



ROCKWELL INTERNATIONAL
NORTH AMERICAN SPACE OPERATIONS
ROCKY FLATS PLANT

Remedial Investigation Report for High Priority Sites (881 Hillside Area)

Volume VII

U.S. DEPARTMENT OF ENERGY

**Rocky Flats Plant
Golden, Colorado**

1 MARCH 1988

ADMIN RECORD

REVIEWED FOR CLASSIFICATION/UCM

By *[Signature]*

Date *9/20/91*

REVIEWED FOR CLASSIFICATION ①

By *[Signature]*

Date *6/18/90*

A-DU01-000010

APPENDIX E-3
1987 MONITOR WELLS

REVIEWED FOR CLASSIFICATION/USE
By *[Signature]*
Date 9/26/91

EXPLANATION OF SYMBOLS AND TERMS ON 881 HILLSIDE-1987 BORING LOGS

SAMPLE TYPE



Split Spoon

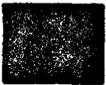


NC Core

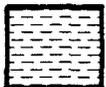


Continuous Drive

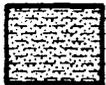
GRAPHIC LOG



Lignite



Clay or Claystone or Shale



Clayey Sand or Sandy Clay



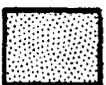
Clay and Gravel



Gravel



Sand and Gravel



Sand or Sandstone



Silt or Siltstone

INDEX OF DATA

Boring No.: 1-87

Completed as well? Yes

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
 Coordinates N35145.6 E20540.6
 Total Depth 14.87'

Borehole/Well No. 1-87
 Ground Surface Elevation 5992.35'
 Water Level Encountered 11.75'
 Static 5981.29' 16/24/87
 Driller R. Sharp
 Helper A. Shade
 Drilling Fluid None
 Checked By [Signature]
 Site Manager
 CEARP Manager

Drilling Company Boyles Bros.
 Date Drilled May 8, 1987
 Drilling Method Hollow Stem Auger
 Logged By K. D. Holliday
 Geologist

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			ROCKY FLATS ALLUVIUM (DISTURBED) <i>Artificial Fill</i>	
			0.0-4.0' - Sample. Recovered 1.65/4.0' = 41%. CLAY: dark yellowish brown (10YR 4/2); occasional quartzite cobbles and gravel; unconsolidated; damp to moist.	HNu Background = 0.3ppm. No OVA readings. No readings above background.
5			4.0-7.5' - Sample. Recovered 3.0/3.5' = 86%. CLAY: same as above; dark yellowish orange (10YR 6/6) stains common; damp to moist.	
10			7.5-12.5' - Sample. Recovered 1.15/5.0' = 23%. 6.85-7.35': CLAY: same as above 7.35-7.50': Lost core. 7.50-8.20': CLAY: same as above; trace sand (2.0-1.5Ø); very pale orange (10YR 5/4); subrounded; moderate reddish brown (10R 4/6) stains; moist. 8.20-8.70': CLAY: moderate brown (5YR 4/6) to moderate yellowish brown (10YR 5/4); weathered; unconsolidated; moist.	
15			8.70': COBBLE; quartzite; dusky yellowish brown (10YR 2/2); clay matrix. 8.70'-11.75': Lost core.	
20				

LOG OF BOREHOLE

Location _____
 Coordinates _____
 Total Depth _____

Borehole/Well No. 1-87 (cont'd.)
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____

Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By [Signature]
Site Manager
[Signature]
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			<u>ARAPAHOE FORMATION</u> 11.75-11.87': SANDSTONE: pale yellowish orange (10YR 8/6) to dusky yellowish brown (10YR 2/2); clayey; weathered; moist to wet. 11.87-12.50': CLAYSTONE: light olive gray (5Y 5/2); weathered; trace of iron staining; moist to wet.	
25			<u>12.0-15.0'</u> - Sample. Recovered 3.25/2.0' = 108%. CLAYSTONE: light olive brown (5Y 5/6); trace caliche; trace dark yellowish orange iron staining (10YR 6/6); weathered; moist to wet.	
30			TOTAL DEPTH: 14.87'	
35				
40				

WELL COMPLETION INFORMATION

Location ROCKY FLATS PLANT 881 HILLSIDE

Well No. 1-87

Coordinates N35145.5971 E20540.5926

Elevation: Ground Surface 5992.35'

Total Depth: Well 12.08'

Top of Casing 5994.23'

Borehole 14.87'

Formation of Completion ROCKY FLATS ALLUVIUM

Casing Material SCH. 5, TYPE 316, TEJ STAINLESS

Casing Diameter 2" ID

Screen Material 0.010" WIRE WRAP, TYPE 316, STAINLESS

Surface Casing Diameter 5" ID

Date Installed MAY 8, 1987

316, STAINLESS

Approved By [Signature]

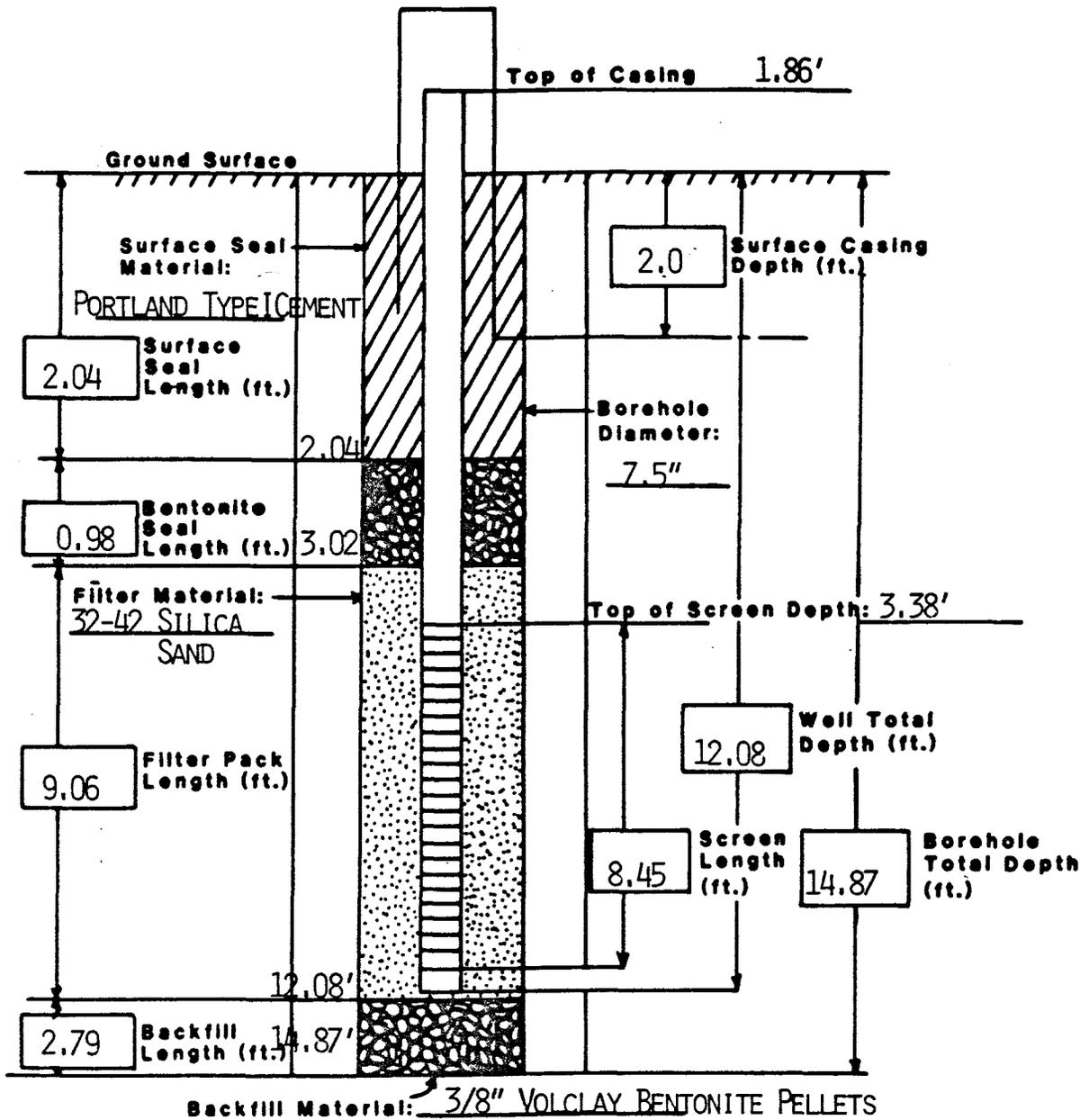
Installed By K.D. HOLLIVAY
Geologist

STEEL

Site Manager

CEARP Manager

Comments _____



02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
0187	06/24/87	5992.35	5994.23	1.88	13.71	12.94	5981.29
	08/04/87	5992.35	5994.23	1.88	13.71	-1.00	DRY
	09/02/87	5992.35	5994.23	1.88	13.71	9.80	5984.43
	09/29/87	5992.35	5994.23	1.88	13.71	12.70	5981.53
	11/09/87	5992.35	5994.23	1.88	13.71	10.80	5983.43
	12/21/87	5992.35	5994.23	1.88	13.71	10.40	5983.83
	01/11/88	5992.35	5994.23	1.88	13.71	10.10	5984.13
	02/04/88	5992.35	5994.23	1.88	13.71	10.22	5984.01

