00 44994

PAGE

ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN 634619

Proj. ECN

2. ECN Category (mark one) Supplemental [] Direct Revision [X] Change ECN [] Temporary [] Standby [] Supersedure [] Cancel/Void []	3. Originator's Name, Organization, MSIN, and Telephone No. F. N. Hodges, PSS/HTS, H6-06, 376-4627		4. Date 12/29/95
	5. Project Title/No./Work Order No. Groundwater Monitoring Plan for the Solid Waste Landfill, Hanford, Washington	6. Bldg./Sys./Fac. No. SWL	7. Impact Level QE
	8. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-EN-AP-043, Rev. 0	9. Related ECN No(s). N/A	10. Related PO No. N/A

11a. Modification Work [] Yes (fill out Blk. 11b) [X] No (NA Blks. 11b, 11c, 11d)	11b. Work Package No. N/A	11c. Modification Work Complete N/A Cog. Engineer Signature & Date	11d. Restored to Original Condition (Temp. or Standby ECN only) N/A Cog. Engineer Signature & Date

12. Description of Change

See Attached.

AUG 1996 RECEIVED EDMC

13a. Justification (mark one)		Criteria Change	[]	Design Improvement	[]	Environmental	[X]
As-Found	[]	Facilitate Const.	[]	Const. Error/Omission	[]	Design Error/Omission	[]

13b. Justification Details

The changes bring the groundwater monitoring plan in line with changes in the groundwater monitoring network.

14. Distribution (include name, MSIN, and no. of copies)

See attached

RELEASE STAMP

AUG 07 1996

DATE: STA: 37 HANFORD RELEASE ID: 20

A-7900-013-2 (06/92) GEF095

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1) ~~172219~~ 634619

15. Design Verification Required	16. Cost Impact				17. Schedule Impact (days)	
	ENGINEERING		CONSTRUCTION			
[] Yes N/A	Additional	[] $ N/A	Additional	[] $	Improvement	[] N/A
[] No	Savings	[] $	Savings	[] $	Delay	[]

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]		[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request	[]		[]

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision
	N/A	

20. Approvals

Signature	Date	Signature	Date
OPERATIONS AND ENGINEERING		ARCHITECT-ENGINEER	
Cog Engineer F. N. Hodges *F. N. Hodges*	12/29/95	PE	
Cog. Mgr. J. S. Schmid *J. S. Schmid*	3/8/96	QA	
QA W. R. Thachaberry *W. R. Thackaberry*	3-8-96	Safety	
Safety		Design	
Environ. ~~D. W. Fritz~~ W. E. Toebe *[signature] for WET*	3-8-96	Environ.	
Other B. A. Williams *[signature]*	1/3/96	Other	
		DEPARTMENT OF ENERGY	
		Signature or Letter No.	
		ADDITIONAL	

Groundwater Monitoring Plan for the Solid Waste Landfill, Hanford, Washington

Floyd N. Hodges
Westinghouse Hanford Company, Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-87RL10930

EDT/ECN: 634619 UC: 630
Org Code: 8H200 Charge Code: R4069
B&R Code: EW3120100 Total Pages: 262

Key Words: Groundwater Monitoring, SWL

Abstract: This replacement brings the groundwater monitoring plan into line with changes in groundwater monitoring network to reflect new wells.

AUG 07 1996
DATE: HANFORD RELEASE
STA: 37
ID: 20

Janie Bishop 8-7-96
Release Approval Date

Release Stamp

Approved for Public Release

RECORD OF REVISION	(1) Document Number WHC-SD-EN-AP-043	Page 1

(2) Title
Groundwater Monitoring Plan for the Solid Waste Landfill, Hanford, Washington

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release (5) Cog. Engr.	(6) Cog. Mgr. Date
0	EDT-141960, 3/10/94		
0A RS	(7) Replace pages 3-1 through 3-6, 3-15, 3-19 (Rev. 0) with corrected pages and add well summary sheets for wells 699-22-35 and 699-23-34B (4 pages) (Rev. 0-A). ECN-634619	Floyd N. Hodges 7/26/96	D.G. Horton 7/30/96
		FN Hodges	DG Horton

A-7320-005 (08/91) WEF168

3.0 GROUNDWATER MONITORING PROGRAM

3.1 SUMMARY OF MONITORING PROGRAM HISTORY

Quarterly sampling was initiated in 1987 and has continued since that time with only one break. The site was not sampled between April 1990 and August 1991 because of the interruption in analytical work resulting from the cancellation of the U. S. Testing contract by PNL.

