PNNL-13014

Groundwater Monitoring Plan for the Solid Waste Landfill

J. W. Lindberg
C. J. Chou

October 2000

Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RL01830

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Pacific Northwest National Laboratory
Richland, Washington 99352

Summary

The Solid Waste Landfill (SWL) is regulated by the Washington State Department of Ecology under WAC 173-304. Between 1973 and 1976, the landfill received primarily paper waste and construction debris, but it also received asbestos, sewage, and catch tank liquid waste. Groundwater monitoring results indicate the SWL has contaminated groundwater with volatile organic compounds and possibly metals at levels that exceed regulatory limits. DynCorp, Tri-Cities, Inc. operates the facility under an interim closure plan (final closure plan will be released shortly). Pacific Northwest National Laboratory (PNNL) monitors groundwater at the site.

This monitoring plan includes well and constituent lists, and summarizes sampling, analytical, and quality control requirements. Changes from the previous monitoring plan include elimination of two radionuclides from the analyte list and some minor changes in the statistical analysis.

Existing wells in the current monitoring network only monitor the uppermost portion of the uppermost aquifer. Therefore, two new downgradient wells and one existing upgradient well are proposed to determine whether groundwater waste constituents have reached the lower portion of the uppermost aquifer. The proposed well network includes three upgradient wells and ten downgradient wells. The wells will be sampled quarterly for 14 analytes required by WAC 173-304-490 plus volatile organic compounds and filtered arsenic as site-specific analytes.

Upgradient Wells:	699-26-35A	
	699-24-35	
	699-26-35C (Proposed Existing Deeper Well)	
Downgradient Wells:	699-25-34C	
	699-24-34A	
	699-24-34B	
	699-24-34C	
	699-23-34A	
	699-23-34B	
	699-22-35	
	699-24-33	
	Two Proposed New Deeper Wells	
Analytes Required By WAC 173-304-490:	Temperature	Sulfate
	Specific Conductance	Filtered Iron
	pH	Filtered Zinc
	Chloride	Filtered Manganese
	Nitrate	Chemical Oxygen Demand
	Nitrite	Total Organic Carbon
	Ammonium	Total Coliform

Site-Specific Analytes: Volatile Organic Compounds
Filtered Arsenic

The proposed monitoring well network is designed to

- represent the quality of background groundwater quality that has not been affected by the SWL (sample and analyze groundwater from upgradient wells)

- represent the quality of groundwater passing the point of compliance (sample and analyze groundwater from downgradient wells)

- determine whether downgradient concentrations of groundwater constituents specifically required by government regulations are statistically increased over background concentrations

- determine whether concentrations of other groundwater constituents of concern (volatile organic compounds) have exceeded groundwater quality criteria (performance standards).

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1.0 Introduction

The Solid Waste Landfill (SWL) is located in the center of the U.S. Department of Energy's (DOE's) Hanford Site in southeastern Washington State (Figure 1.1). The landfill received primarily paper waste and construction debris, but also some asbestos and sewage waste. The Nonradioactive Dangerous Waste Landfill (NRDWL), which is regulated and monitored separately, is adjacent to the SWL on the north side. The Washington State Department of Ecology (Ecology) regulates the SWL under WAC 173-304, *Washington Solid Waste Regulations*. DynCorp, Tri-Cities, Inc. (DYN), under a contract to Fluor Hanford, Inc., is responsible for post-operation administration of the SWL. Currently the site is operating under an interim closure plan. The final closure plan is expected in the fall 2000.

Pacific Northwest National Laboratory (PNNL)[1] conducts groundwater monitoring at the SWL. The existing monitoring network includes two upgradient wells (one shared with the NRDWL) and eight downgradient wells. The wells are sampled quarterly for a list of constituents specified by WAC 173-304-490 plus various site-specific constituents.

The monitoring network (with the possible exception of the two proposed new wells) and the frequency of sampling will remain the same as in the past. However, the statistical analysis has been changed slightly. The downgradient concentrations of volatile organic compounds will no longer be compared to background (upgradient) data, but the downgradient values will be directly compared to groundwater performance standards. Required WAC 173-304-490(2)(d) constituents will continue to be compared with background values and only compared to the performance standards when downgradient values exceed background limits. Other changes in statistical techniques include a different method to determine the goodness of fit for the distribution of the background data. Some elective constituents will no longer be analyzed for SWL objectives because they are covered under other groundwater monitoring programs. This plan proposes installation of two new downgradient wells to determine whether groundwater waste constituents have reached the lower portion of the uppermost aquifer. Existing wells only monitor the uppermost portion of the uppermost aquifer.

1.1 Purpose

The purpose of this plan is to present a groundwater monitoring program to determine the impact of waste disposal at the SWL on the quality of groundwater in the uppermost and interconnected aquifers underlying the facility, as required in WAC 173-304-490. This document supersedes all previous monitoring plans (DOE 1986; Fruland et al. 1989; Hodges 1994). Hodges 1996 incorporated two new wells suggested in Hodges 1994 into the monitoring network. The monitoring program proposed in this document is based on current conceptualization of the site and is consistent with data collected during 13 years of monitoring the site.

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[1] Pacific Northwest Laboratory is operated by Battelle for the U.S. Department of Energy.

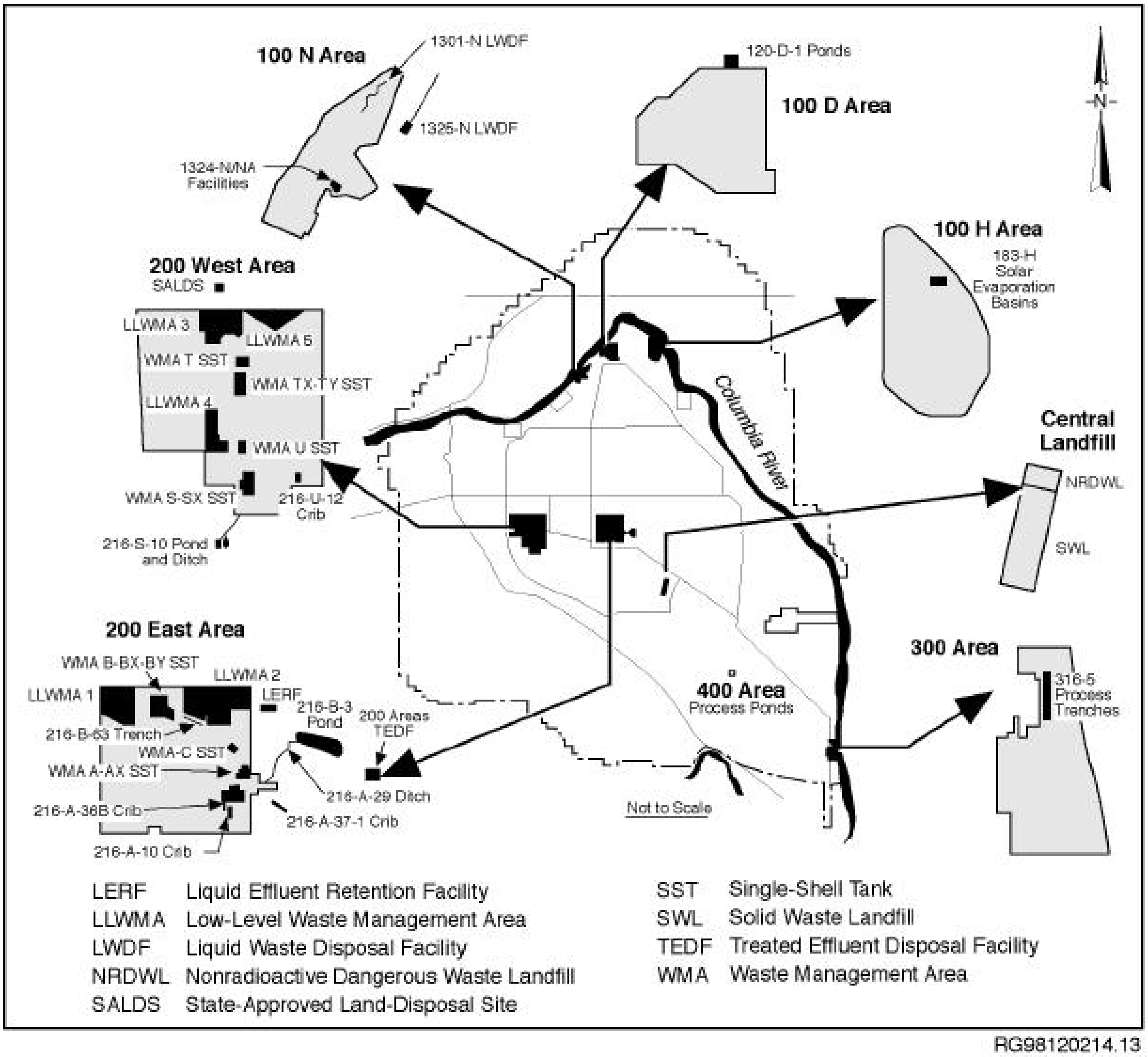

Figure 1.1. Regulated Units on the Hanford Site Requiring Groundwater Monitoring

1.2 Regulatory Status and History

The SWL is regulated by *Washington Administrative Code* (WAC 173-304), under which the regulatory agency is the Benton-Franklin Public Health Department. The U.S. Department of Energy, Richland Operations Office (RL) submitted a permit application (to continue operations at the SWL) to the Benton-Franklin Public Health District in January of 1991 (DOE 1991a). The permit application was rejected because there was sufficient evidence to suggest that the SWL had contaminated groundwater. As a result of subsequent negotiation between the Benton-Franklin Public Health Department and Ecology, Ecology accepted responsibility for regulation of the SWL.

RL submitted a revised permit application to Ecology in 1993 (DOE 1993a). Ecology reviewed the revised permit application and issued a letter to RL requesting that a corrective action program be established for the SWL.[2] The letter further requested that a corrective action plan meeting the requirements of WAC 173-304-490(2)(j), be submitted to Ecology by September 30, 1994. RL subsequently requested a two-month extension, which moved the due date to November 30, 1994. A corrective action plan meeting the requirements of WAC 173-304-490(2)(j) was written (DOE 1994a) and submitted to Ecology by November 30, 1994. The corrective action plan was accepted by Ecology. However, the corrective action plan was never implemented due to other site activities having higher priority. The SWL was permanently closed in 1996 and continues to be regulated by the interim closure plan (DOE 1996a) and the requirements of WAC 173-304.

[2] Letter from F. Ma, Washington State Department of Ecology, to J. E. Rasmussen, DOE-RL, dated June 23, 1994, *Corrective Action Program Requirements, Scale Construction, Operational Plan, and Lysimeter Installation, Hanford Site Solid Waste Landfill*.

2.0 Description of the Solid Waste Landfill

This section discusses the physical structures, operational history, and waste characteristics at the SWL and is largely taken from *Conceptual Model for the SWL* (BHI 1997) unless otherwise noted.

2.1 Physical Structure and Operational History

The SWL is located about 5.6 kilometers southeast of the 200 East Area (see Figure 1.1) and occupies approximately 26 hectares (65 acres). It consists of a series of parallel trenches that vary in length from 168 to 200 meters, are 5 meters wide at the base (single width) to 16 meters wide at the base (double width), and are 6 meters deep (Figure 2.1). The general method of landfilling used at the SWL was the trench method, where waste was placed in the trenches and covered with soil. Asbestos debris was segregated from general sanitary waste and placed in the single-wide trenches. Sanitary waste usually went into double-wide trenches. At the end of a typical day of operation, a portion of the spoil pile was pushed over the refuse to form the daily cover, which was typically 15 to 30 centimeters thick. After a trench was filled, the remaining spoil pile was bulldozed over the trench to form an operational cover.

The site was originally designated as the Central Landfill. The Central Landfill began operation in 1973 to receive sanitary waste, asbestos, and construction and demolition debris from Hanford Site operations. The landfill also received sewage and liquid waste (including wash-water waste from the bus garage) beginning in 1974. The Central Landfill (original area 154,000 square meters) was subdivided into two units for operational purposes. In 1975, the northern-most unit (40,000 square meters) of the Central Landfill was isolated to dispose of asbestos waste material and non-radioactive chemical waste. This northern unit was designated formally as the NRDWL because of the presence of regulated dangerous waste. It is regulated as a RCRA land disposal facility and has a separate groundwater monitoring program (Lindberg and Hartman 1999). The remainder of the Central Landfill (114,000 square meters) is designated as the SWL. In 1982, the Central Landfill was expanded 154,000 square meters to the south. This was dubbed the Phase II Area (the former area then became the Phase I Area). The total area of the Central Landfill became 268,000 square meters (see Figure 2.1).

After closure of the SWL in March 1996, an “interim cover” (which was the operational cover during operation of the SWL) was placed over the SWL trenches. The cover consists of native, well-graded sand with a very low percentage of fines (DOE 1996a). The soil was distributed evenly and leveled in order to minimize topographic lows, which could collect precipitation and runoff.

2.2 Waste Characterization

2.2.1 Waste Types and Inventory

Both solid and liquid waste was disposed at the SWL. There is no evidence that the solid waste contained volatile organic compounds. Analysis of one type of liquid waste indicates that it contained carbon tetrachloride, 1,1,1-trichloroethane, trichloroethene, and tetrachloroethene. Radioactive waste was not disposed in the SWL.

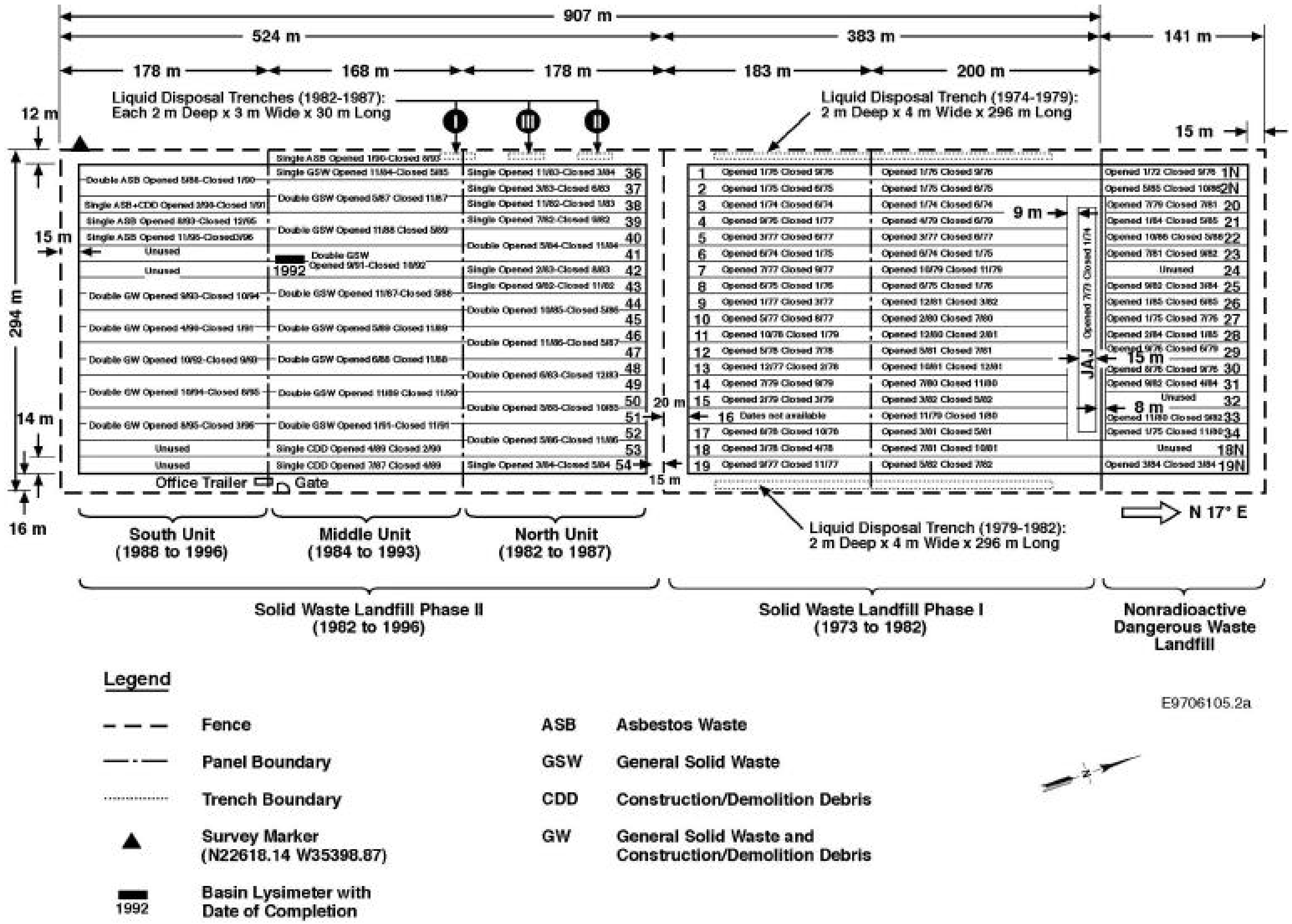

Figure 2.1. Map of the Solid Waste Landfill and Nonradioactive Dangerous Waste Landfill (from BHI 1997)

The types of waste disposed at the SWL include office waste, construction/demolition debris, asbestos material, bulky items, and miscellaneous waste, based on waste receipts (DOE 1993a, 1996a):

- Office waste comprises approximately 40% of the total volume of waste disposed in the SWL, and most of the office waste is waste paper products.

- Construction/demolition debris, approximately 30% of the total waste, is from construction activities and from the renovation of buildings including waste wood products like pallets.

- Asbestos material (non-radioactive or non-hazardous asbestos or material containing asbestos) accounts for approximately 10% by volume of all waste disposed at the SWL. Most of this material came from the demolition or renovation activities at Hanford Site buildings.

- Bulky items include large items of refuse such as appliances and office furniture that do not fit into solid waste collection containers. Approximately 10% of the total waste volume at SWL includes material in the bulky items category.

- Miscellaneous waste at the SWL includes garbage from Hanford Site personnel lunches, industrial waste such as packing and empty containers, medical waste from first aid stations, and various inert materials. The volume of the total estimated to be miscellaneous waste is 10%.

From 1973 to 1987, sewage and 1100 Area catch tank liquid was discharged to the SWL in separate shallow trenches. The sewage originated from portable toilets and septic tanks. Catch tank liquid from the 1100 Area heavy equipment garage and bus shop also was disposed in these trenches from 1985 to 1987. Chemical analysis of the 1100 Area catch liquid showed that the following were detected (DOE 1993a):

- carbon tetrachloride
- 1,1,1-trichloroethane
- trichloroethene
- tetrachloroethene.

It is possible, but unlikely, that these organic compounds were in the form of dense nonaqueous phase liquids (DNAPLs). Sewage and other liquids were not accepted at the SWL after 1987, and disposal of radioactive and dangerous waste was always prohibited at the SWL.

Based on waste receipts, the SWL received approximately 400,266 cubic meters of solid waste and 14, 496 cubic meters of asbestos waste during the years 1973 to 1995. An estimated 3,800,000 to 5,700,000 liters of sewage were discharged to the liquid trenches from 1975 to April 1987. For the two years catch tank waste liquid was disposed at the SWL, the estimated total volume of catch tank waste liquid disposed is 380,000 liters (DOE 1996a).

2.2.2 Soil Gas Surveys

A soil gas survey was conducted at the SWL from June 1988 through February 1989 to determine the areal extent of chlorinated hydrocarbons (Evans et al. 1989a). Soil gas samples were collected from probes emplaced at depths of 1.2 to 1.8 meters at sites 30 meters apart. Probes were more closely spaced near the three short disposal trenches used for 1100 Area wash-water disposal to better define the spatial distribution of contaminants at their presumed source. The survey found detectable concentrations of 1,1,1-trichloroethane, trichloroethene, tetrachloroethene, 1,1-dichloroethane, carbon tetrachloride, carbon dioxide, and methane. 1,1,1-trichloroethane, tetrachloroethene, and trichloroethene were detected as far as 130 meters west and 115 meters east of the SWL.

Results of the June 1988 to February 1989 soil gas survey show that the areas of relatively high soil gas concentrations generally do not coincide with the locations of the known liquid disposal trenches. Because it is reasonable to assume that the highest soil gas concentrations will persist at the contaminant source, these data suggest that there may be other, undocumented (completely unknown) sources of volatile organic compounds within the SWL area.

2.2.3 In Situ Gas Monitoring During Drilling

In situ soil gas samples were collected while drilling groundwater monitoring well 699-22-35 and 699-23-34B (Figure 2.2) at the southeast corner of the SWL in 1993 and 1994 (Hodges 1997). The soil gas samples were collected using a membrane sampling system that allows sampling at discrete intervals within the borehole. Samples were collected at approximately every 6 meters at each borehole. The only target analyte detected in the borehole samples was carbon tetrachloride. All 11 borehole samples contained detectable quantities of carbon tetrachloride in concentrations ranging from 0.1 ppmv to 1.4 ppmv.

2.2.4 Gas Well Monitoring

Sixteen soil gas probes were installed at eight locations (Figure 2.3) around the perimeter of the SWL in September 1993 to monitor concentrations of landfill gases (methane, carbon dioxide, and oxygen) in accordance with WAC 173-304 and sample (field-screening analysis) for chlorinated hydrocarbons.[1] Two dedicated soil-gas probes were installed at each monitoring location, one at a depth of approximately 2.7 meters (labeled with an A) and a second at a depth of 4.6 meters (labeled with a B).

While conducting the field screenings for chlorinated hydrocarbons at four times (four phases) during the period 1993 to 1997, the primary contaminant detected was 1,1,1-trichloroethane. The highest concentration was consistently detected at probe SWL-08B (4.6-meter depth) on the south side of the SWL. The second highest concentrations were at probe SWL-02B on the east side and probe SWL-08A. The concentrations of 1,1,1-trichloroethane decreased during the field screenings at all three of these locations. During 1993, low levels of tetrachloroethene (0.02 to 0.19 ppmv) were detected at seven of the

[1] Internal memo from R. B. Kerkow to R. R. Knight, Bechtel Hanford, Inc., Richland, Washington, dated December 17, 1993, S*olid Waste Landfill – Methane Monitoring (Phase I and II).*

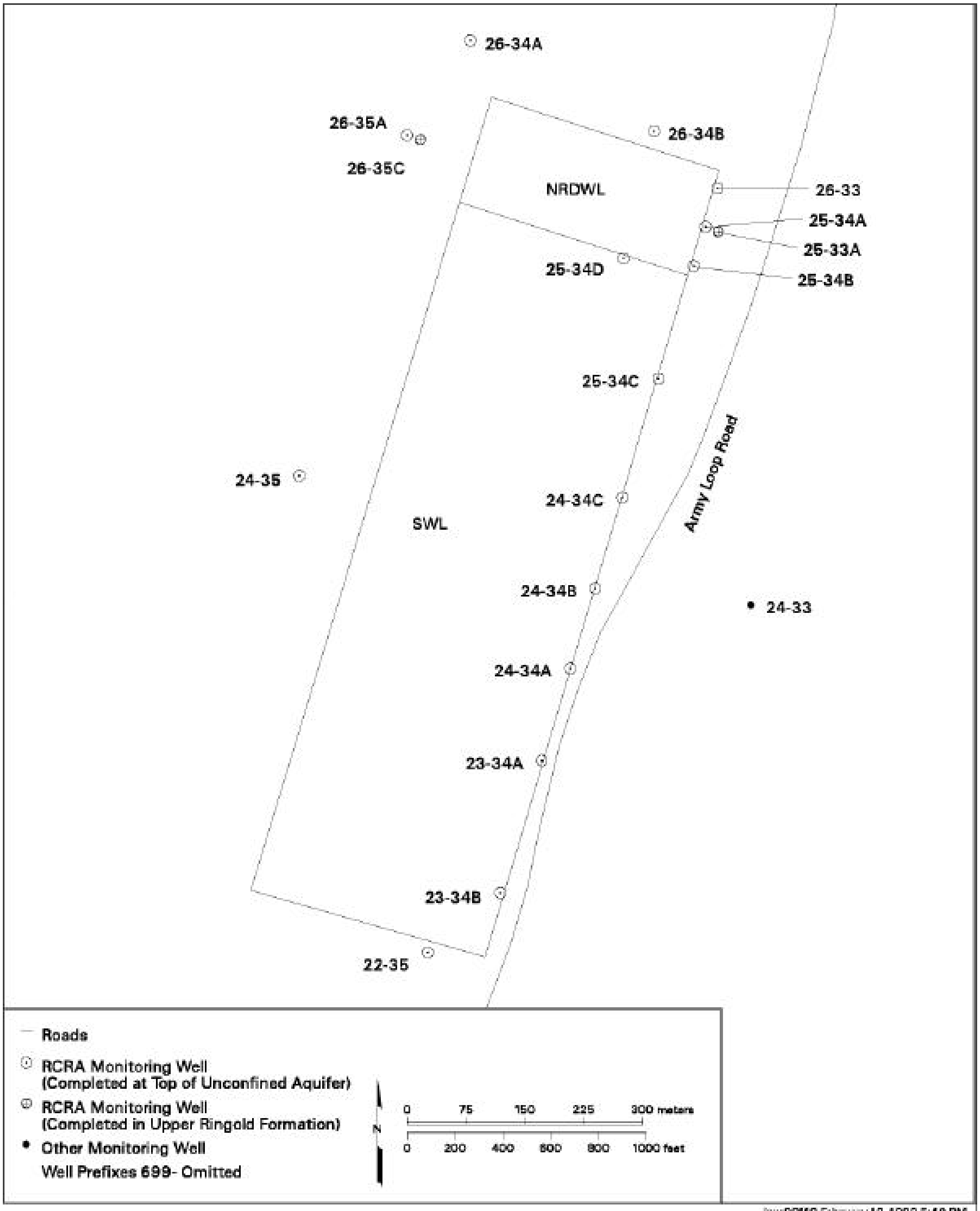

Figure 2.2. Monitoring Well Locations for Nonradioactive Dangerous Waste Landfill and Solid Waste Landfill

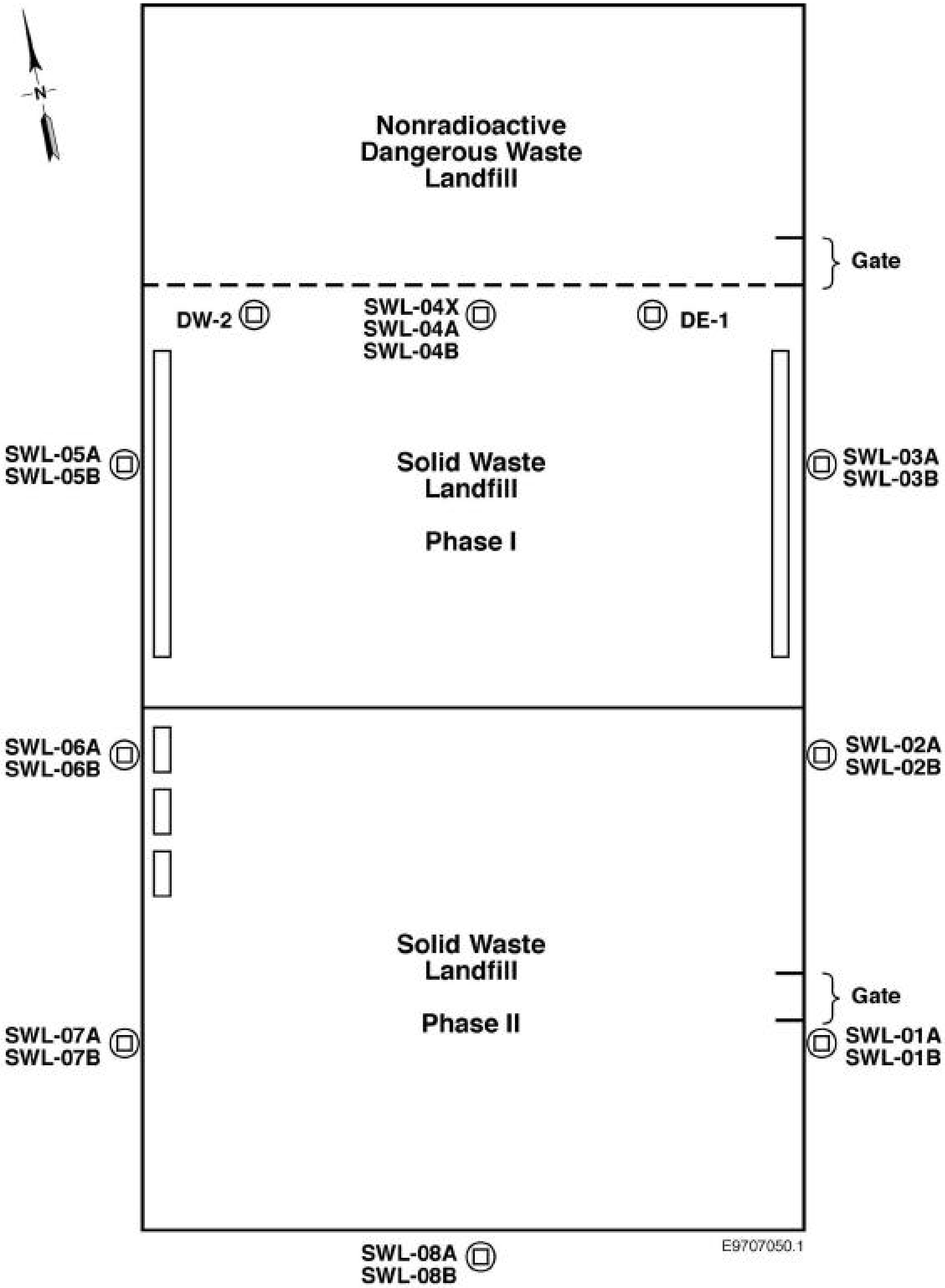

Figure 2.3. Location of Soil Gas Monitoring Stations at the Perimeter of the Solid Waste Landfill (from BHI 1997)

probes and were not detected subsequently. In 1993, trichloroethene was detected at concentrations ranging from <0.010 to 0.045 ppmv at three probes, and during 1997 was detected at trace levels at four of the probes.

