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Pacific Northwest
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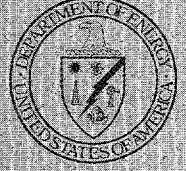
Borehole Data Package for 216-U-12 Crib Well 299-W22-79

D. G. Horton
B. A. Williams

March 1999



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

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Pacific Northwest National Laboratory
Richland, Washington 99352

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1.0 Introduction

One new Resource Conservation and Recovery Act (RCRA) groundwater monitoring well was installed at the 216-U-12 crib in September 1998 in support of Tri-Party Agreement (Ecology 1996) milestone M-24-36. The new well is 299-W22-79 and is a downgradient well in the groundwater monitoring network. There are a total of six wells in the groundwater monitoring network for the 216-U-12 crib and their locations are shown on Figure 1.

The groundwater assessment monitoring plan for the 216-U-12 crib (Chou and Williams 1993) describes the hydrogeology of the 200 West Area and the 216-U-12 crib area. An Interim Change Notice to the assessment plan provides justification for the well (Chou and Williams 1997). The new well was constructed to the specifications and requirements described in Washington Administrative Code (WAC) 173-160, and WAC-173-303, and in Chou and Williams (1997).

This document compiles information on the drilling and construction, well development, and permanent pump installation applicable to well 299-W22-79. Appendix A contains the geologist's log, the Well Construction Summary Report, and Well Summary Sheet (as-built diagram). Additional documentation concerning well construction is on file with Bechtel Hanford, Inc., Richland, Washington.

English units are used in this report because they are used by drillers to measure and report depths and well construction details. The conversion is made by multiplying feet by 0.3048 to obtain meters; or multiplying inches by 2.54 to obtain centimeters.

2.0 Well 299-W22-79

2.1 Drilling

Well 299-W22-79 was drilled using an air rotary rig in September 1998. The well was completed at a total depth of 286 ft below ground surface (bgs). Temporary 8 5/8 in.-outside-diameter, carbon steel casing was used during drilling from surface to total depth. No water was added to the well during drilling. Static water level was 241 ft bgs on September 30, 1998.

Sediments encountered during drilling were predominantly Hanford formation sand and silty sand from the surface to about 156 ft bgs; Plio-Pliestocene silt and sandy silt between 156 and 236 ft bgs; and Ringold Formation Unit E sandy gravel and gravelly sand between 236 ft and the bottom of the well (286 ft bgs). The geologists' log is included in Appendix A. Sediment samples were collected for geologic description and archival at approximately 10 ft intervals throughout the entire well. In addition, five grab samples of sediment were collected between 232 and 242 ft bgs for analysis of residual contamination remaining on sediment surfaces from a declining water table; no analyses have been done on these samples to date.

