Appendix M

Data from New Characterization Boreholes and Wells and Development of Geologic Cross Sections

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M1 Introduction

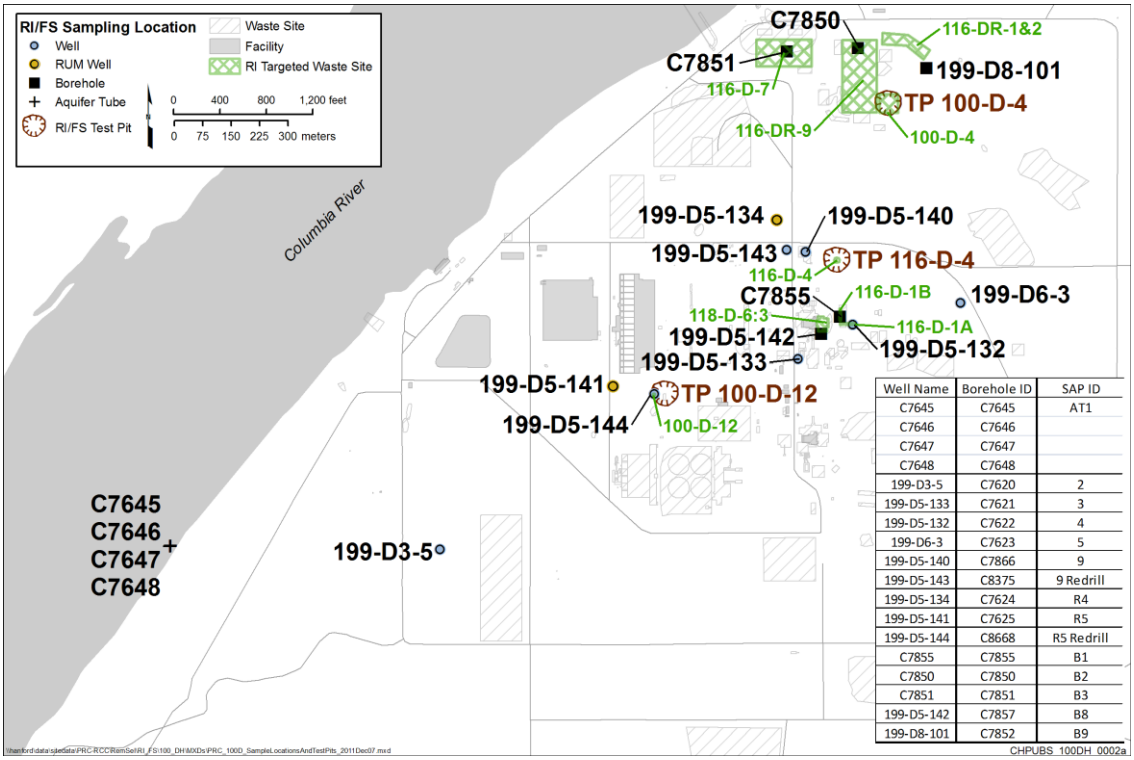
This appendix presents the lithologic descriptions and geophysical logs from RI boreholes and wells drilled to support the Integrated 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2, and 100-HR-3 Operable Units (OUs) remedial investigation and feasibility study (RI/FS). In addition, a summary table for all historical and recent boreholes and wells is provided.

M2 Data from New Characterization Boreholes and Wells

Table M-1 summarizes geologic data for boreholes and wells in and near 100-D/H. This table includes all of the exploratory boreholes drilled in 100-D/H and the boreholes subsequently drilled to support the interim remedial actions. Figure M-1 (100-D remedial investigation [RI] boreholes/wells), Figure M-2 (100-H remedial investigation boreholes/wells), and Figure M-3 (remedial process optimization [RPO] wells) show borehole and well locations discussed in this Appendix. Geologic and geophysical logs for wells installed for the RI and RPO wells with selected data to support the RI are included in the following:

- *Borehole Summary Report for the Installation of 16 Resource Protection Wells in the 100-HR-3 Groundwater Operable Unit in Support of the Integrated 100 Areas RI/FS: 100-D/H Decisional Unit* (SGW-49912)
- *Borehole Summary Report for 100-HR-3 Washington Closure Hanford RI/FS Boreholes* (SGW-50131)
- *Borehole Summary Report for the Installation of 70 Remedial Process Optimization, Pump-and-Treat Expansion Wells, for the 100-HR-3 Operable Unit* (SGW-48612)
- *Borehole Summary Report for the Installation of Well C8668 at 100-D-12 in FY2012* (SGW-51502)

The following subsections discuss geologic information for each RI borehole/well. Each location was chosen to answer specific data gaps and data needs; resolution of these data gaps and date needs through the RI process is an important step in the process leading up to the selection of the final remedy(s). Geophysical Logs for each borehole/well are included later in this Appendix and provide a visual summary of information, including geology, sampled intervals, well completion, geophysics, and soil contaminants.



Well Name	Borehole ID	SAP ID
C7645	C7645	AT1
C7646	C7646	
C7647	C7647	
C7648	C7648	
199-D3-5	C7620	2
199-D5-133	C7621	3
199-D5-132	C7622	4
199-D6-3	C7623	5
199-D5-140	C7866	9
199-D5-143	C8375	9 Redrill
199-D5-134	C7624	R4
199-D5-141	C7625	R5
199-D5-144	C8668	R5 Redrill
C7855	C7855	B1
C7850	C7850	B2
C7851	C7851	B3
199-D5-142	C7857	B8
199-D8-101	C7852	B9

Figure M-1. Map Showing 100-D Remedial Investigation Sampling Locations

Well Name	Borehole ID	SAP ID
199-H3-6	C7626	6
199-H3-7	C7627	7
C7649	C7649	AT8
C7650	C7650	
199-H6-3	C7628	10
199-H6-4	C7629	11
199-H1-7	C7630	12
199-H3-9	C7639	R1
199-H3-10	C7640	R2
199-H2-1	C7631	R3
C7862	C7862	B4
C7864	C7864	B5
199-H4-83	C7861	B6
199-H3-11	C7863	B7
199-H4-84	C7860	B10

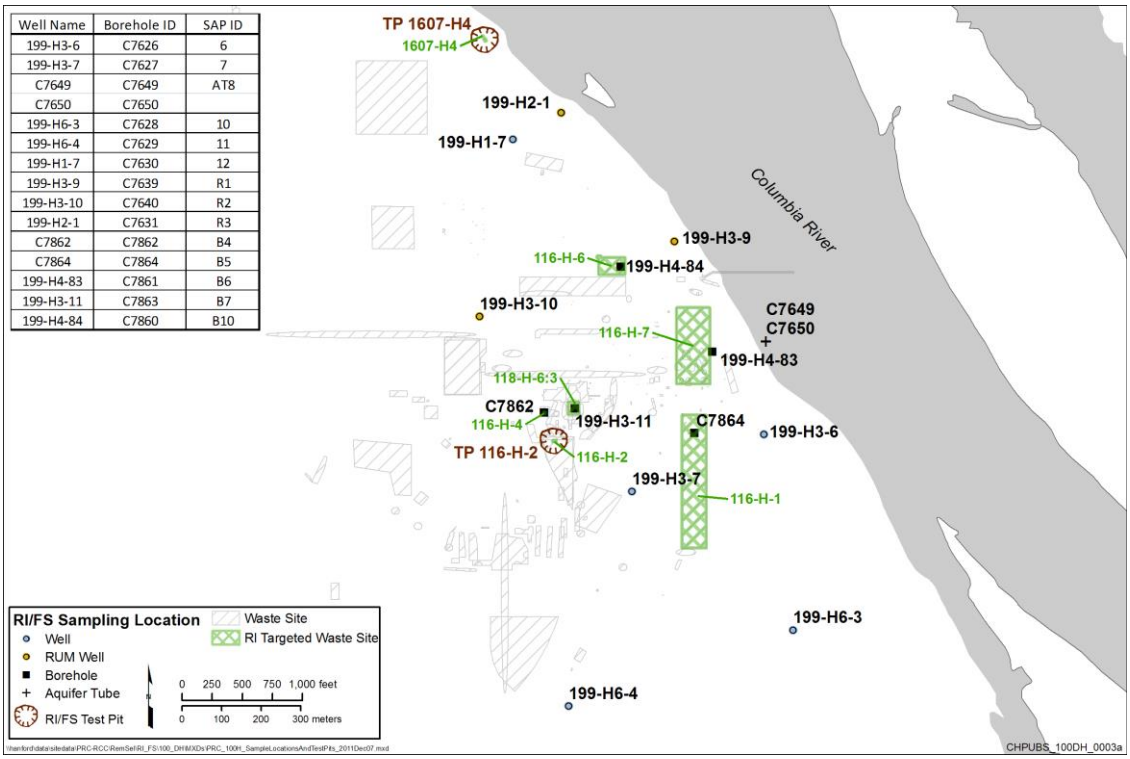


Figure M-2. Map Showing 100-H Remedial Investigation Sampling Locations

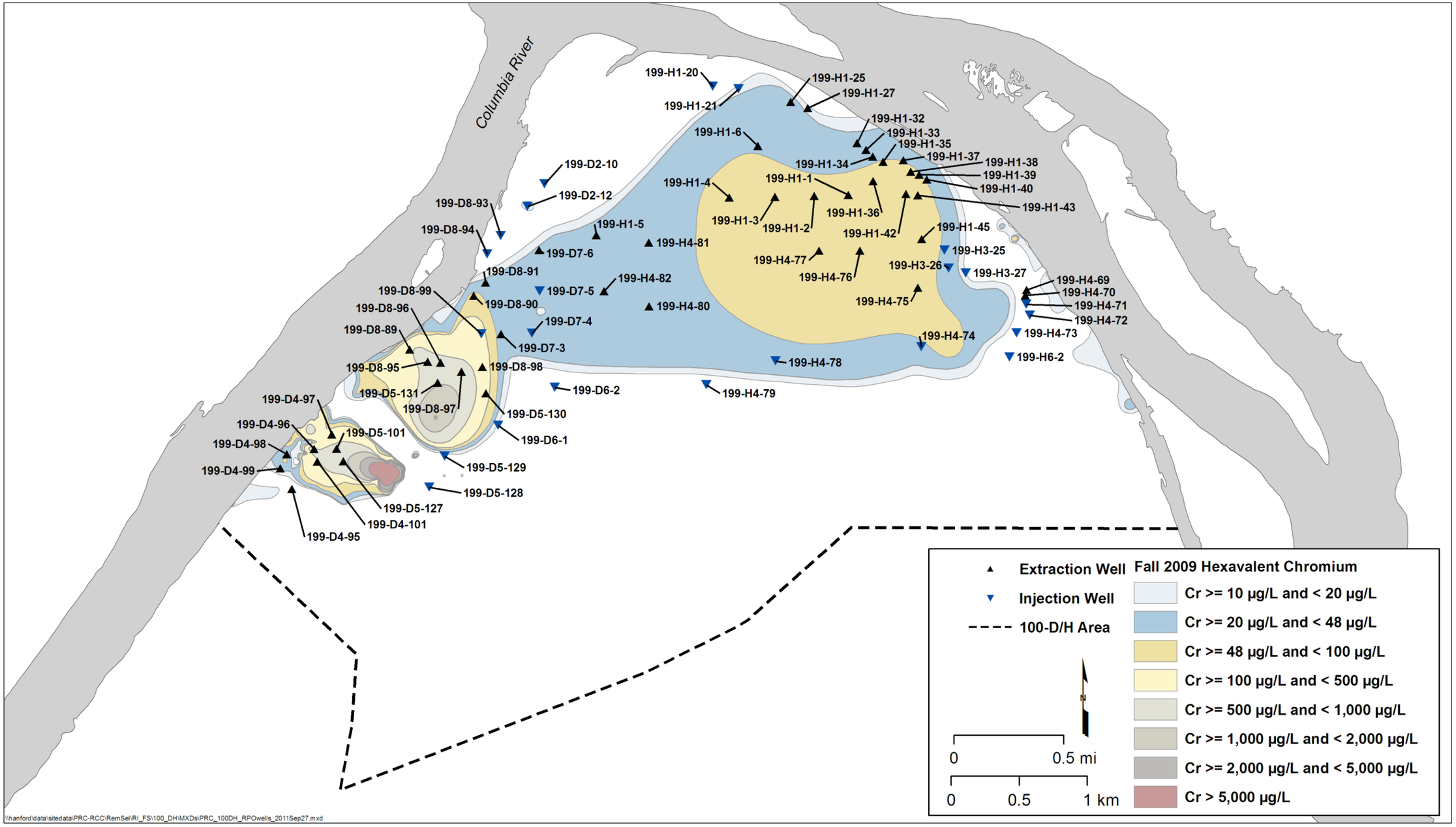


Figure M-3. Remedial Process Optimization Well Locations

Table M-1. 100-D/H Borehole/Well Summary Information

Well Name	Well ID	Northing (m)	Easting (m)	Year Inst.	Well Status	Surface Elev. (m)	Depth to screen or perf top (m)	Depth to screen or perf bot (m)	Drill Depth (m)	Depth to RE (m)	Hf/Re Elev. (m)	Depth to RUM (ft)	Depth to RUM (m)	RUM Elev. (m)	Head Date*	Head (m)	Aquifer Thickness (m)	Comments
199-D2-5	A4567	151148.18	573812.30	1960	Decom.	140.51	11.0	26.2	29.0	X	X	90.0	27.4	113.1	None	None		
199-D2-6	A4568	151119.86	573000.21	1992	In use	143.36	23.5	29.9	33.7	22.9	120.5	102.9	31.4	112.0	3/6/2011	118.27	6.3	
199-D2-8	C3040	151208.59	573263.60	2000	Decom.	143.61	23.5	29.6	30.8	15.4	128.2	NDE	NDE	<112.9	6/7/2011	117.89		Minor discrepancy with *100-HR-3 Remedial Process Optimization Modeling Data Package* (SGW-40781) interpretation of RE elevation of 128.1
199-D2-10	C7089	153465.17	574470.70	2009	In use	120.14	3.0	7.6	9.4	NP	NP	26.0	7.9	112.2	None	None		Hf/RE not identified in log, appears to transition from Hf directly to RUM
199-D2-11	C5394	151120.73	573328.18	2007	In use	143.45	22.8	34.7	34.7	27.5	116.0	110.0	33.5	109.9	3/6/2011	118.35	8.4	
199-D2-12	C7090	153300.80	574343.40	2009	In use	120.39	3.6	8.2	10.4	NP	NP	28.2	8.6	111.8	None	None		
199-D3-2	B8074	151165.65	572453.96	1997	In use	142.85	25.0	31.1	33.7	19.5	123.3	NDE	NDE	<109.2	3/6/2011	118.49		
199-D3-3	C3312	151186.96	572482.54	2002	In use	143.20	25.0	34.2	34.7	19.5	123.7	113.5	34.6	108.6	1/28/2011	119.39	10.8	
199-D3-4	C3314	151170.97	572468.16	2002	In use	143.25	25.1	34.2	34.8	20.6	122.6	113.0	34.4	108.8	1/28/2011	117.73	8.9	
199-D3-5	C7620	150994.54	572787.66	2010	In use	144.05	22.5	31.6	34.2	26.5	117.5	104.0	31.7	112.4	None	None		
199-D4-1	B2895	151558.89	572752.85	1996	In use	143.25	22.8	28.9	32.0	16.8	126.5	98.0	29.9	113.4	5/11/2011	117.80	4.4	
199-D4-2	B8058	151543.96	572768.37	1997	In use	143.75	25.5	30.1	30.5	X	X	97.5	29.7	114.0	None	None		Hf/RE not identified in log
199-D4-3	B8059	151546.12	572766.08	1997	In use	143.67	25.5	30.0	31.1	17.4	126.3	98.0	29.9	113.8	None	None		
199-D4-4	B8060	151571.61	572754.61	1997	In use	143.42	23.7	29.8	32.3	17.3	126.1	97.5	29.7	113.7	4/27/2011	117.96	4.3	
199-D4-5	B8061	151556.50	572740.54	1997	In use	143.31	24.3	30.4	30.8	17.4	125.9	96.2	29.3	114.0	4/27/2011	117.97	4.0	
199-D4-6	B8064	151577.92	572733.34	1997	In use	143.28	23.1	29.2	30.8	16.3	127.0	96.0	29.3	114.0	5/11/2011	118.04	4.0	
199-D4-7	B8065	151551.25	572760.87	1997	In use	143.36	24.4	28.9	29.3	17.1	126.3	NDE	NDE	<114.1	3/6/2011	117.68		
199-D4-8	B8066	151552.65	572763.30	1997	In use	143.34	23.2	29.1	30.2	16.9	126.4	96.0	29.3	114.1	11/20/2008	117.65	3.6	
199-D4-9	B8067	151543.32	572758.20	1997	In use	143.60	24.5	29.3	29.7	17.4	126.2	96.5	29.4	114.2	1/28/2011	117.37	3.2	
199-D4-10	B8068	151540.44	572750.25	1997	In use	143.44	24.7	29.3	29.8	16.5	127.0	97.0	29.6	113.9	1/28/2011	117.92	4.0	
199-D4-11	B8069	151554.14	572768.94	1997	In use	143.38	24.4	29.0	29.6	17.1	126.3	95.5	29.1	114.3	1/28/2011	117.85	3.6	
199-D4-12	B8070	151562.08	572771.58	1997	In use	143.50	24.8	29.4	30.1	18.3	125.2	97.0	29.6	113.9	1/28/2011	117.91	4.0	
199-D4-13	B8071	151424.47	572665.86	1997	In use	142.94	21.9	28.0	30.8	15.5	127.4	91.0	27.7	115.2	9/21/2011	117.96	2.8	
199-D4-14	B8072	151641.64	572839.81	1997	In use	143.47	23.2	29.3	31.1	13.1	130.4	97.0	29.6	113.9	5/23/2011	119.15	5.2	
199-D4-15	B8073	151424.86	572936.64	1997	In use	143.66	23.7	29.8	32.0	15.2	128.4	100.0	30.5	113.2	3/6/2011	117.79	4.6	

Table M-1. 100-D/H Borehole/Well Summary Information

Well Name	Well ID	Northing (m)	Easting (m)	Year Inst.	Well Status	Surface Elev. (m)	Depth to screen or perf top (m)	Depth to screen or perf bot (m)	Drill Depth (m)	Depth to RE (m)	Hf/Re Elev. (m)	Depth to RUM (ft)	Depth to RUM (m)	RUM Elev. (m)	Head Date*	Head (m)	Aquifer Thickness (m)	Comments
199-D4-16	B8110	151555.32	572756.74	1997	In use	143.43	24.4	29.1	31.0	17.1	126.4	97.9	29.8	113.6	None	None		
199-D4-17	B8459	151558.43	572738.09	1997	In use	143.37	24.6	29.3	31.4	17.7	125.7	97.0	29.6	113.8	6/8/2011	119.39	5.6	
199-D4-18	B8460	151570.93	572726.34	1997	In use	142.98	24.2	29.0	31.1	4.6	138.4	95.5	29.1	113.9	6/8/2011	120.51	6.6	
199-D4-19	B8746	151282.04	572559.35	1999	In use	143.12	23.4	32.6	33.7	18.7	124.4	110.0	33.5	109.6	5/23/2011	117.42	7.8	
199-D4-20	B8750	151257.47	572794.04	1999	In use	143.56	24.6	30.7	32.8	19.2	124.4	105.0	32.0	111.6	3/4/2011	118.06	6.5	
199-D4-21	B8755	151569.80	572778.85	1999	In use	143.65	25.0	29.6	30.2	14.9	128.7	97.5	29.7	113.9	6/21/2010	117.25	3.3	
199-D4-22	B8778	151539.29	572788.45	1999	In use	144.03	24.1	30.2	30.8	17.7	126.4	98.0	29.9	114.2	3/6/2011	117.58	3.4	
199-D4-23	B8779	151592.87	572672.46	1999	In use	140.39	19.6	25.7	26.8	13.7	126.7	83.0	25.3	115.1	3/4/2011	118.12	3.0	
199-D4-24	B8975	151471.43	572699.89	2000	In use	143.20	24.4	29.0	30.8	13.4	129.8	98.5	30.0	113.2	None	None		
199-D4-25	B8976	151476.24	572711.44	2000	In use	143.51	25.6	30.2	32.3	15.7	127.8	101.5	30.9	112.6	8/17/2010	115.61	3.0	
199-D4-26	B8977	151488.88	572712.33	2000	In use	143.46	25.9	30.5	32.0	18.0	125.5	101.0	30.8	112.7	5/18/2010	115.55	2.9	
199-D4-27	B8978	151493.48	572724.23	2000	In use	143.63	25.7	30.3	32.0	17.1	126.6	101.0	30.8	112.9	8/17/2010	115.38	2.5	
199-D4-28	B8979	151506.07	572725.09	2000	In use	143.52	25.1	29.7	31.1	17.1	126.5	98.5	30.0	113.5	None	None		
199-D4-29	B8980	151510.69	572736.86	2000	In use	143.81	25.2	29.7	31.1	17.7	126.1	98.0	29.9	113.9	None	None		
199-D4-30	B8981	151523.22	572737.44	2000	In use	143.82	24.6	29.2	29.6	16.5	127.4	97.0	29.6	114.3	None	None		
199-D4-31	B8982	151528.00	572749.47	2000	In use	143.88	24.7	29.3	29.9	16.5	127.4	97.0	29.6	114.3	4/27/2011	117.93	3.6	
199-D4-32	B8983	151573.75	572790.87	2000	In use	143.69	25.0	29.6	30.8	15.8	127.8	98.0	29.9	113.8	5/9/2011	117.24	3.4	
199-D4-33	B8984	151585.94	572792.63	2000	In use	143.71	25.5	30.1	31.4	15.2	128.5	99.5	30.3	113.4	None	None		
199-D4-34	B8985	151590.03	572804.60	2000	In use	143.58	25.4	29.9	31.7	17.1	126.5	99.5	30.3	113.3	3/6/2001	117.95	4.7	
199-D4-35	B8986	151602.28	572806.31	2000	In use	143.52	24.8	29.4	31.1	17.7	125.8	97.0	29.6	114.0	1/28/2011	115.68	1.7	
199-D4-36	B8987	151606.22	572818.19	2000	In use	143.52	24.8	29.4	31.1	14.3	129.2	98.0	29.9	113.6	4/27/2011	117.97	4.3	
199-D4-37	B8988	151618.58	572820.29	2000	In use	143.52	25.0	29.6	31.1	16.8	126.8	98.0	29.9	113.6	None	None		
199-D4-38	B8989	151537.86	572671.32	2000	In use	142.81	22.9	29.0	31.1	16.6	126.2	98.0	29.9	112.9	9/13/2010	115.06	2.1	
199-D4-39	B8990	151650.84	572747.45	2000	In use	143.19	22.6	28.7	31.1	15.2	128.0	97.5	29.7	113.5	9/13/2010	117.94	4.5	
199-D4-40	C3270	151622.63	572832.35	2001	In use	143.57	24.9	29.6	30.7	16.5	127.1	98.0	29.9	113.7	None	None		
199-D4-41	C3271	151634.66	572834.11	2001	In use	143.48	25.1	29.6	30.8	16.5	127.0	98.6	30.1	113.4	None	None		
199-D4-42	C3272	151642.44	572847.13	2001	In use	143.51	23.7	29.8	32.0	14.3	129.2	100.5	30.6	112.9	None	None		

Table M-1. 100-D/H Borehole/Well Summary Information

Well Name	Well ID	Northing (m)	Easting (m)	Year Inst.	Well Status	Surface Elev. (m)	Depth to screen or perf top (m)	Depth to screen or perf bot (m)	Drill Depth (m)	Depth to RE (m)	Hf/Re Elev. (m)	Depth to RUM (ft)	Depth to RUM (m)	RUM Elev. (m)	Head Date*	Head (m)	Aquifer Thickness (m)	Comments
199-D4-43	C3273	151656.21	572849.65	2001	In use	143.46	25.2	29.7	31.1	16.5	127.0	100.0	30.5	113.0	None	None		
199-D4-44	C3274	151665.63	572856.12	2001	In use	143.34	25.8	30.3	31.4	17.1	126.3	100.5	30.6	112.7	None	None		
199-D4-45	C3275	151671.80	572868.01	2001	In use	143.28	24.0	30.0	32.3	16.8	126.5	97.0	29.6	113.7	None	None		
199-D4-46	C3276	151684.94	572868.85	2001	In use	143.17	25.7	30.2	31.7	16.2	127.0	101.0	30.8	112.4	None	None		
199-D4-47	C3277	151690.13	572880.48	2001	In use	143.16	25.3	29.9	31.2	17.1	126.1	98.0	29.9	113.3	None	None		
199-D4-48	C3278	151703.46	572881.30	2001	In use	143.00	23.9	30.0	32.9	17.4	125.6	104.0	31.7	111.3	5/9/2011	114.71	3.4	
199-D4-49	C3279	151458.69	572699.12	2001	In use	143.24	25.0	29.6	30.5	17.7	125.6	98.0	29.9	113.4	None	None		
199-D4-50	C3280	151454.01	572687.30	2001	In use	143.12	25.2	29.7	29.9	17.4	125.7	97.5	29.7	113.4	None	None		
199-D4-51	C3281	151441.40	572686.61	2001	In use	143.15	24.9	29.5	30.4	18.3	124.9	98.0	29.9	113.3	None	None		
199-D4-52	C3282	151436.73	572674.91	2001	In use	143.17	24.9	29.4	30.4	18.1	125.0	98.0	29.9	113.3	None	None		
199-D4-53	C3283	151424.63	572674.10	2001	In use	143.14	25.0	29.5	29.7	16.5	126.7	97.0	29.6	113.6	None	None		
199-D4-54	C3284	151419.73	572662.43	2001	In use	143.17	25.1	29.6	30.0	18.0	125.2	97.5	29.7	113.5	None	None		
199-D4-55	C3285	151414.64	572659.03	2001	In use	143.19	25.3	29.9	30.3	18.6	124.6	98.0	29.9	113.3	None	None		
199-D4-56	C3286	151402.28	572657.66	2001	In use	143.10	24.9	29.5	29.7	16.2	126.9	97.2	29.6	113.5	None	None		
199-D4-57	C3287	151397.86	572645.94	2001	In use	143.16	25.0	29.6	29.9	X	X	98.2	29.9	113.2	None	None		Hf/RE not identified in log
199-D4-58	C3288	151385.35	572644.81	2001	In use	143.34	25.3	29.8	32.5	X	X	102.7	31.3	112.0	None	None		Hf/RE not identified in log
199-D4-59	C3289	151380.82	572633.32	2001	In use	143.22	25.7	30.3	31.2	X	X	100.0	30.5	112.7	None	None		Hf/RE not identified in log
199-D4-60	C3290	151368.26	572632.37	2001	In use	143.18	26.0	30.5	30.8	18.9	124.3	101.0	30.8	112.4	None	None		
199-D4-61	C3291	151363.70	572620.66	2001	In use	143.10	26.3	30.8	31.1	18.9	124.2	102.0	31.1	112.0	None	None		
199-D4-62	C3292	151351.07	572619.52	2001	In use	143.19	25.5	33.0	33.4	18.6	124.6	109.0	33.2	110.0	9/22/2011	115.81	5.8	
199-D4-63	C3293	151346.84	572607.64	2001	In use	143.29	25.9	33.4	33.9	18.6	124.7	110.0	33.5	109.8	None	None		
199-D4-64	C3294	151333.91	572606.95	2001	In use	143.32	25.8	33.4	33.8	19.8	123.5	110.5	33.7	109.6	None	None		
199-D4-65	C3295	151329.74	572594.77	2001	In use	143.32	25.9	33.5	34.1	18.9	124.4	111.0	33.8	109.5	None	None		
199-D4-66	C3296	151316.86	572594.28	2001	In use	143.33	25.6	33.2	33.6	19.1	124.3	110.6	33.7	109.6	None	None		
199-D4-67	C3297	151312.78	572581.86	2001	In use	143.28	25.8	33.3	33.8	18.6	124.7	111.0	33.8	109.4	None	None		
199-D4-68	C3298	151299.84	572581.32	2002	In use	143.07	24.5	33.7	33.7	18.3	124.8	112.0	34.1	108.9	None	None		
199-D4-69	C3299	151295.69	572569.00	2002	In use	143.08	25.3	33.0	33.0	18.0	125.1	110.0	33.5	109.6	None	None		

Table M-1. 100-D/H Borehole/Well Summary Information

Well Name	Well ID	Northing (m)	Easting (m)	Year Inst.	Well Status	Surface Elev. (m)	Depth to screen or perf top (m)	Depth to screen or perf bot (m)	Drill Depth (m)	Depth to RE (m)	Hf/Re Elev. (m)	Depth to RUM (ft)	Depth to RUM (m)	RUM Elev. (m)	Head Date*	Head (m)	Aquifer Thickness (m)	Comments
199-D4-70	C3300	151282.68	572568.79	2002	In use	143.13	25.0	32.6	32.6	18.6	124.5	110.5	33.7	109.4	None	None		
199-D4-71	C3301	151278.50	572556.29	2002	In use	143.12	24.2	33.3	33.3	18.3	124.8	110.5	33.7	109.4	None	None		
199-D4-72	C3302	151265.78	572554.43	2002	In use	142.00	24.4	33.4	33.5	18.0	124.0	111.0	33.8	108.2	None	None		
199-D4-73	C3303	151262.72	572542.17	2002	In use	143.15	24.5	33.6	33.7	18.4	124.7	111.5	34.0	109.2	None	None		
199-D4-74	C3304	151249.80	572539.80	2002	In use	142.90	24.7	33.7	33.8	18.3	124.6	111.5	34.0	108.9	None	None		
199-D4-75	C3305	151246.95	572527.76	2002	In use	143.07	24.9	34.0	34.0	18.1	124.9	113.5	34.6	108.5	None	None		
199-D4-76	C3306	151234.24	572526.06	2002	In use	142.97	24.7	33.8	33.9	18.4	124.5	112.5	34.3	108.7	None	None		
199-D4-77	C3307	151231.01	572513.33	2002	In use	142.93	24.4	33.4	33.5	18.4	124.5	111.0	33.8	109.1	None	None		
199-D4-78	C3308	151218.26	572511.28	2002	In use	142.98	24.7	33.7	34.4	18.6	124.4	112.0	34.1	108.8	4/27/2011	118.63	9.8	
199-D4-79	C3309	151214.02	572498.24	2002	In use	143.63	24.8	33.8	35.1	19.2	124.4	113.0	34.4	109.2	None	None		
199-D4-80	C3310	151202.59	572496.87	2002	In use	143.43	24.7	33.8	34.4	18.6	124.8	112.8	34.4	109.0	1/28/2011	114.63	5.6	
199-D4-81	C3311	151199.64	572484.36	2002	In use	143.33	24.8	33.8	34.4	18.7	124.6	112.5	34.3	109.1	1/28/2011	114.76	5.7	
199-D4-82	C3313	151183.89	572470.26	2002	In use	143.23	25.0	34.1	35.1	19.8	123.4	113.5	34.6	108.6	1/28/2011	115.29	6.7	
199-D4-83	C3315	151723.42	572859.43	2001	In use	142.89	23.5	28.0	29.9	X	X	97.0	29.6	113.3	6/21/2010	115.84	2.5	Hf/RE not identified in log
199-D4-84	C3316	151433.52	572568.04	2001	In use	143.63	23.1	30.8	31.5	17.7	126.0	101.5	30.9	112.7	9/13/2010	115.93	3.2	
199-D4-85	C3317	151324.20	572486.16	2001	In use	143.31	23.8	32.9	35.1	X	X	111.0	33.8	109.5	9/13/2010	118.20	8.7	Hf/RE not identified in log
199-D4-86	C3318	151202.14	572389.06	2001	In use	142.60	23.4	32.5	34.3	29.6	113.0	110.0	33.5	109.1	4/19/2011	118.63	9.6	
199-D4-87	C3799	151549.97	572757.10	2002	In use	143.44	26.6	27.2	27.3	X	X	97.2	29.6	113.8	None	None		Hf/RE not identified in log
199-D4-88	C3800	151553.22	572758.67	2002	In use	143.40	24.9	25.5	29.9	X	X	NDE	NDE	<113.5	None	None		Hf/RE not identified in log
199-D4-89	C3801	151549.29	572760.90	2002	In use	143.53	28.4	29.0	29.1	19.8	123.7	97.0	29.6	114.0	None	None		
199-D4-90	C4686	151616.13	572823.20	2005	In use	143.45	25.0	29.6	30.9	17.4	126.1	99.0	30.2	113.3	None	None		
199-D4-91	C4687	151621.08	572817.65	2005	In use	143.45	23.5	29.6	30.4	17.1	126.3	97.3	29.6	113.8	None	None		
199-D4-92	C4688	151486.31	572714.05	2005	In use	143.52	25.3	31.4	32.5	17.3	126.2	102.5	31.2	112.3	5/14/2010	117.50	5.2	
199-D4-93	C4689	151491.20	572710.39	2005	In use	143.33	25.0	31.2	32.1	15.5	127.8	101.8	31.0	112.3	3/1/2010	116.52	4.2	
199-D4-94	C7075	151496.05	572712.89	2009	In use	143.33	22.3	29.9	31.3	17.4	126.0	98.5	30.0	113.3	None	None		
199-D4-95	C7083	151227.00	572613.00	2009	In use	143.17	24.1	34.8	37.0	20.4	122.7	115.5	35.2	108.0	None	None		
199-D4-96	C7084	151520.00	572777.00	2009	In use	143.89	26.8	29.9	32.5	18.0	125.9	100.0	30.5	113.4	None	None		

Table M-1. 100-D/H Borehole/Well Summary Information

Well Name	Well ID	Northing (m)	Easting (m)	Year Inst.	Well Status	Surface Elev. (m)	Depth to screen or perf top (m)	Depth to screen or perf bot (m)	Drill Depth (m)	Depth to RE (m)	Hf/Re Elev. (m)	Depth to RUM (ft)	Depth to RUM (m)	RUM Elev. (m)	Head Date*	Head (m)	Aquifer Thickness (m)	Comments
199-D4-97	C7085	151624.87	572906.53	2009	In use	143.55	26.9	31.4	33.5	18.3	125.3	104.5	31.9	111.7	None	None		
199-D4-98	C7086	151486.00	572606.30	2009	In use	142.85	24.4	30.5	33.8	18.0	124.9	102.8	31.3	111.5	None	None		
199-D4-99	C7087	151376.60	572526.50	2009	In use	143.09	23.7	32.9	35.4	18.6	124.5	109.5	33.4	109.7	None	None		
199-D4-101	C7580	151425.75	572800.30	2010	In use	143.61	24.7	30.8	33.5	19.2	124.4	105.0	32.0	111.6	None	None		
199-D5-12	A4569	151557.20	573839.62	1960	Decom.	143.74	10.7	27.4	27.7	14.6	129.1	89.0	27.1	116.6	None	None		RE depth may not be accurate (from driller's log)
199-D5-13	A4570	151955.18	573535.53	1991	In use	143.65	23.3	29.6	29.7	15.5	128.1	91.0	27.7	115.9	3/6/2011	117.51	1.6	
199-D5-14	A4571	151787.99	573789.63	1992	In use	143.85	23.5	29.8	30.8	X	X	NDE	NDE	<113.1	3/6/2011	118.23	>5.2	Hf/RE not identified in log
199-D5-15	A4572	151673.75	573738.61	1992	In use	143.90	23.5	29.9	31.0	14.0	129.9	101.0	30.8	113.1	3/6/2011	118.57	5.5	
199-D5-16	A4573	151652.51	573917.45	1992	In use	144.45	23.6	29.9	29.9	X	X	NDE	NDE	<114.6	3/6/2011	118.37	>3.8	Hf/RE not identified in log
199-D5-17	A4574	151322.83	573730.52	1992	In use	143.26	22.9	29.3	35.1	X	X	103.5	31.5	111.7	3/6/2011	119.02	7.3	Hf/RE not identified in log
199-D5-18	A4575	151325.18	573861.70	1992	In use	142.58	20.8	28.5	30.6	X	X	99.0	30.2	112.4	3/6/2011	118.69	6.3	
199-D5-19	A4576	151243.19	573849.12	1992	In use	141.99	22.8	29.0	29.0	15.2	126.8	94.5	28.8	113.2	3/6/2011	118.43	5.2	Some uncertainty in Hf/RE contact
199-D5-20	A4577	152030.15	573239.97	1992	In use	142.97	23.2	29.6	31.5	X	X	101.0	30.8	112.2	6/16/2004	118.26	6.1	
199-D5-32	C4185	151903.39	573372.04	2003	In use	143.14	23.7	31.3	32.2	X	X	105.0	32.0	111.1	6/16/2004	118.06	6.9	
199-D5-33	C4186	151714.54	573095.03	2003	In use	143.41	23.2	30.8	31.8	16.8	126.6	103.0	31.4	112.0	3/6/2011	118.43	6.4	
199-D5-34	C4187	151554.12	573240.42	2003	In use	144.52	24.2	31.8	32.8	16.5	128.1	105.0	32.0	112.5	3/6/2011	118.12	5.6	
199-D5-36	B8744	151746.32	572909.82	1999	In use	143.12	22.8	28.9	31.4	14.3	128.8	98.0	29.9	113.2	9/22/2011	118.22	5.0	
199-D5-37	B8745	151916.37	573092.24	1999	In use	143.07	23.7	28.3	30.3	14.0	129.0	94.5	28.8	114.3	3/4/2011	118.47	4.2	
199-D5-38	B8747	151545.59	572996.82	1999	In use	143.96	25.0	31.1	33.5	16.5	127.5	105.0	32.0	112.0	9/21/2011	118.43	6.5	
199-D5-39	B8748	151428.43	573142.86	1999	In use	143.98	24.4	30.5	32.9	15.2	128.7	103.0	31.4	112.6	9/7/2006	118.44	5.9	Some uncertainty in Hf/RE contact
199-D5-40	B8749	151272.02	573003.26	1999	In use	143.98	25.2	31.3	33.4	22.6	121.4	106.0	32.3	111.7	3/4/2011	118.02	6.3	
199-D5-41	B8751	151792.19	573358.16	1999	In use	142.43	24.8	30.9	33.4	15.2	127.2	104.5	31.9	110.6	9/13/2011	120.27	9.7	
199-D5-42	B8752	151622.67	573479.77	1999	In use	143.85	25.3	31.4	33.4	14.6	129.2	106.0	32.3	111.5	3/5/2004	118.26	6.7	
199-D5-43	B8753	151269.43	573179.98	1999	In use	143.84	24.0	31.6	34.3	20.1	123.7	107.0	32.6	111.2	3/4/2011	118.14	6.9	
199-D5-44	B8754	151835.74	572993.58	1999	In use	142.66	23.6	28.1	30.5	14.5	128.2	95.2	29.0	113.6	9/13/2010	117.56	3.9	
199-D5-92	C4583	152009.82	573131.93	2004	In use	142.48	23.0	29.4	30.2	16.8	125.7	98.0	29.9	112.6	12/14/2007	117.69	5.1	
199-D5-93	C4672	151459.64	573350.22	2004	In use	143.61	25.0	31.1	33.2	X	X	109.0	33.2	110.4	3/15/2011	118.38	8.0	Hf/RE not identified in log

Table M-1. 100-D/H Borehole/Well Summary Information

Well Name	Well ID	Northing (m)	Easting (m)	Year Inst.	Well Status	Surface Elev. (m)	Depth to screen or perf top (m)	Depth to screen or perf bot (m)	Drill Depth (m)	Depth to RE (m)	Hf/Re Elev. (m)	Depth to RUM (ft)	Depth to RUM (m)	RUM Elev. (m)	Head Date*	Head (m)	Aquifer Thickness (m)	Comments
199-D5-97	C5390	151302.47	573250.11	2007	In use	143.72	24.4	33.5	34.6	X	X	109.0	33.2	110.5	3/7/2011	118.22	7.7	Hf/RE not identified in log
199-D5-98	C5391	151272.44	573369.56	2007	In use	142.97	24.1	33.3	34.6	17.4	125.6	108.0	32.9	110.1	3/17/2011	118.50	8.4	
199-D5-99	C5392	151402.01	573349.61	2007	In use	143.99	24.2	33.4	35.1	X	X	109.5	33.4	110.6	3/30/2011	118.43	7.8	Hf/RE not identified in log
199-D5-100	C7516	151223.78	573181.98	2011	Decom.	143.32	N/A	N/A	8.7	NDE	<134.6	NDE	NDE	<134.6	None	None		Abandoned horizontal well reached 28.6 vertical ft depth
199-D5-101	C7583	151521.29	572942.78	2010	In use	143.83	23.2	32.4	34.8	X	X	108.0	32.9	110.9	None	None		
199-D5-102	C5398	151340.23	573428.15	2007	In use	143.81	23.8	32.9	34.6	14.8	129.0	108.0	32.9	110.9	3/7/2011	118.56	7.7	
199-D5-103	C5399	151460.87	573505.87	2007	In use	143.61	24.5	33.6	35.7	18.3	125.3	110.7	33.7	109.9	3/6/2011	118.84	9.0	
199-D5-104	C5400	151422.43	573265.48	2007	In use	144.05	24.4	33.5	35.4	X	X	110.3	33.6	110.4	6/21/2010	115.36	4.9	Hf/RE not identified in log
199-D5-106	C5511	151597.97	573503.74	2007	In use	143.67	20.8	31.4	32.7	15.2	128.4	NDE	NDE	<111.0	3/6/2011	118.89		
199-D5-107	C5577	151283.14	572932.37	2007	In use	144.09	25.1	31.2	31.7	X	X	101.0	30.8	113.3	8/18/2010	116.06	2.8	Hf/RE not identified in log
199-D5-108	C5578	151222.90	572923.34	2007	In use	144.38	25.5	31.6	32.3	22.9	121.5	103.0	31.4	113.0	6/16/2010	115.65	2.7	
199-D5-109	C5579	151285.57	572917.37	2007	In use	144.02	25.3	31.4	31.7	22.3	121.8	104.1	31.7	112.3	7/23/2010	115.55	3.3	
199-D5-110	C5580	151277.61	572931.57	2007	In use	144.12	24.5	30.6	31.2	20.7	123.4	100.5	30.6	113.5	7/23/2010	115.67	2.2	
199-D5-111	C5581	151281.47	572943.24	2007	In use	144.11	24.4	30.5	31.0	21.3	122.8	100.0	30.5	113.6	None	None		
199-D5-112	C5582	151289.87	572929.08	2007	In use	143.99	25.2	26.8	28.6	20.7	123.3	NDE	NDE	<115.4	None	None		*100-HR-3 Remedial Process Optimization Modeling Data Package* (SGW-40781) RUM elev. in m amsl is in error (should be >28.6)
199-D5-113	C5583	151288.45	572927.02	2007	In use	143.99	29.0	30.5	31.1	20.7	123.3	100.5	30.6	113.4	None	None		
199-D5-114	C5584	151223.75	572918.04	2007	In use	144.36	25.4	31.5	31.8	22.3	122.1	104.3	31.8	112.6	8/23/2010	115.81	3.2	
199-D5-115	C5585	151221.12	572923.15	2007	In use	144.39	25.4	31.5	32.0	22.3	122.1	104.0	31.7	112.7	8/18/2010	118.63	5.9	
199-D5-116	C5586	151222.35	572926.93	2007	In use	144.42	25.4	31.5	31.9	22.6	121.9	104.0	31.7	112.7	None	None		
199-D5-117	C5587	151225.43	572922.94	2007	In use	144.39	25.7	27.2	27.9	22.4	122.0	NDE	NDE	<116.5	None	None		
199-D5-118	C5588	151224.45	572921.03	2007	In use	144.37	29.9	31.4	31.9	22.4	122.0	104.0	31.7	112.7	None	None		
199-D5-119	C5933	151417.95	573306.17	2008	In use	144.01	24.5	33.7	34.6	22.6	121.5	110.0	33.5	110.5	3/6/2011	118.29	7.8	
199-D5-120	C5934	151406.84	573377.18	2008	In use	143.66	23.8	33.0	34.3	16.2	127.5	108.0	32.9	110.7	12/13/2010	115.67	4.9	
199-D5-121	C5935	151399.27	573430.24	2008	In use	143.77	23.5	32.6	34.1	19.2	124.6	107.0	32.6	111.2	3/9/2011	118.49	7.3	
199-D5-122	C5936	151349.29	573300.25	2008	In use	143.67	23.7	32.9	34.2	22.6	121.1	107.7	32.8	110.8	3/30/2011	118.40	7.6	
199-D5-123	C6387	151639.41	573824.21	2008	In use	144.17	24.0	36.3	37.7	X	X	120.0	36.6	107.6	4/5/2011	118.56	11.0	Hf/RE not identified in log