2.2.5 Leachate Monitoring

In 1992, a basin lysimeter was installed beneath the Phase II area middle unit at the southern end of double trench 41 and 42 (see Figure 2.1). This trench was filled from north to south and closed in October 1992. The lysimeter is 21 meters long, 4.6 meters wide on one end and 3.9 meters on the other end, with a collection area of 88 square meters. A discharge pipe continuously drains the leachate by gravity flow from the basin to a nearby collection sump. The lysimeter is designed to collect leachate generated by water infiltrating through the overlying waste trench and to drain the leachate to a collection system. The leachate quality and quantity are analyzed to evaluate the impact that leachate would have on groundwater quality.

Starting in 1996, the sump associated with the lysimeter began accumulating leachate (indicating a four-year lag time between occurrence of precipitation at the surface and appearance of that same water as leachate). Initially the collection rate was 19 liters per day, but reached 38 liters per day by 1997. Leachate samples were analyzed for the indicator parameters (specific conductance, pH, chloride, nitrate, nitrite, ammonium ion, sulfate, chemical oxygen demand, and total organic carbon)[1] as specified in the landfill permit application (DOE 1993a). In addition, the samples were also analyzed for the constituents identified in WAC 173-351-990, Appendices I and II, and for four volatile organic compounds (1,1,1-trichloroethane; 1,1-dichloroethane; tetrachloroethene; and trichloroethene) that had been detected in groundwater beneath the landfill.[2] After these initial rounds of sampling and analysis in 1996, a sampling and analysis plan for leachate was developed that is consistent with the provisions of the SWL interim closure plan and the permit application (DOE 1996a, 1993a). In 1997, the plan was modified to monitor specific analytes quarterly and to include all analytes per WAC 173-351-990, Appendices I and II, annually to verify no change in other analytes (Sayler 1997).

Of the primary contaminants of concern, 1,1,1-trichloroethane; 1,1-dichloroethane; tetrachloroethene; cis-1,2- dichloroethene; and trichloroethene were detected in the early rounds of sampling in 1996 and 1997. Both dichloroethane and tetrachloroethene concentrations in these early analyses exceeded the groundwater quality criteria of WAC 173-200. Several of the indicator parameters, some volatile organic constituents, and some metals continue to be above the groundwater quality criteria and/or maximum contaminant levels for public water supplies established in WAC 246-290. However, 1,1-dichloroethane and tetrachoroethene (primary contaminants of concern in the earlier analyses) are no longer detected in the leachate. Table 2.1 shows leachate monitoring results for several key constituents for the third quarter

[1] Letter 9653595 from Westinghouse Hanford Company to U.S. Department of Energy, Richland Operations Office, Richland, Washington, dated August 16, 1996, *Leachate Test Results from Solid Waste Landfill*.

[2] Letter 9653595 R1 from Westinghouse Hanford Company to U.S. Department of Energy, Richland Operations Office, Richland, Washington, dated September 27, 1996, *Leachate Test Results from Solid Waste Landfill*.

Table 2.1. Leachate Monitoring Results for the Third Quarter, Fiscal Year 2000 (Data provided by DYN)

Parameter	Result	GWQC[a]	MCL[b]
pH	7.39	6.5-8.5	NA
Conductivity	1,986 µS/cm	NA	700 µS/cm
Sulfate	<20.2 mg/L	250 mg/L	250 mg/L
Chloride	236.2 mg/L	250 mg/L	250 mg/L
Total Dissolved Solids	1,361 mg/L	500 mg/L	NA
Arsenic	15.6 µg/L	0.05 µg/L	50 µg/L
Barium	447 µg/L	1,000 µg/L	2,000 µg/L
Mercury	<0.125 µg/L	2 µg/L	2 µg/L
Manganese	2,850 µg/L	50 µg/L	50 µg/L
Nickel	233 µg/L	NA	100 µg/L
Cadmium	<0.25 µg/L	10 µg/L	5 µg/L
Copper	4.01 µg/L	1,000 µg/L	NA
Selenium	2.5 µg/L	10 µg/L	50 µg/L
Zinc	584 µg/L	5,000 µg/L	5,000 µg/L
1,4-Dioxane	100 µg/L	7 µg/L	NA
1,4-Dichlorobenzene	5 µg/L	4 µg/L	NA

(a) Groundwater quality criteria from WAC 173-200.
(b) Maximum contaminant level from WAC 246-290.

of fiscal year 2000. (Appendix A is a summary of all of the SWL leachate analysis results for the first quarter of fiscal year 1997 through the third quarter of fiscal year 2000.) Total dissolved solids, arsenic, manganese, 1,4-dioxane, and 1,4-dichlorobenzene are equal to or exceed the groundwater quality criteria. In addition, conductivity, manganese, and nickel exceed the maximum contaminant levels. The primary contaminants of concern listed above (i.e., 1,1,1-trichloroethane; 1,1- dichloroethane) were below the detection limits in the second quarter of fiscal year 2000.

3.0 Hydrogeology

All of the wells at the SWL are completed in the upper portion of the uppermost aquifer with an average borehole depth of 43 meters. However, five wells at the NRDWL are deeper and provide geologic and hydrologic information to a depth of 78 meters below ground surface (83 meters above mean sea level). Therefore, much of what is known about the subsurface at the SWL is derived from the nearby wells at the NRDWL. The geology and hydrology of the SWL and the NRDWL are described in detail by Weekes et al. (1987), Fruland et al. (1989), DOE (1993a), and Hodges (1994, 1996). The following summary is taken largely from those documents unless indicated otherwise.

3.1 Physical Hydrogeology

The SWL is underlain by sands and gravels of the Hanford and Ringold formations (Figure 3.1). The vadose zone is 38- to 40-meters thick and consists of sand and silty gravelly sand grading downward to sandy gravel and gravel. The water table is near the top of a silty sand unit of the Hanford formation. Saturated sediment is composed of the following units:

- Saturated Hanford formation sediment: gravelly sand to sandy gravel, ~18-meters thick; estimated hydraulic conductivity (assuming saturated thickness of 18 meters) from field aquifer tests is approximately 500 to 1,500 meters per day.

- Upper Ringold and Ringold Formation unit E, divided into three units based on lithology and hydraulic conductivity (40- to 45-meters thick):

  - Slightly silty gravelly sand to sand, ~4-meters thick; estimated horizontal hydraulic conductivity from field aquifer tests is 60 meters per day.

    Hard, clayey silt (low permeability) 1- to 4- meters thick; estimated vertical hydraulic conductivity from field aquifer tests ranges from 0.006 to 3 meters per day.

  - Silty sand to sandy gravel, unknown thickness; estimated horizontal hydraulic conductivity from field aquifer tests ranges from 0.3 to 15 meters per day. This unit is probably unit E, but there are no wells in the vicinity that fully penetrate the unit. Approximately 2 kilometers east at well 699-25-26, the Ringold Formation unit E is 40 meters thick (Lindsey 1991).

- Ringold Formation unit C, unit B, the lower mud unit, and unit A are estimated as follows:

  - Unit C, 10 meters, gravel and sandy gravel
  - Overbank deposit, 20 meters, sandy silt and silty sand
  - Unit B, 10 meters, gravel and sandy gravel
  - Lower mud unit, 17 meters, silt and sandy silt
  - Unit A, 28 meters, gravel and sandy gravel

- Top of basalt at a depth of ~180 meters.

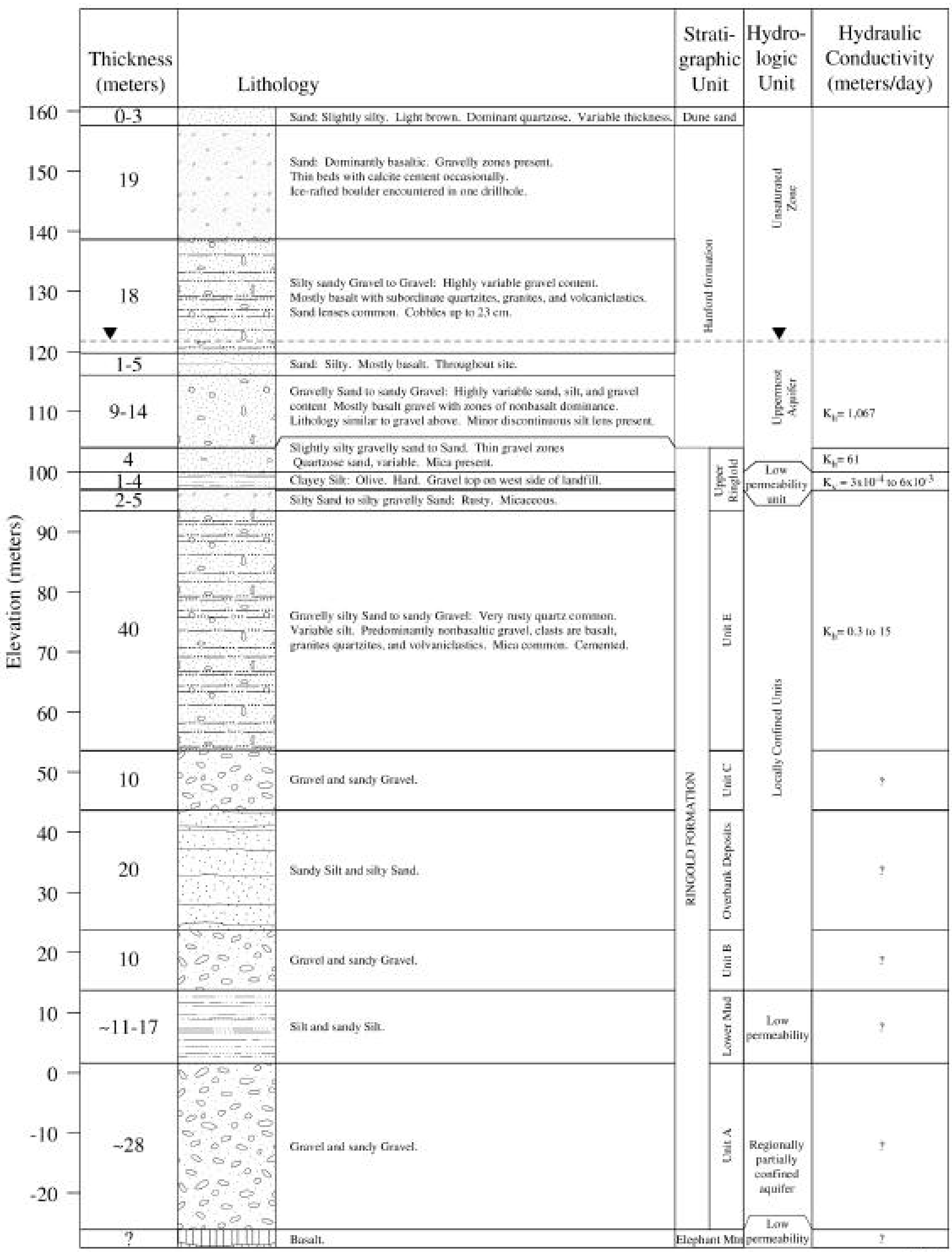

Figure 3.1. Stratigraphic Column at the Nonradioactive Dangerous Waste Landfill and Solid Waste Landfill and Associated Hydrogeology

The uppermost aquifer is unconfined and is part of the saturated Hanford formation sediment and probably the upper portion of the Upper Ringold unit. A low-permeability unit perhaps in the lower portion of the Upper Ringold unit or in unit E is believed to form the base of the uppermost aquifer because the hydraulic conductivity of the aquifer base is orders of magnitude lower than the overlying sediment.

The hydraulic gradient beneath the SWL is very low because the uppermost aquifer is very transmissive. Weekes et al. (1987) reported the hydraulic gradient at the nearby NRDWL at approximately 0.00005. Previous estimates based on well data indicate that flow is generally west to east (Weekes et al. 1987, p. 43). A water-table map of the region around the SWL is shown in Figure 3.2. Assuming groundwater flows perpendicular to the equipotential lines, flow converges from the north-northeast and the southwest, and moves toward the southeast. Contaminant plumes originating in the 200 East Area move through the area from northwest to southeast, corroborate this interpretation.

Two wells at NRDWL sample the bottom of the uppermost aquifer, i.e., just above the low-permeability unit. Heads in these wells are virtually the same as in adjacent wells completed at the top of the aquifer, indicating no significant vertical gradient (Hartman et al. 1999, Section 3.7).

Water levels beneath the SWL declined approximately 2 meters since 1988 because lower volumes of liquid waste are being discharged to the ground in the 200 Areas (see Figure 3.2 and Hartman et al. 1999, Section 3.7 and Figure 3.7-1). Based on a comparison of present levels of the water table with a hindcast water-table map (estimating water-table elevations in 1944, ERDA 1975), the water table could decline as much as an additional 2.5 to 3 meters before returning to pre-Hanford Site levels.

3.2 Summary of Groundwater Monitoring Results

WAC 173-304 requires that groundwater beneath solid waste landfills is monitored to determine whether or not the landfill operations have effected groundwater at the point of compliance (the perimeter fence). To comply with WAC 173-304, ten groundwater monitoring wells have been installed at the water table at two upgradient locations and eight downgradient locations (see Figure 2.2). Construction details for the SWL groundwater monitoring wells are presented in Appendix C. All but one well (699-24-33) meet the construction requirements of WAC 173-160. Well 699-24-33 was drilled in 1948 and consists of 8-inch-inside-diameter carbon steel casing that is perforated below the water table. Results from this well were used to support other well information and were not used for statistical upgradient versus downgradient comparisons. The well sampling results are also useful for providing groundwater monitoring data downgradient of the SWL between 1948 and 1987 when the other wells were constructed.

Statistical analyses of groundwater chemical data collected up to August 1988 is reported in Fruland et al. (1989). Subsequent statistical analyses are reported in RCRA annual reports and annual reports for the Hanford Site groundwater monitoring program (DOE 1991b, 1992, 1993b, 1994b, 1995, 1996b; Fruland and Lundgren 1989; Smith and Gorst 1990; Hartman and Dresel 1997, 1998; Hartman et al. 1999; and Hartman et al. 2000).

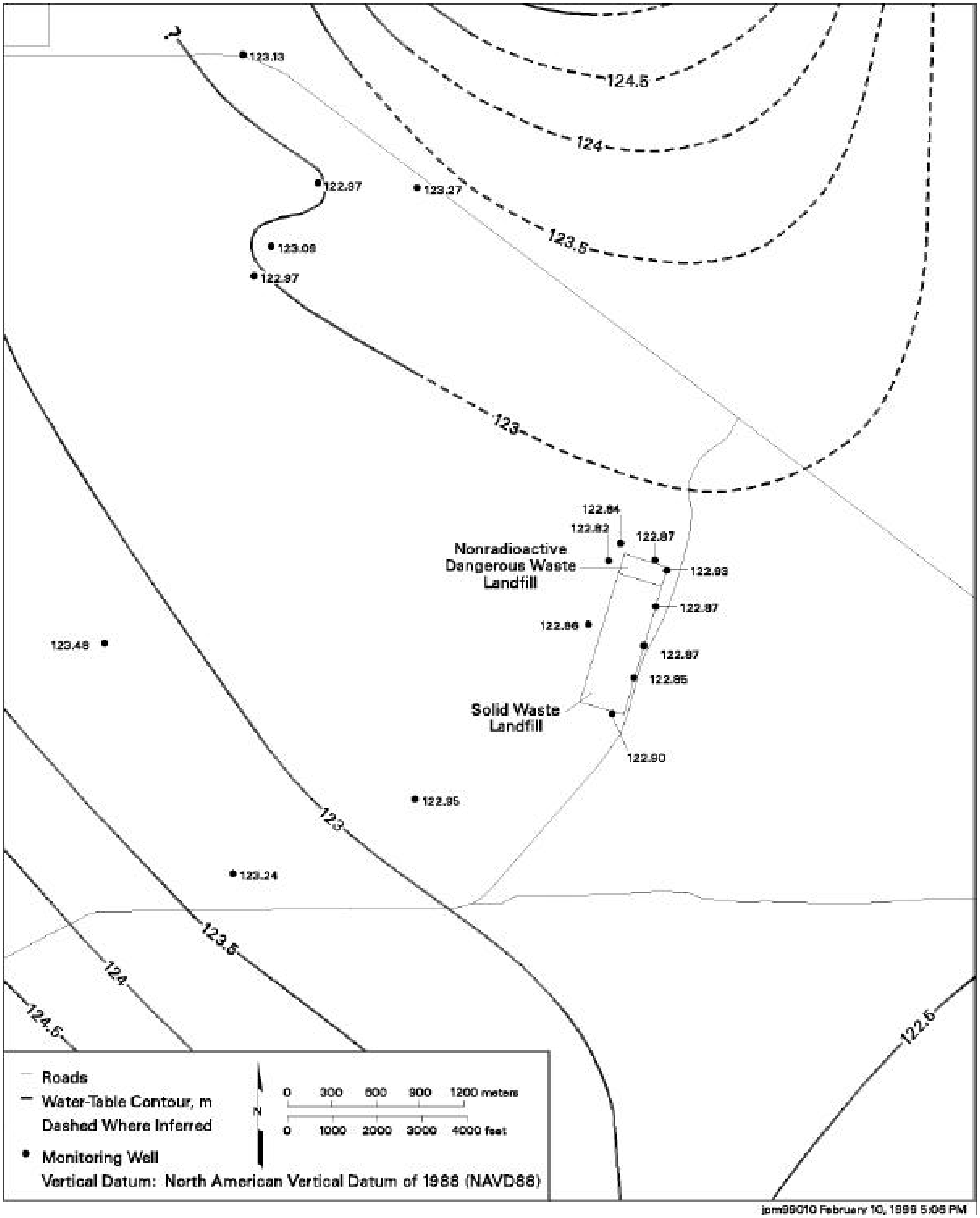

Figure 3.2. Water-Table Map for Nonradioactive Dangerous Waste Landfill/Solid Waste Landfill, June 1998

Groundwater samples have been collected at the SWL since May 1987. Sampling continued on a quarterly basis (as required by WAC 173-304-490) through April 1990, and from August 1991 to present. Quarterly sampling was interrupted between May 1990 and August 1991 because of the loss of the analytical laboratory (DOE 1993b). Water-table elevations were measured monthly at each groundwater monitoring well through 1995, but subsequently were changed to quarterly measurements taken at the same time the wells were sampled (as required by WAC 173-304-490).

The constituent list for groundwater analyses of SWL samples consisted of those analytes required by WAC 173-304-490. In addition, total organic halogens, chlorinated hydrocarbons, gross alpha, gross beta, and tritium were included in the monitoring list as site-specific constituents. Tritium concentration was monitored to provide information on groundwater flow rates and directions. However, tritium, as well as other analytes, have been dropped from the list of SWL analytes (see Section 5.3.2).

Chlorinated hydrocarbons were included on the list of groundwater analytes because they were detected in well 699-24-33 downgradient of the SWL during a Hanford Site-wide groundwater survey in January 1986 (Hall 1988, Fruland et al. 1989). The chlorinated hydrocarbons detected were 1,1,1-trichloroethane; 1,1-dichloroethane; trichloroethene, and tetrachloroethene (Appendix B provides minimum, maximum, and average detected values for all detected analytes at the SWL). Soil gas analyses (Evans et al. 1989a, b) confirmed the presence of these four chlorinated hydrocarbons and indicated the presence (in low concentrations) of chloroform and carbon tetrachloride (see Section 2.2.2).

In addition to the routinely detected chlorinated hydrocarbons, other volatile organic compounds detected infrequently or occasionally include: 1,1,2-trichloroethane; 1,2-dichloroethane; 1,4-dichlorobenzene; 4-methyl-2-pentanone; benzene; ethylbenzene; cis-1,2- dichloroethene; trans-1,2-dichloroethene; methylene chloride; toluene; and xylenes (Appendix B). Of these volatile organic compounds, only methylene chloride and 1,2-dichloroethane were detected at levels exceeding the groundwater quality criteria (WAC 173-200). Concentrations of these two volatile organic compounds at levels exceeding their respective groundwater quality criteria were not confirmed by subsequent sampling results, and therefore, these two exceedances are considered anomalous and unrepresentative.

1,1,1-trichloroethane is one of the most commonly detected volatile organic compounds at the SWL, though the highest concentration detected was 62.5 μg/L at well 699-24-34B, which is well below the groundwater quality criteria of 200 μg/L (WAC 173-200). It has been detected in all wells at the SWL including monitoring wells at the adjacent NRDWL. The concentrations of 1,1,1- trichloroethane are highest in the six groundwater monitoring wells near the southern end of the landfill (see Figure 2.2). Concentrations of 1,1,1-trichloroethane dropped steadily through 1996 and have remained steady or decreased slightly since then.

Trichloroethene was detected in downgradient monitoring wells at the SWL in concentrations as high as 8.0 μg/L (699-24-34B), which is above the groundwater quality criteria of 3 μg/L and the federal maximum contaminant levels of 5 μg/L. The groundwater concentration pattern for trichloroethene in downgradient wells is similar to that for 1,1,1-trichloroethane where it is most concentration in the southern wells of the groundwater monitoring well network. Also, like 1,1,1-trichloroethane, the concentration of trichloroethene dropped steadily through 1996 and continued to drop slightly or remained steady since then.

Tetrachloroethene (sometimes called perchloroethylene – PCE) was detected in all wells at the SWL, both upgradient and downgradient. The highest detected level was 12 µg/L at well 699-23-34A in April 1990. Tetrachloroethene concentrations are decreasing with time but remain above the groundwater quality criteria (0.8 µg/L). The highest concentrations tend to occur in the downgradient wells near the southern end of the SWL. However, unlike the distribution pattern for trichloroethane and trichloroethene, concentrations of tetrachloroethene in the two most southern wells are not as high as the four wells immediately north of these two most southern wells (DOE 1993a, DOE 1994a).

1,1-dichloroethane was detected in the downgradient monitoring wells of the SWL in concentrations as high as 7 µg/L (well 699-23-34A, April 1990), which is above the groundwater quality criteria of 1.0 µg/L. The highest concentrations of 1,1-dichloroethane occur in the six southern-most downgradient wells. In one upgradient well, the concentration reached 0.4 µg/L. The groundwater distribution pattern for 1,1-dichloroethane in downgradient wells is quite similar to that of 1,1,1-trichloroethane, which suggests it may be a breakdown product of 1,1,1-trichloroethane (DOE 1993a, DOE 1994a). Like 1,1,1-trichloroethane, the concentration of 1,1-dichloroethane decreased steadily through 1996 and has either remained steady or dropped slightly since 1996.

Carbon tetrachloride was detected in both upgradient and downgradient monitoring wells at the SWL. Between 1994 and 2000, concentrations ranged from non-detect to 3.2 µg/L in the two southern-most downgradient wells. Occasional detections in the other six downgradient wells have ranged from 0.6 to 9.3 µg/L (well 699-24-34B, February 1996) without a consistent pattern, but exceeding the groundwater quality criteria of 0.3 µg/L. Carbon tetrachloride was detected in the upgradient well 699-26-35A, and the highest concentration was 2.0 µg/L in August 1995.

Chloroform was detected only in downgradient wells at the SWL. Reported concentrations have been less than the groundwater quality criteria of 7 µg/L. Maximum reported values range from 0.34 µg/L at well 699-24-35 to 4.6 µg/L (November 1996) at well 699-22-35 (Appendix B). The highest reported value is in the southernmost well. There were only occasional detections in the other wells with the highest value at 1.5 µg/L.

Specific conductance in downgradient wells, and sometimes upgradient wells, consistently exceeds the background threshold value of 550 µS/cm (see Section 6.3.3 for an explanation and discussion of background threshold values). The highest value for specific conductance was 1,557 µg/L in well 699-22-35. In general specific conductance increases from north to south along the line of downgradient wells. However, in many instances well 699-24-34C has the highest specific conductance values in the monitoring well network (DOE 1994a, Hodges et al. 1996).

The increased specific conductance observed in SWL wells is principally caused by an increased carbonate or bicarbonate concentration in the groundwater (DOE 1994a). In turn, the increased carbonate concentration is the result of high carbon dioxide in the vadose zone as observed by Evans et al. (1989a) and Jacques (1993a). The elevated carbon dioxide concentrations in the vadose zone apparently result from the breakdown of sewage beneath the SWL under oxidizing conditions. The major effect of this process is an increase in the hardness of the groundwater (DOE 1994a), which is also responsible for increasing the concentration of sulfate, lowering the pH, and raising the specific conductance. Sulfate concentration often exceeds the background threshold value (250 mg/L standard in WAC 173-200) in wells 699-22-35 and 699-23-34B. The lowest reported pH value is 3.5 in well 699-24-34B. However, since 1995 reported pH values have not exceeded the background threshold range of 6.2 to 8.46.

Filtered iron and zinc and chemical oxygen occasionally exceed their respective background threshold values (160, 34, and 5,000 µg/L respectively) in several SWL network monitoring wells. However, these exceedances are suspected to be sampling or laboratory errors because they are not repeatable. In almost every case, these exceedances are followed by succeeding samples with results not exceeding the background threshold values.

4.0 Conceptual Model

Waste disposal at the SWL has affected groundwater quality downgradient of the site. The following statements summarize the current interpretation ("Conceptual Model") of waste disposal, movement through the vadose zone, and in groundwater.

- Volatile organic compounds were disposed in the SWL in the form of catch tank liquid from the 1100 Area heavy equipment garage and bus shop. Some of this waste has reached groundwater beneath the SWL.

- The bulk of the waste disposed at the SWL was solid waste that contained no volatile organic compounds or radioactive waste.

- Significant quantities of sewage were disposed at SWL and affect groundwater quality at the SWL. Degradation of the sewage increases the concentration of carbon dioxide in the vadose zone which, in turn, increases hardness, sulfate, and specific conductance in groundwater.

- It is possible, but unlikely, that DNAPL was disposed at the SWL.

- Collected leachate from the buried waste at the SWL is known to contain arsenic, manganese, nickel, and various volatile organic compounds. These and other dangerous waste constituents remain in the landfill and may be detected in the future by groundwater monitoring network.

- Natural precipitation or water from the waste carries contaminants through the vadose zone to groundwater.

- Volatile organic compounds are present in vadose zone vapors and are the primary contaminant of concern for groundwater. Soil gas surveys suggest that the areas of highest soil gas vapors do not correspond with areas of known disposal. Contaminants may move laterally within the vadose zone via vapor transport. However, soil gas studies to date have failed to prove this. There may be other, undocumented sources of volatile organic compounds with SWL area.

