new wells were installed at B Pond in 1988. These, in conjunction with three existing wells (Figure 12.1) and six additional wells to be installed in 1989, will provide a ground-water background monitoring system for the pond. Wells 299-E18-1 and 299-E32-4 are the background wells, and wells 699-42-40A, 699-42-42B, 699-43-42J, 699-43-43, and 699-44-42 are the downgradient monitoring wells. Wells BP-1, BP-2, BP-4, BP-5, BP-6, and BP-9 (to be constructed in 1989) will also be downgradient wells. The first set of quarterly background ground-water samples has been collected and analyzed.

EVALUATION OF WATER-LEVEL ELEVATIONS

Water-level measurements and elevations for the seven wells were presented in Fruland, Bates, and Lundgren (1989b). Water levels were measured before sample collection, and supplemental measurements were also made at other times. A map of the water-level elevations and the inferred surface of the water table (constructed from data from wells completed in the upper part of the aquifer) is shown in Figure 12.2. New wells on this map are indicated by their permanent well numbers, 699-42-42, 699-43-42J, 699-43-43, and 699-42-42B. This map suggests ground-water flow generally from east to west; however, because a ground-water mound exists beneath B Pond, this concept is oversimplified and likely not accurate. Because of the ground-water mound beneath B Pond, it is reasonable to expect that all the wells are "downgradient" of the facility.

The background wells, shown in Figure 12.1, are located over 2 miles west of the pond. These wells are located regionally "upgradient" of the

pond. Evaluation of the water levels from these wells does not reflect on ground-water flow directly beneath the pond.

EVALUATION OF WATER CHEMISTRY AND PARAMETERS

Data are currently being collected to establish background levels at the 216-B-3 Pond. The first quarterly set of data is available (Fruland, Bates, and Lundgren 1989b). Ground-water samples from wells at the 216-B-3 Pond have exceeded the PDWSs for chromium (unfiltered) and tritium. Elevated chromium concentrations, presumably from well drilling or construction, have been observed in samples from recently constructed wells at several Hanford locations (see Section 1.0 Introduction). Indicator parameters will not be statistically evaluated until the background levels have been established.

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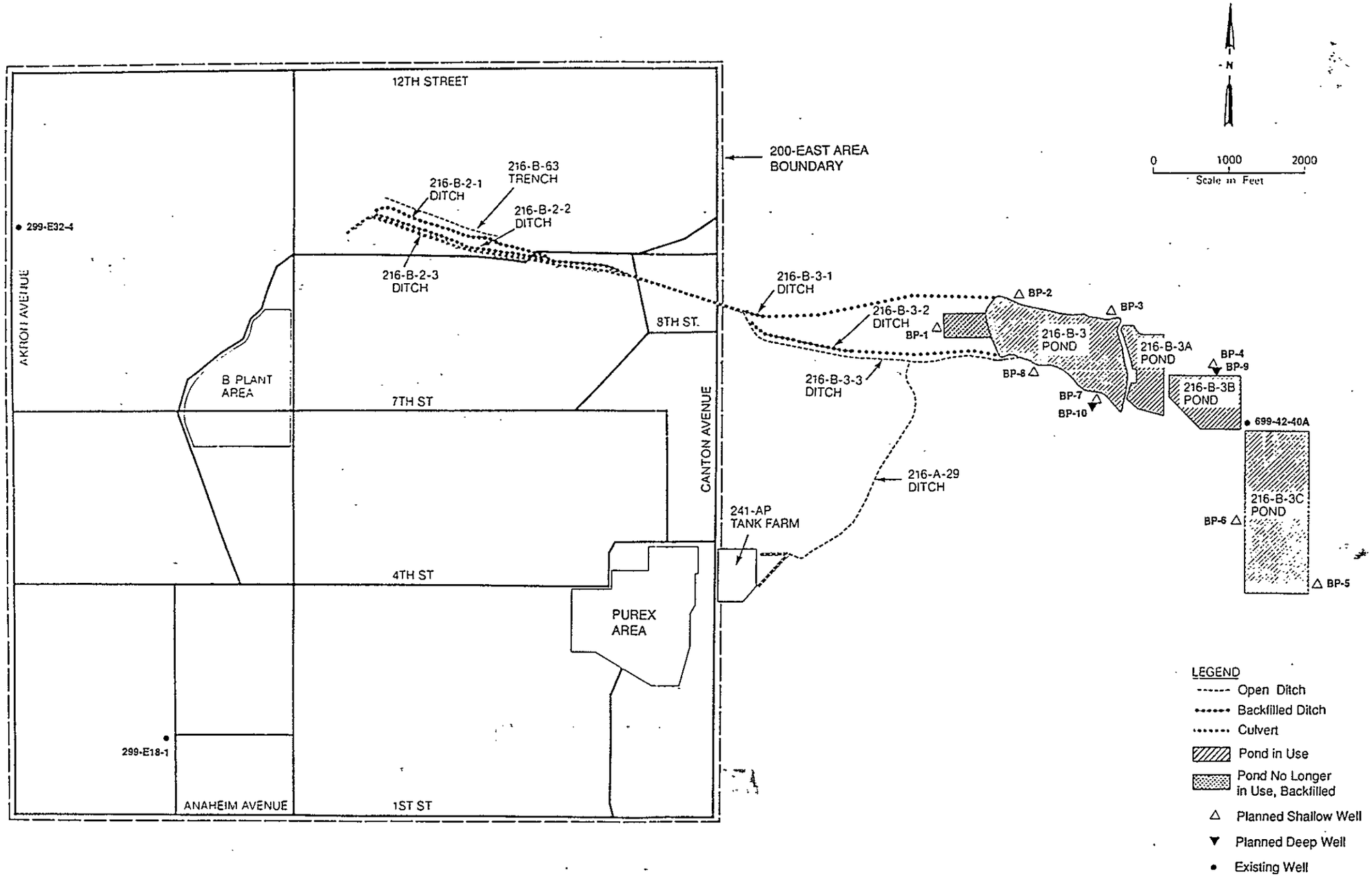