Table M-1. 100-D/H Borehole/Well Summary Information

Well Name	Well ID	Northing (m)	Easting (m)	Year Inst.	Well Status	Surface Elev. (m)	Depth to screen or perf top (m)	Depth to screen or perf bot (m)	Drill Depth (m)	Depth to RE (m)	Hf/Re Elev. (m)	Depth to RUM (ft)	Depth to RUM (m)	RUM Elev. (m)	Head Date*	Head (m)	Aquifer Thickness (m)	Comments
199-D5-125	C6389	151746.18	573667.39	2008	In use	143.99	24.1	32.7	34.1	22.9	121.1	106.8	32.6	111.4	3/30/2011	118.45	7.0	
199-D5-126	C6390	151843.28	573705.71	2008	In use	143.63	24.4	33.5	34.8	X	X	110.0	33.5	110.1	3/30/2011	118.20	8.1	Hf/RE not identified in log
199-D5-127	C7591	151428.66	572992.87	2010	In use	143.83	24.2	30.3	33.2	19.5	124.3	106.0	32.3	111.5	None	None		
199-D5-128	C7612	151237.06	573622.04	2010	In use	143.00	23.8	29.8	32.5	18.9	124.1	99.0	30.2	112.8	None	None		
199-D5-129	C7600	151443.19	573728.41	2010	In use	143.15	23.8	31.4	34.6	18.3	124.9	105.5	32.2	111.0	None	None		
199-D5-130	C7590	151928.16	574039.43	2010	In use	142.40	24.1	28.7	30.9	14.6	127.8	95.0	29.0	113.4	None	None		
199-D5-131	C7601	152007.01	573684.30	2010	In use	143.75	24.7	32.4	35.5	16.8	127.0	109.0	33.2	110.5	None	None		
199-D5-132	C7622	151586.87	573875.35	2011	In use	144.363	24.6	32.3	34.1	15.5	128.8	106.0	32.3	112.1	8/23/2011	118.56	6.5	
199-D5-133	C7621	151497.37	573731.55	2010	In use	143.439	22.9	32.0	34.1	16.2	127.3	104.0	31.7	111.7	8/23/2011	119.85	8.1	
199-D5-134	C7624	151862.46	573675.32	2011	In use	143.676	40.2	43.3	82.3	16.2	127.5	108.5	33.1	110.6	None	None		Screened in RUM
199-D5-140	C7866	151778.82	573750.68	2011	Decom.	143.946	24.8	32.4	34.4	14.6	129.3	108.0	32.9	111.0	6/10/2011	116.79	5.8	
199-D5-141	C7625	151424.51	573243.43	2011	In use	144.213	49.1	52.1	96.5	18.0	126.2	112.0	34.1	110.1	8/18/2011	118.30	8.2	Screened in RUM
199-D5-142	C7857	151563.26	573791.87	2011	In use	143.16	23.5	26.5	27.4	13.7	129.4	NDE	NDE	<115.8	None	None		
199-D5-143	C8375	151784.26	573701.53	2011	In use	143.709	24.4	32.0	36.0	17.4	126.3	105.0	32.0	111.7	8/23/2011	116.43	4.7	
199-D5-144	C8668	151404.96	573352.05	2011	In use	143.64	22.4	33.1	35.2	X	X	108.5	33.1	110.6	None	None		Hf/RE not identified in log
199-D6-1	C7592	151691.50	574129.64	2010	In use	144.22	24.4	30.5	32.6	18.9	125.3	101.0	30.8	113.4	None	None		
199-D6-2	C7607	151970.55	574545.22	2010	In use	133.72	14.3	22.0	24.5	13.4	120.3	77.0	23.5	110.3	None	None		Hf/RE not identified in log
199-D6-3	C7623	151643.85	574159.09	2010	In use	143.927	23.2	30.8	33.7	18.3	125.6	101.6	31.0	113.0	8/23/2011	119.29	6.3	
199-D7-3	C7599	152364.06	574151.35	2010	In use	135.38	14.4	25.1	27.2	NP	NP	84.0	25.6	109.8	None	None		RE not present
199-D7-4	C7594	152369.54	574376.96	2010	In use	133.76	15.2	21.3	23.6	13.4	120.3	74.0	22.6	111.2	None	None		
199-D7-5	C7608	152678.57	574434.21	2010	In use	131.43	10.1	16.2	19.4	NP	NP	54.0	16.5	115.0	None	None		
199-D7-6	C7611	152980.21	574428.64	2010	In use	125.01	4.7	10.8	13.4	9.1	115.9	36.5	11.1	113.9	None	None		
199-D8-4	A4579	152090.21	573447.19	1991	In use	143.22	22.6	28.7	31.5	X	X	103.4	31.5	111.7	3/6/2011	117.53	5.8	Hf/RE not identified in log
199-D8-5	A4580	152243.50	573537.15	1991	In use	138.17	19.2	25.3	26.6	13.5	124.6	83.0	25.3	112.9	3/4/2011	117.33	4.5	
199-D8-6	A4585	152060.82	573434.69	1991	In use	145.42	26.7	32.9	33.5	X	X	NDE	NDE	<111.9	12/13/2010	116.43		Hf/RE not identified in log
199-D8-53	A4581	152452.26	573889.86	1991	In use	132.89	13.7	20.0	21.2	12.2	120.7	69.0	21.0	111.9	12/7/2005	117.33	5.5	
199-D8-54A	A4582	152408.03	573781.17	1991	In use	134.93	15.7	22.1	23.8	19.8	115.1	76.0	23.2	111.8	None	None		

Table M-1. 100-D/H Borehole/Well Summary Information

Well Name	Well ID	Northing (m)	Easting (m)	Year Inst.	Well Status	Surface Elev. (m)	Depth to screen or perf top (m)	Depth to screen or perf bot (m)	Drill Depth (m)	Depth to RE (m)	Hf/Re Elev. (m)	Depth to RUM (ft)	Depth to RUM (m)	RUM Elev. (m)	Head Date*	Head (m)	Aquifer Thickness (m)	Comments
199-D8-54B	A4583	152398.65	573768.24	1991	In use	134.92	39.6	42.8	43.9	10.7	124.3	76.0	23.2	111.8	3/7/2011	117.98	6.2	
199-D8-55	A4584	152364.35	573620.95	1992	In use	135.60	16.9	23.2	22.6	10.7	124.9	69.0	21.0	114.6	9/13/2010	117.86	3.3	
199-D8-68	B2772	152427.12	573711.66	1996	In use	134.90	14.6	22.3	24.4	NP	NP	75.0	22.9	112.0	12/7/2005	117.34	5.3	RE not present
199-D8-69	B2773	152552.20	573843.61	1996	In use	130.53	11.3	17.4	18.9	NP	NP	57.5	17.5	113.0	12/13/2010	118.51	5.5	RE not present
199-D8-70	B2774	152508.74	573942.10	1996	In use	131.95	12.5	21.6	22.6	NP	NP	71.0	21.6	110.3	3/6/2011	117.71	7.4	RE not present
199-D8-71	B2775	152429.39	573837.10	1996	In use	133.72	14.0	23.2	24.7	NP	NP	77.0	23.5	110.3	3/6/2011	117.72	7.5	RE not present
199-D8-72	C3829	152211.77	573570.48	2002	In use	140.75	22.1	28.0	29.0	15.7	125.1	93.5	28.5	112.3	None	None		
199-D8-73	C4474	152167.38	573388.70	2004	In use	141.79	21.7	26.9	28.2	16.0	125.8	89.5	27.3	114.5	6/21/2010	118.66	4.1	
199-D8-88	C4536	152141.26	573292.33	2004	In use	141.10	22.7	29.1	29.8	15.8	125.3	96.0	29.3	111.8	6/21/2010	117.21	5.4	
199-D8-89	C7091	152246.40	573468.10	2009	In use	137.87	20.4	23.5	25.8	15.8	122.0	78.0	23.8	114.1	None	None		
199-D8-90	C7092	152646.20	573948.80	2010	In use	125.84	7.4	15.1	17.2	NP	NP	51.0	15.5	110.3	None	None		RE not present
199-D8-91	C7093	152741.30	574037.20	2010	In use	123.55	6.2	12.3	14.2	NP	NP	42.0	12.8	110.7	None	None		RE not present
199-D8-93	C7095	153067.30	574191.20	2009	In use	120.22	3.1	4.6	6.4	X	X	16.0	4.9	115.3	None	None		Hf/RE not identified in log
199-D8-94	C7096	152920.22	574082.34	2009	In use	120.08	3.0	7.6	9.5	X	X	26.3	8.0	112.1	None	None		Hf/RE not identified in log
199-D8-95	C7589	152160.76	573611.76	2010	In use	141.81	22.9	28.9	31.8	17.7	124.1	97.0	29.6	112.2	None	None		
199-D8-96	C7603	152152.59	573705.88	2010	In use	140.48	21.4	27.5	30.9	19.8	120.7	97.0	29.6	110.9	None	None		
199-D8-97	C7582	152087.60	573859.59	2010	In use	140.85	20.1	29.2	31.8	X	X	92.5	28.2	112.7	None	None		
199-D8-98	C7602	152122.67	574012.53	2010	In use	138.03	17.7	25.3	27.9	NP	NP	85.0	25.9	112.1	None	None		RE not present
199-D8-99	C7593	152363.99	574006.34	2010	In use	136.54	16.7	24.4	27.1	17.4	119.2	84.0	25.6	110.9	None	None		
199-D8-101	C7852	152262.43	574069.46	2011	In use	136.38	18.2	21.3	21.9	X	X	NDE	NDE	<114.4	6/21/2011	117.84	>3.4	RE not determinable
199-H1-1	C7585	153384.49	576702.31	2010	In use	123.52	5.5	10.1	12.5	NP	NP	33.8	10.3	113.2	None	None		RE not present
199-H1-2	C7584	153378.26	576451.07	2010	In use	128.13	10.8	13.8	16.6	NP	NP	45.6	13.9	114.2	None	None		RE not present
199-H1-3	C7581	153371.29	576147.90	2010	In use	128.19	9.8	12.8	14.8	X	X	42.0	12.8	115.4	None	None		
199-H1-4	C7604	153366.87	575826.78	2010	In use	127.88	9.5	12.6	14.8	NP	NP	41.0	12.5	115.4	None	None		RE not present
199-H1-5	C7610	153090.79	574846.11	2010	In use	123.74	4.9	12.5	14.2	4.6	119.2	42.5	13.0	110.8	None	None		
199-H1-6	C7606	153745.74	576037.81	2010	In use	125.44	7.9	10.9	14.3	NP	NP	36.5	11.1	114.3	None	None		
199-H1-7	C7630	153172.10	577629.60	2010	In use	124.804	6.6	9.6	11.3	NP	NP	31.5	9.6	115.2	8/17/2011	117.45	2.2	

Table M-1. 100-D/H Borehole/Well Summary Information

Well Name	Well ID	Northing (m)	Easting (m)	Year Inst.	Well Status	Surface Elev. (m)	Depth to screen or perf top (m)	Depth to screen or perf bot (m)	Drill Depth (m)	Depth to RE (m)	Hf/Re Elev. (m)	Depth to RUM (ft)	Depth to RUM (m)	RUM Elev. (m)	Head Date*	Head (m)	Aquifer Thickness (m)	Comments
199-H1-20	C7113	154184.40	575705.70	2010	In use	121.11	3.5	9.6	17.6	NP	NP	38.0	11.6	109.5	None	None		RE not present
199-H1-21	C7111	154163.20	575896.60	2010	In use	121.38	5.2	9.8	12.1	4.9	116.5	33.0	10.1	111.3	None	None		
199-H1-25	C7478	154069.90	576279.20	2010	In use	122.96	3.5	9.6	12.0	X	X	32.0	9.8	113.2	None	None		
199-H1-27	C7480	154024.21	576403.86	2010	In use	123.57	4.3	10.4	12.6	NP	NP	35.0	10.7	112.9	None	None		
199-H1-32	C7100	153766.00	576767.00	2010	In use	127.46	6.9	13.0	15.7	X	X	43.0	13.1	114.4	None	None		
199-H1-33	C7105	153716.00	576833.00	2010	In use	126.09	7.0	11.6	13.7	X	X	39.0	11.9	114.2	None	None		
199-H1-34	C7108	153667.00	576883.00	2010	In use	125.36	6.9	11.5	13.7	X	X	38.0	11.6	113.8	None	None		
199-H1-35	C7106	153627.61	576958.64	2010	In use	125.57	7.8	12.3	14.6	X	X	41.0	12.5	113.1	None	None		
199-H1-36	C7102	153486.75	576885.17	2010	In use	125.46	7.0	11.6	14.2	X	X	39.0	11.9	113.6	None	None		
199-H1-37	C7099	153642.00	577107.00	2010	In use	126.05	7.8	12.4	14.1	NP	NP	46.4	14.1	111.9	None	None		
199-H1-38	C7098	153562.12	577159.31	2010	In use	126.24	8.1	12.7	14.5	NP	NP	42.0	12.8	113.4	None	None		
199-H1-39	C7109	153533.00	577224.00	2010	In use	125.57	7.0	11.6	13.4	NP	NP	38.0	11.6	114.0	None	None		
199-H1-40	C7104	153499.82	577279.43	2010	In use	125.95	7.0	11.6	13.5	NP	NP	39.5	12.0	113.9	None	None		
199-H1-42	C7107	153391.65	577127.18	2009	In use	124.62	8.6	11.6	13.4	NP	NP	41.0	12.5	112.1	None	None		
199-H1-43	C7492	153384.28	577213.74	2009	In use	125.35	9.8	12.8	14.9	NP	NP	43.0	13.1	112.2	3/31/2010	115.39	3.1	
199-H1-45	C7477	153062.56	577239.39	2009	In use	127.90	11.8	16.4	18.6	X	X	56.0	17.1	110.8	None	None		
199-H2-1	C7631	153239.89	577752.31	2011	In use	123.347	19.5	22.5	57.6	NP	NP	37.5	11.4	112.0	8/17/2011	118.08	6.1	Screened in RUM
199-H3-1	A4610	152437.94	577645.04	1960	In use	129.13	8.8	22.6	22.9	NP	NP	56.0	17.1	112.1	None	None		Hf/RE not identified in log
199-H3-2A	A4611	152750.07	577624.61	1986	In use	128.05	11.0	15.5	17.1	NP	NP	54.0	16.5	111.6	3/6/2011	116.03	4.4	Hf/RE not identified in log
199-H3-2B	A4612	152757.16	577628.27	1986	In use	127.92	15.2	16.8	17.7	NP	NP	57.0	17.4	110.5	3/6/2011	116.03	5.5	Hf/RE not identified in log
199-H3-2C	A4613	152750.30	577632.07	1986	In use	128.02	30.5	33.5	47.2	NP	NP	55.0	16.8	111.3	5/23/2010	118.71	7.5	Hf/RE not identified in log
199-H3-3	B2778	152363.17	577562.09	1996	In use	128.05	8.8	14.9	16.3	NP	NP	49.0	14.9	113.1	3/6/2011	115.83	2.7	
199-H3-4	B2779	152293.21	577544.29	1996	In use	126.46	6.4	14.0	14.9	NP	NP	45.0	13.7	112.7	4/20/2011	118.23	5.5	
199-H3-5	B2780	152287.50	577454.70	1996	In use	126.29	7.9	14.0	15.2	NP	NP	45.5	13.9	112.4	3/6/2011	115.87	3.4	
199-H3-6	C7626	152425.33	578266.47	2010	In use	128.533	10.5	16.6	18.8	NP	NP	54.5	16.6	111.9	None	None		
199-H3-7	C7627	152279.97	577931.74	2010	In use	129.071	11.4	15.9	18.0	NP	NP	52.5	16.0	113.1	None	None		
199-H3-9	C7639	152913.60	578039.12	2011	In use	126.364	23.8	26.9	66.5	NP	NP	50.0	15.2	111.1	8/17/2011	118.68	7.6	Screened in RUM

Table M-1. 100-D/H Borehole/Well Summary Information

Well Name	Well ID	Northing (m)	Easting (m)	Year Inst.	Well Status	Surface Elev. (m)	Depth to screen or perf top (m)	Depth to screen or perf bot (m)	Drill Depth (m)	Depth to RE (m)	Hf/Re Elev. (m)	Depth to RUM (ft)	Depth to RUM (m)	RUM Elev. (m)	Head Date*	Head (m)	Aquifer Thickness (m)	Comments
199-H3-10	C7640	152723.52	577545.14	2011	In use	128.249	31.4	34.4	70.3	NP	NP	55.0	16.8	111.5	3/6/2011	115.76	4.3	Screened in RUM
199-H3-11	C7863	152490.41	577786.74	2011	In use	130.21	12.8	15.9	16.6	NP	NP	NDE	NDE	<113.4	3/6/2011	115.65	>2.1	
199-H3-25	C7110	152989.70	577408.50	2009	In use	127.79	10.3	16.4	18.7	NP	NP	56.0	17.1	110.7	3/31/2010	117.50	6.8	
199-H3-26	C7115	152846.50	577440.83	2009	In use	127.30	10.7	15.2	17.2	NP	NP	NDE	NDE	<110.1	None	None		
199-H3-27	C7114	152810.80	577566.80	2009	In use	128.36	10.9	17.0	18.9	NP	NP	57.0	17.4	111.0	None	None		
199-H4-1	A5685	152657.65	578148.51	1952	Decom.	128.48	N/A	N/A	22.9	X	X	55.0	16.8	111.7	None	None		Hf/RE not identified in log
199-H4-2	A5686	152501.48	578093.55	1952	In use	128.21	111.9	116.4	117.7	X	X	65.0	19.8	108.4	3/9/2011	143.19	34.8	Hf/RE not identified in log
199-H4-3	A4629	152858.54	577940.49	1974	In use	128.48	10.4	16.8	17.6	15.2	113.2	NDE	NDE	<110.9	8/11/2011	115.96	>5.1	Uncertain whether contact identified as "Ringold" is RE or RUM. since "caliche" identified deeper, assumed to be RE
199-H4-4	A4630	152853.96	578060.86	1983	In use	126.84	10.1	13.1	16.8	X	X	NDE	NDE	<110.1	3/10/2005	115.08	>5.0	Inconclusive (drill log)
199-H4-5	A4636	152939.78	577944.94	1983	In use	127.33	9.8	12.8	18.3	X	X	48.0	14.6	112.7	3/8/2011	115.82	3.1	Hf/RE not identified in log
199-H4-6	A4637	152888.39	577585.32	1983	In use	128.67	11.9	14.9	16.8	X	X	NDE	NDE	<111.9	3/6/2011	116.02	>4.1	
199-H4-7	A4638	152890.85	577804.13	1986	In use	128.76	11.6	16.2	16.8	X	X	54.0	16.5	112.3	8/1/2005	116.04	3.7	Hf/RE not identified in log
199-H4-8	A4639	152921.70	577860.69	1986	In use	128.60	11.6	14.6	16.8	X	X	48.0	14.6	114.0	3/6/2011	116.16	2.2	Hf/RE not identified in log
199-H4-9	A4640	152893.89	577923.19	1986	In use	128.28	11.0	14.0	15.5	NP	NP	46.6	14.2	114.1	3/6/2011	116.01	1.9	
199-H4-10	A4614	153155.81	577827.21	1986	In use	123.70	7.0	11.6	11.6	X	X	38.0	11.6	112.1	3/6/2011	115.76	3.6	Hf/RE not identified in log
199-H4-11	A4615	152728.43	578141.91	1986	In use	127.68	11.6	16.2	16.2	X	X	59.0	18.0	109.7	3/6/2011	115/65	>4.1	Hf/RE not identified in log
199-H4-12A	A4616	152912.73	578009.15	1986	In use	126.47	10.1	14.6	14.6	X	X	51.0	15.5	110.9	1/24/2011	117.29	6.4	Hf/RE not identified in log
199-H4-12B	A4617	152918.47	578004.39	1986	In use	126.46	13.7	15.2	15.5	X	X	50.5	15.4	111.1	3/6/2011	115.68	4.6	Hf/RE not identified in log
199-H4-12C	A4618	152919.81	578011.77	1986	In use	126.34	21.9	25.0	67.1	X	X	50.0	15.2	111.1	3/6/2011	115.59	4.5	Hf/RE not identified in log
199-H4-13	A4619	152595.27	578219.30	1986	In use	127.86	11.3	15.8	18.6	X	X	59.0	18.0	109.9	4/20/2011	118.19	8.3	Hf/RE not identified in log
199-H4-14	A4620	152752.36	577803.75	1986	In use	128.61	11.6	16.2	16.2	X	X	59.0	18.0	110.6	11/18/2009	115.81	5.2	Hf/RE not identified in log
199-H4-15A	A4621	153053.42	577904.31	1986	In use	124.63	8.2	12.8	14.0	X	X	44.0	13.4	111.2	None	None		Hf/RE not identified in log
199-H4-15B	A4622	153059.55	577899.60	1986	In use	124.53	11.3	12.8	13.4	X	X	43.0	13.1	111.4	3/6/2011	115.68	4.3	Hf/RE not identified in log
199-H4-15C	A5689	153059.98	577907.68	1986	In use	124.64	N/A	N/A	100.6	X	X	46.0	14.0	110.6	None	None		Hf/RE not identified in log; pz host well
199-H4-15CP	A9496	153059.98	577907.68	1986	In use	124.64	99.1	99.7	100.6						3/6/2011	107.88		Pz screened in Rattlesnake Ridge Interbed
199-H4-15CQ	A4623	153059.98	577907.68	1986	In use	124.64	89.9	90.5	100.6						3/6/2011	116.09		Pz screened in Ringold unit 9?

Table M-1. 100-D/H Borehole/Well Summary Information

Well Name	Well ID	Northing (m)	Easting (m)	Year Inst.	Well Status	Surface Elev. (m)	Depth to screen or perf top (m)	Depth to screen or perf bot (m)	Drill Depth (m)	Depth to RE (m)	Hf/Re Elev. (m)	Depth to RUM (ft)	Depth to RUM (m)	RUM Elev. (m)	Head Date*	Head (m)	Aquifer Thickness (m)	Comments
199-H4-15CR	A4624	153059.98	577907.68	1986	In use	124.64	59.1	59.7	100.6						3/6/2011	115.95		Pz screened in Ringold unit 7?
199-H4-15CS	A4625	153059.98	577907.68	1986	In use	124.64	23.8	24.4	100.6						3/6/2011	115.79		Pz screened in RUM
199-H4-16	A4626	152591.57	577981.91	1987	In use	129.82	13.0	17.8	18.6	NP	NP	61.0	18.6	111.2	3/6/2011	115.95	4.7	Drill/borehole log describes all cuttings as mostly basaltic gravel, bottom assumed to be RUM, RE in other boreholes does not contain clay.
199-H4-17	A4627	153037.64	577779.18	1987	In use	129.34	10.7	13.7	12.6	NP	NP	45.0	13.7	115.6	12/13/2010	118.13	2.5	Drill/borehole log describes all sand and gravel as predominantly basalt. Clay balls in last foot of hard tool drilling indicate RUM. RE in other boreholes does not contain clay.
199-H4-18	A4628	152756.48	578018.29	1987	In use	129.10	12.2	15.2	15.5	NP	NP	50.0	15.2	113.9	12/13/2010	118.31	4.5	Drill/borehole log describes all sand and gravel as predominantly basalt. Clay balls in last foot of hard tool drilling indicate RUM. RE in other boreholes does not contain clay.
199-H4-45	A4631	152433.39	578156.39	1997	In use	127.13	9.8	16.1	16.6	X	X	NDE	NDE	<110.5	3/6/2011	115.70	>5.2	Hf/RE not identified in log
199-H4-46	A4632	152439.87	577883.86	1997	In use	129.38	11.8	18.1	18.7	X	X	61.0	18.6	110.8	5/23/2011	118.92	8.1	Hf/RE not identified in log
199-H4-47	A4633	152553.30	577891.18	1997	In use	129.55	11.8	18.2	18.3	X	X	NDE	NDE	<111.3	3/6/2011	116.02	>4.7	Hf/RE not identified in log
199-H4-48	A4634	152620.21	577792.66	1997	In use	129.97	11.9	18.2	18.9	12.2	117.8	62.0	18.9	111.1	3/6/2011	116.11	5.0	Hf/RE contact uncertain
199-H4-49	A4635	152445.15	577713.83	1997	In use	129.62	11.6	16.4	18.3	X	X	55.0	16.8	112.9	7/29/2010	117.89	5.0	Hf/RE not identified in log
199-H4-63	B2776	152665.53	578185.83	1996	In use	127.60	11.1	17.2	19.5	X	X	57.0	17.4	110.2	9/23/2005	114.26	4.0	Hf/RE not identified in log
199-H4-64	B2777	153010.58	577946.11	1996	In use	125.29	6.6	12.7	17.2	10.7	114.6	48.0	14.6	110.7	3/10/2005	115.11	4.5	
199-H4-65	B8759	152787.29	577998.26	1999	In use	128.82	11.9	14.9	16.2	X	X	50.0	15.2	113.6	5/6/2011	115.60	2.0	Hf/RE not identified in log
199-H4-69	C7485	152686.50	578011.02	2009	In use	129.39	13.9	17.0	19.5	NP	NP	60.0	18.3	111.1	None	None		RE not present
199-H4-70	C7483	152646.46	578004.71	2009	In use	129.60	13.7	16.8	18.7	NP	NP	56.0	17.1	112.5	None	None		RE not present
199-H4-71	C7487	152581.53	578010.64	2009	In use	129.78	13.7	18.3	21.6	NP	NP	62.0	18.9	110.9	None	None		RE not present
199-H4-72	C7488	152500.14	578036.28	2009	In use	128.39	12.2	16.8	18.7	NP	NP	56.0	17.1	111.3	None	None		RE not present
199-H4-73	C7484	152369.98	577940.58	2009	In use	129.31	13.2	19.3	21.6	NP	NP	64.5	19.7	109.7	None	None		RE not present
199-H4-74	C7598	152268.83	577239.07	2010	In use	125.36	7.0	11.6	14.0	9.1	116.2	38.0	11.6	113.8	None	None		
199-H4-75	C7597	152704.64	577212.36	2010	In use	128.54	10.5	15.1	18.0	12.2	116.4	50.0	15.2	113.3	None	None		
199-H4-76	C7587	152976.85	576787.32	2010	In use	129.66	11.3	14.3	17.2	X	X	47.5	14.5	115.2	None	None		Hf/RE not identified in log
199-H4-77	C7605	152975.43	576487.79	2010	In use	127.89	9.9	13.0	15.5	NP	NP	42.5	13.0	114.9	None	None		RE not present
199-H4-78	C7588	152166.12	576168.23	2010	In use	129.54	11.6	17.7	19.5	2.6	127.0	59.5	18.1	111.4	None	None		

Table M-1. 100-D/H Borehole/Well Summary Information

Well Name	Well ID	Northing (m)	Easting (m)	Year Inst.	Well Status	Surface Elev. (m)	Depth to screen or perf top (m)	Depth to screen or perf bot (m)	Drill Depth (m)	Depth to RE (m)	Hf/Re Elev. (m)	Depth to RUM (ft)	Depth to RUM (m)	RUM Elev. (m)	Head Date*	Head (m)	Aquifer Thickness (m)	Comments
199-H4-79	C7586	151989.31	575659.13	2010	In use	131.30	11.9	18.0	19.8	14.6	116.7	59.5	18.1	113.2	None	None		
199-H4-80	C7595	152568.23	575239.41	2010	In use	129.34	9.5	20.2	22.6	12.2	117.2	67.0	20.4	108.9	None	None		
199-H4-81	C7596	153035.23	575234.16	2010	In use	124.79	5.6	11.7	13.5	NP	NP	39.0	11.9	112.9	None	None		RE not present
199-H4-82	C7609	152684.44	574861.12	2010	In use	129.60	10.0	16.0	18.0	NP	NP	53.0	16.2	113.4	None	None		RE not present
199-H4-83	C7861	152634.01	578135.04	2011	In use	126.48	9.7	12.8	14.8	NP	NP	NDE	NDE	<111.7	None	None		RE not present
199-H4-84	C7860	152848.73	577902.58	2011	In use	128.66	11.5	14.5	12.9	NP	NP	NDE	NDE	<115.8	None	None		RE not present
199-H5-1A	A4641	152257.72	577650.08	1992	In use	128.17	10.6	15.5	17.4	X	X	52.0	15.8	112.3	3/6/2011	115.85	3.5	Hf/RE not identified in log
199-H5-2	A9892	152262.00	577631.00	1995	In use	127.00	13.8	15.4	16.5	X	X	50.3	15.3	111.7	None	None		Redox test well. Incomplete logs.
199-H5-3O	A9978	152261.00	577634.00	1995	In use	127.00	12.5	13.3	16.5	X	X	50.3	15.3	111.7	None	None		Redox test well. Incomplete logs.
199-H5-3P	A9973	152263.00	577634.00	1995	In use	127.00	14.1	14.9	16.5	X	X	50.2	15.3	111.7	None	None		Redox test well. Incomplete logs.
199-H5-4O	A9977	152261.00	577637.00	1995	In use	127.00	12.7	13.5	16.5	X	X	50.2	15.3	111.7	None	None		Redox test well. Incomplete logs.
199-H5-4P	A9974	152263.00	577637.00	1995	In use	127.00	14.5	15.3	16.5	X	X	50.2	15.3	111.7	None	None		Redox test well. Incomplete logs.
199-H5-5O	A9976	152261.00	577640.00	1995	In use	127.00	12.7	13.4	16.5	X	X	NDE	NDE	NDE	None	None		Redox test well. Incomplete logs.
199-H5-5P	A9975	152263.00	577640.00	1995	In use	127.00	14.8	15.5	16.5	X	X	NDE	NDE	NDE	None	None		Redox test well. Incomplete logs.
199-H5-6	A9979	152260.00	577643.00	1995	In use	127.00	14.0	14.7	16.5	X	X	NDE	NDE	NDE	None	None		Redox test well. Incomplete logs.
199-H5-7	A9980	152259.00	577645.00	1995	In use	127.00	14.2	15.0	16.5	X	X	50.5	15.4	111.6	None	None		Redox test well. Incomplete logs.
199-H5-8	B2425	152258.00	577647.00	1995	In use	127.00	12.8	15.8	15.5	X	X	50.7	15.5	111.5	None	None		Redox test well. Incomplete logs.
199-H5-9	A9981	152264.00	577643.00	1995	In use	127.00	14.4	15.1	15.9	X	X	50.5	15.4	111.6	None	None		Redox test well. Incomplete logs.
199-H5-10	A9982	152266.00	577644.00	1995	In use	127.00	14.2	15.0	16.1	X	X	50.5	15.4	111.6	None	None		Redox test well. Incomplete logs.
199-H5-11	B2426	152268.00	577646.00	1995	In use	127.00	14.1	14.9	16.2	X	X	50.5	15.4	111.6	None	None		Redox test well. Incomplete logs.
199-H5-12	B2427	152279.00	577650.00	1995	In use	127.00	12.8	15.8	16.0	X	X	50.5	15.4	111.6	None	None		Redox test well. Incomplete logs.
199-H5-13	B2433	152288.00	577650.00	1995	In use	127.00	12.8	15.6	16.0	X	X	NDE	NDE	NDE	None	None		Redox test well. Incomplete logs.
199-H5-14	B2434	152286.00	577656.00	1995	In use	127.00	12.9	16.0	16.0	X	X	NDE	NDE	NDE	None	None		Redox test well. Incomplete logs.
199-H5-15	B2629	unknown	unknown	1995	In use	unknown	12.6	15.6	16.7	X	X	50.6	15.4	unknown	None	None		Redox test well. Incomplete logs. No survey estimates.
199-H6-1	A4642	152247.63	578236.56	1992	In use	127.55	10.3	16.7	17.1	X	X	NDE	NDE	NDE	3/6/2011	115.59		
199-H6-2	C7489	152193.17	577886.19	2009	In use	129.02	12.1	15.2	18.5	NP	NP	50.0	15.2	113.8	None	None		RE not present
199-H6-3	C7628	151929.35	578340.40	2010	In use	128.401	11.3	18.9	20.5	NP	NP	60.0	18.3	110.1	None	None		RE not present; RUM contact transitional

Table M-1. 100-D/H Borehole/Well Summary Information

Well Name	Well ID	Northing (m)	Easting (m)	Year Inst.	Well Status	Surface Elev. (m)	Depth to screen or perf top (m)	Depth to screen or perf bot (m)	Drill Depth (m)	Depth to RE (m)	Hf/Re Elev. (m)	Depth to RUM (ft)	Depth to RUM (m)	RUM Elev. (m)	Head Date*	Head (m)	Aquifer Thickness (m)	Comments
199-H6-4	C7629	151737.10	577771.59	2010	In use	127.456	9.7	17.3	19.2	X	X	55.5	16.9	110.5	None	None		RE not determinable, but possibly present
699-87-55	A5346	149903.90	572969.70	1969	In use	141.12	18.0	28.0	28.7	18.6	122.5	NDE	NDE	<112.5	3/4/2011	118.66		
699-90-45	A5352	151024.50	576169.20	unknown	In use	129.51	9.8	12.8	12.8	X	X	X	X	X	3/4/2011	117.62		No log
699-91-46A	A5354	151156.64	575910.95	unknown	In use	127.26	7.0	13.4	13.9	NP	NP	NDE	NDE	NDE	None	None		RE not present
699-93-48A	A5356	151795.30	575094.10	1992	In use	133.54	12.6	18.9	25.3	NP	NP	73.0	22.3	111.3	3/4/2011	117.48	6.2	
699-94-41	C5665	152111.70	577223.10	2007	In use	124.96	7.9	10.9	12.2	NP	NP	35.5	10.8	114.1	3/6/2011	116.04	1.9	RE not present
699-94-43	C5661	152087.90	576625.60	2007	In use	129.81	12.2	16.8	18.5	13.7	116.1	55.5	16.9	112.9	3/6/2011	116.80	3.9	
699-95-45	C5660	152556.30	576257.00	2007	In use	128.54	11.0	14.1	15.4	X	X	45.3	13.8	114.7	3/6/2011	116.87	2.1	Hf/RE not identified in log
699-95-48	C5667	152323.10	575253.40	2007	In use	130.69	12.1	18.2	19.6	NP	NP	59.1	18.0	112.7	3/4/2011	117.30	4.6	RE not present
699-95-51	C5663	152528.60	574439.50	2007	In use	132.29	14.0	20.1	21.7	X	X	66.0	20.1	112.2	3/4/2011	117.60	5.4	Possible remnant of Ringold E
699-96-43	A5357	152605.31	576761.45	1992	In use	128.71	14.8	9.9	16.2	NP	NP	45.0	13.7	115.0	9/21/2011	116.96	2.0	RE not present
699-96-49	A5358	152858.08	574851.25	1962	Decom.	128.256	N/A	N/A	30.5	NP	NP	61.0	18.6	109.7	6/16/2008	117.87	8.2	Inconclusive (drill log)
699-96-52B	C5668	152656.20	573910.20	2007	In use	123.56	6.1	12.2	14.0	NP	NP	40.0	12.2	111.4	3/21/2011	117.35	6.0	RE not present
699-97-41	C5657	153090.40	577217.50	2007	In use	127.59	10.3	16.4	17.9	NP	NP	54.0	16.5	111.1	3/6/2011	116.00	4.9	
699-97-43	A5360	153090.40	577217.50	1962	Decom.	127.59	N/A	N/A	30.5	X	X	55.0	16.8	110.8	3/5/2008	116.51	5.7	Hf/RE not identified in log
699-97-43B	C5664	153090.40	577217.50	2007	In use	127.59	11.6	14.6	16.3	NP	NP	48.0	14.6	113.0	3/6/2011	116.13	3.2	RE not present
699-97-43C	C5685	153090.40	577217.50	2007	In use	127.59	24.8	26.4	38.4	NP	NP	50.5	15.4	112.2	3/2/2011	116.17	4.0	RE not present
699-97-45	C5659	152979.00	576051.70	2007	In use	126.03	7.5	12.1	13.9	X	X	39.9	12.2	113.9	3/6/2011	116.78	2.9	Hf/RE not identified in log
699-97-45B	C5686	152979.00	576051.70	2007	In use	126.03	16.9	18.6	36.7	NP	NP	39.6	12.1	114.0	3/23/2011	116.74	2.8	RE not present
699-97-48B	C5662	152979.40	576049.30	2007	In use	125.99	10.4	16.5	18.1	NP	NP	54.0	16.5	109.5	3/21/2011	117.26	7.7	RE not present
699-97-48C	C5687	152979.40	576049.30	2007	In use	125.99	22.9	24.4	37.5	NP	NP	55.0	16.8	109.2	3/21/2011	117.20	8.0	RE not present
699-97-51A	A5362	153122.09	574468.12	unknown	In use	123.2	3.7	11.9	12.2	X	X	X	X	X	3/4/2011	117.41		No log
699-98-43	C5656	153369.90	576862.10	2007	In use	122.44	5.9	10.5	12.0	NP	NP	34.0	10.4	112.1	3/6/2011	116.18	4.1	RE not present
699-98-46	C5658	153365.63	575726.86	2007	In use	127.372	9.0	12.1	13.9	NP	NP	40.5	12.3	115.0	3/6/2011	116.74	1.7	RE not present
699-98-49A	A5363	153310.10	574823.30	unknown	In use	123.48	N/A	N/A	12.2	X	X	X	X	X	3/4/2011	117.31		Old dug well
699-98-51	C5669	153302.70	574339.30	2007	In use	120.4	3.2	7.7	9.2	NP	NP	25.0	7.6	112.8	3/4/2011	117.43	4.7	RE not present
699-99-42B	C5648	153761.02	577010.23	2007	In use	127.12	10.8	13.9	15.7	NP	NP	45.5	13.9	113.3	3/2/2011	116.25	3.0	RE not present

Table M-1. 100-D/H Borehole/Well Summary Information

Well Name	Well ID	Northing (m)	Easting (m)	Year Inst.	Well Status	Surface Elev. (m)	Depth to screen or perf top (m)	Depth to screen or perf bot (m)	Drill Depth (m)	Depth to RE (m)	Hf/Re Elev. (m)	Depth to RUM (ft)	Depth to RUM (m)	RUM Elev. (m)	Head Date*	Head (m)	Aquifer Thickness (m)	Comments
699-99-44	C5650	153592.40	576458.77	2007	In use	124.16	6.7	9.8	11.4	NP	NP	32.5	9.9	114.3	3/6/2011	116.37	2.1	RE not present
699-100-43B	C5647	154008.65	576675.90	2007	In use	122.18	5.9	9.0	10.7	NP	NP	29.5	9.0	113.2	3/6/2011	116.37	3.2	RE not present
699-101-45	C5666	154124.20	576032.40	2007	In use	121.81	4.8	7.8	9.4	NP	NP	25.5	7.8	114.0	3/6/2011	116.69	2.7	RE not present
699-101-48C	A9102	154411.01	575222.89	1943	Decom.	119.42	N/A	N/A	23.5	X	X	49.0	14.9	104.5	None	None		Hf/RE not identified in log, "fine yellow sandstone" assumed to be RUM silts
C7850	C7850	152315.27	573888.94	2011	Decom.	136.39	N/A	N/A	22.0	NP	NPq	NDE	NDE	<114.4	1/6/2011	116.82	>2.5	Characterization borehole in 100-D
C7851	C7851	152306.96	573701.84	2011	Decom.	135.54	N/A	N/A	21.0	X	X	NDE	NDE	<114.5	1/3/2011	116.55	>2.0	Characterization borehole in 100-D
C7855	C7855	151608.16	573841.65	2010	Decom.	144.18	N/A	N/A	27.8	15.2	128.9	NDE	NDE	<116.4	1/10/2011	117.66	>1.3	Characterization borehole in 100-D
C7862	C7862	152479.39	577708.85	2010	Decom.	129.61	N/A	N/A	16.0	NP	NP	NDE	NDE	<113.6	8/25/2010	115.95	>2.3	Characterization borehole in 100-H
C7864	C7864	152428.01	578090.07	2011	Decom.	128.74	N/A	N/A	15.5	NP	NP	NDE	NDE	<113.3	2/4/2011	115.48	>2.2	Characterization borehole in 100-H

*. Spring 2011 where available; otherwise, most recent since 2000.

Decom = decommissioned
Hf = Hanford formation
N/A = not applicable
NDE = borehole not deep enough to reach formation
NP = formation not present
Re = Ringold Formation unit E
RUM = Ringold upper mud
X = not determined

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M3 Hydrogeologic Cross Sections

Hydrogeologic cross sections were created for this RI report to present detailed representations of the key geologic units, their associated contacts, and stratigraphic changes occurring in the area. Considerable information now exists for accurately defining the unconfined aquifer system in 100-D/H as the majority of boreholes were drilled to confirm the depth to the RUM (i.e., the base of the unconfined aquifer). Hydrogeologic information about the deeper Ringold sediments (e.g., Ringold unit B, RUM) historically was limited compared to the information obtained for the Hanford formation and Ringold Formation unit E sediments. Several wells at 100-H drilled in the 1990s were deep enough to provide information on the RUM and Ringold unit B. However, the Horn Study (*Hydrogeological Summary Report for 600 Area Between 100-D and 100-H for the 100-HR-3 Groundwater Operable Unit* [DOE/RL-2008-42]), RPO effort (*Sampling and Analysis Plan for Installation of 100-HR-3, Groundwater Operable Unit Remedial Process Optimization Wells* [DOE/RL-2009-09]) and the RI characterization conducted for this report have significantly improved understanding of the relationships and properties of these units. Figure M-4 presents the selected trend lines used to construct five hydrogeologic cross sections, and includes the locations of the 17 new RI wells. Note that a thorough discussion of contaminant fate and transport is presented in Chapter 5, which uses recent hydrogeologic and groundwater sampling data to aid in the development of the CSM.

Cross section A to A’ (Figure M-5) trends from the Columbia River in the southern portion of 100-D to the east. The cross section clearly shows the hydraulic connection between the Columbia River and the unconfined aquifer in the Ringold Formation unit E. In addition, the minimal thickness of the aquifer is evident, which is significant because it complicates groundwater cleanup because of extraction wells having the potential to run dry depending on river stage. Wells 199-D5-141 and 199-D5-104 coincide with a scour depression in the RUM surface. The RUM surface rises slightly toward the river in this area, which may act as an impediment to contaminant migration. Therefore, these RUM surface depressions may play a significant role in contaminant fate and transport within this area. This cross section also displays a water-bearing layer identified within the RUM while drilling well 199-D5-141.

Cross section B to B’ (Figure M-6) begins at the Columbia River and extends to the east, through northern 100-D. Several depressions occur in the RUM surface. This dip in the RUM extends across a wider area in cross section B to B’ than in cross section A to A’. As in cross section A to A’, the RUM surface rises as it gets closer to the river. Both hydrogeologic cross section A to A’ and B to B’ present the geology and well screen locations around D Reactor. The water table in both locations is within the Ringold Formation unit E.

