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Revision 0

Borehole Summary Report for Wells 299-E24-24 (C4647) and 299-E17-26 (C4648), Integrated Disposal Facility

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

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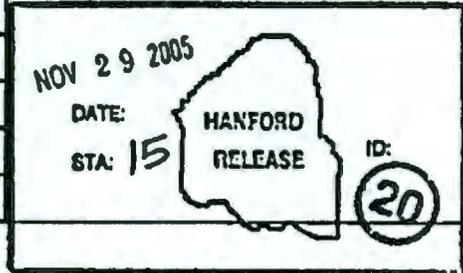
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ACRONYMS

bgs	below ground surface
btoc	below the top of casing
bwt	below the water table
CHG	CH2M Hill Hanford Group, Inc.
DOE-RL	U.S. Department of Energy, Richland Operations Office
DOW	Description of Work
DQO	Data Quality Objective
EPA	U.S. Environmental Protection Agency
FH	Fluor Hanford, Inc.
gpm	gallons per minute
ID	inside diameter
IDF	Integrated Disposal Facility
NTU	Nephelometric Turbidity Unit
OD	outside diameter
psi	pounds per square inch
QA	Quality Assurance
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
ROD	record of decision
SGLS	Spectral Gamma Logging System
SOW	Statement of Work
TOC	top of casing
WAC	<i>Washington Administrative Code</i>

METRIC CONVERSION CHART

Into Metric Units			Out of Metric Units		
<i>If You Know</i>	<i>Multiply By</i>	<i>To Get</i>	<i>If You Know</i>	<i>Multiply By</i>	<i>To Get</i>
Length			Length		
inches	25.4	millimeters	millimeters	0.039	inches
inches	2.54	centimeters	centimeters	0.394	inches
feet	0.305	meters	meters	3.281	feet
yards	0.914	meters	meters	1.094	yards
miles	1.609	kilometers	kilometers	0.621	miles
Area			Area		
sq. inches	6.452	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.093	sq. meters	sq. meters	10.76	sq. feet
sq. yards	0.0836	sq. meters	sq. meters	1.196	sq. yards
sq. miles	2.6	sq. kilometers	sq. kilometers	0.4	sq. miles
acres	0.405	hectares	hectares	2.47	acres
Mass (weight)			Mass (weight)		
ounces	28.35	grams	grams	0.035	ounces
pounds	0.454	kilograms	kilograms	2.205	pounds
ton	0.907	tonne	tonne	1.102	ton
Volume			Volume		
teaspoons	5	milliliters	milliliters	0.033	fluid ounces
tablespoons	15	milliliters	liters	2.1	pints
fluid ounces	30	milliliters	liters	1.057	quarts
cups	0.24	liters	liters	0.264	gallons
pints	0.47	liters	cubic meters	35.315	cubic feet
quarts	0.95	liters	cubic meters	1.308	cubic yards
gallons	3.8	liters			
cubic feet	0.028	cubic meters			
cubic yards	0.765	cubic meters			
Temperature			Temperature		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius	Celsius	multiply by 9/5, then add 32	Fahrenheit
Radioactivity			Radioactivity		
picocuries	37	millibecquerel	millibecquerel	0.027	picocuries

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1.0 INTRODUCTION

This report describes the fiscal year 2005 field activities associated with the installation of two monitoring wells drilled in the 200 East Area to support the Integrated Disposal Facility (IDF) groundwater monitoring network. These wells were installed for Fluor Hanford, Inc. (FH) in accordance with *Hanford Federal Facility Agreement and Consent Order*, Milestone M-24-57 (Ecology et al. 1989), the *Resource Conservation and Recovery Act of 1976* (RCRA), and the appropriate Description of Work (DOW) document (FH 2004b).

Documents supporting field activities as well as procedures followed during borehole characterization and well construction are listed in Section 7.0 of this document (References).

1.1 PURPOSE AND SCOPE

The primary purpose of this field effort was to install two compliance monitoring wells in the 200 East Area. These wells, located to the west and southwest of PUREX, will serve as monitoring wells to support the IDF groundwater monitoring network. A summary of the new wells is provided in Table 1-1 and the well locations are shown in Figure 1-1.

The scope of activities described in this report includes the technical data that encompasses the drilling of two boreholes and related well construction. Additional scope of work described in the report includes waste management and subsurface descriptions.

These boreholes were completed as RCRA compliance monitoring wells for CH2M Hill Hanford Group, Inc. (CHG).

Table 1-1 Drilling Summary of Boreholes and Wells.

Well ID	Area	Drilling Date		Northing (m)	Easting (m)	Ground Surface Elevation ^a (Brass Cap) (m)	Total Depth (feet bgs)
		Start	Finish				
C4647	200 East	5/9/05	5/26/05	135459.30	574179.77	220.483	364
C4648	200 East	5/23/05	6/29/05	135025.06	574662.61	224.430	379

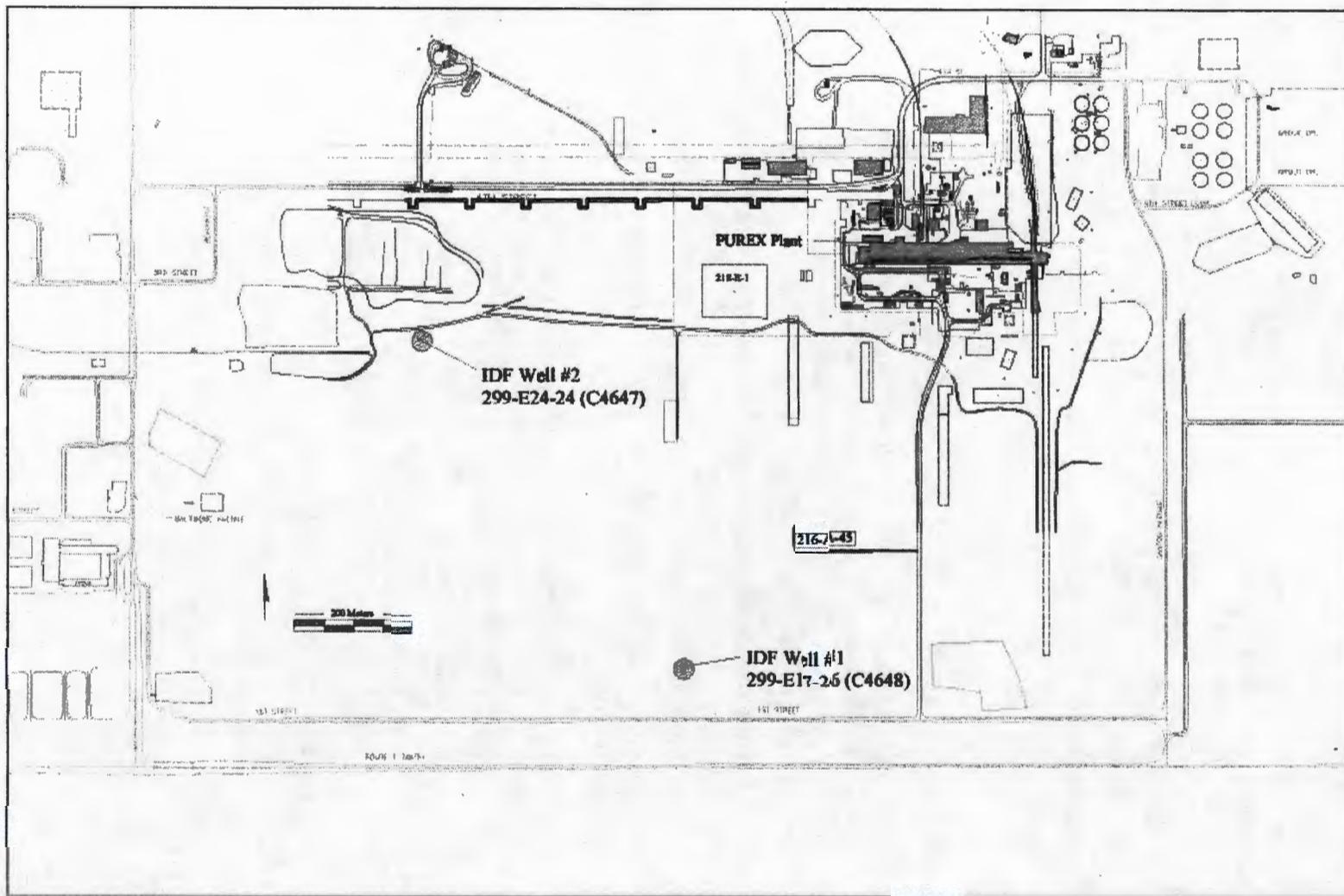
Notes:

Northing and easting coordinates are based on Washington State Plane Coordinates North American Datum of 1983 (NAD83[91]) rounded to 1 m.

^aNorth American Vertical Datum of 1988 (NAVD88) values rounded to 0.001 m.

bgs = below ground surface.

Figure 1-1 Location Map for IDF Monitoring Wells.



1-2

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2.0 TECHNICAL DATA

This section describes the methods used to drill and install, and develop wells in addition to the waste handling activities related to drilling.

2.1 IDF MONITORING WELL NETWORK

This section provides technical details of the drilling methods, well completion, well development, and pump installation activities performed during construction of the two groundwater compliance monitoring wells for the Integrated Disposal Facility (see Figure 1-1). Drilling data are presented in Table 1-1 and well summary information is located in Appendices A through D.

2.1.1. Well 299-E24-24 (C4647)

This section summarizes activities related to the drilling, sampling, and construction of groundwater compliance monitoring well 299-E24-24 (C4647).

2.1.1.1. Drilling Summary

Drilling of Well 299-E24-24 (C4647) began on May 9, 2005 using a diesel hammer (Becker Hammer drill rig) driving 9x6 inch dual wall temporary casing. The casing advanced to 364.0 feet below ground surface (bgs), with the total depth (TD) at 364.0 feet bgs reached on May 11, 2005. The static groundwater level was reached on May 10, 2005 at 322.7 feet bgs. It should be noted that groundwater depths based on drilling returns were likely artificially depressed by the high air injection rates required to lift coarse gravels encountered during dual wall percussion drilling.

2.1.1.2. Sampling Summary

Archive samples (1-pint jars) were collected for CHG at five-foot intervals. Also, five-foot interval samples were placed in plastic chip trays. A total of two split spoon samples were collected for sieve tray analysis. The first split spoon was collected on May 10, 2005 from 329.5 to 331.1 feet bgs, 6.7 feet below the water table (btw). The second split spoon sample was collected on May 11, 2005 from 354.5 to 356.2 feet bgs, which is 31.8 feet bwt. Table 2-1 summarizes the sampling for Well 299-E24-24 (C4647).

Table 2-1 Summary of Sampling at Well 299-E24-24 (4647).

Sampling Method	Sample Media	Collection Date	Sample Depth (ft bgs)	Sample Depth (ft bwt)
Split Spoon	Sediment	5/10/05	329.5 to 331.1	6.7
Split Spoon	Sediment	5/11/05	354.5 to 356.2	31.8

Notes:

bgs = below ground surface

bwt = below the water table

ft = feet

2.1.1.3. Well Construction

Well construction materials, filter pack installation, initial well development, and annular seal for Well 299-E24-24 (C4647) are discussed below. A straightness test was performed using a 4.5-inch outer diameter (OD), 20 foot-long tool prior to well completion activities. Construction and completion of this well were carried out on May 13, 16, 17, and 24, 2005. Well completion summary data are provided in Table 2-5 and well construction summary sheets are presented in Appendix D.