FIGURE 12.1. Monitoring Well Locations for the 216-B-3 Pond

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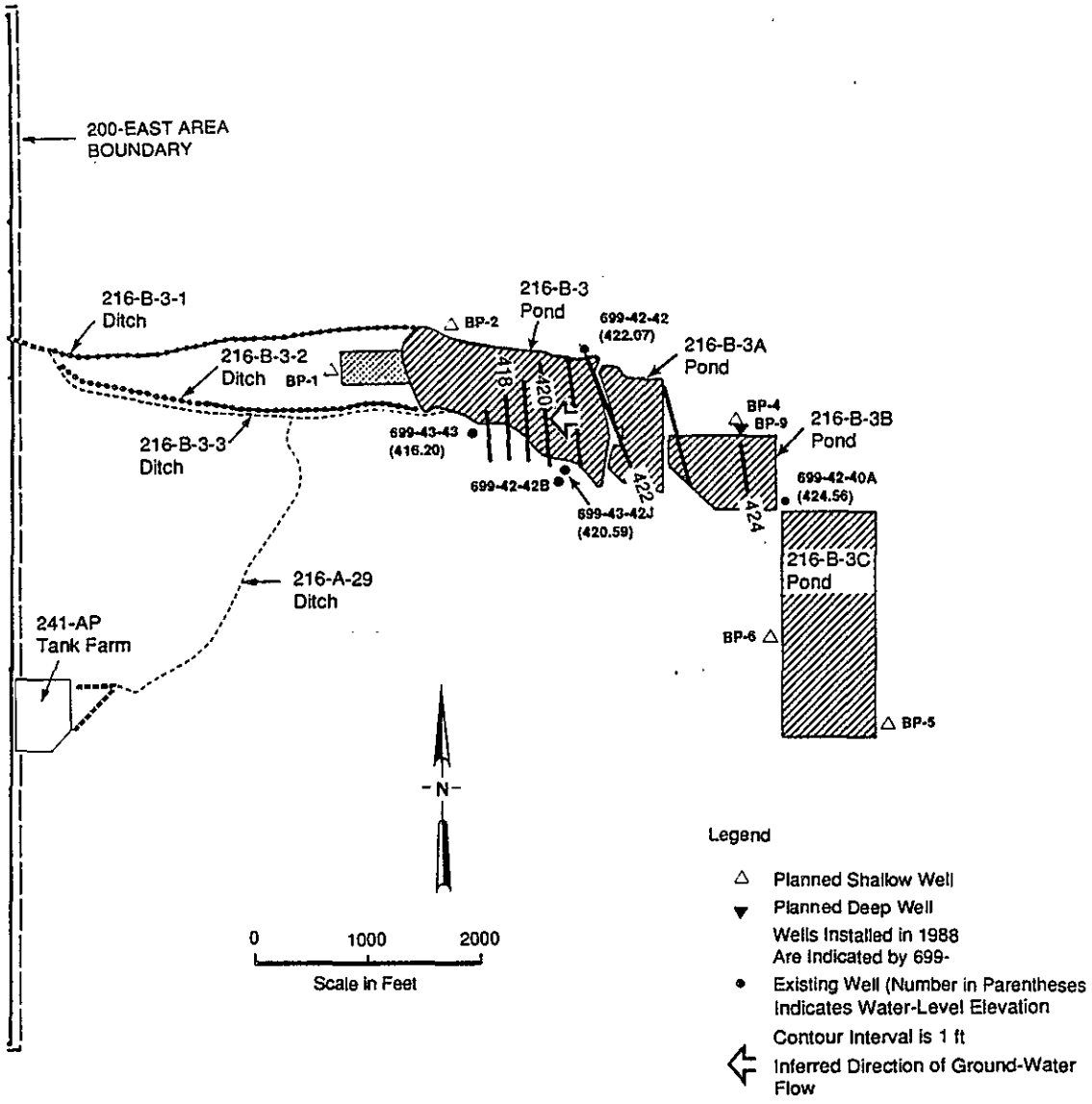

FIGURE 12.2. Water-Level Elevations and a Preliminary Water-Table Contour Map Beneath the 216-B-3 Pond, November-December 1988

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13.0 2101-M POND

M. A. Chamness

The RCRA ground-water monitoring project for the 2101-M Pond is an interim-status, background monitoring and characterization effort located in the 200-East Area (Figure 1.1). The 2101-M Pond is located west-southwest of the 2101-M Building in the southwest portion of the 200-East Area (Figure 13.1). The pond has received waste water from the 2101-M Building heating and air conditioning system from 1953 to the present. In 1981, laboratories were plumbed into the discharge line from the 2101-M Building to the pond. From 1981 until mid-1985, these laboratories may have discharged dangerous wastes into the pond.