Hydrogeologic cross section C to C’ (Figure M-7) runs parallel to the Columbia River from the ISRM well location to the horn area in the north. Cross section C to C’ shows the unconfined aquifer completely within the Ringold Formation unit E near 100-D, with the RUM forming the bottom of the unconfined aquifer. As the cross section extends to the north, the Ringold Formation unit E is no longer identified in boring logs, with the aquifer being present entirely in Hanford formation material, which is more conductive than the Ringold Formation unit E. The abrupt change in geology near Well 199-D8-55 and Well 199-D8-68 aligns roughly with the southern edge of surface outburst channels during historic flood events (Figure 3-1) that crossed the horn, eroding the Ringold Formation unit E. In addition, the outburst channels may have developed preferential pathways across the horn, resulting in the wide distribution of Cr(VI) during reactor operations through this zone. This cross section also shows the undulation of the RUM surface through the area, and a significant drop in elevation at the horn.

Cross section D to D’ (Figure M-8) spans 100-D/H, beginning just north of 100-D and extending across the horn to 100-H. The D-D’ cross section illustrates that the unconfined aquifer occurs within the

Ringold Formation unit E at 100-D, but transitions to the Hanford formation across the horn and at 100-H, with some few exceptions. Consistent with cross section C to C', the Ringold Formation unit E appears to pinch out near the intersection of cross section C to C' and D to D', aligning with the surface outburst channels. The transition of the aquifer matrix from Ringold Formation unit E to the Hanford formation likely resulted in the lateral spread of Cr(VI) across the Horn area and 100-H, due to greater hydraulic conductivity values of the Hanford formation. The spreading would have dramatically increased with the significant groundwater mounding that was caused by reactor operations and the 1967 test.

Also visible in cross section D to D' are the semi- to confined water-bearing sand lenses within the RUM. Stratigraphic data obtained from RI and RPO boreholes provided greater insight into how post-depositional deformation of the first water-bearing unit in the RUM significantly altered the 100-D/H hydrogeology, and ultimately control contaminant transport in this unit. Specifically, post-depositional seismic events compressed sediments underlying 100-D/H, thereby forming the Wahluke Syncline. The down-dipping and up-dipping portions of the syncline played a significant role in the introduction of contaminants into this unit during reactor operations and continue today through contaminant migration (Chapter 4, Section 4.5).

Aquifer tests (see Chapter 3, Section 3.6) indicate that a hydraulic connection exists between the first water bearing unit in the RUM and the unconfined aquifer underlying a localized area of 100-H. Based on boreholes placed near the H reactor and the aquifer test results, it appears the RUM thins out near the H reactor, which allowed coolant water to enter the first water-bearing unit within the RUM. Stratigraphic data from RI boreholes and groundwater sampling results confirm the first water-bearing unit is hydraulically connected laterally from Wells 199-H3-10 to 199-H3-2C to 199-H3-9 to the Columbia River, where discharge occurs (Figure M-8). In addition, it appears the unit also extends to the north from Wells 199-H3-9 to 199-H4-12 to 199-H4-15 to 199-H2-1. However, the lateral extent and interconnectedness of this unit to the west and south is still unknown.

Running parallel to the Columbia River at 100-H is cross section E to E' (Figure M-9). Consistent with the 100-H portion of cross section D to D', the unconfined aquifer is present in the Hanford formation. This cross section shows several wells with screens completed in a confined transmissive lens (fine sand) that occurs within the RUM unit. The cross section also indicates that the unconfined aquifer is very thin at 100-H.

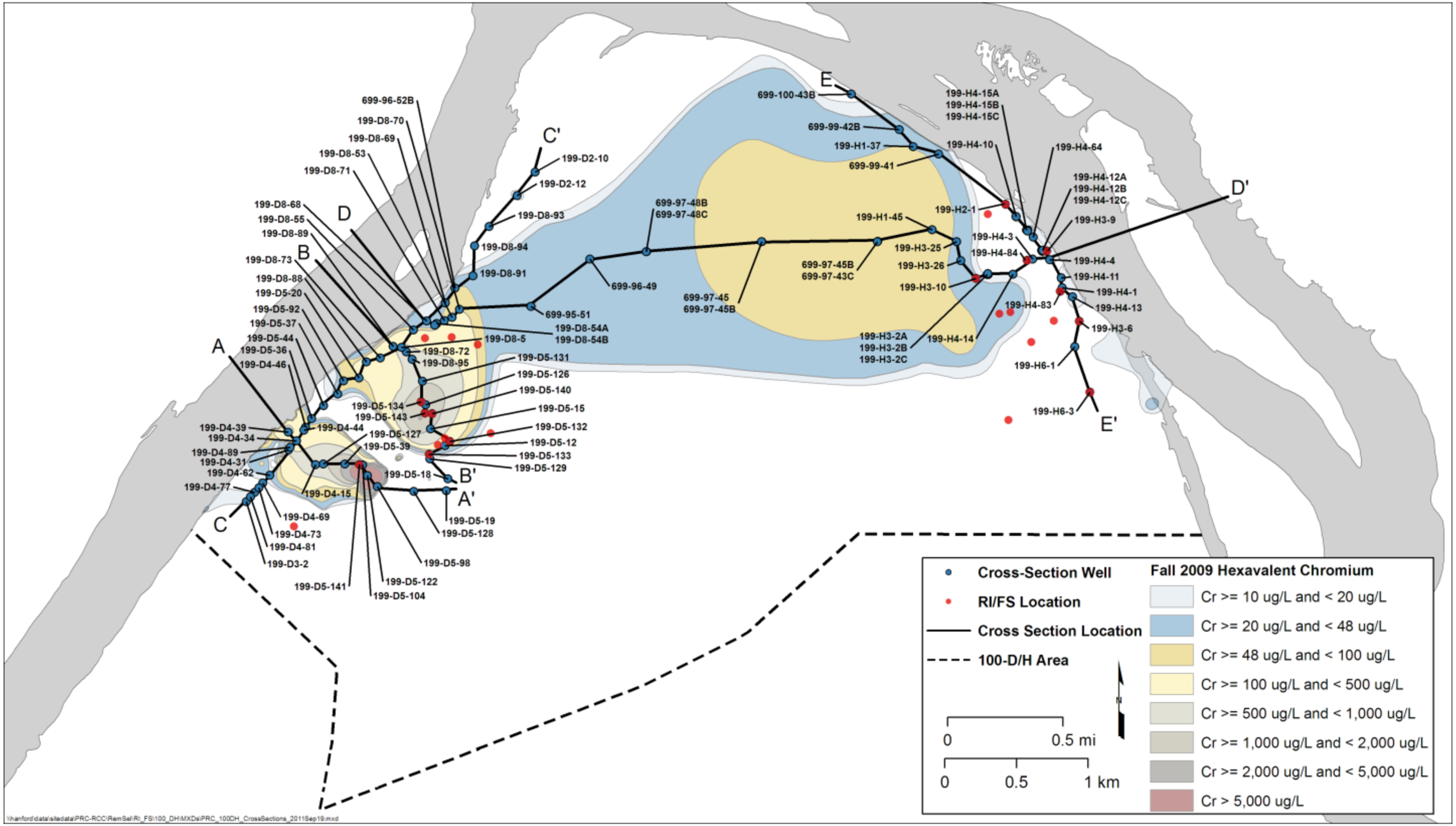


Figure M-4. Trendline Location Map for 100-D/H Hydrogeologic Cross Sections and New RI Wells

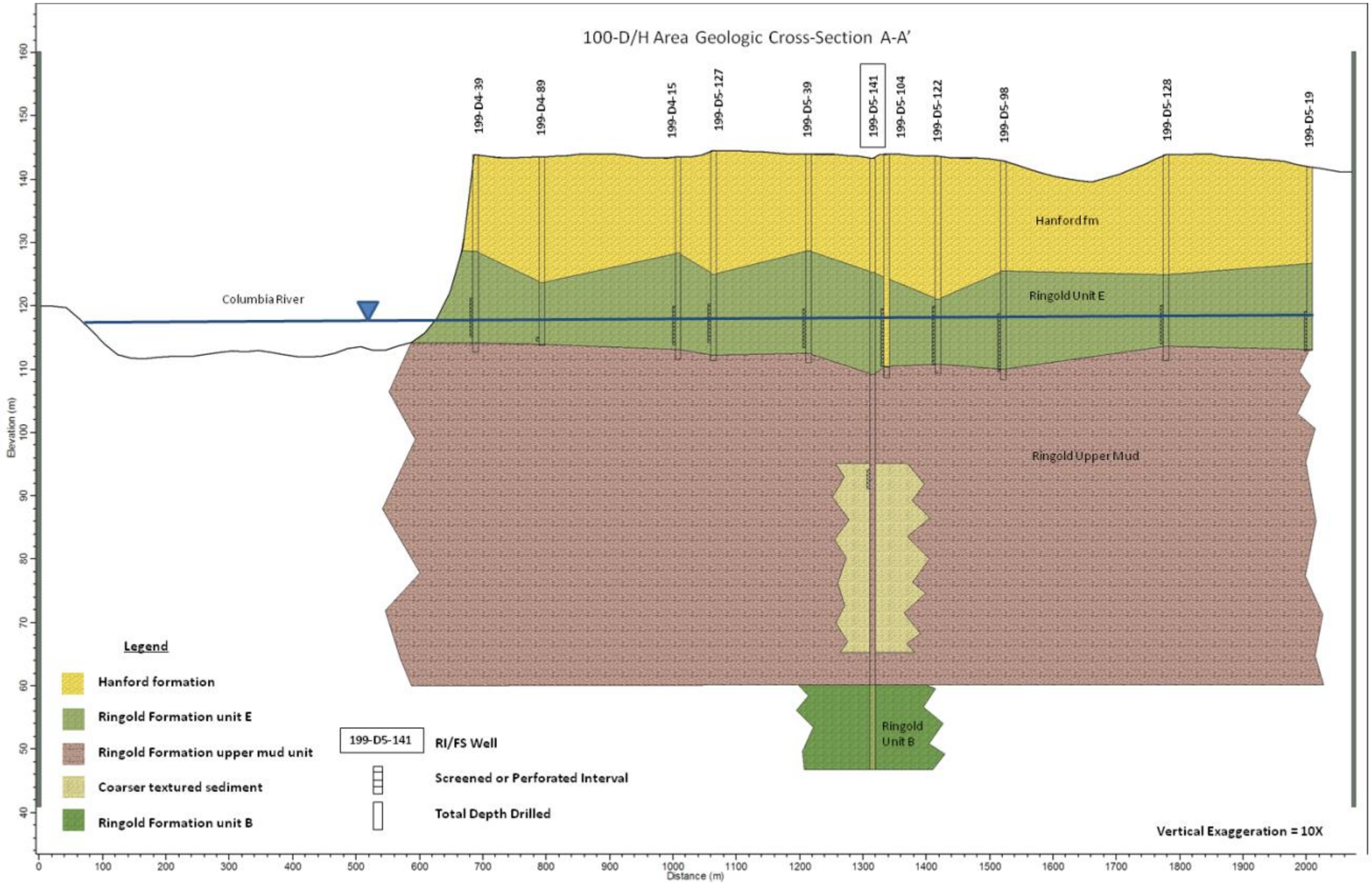


Figure M-5. Hydrogeologic Cross Section A-A' – Southern Plume at 100-D

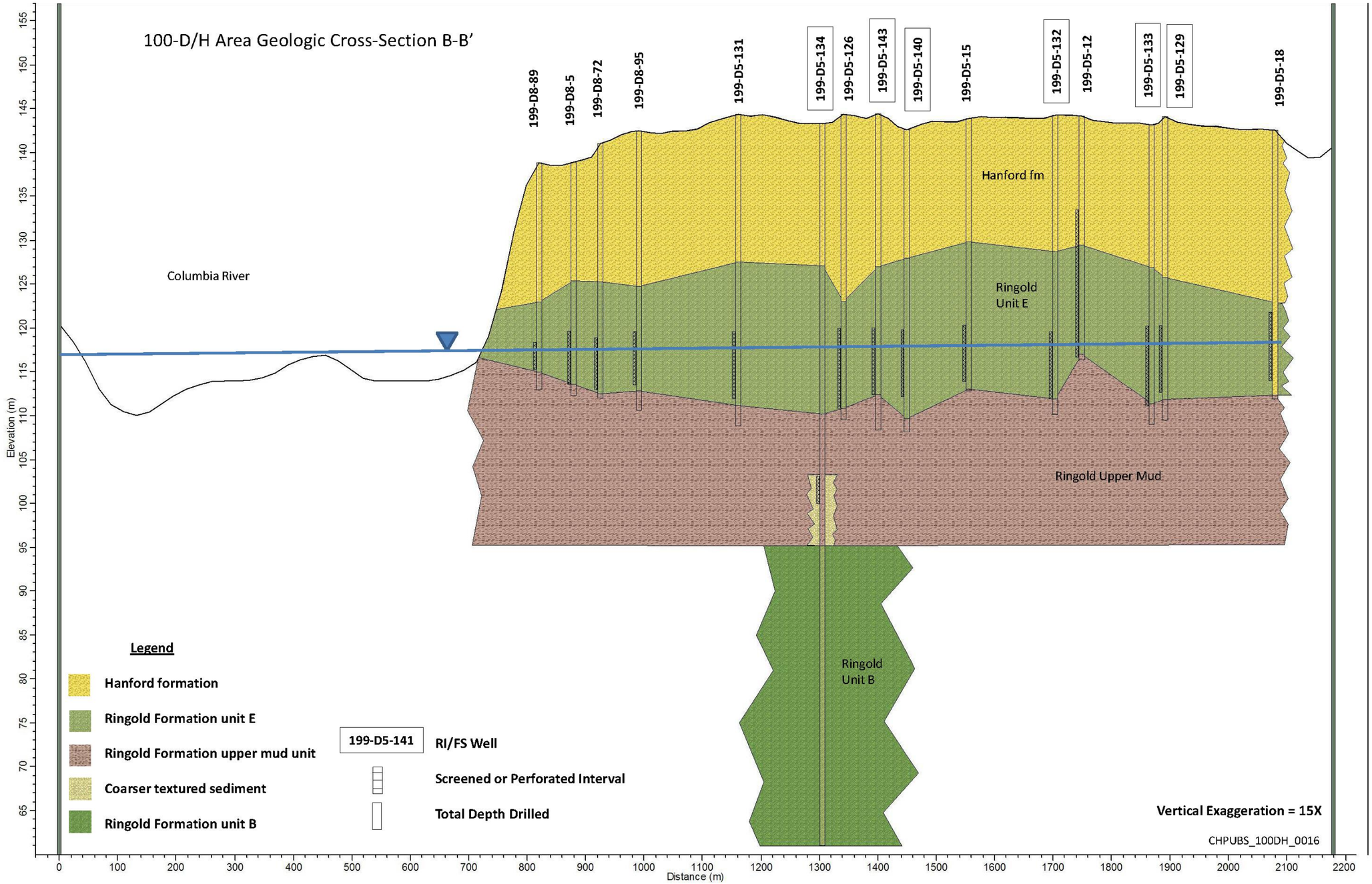


Figure M-6. Hydrogeologic Cross Section B-B'- Northern Plume at 100-D

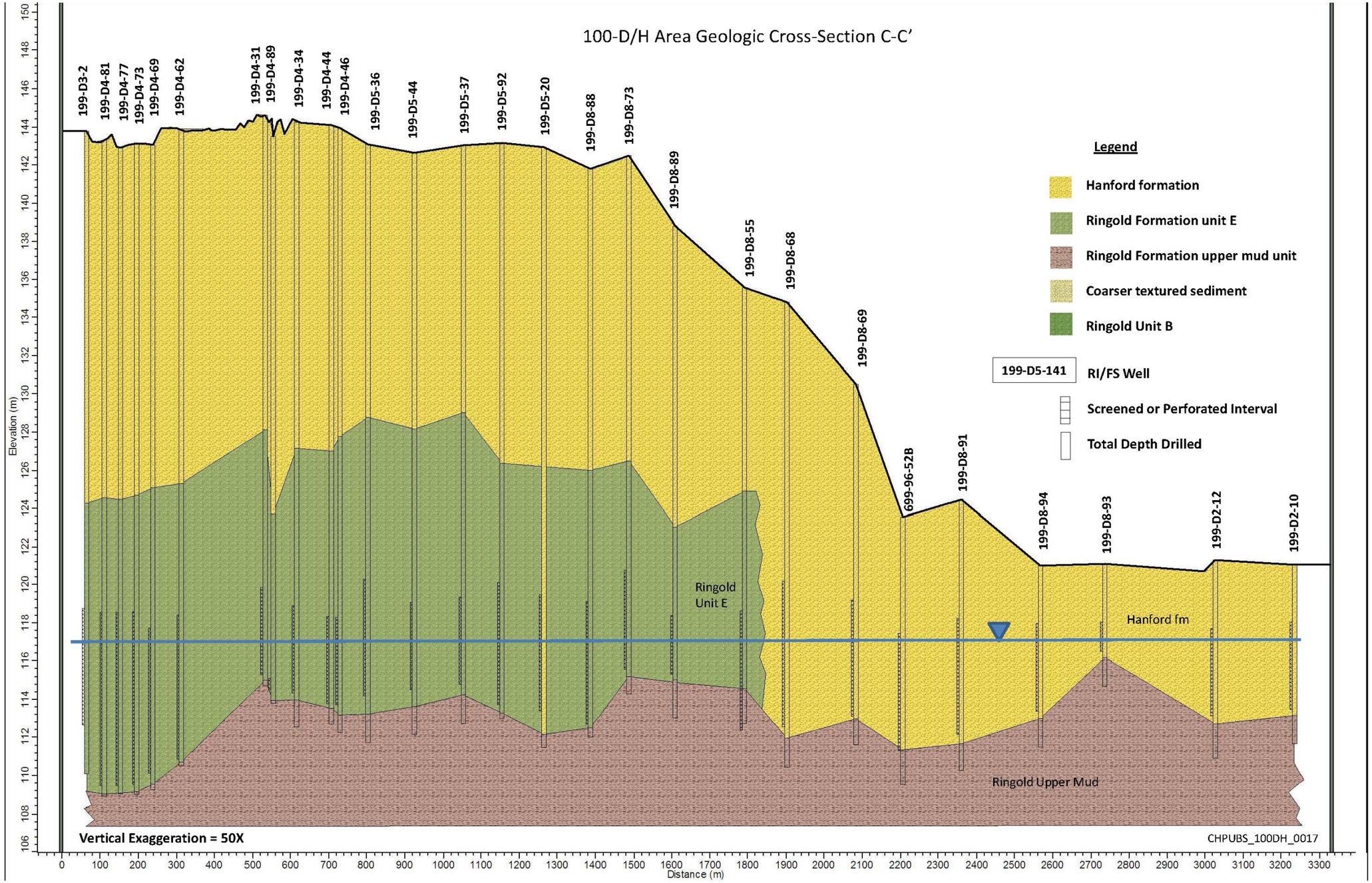


Figure M-7. Hydrogeologic Cross Section C-C' – 100-D to Horn Along the River

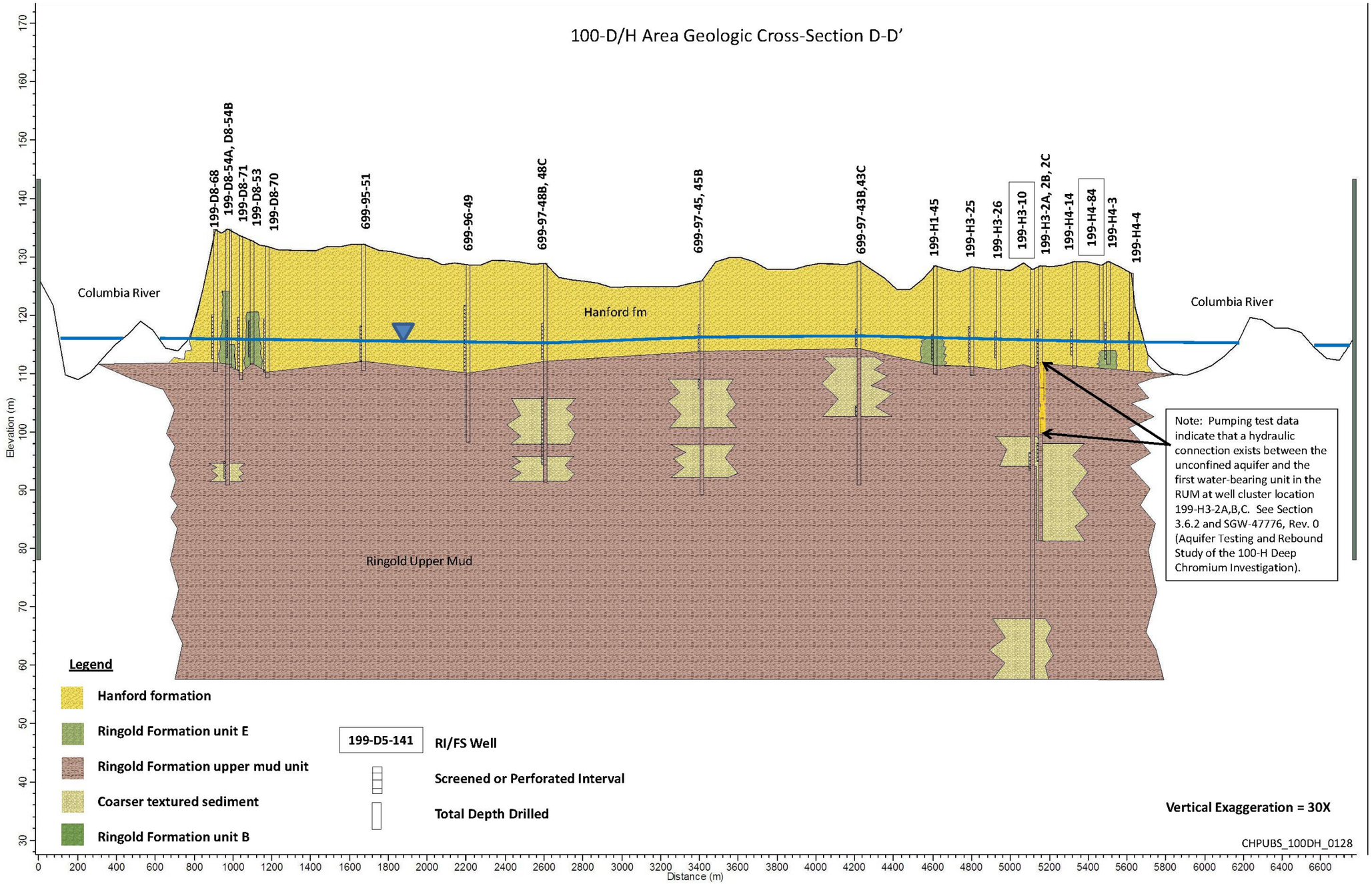


Figure M-8. Hydrogeologic Cross Section D-D' – 100-D to 100-H

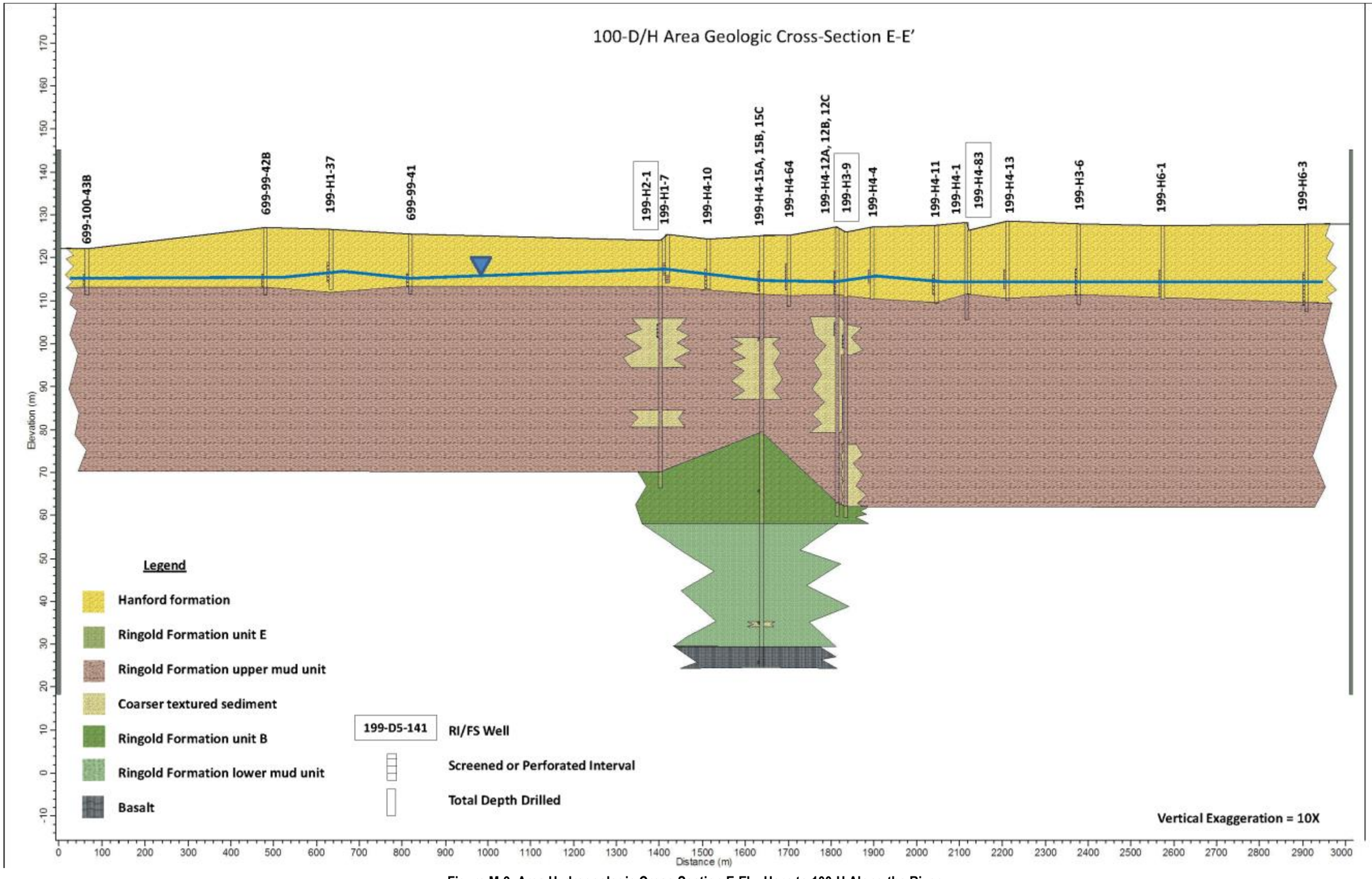


Figure M-9. Area Hydrogeologic Cross Section E-E' – Horn to 100-H Along the River

M4 Geophysical and Analytical Data Logs

This section provides a brief summary of information on the RI boreholes and wells, including purpose of each boring/well, location, general lithology, Hanford formation/Ringold Formation unit E (100-D only) and RUM contact depths, water table or potentiometric surface depth, and a brief discussion of geophysical logs. Geophysical logs for each borehole are presented at the end of this appendix section rather than immediately following individual figure callouts due to the large number of these figures.

Well 199-D3-5 (C7620) Log. Well 199-D3-5 (C7620, Well 2) is located southwest of the ISRM barrier and west of 118-D-2 (105-D operations waste). This well was drilled to define the extent of Cr(VI) in groundwater. The well is completed in the unconfined aquifer on top of the RUM, which was identified at 31.7 m (104 ft) bgs. The water table (26.2 m (86 ft) bgs is located predominantly in the Ringold Formation unit E, rising into the Hanford formation during high water. The Hanford formation/Ringold unit E contact was identified at 26.5 m (87.0 ft) bgs.

The Hanford formation was observed at this location from ground surface to a depth of 26.5 m (87.0 ft) bgs. The lithology consists primarily of sandy gravels and gravelly sands, as well as sporadic silty-sandy gravels and gravel lenses. The sandy gravel, gravelly sands, silty-sandy gravels, and gravels were majorly comprised of 85 to 98 percent mafic basalt and 2 to 15 percent felsic quartzite gravels ranging in size from pebble (4 to 6 mm) to boulder (>256 mm). The gravels tended to be very angular to very well rounded, depending on depth, and poorly sorted. The sands associated with this formation consisted mainly of 85 to 100 percent mafic and 0 to 15 percent felsic grains. Generally, the sand size ranged from very fine to very coarse grain and tended to be angular. Overall, silt content in samples was minor; however, when they were present, the percentage ranged from trace to a maximum of 10 percent. Sediment color ranged between light brown (10YR 3/4), very dark grayish brown (10YR 3/2) and black (10YR 2/1).

The Ringold Formation unit E was observed at this location from 26.5 m (87.0 ft) bgs to a depth of 31.7 m (104 ft) bgs. The lithology consisted primarily of sandy gravels, gravelly sands, silty sandy gravels, as well as periodic gravel and sand lenses. The sandy gravels, gravelly sands, silty-sandy gravels, and gravel and sand lenses majorly contained 50 to 95 percent felsic (quartzite). Gravels ranged from pebble to large cobble sized. The matrix consisted of coarse to very coarse, sub-angular to angular sand, with the sediment coloration ranging from olive brown, brown, and black. Recorded reaction to hydrochloric acid ranged from weak to very strong.

The RUM was observed at this location from 31.7 to 34.2 m (104.0 to 112.2 ft) bgs. The RUM sediments consist of slightly moist, dark grayish-brown silt.

The total gamma and natural potassium-40, uranium-238, and thorium-228 (KUT) geophysical log plots show an increased count rate at depth, indicating the top of the RUM at a depth of approximately 31.7 m (104 ft) bgs (Figure M-10). No change in signature is noted at the Hanford formation/Ringold Formation unit E contact. Their lithology is very similar in this location.

Well 199-D5-133 (C7621) Log. Well 199-D5-133 (C7621, Well 3), is located southwest of 105-D and was drilled to define the extent of Cr(VI) and strontium-90 in groundwater. In addition, this well will further refine the easterly split of the north and south Cr(VI) plumes. The well is completed in the unconfined aquifer with the screen set on top of the RUM, which was identified at 31.7 m (104 ft) bgs. The water table is within the Ringold Formation unit E, which was encountered at 25.3 m (83 ft) bgs. The Hanford formation/Ringold Formation unit E contact was identified at 16.2 m (53.2 ft) bgs.

The Hanford formation consists predominantly of sandy gravel and muddy-sandy gravel with a layer of sand from 6.1 to 9.1 m (20 to 30 ft) and muddy sand in the upper 1.5 m (5 ft) near the surface. Sediments within this formation were primarily basalt-dominant (70 to 95 percent), excluding the upper 1.5 m (5 ft), which consisted of sub-rounded, small to medium pebbles (15 percent mafic, 85 percent felsic material). Sediments exhibited no reaction to a moderate reaction to hydrochloric acid.

The Ringold Formation unit E was observed at this location from 16.2 to 31.7 m (53.2 to 104.0 ft) and consists of sandy gravel and silty-sandy gravel with an inner layer of sandy gravel from 25.9 to 27.7 m (85 to 91 ft) bgs.

The RUM was observed at this location from 31.7 to 34.1 m (104.0 to 112.0 ft) bgs. The RUM sediments consisted of light yellowish-brown silt.

The total gamma and natural KUT geophysical log plots show an increased count rate at depth, indicating the top of the RUM at a depth of approximately 31.7 m (104 ft) bgs (Figure M-11). The total gamma signature is not distinct for the Hanford formation/Ringold Formation unit E contact at 16.2 m (53.2 ft) bgs. There is one zone of higher counts in a zone from 20 to 24 m (65.6 to 78.7 ft) below the surface where a fine-grained unit is able to support higher moisture contents due to the smaller pore structure. This unit may represent the top of a Hanford flood sequence that did not experience as much wind erosion of the fine-grained material from the top of the sequence.

Well 199-D5-132 (C7622) Log. Well 199-D5-132 (C7622, Well 4) is located northeast of D Reactor and was drilled to assess vadose zone contamination beneath the remediated waste site 116-D-1A, and to define the extent of Cr(VI) and strontium-90 in groundwater. The well is completed in the unconfined aquifer on top of the RUM, which was identified at 32.3 m (106 ft) bgs. The water table is within the Ringold Formation unit E, which was encountered at 26.1 m (85.5 ft) bgs. The Hanford formation/Ringold Formation unit E contact was identified at 15.5 m (51 ft) bgs.

The Hanford formation was observed at this location from ground surface to a depth of 15.5 m (51.0 ft) bgs. The lithology consists primarily of basalt-dominated (60 to 90 percent) gravelly sand and silty-sandy gravel. Gravels encountered were rounded to sub-rounded small to large cobbles. Sand size ranged from very fine to medium grained and was generally brown (10YR 4/3) in color.

The Ringold Formation unit E is approximately 16.8 m (55 ft) thick and consists primarily of sandy gravel and silty-sandy gravel, gravelly sand, silty gravel and gravelly-silty sand, with a 3 m (10 ft) layer of sandy gravel resting on one foot of muddy sandy gravel on top of the RUM. Sediments were dominated by felsic quartzite material (75 to 98 percent). Gravels consist of sub-angular to rounded small to large cobbles. Sand size ranged from very fine to medium, and exhibited a week to strong reaction to hydrochloric acid. A minor silt component was noted in some places. Matrix colors were generally dark yellowish-brown or yellowish-brown.

The RUM was recorded from 32.3 to 34.1 m (106.0 to 112.0 ft) bgs. Sediments consist of silt to clay sized, very well sorted with medium plasticity. Sediments were brown and showed no reaction to hydrochloric acid.

The total gamma and natural KUT geophysical log plots show an increased count rate at depth, indicating the top of the RUM at a depth of approximately 32.3 m (106 ft) bgs (Figure M-12). The total gamma signature is not distinct for the Hanford formation/Ringold Formation unit E contact at 15.5 m (51.0 ft) bgs, but there is a distinct increase in the thorium segment of the KUT log. There also is an increase in the potassium-40 log at the contact, consistent with more granitic, felsic rocks in the Ringold Formation unit E.

Well 199-D6-3 (C7623) Log. Well 199-D6-3 (C7623, Well 5) was drilled along the eastern perimeter of 100-D to define the extent of Cr(VI) and strontium-90 in groundwater. The well is completed in the unconfined aquifer on top of the RUM, which was identified at 31 m (101.6 ft) bgs. The water table is within the Ringold Formation unit E, which was identified at 26.7 m (87.5 ft) bgs. The contact between the Hanford formation and the Ringold Formation unit E was identified at 18.3 m (60.0 ft) bgs.

The Hanford formation extends from ground surface to a depth of 18.3 m (60.0 ft) bgs. The lithology is basalt-dominant (70 percent) gravelly sand and silty-sandy gravel. Gravels are angular to sub-rounded small to medium cobbles. Sands were very fine to medium grained. No reaction to hydrochloric acid was recorded.

The Ringold Formation unit E was observed from 18.3 to 31 m (60.0 to 101.6 ft) bgs. The lithology consists primarily of silty-sandy gravel, compositionally dominated by felsic quartzite material (70 percent). Gravels ranged from small pebbles to cobbles and were sub-rounded to angular in shape. Sands were very fine to medium grained, with 10 percent silt. No reaction to hydrochloric acid was observed.

The RUM unit was encountered from 31 to 33.7 m (101.6 to 110.5 ft) bgs and consists of black to brown silts.

The total gamma and natural KUT geophysical log plots show an increased count rate at depth, indicating the top of the RUM at a depth of 31 m (101.6 ft) bgs (Figure M-13). The KUT signature is reasonably distinct for the Hanford formation/Ringold Formation unit E contact at 18.3 m (60.0 ft) bgs, particularly in the U-Th portion of the signature. Counts are generally stable in the vadose zone portion of the Ringold Formation unit E, with a distinct drop at the water table.

Well 199-D5-140 (C7866) Log.Well 199-D5-140 (C7866, Well 9) was intended to be drilled near the 100-D-56 Pipeline, where a hole in the pipeline was observed during previous remediation activities. However, this well was mistakenly placed 70 m (230 ft) west of its intended location. Therefore, samples collected from this borehole are not representative of data needs specified in the RI/FS work plan (*Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan, Addendum 1: 100-D/H Decision Unit* [DOE/RL-2008-46-ADD1]). The well was installed before the mistake was identified. The well is completed in the unconfined aquifer on top of the RUM, which was identified at 32.9 m (108.0 ft) bgs. The water table is within the Ringold Formation unit E, which was identified at 25.9 m (85.0 ft) bgs.

The Hanford formation was observed from ground surface to a depth of 14.6 m (48.0 ft) bgs. The lithology consists of gravelly sand, slightly gravelly sand, sand, gravel, and sandy gravel. Sediments were primarily basalt-dominant (60 to 80 percent), with gravels consisting mainly of small pebbles. Sand grains were sub-angular and medium in size. A non-existent to a strong reaction with hydrochloric acid was recorded.

The Ringold Formation unit E was observed from 14.6 to 32.9 m (48.0 to 108.0 ft) bgs. The lithology consisted primarily of gravelly sand, gravel, sandy gravel, sand, and silty-sandy gravel. Sediments were dominated by felsic material (40 to 85 percent). Gravels ranged in size from small pebbles to medium cobbles and were sub-rounded to rounded. Sands were very fine to coarse grained and sub-angular. A slight reaction to hydrochloric acid was recorded.

Ringold Upper Mud (RUM) was recorded from 32.9 to 34.4 m (108.0 to 112.9 ft bgs. The RUM sediments consisted of predominantly silt with some gravels and no plasticity. No hydrochloric acid reaction was recorded.

The total gamma and natural KUT geophysical log plots show an increased count rate at depth, indicating the top of the RUM at a depth of approximately 32.9 m (108 ft) bgs (Figure M-14). The total gamma signature is not distinct for the Hanford formation/Ringold Formation unit E contact at 14.6 m (48 ft) bgs, placing the elevation of that surface at 129.3 m mean sea level. There is one zone of higher counts in a zone from 20 to 24 m (65.6 to 78.7 ft) below the surface where a fine-grained unit is able to support higher moisture contents due to the smaller pore structure. This unit may represent the top of a Hanford Site flood sequence that did not experience as much wind erosion of the fine-grained material from the top of the sequence.

Well 199-D5-143 (C8375) Log–Well 9 Redrill. Well 199-D5-143 (C8375, Well 9 Redrill) is located northwest of D Reactor, south of Palouse Street. It was drilled beneath the 100-D-56 Pipeline, where a hole in the pipeline was observed during previous remediation activities. This well replaced Well 199-D5-140 (C7866, Well 9) to investigate additional Cr(VI) sources in the vadose zone and to evaluate Cr(VI) concentrations in groundwater. The well is completed in the unconfined aquifer on top of the RUM, which was identified at 32.0 m (105.0 ft) bgs. The water table is within the Ringold Formation unit E, which was identified at 25.1 m (82.5 ft) bgs.

The Hanford formation was observed from ground surface to a depth of 17.4 m (57.1 ft) bgs. The lithology consists of silty-sandy gravel and gravelly sand. Sediments were primarily basalt-dominant (70 to 80 percent). Gravels consisted of sub-angular to sub-rounded, very small pebbles to large cobbles. Sand grains were fine to medium in size. No reaction with hydrochloric acid was recorded. The contact between the Hanford formation and the Ringold Formation unit E was identified at 17.4 m (57.1 ft) bgs.

The Ringold Formation unit E was observed from 17.4 to 32.0 m (57.1 to 105.0 ft) bgs. The lithology consists primarily of silty sandy gravel. Sediments within this formation were dominated by felsic material (70 percent). Gravels ranged in size from small pebbles to large cobbles. Gravel material was sub-rounded to rounded. Sands were very fine to medium grain.

The RUM unit was encountered from 32.0 to 36.0 m (105.0 to 118.0 ft) bgs. The RUM sediments consist primarily of gravelly silt, with the gravel composition consisting of 70 percent mafic minerals. Gravels are sub rounded to rounded small to large cobbles. No hydrochloric acid reaction was recorded.

The total gamma and natural KUT geophysical log plots show an increased count rate at depth, indicating the top of the RUM at a depth of 32.0 m (105.0 ft) bgs (Figure M-15). The total gamma signature is not distinct for the Hanford formation/Ringold Formation unit E contact at 17.4 m (57.1 ft) bgs, placing the contact at 126.3 m (414.4 ft) msl.

Well 199-D5-134 (C7624) Log. Well 199-D5-134 (C7624, Well R4) is located in the area of the 100-D north plume, north of the D Reactor. The well was drilled into the Ringold Formation unit B to assess the potential for Cr(VI) to reach greater depths below the RUM, as well as for evaluating Cr(VI) in the vadose zone. In addition, data are used to evaluate alternative CSM components regarding whether groundwater contamination is from vadose zone sources (in the periodically rewetted zone), within the unconfined aquifer, above the RUM, or within the RUM and diffusing to the unconfined aquifer. Well 199-D5-134 was drilled to the Ringold Formation unit B beneath 100-D, thereby providing additional stratigraphic data that extends to depths well below the RUM surface. This well was screened within the uppermost confined water-bearing unit of the RUM at a depth from 40 to 43 m (132 to 142 ft).

The Hanford formation consists mainly of sandy gravel, with a layer of silty sand present from 9.1 m to 11.3 m (30 ft to 37 ft) bgs. Sediments consist of basalt-dominant (60 to 90 percent) sub-rounded to rounded small pebbles to small cobbles. A moderate reaction to hydrochloric acid was recorded. The

contact between the Hanford formation and the Ringold Formation unit E was identified at 16.2 m (53.2 ft) bgs.

The Ringold Formation unit E consists of an upper unit dominated by sandy gravel to approximately 24.4 m (80 ft) bgs, which grades into a silty-sandy gravel down to the RUM contact at 33.1 m (108.5 ft) bgs. Sediments consist of felsic-dominant (55 to 70 percent) sub-angular to sub-rounded small pebbles to small cobbles. Sands were poorly sorted, fine to medium grained. Reaction to hydrochloric acid was strong to nonreactive.

The RUM consists of silt (85 percent), sand (5 percent), and cobbles (10 percent) from 33.1 m (108.5 ft) to 40 m (132 ft) bgs and grades into a water-bearing, gravelly sandy mud from 40 m (132 ft) to 47.9 m (157 ft bgs).

The RUM is underlain mostly with muddy sand down to 80.8 m (265 ft) bgs. However, the muddy sand contains two interbedded sandy gravel layers from 57.9 m (190 ft) to 60.7 m (199 ft bgs), 67 m (220 ft) to 68.6 m (225 ft bgs). Finally, a muddy sandy gravel was encountered from 80.8 m (265 ft) to the bottom of the borehole at 82.3 m (270 ft) bgs.

The total gamma and natural KUT geophysical log plots show an increased count rate at depth, indicating the top of the RUM at a depth of approximately 33.1 m (108.5 ft) bgs (Figure M-16). The total gamma signature and KUT exhibit a slight increase in count rate at the Hanford formation/Ringold Formation unit E contact at approximately 16.2 m (53.2 ft) bgs. There is a slight drop in the count rate at the water table for the total gamma log but it is not distinct.

During drilling operations, a strong upward hydraulic gradient was observed when the Ringold Formation unit B was encountered. In fact, sand heaving occurred in the borehole. The potentiometric surface of the unit B aquifer rose to the same level as the water table, at 25.8 m (84.5 ft) bgs. This is 7.3 m (24.0 ft) bgs above the RUM aquitard, which confirms the strong upward hydraulic gradient between the confined unit B aquifer and the unconfined Ringold Formation unit E aquifer. On February 18, 2011, the potentiometric surface of groundwater from the first water-bearing unit in the RUM was measured at 25.3 m (83 ft) bgs. This groundwater level is above the water table, which indicates there is also an upward hydraulic gradient between the first water-bearing unit in the RUM and the Ringold Formation unit E unconfined aquifer.

