

Appendix A

Geologic Logs and Well Installation Reports

Geologic Logs and Well Installation Reports

This appendix contains geologic logs and installation reports for all wells installed at the Frontier Hard Chrome site in support of the In Situ Redox Manipulation permeable reactive barrier installation. Information is provided for both the pilot test well network and the remedial action injection and monitoring well network. Also included are composite photographs of drill cuttings from the characterization boreholes (with the exception of PP016, which is shown in Section 3.2 of the main report). As indicated in Table 3.1 in that report, some pilot test site wells were decommissioned or reconfigured during remedial action drilling activities.

		MAJOR DIVISIONS		SOIL DESCRIPTIONS		
UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)	COARSE GRAINED SOILS MORE THAN HALF IS LARGER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS RETAINED ON THE NO. 4 SIEVE SIZE	CLEAN GRAVELS WITH LESS THAN 5% FINES	GW		WELL GRADED GRAVELS
				GP		POORLY GRADED GRAVELS
			GRAVELS WITH OVER 15% FINES	GM		SILTY GRAVELS
				GC		CLAYEY GRAVELS
		SANDS MORE THAN HALF COARSE FRACTION PASSES THE NO. 4 SIEVE SIZE	CLEAN SANDS WITH LESS THAN 5% FINES	SW		WELL GRADED SANDS
				SP		POORLY GRADED SANDS
			SANDS WITH OVER 15% FINES	SM		SILTY SANDS
				SC		CLAYEY SANDS
	FINE GRAINED SOILS MORE THAN HALF IS SMALLER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50	ML		SILT	
			CL		LEAN CLAY	
			OL		LOW ORGANIC SILT	
		SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50	MH		ELASTIC SILT	
			CH		FAT CLAY	
			OH		ORGANIC CLAY	
PT				PEAT		
HIGHLY ORGANIC						

EXPLANATION OF SYMBOLS	LABORATORY GS - Grain Size TOC - Total Organic Carbon HCID - Hydrocarbon ID VOC - Volatile Organic Compounds Cr (VI) - Hexavalent Chromium PCB - Polychlorinated Biphenyls PCP - Pentachlorophenol PAH - Polycyclic Aromatic Hydrocarbons 418.1 - Total Petroleum Hydrocarbons TPH-G - Total Petroleum Hydrocarbons (Gas) BNA - Base/Neutral/Acid (Semi-Volatile) METALS - TAL Metals MC - Moisture Content	CONTACT BETWEEN UNITS Sharp Gradational Approximate	SAMPLE TYPE "Undisturbed" Bulk/Grab Not Recovered
		BLOWS PER FOOT The number of hammer blows needed to drive the sampler the final 12 inches of the sample interval Hammer is 140 pounds with 30 inch drop unless otherwise noted	WATER Static Water Level Water Level at Time of Drilling
		MOISTURE DESCRIPTION Dry - Absense of moisture, dusty, dry to the touch Moist - Damp, but not visible water Wet - Visible free water, usually soil is below water table	

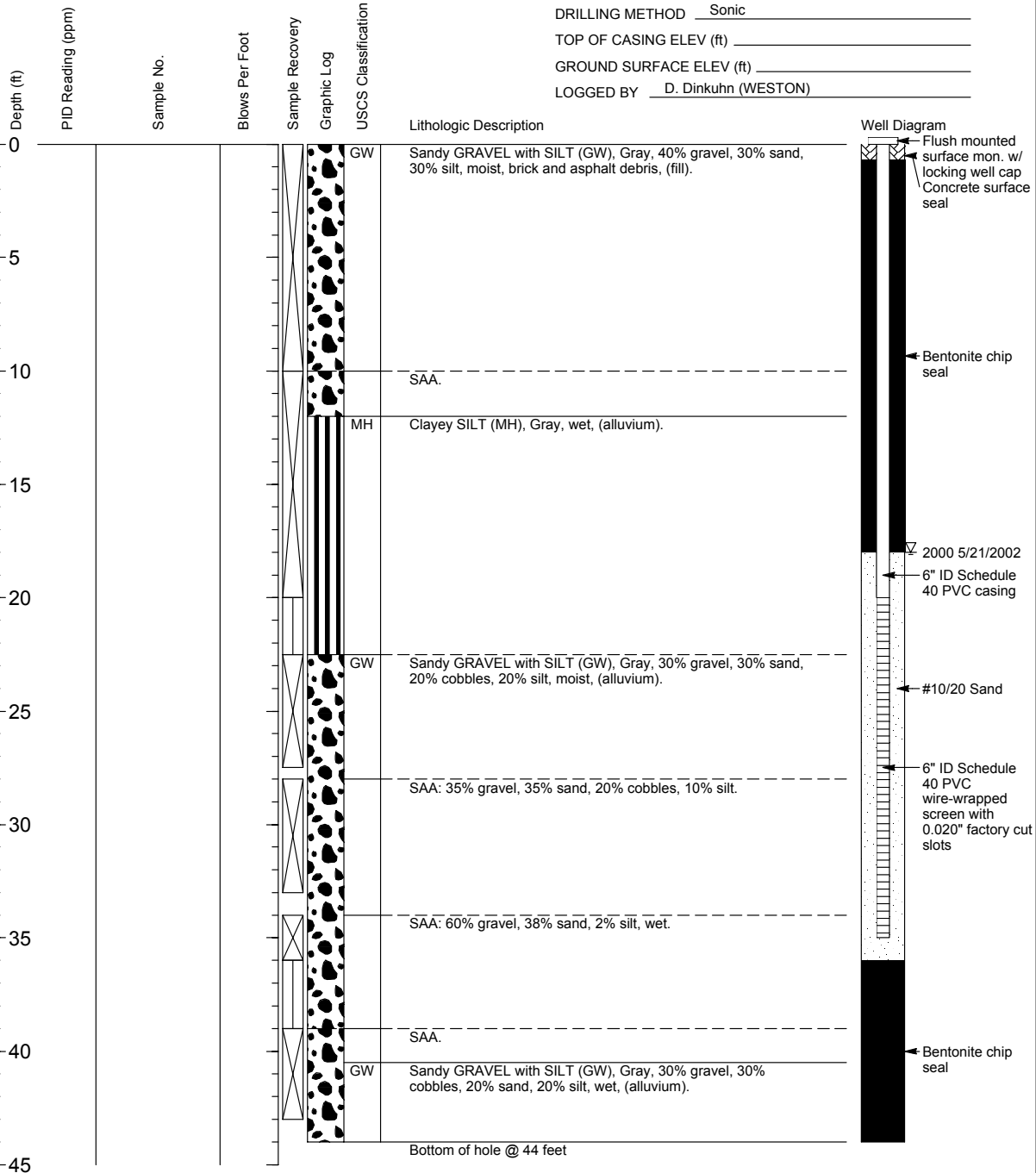
Explanation of Boring Log & Soil Classification Symbols





Monitoring Well INJ-1

PROJECT Frontier Hard Chrome
 JOB NUMBER 20064-134-100-0740
 DATE COMPLETED May 21, 2002
 DRILLING METHOD Sonic
 TOP OF CASING ELEV (ft) _____
 GROUND SURFACE ELEV (ft) _____
 LOGGED BY D. Dinkuhn (WESTON)

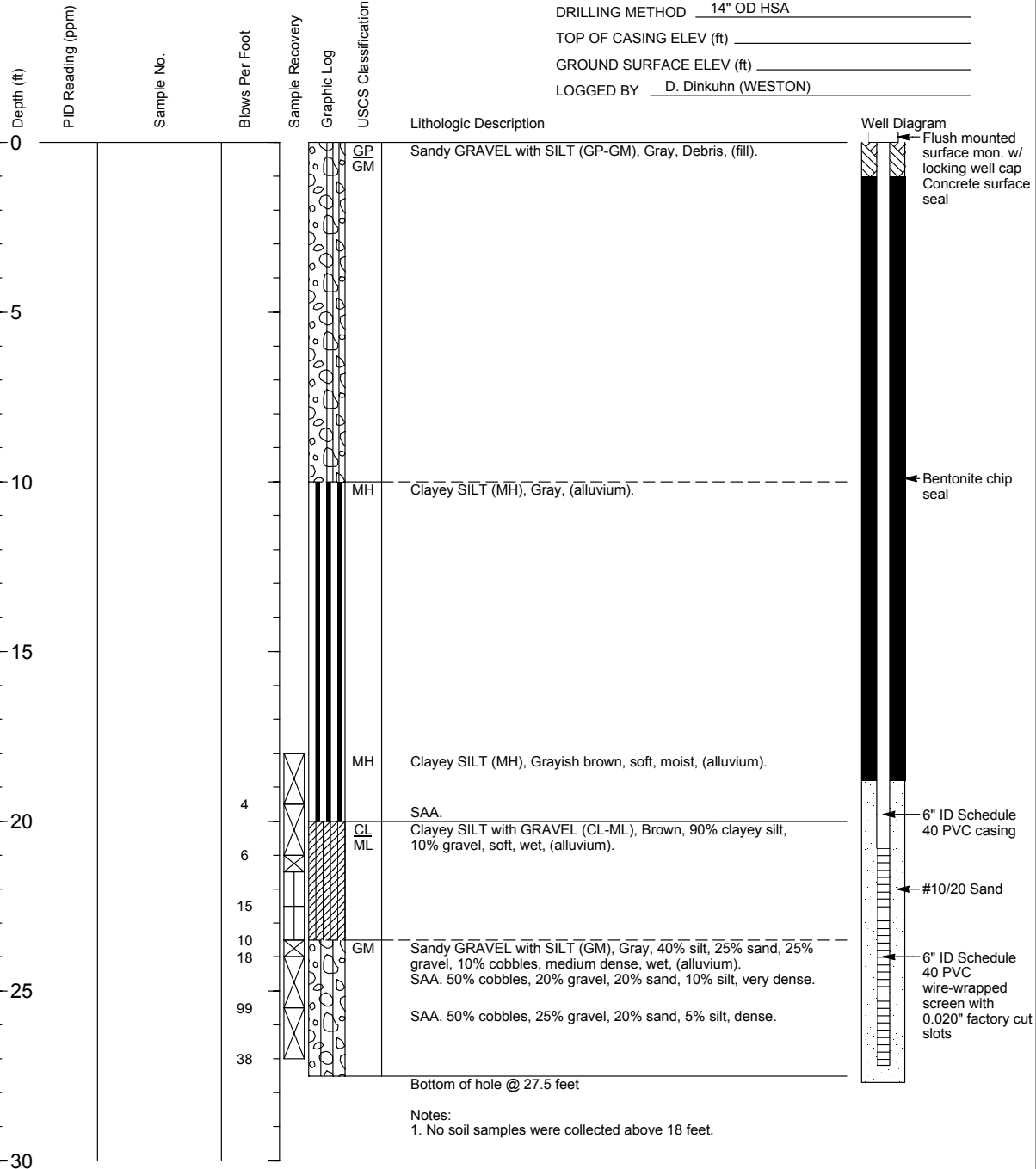


BOREHOLE LOG FHC BORING LOGS.GPJ RFW SEATTLE.GDT 1/26/04 12:33



Monitoring Well INJ-2

PROJECT Frontier Hard Chrome
 JOB NUMBER 20064-134-100-0740
 DATE COMPLETED August 29, 2002
 DRILLING METHOD 14" OD HSA
 TOP OF CASING ELEV (ft) _____
 GROUND SURFACE ELEV (ft) _____
 LOGGED BY D. Dinkuhn (WESTON)



Notes:
 1. No soil samples were collected above 18 feet.

Plate

BOREHOLE LOG FHC BORING LOGS.GPJ RFW SEATTLE GDT 1/26/04 12:33



Monitoring Well MW-1

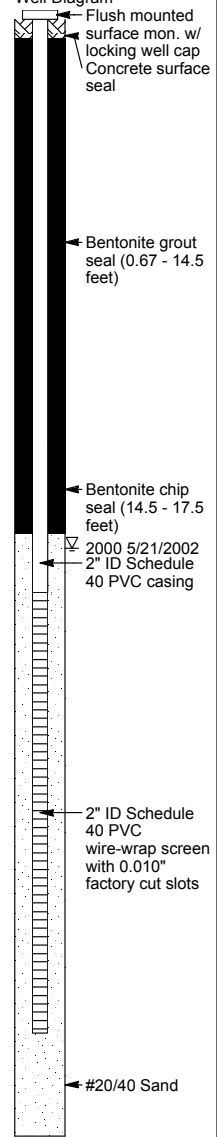
PROJECT Frontier Hard Chrome
 JOB NUMBER 20064-134-100-0740
 DATE COMPLETED May 21, 2002
 DRILLING METHOD 8" OD HSA
 TOP OF CASING ELEV (ft) _____
 GROUND SURFACE ELEV (ft) _____
 LOGGED BY D. Dinkuhn (WESTON)

Depth (ft)	PID Reading (ppm)	Sample No.	Blows Per Foot	Sample Recovery	Graphic Log	USCS Classification
0						
5						
10						
15						
20						
25						
30						
35						
40						

Lithologic Description

Augered to 20', started grinding on gravel at 19'. Fill to silt transition above indefinite. Hard drilling (cobble) at 24'.

Well Diagram



Bottom of hole @ 38 feet

- Notes:
 1. No soil samples were collected.
 2. Well screen stuck in auger, had to pull out and clean then reinstall.

Plate
D-1

BOREHOLE LOG: FHC BORING LOGS.GPJ REW SEATTLE.GDT 1/26/04 12:33



Monitoring Well MW-3

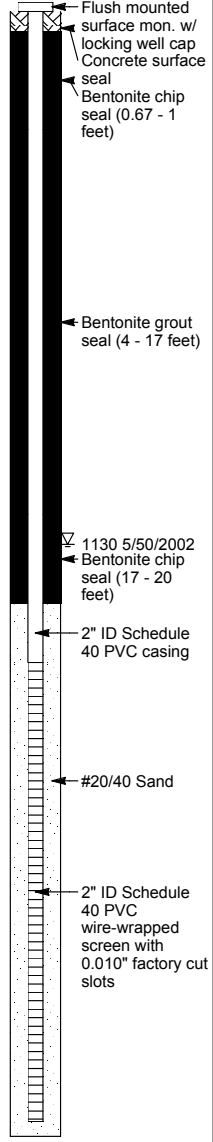
PROJECT Frontier Hard Chrome
 JOB NUMBER 20064-134-100-0740
 DATE COMPLETED May 20, 2002
 DRILLING METHOD 8" OD HSA
 TOP OF CASING ELEV (ft) _____
 GROUND SURFACE ELEV (ft) _____
 LOGGED BY D. Dinkuhn (WESTON)

Depth (ft)
 PID Reading (ppm)
 Sample No.
 Blows Per Foot
 Sample Recovery
 Graphic Log
 USCS Classification

Lithologic Description

Gravel contacted at 19.5'. No definite silt contact above. Fill to silt transition not definite. Hard, cobbly drilling 25' - 35'.