3.2 OBJECTIVES

The objectives of the groundwater monitoring program for the SWL are the following:

- To complete the downgradient compliance point monitoring network for the SWL
- To determine background groundwater quality
- To determine if hazardous waste or hazardous waste constituents that originate from the SWL are present in the groundwater above background levels.

3.3 APPROACH

The approach to establishing a groundwater monitoring system should be based on a knowledge of existing data, a knowledge of the uncertainties in the data and where information is lacking, and regulations governing the safe operation of the facility. In addition, DOE Order 5400.1, "General Environmental Protection Program," 1986, established groundwater protection management program requirements for DOE sites; in 1989 the Hanford Site established the Hanford Site Groundwater Protection Management Program (DOE/RL 1989), which established goals and objectives for the Hanford Site.

Two new compliance point wells have been installed to assess and improve the groundwater monitoring system around the SWL. These wells will provide information to help characterize the shallow hydrogeology at the landfill and determine the quality of groundwater near the top of the unconfined aquifer.

Six existing groundwater monitoring wells also will be utilized to evaluate groundwater quality at the SWL. Construction diagrams of the existing six wells are included in Appendix A. The submersible pumps with ABN sampling tubes, indicated in the construction diagrams, have been replaced with Hydrostar (a trademark of Instrumentation Northwest, Inc.) pumps with stainless steel sampling tubes. One well (699-24-35) was installed upgradient as a background well and five wells (699-25-34C, 699-24-34C, 699-24-34B, 699-24-34A, and 699-23-34) were installed as downgradient monitoring wells at the compliance point. In addition, Well 699-24-33, completed in 1948 and located approximately 150 m (500 ft) east (downgradient) of the SWL, will be monitored for indication and for historical continuity.

~~Subsurface sediment samples will be obtained during drilling at each location. These samples will be described and classified in the field, and specific samples may be submitted to a laboratory for analyses to determine various physical and chemical parameters. Vadose gas samples will be collected at 6.1 m (20 ft) intervals down to a depth of 36.6 m (120 ft) using the procedure outlined in WHC (1992b). Groundwater samples will be collected on reaching the water table in accordance with requirements of the RCRA quality assurance project plan (QAPP) (WHC 1993a). These samples will be analyzed for contamination indicator parameters (noted later in this section) before aquifer testing or disposal of purge water. If contamination is not detected above established guidelines, aquifer tests may be conducted to provide estimates of transmissivity and hydraulic conductivity of materials below the site.~~

~~Upon well completion, groundwater samples will be collected and analyzed quarterly from all new monitoring wells at the SWL. Quarterly sampling of the initial six monitoring wells started in 1987. Statistical evaluation of data for the required parameters and constituents will be initiated after one year of sampling of the new downgradient wells.~~

3.4 DETECTION LEVEL GROUNDWATER MONITORING SYSTEM

This section defines the aquifer that will be monitored, the location and justification of the monitoring wells, how the new wells will be installed, what hydrogeologic data will be collected, the frequency of sampling, and the groundwater constituents to be analyzed.

3.4.1 Uppermost Aquifer

The unconfined aquifer beneath the SWL is contained primarily within sediments of the Hanford formation and the Ringold Formation. The uppermost aquifer extends from the water table to the top of basalt. Hydrogeologic characterization activities are designed to obtain additional information on groundwater flow characteristics of the uppermost aquifer. The uppermost aquifer is discussed in more detail in Section 2.0.

3.4.2 Background Wells

One well (699-24-35) was installed upgradient as a background well to determine the background groundwater chemistry (Fruland et al. 1989). In addition, Well 699-26-35A, constructed as an upgradient well for the adjacent NRDWL, will be used as an upgradient well for the SWL.

3.4.3 Detection (Downgradient) Wells

Five wells (699-25-34C, 699-24-34C, 699-24-34B, 699-24-34A, and 699-23-34) were installed as downgradient detection wells (see Figure 2-9) in 1987. All five wells were designed for detection groundwater sampling in the top of the unconfined aquifer, with an approximately 3 m (10 ft) screened interval beneath the water table. Table 3-1 summarizes the construction details for the detection monitoring wells.

The two new wells are downgradient, top of the unconfined aquifer wells located approximately 15 m (50 ft) from the edge (boundary fence) of the landfill. This distance was chosen to allow adequate working space around the drill site and to be consistent with the compliance point defined by the existing wells. The new wells ~~will~~ have 10.7 m (35 ft) screened intervals to allow for expected decline of the water table.

3.4.4 Justification for Using Existing Monitoring Wells

To justify use of the existing wells as part of the groundwater monitoring system for the SWL, three aspects must be considered: (1) whether the wells are adequately located, (2) whether the wells will provide samples that are representative of the groundwater, and (3) whether the structural integrity of each well is adequate.