- Contaminants remain in the uppermost aquifer above the low-permeability unit. Existing wells only monitor the uppermost portion of the uppermost aquifer. Additional wells downgradient are needed to discover whether waste constituents (in either the dissolved phase or DNAPLs) have reached the lower portion of the uppermost aquifer (top of the low-permeability unit).

- Regionally, groundwater flows toward the southeast; however, flow directly beneath to the SWL may be toward the east or even northeast. The hydraulic gradient in the immediate vicinity of SWL is extremely low (approximately 0.00005).

5.0 Groundwater Monitoring Program

5.1 Objectives

The overall objectives of the Groundwater Monitoring Program at the Hanford Site are to (a) protect human health and the environment; (b) comply with governmental regulations; and (c) contribute to groundwater investigation or remediation. Specifically, the objective of the groundwater monitoring at the SWL is to determine the impact of waste disposal at the SWL on groundwater.

5.2 Special Conditions

There are two hydrogeological conditions at the SWL that are of special concern to the development of this groundwater monitoring plan. The first is the low-permeability unit within the Upper Ringold unit or Ringold Formation unit E. This low-permeability layer limits the thickness of the uppermost aquifer locally to about 22 meters. It is believed to limit the depth of contamination from the SWL. A groundwater monitoring plan must account for this low-permeability zone and provide assurance that groundwater contamination from SWL has not reached the top of the low-permeability unit, as well as more shallow depths of the uppermost aquifer. (See also Section 4.0, Conceptual Model.)

The second special condition is the extremely low hydraulic gradient and the difficulty to determine an accurate direction of groundwater flow in the uppermost aquifer. Water-table maps (Hartman et al. 2000, Plate 2) indicate the flow should be generally from west to east in the immediate vicinity of the SWL. However, contaminant plumes like tritium from the 200 East Area (Hartman et al. 2000, Plate 3) are moving from the northwest to the southeast. (See also Section 4.0, Conceptual Model.)

5.3 Sampling and Analysis Plan

5.3.1 Monitoring Well Network

The eight downgradient wells and two upgradient wells (Table 5.1) of the existing monitoring well network (see Figure 2.2) are designed to

- represent the quality of background groundwater that has not been affected by the SWL [WAC 173-304-490(2)(a)(i)]
- represent the quality of groundwater passing the point of compliance (downgradient wells) [WAC 173-304-490(2)(a)(ii)]
- determine whether downgradient concentrations of groundwater constituents specifically required by governmental regulations are statistically increased over background concentrations [WAC 173-304-490(2)(f)]
- determine whether concentrations of other groundwater constituents of concern (volatile organic compounds) have exceeded groundwater quality criteria or other maximum contaminant levels.

Table 5.1. Groundwater Monitoring Wells in the Solid Waste Landfill Monitoring Network (All wells monitor the uppermost portion of the uppermost aquifer; downgradient wells listed north to south.)

Well Number Upgradient or Downgradient	Date Installed	WAC 173-160 Compliant?
699-26-35A Upgradient	1986	Yes
699-24-35 Upgradient	1987	Yes
699-25-34C	1987	Yes
699-24-34C	1987	Yes
699-24-34B	1987	Yes
699-24-34A	1987	Yes
999-23-34A	1987	Yes
699-23-34B	1993	Yes
699-22-35	1993	Yes
699-24-33	1948	No

The eight existing downgradient wells are located around the eastern and southern boundaries of the SWL (see Figure 2.2) to detect potentially contaminated groundwater in response to groundwater flowing either eastward (interpreted from water table contours: less reliable) or southeastern (interpreted from plume maps: more reliable). Monitoring Efficiency Model ("MEMO" Domenico and Robbins 1985) results demonstrate that the downgradient wells have a monitoring efficiency of approximately 95% for the flow direction of 135 degrees clockwise from due north (southeast – the most likely flow direction)(Hodges 1994).

Wells 699-24-35 and 699-26-35A (see Figure 2.2) are two existing upgradient wells in the monitoring well network and are located west and northwest of the SWL to determine background water quality. They are screened near the water table and they are compared with downgradient water quality (from 7 of the 8 downgradient wells) to determine if the SWL has adversely affected groundwater quality. All of the existing downgradient wells are also screened near the water table. (See Sections 6.2 and 6.3 for an explanation of the methods used to compare background and downgradient water quality. Well 699-26-35A is shared with the NRDWL monitoring well network.)

Well 699-24-33 is the one well of the eight downgradient wells that is not used for upgradient-downgradient water quality comparisons. It is not used because it is an older well that is not constructed to the standards of WAC 173-160. The construction is simply an 8-inch carbon steel casing drilled to

50 meters, perforated from 35 to 50 meters below ground surface, and constructed without any surface seal, annular seal, or surface protection. Groundwater analyses from this well will continue to be used for supporting data only.

Shallow groundwater monitoring wells on the east (downgradient) side of the SWL indicate groundwater contamination with chlorinated hydrocarbons. This contamination may be due to the disposal of wash water from the bus lot. However, the evidence for this is not entirely convincing, and there is the possibility that the detected contaminants are the dissolved fraction of one or more DNAPL plumes at the bottom of the uppermost aquifer.

Two new wells are proposed to determine the geology of the lower portion of the uppermost aquifer and to sample and analyze groundwater from the uppermost aquifer immediately above the low-permeability unit. The purpose of the new wells is to define the depth of groundwater contamination (DOE 1996a, Section 5.3) and also to look for the presence of DNAPLs. The two new wells will be drilled into the low-permeability unit for geologic and hydrologic characterization and then backfilled and completed on top of the unit. They will be located at sites immediately outside of the landfill boundary and downgradient of positions in the landfill where volatile organic compounds are most likely buried or where existing wells show the highest concentrations of volatile organic compounds (e.g., one on the east side about midway along the SWL and another at the southern end). A third deep well that could be added to the SWL network as an upgradient well would be well 699-26-35C. This existing well is being used as an upgradient/deep well for the NRDWL monitoring well network.

Installation of new wells on the Hanford Site is subject to competing site priorities and negotiations between DOE and Ecology. The location, depth, and other details of the new wells will be determined later, and this monitoring plan will be revised to include those wells after (and if) they are installed.

Appendix A contains construction details for each existing well in the groundwater monitoring network at the SWL, as well as the proposed additional well 699-26-35C (an existing well at NRDWL).

5.3.2 Constituent List and Sampling Frequency

WAC 173-304-490 requires that the following list of groundwater waste constituents be monitored quarterly. These waste constituents will be the basis for future groundwater monitoring at the SWL:

ammonium	nitrate
chemical oxygen demand	nitrite
chloride	pH
conductivity	sulfate
filtered iron	temperature
filtered manganese	total coliform
filtered zinc	total organic carbon

In addition, the following site-specific parameters are also proposed to be sampled quarterly. Their selection is based on waste disposal and groundwater monitoring history at the SWL and results of leachate sample analyses. The site-specific parameters include the following:

- volatile chlorinated hydrocarbons (including, but not limited to, carbon tetrachloride, 1,1-dichloroethane, 1,2-dichloroethane, tetrachloroethene, trichloroethene, 1,1,1-trichloroethane, 1,4-dioxane, and 1,4-dichlorobenzene).

- filtered arsenic

The SWL is within the major tritium, nitrate, and iodine-129 plumes from the 200 East Area. Tritium and nitrate were analytes in the previous version of the SWL groundwater monitoring plan (Hodges 1994, 1996). The success of using tritium concentrations to determine groundwater flow rate and direction at the SWL has met with limited success. In addition, tritium is not considered to be a site-specific parameter (DOE 1993a). Therefore, it will not be monitored by this groundwater monitoring plan but will be monitored by the Hanford Groundwater Monitoring Project for the *Atomic Energy Act of 1954* and for the PUREX cribs (a RCRA treatment, storage, and disposal unit) (see Hartman et al. 1999). Nitrate will continue to be an analyte because it is required by WAC 173-304-490. Total organic halogens, gross alpha, and gross beta, which were included in the list of groundwater constituents analyzed at the SWL previously, are also removed from the list. Because the groundwater samples are analyzed for volatile organics, they are specifically tested for all the likely volatile organics that could have been disposed at the SWL. Therefore, there is no need to run the indicator parameter total organic halogens. Furthermore, testing for the indicator parameters gross alpha and gross beta was discontinued because there is no evidence that any radioactively-contaminated waste was disposed at the SWL, and radioactive waste has never been detected at the SWL other than at background levels or from upgradient sources (i.e., tritium).

5.3.3 Groundwater Parameter Analysis Method Detection Limit

Table 5.2 lists the groundwater analysis method detection limits currently in use for groundwater parameters required in Section 5.3.2, as well as the groundwater quality criteria (also called groundwater performance standards). (Note: If there is no applicable groundwater quality criteria for a particular analyte, then the groundwater performance standard is the maximum contaminant level.) The groundwater analyses methods currently used to analyze the groundwater samples are designed, for the most part, to meet the groundwater quality criteria. However, the groundwater quality criteria for a few constituents are too low, and the corresponding cost too high, to be cost effective at the present level of technology for routine analyses. These constituents include arsenic and 1,4-dioxane. For these constituents, the analysis methods selected have corresponding method detection limits as close as possible to the groundwater quality criteria to remain useful, but cost effective, for this groundwater monitoring plan.

5.3.4 Determination of Groundwater Flow

WAC 173-304-490(2)(h) requires that the groundwater flow direction and flow rate be determined and reported annually (see also the reporting plans in Section 6.4).

Table 5.2. Groundwater Quality Criteria for Solid Waste Landfill Groundwater Waste Parameters and Associated Method Detection Limits

Groundwater Constituent	GWQC[(a)] (or MCL)[(b)]	MDL[(c)] (IDL[(d)] for metals)
Temperature	--	--
Specific Conductance	700 µS/cm (WAC 246-290-310)	0.278 µS/cm
Field pH	6.5-8.5	0.1
Total Organic Carbon	--	222 µg/L
Chloride	250,000 µg/L	34.6 µg/L
Nitrate	(45,000 µg/L)	48.7 µg/L
Nitrite	(3,300 µg/L)	24.3 µg/L
Ammonium	--	37 µg/L
Sulfate	250,000 µg/L	108 µg/L
Iron (filtered)	300 µg/L	(56.6 µg/L)
Zinc (filtered)	5,000 µg/L	(4.2 µg/L)
Manganese (filtered)	50 µg/L	(1.9 µg/L)
Coliform (most prob. number)	1/100 ml	--
Chemical Oxygen Demand	--	3,067 µg/L
Arsenic (filtered)	0.05 µg/L	(0.9 µg/L)
Carbon Tetrachloride	0.3 µg/L	0.32 µg/L
1,1-Dichloroethane	1.0 µg/L	0.36 µg/L
1,2-Dichloroethane	0.5 µg/L	0.34 µg/L
Tetrachloroethene	0.8 µg/L	0.15 µg/L
Trichloroethene	3.0 µg/L	0.26 µg/L
1,1,1-Trichloroethane	(200 µg/L)	0.35 µg/L
1,4-Dioxane	7.0 µg/L	40 µg/L
1,4-Dichlorobenzene	(4.0 µg/L)	0.10 µg/L

(a) Groundwater quality criteria in WAC 173-200.
(b) Maximum contaminant levels in 40 CFR 141, 40 CFR 143, EPA 822-R-96-001.
(c) Method detection level.
(d) Instrument detection level.

Depth-to-water measurements will continue to be collected from each monitoring well when each is sampled. Therefore, depth-to-water will be measured quarterly at all network wells. These depth-to-water measurements will be used to construct water-table maps which, in turn, will be re-evaluated annually to determine the direction of groundwater flow beneath the SWL.

The water table at the SWL has a very low gradient. Water-table maps constructed previously from the depth-to-water measurements (and surveyed elevation of the ground surface and casing top at each well) show that the gradient across the site is approximately 0.00005 (Weekes et al. 1987). Determining groundwater flow direction in an area the size of the SWL when the gradient in 0.00005 is very difficult. Very small errors in depth-to-water measurements or in surveyed casing elevations are significantly large compared to the low gradient. Therefore, maps showing the major plumes of tritium, nitrate, and iodine-129 will be used to corroborate flow directions based on water-table maps.

Using the Darcy equation,

$$v = \frac{K(i)}{n_{(e)}} \quad (1)$$

average groundwater flow rate (v) will be calculated from known estimates of hydraulic conductivity (K), the water-table gradient (i), and effective porosity ($n_{(e)}$).

Another method of determining groundwater flow direction and flow rate is the use of one or more type of down-well flow meters. One type of flow meter currently being used in the 200 East Area is one using a down-hole camera with magnetometer. This type of flow meter tracks the movement of colloidal-size particles by observing the particles with the camera. The flow rate and direction of the particles are recorded and used to calculate groundwater flow rate and flow direction. This type of flow meter will be used at one or more of the SWL network wells to corroborate the interpretations of flow direction and rate with more conventional methods (i.e., water-table maps, pumping tests).

5.3.5 Sampling and Analysis Protocol

Groundwater monitoring for the SWL is part of the Hanford Groundwater Monitoring Project. Procedures for groundwater sampling, documentation, sample preservation, shipment, and chain-of-custody requirements are described in PNNL or subcontractor procedures manuals[1] and quality requirements are provided in the quality assurance plan.[2] Samples generally are collected after three casing volumes of water have been purged from the well or after field parameters (pH, temperature, specific conductance, and turbidity) have stabilized. For routine groundwater samples, preservatives are added to the collection bottles before their use in the field. Samples to be analyzed for metals are usually filtered in the field so that results represent dissolved metals.

Procedures for field measurements are specified in the subcontractor's or manufacturer's manuals. Analytical methods are specified in contracts with laboratories, and most are standard methods from *Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods* (EPA 1986a). Alternative procedures meet the guidelines of SW-846, Chapter 10. Analytical methods are described in Gillespie (1999).

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[1] Procedure manual ES-SSPM-001, Waste Management Technical Services, Inc., Northwest Operations, Richland, Washington.

[2] ETD-012, Rev. 1, *Quality Assurance Plan*, Hanford Groundwater Monitoring Project, Pacific Northwest National Laboratory, Richland, Washington.

5.3.6 Quality Assurance and Quality Control

The groundwater monitoring project's quality assurance/quality control (QA/QC) program is designed to assess and enhance the reliability and validity of groundwater data. The primary quantitative measures or parameters used to assess data quality are accuracy, precision, completeness, and the method detection limit. Qualitative measures include representativeness and compatibility. Goals for data representativeness for groundwater for groundwater monitoring projects are addressed qualitatively by the specification of well locations, well construction, sampling intervals, and sampling and analysis techniques in the groundwater monitoring plan for each facility. Comparability is the confidence with which one data set can be compared to another.

The QC parameters are evaluated through laboratory checks (e.g., matrix spikes, laboratory blanks), replicate sampling and analysis, analysis of blind standards and blanks, and interlaboratory comparisons. Acceptance criteria have been established for each of these parameters,[1] based on guidance from the U.S. Environmental Protection Agency (EPA 1986a). When a parameter is outside the criteria, corrective actions are taken to prevent a future occurrence and affected data are flagged in the database.

[1] ETD-012, Rev. 1, *Quality Assurance Plan*, Hanford Groundwater Monitoring Project, Pacific Northwest National Laboratory, Richland, Washington.

6.0 Data Management, Evaluation, and Reporting

This section describes how groundwater data are stored, retrieved, evaluated, and interpreted. Statistical evaluation methods and reported requirements are also described.

6.1 Data Management

The contract laboratories report analytical results electronically. The results are loaded into the Hanford Environmental Information System (HEIS) database. Field-measured parameters are entered manually or through electronic transfer. Paper data reports and field records are considered to be the record copies and are stored at PNNL.

The data undergo a validation/verification process according to a documented procedure (Procedure QC-5, RCRA Groundwater Data Validation and Verification Process in PNL-MA-567 Manual) cited in the project QA plan.[1] QC data are evaluated against the criteria listed in the project QA plan and data flags are assigned when the data do not meet those criteria. In addition, data are screened by scientists familiar with the local hydrogeology, compared to historical trends or spatial patterns, and flagged if they are not representative. If necessary, the lab may be asked to check calculations or reanalyze the sample, or the well may be resampled.

6.2 Interpretation

After data are validated and verified, the data are used to interpret groundwater conditions at the site. Interpretive techniques include:

- Hydrographs: graph water levels versus time to determine decreases, increases, seasonal, or manmade fluctuations in groundwater levels.

- Water-table maps: use water-table elevations from multiple wells to construct contour maps to estimate flow directions. Groundwater flow is assumed to be perpendicular to lines of equal potential.

- Trend plots: graph concentrations of chemical or radiological constituents versus time to determine increases, decreases, and fluctuations. May be used in tandem with hydrographs and/or water-table maps to determine if concentrations relate to changes in water level or in groundwater flow directions.

[1] ETD-012, Rev. 1, *Quality Assurance Plan*, Hanford Groundwater Monitoring Project, Pacific Northwest National Laboratory, Richland, Washington.

- Plume maps: map distributions of chemical or radiological constituents areally in the aquifer to determine the source and extent of contamination. Changes in plume distribution over time aid in determination of movement of plumes and direction of flow.

- Contaminant ratios: can sometimes be used to distinguish between different sources of contamination.

6.3 Statistical Evaluation

Statistical evaluation of data consists of the required comparisons between downgradient compliance point wells with the background data to determine whether a statistically significant change over background values has occurred for the WAC 173-304-490(2)(d) constituents [see WAC 173-304-490(2)(f)]. If there is a statistically significant increase for parameters or constituents at any monitoring well at the compliance point [WAC 173-304-490(2)(i)(ii)], then it must be determine whether the groundwater performance standard (groundwater quality criteria or maximum contaminant level; see Table 5.1) has been exceeded.

6.3.1 Background Summary Statistics

Summary statistics were recalculated for the WAC 173-304-490(2)(d) constituents using quarterly monitoring data collected from March 1993 to May 2000 from upgradient wells (699-24-35 and 699-26-35A). The old summary statistics were calculated from data collected from 1987 to 1993 (Hodges 1994, 1996). Results of summary statistics from the new data are presented in Table 6.1. Some of the background data are below the laboratory's specified method detection limit. Following guidance in EPA (1989, 1992) and Ecology (1996), the following procedures were used in handling the non-detects. In cases where the proportion of non-detects is less than 15%, not detected measurements were replaced by half of their method detection limits, and the usual calculations were performed. In cases where the proportion of non-detects is between 15% to 50%, Cohen's method (Cohen 1959, 1961) was used to estimate the mean and standard deviation (dissolved iron, manganese, and zinc). For total organic carbon, Aitchison's adjustment (Aitchison 1955) was used because the fraction of non-detects exceeds 50% and Cohen's method may not give valid results (EPA 1992, pages 27   34). For nitrite, ammonium, coliform bacteria, and chemical oxygen demand, summary statistics are not calculated because these constituents are essentially not detected.

6.3.2 Testing the Assumption of Normality of Data

Background water quality is statistically defined as the 95% upper tolerance interval with a 95% confidence (see Ecology 1996, page 65). The tolerance interval defines a concentration range (from background well data) that contains at least a specified proportion (coverage) of the population with a specified probability (level of confidence). There are two types of tolerance intervals: parametric and non-parametric. Parametric tolerance interval techniques are valid when the assumption that the data are drawn from a normal (or lognormal) population holds. When data is not normally (or log-normally) distributed, a non-parametric tolerance interval is used to estimate background values.

Table 6.1. Background Summary Statistics for the Monitoring Constituent Data for the Solid Waste Landfill

Constituent[(a)] (Unit)[(b)]	N	GT	LT	Mean	Median	Standard Deviation	CV (%)	Min.	Max.
Temperature	60	60	0	18.8	19.1	1.07	5.7	16	20.7
Specific Conductance	55[(c)]	55	0	489.8	484	42.9	8.8	409	578
Field pH	60[(c)]	60	0	7.24	7.22	0.25	3.4	6.70	7.74
TOC[(c)]	60	29	31	191.7[(e)]	266	235.5[(e)]	122.8	73.8	842.3
Chloride	60	60	0	6,496	6,600	745.4	11.5	5,200	7,820
Nitrate (as NO_3^-)	60	60	0	17,299	16,577	6,143	35.5	10,491	29,000
Nitrite (as NO_2^-)	60	0	60	BDL	BDL	NC	NC	BDL	BDL
Ammonium (as NH_3^-)	52	9	43	BDL	BDL	NC	NC	BDL	90
Sulfate	60	60	0	40,780	40,350	3,000	7.4	33,800	47,000
Iron,[(d)] Dissolved	59[(c)]	50	9	35.8[(e)]	34	27.2[(e)]	75.9	BDL	160
Zinc, Dissolved	59[(c)]	41	18	6.93[(e)]	8.7	8.46[(e)]	122.0	BDL	34.9
Manganese, Dissolved	60	40	20	1.79[(e)]	2.4	2.41[(e)]	134.9	BDL	10
Coliform Bacteria	56	0	56	BDL	BDL	NC	NC	BDL	BDL
Chemical Oxygen Demand	57[(d)]	2	55	BDL	BDL	NC	NC	BDL	5,000

(a) Constituents are specified in WAC 173-304-490(2)(d). Data collected March 1993 to May 2000 from upgradient wells 699-24-35 and 699-26-35A.
(b) Measuring unit for temperature is ^oC, for specific conductance is µS/cm, for coliform bacteria is colonies/100 ml, all chemical constituents are in µg/L.
(c) Outlier(s) removed.
(d) Less than detection values were replaced by half of the vendor's method detection limit.
(e) Estimated by Cohen's method (iron, zinc, and manganese) and Aitchison's method (total organic carbon).
GT = number of samples that are greater than the method detection limit.
LT = number of samples that are less than the method detection limit.
CV = coefficient of variation [(standard deviation/mean)*100].
Min = minimum.
Max = maximum.
BDL = below contractually required detection limit.
NC = not calculated because of insufficient measured values.

Parametric tolerance intervals are sensitive to the assumption that the data are normally distributed. The statistical tests used for evaluating whether or not the data follow a specified distribution are called goodness-of-fit tests. A recommended test is the Shapiro-Wilk test for normality of the data (Shapiro and Wilk 1965). It is considered to be one of the very best tests of normality available (Miller 1986; Mandansky 1988).

The Shapiro-Wilk test statistic (W) will tend to be large when a probability plot of the data indicates a nearly straight line (i.e., normal distribution). Only when the plotted data show significant departure from normality the test statistic will be small. Hence, if the computed value of W is less than the critical value

W_α for a prechosen value of α (e.g., α = 5%) shown in statistical table, the hypothesis of normality is rejected. The Shapiro-Wilk test of normality can be used for sample sizes up to 50. When sample size is larger than 50 (up to 98), a slight modification of the procedure called the Shapiro-Francia test (Shapiro and Francia 1972) can be used instead. Like the Shapiro-Wilk test, the Shapiro-Francia test statistic (W') will be small when the probability plot shows significant bends or curves (i.e., non-normality). Procedures are provided in EPA (1992, pages 9-12) and Shapiro (1980, pages 20-24).

Background quality data were evaluated using quarterly monitoring data collected from March 1993 to May 2000 from upgradient wells (699-24-35 and 699-26-35A). Shapiro-Francia tests were applied first on the logarithms of the original data (to test for log-normality) because sample sizes are larger than 50. If the logged data indicate non-normality, a re-test is performed on the original data to test for normality of the original concentrations. Results are provided in Table 6.2. Specific conductance, pH, and sulfate concentration measurements from background wells are approximately log-normally distributed. Temperature, chloride, nitrate, and iron concentrations are neither lognormal nor normal. Total organic carbon, nitrite, ammonium, zinc, manganese, coliform bacteria, and chemical oxygen demand are not tested because the fractions of non-detects are much higher than 15%.

6.3.3 Re-Establish Background Levels

The earlier background values were established for the WAC 173-304-490(2)(d) constituents based on the tolerance interval approach using monitoring data collected from upgradient wells (699-24-35 and 699-26-35A) during May 1987 to September 1993. Since then, more information has been gained and analytical laboratory has changed. It is deemed appropriate to revise the original background values (using data collected 1993 to 2000) to reflect the most current site conditions and improve estimates of background mean and standard deviation. Both the upper and lower limits of the interval (two sided) were calculated for pH. Only the upper limits of the intervals (one sided) were calculated for other constituents.

If a lognormal (or a normal) distribution is a reasonable approximation of the background concentrations, a parametric tolerance interval (TI) of the following form is calculated.

$$TI = \overline{x}_b \pm kS_b \text{ (two-sided), or}$$

$$TI = \overline{x}_b + kS_b \text{ (one-sided)}$$

where: $\overline{x}_b$ = background mean.

k = a normal tolerance factor, which depends on the number of background samples (n), coverage (P%), and confidence level (Y). A coverage of 95% and confidence of 95% are used. With n = 60, P = 95%, and Y = 95%, k is 2.022 for a one-sided normal tolerance interval (Gibbons 1991).

S_b = background standard deviation.

If background concentration does not follow a lognormal or normal distribution or the proportion of non-detects is greater than 15%, a nonparametric tolerance interval is constructed (Conover 1980). A

Table 6.2. Results of Shapiro and Francia Test for Normality and Background Threshold Values for the Solid Waste Landfill

Constituent[a] (Unit)[b]	Test Statistic W' (log-value)	Test Statistic W' (raw data)	Critical Value[c] W'_{α}	Upper Tolerance Limit	Background Threshold Value
Temperature	0.953 s	0.961 s	0.963	20.7[d]	20.7
Specific Conductance	0.978 ns	NA	0.960	583[e]	583
Field pH	0.988 ns	NA	0.963	[6.68, 7.84][e]	[6.68, 7.84]
TOC	NC	NC	NC	842[d] 1,143[f]	1,143
Chloride	0.954 s	0.962 s	0.963	7,820[d]	7,820
Nitrate (as NO_3^-)	0.833 s	0.844 s	0.963	29,000[d]	29,000
Nitrite (as NO_2^-)	NC	NC	NC	359[g]	359
Ammonium (as NH_3^-)	NC	NC	NC	90[d] 165[g]	165
Sulfate	0.983 ns	NA	0.963	47,200[e]	47,200
Iron, Dissolved	0.960 s	0.802 s	0.962	160[d] 137[g]	160
Zinc, Dissolved	NC	NC	NC	34.9[d] 19[g]	34.9
Manganese, Dissolved	NC	NC	NC	10[d] 2.3[g]	10
Coliform Bacteria	NC	NC	NC	3.7[h]	3.7
Chemical Oxygen Demand	NC	NC	NC	5,000[h]	5,000

(a) Constituents are specified in WAC 173-304-490(2)(d). Data collected from March 1993 to May 2000 from upgradient wells 699-24-35 and 699-26-35A.
(b) Measuring unit for temperature is °C, for specific conductance is µS/cm, for coliform bacteria is colonies/100 ml, all chemical constituents are in µg/L.
(c) Obtained from Table A-9 (in Shapiro 1980) for α = 5%.
(d) Maximum value reported.
(e) Based on log-normal distribution.
(f) Based on limit of quantitation using field blank data for the second quarter of FY 2000.
(g) Based on limit of quantitation using method detection limit (Hartman et al. 2000, Table B.20).
(h) Based on laboratory practical quantitation limit.

two-sided nonparametric tolerance interval is just the range of the observed data. An upper one-sided non-parametric tolerance limit is the largest observation. With 56 to 60 background samples for total organic carbon, nitrite, iron, manganese, zinc, coliform bacteria, and chemical oxygen demand (see Table 6.1), the upper one-sided tolerance limit defined by the largest observation contains at least 95% of the background population with 95% probability.

In cases where all of the background values are below the contractually established detection limits or where the proportion of non-detects is more than 15%, a limit of quantitation was also calculated using the fiscal year 1999 field blanks data or based on method detection limits (Hartman et al. 2000, Appendix B). Following guidance (EPA 1986b, Ecology 1996), it was decided that for cases where the calculated upper tolerance limit is below the limit of quantitation, the most recently determined limit of quantitation will be used as the background threshold value (comparison value) between data obtained from background and downgradient compliance wells. This approach uses quality control data to target the limits of quantifiable data and provides a realistic approach for background/compliance well comparisons when upgradient wells yield values that are below the detection limit. In cases where limit of quantitation is not available (e.g., coliform bacteria and chemical oxygen demand), the contractually required quantitation limits were used as the background threshold values. It should be noted that inconsistent values (i.e., outliers) were tested and removed from the background data sets in the statistical evaluations. The exclusion of extreme observation(s) from the background data sets provides smaller variability and lower comparison values. Thus, it is more conservative. The resulting background threshold values are also presented in Table 6.2.