Well Diagram



Bottom of hole @ 38 feet

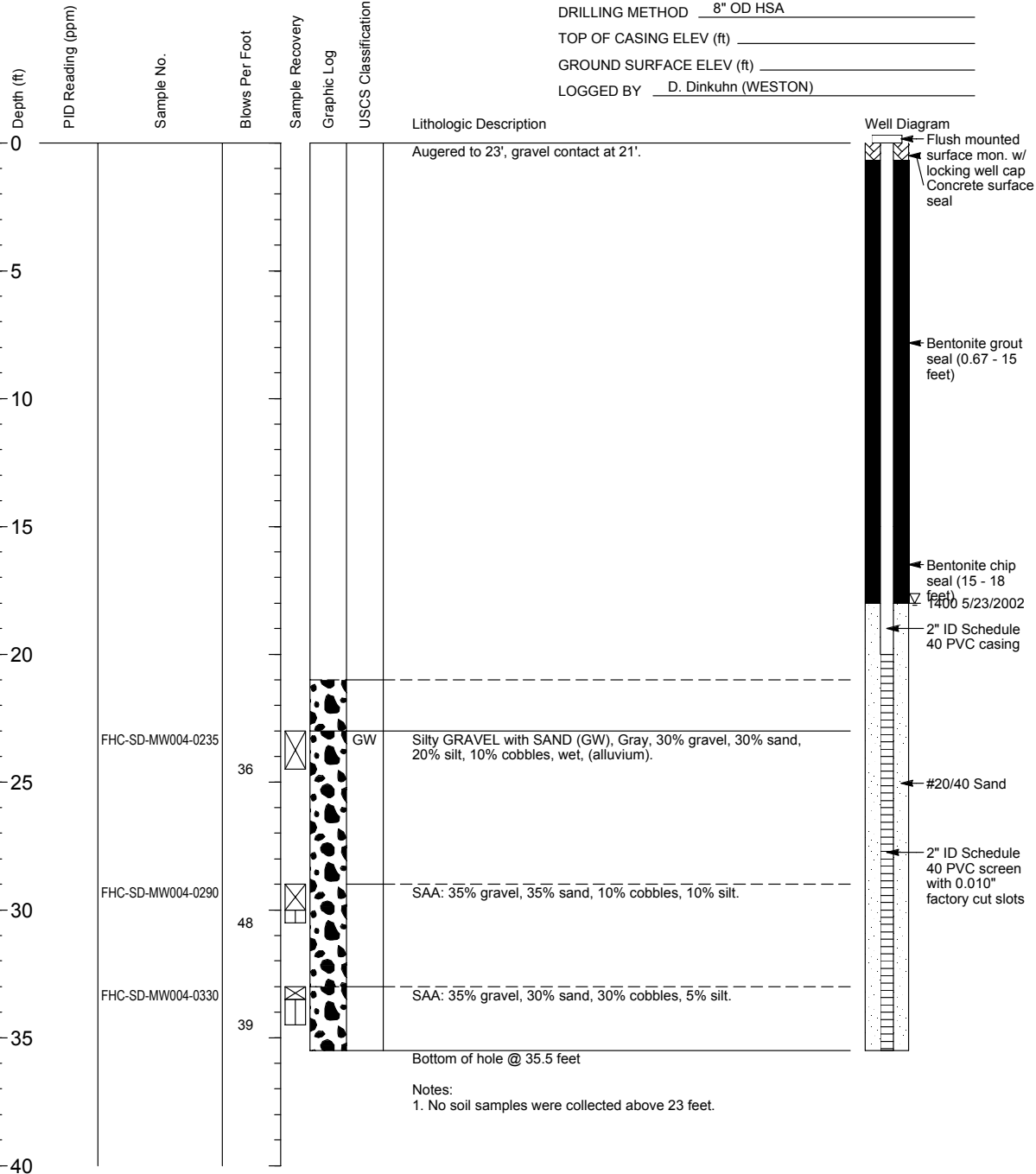
Notes:
 1. No soil samples were collected.

BOREHOLE LOG FHC BORING LOGS.GPJ RFW SEATTLE GDT 1/26/04 12:33



Monitoring Well MW-4

PROJECT Frontier Hard Chrome
 JOB NUMBER 20064-134-100-0740
 DATE COMPLETED May 23, 2002
 DRILLING METHOD 8" OD HSA
 TOP OF CASING ELEV (ft) _____
 GROUND SURFACE ELEV (ft) _____
 LOGGED BY D. Dinkuhn (WESTON)



BOREHOLE LOG FHC BORING LOGS.GPJ RFW SEATTLE GDT 1/26/04 12:33



Monitoring Well MW-5

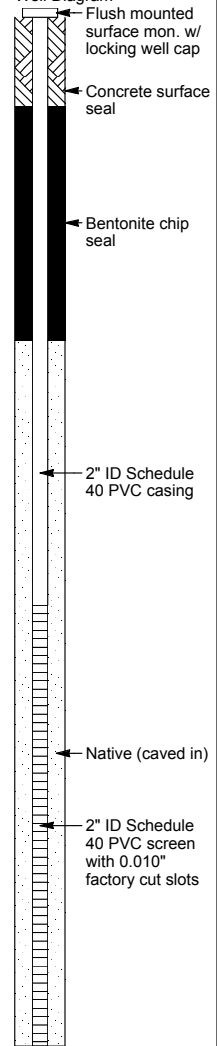
PROJECT Frontier Hard Chrome
 JOB NUMBER 20064-134-100-0740
 DATE COMPLETED May 22, 2002
 DRILLING METHOD 3 1/4" OD Geoprobe
 TOP OF CASING ELEV (ft) _____
 GROUND SURFACE ELEV (ft) _____
 LOGGED BY T. Slotta

Depth (ft)	PID Reading (ppm)	Sample No.	Blows Per Foot	Sample Recovery	Graphic Log	USCS Classification
0						
5						
10						
15						
20						
25						
30						
35						
40						

Lithologic Description

No soil samples were collected. Predrilled hole with 8" OD HSA to 11'.

Well Diagram



Bottom of hole @ 35 feet

- Notes:
 1. No soil samples were collected.
 2. Predrilled hole with 8" OD HSA to 11'.

BOREHOLE LOG: FHC BORING LOGS.GPJ REW SEATTLE.GDT 1/26/04 12:33



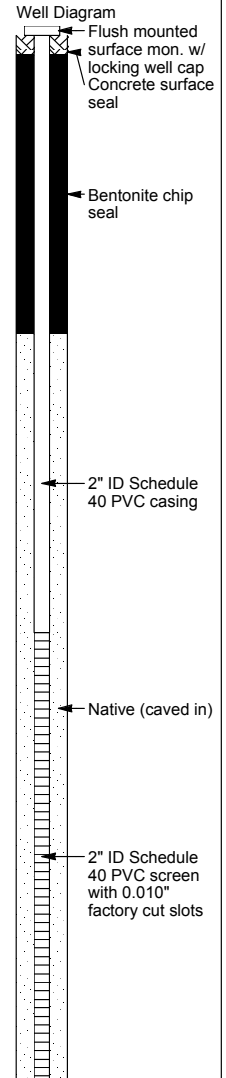
Monitoring Well MW-6

PROJECT Frontier Hard Chrome
 JOB NUMBER 20064-134-100-0740
 DATE COMPLETED May 22, 2002
 DRILLING METHOD 3 1/4" OD Geoprobe
 TOP OF CASING ELEV (ft) _____
 GROUND SURFACE ELEV (ft) _____
 LOGGED BY D. Dinkuhn (WESTON)

Depth (ft)	PID Reading (ppm)	Sample No.	Blows Per Foot	Sample Recovery	Graphic Log	USCS Classification
0						
5						
10						
15						
20						
25						
30						
35						
40						

Lithologic Description

No soil samples were collected.



Bottom of hole @ 35 feet

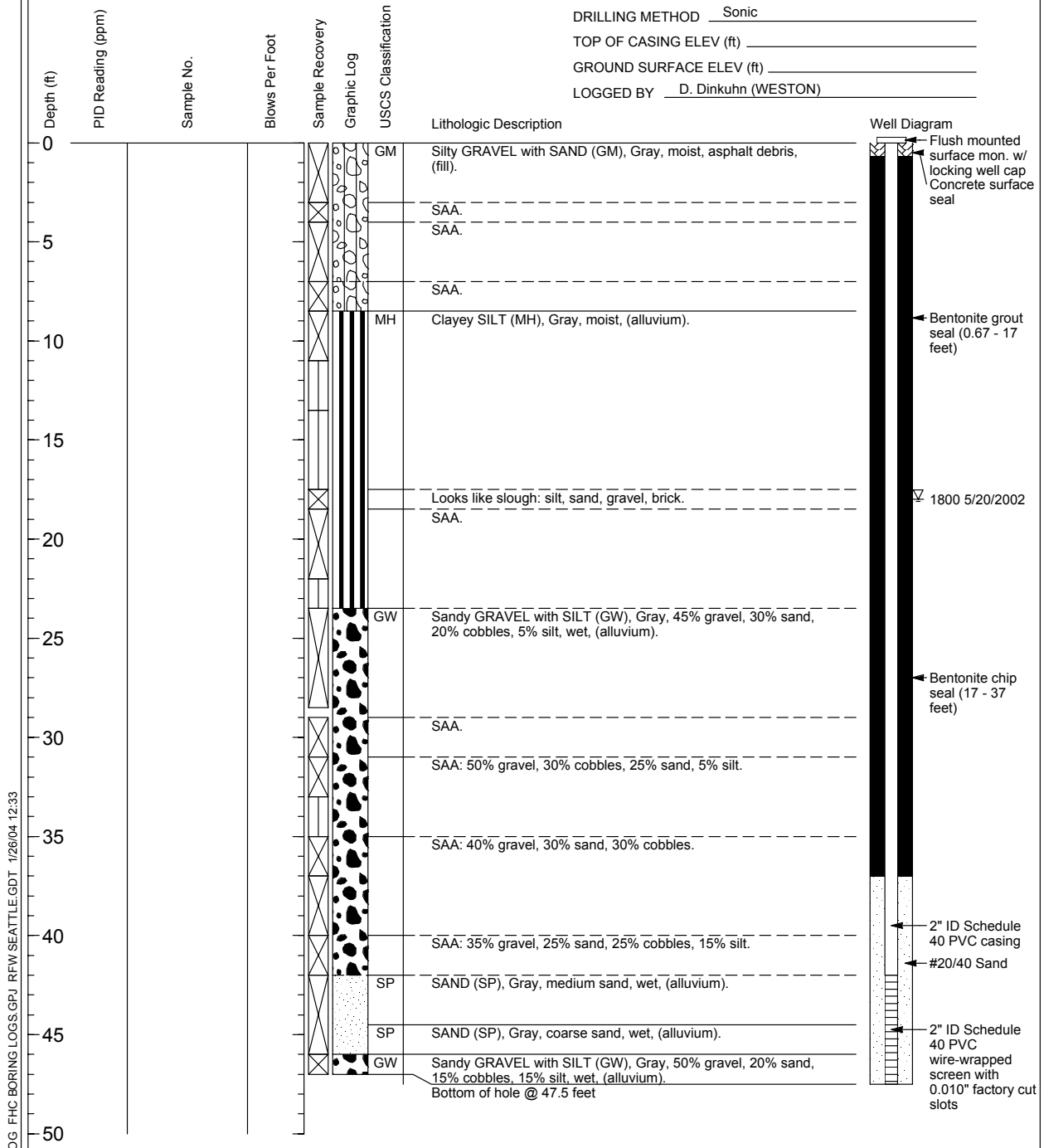
Notes:
 1. No soil samples were collected.

BOREHOLE LOG FHC BORING LOGS.GPJ RFW SEATTLE.GDT 1/26/04 12:33



Monitoring Well MW-7

PROJECT Frontier Hard Chrome
 JOB NUMBER 20064-134-100-0740
 DATE COMPLETED May 20, 2002
 DRILLING METHOD Sonic
 TOP OF CASING ELEV (ft) _____
 GROUND SURFACE ELEV (ft) _____
 LOGGED BY D. Dinkuhn (WESTON)



BOREHOLE LOG FHC BORING LOGS.GPJ RFW SEATTLE.GDT 1/26/04 12:33



Monitoring Well MW-9

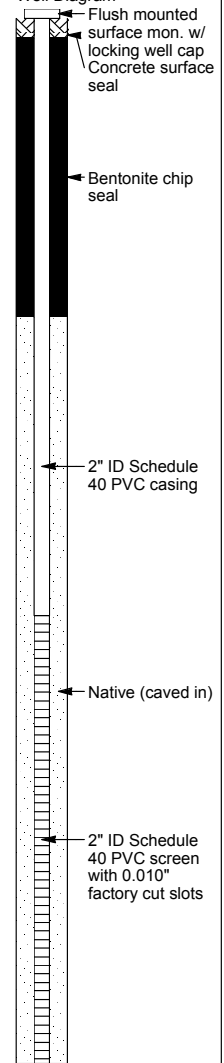
PROJECT Frontier Hard Chrome
 JOB NUMBER 20064-134-100-0740
 DATE COMPLETED May 29, 2002
 DRILLING METHOD 3 1/4" OD Geoprobe
 TOP OF CASING ELEV (ft) _____
 GROUND SURFACE ELEV (ft) _____
 LOGGED BY D. Dinkuhn (WESTON)

Depth (ft)	PID Reading (ppm)	Sample No.	Blows Per Foot	Sample Recovery	Graphic Log	USCS Classification
0						
5						
10						
15						
20						
25						
30						
35						
40						

Lithologic Description

No soil samples were collected.

Well Diagram



Bottom of hole @ 35 feet

BOREHOLE LOG FHC BORING LOGS.GPJ RFW SEATTLE.GDT 1/26/04 12:33



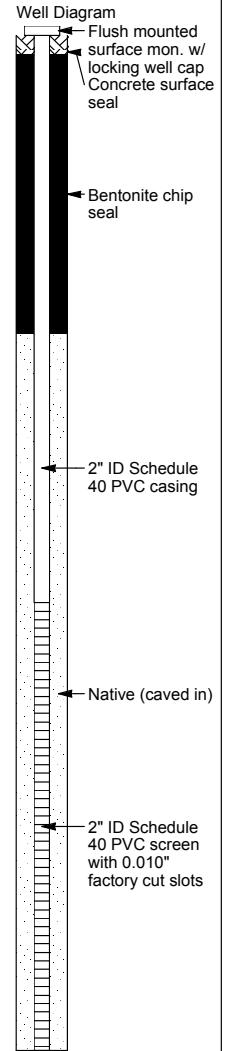
Monitoring Well MW-10

PROJECT Frontier Hard Chrome
 JOB NUMBER 20064-134-100-0740
 DATE COMPLETED May 29, 2002
 DRILLING METHOD 3 1/4" OD Geoprobe
 TOP OF CASING ELEV (ft) _____
 GROUND SURFACE ELEV (ft) _____
 LOGGED BY D. Dinkuhn (WESTON)

Depth (ft)	PID Reading (ppm)	Sample No.	Blows Per Foot	Sample Recovery	Graphic Log	USCS Classification
0						
5						
10						
15						
20						
25						
30						
35						
40						

Lithologic Description

No soil samples were collected.