- **Screen, Riser Casing, and Filter Pack.** Stainless steel screen and riser materials were chosen for this well, consisting of 4-inch inner diameter (ID), 20-slot (0.020-inch), continuous v-wire wrap, Type 304L stainless steel screen, 35.00 feet in length; a 4-inch ID, Type 304L stainless steel sump, 2.00 feet in length; and a 4-inch ID, Type 304L stainless steel casing. Filter pack material consists of 10-20 mesh Colorado silica sand. These selections were based on hydrogeology encountered during drilling, as well as information from nearby wells. The bottom of the stainless steel sump was placed at 358.4 feet bgs and the bottom of the stainless steel screen was set at 356.4 feet bgs while the top of the screen was set at 321.4 feet bgs. The top of the stainless steel riser casing was set 2.0 feet above ground surface. The top of the stainless steel protective casing was set 2.4 feet above the concrete pad (approximately 3.0 feet above ground surface). The annular space between the stainless steel screen and the sediments in the borehole was filled with 10-20 mesh filter pack sand from total depth of 364.0 feet bgs to 310.9 feet bgs (10.5 feet above the top of the screen).
- **Filter Pack Installation and Initial Well Development.** The filter pack installation and initial well development process consisted of introducing silica sand into the annular space around the screen and settling the filter pack to eliminate void spaces. Development of the well removed fines in the newly constructed well and reconditioned the borehole walls to minimize effects of drilling, primarily due to air injection and caving. A dual-flange surge block was used to develop and settle the sand filter pack in the annular space between the screen and the borehole walls. Surging was carried out in three stages, with the first stage of surging developing the bottom portion of the screen (about 357 feet bgs to 337 feet bgs). The second stage of surging developed the middle portion

of the screen (about 348 feet bgs to 337 feet bgs), and the third stage of surging developed the upper portion of the screen (about 337 feet bgs to 322 feet bgs). Overlap between the filter sand and temporary casing was maintained throughout so that unconsolidated formation sediments would not cave and come in direct contact with the well screen. The level of the filter pack was measured periodically with a weighted tape to monitor overlap and determine when the settling rate within the filter pack had decreased to less than 0.1 feet over a period of 15 minutes. The bottom portion of the sand filter pack was surged for 71 minutes, with stability achieved after surging for 56 minutes. The middle portion of the sand filter pack was surged for 60 minutes, with stability achieved after surging for 45 minutes. The upper portion of the sand filter pack was subsequently surged for 65 minutes, with stability achieved after surging for 50 minutes.

- **Annular Seal.** An annular seal was constructed above the filter pack using bentonite pellets, extending from 310.9 feet bgs to 305.5 feet bgs. The bentonite pellets were followed by granular bentonite from 305.5 to 11.3 feet bgs. Additionally, a cement grout surface seal was installed from 11.3 feet bgs to ground surface, consisting of Portland cement and approximately 2% by weight ground bentonite.

2.1.1.4. Final Well Development and Pumping Test.

Final well development for 299-E24-24 (C4647) was performed on May 25, 2005, in accordance with CP-GPP-EE-01-6.3, "Well Development and Testing". A 5-HP Franklin electric submersible pump was used to develop the well in two intervals until turbidity was less than 5 Nephelometric Turbidity Units (NTU) and other water parameters including temperature and conductivity had stabilized. Water level drawdown during development was monitored continuously using a 20 pounds per square inch (psi) pressure transducer and was recorded with an In-Situ Hermit 3000 datalogger.

Since the well screen is greater than 20 feet in length, the Statement of Work (SOW), RFP-115806 (FH 2004c), states that the final well development should be performed in 2 stages. During the first stage of development, the pump intake was located at 353.7 ft. below the top of casing (btoc) or 350.7 feet bgs. There were two unsuccessful drawdown tests prior to the successful drawdown test which produced a flow rate of approximately 30 gallons per minute (gpm) for 43 minutes. The turbidity value at the completion of development was 0.53 NTU. Measurable drawdown was not observed for the first stage of the final well development. During the second stage of development, the pump intake was placed at a depth of 338.5 feet btoc or 335.5 feet bgs. The pump ran for a total of 20 minutes producing a flow rate of approximately 32 gpm. The turbidity value at the completion of development was 3.17 NTU. Again, measurable drawdown was not observed for the second stage of the pumping test.

Final groundwater parameters are presented in Table 2-3 and well development data are found in Appendix E. Drawdown and recovery curves for the final well

development of Well 299-E24-24 (C4647) are not presented due to a lack of measurable drawdown during final well development.

2.1.1.5. Pump Installation

Pump installation was completed on May 26, 2005. An electric submersible pump (Grundfos™ 10Redi-Flo3, Model 10SQE340NE) was set with the pump intake at 340.0 feet bgs (343.0 feet btoc [6-inch protective casing]), which is 16.4 feet above the bottom of the screen and approximately 17.3 feet below the static water table.

2.1.2. WELL 299-E17-26 (C4648)

This section summarizes activities related to the drilling, sampling, and construction of groundwater compliance monitoring well 299-E17-26 (C4648).

2.1.2.1. Drilling Summary

Drilling of well 299-E17-26 (C4648) began on May 23, 2005 using a diesel hammer (Becker Hammer drill rig) driving 9x6 inch dual wall temporary casing. The casing advanced to 378.8 feet bgs, with the TD at 379.0 feet bgs on June 1, 2005. The static groundwater level was reached on May 31, 2005 at 339.3 feet bgs. It should be noted that groundwater depths based on drilling returns were likely artificially depressed by the high air injection rates required to lift coarse gravels encountered during dual wall percussion drilling.

2.1.2.2. Sampling Summary

Archive samples (1-pint jars) were collected for CHG at five-foot intervals. Also, five-foot interval samples were placed in plastic chip trays. A total of two split spoon samples were collected for sieve tray analysis. The first split spoon was collected on June 1, 2005 from 343.5 to 344.3 feet bgs, 4.8 feet below water table. The second split spoon sample was also collected on June 1, 2005 from 369.3 to 370.5 feet bgs (only 1.2 feet due to refusal), or 30.6 feet bwt. Table 2-2 summarizes the sampling for Well 299-E24-24 (C4647).

™ Grundfos 10Redi-Flo3 is a trademark of Grundfos Pumps Corporation of Clovis, California.

Table 2-2 Summary of Sampling at Well 299-E17-26 (4648).

Sampling Method	Sample Media	Collection Date	Sample Depth (ft bgs)	Sample Depth (ft bwt)
Split Spoon	Sediment	6/1/05	343.5 to 344.3	4.8
Split Spoon	Sediment	6/1/05	369.3 to 370.5	30.6

Notes:

bgs = below ground surface

bwt = below the water table

ft = feet

2.1.2.3. Well Construction

Well construction materials, filter pack installation, initial well development, and annular seal for Well 299-E17-26 (C4648) are discussed below. A straightness test was performed using a 4.5-in OD, 20 foot-long tool prior to well completion activities. Construction and completion of this well were carried out from June 6 to 28, 2005. Well completion summary data are provided in Table 2-5 and well construction summary sheets are presented in Appendix D.

- Screen, Riser Casing, and Filter Pack.** Stainless steel screen and riser materials were chosen for this well, consisting of 4-inch ID, 20-slot (0.020-in), continuous v-wire wrap, Type 304L stainless steel screen, 34.98 feet in length; a 4-inch ID, Type 304L stainless steel sump, 2.00 feet in length; and a 4-inch ID, 304L stainless steel riser casing. Filter pack material consists of 10-20 mesh Colorado silica sand. These selections were based on hydrogeology encountered during drilling, as well as information from nearby wells. The bottom of the stainless steel sump was placed at 375.1 feet bgs and the bottom of the stainless steel screen was set at 373.1 feet bgs while the top of the screen was set at 338.1 feet bgs. The top of the stainless steel riser casing was set 2.0 feet above ground surface. The top of the stainless steel protective casing was set 2.4 feet above the concrete pad (approximately 3.1 feet above ground surface). The annular space between the stainless steel screen and the sediments in the borehole was filled with 10-20 mesh filter pack sand from total depth of 379.0 feet bgs to 327.1 feet bgs (11 feet above the top of the screen).
- Filter Pack Installation and Initial Well Development.** The filter pack installation and initial well development process consisted of introducing silica sand into the annular space around the screen and settling the filter pack to eliminate void spaces. Development of the well removed fines in the newly constructed well and reconditioned the borehole walls to minimize effects of drilling, primarily due to air injection and caving. A dual-flange surge block was used to develop and settle the sand filter pack in the annular space between the screen and the borehole walls. Surging was carried out in three stages, with the first stage of surging developing the bottom portion of the screen (about 373 feet bgs to 358 feet bgs). The second stage of surging developed the middle portion

of the screen (about 358 feet bgs to 348 feet bgs), and the third stage of surging developed the upper portion of the screen (about 348 feet bgs to 338 feet bgs). Overlap between the filter sand and temporary casing was maintained throughout so that unconsolidated formation sediments would not cave and come in direct contact with the well screen. The level of the filter pack was measured periodically with a weighted tape to monitor overlap and determine when the settling rate within the filter pack had decreased to less than 0.1 feet over a period of 15 minutes. The bottom portion of the sand filter pack was surged for 60 minutes, with stability achieved after surging for 17 minutes. The middle portion of the sand filter pack was surged for 60 minutes, with stability achieved after surging for 21 minutes. The upper portion of the sand filter pack was subsequently surged for 60 minutes, with stability achieved after surging for 36 minutes.

- **Annular Seal.** An annular seal was constructed above the filter pack using bentonite pellets, extending from 327.1 feet bgs to 322.1 feet bgs. The bentonite pellets were followed by granular bentonite from 322.1 to 11.2 feet bgs. Additionally, a cement grout surface seal was installed from 11.2 feet bgs to ground surface, consisting of Portland cement and approximately 2% by weight ground bentonite.

2.1.2.4. Final Well Development and Pumping Test

Final well development for 299-E17-26 (C4648) was performed on June 27, 2005, in accordance with CP-GPP-EE-01-6.3, "Well Development and Testing". A 5-HP Franklin electric submersible pump was used to develop the well in two intervals until turbidity was less than 5 Nephelometric Turbidity Units (NTU) and other water parameters including temperature and conductivity had stabilized. Water level drawdown during development was monitored continuously using a 20 psi pressure transducer and was recorded with an In-Situ Hermit 3000 datalogger.

Since the well screen is greater than 20 feet in length, the SOW, RFP-115806 (FH 2004c), states that the final well development should be performed in 2 stages. During the first stage of well development, the pump was operated with the intake located approximately 370 feet bgs. The pump ran for a total of 34 minutes producing a flow rate of approximately 20 gpm. The turbidity value at the completion of development was 1.99 NTU. Measurable drawdown was not observed for the first stage of the final well development. Because the pump temporarily malfunctioned, a recovery test was not run. During the second stage of development, the pump intake was placed at a depth of approximately 355 feet bgs. The pump ran for a total of 17 minutes producing a flow rate of 18 gpm. The turbidity value at the completion of development was 4.91 NTU. Again, measurable drawdown was not observed for the second stage of the pumping test.

Final groundwater parameters are presented in Table 2-3 and well development data are found in Appendix E. Drawdown and recovery curves for the final well development of Well 299-E17-26 (C4648) are not presented due to a lack of measurable drawdown during final well development.

2.1.2.5. Pump Installation

Pump installation was completed on June 28, 2005. An electric submersible pump (Grundfos™ 10Redi-Flo3, Model 10SQE340NE) was set with the pump intake at 343.3 feet bgs (346.4 feet btoc [6-inch protective casing]), which is 29.8 feet above the bottom of the screen and approximately 4.0 feet below the static water table.

™ Grundfos 10Redi-Flo3 is a trademark of Grundfos Pumps Corporation of Clovis, California.

Table 2-3 Well Completion Summary for IDF Monitoring Wells.

Well Name	Well ID	Water Level (ft bgs)	Screen ^a					Sandpack ^b Interval (ft bgs)	Seal ^c (ft bgs)	Grout ^d Depth (ft bgs)	Riser		Pump ^e Intake Depth ^f (ft bwt)
			Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Screen Length (ft)	Sump (ft)	Material				Top (ft)	Material	
299-E24-24	C4647	~322.7	321.4	356.4	35.00	2.00	ss304L	310.9 - 364.0	305.5 - 310.9	0 - 11.3	+2.0	ss304L	~17.3
299-E17-26	C4648	~339.3	338.1	373.1	34.98	2.00	ss304L	327.1 - 379.0	322.1 - 327.1	0 - 11.2	+2.0	ss304L	~4.0

Notes:

^aScreen slot size is 0.02 inch

^bSandpack consists of Colorado silica sand (10-20 mesh)

^cBentonite seal consists of 3/8-inch bentonite pellets.