6.3.4 Comparisons with Groundwater Performance Standards

Groundwater monitoring results have been, and will continue to be, compared on a quarterly basis with background levels determined in accordance to methods presented in Section 6.3.3. In addition, when there is a statistically significant increase for parameters or constituents listed in WAC 173-304-490(2)(d) the owner and/or operator need to determine whether the groundwater performance standard (groundwater quality criteria or maximum contaminant level; see Table 5.2) has been exceeded, and initiate the notification process. Results of past groundwater monitoring have detected the following primary chlorinated hydrocarbons in the groundwater beneath the SWL: 1,1-dichloroethane; 1,2-dichloroethane; 1,1,1-trichloroethane; carbon tetrachloride; trichloroethene; tetrachloroethene; and 1,4-dichlorobenzene.

These contaminants will be compared with WAC 173-200 groundwater quality criteria presented in Table 6.3. If the criterion is exceeded, Ecology will determine whether corrective action program is required. In that case, this plan will be either revised or rewritten.

6.4 Reporting

Chemistry and water-level data are reviewed at least quarterly and are available in HEIS.

WAC 173-304-490 requires that the groundwater flow direction in the uppermost aquifer be determined at least annually. The interpreted flow direction is reported annually (usually in March) along with interpretations of groundwater quality data for the previous fiscal year in the annual report on Hanford Site groundwater monitoring (e.g., Hartman et al. 2000).

Table 6.3. Groundwater Quality Criteria

Contaminant[a]	Criterion[b]
1,1,1-Trichloroethane	0.20 mg/L
Carbon tetrachloride	0.3 µg/L
1,1-dichloroethane	1.0 µg/L
1,2-dichloroethane	0.5 µg/L
1,4-dichlorobenzene	4 µg/L
Tetrachloroethene	0.8 µg/L
Trichloroethene	3 µg/L

(a) Based on groundwater monitoring results, the list of contaminants will be revised as necessary to include any new contaminants detected in the groundwater.
(b) Source: WAC 173-200 (Table 1).

WAC 173-304-490 also requires that the jurisdictional health department (Ecology[1]) be notified in writing within seven days when there is a statistically significant increase for parameters or constituents at any of the network groundwater monitoring wells (i.e., exceedances of the background threshold values or exceedance of performance standards). The notification must indicate what parameters or constituents have shown statistically significant increases or exceedances of standards. In addition, the jurisdictional health department (Ecology) must be notified within 14 days of the results of any re-sampling done as a result of the increase in groundwater parameters or constituents or exceedance of performance standards. Because several groundwater parameters or constituents (e.g., specific conductance, sulfate, zinc, and chemical oxygen demand) repeatedly exceed background threshold values, notification will not occur for parameters or constituents that have historically exceeded the background threshold values or performance standards. Notification will be limited to new exceedances. If the jurisdictional health department (Ecology) requires a corrective action program as a result of parameter or constituent exceedances, a new or revised groundwater monitoring plan will be written and contain new reporting requirements.

[1] Responsibility for regulating the SWL was transferred from Benton-Franklin Public Health Department to Ecology.

7.0 References

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Appendix A

Leachate Monitoring Results

(Leachate monitoring results provided by DYN)

Table A.1. Summary of Solid Waste Landfill Leachate Analysis (first quarter 1997 through third quarter 2000)

Analytical Parameters	Units	1st Quarter 1997	2nd Quarter 1997	3rd Quarter 1997	4th Quarter 1997	1st Quarter 1998	2nd Quarter 1998	3rd Quarter 1998	4th Quarter 1998	1st Quarter 1999	2nd Quarter 1999	3rd Quarter 1999	3rd Quarter 1999 Resample	4th Quarter 1999	1st Quarter 2000	2nd Quarter 2000	3rd Quarter 2000
Indicator Parameters																	
Alkalinity	mg/L	Not required	Not required	930	870	810	Not required	Not required	Not required	Not required	734	748		Not required	Not required	Not required	Not required
Ammonia as N	mg/L	0.7	1.7	0.41	0.5	0.28	0.6	0.77	0.7	0.7	0.729	0.6		0.7	0.5	<0.909	0.618
Bromide	mg/L									Not required	2	2		3	2	2.526	<10.1
Chemical Oxygen Demand	ppm	1,053	410	210	180	200	237	222	203	211	203	Not sampled		242	221	216	228
Chloride	mg/L	210	200	250	230	22	212	214	218	212.5	208.8	233		238.9	223.5	188.3	236.2
Conductivity	µmhos/cm	2,890	2,400	2,200	2,000	2,000	1,987	2,030	2,130	1,870	2,100	2,070		2,000	1,970	1,943	1,986
Fluoride	mg/L	27	6.8	<0.3	<0.6	<0.3	Not required	Not required	Not required	Not required	0.05	0.6		<0.1	<0.07	<0.07	<0.707
Nitrate as N	mg/L	0.2	<0.3	<0.3	0.07	<0.03	Not required	Not required	Not required	Not required	<0.095	<0.095		<0.19	<0.4	<0.4	<4.04
Nitrite as N	mg/L	<0.15	<0.3	<0.3	<0.06	<0.03	Not required	Not required	Not required	Not required	<0.4	<0.2		<0.4	<0.2	<2.02	<2.02
pH		7.08	6.97	7.04	7.02	7.17	6.95	7.35	6.96	7.32	7.17	6.92		7.6	6.14	7.43	7.39
Phosphate	mg/L									Not required	<0.29	<0.295		<0.59	<0.6	<0.6	<6.06
Sulfate	mg/L	<1.5	<3.0	<0.3	0.4	1.3	Not required	Not required	Not required	Not required	6.345	6.85		8	8	7.664	<20.2
Total Dissolved Solids	mg/L	Not required	Not required	1,300	1,400	1,400	Not required	Not required	Not required	Not required	1190	1312		1300	1,288	1,297	1,361
Total Organic Carbon	mg/L	330	140	68	68	65	90.2	56	65.4	74.1	63.5	69.1		59.55	61.6	58.05	61.45
Total Organic Halides	µg/L	330	590	<0.5	610	710	Not required	Not required	Not required	Not required	83.9	1.06		724	586	945	708
Inorganics																	
Aluminum	µg/L	Not required	Not required	Not required	<200	Not required	Not required	Not required	Not required	Not required	29.2	95.9	139	27.2	21.5	22.1	31.7
Antimony	µg/L	Not required	Not required	<1	<1	<10	Not required	Not required	Not required	Not required	27.3	236	14.6	0.812	0.28	<0.25	0.263
Arsenic	µg/L	27	19	22	23	28	8.5	15	25.9	38.5	21.2	39.9	66	19.2	17.5	13	15.6
Barium	µg/L	720	620	580	530	500	469	404	451	489	456	475	495	458	444	384	447

Analytical Parameters	Units	1st Quarter 1997	2nd Quarter 1997	3rd Quarter 1997	4th Quarter 1997	1st Quarter 1998	2nd Quarter 1998	3rd Quarter 1998	4th Quarter 1998	1st Quarter 1999	2nd Quarter 1999	3rd Quarter 1999	3rd Quarter 1999 Resample	4th Quarter 1999	1st Quarter 2000	2nd Quarter 2000	3rd Quarter 2000
Beryllium	µg/L	Not required	Not required	<3	<3	<5	Not required	Not required	Not required	Not required	2	0.611	0.865	<0.25	<0.125	<0.125	<0.125
Cadmium	µg/L	Not required	Not required	<0.5	<0.5	<5	Not required	1.1	Not required	Not required	2.1	<0.55	0.57	<0.5	0.45	0.29	<0.25
Calcium	mg/L	Not required	Not required	240	220	220	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
Chromium	µg/L	<10	<10	<10	<10	<10	<7	2.9	3.7	6.6	<6	<3.85	<3.85	<3	<1.5	<1.5	1.7
Cobalt	µg/L	29	<50	<50	<50	12	<13	Not required	Not required	Not required	5.3	4.14	10.4	4.55	4.01	4.2	4.25
Copper	µg/L	Not required	Not required	<20	<20	19	Not required	Not required	Not required	Not required	14.5	15.5	2.5	7.97	4.05	2.78	4.01
Iron	µg/L	39,000	20,000	19,000	18,000	19,000	17,600	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
Lead	µg/L	Not required	Not required	0.52	7.3	<5	Not required	<0.2	Not required	Not required	5.18	4.94	2.16	<3	3.59	<1.5	<1.5
Magnesium	µg/L	Not required	Not required	130,000	110,000	Not required	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
Manganese	µg/L	1,400	930	1,400	1,500	1,600	1,650	Not required	Not required	Not required	2,500	2,360	2,700	2,480	2,480	2,310	2,850
Mercury	µg/L	<0.2	<0.2	0.41	<0.2	10	<0.2	<0.2	<0.2	2.27	<2	4.14	<4.4	<0.25	<0.125	0.255	<0.125
Molybdenum	µg/L									Not required	50	<132	<132	6.79	QC fail	7.22	6.17
Nickel	µg/L	200	220	240	220	210	217	Not required	Not required	Not required	218	215	213	208	179	191	233
Potassium	µg/L	Not required	Not required	15	13	14	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
Selenium	µg/L	Not required	Not required	<2	<2	<20	Not required	4.6	Not required	Not required	<12	<55	<55	3.65	2.79	2.48	2.5
Silver	µg/L	Not required	Not required	<20	<0.5	<5	Not required	<0.2	Not required	Not required	<2	6.06	<1.1	<0.5	<0.25	<0.25	<0.25
Sodium	µg/L	Not required	Not required	64	62	61	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
Thallium	µg/L	Not required	Not required	<1,500	<0.5	<5	Not required	Not required	Not required	Not required	<1	0.715	0.85	<0.25	<0.125	<0.125	<0.125
Thorium	µg/L									Not required	<1	<16.5	<16.5	<0.25	0.131	<0.125	<0.125
Uranium	µg/L									Not required	7	<1.1	1.13	<0.25	0.163	0.206	<0.125
Vanadium	µg/L	Not required	Not required	<50	<50	Not required	Not required	Not required	Not required	Not required	9.13	<1.65	1.8	3.01	2.54	2.49	2.98

Analytical Parameters	Units	1st Quarter 1997	2nd Quarter 1997	3rd Quarter 1997	4th Quarter 1997	1st Quarter 1998	2nd Quarter 1998	3rd Quarter 1998	4th Quarter 1998	1st Quarter 1999	2nd Quarter 1999	3rd Quarter 1999	3rd Quarter 1999 Resample	4th Quarter 1999	1st Quarter 2000	2nd Quarter 2000	3rd Quarter 2000
Zinc	µg/L	Not required	Not required	1,300	2,800	41	Not required	Not required	Not required	Not required	1,880	646	15	1,490	649	448	584
Organics																	
1,1,1,2-Tetrachloroethane	µg/L	Not required	<0.4	<0.4	Not required	<0.4	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
1,1,1-Trichloroethane	µg/L	<0.4	<0.4	<0.4	<0.4	<0.4	<0.60	<0.6	0.6	<300	<0.6	<0.6		<0.6	<0.6	<0.6	<0.6
1,1,2,2-Tetrachloroethane	µg/L	<0.4	<0.4	<0.4	Not required	<0.4	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	<0.6
1,1,2-Trichloroethane	µg/L	<0.4	<0.4	<0.4	Not required	<0.4	<0.60	<0.6	Not required	Not required	<0.6	<0.6		<0.6	<0.6	<0.6	<0.6
1,1-Dichloroethane	µg/L	<0.4	<0.4	0.44	1.4	0.8	<0.30	<0.3	1	<200	<0.6	<0.3		<0.3	<0.3	<0.3	<0.3
1,1-Dichloroethene	µg/L	<0.4	<0.4	<0.4	Not required	<0.4	Not required	<0.4	Not required	Not required	Not required	<0.4		<0.4	<0.4	<0.4	<0.4
1,2,3-Trichloropropane	µg/L	Not required	<0.4	<0.4	Not required	<0.4	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
1,2,4-Trichlorobenzene	µg/L													<64	<5.4	<5.4	<5.4
1,2-Dibromo-3-chloropropane	µg/L	Not required	<0.4	Not required	Not required	<0.4	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
1,2-Dibromoethane	µg/L	Not required	<0.4	<0.4	Not required	<0.4	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
1,2-Dichlorobenzene	µg/L	<0.4	<0.4	<0.4	Not required	<0.4	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
1,2-Dichloroethane	µg/L	<0.4	<0.4	<0.4	Not required	<0.4	Not required	<0.5	Not required	Not required	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethene	µg/L									Not required	<0.4	<1.2		<0.4	<1.2	<1.2	<1.2
1,2-Dichloropropane	µg/L	<0.4	<0.4	<0.4	Not required	<0.4	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
1,4-Dichlorobenzene (SVOA)						4	9	<5.6	<280	<280	10	4		<56	12	<5.6	10
1,4-Dichlorobenzene (VOA)	µg/L	8.9	8.7	10	7.7	6.8	8	5	9	<300	5	5		6	6	4	5
1,4-Dioxane	µg/L	<50	<40	<1,000	89	89	110	65	52	<1300	40		44	180	150	57	100
1-Butanol	µg/L													<1500	<150	<150	<150
2,4-Dichlorophenol	µg/L													<11	<1.1	<1.1	<1.1
2,4-Dinitrotoluene	µg/L													<16	<1.6	<1.6	<1.6

Analytical Parameters	Units	1st Quarter 1997	2nd Quarter 1997	3rd Quarter 1997	4th Quarter 1997	1st Quarter 1998	2nd Quarter 1998	3rd Quarter 1998	4th Quarter 1998	1st Quarter 1999	2nd Quarter 1999	3rd Quarter 1999	3rd Quarter 1999 Resample	4th Quarter 1999	1st Quarter 2000	2nd Quarter 2000	3rd Quarter 2000
2-Butanone (MEK)	µg/L	92	8.7	24	1.8	Not required	<3.1	<3.1	Not required	Not required	<3.1	<3.1		<3.1	<3.1	12	17
2-Butoxyethanol	µg/L													<12	<1.2	2	<1.2
2-Chlorophenol	µg/L													<9	<0.9	<0.9	<0.9
2-Hexanone	µg/L	11	Not required	<8	Not required	Not required	<1.1	<1.1	Not required	Not required	<1.1	<1.1		<1.1	<1.1	<1.1	<1.1
2-Methylphenol	µg/L	<0.47	<0.45	1.1	1.8	0.59	<1	1	<80	<80	<1.6	<1.6		<16	<1.6	<1.6	<1.6
2-Methylpyridine	µg/L													<6	<0.6	<0.6	<0.6
2-Nitrophenol	µg/L													<17	<1.7	<1.7	<1.7
2-Pentanone	µg/L													<2.3	<2.3	<2.3	12
3-& 4-Methylphenol	µg/L	880	690	91	3.9	0.63	<1.3	<2.1	<110	<110	<2.1	<2.1		<21	<2.1	<2.1	<2.1
4-Chloro-3-methylphenol	µg/L													<7	<0.7	<0.7	<0.7
4-Methyl-2-pentanone	µg/L	16	6.9	1.4	<8	Not required	<0.9	<0.9	Not required	Not required	<0.9	<0.9		<0.9	<0.9	<0.9	<0.9
4-Nitrophenol	µg/L													<11	<1.1	<1.1	<1.1
Acenaphthene	µg/L													<35	<3.5	<3.5	<3.5
Acetone	µg/L	<8	29	85	9.4	Not required	8	8	Not required	Not required	22	15		12	8	19	20
Acetophenone	µg/L													<12	<1.2	<1.2	<1.2
Acryonitrile	µg/L	Not required	Not required	<2	Not required	Not required	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
Benzene	µg/L	<0.4	<0.4	<0.4	Not required	<0.4	<0.5	<0.5	Not required	Not required	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Benzothiazole	µg/L													<10	<1	<1	<1
Benzyl Alcohol	µg/L													<9	<0.9	<0.9	<0.9
Bis(2-Ethylhexyl) phtalate	µg/L											18		<35	1	<3.5	<3.5
Bromochloro-methane	µg/L	Not required	<0.4	<0.4	Not required	<0.4	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
Bromodichloro-methane	µg/L	<0.4	<0.4	<0.4	Not required	<0.4	<0.4	<0.4	Not required	Not required	<0.4	<0.4		<0.4	<0.4	<0.4	<0.4
Bromoform	µg/L	<0.4	<0.4	<0.4	Not required	<0.4	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
Bromomethane	µg/L	<0.4	Not required	<0.4	Not required	Not required	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required

Analytical Parameters	Units	1st Quarter 1997	2nd Quarter 1997	3rd Quarter 1997	4th Quarter 1997	1st Quarter 1998	2nd Quarter 1998	3rd Quarter 1998	4th Quarter 1998	1st Quarter 1999	2nd Quarter 1999	3rd Quarter 1999	3rd Quarter 1999 Resample	4th Quarter 1999	1st Quarter 2000	2nd Quarter 2000	3rd Quarter 2000
Carbon Disulfide	µg/L	Not required	Not required	<0.4	Not required	Not required	<0.6	<0.6	Not required	Not required	<0.6	<0.6		<0.6	<0.6	<0.6	<0.6
Carbon Tetrachloride	µg/L	<0.4	<0.4	<0.4	<0.4	<0.4	<0.6	<0.6	<0.6	<300	<0.6	<0.6		<0.6	<0.6	<0.6	<0.6
Chlorobenzene	µg/L	<0.4	<0.4	<0.4	Not required	<0.4	<0.4	<0.4	Not required	Not required	<0.4	<0.4		<0.4	<0.4	<0.4	<0.4
Chloroethane	µg/L	4.8	4	11	4.9	2.9	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
Chloroform	µg/L	<0.4	<0.4	<0.4	Not required	<0.4	<0.4	<0.4	<0.4	<200	<0.4	<0.4		<0.4	<0.4	<0.4	<0.4
Chloromethane	µg/L	<0.4	<0.4	6.1	Not required	<0.4	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
Cis-1,2-Dichloroethylene	µg/L	1.1	0.88	1.8	Not required	Not required	Not required	Not required	Not required	Not required	<1.2	Not required		Not required	Not required	Not required	Not required
Cis-1,3-Dichloropropene	µg/L	<0.4	Not required	<0.4	Not required	<0.4	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
Decane	µg/L													<24	<2.4	<2.4	<2.4
Dibromochloro-methane	µg/L	<0.4	<0.4	<0.4	Not required	<0.4	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
Dibromomethane	µg/L	Not required	<0.4	<0.4	Not required	<0.4	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
Di-n-Octylphthalene	µg/L													<18	<1.8	<1.8	<1.8
Dodecane	µg/L													<27	<2.7	<2.7	<2.7
Ethyl Cyanide	µg/L													<3	<3	<3	<3
Ethylbenzene	µg/L	1.1	<0.4	<0.4	<0.4	<0.4	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
Hexachloroethane	µg/L													<63	<6.3	<6.3	<6.3
Methyl Iodide	µg/L	Not required	Not required	<0.4	Not required	Not required	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
Methylene Chloride	µg/L	<0.4	<0.4	17	2.8	1.8	1	0.6	0.7	<200	4	<0.4		<0.4	<0.4	<0.4	<0.4
Napthalene	µg/L													<42	<4.2	<4.2	<4.2
N-Nitrosodimethylamine	µg/L													<8	<0.8	<0.8	<0.8
N-Nitroso-di-n-Propylamine	µg/L													<14	<1.4	<1.4	<1.4
Pentachlorophenol	µg/L															<2.6	<2.6
Phenol	µg/L	96	62	1	0.2	<0.45	<0.42	<2	<100	<100	<2	<2		<20	<2	<2	<2
Pyrene	µg/L													<5	<0.5	<0.5	<0.5

Analytical Parameters	Units	1st Quarter 1997	2nd Quarter 1997	3rd Quarter 1997	4th Quarter 1997	1st Quarter 1998	2nd Quarter 1998	3rd Quarter 1998	4th Quarter 1998	1st Quarter 1999	2nd Quarter 1999	3rd Quarter 1999	3rd Quarter 1999 Resample	4th Quarter 1999	1st Quarter 2000	2nd Quarter 2000	3rd Quarter 2000
Styrene	µg/L	Not required	<0.4	<0.4	Not required	<0.4	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
Tetrachloroethene	µg/L	<0.4	<0.4	<0.4	<0.4	7.2	Not required	<0.5	84	<250	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Tetradecane	µg/L													<30	<3	<3	<3
Tetrahydrofuran	µg/L									Not required	24	22		22	24	21	21
Toluene	µg/L	20	85	13	2.4	6.3	1	0.7	1	<350	<0.7	<0.7		<0.7	<0.7	<0.7	<0.7
Total Methylphenols	µg/L													<36	<3.6	<3.6	<3.6
Total Xylenes	µg/L	1.91	0.58	0.53	0.46	<0.8	<1.2	<1.2	1	<600	<1.2	<1.2		<1.2	<1.2	<1.2	<1.2
Trans-1,2-Dichloroethylene	µg/L	<0.4	<0.4	<0.4	Not required	Not required	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
Trans-1,3-Dichloropropene	µg/L	<0.4	Not required	Not required	Not required	<0.4	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
Trans-1,4-Dichloro-2-butene	µg/L	Not required	Not required	<2	Not required	Not required	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
Trichloroethene	µg/L	0.68	<0.4	0.51	0.48	<0.4	Not required	<0.5	0.7	<250	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Trichlorofluoro-methane	µg/L	<0.4	<0.4	<0.4	Not required	<0.4	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
Tri-n-Butylphosphate	µg/L													<7	<0.7	<0.7	<0.7
Tris(2-Chloroethyl) Phosphate	µg/L													<15	<1.5	<1.5	<1.5
Vinyl Acetate	µg/L	Not required	Not required	<2	Not required	Not required	Not required	Not required	Not required	Not required	Not required	Not required		Not required	Not required	Not required	Not required
Vinyl Chloride	µg/L	<0.4	<0.4	<0.4	Not required	<0.4	<0.6	<0.6	Not required	Not required	<0.6	<0.6		<0.6	<0.6	<0.6	<0.6

Appendix B

Range and Average Concentration of Detected Groundwater Monitoring Constituents

Table B.1. Range and Average Concentration of Detected Groundwater Monitoring Constituents

Constituent	Well Number	Filtered	Minimum	Maximum	Average	Units	Number of Samples
1,1,1-Trichloroethane	699-22-35	N	4.1	38	14.23461538	µg/L	26
1,1,1-Trichloroethane	699-23-34A	N	2	60	22.42156863	µg/L	52
1,1,1-Trichloroethane	699-23-34B	N	1.5	30	12.77307692	µg/L	26
1,1,1-Trichloroethane	699-24-33	N	0	26.33333333	9.269496855	µg/L	54
1,1,1-Trichloroethane	699-24-34A	N	3	44	15.44795918	µg/L	50
1,1,1-Trichloroethane	699-24-34B	N	2	62.5	16.419	µg/L	51
1,1,1-Trichloroethane	699-24-34C	N	0	35	11.82941176	µg/L	52
1,1,1-Trichloroethane	699-24-35	N	0	6.8	2.680392157	µg/L	52
1,1,1-Trichloroethane	699-25-34C	N	0	8.1	2.989	µg/L	51
1,1,1-Trichloroethane	699-26-35A	N	0	4	1.20452381	µg/L	42
1,1,2-Trichloroethane	699-23-34A	N	0	0.06	0.0012	µg/L	51
1,1,2-Trichloroethane	699-24-34B	N	0	0.5	0.010204082	µg/L	50
1,1,2-Trichloroethane	699-24-34C	N	0	0.6	0.012	µg/L	51
1,1,2-Trichloroethane	699-24-35	N	0	0.28	0.0056	µg/L	51
1,1,2-Trichloroethane	699-25-34C	N	0	0.06	0.00122449	µg/L	50
1,1-Dichloroethane	699-22-35	N	1.2	5.5	3.480769231	µg/L	26
1,1-Dichloroethane	699-23-34A	N	0	7	2.586078431	µg/L	52
1,1-Dichloroethane	699-23-34B	N	0	5.4	3.130769231	µg/L	26
1,1-Dichloroethane	699-24-33	N	0	2.2	0.8625	µg/L	51
1,1-Dichloroethane	699-24-34A	N	0	5.1	1.701734694	µg/L	50
1,1-Dichloroethane	699-24-34B	N	0	6	1.6607	µg/L	51
1,1-Dichloroethane	699-24-34C	N	0	4	1.372352941	µg/L	52
1,1-Dichloroethane	699-24-35	N	0	1.4	0.135960784	µg/L	52
1,1-Dichloroethane	699-25-34C	N	0	1.4	0.173	µg/L	51
1,1-Dichloroethane	699-26-35A	N	0	1.3	0.046428571	µg/L	42
1,2-Dichloroethane	699-23-34A	N	0	0.3	0.013333333	µg/L	52
1,2-Dichloroethane	699-23-34B	N	0	1	0.038461538	µg/L	26
1,2-Dichloroethane	699-24-34A	N	0	0.63	0.012857143	µg/L	50
1,2-Dichloroethane	699-24-34B	N	0	0.5	0.01	µg/L	51
1,2-Dichloroethane	699-24-34C	N	0	0.5	0.009803922	µg/L	52
1,2-Dichloroethane	699-24-35	N	0	0.5	0.01	µg/L	51
1,2-Dichloroethane	699-25-34C	N	0	0.12	0.00244898	µg/L	50
1,2-Dichloroethane	699-26-35A	N	0	1	0.024390244	µg/L	41
1,4-Dichlorobenzene	699-22-35	N	0	0.1	0.003846154	µg/L	26
1,4-Dichlorobenzene	699-23-34A	N	0	1	0.240869565	µg/L	47
1,4-Dichlorobenzene	699-23-34B	N	0	0.87	0.117192308	µg/L	26
1,4-Dichlorobenzene	699-24-33	N	0	0.5	0.015468085	µg/L	48
1,4-Dichlorobenzene	699-24-34A	N	0	0.37	0.073840909	µg/L	45
1,4-Dichlorobenzene	699-24-34B	N	0	0.43	0.085822222	µg/L	46
1,4-Dichlorobenzene	699-24-34C	N	0	0.38	0.009347826	µg/L	47
1,4-Dichlorobenzene	699-24-35	N	0	0.055	0.001195652	µg/L	47
1,4-Dichlorobenzene	699-26-35A	N	0	0.05	0.001315789	µg/L	38