BOREHOLE LOG FHC BORING LOGS.GPJ RFW SEATTLE.GDT 1/26/04 12:33



Monitoring Well MW-20

PROJECT Frontier Hard Chrome
 JOB NUMBER 20064-134-100-0740
 DATE COMPLETED May 22, 2002
 DRILLING METHOD 8" OD HSA
 TOP OF CASING ELEV (ft) _____
 GROUND SURFACE ELEV (ft) _____
 LOGGED BY D. Dinkuhn (WESTON)

Depth (ft)	PID Reading (ppm)	Sample No.	Blows Per Foot	Sample Recovery	Graphic Log	USCS Classification
0						
5						
10						
15						
20						
25						
30						

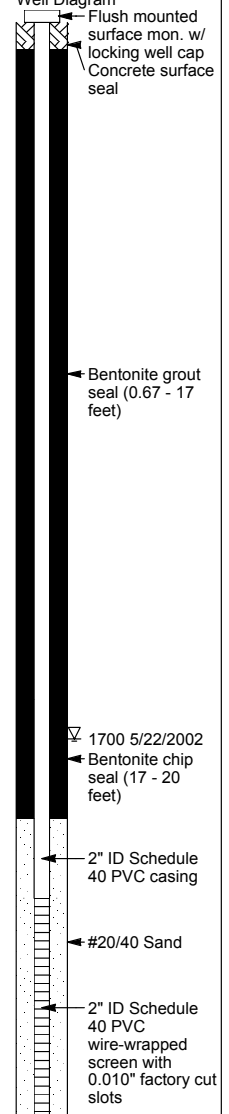
Lithologic Description

Silt to gravel contact at 20.5'.

Bottom of hole @ 27.5 feet

Notes:
 1. No soil samples were collected.

Well Diagram

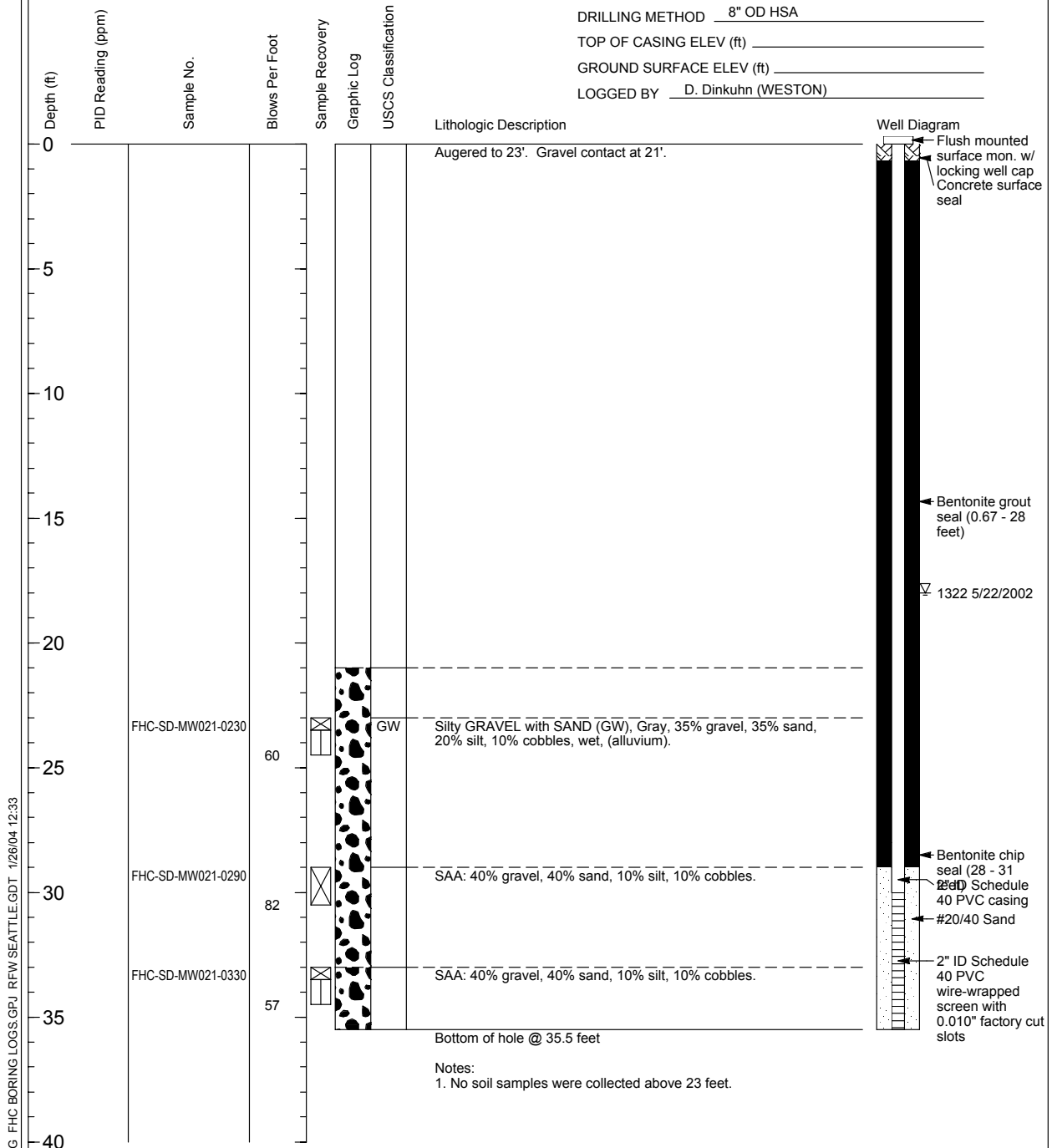


BOREHOLE LOG FHC BORING LOGS.GPJ RFW SEATTLE.GDT 1/26/04 12:33



Monitoring Well MW-21

PROJECT Frontier Hard Chrome
 JOB NUMBER 20064-134-100-0740
 DATE COMPLETED May 22, 2002
 DRILLING METHOD 8" OD HSA
 TOP OF CASING ELEV (ft) _____
 GROUND SURFACE ELEV (ft) _____
 LOGGED BY D. Dinkuhn (WESTON)



Notes:
 1. No soil samples were collected above 23 feet.

Plate
 D-10

BOREHOLE LOG FHC BORING LOGS.GPJ RFW SEATTLE.GDT 1/26/04 12:33



Monitoring Well MW-22

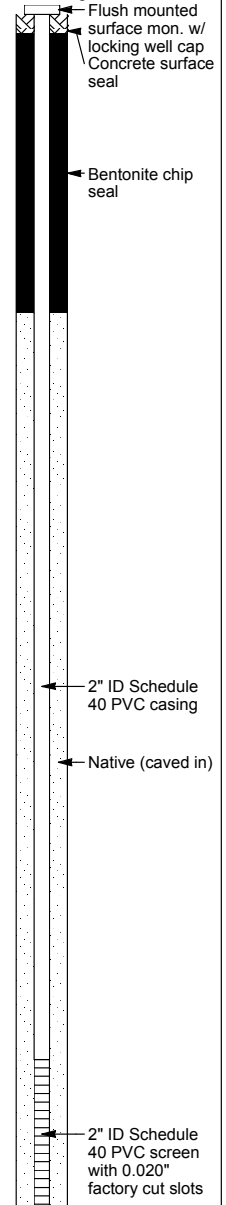
PROJECT Frontier Hard Chrome
 JOB NUMBER 20064-134-100-0740
 DATE COMPLETED May 24, 2002
 DRILLING METHOD 3 1/4" OD Geoprobe
 TOP OF CASING ELEV (ft) _____
 GROUND SURFACE ELEV (ft) _____
 LOGGED BY D. Dinkuhn (WESTON)

Depth (ft)	PID Reading (ppm)	Sample No.	Blows Per Foot	Sample Recovery	Graphic Log	USCS Classification
0						
5						
10						
15						
20						
25						
30						
35						
40						

Lithologic Description

No soil samples were collected.

Well Diagram

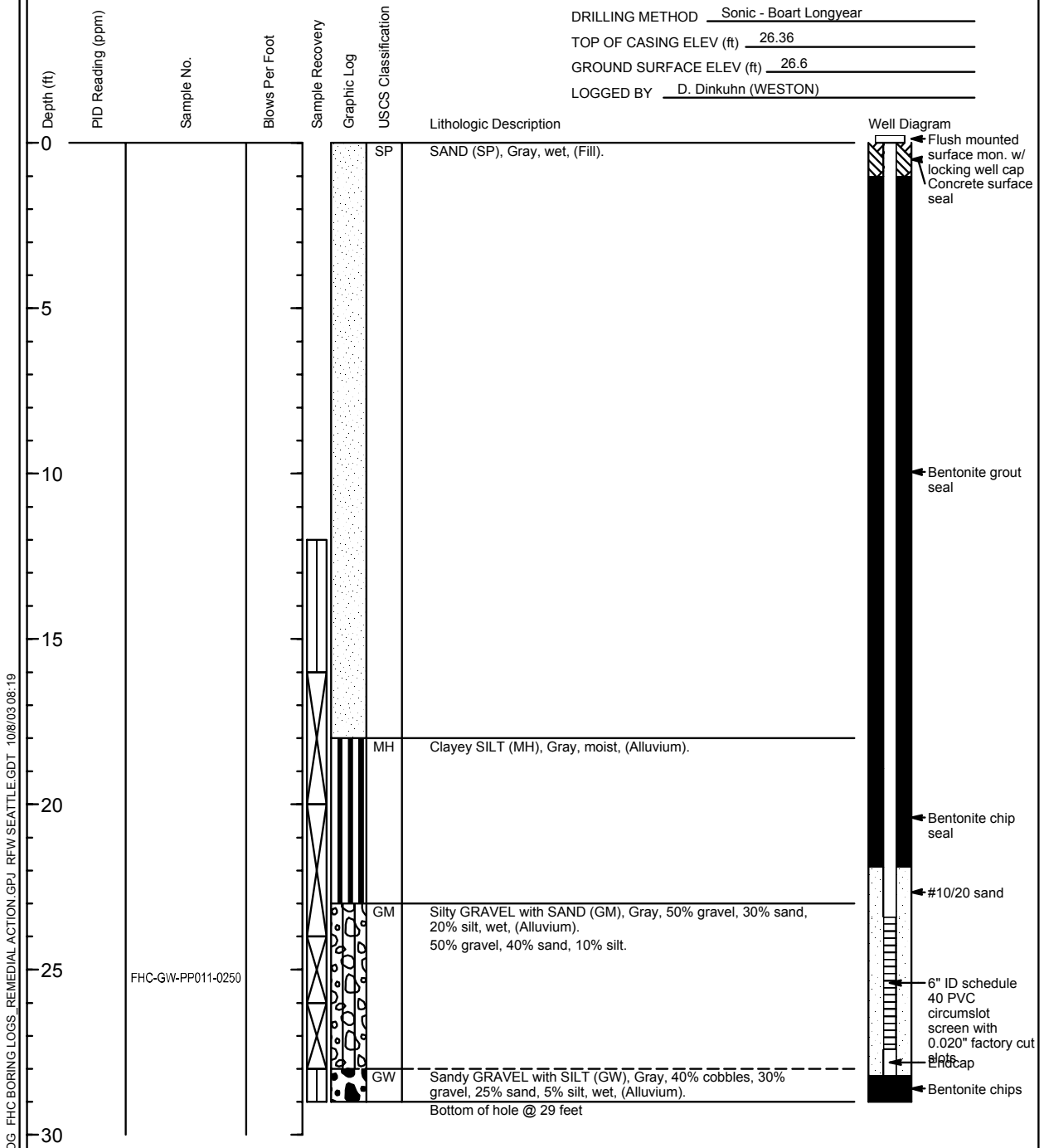


Bottom of hole @ 40 feet

BOREHOLE LOG FHC BORING LOGS.GPJ RFW SEATTLE.GDT 1/26/04 12:33

Monitoring Well RA-IW-2A

PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED April 23, 2003
 DRILLING METHOD Sonic - Boart Longyear
 TOP OF CASING ELEV (ft) 26.36
 GROUND SURFACE ELEV (ft) 26.6
 LOGGED BY D. Dinkuhn (WESTON)