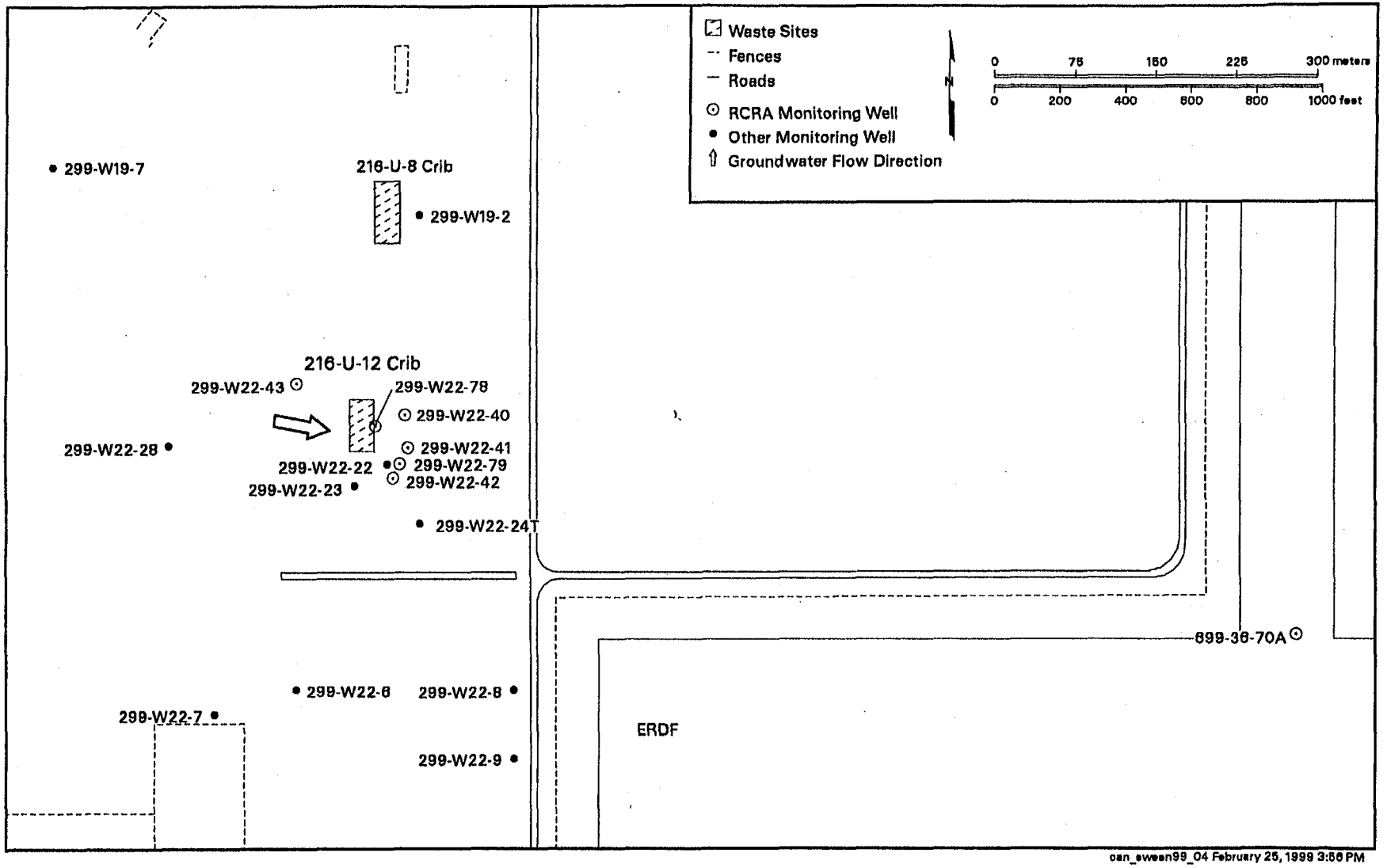

Figure 1. Locations of Wells in the Groundwater Monitoring Network at the 216-U-12 Crib

The borehole and drill cuttings were monitored regularly for organic vapors and radionuclide contaminants. One hundred counts per minute were measured on cuttings from about 230 ft bgs (below Plio-Pliestocene fine grained sequence) where the radiation control technologist put a temporary hold on drilling. A 2 L sample (sample number BOR1L8) was collected for analysis at this depth. The radiation detected was radon.

2.2 Well Completion

The permanent casing and screen were installed in well 299-W22-79 in September 1998. A 4-in.-diameter, stainless steel, continuous wire wrap (0.01 in. slot) screen was set from 242.7 to 277.8 ft bgs. The permanent casing is 4-in.-inner-diameter, stainless steel from 242.7 ft bgs to 2 ft above ground surface. Centralizers were placed above and below the screen and every 40 ft from the screen to ground surface. The bottom of the screen has a 4 in. end cap.

The filter pack is 20 to 40 mesh silica sand from 282.6 to 230.4 ft bgs; the annular seal is 0.25 to 0.38 in. dry bentonite chunks between 230.4 and 11.1 ft bgs. The remaining annulus (11.1 ft bgs to ground surface) was filled with Portland cement. An 8-in.-diameter carbon steel protective casing, with a locking cap, was set from 3 ft bgs to 3 ft above ground surface. A 4 ft by 4 ft by 6 in. concrete pad was placed around the well at the surface with 4 protective steel posts set into the concrete. A brass marker stamped with the well number was placed into the concrete. The Well Construction Summary Report and the Well Summary Sheet are included in Appendix A.