INDEX OF DATA

Boring No.: 2-87/BH3-87

Completed as well? Yes

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

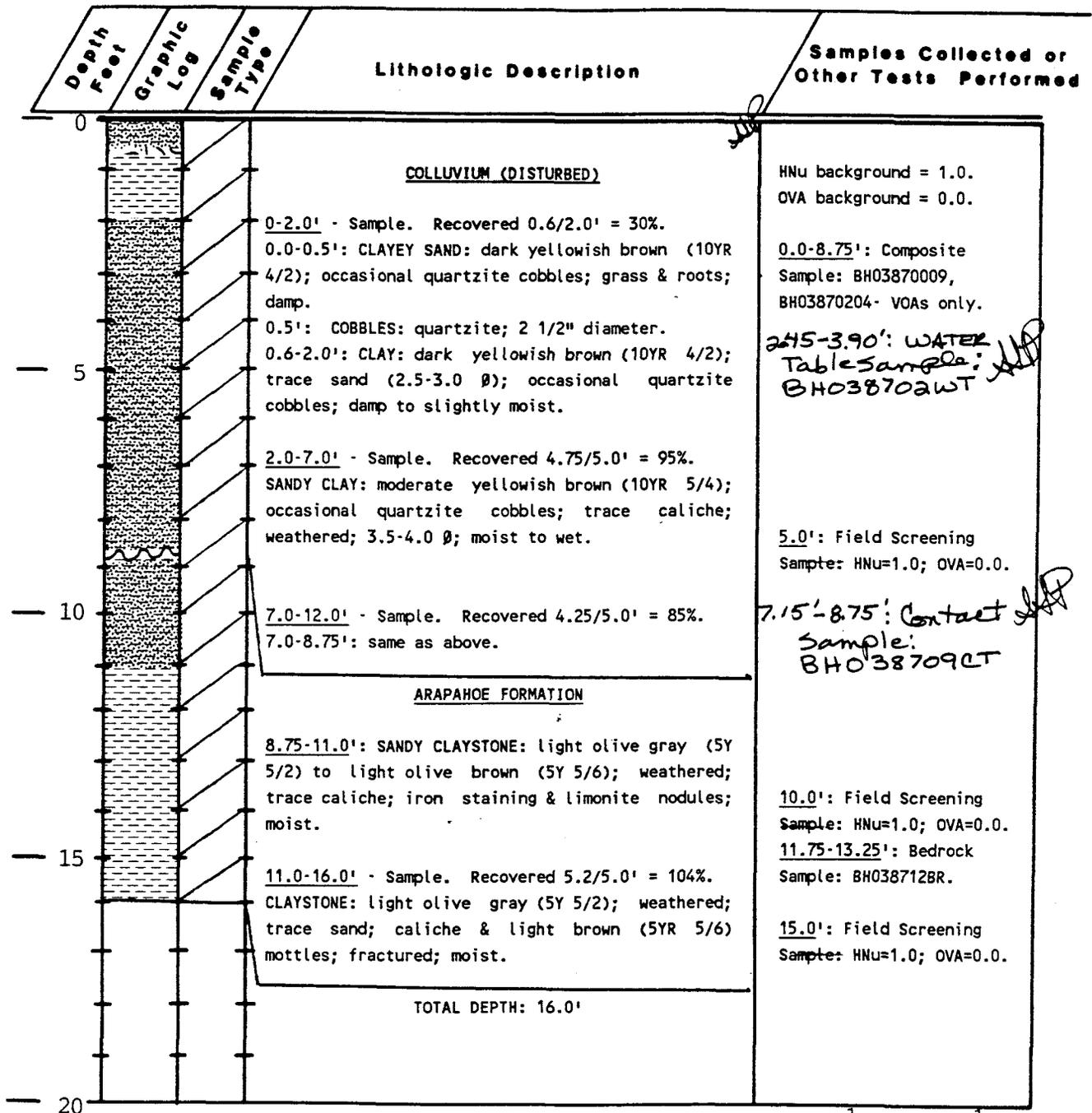
Location Rocky Flats Plant; 881 Hillside
 Coordinates N34725.8 E20819.7
 Total Depth 16.0'

Borehole/Well No. 2-87/BH3-87
 Ground Surface Elevation 5930.56
 Water Level Encountered 2.45'
 Static 5929.59' (6/24/87)

Drilling Company Boyles Bros.
 Date Drilled May 19, 1987
 Drilling Method Hollow Stem Auger
 Logged By K. D. Holliway
 Geologist

Driller A. Shade
 Helper T. Merritt
 Drilling Fluid None
 Checked By J. Paschke
 Site Manager
T. [Signature]
 CEARP Manager

Comments _____



WELL COMPLETION INFORMATION

Location ROCKY FLATS PLANT 881 HILLSIDE

Well No. 2-87

Coordinates N34725.7568 E20819.7497

Elevation: Ground Surface 5930.56'

Total Depth: Well 9.32'

Top of Casing 5932.63'

Borehole 16.0'

Formation of Completion COLLUVIUM

Casing Material SCH. 5, TYPE 316, TEJ STAINLESS

Casing Diameter 2" ID

Screen Material 0.010" WIRE WRAP, TYPE 316, STAINLESS

Surface Casing Diameter 5" ID

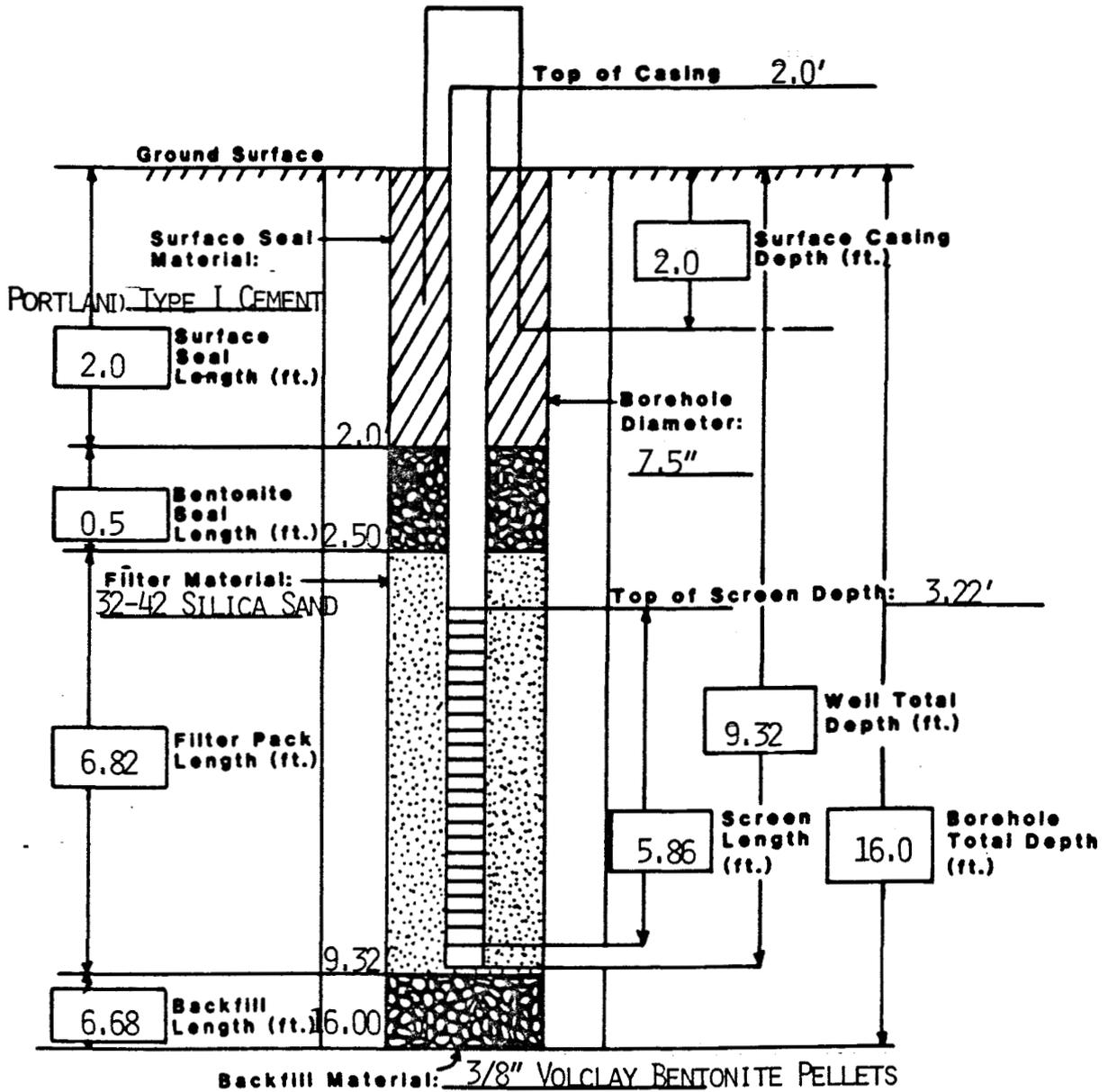
Date Installed MAY 20, 1987

Approved By [Signature]

Installed By K.D. HOLLIWAY
Geologist

[Signature]
Site Manager
[Signature]
CEARP Manager

Comments _____

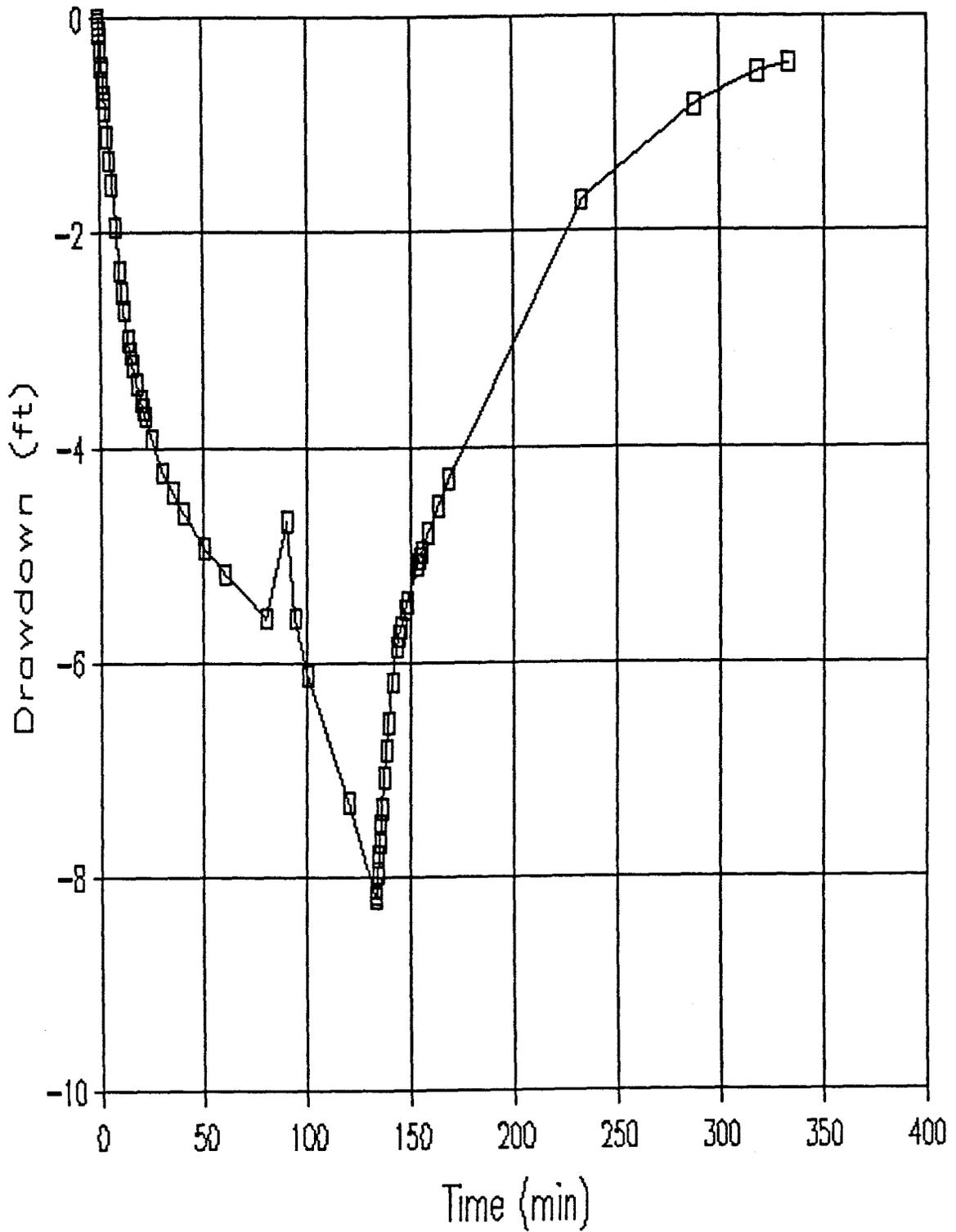


2-87 P-test
6-15-87

Time (min)	Recovery Time (min)	Depth to Water (feet)	Draw- down (feet)
0		3.41	.00
.25		3.46	.05
.5		3.54	.13
1		3.71	.30
1.5		3.86	.45
2		4.00	.59
2.5		4.14	.73
3		4.26	.85
4		4.51	1.10
5		4.73	1.32
6		4.95	1.54
8		5.35	1.94
10		5.76	2.35
11		5.96	2.55
12		6.13	2.72
14		6.41	3.00
15		6.53	3.12
16		6.64	3.23
18		6.81	3.40
20		6.97	3.56
21		7.05	3.64
22		7.12	3.71
25		7.33	3.92
30		7.64	4.23
35		7.83	4.42
40		8.02	4.61
50		8.35	4.94
60		8.59	5.18
80		9.00	5.59
90		8.10	4.69
94		9.00	5.59
100		9.53	6.12
120		10.71	7.30
133	0	11.61	8.20
133.25	.25	11.58	8.17
133.5	.5	11.51	8.10
134	1	11.37	7.96
134.5	1.5	11.22	7.81
135	2	11.08	7.67
135.5	2.5	10.92	7.51
136	3	10.77	7.36
137	4	10.49	7.08
138	5	10.23	6.82
139	6	9.98	6.57
141	8	9.60	6.19
143	10	9.27	5.86
145	12	9.09	5.68
147	14	8.92	5.51
148	15	8.85	5.44
153	20	8.50	5.09
155	22	8.39	4.98
158	25	8.21	4.80
163	30	7.96	4.55
168	35	7.71	4.30
233	100	5.12	1.71