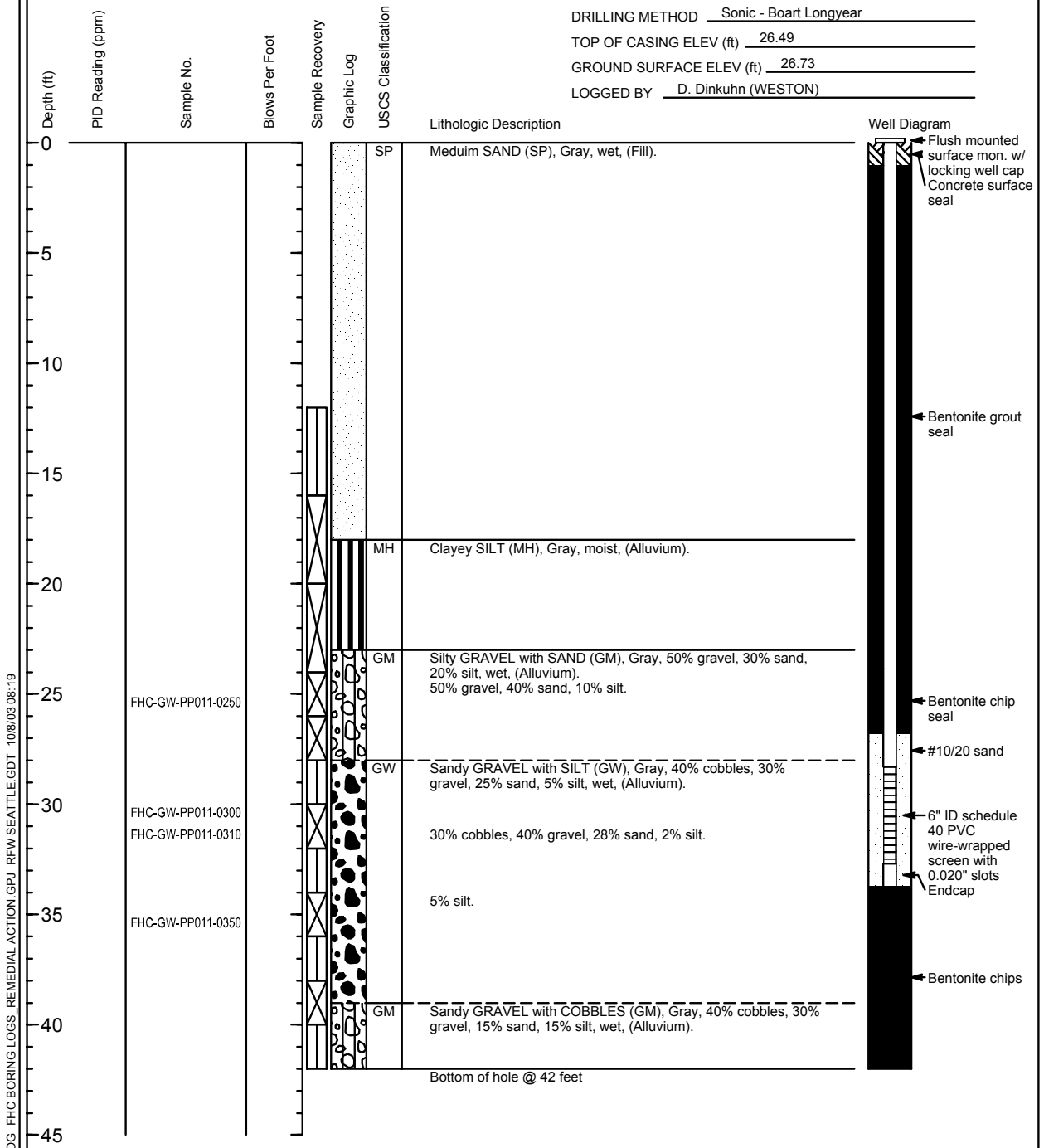
BOREHOLE LOG FHC BORING LOGS, REMEDIAL ACTION.GPJ RFW SEATTLE.GDT 10/8/03 08:19

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Monitoring Well RA-IW-2B

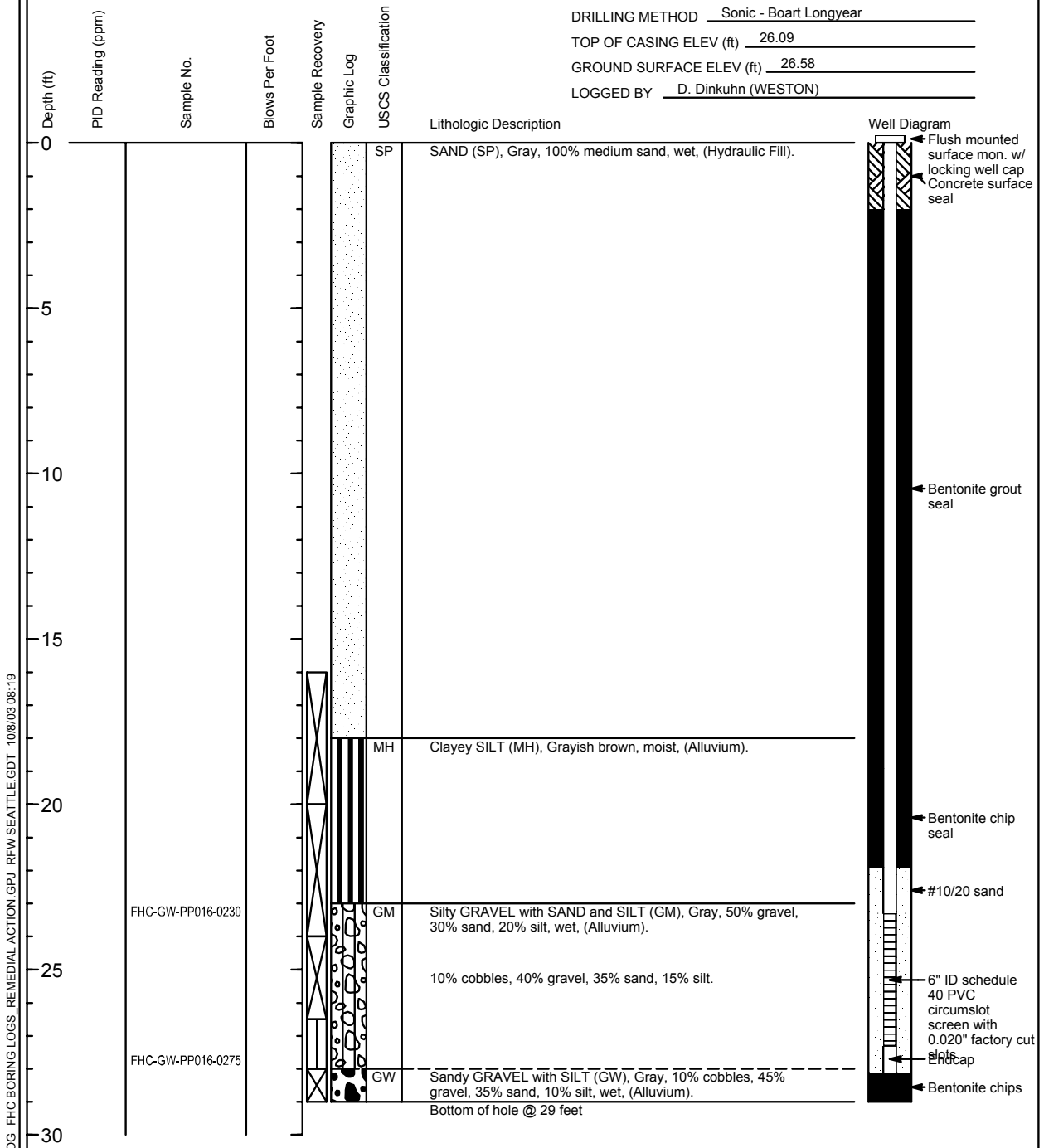
PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED April 22, 2003
 DRILLING METHOD Sonic - Boart Longyear
 TOP OF CASING ELEV (ft) 26.49
 GROUND SURFACE ELEV (ft) 26.73
 LOGGED BY D. Dinkuhn (WESTON)



BOREHOLE LOG: FHC BORING LOGS, REMEDIAL ACTION, GPJ, RFW SEATTLE.GDT, 10/8/03 08:19

Monitoring Well RA-IW-3A

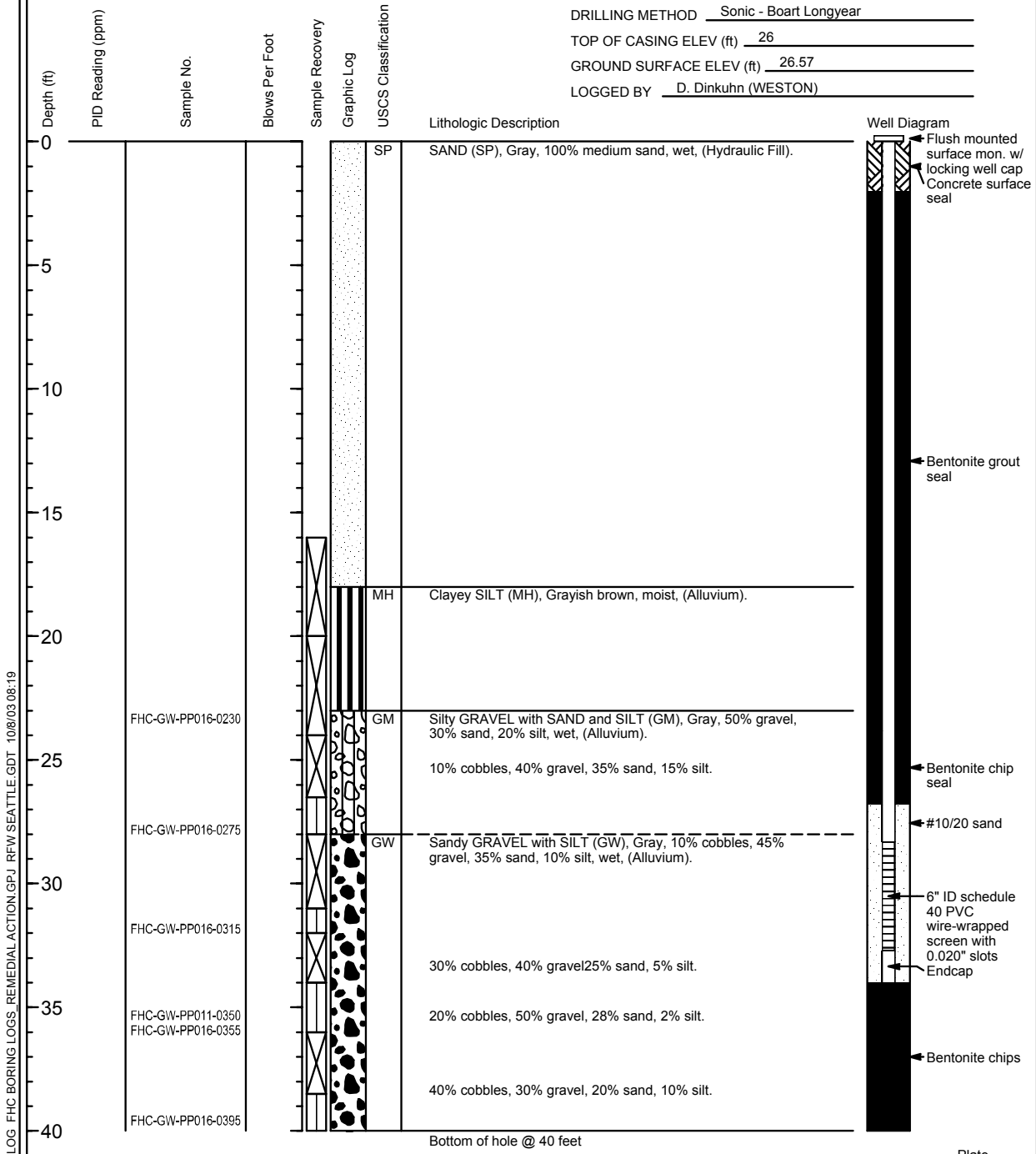
PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED April 23, 2003
 DRILLING METHOD Sonic - Boart Longyear
 TOP OF CASING ELEV (ft) 26.09
 GROUND SURFACE ELEV (ft) 26.58
 LOGGED BY D. Dinkuhn (WESTON)



BOREHOLE LOG: FHC BORING LOGS - REMEDIAL ACTION.GPJ RFW SEATTLE.GDT 10/8/03 08:19

Monitoring Well RA-IW-3B

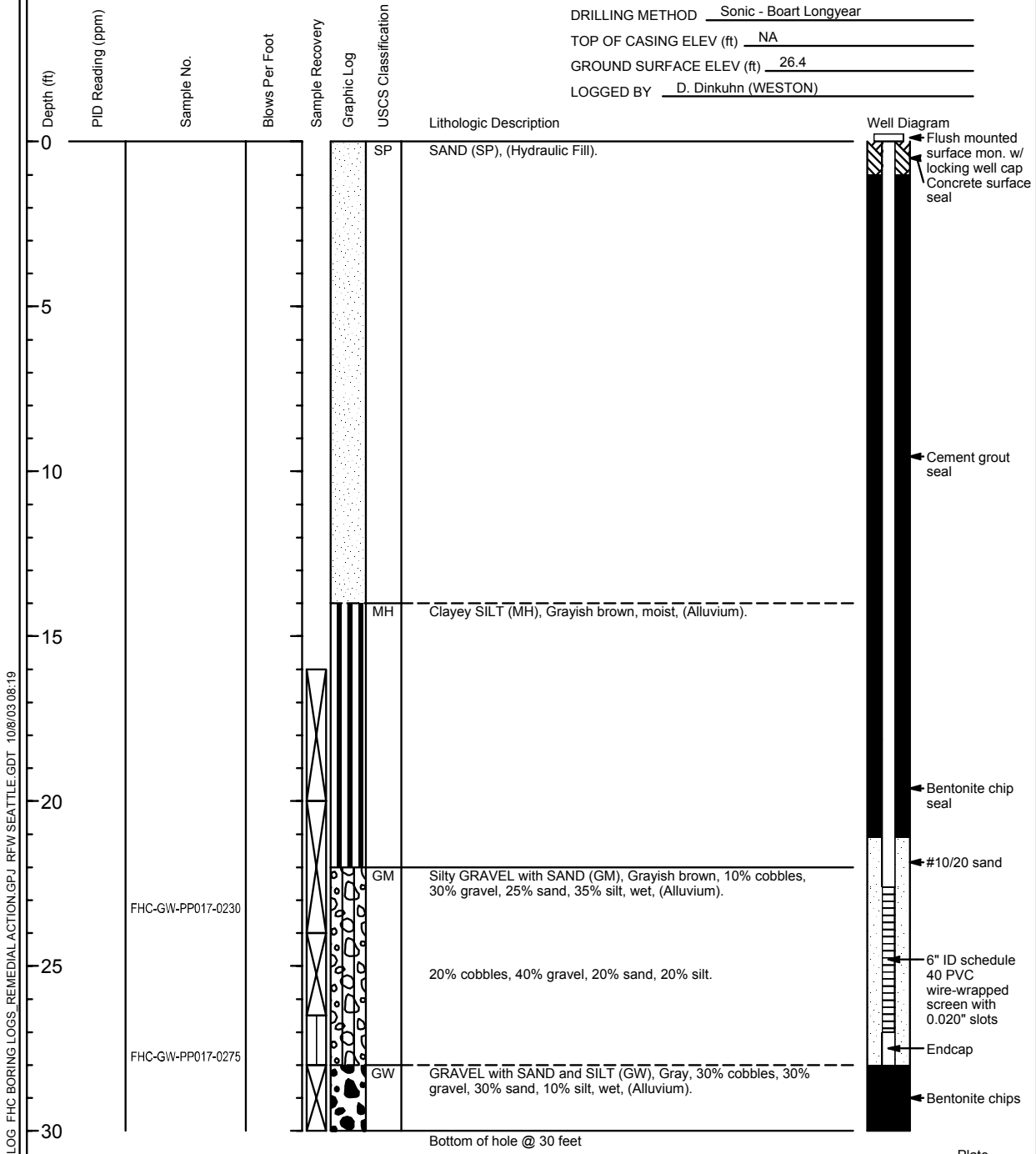
PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED April 22, 2003
 DRILLING METHOD Sonic - Boart Longyear
 TOP OF CASING ELEV (ft) 26
 GROUND SURFACE ELEV (ft) 26.57
 LOGGED BY D. Dinkuhn (WESTON)



BOREHOLE LOG FHC BORING LOGS_REMEDIAL ACTION GPJ RFW SEATTLE.GDT 10/08/03 08:19

Monitoring Well RA-IW-4A

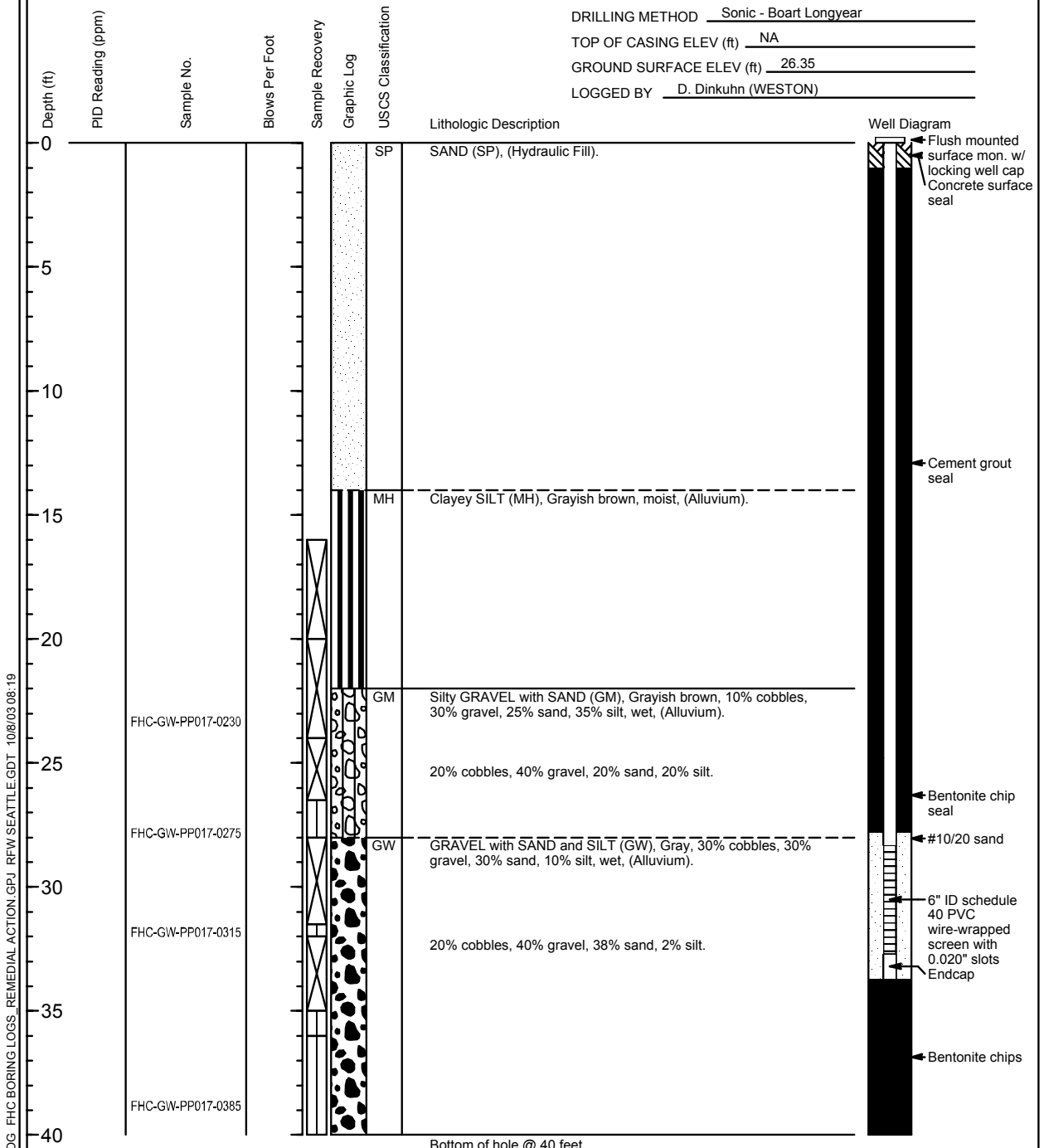
PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED June 25, 2003
 DRILLING METHOD Sonic - Boart Longyear
 TOP OF CASING ELEV (ft) NA
 GROUND SURFACE ELEV (ft) 26.4
 LOGGED BY D. Dinkuhn (WESTON)