^dGrout consists of Portland cement with ~2% by weight Quik-Gel bentonite powder.

^eRedi-Flo3 pumps are manufactured by Grundfos Pumps Corporation, Clovis, California.

^f Pump intake depth is determined from groundwater readings taken on day pump was installed and piping used in pump installation. Water level readings recorded at pump installation may vary somewhat from data collected during drilling (column 4).

bgs = below ground surface

bwt = below water table

ft = feet

N/A = not applicable

ss = stainless steel

~ = approximate value given

Table 2-4 Well Development Data for IDF Monitoring Wells.

Well Name	Well ID	Static Water Level (ft bgs)	Development Date	Pump Intake Depth (ft bgs)	Development Pumping Duration (minutes)	Final Turbidity (NTU)	Final Conductivity (µS/cm)	Final Temp (°C)	Flow Rate (gpm)	Final Drawdown (ft)	Total Gallons Pumped
299-E24-24	C4647	322.7	5/25/05	353.7	43	0.53	458	22.7	~30	None ¹	~1290
				338.5	20	3.17	458	22.3	~32	None ¹	~640
299-E17-26	C4648	338.7	6/27/05	~370	34	1.99	506	20.3	~20	None ¹	~680
				~355	17	4.91	520	20.7	~18	None ¹	~300

Notes:

¹ = measurable drawdown was not observed during final well development activities

bgs = below ground surface

gpm = gallons per minute

ft = feet

NTU = Nephelometric Turbidity Units

µs/cm = micro seimen per centimeter

°C = degrees Centigrade

~ = approximate value given

WMP-27008, REV. 0

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3.0 WASTE MANAGEMENT

Waste generated by the installation of the IDF monitoring wells was managed using the specific requirements regarding waste generation as outlined in the supporting documentation. Waste included drill cuttings, purgewater, decontamination waste, and miscellaneous waste. The specific waste characterization requirements are defined in the *Data Quality Objective [DQO] Summary Report for FY2004 Seismic Well in 200 East*, WMP-21109 (FH 2004a), with additional details provided below.

All wastes generated from drilling and sampling operations were handled and managed in accordance with the appropriate DQO summary report, WMP-21109 (FH 2004a).

3.1 VADOSE ZONE CUTTINGS

Vadose zone cuttings were handled as described in the following section.

3.1.1. IDF Groundwater Monitoring Well Network

Vadose zone cuttings from the new IDF groundwater monitoring wells (C4647 and C4648) did not designate as a dangerous waste, were below the *Model Toxics Control Act*, Method B (WAC 173-340) soil cleanup standards, and when released from a radiological perspective were placed on the ground near the point of generation on plastic sheeting until released back into the ground based on field surveys. Drill cuttings were surveyed in accordance with *Hanford Site Solid Waste Acceptance Criteria* (HNF-EP-0063).

3.2 SATURATED ZONE CUTTINGS

Saturated zone cuttings were handled as described in the following section.

3.2.1 IDF Groundwater Monitoring Well Network

All drill cuttings below the highest recorded water table were containerized in 55-gallon drums lined with a 10-mil plastic liner. Drums were stored on site for final disposition. As of the final walkdown, the drums were still stored on site.

3.3 PURGEWATER

Purgewater was collected and contained at the well sites until transported to the Purgewater Storage and Treatment Facility or the Effluent Treatment Facility. Purgewater, groundwater samples, and decontamination fluids generated during well drilling and sample screening were managed as purgewater in accordance with CP-GFP-EE-02-10.2, "*Purge Water Handling*", and 90-ERB-040, *Strategy for Handling and Disposing of Purgewater at the Hanford Site*, Washington (Izatt 1990).

WASTE MANAGEMENT

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LANDFILL CLOSURE

The landfill closure monitoring well network...

LANDFILL CLOSURE

The landfill closure monitoring well network...

RUNOFF WATER

Runoff water is collected in a series of...

4.0 GEOPHYSICAL SURVEYS

Borehole geophysical surveys were carried out in well 299-E24-24 (C4647) on May 12, 2005 and well 299-E17-26 (C4648) on June 2, 2005 and June 6, 2005. A Spectral Gamma Logging System (SGLS) survey was carried out by S.M. Stoller Corporation from ground surface to TD for both C4647 and C4648.

A separate report will provide details of these geophysical surveys.

4.0 GEOPHYSICAL SURVEYS

Two-hole geophysical surveys were carried out in well 202 E14-24 (C104) on May 11, 2005 and well 202 E17-24 (C105) on June 1, 2005 and June 6, 2005. A spectral induced polarization (SIP) survey was carried out by S.M. Stoller Corporation from ground to well 202 E17-24 (C105) on June 6, 2005.

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5.0 CIVIL SURVEY

A civil survey was performed on July 13, 2005 by a professional land surveyor registered in the State of Washington. The civil survey data are presented in Table 4-1 and will be entered into the Hanford Well Information System (HWIS) database.

Table 5-1 Civil Survey Summary.

Well Name	Well ID	Easting	Northing	Elevation (feet)
299-E24-24	C4647	574179.77	135459.30	221.223 Pump baseplate 221.217 Top of casing 220.483 Brass survey marker
299-E17-26	C4648	574662.61	135025.06	225.135 Pump baseplate 225.129 Top of casing 224.430 Brass survey marker

Notes:

Northing and easting coordinates are based on Washington State Plane Coordinates North American Datum of 1983 (NAD83[91]) rounded to 1 m.

North American Vertical Datum of 1988 (NAVD88) values rounded to 0.001 m.

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6.0 WELL ACCEPTANCE

The IDF groundwater monitoring wells were transferred from Layne Christensen and accepted by FH. The site acceptance walkdowns for wells C4647 and C4648 were performed on May 27, 2005 and June 29, 2005, respectively, and included representatives from Layne Christensen and FH, including FH representatives from Geosciences, Environmental Compliance and Quality Assurance (QA).

QA Surveillance was performed during the drilling and construction phase and during the final acceptance walkdowns. Aspects of well drilling such as waste handling, drill rig decontamination, driller qualification, selection of well construction materials, surface protection features, sampling pumps, well identification and site clean-up were observed. The surveillance was deemed satisfactory.

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7.0 SUBSURFACE DESCRIPTION

This section provides the generalized stratigraphy at the IDF, as well as summaries of field observations.

7.1 IDF GEOLOGY/HYDROGEOLOGY

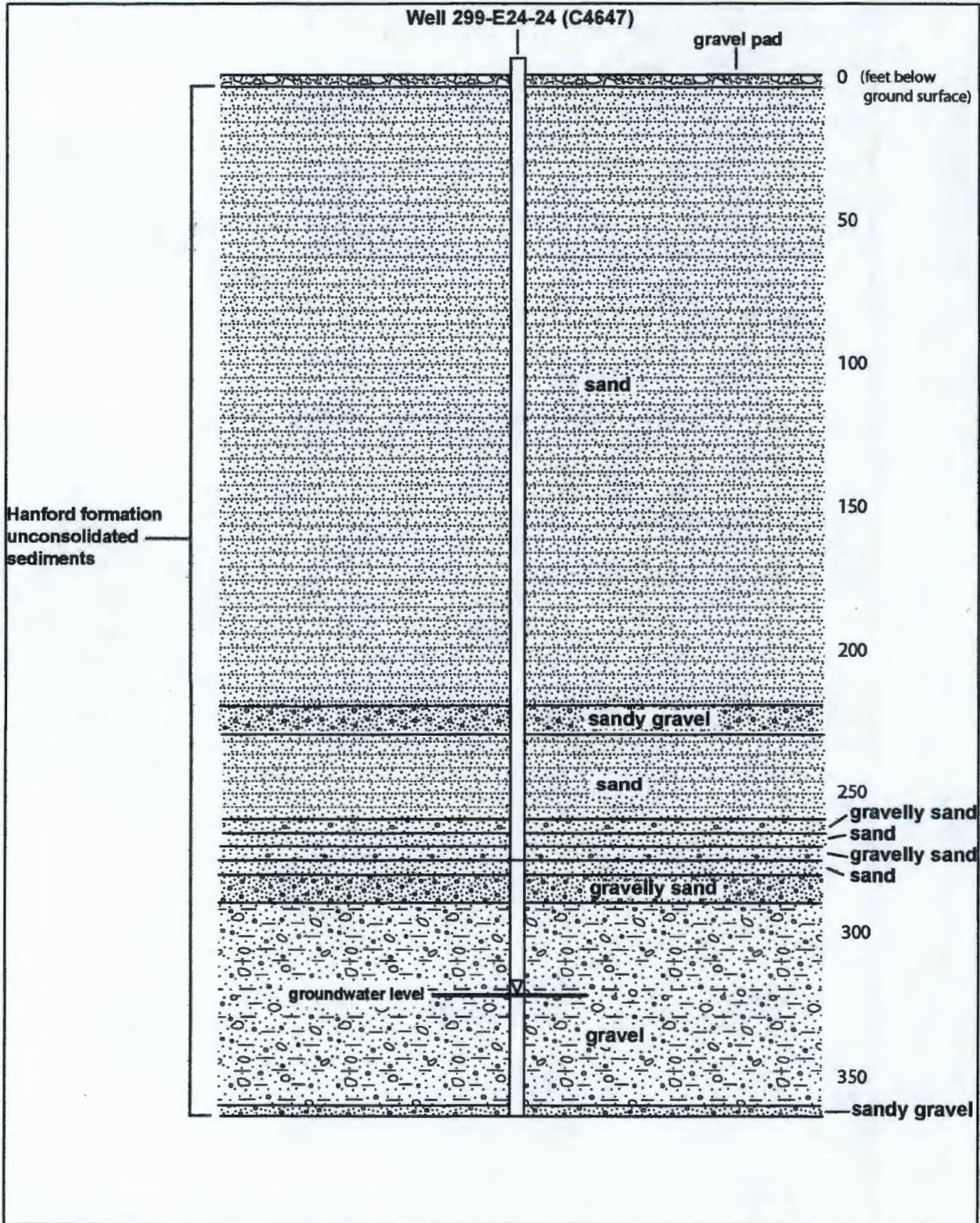
Generalized stratigraphy in the area of the IDF consists of sand-dominated facies of the Pleistocene Hanford Formation, together with gravelly sand or silt/clay interbeds to an approximate depth of 285 feet bgs followed by the gravel dominated facies to total depth. Unit E of the late Miocene to Pliocene Ringold Formation, which consists of moderately to well-cemented sandy gravels, lies beneath the Hanford formation but was not encountered during the drilling operations.

7.1.1. Well 299-E24-24 (C4647)

At this well, the sand dominated facies of the Hanford Formation was encountered from 5 ft. bgs to 290 feet bgs followed by the gravel dominated facies from 290 feet bgs to TD.

The interval from ground surface to 2 feet bgs consists of a crushed rock drill pad. From 2 to 5 feet bgs, a layer of intermixed very fine aeolian sand and crushed gravel from the gravel pad overlies a thin layer of very fine sand from 5 to 10 feet bgs. Medium to coarse sand with very sparse pebbles comprise the interval from 10 to 220 feet bgs. The interval from 220 to 230 feet bgs consists of sandy gravel, followed by medium to coarse sand from 230 to 260 feet bgs. A thin layer of gravelly sand forms the interval from 260 to 265 feet bgs with another layer of coarse sand from 265 to 270 feet bgs. The interval from 270 to 275 feet bgs consists of gravelly sand, and then a layer of medium to coarse sand follows from 275 to 280 feet bgs. Gravelly sand comprises the interval from 280 to 290 feet bgs. The interval from 290 to 360 consists of coarse to very coarse gravel. In this interval, the moisture content increased as depth increased. Sandy gravel forms the interval from 360 to 364 feet bgs (TD).

Figure 7-1 Subsurface Geology at Well 299-E24-24 (C4647).