2-87

6-15-87



02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
0287	06/15/87	5930.56	5932.63	2.07	11.15	3.41	5929.22
	06/24/87	5930.56	5932.63	2.07	11.15	3.04	5929.59
	07/08/87	5930.56	5932.63	2.07	11.15	2.20	5930.43
	08/06/87	5930.56	5932.63	2.07	11.15	3.40	5929.23
	10/05/87	5930.56	5932.63	2.07	11.15	3.50	5929.13
	11/03/87	5930.56	5932.63	2.07	11.15	0.70	5931.93
	12/16/87	5930.56	5932.63	2.07	11.15	1.00	5931.63
	01/09/88	5930.56	5932.63	2.07	11.15	1.50	5931.13

INDEX OF DATA

Boring No.: 3-87BR

Completed as well? Yes

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
 Coordinates N34723.3 E20847.6
 Total Depth 117.0'

Borehole/Well No. 3-87BR
 Ground Surface Elevation 5930.58'
 Water Level Encountered 6.5', 16.1', 19.8'
 Static 5851.09'

Drilling Company Boyles Bros.
 Date Drilled May 15, June 1, and June 2, 1987
 Drilling Method 0.0-50.6': Hollow Stem Auger
50.6-117.0': Rotary Core
 Logged By K. D. Holliday; J. B. Bergman
 Geologist

Driller A. Shade; P. Bushkovski
 Helper D. Jarvie; M. Depew
 Drilling Fluid 0.0-50.6': None; 50.6-117.0'
 Checked By [Signature] Wat
 Site Manager
 CEARP Manager

Comments Surface casing set to 52.75' on May 15, 1987 by K. D. Holliday

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>COLLUVIUM (DISTURBED)</u>	
			<u>0.0-2.0'</u> - Sample. Recovered 2.2/2.0' = 110%. CLAY: dark yellowish brown (10YR 4/2) to grayish brown (5YR 3/2); unconsolidated; trace quartzite cobbles; grasses and roots; damp to moist.	HNu background = 0.2. No OVA readings. No readings above background.
5			<u>2.0-6.0'</u> - Sample. Recovered 4.15/4.0' = 104%. CLAY: same as above; no vegetation; trace caliche; trace sand; damp to moist.	
			<u>6.0-11.0'</u> - Sample. Recovered 4.95/5.0' = 99%. <u>6.15-9.45'</u> : CLAY: same as above; sandy (2.0-2.5 Ø); grayish orange (10YR 7/4). <u>9.45-11.0'</u> : CLAY: moderate yellowish brown (10YR 5/4); trace dark yellowish orange (10YR 6/6) stains; trace quartzite cobbles; (1/4' diameter); subrounded. Fe nodule at 10.6'; dusky brown (5YR 2/2).	
			<u>ARAPAHOE FORMATION</u>	
			<u>11.0-16.0'</u> - Sample. Recovered 5.1/5.0' = 102%. SANDY CLAY: moderate yellowish brown (10YR 5/4) with dark yellowish brown iron (10YR 6/6) stains; some quartzite pebbles throughout; damp.	<i>JBB</i> 2/23/88
15			<u>16.1-21.1'</u> - Sample. Recovered 5.1/5.0' = 102%. <u>16.1-20.0'</u> : CLAY: grayish orange (10YR 7/4); trace sand and occasional quartzite cobbles; trace caliche; moist & wet.	<i>JBB</i> 2/23/88
20				

LOG OF BOREHOLE

Location _____
 Coordinates _____
 Total Depth _____

Borehole/Well No. 3-87BR (cont'd.)
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____

Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By [Signature]
Site Manager
[Signature]
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20	[Hatched pattern]		<p>20.0-21.2': CLAYSTONE: light olive gray (5Y 5/2); trace caliche; weathered; reworked bedrock; moist to wet.</p> <p>21.1-26.1' - Sample. Recovered 1.9/4.9' = 39%.</p> <p>21.2-24.2': Lost Core.</p> <p>24.2-26.1': SANDY CLAY: dark yellowish brown (5Y 5/2) with light brown (5YR 5/6) stains; sand 3.5-30 #; weathered; dry.</p>	
25	[Dotted pattern]		<p>26.1-31.1' - Sample. Recovered 5.0/5.0' = 100%</p> <p>26.1-28.0': CLAYEY SAND; grayish brown (5YR 3/2) with light brown (5YR 5/6) stains; weathered; slightly damp.</p> <p>28.0-28.1': SAND: Grayish orange (10YR 7/4); trace iron stains; 3.5-3.0 #; weathered lens; slightly damp.</p>	
30	[Dotted pattern]		<p>28.1-30.2': CLAYEY SAND: dark yellowish orange (10YR 6/6) to light olive gray (5Y 5/2); to light olive gray (5Y 5/2); very fine-grained sand; weathered; slightly damp. Clay lens at 29.1-29.3; olive gray (5Y 3/2) with 30% dark yellowish orange (10YR 6/6) stains; weathered.</p> <p>30.2-31.1': SAND: grayish orange (10YR 7/4); trace clay w/iron stains; 3.0-2.50; consolidated; weathered; slightly damp.</p>	
35	[Dotted pattern]		<p>31.1-35.1' - Sample. Recovered 3.61/4.0' = 90%.</p> <p>CLAYSTONE: dark yellowish orange (10YR 6/6) with light brown (5YR 5/6) stains; limonite nodules - grayish brown (5YR 3/2); weathered; damp.</p>	
40	[Dotted pattern]			

LOG OF BOREHOLE

Location _____
 Coordinates _____
 Total Depth _____

Borehole/Well No. 3-87BR (cont'd.)
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____

Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By [Signature]
Site Manager
[Signature]
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
40			<p><u>35.1-40.1</u> - Sample. Recovered 2.3/5.0' = 46%. 35.1-36.1: CLAYSTONE: olive gray (5Y 3/2); some light brown (5YR 5/6) stains; weathered; wet. 36.1-36.9: CLAYSTONE: light olive gray (5Y 5/2); weathered; dry. 36.9-38.4: CLAYEY SAND: light olive gray (5Y 5/2); some iron stains; weathered; dry.</p>	
45			<p><u>41.1-46.1</u> - Sample. Recovered 5.0/5.0' = 100%. 41.1-44.1': SANDY CLAY: olive gray (5Y 4/1) with 30% iron stains light brown (5YR 5/6) in fractures; grading to claystone; weathered; very fine-grained sand; dry to slightly damp. 44.1-46.1: CLAYSTONE/SILTSTONE: dusky yellowish brown (10YR 2/2) to olive gray (5Y 3/2); iron stains (20-30%); dry to slightly damp.</p>	
50			<p><u>46.1-51.1</u> - Sample. Recovered 5.3/5.0' = 106%. 46.1-47.0: CLAYSTONE/SILTSTONE: same as above. 46.2-46.35': SILTY CLAY LENS: moderate yellowish brown (10YR 5/4); iron staining. 47.0-51.1': CLAYSTONE: olive black (5Y 2/1) with trace iron stains.</p>	
55			<p><u>52.0-56.0</u>': Sample. Recovered 0.0/4.0' = 0%.</p>	
60			<p><u>56.0-57.0</u>' - Sample. Recovered 4.75/1.0' = 475%. ROD = 4.75/4.75 = 100%. CLAYSTONE: olive gray (5Y 3/2); unweathered; no stains; consolidated; homogenous; dry.</p>	

**LOG
OF
BOREHOLE**

Location _____
 Coordinates _____
 Total Depth _____

Borehole/Well No. 3-87BR (cont'd.)
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____

Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By J. Pasolby
Site Manager
TC
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
60			<p><u>57.0-61.0'</u> - Sample. Recovered 4.0/4.0 = 100%. RQD=4.0/4.0 = 100%. CLAYSTONE: same as above; moist.</p>	
			<p><u>61.0-66.0'</u> : Sample. Recovered 2.2/5.0' = 44%. RQD=2.2/2.2' = 100%. CLAYSTONE: same as above.</p>	Packer Test Interval #5: 63.90'-72.55'
65		<p><u>66.0-69.0'</u> - Sample. Recovered 3.0/3.0' = 100%. RQD=2.8/3.0 = 93%. 66.0-68.8 - CLAYSTONE: same as above. 68.8-69.0: SILTSTONE: grayish brown (5YR3/2); dense; angular cobbles and gravels; unsorted; wet to moist.</p>		
			<p><u>69.0-73.0'</u> - Sample. Recovered 4.0/4.0' = 100%. RQD=2.3/4.0 = 58%. 69.0-70.0': SILTSTONE: same as above with few calcareous pockets; damp . 70-73.0': CLAYSTONE: olive gray (5Y 3/2), some organics; unweathered; consolidated; moist.</p>	
70			<p><u>73.0-77.0'</u> - Sample. Recovered 4.0/4.0' = 100%. RQD=2.65/4.0 = 66%. 73.0-73.9': CLAYSTONE: same as above. 73.9-74.8': SILTSTONE: grayish brown (5YR 3/2); dense; angular; well sorted; moist. 74.8-77.0': CLAYSTONE: same as (73.0-73.9') claystone.</p>	Packer Test Interval #4: 74.55'-84.20'
75			<p><u>77.0-81.0'</u> - Sample. Recovered 4.7/4.0' = 118%. RQD=3.1/4.7 = 66%. CLAYSTONE: same as above.</p>	
80				

LOG OF BOREHOLE

Location _____

Coordinates _____

Total Depth _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____

Geologist

Borehole/Well No. 3-87BR (cont'd.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____