Progress in 1988 included completion of four ground-water monitoring wells (Figure 13.1) and collection of two sets of quarterly background samples.

EVALUATION OF WATER-LEVEL ELEVATIONS

Not only have water levels been measured in the four monitoring wells whenever samples were taken, they have also been measured at least once a month since October 1988. It is felt that the latter measurements provide the best data, because the same two steel tapes have been used and all four of the wells are measured within a short period of time on the same day. Consequently, only those data collected at times other than when samples were taken are provided in Table 13.1. To date, these data are inconclusive in defining the ground-water gradient beneath the 2101-M Pond. This is in large part a result of the particularly flat gradient, which is on the order of 10^{-4} to 10^{-5} ft/ft in the area around the pond. More water-level data will be collected and evaluated, the gradient beneath the pond determined if possible, and the adequacy of the network examined by the end of the first year of background data collection.

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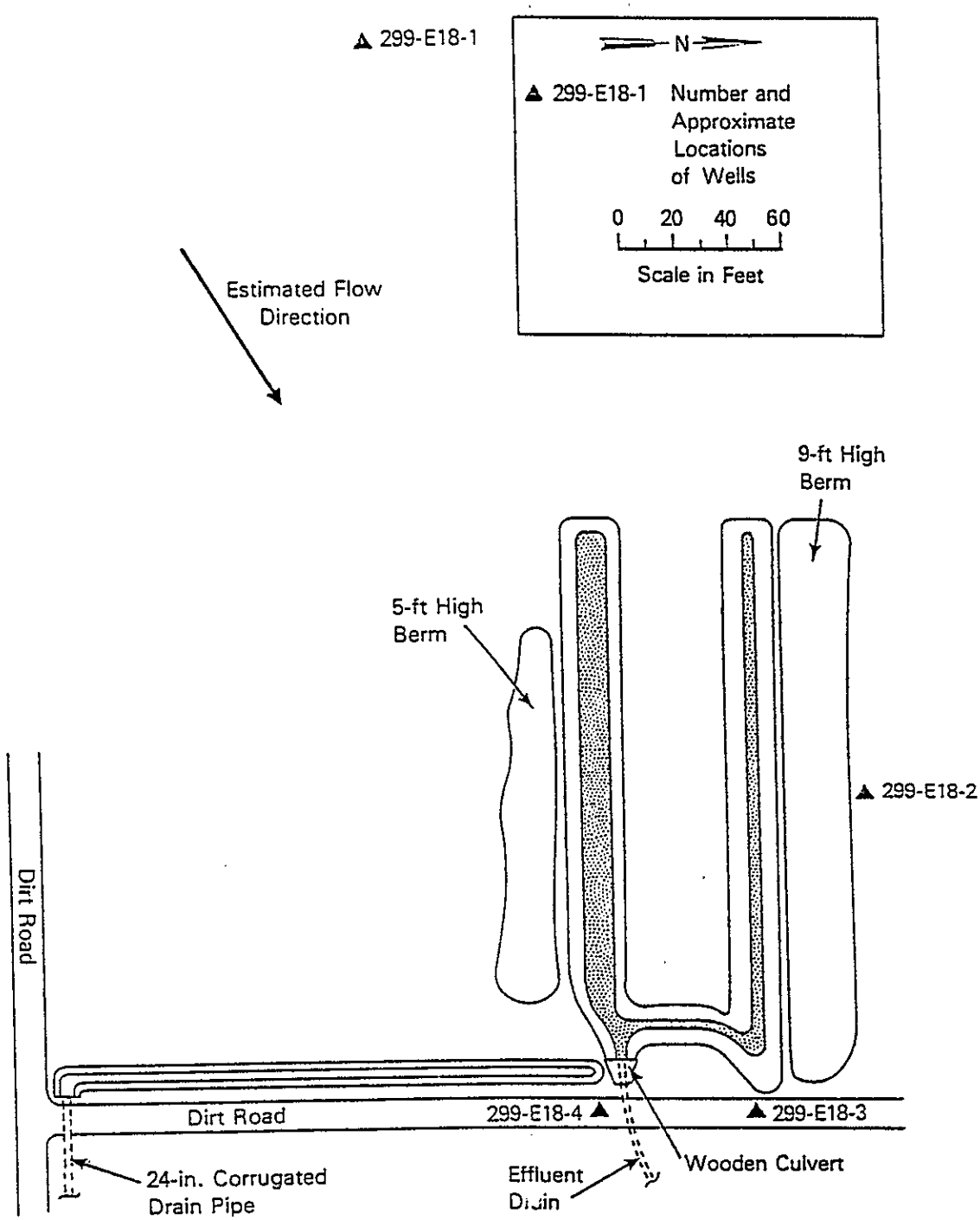