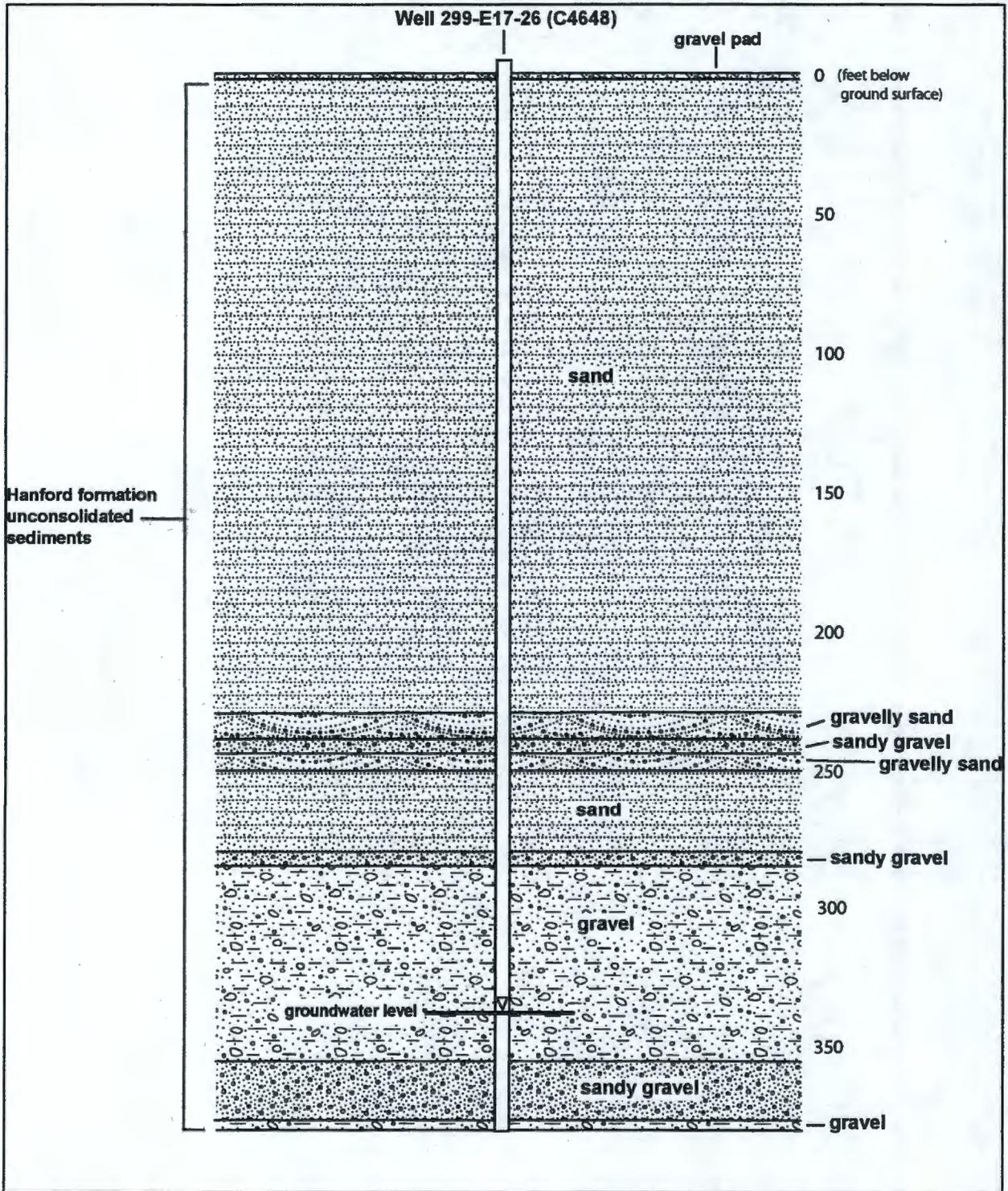


7.1.2. Well 299 E24-24 (C4647)

At this well, the sand dominated facies of the Hanford Formation was encountered from 5 ft. bgs to 280 feet bgs followed by the gravel dominated facies from 280 feet bgs to TD.

The interval from ground surface to 2 feet bgs consists of a crushed rock drill pad. From 2 to 5 feet bgs, a layer of intermixed very fine aeolian sand and crushed gravel from the gravel pad overlies a layer of very fine aeolian sand from 5 to 10 feet bgs. Moist, very fine aeolian sand is found from 10 to 15 feet bgs. The interval from 15 to 25 feet bgs consists of very fine to medium grained sand followed by medium to coarse grained sand from 25 to 50 feet bgs. A thin layer of medium to very coarse sand is found from 50 to 55 feet bgs. The interval from 55 to 70 feet bgs consists of coarse to very coarse sand overlying a layer of coarse sand with sparse pebbles from 70 to 75 feet bgs. Very fine to very coarse sand is found in the interval from 75 to 230 feet bgs. The interval from 230 to 235 feet bgs consists of sandy gravel followed by gravelly sand from 235 to 240 feet bgs. Sandy gravel is seen in the interval from 240 to 245 feet bgs, and gravelly sand from 245 to 250 feet bgs. The interval from 250 to 265 consists of coarse sand. From 265 to 280 feet bgs, there is a medium to coarse grained sand. Sandy gravel is seen in the interval from 280 to 285 feet bgs, overlying medium to very coarse gravel from 285 to 355 feet bgs. The interval from 355 to 375 consists of sandy gravel overlying coarse gravel from 375 to 379 feet bgs (TD).

Figure 7-2 Subsurface Geology at Well 299-E17-26 (C4648).



8.0 REFERENCES

- CP-GPP-EE-01-6.3, Rev. 0, "*Well Development and Testing*," Fluor Hanford, Inc., Richland, Washington.
- CP-GPP-EE-01-7.0, Rev. 0, "*Geologic Logging*," Fluor Hanford, Inc., Richland, Washington.
- CP-GPP-EE-01-10.2, Rev. 0, "*Purge Water Handling*," Fluor Hanford, Inc., Richland, Washington.
- Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.
- FH 2004a, *Data Quality Objective (DQO) Summary Report for FY2004 Seismic Well in 200 East*, WMP-21109, Rev. 0, Fluor Hanford Inc., Richland, Washington.
- FH 2004b, *Description of Work for the Installation of Groundwater Wells at 200-UP-1 OU & the Integrated Disposal Facility FY 2005*, WMP-23262, Rev. 0, Fluor Hanford, Inc., Richland, Washington.
- FH 2004c, *Statement of Work for Fourth Quarter, Calendar Year 2004 IDF, 200-UP-1 OU, and WMA's S-SX, TX-TY, and T Groundwater Drilling*, RFP-115806, Rev. 0, Fluor Hanford Inc., Richland, Washington.
- HNF-EP-0063, 2004, *Hanford Site Solid Waste Acceptance Criteria*, Rev. 10, Fluor Hanford, Inc., Richland, Washington.
- Izatt, R. D., 1990, Strategy for Handling and Disposing of Purgewater at the Hanford Site, Washington, letter 90-ERB-040, to P. T. Day, U.S. Environmental Protection Agency, and T. L. Nord, Washington State Department of Ecology, dated July 19, 1990, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Resource Conservation and Recovery Act of 1976, 42 U.S.C. s/s 321 et seq.
- Resource Conservation and Recovery Act of 1976*, 42 U.S.C. 6901, et seq.
- WAC 173-340, "Model Toxics Control Act – Cleanup" *Washington Administrative Code*, as amended.

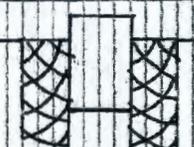
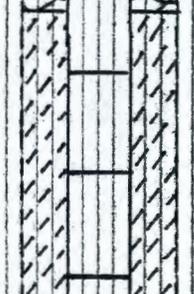
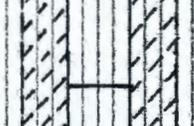
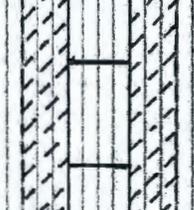
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Appendix A: Well Summary Sheets

Well 299-E24-24 (C4647) – 3 pages

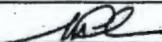
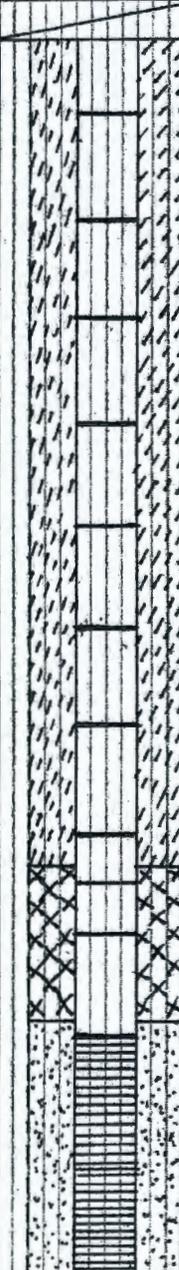
Well 299-E17-26 (C4648) – 4 pages

WELL SUMMARY SHEET		Start Date: 5-9-05	Page 2 of 3
		Finish Date: 5-26-05	
Well ID: C4647		Well Name: 299-E24-24	
Location: 200 East, SW of Purser		Project: IDF Monitoring Wells	
Prepared By: N. Boyles	Date: 6/2/05	Reviewed By: L.D. Walker	Date: 6/7/05
Signature: <i>N. Boyles</i>		Signature: <i>L.D. Walker</i>	
CONSTRUCTION DATA		GEOLOGIC/HYDROLOGIC DATA	
Description	Diagram	Depth in Feet	Graphic Log Lithologic Description
		150	
		175	
		200	
		225	220' → 230': Sandy Gravel (SG)
		230	230' → 260': Sand (S)
		250	250' → (S)
		260	260' → 265': gravelly Sand (GS)
		265	265' → 270': Sand (S)
		270	270' → 275': gravelly Sand (GS)
		275	275' → 280': Sand (S)
		280	280' → 290': gravelly Sand (GS)
		290	290' → 360': Gravel (G)

WELL SUMMARY SHEET		Start Date: 5-23-05	Page 1 of 4
		Finish Date: 6-29-05	
Well ID: 64648	Well Name: 299-E17-26		
Location: 200 East, SW of Purex	Project: IDF Monitoring Wells		
Prepared By: Michael E. Carm	Date: 6-7-05	Reviewed By: L.D. Walker	Date: 6/30/05
Signature: <i>MEL</i>		Signature: <i>L.D. Walker</i>	
CONSTRUCTION DATA		GEOLOGIC/HYDROLOGIC DATA	
Description	Diagram	Depth in Feet	Lithologic Description
Portland Cement Grout 0 - 11.19'		0	0 - 2': crushed rock drill pad
Granular Bentonite: 11.19' - 322.10'		20	
Bentonite Pellets: 322.10' - 327.09'		40	2 - 230': Hanford fm. sand
10-20 Colorado Silica Sand: 327.09' - 379.00'		60	
		80	
		100	
		120	
		140	
		160	
		180	
		200	
		220	
		240	
		260	
		280	
		300	
		320	
		340	
		360	
		380	
		400	

WELL SUMMARY SHEET		Start Date: 5-23-05	Page 2 of 4
		Finish Date: 6-29-05	
Well ID: C 4648	Well Name: 299-E17-26		
Location: 200 E - SW of PUREX	Project: IDF Monitoring Well		
Prepared By: Michael E. Cavan	Date: 6-7-05	Reviewed By: L.D. Walker	Date: 6/30/05
Signature: <i>[Signature]</i>		Signature: <i>[Signature]</i>	
CONSTRUCTION DATA		GEOLOGIC/HYDROLOGIC DATA	
Description	Diagram	Depth in Feet	Lithologic Description
4" ID 304L stainless steel well casing: 2.25' above ground surface to 338.08'		120	
4" ID 10-20 slot 304 stainless steel well casing: 338.08' - 373.06'		140	
4" ID 304 L stainless steel well sump: 373.06' - 375.06'		160	
		180	2-230': Hanford fm. sand
		200	
		220	
			230-240': Hanford fm. gravelly sand