Site Manager

CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
80	[Hatched pattern]		<p><u>81.0-85.0'</u> - Sample. Recovered 2.85/4.0' = 71%. RQD=2.85/2.85' = 100%. CLAYSTONE: same as above.</p>	
85	[Hatched pattern]		<p><u>85.0-89.0'</u> - Sample. Recovered 4.3/4.0' = 108%. RQD=4.3/4.3' = 100%. CLAYSTONE: same as above; lignite bed at 87.55-88.10'; black; horizontal breaks; moist.</p>	
	[Solid black]		<p><u>89.0-93.0'</u> - Sample. Recovered 0.04/4.0' = 0%.</p>	
90	[Hatched pattern]		<p><u>93.0-94.0'</u> - Sample. Recovered 4.85/1.0' = 485%. RQD=3.9/4.85' = 80%. CLAYSTONE: olive gray (5Y 3/2); organics; unweathered; consolidated, wet.</p>	<p>Packer Test Interval #3: 88.20'-97.85'</p>
	[Hatched pattern]		<p><u>94.0-97.0'</u> - Sample. Recovered 2.8/3.0' = 93%. RQD=2.8/2.8' = 100%. CLAYSTONE: same as above; moist.</p>	
	[Hatched pattern]		<p><u>97.0-101.5'</u> - Sample. Recovered 2.1/4.5' = 47%. RQD=1.3/2.1' = 62%. CLAYSTONE: same as above.</p>	<p>Packer Test Interval #2: 97.85'-107.50'</p>
95	[Hatched pattern]		<p><u>101.5-105.0'</u> - Sample. Recovered 4.7/3.5' = 134%. RQD=4.0/4.7' = 85%.</p> <p>101.5-103.1: CLAYSTONE: same as above. 103.1-105.0: SANDSTONE: pale olive (10Y 6/2); very fine-grained; well sorted rounded; salt & pepper look; silty; moist to wet.</p>	
100	[Hatched pattern]			

WELL COMPLETION INFORMATION

Location ROCKY FLATS PLANT; 881 HILLSIDE
 Coordinates N34723.3325 E20847.5829
 Total Depth: Well 108.00'
 Borehole 117.0'

Well No. 3-87 BR
 Elevation: Ground Surface 5930.58'
 Top of Casing 5932.44'

Formation of Completion ARAPAHOE FORMATION

Casing Material SCH. 5, TYPE 316, TFJ STAINLESS

Casing Diameter 2" ID

Screen Material 0.010" WIRE WRAP, TYPE 316 STEEL

Surface Casing Diameter 5" ID

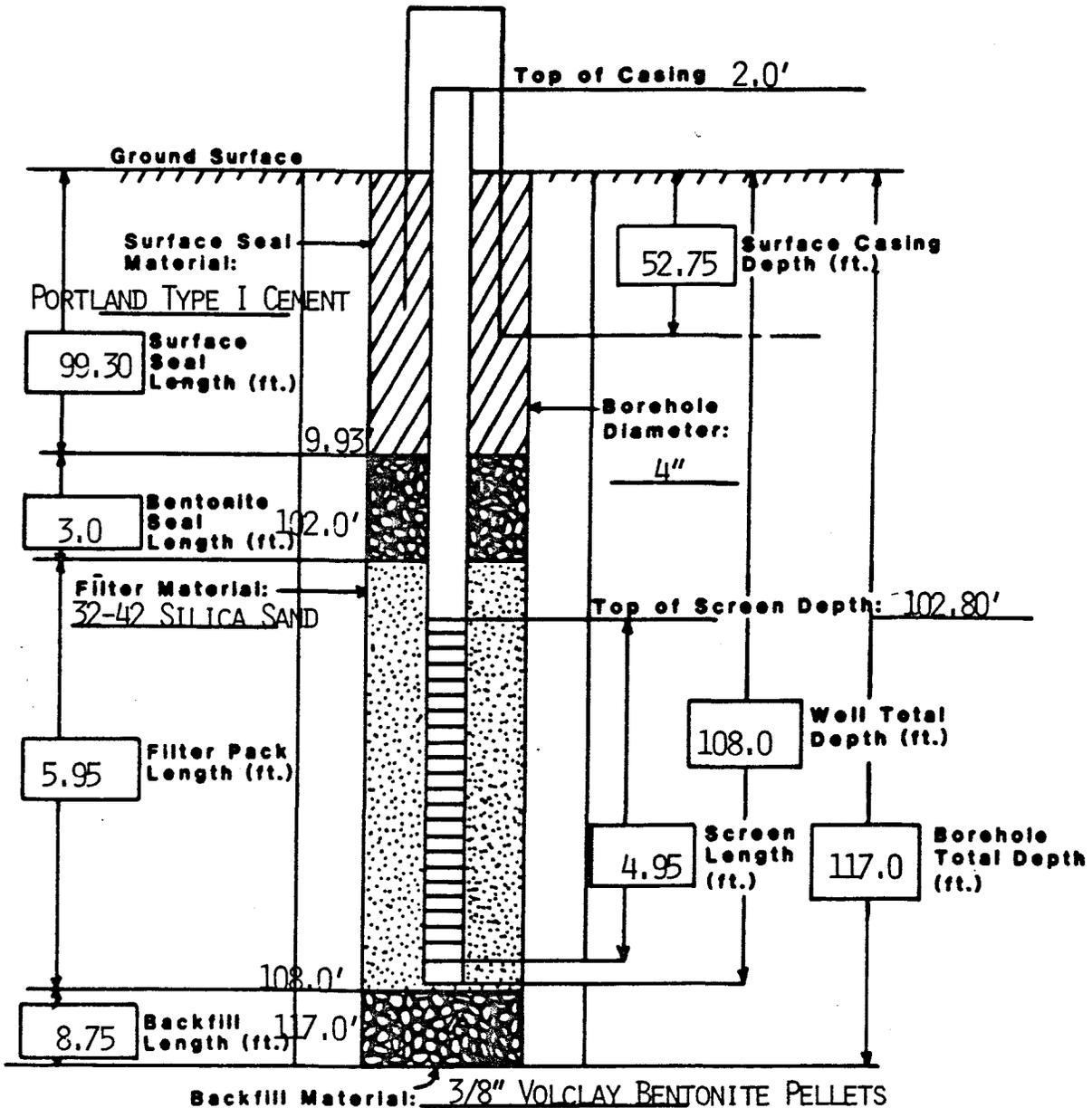
Date Installed JUNE 4, 1987 STAINLESS STEEL

Approved By [Signature]

Installed By J. BERGMAN
 Geologist

[Signature]
 Site Manager
[Signature]
 CEARP Manager

Comments _____

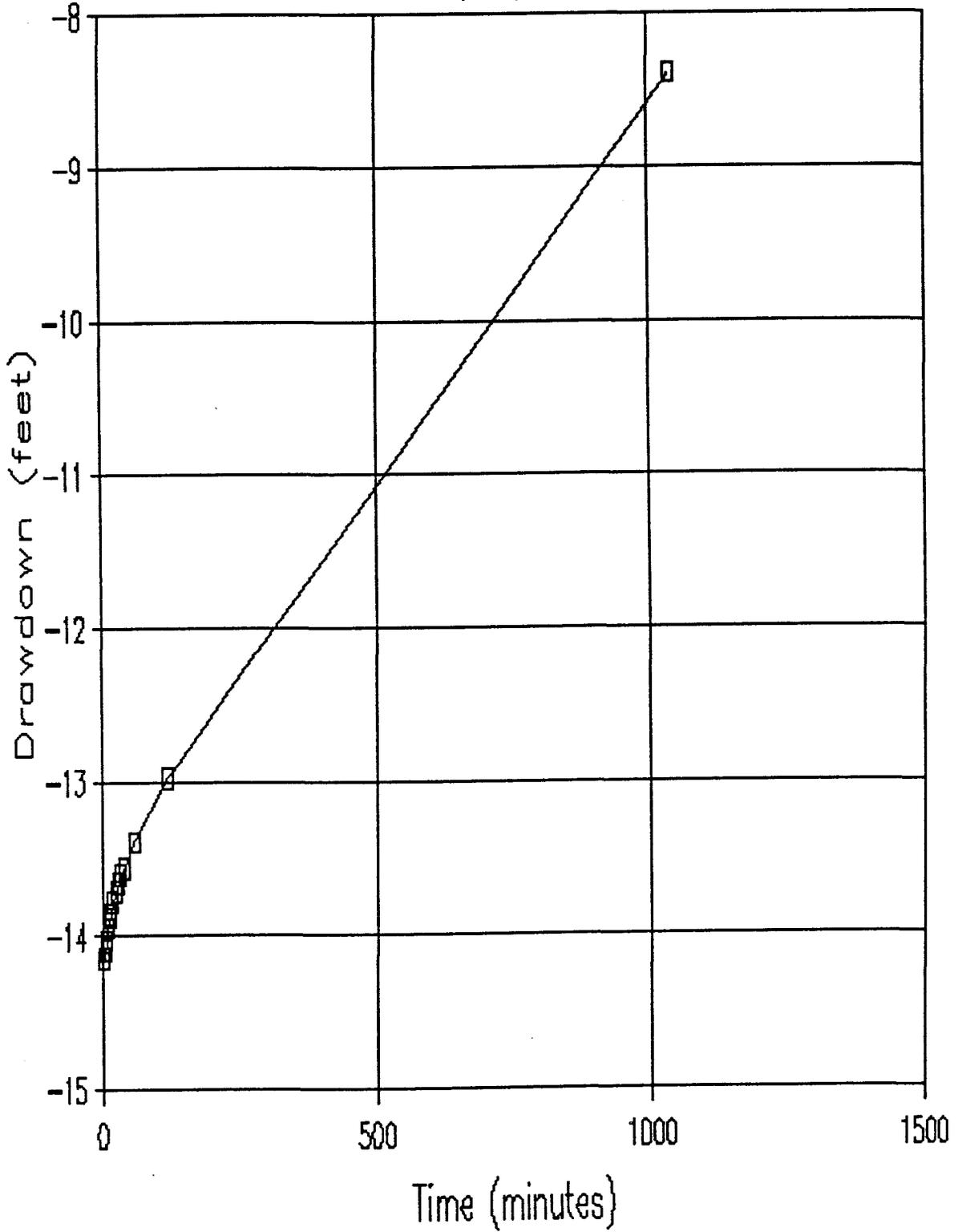


3-87BR
06/18/87
Q = 11 lit/21 min

Recovery Time (min)	Depth to Water (feet)	Draw- down (feet)
static	95.67	
5	109.82	14.15
6	109.76	14.09
8	109.71	14.04
10	109.62	13.95
13	109.55	13.88
15	109.53	13.86
20	109.45	13.78
25	109.38	13.71
30	109.33	13.66
35	109.28	13.61
40	109.23	13.56
60	109.06	13.39
120	108.64	12.97
1040	104.05	8.38

3-87BR

06/18/87



PACKER TEST ANALYSIS

WELL NO. 3-87BR

ROCKY FLATS PLANT: 881 HILLSIDE

JOB NO. 2029-17-02

DATE TESTED: 6/4/87

BY: J.B. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 62.90 - 72.55

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 79.35

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = 0.00001448 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 67.73 + 9.02 + 0.00 * 2.31 = 76.75

R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000001 FT/MIN

K = 0.00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = 0.00115844 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 67.73 + 5.20 + 12.50 * 2.31 = 101.80

R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000064 FT/MIN

K = 0.00000033 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = 0.00004344 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 67.73 + 8.93 + 0.00 * 2.31 = 76.66

R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000003 FT/MIN

K = 0.00000002 CM/SEC

PACKER TEST ANALYSIS

WELL NO. 3-87BR

ROCKY FLATS PLANT; 881 HILLSIDE JOB NO. 2029-17-02

DATE TESTED: 6/4/87 BY: J.B. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 74.55 - 84.20

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 79.35

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = 0.00000145 (FEET3/MIN)
 L = LENGTH OF TEST INTERVAL = 9.65 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 79.37 + 8.21 + 0.00 * 2.31 = 87.58
 R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000000 FT/MIN
 K = 0.00000000 CM/SEC