The wells were constructed specifically to be monitoring wells for the SWL, and their locations are adequate. The wells are constructed of stainless steel casing with stainless steel screens, which are relatively inert under existing groundwater conditions and should yield representative samples. The wells were constructed in 1987 with adequate annular, surface seals, and surface protection. They are structurally sound and meet the requirements of WAC 173-160.

3.4.5 ~~Proposed RCRA Monitoring Wells~~

~~The new groundwater monitoring wells to be constructed at the SWL will be *Resource Conservation and Recovery Act* (RCRA) standard wells constructed to the generic specification for groundwater monitoring wells (WHC 1992a). WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells," was used to set the basic design requirements.~~

~~Coordinates and construction details for these wells are contained in Table 3-2. Procedures for controlling the well site activities are given in the *Environmental Investigations and Site Characterization Manual*, WHC-CM-7-7 (WHC 1988) and listed in Table 3-3.~~

~~The new wells will probably be drilled with an air rotary rig. This technique allows rapid, cost effective drilling with collection of representative geological samples and the introduction of minimum contamination into the vadose zone and aquifer. If an air rotary rig is unavailable, the wells will be drilled using the cable tool method.~~

~~Drill cuttings will be routinely monitored for radiation and hazardous material in accordance with a site specific health and safety plan. Contaminated cuttings will be handled, transported, and disposed according to EII 4.2, "Interim Control of Unknown, Suspected Hazardous and Mixed Waste." If the level of contamination is significant enough to require changes in well design or well location, the Washington State Department of Ecology (Ecology) will be notified by WHC prior to making the changes.~~

~~Drill rigs and peripheral equipment (drill tools, cables, and temporary casing) will be steam cleaned before arriving on site, moving to a new site, and beginning construction of the next well, in accordance with EII 5.4, "Field Decontamination of Drilling, Well Development, and Sampling Equipment." The addition of water to the borehole will be kept to a minimum or avoided. This will minimize well development pumping after wells are completed and minimize the chances of driving any vadose zone contaminants into the groundwater.~~

~~Temporary carbon steel casing with a minimum diameter of 8 in. will be driven to total depth as each borehole is advanced. A temporary, 8-in.-diameter telescoping screen may be installed for aquifer testing, if necessary. After the borehole has been drilled to its total depth, the final well casing and screen will be installed, and the temporary carbon steel casing will be removed as the filter pack and annular seal materials are placed in the annular space. If a temporary screen is used, it will be left in place.~~

3.4.6 New Characterization/Monitoring Wells

Two new wells have been added to the existing monitoring system at the SWL. The new wells are downgradient, compliance point wells that ~~will~~ complete the shallow compliance point coverage around the south end of the site. ~~The two additional monitoring wells will be completed in the top 10.7 to 15.2 m (35 to 50 ft) of the unconfined aquifer. Estimated coordinates and construction details for these wells are presented in Table 3-2 and shown in Figure 3-1.~~

3.4.6.1 ~~**Justification for Planned Well Locations.** The need for the two new wells is indicated by both the configuration of the compliance point for the site and the chemistry of groundwater in the downgra~~dient wells. This section provides the justification for the additional wells.

3.4.6.2 Compliance Point. The compliance point is defined (WAC 173-303-645[6]) as a vertical surface located at the hydraulically downgradient limit of the waste management area that extends downward into the uppermost aquifer underlying the regulated units. In effect, the compliance point is defined by the array of downgradient wells located adjacent to the facility boundary. The compliance point along the east side of the SWL is defined by the line of downgradient wells located approximately 15 m (50 ft) east of the site boundary. The general flow direction for the site (130°-140° east of north) indicates that the point of compliance must include the southern boundary of the site (see Figure 3-1). With the new wells the compliance point well network ~~does not~~ adequately covers the south end of the site, including the southern boundary of the site.

3.4.6.3 Monitoring Efficiency Model. The Monitoring Efficiency Model (MEMO) was used to estimate the monitoring efficiency of the current compliance point monitoring network and the effect of adding two new downgradient wells. The MEMO model simulates contaminant plumes originating at a number of grid points within the site using the Domenico-Robbins method (Domenico and Robbins 1985), and determines whether the plume will be detected by a monitoring well before it travels some predetermined distance past the site boundary (buffer zone).

The percent of the area of the site over which a plume will be detected before it travels the predetermined distance past the site boundary is reported as the monitoring efficiency.