A-8003-643 (03/03)

WELL SUMMARY SHEET		Start Date: 5-23-05	Page 3 of 4	
		Finish Date: 6-29-05		
Well ID: C4648	Well Name: 29A-E17-26			
Location: 200 E - SW of PUREX	Project: JDF Monitoring Well			
Prepared By: Michael E. Carm	Date: 6-7-05	Reviewed By: L.D. Walker	Date: 6/30/05	
Signature: 		Signature: 		
CONSTRUCTION DATA		GEOLOGIC/HYDROLOGIC DATA		
Description	Diagram	Depth in Feet	Lithologic Description	
		240	240-245': Hanford fm. sandy gravel	
			245-250': Hanford fm. gravelly sand	
			260	255-280': Hanford fm. sand
			280	280-285': Hanford fm. sandy gravel
			300	285-323': Hanford fm. gravel
			320	
			340	323-355': Ringold 'E' gravel
				355-375': Ringold 'E' sandy gravel
Water level = 338.7' bgs (6-6-05)				

A-6003-643 (3/03)

WMP-27008, REV. 0

Appendix B: Borehole Logs Sheets

Well 299-E24-24 (C4647) – 5 pages

Well 299-E17-26 (C4648) – 5 pages

BOREHOLE LOG

Page 1 of 5
Date: 5/9/05

Well ID: C4647 Well Name: 299-E24-24 Location: 200 East, SW of Rurex

Project: IPF monitoring wells Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments
	Type No.	Blows Recovery			
0				0' to 2': Crushed rock drill pad	Diesel hammer 9" x 6" dual wall casing.
2	Grab Archive			2' to 5': some crushed rock, mostly very fine wind-blown sands (9)	5' Grab Sample For archive.
5	Grab Archive			5' to 10': very fine sand (9)	10' Grab Sample For archive.
10	Grab Archive			10' to 15': Medium to coarse sand (9) some angular pebble fragments, (25%)	15' Grab Sample For archive.
15	Grab Archive			15' to 20': medium sand (9) sparse pebbles (to 1/2") (25%)	20' Grab Sample For archive.
20	Grab Archive			20' to 25': medium sand (9)	25' Grab Sample For archive.
25	Grab Archive			25' to 30': medium to coarse sand (9)	30' Grab sample for archive.
30	Grab Archive			30' to 35': medium to coarse sand (9)	35' Grab sample for archive.
35	Grab Archive				
40	Grab Archive			35' to 40': coarse sand (9)	40' Grab sample for archive.
45	Grab Archive			40' to 45': coarse sand (9) w/ some small pebbles (to 1/4") (25%)	45' Grab/Archive.
50	Grab Archive			45' to 50': medium to coarse sand (9) well sorted, some (25%) medium.	50' Grab/Archive.
55	Grab Archive			50' to 55': coarse sand (9) w/ some sparse pebbles (to 1/2") (25%)	55' Grab/Archive.
60	Grab Archive			55' to 60': medium to coarse sand (9) w/ some sparse pebbles (to 1/2") (5%)	60' Grab/Archive.
65	Grab Archive			60' to 65': Medium sand (9)	65' Grab/Archive.
70	Grab Archive			65' to 70': medium to coarse sand (9) mixed, well sorted.	70' Grab/Archive.
75	Grab Archive			70' to 75': Medium to coarse sand (9) mixed, poorly sorted.	75' Grab/Archive.

Reported By: N. Bowles

Reviewed By: L.D. Walker

Title: Geologist

Title: Geologist

Signature: [Signature]

Date: 5/9/05

Signature: [Signature]

Date: 6/6/05

BOREHOLE LOG					Page 2 of 5
Well ID: 14647		Well Name: 299-E21-24		Location: 200 East, SW of Purex	
Project: IDF Monitoring Wells				Reference Measuring Point: Ground Surface	
Depth (Fl.)	Sample		Graphic Log	Sample Description	Comments
	Type No.	Blows Recovery			
80	Grab Archive			75' to 80': Medium to coarse Sand (S). Quartz dominated w/ some basalts.	Diesel Hammer, 9" x 6" dual well casing.
	Grab Archive			80' to 85': Medium to coarse Sand (S) w/ some small pebble fragments (to 1/4") (25%)	80' Grab / Archive. 85' Grab / Archive.
90	Grab Archive			85' to 90': Medium to coarse Sand (S).	90' Grab / Archive.
	Grab Archive			90' to 95': Medium to coarse Sand (S). well sorted.	95' Grab / Archive.
100	Grab Archive			95' to 100': Medium to coarse Sand (S) w/ sparse pebbles (to 1/2") (25%)	100' Grab / Archive.
	Grab Archive			100' to 105': Medium Sand (S)	105' Grab / Archive.
110	Grab Archive			105' to 110': Medium Sand (S) w/ some coarse (25%).	110' Grab / Archive.
	Grab Archive			110' to 115': Medium Sand (S).	115' Grab / Archive.
120	Grab Archive			115' to 120': medium to coarse Sand (S) mixed, well sorted.	120' Grab / Archive.
	Grab Archive			120' to 125': Medium Sand (S). w/ some coarse (25%)	125' Grab / Archive.
130	Grab Archive			125' to 130': Medium Sand (S).	130' Grab / Archive.
	Grab Archive			130' to 135': Medium Sand (S) w/ some coarse (25%).	135' Grab / Archive.
140	Grab Archive			135' to 140': Medium Sand (S) w/ some coarse.	140' Grab / Archive.
	Grab Archive			140' to 145': Medium Sand (S).	145' Grab / Archive.
150	Grab Archive			145' to 150': Medium Sand (S). w/ some coarse (25%).	150' Grab / Archive.
	Grab Archive			150' to 155': Medium Sand (S).	155' Grab / Archive.

Reported By: P. Bondas	Reviewed By: L.D. Walker
Title: Geologist	Title: Geologist
Signature:	Signature:
Date: 5/9/05	Date: 6/6/05

BOREHOLE LOG					Page <u>3</u> of <u>5</u>
				Date: <u>5/9/05</u>	
Well ID: <u>CH47</u>		Well Name: <u>299-E24-24</u>		Location: <u>200 East, SW of Purex</u>	
Project: <u>TPF Monitoring Wells</u>			Reference Measuring Point: <u>Ground Surface</u>		
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments
	Type No.	Blows Recovery			
160	Grab Archive			155' to 160': Medium Sand (S)	Diesel Hammer, 9" x 6" dual wall casing.
	Grab Archive			160' to 165': Medium Sand (S) w/ some fines.	160' Grab/Archive. 165' Grab/Archive.
170	Grab Archive			165' to 170': Medium Sand (S) w/ ~10% coarse sand.	170' Grab/Archive.
	Grab Archive			170' to 175': medium Sand (S) w/ ~10% coarse sand.	175' Grab/Archive.
180	Grab Archive			175' to 180': Medium Sand (S) w/ ~10% coarse sand.	180' Grab/Archive.
	Grab Archive			180' to 185': Medium Sand (S) w/ ~25% coarse	185' Grab/Archive.
190	Grab Archive			185' to 190': Medium Sand (S) w/ ~25% coarse	190' Grab/Archive.
	Grab Archive			190' to 195': medium to coarse Sand (S) Increasing to coarse (~50%).	195' Grab/Archive.
200	Grab Archive			195' to 200': medium to coarse Sand (S) 250% coarse.	200' Grab/Archive.
	Grab Archive			200 to 205': medium-medium Sand (S) w/ ~20% coarse.	205' Grab/Archive.
210	Grab Archive			205' to 210': Medium Sand (S) ~20% coarse.	210' Grab/Archive.
	Grab Archive			210' to 215': coarse Sand (S) w/ ~10% medium & sparse pebbles (~5% to 1/4").	215' Grab/Archive.
220	Grab Archive			215' to 220': Medium to coarse Sand (S)	220' Grab/Archive.
	Grab Archive			220' to 225': sandy gravel (SG) ~40% med. to coarse sand w/ ~60% gravel/pebbles to ~1/4".	225' Grab/Archive.
230	Grab Archive			225' to 230': sandy gravel (SG) ~40% coarse sand w/ pebbles to ~1/8".	230' Grab/Archive.
	Grab Archive			230' to 235': coarse Sand (S) w/ sparse pebbles (<5% to 1/4").	235' Grab/Archive.

BOREHOLE LOG					Page 4 of 5
				Date: 5/10/05 - Start 5/10/05 - Finish	
Well ID: C4647		Well Name: 299-E24-24		Location: 200 East, SW of Purex	
Project: IDF Monitoring Wells			Reference Measuring Point: Ground Surface		
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments
	Type No.	Blows Recovery			
240	Grab Archive			235' to 240': Medium Sand (S) w/ ~10% coarse sand.	Diesel hammer. 9" X 6" dia. wall casing.
	Grab Archive			240' to 245': medium to coarse Sand (S) ~40% med. / ~60% coarse	240' Grab/Archive. 245' Grab/Archive.
250	Grab Archive			245' to 250': Medium Sand (S) w/ ~10% coarse sand.	250' Grab/Archive.
	Grab Archive			250' to 255': medium to coarse Sand (S) w/ sparse pebbles (to 1/8")	255' Grab/Archive.
260	Grab Archive			255' to 260': Medium to coarse Sand (S) Coarse Sand (S) w/ sparse pebbles (to 1/2")	260' Grab/Archive.
	Grab Archive			260' to 265': gravelly sand (GS) ~90% med. to coarse sand w/ sparse med. to coarse pebbles (to ~1")	265' Grab/Archive.
270	Grab Archive			265' to 270': Coarse Sand (S) w/ sparse pebbles (to 1/2"), 45%	270' Grab/Archive.
	Grab Archive			270' to 275': gravelly sand (GS) ~70% med. to coarse sand w/ ~30% coarse to very coarse pebbles	275' Grab/Archive.
280	Grab Archive			275' to 280': med. to coarse Sand (S) w/ sparse coarse pebbles (to 1")	280' Grab/Archive.
	Grab Archive			280' to 285': gravelly sand (GS) w/ ~20% to 30% coarse/very coarse pebbles & ~5% small cobbles.	285' Grab/Archive.
290	Grab Archive			285' to 290': gravelly Sand (GS) ~80% med. to coarse sand w/ coarse to very coarse pebbles & sparse silt/clay	290' Grab/Archive.
	Grab Archive			290' to 295': Coarse Gravel (G) ~40% med. to coarse pebbles	295' Grab/Archive.
300	Grab Archive			295' to 300': Coarse Gravel (G) Med. to very coarse pebbles.	300' Grab/Archive.
	Grab Archive			300' to 305': Coarse Gravel (G) ~95% med. to very coarse pebbles	305' Grab/Archive.
310	Grab Archive			w/ ~5% med. coarse sands, slightly cemented.	
	Grab Archive			305' to 310': coarse Gravel (G) Med. to very coarse pebbles w/ sparse silt cobbles.	310' Grab/Archive.
	Grab Archive			310' to 315': Coarse Gravel (G). Med. to v. coarse pebbles w/ sparse silt cobbles. Showing more moisture.	315' Grab/Archive.