FIGURE 13.1. Monitoring Well Locations for the 2101-M Pond

TABLE 13.1. Water-Level Measurements and Elevation Data for Wells Near the 2101-M Pond

Well Number	Top of Casing Elevation, ft	Correction Factor[a]	Measurement Date	Depth to Water, ft	Water-Level Elevation, ft
299-E18-1	720.24	+0.06	10/06/88	314.29	406.01
			10/14/88	314.24	406.06
			10/26/88	314.32	405.98
			11/14/88	314.49	405.81
			12/08/88	314.21	406.09
299-E18-2	721.21	+0.22	10/06/88	315.52	405.91
			10/14/88	315.52	405.91
			10/26/88	315.55	405.88
			11/14/88[b]	315.69	405.74
			12/08/88	315.47	405.96
299-E18-3	722.04	+0.03	10/06/88[c]		
			10/14/88	316.13	405.94
			10/26/88	316.10	405.97
			11/14/88	316.21	405.86
			12/08/88[b]	316.02	406.05
299-E18-4	721.57	+0.0	10/06/88	315.59	405.98
			10/14/88	315.66	405.91
			10/26/88	315.62	405.95
			11/14/88	315.74	405.83
			12/08/88	315.53	406.04

(a) Based on inclinometer measurements. This has already been calculated into the water-level elevations.
(b) Measured only once.
(c) Unable to make measurements.

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EVALUATION OF WATER CHEMISTRY AND PARAMETERS

The 2101-M Pond project is currently collecting quarterly background ground-water chemistry information. Two sampling rounds have been completed. Chromium, selenium, and arsenic were above PDWSs for the first round of sampling; however, second quarter samples showed no constituents above PDWSs (Fruland, Bates, and Lundgren 1989a,b). Background levels will be established after two more quarterly samples are collected.

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14.0 GROUT TREATMENT FACILITY

S. S. Teel

The RCRA ground-water monitoring project for the Grout Treatment Facility (GTF) is an interim-status, background monitoring and characterization effort located adjacent to the eastern boundary of the 200-East Area (Figure 1.1). The project was initiated in 1988. It is based on characterization work presented in Swanson et al. (1988) and the Part B Permit Application (WHC 1988b) submitted to the Washington State Department of Ecology in November 1988.

The Grout Treatment Facility will be used for the treatment and disposal of liquid mixed waste (WHC 1988). The wastes will be mixed with a cementitious grout material and then poured into concrete-lined vaults where they will solidify. Field data collection in support of this project began in 1984. Treatment and disposal of a nondangerous mixture of phosphate/sulfate waste began in August 1988 (WHC 1988b). The site is scheduled to begin processing mixed wastes in FY 1991.

The RCRA monitoring project consists of two upgradient wells (299-E25-25 and 299-E25-32) and three downgradient wells (299-E25-29, 299-E25-31, and 299-E25-33). Ground-water samples are also collected and analyzed from six site characterization wells to monitor the effects of nearby waste-disposal facilities. The locations of all of the wells in the monitoring network are shown in Figure 14.1.

Quarterly samples were collected in January, March/April, July/August, and October of 1988. A total of 27 samples were collected.

Five wells were added to the sampling network in 1988. These wells, and the month they were first sampled, are shown in Table 14.1.

EVALUATION OF WATER-LEVEL ELEVATIONS

All of the wells in the sampling network, except for well 299-E25-28, monitor the top of the unconfined aquifer. Well 299-E25-28 monitors the bottom portion of the unconfined aquifer. Water levels are measured quarterly before sample collection.