BOREHOLE LOG FHC BORING LOGS_REMEDIAL ACTION GPJ RFW SEATTLE.GDT 10/8/03 08:19

Monitoring Well RA-IW-4B

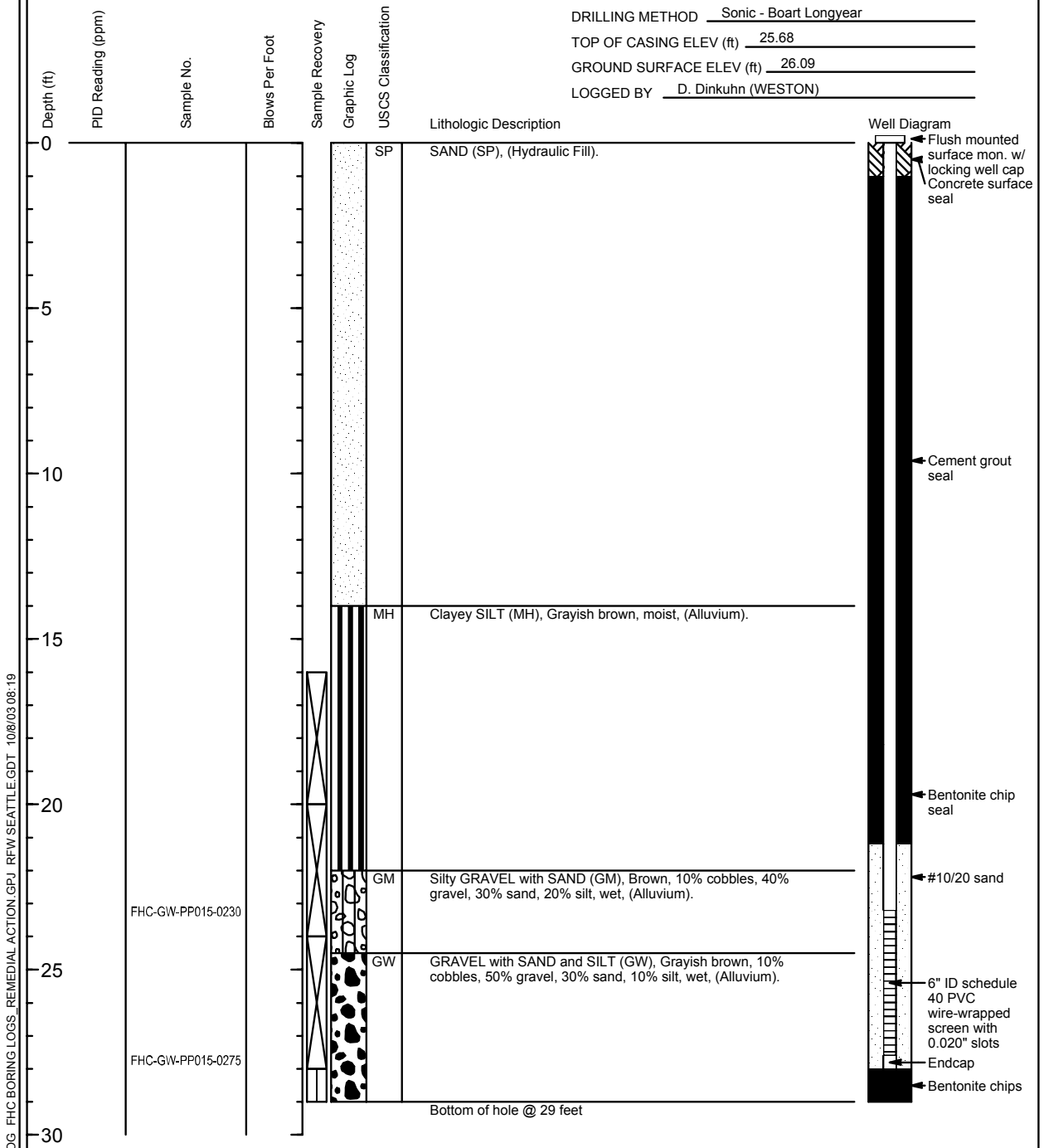
PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED June 24, 2003
 DRILLING METHOD Sonic - Boart Longyear
 TOP OF CASING ELEV (ft) NA
 GROUND SURFACE ELEV (ft) 26.35
 LOGGED BY D. Dinkuhn (WESTON)



BOREHOLE LOG FHC BORING LOGS, REMEDIAL ACTION.GPJ RFW SEATTLE.GDT 10/8/03 08:19

Monitoring Well RA-IW-5A

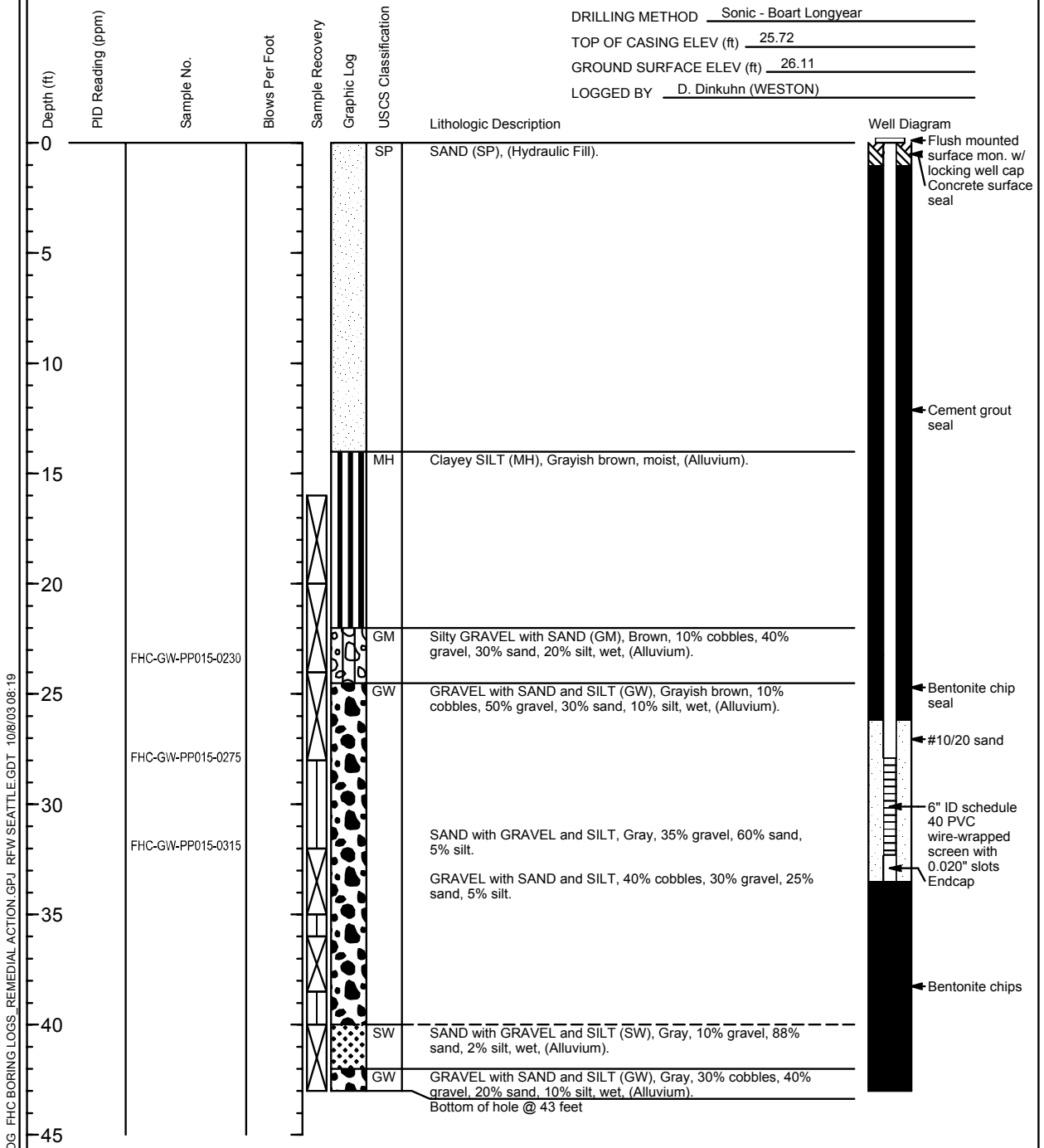
PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED June 26, 2003
 DRILLING METHOD Sonic - Boart Longyear
 TOP OF CASING ELEV (ft) 25.68
 GROUND SURFACE ELEV (ft) 26.09
 LOGGED BY D. Dinkuhn (WESTON)



BOREHOLE LOG FHC BORING LOGS_REMEDIAL ACTION.GPJ RFW SEATTLE.GDT 10/8/03 08:19

Monitoring Well RA-IW-5B

PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED June 25, 2003
 DRILLING METHOD Sonic - Boart Longyear
 TOP OF CASING ELEV (ft) 25.72
 GROUND SURFACE ELEV (ft) 26.11
 LOGGED BY D. Dinkuhn (WESTON)



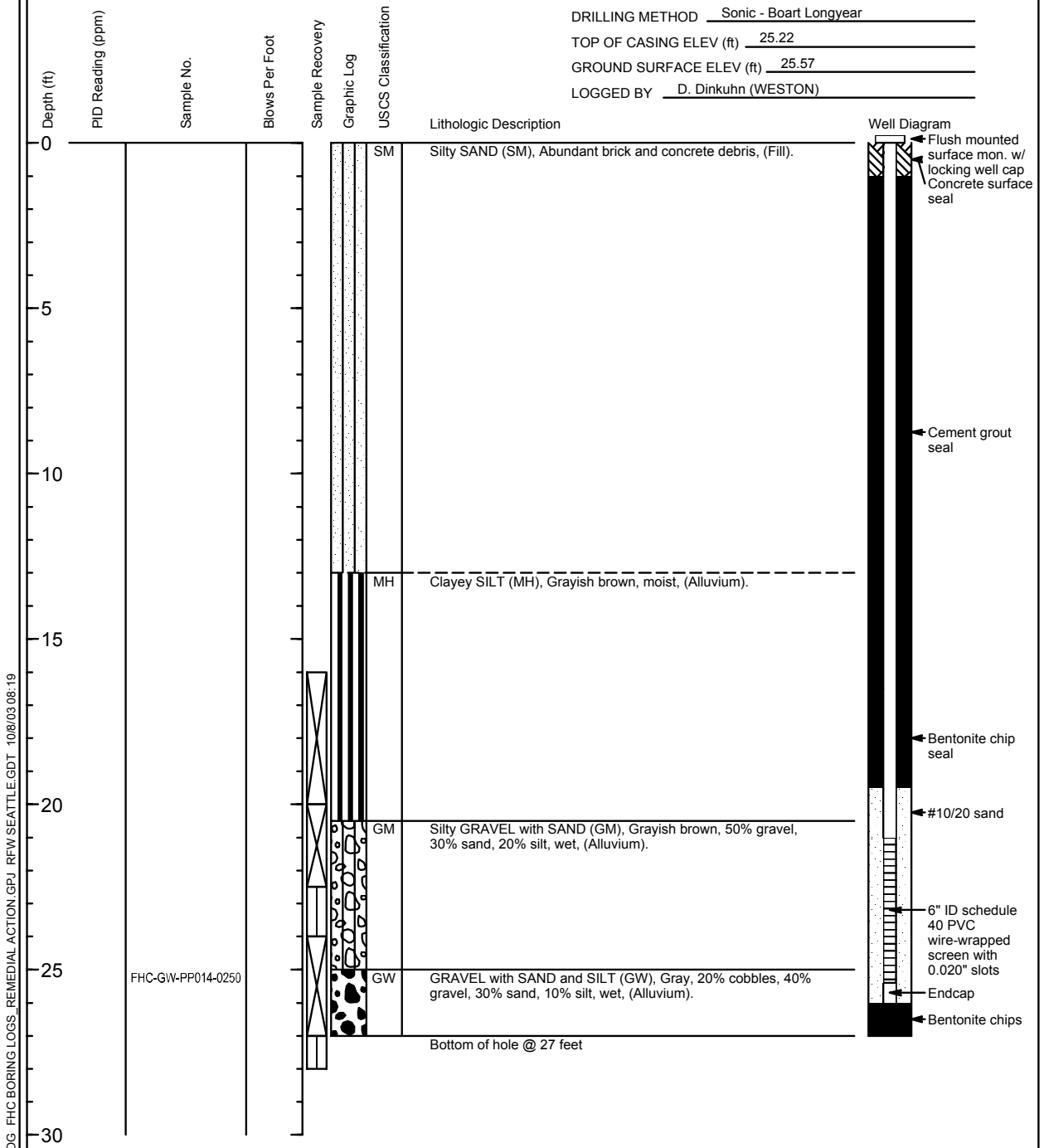
BOREHOLE LOG: FHC BORING LOGS, REMEDIAL ACTION, GPJ, RFW SEATTLE, GDT, 10/8/03 08:19

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Monitoring Well RA-IW-6A

PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED June 27, 2003
 DRILLING METHOD Sonic - Boart Longyear
 TOP OF CASING ELEV (ft) 25.22
 GROUND SURFACE ELEV (ft) 25.57
 LOGGED BY D. Dinkuhn (WESTON)