Constituent	Well Number	Filtered	Minimum	Maximum	Average	Units	Number of Samples
1-(o-Chlorophenyl)thiourea	699-23-34A	N	200	200	200	µg/L	1
1-(o-Chlorophenyl)thiourea	699-24-34A	N	200	200	200	µg/L	1
1-(o-Chlorophenyl)thiourea	699-24-34B	N	200	200	200	µg/L	1
1-(o-Chlorophenyl)thiourea	699-24-34C	N	200	200	200	µg/L	1
1-(o-Chlorophenyl)thiourea	699-24-35	N	200	200	200	µg/L	1
1-(o-Chlorophenyl)thiourea	699-25-34C	N	200	200	200	µg/L	1
1-(o-Chlorophenyl)thiourea	699-26-35A	N	200	200	200	µg/L	1
1-Acetyl-2-thiourea	699-23-34A	N	200	200	200	µg/L	1
1-Acetyl-2-thiourea	699-24-34A	N	200	200	200	µg/L	1
1-Acetyl-2-thiourea	699-24-34B	N	200	200	200	µg/L	1
1-Acetyl-2-thiourea	699-24-34C	N	200	200	200	µg/L	1
1-Acetyl-2-thiourea	699-24-35	N	200	200	200	µg/L	1
1-Acetyl-2-thiourea	699-25-34C	N	200	200	200	µg/L	1
1-Acetyl-2-thiourea	699-26-35A	N	200	200	200	µg/L	1
1-Naphthyl-2-thiourea	699-23-34A	N	200	200	200	µg/L	1
1-Naphthyl-2-thiourea	699-24-34A	N	200	200	200	µg/L	1
1-Naphthyl-2-thiourea	699-24-34B	N	200	200	200	µg/L	1
1-Naphthyl-2-thiourea	699-24-34C	N	200	200	200	µg/L	1
1-Naphthyl-2-thiourea	699-24-35	N	200	200	200	µg/L	1
1-Naphthyl-2-thiourea	699-25-34C	N	200	200	200	µg/L	1
1-Naphthyl-2-thiourea	699-26-35A	N	200	200	200	µg/L	1
Alkalinity	699-22-35	N	288000	288000	288000	µg/L	1
Alkalinity	699-23-34A	N	239000	239000	239000	µg/L	1
Alkalinity	699-23-34B	N	302000	302000	302000	µg/L	1
Alkalinity	699-24-33	N	237000	237000	237000	µg/L	1
Alkalinity	699-24-34A	N	210000	210000	210000	µg/L	1
Alkalinity	699-24-34B	N	228000	228000	228000	µg/L	1
Alkalinity	699-24-34C	N	261000	261000	261000	µg/L	1
Alkalinity	699-25-34C	N	187000	187000	187000	µg/L	1
Alkalinity	699-26-35A	N	163000	163000	163000	µg/L	1
Alpha	699-23-34A	N	1.3	3.73	2.695	pCi/L	4
Alpha	699-24-33	N	1.08	4.62	2.729166667	pCi/L	6
Alpha	699-24-34A	N	2.4	4.38	3.755	pCi/L	4
Alpha	699-24-34B	N	1.93	5.05	2.9025	pCi/L	4
Alpha	699-24-34C	N	2.62	3.88	3.108333333	pCi/L	3
Alpha	699-24-35	N	2.62	4.57	4.04375	pCi/L	4
Alpha	699-25-34C	N	2.44	4.25	3.3375	pCi/L	4
Alpha	699-26-35A	N	2.13	2.13	2.13	pCi/L	1
Aluminum	699-22-35	Y	0	239	22.75	µg/L	26
Aluminum	699-23-34A	Y	0	52.8	4.930232558	µg/L	43
Aluminum	699-23-34B	Y	0	74.6	6.25	µg/L	26
Aluminum	699-24-33	Y	0	75	5.243902439	µg/L	41
Aluminum	699-24-34A	Y	0	128	10.81463415	µg/L	41
Aluminum	699-24-34B	Y	0	413	18.20232558	µg/L	43
Aluminum	699-24-34C	Y	0	92.7	5.206818182	µg/L	44

Constituent	Well Number	Filtered	Minimum	Maximum	Average	Units	Number of Samples
Aluminum	699-24-35	Y	0	80	5.786363636	µg/L	44
Aluminum	699-25-34C	Y	0	60.2	4.193023256	µg/L	43
Aluminum	699-26-35A	N	0	522	52.2	µg/L	10
Aluminum	699-26-35A	Y	0	53.3	5.741666667	µg/L	36
Ammonia	699-24-33	N	0	28	1.75	µg/L	16
Ammonia	699-25-34C	N	0	68	4.25	µg/L	16
Ammonium ion	699-22-35	N	0	30	4.5	µg/L	10
Ammonium ion	699-23-34A	N	0	100	16.78787879	µg/L	33
Ammonium ion	699-23-34B	N	0	60	15	µg/L	10
Ammonium ion	699-24-33	N	0	156.6666667	13.83838384	µg/L	33
Ammonium ion	699-24-34A	N	0	100	12.29032258	µg/L	31
Ammonium ion	699-24-34B	N	0	100	10.75757576	µg/L	33
Ammonium ion	699-24-34C	N	0	100	12.90909091	µg/L	33
Ammonium ion	699-24-35	N	0	100	14.45454545	µg/L	33
Ammonium ion	699-25-34C	N	0	100	13.33333333	µg/L	33
Ammonium ion	699-26-35A	N	0	100	20.47619048	µg/L	21
Antimony	699-23-34B	Y	0	40	4.073076923	µg/L	26
Antimony	699-24-33	Y	0	900	19.56521739	µg/L	46
Antimony	699-24-34B	Y	0	31.4	0.682608696	µg/L	46
Antimony	699-24-35	Y	0	17.5	0.372340426	µg/L	47
Antimony	699-25-34C	Y	0	46	1	µg/L	46
Antimony	699-26-35A	Y	0	35	0.897435897	µg/L	39
Antimony-125	699-24-33	N	-11	13.60000038	3.648888932	pCi/L	9
Arsenic	699-24-34A	N	0	5	0.454545455	µg/L	11
Arsenic	699-24-34B	N	0	6	1.090909091	µg/L	11
Arsenic	699-24-35	N	0	7	2.272727273	µg/L	11
Arsenic	699-25-34C	N	0	22	3.2	µg/L	10
Arsenic	699-26-35A	N	0	5.2	1.381818182	µg/L	11
Arsenic	699-26-35A	Y	0	6.3	3.15	µg/L	2
Arsenic, filtered	699-24-33	N	0	5	0.416666667	µg/L	12
Arsenic, filtered	699-24-35	N	0	6	1.909090909	µg/L	11
Arsenic, filtered	699-25-34C	N	0	6	1.1	µg/L	10
Arsenic, filtered	699-26-35A	N	0	5	0.833333333	µg/L	6
Barium	699-22-35	Y	97	152	129.1153846	µg/L	26
Barium	699-23-34A	N	70.9	84	77.46470588	µg/L	17
Barium	699-23-34A	Y	68	150	91.05208333	µg/L	48
Barium	699-23-34B	Y	52.8	143	121.2038462	µg/L	26
Barium	699-24-33	N	47.33333333	63.6	58.1037037	µg/L	9
Barium	699-24-33	Y	53	114	74.35217391	µg/L	46
Barium	699-24-34A	N	57	69	63.33333333	µg/L	15
Barium	699-24-34A	Y	58	121	75.42391304	µg/L	46
Barium	699-24-34B	N	61.4	82	67.8375	µg/L	16
Barium	699-24-34B	Y	60	131	77.79791667	µg/L	48
Barium	699-24-34C	N	46	61	51.10588235	µg/L	17

Constituent	Well Number	Filtered	Minimum	Maximum	Average	Units	Number of Samples
Barium	699-24-34C	Y	46	104	61.91020408	µg/L	49
Barium	699-24-35	N	42	60	47.52941176	µg/L	17
Barium	699-24-35	Y	41	2800	113.7755102	µg/L	49
Barium	699-25-34C	N	33	45	39.5625	µg/L	16
Barium	699-25-34C	Y	33	75.4	52.11041667	µg/L	48
Barium	699-26-35A	N	28	44	33.75	µg/L	14
Barium	699-26-35A	Y	29	55.3	39.61707317	µg/L	41
Benzene	699-22-35	N	0	0.54	0.029	µg/L	25
Benzene	699-23-34A	N	0	0.17	0.003777778	µg/L	45
Benzene	699-23-34B	N	0	0.09	0.0052	µg/L	25
Benzene	699-24-34C	N	0	0.21	0.004666667	µg/L	45
Benzene	699-26-35A	N	0	0.4	0.01	µg/L	40
Beryllium	699-22-35	Y	0	0.61	0.181153846	µg/L	26
Beryllium	699-23-34A	Y	0	0.71	0.076956522	µg/L	46
Beryllium	699-23-34B	Y	0	0.8	0.189230769	µg/L	26
Beryllium	699-24-33	Y	0	0.91	0.066195652	µg/L	46
Beryllium	699-24-34A	Y	0	0.79	0.059090909	µg/L	44
Beryllium	699-24-34B	Y	0	0.74	0.044565217	µg/L	46
Beryllium	699-24-34C	Y	0	6	0.234468085	µg/L	47
Beryllium	699-24-35	Y	0	7	0.303617021	µg/L	47
Beryllium	699-25-34C	Y	0	0.73	0.077826087	µg/L	46
Beryllium	699-26-35A	Y	0	0.84	0.149487179	µg/L	39
Beryllium-7	699-24-33	N	-154	10.5	-43.55000019	pCi/L	4
Boron	699-23-34A	N	30	98	42.21428571	µg/L	7
Boron	699-23-34A	Y	26	40	33.16666667	µg/L	6
Boron	699-24-33	N	36	57	44.5	µg/L	5
Boron	699-24-33	Y	39.5	51	44.9	µg/L	5
Boron	699-24-34A	N	35	164.5	65.3	µg/L	5
Boron	699-24-34A	Y	38	68.5	46.625	µg/L	4
Boron	699-24-34B	N	32	65	45.25	µg/L	6
Boron	699-24-34B	Y	34	46	38.83333333	µg/L	6
Boron	699-24-34C	N	31	49	39.92857143	µg/L	7
Boron	699-24-34C	Y	36	46	39.5	µg/L	7
Boron	699-24-35	N	28	138	47.71428571	µg/L	7
Boron	699-24-35	Y	25	88	39.85714286	µg/L	7
Boron	699-25-34C	N	29	71	42.42857143	µg/L	7
Boron	699-25-34C	Y	28	44	35.57142857	µg/L	7
Boron	699-26-35A	N	29	29	29	µg/L	1
Boron	699-26-35A	Y	42	42	42	µg/L	1
Bromide	699-22-35	N	0	60	18.21428571	µg/L	14
Bromide	699-23-34A	N	0	100	14.2	µg/L	35
Bromide	699-23-34B	N	0	100	22.92857143	µg/L	14
Bromide	699-24-33	N	0	99	14.61764706	µg/L	34
Bromide	699-24-34A	N	0	200	17.96969697	µg/L	33

Constituent	Well Number	Filtered	Minimum	Maximum	Average	Units	Number of Samples
Bromide	699-24-34B	N	0	101	16.94117647	µg/L	34
Bromide	699-24-34C	N	0	95	11.08571429	µg/L	35
Bromide	699-24-35	N	0	106	13.05714286	µg/L	35
Bromide	699-25-34C	N	0	100	8.257142857	µg/L	35
Bromide	699-26-35A	N	0	99	8.586206897	µg/L	29
Cadmium	699-22-35	Y	0	3.2	0.288461538	µg/L	26
Cadmium	699-23-34A	N	0	2	0.117647059	µg/L	17
Cadmium	699-23-34A	Y	0	2	0.104166667	µg/L	48
Cadmium	699-23-34B	Y	0	3.4	0.192307692	µg/L	26
Cadmium	699-24-34A	N	0	3.65	0.376666667	µg/L	15
Cadmium	699-24-34A	Y	0	3	0.108695652	µg/L	46
Cadmium	699-24-34B	N	0	3	0.3125	µg/L	16
Cadmium	699-24-34C	N	0	2	0.117647059	µg/L	17
Cadmium	699-24-34C	Y	0	2.2	0.07755102	µg/L	49
Cadmium	699-24-35	N	0	3	0.411764706	µg/L	17
Cadmium	699-24-35	Y	0	3.7	0.173469388	µg/L	49
Cadmium	699-25-34C	N	0	8	0.5	µg/L	16
Cadmium	699-25-34C	Y	0	4.65	0.148958333	µg/L	48
Cadmium	699-26-35A	Y	0	2.1	0.051219512	µg/L	41
Calcium	699-22-35	Y	91000	129000	112057.6923	µg/L	26
Calcium	699-23-34A	N	63900	81000	73129.41176	µg/L	17
Calcium	699-23-34A	Y	53900	104000	83048.95833	µg/L	48
Calcium	699-23-34B	Y	63000	123000	104719.2308	µg/L	26
Calcium	699-24-33	N	63300	75000	68175	µg/L	8
Calcium	699-24-33	Y	49300	109000	81355.43478	µg/L	46
Calcium	699-24-34A	N	52000	76500	67850	µg/L	15
Calcium	699-24-34A	Y	50800	92300	75706.52174	µg/L	46
Calcium	699-24-34B	N	58200	87800	71975	µg/L	16
Calcium	699-24-34B	Y	55700	99400	78765.625	µg/L	48
Calcium	699-24-34C	N	55400	88000	69302.94118	µg/L	17
Calcium	699-24-34C	Y	51200	110000	85993.87755	µg/L	49
Calcium	699-24-35	N	37800	63100	46370.58824	µg/L	17
Calcium	699-24-35	Y	34100	290000	62729.59184	µg/L	49
Calcium	699-25-34C	N	35900	56000	44500	µg/L	16
Calcium	699-25-34C	Y	31200	86400	61317.70833	µg/L	48
Calcium	699-26-35A	N	31000	46000	39757.14286	µg/L	14
Calcium	699-26-35A	Y	30900	65600	47707.31707	µg/L	41
Carbon tetrachloride	699-22-35	N	0	3.2	0.581923077	µg/L	26
Carbon tetrachloride	699-23-34A	N	0	7	0.146730769	µg/L	53
Carbon tetrachloride	699-23-34B	N	0	2.1	0.34	µg/L	26
Carbon tetrachloride	699-24-33	N	0	1.6	0.087264151	µg/L	54
Carbon tetrachloride	699-24-34A	N	0	5	0.1274	µg/L	51
Carbon tetrachloride	699-24-34B	N	0	9.3	0.314901961	µg/L	52
Carbon tetrachloride	699-24-34C	N	0	4	0.136826923	µg/L	53

Constituent	Well Number	Filtered	Minimum	Maximum	Average	Units	Number of Samples
Carbon tetrachloride	699-24-35	N	0	0.58	0.018823529	µg/L	52
Carbon tetrachloride	699-25-34C	N	0	1	0.10256	µg/L	51
Carbon tetrachloride	699-26-35A	N	0	2	0.184285714	µg/L	42
Cerium/Praseodymium-144	699-24-33	N	1.480000019	14.89999962	6.307499886	pCi/L	4
Cesium-134	699-24-33	N	-6.110000134	2.829999924	-1.895000041	pCi/L	4
Cesium-137	699-23-34A	N	-0.331	3.6	2.2878	pCi/L	5
Cesium-137	699-24-33	N	-8.930000305	7.510000229	-0.77515	pCi/L	20
Cesium-137	699-24-34A	N	-1.14	2.86	0.2808	pCi/L	5
Cesium-137	699-24-34B	N	-2.7845	8.27	1.8811	pCi/L	5
Cesium-137	699-24-34C	N	-3.72	1.66	-1.032	pCi/L	5
Cesium-137	699-24-35	N	-1.42	2.63	0.5502	pCi/L	5
Cesium-137	699-25-34C	N	-3.12	3.65	1.279	pCi/L	5
Chemical Oxygen Demand	699-22-35	N	2600	33000	4576.153846	µg/L	26
Chemical Oxygen Demand	699-23-34A	N	2550	19000	3558	µg/L	35
Chemical Oxygen Demand	699-23-34B	N	2600	25000	4117.692308	µg/L	26
Chemical Oxygen Demand	699-24-33	N	2550	34000	5388.571429	µg/L	35
Chemical Oxygen Demand	699-24-34A	N	2550	26000	3988.857143	µg/L	35
Chemical Oxygen Demand	699-24-34B	N	2550	25000	4046.857143	µg/L	35
Chemical Oxygen Demand	699-24-34C	N	2550	24000	3931.714286	µg/L	35
Chemical Oxygen Demand	699-24-35	N	2550	41000	4246	µg/L	35
Chemical Oxygen Demand	699-25-34C	N	2550	50000	4531.714286	µg/L	35
Chemical Oxygen Demand	699-26-35A	N	2550	38000	4274.571429	µg/L	35
Chloride	699-22-35	N	0	7100	5876.153846	µg/L	26
Chloride	699-23-34A	N	5270	25000	7143.333333	µg/L	51
Chloride	699-23-34B	N	5470	7700	6095.192308	µg/L	26
Chloride	699-24-33	N	4370	9040	7199.239766	µg/L	57
Chloride	699-24-34A	N	5300	8600	6808.163265	µg/L	49
Chloride	699-24-34B	N	5360	8775	6968.2	µg/L	50
Chloride	699-24-34C	N	5700	9200	7251.568627	µg/L	51
Chloride	699-24-35	N	5200	8660	6531.764706	µg/L	51
Chloride	699-25-34C	N	6100	9120	7160.8	µg/L	50
Chloride	699-26-35A	N	6000	8620	7119.148936	µg/L	47
Chloroform	699-22-35	N	0	4.6	1.052307692	µg/L	26
Chloroform	699-23-34A	N	0	0.92	0.10425	µg/L	53
Chloroform	699-23-34B	N	0	1	0.379307692	µg/L	26
Chloroform	699-24-33	N	0	0.91	0.040365385	µg/L	53
Chloroform	699-24-34A	N	0	0.6	0.03994	µg/L	51
Chloroform	699-24-34B	N	0	0.6	0.065627451	µg/L	52
Chloroform	699-24-34C	N	0	1.5	0.08625	µg/L	53
Chloroform	699-24-35	N	0	0.34	0.007647059	µg/L	52
Chloroform	699-25-34C	N	0	0.95	0.09202	µg/L	51
Chloroform	699-26-35A	N	0	1	0.075428571	µg/L	42
Chromium	699-22-35	Y	0	7.2	2.080769231	µg/L	26
Chromium	699-23-34A	N	0	17	1.647058824	µg/L	17
Chromium	699-23-34A	Y	0	13	2.527083333	µg/L	48

Constituent	Well Number	Filtered	Minimum	Maximum	Average	Units	Number of Samples
Chromium	699-23-34B	Y	0	19.8	2.607692308	µg/L	26
Chromium	699-24-33	N	0	10.33333333	1.148148148	µg/L	9
Chromium	699-24-33	Y	0	14	5.215217391	µg/L	46
Chromium	699-24-34A	N	0	56	7.066666667	µg/L	15
Chromium	699-24-34A	Y	0	15	3.2	µg/L	46
Chromium	699-24-34B	N	0	14	2.40625	µg/L	16
Chromium	699-24-34B	Y	0	17	4.236458333	µg/L	48
Chromium	699-24-34C	N	0	37	3.470588235	µg/L	17
Chromium	699-24-34C	Y	0	16	6.102040816	µg/L	49
Chromium	699-24-35	N	0	29	4.058823529	µg/L	17
Chromium	699-24-35	Y	0	380	14.9755102	µg/L	49
Chromium	699-25-34C	N	0	30	4.625	µg/L	16
Chromium	699-25-34C	Y	0	93	11.60416667	µg/L	48
Chromium	699-26-35A	N	0	15	1.071428571	µg/L	14
Chromium	699-26-35A	Y	0	24	13.15121951	µg/L	41
cis -1,2-Dichloroethylene	699-22-35	N	0	0.051	0.003307692	µg/L	26
cis -1,2-Dichloroethylene	699-23-34A	N	0	0.13	0.005945946		37
cis -1,2-Dichloroethylene	699-23-34B	N	0	0.2	0.013846154	µg/L	26
cis -1,2-Dichloroethylene	699-24-33	N	0	0.05	0.001282051		39
cis -1,2-Dichloroethylene	699-24-34A	N	0	1.7	0.096486486	µg/L	37
cis -1,2-Dichloroethylene	699-24-34B	N	0	0.56	0.037189189		37
cis -1,2-Dichloroethylene	699-24-34C	N	0	1.3	0.060378378		37
cis -1,2-Dichloroethylene	699-24-35	N	0	0.27	0.013888889	µg/L	36
cis -1,2-Dichloroethylene	699-25-34C	N	0	0.23	0.009444444	µg/L	36
Citrus red No. 2	699-23-34A	N	1000	1000	1000	µg/L	1
Citrus red No. 2	699-24-34A	N	1000	1000	1000	µg/L	1
Citrus red No. 2	699-24-34B	N	1000	1000	1000	µg/L	1
Citrus red No. 2	699-24-34C	N	1000	1000	1000	µg/L	1
Citrus red No. 2	699-24-35	N	1000	1000	1000	µg/L	1
Citrus red No. 2	699-25-34C	N	1000	1000	1000	µg/L	1
Citrus red No. 2	699-26-35A	N	1000	1000	1000	µg/L	1
Cobalt	699-22-35	Y	0	8.2	0.315384615	µg/L	26
Cobalt	699-23-34B	Y	0	7.5	0.423076923	µg/L	26
Cobalt	699-24-34C	Y	0	4.9	0.119512195	µg/L	41
Cobalt	699-24-35	Y	0	200	4.87804878	µg/L	41
Cobalt	699-25-34C	Y	0	11	0.363414634	µg/L	41
Cobalt-60	699-23-34A	N	2.07	6.04	3.254	pCi/L	5
Cobalt-60	699-24-33	N	-14.1	22	2.840958311	pCi/L	24
Cobalt-60	699-24-34A	N	-1.66	4.74	1.442	pCi/L	5
Cobalt-60	699-24-34B	N	0.977	4.8	3.3074	pCi/L	5
Cobalt-60	699-24-34C	N	-3.11	4.03	0.6258	pCi/L	5
Cobalt-60	699-24-35	N	-2.76	6.48	2.2156	pCi/L	5
Cobalt-60	699-25-34C	N	-3.91	1.7	-0.565	pCi/L	5
Coliform (Membrane Filter Technique)	699-24-34C	N	0	7	1.75	µg/L	4

Constituent	Well Number	Filtered	Minimum	Maximum	Average	Units	Number of Samples
Coliform Bacteria	699-22-35	N	0	1	0.291666667	Col/100mL	24
Coliform Bacteria	699-23-34A	N	0	2.2	0.895555556	MPN	45
Coliform Bacteria	699-23-34B	N	0	6	0.52	Col/100mL	25
Coliform Bacteria	699-24-33	N	0	3	0.658974359	MPN	39
Coliform Bacteria	699-24-34A	N	0	2.2	1.019148936	MPN	47
Coliform Bacteria	699-24-34B	N	0	9	1.071111111	MPN	45
Coliform Bacteria	699-24-34C	N	0	2.2	0.873913043	MPN	46
Coliform Bacteria	699-24-35	N	0	2.2	0.94893617	MPN	47
Coliform Bacteria	699-25-34C	N	0	5.1	0.979545455	MPN	45
Coliform Bacteria	699-26-35A	N	0	16	1.505	MPN	40
Copper	699-22-35	Y	0	14	0.634615385	µg/L	26
Copper	699-23-34A	N	0	6	0.352941176	µg/L	17
Copper	699-23-34A	Y	0	14.1	1.002083333	µg/L	48
Copper	699-23-34B	Y	0	18.7	1.961538462	µg/L	26
Copper	699-24-33	Y	0	9.9	0.910869565	µg/L	46
Copper	699-24-34A	N	0	37	3.866666667	µg/L	15
Copper	699-24-34A	Y	0	12.2	0.460869565	µg/L	46
Copper	699-24-34B	N	0	10	0.625	µg/L	16
Copper	699-24-34B	Y	0	17	0.610416667	µg/L	48
Copper	699-24-34C	N	0	26	1.529411765	µg/L	17
Copper	699-24-34C	Y	0	18	0.934693878	µg/L	49
Copper	699-24-35	N	0	51	4.470588235	µg/L	17
Copper	699-24-35	Y	0	500	11.52959184	µg/L	49
Copper	699-25-34C	N	0	42	3.375	µg/L	16
Copper	699-25-34C	Y	0	16.25	0.730208333	µg/L	48
Copper	699-26-35A	Y	0	14	1.2	µg/L	41
Dibutylphosphate	699-26-35A	N	10000	10000	10000	µg/L	1
Diethylstilbesterol	699-23-34A	N	200	200	200	µg/L	1
Diethylstilbesterol	699-24-34A	N	200	200	200	µg/L	1
Diethylstilbesterol	699-24-34B	N	200	200	200	µg/L	1
Diethylstilbesterol	699-24-34C	N	200	200	200	µg/L	1
Diethylstilbesterol	699-24-35	N	200	200	200	µg/L	1
Diethylstilbesterol	699-25-34C	N	200	200	200	µg/L	1
Diethylstilbesterol	699-26-35A	N	200	200	200	µg/L	1
Ethylbenzene	699-22-35	N	0	0.16	0.0064	µg/L	25
Ethylbenzene	699-23-34A	N	0	0.11	0.003055556		36
Ethylbenzene	699-24-33	N	0	5.1	0.138421053		38
Ethylbenzene	699-24-34A	N	0	0.097	0.004361111		36
Ethylbenzene	699-24-34B	N	0	0.35	0.014916667		36
Ethylbenzene	699-24-34C	N	0	0.12	0.003333333		36
Ethylbenzene	699-24-35	N	0	0.14	0.004	µg/L	35
Ethylbenzene	699-25-34C	N	0	0.11	0.004914286	µg/L	35
Ethylbenzene	699-26-35A	N	0	0.1	0.004909091	µg/L	33
Ethylene glycol	699-23-34A	N	10000	10000	10000	µg/L	1
Ethylene glycol	699-24-34A	N	10000	10000	10000	µg/L	1

Constituent	Well Number	Filtered	Minimum	Maximum	Average	Units	Number of Samples
Ethylene glycol	699-24-34B	N	10000	10000	10000	µg/L	1
Ethylene glycol	699-24-34C	N	10000	10000	10000	µg/L	1
Ethylene glycol	699-24-35	N	10000	10000	10000	µg/L	1
Ethylene glycol	699-25-34C	N	10000	10000	10000	µg/L	1
Ethylenethiourea	699-23-34A	N	200	200	200	µg/L	1
Ethylenethiourea	699-24-34A	N	200	200	200	µg/L	1
Ethylenethiourea	699-24-34B	N	200	200	200	µg/L	1
Ethylenethiourea	699-24-34C	N	200	200	200	µg/L	1
Ethylenethiourea	699-24-35	N	200	200	200	µg/L	1
Ethylenethiourea	699-25-34C	N	200	200	200	µg/L	1
Ethylenethiourea	699-26-35A	N	200	200	200	µg/L	1
Europium-154	699-24-33	N	-1.779999971	5.300000191	0.900000066	pCi/L	4
Europium-155	699-24-33	N	-3.849999905	1.429999948	-0.862749998	pCi/L	4
Fluoride	699-22-35	N	0	1200	478.6730769	µg/L	26
Fluoride	699-23-34A	N	0	1400	558.4019608	µg/L	51
Fluoride	699-23-34B	N	139	1300	597.3269231	µg/L	26
Fluoride	699-24-33	N	0	1100	517.0628655	µg/L	57
Fluoride	699-24-34A	N	195	1300	546.5918367	µg/L	49
Fluoride	699-24-34B	N	200	1300	560.1316667	µg/L	50
Fluoride	699-24-34C	N	202	1200	552.5343137	µg/L	51
Fluoride	699-24-35	N	218.5	1000	494.9803922	µg/L	51
Fluoride	699-25-34C	N	244	1000	537.44	µg/L	50
Fluoride	699-26-35A	N	0	900	500.2553191	µg/L	47
Gross alpha	699-22-35	N	2.85	12.2	5.802307692	pCi/L	26
Gross alpha	699-23-34A	N	2.147	7.48	4.379813953	pCi/L	43
Gross alpha	699-23-34B	N	1.65	11.4	5.593192308	pCi/L	26
Gross alpha	699-24-33	N	1.42	7.46	3.944535717	pCi/L	56
Gross alpha	699-24-34A	N	1.68	51.6	5.456848837	pCi/L	43
Gross alpha	699-24-34B	N	1.55	9.78	4.143918605	pCi/L	43
Gross alpha	699-24-34C	N	2.15	7.58	4.070627907	pCi/L	43
Gross alpha	699-24-35	N	1.16	5.52	3.773325581	pCi/L	43
Gross alpha	699-25-34C	N	1.46	5.76	3.528130952	pCi/L	42
Gross alpha	699-26-35A	N	1	5.53	3.188636364	pCi/L	44
Gross beta	699-22-35	N	8.904	16.1	12.42457692	pCi/L	26
Gross beta	699-23-34A	N	8.699	30.4	13.81093617	pCi/L	47
Gross beta	699-23-34B	N	8.75	21.2	12.52057692	pCi/L	26
Gross beta	699-24-33	N	5.555	31.25	16.3506029	pCi/L	68
Gross beta	699-24-34A	N	4.27	29.1	14.25441489	pCi/L	47
Gross beta	699-24-34B	N	9.89	30	15.11225532	pCi/L	47
Gross beta	699-24-34C	N	11.2	28.8	16.08458696	pCi/L	46
Gross beta	699-24-35	N	7.49	27.4	13.16010638	pCi/L	47
Gross beta	699-25-34C	N	10.095	34	16.73930435	pCi/L	46
Gross beta	699-26-35A	N	8.929	35.7	16.88015556	pCi/L	45
Iodine-129	699-22-35	N	0.0746	0.0746	0.0746	pCi/L	1
Iodine-129	699-23-34A	N	-0.068	0.22	0.076	pCi/L	2