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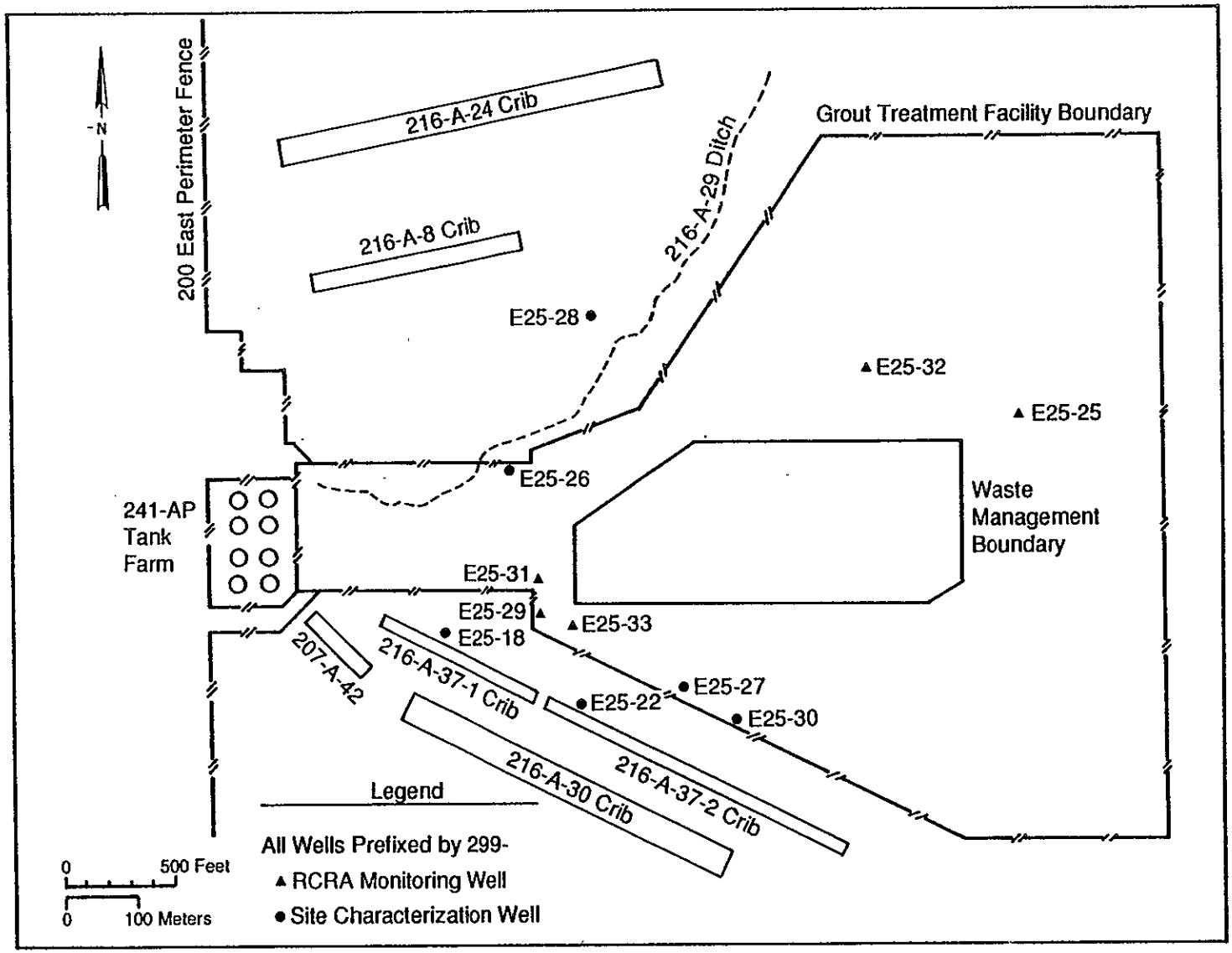

FIGURE 14.1. Monitoring Well Locations for the Grout Treatment Facility

TABLE 14.1. Wells Added to the Grout Treatment Facility Sampling Network in 1988

Well Number	Month of First Sampling
299-E25-29	July
299-E25-30	April
299-E25-31	January
299-E25-32	August
299-E25-33	April

A list of water-level data collected before sample collection in 1988 is shown in Table 14.2. Water-level measurements were mistakenly not taken during the first two quarterly samplings of 1988 (January and March/April). For the next two quarterly samplings, water-level measurements were taken at all wells except 299-E25-32 during the July/August sampling and 299-E25-26 during the October sampling.

Water-level data collected on a monthly basis during 1988 (not associated with sampling) are shown in Table 14.3.

Figure 14.2 shows a water-table map constructed from data collected in October 1988 (Table 14.3). Data from Table 14.3 were used in constructing this map, instead of the data in Table 14.2, because the data shown in Table 14.3, for October, are more complete. Data for well 299-E25-28 were not used in constructing this map because this well is completed at the bottom of the unconfined aquifer; this is a different completion interval than the other wells in the network. This map suggests that the direction of ground-water flow beneath the GTF is to the southwest. This is consistent with data reported by WHC (1988b), and indicates that the locations of the five RCRA monitoring wells meet the requirements in 40 CFR 265.91(a).

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TABLE 14.2. Water-Level Data Taken Before Sample Collection in 1988 for the Grout Treatment Facility

Well Name	Date	Depth to Water, ft	Water-Table Elevation, ft above MSL[a]	Casing Elevation, ft above MSL
299-E25-18	10/17/88	273.01	406.04	679.05
299-E25-22	10/17/88	267.98	406.04	674.02
299-E25-25	1/19/88	NM[b]	NM	669.42
299-E25-25	8/05/88	262.01	407.41	669.42
299-E25-25	10/18/88	261.12	408.30	669.42
299-E25-26	10/19/88	NM	NM	668.52
299-E25-26	12/15/88	261.44	407.08	668.52
299-E25-27	10/18/88	268.99	407.09	676.08
299-E25-28	10/19/88	255.62	406.82	662.44
299-E25-28	11/18/88	255.75	406.69	662.44
299-E25-29	7/08/88	266.29	406.33	672.62
299-E25-29	10/17/88	266.02	406.60	672.62
299-E25-30	10/18/88	265.93	412.27	678.20
299-E25-31	1/20/88	NM	NM	672.53
299-E25-31	7/11/88	266.26	406.27	672.53
299-E25-31	10/18/88	265.31	407.22	672.53
299-E25-32	8/11/88	NM	NM	669.19
299-E25-32	10/19/88	261.06	408.13	669.19
299-E25-32	11/21/88	260.85	408.34	669.19
299-E25-33	7/08/88	268.71	406.26	674.97
299-E25-33	10/17/88	285.40	389.57	674.97

(a) MSL = mean sea level.
(b) NM = not measured.