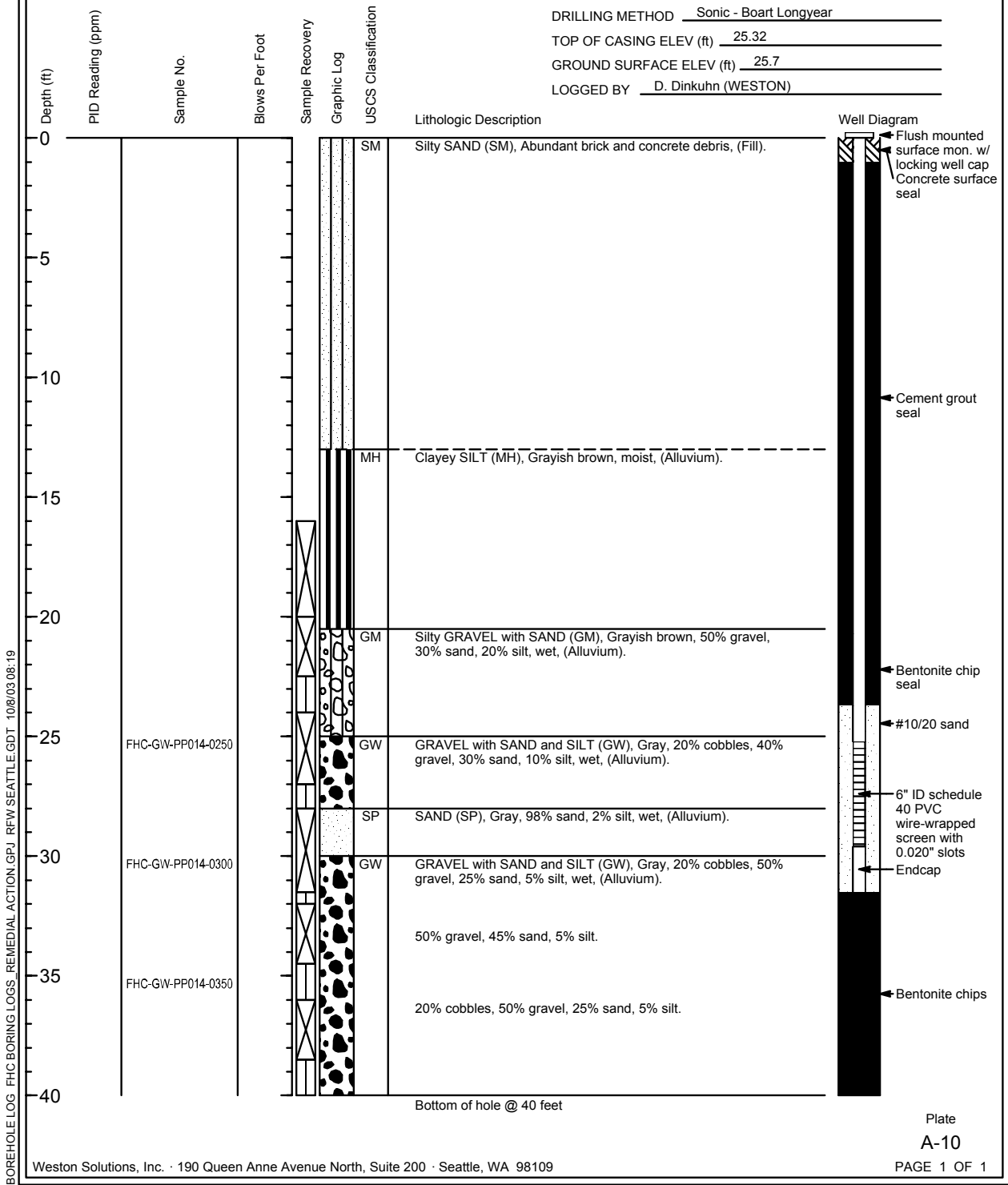
BOREHOLE LOG: FHC BORING LOGS, REMEDIAL ACTION, GPJ, RFW, SEATTLE, GDT, 10/8/03 08:19

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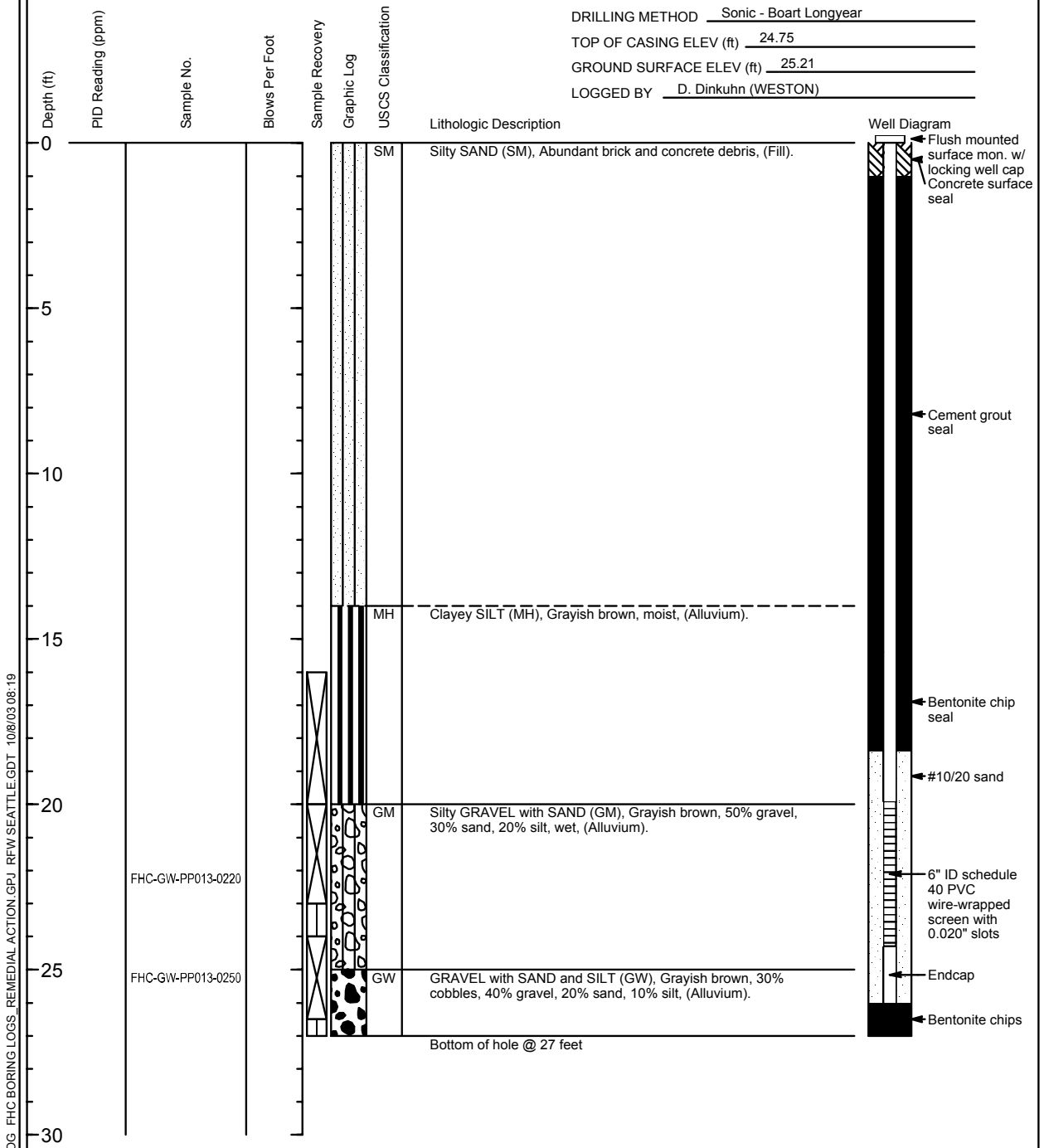
Monitoring Well RA-IW-6B

PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED June 27, 2003
 DRILLING METHOD Sonic - Boart Longyear
 TOP OF CASING ELEV (ft) 25.32
 GROUND SURFACE ELEV (ft) 25.7
 LOGGED BY D. Dinkuhn (WESTON)



Monitoring Well RA-IW-7A

PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED June 28, 2003
 DRILLING METHOD Sonic - Boart Longyear
 TOP OF CASING ELEV (ft) 24.75
 GROUND SURFACE ELEV (ft) 25.21
 LOGGED BY D. Dinkuhn (WESTON)



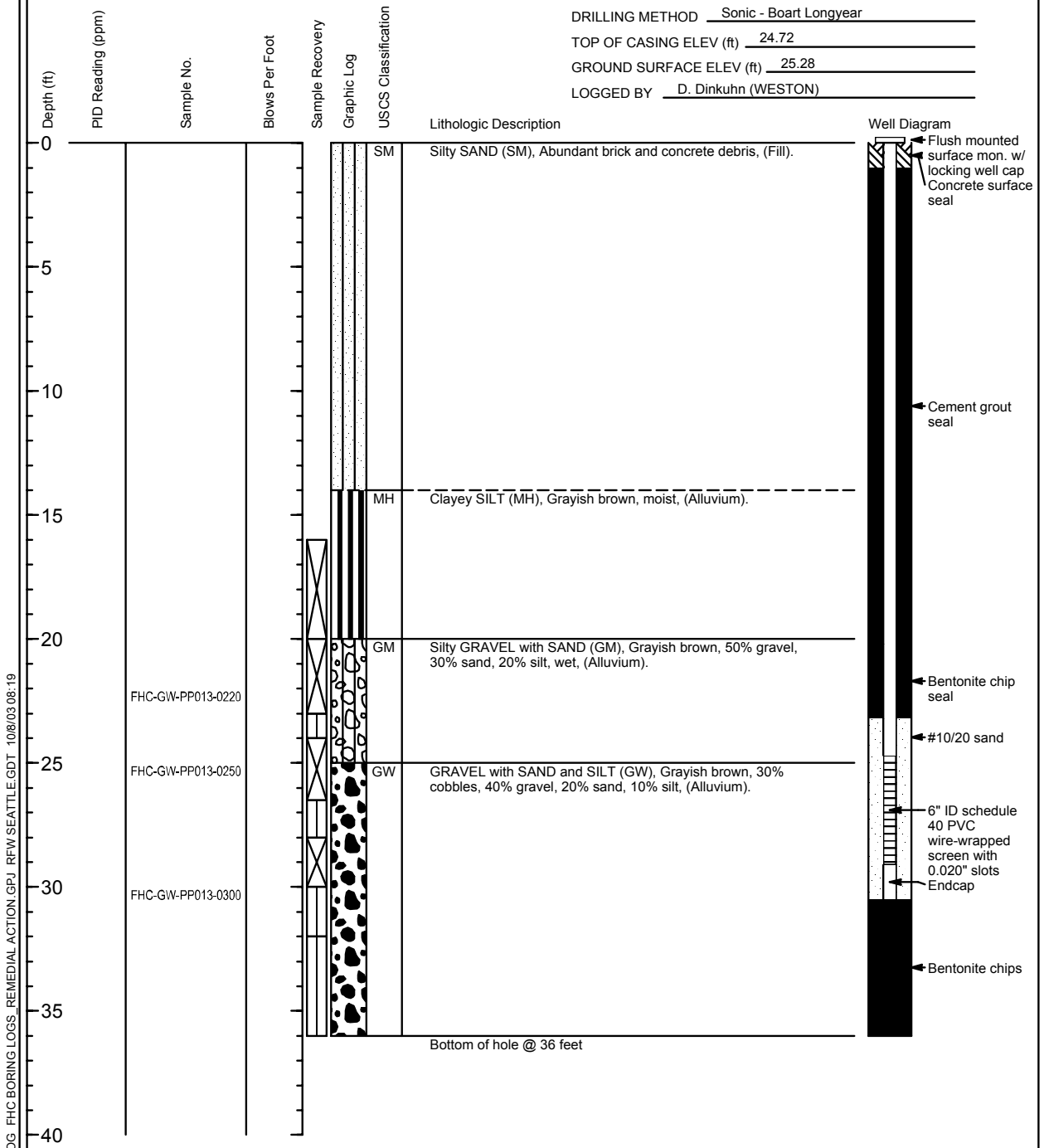
BOREHOLE LOG FHC BORING LOGS_REMEDIAL ACTION.GPJ RFW SEATTLE.GDT 10/8/03 08:19

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Monitoring Well RA-IW-7B

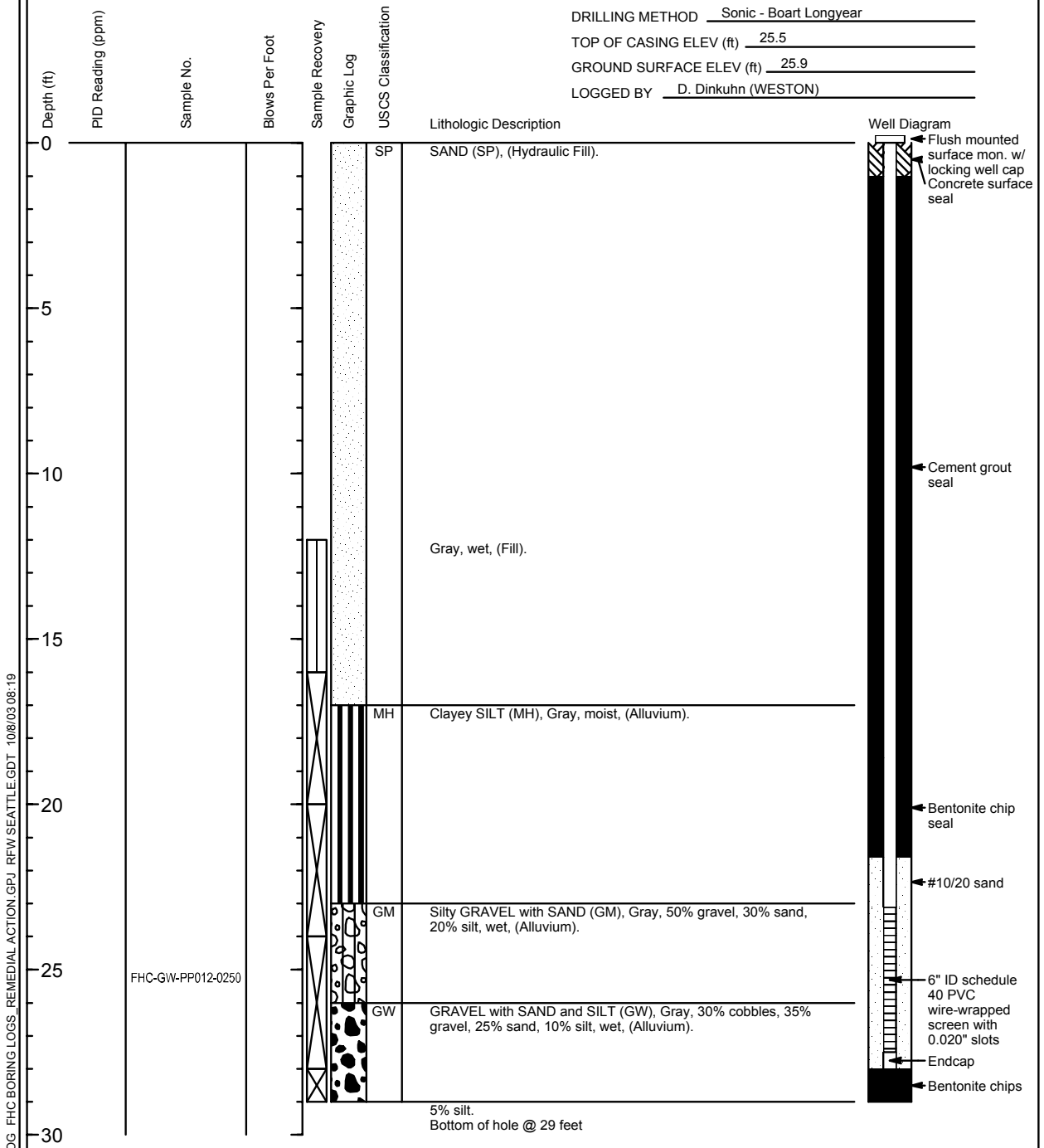
PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED June 28, 2003
 DRILLING METHOD Sonic - Boart Longyear
 TOP OF CASING ELEV (ft) 24.72
 GROUND SURFACE ELEV (ft) 25.28
 LOGGED BY D. Dinkuhn (WESTON)