Constituent	Well Number	Filtered	Minimum	Maximum	Average	Units	Number of Samples
Iodine-129	699-23-34B	N	0.262	0.262	0.262	pCi/L	1
Iodine-129	699-24-33	N	0.743	2.71	1.7265	pCi/L	2
Iodine-129	699-26-35A	N	1.75	2.85	2.0625	pCi/L	4
Iron	699-22-35	Y	14	260	55.07115385	µg/L	26
Iron	699-23-34A	N	28	816	232.7647059	µg/L	17
Iron	699-23-34A	Y	0	133	46.62083333	µg/L	48
Iron	699-23-34B	Y	23	241	58.04615385	µg/L	26
Iron	699-24-33	N	0	4130	504.9444444	µg/L	9
Iron	699-24-33	Y	0	174	25.83913043	µg/L	46
Iron	699-24-34A	N	60	1620	455.3	µg/L	15
Iron	699-24-34A	Y	0	253	63.03913043	µg/L	46
Iron	699-24-34B	N	29	4620	594.84375	µg/L	16
Iron	699-24-34B	Y	0	408	55.28333333	µg/L	48
Iron	699-24-34C	N	55	1030	319.4117647	µg/L	17
Iron	699-24-34C	Y	0	103	46.31122449	µg/L	49
Iron	699-24-35	N	0	2080	243.6176471	µg/L	17
Iron	699-24-35	Y	0	410000	8417.107143	µg/L	49
Iron	699-25-34C	N	28	34000	2390.125	µg/L	16
Iron	699-25-34C	Y	0	400	46.87083333	µg/L	48
Iron	699-26-35A	N	0	4610	734.0357143	µg/L	14
Iron	699-26-35A	Y	0	99.3	22.6	µg/L	41
Lead	699-23-34A	N	0	7.5	0.681818182	µg/L	11
Lead	699-24-34A	N	0	8	0.727272727	µg/L	11
Lead	699-24-34B	N	0	7	0.75	µg/L	11
Lead	699-24-34C	N	0	3	0.272727273	µg/L	11
Lead	699-25-34C	N	0	7	0.95	µg/L	10
Lead	699-26-35A	N	0	5.8	0.527272727	µg/L	11
Lead	699-26-35A	Y	0	5.8	2.9	µg/L	2
Lithium	699-23-34A	N	0	10.5	2.928571429	µg/L	7
Lithium	699-23-34A	Y	0	11.5	1.916666667	µg/L	6
Lithium	699-24-34B	N	0	11	1.833333333	µg/L	6
Lithium	699-24-34B	Y	0	10	1.666666667	µg/L	6
M+P-Xylene	699-24-34B	N	0	0.3	0.042857143	µg/L	7
M+P-Xylene	699-26-35A	N	0	0.5	0.0625	µg/L	8
Magnesium	699-22-35	Y	21000	28900	25448.07692	µg/L	26
Magnesium	699-23-34A	N	14700	17500	16067.64706	µg/L	17
Magnesium	699-23-34A	Y	13900	22500	18137.5	µg/L	48
Magnesium	699-23-34B	Y	15800	25300	21688.46154	µg/L	26
Magnesium	699-24-33	N	13700	17000	15362.5	µg/L	8
Magnesium	699-24-33	Y	14400	24600	18476.08696	µg/L	46
Magnesium	699-24-34A	N	14050	17000	15290	µg/L	15
Magnesium	699-24-34A	Y	14400	21000	17207.6087	µg/L	46
Magnesium	699-24-34B	N	14500	18800	16031.25	µg/L	16
Magnesium	699-24-34B	Y	14600	22000	17678.125	µg/L	48

Constituent	Well Number	Filtered	Minimum	Maximum	Average	Units	Number of Samples
Magnesium	699-24-34C	N	14300	17000	15429.41176	µg/L	17
Magnesium	699-24-34C	Y	14700	22000	18128.57143	µg/L	49
Magnesium	699-24-35	N	10500	14900	11697.05882	µg/L	17
Magnesium	699-24-35	Y	1400	180000	16800	µg/L	49
Magnesium	699-25-34C	N	10400	15000	11918.75	µg/L	16
Magnesium	699-25-34C	Y	10600	21300	15482.29167	µg/L	48
Magnesium	699-26-35A	N	9500	13000	11164.28571	µg/L	14
Magnesium	699-26-35A	Y	10200	17500	13160.97561	µg/L	41
Manganese	699-22-35	Y	0.315	72	6.847884615	µg/L	26
Manganese	699-23-34A	N	0	6	0.352941176	µg/L	17
Manganese	699-23-34A	Y	0	6	1.935	µg/L	48
Manganese	699-23-34B	Y	0.67	59	6.056538462	µg/L	26
Manganese	699-24-33	N	0	40.8	4.533333333	µg/L	9
Manganese	699-24-33	Y	0	6.4	1.486847826	µg/L	46
Manganese	699-24-34A	N	0	15	3.592666667	µg/L	15
Manganese	699-24-34A	Y	0	6.4	1.813695652	µg/L	46
Manganese	699-24-34B	N	0	36	3.0625	µg/L	16
Manganese	699-24-34B	Y	0	17	2.075	µg/L	48
Manganese	699-24-34C	N	0	37	3.705882353	µg/L	17
Manganese	699-24-34C	Y	0	35	2.988163265	µg/L	49
Manganese	699-24-35	N	0	9	0.882352941	µg/L	17
Manganese	699-24-35	Y	0	7900	162.7493878	µg/L	49
Manganese	699-25-34C	N	0	42	3.8125	µg/L	16
Manganese	699-25-34C	Y	0	75	3.4484375	µg/L	48
Manganese	699-26-35A	N	0	44	6.571428571	µg/L	14
Manganese	699-26-35A	Y	0	11	1.54902439	µg/L	41
Methylenechloride	699-22-35	N	0	0.7	0.042692308	µg/L	26
Methylenechloride	699-23-34A	N	0	3	0.068711538	µg/L	53
Methylenechloride	699-23-34B	N	0	0.35	0.024230769	µg/L	26
Methylenechloride	699-24-33	N	0	4	0.096557692	µg/L	53
Methylenechloride	699-24-34A	N	0	1200	24.08378	µg/L	51
Methylenechloride	699-24-34B	N	0	3	0.081764706	µg/L	52
Methylenechloride	699-24-34C	N	0	160	3.113846154	µg/L	53
Methylenechloride	699-24-35	N	0	510	10.09931373	µg/L	52
Methylenechloride	699-25-34C	N	0	3.5	0.07358	µg/L	51
Methylenechloride	699-26-35A	N	0	6	0.254357143	µg/L	42
Monobutyl phosphate	699-26-35A	N	10000	10000	10000	µg/L	1
N-Phenylthiourea	699-23-34A	N	500	500	500	µg/L	1
N-Phenylthiourea	699-24-34A	N	500	500	500	µg/L	1
N-Phenylthiourea	699-24-34B	N	500	500	500	µg/L	1
N-Phenylthiourea	699-24-34C	N	500	500	500	µg/L	1
N-Phenylthiourea	699-24-35	N	500	500	500	µg/L	1
N-Phenylthiourea	699-25-34C	N	500	500	500	µg/L	1
N-Phenylthiourea	699-26-35A	N	500	500	500	µg/L	1

Constituent	Well Number	Filtered	Minimum	Maximum	Average	Units	Number of Samples
Nickel	699-22-35	Y	0	19	1.1	µg/L	26
Nickel	699-23-34A	N	0	11	0.647058824	µg/L	17
Nickel	699-23-34A	Y	0	48	1.229166667	µg/L	48
Nickel	699-23-34B	Y	0	13	0.946153846	µg/L	26
Nickel	699-24-34A	Y	0	15	0.326086957	µg/L	46
Nickel	699-24-34B	Y	0	11.1	0.460416667	µg/L	48
Nickel	699-24-34C	N	0	19	1.117647059	µg/L	17
Nickel	699-24-34C	Y	0	18	0.846938776	µg/L	49
Nickel	699-24-35	N	0	10	0.588235294	µg/L	17
Nickel	699-24-35	Y	0	580	14.57346939	µg/L	49
Nickel	699-25-34C	N	0	12	0.75	µg/L	16
Nickel	699-25-34C	Y	0	430	9.566666667	µg/L	48
Nickel	699-26-35A	Y	0	11.4	0.551219512	µg/L	41
Nitrate	699-22-35	N	11000	15582.336	13971.77908	µg/L	26
Nitrate	699-23-34A	N	10491.516	510000	25933.17992	µg/L	51
Nitrate	699-23-34B	N	11000	22842.288	13424.018	µg/L	26
Nitrate	699-24-33	N	14165.76	40000	25806.64702	µg/L	63
Nitrate	699-24-34A	N	11000	33150	17627.07592	µg/L	49
Nitrate	699-24-34B	N	11509.68	35900	20671.15632	µg/L	50
Nitrate	699-24-34C	N	14165.76	37000	24712.93565	µg/L	51
Nitrate	699-24-35	N	10491.516	29400	16099.26757	µg/L	51
Nitrate	699-25-34C	N	17264.52	35100	26089.8278	µg/L	50
Nitrate	699-26-35A	N	19654.992	33800	25379.06715	µg/L	47
Nitrite	699-24-34C	N	0	1130	24.56521739	µg/L	46
o-Xylene	699-24-34A	N	0	0.21	0.03	µg/L	7
o-Xylene	699-24-34B	N	0	0.23	0.032857143	µg/L	7
o-Xylene	699-25-34C	N	0	0.17	0.024285714	µg/L	7
pH Measurement	699-22-35	N	6.595	7.2175	6.913240741	pH	27
pH Measurement	699-23-34A	N	5.1	7.61	6.675740741	pH	54
pH Measurement	699-23-34B	N	6.7025	8.03	6.924296296	pH	27
pH Measurement	699-24-33	N	6.6875	7.755	7.150125	pH	60
pH Measurement	699-24-34A	N	3.9	7.425	6.6997	pH	50
pH Measurement	699-24-34B	N	3.5	7.3	6.725735294	pH	51
pH Measurement	699-24-34C	N	6.3	7.6	6.9675	pH	52
pH Measurement	699-24-35	N	5.5	8.45	7.113621795	pH	52
pH Measurement	699-25-34C	N	6.55	7.8	7.27122549	pH	51
pH Measurement	699-26-35A	N	5.4	8.275	7.354460784	pH	51
Phenol	699-26-35A	N	0	4.1	0.215789474	µg/L	19
Potassium	699-22-35	Y	7600	11000	9618.461538	µg/L	26
Potassium	699-23-34A	N	6860	8130	7500	µg/L	17
Potassium	699-23-34A	Y	6800	10100	7897.083333	µg/L	48
Potassium	699-23-34B	Y	6850	10600	8461.923077	µg/L	26
Potassium	699-24-33	N	6170	8100	7053.888889	µg/L	9
Potassium	699-24-33	Y	6780	8765	7737.608696	µg/L	46
Potassium	699-24-34A	N	7020	8090	7318.333333	µg/L	15

Constituent	Well Number	Filtered	Minimum	Maximum	Average	Units	Number of Samples
Potassium	699-24-34A	Y	6500	9840	7736.195652	µg/L	46
Potassium	699-24-34B	N	6910	8890	7360.3125	µg/L	16
Potassium	699-24-34B	Y	6730	8830	7702.916667	µg/L	48
Potassium	699-24-34C	N	6350	8000	7084.117647	µg/L	17
Potassium	699-24-34C	Y	6030	9210	7681.122449	µg/L	49
Potassium	699-24-35	N	6120	8100	6932.058824	µg/L	17
Potassium	699-24-35	Y	5940	22000	7712.653061	µg/L	49
Potassium	699-25-34C	N	5460	7100	6288.125	µg/L	16
Potassium	699-25-34C	Y	5980	8910	7123.958333	µg/L	48
Potassium	699-26-35A	N	5200	6900	6230	µg/L	14
Potassium	699-26-35A	Y	4220	8570	6600.97561	µg/L	41
Potassium-40	699-24-33	N	58.5	211	98.67500019	pCi/L	4
Radium	699-23-34A	N	0.168	0.364	0.234333333	pCi/L	3
Radium	699-24-33	N	-0.00908	0.466	0.25523	pCi/L	4
Radium	699-24-34A	N	0.0135	0.312	0.136766667	pCi/L	3
Radium	699-24-34B	N	-0.0648	0.261	0.114733333	pCi/L	3
Radium	699-24-34C	N	-0.0176	0.128	0.071466667	pCi/L	3
Radium	699-24-35	N	0.0571	0.224	0.128366667	pCi/L	3
Radium	699-25-34C	N	0.0376	0.317	0.1652	pCi/L	3
Radium	699-26-35A	N	-0.049	0.108	0.03209125	pCi/L	8
Ruthenium-106	699-23-34A	N	-19.8	31.5	4.724	pCi/L	5
Ruthenium-106	699-24-33	N	-32.59999847	78.8	9.33450016	pCi/L	20
Ruthenium-106	699-24-34A	N	-33.3	24.1	4.292	pCi/L	5
Ruthenium-106	699-24-34B	N	-13.6	18.7	6.312	pCi/L	5
Ruthenium-106	699-24-34C	N	-18.7	-1.05	-9.326	pCi/L	5
Ruthenium-106	699-24-35	N	-6.33	51	25.534	pCi/L	5
Ruthenium-106	699-25-34C	N	-17.7	44.9	0.976	pCi/L	5
Selenium	699-23-34A	N	0	3	0.272727273	µg/L	11
Selenium	699-24-34A	N	0	2.5	0.227272727	µg/L	11
Silicon	699-23-34A	N	19100	21700	20242.85714	µg/L	7
Silicon	699-23-34A	Y	18600	21000	20025	µg/L	6
Silicon	699-24-33	N	18600	20900	19730	µg/L	5
Silicon	699-24-33	Y	19600	23200	20620	µg/L	5
Silicon	699-24-34A	N	18700	21700	19810	µg/L	5
Silicon	699-24-34A	Y	19100	20000	19725	µg/L	4
Silicon	699-24-34B	N	19550	24600	21041.66667	µg/L	6
Silicon	699-24-34B	Y	20100	21300	20650	µg/L	6
Silicon	699-24-34C	N	18800	21800	19585.71429	µg/L	7
Silicon	699-24-34C	Y	18600	22300	20200	µg/L	7
Silicon	699-24-35	N	17800	21700	19557.14286	µg/L	7
Silicon	699-24-35	Y	17800	21950	19307.14286	µg/L	7
Silicon	699-25-34C	N	18400	22700	20057.14286	µg/L	7
Silicon	699-25-34C	Y	18900	23300	20357.14286	µg/L	7
Silicon	699-26-35A	N	18700	18700	18700	µg/L	1
Silicon	699-26-35A	Y	19800	19800	19800	µg/L	1

Constituent	Well Number	Filtered	Minimum	Maximum	Average	Units	Number of Samples
Silver	699-22-35	Y	0	8.7	0.615384615	µg/L	26
Silver	699-23-34A	Y	0	5.6	0.116666667	µg/L	48
Silver	699-23-34B	Y	0	5.7	0.219230769	µg/L	26
Silver	699-24-33	Y	0	5.3	0.115217391	µg/L	46
Silver	699-24-34A	Y	0	27	0.586956522	µg/L	46
Silver	699-24-34B	N	0	11	0.6875	µg/L	16
Silver	699-24-34B	Y	0	3	0.0625	µg/L	48
Silver	699-24-34C	Y	0	5.9	0.330612245	µg/L	49
Silver	699-24-35	Y	0	8.2	0.344897959	µg/L	49
Silver	699-25-34C	Y	0	9.6	0.2	µg/L	48
Silver	699-26-35A	Y	0	6.4	0.236585366	µg/L	41
Sodium	699-22-35	Y	22000	27000	24628.84615	µg/L	26
Sodium	699-23-34A	N	20400	25000	22488.23529	µg/L	17
Sodium	699-23-34A	Y	20000	25000	22619.79167	µg/L	48
Sodium	699-23-34B	Y	22000	26000	23690.38462	µg/L	26
Sodium	699-24-33	N	20600	24100	22637.03704	µg/L	9
Sodium	699-24-33	Y	20000	26200	23557.6087	µg/L	46
Sodium	699-24-34A	N	21100	26100	22706.66667	µg/L	15
Sodium	699-24-34A	Y	20000	26900	22782.6087	µg/L	46
Sodium	699-24-34B	N	21600	28600	22996.875	µg/L	16
Sodium	699-24-34B	Y	19850	26300	23090.625	µg/L	48
Sodium	699-24-34C	N	20600	26200	22582.35294	µg/L	17
Sodium	699-24-34C	Y	19600	27000	23392.85714	µg/L	49
Sodium	699-24-35	N	20800	26150	22626.47059	µg/L	17
Sodium	699-24-35	Y	20000	74000	23530.61224	µg/L	49
Sodium	699-25-34C	N	20600	27000	23050	µg/L	16
Sodium	699-25-34C	Y	19500	27000	23731.25	µg/L	48
Sodium	699-26-35A	N	20500	24100	22564.28571	µg/L	14
Sodium	699-26-35A	Y	20900	27000	23358.53659	µg/L	41
Specific Conductance	699-22-35	N	484.25	1556.75	786.1851852	µS/cm	27
Specific conductance	699-23-34A	N	265.5	1248	613.712963	µS/cm	54
Specific Conductance	699-23-34B	N	441.75	1426.75	745.6888889	µS/cm	27
Specific conductance	699-24-33	N	299.75	1323	618.1958333	µS/cm	60
Specific conductance	699-24-34A	N	439	1232	591.625	µS/cm	50
Specific conductance	699-24-34B	N	285.75	1251	614.0784314	µS/cm	51
Specific conductance	699-24-34C	N	388.5	1344.25	641.4375	µS/cm	52
Specific conductance	699-24-35	N	280.25	1032.25	488.3365385	µS/cm	52
Specific conductance	699-25-34C	N	287	1120	511.5147059	µS/cm	51
Specific conductance	699-26-35A	N	206	912.25	429.4460784	µS/cm	51
Strontium (elemental)	699-22-35	Y	450	605	533.9	µg/L	20
Strontium (elemental)	699-23-34A	N	273	321	295.5384615	µg/L	13
Strontium (elemental)	699-23-34A	Y	0	425	327.46875	µg/L	32
Strontium (elemental)	699-23-34B	Y	269	533	452.925	µg/L	20
Strontium (elemental)	699-24-33	N	256	290	277.6666667	µg/L	6

Constituent	Well Number	Filtered	Minimum	Maximum	Average	Units	Number of Samples
Strontium (elemental)	699-24-33	Y	0	447	307.6875	µg/L	32
Strontium (elemental)	699-24-34A	N	0	301	244.1818182	µg/L	11
Strontium (elemental)	699-24-34A	Y	0	376	299.85	µg/L	30
Strontium (elemental)	699-24-34B	N	0	351	262.375	µg/L	12
Strontium (elemental)	699-24-34B	Y	0	389	305.109375	µg/L	32
Strontium (elemental)	699-24-34C	N	0	324	261.8461538	µg/L	13
Strontium (elemental)	699-24-34C	Y	0	410	321.469697	µg/L	33
Strontium (elemental)	699-24-35	N	0	274	197.8076923	µg/L	13
Strontium (elemental)	699-24-35	Y	0	340	251.1875	µg/L	32
Strontium (elemental)	699-25-34C	N	0	224	184.9166667	µg/L	12
Strontium (elemental)	699-25-34C	Y	0	384	260.515625	µg/L	32
Strontium (elemental)	699-26-35A	N	161	192	176.4	µg/L	5
Strontium (elemental)	699-26-35A	Y	171	294	224.7916667	µg/L	24
Strontium-90	699-23-34A	N	-0.308	0.878	0.0772	pCi/L	4
Strontium-90	699-24-33	N	-0.374	0.512	0.08127	pCi/L	4
Strontium-90	699-24-34A	N	-0.548	0.00438	-0.265405	pCi/L	4
Strontium-90	699-24-34B	N	-0.285	1.23	0.268575	pCi/L	4
Strontium-90	699-24-34C	N	-0.385	0.444	0.11375	pCi/L	4
Strontium-90	699-24-35	N	-0.49	0.525	-0.0065	pCi/L	4
Strontium-90	699-25-34C	N	-0.568	0.435	-0.206	pCi/L	4
Sulfate	699-22-35	N	49000	527000	71134.61538	µg/L	26
Sulfate	699-23-34A	N	41300	73000	45894.11765	µg/L	51
Sulfate	699-23-34B	N	39300	56400	51140.38462	µg/L	26
Sulfate	699-24-33	N	37000	55633.33333	42306.72515	µg/L	57
Sulfate	699-24-34A	N	40900	57700	44513.26531	µg/L	49
Sulfate	699-24-34B	N	37000	47700	43151	µg/L	50
Sulfate	699-24-34C	N	32000	47000	41698.03922	µg/L	51
Sulfate	699-24-35	N	38400	51500	44864.70588	µg/L	51
Sulfate	699-25-34C	N	35600	51000	40783	µg/L	50
Sulfate	699-26-35A	N	33800	46700	39102.12766	µg/L	47
Technetium-99	699-23-34A	N	10.9	10.9	10.9	pCi/L	1
Technetium-99	699-23-34B	N	4.09	4.09	4.09	pCi/L	1
Technetium-99	699-24-33	N	1.070000052	1.070000052	1.070000052	pCi/L	1
Temperature	699-22-35	N	16.475	19.6	17.92037037	Deg C	27
Temperature	699-23-34A	N	15	22	18.24814815	Deg C	54
Temperature	699-23-34B	N	17	25	18.23037037	Deg C	27
Temperature	699-24-33	N	17	21	19.53467742	Deg C	62
Temperature	699-24-34A	N	16	25.2	18.63571429	Deg C	49
Temperature	699-24-34B	N	16	22	18.7005	Deg C	50
Temperature	699-24-34C	N	16	21	18.718	Deg C	50
Temperature	699-24-35	N	16	25	18.27320261	Deg C	51
Temperature	699-25-34C	N	17	25	19.20102041	Deg C	49
Temperature	699-26-35A	N	18.6	26.6	19.85691489	Deg C	47
Tetrachloroethene	699-22-35	N	1	3	1.755769231	µg/L	26
Tetrachloroethene	699-23-34A	N	0	12	4.276470588	µg/L	52

Constituent	Well Number	Filtered	Minimum	Maximum	Average	Units	Number of Samples
Tetrachloroethene	699-23-34B	N	0.95	7	2.188846154	µg/L	26
Tetrachloroethene	699-24-33	N	0	11	2.822641509	µg/L	54
Tetrachloroethene	699-24-34A	N	0	9	3.632653061	µg/L	50
Tetrachloroethene	699-24-34B	N	0	11	4.492	µg/L	51
Tetrachloroethene	699-24-34C	N	0	9	3.670588235	µg/L	52
Tetrachloroethene	699-24-35	N	0	3	0.754117647	µg/L	52
Tetrachloroethene	699-25-34C	N	0	6.5	1.1948	µg/L	51
Tetrachloroethene	699-26-35A	N	0	3	0.489047619	µg/L	42
Thiourea	699-23-34A	N	200	200	200	µg/L	1
Thiourea	699-24-34A	N	200	200	200	µg/L	1
Thiourea	699-24-34B	N	200	200	200	µg/L	1
Thiourea	699-24-34C	N	200	200	200	µg/L	1
Thiourea	699-24-35	N	200	200	200	µg/L	1
Thiourea	699-25-34C	N	200	200	200	µg/L	1
Thiourea	699-26-35A	N	200	200	200	µg/L	1
Tin	699-22-35	Y	0	28	4.5	µg/L	12
Tin	699-23-34A	Y	0	69	4.269230769	µg/L	26
Tin	699-23-34B	Y	0	88	10.08333333	µg/L	12
Tin	699-24-33	Y	0	41	2.92	µg/L	25
Tin	699-24-34A	Y	0	44	1.833333333	µg/L	24
Tin	699-24-34B	Y	0	50	4.230769231	µg/L	26
Tin	699-24-35	Y	0	28.6	1.744444444	µg/L	27
Toluene	699-22-35	N	0	0.17	0.0084	µg/L	25
Toluene	699-23-34B	N	0	0.054	0.00216	µg/L	25
Toluene	699-24-33	N	0	0.058	0.00126087	µg/L	46
Toluene	699-24-34A	N	0	0.9	0.021266667	µg/L	45
Toluene	699-24-34B	N	0	0.061	0.002688889	µg/L	45
Toluene	699-24-35	N	0	0.08	0.003977273	µg/L	44
Toluene	699-25-34C	N	0	0.084	0.002883721	µg/L	43
Toluene	699-26-35A	N	0	0.2	0.005	µg/L	40
Total carbon	699-22-35	N	26800	105000	77506.81818	µg/L	22
Total carbon	699-23-34A	N	23000	96700	68856.75676	µg/L	37
Total carbon	699-23-34B	N	36500	108000	74615.90909	µg/L	22
Total carbon	699-24-33	N	20700	78150	60095.94595	µg/L	37
Total carbon	699-24-34A	N	27300	89000	62363.88889	µg/L	36
Total carbon	699-24-34B	N	24200	91000	64283.78378	µg/L	37
Total carbon	699-24-34C	N	28600	97000	66143.24324	µg/L	37
Total carbon	699-24-35	N	18100	62450	43293.24324	µg/L	37
Total carbon	699-25-34C	N	20600	61300	44688.57143	µg/L	35
Total carbon	699-26-35A	N	4590	42300	31557.25	µg/L	40
Total dissolved solids	699-22-35	N	440000	582000	494545.4545	µg/L	22
Total dissolved solids	699-23-34A	N	325000	668000000	74653785.71	µg/L	28
Total dissolved solids	699-23-34B	N	304000	495500	456886.3636	µg/L	22
Total dissolved solids	699-24-33	N	311000	367000000	15687500	µg/L	24

Constituent	Well Number	Filtered	Minimum	Maximum	Average	Units	Number of Samples
Total dissolved solids	699-24-34A	N	351000	367000000	63211178.57	µg/L	28
Total dissolved solids	699-24-34B	N	350000	383000000	65325857.14	µg/L	28
Total dissolved solids	699-24-34C	N	400500	377000000	64853089.29	µg/L	28
Total dissolved solids	699-24-35	N	310000	295000000	50669017.86	µg/L	28
Total dissolved solids	699-25-34C	N	332000	306000000	39015648.15	µg/L	27
Total dissolved solids	699-26-35A	N	249000	269000000	39296666.67	µg/L	27
Total halogens (all)	699-22-35	N	19.775	27.21666667	23.49583333	µg/L	2
Total halogens (all)	699-23-34A	N	8.2625	10.525	9.39375	µg/L	2
Total halogens (all)	699-23-34B	N	12.15	22.075	17.1125	µg/L	2
Total halogens (all)	699-24-33	N	6.875	7.8875	7.38125	µg/L	2
Total halogens (all)	699-24-34A	N	6.2	6.475	6.3375	µg/L	2
Total halogens (all)	699-24-34B	N	7.3875	9.525	8.45625	µg/L	2
Total halogens (all)	699-24-34C	N	6.5875	7.125	6.85625	µg/L	2
Total halogens (all)	699-24-35	N	4.2625	4.4	4.33125	µg/L	2
Total halogens (all)	699-25-34C	N	2.65	4.15	3.4	µg/L	2
Total halogens (all)	699-26-35A	N	3.2625	3.575	3.41875	µg/L	2
Total organic carbon	699-22-35	N	141.75	705.5	371.25	µg/L	26
Total organic carbon	699-23-34A	N	110	1100	470.4215686	µg/L	51
Total organic carbon	699-23-34B	N	110	900	384.6442308	µg/L	26
Total organic carbon	699-24-33	N	132.5	19850	879.5680272	µg/L	49
Total organic carbon	699-24-34A	N	110	1750	482.0255102	µg/L	49
Total organic carbon	699-24-34B	N	125	1250	464.625	µg/L	50
Total organic carbon	699-24-34C	N	110	1000	474.9901961	µg/L	51
Total organic carbon	699-24-35	N	162.5	1000	462.9787582	µg/L	52
Total organic carbon	699-25-34C	N	112.5	1500	493.82	µg/L	50
Total organic carbon	699-26-35A	N	32	1264.5	486.2755102	µg/L	49
Total organic halides	699-22-35	N	6.475	45.625	22.3587	µg/L	25
Total organic halides	699-23-34A	N	4.9	68.8	27.2088447	µg/L	45
Total organic halides	699-23-34B	N	4.4625	38.95	19.35546875	µg/L	24
Total organic halides	699-24-33	N	2.65	62.5	15.72608156	µg/L	47
Total organic halides	699-24-34A	N	2.4725	826	47.79841667	µg/L	46
Total organic halides	699-24-34B	N	4.02	343.25	27.68011111	µg/L	45
Total organic halides	699-24-34C	N	3.4075	673.75	31.82127778	µg/L	45
Total organic halides	699-24-35	N	2	914.5	37.43714692	µg/L	44
Total organic halides	699-25-34C	N	2.65	17.5	8.724331395	µg/L	44
Total organic halides	699-26-35A	N	3.0025	100	12.52895833	µg/L	48
trans-1,2-Dichloroethylene	699-24-34A	N	0	2	0.0408	µg/L	51
trans-1,2-Dichloroethylene	699-24-34B	N	0	0.23	0.004509804	µg/L	52
trans-1,2-Dichloroethylene	699-24-34C	N	0	1.7	0.033846154	µg/L	53
trans-1,2-Dichloroethylene	699-24-35	N	0	0.15	0.002941176	µg/L	52
Trichloroethene	699-22-35	N	0.54	4.3	1.4884	µg/L	25
Trichloroethene	699-23-34A	N	0	10	2.8818	µg/L	51
Trichloroethene	699-23-34B	N	0.43	2.6	1.3132	µg/L	25
Trichloroethene	699-24-33	N	0	3	1.132884615	µg/L	53