EVALUATION OF WATER CHEMISTRY AND PARAMETERS

The Grout Treatment Facility Ground-Water Monitoring Project is still collecting water chemistry data to determine background water quality levels. Four quarters of data from all five RCRA monitoring wells will be available on analysis of ground-water samples scheduled for collection in late February 1989. Water chemistry and other parameters will be fully evaluated when background levels have been established. Some samples exceeded the PDWSs for chromium (unfiltered) and tritium. The GTF is not yet operational; therefore, these elevated levels cannot be a result of facility operations. The source of the elevated chromium values may be natural borehole sediments

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TABLE 14.3. Monthly Water-Level Data Collected in 1988 for Wells Near the Grout Treatment Facility (not associated with sampling)

Well Number	Date	Depth to Water, ft	Water-Table Elevation, ft above MSL[a]	Casing Elevation, ft above MSL
299-E25-18	06/29/88	273.33	405.72	679.05
299-E25-18	06/29/88	273.34	405.71	679.05
299-E25-18	07/27/88	273.25	405.80	679.05
299-E25-18	07/27/88	273.25	405.80	679.05
299-E25-18	08/31/88	272.87	406.18	679.05
299-E25-18	08/31/88	272.87	406.18	679.05
299-E25-18	09/30/88	272.76	406.29	679.05
299-E25-18	09/30/88	272.75	406.30	679.05
299-E25-18	10/27/88	272.75	406.30	679.05
299-E25-18	10/27/88	272.75	406.30	679.05
299-E25-18	11/29/88	272.76	406.29	679.05
299-E25-18	11/29/88	272.76	406.29	679.05
299-E25-18	12/27/88	272.80	406.25	679.05
299-E25-18	12/27/88	272.81	406.24	679.05
299-E25-22	06/30/88	268.16	405.86	674.02
299-E25-22	06/30/88	268.16	405.86	674.02
299-E25-22	07/27/88	268.21	405.81	674.02
299-E25-22	07/27/88	268.21	405.81	674.02
299-E25-22	08/31/88	267.81	406.21	674.02
299-E25-22	08/31/88	267.80	406.22	674.02
299-E25-22	09/30/88	267.76	406.26	674.02
299-E25-22	09/30/88	267.77	406.25	674.02
299-E25-22	10/27/88	267.65	406.37	674.02
299-E25-22	10/27/88	267.65	406.37	674.02
299-E25-22	11/29/88	267.67	406.35	674.02
299-E25-22	11/29/88	267.66	406.36	674.02
299-E25-22	12/27/88	267.78	406.24	674.02
299-E25-22	12/27/88	267.79	406.23	674.02
299-E25-25	06/30/88	261.83	407.59	669.42
299-E25-25	06/30/88	261.83	407.59	669.42
299-E25-25	07/27/88	262.17	407.25	669.42
299-E25-25	07/27/88	262.19	407.23	669.42
299-E25-25	08/31/88	261.25	408.17	669.42
299-E25-25	08/31/88	261.24	408.18	669.42
299-E25-25	09/30/88	261.38	408.04	669.42
299-E25-25	09/30/88	261.39	408.03	669.42
299-E25-25	10/27/88	261.39	408.03	669.42
299-E25-25	10/27/88	261.39	408.03	669.42
299-E25-25	11/29/88	261.48	407.94	669.42
299-E25-25	11/29/88	261.50	407.92	669.42
299-E25-25	12/27/88	261.97	407.45	669.42
299-E25-25	12/27/88	261.98	407.44	669.42

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TABLE 14.3. (contd)