Reported By: N. Bowler		Reviewed By: L.D. Walker	
Title: Geologist		Title: Geologist	
Signature:	Date: 5/10/05	Signature:	Date: 6/6/05

BOREHOLE LOG					Page 5 of 5
					Date: 5/11/05 - Start 5/11/05 - Finish
Well ID: C4647		Well Name: 299-E24-24		Location: 200 East, SW of Purvex	
Project: IDF Monitoring Wells			Reference Measuring Point: Ground Surface		
Depth (FL)	Sample		Graphic Log	Sample Description	Comments
	Type No.	Blows Recovery			
Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl					
Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level					
320	Grab Archive			315' to 320': coarse gravel (G) med. to v. lg pebbles. Surface moisture.	Pregel hammer. 9" x 6" dia wall casing.
	Grab Archive			320' to 325': coarse gravel (G), ~95% fine to v. coarse pebbles, moist	320' Grab/Archive 325' Grab/Archive
330	Split Spoon Sample	100%		~5% med. to v. coarse sand.	
	Grab Archive			325' to 330': v. coarse gravels (G) ~50% small to lg cobbles (to ~6")	330' Grab/Archive 329.5' to 331.1' bgs
	Grab Archive			~60% med. to v. coarse pebbles. All units	↳ Split-spoon sample for sieve-tray analysis.
340	Grab Archive			330' to 335': v. coarse gravels (G) Similar to above (to ~4").	335' Grab/Archive
	Grab Archive			335' to 340': v. coarse gravel (G) ~30% small to large cobbles (to ~4")	340' Grab/Archive
	Grab Archive			~70% med. to v. coarse pebbles.	
350	Grab Archive			340' to 345': v. coarse gravel (G) w/ some coarse sands (~5%) upto 4".	345' Grab/Archive
	Grab Archive			345' to 350': v. coarse gravel (G) to ~4" w/ some coarse sands (~50%).	350' Grab/Archive
	Grab Archive	100%		350' to 355': v. coarse gravel (G) to ~3" w/ some coarse sands (~5 to 10%).	355' Grab/Archive 351.52' to 356.22' bgs
360	Grab Archive			355' to 360': v. coarse gravel (G) to ~6" ~80% med. to v. coarse pebbles, w/ ~5% coarse sands & sparse large cobbles.	↳ Split-spoon sample for sieve-tray analysis. 360' Grab/Archive
	Grab Archive		360' to 365' 364': sandy gravel (SG) ~60% med. to v. coarse pebbles ~35 to 40% v. coarse sand w/ sparse small cobbles (to ~4").	365' 364' Grab/Archive	
T.D. = 364.01' bgs					
					W.L. = 322.74' bgs (5/11/05)

Reported By: <u>N. Bowles</u>	Reviewed By: <u>L.D. Walter</u>
Title: <u>Geologist</u>	Title: <u>Geologist</u>
Signature: <u>[Signature]</u>	Signature: <u>[Signature]</u>
Date: <u>5/11/05</u>	Date: <u>6/6/05</u>

BOREHOLE LOG					Page <u>1</u> of <u>5</u>
Well ID: <u>L4648</u>		Well Name: <u>299-ET-26</u>		Location: <u>200 East, SW of Punex.</u>	
Project: <u>IDF Monitoring Wells</u>				Reference Measuring Point: <u>Ground Surface</u>	
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments
	Type No.	Blows Recovery			
0				0' to 2': <u>Crushed rock drill pad.</u>	<u>Diesel Hammer</u> <u>9" x 6" dual wall</u> <u>Casing.</u>
	<u>Grab Archive</u>			2' to 5': <u>v. fine sand (s) w/</u> <u>some sparse crushed rock.</u>	<u>5' Grab Sample for</u> <u>Archive.</u>
10	<u>Grab Archive</u>			5' to 10': <u>v. fine sand (s), with</u> <u>blown (dune) sand.</u>	<u>10' Grab/Archive.</u>
	<u>Grab Archive</u>			10' to 15': <u>v. fine sand (s)</u> <u>same as previous, moist</u>	<u>15' Grab/Archive.</u>
20	<u>Grab Archive</u>			15' to 20': <u>v. fine to med. sand (s)</u> <u>~ 20% med. grain, moisture</u>	<u>20' Grab/Archive.</u>
	<u>Grab Archive</u>			20' to 25': <u>fine to med sand (s)</u> <u>~ 40% med., moisture.</u>	<u>25' Grab/Archive.</u>
30	<u>Grab Archive</u>			25' to 30': <u>med. to coarse sand (s)</u> <u>~ 40% coarse, some slight moist.</u>	<u>30' Grab/Archive.</u>
	<u>Grab Archive</u>			30' to 35': <u>med. to coarse sand (s)</u> <u>w/ some sparse v. coarse sands</u> <u>losing moisture.</u>	<u>35' Grab/Archive.</u>
40	<u>Grab Archive</u>			35' to 40': <u>med. to coarse sand (s)</u> <u>w/ some sparse v. coarse sands.</u> <u>No moisture</u>	<u>40' Grab/Archive.</u>
	<u>Grab Archive</u>			40' to 45': <u>med. to coarse sand (s)</u> <u>~ 50% coarse</u>	<u>45' Grab/Archive.</u>
50	<u>Grab Archive</u>			45' to 50': <u>med. to coarse sand (s)</u> <u>> 50% coarse.</u>	<u>50' Grab/Archive.</u>
	<u>Grab Archive</u>			50' to 55': <u>med. to v. coarse sand (s)</u> <u>w/ some v. sparse clay balls??</u> <u>(could be from nuclear casing?)</u>	<u>55' Grab/Archive.</u>
60	<u>Grab Archive</u>			55' to 60': <u>coarse to v. coarse sand (s)</u>	<u>60' Grab/Archive.</u>
	<u>Grab Archive</u>			60' to 65': <u>coarse to v. coarse sand (s)</u> <u>w/ some sparse pebbles (to 1/4")</u>	<u>65' Grab/Archive.</u>
70	<u>Grab Archive</u>			65' to 70': <u>coarse to v. coarse sand (s)</u> <u>well sorted, no pebbles.</u>	<u>70' Grab/Archive.</u>
	<u>Grab Archive</u>			70' to 75': <u>coarse sand (s)</u> <u>w/ v. sparse pebbles (to 1/4")</u>	<u>75' Grab/Archive.</u>

Reported By: <u>N. Bowles</u>	Reviewed By: <u>L. D. Walker</u>
Title: <u>Geologist</u>	Title: <u>Geologist</u>
Signature:	Signature:
Date: <u>5/23/05</u>	Date: <u>6/30/05</u>

BOREHOLE LOG					Page 2 of 5
Well ID: <u>44648</u>					Date: <u>5/23/05</u>
Well Name: <u>299-E17-26</u>			Location: <u>200 East, SW of Purvex</u>		
Project: <u>IDF Monitoring Wells</u>			Reference Measuring Point: <u>Ground Surface</u>		
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments
	Type No.	Blows Recovery			
80	Grab Arch.			75' to 80': med. to cse sand (S)	Diesel Pump, 9"x6" D.W. ↓ 80' Grab/Archive.
	Grab Arch.			w/ some v. sparse clay ?? or silts	
	Grab Arch.			80' to 85': fine to med. sand (S)	85' Grab/Archive
	Grab Arch.			w/ some (15%) coarse & (15%) fine	
90	Grab Arch.			85' to 90': fine to med. sand (S)	90' Grab/Arch.
	Grab Arch.			w/ some (45%) coarse & v. sparse small pebbles (to 1/4")	95' Grab/Arch.
	Grab Arch.			90' to 95': cse. to v. cse sand (S)	
100	Grab Arch.			95' to 100': cse sand (S)	100' Grab/Arch.
	Grab Arch.			w/ v. 5% med. & ~5% v. cse.	
	Grab Arch.			100' to 105': cse. to v. cse sand (S)	105' Grab/Arch.
110	Grab Arch.			105' to 110': med to cse sand (S)	110' Grab/Arch.
	Grab Arch.			w/ ~5% v. coarse	
	Grab Arch.			110' to 115': med. to cse sand (S)	115' Grab/Arch.
	Grab Arch.			w/ ~10% fines	
120	Grab Arch.			115' to 120': fine to med. sand (S)	120' Grab/Arch.
	Grab Arch.		some slight moisture.		
	Grab Arch.		120' to 125': med. to v. coarse sand (S)	125' Grab/Arch.	
	Grab Arch.		w/ some v. sparse, v. small pebbles (to 1/4").		
130	Grab Arch.		125' to 130': fine to coarse sand (S)	130' Grab/Arch.	
	Grab Arch.		130' to 135': fine to med. sand (S)	135' Grab/Arch.	
	Grab Arch.		w/ some coarse (25%) & some v. fine (25%).		
140	Grab Arch.		135' to 140': fine to cse sand (S)	140' Grab/Arch.	
	Grab Arch.		w/ some (25%) v. cse.		
	Grab Arch.		140' to 145': v. fine to fine (S)	145' Grab/Arch.	
	Grab Arch.		w/ ~10% med.		
150	Grab Arch.		145' to 150': med. to cse sand (S)	150' Grab/Arch.	
	Grab Arch.		w/ ~5% v. cse.		
	Grab Arch.		150' to 155': fine to med. sand (S)	155' Grab/Arch.	
	Grab Arch.		w/ some ~5% coarse.		

Reported By: N. Bordes Reviewed By: L.D. Walker
 Title: Geologist Title: Geologist
 Signature: [Signature] Date: 5/23/05 Signature: [Signature] Date: 6/30/05

BOREHOLE LOG					Page <u>3</u> of <u>5</u>
Well ID: <u>C4648</u>		Well Name: <u>209-E17-26</u>		Location: <u>200 East, SW of Purax</u>	
Project: <u>IDF Monitoring Wells</u>			Reference Measuring Point: <u>Ground Surface</u>		
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments
	Type No.	Blows Recovery			
160	Grab Arch			155' to 160': v. fine to med. sand (S)	Diesel Ham., 9" x 6" p.w.s. ↓ 160' Grab/Arch.
	Grab Arch			160' to 165': med. to coarse sand (S) w/ ~10% fines.	165' Grab/Arch.
170	Grab Arch			165' to 170': Coarse sand (S) w/ ~5 to 10% med. & plates of formation	170' Grab/Arch.
	Grab Arch			170' to 175': fine to med sand (S) well sorted	175' Grab/Arch
180	Grab Arch			175' to 180': fine to med. sand (S) w/ ~5% coarse.	180' Grab/Arch.
	Grab Arch			180' to 185': med. to coarse sand (S) ~5% fine	185' Grab/Arch.
190	Grab Arch			185' to 190': med to coarse sand (S) ~5% fine	190' Grab/Arch.
	Grab Arch			190' to 195': med. sand (S) w/ v. sparse pebbles (to ~1")	195' Grab/Arch.
200	Grab Arch			195' to 200': fine to med. sand (S) w/ v. sparse pebbles (to ~1")	200' Grab/Arch.
	Grab Arch			200' to 205': coarse to v. coarse sand (S) Increasing in basal	205' Grab/Arch.
210	Grab Arch			205' to 210': coarse sand (S) w/ ~5% v. coarse & ~5% med.	210' Grab/Arch.
	Grab Arch			210' to 215': coarse sand (S) w/ ~5% v. coarse & ~5% med.	215' Grab/Arch.
220	Grab Arch			215' to 220': coarse sand (S) (Same as above)	220' Grab/Arch.
	Grab Arch			220' to 225': coarse sand (S) (Same as above)	225' Grab/Arch.
230	Grab Arch			225' to 230': v. coarse sand (S) ~10% med. to coarse, ~5% v. fine pebbles & fine pebbles	230' Grab/Arch.
	Grab Arch			230' to 235': sandy gravel (1/4 to 1/2")	235' Grab/Arch.