P2/3 TEST

Q = INJECTION RATE = 0.00020997 (FEET3/MIN)
 L = LENGTH OF TEST INTERVAL = 9.65 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 79.37 + 5.20 + 15.00 * 2.31 = 119.22
 R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000010 FT/MIN
 K = 0.00000005 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = 0.00010860 (FEET3/MIN)
 L = LENGTH OF TEST INTERVAL = 9.65 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 79.37 + 8.56 + 0.00 * 2.31 = 87.93
 R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000007 FT/MIN
 K = 0.00000004 CM/SEC

PACKER TEST ANALYSIS

WELL NO. 3-878R

ROCKY FLATS PLANT; 881 HILLSIDE

JOB NO. 2029-17-02

DATE TESTED: 6/4/87

BY: J.B. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 88.20 - 97.85

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 79.35

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = 0.00001448 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 79.35 + 8.57 + 0.00 * 2.31 = 87.92

R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000001 FT/MIN

K = 0.00000000 CM/SEC

P2/3 TEST

Q = INJECTION RATE = 0.00199107 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 79.35 + 5.20 + 19.00 * 2.31 = 128.44

R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000088 FT/MIN

K = 0.00000045 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = 0.00000145 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 79.35 + 8.21 + 0.00 * 2.31 = 87.56

R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000000 FT/MIN

K = 0.00000000 CM/SEC

PACKER TEST ANALYSIS

WELL NO. 3-87BR

ROCKY FLATS PLANT: 881 HILLSIDE JOB NO. 2029-17-02

DATE TESTED: 6/4/87 BY: J.B. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 97.85 - 107.50

MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 79.35

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = 0.00023169 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.65 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 79.35 + 9.02 + 0.00 * 2.31 = 88.37
 R = BOREHOLE RADIUS = 0.31 FEET

 K = HYDRAULIC CONDUCTIVITY = 0.00000015 FT/MIN
 K = 0.00000008 CM/SEC

P2/3 TEST

Q = INJECTION RATE = 0.00203451 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.65 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 79.35 + 5.20 + 20.50 * 2.31 = 131.90
 R = BOREHOLE RADIUS = 0.31 FEET

 K = HYDRAULIC CONDUCTIVITY = 0.00000087 FT/MIN
 K = 0.00000044 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = 0.00014480 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.65 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 79.35 + 8.28 + 0.00 * 2.31 = 87.63
 R = BOREHOLE RADIUS = 0.31 FEET

 K = HYDRAULIC CONDUCTIVITY = 0.00000009 FT/MIN
 K = 0.00000005 CM/SEC

PACKER TEST ANALYSIS

WELL NO. 3-B7BR

ROCKY FLATS PLANT; 881 HILLSIDE JOB NO. 2029-17-02

DATE TESTED: 6/4/87 BY: J.B. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 101.26 - 110.91

MATERIAL TESTED: ARAFAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 79.35

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = 0.00000145 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.65 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 79.35 + 8.40 + 0.00 * 2.31 = 87.75
 R = BOREHOLE RADIUS = 0.31 FEET

 K = HYDRAULIC CONDUCTIVITY = 0.00000000 FT/MIN
 K = 0.00000000 CM/SEC

P2/3 TEST

TEST ABORTED
 Q = INJECTION RATE = 0.00000000 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.65 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 79.35 + 5.20 + 0.00 * 2.31 = 84.55
 R = BOREHOLE RADIUS = 0.31 FEET

 K = HYDRAULIC CONDUCTIVITY = 0.00000000 FT/MIN
 K = 0.00000000 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = 0.00000145 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.65 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 79.35 + 8.64 + 0.00 * 2.31 = 87.99
 R = BOREHOLE RADIUS = 0.31 FEET

 K = HYDRAULIC CONDUCTIVITY = 0.00000000 FT/MIN
 K = 0.00000000 CM/SEC

02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
0387	06/18/87	5930.58	5932.44	1.86	109.61	95.67	5836.77
	06/24/87	5930.58	5932.44	1.86	109.61	81.35	5851.09
	07/08/87	5930.58	5932.44	1.86	109.61	53.00	5879.44
	08/06/87	5930.58	5932.44	1.86	109.61	48.60	5883.84
	09/02/87	5930.58	5932.44	1.86	109.61	45.50	5886.94
	10/05/87	5930.58	5932.44	1.86	109.61	90.20	5842.24
	11/10/87	5930.58	5932.44	1.86	109.61	44.90	5887.54
	12/16/87	5930.58	5932.44	1.86	109.61	44.80	5887.64
	01/09/88	5930.58	5932.44	1.86	109.61	44.00	5888.44
	02/04/88	5930.58	5932.44	1.86	109.61	43.95	5888.49

INDEX OF DATA

Boring No.: 4-87

Completed as well? Yes

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside

Coordinates N34957.4 E21774.1

Total Depth 23.0'

Borehole/Well No. 4-87

Ground Surface Elevation 5909.79'

Water Level Encountered 5.0', 20.4'

Static 5904.17'

Drilling Company Boyles Bros.

Date Drilled May 11, 1987

Drilling Method Hollow Stem Auger

Logged By K. D. Holliday

Geologist

Driller R. Sharp

Helper A. Shade

Drilling Fluid None

Checked By *AS Pasche*

Site Manager

CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>COLLUVIUM</u>	
			0-2.5' - Sample. Recovered 2.33/2.5' = 93%. CLAY: moderate brown (5YR 2/2); grass; very fine grained (4.0-3.5 ϕ) sand; occasional quartzite cobbles; moist to damp.	HNu background = 2.2. No OVA readings. No readings above background.
5			2.5-5.0' - Sample. Recovered 2.1/2.5' = 84%. CLAY: dusky yellowish brown (10YR 2/2); to dark yellowish brown (10YR 4/2); grass; small (up to 2") quartzite cobbles; fine-grained sand (3.5-3.0 ϕ); moist to damp.	
10			5.0-10.0' - Sample. Recovered 4.28/5.0' = 86%. SAND AND GRAVEL: moderate yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/2); some sand; fine-grained (2.0-4.0 ϕ); clay-rich; some quartzite cobbles and pebbles; subrounded to subangular; caliche (8.28-8.36') very pale orange (10YR 8/2) to grayish orange (10YR 7/4); moist to wet.	
15			10.0-13.0' - Sample. Recovered 2.44/3.0 = 81%. 10.0-11.0 SANDY CLAY: moderate yellowish brown (10YR 5/4); fine grained sand (2.0-4.0 ϕ); occasional quartzite cobbles and pebbles; subrounded to subangular; clayey; moist to wet. 11.0-11.52: SAND AND GRAVEL: light brown (5YR 5/6); sand (2.5-2.0 ϕ); quartzite cobbles; subrounded; moist to wet.	
20				

LOG OF BOREHOLE

Location _____

Coordinates _____

Total Depth _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____

Geologist

Borehole/Well No. 4-87 (cont'd.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By *J. Passley*

Site Manager

T. ...

CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			<p>11.52-12.38 CLAY: light olive gray (5Y 5/2) with patches of dark yellowish orange (10YR 6/6) iron staining; quartzite cobble at 12.38; moist.</p> <p>13.0-16.0' - Sample. Recovered 3.1/3.0' = 103%. 13.0-14.1; GRAVEL: dark yellowish orange (10YR 6/6); quartzite; angular; brown; sandy; clayey; wet.</p> <p>14.1-14.6: CLAY: dark yellowish orange (10YR 6/6) and light olive gray (5Y 5/2); quartzite cobble at 14.6; subrounded; moist to damp.</p> <p>14.6-16.0; SANDY CLAY: moderate yellowish brown (10YR 5/4); quartzite cobbles and pebbles; sand (2.0-2.50); moist to damp.</p>	
25			<p>16.0-18.0' - Sample. Recovered 1.95/2.0 = 98%. SANDY CLAY: moderate yellowish brown (10YR 5/4); quartzite cobbles and pebbles; subangular; sand (2.0-2.5 0); moist to slightly damp.</p> <p>18.0-20.5; - Sample. Recovered 2.1/2.5 = 81%. 18.0-19.5; SANDY CLAY: dark yellowish orange (10YR 6/6); sand (1.5-2.0 0); quartzite cobbles and pebbles; damp to moist.</p>	
30			<p><u>ARAPAHOE FORMATION</u></p>	
35			<p>19.5-20.4': CLAYSTONE: light olive gray (5Y 5/2); disturbed; weathered; slightly damp.</p>	
40				

WELL COMPLETION INFORMATION

Location ROCKY FLATS PLANT; 881 HILLSIDE
 Coordinates N34957.4079 E21774.116
 Total Depth: Well 19.70'
 Borehole 23.0'

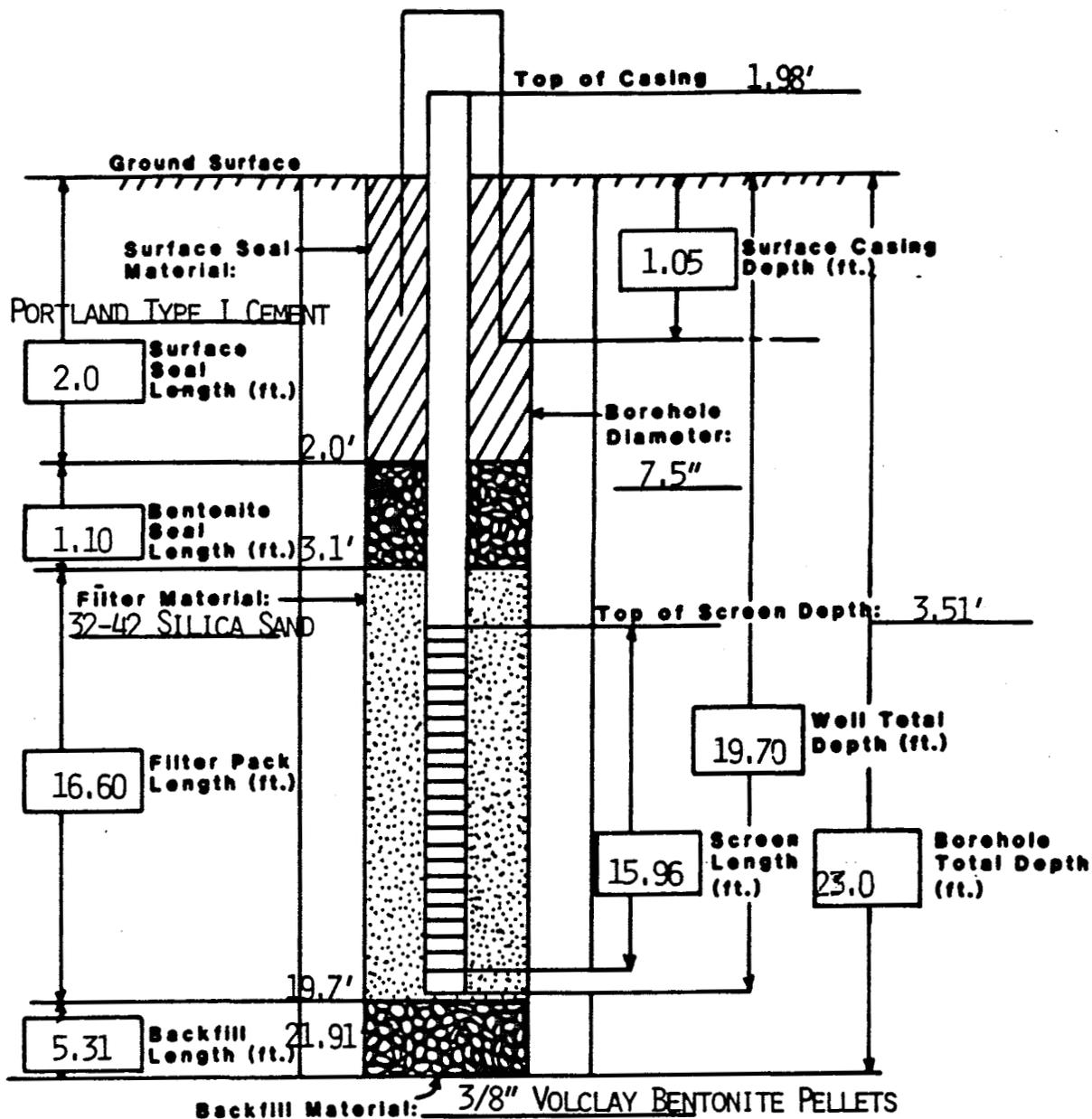
Well No. 4-87
 Elevation: Ground Surface 5909.79'
 Top of Casing 5911.81'