The MEMO model results for the existing downgradient monitoring network are presented in Figure 3-2. The site-specific parameters assumed for the calculation are a groundwater flow direction of 135° east of north, a transverse dispersivity of 3 m (10 ft), a limit of detection for the contaminant at 0.001 of the initial concentration when it entered the groundwater, and a buffer zone width of 150 m (500 ft). The dark areas on the map represent areas where a plume would not be detected prior to reaching the boundary of the buffer zone. The indicated monitoring efficiency for the network is 72.3%, indicating that plumes originating in over one-quarter of the site would be over 150 m (500 ft) past the site boundary before they were detected.

The MEMO model results for the existing monitoring network plus the two new downgradient wells are shown in Figure 3-3. The parameters for this computation were the same as for the case presented in Figure 3-2. In this case, the monitoring efficiency for the site is approximately 95% and the monitoring efficiency for the southern part of the site is comparable to the monitoring efficiency for the rest of the site.

3.4.6.4 ~~**Groundwater Chemistry.**~~ ~~A number of chemical components, including several chlorinated hydrocarbons, are higher than background in the southern four monitoring wells of the SWL downgradient network (Section 2.3.3.4) and apparently are a result of groundwater contamination by the SWL. The pH decreases southward along the line of downgradient wells. For many of these components, the highest values occur in the southernmost downgradient well (699-23-34). pH is lowest in Well 699-23-34. It is impossible to evaluate the observed trend and thus the magnitude of the impact of the SWL on groundwater without new wells to the south of the existing wells.~~

3.4.6.5 Justification for Deep Well. Two separate justifications exist for the deep well. Either justification would be sufficient for drilling the well; however, the second dictates the location of the proposed well.

The first justification is the lack of characterization data for the 450 feet of suprabasalt aquifer beneath the deepest well at the SWL. Without evidence to the contrary it must be assumed that this entire saturated thickness represents a single unconfined aquifer beneath the site. Regulations require characterization of the uppermost and all connected aquifers beneath the site.

The second justification is provided by the chlorinated hydrocarbons present in groundwater beneath the site. The source of the chlorinated hydrocarbons is uncertain and it cannot be ruled out that one or more DNAPL plumes exist in the aquifer beneath the site (DOE 199?). DNAPL's tend to migrate downward toward the base of an aquifer and to move lateraly downdip along any impermeable strata encounterd. A deep, downdip well is needed to determine whether or not DNAPL's are a problem at the SWL.

The SWL lies above the north flank of a syncline (Figure 2-6) and any dip in the underlying sediments will be to the south. Any DNAPL beneath the site would tend to migrate downdip toward the south; therefore, placing a deep well at the south (downdip) end of the site is analogous to placing downgradient shallow wells along the site compliance point.

3.4.7 Drilling and Well Construction

The existing groundwater monitoring wells for the SWL were installed in 1987 using the cable tool method. Construction diagrams for the existing well are presented in Appendix A. The two new wells were drilled~~, if possible,~~ using air rotary techniques. Air rotary is a rapid, clean-drilling technology that allows almost instantaneous collection of samples of the material being penetrated.

~~Drill cuttings are routinely monitored for radiation and hazardous material. If contamination is encountered, cuttings will be handled, transported, and disposed according to WHC procedures.~~