Constituent	Well Number	Filtered	Minimum	Maximum	Average	Units	Number of Samples
Trichloroethene	699-24-34A	N	0	7	1.991736111	µg/L	49
Trichloroethene	699-24-34B	N	0	8	2.116122449	µg/L	50
Trichloroethene	699-24-34C	N	0	4	1.3603	µg/L	51
Trichloroethene	699-24-35	N	0	1.1	0.21283	µg/L	51
Trichloroethene	699-25-34C	N	0	3	0.58244898	µg/L	50
Trichloroethene	699-26-35A	N	0	1	0.194390244	µg/L	41
Tritium	699-22-35	N	-118	422	140.9323333	pCi/L	27
Tritium	699-23-34A	N	206	158000	30940.55	pCi/L	40
Tritium	699-23-34B	N	-83.2	88400	3651.761538	pCi/L	26
Tritium	699-24-33	N	22800	330000	158478.0317	pCi/L	63
Tritium	699-24-34A	N	2280	216000	43585.86842	pCi/L	38
Tritium	699-24-34B	N	3770	301000	89763.925	pCi/L	40
Tritium	699-24-34C	N	-47.7	326000	138302.7075	pCi/L	40
Tritium	699-24-35	N	391	163000	29339.6575	pCi/L	40
Tritium	699-25-34C	N	42400	298000	162755.75	pCi/L	40
Tritium	699-26-35A	N	51800	297000	163028.75	pCi/L	40
Turbidity	699-22-35	N	0.47	4.575	1.343409091	NTU	22
Turbidity	699-22-35	Y	0.34	0.59	0.4275	NTU	4
Turbidity	699-23-34A	N	0.36	4.09	1.817272727	NTU	22
Turbidity	699-23-34A	Y	0.27	0.74	0.476666667	NTU	3
Turbidity	699-23-34B	N	0.38	4.11	1.34797619	NTU	21
Turbidity	699-23-34B	Y	0.26	0.81	0.496666667	NTU	3
Turbidity	699-24-33	N	0.09	2.32	0.780340909	NTU	22
Turbidity	699-24-33	Y	0.34	0.8	0.4875	NTU	4
Turbidity	699-24-34A	N	0.27	4.35	1.819801587	NTU	21
Turbidity	699-24-34A	Y	0.32	0.63	0.426666667	NTU	3
Turbidity	699-24-34B	N	0.17	4.17	1.590833333	NTU	21
Turbidity	699-24-34B	Y	0.23	0.57	0.343333333	NTU	3
Turbidity	699-24-34C	N	0.47	4.92	2.645454545	NTU	22
Turbidity	699-24-34C	Y	0.17	0.53	0.363333333	NTU	3
Turbidity	699-24-35	N	0.57	4.25	1.811428571	NTU	21
Turbidity	699-24-35	Y	0.13	0.55	0.31	NTU	4
Turbidity	699-25-34C	N	0.28	6.1	2.156363636	NTU	22
Turbidity	699-25-34C	Y	0.16	1.13	0.513333333	NTU	3
Turbidity	699-26-35A	N	0.1	1.466666667	0.658174603	NTU	21
Turbidity	699-26-35A	Y	0.27	0.36	0.306666667	NTU	3
Uranium	699-24-33	N	4.329999924	4.329999924	4.329999924	µg/L	1
Vanadium	699-22-35	Y	5.6	26.6	15.29807692	µg/L	26
Vanadium	699-23-34A	N	0	18	10.53117647	µg/L	17
Vanadium	699-23-34A	Y	0	34	13.15625	µg/L	48
Vanadium	699-23-34B	Y	5.2	31	15.98846154	µg/L	26
Vanadium	699-24-33	N	0	17	11.87407407	µg/L	9
Vanadium	699-24-33	Y	0	35.5	14.79782609	µg/L	46
Vanadium	699-24-34A	N	0	20	13.08	µg/L	15
Vanadium	699-24-34A	Y	0	33.8	13.74021739	µg/L	46
Vanadium	699-24-34B	N	0	19	12.2375	µg/L	16

Constituent	Well Number	Filtered	Minimum	Maximum	Average	Units	Number of Samples
Vanadium	699-24-34B	Y	0	28.8	13.64791667	µg/L	48
Vanadium	699-24-34C	N	0	16	11.86470588	µg/L	17
Vanadium	699-24-34C	Y	0	43.2	15.53979592	µg/L	49
Vanadium	699-24-35	N	0	24	16.88235294	µg/L	17
Vanadium	699-24-35	Y	0	660	30.45	µg/L	49
Vanadium	699-25-34C	N	0	70	21.625	µg/L	16
Vanadium	699-25-34C	Y	0	41	17.14166667	µg/L	48
Vanadium	699-26-35A	N	0	26	15.78571429	µg/L	14
Vanadium	699-26-35A	Y	0	36.6	19.61707317	µg/L	41
Vinyl chloride	699-22-35	N	0	1.8	0.1008	µg/L	25
Vinyl chloride	699-23-34B	N	0	1.5	0.06	µg/L	25
Vinyl chloride	699-24-35	N	0	0.37	0.0074	µg/L	51
Xylenes (total)	699-22-35	N	0	0.58	0.051	µg/L	20
Xylenes (total)	699-23-34B	N	0	0.039	0.00195	µg/L	20
Xylenes (total)	699-24-33	N	0	0.07	0.001627907	µg/L	43
Xylenes (total)	699-24-34A	N	0	0.22	0.0055	µg/L	40
Xylenes (total)	699-26-35A	N	0	0.22	0.006470588	µg/L	34
Zinc	699-22-35	Y	0	48.6	9.234615385	µg/L	26
Zinc	699-23-34A	N	0	64	18.58352941	µg/L	17
Zinc	699-23-34A	Y	0	37	8.764583333	µg/L	48
Zinc	699-23-34B	Y	0	310	20.7	µg/L	26
Zinc	699-24-33	N	0	10	2.69	µg/L	8
Zinc	699-24-33	Y	0	77.6	11.81956522	µg/L	46
Zinc	699-24-34A	N	0	95	29.44	µg/L	15
Zinc	699-24-34A	Y	0	234	14.74456522	µg/L	46
Zinc	699-24-34B	N	0	62	14.83125	µg/L	16
Zinc	699-24-34B	Y	0	315	19.60416667	µg/L	48
Zinc	699-24-34C	N	12.4	130	49.02352941	µg/L	17
Zinc	699-24-34C	Y	0	188	27.53571429	µg/L	49
Zinc	699-24-35	N	0	43	10.70588235	µg/L	17
Zinc	699-24-35	Y	0	880	25.76632653	µg/L	49
Zinc	699-25-34C	N	0	455	49.25	µg/L	16
Zinc	699-25-34C	Y	0	49	11.31145833	µg/L	48
Zinc	699-26-35A	N	0	17	3.857142857	µg/L	14
Zinc	699-26-35A	Y	0	53	7.490243902	µg/L	41
Zinc-65	699-24-33	N	-17.60000038	13.60000038	-3.014999986	pCi/L	4
Zirconium/Niobium-95	699-24-33	N	-32	3.559999943	-5.695000052	pCi/L	4

1. Data are since 1986 for SWL network wells.
2. Units converted to µg/L.
3. Non-detects changed to 0.0.
4. Duplicate values on same date are averaged.
5. Constituents for SWL wells are listed only when there was at least one detected value.

Appendix C

Construction Details of the Wells in the Monitoring Network

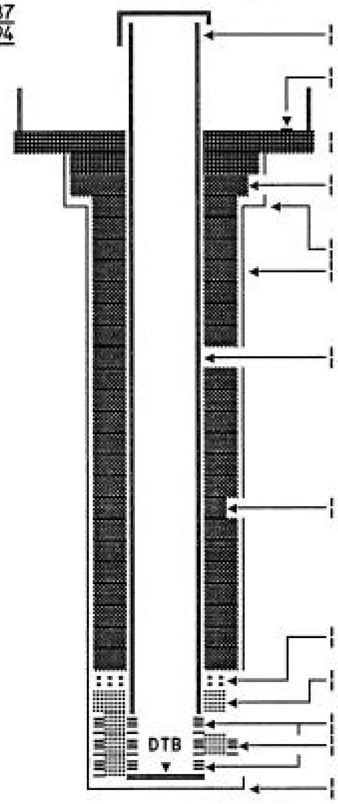
WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool	Sample Method: Drive barrel Hard tool	WELL NUMBER: 699-24-35 A5093 TEMPORARY WELL NO: SW-1
Drilling Fluid Used: Water	Additives Used: None documented	Hanford Coordinates: N/S N 24,351 E/W W 35,203
Driller's Name: L Bultena/D Ludtke	WA State Lic Nr: Not documented	State Coordinates: N 429,563 E 2,260,060
Drilling Company: Onwego Drilling Co	Company Location: Kennewick, WA	Start Card #: Not documented T___ R___ S___
Date Started: 03Feb87	Date Complete: 02Mar87	Elevation Ground surface: 536.52 Brass cap

Depth to water: 132.3-ft 27Feb87
(Ground surface) 135.3-ft 20Jun94

GENERALIZED STRATIGRAPHY Geologist's Log
Sl=slightly

0↔8: Fine SAND
8↔10: Gravelly SAND
10↔11: SAND
11↔15: Silty SAND
15↔31: SAND
31↔32.5: Silty SAND
32.5↔35: SAND
35↔37.5: Sl gravelly SAND
37.5↔40: SAND
40↔60: Gravelly SAND
60↔75: SAND
75↔105: Gravelly SAND
105↔125: Sandy GRAVEL
125↔130: Sandy GRAVEL w/CLAY
130↔140: Sandy GRAVEL
140↔143: SAND
143↔145: Sandy GRAVEL



Elevation of reference point: [538.81-ft]
(top of casing)
Height of reference point above ground surface [2.29-ft]
Depth of surface seal [0.0↔5.0-ft]
Type of surface seal
Cement grout to 5.0-ft
4 x 4-ft x 4-in concrete pad
15-in nominal hole, 0↔10-ft
11-in nominal hole, 10↔145.5-ft
6-in ID stainless steel casing, +2.3↔128.0-ft
Volclay grout, 5.0↔~119.0-ft
Volclay pellets, ~119.0↔~124.0-ft
10↔20 and 8↔12-mesh silica sand pack, ~124.0↔145.5-ft
6-in stainless steel screen, 128.0↔143.0-ft, #30-slot
10-in telescoping stainless steel screen, 128↔143.0-ft, #40-slot
Borehole drilled depth: [145.5-ft]

DTB=Depth to bottom, 142.8-ft, 14Sep93

Drawing By: RKL/6N24W35.ASB
Date : 14Sep94
Reference : HANFORD WELLS

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 699-24-35

WELL DESIGNATION	:	699-24-35
RCRA FACILITY	:	Central Landfill
CERCLA UNIT	:	Not applicable
HANFORD COORDINATES	:	N 24,351 W 35,203 [HANFORD WELLS]
LAMBERT COORDINATES	:	N 429,563 E 2,260,060 [HANCONV]
DATE DRILLED	:	Mar87
DEPTH DRILLED (GS)	:	145.5-ft
MEASURED DEPTH (GS)	:	142.8-ft, 14Sep93
DEPTH TO WATER (GS)	:	132.3-ft, 27Feb87 135.3-ft, 20Jun94
CASING DIAMETER	:	6-in, stainless steel, +2.3↔128.0-ft
ELEV TOP CASING	:	538.81-ft, [10May91-NGVD'29]
ELEV GROUND SURFACE	:	536.52-ft Brass cap [10May91-NGVD'29]
PERFORATED INTERVAL	:	Not applicable
SCREENED INTERVAL	:	128.0↔143.0-ft, 6-in stainless steel, #30-slot; 128.0↔143.0-ft, 10-in stainless steeltelescoping, #40-slot
COMMENTS	:	FIELD INSPECTION, 14Sep93 6-in stainless steel casing. 4-ft by 4-ft concrete pad, 4 posts, 1 removable. Capped and locked, brass cap in pad with well ID. Not in radiation zone. OTHER;
AVAILABLE LOGS	:	Geologist, Driller
TV SCAN COMMENTS	:	Not applicable
DATE EVALUATED	:	Not applicable
EVAL RECOMMENDATION	:	Not applicable
LISTED USE	:	Central Landfill monthly water level measurement, 29Dec89↔20Jun94,
CURRENT USER	:	WHC ES&M w/l monitoring and RCRA samping, PNL sitewide sampling
PUMP TYPE	:	Hydrostar,
MAINTENANCE	:	

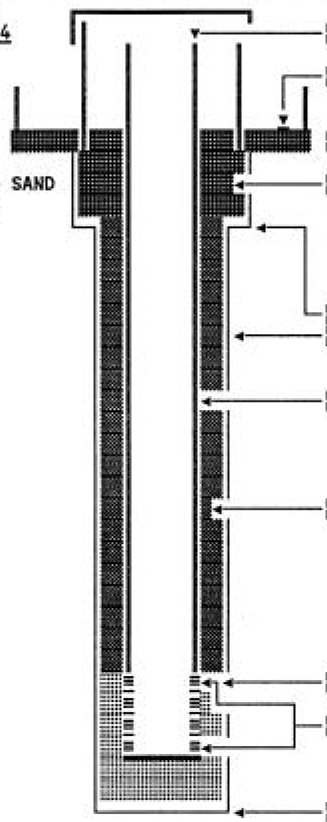
WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool	Sample Method: Drive barrel Hard tool	WELL NUMBER: 699-26-35A A5103 TEMPORARY WELL NO: SM-1
Drilling Fluid Used: Water	Additives Used: Bentonite	Hanford Coordinates: N/S N 25,768.80 E/W W 34,748.81
Driller's Name: Myricks(s)	WA State Lic Nr: Not documented	State Coordinates: N 430,981.54 E 2,260,510.15
Drilling Company: Myrick's Well Drill.	Company Location: Not documented	Start Card #: Not documented T____ R____ S______
Date Started: 20May86	Date Complete: 14Jul86	Elevation Ground surface: 530.38 Brass cap

Depth to water: 126.5-ft Jun86
(Ground surface) 129.7-ft 20Jun94

GENERALIZED Driller's
STRATIGRAPHY Log

0↔38: Not documented
38↔69: 90% coarse SAND, 10% fine SAND
69↔70: 20% GRAVEL, 80% fine SAND
70↔95: Not documented
95↔114: BOULDERS
114↔120: GRAVEL
120↔130: GRAVEL & SAND
130↔152.5: SAND & GRAVEL



Elevation of reference point: [532.38-ft]
(top of 5-in casing)
Height of reference point above [2.0-ft]
ground surface
Depth of surface seal [0↔20-ft]
Type of surface seal:
Cement grout w/5% bentonite to 20-ft
4-ft x 4-ft x 4-in concrete pad
with 2-ft round pad supporting
10-in ID carbon steel protective
casing to 2-ft
11-in nominal hole, 0↔20-ft
9-in nominal hole, 20↔152.5-ft
5-in ID sch 40 carbon steel casing,
+2.0↔120.4-ft
Granular bentonite, 20↔120.5-ft
Monterey crystal sand pack,
120.5↔152.5-ft, mesh not documented
5-in stainless steel screen,
120.4↔130.4-ft, #20-slot
130.4↔140.4-ft, #25-slot
Borehole drilled depth: [152.5-ft]

Drawing By: RKL/6N26W35A.ASB
Date : 14Sep94
Reference : HANFORD WELLS

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 699-26-35A

WELL DESIGNATION	:	699-26-35A
RCRA FACILITY	:	Central Landfill
CERCLA UNIT	:	Not applicable
HANFORD COORDINATES	:	N 25,768.80 W 34,748.81 [29Jul86-200E]
LAMBERT COORDINATES	:	N 430,981.54 E 2,260,510.15 [11Nov86-WA S]
DATE DRILLED	:	Jul86
DEPTH DRILLED (GS)	:	152.5-ft
MEASURED DEPTH (GS)	:	130.3-ft, 25Jun91
DEPTH TO WATER (GS)	:	126.5-ft, Jun86 129.7-ft, 20Jun94
CASING DIAMETER	:	10-in, carbon steel, +2.3↔2.0-ft, 5-in, carbon steel, +2.0↔120.4-ft
ELEV TOP CASING	:	532.38-ft, (5-in) [10May91-NGVD'29] 532.66-ft, (10-in) [10May91-NGVD'29]
ELEV GROUND SURFACE	:	530.38-ft, Brass cap [10May91-NGVD'29]
PERFORATED INTERVAL	:	Not applicable
SCREENED INTERVAL	:	120.4↔140.4-ft, 5-in stainless steel, 120.4↔130.4-ft, #20-slot, 130.4↔140.4-ft, #25-slot,
COMMENTS	:	FIELD INSPECTION, 25Jun91, 10 and 5-in carbon steel casings. Capped and locked 4-ft x 4-ft pad with 2-ft pad supporting 10-in casing, no posts, has well identification stamped on brass marker in pad. Not in radiation zone. OTHER;
AVAILABLE LOGS	:	Driller
TV SCAN COMMENTS	:	Not applicable
DATE EVALUATED	:	Not applicable
EVAL RECOMMENDATION	:	Not applicable
LISTED USE	:	WHC Central Landfill monthly water level measurement, 01Apr88↔20Jun94;
CURRENT USER	:	WHC ES&M RCRA sampling and w/l monitoring, PNL sitewide sampling
PUMP TYPE	:	Hydrostar
MAINTENANCE	:	

0502850

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method:	Air Rotary	Sample Method:	Grab/Split Spoon	WELL NUMBER:	699-22-35 A8443
Drilling Fluid Used:	Air	Additives Used:	None	TEMPORARY WELL NO:	None
Driller's Name:	D. Kettle	WA State Lic Nr:	Not Available	Coordinates: N	Not documented
Drilling Company:	PC Drilling Co.	Company Location:	Richland, WA	Coordinates: E	Not documented
Date Started:	20Dec93	Date Completed:	11Jan94	Start Card #:	Not Available
				Elevation Ground Surface:	

Depth to Water: 124.9 ft 05Jan94
(Ground surface)

Elevation of Reference Point: m

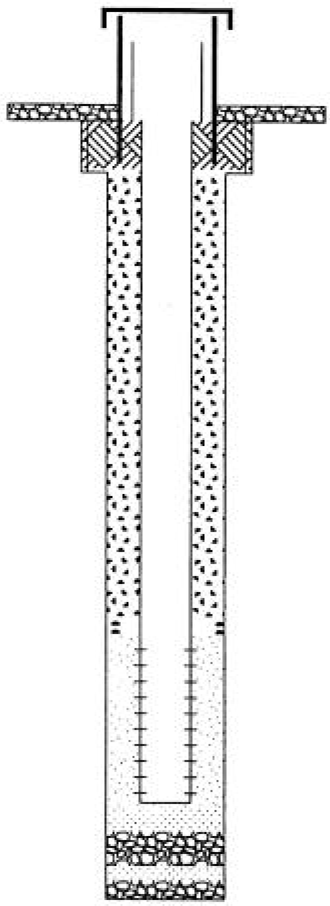
Height of Reference Point Above Ground Surface:

Depth of Surface Seal: 11 ft.

Type of Surface Seal: 4x4 Concrete Pad

GENERALIZED STRATIGRAPHY Geologist's Log

0 - 2 ft : Sand
2 - 2.4 ft : Sand and Carbonate
2.4 - 30 ft : Sand
30 - 35 ft : Gravelly Sand
35 - 56 ft : Sand
56 - 67.5 ft : Gravelly Sand
67.5 - 71 ft : Sandy Gravel
71 - 86 ft : Sand
86 - 110 ft : Sandy Gravel
110 - 124 ft : Silty Sandy Gravel
124 - 136 ft : Gravel
136 - 150 ft : Gravelly Sand
150 - 180.25 ft : Sandy Gravel



180.25 ft : Borehole drilled depth

0 - 12 ft : 13-in. 12-3/4" CS Temp. Casing
12 - 180.25 ft : 9-in. 8-5/8" CS Temp. Casing

Fill

0 - 11 ft : 13-inch hole Cement
11 - 12 ft : 13-inch hole Bentonite Crumbles
12 - 115.1 ft : 9-inch hole Bentonite Crumbles
115.1 - 117 ft : 9-inch hole 3/8" Bentonite Pellets
117 - 119 ft : 9-inch hole 1/4" Bentonite Pellets
119 - 157.7 ft : 9-inch hole 20-40 Silica Sand
157.7 - 158 ft : 9-inch hole 20-40 Silica Sand
158 - 158.6 ft : 9-inch hole 10-20 Silica Sand
158.6 - 164.4 ft : 9-inch hole Hole Plug
164.4 - 172.4 ft : 9-inch hole Slough
172.4 - 175.9 ft : 9-inch hole Hole Plug
175.9 - 180.25 ft : 9-inch hole Slough

Casing

0 - 12 ft : 13 inch 12-3/4" CS Temp. Casing
0 - 122.4 ft : 4 inch 4" Perm. Casing
12 - 180.25 ft : 9 inch 8-5/8" CS Temp. Casing
157.4 - 157.7 ft : 4 inch End Cap

Screen

122.4 - 157.4 ft : 4 inch 4" .010 SS Wire Wrap Pipe Size

Drawing By:	DLF
Reference:	Hanford Wells
Revision:	0
Revision Date:	14Jan98
Print Date:	14Jan98

BECHTEL

Report Form: WELLS Project File: WELLS.GPJ

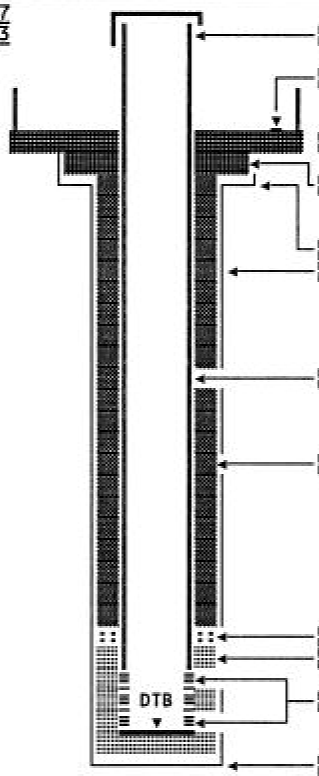
WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool	Sample Method: Drive barrel Hard tool	WELL NUMBER: 699-23-34A A5087 TEMPORARY WELL NO: SW-2
Drilling Fluid Used: Water	Additives Used: None documented	Hanford Coordinates: N/S N 23,161 E/W W 34,191
Driller's Name: L Bultena	WA State Lic Nr: Not documented	State Coordinates: N 428,375 E 2,261,075
Drilling Company: Onwego Drilling Co	Company Location: Kennewick, WA	Start Card #: Not documented T___ R___ S___
Date Started: 09Jan87	Date Complete: 29Jan87	Elevation Ground surface: 530.50-ft Brass cap

Depth to water: 126.0-ft 30Jan87
(Ground surface) 129.5-ft 27Dec93

GENERALIZED STRATIGRAPHY Geologist's Log
Sl=slightly

0↔2: BACKFILL
2↔10: Cse SAND
10↔15: Sl gravelly SAND
15↔16: Silty SAND
16↔20: Cse to med SAND
20↔25: Sl gravely SAND
25↔45: SAND
45↔55: Sl gravelly SAND
55↔59: Silty gravelly SAND
59↔63: Brown SAND
63↔70: Sl gravelly<>pebbly SAND
70↔80: Gravelly SAND, some SILT 30↔40%GRAVEL 60↔70%SAND,
80↔125: Sandy GRAVEL 30↔40%SAND 60↔70%GRAVEL
125↔139: Silty sandy GRAVEL
139 : Sandy GRAVEL



Elevation of reference point: [532.84-ft] (top of 6-in casing)
Height of reference point above ground surface [2.3-ft]
Depth of surface seal [0↔7.5-ft]
Type of surface seal: Cement grout to 7.5-ft
4-ft x 4-ft x 4-in concrete pad
15-in nominal hole, 0↔10-ft
9-in nominal hole, 10↔139-ft
6-in ID stainless steel casing, +2.3↔120.8-ft
Volclay grout, 7.5↔112.0-ft
Volclay pellets, 112.0↔118.0-ft
Colorado silica sand pack, 118.0↔139.0-ft, 8↔12/10↔20-mesh
6-in stainless steel screen, 120.8↔136.1-ft, #30-slot
Borehole drilled depth: [139.0-ft]

DTB=Depth to bottom, 136.2-ft, 24Aug93

Drawing By: RKL/6N23W34.ASB
Date : 14Sep94
Reference : HANFORD WELLS

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 699-23-34A

WELL DESIGNATION	:	699-23-34
RCRA FACILITY	:	Central Landfill-NRDWL
CERCLA UNIT	:	Not applicable
HANFORD COORDINATES	:	N 23,161 W 34,191 [HANFORD WELLS]
LAMBERT COORDINATES	:	N 428,375 E 2,261,075 [HANCONV]
DATE DRILLED	:	Jan87
DEPTH DRILLED (GS)	:	139.0-ft
MEASURED DEPTH (GS)	:	136.2-ft, 24Aug93
DEPTH TO WATER (GS)	:	126.0-ft, 30Jan87 129.5-ft, 27Dec93
CASING DIAMETER	:	6-in, carbon steel, +2.3↔120.8-ft;
ELEV TOP CASING	:	532.84-ft, (5-in) [NGVD'29-10May91]
ELEV GROUND SURFACE	:	530.50-ft Brass cap [NGVD'29-10May91]
PERFORATED INTERVAL	:	Not applicable
SCREENED INTERVAL	:	120.8↔136.1-ft, 6-in stainless steel, #30-slot;
COMMENTS	:	FIELD INSPECTION, 24Aug93 6-in stainless steel casing. Capped and locked 4-ft x 4-ft concrete pad with 4 posts. Has stamped identification on brass marker. Not in radiation zone. OTHER;
AVAILABLE LOGS	:	Geologist, Driller
TV SCAN COMMENTS	:	Not applicable
DATE EVALUATED	:	Not applicable
EVAL RECOMMENDATION	:	Not applicable
LISTED USE	:	WHC Central Landfill monthly water level measurement, 29Dec89↔27Dec93,
CURRENT USER	:	WHC ES&M RCRA sampling, PNL sitewide sampling and water level monitoring
PUMP TYPE	:	Electric submersible
MAINTENANCE	:	

0500344

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method:	Cable Tool	Sample Method:	Grab/Split Spoon	WELL NUMBER:	699-23-34B A8450 TEMPORARY WELL NO None
Drilling Fluid Used:	NA	Additives Used:	None	Coordinates: N	Not documented
Driller's Name:	C. Shields	WA State Lic Nr:	Not Available	Coordinates: E	Not documented
Drilling Company:	KEH Constr. Forces	Company Location:	Hanford	Start Card #:	Not Available
Date Started:	04Nov93	Date Completed:	07Jan94	Elevation Ground Surface:	

Depth to Water: 125.23 ft 10Jan94
(Ground surface)

Elevation of Reference Point: m

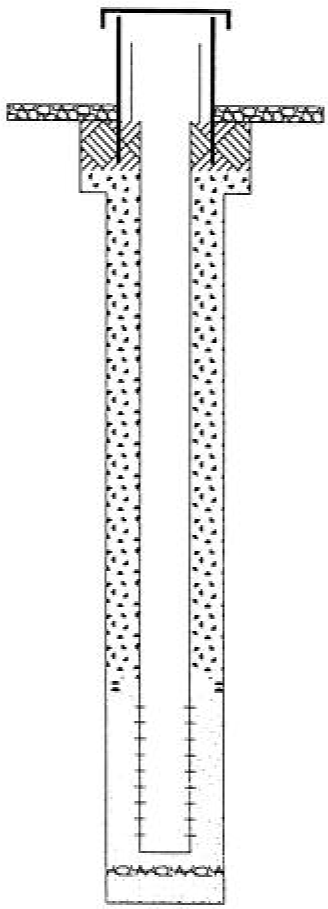
Height of Reference Point Above Ground Surface:

Depth of Surface Seal: 10.3 ft.