Formation of Completion COLLUVIUM

Casing Material SCH. 5, TYPE 316, TEJ STAINLESS STEEL
 Screen Material 0.010" WIRE WRAP, TYPE 316 STAINLESS STEEL
 Date Installed MAY 12, 1987
 Installed By K.D. HOLLWAY
 Geologist

Casing Diameter 2" ID
 Surface Casing Diameter 5" ID
 Approved By [Signature]
 Site Manager
[Signature]
 CEARP Manager

Comments CENTRALIZER FROM 8.32-9.57'

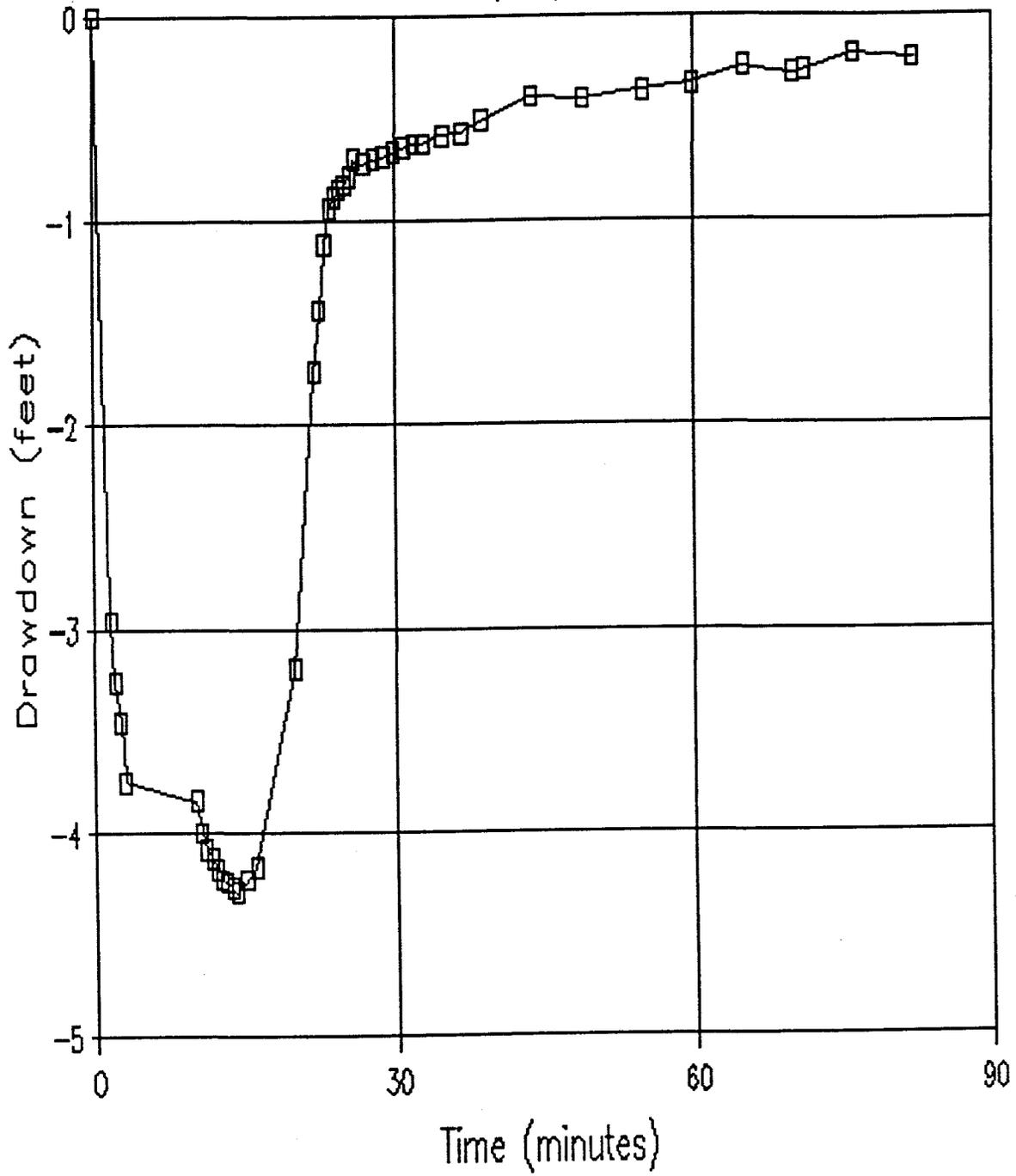


4-87 P-Test
06/02/87

Time (min)	Recovery Time (min)	Depth to Water (feet)	Draw- down (feet)
0		15.13	.00
1.5		17.63	2.96
2		32.25	3.26
2.5		34.63	3.46
3		38.13	3.75
10		39.25	3.84
10.5		41.13	4.00
11		42.13	4.08
11.5		42.63	4.13
12		43.25	4.18
12.5		43.88	4.23
13		44.00	4.24
13.5		44.38	4.27
14		44.63	4.29
15		43.88	4.23
16		43.13	4.17
20	3	31.50	3.20
22	5	14.00	1.74
22.5	5.5	10.38	1.44
23	6	6.50	1.11
23.5	6.5	4.38	.94
24	7	3.75	.89
24.5	7.5	3.25	.84
25	8	3.00	.82
25.5	8.5	2.50	.78
26	9	1.50	.70
27	10	1.75	.72
28	11	1.50	.70
29	12	1.38	.69
30	13	1.13	.67
31	14	.88	.65
32	15	.63	.63
33	16	.63	.63
35	18	.13	.58
37	20	.00	.57
39	22	-.75	.51
44	27	-2.13	.40
49	32	-2.00	.41
55	38	-2.50	.36
60	43	-2.88	.33
65	48	-3.88	.25
70	53	-3.50	.28
71	54	-3.63	.27
76	59	-4.63	.19
82	65	-4.38	.21

P-TEST OF 4-87

06/02/87



02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
0487	06/24/87	5909.79	5911.81	2.02	21.49	7.64	5904.17
	07/08/87	5909.79	5911.81	2.02	21.49	6.50	5905.31
	08/06/87	5909.79	5911.81	2.02	21.49	8.60	5903.21
	10/05/87	5909.79	5911.81	2.02	21.49	10.00	5901.81
	11/10/87	5909.79	5911.81	2.02	21.49	10.10	5901.71
	12/16/87	5909.79	5911.81	2.02	21.49	10.00	5901.81
	01/08/88	5909.79	5911.81	2.02	21.49	9.90	5901.91
	02/04/88	5909.79	5911.81	2.02	21.49	8.28	5903.53

INDEX OF DATA

Boring No.: 5-87BR

Completed as well? Yes

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside

Coordinates N35095.3 E21736.5

Total Depth 61.0'

Borehole/Well No. 5-87BR

Ground Surface Elevation 5927.76'

Water Level Encountered None

Static 5883.60' (6/26/87)

Drilling Company Boyles Bros.

Date Drilled May 22 and 27, 1987

Drilling Method 0.00-23.0': HOLLOW Stem Auger

Logged By M. D. Gard ; J. B. Bergman

Geologist

Driller D. Jarvie; P. Bushkovski

Helper T. Merritt; K. Martin

Drilling Fluid 0.0-23.0': None; 23.0-61.0': W

Checked By [Signature]

Site Manager

CEARP Manager

Comments Surface casing set to 23.3' on May 22, 1987 by M. D. Gard.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			COLLUVIUM (DISTURBED)	
			<p><u>0.0-2.0'</u> - Sample. Recovered 1.2/2.0' = 60%.</p> <p>0.0-0.8': TOPSOIL: moderate brown (5YR 4/4); clay; sandy; abundant organics; moist.</p> <p>0.8-2.0': CLAY: dark yellowish brown (10YR 4/2); trace sand; some quartzite pebbles; weathered; moist.</p>	<p>HNu background = 2</p> <p>OVA background = 1.4</p>
5			<p><u>2.0-4.0'</u> - Sample. Recovered 2.0/2.0' = 100%.</p> <p>2.0-3.9': CLAY: same as above.</p> <p>3.9-4.0': CLAY: moderate yellowish brown (10YR 5/4); silty; moist.</p>	<p>HNu rdg = 50 units on core.</p> <p>200 units over cuttings</p>
			<p><u>4.0-8.0'</u> - Sample. Recovered 4.0/4.0' = 100%.</p> <p>4.0-5.7': CLAY: same as above.</p> <p><u>5.7-8.0'</u>: CLAY: moderate yellowish brown (10YR 5/4) abundant quartzite pebbles; silty; trace sand; moist.</p>	
10			<p><u>8.0-13.0'</u> - Sample. Recovered 3.0/5.0' = 60%.</p> <p>8.0-10.0': CLAY: same as above.</p> <p>10.0-12.2: SAND: light brown (5YR 5/6): 1.0-1.5 φ; gravelly; moist.</p>	
			ARAPAHOE FORMATION	
15			<p><u>12.2-13.0'</u>: CLAYSTONE: olive gray (5Y 3/2); abundant limonite stains; fractured; moist.</p>	
20				

LOG OF BOREHOLE

Location _____
 Coordinates _____
 Total Depth _____

Borehole/Well No. 5-87BR (cont'd.)
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____

Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
 Geologist

Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By W Pasche
 Site Manager
TC
 CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed	
20			<p><u>13.0-18.0'</u> - Sample. Recovered 5.0/5.0 = 100%. CLAYSTONE: same as above.</p> <p><u>18.0-23.0'</u> - Sample. Recovered 5.0/5.0' = 100%. CLAYSTONE: same as above.</p> <p><u>23.0-27.0'</u> - Sample. Recovered 0.8/4.0' = 20%. RQD = 0.0/0.8' = 0%. CLAYSTONE: light olive (10Y 5/4) with some light olive brown (5Y 5/6) mottles; dense; some very fine-grained sand at 23.5'; weathered; moist.</p> <p><u>27.0-29.0'</u> - Sample. Recovered 1.3/2.0' = 65%. RQD = 0.75/1.3' = 58%. CLAYSTONE: light olive brown (10Y 5/4) with common moderate reddish orange (10Y 6/6) mottles; some fractures; weathered; moist.</p> <p><u>29.0-33.0'</u> - Sample. Recovered 0.2/4.0' = 5%. RQD = 0.0/0.2' = 0%. CLAYSTONE: same as above.</p> <p><u>33.0-34.3'</u> - Sample. Recovered 2.5/1.3' = 192%. RQD = 1.2/2.5' = 48%. CLAYSTONE: moderate olive brown (5Y 4/4) with abundant moderate reddish brown (10R 4/6) mottles; weathered; dense; abundant FeO concretions; dry.</p> <p><u>34.3-38.5'</u> - Sample. Recovered 0/4.2' = 0%.</p>	<p>Packer Test Interval #3: 26.40'-36.05'</p> <p>Packer Test Interval #2: 36.05'-45.70'.</p>	
25					
30					
35					
40					