Well 199-D5-141 (C7625).Well 199-D5-141 (C7625, Well R5) was drilled in the incorrect location. Initially, this well was to be located near the 100-D south plume, south of the 182-D reservoir. However, this well was drilled approximately 85 m (279 ft) northwest of the proposed location. The well was drilled into the Ringold Formation unit B to assess the potential for Cr(VI) to reach greater depths below the RUM, as well as for evaluating Cr(VI) in the vadose zone. In addition, data are used to evaluate alternative CSM components regarding whether groundwater contamination is from vadose zone sources (in the periodically rewetted zone), within the unconfined aquifer, above the RUM, or within the RUM and diffusing to the unconfined aquifer. Well 199-D5-141 was drilled to the Ringold Formation unit B beneath 100-D, thereby providing additional stratigraphic data that extends to depths well below the RUM surface. This well was screened within the uppermost confined water-bearing unit of the RUM at a depth from 49 to 52 m (161 to 171 ft).

The Hanford formation consists of three sequences of deposits starting from ground surface with slightly muddy gravelly sand, silty-sandy gravel, and sandy gravel, with the composition being basalt-dominant (50 to 80 percent). Gravels consist of angular to sub-rounded small pebbles to large cobbles. Sands were very fine to medium grained with a salt-and-pepper composition (50 percent mafic; 50 percent felsic). No reaction to hydrochloric acid was observed. The contact between the Hanford formation and the Ringold Formation unit E was identified at 18.0 m (59.0 ft) bgs.

The Ringold Formation unit E consists of silty sandy gravel (felsic dominant 70 percent) down to the RUM contact at 34.1 m (112 ft) bgs. Gravels consist of angular to rounded small pebbles to large cobbles. Sands were very fine to medium grained. A slight reaction to hydrochloric acid was observed.

The RUM was observed from 34.1 to 41.1 m (112 to 135 ft) bgs and consists of gravelly sandy silt and silt. Sands were fine to medium grained, with a salt-and-pepper composition (50 percent mafic; 50 percent felsic) Gravels consist of 70 percent felsic rounded to sub-rounded small pebbles to large cobbles.

The RUM is underlain with gravelly muddy sand down and muddy sand from 82.9 m to 91.4 m (272 ft to 300 ft) bgs. Underlying the muddy sand is a sandy unit that likely represents the Ringold Formation unit B. This sand extended to a depth of at least 96.3 m (316 ft), which is where the borehole was terminated.

The total gamma and natural KUT geophysical log plots show an increased count rate at depth, indicating the top of the RUM at a depth of approximately 34.1 m (112 ft) bgs (Figure M-17). The total gamma signature is not distinct for the Hanford formation/Ringold Formation unit E contact at approximately 18 m (59 ft) bgs. There is a slight drop in the count rate at the water table for the total gamma log but it is not distinct.

During drilling operations, a strong upward hydraulic gradient was observed when the Ringold Formation unit B was encountered. The potentiometric surface of the unit B aquifer rose to the same level as the water table, at 26.0 m (85.2 ft) bgs. This is 8.3 m (27.3 ft) bgs above the RUM aquitard, which confirms the strong upward hydraulic gradient between the confined unit B aquifer and the unconfined Ringold Formation unit E aquifer. On March 22, 2011, the potentiometric surface of groundwater from the first water-bearing unit in the RUM was measured at 25.6 m (84 ft) bgs. This groundwater level is above the water table, which indicates there is also an upward hydraulic gradient between the first water-bearing unit in the RUM and the Ringold Formation unit E unconfined aquifer.

Well 199-D5-144 (C8668) Log –Well R5 Redrill. Well 199-D5-144 (C8668, Well R5 Redrill) is located at the 100-D-12 waste site, where a French drain was suspected of being used to dispose of sodium dichromate during transfer operations. This well replaced well 199-D5-140 (C7866, Well 9) to investigate additional Cr(VI) sources in the vadose zone and to assess the potential for Cr(VI) to reach greater depths below the RUM. However, note that this borehole was terminated at the RUM surface and did not extend into the Ringold Formation unit B sand, as originally proposed. Therefore, this well can only be used to monitor contaminant concentrations in the unconfined aquifer, and not the Ringold Formation unit B water-bearing unit. The well is completed in the unconfined aquifer on top of the RUM, which was identified at 33.1 m (108.5 ft) bgs. The water table is within the Ringold Formation unit E, which was identified at 24.9 m (81.8 ft) bgs.

The Hanford formation was observed from ground surface to a depth of approximately 21.3 m (70.0 ft) bgs, although the absolute Hanford formation/Ringold Formation unit E contact is difficult to discern. The lithology consists of primarily sandy gravel and gravelly sand, with occasional silt present in the upper portion. Sediments were primarily basalt-dominant (70 to 80 percent), with increasing felsic mineral content (50 percent) at approximately 21.3 m (70 ft) bgs. Gravels consisted of sub-angular to sub-rounded, very small pebbles to coarse pebbles. Sand grains were fine to medium in size. No reaction with hydrochloric acid was observed. Note that mud rip-up clasts were observed at the suspected contact.

The Ringold Formation unit E is assumed to occur from 21.3 to 33.1 m (70.0 to 108.5 ft) bgs. The lithology consists primarily of sandy gravel and gravelly sand from 21.3 m to 24.1 m (70 to 79 ft) bgs. Gravels range from small to large pebble size. At 24.1 m (79 ft) bgs, a fining downward trend occurs to 28.0 m (92 ft) bgs, as well-sorted, medium-grained sands (95 percent) dominate the aquifer matrix.

Underlying the sand is a silty sandy gravel that extends down to the RUM surface at 33.1 m (108.5 ft) bgs. Sediments within this formation are dominated by felsic material (60 percent). Gravels ranged in size from small pebbles to large cobbles. Gravel material was sub-rounded to rounded.

The RUM unit was encountered from 33.1 to 35.0 m (108.5 to 114.7 ft) bgs and consists of yellowish-brown silt/clay (95 percent). No hydrochloric acid reaction was recorded.

The total gamma and natural KUT geophysical log plots show an increased count rate at depth, indicating the top of the RUM at a depth of 33.1 m (108.5 ft) bgs (Figure M-18). The total gamma signature is also not distinct for the Hanford formation/Ringold Formation unit E contact, which is estimated to be at 21.3 m (70.0 ft) bgs.

Well 199-H3-6 (C7626). Well 199-H3-6 (C7626, Well 6) is located on the east side of 100-H, west of the 116-H-1 Waste Site to define the extent of strontium-90 in groundwater. The well is completed in the unconfined aquifer on top of the RUM, which was identified at 16.5 m (54.5 ft) bgs. During drilling operations, the water table was encountered in the Hanford formation at 13.6 m (44.7 ft) bgs. At this borehole location, the Hanford formation overlies the RUM directly; consequently, the vadose zone and aquifer are both in the Hanford formation. No Ringold Formation unit E is present.

The Hanford formation was observed from ground surface to a depth of 16.5 m (54.5 ft) bgs, and consists of four differing lithologies in order from top to bottom: gravelly muddy sand, sandy gravel, sand, and sandy gravel. Greater than 80 percent of this formation consists of basalt-dominant (60 to 90 percent) sandy gravel. Gravels are generally sub-rounded very small pebbles to medium cobbles. Sands were very fine to very coarse and sub-angular to angular in shape.

The RUM unit was encountered from 16.5 to 18.7 m (54.5 to 61.6 ft) bgs and consists of clayey silts with no to very low plasticity.

The total gamma and natural KUT geophysical log plots show an increased count rate at depth, indicating the top of the RUM at a depth of approximately 16.5 m (54.5ft) bgs (Figure M-19). The Hanford formation/RUM contact defines the base of the aquifer.

Well 199-H3-7 (C7627) Log. Well 199-H3-7 (C7627, Well 7) is located in south-central 100-H, west of the 116-H-1 waste site. This well was drilled to define the extent of strontium-90 in groundwater. The well is completed in the unconfined aquifer on top of the RUM, which was identified at 16.0 m (52.5 ft) bgs. The water table was measured in the Hanford formation at 13.6 m (44.6 ft) bgs. At this borehole location, the Hanford formation overlies the RUM directly; consequently, the vadose zone and aquifer are both in the Hanford formation. No Ringold Formation unit E is present.

The Hanford formation was observed from ground surface to a depth of 16.0 m (52.5 ft), and consists primarily of basalt-dominant (70 to 80 percent) gravelly sand and sandy gravel. Gravels are generally sub-angular to sub-rounded small to large pebbles. Sands were very fine to very coarse and sub-angular to angular in shape. No reaction to hydrochloric acid was recorded.

The RUM unit was encountered from 16.0 to 18.0 m (52.5 to 59.0 ft) and consists of clayey silts with medium plasticity.

The total gamma and natural KUT geophysical log plots show an increased count rate at depth, indicating the top of the RUM near 16.0 m (52.5 ft) bgs (Figure M-20). The Hanford formation forms the vadose zone and unconfined aquifer in 100-H. Therefore, the Hanford formation/RUM contact defines the base of the aquifer.

Well 199-H6-3 (C7628) Log. Well 199-H6-3 (C7628, Well 10) is located on the southeast edge of 100-H, and was drilled to define the extent of strontium-90 and monitor nitrate concentrations in groundwater. The well is completed in the unconfined aquifer on top of the RUM, which was identified at 18.3 m (60.0 ft) bgs. The water table was measured at 13.9 m (45.6 ft) bgs. At this borehole location, the Hanford formation overlies the RUM directly; consequently, the vadose zone and aquifer are both in the Hanford formation. No Ringold Formation unit E is present.

The Hanford formation was observed from ground surface to a depth of 18.3 m (60.0 ft) bgs, and consists of primarily basalt-dominant (60 to 100 percent) sandy silt, sandy gravel, gravelly sand, slightly gravelly sand and slightly sandy gravel. Gravels are sub-angular to sub-rounded pebbles and cobbles. Sands were very fine to very coarse and sub-angular to sub-rounded in shape. No reaction to hydrochloric acid was recorded.

The RUM unit was encountered from 18.3 to 20.5 m (60.0 to 67.4 ft) bgs and consists of semi-consolidated, gravelly clay.

The total gamma and natural KUT geophysical log plots show an increased count rate at depth, indicating the top of the RUM at a depth of approximately 18.3 m (60.0 ft) bgs (Figure M-21). The Hanford formation forms the vadose zone and unconfined aquifer in 100-H. Therefore, the Hanford formation/RUM contact defines the base of the aquifer.

Well 199-H6-4 (C7629) Log. Well 199-H6-4 (C7629, Well 11) is located at the south edge of 100-H to monitor nitrate concentrations in groundwater. The well is completed in the unconfined aquifer on top of the RUM, which was identified at 16.9 m (55.5 ft) bgs. The water table was measured at 11.5 m (38.0 ft) bgs. At this borehole location, the Hanford formation overlies the RUM directly; consequently, the vadose zone and aquifer are both in the Hanford formation. No Ringold Formation unit E is present.

The Hanford formation was observed from ground surface to a depth of 16.9 m (55.5 ft) bgs and consists of basalt-dominant (70 to 80 percent) slightly gravelly sand, sandy gravel, and gravel. Gravels are sub-angular to well-rounded small to coarse pebbles. Sands are very fine to medium grained consisting of 70 percent mafic, 30 percent felsic material. No reaction with hydrochloric acid was recorded.

The RUM unit was encountered from 16.9 to 19.2 m (55.5 to 63.0 ft) bgs and consists of slightly moist silt and exhibited no plasticity.

The total gamma and natural KUT geophysical log plots show an increased count rate at depth, indicating the top of the RUM at a depth of approximately 16.9 m (55.5 ft) bgs (Figure M-22). The Hanford formation forms the vadose zone and unconfined aquifer in 100-H. Therefore, the Hanford formation/RUM contact defines the base of the aquifer.

Well 199-H1-7 (C7630) Log. Well 199-H1-7 (C7630, Well 12) is located at the north end of 100-H, east of waste site 128-H-1. This well was drilled to monitor contaminants in groundwater downgradient of the 1607-H-3 septic system. The well is completed in the unconfined aquifer on top of the RUM, which was identified at 9.6 m (31.5 ft) bgs. Groundwater was not encountered during drilling, however, after well completion the water table was measured at 9.3 m (30.5 ft) bgs. At this borehole location, the Hanford formation overlies the RUM directly; consequently, the vadose zone and aquifer are both in the Hanford formation. No Ringold Formation unit E is present.

The Hanford formation was observed from ground surface to 9.6 m (31.5 ft) bgs and consists of basalt dominant (70 to 80 percent) slightly sandy gravelly silt and silty gravelly sand. Gravels consisted of small pebbles to large cobbles. Sands were very fine to medium grained consisting of 50 percent mafic and 50 percent felsic material. A slight reaction with hydrochloric acid was recorded.

The RUM unit was encountered from 9.6 to 11.3 m (31.5 to 37.0 ft) bgs and consists of damp, consolidated silt and exhibited no reaction to hydrochloric acid.

The total gamma and natural KUT geophysical log plots show an increased count rate at depth, indicating the top of the RUM at a depth of approximately 9.6 m (31.5 ft) bgs (Figure M-23). The Hanford formation forms the vadose zone and unconfined aquifer in 100-H, and the Hanford formation/RUM contact defines the base of the aquifer.

Well 199-H2-1 (C7631) Log. Well 199-H2-1 (C7631, Well R3) is located north of the 1607-H2 site, near the Columbia River. This well was drilled into the Ringold Formation unit B to characterize the vertical distribution of contamination in the vadose zone and to evaluate alternative CSM components regarding whether groundwater contamination is from vadose zone sources (in the periodically rewetted zone), within the unconfined aquifer, above the RUM, or within the RUM and diffusing to the unconfined aquifer. This well was screened within the uppermost confined water-bearing unit of the RUM at a depth from 19.5 to 22.5 m (64 to 74 ft).

Well 199-H2-1 was drilled to the Ringold Formation unit B beneath 100-H, thereby providing additional stratigraphic data that extends to depths well below the RUM surface. At this borehole location, the Hanford formation overlies the RUM directly; consequently, the vadose zone and aquifer are both in the Hanford formation. No Ringold Formation unit E is present.

The Hanford formation was observed from ground surface to a depth of 11.4 m (37.5 ft) bgs and consists of basalt dominant (50 to 80 percent) sandy gravel, silty sandy gravel, slightly silty gravelly sand, and gravel. Gravels consist of coarse pebbles to large cobbles. Sands were medium to very coarse grained and sub-angular. Reaction to hydrochloric acid was non-existent to a strong reaction.

The Hanford formation/RUM contact is present at 11.4 m (37.5 ft) bgs. The RUM consists of alternating layers of mud and a mud matrix that is intercalated with gravel and sand. Several dominant muddy sand units were encountered with increasing depth from approximately 18.3 to 29.6 m (60 to 97 ft) bgs, 36.6 to 43.3 m (120 to 142 ft) bgs, 53.9 to 56.1 m (177 to 184 ft) bgs, and 57.3 to 57.6 m (188 to 189 ft) bgs. These lenses often consisted of angular, coarse, sand with no reaction to hydrochloric acid. Finally, a clean, water-bearing sand was encountered from 53.9 to 56.1 m (177 to 184 ft) bgs.

The total gamma and natural KUT geophysical log plots show an increased count rate at depth, indicating the top of the RUM at a depth of approximately 11.4 m (37.5 ft) bgs (Figure M-24). The Hanford formation forms the vadose zone and unconfined aquifer in 100-H. Therefore, the Hanford formation/RUM contact defines the base of the aquifer.

During drilling operations, a strong upward hydraulic gradient was observed when the Ringold Formation unit B was encountered. In fact, sand heaving occurred in the borehole. The potentiometric surface of the unit B aquifer rose to the same level as the water table, at 7.5 m (24.7.0 ft) bgs. This is 3.8 m (12.3 ft) bgs above the RUM aquitard, which confirms the strong upward hydraulic gradient between the confined unit B aquifer and the unconfined Hanford formation aquifer. After well installation, the potentiometric surface of groundwater from the first water-bearing unit in the RUM was measured at 7.2 m (23.7 ft) bgs. This groundwater level is above the water table, which indicates there is also an upward hydraulic gradient between the first water-bearing unit in the RUM and the Hanford formation aquifer.

Well 199-H3-9 (C7639) Log. Well 199-H3-9 (C7639, Well R1) is located east of the 182-H Reservoir and 183-H Solar Evaporation Basins, near the Columbia River. This well was drilled into the Ringold Formation unit B to characterize the vertical distribution of contamination in the vadose zone and to evaluate alternative CSM components regarding whether groundwater contamination is from vadose zone sources (in the periodically rewetted zone), within the unconfined aquifer, above the RUM, or within the

RUM and diffusing to the unconfined aquifer. This well was screened within the uppermost confined water-bearing unit of the RUM at a depth from 23.8 to 26.9 m (78 to 88 ft).

Well 199-H3-9 was drilled to the Ringold Formation unit B beneath 100-H, thereby providing additional stratigraphic data that extends to depths well below the RUM surface. At this borehole location, the Hanford formation overlies the RUM directly; consequently, the vadose zone and aquifer are both in the Hanford formation. No Ringold Formation unit E is present.

The Hanford formation was observed from ground surface to a depth of 15.2 m (50.0 ft) bgs and consists of basalt-dominant (70 percent) sandy gravel and silty sandy gravel. Gravels consist of very fine pebbles to small cobbles. Sands were sub-angular, coarse to very coarse grained, with no reaction to a strong reaction with hydrochloric acid.

The RUM unit was encountered from 15.2 to 66.1 m (50 to 217 ft) bgs. The RUM consists mainly of mud with occasional clean water-bearing sand layers identified at 23.2 to 29.6 m (76 to 97 ft) bgs and 63.1 to 66.4 m (207 to 218 ft) bgs. The borehole was terminated at 66.4 m (218 ft bgs).

The total gamma and natural KUT geophysical log plots show an increased count rate at depth, indicating the top of the RUM at a depth of 15.2 m (50.0 ft) bgs (Figure M-25). The Hanford formation forms the vadose zone and unconfined aquifer in 100-H. Therefore, the Hanford formation/RUM contact defines the base of the aquifer.

During drilling operations, a strong upward hydraulic gradient was observed when the Ringold Formation unit B was encountered. In fact, sand heaving occurred in the borehole. The potentiometric surface of the unit B aquifer rose to the same level as the water table, at 10.6 m (34.8.0 ft) bgs. This is 4.6 m (15.2 ft) bgs above the RUM aquitard, which confirms the strong upward hydraulic gradient between the confined unit B aquifer and the unconfined Hanford formation aquifer. On February 10, 2011, the potentiometric surface of groundwater from the first water-bearing unit in the RUM was measured at 10.8 m (35.5 ft) bgs. This groundwater level is slightly below the water table level, which indicates groundwater levels in this well is influenced by the pumping of wells 199-H3-2C and 199-H4-12C, which are screened in the first water-bearing unit of the RUM. Based on trends from other nearby wells screened in the same unit, we would expect this well to show an upward hydraulic gradient, because groundwater from the first water-bearing unit discharges to the Columbia River.

Well 199-H3-10 (C7640) Log. Well 199-H3-10 (C7640, Well R2) is located northeast of the 100-H 37 site. This well was drilled into the Ringold Formation unit B to characterize the vertical distribution of contamination in the vadose zone and to evaluate alternative CSM components regarding whether groundwater contamination is from vadose zone sources (in the periodically rewetted zone), within the unconfined aquifer, above the RUM, or within the RUM and diffusing to the unconfined aquifer. This well was screened within the uppermost confined water-bearing unit of the RUM at a depth from 31.4 to 34.4 m (103 to 112.9 ft).

Well 199-H3-10 was drilled to the Ringold Formation unit B beneath 100-H, thereby providing additional stratigraphic data that extends to depths well below the RUM surface. At this borehole location, the Hanford formation overlies the RUM directly; consequently, the vadose zone and aquifer are both in the Hanford formation. No Ringold Formation unit E is present.

The Hanford formation was observed from ground surface to a depth of 16.8 m (55.0 ft) bgs and consists of basalt-dominant (70 to 85 percent) silty sandy gravel. Gravels consist of very fine pebbles to small cobbles. Sands were angular, coarse to very coarse grained. A non-existent to a strong reaction with hydrochloric acid was recorded.

The RUM unit was encountered from 16.8 m to 70.3 m (55.0 to 230.8 ft) bgs. The RUM consists mainly of silt with occasional intercalated sands and gravels down to borehole terminated at 70.3 m (230.8 ft). Hydrochloric acid reaction was recorded as weak to strong. Sand dominant lenses consisting of sub-angular, very fine to coarse grained, were noted from 21.6 to 23.2 m (71 to 76 ft) bgs, 29.9 to 34.7 m (98 to 114 ft) bgs and 60.0 to 70.3 (197 to 230.8) ft bgs.

The total gamma and natural KUT geophysical log plots show an increased count rate at depth, indicating the top of the RUM at a depth of approximately 16.8 m (55.0 ft) bgs (Figure M-26). The Hanford formation forms the vadose zone and unconfined aquifer in 100-H. Therefore, the Hanford formation-RUM contact defines the base of the aquifer. The RUM top is located at an elevation of 111.5 m msl.

During drilling operations, a strong upward hydraulic gradient was observed when the Ringold Formation unit B was encountered. In fact, sand heaving occurred in the borehole. The potentiometric surface of the unit B aquifer rose to the same level as the water table, at 12.6 m (41.5 ft) bgs. This is 4.1 m (13.5 ft) bgs above the RUM aquitard, which confirms the strong upward hydraulic gradient between the confined unit B aquifer and the unconfined Hanford formation aquifer. On April 28, 2011, the potentiometric surface of groundwater from the first water-bearing unit in the RUM was measured at 12.6 m (41.5 ft) bgs. This groundwater level is equal to the water table level, which indicates groundwater levels in this well may be influenced by the pumping of wells 199-H3-2C and 199-H4-12C, which are screened in the first water-bearing unit of the RUM. Based on trends from other nearby wells screened in the same unit, we would expect this well to show an upward hydraulic gradient, because groundwater from the first water-bearing unit discharges to the Columbia River.

Borehole C7850 Log. Borehole C7850 (B2) was drilled within the 116-DR-9 Retention Basin to characterize the vadose zone and upper 1.5 m (5 ft) of the unconfined aquifer. The site received cooling water effluent from DR Reactor, which at times, also contained ruptured fuel element waste. Data were collected to evaluate whether residual Cr(VI) and various radionuclides extend beyond the depth (4.6 m [15 ft]) of a previous remedial action. The borehole was drilled to a depth of 21.5 m (70.4 ft) bgs, with the final split spoon being taken from 21.5 to 22.1 m (70.4 to 72.4 ft) bgs.

Soils encountered in borehole C7850 represent undifferentiated material that has been partially reworked through remedial actions. No Ringold Formation unit E was identified in either the lower portion of the vadose zone or the upper few feet of the water table. The soil appears to be mostly backfill overlying Hanford formation. The undifferentiated soils consist of gravelly sand from ground surface down to the bottom of the borehole. The RUM surface could not be identified because this vadose zone characterization borehole was not drilled beyond the upper 1.5 m (5 ft) of the aquifer. The water table was measured at 19 to 19.5 m (62 to 64 ft) bgs. This borehole was properly abandoned following collection of a groundwater sample at the water table.

The total gamma and natural KUT geophysical log plots show a steady count rate with depth suggesting that the gravelly sand is relatively homogeneous throughout the soil column (Figure M-27).

Borehole C7851 Log. Borehole C7851 (B3) was drilled within the 116-D-7 Retention Basin to characterize the vadose zone and upper 1.5 m (5 ft) of the unconfined aquifer. This Basin received cooling water effluent from D Reactor for radioactive decay and thermal cooling before release to the Columbia River. Data were collected to evaluate whether residual Cr(VI) and various radionuclides extend beyond the depth (7.4 m [24.3 ft]) of a previous remedial action. The borehole was drilled to a depth of 21 m (69 ft) bgs.

Soils encountered in borehole C7851 represent undifferentiated material that has been reworked through remedial actions in the upper portion of the borehole underlain by Hanford formation. The Hanford formation contact with the Ringold Formation unit E is not clear. There is some additional silt content at about 18.3 m (60 ft) below ground surface that may represent the top of the Ringold or it could be beneath the bottom of the hole. The soils consist of alternating layers of muddy sandy gravel (3) and sandy gravel (2). The water table was measured at 19 m (62 ft) bgs and is present within the third muddy sandy gravel layer. The RUM surface could not be identified due to the early termination of this vadose zone characterization borehole 1.5 m (5 ft) below the water table. This borehole was properly abandoned following collection of a groundwater sample at the water table.

The total gamma and natural KUT geophysical log plots show inconsistent results with the gamma count increasing considerably at approximately 6.1 m (20 ft) bgs with the muddy sandy gravel, then decreasing through a sandy gravel layer, continuing into the third muddy sandy gravel layer (Figure M-28). The K increases in sandy gravel layers, but the U and Th are inconsistent throughout the borehole.

Well 199-D8-101 (C7852) Log. Well 199-D8-101 (C7852, B9) was drilled in the 116-DR-1&2 Trench to fully characterize the vadose zone and upper 1.5 m (5 ft) of the unconfined aquifer. These trenches received waste effluents from various sources where ruptured fuel elements were present. Data were collected to evaluate whether residual Cr(VI) and various radionuclides extend beyond the depth (5 m [16.4 ft]) of a previous remedial action. In addition, previous verification sampling activities did not account for all inventoried contaminants potentially discharged to this site. The borehole was drilled to a depth of 21.9 m (72 ft) bgs.

Soils encountered in borehole C7852 represent material that has been reworked through remedial actions in the upper portion of the hole underlain by Hanford formation. The Hanford formation contact with the Ringold Formation unit E appears to occur beneath the depth of drilling at this location. The lithology is sandy gravel into the upper 1.5 m (5 ft) of the water table. The undifferentiated soils consist of 4.6 m (15 ft) of muddy sandy gravel underlain by sandy gravel to the bottom of the borehole. The RUM surface could not be identified due to the early termination of the borehole.

Following sample collection activities a determination was made to convert borehole C7852 (B9) into monitoring well 199-D8-101. This action was completed based on the following rationale: Given that monitoring wells providing continuous groundwater level data are located near the shoreline, it is desirable to obtain additional data farther upgradient/inland (i.e., near the 116-DR-1&2 Trench). Such information will provide further insight on the hydraulic gradients in that area and will lead to improved decisions/evaluations on the P&T system design and performance. Numerical modeling and semianalytical methods applied to design and system performance evaluations will benefit from the additional data, as model calibration datasets will be enhanced. Especially in areas where limited information is currently available, and hydraulic gradient calculations using triangulation techniques will be based on a monitoring well network with increased coverage. Based on this recommendation the well screen was set from 18.2 to 21.3 m (59.73 to 69.73 ft) bgs, across the water table. The water table was measured at 19.6 to 19.8 m (64.2 to 64.9 ft) bgs.

The KUT counts are generally stable in the vadose zone with a distinct drop at the water table (Figure M-29). The contact between the Hanford formation and Ringold Formation unit E could not be determined. This borehole was drilled into the upper most portion of the unconfined aquifer; it did not reach the top of the RUM.

Borehole C7855 Log. Borehole C7855 (B8) was drilled within the 116 D 1B Trench to characterize the vadose zone and upper 1.5 m (5 ft) of the unconfined aquifer. This site received 1,100 kg (2,425 lb) of sodium dichromate and liquid wastes from the 105-D fuel storage basin. Therefore, data were collected to

evaluate whether residual Cr(VI) and various radionuclides extend beyond the depth (4.6 m [15 ft]) of a previous remedial action. The borehole was drilled to a depth of 27.9 m (91.7 ft) bgs, with the final split spoon being taken from 27.9 to 28.6 m (91.7 to 93.7 ft) bgs.

The Hanford formation/Ringold Formation unit E contact was identified in the field at 15.2 m (50 ft) below ground surface. The Hanford formation consists of gravelly sand and sand from ground surface down to the Hanford formation/Ringold Formation contact at 15.2 m (50 ft) bgs. The Ringold Formation unit E consists of sandy gravel down to the bottom of the borehole. The RUM surface could not be identified due to the early termination of the borehole 1.5 m (5 ft) into the water table, well above the expected RUM contact at the base of the aquifer. The water table was measured at 26.3 to 26.5 m (86.4 to 87 ft) bgs. This borehole was properly abandoned following collection of a groundwater sample at the water table.

The total gamma and natural KUT geophysical log plots show mainly steady count rate with depth, suggesting that the material is relatively homogeneous (Figure M-30). However, there appears to be an anomaly in both the gamma and KUT plots from 4.6 to 7.6 m (15 to 25 ft) bgs. In fact, the gamma count increases off the scale. Based on the lithologic description at that depth, it is unclear as to whether the lithology of the soil is actually causing the anomaly.

Well 199-D5-142 (C7857) Log. Well 199-D5-142 (C7857, B1) was drilled in the 118-D-6 Reactor Fuel Storage Basin to fully characterize the vadose zone and upper 1.5 m (5 ft) of the unconfined aquifer. This basin is being characterized because the fuel storage basin walls and floor were left in place with high concentrations of radionuclides and other contaminants identified in concrete samples. Data were collected to evaluate whether residual Cr(VI) and various radionuclides extend beneath the concrete floor. The borehole was drilled to a depth of 26.8 m (87.8 ft) bgs, with the final split spoon being taken from 26.8 to 27.4 m (87.8 to 89.8 ft) bgs.

The Hanford formation/Ringold Formation unit E contact was identified in the field at about 13.7 m (45 ft) below ground surface. The Hanford formation consists of muddy sandy gravel from 0 to 4.6 m (0 to 15 ft) bgs, underlain by sandy gravel down to the Hanford formation/ Ringold Formation unit E contact at 13.7 m (45 ft) bgs. The Ringold Formation unit E consists of muddy sandy gravel down to the bottom of the borehole. The RUM surface could not be identified due to the early termination of the borehole within the upper 1.5 m (5 ft) of the aquifer, well above the expected contact with the RUM at the base of the aquifer.

Following sample collection activities a determination was made to convert borehole C7852 (B9) into monitoring well 199-D5-142. This action was completed because preliminary Cr(VI) and radionuclide laboratory results were outliers, which required further verification. The screen was set from 23.5 to 26.5 m (77 to 87 ft) bgs across the water table. The water table was measured at 25 m (82.2 ft) bgs.

The total gamma and natural KUT geophysical log plots show an increased count rate at depth, marking the contact between the Hanford formation and the Ringold Formation unit E at 13.5 m (45 ft) bgs (Figure M-31). There also is an increase in the potassium-40 log at the contact, consistent with more granitic, felsic rocks in the Ringold Formation unit E. The gamma signature is broken out into cesium-137, cobalt-60, and europium-152 components between 5 and 8 m (16 and 26 ft) bgs. There is approximately 60 pCi/g of cesium-137 in this zone. There appears to be an anomaly in both the gamma and KUT plots from 4.9 to 8.2 m (16 to 27 ft) bgs. In fact, the gamma count increases off the scale. Based on the lithologic description at that depth, it is unclear as to whether the lithology of the soil is actually causing the anomaly. This is similar as to what was observed in boring C7855.

Well 199-H4-84 (C7860) Log. Well 199-H4-84 (C7860, B10) was drilled in the 116-H-6 Solar Evaporation Basin to fully characterize the vadose zone and upper 1.5 m (5 ft) of the unconfined aquifer. This facility received routine and nonroutine wastes for disposal. Data were collected to evaluate whether residual Cr(VI), nitrate, fluoride, and various metals and radionuclides extend beyond the depth 4.6 m (15 ft) of a previous remedial action. The borehole was drilled to a depth of 14.8 m (48.6 ft) bgs. At this borehole location, the Hanford formation overlies the RUM directly; consequently, the vadose zone and aquifer are both in the Hanford formation. No Ringold Formation unit E is present.

Soils encountered in borehole C7860 represent undifferentiated Hanford formation that has been reworked through remedial actions. The undifferentiated soils consist of an upper and lower layer of sandy gravel, with a muddy sandy gravel layer in between from 5.8 to 12.5 m (19 to 41 ft) bgs. The RUM surface could not be identified due to the early termination of the borehole.

Following sample collection activities a determination was made to convert borehole C7860 (B10) into monitoring well 199-H4-84. This action was completed based on the following rationale: The turbidity values in the temporary groundwater sample were elevated. Therefore, the borehole water sample may not be representative of actual groundwater conditions. Based on this recommendation the well screen was set from 11.5 to 14.5 m (37.65 to 47.65 ft) bgs, across the water table. The water table was measured at 12.5 to 12.6 m (41 to 41.5 ft).

The total gamma and natural KUT geophysical log plots show a relatively consistent signature in the Hanford formation sediment (Figure M-32).

Well 199-H4-83 (C7861) Log. Well 199-H4-83 (C7861, B6) was drilled in the 116-H-7 Retention Basin to fully characterize the vadose zone and upper 1.5 m (5 ft) of the unconfined aquifer. This basin received cooling water from the H Reactor, which contained chemical additives (e.g., sodium dichromate). Data were collected to evaluate whether residual Cr(VI), various metals, and radionuclides extend beyond the depth 4.8 m (15.7 ft) of a previous remedial action. In addition, data from this borehole is also used to address uncertainty regarding the lateral extent of remediation. The borehole was drilled to a depth of 12.9 m (42.3 ft) bgs. At this borehole location, the Hanford formation overlies the RUM directly; consequently, the vadose zone and aquifer are both in the Hanford formation. No Ringold Formation unit E is present.

Soils encountered in borehole C7861 represent undifferentiated Hanford formation that has been reworked through remedial actions. The undifferentiated soils consist of an upper and lower layer of gravelly sand, with a sandy gravel layer in between from 6.1 to 9.1 m (20 to 30 ft) bgs. The RUM surface could not be identified due to the early termination of the borehole.

Following sample collection activities a determination was made to convert borehole C7861 (B6) into monitoring well 199-H4-83. This action was completed based on the following rationale: The turbidity values in the temporary groundwater sample were elevated. Therefore, the borehole water sample may not be representative of actual groundwater conditions. Based on this recommendation the well screen was set from 9.7 to 12.8 m (31.85 to 41.85 ft) bgs, across the water table. The water table was measured at 10.4 to 10.7 m (34.4 to 35 ft) bgs.

The total gamma and natural KUT geophysical log plots show an increased count rate at depth, which appears to be mostly contributed from cesium-137 contamination (Figure M-33).

Borehole C7862 Log. Borehole C7862 (B4) was drilled within the 116-H-4 Pluto Crib to characterize the vadose zone and upper 1.5 m (5 ft) of the unconfined aquifer. This site was a significant source of coolant waste containing concentrated Cr(VI) and sodium dichromate. Data were collected to evaluate whether residual Cr(VI), lead, and various radionuclides extend beyond the depth of a previous remedial action

that is not well documented. The borehole was drilled to a depth of 16 m (52.4 ft) bgs. At this borehole location, the Hanford formation overlies the RUM directly; consequently, the vadose zone and aquifer are both in the Hanford formation. No Ringold Formation unit E is present.

Soils encountered in borehole C7862 represent undifferentiated Hanford formation material that has been reworked through remedial actions. The undifferentiated soils consist of muddy sandy gravel from ground surface down to the bottom of the borehole. The RUM surface could not be identified due to the early termination of the borehole. The water table was measured at 13.7 to 13.8 m (44.8 to 45.1 ft) bgs. This borehole was properly abandoned following collection of a groundwater sample at the water table.

The total gamma and natural KUT geophysical log plots show a steady count rate with depth, suggesting that the material is relatively homogeneous (Figure M-34).

Well 199-H3-11 (C7863) Log. Well 199-H3-11 (C7863, B7) was drilled in the 118-H-6 Reactor Fuel Storage Basin to fully characterize the vadose zone and upper 1.5 m (ft) of the unconfined aquifer, because of a potential leak at 118-H-6. Data were collected to evaluate whether residual Cr(VI) and radionuclides extend beyond the depth (deep soil >4.6 m [>15 ft]) of a previous remedial action. In addition, data from this borehole is also used to evaluate the nature and extent of contamination beneath reactor structures. The borehole was drilled to a depth of 17 m (55.8 ft) bgs. At this borehole location, the Hanford formation overlies the RUM directly; consequently, the vadose zone and aquifer are both in the Hanford formation. No Ringold Formation unit E is present.

Soils encountered in borehole C7863 represent undifferentiated Hanford formation that has been reworked through remedial actions. The undifferentiated soils consist of an upper layer of gravelly sand that extends from ground surface to 9.8 m (32 ft) bgs underlain with sandy gravel down to the bottom of the borehole. The RUM surface could not be identified due to the early termination of the borehole.

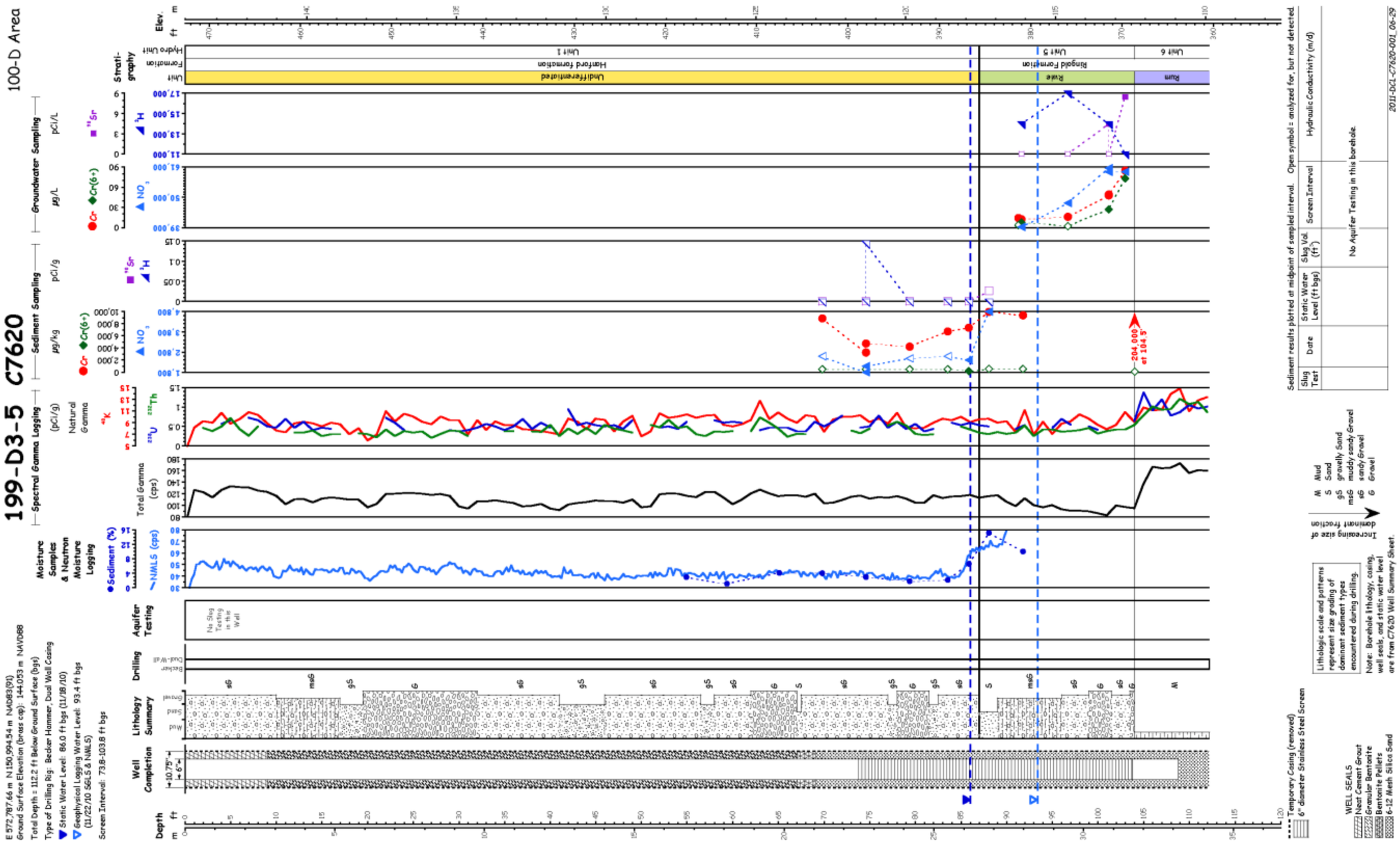
Following sample collection activities a determination was made to convert borehole C7863 (B7) into monitoring well 199-H3-11. This action was completed based on the following rationale: The turbidity values in the temporary groundwater sample were elevated. Therefore, the borehole water sample may not be representative of actual groundwater conditions. In addition, this well provides an additional monitoring point, slightly downgradient of the reactor and fuel storage basin. Therefore, based on this recommendation the well screen was set from 12.8 to 15.9 m (42.05 to 52.10 ft) bgs, across the water table. The water table was measured at 14.5 m (47.6 ft) bgs.

The total gamma and natural KUT geophysical log plots show a steady count rate with depth suggesting that the material is relatively homogeneous (Figure M-35).

Borehole C7864 Log. Borehole C7864 (B5) was drilled within the 116-H-1 Trench to characterize the vadose zone and upper 1.5 m (5 ft) of the unconfined aquifer. This trench received coolant effluent that reportedly contained fuel rupture debris. Data were collected to evaluate whether residual Cr(VI) and various radionuclides extend beyond the depth (4.6 m [15 ft]) of a previous remedial action. The borehole was drilled to a depth of 15.5 m (50.8 ft) bgs. At this borehole location, the Hanford formation overlies the RUM directly; consequently, the vadose zone and aquifer are both in the Hanford formation. No Ringold Formation unit E is present.

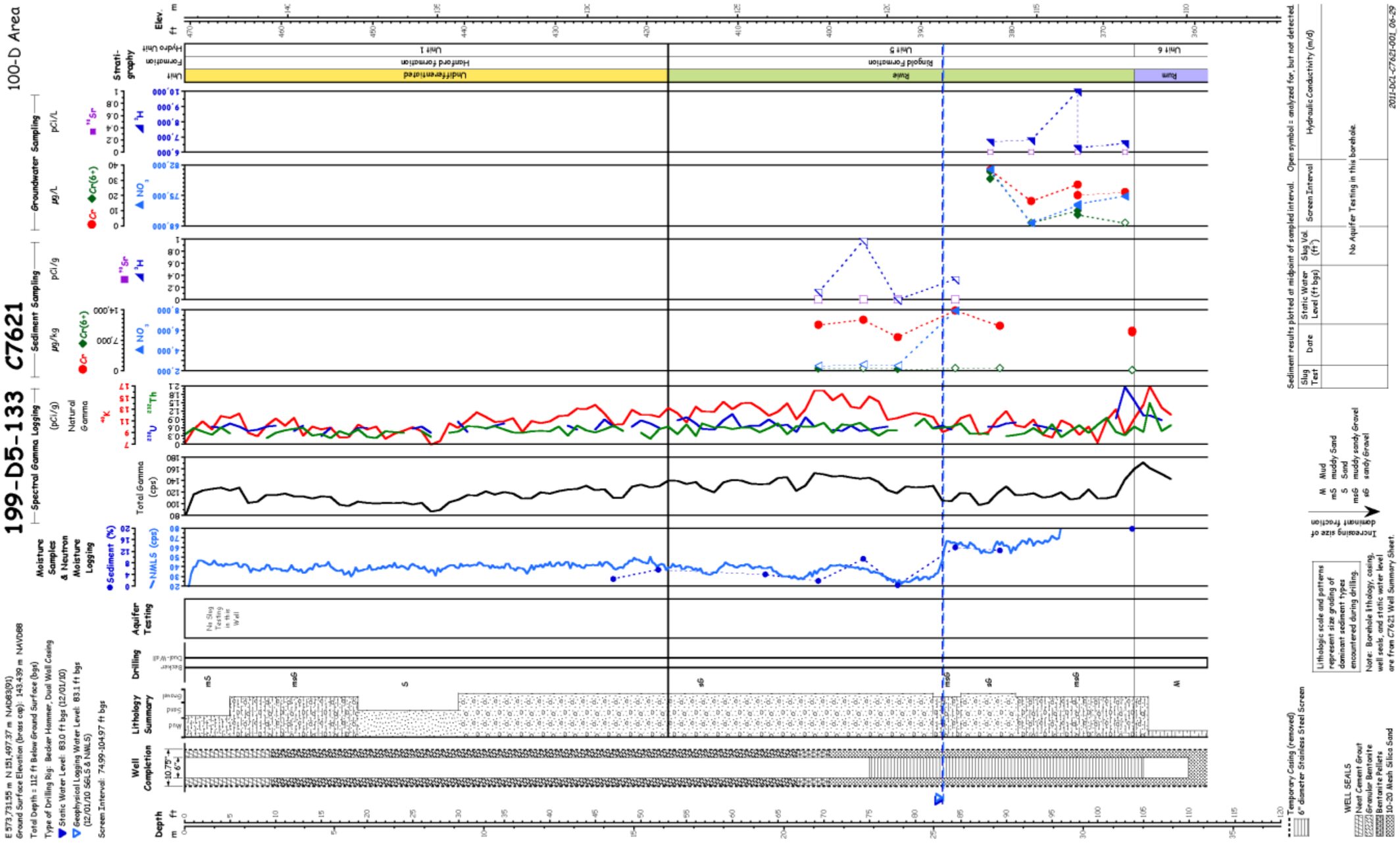
Soils encountered in borehole C7864 represent undifferentiated Hanford formation material that has been reworked through remedial actions. The undifferentiated soils consist of the following three distinct layers starting from ground surface to the bottom of the borehole: gravelly sand, muddy sandy gravel, and sandy gravel. The RUM surface could not be identified due to the early termination of the borehole. The water table was measured at 13.3 m (43.5 ft) bgs. This borehole was properly abandoned following collection of a groundwater sample at the water table.