The vertical and horizontal coordinates of the well were surveyed in December 1998. The horizontal position of the well was determined by global positioning system observations referenced to horizontal control stations established by the U.S. Army Corps of Engineers. The coordinates are Washington Coordinate System, South Zone, NAD83/91 datum. Vertical datum is NAVD 1988 and is based on existing bench marks established by the U.S. Army Corps of Engineers. Survey data are included in Table 1.

Table 1. Survey Data for Well 299-W22-79

Well Name	Easting (m)	Northing (m)	Elevation (m)	
299-W22-79	567,629.5395	134,464.8455		Center of Casing
			211.7349	"X" on Casing
	567,629.5265	134,465.168	210.9408	Brass Cap

2.3 Well Development and Pump Installation

Well 299-W22-79 was developed on October 29, 1998. A temporary, 2 hp submersible pump was used to remove approximately 2,500 gal of formation water from the well at about 7 gal/min. The final turbidity was 12 NTU.

A dedicated Hydrostar sampling pump was installed in well 299-W22-79 on October 30, 1998. The sampling pump intake is at 261.50 ft depth relative to the brass cap (see Table 1) or approximately 20 ft below the water table.

3.0 References

Chou, C. J., and B. A. Williams. 1993. *Interim-Status Groundwater Quality Assessment Plan for the 216-U-12 Crib*. WHC-SC-EN-AP-108, Westinghouse Hanford Company, Richland, Washington.

Chou, C. J., and B. A. Williams. 1997. *Interim Change Notice to Interim-Status Groundwater Quality Assessment Plan for the 216-U-12 Crib*. ICN-WHC-SD-EN-AP-108.1R0, Westinghouse Hanford Company, Richland, Washington.

Ecology - Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy. 1996. *Hanford Federal Facility Agreement and Consent Order*. Document No. 89-10, Rev. 4 (The Tri-Party Agreement), Ecology, Olympia, Washington.

RCRA - Resource Conservation and Recovery Act. 1976. Public Law 94-580, as amended, 90 Stat. 2795, 42 USC 6901 et seq.

WAC 173-160, Washington Administrative Code. *Minimum Standards for Construction and Maintenance of Wells*. Olympia, Washington.

WAC 173-303, Washington Administrative Code. *Dangerous Waste Regulations*. Olympia, Washington.

Appendix

Well Construction and Completion Documentation

WELL CONSTRUCTION SUMMARY REPORT

Start Date: 9/24/98
Finish Date: 9/30/98

Specification No.: 01006-SWG-00008	Rev. No.: 1	Well Name: 299-W22-79	Temp. Well No.: B8552
ECNs: NA		Approximate Location: ¼ mile South of U-Plant, 200W	
Project: 1998 RCRA Drilling		Other Companies: CH2M Hill	
Drilling Company: Layne Christensen		Geologist(s): L.D. Walker, D.C. Weekes, K.M. Singleton, J.M. Faurste	
Driller: W. Franklin			

TEMPORARY CASING AND DRILL DEPTH

*Size/Grade/Lbs. Per Ft.	Interval	Shoe O.D./I.D.
Carbon steel (FJ)	0 - 285'	8 5/8" / 8"
	-	
	-	
	-	
	-	

*Indicate Welded (W) - Flush Joint (FJ) Coupled (C) & Thread Design

DRILLING METHOD/HOLE DIAMETER

Auger:	Diameter From ____ to ____
Cable Tool:	Diameter From ____ to ____
Air Rotary: Tubex (9")	Diameter From 0' to 286'
A.R. w/Sonic:	Diameter From ____ to ____
	Diameter From ____ to ____
	Diameter From ____ to ____
	Diameter From ____ to ____

Drilling Fluid: None

Total Drilled Depth: 286'	Hole Dia @ TD: 9"	Total Amt. Of Water Added During Drilling: None	
Well Straightness Test Results: NA		Static Water Level: 241.91	Date: 9/30/98