LOG OF BOREHOLE

Location _____
 Coordinates _____
 Total Depth _____

Borehole/Well No. 5-87BR (cont'd.)
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____

Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By J. Pasalle
Site Manager
T. [Signature]
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
40	[Hatched pattern]		<p><u>38.5-40.2'</u> - Sample. Recovered 1.7/1.7' = 100%. RQD = 1.7/1.7' = 100%. CLAYSTONE: moderate olive brown (5Y 4/4) with abundant light olive brown (5Y 5/6) mottles; homogenous; damp.</p> <p><u>40.2-41.5'</u> - Sample. Recovered 0/1.3' = 0%.</p>	
45	[Dotted pattern]		<p><u>41.5-44.5'</u> - Sample. Recovered 3.0/3.0' = 100%. RQD = 3.0/3.0' = 100%. CLAYSTONE: dusky yellow (5Y 6/4); abundant FeO stains moderate brown (5YR 4/4); some very fine-grained sand; sorted; large fracture from 42.3 to 43.3' (vertical); slightly damp.</p>	Packer Test Internal #1: 45.70'-55.35'.
50	[Dotted pattern]		<p><u>44.5-48.0'</u> - Sample. Recovered 3.8/3.5' = 109%. RQD = 3.6/3.8' = 95%.</p> <p><u>44.5-45.7'</u>: CLAYSTONE: dusky yellow (5Y 6/4) with abundant moderate brown (5YR 4/4) stains; 2-45° fractures at 44.7' and 45.5'; damp.</p> <p><u>45.7-47.7'</u>: SANDSTONE: moderate yellowish brown (10YR 5/4); very fine-grained; well sorted; clayey; abundant moderate brown (5YR 4/4) stains; damp.</p>	
55	[Hatched pattern]		<p><u>48.0-52.5'</u> - Sample. Recovered 4.5/4.5' = 100%. RQD = 3.7/4.5' = 82%.</p> <p><u>48.0-51.3'</u>: SANDSTONE: same as above.</p> <p><u>51.3-52.5'</u>: CLAYSTONE: olive gray (5Y 3/2); dense; homogenous; unweathered; damp.</p>	
60	[Hatched pattern]			

LOG OF BOREHOLE

Location _____
 Coordinates _____
 Total Depth _____

Borehole/Well No. 5-87BR (cont'd.)
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____

Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By Al Pasallo
Site Manager
TC
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
60	[Hatched Box]	[Vertical Lines]	<p><u>52.5-57.0'</u> - Sample. Recovered 4.8/4.5' = 107%. RQD = 1.8/4.8' = 38%. CLAYSTONE: olive gray (5Y 3/2); abundant light brown (5Y 5/6) stains; consolidated; homogenous, fractured; moist.</p> <p><u>57.0-61.0'</u> - Sample. Recovered 4.1/4.0' = 103%. RQD - 4.1/4.1' = 100%. CLAYSTONE: same as above.</p> <p style="text-align: center;">Total Depth: 61.0'</p>	
65				
70				
75				
80				

PROGRAM SLUGT, VERSION 4,OCT. 1985

THIS PROGRAM CALCULATES MEAN TRANSMISSIVITIES FROM SLUG-TEST DATA BASED ON TWO ANALYTICAL APPROACHES:

- (1) METHOD OF COOPER, BREDEHOEFT AND PAPADOPULOS, 1967 (ARTICLE IN VOL.3,NO.1 OF WRR ENTITLED "RESPONSE OF A FINITE DIAMETER WELL TO AN INSTANTANEOUS CHARGE OF WATER")
- (2) METHOD OF BOUWER AND RICE, 1976 (ARTICLE IN VOL. 12, NO.3 OF WRR ENTITLED "A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AQUIFERS WITH COMPLETELY OR PARTIALLY PENETRATING WELLS")

PROJECT NO.: 6-011B-87

CLIENT: Rockwell International

ITE LOCATION: Rocky Flats Plant

DATE OF SLUG TEST: 10-23-87

FIELD INVESTIGATOR: Kevin McNeill

WELL NO.: 5-87 BR

INPUT DATA ARE:

INNER CASING DIAMETER = 2.00 INCHES	LENGTH OF SCREEN OR INTAKE PORTION = 6.25 FEET
INNER SCREEN OR OPEN-HOLE DIAMETER = 2.00 INCHES	DEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = 6.25 FEET
DIAMETER OF DRILLED HOLE = 4.00 INCHES	THICKNESS OF SATURATED AQUIFER ZONE = 6.30 FEET
ESTIMATED POROSITY OF GRAVEL PACK = .25	FALLING-HEAD INDEX = 1 ("1" IF FALLING,"0" IF RISING)
NUMBER OF HEAD-TIME DATA POINTS = 46	

TIME (sec)	HEAD (FEET)
1.00	.600
2.00	.590
3.00	.580
4.00	.570
5.00	.570
6.00	.560
7.00	.560
8.00	.550
9.00	.540
10.00	.540
11.00	.530
12.00	.520
13.00	.520
14.00	.520
15.00	.510
20.00	.500
25.00	.480
30.00	.460
35.00	.450
40.00	.440
45.00	.430
50.00	.420
60.00	.400
70.00	.380
80.00	.360
90.00	.340

110.00	.310
130.00	.290
150.00	.270
180.00	.250
230.00	.210
290.00	.180
350.00	.160
410.00	.150
470.00	.130
530.00	.120
650.00	.110
770.00	.090
890.00	.080
1070.00	.070
1340.00	.060
1650.00	.050
1940.00	.030
2240.00	.030
2540.00	.020
2840.00	.020

HO WAS COMPUTED FROM INTERCEPT OF PLOT OF LOG(H) VS. TIME

SUCCESSIVE COMPUTED
VALUES FOR HO
(FEET)

.4216
.4300

METHOD OF BOUWER AND RICE

COMPUTED RESULTS USING DIAMETER OF DRILLED HOLE:

PERMEABILITY = 2.16E-06 FT/sec = 6.57E-05 CM/sec

TRANSMISSIVITY = 1.36E-05 FT**2/sec

COMPUTED RESULTS USING DIAMETER OF CASING AND SCREEN:

PERMEABILITY = 2.59E-06 FT/sec = 7.91E-05 CM/sec

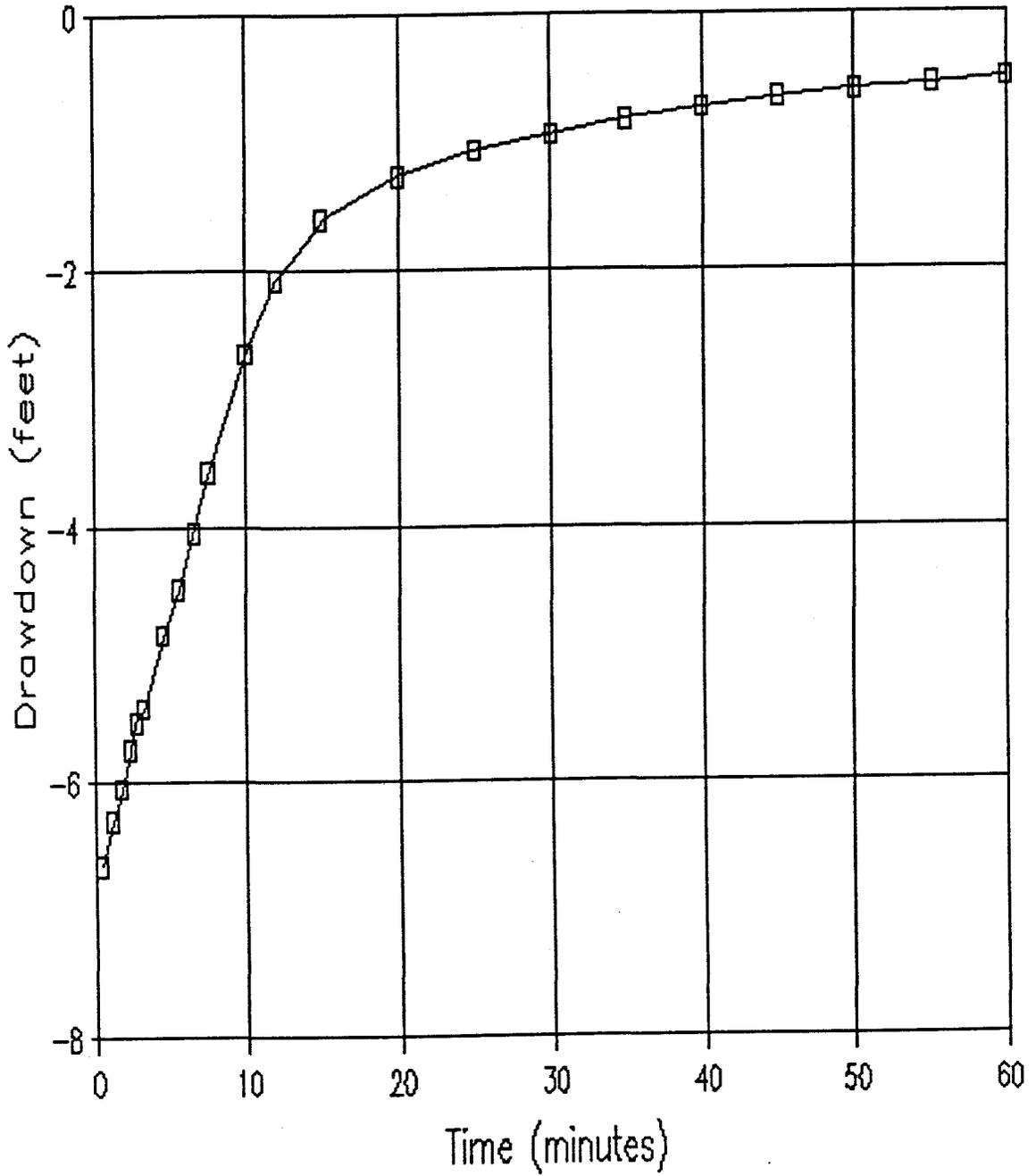
TRANSMISSIVITY = 1.63E-05 FT**2/sec

5-87BR
06/16/87
Bailed 8.3 liters in 10 minutes

Time (min)	Recovery Time (min)	Depth to Water (feet)	Draw- down (feet)
0		46.87	
10	0		
10.33	.33	53.52	6.65
11.12	1.12	53.17	6.30
11.67	1.67	52.92	6.05
12.25	2.25	52.61	5.74
12.67	2.67	52.40	5.53
13.17	3.17	52.29	5.42
14.5	4.5	51.71	4.84
15.5	5.5	51.35	4.48
16.5	6.5	50.91	4.04
17.5	7.5	50.44	3.57
20	10	49.52	2.65
22	12	48.95	2.08
25	15	48.48	1.61
30	20	48.14	1.27
35	25	47.94	1.07
40	30	47.82	.95
45	35	47.70	.83
50	40	47.61	.74
55	45	47.53	.66
60	50	47.47	.60
65	55	47.43	.56
70	60	47.38	.51