The total gamma and natural KUT geophysical log plots show a steady count rate with depth, suggesting that the material is relatively homogeneous (Figure M-36). The total gamma spectrum was broken out into cesium-137, cobalt-60, europium-152, and europium-154. It appears that the total gamma trend is influenced by cesium-137 and europium-152. There appears to be an anomaly in both the gamma and KUT plots from 4.6 to 7 m (15 to 23 ft) bgs. In fact, the gamma count increases off the scale. Based on the lithologic description at that depth, it is unclear as to whether the lithology of the soil is actually causing the anomaly, although the neutron signature also shows an increasing trend. This log is similar to what was observed in borings C7855 and C7857.



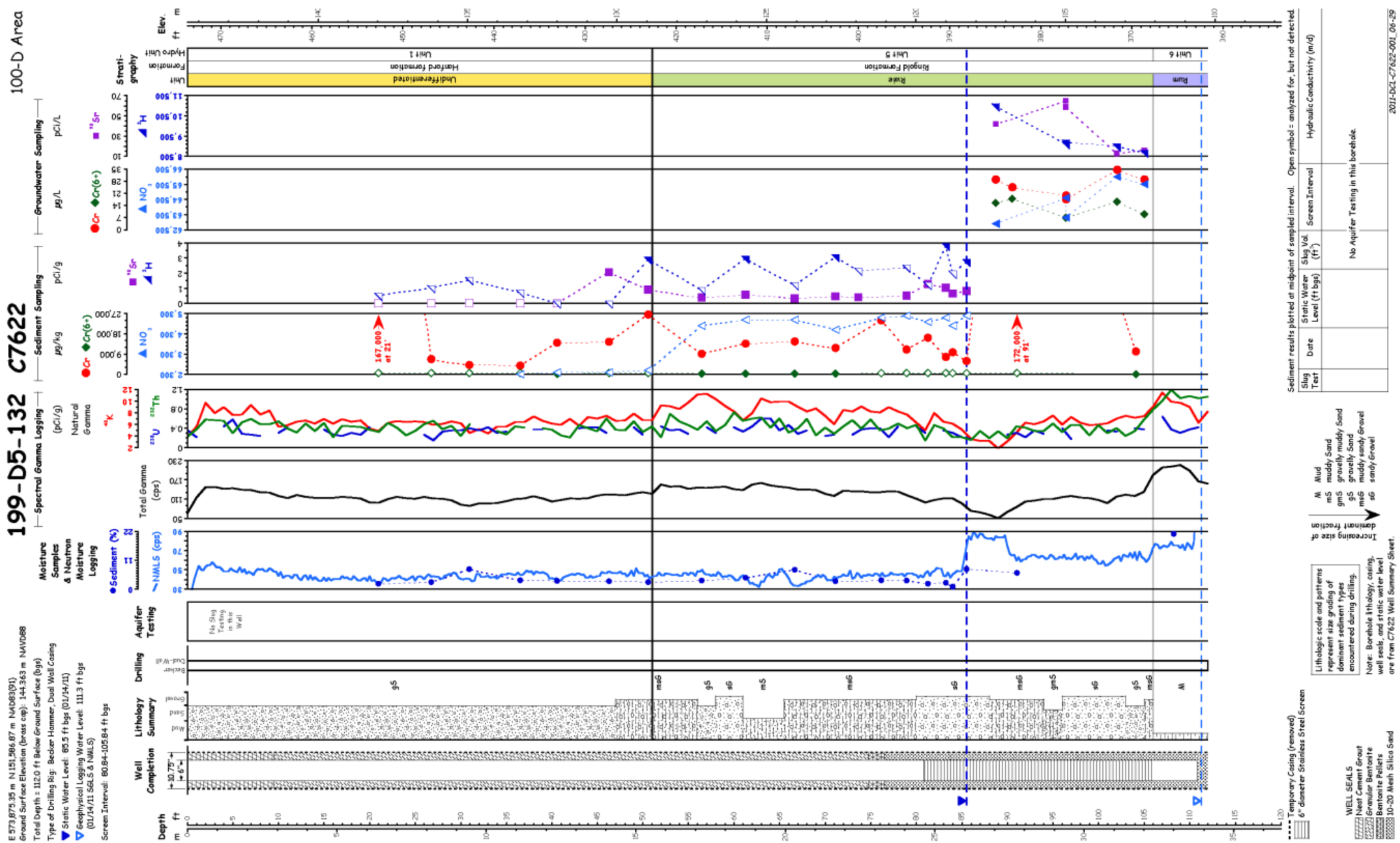
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-10. Well 199-D3-5 (C7620) Log



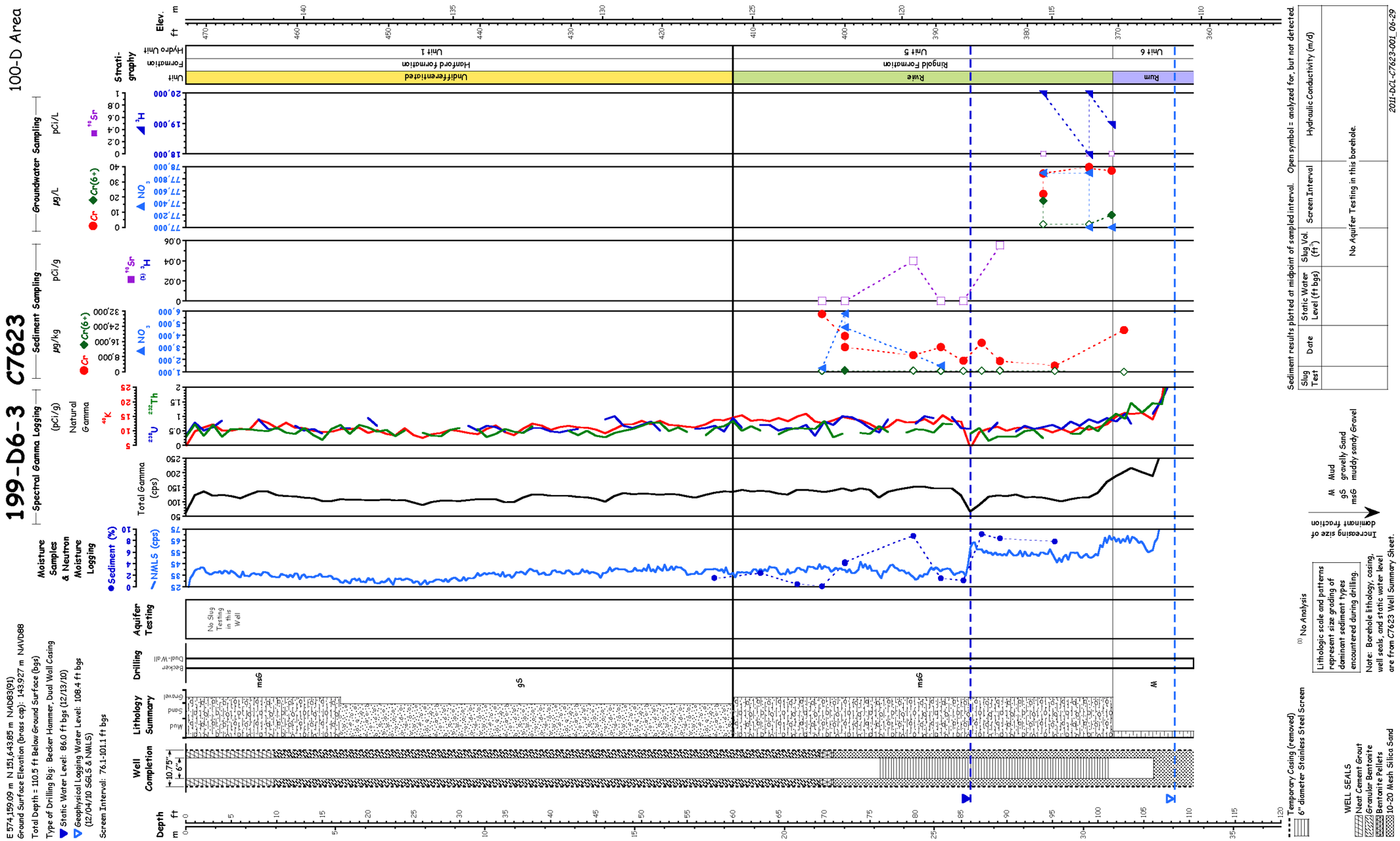
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-11. Well 199-D5-133 (C7621) Log



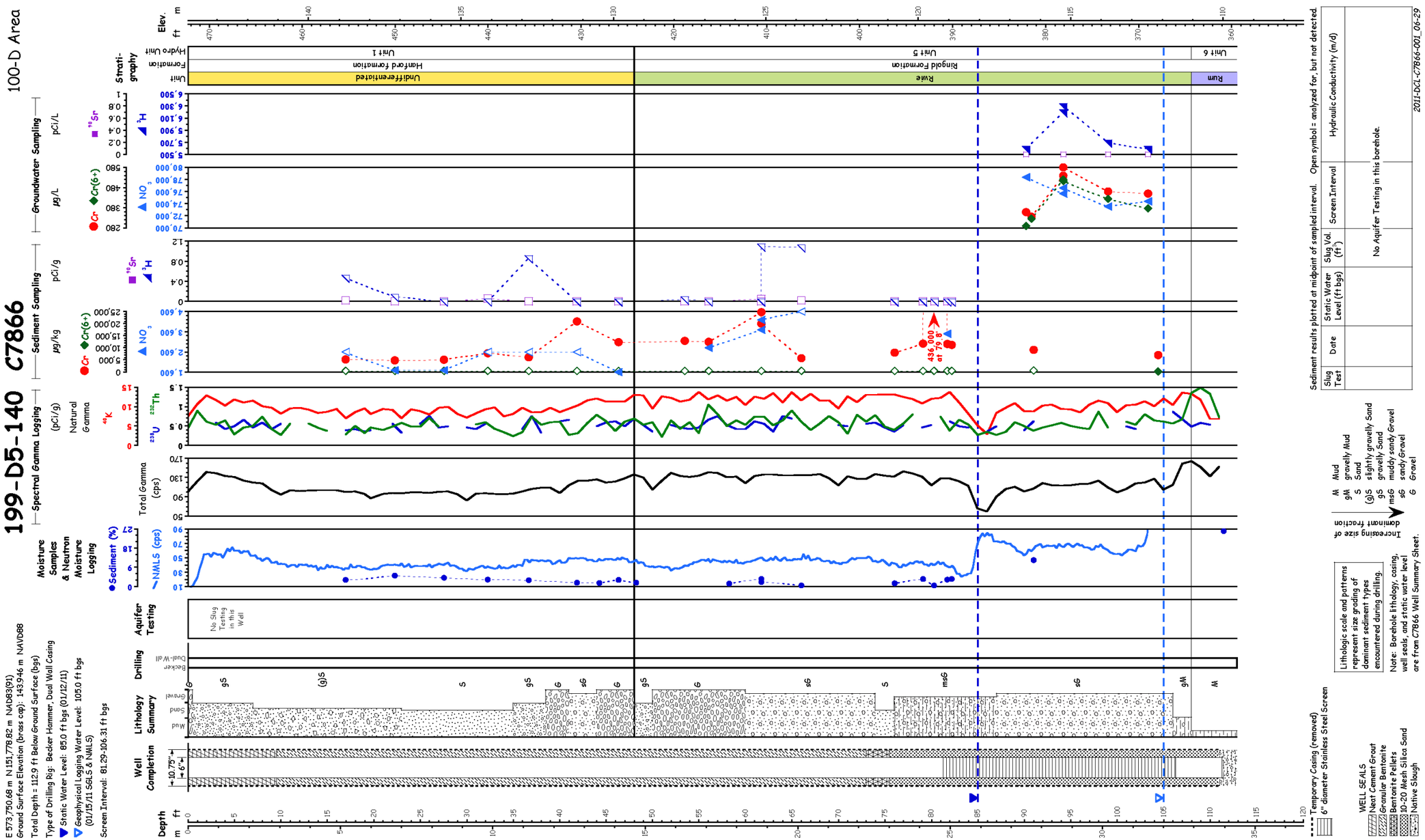
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-12. Well 199-D5-132 (C7622) Log



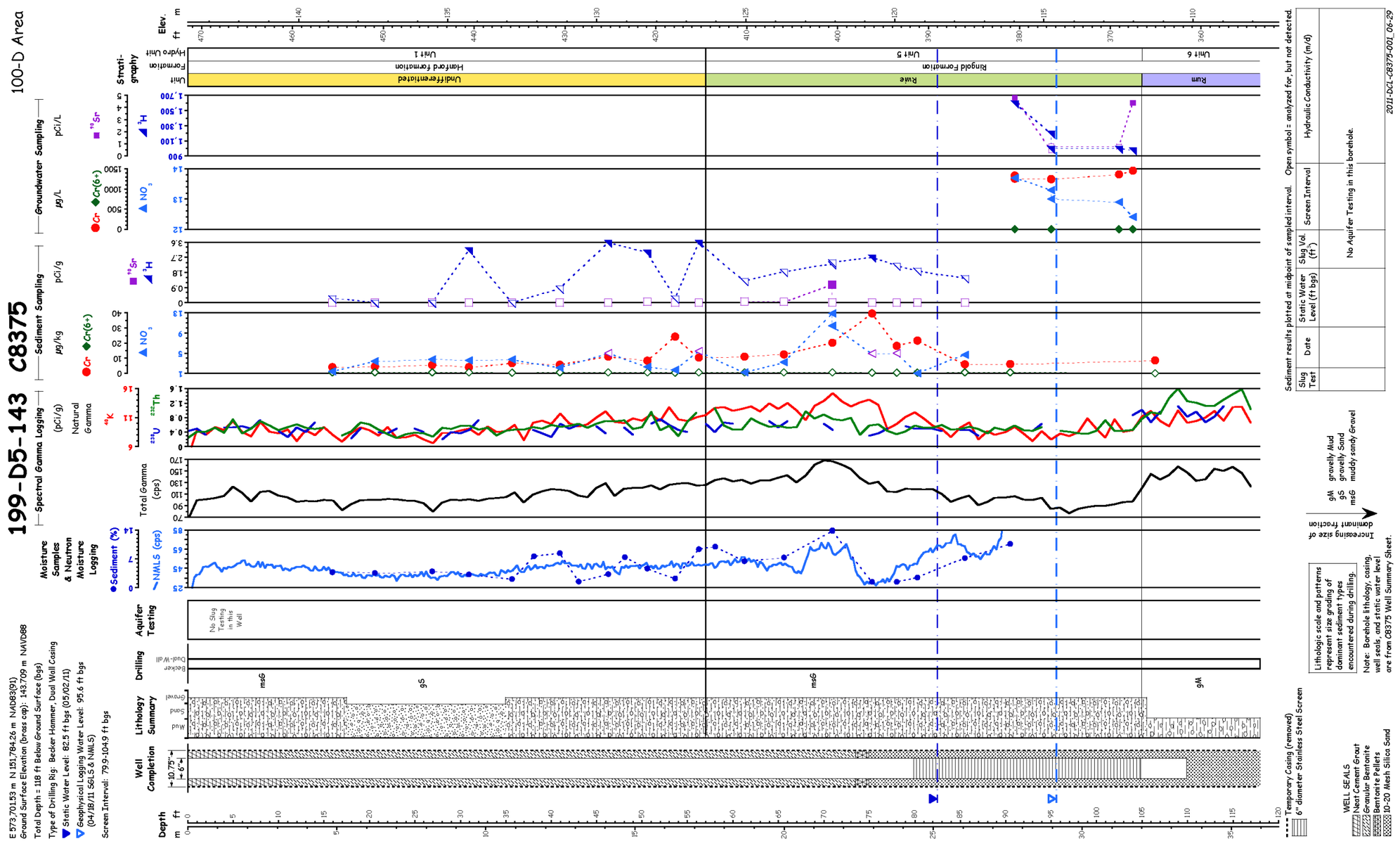
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-13. Well 199-D6-3 (C7623) Log



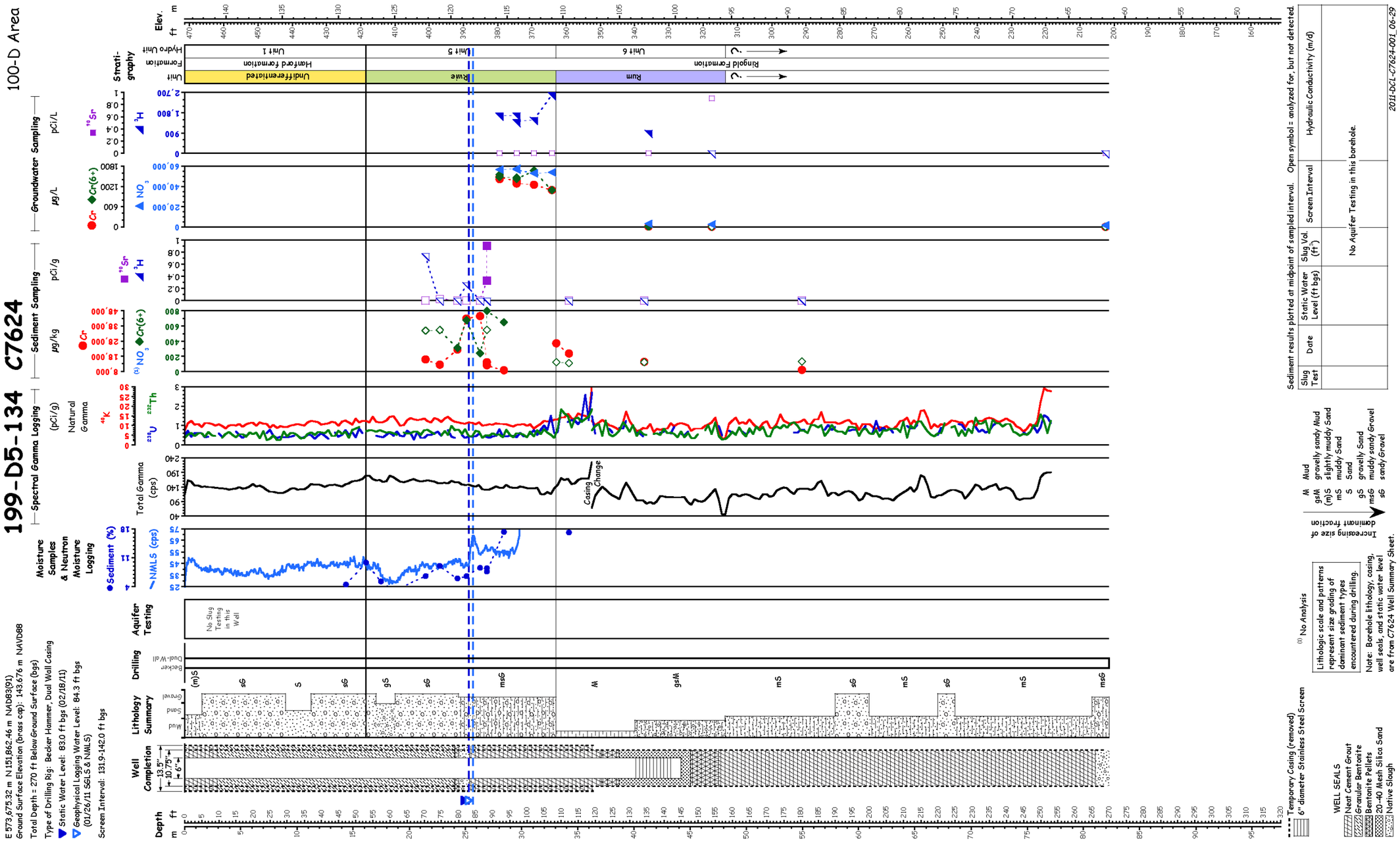
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-14. Well 199-D5-140 (C7866) Log



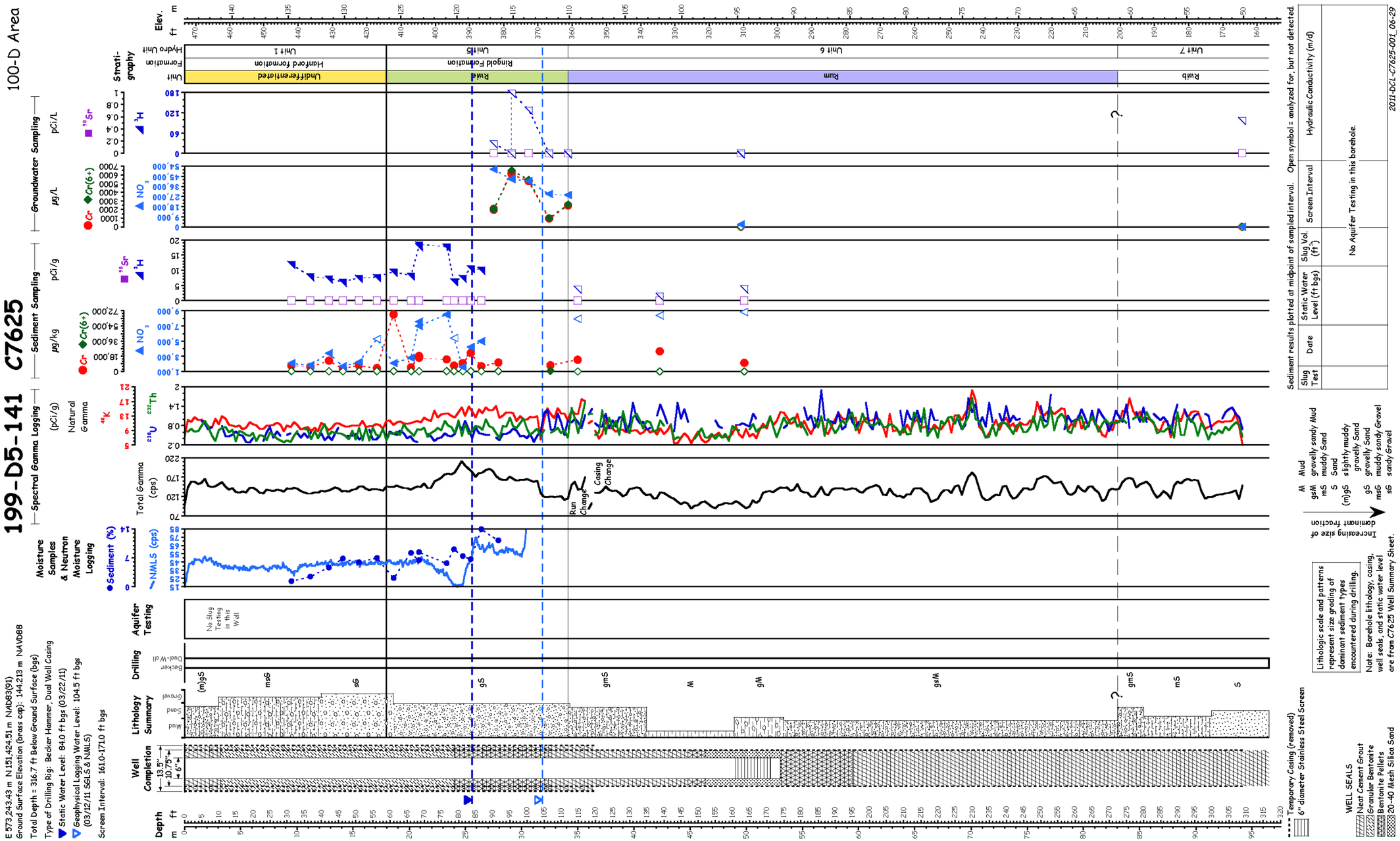
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-15. Well 199-D5-143 (C8375) Log



Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-16. Well 199-D5-134 (C7624) Log



Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-17. Well 199-D5-141 (C7625) Log

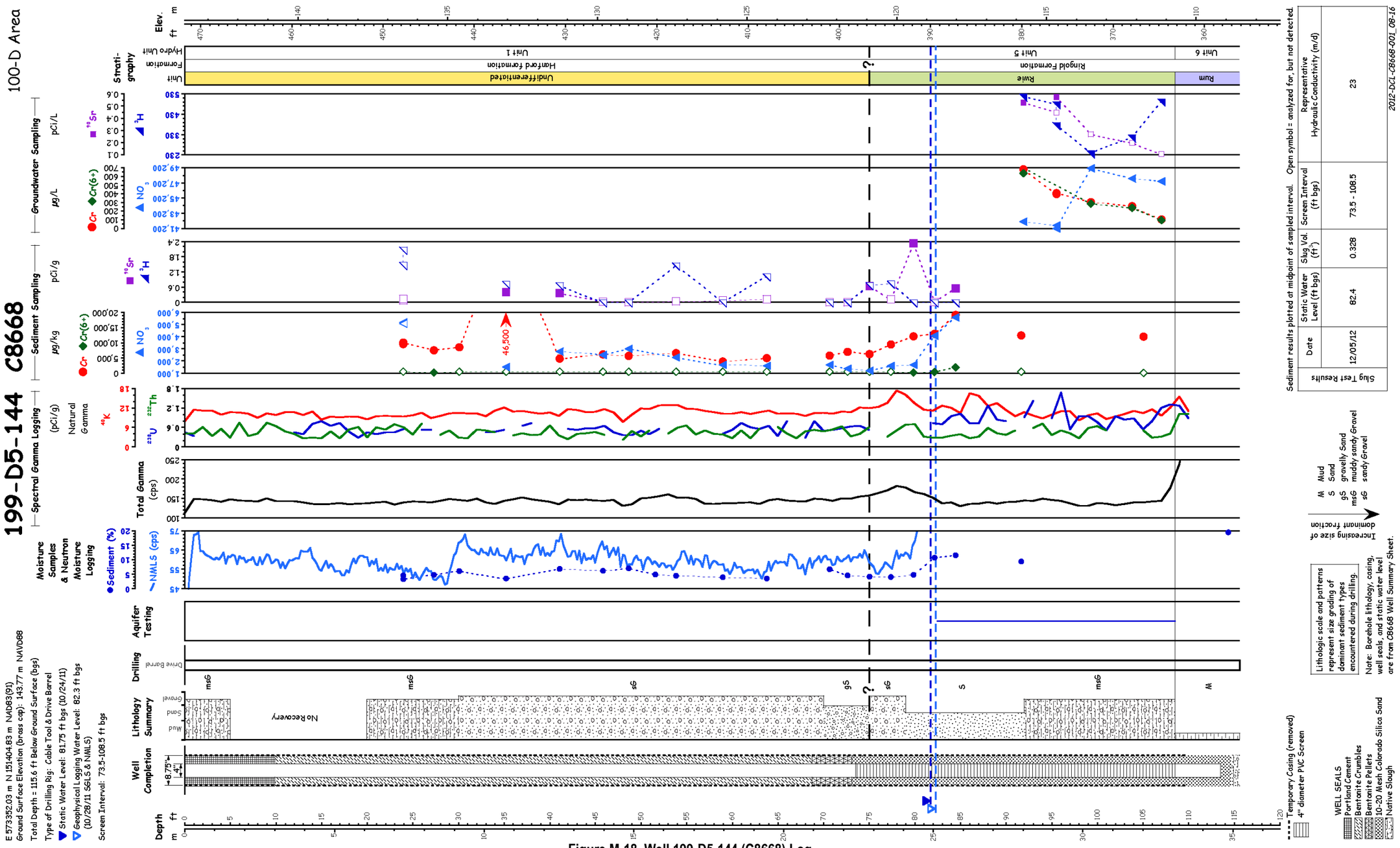
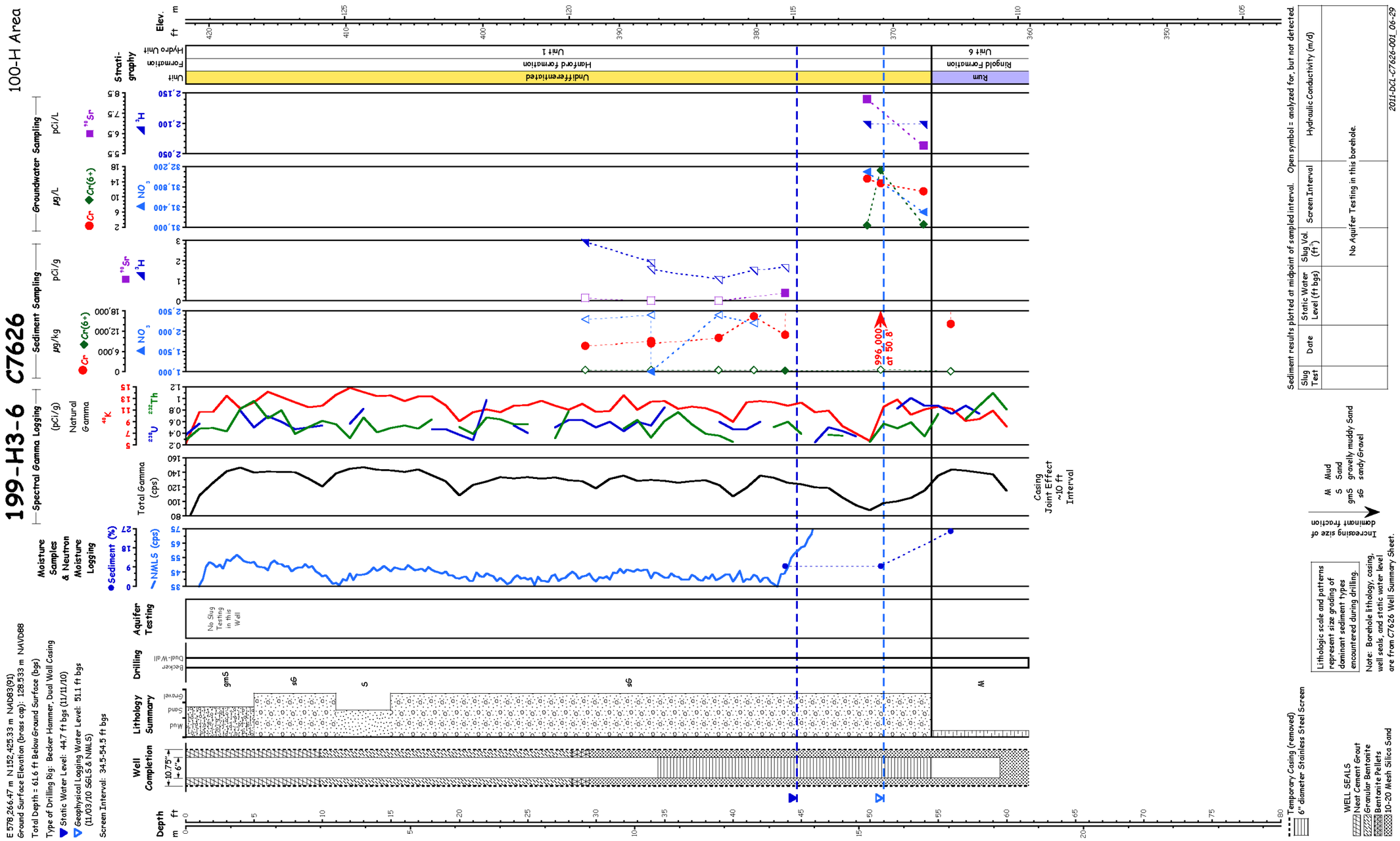
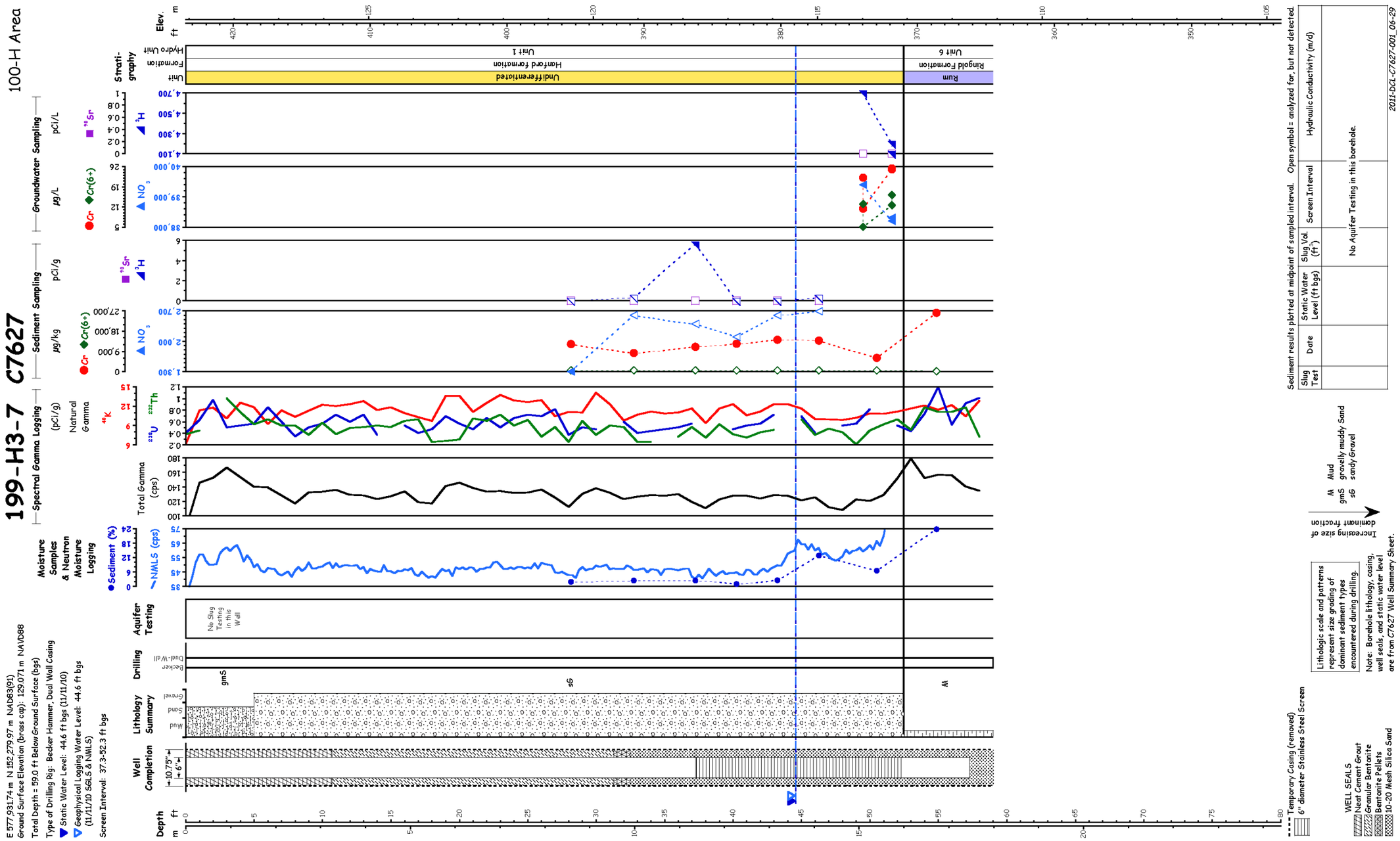


Figure M-18. Well 199-D5-144 (C8668) Log



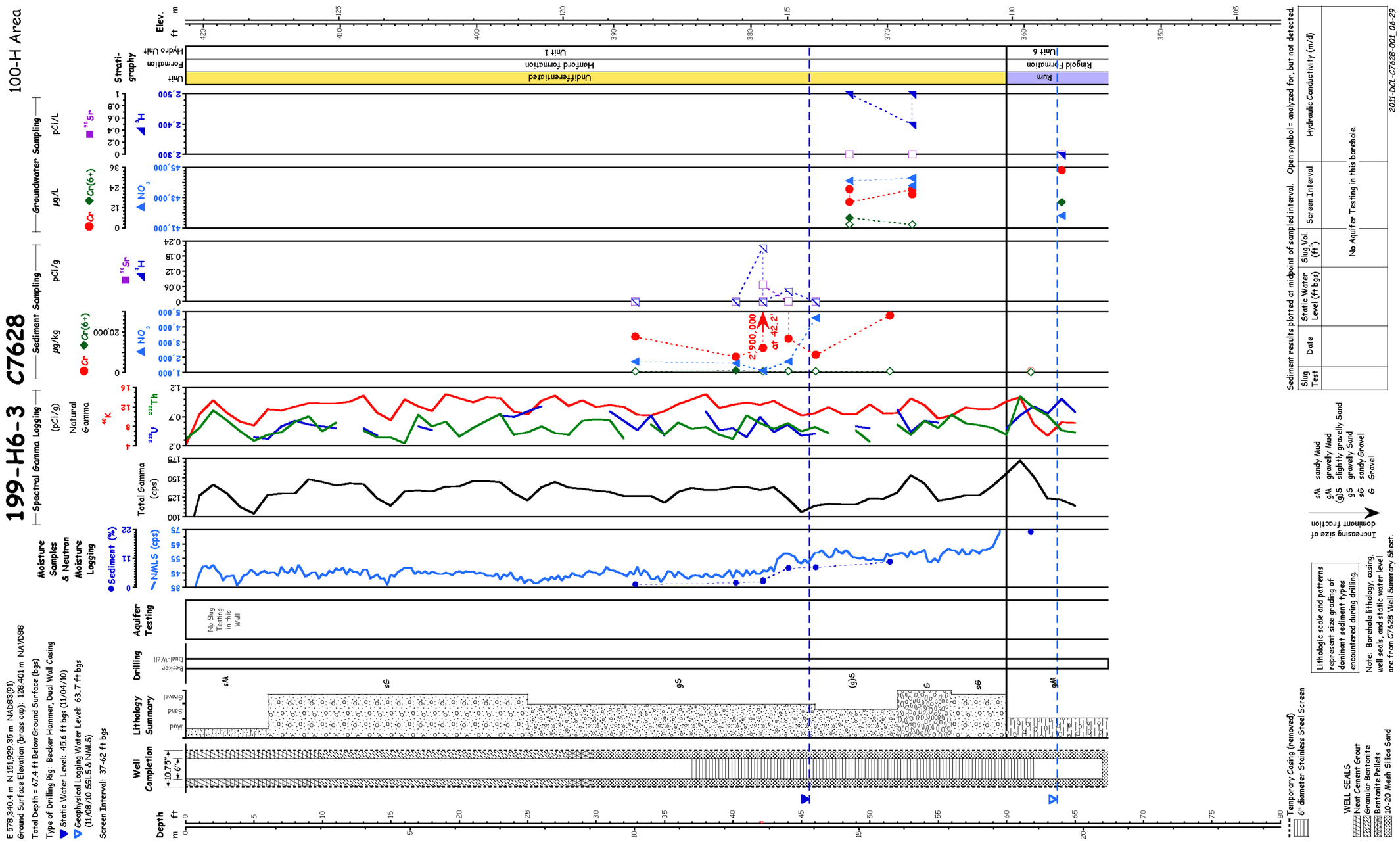
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-19. Well 199-H3-6 (C7626) Log



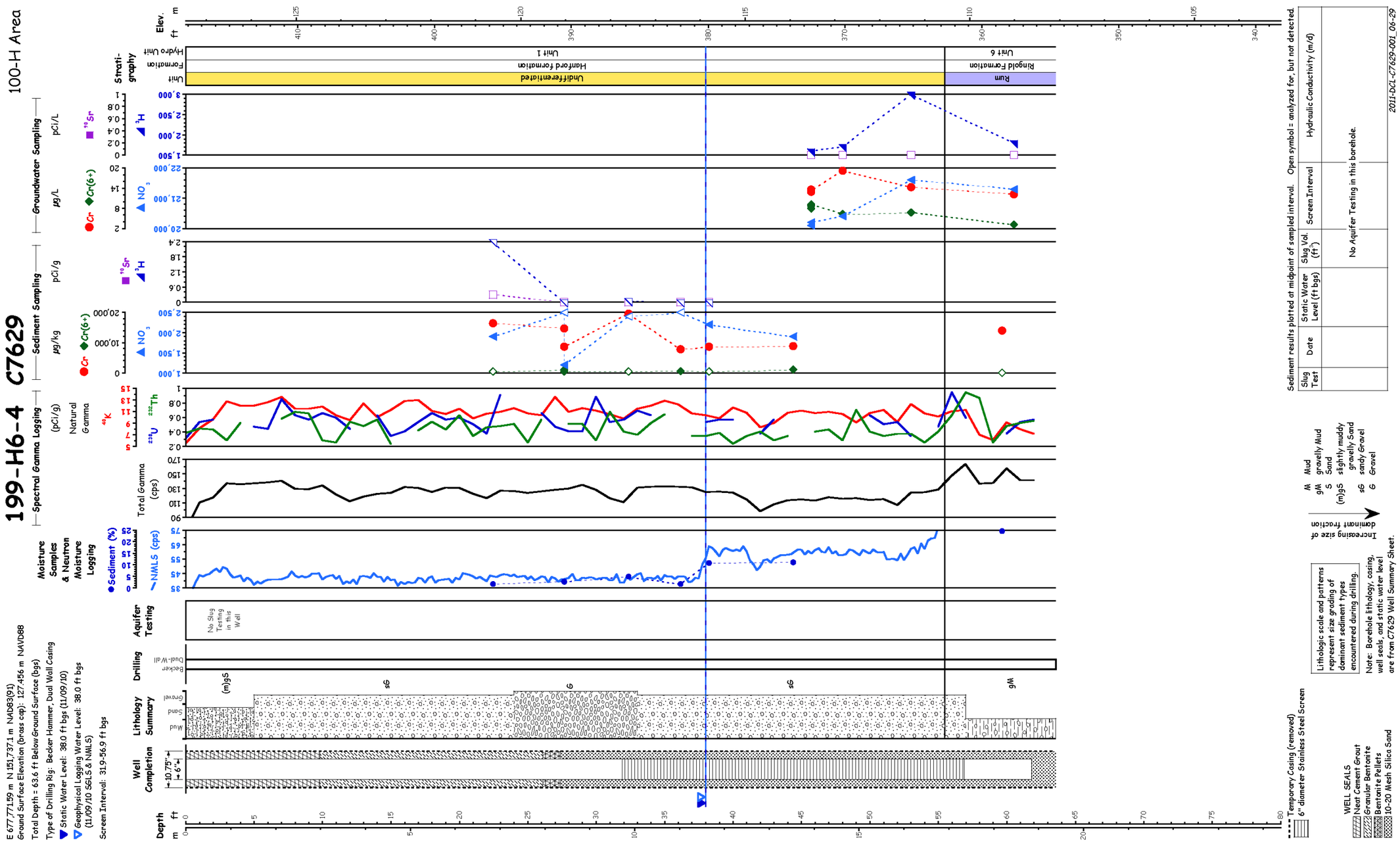
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-20. Well 199-H3-7 (C7627) Log