Reported By: <u>U. Bowler</u>	Reviewed By: <u>L.D. Walker</u>
Title: <u>Geologist</u>	Title: <u>Geologist</u>
Signature:	Signature:
Date: <u>5/23/05</u>	Date: <u>6/30/05</u>

BOREHOLE LOG						Page 4 of 5
Well ID: C4648		Well Name: 299-E17-26		Location: 20 East, SW of Puvex		
Project: IDF Monitoring Wells				Reference Measuring Point: Ground Surface		
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments	
	Type No.	Blows Recovery				
240	Grab Arch.			235' to 240': Sandy Gravel (SG) (to 1/4") (S) ~5% v. cse sand (S) w/ ~20% pebbles (to 1/4")	240' Grab/Arch. Diesel Hammer, 1 1/2" D.W. 6	
	Grab Arch.			240' to 245': Sandy Gravel (SG) (to ~1/4") ~20% cse to v.cse sand.	245' Grab/Arch.	
250	Grab Arch.			245' to 250': gravelly sand (GS) w/ ~5% large basalt cobbles (broken).	250' Grab/Arch.	
	Grab Arch.			250' to 255': Sandy Gravel (SG) ~90% cse sand. w/ (S)	255' Grab/Arch.	
260	Grab Arch.			255' to 260': cse sand (S) w/ ~70% med.	260' Grab/Arch.	
	Grab Arch.			260' to 265': cse sand (S) w/ ~20% med. & ~5% v.cse.	265' Grab/Arch.	
270	Grab Arch.			265' to 270': med to cse sand (S)	270' Grab/Arch.	
	Grab Arch.			270' to 275': med to cse sand (S) Same as above.	275' Grab/Arch.	
280	Grab Arch.			275' to 280': med. to cse sand (S) Same as above w/ ~5% fines also.	280' Grab/Arch.	
	Grab Arch.			280' to 285': Sandy Gravel (SG) ~20% to 30% cse sand no fine to v. lg pebbles (~90%) & sparse (5%) cobbles to 6"	285' Grab/Arch.	
290	Grab Arch.			285' to 290': cse gravel (G) ~10% v.cse sand & cobbles to 6"	290' Grab/Arch.	
	Grab Arch.			290' to 295': v.cse gravel (G) lg. cobbles (to 6") (~10%) w/ ~80% med to coarse pebbles	295' Grab/Arch.	
300	Grab Arch.			295' to 300': v.cse gravel (G) Same as above w/ ~5 to 10% sand	300' Grab/Arch.	
	Grab Arch.			300' to 305': cse gravel (G) w/ Fract. cobble to 2 1/4". ~20% med. to coarse pebbles	305' Grab/Arch.	
310	Grab Arch.			305' to 310': v.cse gravel (G) (to 4") w/ 80% sm. to v.cse pebbles ~10% cobbles	310' Grab/Arch.	
	Grab Arch.		310' to 315': v.cse gravel (G) (to 8") w/ 60% med. to cse pebbles & ~20% cobbles.	315' Grab/Arch.		

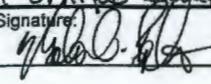
BOREHOLE LOG						Page 5 of 5	
Well ID: C4648		Well Name: 299-E17-26		Location: 200 East, SW of Purex		Date: 6/1/05 - 5/27/05	
Project: IDF Monitoring Wells				Reference Measuring Point: Ground Surface			
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments		
	Type No.	Blows Recovery			Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level	
320	Grab Arch			315' to 320': cse gravel (G) (to ~4")	320' Grab/Arch.		
	Grab Arch			~20% highly fractured pieces of lg. cobbles			
	Grab Arch			~75% med. to v. cse pebbles			
	Grab Arch			320' to 325': cse gravel (G) (to 6")	325' Grab/Arch.		
	Grab Arch			Same as above but showing cemented			
330	Grab Arch			325' to 330': cse gravel (G) (to 4")	330' Grab/Arch.		
	Grab Arch			~60 is med. pebbles w/ sparse lg. cse pebbles (~5%) some sand.			
	Grab Arch			330' to 335': cse gravel (G) w/ some (~5% sand). Highly cemented	335' Grab/Arch.		
	Grab Arch			& showing slight moisture inc. in basalts.			
340	Grab Arch			335' to 340': v. cse gravel (G) w/ highly cemented coatings damp.	340' Grab/Arch.		
	Grab Arch			~10% sim. to lg. basalt cobbles	Split spoon sample: 2		
	Grab Arch			340' to 345': v. cse gravel (G) w/ ~10 to 20% cse to v. cse sand, cobbles to 6"	345' Grab/Arch.		Producing water @ ~348' bgs.
350	Grab Arch		345' to 350': v. cse gravel (G) sim. to above, less sand (~5%)	350' Grab/Arch.			
	Grab Arch		350' to 355': v. cse gravel (G) (to ~6") inc. sand (~20% cse to v. cse) basalts inc.	355' Grab/Arch.			
	Grab Arch		355' to 360': sandy gravel (SG) ~30% med. to cse sand. cobbles (to 6")	360' Grab/Arch.			
	Grab Arch		360' to 365': sandy gravel (SG) inc. sandy (~40%) fine to cse. ~20% cobbles (up to 6") rest fine to v. cse pebbles	365' Grab/Arch.			
370	Grab Arch		365' to 370': sandy gravel (SG) (to 6") sim. to above, but no fine sand.	370' Grab/Arch.		Split spoon sample	
	Grab Arch		370' to 375': sandy gravel (SG) (to ~4") ~30% med. to cse sand, 50% fine to v. cse pebbles, sparse sim. cobbles	375' Grab/Arch.		369.3' to 370.5' bgs	
	Grab Arch		375' to 379': cse gravel (G) (to ~4") w/ ~20% med. to cse sand. sparse cobbles to 4" (5%)	379' Grab/Arch.			
380			mostly fine to v. cse pebbles.			TD=379' (~378.85 bgs) on 6/1/05	
390							

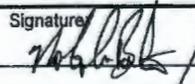
Reported By: P. Bowles
 Reviewed By: L.D. Walker
 Title: Geologist
 Signature: [Signature] Date: 6/1/05
 Title: Geologist
 Signature: [Signature] Date: 6/30/05

Appendix C: Well Construction Summary Sheets

Well 299-E24-24 (C4647) – 1 page

Well 299-E17-26 (C4648) – 1 page

WELL CONSTRUCTION SUMMARY REPORT				Start Date: 5-9-05			
				Finish Date: 5-26-05			
				Page 1 of 1			
Well ID: <u>24647</u>		Well Name: <u>299-E24-24</u>		Approximate Location: <u>200 East, SW of Pures</u>			
Project: <u>IDF Monitoring Wells</u>		Other Companies: <u>FH, GRAM</u>		Geologist(s): <u>M. Bowles, M. Caron, & Brockilland</u>			
Drilling Company: <u>Layne Christensen Co.</u>		Driller: <u>A. Madec & S. Madec</u> License #: <u>WA 2647</u>					
TEMPORARY CASING AND DRILL DEPTH			DRILLING METHOD	HOLE DIAMETER (In.) / INTERVAL (ft)			
*Size/Grade/Lbs. Per Ft.	Interval	Shoe O.D./I.D.	Auger:	Diameter _____ From _____ to _____			
<u>4" x 6" Dual Wall C.S.</u>	<u>0' - 364'</u>	<u>9 1/2" / 5 1/2"</u>	Cable Tool:	Diameter _____ From _____ to _____			
			Air Rotary:	Diameter _____ From _____ to _____			
			A.R. w/Sonic:	Diameter _____ From _____ to _____			
			<u>Diesel Hammer</u>	Diameter <u>9 1/2"</u> From <u>0'</u> to <u>364'</u>			
				Diameter _____ From _____ to _____			
*Indicate Welded (W) - Flush Joint (FJ) Coupled (C) & Thread Design				Diameter _____ From _____ to _____			
			Drilling Fluid: <u>Air</u>				
Total Drilled Depth: <u>364'</u>		Hole Dia @ TD: <u>9 1/2"</u>		Total Amt. Of Water Added During Drilling: <u>-N/A-</u>			
Well Straightness Test Results: <u>Pass (9/13/05 @ 5" o.d., 142'L)</u>			Static Water Level: <u>322.70' bgs</u> Date: <u>5-26-05 5:27-05</u>				
GEOPHYSICAL LOGGING							
Sondes (type)	Interval	Date	Sondes (type)	Interval	Date		
<u>Spectral Gamma.</u>	<u>0' - 364'</u>	<u>5/12/05</u>					
COMPLETED WELL							
Size/Wt./Material	Depth	Thread	Slot Size	Type	Interval Annular Seal/Filter Pack	Volume	Mesh Size
<u>4" sch. 53, 55304L Sump</u>	<u>358.36' - 364.36'</u>	<u>F480</u>	<u>-N/A-</u>	<u>Silica Sand Filter Pack</u>	<u>364.0' - 310.9'</u>	<u>55 bags</u>	<u>10/20</u>
<u>4" 55304L Screen</u>	<u>358.36' - 321.36'</u>	<u>F480</u>	<u>0.020"</u>	<u>Coarse Bentonite Slits</u>	<u>310.9' - 305.5'</u>	<u>3 buckets</u>	<u>1/4"</u>
<u>4" sch. 53, 55304L Casing</u>	<u>321.36' - 12.00'</u>	<u>F480</u>	<u>-N/A-</u>	<u>Groundwater Bentonite</u>	<u>305.5' - 11.3'</u>	<u>101 bags</u>	<u>#8</u>
				<u>Portland Cement Grt.</u>	<u>11.3' - 3.0'</u>	<u>7 bags</u>	<u>-N/A-</u>
				<u>Gen. Purp. Concrete Aggregate</u>	<u>3.0' - 0'</u>	<u>7 bags</u>	<u>-N/A-</u>
OTHER ACTIVITIES							
Aquifer Test:		Date:	Well Decommission:		Yes: No: Date:		
Description:			Description:				
WELL SURVEY DATA (if applicable)							
Washington State Plane Coordinates:			Protective Casing Elevation:				
			Brass Survey Marker Elevation:				
COMMENTS / REMARKS							
<p><u>Perme Pump Information: Grundfos S.S. 10 RediFlow 3370 (10 S&F 340-NE); set @ 340.02' bgs (include).</u></p> <p><u>Perme. Drilling pipe info: 3/4" S.S., Sch. 40s, TP304/304L; Tot. Length = 341.97' in 34 pieces.</u></p> <p><u>Ground Surface is self referring to original drill pad elevation, not 4'x4' well pad.</u></p>							
Reported By:	Title:	Signature:		Date:			
<u>N. Bowles</u>	<u>Geologist</u>			<u>5/26/05/17/05</u>			

WELL CONSTRUCTION SUMMARY REPORT				Start Date: 5-23-05			
				Finish Date: 6-29-09			
				Page 1 of 1			
Well ID: 44648		Well Name: 299-E17-26		Approximate Location: 200 East, SW of Purex			
Project: IDF Monitoring Wells			Other Companies: FH, GRAM				
Drilling Company: Layne Christensen			Geologist(s): N. Bowles, L. Brouillard, M. Caron, R. Henderson				
Driller: A. Macke & S. Macke		License #: WA 25922 WA 2643					
TEMPORARY CASING AND DRILL DEPTH			DRILLING METHOD	HOLE DIAMETER (in.) / INTERVAL (ft)			
*Size/Grade/Lbs. Per Ft.	Interval	Shoe O.D./I.D.	Auger:	Diameter _____ From _____ to _____			
9" x 6" Dual Wall C.S.	0' - 379'	9 1/2" / 5 1/2"	Cable Tool:	Diameter _____ From _____ to _____			
			Air Rotary:	Diameter _____ From _____ to _____			
			A.R. w/Sonic:	Diameter _____ From _____ to _____			
			Diesel Hammer	Diameter 9 1/2" From 0' to 379'			
				Diameter _____ From _____ to _____			
*Indicate Welded (W) - Flush Joint (FJ) Coupled (C) & Thread Design				Diameter _____ From _____ to _____			
			Drilling Fluid: Air				
Total Drilled Depth: 379'		Hole Dia @ TD: 9 1/2"		Total Amt. Of Water Added During Drilling: -N/A-			
Well Straightness Test Results: passed 6-6-05			Static Water Level: 339.3' bgs Date: 5-31-05				
GEOPHYSICAL LOGGING							
Sondes (type)	Interval	Date	Sondes (type)	Interval	Date		
Spectral Gamma (SGLS)	0' - 379'	6/2/05 & 6/6/05					
COMPLETED WELL							
Size/WL/Material	Depth	Thread	Slot Size	Type	Interval Annular Seal/Filter Pack	Volume	Mesh Size
4" ID 304L Sump	373.00' - 375.00'	F480	N/A	Colorado Silica Sand	327.01' - 379.0'	39.6	10-20
4" ID 10-20 slot S.S. screen	372.00' - 373.01'	"	0.020-10 10-20	Bentonite Pellets	322.10' - 322.09'	2	3/8"
4" ID 304L S.S. casing	225.00' - 322.00'	"	N/A	Granular Bentonite	11.19' - 322.10'	115	
				Portland Cement	0 - 11.19'	5	
OTHER ACTIVITIES							
Aquifer Test:		Date:	Well Decommission:	Yes:	No:	Date:	
Description:			Description:				
WELL SURVEY DATA (if applicable)							
Washington State Plane Coordinates:			Protective Casing Elevation:				
			Brass Survey Marker Elevation:				
COMMENTS / REMARKS							
Reported By: N. Bowles / R. Henderson		Title: Geologist		Signature: 		Date: 6-27-05	