BOREHOLE LOG FHC BORING LOGS, REMEDIAL ACTION, GPJ RFW SEATTLE GDT 10/8/03 08:19

Monitoring Well RA-IW-8A

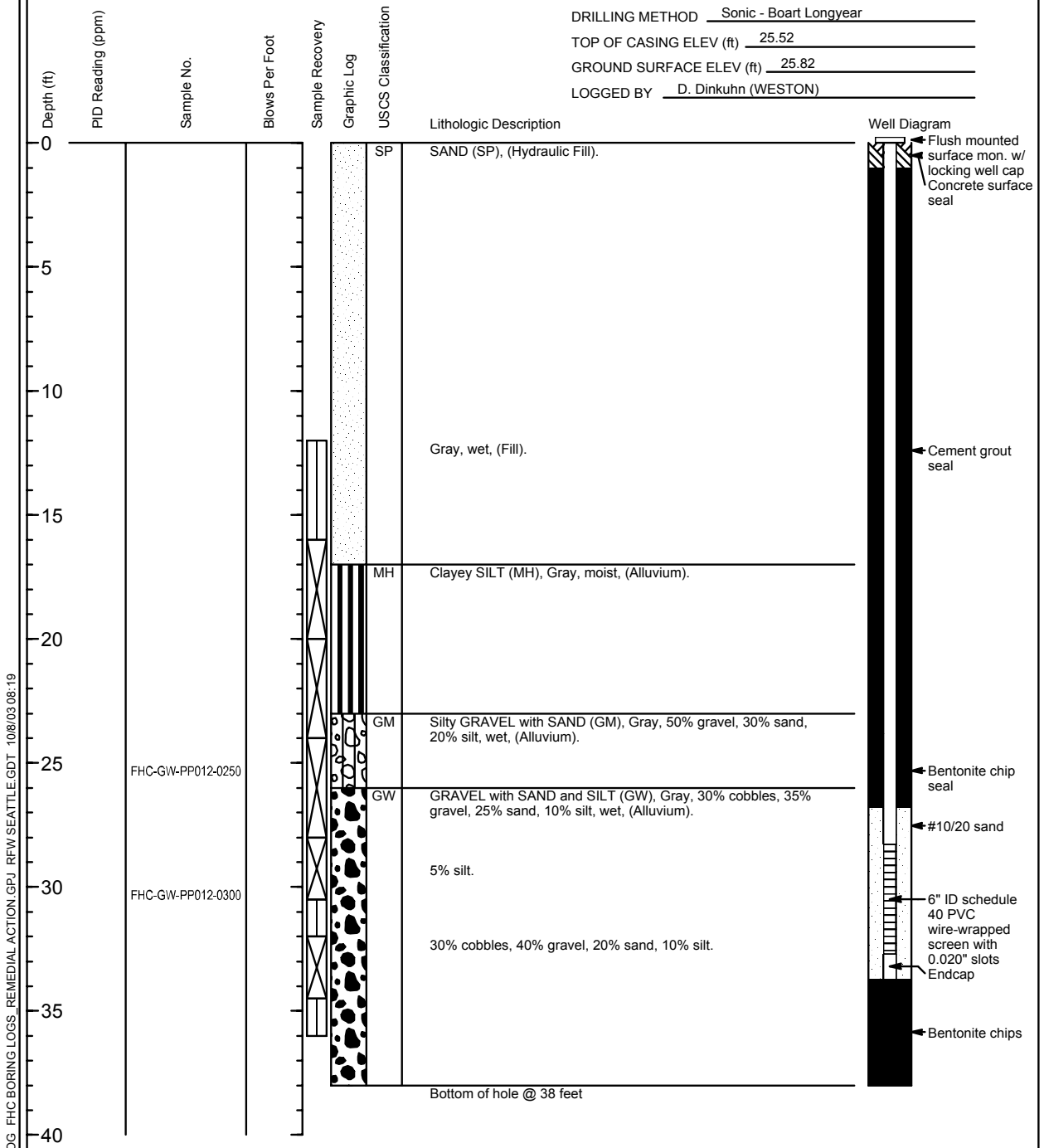
PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED June 30, 2003
 DRILLING METHOD Sonic - Boart Longyear
 TOP OF CASING ELEV (ft) 25.5
 GROUND SURFACE ELEV (ft) 25.9
 LOGGED BY D. Dinkuhn (WESTON)



BOREHOLE LOG: FHC BORING LOGS, REMEDIAL ACTION.GPJ RFW SEATTLE.GDT 10/8/03 08:19

Monitoring Well RA-IW-8B

PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED June 29, 2003
 DRILLING METHOD Sonic - Boart Longyear
 TOP OF CASING ELEV (ft) 25.52
 GROUND SURFACE ELEV (ft) 25.82
 LOGGED BY D. Dinkuhn (WESTON)



BOREHOLE LOG FHC BORING LOGS_REMEDIAL ACTION.GPJ RFW SEATTLE.GDT 10/8/03 08:19



Monitoring Well RA-MW-11A

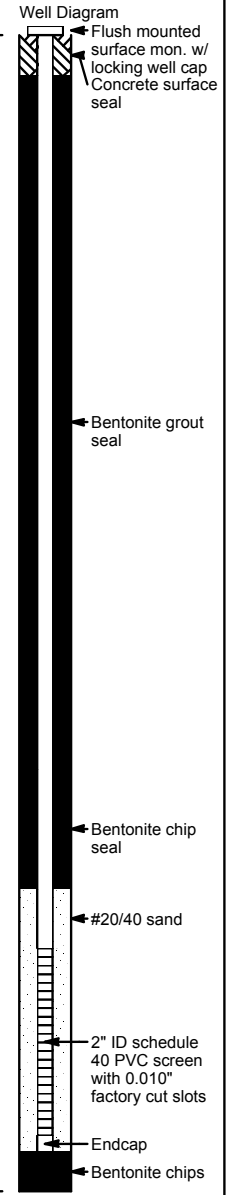
PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED May 2, 2003
 DRILLING METHOD HSA 11" OD - Holt Drilling
 TOP OF CASING ELEV (ft) 26.17
 GROUND SURFACE ELEV (ft) 26.45
 LOGGED BY D. Dinkuhn (WESTON)

BOREHOLE LOG FHC BORING LOGS_REMEDIAL ACTION.GPJ RFW SEATTLE.GDT 10/8/03 08:20

Depth (ft)	PID Reading (ppm)	Sample No.	Blows Per Foot	Sample Recovery	Graphic Log	USCS Classification
0						
5						
10						
15						
20						
25						
30						

Lithologic Description
 Refer to nearest injection well log for lithologic description.

Bottom of hole @ 29 feet

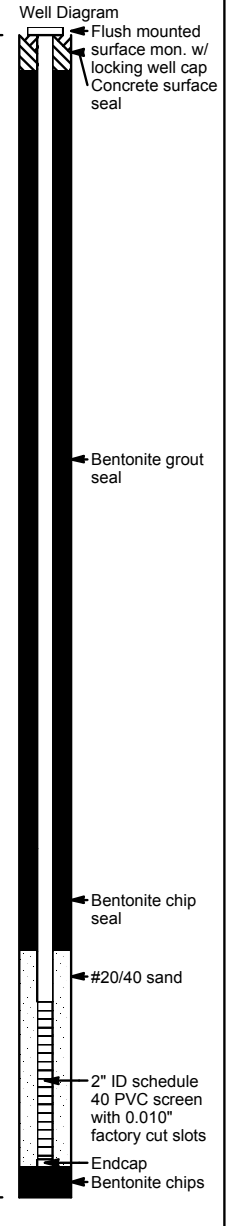


Monitoring Well RA-MW-11B

PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED May 1, 2003
 DRILLING METHOD HSA 11" OD - Holt Drilling
 TOP OF CASING ELEV (ft) 26.17
 GROUND SURFACE ELEV (ft) 26.45
 LOGGED BY D. Dinkuhn (WESTON)

Depth (ft)	PID Reading (ppm)	Sample No.	Blows Per Foot	Sample Recovery	Graphic Log	USCS Classification
0						
5						
10						
15						
20						
25						
30						
35						

Lithologic Description
 Refer to nearest injection well log for lithologic description.



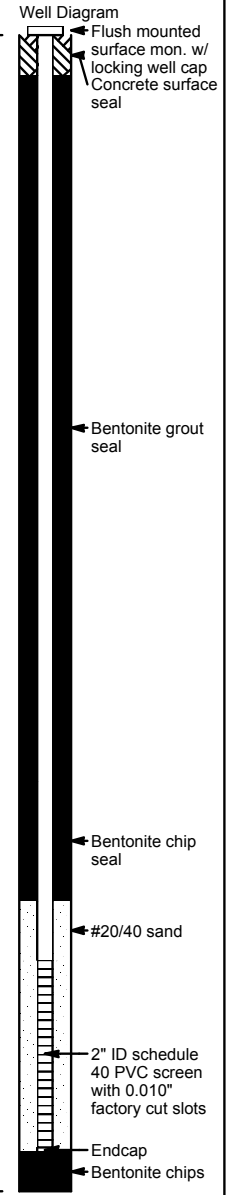
Bottom of hole @ 34 feet

BOREHOLE LOG FHC BORING LOGS_REMEDIAL ACTION.GPJ RFW SEATTLE.GDT 10/8/03 08:20

Monitoring Well RA-MW-12A

PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED May 1, 2003
 DRILLING METHOD HSA 11" OD - Holt Drilling
 TOP OF CASING ELEV (ft) 26.17
 GROUND SURFACE ELEV (ft) 26.47
 LOGGED BY D. Dinkuhn (WESTON)

Depth (ft)	PID Reading (ppm)	Sample No.	Blows Per Foot	Sample Recovery	Graphic Log	USCS Classification	Lithologic Description	
0							Refer to nearest injection well log for lithologic description.	
5								
10								
15								
20								
25								
29								
30								



BOREHOLE LOG FHC BORING LOGS, REMEDIAL ACTION.GPJ RFW SEATTLE.GDT 10/8/03 08:20

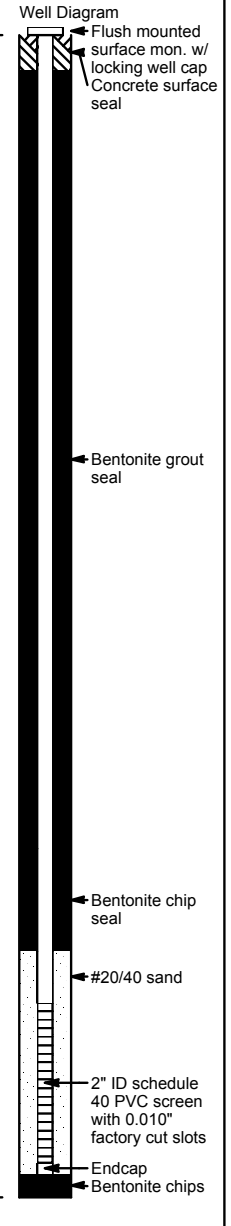
Monitoring Well RA-MW-12B

PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED May 1, 2003
 DRILLING METHOD HSA 11" OD - Holt Drilling
 TOP OF CASING ELEV (ft) 26.16
 GROUND SURFACE ELEV (ft) 26.53
 LOGGED BY D. Dinkuhn (WESTON)

Depth (ft)	PID Reading (ppm)	Sample No.	Blows Per Foot	Sample Recovery	Graphic Log	USCS Classification
0						
5						
10						
15						
20						
25						
30						
35						

Lithologic Description
 Refer to nearest injection well log for lithologic description.

Bottom of hole @ 34 feet



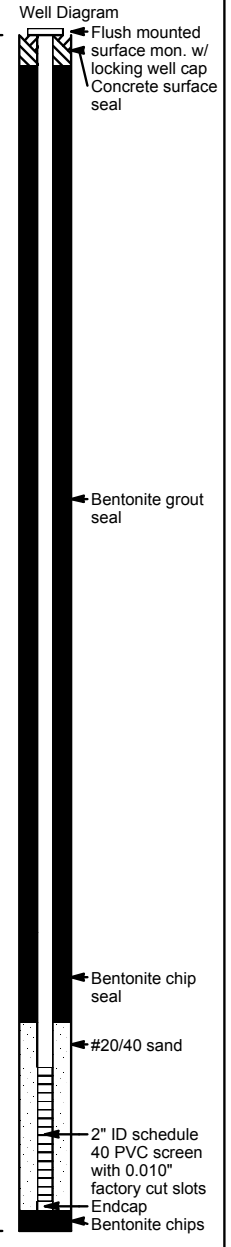
BOREHOLE LOG FHC BORING LOGS_REMEDIAL ACTION.GPJ RFW SEATTLE.GDT 10/8/03 08:20

Monitoring Well RA-MW-12C

PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED April 30, 2003
 DRILLING METHOD HSA 11" OD - Holt Drilling
 TOP OF CASING ELEV (ft) 26.01
 GROUND SURFACE ELEV (ft) 26.48
 LOGGED BY D. Dinkuhn (WESTON)

Depth (ft)	PID Reading (ppm)	Sample No.	Blows Per Foot	Sample Recovery	Graphic Log	USCS Classification
0						
5						
10						
15						
20						
25						
30						
35						
40						

Lithologic Description
 Refer to nearest injection well log for lithologic description.