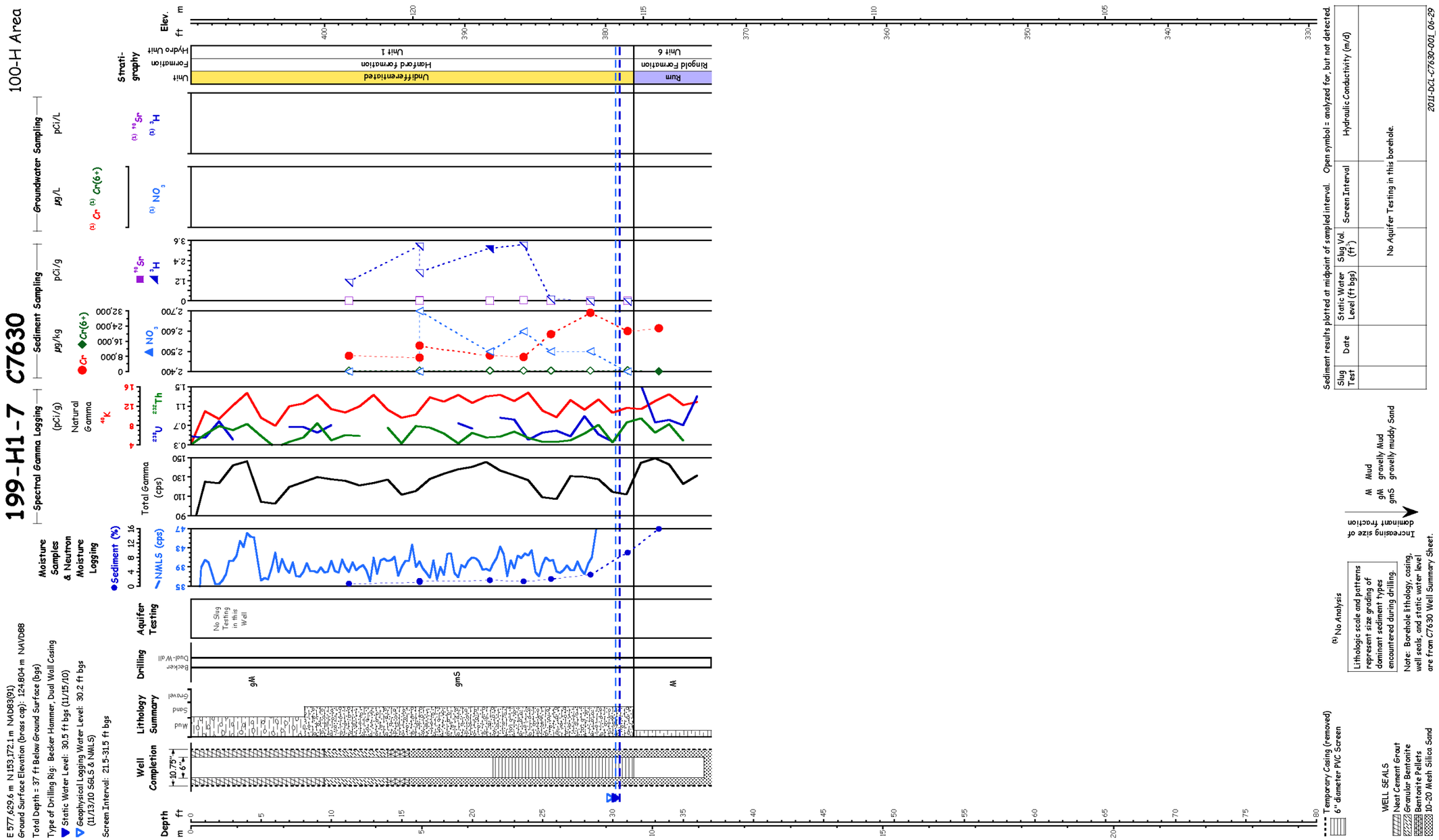
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-21. Well 199-H6-3 (C7628) Log



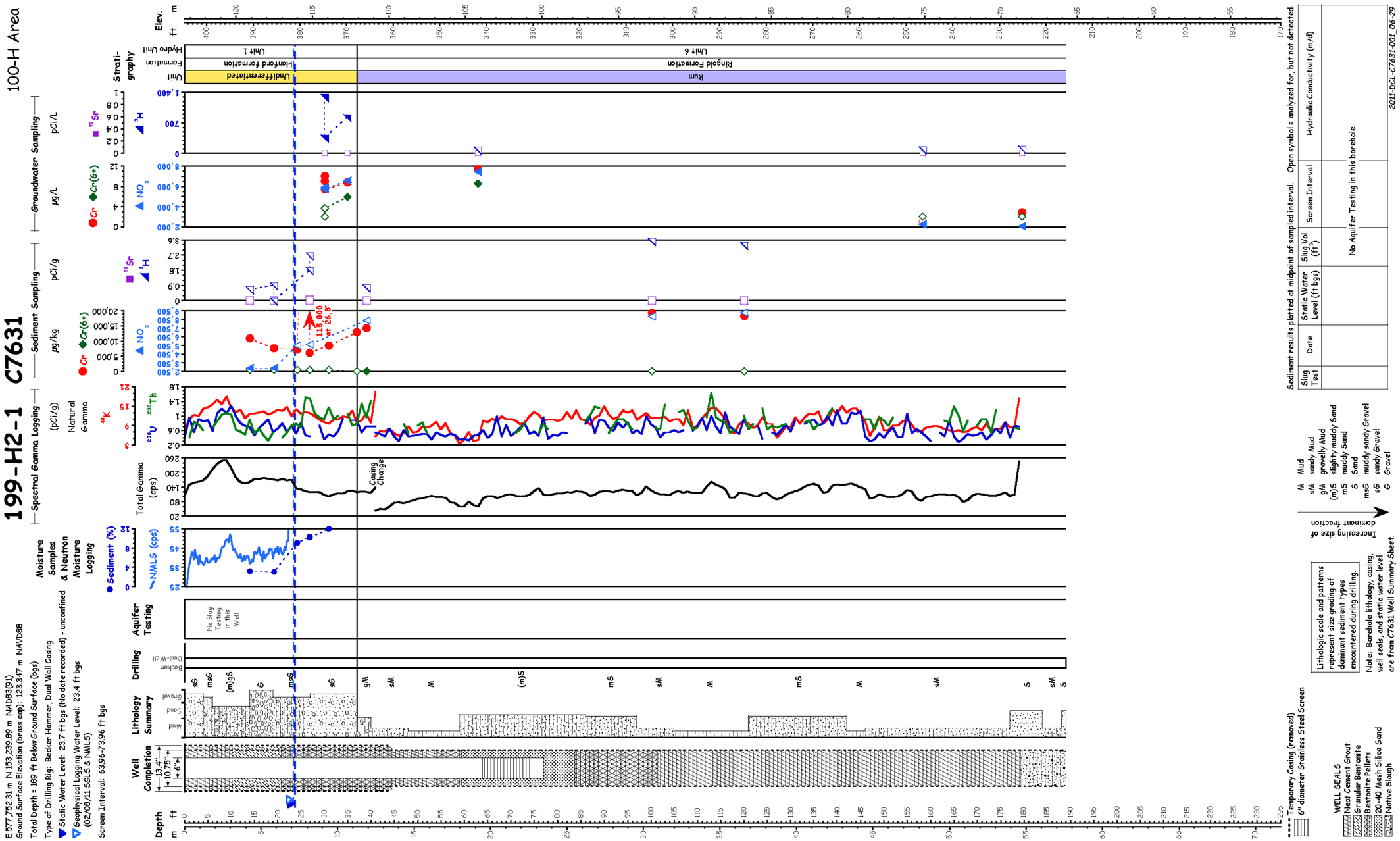
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-22. Well 199-H6-4 (C7629) Log



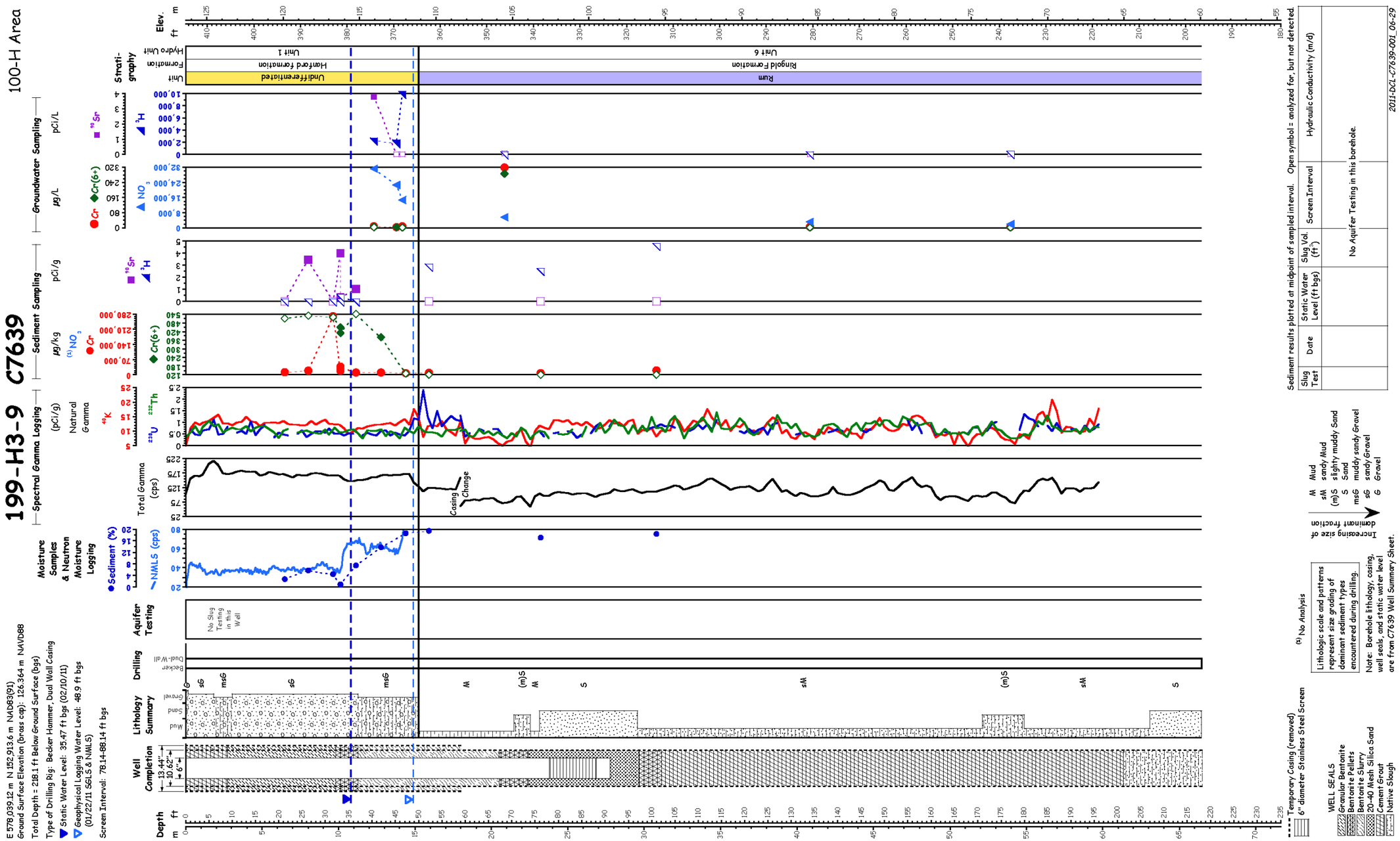
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-23. Well 199-H1-7 (C7630) Log



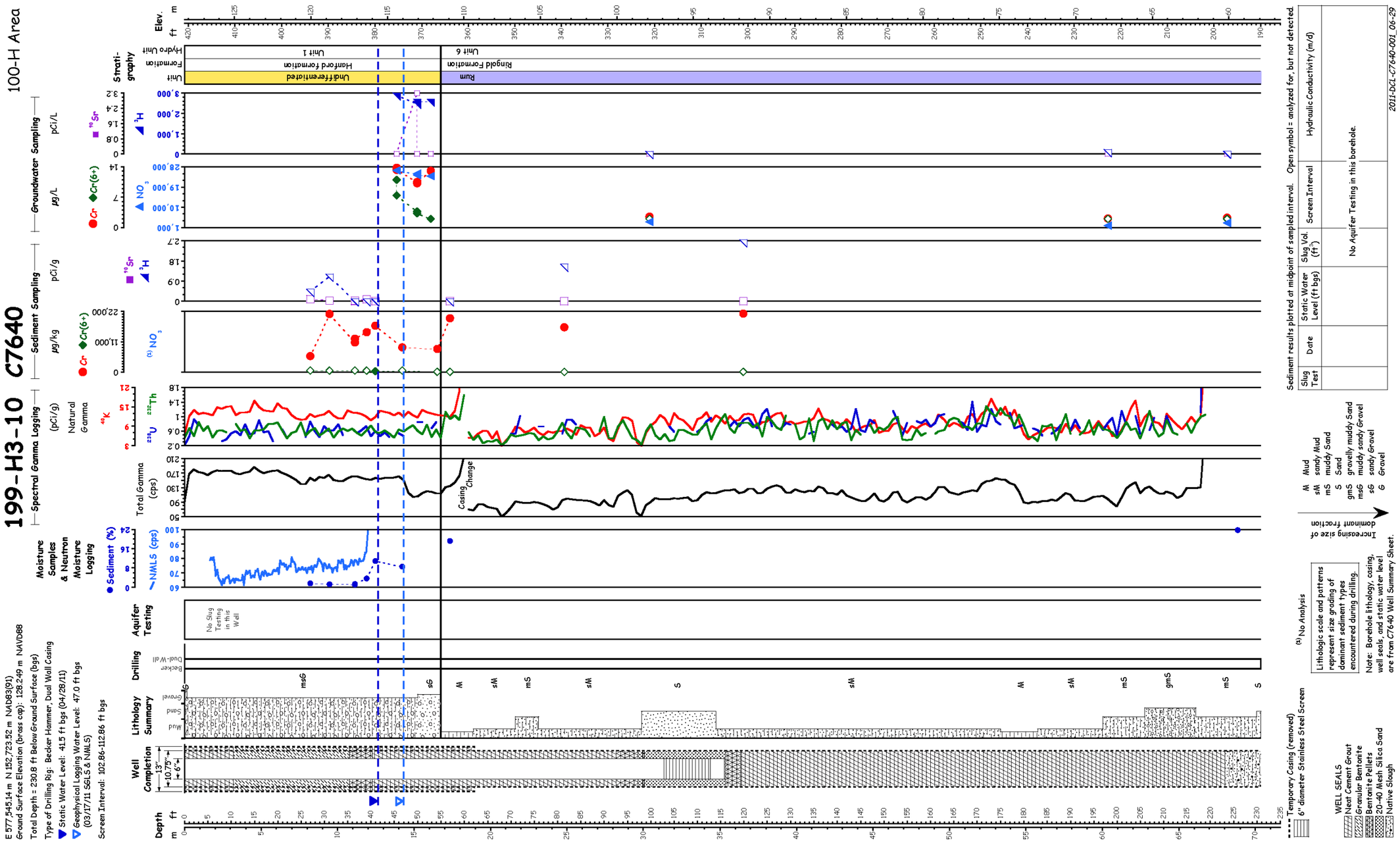
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-24. Well 199-H2-1 (C7631) Log



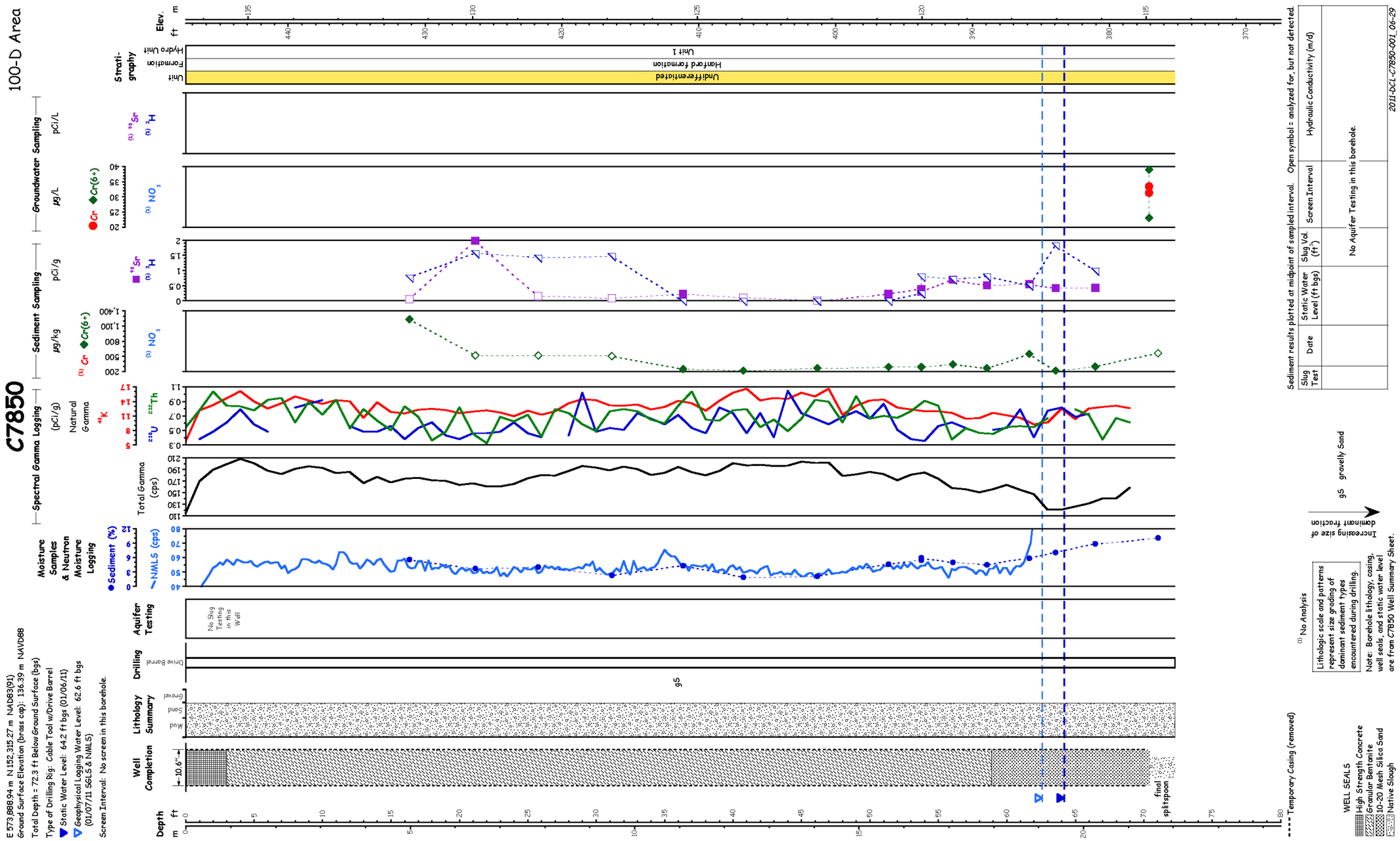
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-25. Well 199-H3-9 (C7639) Log



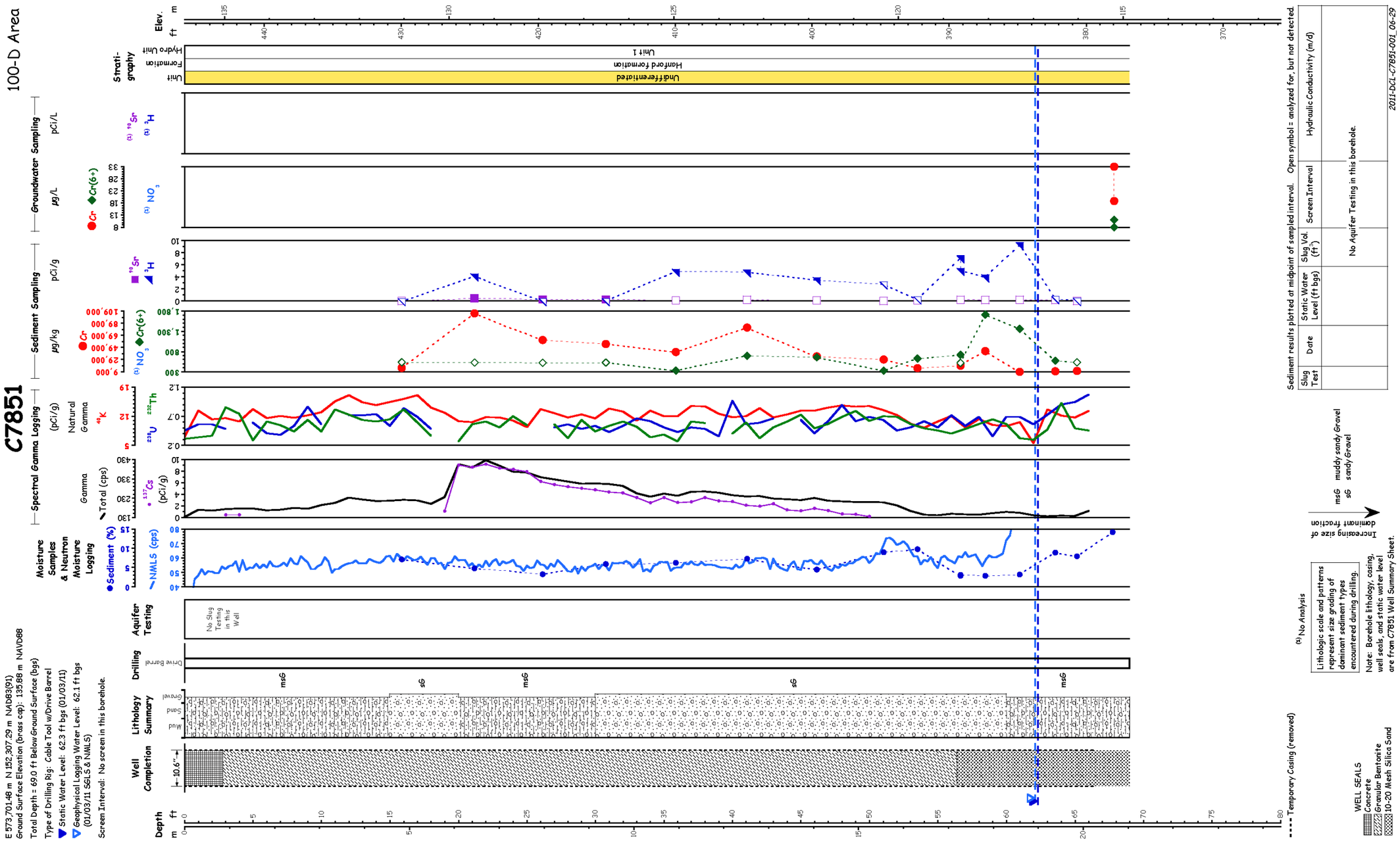
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-26. Well 199-H3-10 (C7640) Log



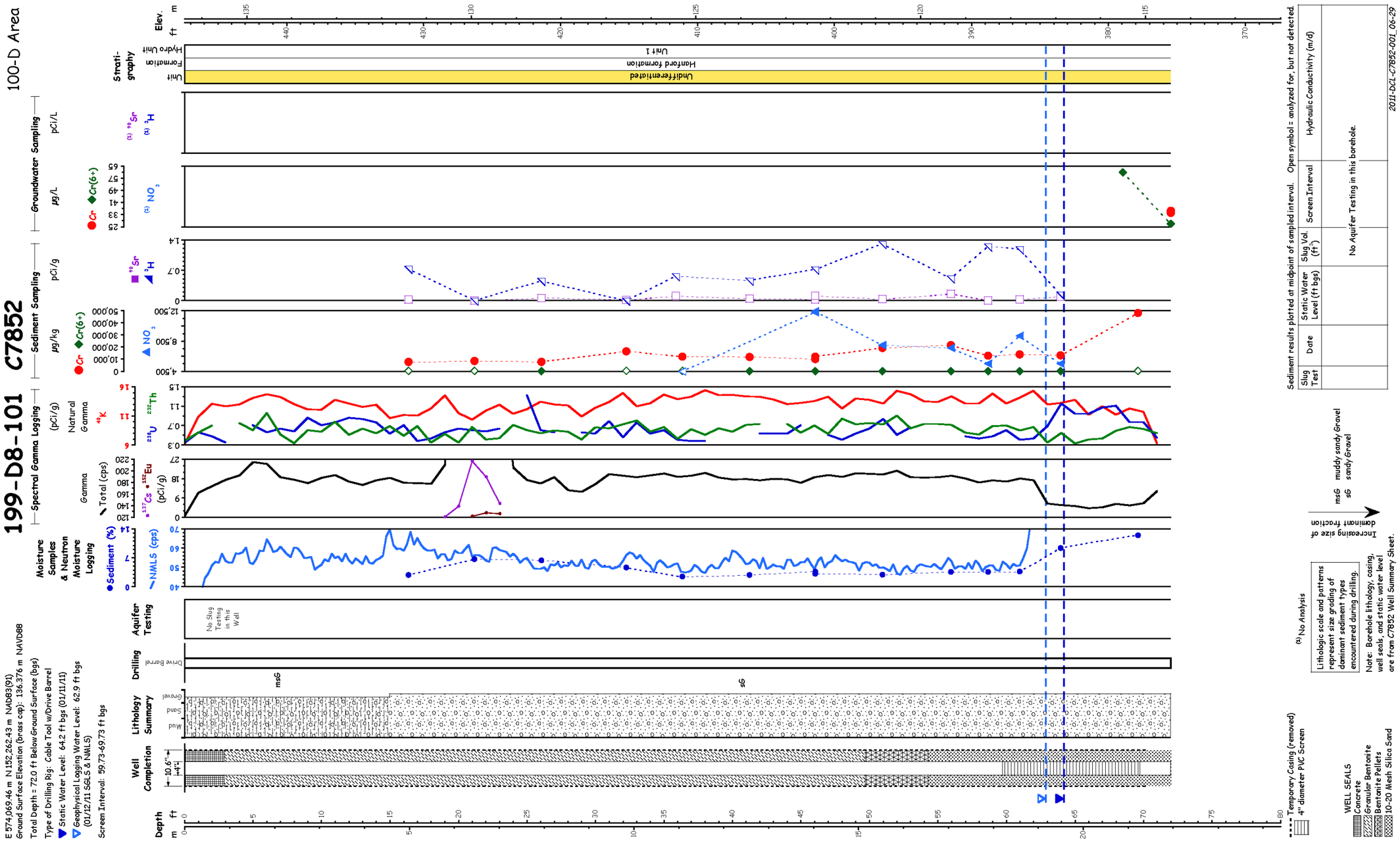
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-27. Borehole C7850 Log



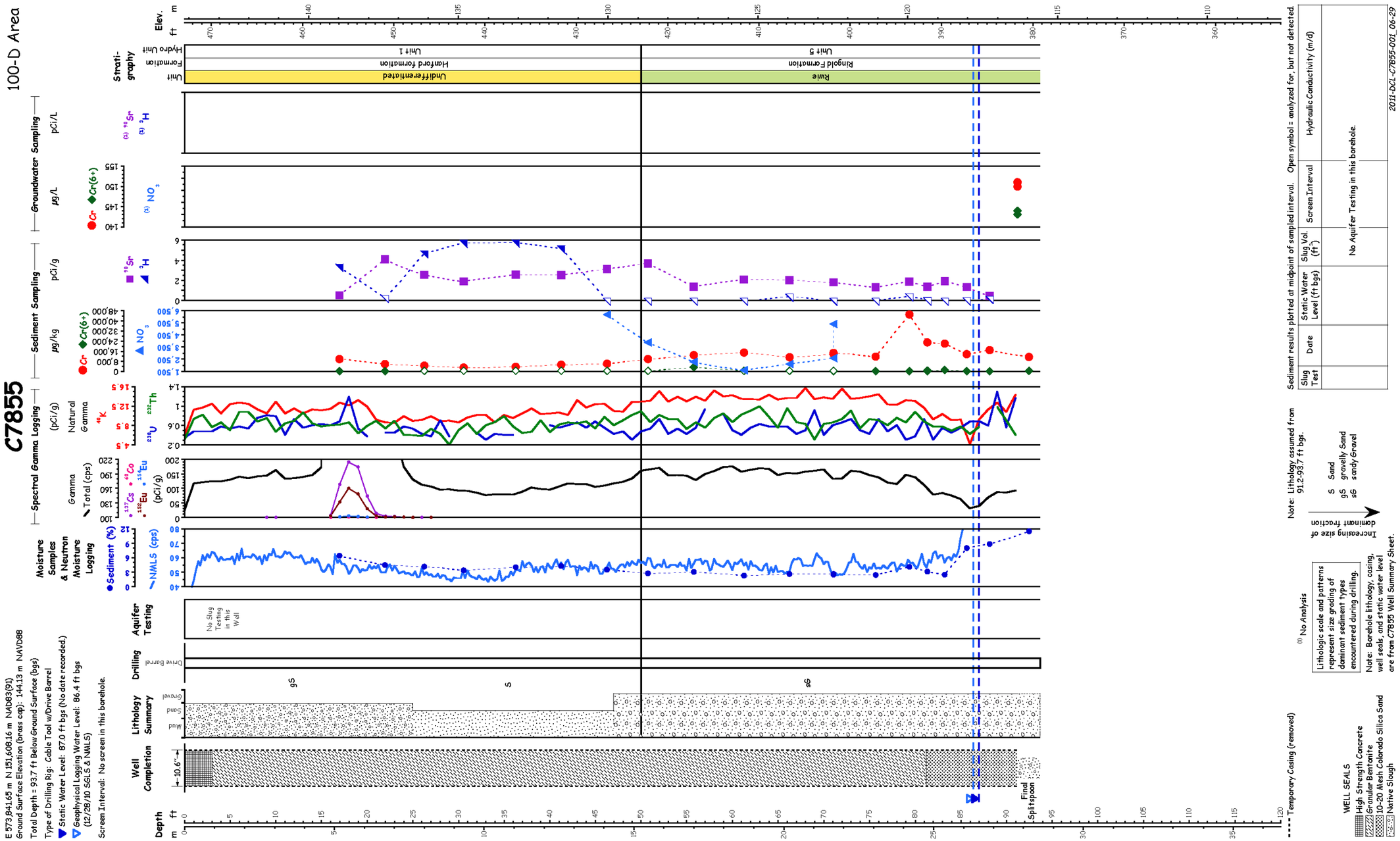
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-28. Borehole C7851 Log



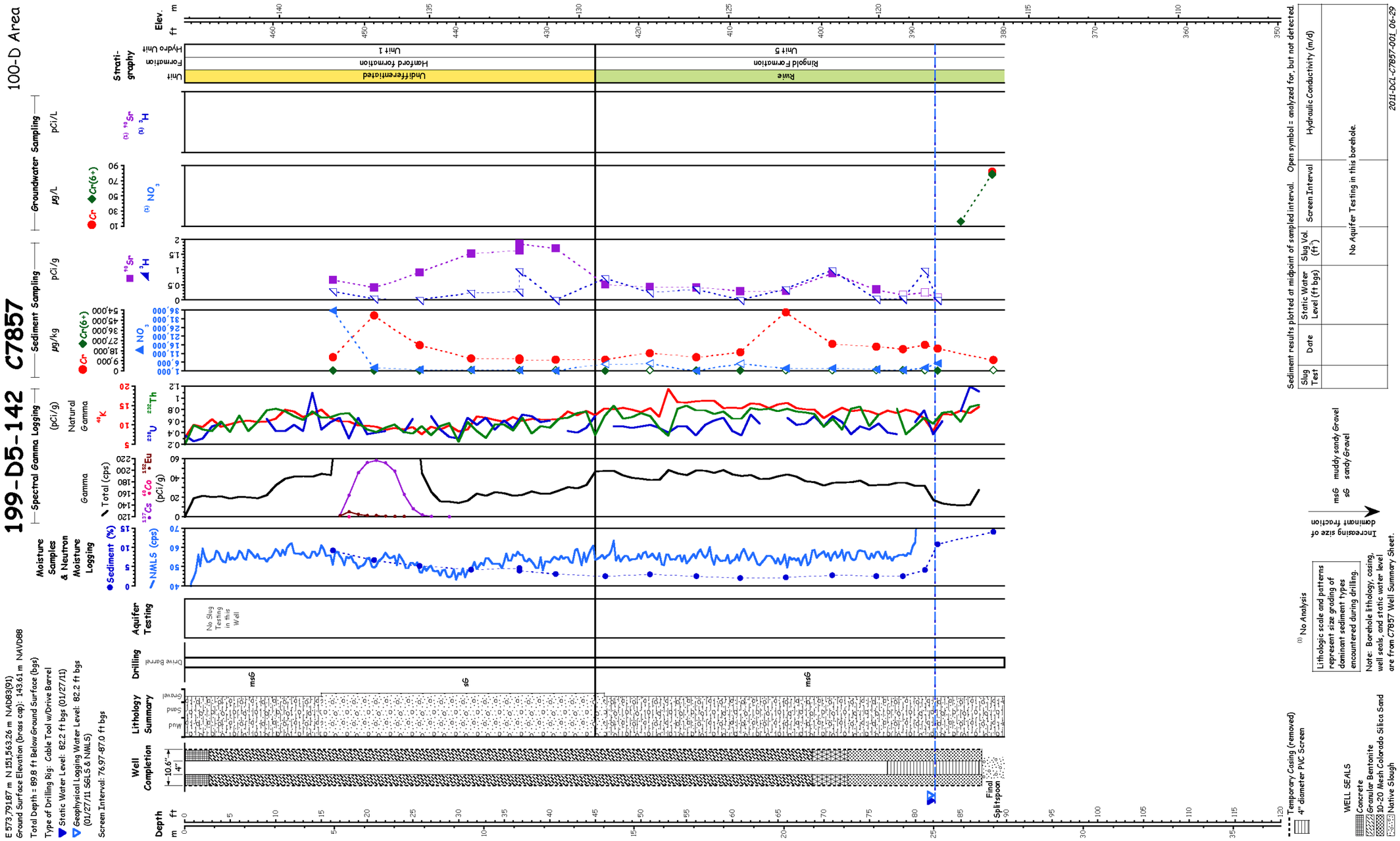
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-29. Well 199-D8-101 (C7852) Log



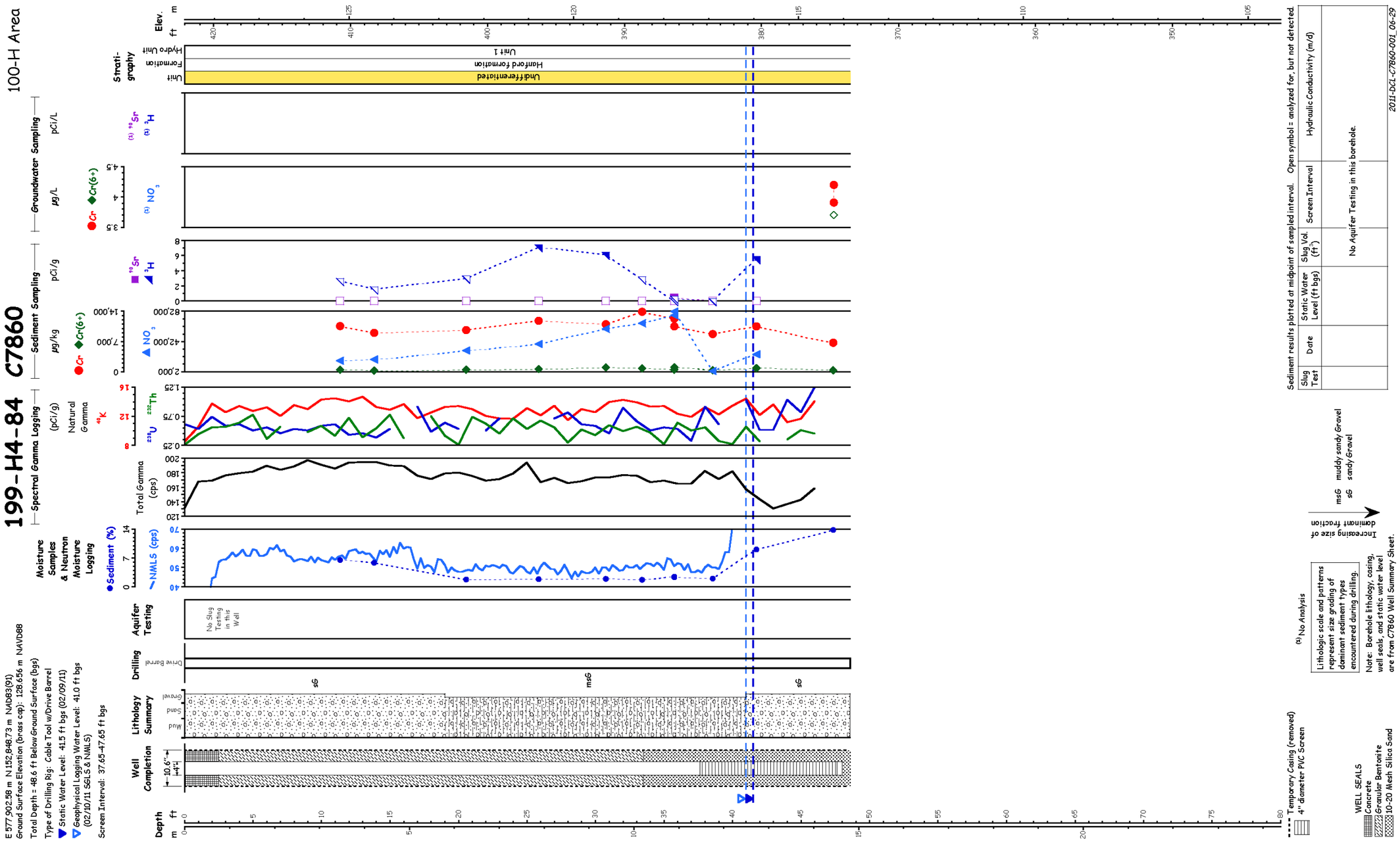
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-30. Borehole C7855 Log



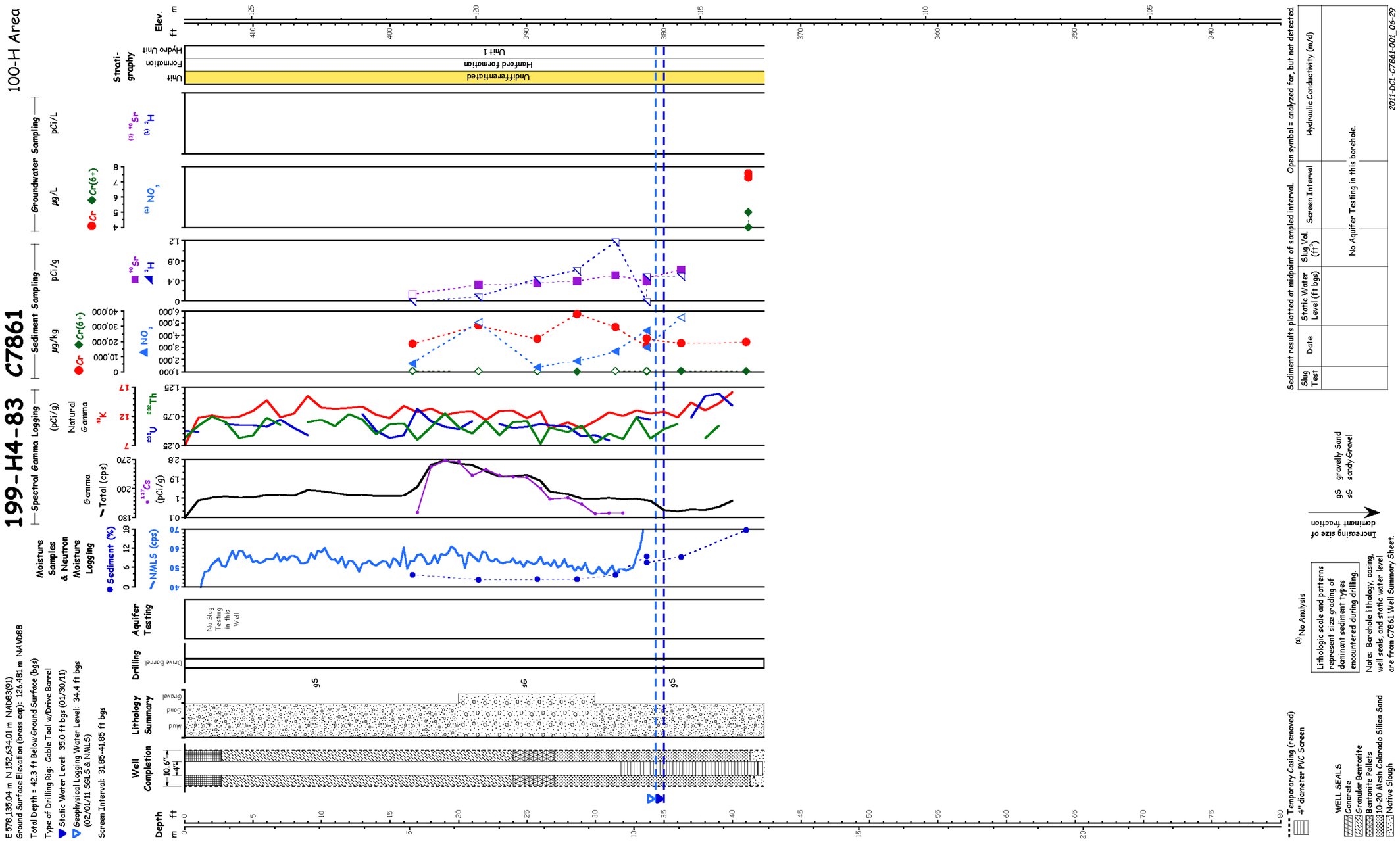
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-31. Well 199-D5-142 (C7857) Log



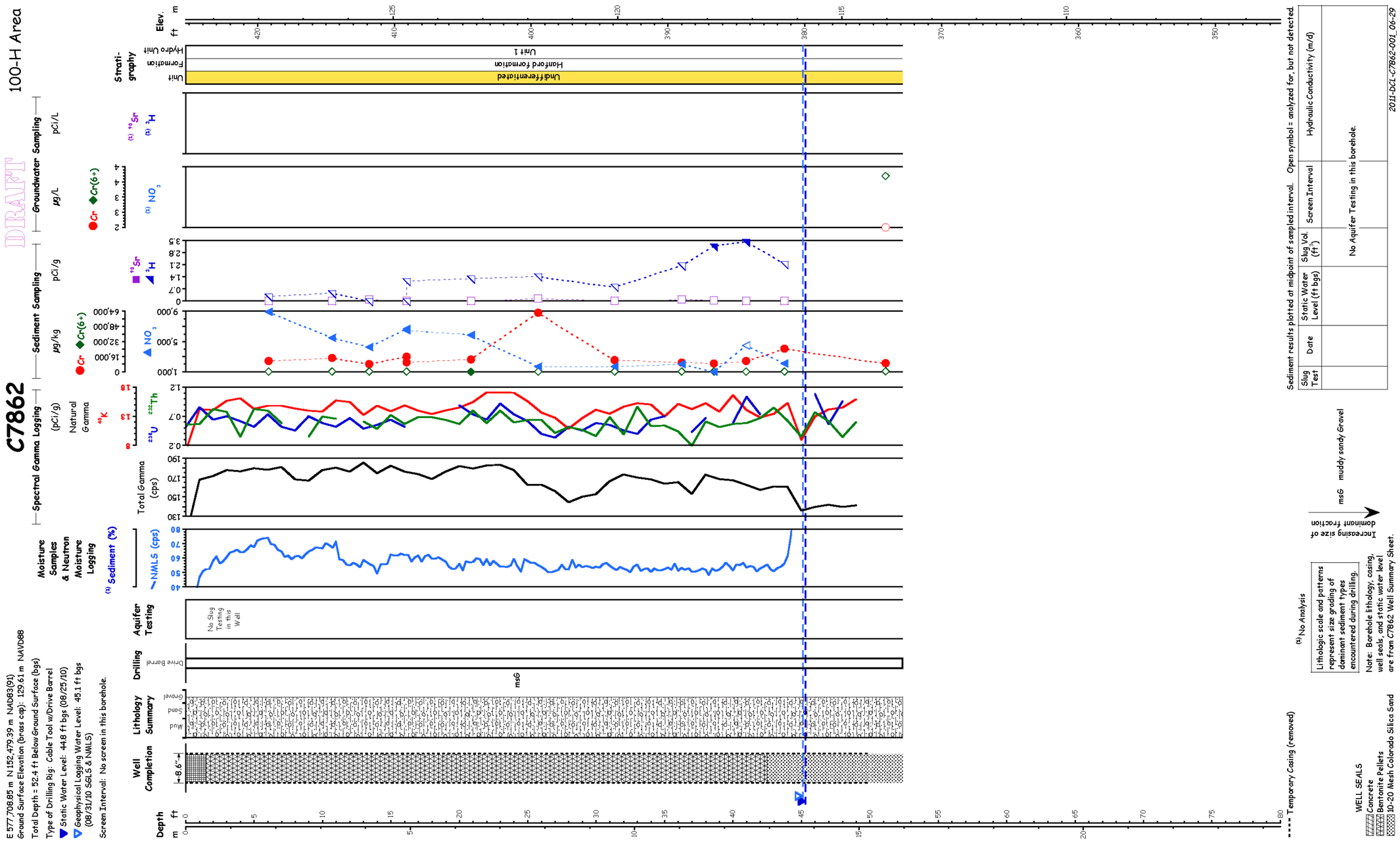
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-32. Well 199-H4-84 (C7860) Log