WMP-27008, REV. 0

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Appendix D: Well Development and Testing Data Sheets

Well 299-E24-24 (C4647) – 2 pages

Well 299-E17-26 (C4648) – 2 pages

WELL DEVELOPMENT AND TESTING DATA				p. 1 of 2
Well Name: 249-E24-24	Well ID: C4647	Well Location: 200 East, SW of Purex	Date: 5/25/05	
Reference Measuring Point (unless otherwise noted): TOP OF OUTER CASING (TOC) 6'				
Has the well been surveyed? <input type="radio"/> Yes <input checked="" type="radio"/> No		Does the well have a cement pad? <input checked="" type="radio"/> Yes <input type="radio"/> No		
PART 1		PART 4		
STATIC WATER LEVEL:		<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 5px;"> Last Recorded Measurements Date: -N/A- </div> <div style="border: 1px solid black; padding: 5px;"> Current Measurements Date: 5/25/05 </div> </div>		
Start of Job 325.69' bto c (1")/ea				
End of Job 325.60' bto c (10")/20/05				
DEPTH TO BOTTOM:				
Start of Job ~361.2' bto c (6")		A = -N/A-		
End of Job ~360.8' bto c (on 5/26/05)		B = -N/A-		
PART 2		C = -N/A-		
WELL DEVELOPMENT DATA				
Pump Model Fdw mod #4F27550/SHP				
Intake Depth 353.54' bto c (6")				
Starting Turbidity >1000 NTU				
Pump Start	Stop	Flow Rate	A' = 3.00 2.43'	
1120	1153	3.33 gpm	B' = 2.00	
1164	1208	3.33 gpm	C' = 1.00	
1255	1338	~29.9 gpm		
See p. 2				
Total Pumped 110/40/1285 gallons				
Final Turbidity 0.53 NTU				
XD SN/Range (PSI) #2740 DI / 20 psi.				
PART 3		PART 5		
INSTANTANEOUS SLUG TEST		COMMENTS:		
Static Water Level (TOC)		#1 - Initial 24.343 (25) ft H ₂ O = XD		
Transducer Depth		First interval w/ pump intake @ 353.54' bto c		
Baseline Start		Drawdown recorded @ test #01, Recovery as test #02		
Injection Start		Stopped test due to inadequate flow rate & drawdown.		
Baseline Start		#2 Try again - Flow inadequate => Stopped		
Withdrawal Start		#3 3 rd Try - Initial XD = 24.370 ft H ₂ O, Pump @ 353.54' bto c		
Slug Volume		Drawdown recorded @ test #05, Recovery as test #04		
XD SN/Range (PSI)		- Stopped Recovery due to check valve/backflow not working right.		
Prepared by (print name): N. Bowles		Signature: 		Date: 5/25/05
Reviewed by (print name): L.D. Walker		Signature: 		Date: 6-7-05

WELL DEVELOPMENT AND TESTING DATA p. 2 of 2 (25)																					
Well Name: 299-E24-224	Well ID: L4647	Well Location: 200 East, SW of Purex	Date: 5/25/08																		
Reference Measuring Point (unless otherwise noted): TOP OF OUTER CASING (TOC) → (6")																					
Has the well been surveyed? <input type="radio"/> Yes <input checked="" type="radio"/> No		Does the well have a cement pad? <input checked="" type="radio"/> Yes <input type="radio"/> No																			
PART 1		PART 4																			
STATIC WATER LEVEL:		<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 5px;"> Last Recorded Measurements Date: - N/A - </div> <div style="border: 1px solid black; padding: 5px;"> Current Measurements Date: 5/25/05 </div> </div>																			
Start of Job 325.69' btoc (6")																					
End of Job 325.60' btoc (on 5/20/08)																					
DEPTH TO BOTTOM:																					
Start of Job ~ 361.2' btoc (6")		#5 Ref. Pt btoc = Top 6" C' Top 4"																			
End of Job ~ 360.8' btoc (on 5/20/08)																					
PART 2		A = - N/A - B = - N/A - C = - N/A -																			
WELL DEVELOPMENT DATA (cont'd)																					
Pump Model #210 model # 4F27550/5HP		A' = 3.00 B' = 2.00 C' = 1.00																			
Intake Depth 338.54' btoc																					
Starting Turbidity u/f. (>1000)		Are there any reference marks on the casing strings? <input type="radio"/> Yes <input type="radio"/> No																			
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Pump Start</th> <th>Stop</th> <th>Flow Rate</th> </tr> </thead> <tbody> <tr> <td>#5 1410</td> <td>1430</td> <td>31.89 gpm</td> </tr> <tr> <td colspan="3" style="text-align: center;">2000 1450 31.89</td> </tr> </tbody> </table>				Pump Start	Stop	Flow Rate	#5 1410	1430	31.89 gpm	2000 1450 31.89											
Pump Start	Stop	Flow Rate																			
#5 1410	1430	31.89 gpm																			
2000 1450 31.89																					
Total Pumped 640 gallons		PART 5																			
Final Turbidity 3.17 #5 ppa		COMMENTS:																			
XD SN/Range (PSI) #2748 05/20 psi		#5 Initial XD = 9.382 ft H ₂ O, pump @ 338.54' btoc Drawdown recorded @ test #05, recovery #06.																			
PART 3		<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: center;">INSTANTANEOUS SLUG TEST</th> </tr> </thead> <tbody> <tr><td>Static Water Level (TOC)</td><td></td></tr> <tr><td>Transducer Depth</td><td></td></tr> <tr><td>Baseline Start</td><td></td></tr> <tr><td>Injection Start</td><td></td></tr> <tr><td>Baseline Start</td><td></td></tr> <tr><td>Withdrawal Start</td><td></td></tr> <tr><td>Slug Volume</td><td></td></tr> <tr><td>XD SN/Range (PSI)</td><td></td></tr> </tbody> </table>		INSTANTANEOUS SLUG TEST		Static Water Level (TOC)		Transducer Depth		Baseline Start		Injection Start		Baseline Start		Withdrawal Start		Slug Volume		XD SN/Range (PSI)	
INSTANTANEOUS SLUG TEST																					
Static Water Level (TOC)																					
Transducer Depth																					
Baseline Start																					
Injection Start																					
Baseline Start																					
Withdrawal Start																					
Slug Volume																					
XD SN/Range (PSI)																					
Prepared by (print name): J. Bowles																					
Reviewed by (print name): L.D. Walker																					
Signature: [Signature]																					
Date: 5/25/05																					
Signature: [Signature]																					
Date: 6-7-05																					

WELL DEVELOPMENT AND TESTING DATA			
Well Name: 299-E17-26	Well ID: C4648	Well Location: 200E SW of Porex	Date: 6-27-05
Reference Measuring Point (unless otherwise noted): TOP OF OUTER CASING (TOC)			
Has the well been surveyed? <input type="radio"/> Yes <input checked="" type="radio"/> No		Does the well have a cement pad? <input checked="" type="radio"/> Yes <input type="radio"/> No	
PART 1		PART 4	
STATIC WATER LEVEL:		<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 5px; width: 45%;"> Last Recorded Measurements Date: </div> <div style="border: 1px solid black; padding: 5px; width: 45%;"> Current Measurements Date: 6-28-05 </div> </div> <div style="text-align: center; margin-top: 20px;"> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="width: 45%;"> <p>A = <u>N/A</u></p> <p>B = <u>N/A</u></p> <p>C = <u>N/A</u></p> </div> <div style="width: 45%;"> <p>A' = <u>2.40'</u></p> <p>B' = <u>1.30'</u></p> <p>C' = <u>1.10'</u></p> </div> </div> <p style="margin-top: 20px;">Are there any reference marks on the casing strings? <input type="radio"/> Yes <input type="radio"/> No</p>	
Start of Job 339.75' bgs			
End of Job 339.80' bgs			
DEPTH TO BOTTOM:			
Start of Job Not Measured			
End of Job 374.9' bgs			
PART 2			
WELL DEVELOPMENT DATA			
Pump Model <u>FAN mod. # 4F27550/5A</u>			
Intake Depth <u>~370' bgs</u>			
Starting Turbidity <u>41.2 NTU</u>			
Pump Start	Stop	Flow Rate	
1407	1441	~20 gpm	
NOT USED			
Total Pumped <u>680 gallons</u>		PART 5	
Final Turbidity <u>1.99 NTU</u>		COMMENTS:	
XD SN/Range (PSI) <u>#2748 OJ / 20 PSI</u>		<p>Interval 1: initial H. H₂O = 28.574 = ΔX</p> <p>Drawdown recorded as test #1, test failed</p> <p>Recovery test not performed due to temporary probe failure</p> <p>Final ΔX = 28.436 ft. H₂O</p>	
PART 3			
INSTANTANEOUS SLUG TEST			
Static Water Level (TOC)			
Transducer Depth			
Baseline Start			
Injection Start			
Baseline Start			
Withdrawal Start			
Slug Volume			
XD SN/Range (PSI)			
Prepared by (print name): <u>Robin Henderson</u>		Signature: <u>Robin Henderson</u>	Date: <u>6-29-05</u>
Reviewed by (print name): <u>L. D. Walker</u>		Signature: <u>L. D. Walker</u>	Date: <u>6-30-05</u>

WELL DEVELOPMENT AND TESTING DATA				p 2 of 2
Well Name: 299-E17-26	Well ID: C4648	Well Location: 200E SW of Purex	Date: 6-27-05	
Reference Measuring Point (unless otherwise noted): TOP OF OUTER CASING (TOC)				
Has the well been surveyed? <input type="radio"/> Yes <input checked="" type="radio"/> No		Does the well have a cement pad? <input checked="" type="radio"/> Yes <input type="radio"/> No		
PART 1		PART 4		
STATIC WATER LEVEL:		<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 5px; width: 45%;"> Last Recorded Measurements Date: </div> <div style="border: 1px solid black; padding: 5px; width: 45%;"> Current Measurements Date: </div> </div> <div style="text-align: center; margin-top: 20px;"> </div> <div style="display: flex; justify-content: space-between; margin-top: 20px;"> <div style="width: 45%;"> A = _____ B = _____ C = _____ </div> <div style="width: 45%;"> A' = _____ B' = _____ C' = _____ </div> </div> <p style="text-align: center; margin-top: 10px;">Are there any reference marks on the casing strings? <input type="radio"/> Yes <input type="radio"/> No</p>		
Start of Job 339.75' bgs				
End of Job 339.80' bgs				
DEPTH TO BOTTOM:				
Start of Job Not Measured				
End of Job 374.9' bgs				
PART 2				
WELL DEVELOPMENT DATA				
Pump Model FEW mod # 4E2050/SW				
Intake Depth ~ 355' bgs				
Starting Turbidity 256.0 NTU				
Pump Start	Stop	Flow Rate		
1456	1546	~18 gpm		
Not used				
Total Pumped 900 gallons		PART 5		
Final Turbidity 4.91 NTU		COMMENTS:		
XD SN/Range (PSI) 12748 DS / 20 PSI		Interval 2: initial dx = 14.157 ft. H ₂ O Final dx = 14.121 ft. H ₂ O Drawdown recorded as test 03 Recovery recorded as test 04		
PART 3 N/A				
INSTANTANEOUS SLUG TEST				
Static Water Level (TOC)				
Transducer Depth				
Baseline Start				
Injection Start				
Baseline Start				
Withdrawal Start				
Slug Volume				
XD SN/Range (PSI)				
Prepared by (print name): Robin Henderson		Signature: Robin Henderson		Date: 6-29-05
Reviewed by (print name): L.D. Walker		Signature: L.D. Walker		Date: 6-30-05

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