GEOPHYSICAL LOGGING

Sondes (type)	Interval	Date	Sondes (type)	Interval	Date
	-			-	
	-			-	
	-			-	

COMPLETED WELL

Size/Wt./Material	Depth (277.8)	Thread	Slot Size	Type	Interval Annual Seal/Filter Pack	Volume (ft³)	Mesh Size
4" ID Type 304 ss riser	2'sg. - 242.7	✓	NA	Portland cement	0' - 11.1'	6.4	NA
4" ID Type 304 ss screen	242.7' - ~~267.6~~	✓	0.010-in	Dry bentonite (¼" + ⅜" pelleted chunks)	11.1' - 230.4'	64.3	NA
4" ID Type 304 ss end cap	~~288~~ 277.8' 278.1'	✓	NA	Colorado Silica Sand	230.4' - 282.6'	35.8	20-40
	-			Slough	282.6' - 286'	NA	NA
	-				-		

OTHER ACTIVITIES

Aquifer Test:	Date:	Well Abandoned:	Yes:	No: ✓	Date:
Description:		Description:			

WELL SURVEY DATA

Date:	Protective Casing Elevation:
Washington State Plane Coordinates:	Brass Cap Elevation:

COMMENTS/REMARKS

Assumptions: 1-100# sack of 20-40 mesh Colo. silica sand = 1.12 ft³, ¼" + ⅜" bent pellets yields 0.62 ft³/bucket, 1-50# sack of medium bentonite chunks = 0.69 ft³, 1-94# sack of portland cement yields 1.285 ft³. 8" carbon steel protective casing 3' above ground ±3' below

Reported By: DC Weekes		Reported By: EC LaFlex	
Title: Geologist	Date: 9/30/98	Title: Field Engineer (BHI)	Date: 10/2/98
Signature: DC Weekes		Signature: EC LaFlex	

BHI-EE-181 (12/97)

WELL SUMMARY SHEET

Page 1 of 1

Date: 9/30/98

Well ID: B8552		Well Name: 299-W22-79	
Location: ¼ mi South of U-Plant, 200W		Project: 1998 RCRA Drilling	
Prepared By: DC Weekes	Date: 9/29/98	Reviewed By: EC Rafuse	Date: 10/02/98
Signature: DC Weekes		Signature: EC Rafuse	

CONSTRUCTION DATA

Description	Diagram
8" carbon steel protective casing 3' a.g. to 3' bgs.	
4" ID Type 304 stainless steel riser: 2' a.g. – 242.7'	
4" ID Type 304 stainless steel continuous wire wrap screen (0.010-in slot): 242.7' – 277.8'	
Portland cement 0' – 11.1'	
Dry bentonite (¼" & 3/8" pellets and medium chunks): 11.1' – 230.4'	
Colorado Silica Sand (20-40 mesh): 230.4' – 282.6'	
Slough 282.6' – 286.0'	
SS Centralizers above and below the screen and every 40 ft and as indicated	
Water level (9/30/98): 241.91'	
All temporary casing removed.	
All depths are in ft below ground	

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description
0		
		0'-12': Silty SAND
		12'-34': Gravelly SAND
		34'-94': SAND
50		
		thin layers of silty sand 76'-78'
		thin layers of silty sand @ 85' & 88'
100		94'-98': Silty SAND
		98'-104': SAND
		104'-125': Silty SAND
		125'-128': SAND
		128'-132': Silty SAND
150		132'-138': SAND
		138'-156': Silty SAND
		156'-161': SILT
		161'-187': Sandy SILT
		187'-194': Silty Sandy GRAVEL
200		194'-226': Sandy SILT
		226'-236': SAND
		236'-238': Slightly Silty Gravelly SAND
250		238'-245': Gravelly SAND
		245'-270': Sandy GRAVEL
		270'-286': Silty Sandy GRAVEL
		TD @ 286' 9/26/98

BHI-EE-189 (12/97)