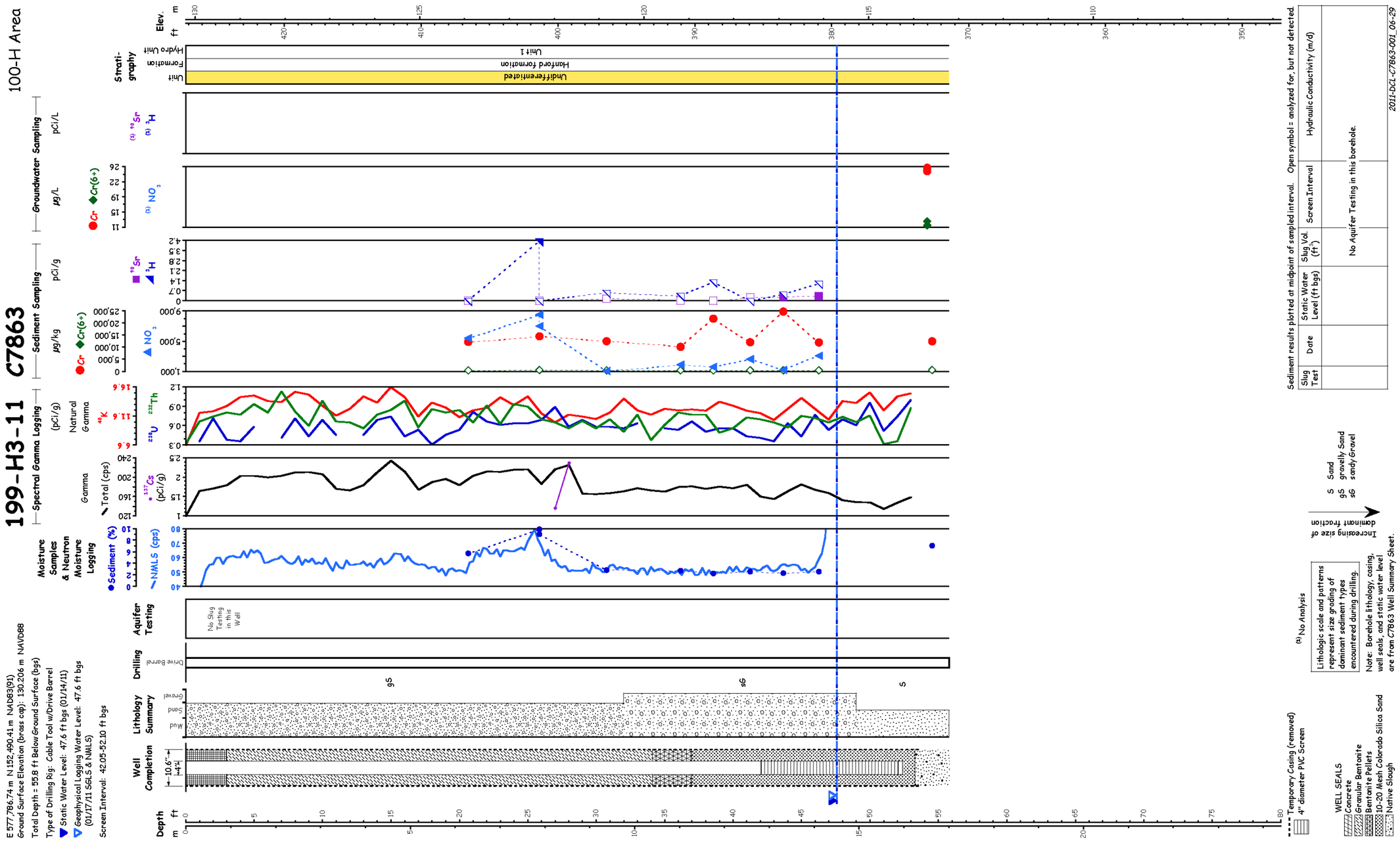
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-33. Well 199-H4-83 (C7861) Log



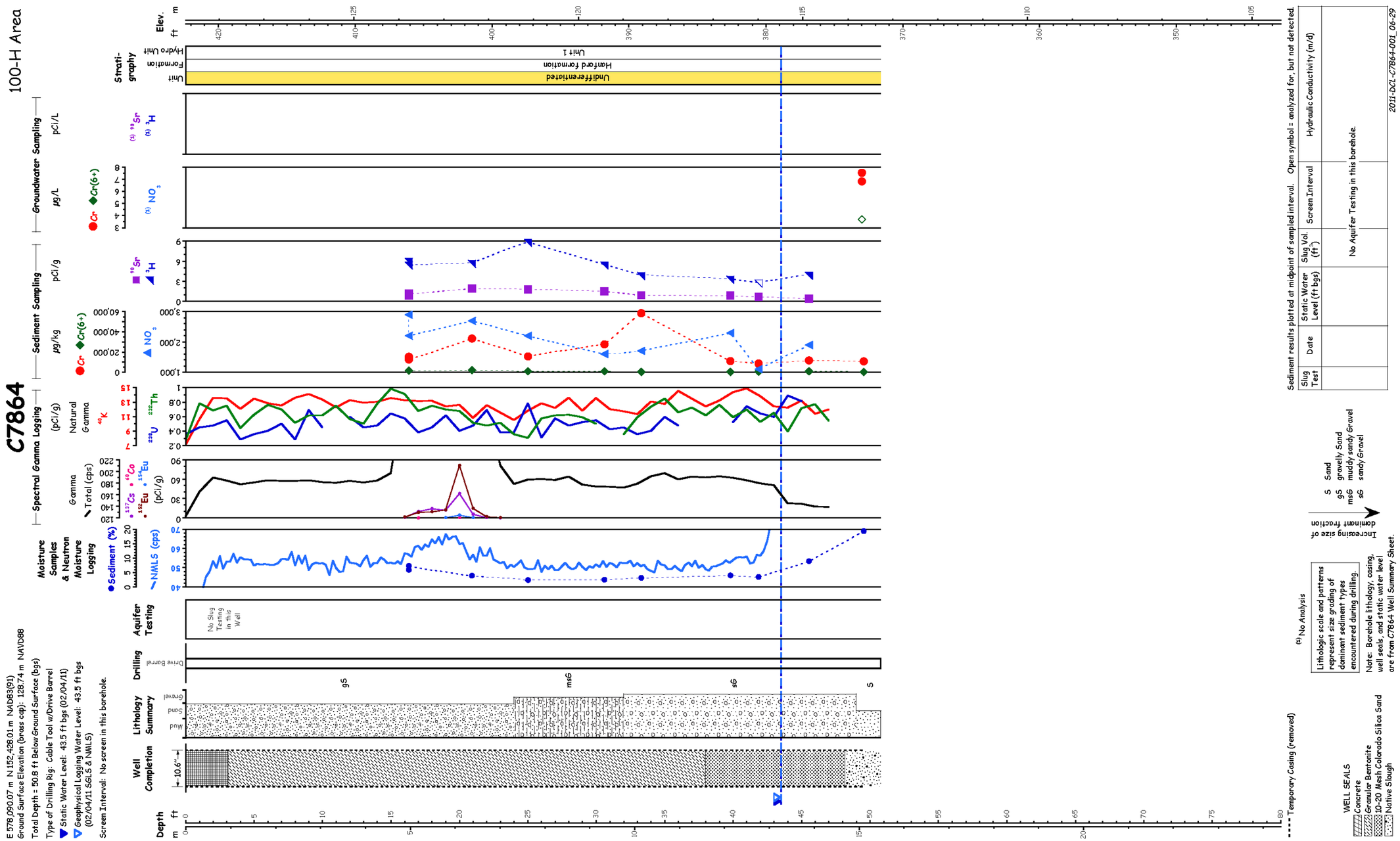
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-34. Borehole C7862 Log



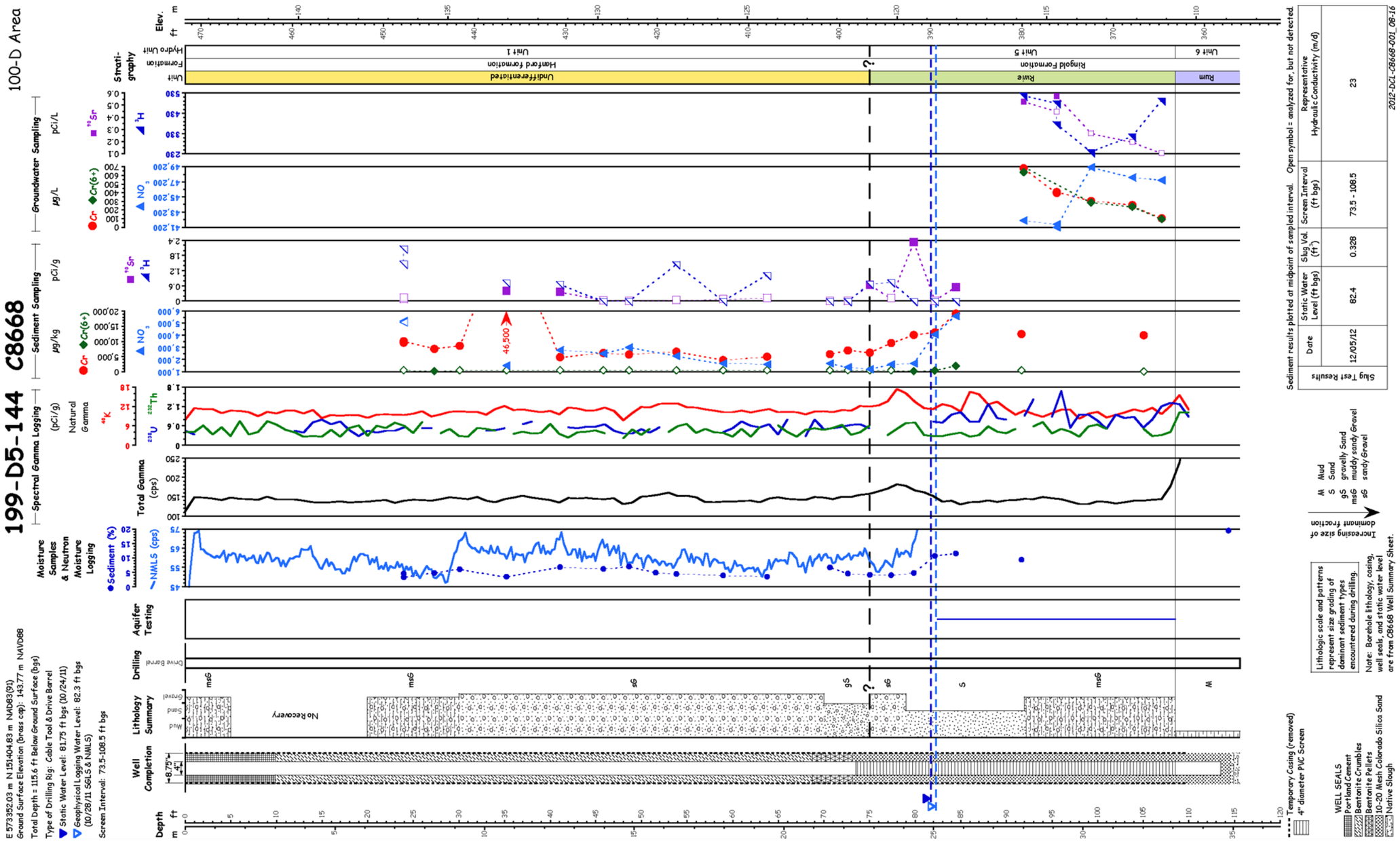
Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-35. Well 199-H3-11 (C7863) Log



Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-36. Borehole C7864 Log



Sources: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure M-37. Well 199-D5-144 (C7864) Log

M5 Borehole/Well Physical Property Data

Table M-2 presents the physical property results for soil samples collected during drilling.

M6 Hydraulic Conductivity Data

Table M-3 provides the vertical hydraulic conductivity data. The slug test analysis is presented in *Analysis of Slug Test Data at the 100-HR-3 Operable Unit* (ECF-100HR3-12-0011). Table M-4 summarizes historical site-specific information on horizontal saturated hydraulic conductivity for the Hanford formation, Ringold Formation unit E, first water-bearing unit in the RUM, and the lower water-bearing unit with the RUM (presumed to be Ringold Formation unit B). Table M-5 incorporates data from *100-HR-3 Remedial Process Optimization Modeling Data Package* (SGW-40781). Values in this table are based on slug and pumping test field data from 100-D/H. As part of a modeling effort (*Conceptual Framework and Numerical Implementation of 100 Areas Groundwater Flow and Transport Model* [SGW-46279]), the hydraulic conductivity data were evaluated to estimate representative values for the Ringold Formation unit E and the Hanford formation.

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Table M-2. Physical Property Results for 100-D/H Soil Samples

Well ID/Waste Site ID Borehole ID & Sample Interval		Sample Depth Interval (m bgs)		Sample Depth Interval (ft bgs)		Interpreted Stratigraphic Formation	Bulk Density (kg/m^3)		Grain Size (% Passing Sieve)												Size Classification (%)		
							Wet	Dry	3 in.	1.5 in.	0.75 in.	0.375 in.	#4	#10	#20	#40	#60	#100	#140	#200	Gravel	Sand	Silt/Clay
199-D3-5 (C7620)	I-001*	16.3	17.2	53.4	56.4	Hanford	2137	2094	100	89.9	74.4	59.6	45.9	35.3	24.4	15.2	11.4	8.8	7.5	6.4	54.1	39.5	6.4
	I-002*	17.7	18.5	58.1	60.6	Hanford	1150	1130	100	74.3	67.4	60.9	57	51.9	44.6	26.8	18.4	13.9	11.8	9.9	43	47.1	9.9
	I-003*	19.4	20.3	63.6	66.6	Hanford	1988	1911	100	100	76.3	59.7	49.1	40	29.3	17.3	13	10.5	9.2	8.2	50.9	40.9	8.2
199-D5-132 (C7622)	I-009*	16.8	17.6	55.2	57.7	Ringold unit E	1855	1791	100	100	90.2	80.3	76.5	73.6	72.7	71.5	44.5	17.7	12.9	9.9	23.5	66.6	9.9
	I-011*	19.9	20.7	65.4	67.9	Ringold unit E	2080	2046	100	90.7	67.5	45.7	36.4	29.8	26.9	24.7	18.7	12.4	10	8.2	63.6	28.2	8.2
	No interval given (RUM Contact)	32.6	33.4	107.0	109.5	RUM	1908	1450	100	100	100	100	100	100	99.9	98.3	95.3	88.2	82.5	77.8	0	22.2	77.8
199-D5-133 (C7621)	I-002*	15.4	16.2	50.6	53.1	Hanford	1887	1820	100	90.7	76.9	63.3	57.9	53.6	46.2	37	24.7	16.8	13.7	11.2	42.1	46.7	11.2
	I-022	31.2	32.0	102.5	105.0	Ringold unit E	2057	1660	100	100	100	100	100	100	97	63.7	13.8	1.4	0.9	0.6	0	99.4	0.6
199-D5-134 (C7624)	I-001*	14.0	14.7	45.9	48.3	Hanford	1791	1735	100	82.1	71.1	56.8	43.8	33.5	28.8	25.6	16.4	8.9	7.1	5.8	56.2	38	5.8
	I-002*	15.8	16.6	51.8	54.3	Hanford/Ringold Unit E contact	2160	2041	100	100	68.8	46.3	38.5	32.2	26.7	16.4	11.1	8.2	6.9	6	61.5	32.5	6
	I-003*	17.2	17.8	56.3	58.3	Ringold unit E	2062	1868	100	100	93.8	91.4	89.9	88.2	87	82.3	53.7	30.3	23.5	19.1	10.1	70.8	19.1
	I-004*	18.6	18.8	61.0	61.7	Ringold unit E	1962	1921	100	86.7	73.6	49.6	35.6	27.1	24.6	21.9	17.2	11.1	8	6.1	64.4	29.5	6.1
	I-025	33.8	34.6	111.0	113.5	RUM	1975	1590	100	100	100	100	100	100	99.1	98.5	97.5	95.9	94.5	91.4	0	8.6	91.4
	I-030	72.2	73.0	237.0	239.5	Presumably Ringold unit B	2000	1420	100	100	100	100	100	100	100	100	99.7	76.5	28.6	7.5	0	92.5	7.5
199-D5-140 (C7866)	I-007*	13.1	13.9	43.0	45.5	Hanford	1970	1865	100	100	84.3	73.9	63.1	50.4	39.4	28.8	23	18	15.4	13.2	36.9	49.9	13.2
	I-009*	14.5	15.0	47.4	49.1	Hanford/Ringold unit E contact	2135	2095	100	87.1	74.4	59.2	49.5	41.9	37	33.5	27.1	20	17.2	15.3	50.5	34.2	15.3
	I-013*	17.5	18.0	57.5	59.0	Ringold unit E	2080	2052	100	82.5	65.3	50.7	39.9	31.2	23.7	19	14.6	11.3	9.8	8.5	60.1	31.4	8.5
	I-034	33.5	34.4	110.0	112.9	RUM	1991	1626	100	100	100	100	100	100	83.9	76	72.4	69.1	66.4	62.2	0	37.8	62.2
199-D5-141 (C7625)	I-012*	22.9	23.7	75.2	77.7	Ringold unit E	2062	1946	100	100	71.6	55.1	48	44.1	42.8	39.2	18.4	7.5	5.4	4.2	52	43.8	4.2
	I-014*	24.4	25.2	80.0	82.5	Ringold unit E	2368	2236	100	92.9	72	52.3	40.5	25.1	21.8	18.3	12.7	7.6	5.9	4.8	59.5	35.7	4.8
	I-030	32.2	32.9	105.5	108.0	Ringold unit E	2026	1621	100	100	100	100	100	100	100	71.8	7.6	1.8	1.2	0.8	0	99.2	0.8
	I-031	34.6	35.4	113.5	116.0	RUM	2203	1913	100	100	100	100	100	100	100	98	67.8	45.7	39.4	35.1	0	64.9	35.1
	I-036	95.8	96.5	314.2	316.7	Presumably Ringold unit B	2081	1590	100	100	100	100	100	100	100	99.8	84.4	21.4	8.4	4.7	0	95.3	4.7

Table M-2. Physical Property Results for 100-D/H Soil Samples

Well ID/Waste Site ID Borehole ID & Sample Interval		Sample Depth Interval (m bgs)		Sample Depth Interval (ft bgs)		Interpreted Stratigraphic Formation	Bulk Density (kg/m^3)		Grain Size (% Passing Sieve)												Size Classification (%)		
							Wet	Dry	3 in.	1.5 in.	0.75 in.	0.375 in.	#4	#10	#20	#40	#60	#100	#140	#200	Gravel	Sand	Silt/Clay
199-D5-143 (C8375)	I-006*	11.4	11.8	37.5	38.7	Hanford	2171	2079	100	75.2	45.3	36	29.4	23.1	18	9.7	7.2	5.9	5.1	4.4	70.6	25	4.4
	I-008*	12.9	13.3	42.4	43.6	Hanford	1964	1780	100	76.6	64.2	48.9	39.5	30.7	24.6	12.9	9.2	7.1	6.2	5.4	60.5	34.1	5.4
	I-010*	14.5	14.8	47.5	48.7	Hanford	2388	2263	100	89.9	68.4	52.3	40.4	30.6	25.4	21.2	12.2	7.5	6.1	5	59.6	35.4	5
	I-012*	16.0	16.7	52.4	54.9	Hanford	2103	2062	100	100	75.4	55.1	45.3	39.1	34.2	31	24.8	14.4	11.4	9.5	54.7	35.8	9.5
	I-013A*	17.6	17.8	57.8	58.3	Ringold unit E	2150	2060	100	79.7	47.8	37.2	28	20	14.3	11	9.2	7	5.8	4.8	72	23.2	4.8
	I-028A	30.5	31.2	100.0	102.5	Ringold unit E	1943	1857	62.7	37.5	37	33.4	30	26	22.8	14.3	7.9	5.3	4.4	3.6	70	26.4	3.6
	I-035	32.9	33.5	108.0	109.8	RUM	1220	947	100	100	100	100	95.9	90.4	85.1	82	80.2	78.5	77.2	75.8	4.1	20.1	75.8
199-D5-144 (C8668)	I-009*	15.5	15.9	50.9	52.2	Hanford	2148	2094	100	81.6	74.3	57.4	41.5	33.4	25.5	10	6.9	5.4	4.7	4.3	58.5	37.2	4.3
	I-011*	18.0	18.7	58.9	61.4	Hanford	1941	1879	100	100	78.5	63	56.2	50.7	43.1	10.4	4.4	3.3	2.9	2.7	43.8	53.5	2.7
	I-015*	21.2	21.9	69.4	71.9	Ringold unit E?	1941	1866	100	77.6	70.1	62.4	57.3	50.3	42.5	26	15.7	11.7	10	8.6	42.7	48.7	8.6
	I-034	34.5	35.2	113.1	115.6	RUM	2070	1692	100	100	100	100	100	100	100	99.8	94	86.8	84.4	83.1	0	16.9	83.1
199-D6-3 (C7623)	I-001*	17.4	18.0	57.0	58.9	Hanford	2303	2278	100	100	61.6	42.6	36.1	30.2	27	24.2	15.1	8.5	7	6	63.9	30.1	6
	I-002*	18.9	19.5	62.0	64.0	Ringold unit E	2782	2750	100	82.1	59.1	44.3	33.7	26.1	19.8	16.4	12.6	8.8	7.2	5.9	66.3	27.8	5.9
199-H1-7 (C7630)	I-003*	6.1	6.9	20.0	22.5	Hanford	2281	2252	100	75	60	46.2	38.7	32.7	27.9	12.1	5.2	3.4	2.9	2.5	61.3	36.2	2.5
	I-016	9.8	10.5	32.0	34.5	RUM	1953	1624	100	100	100	100	98.8	98.7	96.8	94.8	91.8	84.4	77	68.6	1.2	30.2	68.6
199-H2-1 (C7631)	I-006	10.9	11.6	35.7	38.1	Hanford/RUM contact	1903	1616	100	100	100	100	100	100	98.4	96.1	92.7	70.6	50.8	36	0	64	36
	I-007	11.5	12.3	37.8	40.3	Hanford/RUM contact	2105	1799	100	100	100	100	100	100	99.1	97.9	96	72.8	47.7	28.9	0	71.1	28.9
	I-020	48.3	49.0	158.3	160.8	RUM	1996	1370	100	100	100	100	100	100	100	100	99.9	88.3	42.9	11.7	0	88.3	11.7
199-H3-10 (C7640)	I-015	16.2	16.9	53.1	55.4	Hanford	2525	2382	100	86.4	65.3	50.4	41.4	34.9	31.1	17.6	9.8	6.8	5.6	4.7	58.6	36.7	4.7
	I-016	17.0	17.7	55.7	58.2	Hanford/RUM contact	2070	1642	100	100	100	100	100	100	87.9	80.2	75.1	66.7	58.1	48.7	0	51.3	48.7
	I-021	68.2	69.5	223.6	228.1	Presumably Ringold unit B	1965	1530	100	100	100	100	100	100	98.6	94.6	71	39.5	27.5	17.4	0	82.6	17.4
199-H3-6 (C7626)	I-018	16.7	17.3	54.9	56.9	RUM	1999	1611	100	100	100	100	100	100	99.2	97.9	96.6	93.4	89.3	84.2	0	15.8	84.2
199-H3-7 (C7627)	I-003	11.0	11.7	36.0	38.5	Hanford	2153	2110	100	92.5	78.3	56.2	44.9	36.7	32	20.6	11.6	7.9	6.5	5.4	55.1	39.5	5.4
	I-017	16.3	17.1	53.6	56.1	RUM	1730	1250	100	100	100	100	100	100	96.5	92.9	90.6	87.9	85.8	82.3	0	17.7	82.3

Table M-2. Physical Property Results for 100-D/H Soil Samples

Well ID/Waste Site ID Borehole ID & Sample Interval		Sample Depth Interval (m bgs)		Sample Depth Interval (ft bgs)		Interpreted Stratigraphic Formation	Bulk Density (kg/m^3)		Grain Size (% Passing Sieve)												Size Classification (%)		
							Wet	Dry	3 in.	1.5 in.	0.75 in.	0.375 in.	#4	#10	#20	#40	#60	#100	#140	#200	Gravel	Sand	Silt/Clay
199-H3-9 (C7639)	I-017	14.0	14.8	46.0	48.5	Hanford	2161	1911	100	100	78.2	60.9	57.2	55.1	54	43.7	10.2	3.2	2.2	1.6	42.8	55.6	1.6
	I-018	15.5	16.3	51.0	53.5	RUM	1996	1608	100	100	100	100	100	100	88.7	80.3	72.9	53.7	39.6	30.2	0	69.8	30.2
	I-021	22.9	23.5	75.2	77.2	RUM water-bearing	2161	1767	100	100	100	100	100	100	100	98.9	76.9	29.9	9.1	2.4	0	97.6	2.4
	I-022	30.5	31.1	100.0	102.0	RUM	2001	1643	100	100	100	100	100	100	94.1	87.4	80.9	67.5	56.9	45	0	55	45
199-H6-3 (C7628)	I-018	18.4	19.2	60.5	63.0	RUM	1937	1550	100	100	100	100	100	100	99.7	98.4	96.8	94.5	92.4	89.1	0	10.9	89.1
199-H6-4 (C7629)	I-018	17.9	18.4	58.8	60.6	RUM	1977	1605	100	100	100	100	100	100	99.5	98.3	97.2	96.1	95.3	93.7	0	6.3	93.7
199-D5-128 (C7612)	I-002	26.8	27.6	88.0	90.5	Ringold unit E	NC	1323	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
	I-003	29.0	29.6	95.2	97.0	Ringold unit E	NC	1041	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
	I-004	30.2	30.9	99.0	101.5	RUM	NC	1483	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
	I-005	31.5	32.3	103.4	105.9	RUM	NC	1296	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
199-H1-35 (C7106)	I-004	13.2	13.9	43.2	45.7	RUM	NC	1314	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
	I-005	13.9	14.6	45.5	48.0	RUM	NC	1848	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
199-H1-36 (C7102)	I-004	11.9	12.7	39.0	41.5	RUM	NC	1496	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
	I-005	13.4	14.2	44.0	46.5	RUM	NC	1767	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
199-D7-5 (C7608)	I-002	13.4	14.1	43.9	46.1	Hanford	NC	1734	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
	I-004	16.5	17.1	54.0	56.2	Hanford/RUM contact	NC	1558	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
199-D7-6 (C7611)	I-001	6.7	7.5	22.1	24.6	Hanford	NC	1408	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
	I-003	11.1	11.9	36.5	39.0	Hanford/RUM contact	NC	1189	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
	I-006	12.5	13.3	41.0	43.5	RUM	NC	1774	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
199-H1-2 (C7584)	I-003	12.74	13.5	41.80	44.29	Hanford	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
	I-004	13.4	14.1	46.2	48.7	Hanford/RUM contact	NC	1648	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
	I-005	15.9	16.6	52.0	54.5	RUM	NC	1915	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
199-H1-4 (C7604)	I-004	12.5	13.4	41.0	43.8	Hanford/RUM contact	NC	1459	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
	I-005	14.3	15.0	46.8	49.1	RUM	NC	1304	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC

Table M-2. Physical Property Results for 100-D/H Soil Samples

Well ID/Waste Site ID Borehole ID & Sample Interval		Sample Depth Interval (m bgs)		Sample Depth Interval (ft bgs)		Interpreted Stratigraphic Formation	Bulk Density (kg/m^3)		Grain Size (% Passing Sieve)												Size Classification (%)		
							Wet	Dry	3 in.	1.5 in.	0.75 in.	0.375 in.	#4	#10	#20	#40	#60	#100	#140	#200	Gravel	Sand	Silt/Clay
199-D4-96 (C7084)	I-004	30.5	31.1	100.0	102.0	Ringold Unit E/RUM contact	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
	I-005	31.7	32.5	104.1	106.6	RUM	NC	1264	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
199-D8-89 (C7091)	I-004	24.0	24.6	78.8	80.8	RUM	NC	1211	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
	I-005	25.1	25.9	82.3	84.9	RUM	NC	1106	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
C7850	I-006*	12.0	12.8	39.5	42.0	Hanford	2164	2137	100	74.5	60.8	46.8	38.5	32.2	28.8	21.4	13.9	9.3	7.7	6.5	61.5	32	6.5
	I-013*	19.0	19.8	62.3	64.8	Hanford	2385	2230	100	91.1	79.5	72.4	65.8	59.7	50.8	27.9	19.5	15	13.1	11.4	34.2	54.4	11.4
C7851	I-015	20.3	21.0	66.5	69.0	Ringold unit E?	2265	2143	100	75.4	64.4	53.2	37.6	26.8	20.3	12.9	7.2	4	3	2.4	62.4	35.2	2.4
C7855	I-007*	13.7	14.5	45.0	47.5	Hanford	1927	1885	100	70.8	61.1	47.9	39.8	34	25.3	8	4.9	3.7	3.4	3.1	60.2	36.7	3.1
C7864	I-003*	7.5	7.8	24.5	25.5	Hanford	2324	2283	100	84.5	75.4	63.7	53.3	43.9	38.1	31.7	23.8	19.1	16.9	14.8	46.7	38.5	14.8
100-D-12*	Trench Sample	2.4	3.0	8.0	10.0	Hanford	1941	1855	100	100	96.5	76.2	56.2	37.7	27.1	16.2	9	6	4.9	4	43.8	52.2	4
		3.0	3.7	10.0	12.0	Hanford	1885	1799	100	100	89.9	62.5	46.6	36.1	23.2	12.2	9	7.1	6.1	5.3	53.4	41.3	5.3
		4.0	4.6	13.0	15.0	Hanford	1669	1580	100	100	97.2	75.3	63.3	52.2	43.1	23.3	14.1	9.8	7.9	6.3	36.7	57	6.3
		4.6	5.2	15.0	17.0	Hanford	1996	1855	100	100	93.1	72.7	61	51.3	39.4	19.7	12.5	9.2	7.6	6.2	39	54.8	6.2
		5.2	5.8	17.0	19.0	Hanford	1879	1816	100	100	87.8	66.1	50.7	33.6	22.2	12.6	5.8	3.3	2.7	2.3	49.3	48.4	2.3
		5.8	6.4	19.0	21.0	Hanford	1981	1929	100	100	64.4	10.9	1.3	1	0.6	0.3	0.2	0.2	0.2	0.2	98.7	1.1	0.2
		6.4	7.0	21.0	23.0	Hanford	1943	1841	100	100	100	83.5	69.4	48.8	35.3	15.4	9	6.6	5.5	4.6	30.6	64.8	4.6
		7.0	7.6	23.0	25.0	Hanford	1710	1677	100	93	47.8	7.1	1.6	1.2	0.9	0.5	0.4	0.4	0.4	0.3	98.4	1.3	0.3

Table M-2. Physical Property Results for 100-D/H Soil Samples

Well ID/Waste Site ID Borehole ID & Sample Interval		Sample Depth Interval (m bgs)		Sample Depth Interval (ft bgs)		Interpreted Stratigraphic Formation	Bulk Density (kg/m^3)		Grain Size (% Passing Sieve)												Size Classification (%)		
							Wet	Dry	3 in.	1.5 in.	0.75 in.	0.375 in.	#4	#10	#20	#40	#60	#100	#140	#200	Gravel	Sand	Silt/Clay
100-D-4*	Trench Sample	2.7	3.4	9.0	11.0	Hanford	1837	1797	100	100	96.5	92.9	89.6	78.2	37.8	5.5	2	1.6	1.5	1.3	10.4	88.3	1.3
		2.7	3.4	9.0	11.0	Hanford	1709	1605	100	100	95.1	83.5	77.8	72.6	58.7	32.8	25.8	21.6	18.3	14.3	22.2	63.5	14.3
		3.4	4.0	11.0	13.0	Hanford	1884	1741	100	100	87	71.1	62.7	58	47.1	29.2	25.4	22.6	20	16.5	37.3	46.2	16.5
		3.4	4.0	11.0	13.0	Hanford	1760	1720	100	100	97.2	94.2	90.2	81.2	43.8	9	4.8	3.7	3	2.5	9.8	87.7	2.5
		4.0	4.6	13.0	15.0	Hanford	1807	1768	100	100	100	95	90.9	71.6	34	3	1.1	0.9	0.8	0.7	9.1	90.2	0.7
		4.0	4.6	13.0	15.0	Hanford	1720	1580	100	100	100	92.8	87.5	81.2	67.2	34.5	27.5	23.8	20.6	16.4	12.5	71.1	16.4
		4.6	5.2	15.0	17.0	Hanford	1733	1676	100	100	92.5	83.3	79.1	71.9	53.5	13.4	6.2	5.2	4.7	4.2	20.9	74.9	4.2
		4.6	5.2	15.0	17.0	Hanford	1830	1743	100	100	71.5	62.8	60.1	56.4	47.3	22.9	15.9	11.8	9.2	7	39.9	53.1	7
		5.2	5.8	17.0	19.0	Hanford	1722	1624	100	100	80.5	72.9	67.1	62.4	50.8	26.9	21	17.6	15	11.8	32.9	55.3	11.8
		5.2	5.8	17.0	19.0	Hanford	1807	1750	100	100	87.6	74.7	68.4	59.6	39.2	10.4	6	5.2	4.8	4.3	31.6	64.1	4.3
116-H-2*	Trench Sample	3.4	4.0	11.0	13.0	Hanford	1700	1642	100	100	94.7	69.7	66.4	65.4	64.5	44.1	12.2	5.8	4.8	4	33.6	62.4	4
		4.0	4.6	13.0	15.0	Hanford	1834	1790	100	100	66.8	43.7	42.2	42.1	41.8	35.6	13.8	3.5	1.9	1.2	57.8	41	1.2
		4.6	5.2	15.0	17.0	Hanford	1828	1772	100	100	90.4	57.8	51	47.8	45.3	14.7	11.2	8.6	7	5.6	49	45.4	5.6
		5.2	5.8	17.0	19.0	Hanford	1773	1717	100	100	95	56.1	49	46.5	43.5	32.1	10.2	2.8	1.9	1.5	51	47.5	1.5
1607-H4*	Trench Sample	3.4	4.0	11.0	13.0	Hanford	1700	1679	100	100	93.7	89.5	87.6	86.5	85.7	57.1	14.9	6.7	5.1	4	12.4	83.6	4
		4.0	4.6	13.0	15.0	Hanford	1560	1500	100	100	100	90.9	85.7	83.3	82.4	48.1	12	6.1	4.9	4.1	14.3	81.6	4.1
		4.6	5.2	15.0	17.0	Hanford	1631	1611	100	100	98.2	94.6	92.9	92.2	91.5	46.4	6.8	1.7	1.2	0.9	7.1	92	0.9
		5.2	5.8	17.0	19.0	Hanford	1570	1530	100	100	100	95.3	90.6	87.3	85	52.4	17.2	10.1	8.3	6.7	9.4	83.9	6.7

*Samples are within the vadose zone.

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Table M-3. Vertical Saturated Hydraulic Conductivity in Soil at 100-D/H

Well ID	Sample ID	Sample Interval		Sample Interval		K-sat (cm/sec)	Moisture Content (%)	Stratigraphic Formation
		Top (m)	Bottom (m)	Top (ft)	Bottom (ft)			
199-H6-4	B273M3	17.9	18.4	58.8	60.5	0.000000930	24.6	RUM
199-D5-133[a]	B27RH6	15.4	16.2	50.6	53.1	0.00933	5.8	Hanford
199-D5-133	B27RV5	31.2	32.0	102.5	105.0	0.0521	19.8	Ringold unit E
199-H3-6	B28JK3	16.7	17.3	54.9	56.9	0.000000300	25.9	RUM
199-H6-3	B28KF7	18.4	19.2	60.5	63.0	0.000000990	21.1	RUM
199-H1-7[a]	B28KV8	6.1	6.9	20.0	22.5	0.00244	1.8	Hanford
199-H1-7	B28KX0	9.8	10.5	32.0	34.5	0.0000000160	22.2	RUM
199-H3-7[a]	B28MV5	11.0	11.7	36.0	38.5	4.00 [b]	2.5	Hanford
199-H3-7	B28N31	16.3	17.1	53.6	56.1	0.000000160	N/A	RUM
199-H3-9	B29C24	14.0	14.8	46.0	48.5	0.0289	18.6	Hanford
199-H3-9	B29C25	15.5	16.3	51.0	53.5	0.0000380	19.4	RUM
199-H3-9	B29C26	22.9	23.5	75.2	77.2	0.00424	17.1	RUM water bearing
199-H3-9	B29C27	30.5	31.1	100.0	102.0	0.00000570	18.4	RLM
199-H3-10	B29CH5	16.2	16.9	53.1	55.4	0.00364	15.1	Hanford
199-H3-10	B29CH6	17.0	17.7	55.7	58.2	0.00000180	19.2	RUM
199-H3-10[c]	B29CJ3	70.1	70.3	230.0	230.8	0.00242	23.7	Ringold unit B
199-H2-1	B29HN8	10.9	11.6	35.7	38.1	0.00000220	N/A	Hanford/RUM
199-H2-1	B29HN9	11.5	12.3	37.8	40.3	0.000130	N/A	Hanford/RUM
199-H2-1	B29HR0	48.3	49.0	158.3	160.8	0.00500	N/A	Ringold unit B
199-D5-134[a]	B29PC4	14.0	14.7	45.9	48.3	0.00240	4.6	Hanford

Table M-3. Vertical Saturated Hydraulic Conductivity in Soil at 100-D/H

Well ID	Sample ID	Sample Interval		Sample Interval		K-sat (cm/sec)	Moisture Content (%)	Stratigraphic Formation
		Top (m)	Bottom (m)	Top (ft)	Bottom (ft)			
199-D5-134[a]	B29PC5	15.8	16.6	51.8	54.3	0.00169	9.9	Hanford/Ringold
199-D5-134[a]	B29PC6	17.2	17.8	56.3	58.3	0.000904	5.3	Ringold unit E
199-D5-134[a]	B29PC7	18.6	18.8	61.0	61.7	0.000974	3.01	Ringold unit E
199-D5-134	B29P76	33.8	34.6	111.0	113.5	0.000000120	17.1	RUM
199-D5-134	B29P77	72.2	73.0	237.0	239.5	0.00472	N/A	RLM water bearing lens
199-D5-141[a]	B29PY1	22.9	23.7	75.2	77.7	0.000899	5.7	Ringold unit E
199-D5-141[a]	B29PY3	24.4	25.2	80.0	82.5	0.000245	7.4	Ringold unit E
199-D5-141	B29R26	32.2	32.9	105.5	108.0	0.0801	N/A	Ringold unit E
199-D5-141	B29R27	34.6	35.6	113.5	116.0	0.0000000140	N/A	RUM
199-D5-141	B29R28	95.8	96.5	314.2	316.7	0.00954	N/A	Ringold unit B
199-D5-132[a]	B28BX9	16.8	17.6	55.2	57.7	0.0101	3.2	Ringold unit E
199-D5-132[a]	B28BY5	19.9	20.7	65.4	67.9	0.00144	7.4	Ringold unit E
199-D5-132	B2BH81	32.6	33.4	107.0	109.5	0.000000220	21.1	RUM
199-D5-140[a]	B29CN2	13.1	13.9	43.0	45.5	0.000130	1.8	Hanford
199-D5-140[a]	B29CN8	14.5	15.0	47.4	49.1	0.00298[b]	1.9	Hanford/Ringold
199-D5-140[a]	B29CR6	17.5	18.0	57.5	59.0	0.00448	1.5	Ringold unit E
199-D5-140	B2BH82	33.5	34.4	110.0	112.9	0.000000570	26.0	RUM
199-D5-143[a]	B2C637	11.4	11.8	37.5	38.7	0.0265	7.6	Hanford
199-D5-143[a]	B2C638	12.9	13.3	42.4	43.6	0.0394	1.5	Hanford
199-D5-143[a]	B2C639	14.5	14.8	47.5	48.7	0.0123	7.5	Hanford

Table M-3. Vertical Saturated Hydraulic Conductivity in Soil at 100-D/H

Well ID	Sample ID	Sample Interval		Sample Interval		K-sat (cm/sec)	Moisture Content (%)	Stratigraphic Formation
		Top (m)	Bottom (m)	Top (ft)	Bottom (ft)			
199-D5-143[a]	B2C5Y1	16.0	16.7	52.4	54.9	0.00689[b]	2.3	Hanford
199-D5-143[a]	B2C642	17.6	17.8	57.8	58.3	0.0573	10.0	Ringold unit E
199-D5-143	B2CKY5	30.5	31.2	100.0	102.5	0.00364	N/A	Ringold unit E
199-D5-143	B2C648	32.9	33.5	108.0	109.8	0.0000000270	N/A	RUM
199-D5-144[a]	B2H4M5	15.5	15.9	50.9	52.2	0.0235	5.0	Hanford
199-D5-144[a]	B2H4M7	18.0	18.7	58.9	61.4	0.0567	3.9	Hanford
199-D5-144[a]	B2H4N1	21.2	21.9	69.4	71.9	0.00505	6.8	Ringold unit E
199-D5-144	B2H4X6	34.5	35.2	113.1	115.6	0.0000000350	19.5	RUM
199-D3-5[a]	B273L7	16.3	17.2	53.4	56.4	0.00761	3.0	Hanford
199-D3-5[a]	B27BT1	17.7	18.5	58.1	60.6	0.00138	1.1	Hanford
199-D3-5[a]	B27BT2	19.4	20.3	63.6	66.6	0.0232	4.2	Hanford
199-D6-3[a]	B28YC5	17.4	18.0	57.0	58.9	0.00296	1.6	Hanford
199-D6-3[a]	B28CY6	18.9	19.5	62.0	64.0	0.0227	2.4	Ringold unit E
C7850[a]	B27YV8	12.0	12.8	39.5	42.0	0.0269[b]	2.0	Hanford
C7850	B27YW5	19.0	19.8	62.3	64.8	0.00693	7.1	Ringold unit E
C7851[a]	B280D5	20.3	21.0	66.5	69.0	0.00845	14.2	Ringold unit E
C7855[a]	B29861	13.7	14.5	45.0	47.5	0.0125	N/A	Hanford
C7864[a]	B28VF6	7.5	7.8	24.5	25.5	0.000761[a]	2.5	Hanford

Table M-3. Vertical Saturated Hydraulic Conductivity in Soil at 100-D/H

Well ID	Sample ID	Sample Interval		Sample Interval		K-sat (cm/sec)	Moisture Content (%)	Stratigraphic Formation
		Top (m)	Bottom (m)	Top (ft)	Bottom (ft)			

Note: RUM samples not submitted for lab testing in wells 199-D3-5 and 199-D6-3 due to poor recovery Hydraulic conductivity was calculated in the laboratory by Method D2434, "Permeability."

a. Samples are within the vadose zone.

b. Vertical hydraulic conductivity values calculated utilizing sieve analyses.

c. The borehole log indicates no recovery in the split spoon from 68.1 to 70.1 m (223.6 to 230.0 ft) bgs. The last split spoon collected was from 70.1 to 70.3 m (230.0 to 230.8 ft) bgs. The depth of the sample was revised accordingly.