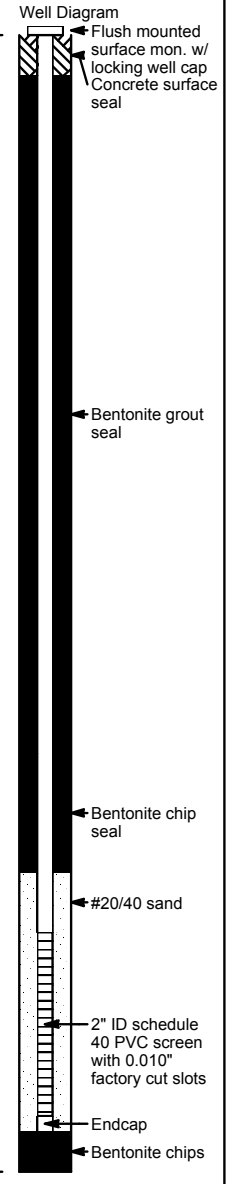
BOREHOLE LOG_FHC BORING LOGS_REMEDIAL ACTION.GPJ_RFW SEATTLE.GDT_10/8/03 08:20

Bottom of hole @ 40 feet

Monitoring Well RA-MW-13A

PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED June 3, 2003
 DRILLING METHOD HSA 10" OD - Holt Drilling
 TOP OF CASING ELEV (ft) 25.69
 GROUND SURFACE ELEV (ft) 25.96
 LOGGED BY D. Dinkuhn (WESTON)

Depth (ft)	PID Reading (ppm)	Sample No.	Blows Per Foot	Sample Recovery	Graphic Log	USCS Classification	Lithologic Description
0							Refer to nearest injection well log for lithologic description.
5							
10							
15							
20							
25							
28.5							
30							



Bottom of hole @ 28.5 feet

BOREHOLE LOG FHC BORING LOGS_REMEDIAL ACTION.GPJ RFW SEATTLE.GDT 10/8/03 08:20

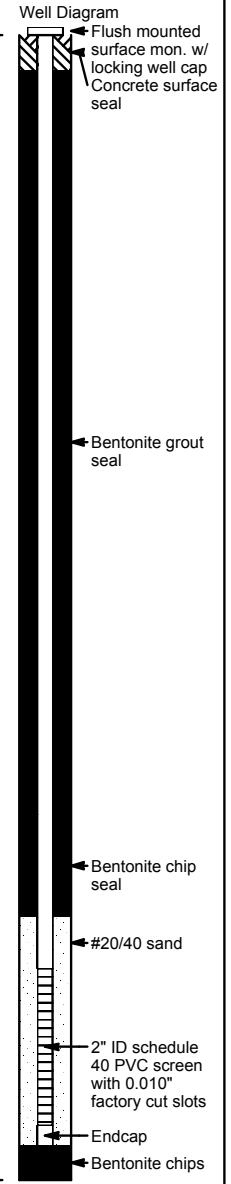
Monitoring Well RA-MW-13B

PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED June 3, 2003
 DRILLING METHOD HSA 10" OD - Holt Drilling
 TOP OF CASING ELEV (ft) 25.61
 GROUND SURFACE ELEV (ft) 25.86
 LOGGED BY D. Dinkuhn (WESTON)

BOREHOLE LOG FHC BORING LOGS_REMEDIAL ACTION.GPJ RFW SEATTLE.GDT 10/8/03 08:20

Depth (ft)	PID Reading (ppm)	Sample No.	Blows Per Foot	Sample Recovery	Graphic Log	USCS Classification
0						
5						
10						
15						
20						
25						
30						
35						

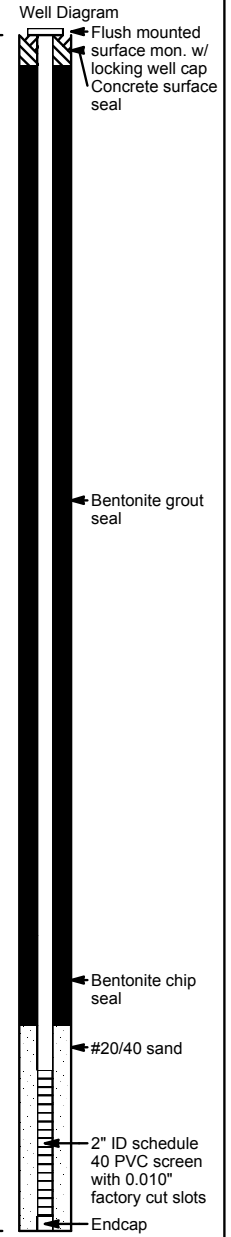
Lithologic Description
 Refer to nearest injection well log for lithologic description.



Monitoring Well RA-MW-13C

PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED June 3, 2003
 DRILLING METHOD HSA 10" OD - Holt Drilling
 TOP OF CASING ELEV (ft) 25.55
 GROUND SURFACE ELEV (ft) 25.97
 LOGGED BY D. Dinkuhn (WESTON)

Depth (ft)	PID Reading (ppm)	Sample No.	Blows Per Foot	Sample Recovery	Graphic Log	USCS Classification	Lithologic Description
0							Refer to nearest injection well log for lithologic description.
5							
10							
15							
20							
25							
30							
35							
40							



BOREHOLE LOG FHC BORING LOGS, REMEDIAL ACTION, GPJ RFW SEATTLE.GDT 10/8/03 08:20

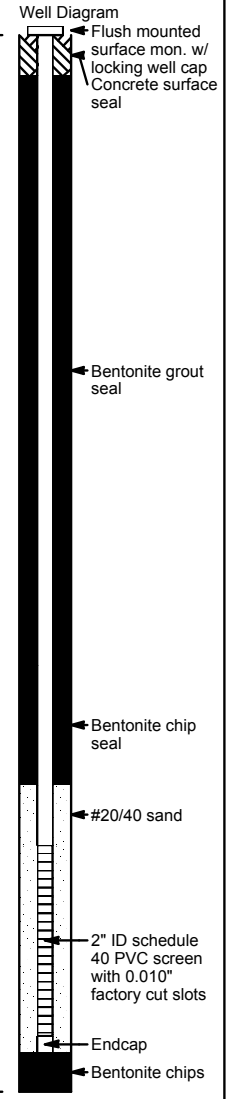
Monitoring Well RA-MW-14A

PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED June 4, 2003
 DRILLING METHOD HSA 10" OD - Holt Drilling
 TOP OF CASING ELEV (ft) 25.06
 GROUND SURFACE ELEV (ft) 25.44
 LOGGED BY D. Dinkuhn (WESTON)

Depth (ft)	PID Reading (ppm)	Sample No.	Blows Per Foot	Sample Recovery	Graphic Log	USCS Classification
0						
5						
10						
15						
20						
25						
30						

Lithologic Description
 Refer to nearest injection well log for lithologic description.

Bottom of hole @ 26.5 feet

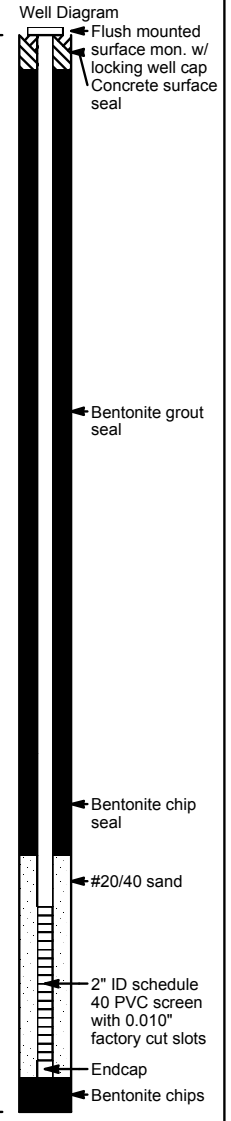


BOREHOLE LOG FHC BORING LOGS_REMEDIAL ACTION.GPJ RFW SEATTLE.GDT 10/8/03 08:20

Monitoring Well RA-MW-14B

PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED June 4, 2003
 DRILLING METHOD HSA 10" OD - Holt Drilling
 TOP OF CASING ELEV (ft) 25
 GROUND SURFACE ELEV (ft) 25.38
 LOGGED BY D. Dinkuhn (WESTON)

Depth (ft)	PID Reading (ppm)	Sample No.	Blows Per Foot	Sample Recovery	Graphic Log	USCS Classification	Lithologic Description	
0							Refer to nearest injection well log for lithologic description.	
5								
10								
15								
20								
25								
30								
35								
								Bottom of hole @ 31.5 feet



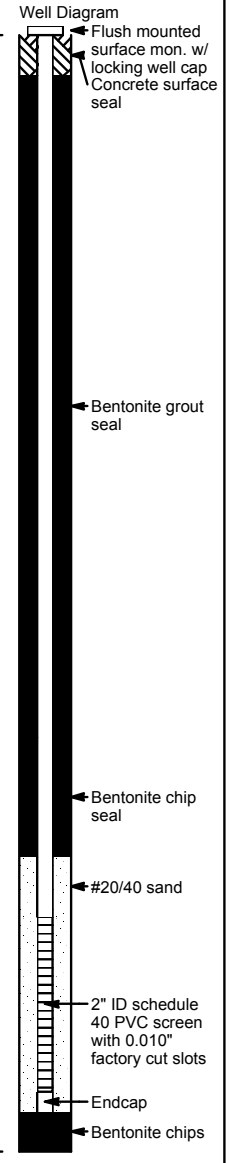
BOREHOLE LOG FHC BORING LOGS_REMEDIAL ACTION.GPJ RFW SEATTLE.GDT 10/8/03 08:20

Monitoring Well RA-MW-15A

PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED May 30, 2003
 DRILLING METHOD HSA 10" OD - Holt Drilling
 TOP OF CASING ELEV (ft) 25.76
 GROUND SURFACE ELEV (ft) 26.11
 LOGGED BY D. Dinkuhn (WESTON)

BOREHOLE LOG FHC BORING LOGS, REMEDIAL ACTION.GPJ RFW SEATTLE.GDT 10/8/03 08:20

Depth (ft)	PID Reading (ppm)	Sample No.	Blows Per Foot	Sample Recovery	Graphic Log	USCS Classification	Lithologic Description	
0							Refer to nearest injection well log for lithologic description.	
5								
10								
15								
20								
25								
30								
								Bottom of hole @ 28 feet



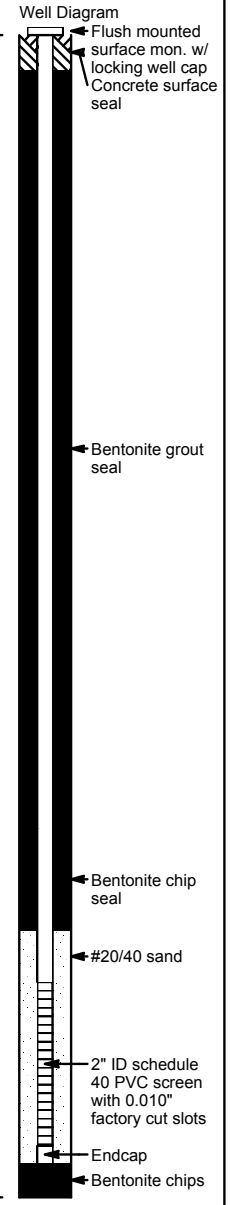
Monitoring Well RA-MW-15B

PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED May 30, 2003
 DRILLING METHOD HSA 10" OD - Holt Drilling
 TOP OF CASING ELEV (ft) 25.79
 GROUND SURFACE ELEV (ft) 26.1
 LOGGED BY D. Dinkuhn (WESTON)

Depth (ft)	PID Reading (ppm)	Sample No.	Blows Per Foot	Sample Recovery	Graphic Log	USCS Classification
0						
5						
10						
15						
20						
25						
30						
35						

Lithologic Description
 Refer to nearest injection well log for lithologic description.

Bottom of hole @ 34 feet



BOREHOLE LOG_FHC BORING LOGS_REMEDIAL ACTION.GPJ_RFW SEATTLE.GDT_10/8/03 08:20

Monitoring Well RA-MW-16A

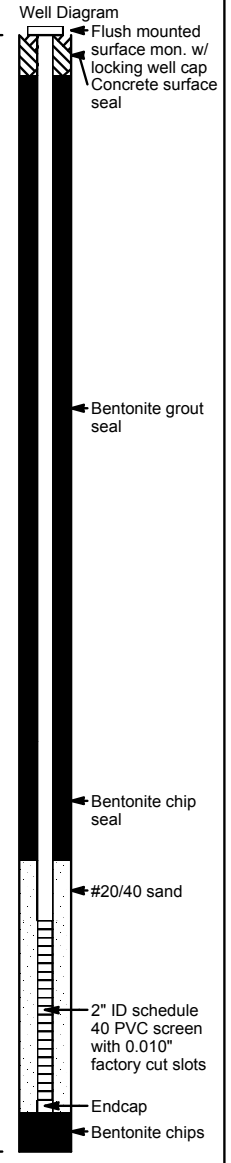
PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED June 2, 2003
 DRILLING METHOD HSA 10" OD - Holt Drilling
 TOP OF CASING ELEV (ft) 25.14
 GROUND SURFACE ELEV (ft) 25.47
 LOGGED BY D. Dinkuhn (WESTON)

BOREHOLE LOG FHC BORING LOGS, REMEDIAL ACTION.GPJ RFW SEATTLE.GDT 10/8/03 08:20

Depth (ft)	PID Reading (ppm)	Sample No.	Blows Per Foot	Sample Recovery	Graphic Log	USCS Classification
0						
5						
10						
15						
20						
25						
30						

Lithologic Description
 Refer to nearest injection well log for lithologic description.

Bottom of hole @ 28 feet



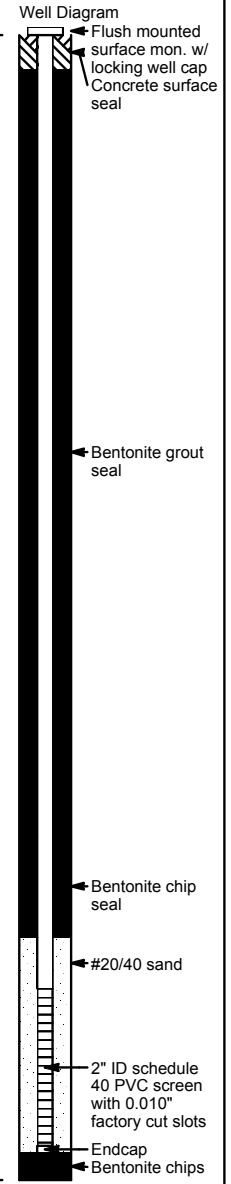
Monitoring Well RA-MW-16B

PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED June 2, 2003
 DRILLING METHOD HSA 10" OD - Holt Drilling
 TOP OF CASING ELEV (ft) 25.45
 GROUND SURFACE ELEV (ft) 25.68
 LOGGED BY D. Dinkuhn (WESTON)

BOREHOLE LOG FHC BORING LOGS_REMEDIAL ACTION.GPJ RFW SEATTLE.GDT 10/8/03 08:20

Depth (ft)	PID Reading (ppm)	Sample No.	Blows Per Foot	Sample Recovery	Graphic Log	USCS Classification
0						
5						
10						
15						
20						
25						
30						
35						

Lithologic Description
 Refer to nearest injection well log for lithologic description.



Bottom of hole @ 33.5 feet

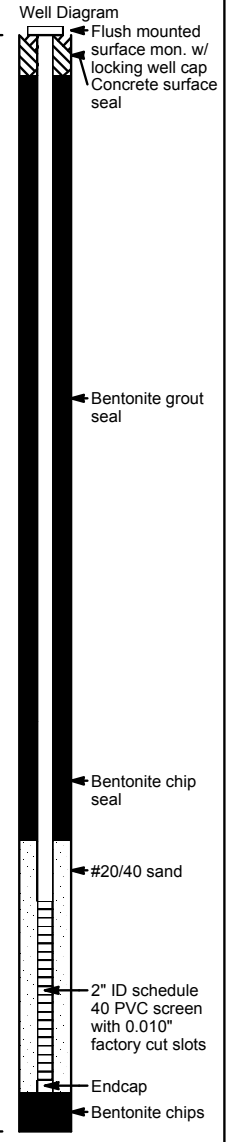
Monitoring Well RA-MW-17A

PROJECT Frontier Hard Chrome: Remedial Action
 JOB NUMBER 20064-153-100-1040
 DATE COMPLETED June 5, 2003
 DRILLING METHOD HSA 10" OD - Holt Drilling
 TOP OF CASING ELEV (ft) 25.96
 GROUND SURFACE ELEV (ft) 26.23
 LOGGED BY D. Dinkuhn (WESTON)

BOREHOLE LOG FHC BORING LOGS_REMEDIAL ACTION.GPJ RFW SEATTLE.GDT 10/8/03 08:20

Depth (ft)	PID Reading (ppm)	Sample No.	Blows Per Foot	Sample Recovery	Graphic Log	USCS Classification
0						
5						
10						
15						
20						
25						
30						

Lithologic Description
 Refer to nearest injection well log for lithologic description.



**Composite Photographs of Drill Cuttings
from the
Characterization Boreholes**