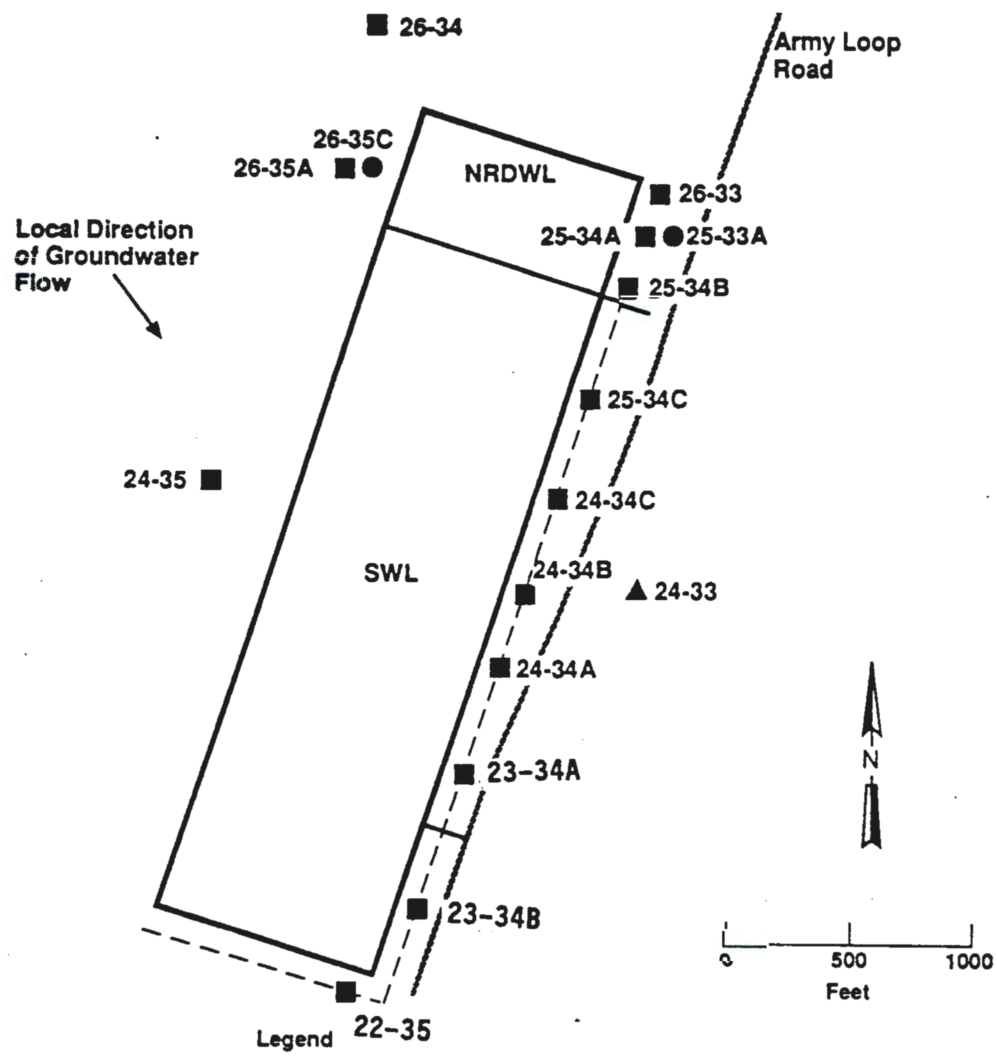
~~All groundwater recovered as a result of sampling, aquifer testing, and well development will be handled according to the appropriate WHC procedures for purge water.~~

~~To help prevent introduction of contaminants into the borehole, the drill rigs and peripheral equipment (e.g., drill tools, cables, and temporary casing) will be steam cleaned before they arrive onsite and between wells. During drilling in the zone to be sampled, the addition of water to the borehole will be avoided or kept to a minimum to minimize subsequent development pumping required to meet hydrochemical development criteria.~~

3.4.7.1 Well Construction. Procedures concerning geologic sampling are given in EII 5.2. Procedures for inspection of well construction are given in EII 6.7. Guidance for designing the wells was obtained from WAC 173-160. Quality Assurance requirements of the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party agreement) and WHC (1990) also apply. All shallow wells will be completed with 4-in. ID stainless steel casing and continuous-slot well screen. Final well screen lengths will be 10.7 m (35 ft) with 9.1 m (30 ft) below the water table. A variance for emplacement of the longer screen will be obtained from Ecology. This placement will permit sampling of the upper portion of the aquifer and will allow detection of any immiscible constituents that might be floating on the water table and any constituents in solution at the surface of the water table. It will also allow for fluctuations of the unconfined aquifer and should be sufficient for the full decrease in the water table that would result from termination of all activities in the 200 Areas. A schematic diagram of a typical groundwater monitoring well is presented in Figure 3-4.

The onsite cognizant engineer will determine the screen slot size and the filter pack size based on guidelines outlined in WHC (1993b, Vol. 4, Sec. 9.1). Sand filter packs will be placed in the annulus between the 20-cm (8-in.) telescoping screen or the temporary 20-cm (8-in.) casing and the permanent 10-cm (4-in.) casing and screen as the temporary casing is withdrawn. The sand filter pack will be placed from total well depth to 1 to 1.5 m (3 to 5 ft) above the top of the screen.

Figure 3-1. Location Map Showing Proposed New Monitoring Wells.



Legend

- ■ - Well completed at the top of the unconfined aquifer
- ● - Well completed in the upper Ringold Formation
- ▲ - Non-Resource Conservation and Recovery Act compliant well used for indication only
- — — · - Compliance point
- ~~⊟ - Proposed water table well~~
- NRDWL - Nonradioactive Dangerous Waste Landfill
- SWL - Solid Waste Landfill

Note : All wells prefixed by 699

39009048.3

Table 3-1. Construction Summary--The SWL Groundwater Monitoring Network.