BOREHOLE LOG

Boring or Well No. 299-W22-79/B8552

Sheet 1 of 4

Location 200 W; ~ 1/4 mile south of U Plant Project RCRA Drilling 1998

Prepared By L.D. Walker (Sign/Print Name) Date 9-24-98 Reviewed By Edward Rohrer/Erwin Rohrer (Sign/Print Name) Date 10/02/98

Depth	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description: Group Name, Group Symbol, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
0	Tubex (Odex)	NA		0'–12': Silty SAND (mS) (75% sand, 25% silt), Sand 10% med, 40% fn, 50% v. Fn; 10YR6/2 (lt. brn gray) dry, mod sort, sub-ang; 20% basalt, 80% qtz & other, tr mica, mod rxn to HCl	8 5/8" OD CS casing; 8" Odex bit makes 9 1/8" bore
10				12'–34': Gravelly SAND (gS) (15% gravel, 85% sand, tr silt); gravel tr med, 50% Fn, 50% v.Fn peb; sand 40% v.cse, 40% cse, 20% med-v.Fn, 10YR5/1 (gray), dry mod. sorted, sub-ang to sub round, (gravel is rounded); 40% basalt 60% qtz & other, tr mica, max. size 15 mm, sl rxn to HCL	OVM, LEL < detect.
20					drill rate 10 Ft/4 min.
30					
40				34'–94': SAND (S) (tr gravel, 100% sand, tr silt) Sand description similar to above - well sorted, no rxn to HCl 40-50% basalt	
50				thin layers gravelly sand at 44', 48' gravel Fn-v.fn pebs	
60				50': Sand is Finer; 20% v.cse 30% cse, ~~20~~ 40% med, 10% fn-v.fn. weak rxn to HCl	
70				55': sand is coarser: v.cse-cse, tr gravel	g, B, X < detectable
				70': sand cse-med	
				76'-78': thin layers of silty sand silt has strong rxn to HCl	

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BOREHOLE LOG

Boring or Well No. 299-W22-79 / 88552

Sheet 2 of 4

Location 200 W, ~1/4 mile south of U Plant

Project RCRA Drilling 1998

Prepared By LD Walker / L.D. Walker (Sign/Print Name) Date 9-24-98

Reviewed By EC Reynolds / EC Reynolds (Sign/Print Name) Date 10/22/98

Depth (80 Ft)	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description: Group Name, Group Symbol, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
	Tubex (Odex)	NA		SAND - med to cse, as above	8 5/8" OD CS casing
					8" Odex bit makes 9 1/8" bore
				85', 88': thin layers of silty sand	
90					
				94' - 98': Silty SAND (mS) (75% sand, 25% silt) Sand is 40% Fn, 60% v. Fn; 10YR6/3 (pale brn) dry, well sorted, sub ang; 80% qtz, 10% basalt, 10% other, weak rxn to HCl, tr mica.	
100					
				98' - 104': SAND (S) (tr gravel, 90% sand, 10% silt), gravel is Fn - v. Fn pcb, sand 20% v.cse, 40% cse, 40% med-v.fn, 10YR5/1 (gray), dry, mod sorted, sub-ang; 60% qtz, 40% basalt	a, β, δ < detect
110					OVM, LEL < detect
				104' - 125': Silty SAND (mS) (75% sand, 25% silt) sand 40% Fn, 60% v. Fn; 10YR6/3 (pale brn) sl. moist, well sorted, sub ang, 80% qtz, 10% basalt, 10% other, tr mica strong rxn HCl	
120					
				125' - 128': SAND (S) similar to 98' → 104'	
130				128' - 132': Silty SAND (mS) similar to mS 104' → 125'	
				132' - 138': SAND (S) med-cse	
				138' - 156': Silty SAND (mS) tr clay, thin beds	
140					
				tr thin beds med-Fn sand	
150					
				156' - 161': SILT (M) tr v.Fn sand 10YR5/3 (brn) wet color	drilling becomes tight at 156'

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BOREHOLE LOG	Boring or Well No. 299-W22-79 / B8552
	Sheet 3 of 4