Well Number	Date	Depth to Water, ft	Water-Table Elevation, ft above MSL[a]	Casing Elevation, ft above MSL
299-E25-26	06/30/88	262.06	406.46	668.52
299-E25-26	06/30/88	262.07	406.45	668.52
299-E25-26	07/27/88	262.14	406.38	668.52
299-E25-26	07/27/88	262.15	406.37	668.52
299-E25-26	08/31/88	261.68	406.84	668.52
299-E25-26	08/31/88	261.68	406.84	668.52
299-E25-26	09/29/88	261.52	407.00	668.52
299-E25-26	09/29/88	261.53	406.99	668.52
299-E25-26	10/27/88	261.55	406.97	668.52
299-E25-26	10/27/88	261.55	406.97	668.52
299-E25-26	11/29/88	261.62	406.90	668.52
299-E25-26	11/29/88	261.62	406.90	668.52
299-E25-26	12/27/88	261.78	406.74	668.52
299-E25-26	12/27/88	261.78	406.74	668.52
299-E25-27	06/30/88	269.60	406.48	676.08
299-E25-27	06/30/88	269.58	406.50	676.08
299-E25-27	07/27/88	269.69	406.39	676.08
299-E25-27	07/27/88	269.68	406.38	676.08
299-E25-27	08/31/88	269.16	406.92	676.08
299-E25-27	08/31/88	269.18	406.90	676.08
299-E25-27	09/29/88	269.02	407.06	676.08
299-E25-27	09/29/88	269.02	407.06	676.08
299-E25-27	10/27/88	269.12	406.96	676.08
299-E25-27	10/27/88	269.10	406.98	676.08
299-E25-27	11/29/88	269.18	406.90	676.08
299-E25-27	11/29/88	269.20	406.88	676.08
299-E25-27	12/27/88	269.33	406.75	676.08
299-E25-27	12/27/88	269.33	406.75	676.08
299-E25-28	06/30/88	255.69	406.75	662.44
299-E25-28	06/30/88	255.71	406.73	662.44
299-E25-28	07/27/88	255.80	406.64	662.44
299-E25-28	07/27/88	255.81	406.63	662.44
299-E25-28	08/31/88	255.24	407.20	662.44
299-E25-28	08/31/88	255.24	407.20	662.44
299-E25-28	09/30/88	255.15	407.29	662.44
299-E25-28	09/30/88	255.15	407.29	662.44
299-E25-28	10/27/88	255.17	407.27	662.44
299-E25-28	10/27/88	255.17	407.27	662.44
299-E25-28	11/29/88	255.19	407.25	662.44
299-E25-28	11/29/88	255.20	407.24	662.44
299-E25-28	12/27/88	255.47	406.97	662.44
299-E25-28	12/27/88	255.47	406.97	662.44

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TABLE 14.3. (contd)

Well Number	Date	Depth to Water, ft	Water-Table Elevation, ft above MSL[a]	Casing Elevation, ft above MSL
299-E25-29A	06/30/88	266.89	405.73	672.62
299-E25-29A	06/30/88	266.90	405.72	672.62
299-E25-29A	07/27/88	266.85	405.77	672.62
299-E25-29A	07/27/88	266.85	405.77	672.62
299-E25-29A	08/31/88	266.56	406.06	672.62
299-E25-29A	08/31/88	266.56	406.06	672.62
299-E25-29A	09/29/88	266.38	406.24	672.62
299-E25-29A	09/29/88	266.38	406.24	672.62
299-E25-29A	10/27/88	266.44	406.18	672.62
299-E25-29A	10/27/88	266.45	406.17	672.62
299-E25-29A	11/29/88	266.44	406.18	672.62
299-E25-29A	11/29/88	266.45	406.17	672.62
299-E25-29A	12/27/88	266.51	406.11	672.62
299-E25-29A	12/27/88	266.50	406.12	672.62
299-E25-30A	06/30/88	272.00	406.20	678.20
299-E25-30A	06/30/88	272.00	406.20	678.20
299-E25-30A	07/27/88	272.10	406.10	678.20
299-E25-30A	07/27/88	272.10	406.10	678.20
299-E25-30A	08/31/88	271.55	406.65	678.20
299-E25-30A	08/31/88	271.56	406.64	678.20
299-E25-30A	09/30/88	271.46	406.74	678.20
299-E25-30A	09/30/88	271.46	406.74	678.20
299-E25-30A	10/27/88	271.49	406.71	678.20
299-E25-30A	10/27/88	271.49	406.71	678.20
299-E25-30A	11/29/88	271.47	406.73	678.20
299-E25-30A	11/29/88	271.46	406.74	678.20
299-E25-31	06/30/88	266.53	406.00	672.53
299-E25-31	06/30/88	266.51	406.02	672.53
299-E25-31	07/27/88	266.51	406.02	672.53
299-E25-31	07/27/88	266.51	406.02	672.53
299-E25-31	08/31/88	266.17	406.36	672.53
299-E25-31	08/31/88	266.18	406.35	672.53
299-E25-31	09/29/88	265.98	406.55	672.53
299-E25-31	09/29/88	265.99	406.54	672.53
299-E25-31	10/27/88	266.07	406.46	672.53
299-E25-31	10/27/88	266.08	406.45	672.53
299-E25-31	11/29/88	266.08	406.45	672.53
299-E25-31	11/29/88	266.08	406.45	672.53
299-E25-31	12/27/88	266.14	406.39	672.53
299-E25-31	12/27/88	266.15	406.38	672.53

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TABLE 14.3. (contd)