Well Number	Date Completed	Depth Drilled[a]	Casing/Screen[b]	Screened Depth[a]	Depth to Water[a]	Date Measured
699-24-35[c]	2/87	146	SS/SS (6-in.)	128-143	132.3	2/87
699-25-34C	3/87	143	SS/SS (6-in.)	132-139	129	3/87
699-24-34C	3/87	141	SS/SS (6-in.)	121-136	126.3	3/87
699-24-34B	3/87	145	SS/SS (6-in.)	122-137	127	3/87
699-24-34A	2/87	142	SS/SS (6-in.)	123-138	127.5	2/87
699-23-34A	1/87	139	SS/SS (6-in.)	121-136	126	1/87
699-22-34	1/96	54.9(180)	SS/SS (4-in.)	37.3-47.9 (122-157)	38.1 (125)	1/96
699-23-34B	1/96	50.0(164)	SS/SS (4-in.)	37.5-46.6 (123-153)	38.1 (125)	1/96

[a]Approximate depths in meters (feet in parenthesis)
[b]SS--Stainless steel; CS--carbon steel; casing diameter in parentheses.
[c]Upgradient well.

~~Table 3-2. Construction Details--Proposed SWL~~

~~Well Number~~	~~Estimated Completion Date~~	~~Estimated Depth[a]~~	~~Casing/Screen[b]~~	~~Screen Length[a]~~	~~Estimated Coordinates[c]~~
~~NW-1~~	~~CY 1993~~	~~150~~	~~SS/SS (4 in.)~~	~~35~~	~~N 22,645 W 34,355~~
~~NW-2~~	~~CY 1993~~	~~150~~	~~SS/SS (4 in.)~~	~~35~~	~~N 22,350 W 34,595~~

~~[a]in feet.~~
~~[b]SS--Stainless steel; CS--carbon steel; casing diameter in parentheses.~~
~~[c]Hanford Coordinates~~

WELL SUMMARY SHEET

Boring or Well No. 699-22-35

Sheet 1 of 2

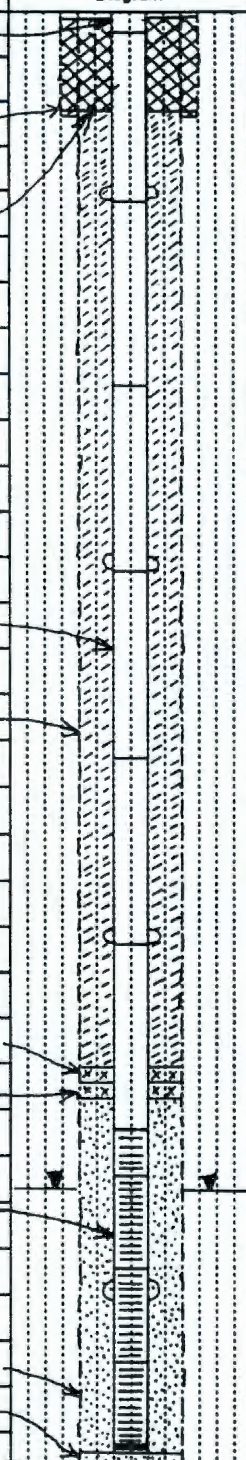
Location: Solid Waste Landfill

Project: WO-~~152~~ 137 1/11/94

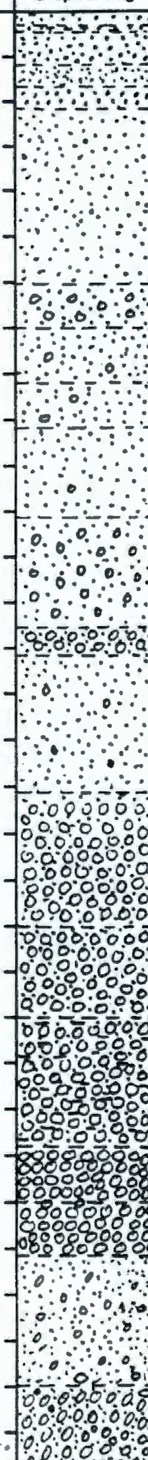
Prepared By: Andrew M. Templeton (Sign/Print Name) Date 12-21-93

Reviewed By: Edward C. Rafuse (Sign/Print Name) Date 02/10/94

CONSTRUCTION DATA — Diagram:



GEOLOGIC/HYDROLOGIC DATA — Graphic Log:



Construction Data: Description	Depth in Feet	Geologic/Hydrologic Data: Lithologic Description
Stickup = 2.6' Above grade	5	0-2 FT. SAND 10% VC 80% C 10% m-f-vf
TEMPORARY 12" CS CASING	10	2-2.4 FT. SAND & CARBONATE
SET AT 12.0' NO SHOE	15	2.4-6 FT. SAND 10% VC 80% C 10% m-f-vf
	20	6-8.5 FT. SAND 50% m 50% f-vf
Portland Cement Surface Seal	25	8.5-11.25 FT. SAND 30% VC 50% C 20% m-f-vf
2.0' to 11.0' Bgs	30	11.25-30 FT SAND 5% VC 30% C 50% m 10% fs 5% vf
	35	30-35 FT. Gravelly SAND
	40	35-41 FT. SAND
	45	41-46 FT. SAND
	50	46-56 FT. SAND
	55	
4½" Dia.	60	56-67.5 FT. Gravelly SAND
~~3½"~~ Type 304 Stainless Steel	65	
Well Casing +2.6' Ags to 122.4' Bgs	70	67.5-71 FT. Sandy GRAVEL
	75	
20 mesh Granular Bentonite	80	71-86 FT. SAND
11.0' to 115.1'	85	
	90	86-100 FT. Sandy GRAVEL
	95	
	100	
	105	100-110 FT. Sandy GRAVEL
	110	
3/8" Bentonite Pellets · 115.1' to 117.0'	115	110-124 FT. Silty Sandy GRAVEL
1/4" Bentonite Pellets · 117.0' to 119.0'	120	
129.3' - 1/11/94 STATIC WATER LEVEL	125	
10 slot type 304 Stainless Steel	130	124-130 FT. GRAVEL 1% silt
Well screen · 122.4' to 157.4'	135	130-136 FT GRAVEL 7% silt
Bottom cap set @ 157.7'	140	
	145	136-150 FT. Gravelly SAND
20-40 Sand · 119.0' to 158.0'	150	
10-20 Sand · 158.0' to 158.6'	155	150-165 FT. Sandy GRAVEL
Bentonite Holeplug · 158.6' to 164.4'		28% Sand 70% Gravel 2% Silt

A-6000-384 (01/93)

WELL SUMMARY SHEET

Boring or Well No. 699-22-35

Sheet 2 of 2

Location: Solid Waste Landfill

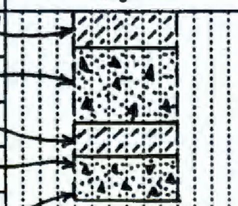
Project: W-~~167~~ 137 · SWL RCRA Groundwater Monitoring (initialed 2/14/94)

Prepared By: [signature] / John Flinn (Sign/Print Name) Date: 1/13/94

Reviewed By: Edward C. LaFuse [signature] / Edward C. LaFuse (Sign/Print Name) Date: 02/10/94

CONSTRUCTION DATA: Description	Depth in Feet	GEOLOGIC/HYDROLOGIC DATA: Lithologic Description
Bentonite Holeplug 158.6' to 164.4'		150'-165' Sandy GRAVEL
Slough 164.4' to 172.4'	165	165'-175' Sandy GRAVEL
Bentonite Holeplug 172.4' to 175.9'	170	50% Sand, 45% Gravel, 5% Silt
Slough 175.9' to 180.25'	175	175'-180.25' Sandy GRAVEL
8" Temporary Casing set at 179.65'	180	38% Sand, 60% Gravel, 2% Silt

Diagram:



Graphic Log:

A-6000-384 (01/93)