Location 200 W; ~1/4 mile south of U Plant Project RCRA Drilling 1998

Prepared By [signature] / L.D. Walker (Sign/Print Name) Date 9-24-98 Reviewed By [signature] / E.C. Rafiee (Sign/Print Name) Date 10/02/98

Depth (160 ft)	Sample: Type and No.	Sample: Blows or Recovery	Graphic Log	Sample Description (Group Name, Group Symbol, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level)
	Tubex	NA		161'–187': Sandy SILT (sM)	8 5/8" OD CS casing
	(Odex)			(20% sand, 80% silt) Sand 100%	8" Odex bit makes 9 1/8" bore
				v. fn, 10YR5/3 (brn), sl. moist	
				well sorted, tr mica, tr basalt,	drill rate 10 Ft/19 min.
170				strong rxn to HCl - calcareous	
				max particle size ~0.1 mm	
180					
				187'–194': Silty Sandy GRAVEL	
				(msG) (50% gravel, 40% sand,	
				10% silt), gravel round, cse-med peb,	
190				sand med-fn, poorly sorted, 10YR5/3	
				(brn), caliche coating on gravel	
				194'–226': Sandy SILT (sM)	
				(20% sand, 80% silt) sand 100% v. fn.	
				10YR 5/3 (brn) sl moist, well sorted	
200				weak rxn HCl ~~below~~ above 200', strong ~~above~~ below 200'	
				203': tr gravel	
210					
					End shift 9-24-98
220					9/25/98
				226'-236' [initials] 9-25-98	
				~~226'-236'~~ lt gy-brn to tan vf to f grained	
				~~slightly sty~~ sand. Mod-well sorted,	
230				sub round to round. ~95% sand,	~100 cpm : RCT puts "hold"
				5% st. The unit is dry, and has NO	on drilling until resolved.
	Grab			rxn to HCl. It is micaceous, and	Maybe Radon (0929)
	Grab			the grains are quartz, with <5%	1239 hrs 9/25/98: Sample BOR1L8
	Grab			being basalt, or mafic.	(26) for analysis; BOR1L9 as Archive,
240	Grab				if necessary.

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BOREHOLE LOG

Boring or Well No. 299-W22-79

Sheet 4 of 4

Location 1/4 mi south of U-Plant, 200 West Project RCRA Drilling 1998

Prepared By JM Faurot / JM Faurot (Sign/Print Name) Date 9/25/98 Reviewed By EC Ryglew / EC Ryglew (Sign/Print Name) Date 10/07/98

Depth (ft)	Sample Type and No.	Sample Blows or Recovery	Graphic Log	Sample Description (Group Name, Group Symbol, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level)
	Grab	NA		236-238 Slightly Silty Gravel SAND (mGS), 10YR5/4 yellowish brown	MPS = Max Particle size
				80% Sand-m, 10% Gravel, >10% Silt	Grab samples from 32'-42'
				Moist, poorly sorted, ANG, RXC-weak,	shall likely be used to evaluated
250				95% Q+Feld, 5% others, MPS = 4mm	chemistry associated with the
				<1% mica	high groundwater elevation/depth.
				245'	
				238'- Gravelly SAND (gS)	
				10YR6/4 light yellow brown (75%	
260				Sand, 20% Gravel, ~5% silt, moist,	
				~~poorly~~ 9-22-98 poorly sorted, ANG, RXC-none	
				95% Qtz+Feld, 5% others, MPS=	
				25mm <1% mica	
				245'-270' Sandy Gravel (sG)	OVM, LEL, Rad Below action levels
270				10YR6/4, light yellow brown, 45% Gravel	
				52% Sand, >3% Silt moist, very	
				poorly sorted, RXC-none 85%	
				Qtz+Feld, 15% other - MPS estimated	
280				<6.4mm, ANG	
				270'-286' Silty Sandy Gravel (msG)	
				10YR4/6 dark yellowish brown, 60% Gravel	
				30% Sand, 10% silt, moist, very poorly	
				sorted, RXC+D acid-none, 80-90% Qtz+Feld	
				10-20% other, MPS estimated <6.4mm, ANG	OVM, LEL, Below action levels
				286 TD	

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