Well Number	Date	Depth to Water, ft	Water-Table Elevation, ft above MSL[a]	Casing Elevation, ft above MSL
299-E25-32A	06/30/88	262.15	407.04	669.19
299-E25-32A	06/30/88	262.15	407.04	669.19
299-E25-32A	07/27/88	262.37	406.82	669.19
299-E25-32A	07/27/88	262.37	406.82	669.19
299-E25-32A	08/31/88	261.58	407.61	669.19
299-E25-32A	08/31/88	261.60	407.59	669.19
299-E25-32A	09/30/88	261.60	407.59	669.19
299-E25-32A	09/30/88	261.61	407.58	669.19
299-E25-32A	10/27/88	261.64	407.55	669.19
299-E25-32A	10/27/88	261.64	407.55	669.19
299-E25-32A	11/29/88	261.70	407.49	669.19
299-E25-32A	11/29/88	261.69	407.50	669.19
299-E25-32A	12/27/88	262.12	407.50	669.19
299-E25-32A	12/27/88	262.13	407.06	669.19
299-E25-33	06/30/88	268.99	405.98	674.97
299-E25-33	06/30/88	268.97	406.00	674.97
299-E25-33	07/27/88	269.03	405.94	674.97
299-E25-33	07/27/88	269.02	405.93	674.97
299-E25-33	08/31/88	268.66	406.31	674.97
299-E25-33	08/31/88	268.64	406.33	674.97
299-E25-33	09/29/88	268.45	406.52	674.97
299-E25-33	09/29/88	268.45	406.52	674.97
299-E25-33	10/27/88	268.55	406.42	674.97
299-E25-33	10/27/88	268.54	406.43	674.97

(a) MSL = mean sea level.

and/or well construction materials (see Section 1.0 Introduction). The elevated tritium values probably result from the disposal of liquids used in chemical processing activities in the 200-East Area.

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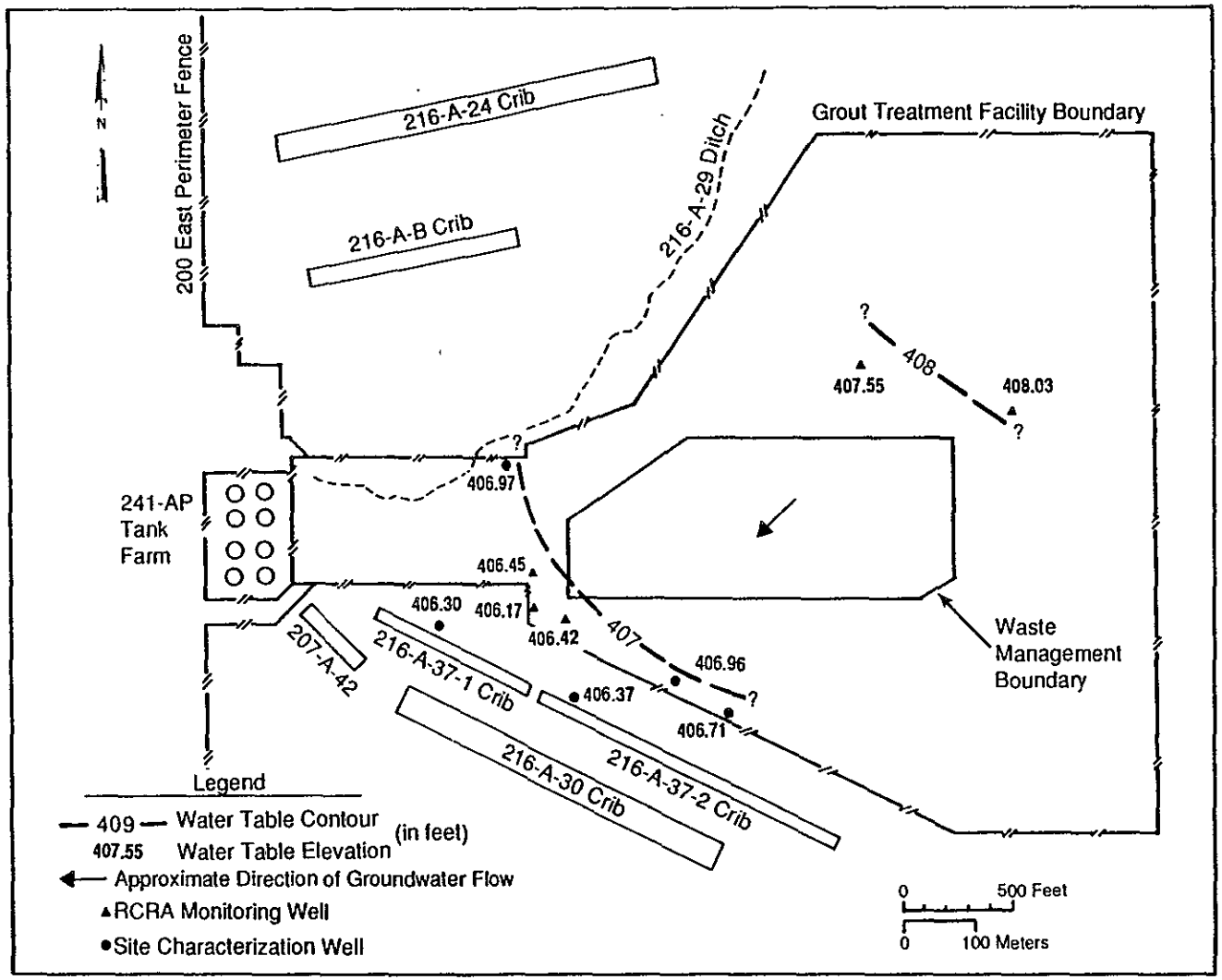

FIGURE 14.2. Water-Table Contour Map for the Grout Treatment Facility, October 27, 1988, Constructed from Data Shown in Table 14.3

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