WELL SUMMARY SHEET

Boring or Well No. 699-23-34B

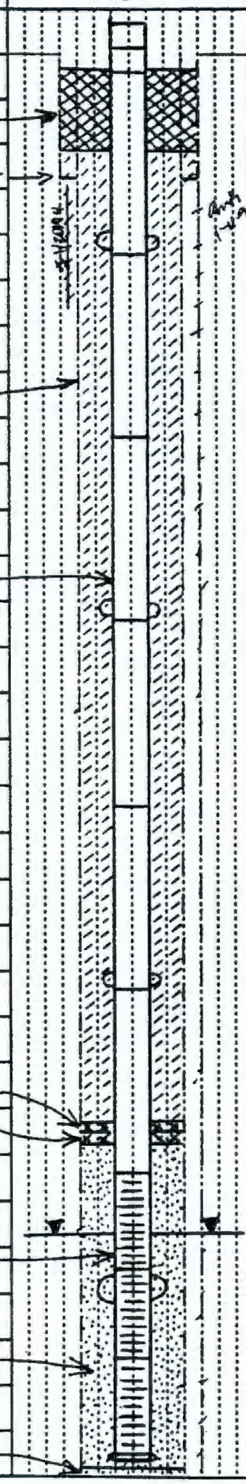
Sheet 1 of 2

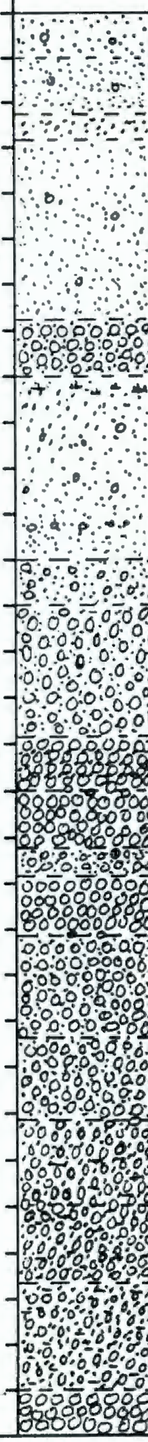
Location: SOLID WASTE LANDFILL

Project: W-~~152~~ 137 LDL 2/17/94

Prepared By: (signature) / ANDREW M. TEMPLETON (Sign/Print Name) Date 11-4-93

Reviewed By: (signature) / Edward C. Rotusk (Sign/Print Name) Date 02/07/94





Construction Data — Description	Depth in Feet	Geologic/Hydrologic Data — Lithologic Description
Stickup: 2.13' AGS	0	
Portland Cement Surface Seal - 2' to 10.3'	5	0-5 FT. SAND S
	10	5-12 FT. SAND S
12" TEMP. CS CASING SET AT 15 FT	15	12-14 FT. SAND S
	20	
	25	14-34 FT. SAND S
	30	
20 Mesh Granular Bentonite 10.3' to 116.3'	35	
	40	34-40 FT. Sandy GRAVEL sG
	45	
	50	40-60 FT. SAND S
	55	
4½" OD Type 304 Stainless Steel Well Casing + 2.13' AGS to 122.5'	60	
	65	60-65 FT. Gravelly SAND gS
	70	
	75	65-79 FT. Sandy GRAVEL sG
	80	
	85	79-85 FT. GRAVEL (Gravelly Sand Interbeds?)
	90	85-92 FT. GRAVEL G
	95	92-94 FT. Sandy GRAVEL
	100	94-101 FT. GRAVEL
	105	
	110	101-112 FT. Sandy GRAVEL
½" Bentonite Pellets 116.3' to 117.6'	115	
¼" Bentonite Pellets 117.6' to 119.2'	120	112-121 FT. Sandy GRAVEL
STATIC WATER LEVEL 127.2 - 1/20/94	125	121-130 FT Sandy GRAVEL
10 slot Type 304 Stainless Steel Well Screen 122.5' to 152.5'	130	130-138 FT Silty Sandy GRAVEL
	135	
	140	
20-40 Sand Pack 119.2' to 154.6'	145	138-150 FT Silty Sandy GRAVEL
10-20 Sand Pack 154.6 to 155.6	150	150-163.5 FT GRAVEL G

A-6000-384 (01/93)

WELL SUMMARY SHEET

Boring or Well No. 699-23-34B

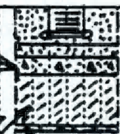
Sheet 2 of 2

Location SOLID WASTE LANDFILL

Project W-~~152~~ 137 LCL 3/18/94

Prepared By [signature] / ANDREW M. TEMPLETON (Sign/Print Name) Date 1-7-94

Reviewed By [signature] / EDWARD C. RAFUSE (Sign/Print Name) Date 02/07/94

CONSTRUCTION DATA: Description	Diagram	Depth in Feet	Graphic Log	GEOLOGIC/HYDROLOGIC DATA: Lithologic Description
Slough 155.6' to 157.7'		155		150-163.5FT. GRAVEL.
TEMP. 8" CS CASING SET		160		
AT 162.9 FT BGS		165		
Bentonite Holeplug 157.7' to 163.1'				BORING TERMINATED AT 163.5
Slough 163.1' to 163.5'				FT BGS
Bottom of Stainless steel Well				
(end cap) set @ 152.8'				

DISTRIBUTION SHEET

To	From	Page 1 of 1
DISTRIBUTION	F. N. Hodges	Date 12/27/1995
Project Title/Work Order		EDT No.
Groundwater Monitoring Plan for the Solid Waste Landfill, Hanford, Washington		ECN No. 634619

Name	MSIN	Text With All Attach.	Text Only	Attach./Appendix Only	EDT/ECN Only
D. J. Carrell	H6-22	X			
D. W. Fritz	H6-22	X			
D. M. Day	H6-06	X			
A. K. McDowell	R1-51	X			
F. N. Hodges	H6-06	(2)			
~~J. S. Schmid~~ D.C. Horton	H6-06	X			
W. R. Thackaberry	H6-32	X			
K. R. Fecht	H4-85	X			
J. Rugg	H4-86	X			
B. A. Williams	H6-06	X			
Central Files	A3-88	(2)			
EPIC	H6-08	(2)			