Type of Surface Seal: 4x4 Concrete Pad

GENERALIZED STRATIGRAPHY Geologist's Log

0 - 5 ft : Sand
5 - 12 ft : Sand
12 - 14 ft : Sand
14 - 34 ft : Sand
34 - 40 ft : Sandy Gravel
40 - 60 ft : Sand
60 - 65 ft : Gravelly Sand
65 - 79 ft : Sandy Gravel
79 - 85 ft : Gravel
85 - 92 ft : Gravel
92 - 94 ft : Sandy Gravel
94 - 101 ft : Gravel
101 - 112 ft : Sandy Gravel
112 - 121 ft : Sandy Gravel
121 - 130 ft : Sandy Gravel
130 - 138 ft : Silty Sandy Gravel
138 - 150 ft : Silty Sandy Gravel
150 - 163.5 ft : Gravel



163.5 ft : Borehole drilled depth

0 - 15 ft : 13-in. 12-3/4" Carbon Steel Temp. Casing
15 - 163.5 ft : 9-in. 8-5/8" Carbon Steel Temp. Casing

Fill

0 - 10.3 ft : 13-inch hole Cement
10.3 - 15 ft : 13-inch hole 20-40 Bentonite Crumbles
15 - 116.3 ft : 9-inch hole 20-40 Bentonite Crumbles
116.3 - 117.6 ft : 9-inch hole 1/2" Bentonite Pellets
117.6 - 119.2 ft : 9-inch hole 1/4" Bentonite Pellets
119.2 - 152.8 ft : 9-inch hole 20-40 Silica Sand
152.8 - 154.6 ft : 9-inch hole 20-40 Silica Sand
154.6 - 155.6 ft : 9-inch hole 10-20 Silica Sand
155.6 - 157.7 ft : 9-inch hole Slough
157.7 - 163.1 ft : 9-inch hole Bentonite Hole Plug
163.1 - 163.5 ft : 9-inch hole Slough

Casing

0 - 15 ft : 13 inch 12-3/4" CS Temp. Welded Csg.
0 - 122.5 ft : 4 inch 4" Casing
15 - 163.5 ft : 9 inch 10-3/4" CS Temp. Welded Csg.
152.5 - 152.8 ft : 4 inch

Screen

122.5 - 152.5 ft : 4 inch 4" .010 SS Wire Wrap Pipe Size

Drawing By: DLF
Reference: Hanford Wells
Revision: 0
Revision Date: 19Dec97
Print Date: 19Dec97

Report Form: WELLS Project File: WELLS.GPJ

BECHTEL

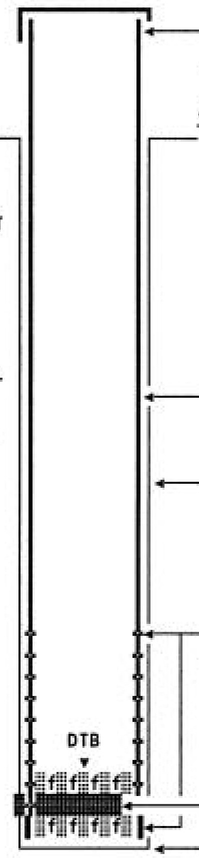
WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool	Sample Method: Hard tool (nom)	WELL NUMBER: 699-24-33 A5089 TEMPORARY WELL NO: 25-35
Drilling Fluid Used: Water	Additives Used: Not documented	Hanford Coordinates: N/S N 23,809 E/W W 33,315
Driller's Name: Rumley	WA State Lic Nr: Not documented	State Coordinates: N 429,025 E 2,261,949
Drilling Company: Not documented	Company Location: Not documented	Start Card #: Not documented T 12N R 27E S 20P1
Date Started: 30Jul48	Date Complete: 12Aug48	Elevation Ground surface: 522.6-ft Estimated

Depth to water: 134-ft 12Aug48
(Ground suirface) 121.8-ft 20Jun94

GENERALIZED STRATIGRAPHY — Driller's Log

0↔20: Fine SAND
20↔27: Basalt SAND and little GRAVEL
27↔30: Fine SAND and BASALT [GRAVEL?]
30↔57: Fine black & white SAND and SILT
57↔70: Fine SAND and SILT
70↔75: Cse b&w SAND and some GRAVEL
75↔86: ROCKS and cse SAND
86↔92: BASALT, GRANITE and ROCKS
92↔93: Fine black SAND
93↔111: BASALT, GRANITE and ROCKS
111↔116: Fine b&w SAND, BASALT & GRAVEL
116↔122: SAND, ROCKS and BOULDERS
122↔127: SAND, ROCKS and GRAVEL
127↔133: SAND, ROCKS, GRAVEL & BASALT
133↔135: GRANITE, ROCKS, BOULDERS and BASALT
135↔140: SAND, SILT and ROCKS
140↔141: SAND and SILT
144↔145: Water SAND and little GRAVEL
145↔150: Water SAND
150↔153: Med SAND
153↔157: Med SAND and ROCKS
157↔164.5: Fine black SAND, ROCKS and some BASALT



Elevation of reference point: [524.27-ft]
(top of casing)
Height of reference point above ground surface [1.7-ft]

Depth of surface seal [ND]
No surface seal documented:

8-in ID carbon steel casing, +1.7↔164.5-ft

9-in nominal hole, 0↔164.5-ft

8-in casing perforations,
116↔122-ft, cuts not documented
129↔144-ft, 2 holes/ft
144↔164-ft, 5 holes/ft

Cement plug, 159↔162-ft

Borehole drilled depth: [164.5-ft]

DTB=Depth to bottom,
155.8-ft, 24Aug93

REMEDIATIONS:
Sep56 by Wall/Richards
Perforated 129↔144-ft
May74 by M Bultena
Cleaned, perforated 116↔122-ft
Dec 76 by M Bultena
Cleaned, set cement plug

Drawing By: RKL/6N24W33.ASB
Date : 14Sep94
Reference : HANFORD WELLS

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 699-24-33

WELL DESIGNATION	:	699-24-33
RCRA FACILITY	:	Central landfill
CERCLA UNIT	:	Not applicable
HANFORD COORDINATES	:	N 23,809 W 33,315 [HANFORD WELLS]
LAMBERT COORDINATES	:	N 429,025 E 2,261,949 [HANCONV]
DATE DRILLED	:	Aug48
DEPTH DRILLED (GS)	:	164.5-ft
MEASURED DEPTH (GS)	:	155.8-ft, 24Aug93
DEPTH TO WATER (GS)	:	134-ft, Aug48 121.8-ft, 20Jun94
CASING DIAMETER	:	8-in, carbon steel, +1.7↔164.5-ft
ELEV TOP CASING	:	524.27-ft [10May91-NGVD'29]
ELEV GROUND SURFACE	:	522.6-ft, Estimated
PERFORATED INTERVAL	:	116↔164-ft
SCREENED INTERVAL	:	Not applicable
COMMENTS	:	FIELD INSPECTION, 24Aug93 8-in carbon steel casing. Capped and locked No pad, posts or permanent identification. Not in radiation zone. OTHER;
AVAILABLE LOGS	:	Driller
TV SCAN COMMENTS	:	Not applicable
DATE EVALUATED	:	Not applicable
EVAL RECOMMENDATION	:	Not applicable
LISTED USE	:	Central landfill monthly level measurement, 01Jun84↔20Jun94;
CURRENT USER	:	WHC ES&M w/l monitoring and RCRA sampling, PNL sitewide sampling and w/l monitoring
PUMP TYPE	:	Electric submersible
MAINTENANCE	:	

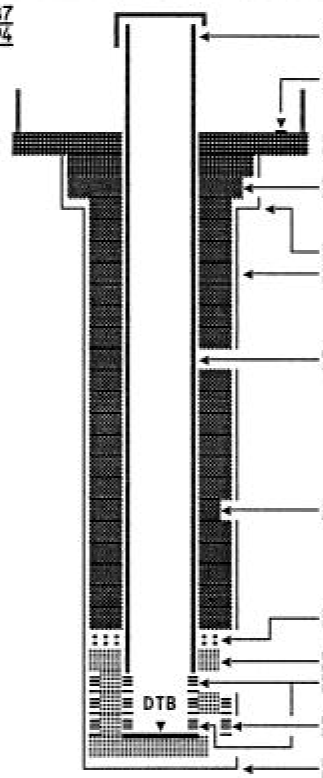
WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool	Sample Method: Drive barrel Hard tool	WELL NUMBER: 699-24-34A A5090
Drilling Fluid Used: SM-2 well water	Additives Used: None documented	TEMPORARY WELL NO: SW-3
Driller's Name: D Ludtke	WA State Lic Nr: Not documented	Hanford Coordinates: N/S N 23,544 E/W W 34,071
Drilling Company: Onwego Drilling Co.	Company Location: Kennewick, WA	State Coordinates: N 428,758 E 2,261,194
Date Started: 19Jan87	Date Complete: 09Feb87	Start Card #: Not documented T___ R___ S___
		Elevation Ground surface: 531.70 Brass cap

Depth to water: 127.5-ft 09Feb87
(Ground surface) 130.6-ft 20Jun94

GENERALIZED STRATIGRAPHY
Geologist's Log

0↔5: Pebbly SAND
5↔15: SAND
15↔25: Pebbly SAND
25↔35: SAND
35↔40: Pebbly SAND
40↔45: Silty SAND w/GRAVEL
45↔55: Pebbly SAND
55↔65: Gravelly SAND
65↔75: SAND
75↔85: Silty sandy GRAVEL
85↔125: Sandy GRAVEL
125↔130: No sample
130↔140: Sandy GRAVEL
140 : Pebbly SAND



Elevation of reference point: [533.88-ft]
(top of casing)
Height of reference point above ground surface [2.18-ft]
Depth of surface seal [0.0↔6.0-ft]
Type of surface seal
Cement grout to 6.0-ft
4 x 4-ft x 4-in concrete pad
15-in nominal hole, 0↔10-ft
11-in nominal hole, 10↔140-ft
6-in ID stainless steel casing, +2.2↔122.5-ft
Volclay grout, 6.0↔112.0-ft
Volclay pellets, 112.0↔118.0-ft
10↔20 and 8↔12-mesh silica sand pack, 118.0↔140.0-ft
6-in stainless steel screen, 122.5↔137.5-ft, #30-slot
10-in stainless steel telescoping screen, 122.0↔137-ft, #40-slot
Borehole drilled depth: [140.0-ft]

DTB=Depth to bottom, 137.5-ft, 24Aug93

Drawing By: RKL/6N24W34A.ASB
Date : 14Sep94
Reference : HANFORD WELLS

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 699-24-34A

WELL DESIGNATION	:	699-24-34A
RCRA FACILITY	:	Central Landfill
CERCLA UNIT	:	Not applicable
HANFORD COORDINATES	:	N 23,544 W 34,071 [HANFORD WELLS]
LAMBERT COORDINATES	:	N 428,758 E 2,261,071 [HANCONV]
DATE DRILLED	:	Feb87
DEPTH DRILLED (GS)	:	140.0-ft
MEASURED DEPTH (GS)	:	137.5-ft, 23Aug93
DEPTH TO WATER (GS)	:	127.5-ft, 09Feb87 130.6-ft, 20Jun94
CASING DIAMETER	:	6-in, stainless steel, +2.2↔122.5-ft
ELEV TOP CASING	:	533.88-ft, [10May91-NGVD'29]
ELEV GROUND SURFACE	:	531.70-ft Brass cap [10May91-NGVD'29]
PERFORATED INTERVAL	:	Not applicable
SCREENED INTERVAL	:	122.5↔137.5-ft, 6-in stainless steel, #30-slot; 122↔137-ft, 10-in stainless steel telescoping, #40-slot
COMMENTS	:	FIELD INSPECTION, 24Aug93 6-in stainless steel casing. 4-ft by 4-ft concrete pad, 4 posts, 1 removable. Capped and locked, brass cap in pad with well ID. Not in radiation zone. OTHER;
AVAILABLE LOGS	:	Geologist, Driller
TV SCAN COMMENTS	:	Not applicable
DATE EVALUATED	:	Not applicable
EVAL RECOMMENDATION	:	Not applicable
LISTED USE	:	Central Landfill monthly water level measurement, 29Dec89↔20Jun94,
CURRENT USER	:	WHC ES&M w/l monitoring and RCRA samping, PNL sitewide sampling
PUMP TYPE	:	Hydrostar,
MAINTENANCE	:	

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool
Drilling Fluid Used: SM-2 well water
Driller's Name: D Ludtke/Joy
Drilling Company: Onwego Drilling Co
Date Started: 11Feb87

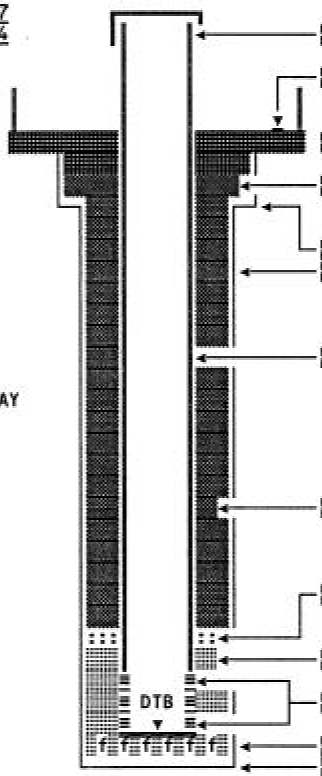
Sample Method: Drive barrel Hard tool
Additives Used: None documented
WA State Lic Nr: Not documented
Company Location: Kennewick, WA
Date Complete: 11Mar87

WELL NUMBER: 699-24-34B A5091
TEMPORARY WELL NO: SW-4
Hanford Coordinates: N/S N 23,879 E/W W 33,967
State Coordinates: N 429,094 E 2,261,297
Start Card #: Not documented T___ R___ S___
Elevation Ground surface: 531.27 Brass cap

Depth to water: 127.2-ft 11Mar87
(Ground surface) 130.3-ft 20Jun94

GENERALIZED STRATIGRAPHY
Geologist's Log
Sl=slightly

0↔13: Gravelly SAND
13↔19: Pebbly SAND
19↔22: SAND
22↔40: Pebbly SAND
40↔45: SAND
45↔50: Pebbly SAND
50↔55: Sl gravelly SAND
55↔60: Gravelly SAND
60↔87: SAND
87↔90: Gravelly SAND
90↔115: Sandy GRAVEL
115↔120: Sandy GRAVEL w/trace CLAY
120↔145: Sandy GRAVEL



Elevation of reference point: [533.50-ft]
(top of casing)
Height of reference point above ground surface [2.23-ft]
Depth of surface seal [0.0↔4.0-ft]
Type of surface seal
Cement grout to 4.0-ft
4 x 4-ft x 4-in concrete pad
15-in nominal hole, 0↔10-ft
11-in nominal hole, 10↔145-ft
6-in ID stainless steel casing, +2.2↔122.0-ft
Volclay grout, 4.0↔112.0-ft
Volclay pellets, 112.0↔118.0-ft
10↔20 and 8↔12-mesh silica sand pack, 118.0↔142.0-ft
6-in stainless steel screen, 122.0↔137.0-ft, #30-slot
Fill, 142↔145-ft
Borehole drilled depth: [145.0-ft]

DTB=Depth to bottom, 136.9-ft, 24Aug93

Drawing By: RKL/6N24W34B.ASB
Date : 14Sep94
Reference : HANFORD WELLS

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 699-24-34B

WELL DESIGNATION	:	699-24-34B
RCRA FACILITY	:	Central Landfill
CERCLA UNIT	:	Not applicable
HANFORD COORDINATES	:	N 23,879 W 33,967 [HANFORD WELLS]
LAMBERT COORDINATES	:	N 429,094 E 2,261,297 [HANCONV]
DATE DRILLED	:	Mar87
DEPTH DRILLED (GS)	:	145.0-ft
MEASURED DEPTH (GS)	:	136.9-ft, 23Aug93
DEPTH TO WATER (GS)	:	127.2-ft, 11Mar87 130.3-ft, 20Jun94
CASING DIAMETER	:	6-in, stainless steel, +2.2↔122.0-ft
ELEV TOP CASING	:	533.50-ft, [10May91-NGVD'29]
ELEV GROUND SURFACE	:	531.27-ft Brass cap [10May91-NGVD'29]
PERFORATED INTERVAL	:	Not applicable
SCREENED INTERVAL	:	122.0↔137.0-ft, 6-in stainless steel, #30-slot;
COMMENTS	:	FIELD INSPECTION, 24Aug93 6-in stainless steel casing. 4-ft by 4-ft concrete pad, 4 posts, 1 removable. Capped and locked, brass cap in pad with well ID. Not in radiation zone. OTHER;
AVAILABLE LOGS	:	Geologist, Driller
TV SCAN COMMENTS	:	Not applicable
DATE EVALUATED	:	Not applicable
EVAL RECOMMENDATION	:	Not applicable
LISTED USE	:	Central Landfill monthly water level measurement, 29Dec89↔20Jun94,
CURRENT USER	:	WHC ES&M w/l monitoring and RCRA samping, PNL sitewide sampling
PUMP TYPE	:	Hydrostar,
MAINTENANCE	:	

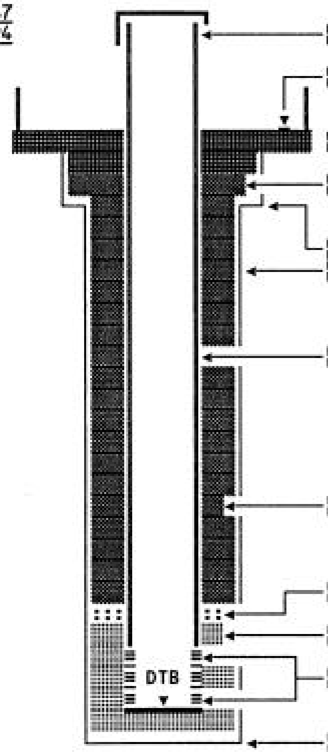
WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool	Sample Method: Drive barrel Hard tool	WELL NUMBER: 699-24-34C A5092 TEMPORARY WELL NO: SW-5
Drilling Fluid Used: Water	Additives Used: None documented	Hanford Coordinates: N/S N 24,257 E/W W 33,853
Driller's Name: D Ludtke/K Olson	WA State Lic Nr: Not documented	State Coordinates: N 429,472 E 2,261,410
Drilling Company: Onwego Drilling Co	Company Location: Kennewick, WA	Start Card #: Not documented T___ R___ S_______
Date Started: 02Mar87	Date Complete: 06Apr87	Elevation Ground surface: 530.67 Brass cap

Depth to water: 126.3-ft 16Mar87
(Ground surface) 129.6-ft 20Jul94

GENERALIZED STRATIGRAPHY Geologist's Log
Sl=slightly

0↔13: Pebbly SAND
13↔15: SAND
15↔18: Silty SAND
18↔20: Pebbly SAND
20↔25: SAND
25↔30: SAND w/PEBBLES
30↔33: Pebbly SAND
33↔35: SAND w/PEBBLES
35↔40: SAND
40↔43: SAND w/PEBBLES
43↔48: SAND
48↔60: Pebbly SAND
60↔75: SAND
75↔76: SAND w/PEBBLES
76↔80: Gravelly SAND
80↔139: Sandy GRAVEL



Elevation of reference point: [532.59-ft]
(top of casing)
Height of reference point above [1.92-ft]
ground surface
Depth of surface seal [0.0↔6.5-ft]
Type of surface seal
Cement grout to 6.5-ft
4 x 4-ft x 4-in concrete pad
15-in nominal hole, 0↔10-ft
11-in nominal hole, 10↔139.1-ft
6-in ID stainless steel casing,
+1.9↔121.0-ft
Volclay grout, 6.5↔111.0-ft
Volclay pellets, 111.0↔116.5-ft
10↔20 and 8↔12-mesh silica sand pack,
116.5↔139.0-ft
6-in stainless steel screen,
121.0↔136.0-ft, #30-slot
Borehole drilled depth: [139.1-ft]

DTB=Depth to bottom,
136.8-ft, 24Aug93

Drawing By: RKL/6N24W34C.ASB
Date : 14Sep94
Reference : HANFORD WELLS

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 699-24-34C

WELL DESIGNATION	:	699-24-34C
RCRA FACILITY	:	Central Landfill
CERCLA UNIT	:	Not applicable
HANFORD COORDINATES	:	N 24,257 W 33,853 [HANFORD WELLS]
LAMBERT COORDINATES	:	N 429,472 E 2,261,410 [HANCONV]
DATE DRILLED	:	Apr87
DEPTH DRILLED (GS)	:	139.1-ft
MEASURED DEPTH (GS)	:	136.8-ft, 24Aug93
DEPTH TO WATER (GS)	:	126.3-ft, 16Mar87 129.6-ft, 20Jun94
CASING DIAMETER	:	6-in, stainless steel, +1.9↔121.0-ft
ELEV TOP CASING	:	532.59-ft, [10May91-NGVD'29]
ELEV GROUND SURFACE	:	530.67-ft Brass cap [10May91-NGVD'29]
PERFORATED INTERVAL	:	Not applicable
SCREENED INTERVAL	:	121.0↔136.0-ft, 6-in stainless steel, #30-slot;
COMMENTS	:	FIELD INSPECTION, 24Aug93 6-in stainless steel casing. 4-ft by 4-ft concrete pad, 4 posts, 1 removable. Capped and locked, brass cap in pad with well ID. Not in radiation zone. OTHER;
AVAILABLE LOGS	:	Geologist, Driller
TV SCAN COMMENTS	:	Not applicable
DATE EVALUATED	:	Not applicable
EVAL RECOMMENDATION	:	Not applicable
LISTED USE	:	Central Landfill monthly water level measurement, 29Dec89↔20Jun94,
CURRENT USER	:	WHC ES&M w/l monitoring and RCRA samping, PNL sitewide sampling
PUMP TYPE	:	Hydrostar,
MAINTENANCE	:	

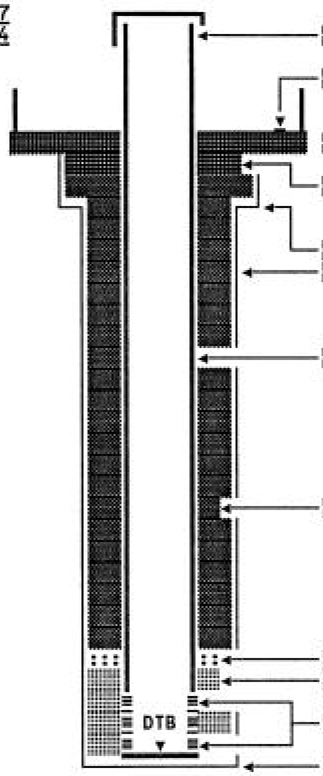
WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool	Sample Method: Drive barrel Hard tool	WELL NUMBER: 699-25-34C A5097 TEMPORARY WELL NO: SW-6
Drilling Fluid Used: Water	Additives Used: None documented	Hanford Coordinates: N/S N 24,752 E/W W 33,700
Driller's Name: H Joy/D Garcia	WA State Lic Nr: Not documented	State Coordinates: N 429,967 E 2,261,562
Drilling Company: Onwego Drilling Co	Company Location: Kennewick, WA	Start Card #: Not documented T___ R___ S___
Date Started: 10Mar87	Date Complete: 16Apr87	Elevation Ground surface: 533.35 Brass cap

Depth to water: 129.2-ft 10Apr87
(Ground surface) 132.2-ft 20Jun94

GENERALIZED STRATIGRAPHY | Geologist's Log

0↔12: SAND
12↔20: Pebbly SAND
20↔30: SAND
30↔55: Pebbly SAND
55↔58: Silty SAND
58↔90: Pebbly SAND
90↔95: Sandy GRAVEL
95↔100: Not documented
100↔105: Gravelly SAND
105↔115: Sandy GRAVEL
115↔130: Pebbly SAND
130↔143: Sandy GRAVEL



Elevation of reference point: [535.46-ft]
(top of casing)
Height of reference point above ground surface [2.11-ft]
Depth of surface seal [0.0↔3.7-ft]
Type of surface seal
Cement grout to 3.7-ft
4 x 4-ft x 4-in concrete pad
15-in nominal hole, 0↔10-ft
11-in nominal hole, 10↔141-ft
6-in ID stainless steel casing, +2.1↔124.2-ft
Volclay grout, 3.7↔114-ft
Volclay pellets, 114.0↔120.6-ft
10↔20 and 8↔12-mesh silica sand pack, 120.6↔142.0-ft
6-in stainless steel screen, 124.2↔139.5-ft, #30-slot
Borehole drilled depth: [143.0-ft]

DTB=Depth to bottom,
138.6-ft, 27Aug93

Drawing By: RKL/6N25W34C.ASB
Date : 14Sep94
Reference : HANFORD WELLS

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 699-25-34C

WELL DESIGNATION	:	699-25-34C
RCRA FACILITY	:	Central Landfill
CERCLA UNIT	:	Not applicable
HANFORD COORDINATES	:	N 24,752 W 33,700 [HANFORD WELLS]
LAMBERT COORDINATES	:	N 429,967 E 2,261,562 [HANCONV]
DATE DRILLED	:	Apr87
DEPTH DRILLED (GS)	:	143.0-ft
MEASURED DEPTH (GS)	:	138.6-ft, 23Aug93
DEPTH TO WATER (GS)	:	129.2-ft, 10Apr87 132.2-ft, 20Jun94
CASING DIAMETER	:	6-in, stainless steel, +2.1↔124.2-ft
ELEV TOP CASING	:	535.46-ft, [10May91-NGVD'29]
ELEV GROUND SURFACE	:	533.35-ft Brass cap [10May91-NGVD'29]
PERFORATED INTERVAL	:	Not applicable
SCREENED INTERVAL	:	124.2↔139.5-ft, 6-in stainless steel, #30-slot;
COMMENTS	:	FIELD INSPECTION, 27Aug93 6-in stainless steel casing. 4-ft by 4-ft concrete pad, 4 posts, 1 removable. Capped and locked, brass cap in pad with well ID. Not in radiation zone. OTHER;
AVAILABLE LOGS	:	Geologist, Driller
TV SCAN COMMENTS	:	Not applicable
DATE EVALUATED	:	Not applicable
EVAL RECOMMENDATION	:	Not applicable
LISTED USE	:	Central Landfill monthly water level measurement, 29Dec89↔20Jun94,
CURRENT USER	:	WHC ES&M w/l monitoring and RCRA samping,
PUMP TYPE	:	Hydrostar,
MAINTENANCE	:	

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