Table M-4. 100-D/H Estimated Horizontal Hydraulic Conductivity Values Using Historical Data

Well Number	Easting (m)	Northing (m)	K_s (ft/day)	K_s (cm/sec)	Formation	Test Type	Reference
199-D2-11	573,328.2	151,120.7	205	0.07	Ringold Formation unit E	Pumping	SGW-38757
199-D2-6	573,000.2	151,119.9	40	0.014	Ringold Formation unit E	Slug	DOE/RL-93-43
199-D4-1	572,752.8	151,558.9	76	0.027	Ringold Formation unit E	Pumping	PNNL-13349
199-D4-11	572,768.9	151,554.1	40	0.014	Ringold Formation unit E	Pumping	PNNL-13349
199-D4-12	572,771.6	151,562.1	73	0.026	Ringold Formation unit E	Pumping	PNNL-13349
199-D4-2	572,768.4	151,544	55	0.019	Ringold Formation unit E	Pumping	PNNL-13349
199-D4-2	572,768.4	151,544	61	0.022	Ringold Formation unit E	Pumping	PNNL-13349
199-D4-3	572,766.1	151,546.1	57	0.020	Ringold Formation unit E	Pumping	PNNL-13349
199-D4-3	572,766.1	151,546.1	61	0.022	Ringold Formation unit E	Pumping	PNNL-13349
199-D4-4	572,754.6	151,571.6	105	0.037	Ringold Formation unit E	Pumping	PNNL-13349
199-D4-7	572,760.9	151,551.3	55	0.019	Ringold Formation unit E	Pumping	PNNL-13349
199-D4-8	572,763.3	151,552.6	36	0.013	Ringold Formation unit E	Pumping	PNNL-13349

Table M-4. 100-D/H Estimated Horizontal Hydraulic Conductivity Values Using Historical Data

Well Number	Easting (m)	Northing (m)	K_s (ft/day)	K_s (cm/sec)	Formation	Test Type	Reference
199-D4-9	572,758.2	151,543.3	53	0.019	Ringold Formation unit E	Pumping	PNNL-13349
199-D5-102	573,428.2	151,340.2	237	0.084	Ringold Formation unit E	Pumping	SGW-38757
199-D5-103	573,505.9	151,460.9	101	0.036	Ringold Formation unit E	Pumping	SGW-38757
199-D5-104	573,265.5	151,422.4	236	0.083	Ringold Formation unit E	Pumping	SGW-38757
199-D5-119	573,306.5	151,415.1	156	0.055	Ringold Formation unit E	Pumping	SGW-38757
199-D5-120	573,377.2	151,406.8	177	0.062	Ringold Formation unit E	Pumping	SGW-38757
199-D5-121	573,429.9	151,399.3	28	0.010	Ringold Formation unit E	Pumping	SGW-38757
199-D5-122	573,302.3	151,346.1	167	0.059	Ringold Formation unit E	Pumping	SGW-38757
199-D5-14	573,789.6	151,788	30	0.011	Ringold Formation unit E	Slug	DOE/RL-93-43
199-D5-15	573,738.6	151,673.8	30	0.011	Ringold Formation unit E	Slug	DOE/RL-93-43
199-D5-16	573,917.5	151,652.5	10	0.004	Ringold Formation unit E	Slug	DOE/RL-93-43
199-D5-17	573,730.5	151,322.8	10	0.004	Ringold Formation unit E	Slug	DOE/RL-93-43
199-D5-18	573,861.7	151,325.2	60	0.021	Ringold Formation unit E	Slug	DOE/RL-93-43
199-D5-19	573,849.1	151,243.2	40	0.014	Ringold Formation unit E	Slug	DOE/RL-93-43
199-D5-20	573,240	152,030.2	40	0.014	Ringold Formation unit E	Slug	DOE/RL-93-43
199-D5-97	573,250.1	151,302.5	158	0.056	Ringold Formation unit E	Pumping	SGW-38757
199-D5-98	573,369.6	151,272.4	169	0.060	Ringold Formation unit E	Pumping	SGW-38757
199-D5-99	573,349.6	151,402	92	0.032	Ringold Formation unit E	Pumping	SGW-38757
199-D8-3	573,942.4	152,347.9	1,837	0.648	Ringold Formation unit E	Pumping	PNL-10886
199-D8-53	573,889.9	152,452.3	530	0.187	Ringold Formation unit E	Slug	DOE/RL-93-43
199-D8-55	573,621	152,364.3	20	0.007	Ringold Formation unit E	Slug	DOE/RL-93-43

Table M-4. 100-D/H Estimated Horizontal Hydraulic Conductivity Values Using Historical Data

Well Number	Easting (m)	Northing (m)	K_s (ft/day)	K_s (cm/sec)	Formation	Test Type	Reference
199-D8-54A	573,781.1	152,408	400	0.141	Ringold Formation unit E	Slug	DOE/RL-93-43
199-H3-2C	577,632.1	152,750.3	39	0.014	First water-bearing unit in RUM	Pumping	PNL-6728
199-H3-2C	577,632.1	152,750.3	48	0.017	First water-bearing unit in RUM	Pumping (Recovery)	SGW-47776
199-H4-15C(R)	577,907.7	153,060	350	0.123	Ringold Formation unit B sand (59.1-59.7 m [194-196 ft] bgs)	Pumping	PNL-6728
199-H4-15C(Q)	577,907.7	153,060	0.14	0.00005	RUM (89.9-90.5 m [295-297 ft] bgs)	Pumping	PNL-6728
699-91-46	575,911	151,156.6	790	0.279	Hanford formation	Slug	DOE/RL-93-43
699-93-48	575,094.1	151,795.3	60	0.021	Hanford formation	Slug	DOE/RL-93-43
699-96-43	576,761.5	152,605.3	50	0.018	Hanford formation	Slug	DOE/RL-93-43
199-D2-5	573,812.3	151,148.2	182	0.064	Ringold Formation unit E	Pumping	PNL-10886
199-H3-2A	577,624.6	152,750.1	1,900	0.670	Hanford formation	Pumping	PNL-6471
199-H3-2A	577,624.6	152,750.1	1,900	0.670	Hanford formation	Pumping	PNL-6728
199-H3-2B	577,628.3	152,757.2	100	0.035	Hanford formation	Slug	PNL-6728
199-H4-10	577,827.2	153,155.8	3,445	1.215	Hanford formation	Pumping	PNL-6471
199-H4-10	577,827.2	153,155.8	5,900	2.081	Hanford formation	Pumping	PNL-6728
199-H4-10	577,827.2	153,155.8	5,940	2.081	Hanford formation	Pumping	PNL-6471
199-H4-10	577,827.2	153,155.8	5,878	2.074	Hanford formation	Pumping	PNL-10886
199-H4-11	578,141.9	152,728.4	50	0.018	Hanford formation	Pumping	PNL-6471
199-H4-11	578,141.9	152,728.4	70	0.025	Hanford formation	Slug	PNL-6728
199-H4-11	578,141.9	152,728.4	71	0.025	Hanford formation	Pumping	PNL-6471
199-H4-12A	578,009.2	152,912.7	134	0.047	Hanford formation	Pumping	PNL-10886

Table M-4. 100-D/H Estimated Horizontal Hydraulic Conductivity Values Using Historical Data

Well Number	Easting (m)	Northing (m)	K_s (ft/day)	K_s (cm/sec)	Formation	Test Type	Reference
199-H4-12A	578,009.2	152,912.7	210	0.074	Hanford formation	Pumping	PNL-6728
199-H4-12A	578,009.2	152,912.7	213	0.075	Hanford formation	Pumping	PNL-6471
199-H4-12A	578,009.2	152,912.7	376	0.133	Hanford formation	Pumping	PNL-6471
199-H4-12B	578,004.4	152,918.5	50	0.018	Hanford formation	Slug	PNL-6728
199-H4-12C	578,011.8	152,919.8	140	0.049	First water-bearing unit in RUM	Pumping	PNL-6728
199-H4-12C	578,011.8	152,919.8	47	0.017	First water-bearing unit in RUM	Pumping (Recovery)	SGW-47776
199-H4-13	578,219.3	152,595.3	420	0.148	Hanford formation	Slug	PNL-6728
199-H4-14	577,803.7	152,752.4	250	0.088	Hanford formation	Slug	PNL-6728
199-H4-15A	577,904.3	153,053.4	109	0.038	Hanford formation	Pumping	PNL-6471
199-H4-15A	577,904.3	153,053.4	182	0.064	Hanford formation	Pumping	PNL-6471
199-H4-15A	577,904.3	153,053.4	187	0.066	Hanford formation	Pumping	PNL-10886
199-H4-15A	577,904.3	153,053.4	195	0.069	Hanford formation	Pumping	PNL-6471
199-H4-15A	577,904.3	153,053.4	200	0.071	Hanford formation	Pumping	PNL-6728
199-H4-15B	577,899.6	153,059.5	460	0.162	Hanford formation	Slug	PNL-6728
199-H4-16	577,981.9	152,591.6	220	0.078	Hanford formation	Slug	PNL-6728
199-H4-18	578,018.3	152,756.5	80	0.028	Hanford formation	Slug	PNL-6728
199-H4-3	577,940.5	152,858.5	171	0.060	Hanford formation	Pumping	PNL-10886
199-H4-45	578,156.4	152,433.4	100	0.035	Hanford formation	Slug	DOE/RL-93-43
199-H4-46	577,883.9	152,439.9	120	0.042	Hanford formation	Slug	DOE/RL-93-43
199-H4-47	577,891.2	152,553.3	90	0.032	Hanford formation	Slug	DOE/RL-93-43
199-H4-48	577,792.7	152,620.2	80	0.028	Hanford formation	Slug	DOE/RL-93-43

Table M-4. 100-D/H Estimated Horizontal Hydraulic Conductivity Values Using Historical Data

Well Number	Easting (m)	Northing (m)	K_s (ft/day)	K_s (cm/sec)	Formation	Test Type	Reference
199-H4-49	577,713.8	152,445.2	90	0.032	Hanford formation	Slug	DOE/RL-93-43
199-H4-7	577,804.1	152,890.8	70	0.025	Hanford formation	Slug	PNL-6728
199-H5-1	577,650.1	152,257.7	110	0.039	Hanford formation	Slug	DOE/RL-93-43
199-H6-1	578,236.6	152,247.6	70	0.025	Hanford formation	Slug	DOE/RL-93-43

Sources: DOE/RL-93-43, *Limited Field Investigation Report for the 100-HR-3 Operable Unit*.
PNL-6471, *Interim Characterization Report for the Area Surrounding the 183-H Basins*.
PNL-6728, *Geohydrologic Characterization of the Area Surrounding the 183-H Solar Evaporation Basins*.
PNL-10886, *Development of a Three-Dimensional Ground-Water Model of the Hanford Site Unconfined Aquifer System: FY 1995 Status Report*.
PNNL-13349, *100-D Area In Situ Redox Treatability Test for Chromate-Contaminated Groundwater*.
SGW-38757, *Investigation of Hexavalent Chromium Source in the Southwest 100-D Area*.
SGW-47776, *Aquifer Testing and Rebound Study in Support of the 100-H Deep Chromium Investigation*.

Table M-5. 100-D/H Estimated Horizontal Hydraulic Conductivity Values for RI Wells

Well Name	Aquifer/Water-Bearing Unit	Storage Coefficient (m^{-1})	Estimated Transmissivity (m^2/day)	Estimated Hydraulic Conductivity cm/sec (ft/day)
199-D3-5	Unconfined—Ringold Formation unit E	0.000002	289	0.068 (194)
199-D5-132	Unconfined—Ringold Formation unit E	0.00064	138	0.025 (72)
199-D5-133	Unconfined—Ringold Formation unit E	0.0002	294	0.046 (131)
199-D5-134	First water-bearing unit in RUM	0.0013	0.308	0.00012 (0.33)
199-D5-140	Unconfined—Ringold Formation unit E	DECOMMISSIONED		
199-D5-141	First water-bearing unit in RUM	0.00033	0.610	0.00023 (0.656)
199-D5-142 (temporary)	Unconfined—Ringold Formation unit E	--	--	--

Table M-5. 100-D/H Estimated Horizontal Hydraulic Conductivity Values for RI Wells

Well Name	Aquifer/Water-Bearing Unit	Storage Coefficient (m^{-1})	Estimated Transmissivity (m^2/day)	Estimated Hydraulic Conductivity cm/sec (ft/day)
199-D5-143	Unconfined—Ringold Formation unit E	0.0002	136	0.025 (72)
199-D5-144	Unconfined—Ringold Formation unit E	0.000066	175	0.029 (82)
199-D6-3	Unconfined—Ringold Formation unit E	0.00059	66	0.015 (43)
199-D8-101 (temporary)	Unconfined—Ringold Formation unit E	--	--	--
199-H1-7	Unconfined—Hanford formation	NO DATA – TEST UNRELIABLE		
199-H2-1	First water-bearing unit in RUM	0.00013	6	0.003 (7)
199-H3-6	Unconfined—Hanford formation	0.00022	115	0.049 (138)
199-H3-7	Unconfined—Hanford formation	0.00072	65	0.036 (102)
199-H3-9	First water-bearing unit in RUM	0.00013	2	0.0007 (2)
199-H3-10	First water-bearing unit in RUM	0.00033	5	0.002 (5)
199-H3-11	Unconfined—Hanford formation	--	--	--
199-H4-83	Unconfined—Hanford formation	--	--	--
199-H4-84	Unconfined—Hanford formation	--	--	--
199-H6-3	Unconfined—Hanford formation	0.00002	153	0.035 (98)
199-H6-4	Unconfined—Hanford formation	0.0000096	662	0.147 (417)

Source: ECF-100HR3-12-0011, *Analysis of Slug Test Data at the 100-HR-3 Operable Unit*.

M7 Geochemical Analysis Charts

A summary of the geochemistry of groundwater is presented in Section 3.7. Data used for that evaluation are presented in Table M-6.

Groundwater monitoring wells in the southern Cr(VI) plume in 100-D, with a few exceptions described below, have a similar geochemical pattern. Wells in the southern plume have higher relative levels of calcium, with high levels of carbonate and sulfate. The pattern is represented on Figure M-38 by Well 199-D5-43, shown in dark blue. Those wells with higher Cr(VI) concentrations, such as Well 199-D5-104, have even higher levels of calcium but have the same overall pattern.

The geochemical signature in the northern plume is similar to that found in the southern plume, with the exception of higher sodium plus potassium, sulfate, and magnesium levels. The pattern of the northern Cr(VI) plume is represented on Figure M-38 by Well 199-D5-16, shown in tan. Well 199-D5-13 has higher levels of Cr(VI) than other wells in the northern plume. As with Well 199-D5-104 in the southern plume, Well 199-D5-13 exhibits higher levels of calcium than other wells in the plume but maintains a similar distribution pattern. Wells 199-D8-5 and 199-D8-68 are also grouped with the northern plume wells based on their chemical signatures, but these wells have overall lower levels of the various ions, likely associated with the wells' locations at the edge of the plume, which would limit the influence of contamination. The area to the east of the southern Cr(VI) plume, represented by Well 199-D5-17 (shown in purple), does not have Cr(VI) contamination. The pattern in these wells is similar to that in the northern Cr(VI) plume, but the pattern shows less chloride than that found in the northern or southern Cr(VI) plume and higher sodium plus potassium.

Wells with a different geochemical pattern are those affected by local contamination or other groundwater additives. Well 199-D4-19 (shown in orange on Figure M-38) is within the ISRM barrier. The reducing agent used in the barrier consists of sodium dithionite ($Na_2S_2O_4$). As expected, the sodium and sulfate levels in the groundwater at the ISRM well are much higher than levels in other wells within 100-D/H. This pattern indicates that the ISRM barrier is maintaining the expected chemical properties at that location.

At Well 199-D5-33, the geochemical pattern is most similar to that found in river water. Leakage from the reservoir is likely affecting the groundwater at Well 199-D5-33. This is consistent with the documented historical leakage from the reservoir, which stores raw river water, and supports the separation of the two plumes because of leakage from the reservoir. Leakage from the reservoir is also supported by the geochemical pattern exhibited in Well 199-D5-20, located on the southern side of the northern Cr(VI) plume. The chemical pattern in Well 199-D5-20 has a signature that is a blending of river water, which was identified in the southern plume. While intrusion into the aquifer during high river stage is possible, there is not adequate data to determine if that is the case. The stiff diagrams for Well 199-D5-33 and Well 199-D5-20 are shown on Figure M-38 in light blue.

Monitoring Wells 199-D8-88 and 199-D8-4 are downgradient from waste site 126-D-1 Coal Ash Pit, with the geochemical pattern for Well 199-D8-4 shown on Figure M-38. Flue gas desulfurization residue consists primarily of gypsum (calcium sulfate) and is frequently combined with fly ash. The chemical distribution found in flue gas desulfurization is consistent with the geochemical pattern identified in the wells downgradient from waste site 126-D-1. No metals were identified in association with these wells, with the exception of a reported value of 60 µg/L of zinc in Well 199-D8-4, which is lower than the ambient water quality criterion of 91 µg/L but higher than typical concentrations in that well.

Table M-6. Major Ion Chemistry in Groundwater at 100-D/H

Well ID	199-D4-19		199-D4-20		199-D5-99		199-D5-98		199-D5-104		199-D5-43		199-D5-39	
	ISRM Barrier		Ringold Formation unit E; Southern Plume		Ringold Formation unit E; Southern Plume		Ringold Formation unit E; Southern Plume		Ringold Formation unit E; Southern Plume		Ringold Formation unit E; Southern Plume		Ringold Formation unit E; Southern Plume	
Sampling Date	11/14/2006		11/14/2006		3/23/2010		11/29/2007		11/29/2007		3/23/2010		11/14/2006	
Concentration Units	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L
Calcium	42,900	2.14	87,000	4.34	62,400	3.11	74,200	3.70	111,000	5.54	67,300	3.36	66,600	3.32
Chloride	28,100	0.79	22,900	0.65	11,400	0.32	19,900	0.56	45,800	1.29	11,300	0.32	20,900	0.59
Sulfate	360,000	7.50	82,000	1.71	82,300	1.71	113,000	2.35	145,000	3.02	8,9000	1.85	90,000	1.87
Alkali/meq/L of carbonate	120,000	2.40	100,000	2.00	100,000	2.00	97,000	1.94	96,000	1.92	110,000	2.20	91,000	1.82
Potassium+Sodium		8.29		0.69		0.54		0.58		0.41		0.64		0.45
Magnesium	18,000	1.48	18,700	1.54	13,400	1.10	17,400	1.43	21,200	1.74	16,400	1.35	1,5600	1.28
Potassium	204,000	5.22	5,870	0.15	3,390	0.09	4,660	0.12	3,580	0.09	4,630	0.12	4,760	0.12
Sodium	70,600	3.07	12,500	0.54	10,500	0.46	10,600	0.46	7,300	0.32	12,000	0.52	7,540	0.33

Table M-6. Major Ion Chemistry in Groundwater at 100-D/H

Well ID	199-D5-33		199-D5-17		199-D5-18		199-D5-19		199-D5-15		199-D5-16		199-D5-13	
	Next to 182-D Reservoir		Ringold Formation unit E		Ringold Formation unit E		Ringold Formation unit E		Ringold Formation unit E; Northern Plume		Ringold Formation unit E; Northern Plume		Ringold Formation unit E; Northern Plume	
Sampling Date	11/20/2006		3/23/2010		3/30/2010		3/24/2010		3/22/2010		3/22/2010		11/22/2006	
Concentration Units	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L
Calcium	25,500	1.27	65,800	3.28	73,500	3.67	77,000	3.84	90,500	4.52	81,500	4.07	97,100	4.85
Chloride	1,700	0.05	10,000	0.28	18,000	0.51	14,400	0.41	21,000	0.59	17,100	0.48	31,600	0.89
Sulfate	13,100	0.27	99,700	2.08	121,000	2.52	135,000	2.81	130,000	2.71	144,000	3.00	125,000	2.60
Alkali/meq/L of carbonate	83,000	1.66	110,000	2.20	120,000	2.40	120,000	2.40	110,000	2.20	110,000	2.20	110,000	2.20
Potassium+Sodium		0.35		0.91		0.84		0.82		0.89		0.78		0.91
Magnesium	6,660	0.55	22,000	1.81	22,900	1.88	24,300	2.00	23,600	1.94	26,400	2.17	26,000	2.14
Potassium	3,570	0.09	5,650	0.14	5,450	0.14	5,740	0.15	5,740	0.15	5,920	0.15	6,290	0.16
Sodium	5,920	0.26	17,600	0.77	16,200	0.70	15,400	0.67	17,100	0.74	14,400	0.63	17,200	0.75

Table M-6. Major Ion Chemistry in Groundwater at 100-D/H

Well ID	199-D5-20		199-D8-5		199-D8-4		199-D8-88		199-D8-54B		199-D8-68		199-D8-70	
	Northern Plume		Northern Plume		Downgradient of 126-D-1		Downgradient of 126-D-1		RUM Well; Northern 100-D					
Sampling Date	11/27/2006		11/8/2006		11/8/2006		11/8/2006		11/17/2004		11/9/2006		11/8/2006	
Concentration Units	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L
Calcium	47,600	2.38	52,700	2.63	81,400	4.06	45,700	2.28	40,000	2.00	61,600	3.07	69,800	3.48
Chloride	8,790	0.25	21,700	0.61	23,500	0.66	20,100	0.57	4,600	0.13	21,800	0.61	30,000	0.85
Sulfate	46,400	0.97	73,000	1.52	116,000	2.42	59,900	1.25	63,200	1.32	75,900	1.58	94,400	1.97
Alkali/meq/L of carbonate	110,000	2.20	58,000	1.16	17,000	0.34	15,000	0.30	164,000	3.28	81,000	1.62	81,000	1.62
Potassium+Sodium		0.49		0.41		0.55		0.45		1.64		0.41		0.52
Magnesium	13,600	1.12	14,600	1.20	2,490	0.20	974	0.08	15,300	1.26	12,100	1.00	11,200	0.92
Potassium	4,200	0.11	4,640	0.12	6,190	0.16	3,640	0.09	9,160	0.23	2,360	0.06	3,880	0.10
Sodium	8,720	0.38	6,770	0.29	9,030	0.39	8,300	0.36	32,200	1.40	7,980	0.35	9,570	0.42

Table M-6. Major Ion Chemistry in Groundwater at 100-D/H

Well ID	699-95-51		699-96.49		699-97-48B		699-97-45		699-95-45		699-101-45		699-98-43	
	Horn (west)												Horn (east)	
Sampling Date	3/21/2010		12/6/2006		3/18/2010		3/18/2010		3/18/2010		3/22/2010		5/18/2010	
Concentration Units	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L
Calcium	68,000	3.39	53,200	2.65	48,200	2.41	49,500	2.47	47,000	2.35	45,400	2.265	51,100	2.55
Chloride	22,400	0.63	16,500	0.47	13,900	0.39	13,700	0.39	16,000	0.45	11,800	0.333	12,900	0.36
Sulfate	94,800	1.97	67,200	1.40	58,400	1.22	64,200	1.34	52,900	1.10	51,600	1.074	57,200	1.19
Alkali/meq/L of carbonate	96,000	1.92	96,000	1.92	110,000	2.20	110,000	2.20	130,000	2.60	100,000	2.000	110,000	2.20
Potassium+Sodium		0.80		0.79		0.81		1.01		1.20		0.628		0.88
Magnesium	13,000	1.07	12,400	1.02	10,500	0.86	10,900	0.90	11,800	0.97	10,400	0.856	11,200	0.92
Potassium	5,820	0.15	5,010	0.13	4,440	0.11	4,380	0.11	5,060	0.13	3,820	0.098	4,790	0.12
Sodium	14,900	0.65	15,200	0.66	16,100	0.70	20,600	0.90	24,600	1.07	12,200	0.531	17,400	0.76

Table M-6. Major Ion Chemistry in Groundwater at 100-D/H

Well ID	199-H4-5		199-H4-49		199-H5-1A		199-H4-15A		199-H4-15B		199-H3-2A		199-H3-2B	
	Hanford fm.; 100-H		Hanford fm.; 100-H		Hanford fm.; 100-H		Hanford fm.; 100-H		Hanford fm.; 100-H					
Sampling Date	3/24/2010		11/21/2006		11/27/2006		1/11/2010		1/11/2010		5/1/1996		5/13/1996	
Concentration Units	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L
Calcium	74,700	3.73	64,400	3.21	53,700	2.68	59,000	2.94	53,000	2.64	39,000	1.95	41,000	2.05
Chloride	41,400	1.17	29,000	0.82	30,000	0.85	32,300	0.91	27,100	0.76	7,000	0.20	7,000	0.20
Sulfate	76,400	1.59	57,000	1.19	45,900	0.96	72,800	1.52	67,700	1.41	49,000	1.02	47,000	0.98
Alkali/meq/L of carbonate	97,000	1.94	120,000	2.40	100,000	2.00	89,000	1.78	91,000	1.82	130,000	2.60	120,000	2.40
Potassium+Sodium		0.68		0.92		0.74		0.56		0.51		0.85		0.92
Magnesium	14,100	1.16	16,100	1.32	13,600	1.12	12,200	1.00	11,200	0.92	8,700	0.72	10,000	0.82
Potassium	5,940	0.15	6,080	0.16	6,470	0.17	5,310	0.14	4,970	0.13	4,400	0.11	5,500	0.14
Sodium	12,100	0.53	17,500	0.76	13,100	0.57	9,720	0.42	8,730	0.38	17,000	0.74	18,000	0.78

Table M-6. Major Ion Chemistry in Groundwater at 100-D/H

Well ID	199-H3-2C		199-H4-12A		199-H4-12B		199-H4-12C		199-H4-15CS		199-H4-15CQ		199-H4-15CR	
	RUM Well						RUM Well		RUM Well		Ringold Formation unit B		RLM Well	
Sampling Date	5/13/1996		5/2/1996		5/13/1996		5/2/1996		1/24/2011		1/24/2011		1/24/2011	
Concentration Units	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L
Calcium	24,000	1.20	23,000	1.15	32,000	1.60	27,000	1.35	32,800	1.64	29,900	1.49	11,300	0.56
Chloride	2,000	0.06	1,800	0.05	3,200	0.09	2,400	0.07	2,760	0.08	7,590	0.21	3,350	0.09
Sulfate	16,000	0.33	15,000	0.31	24,000	0.50	23,000	0.48	21,700	0.45	16,200	0.34	49,700	1.03
Alkali/meq/L of carbonate	110,000	2.20	76,000	1.52	97,000	1.94	100,000	2.00	110,000	2.20	140,000	2.80	59,000	1.18
Potassium+Sodium		0.60		0.32		0.48		0.30		0.34		1.43		1.89
Magnesium	8,300	0.68	4,400	0.36	5,700	0.47	9,600	0.79	12,200	1.00	7,200	0.59	1,050	0.09
Potassium	4,900	0.13	3,500	0.09	4,000	0.10	4,500	0.12	4,810	0.12	6,970	0.18	7,000	0.18
Sodium	11,000	0.48	5,400	0.23	8,700	0.38	4,300	0.19	5,050	0.22	28,800	1.25	39,300	1.71

Table M-6. Major Ion Chemistry in Groundwater at 100-D/H

Well ID	199-D4-15 Time Series										Columbia River Below Priest Rapids Dam	
Sampling Date	11/18/1998		12/1/1999		11/25/2003		11/7/2005		11/20/2006		5/1/1994	
Concentration Units	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L
Calcium	90,800	4.53	9,6700	4.83	93,800	4.68	99,200	4.95	92,400	4.61	18,300	0.91
Chloride	35,600	1.00	39,400	1.11	32,700	0.92	35,500	1.00	33,600	0.95	1,300	0.04
Sulfate	142,000	2.96	153,000	3.19	142,000	2.96	144,000	3.00	104,000	2.17	9,900	0.21
Alkali/meq/L of carbonate	96,000	1.92	101,000	2.02	97,000	1.94	96,000	1.92	96,000	1.92	52,000	1.04
Potassium+Sodium		0.52		0.58		0.65		0.60		0.56		0.12
Magnesium	21,400	1.76	22,400	1.84	21,100	1.74	21,900	1.80	21,300	1.75	4,470	0.37
Potassium	4,780	0.12	4,990	0.13	6,000	0.15	6,420	0.16	4,760	0.12	645	0.02
Sodium	9,140	0.40	10,400	0.45	11,400	0.50	9,970	0.43	10,100	0.44	2,470	0.11

Table M-6. Major Ion Chemistry in Groundwater at 100-D/H

Well ID	199-D5-14 Time Series											
Sampling Date	10/31/1992		12/2/1999		11/20/2003		11/10/2005		11/22/2006		5/13/2010	
Concentration Units	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L
Calcium	58,300	2.91	70,800	3.53	73,600	3.67	75,600	3.77	79,500	3.97	72,300	3.61
Chloride	20,700	0.58	19,000	0.54	15,700	0.44	20,600	0.58	13,200	0.37	18,000	0.51
Sulfate	86,000	1.79	111,000	2.31	125,000	2.60	125,000	2.60	119,000	2.48	115,000	2.39
Alkali/meq/L of carbonate	111,000	2.22	130,000	2.60	108,000	2.16	90,000	1.80	110,000	2.20	110,000	2.20
Potassium+Sodium		0.93		0.89		0.90		0.77		0.88		0.84
Magnesium	16,500	1.36	21,300	1.75	22,500	1.85	23,000	1.89	24,500	2.02	22,600	1.86
Potassium	6,130	0.16	6,000	0.15	6,120	0.16	4,370	0.11	6,810	0.17	5,900	0.15
Sodium	17,700	0.77	16,900	0.74	17,200	0.75	15,200	0.66	16,200	0.70	15,900	0.69

Table M-6. Major Ion Chemistry in Groundwater at 100-D/H

Well ID	199-H4-48 Time Series											
Sampling Date	11/4/1992		11/2/1999		11/13/2003		11/22/2005		11/9/2006		5/13/2010	
Concentration Units	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L
Calcium	27,100	1.35	65,300	3.26	54,200	2.70	61,000	3.04	48,700	2.43	71,200	3.55
Chloride	4,500	0.13	24,600	0.69	26,100	0.74	25,700	0.72	19,300	0.54	40,800	1.15
Sulfate	19,000	0.40	59,400	1.24	47,900	1.00	44,200	0.92	37,300	0.78	77,200	1.61
Alkali/meq/L of carbonate	78,000	1.56	144,000	2.88	114,000	2.28	92,000	1.84	97,000	1.94	98,000	1.96
Potassium+Sodium		0.36		0.81		0.81		0.70		0.64		0.65
Magnesium	5,540	0.46	14,000	1.15	11,800	0.97	12,500	1.03	10,800	0.89	14,700	1.21
Potassium	3,100	0.08	54,60	0.14	6050	0.15	5,720	0.15	4,150	0.11	5,510	0.14
Sodium	6,440	0.28	15,300	0.67	15,100	0.66	12,800	0.56	12,300	0.54	11,700	0.51

Table M-6. Major Ion Chemistry in Groundwater at 100-D/H

Well ID	199-H4-6 Time Series									
Sampling Date	10/13/1988		1/17/1990		10/1/1996		12/2/1996		5/16/2010	
Concentration Units	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L	(µg/L)	meq/L
Calcium	72,700	3.63	63,600	3.17	75,700	3.78	63,000	3.14	53,900	2.69
Chloride	12,400	0.35	13,400	0.38	11,000	0.31	9,870	0.28	24,600	0.69
Sulfate	88,400	1.84	94,700	1.97	114,000	2.37	77,200	1.61	52,700	1.10
Alkali/meq/L of carbonate	150,000	3.00	149,000	2.98	149,000	2.98	148,000	2.96	110,000	2.20
Potassium+Sodium		1.35		1.24		1.38		1.28		0.82
Magnesium	16,000	1.32	14,500	1.19	16,300	1.34	14,100	1.16	12,200	1.00
Potassium	6,990	0.18	6,490	0.17	6,780	0.17	5,830	0.15	5,740	0.15
Sodium	27,000	1.17	24,800	1.08	27,700	1.20	25,900	1.13	15,500	0.67

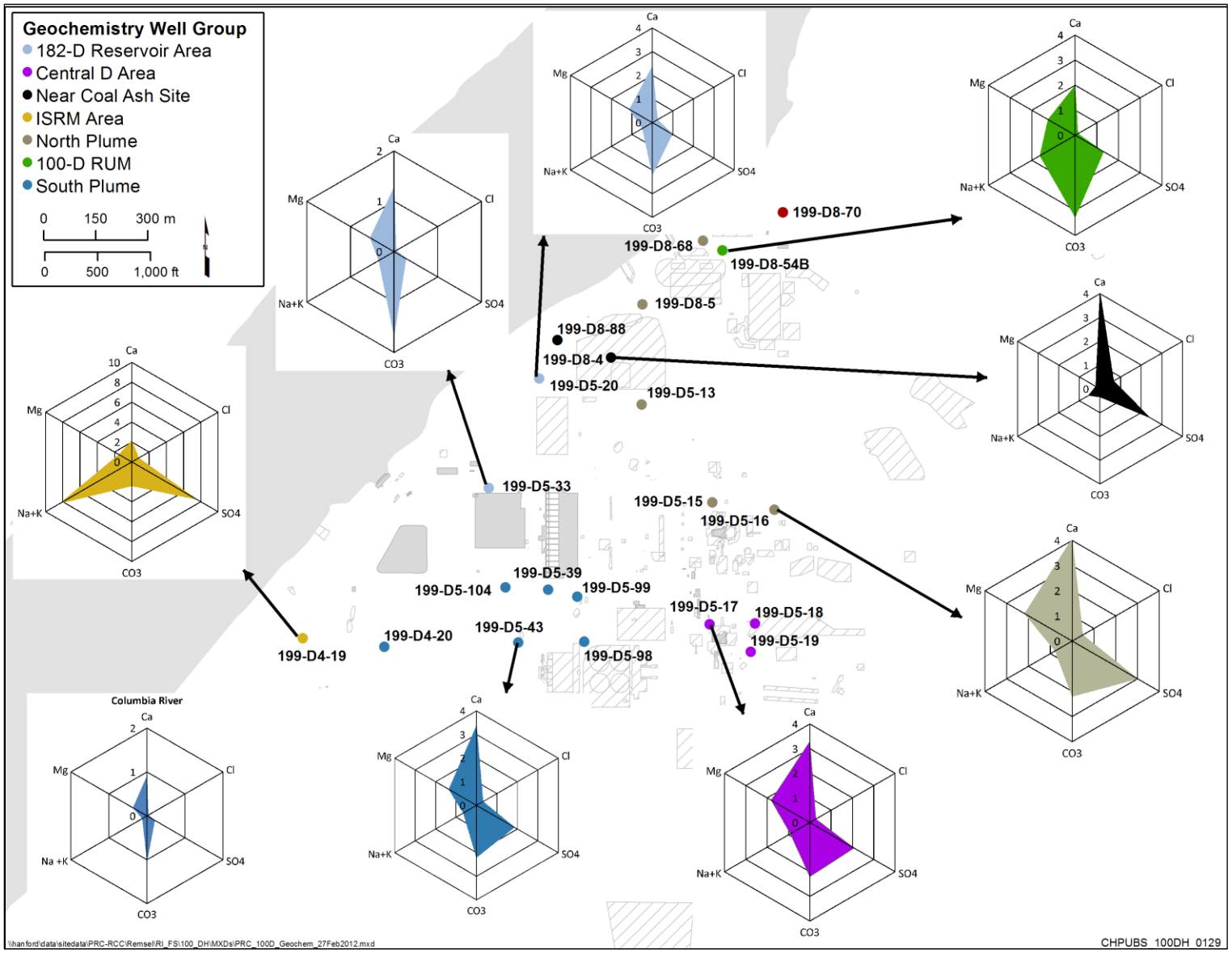

Figure M-38. Major Ion Chemistry of 100-D Groundwater

North of 100-D toward the horn are Wells 199-D8-70 and 699-95-51. The chemical signature in these wells is less distinct. The wells in the northern 100-D/horn transitional area have lower levels of carbonate than in other areas. Because the chemical pattern is slightly closer to that of the horn wells, Wells 199-D8-70 and 699-95-51 are grouped with the horn wells, but they do exhibit a slightly higher sulfate level and lower potassium plus sodium level than horn wells. Well 699-101-45, located to the far north of the horn, is also considered transitional and has the same pattern.

The wells in the horn have a similar geochemical signature to each other. They are presented on Figure M-39 by Well 699-96-49, shown in red. The higher levels of sodium plus potassium in these wells are consistent throughout the horn and are coupled with lower magnesium levels than those found in 100-D. The wells in the horn also tend to have lower chloride levels than wells in 100-H, which are associated with the Hanford formation. Wells completed in the Hanford formation at 100-H have a similar chemical pattern. The concentrations of magnesium, chloride, and sodium plus potassium give the stiff diagram a distinct shape, as represented by Well 199-H4-49 on Figure M-39, shown in orange.

Well 199-D8-54B was completed in the RUM, so it was correctly expected that the chemistry of the well would not be similar to the other wells in the area. However, Well 199-D8-54B is unexpectedly similar in chemical pattern to a group of nested wells (199-H3-2A, B, and C), of which 199-H3-2C is completed in the RUM. It is also similar to nested Wells 199-H4-12A and 199-H4-12B, which are completed in the Hanford formation. However, the RUM Well 199-H4-12C has a different signature. It is undetermined why wells with such different geology would present such similar patterns in groundwater chemistry.

Three sets of nested wells are in 100-H. The nested wells consist of at least three wells or piezometers completed in multiple aquifers and are within a few feet of each other. The nested groups are 199-H3-2, 199-H4-12, and 199-H4-15. Wells with the suffix of A and B are completed in the unconfined aquifer at 100-H. Wells 199-H3-2C, 199-H4-12C, and 199-H4-15CS are completed in the RUM. The remaining piezometers associated with 199-H4-15 are completed in the Ringold Formation unit B (-15CQ), the RLM (-15CR), and the basalt (-15CP) units, which all have distinct geochemistry.

Monitoring Wells 199-H3-2A, 199-H3-2B, 199- H3-2C, 199-H4-12A, and 199-H4-12B have a similar chemical pattern. The deep well, 199-H3-2C, was completed in the RUM. The geochemistry in the RUM well has higher carbonate levels than those in the associated wells completed in the upper units, but it has a very similar chemical pattern. Higher levels of CO_3^{2-} can occur in areas with higher amounts of clay and silt, which is consistent with overbank deposits; however, such a correlation has not yet been shown in these wells. Monitoring Well 199-H3-2C was shown to be connected to the overlying unconfined aquifer wells (199-H3-2A and 199-H3-2B) during the aquifer rebound test (*Aquifer Testing and Rebound Study in Support of the 100-H Deep Chromium Investigation* [SGW-47776]).

The other two RUM well/piezometers at 100-H (199-H4-12C and 199-H4-15CS) are near the Columbia River. Both of these wells have a geochemistry that is similar to river water, and dissimilar to the chemistry found in the associated nested wells. The water levels in these wells also respond to changes in river stage (*Aquifer Testing and Rebound Study in Support of the 100-H Deep Chromium Investigation* [SGW-47776]). The observation of similar geochemistry supports the theory that the RUM is hydrologically connected to the river in that location.

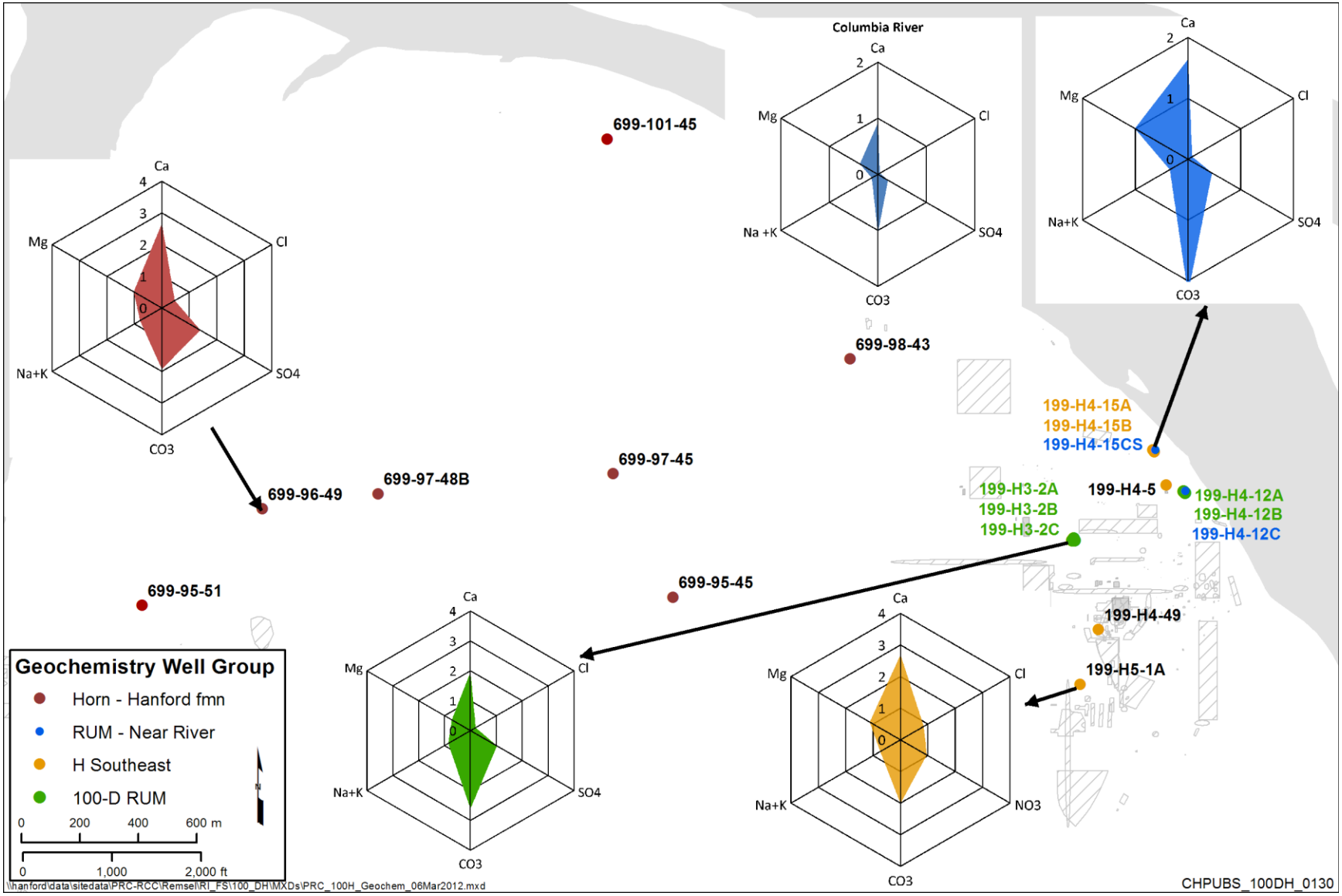

Figure M-39. Major Ion Chemistry of 100-H and Horn Groundwater

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