5-87BR

06/16/87



PACKER TEST ANALYSIS

WELL NO. 5-87BR

ROCKY FLATS PLANT; 881 HILLSIDE

JOB NO. 2029-17-02

DATE TESTED: 5/28/87

BY: J.B. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 26.40 - 36.05

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 44.56

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = 0.00264993 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

$$= 31.22 + 9.22 + 0.00 * 2.31 = 40.44$$

R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000371 FT/MIN

K = 0.00000188 CM/SEC

P2/3 TEST

TEST ABORTED

Q = INJECTION RATE = 0.00000000 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

$$= 31.22 + 5.20 + 0.00 * 2.31 = 36.42$$

R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000000 FT/MIN

K = 0.00000000 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = 0.00000145 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

$$= 31.22 + 9.55 + 0.00 * 2.31 = 40.77$$

R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000000 FT/MIN

K = 0.00000000 CM/SEC

PACKER TEST ANALYSIS

WELL NO. 5-87BR

ROCKY FLATS PLANT: 881 HILLSIDE JOB NO. 2029-17-02

DATE TESTED: 5/28/87 BY: J.B. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 36.05 - 45.70

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 44.56

$$K = \frac{Q}{2(\pi)(L)(H)} \cdot \frac{L}{\ln\left(\frac{L}{R}\right)}$$

1ST P1/3 TEST

Q = INJECTION RATE = 0.00202727 (FEET3/MIN)
 L = LENGTH OF TEST INTERVAL = 9.65 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 40.87 + 9.84 + 0.00 * 2.31 = 50.72
 R = BOREHOLE RADIUS = 0.31 FEET

 K = HYDRAULIC CONDUCTIVITY = 0.00000226 FT/MIN
 K = 0.00000115 CM/SEC

P2/3 TEST

TEST ABORTED
 Q = INJECTION RATE = 0.00000000 (FEET3/MIN)
 L = LENGTH OF TEST INTERVAL = 9.65 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 40.87 + 5.20 + 0.00 * 2.31 = 46.08
 R = BOREHOLE RADIUS = 0.31 FEET

 K = HYDRAULIC CONDUCTIVITY = 0.00000000 FT/MIN
 K = 0.00000000 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = 0.00034753 (FEET3/MIN)
 L = LENGTH OF TEST INTERVAL = 9.65 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 40.87 + 9.86 + 0.00 * 2.31 = 50.74
 R = BOREHOLE RADIUS = 0.31 FEET

 K = HYDRAULIC CONDUCTIVITY = 0.00000039 FT/MIN
 K = 0.00000020 CM/SEC

PACKER TEST ANALYSIS

WELL NO. 5-87BR

ROCKY FLATS FLANT: 881 HILLSIDE JOB NO. 2029-17-02

DATE TESTED: 5/28/87 BY: J.B. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 45.70 - 55.35

MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 44.56

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = 0.00143646 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 44.56 + 8.46 + 0.00 * 2.31 = 53.02

R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000153 FT/MIN

K = 0.00000078 CM/SEC

P2/3 TEST

TEST ABORTED

Q = INJECTION RATE = 0.00000000 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 44.56 + 5.20 + 0.00 * 2.31 = 49.76

R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000000 FT/MIN

K = 0.00000000 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = 0.00038373 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 44.56 + 10.41 + 0.00 * 2.31 = 54.97

R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000039 FT/MIN

K = 0.00000020 CM/SEC

02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

<u>WELL NUMBER</u>	<u>DATE</u>	<u>G. S. ELEVATION</u>	<u>TOC ELEVATION</u>	<u>STICK UP</u>	<u>SI BASE BELOW TOC</u>	<u>WATER DEPTH BELOW TOC</u>	<u>WATER SURFACE ELEVATION</u>
0587	06/16/87	5927.76	5930.16	2.40	53.65	46.87	5883.29
	06/24/87	5927.76	5930.16	2.40	53.65	45.56	5884.60
	07/06/87	5927.76	5930.16	2.40	53.65	46.20	5883.96
	08/04/87	5927.76	5930.16	2.40	53.65	46.30	5883.86
	09/29/87	5927.76	5930.16	2.40	53.65	46.30	5883.86
	11/09/87	5927.76	5930.16	2.40	53.65	46.20	5883.96
	12/21/87	5927.76	5930.16	2.40	53.65	46.50	5883.66
	01/11/88	5927.76	5930.16	2.40	53.65	46.20	5883.96
	02/04/88	5927.76	5930.16	2.40	53.65	31.16	5899.00

INDEX OF DATA

Boring No.: 6-87

Completed as well? Yes

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside

Coordinates N35016.0 E22021.3

Total Depth 15.5'

Drilling Company Boyles Bros.

Date Drilled May 14, 1987

Drilling Method Hollow Stem Auger

Logged By K. D. Holliday
Geologist

Borehole/Well No. 6-87

Ground Surface Elevation 5904.53'

Water Level Encountered 4.2'

Static 5900.7 (6/24/87)

Driller A. Shade

Helper D. Jarvie

Drilling Fluid None

Checked By [Signature]

Site Manager

CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>COLLUVIUM</u>	
			0-2.0' - Sample. Recovered 2.0/2.0' = 100%. CLAY: dusky yellowish brown (10YR 2/2); grasses and roots; occasional quartzite cobbles/pebbles; damp to moist.	
5			2.0-5.5' - Sample. Recovered 3.9/3.5' = 111%. 2.0-4.2': CLAY: dusky yellowish brown (10YR 2/2) to dark yellowish brown (10YR 4/2); roots; occasional quartzite cobble; distributed; <i>JA</i> unconsolidated; damp to moist. 4.2': COBBLE: quartzite in clay matrix; 3' diameter; moist. 4.2-5.50': CLAY: dark yellowish orange (10YR 6/6) with light olive gray (5Y 5/2) stains; weathered; unconsolidated; damp to moist.	
10			5.5-10.5' - Sample. Recovered 3.5/5.0' = 70%. 5.50-5.90': CLAY: dark yellowish orange (10YR 6/6) and yellowish gray (5Y 7/2); weathered; damp. 5.90-6.10': SAND: light brown (5YR 5/6); coarse-grained (1.0-0.5 ϕ and 2.0-2.5 ϕ); quartzite cobbles; clay matrix; unconsolidated; damp to moist. 6.1-6.50': CLAY: grayish orange (10YR 7/4) with yellowish gray (5Y 7/2); quartzite cobble; weathered; damp to moist.	
15				
20				

H_{Nu} background = 0.8.
No readings above background.

LOG OF BOREHOLE

Location _____

Borehole/Well No. 6-87 (cont'd.)

Coordinates _____

Ground Surface Elevation _____

Total Depth _____

Water Level Encountered _____

Static _____

Drilling Company _____

Driller _____

Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By St Pasche

Geologist

Site Manager

CEARP Manager

Comments _____

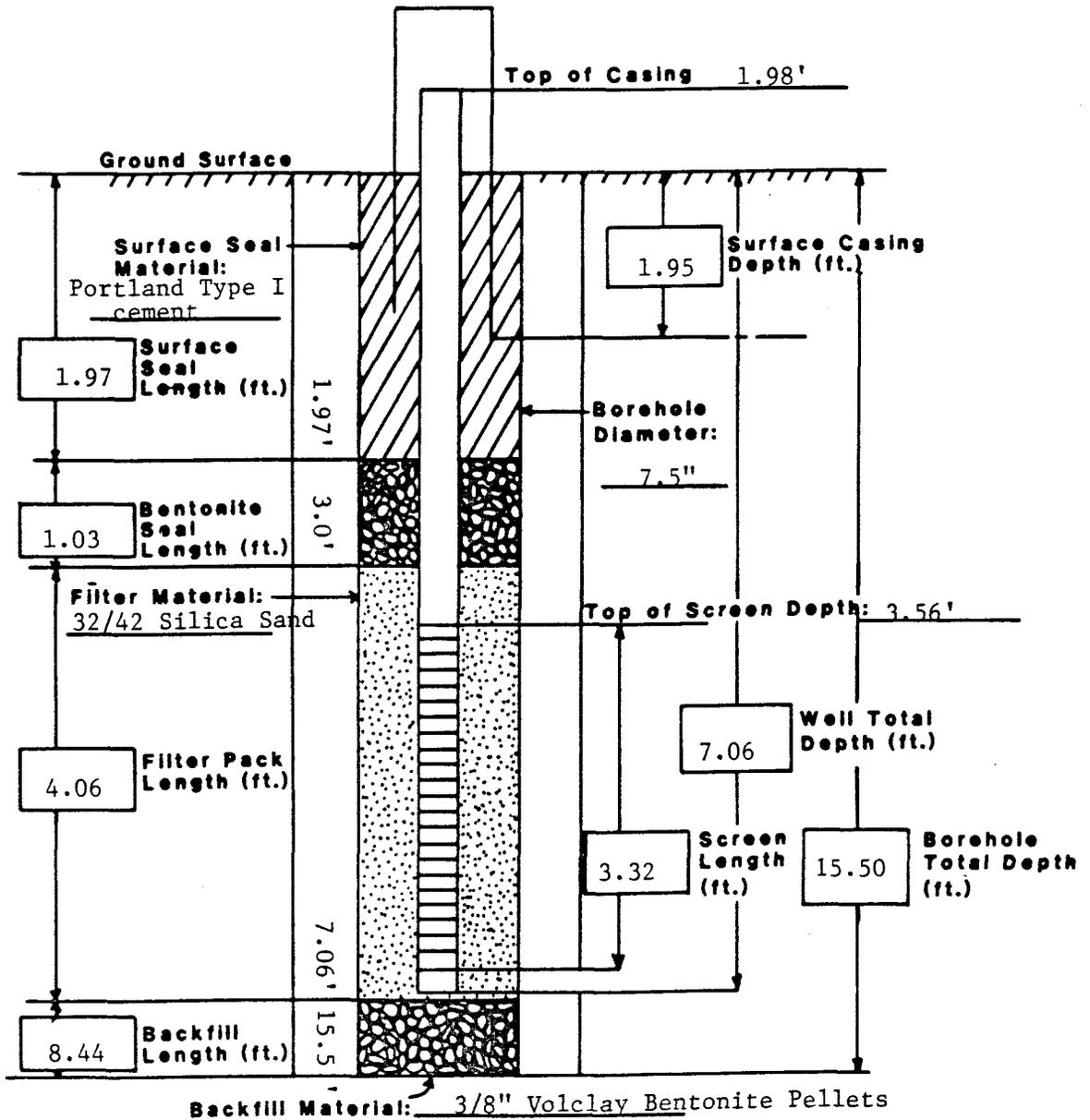
Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			<u>ARAPAHOE FORMATION</u>	
			6.50-9.0': CLAYSTONE: light olive gray (5Y 5/2) with dark yellowish orange (10YR 6/6) stains; unconsolidated; weathered; damp to slightly moist.	
—			10.5-15.5' - Sample. Recovered 5.3/5.0' = 106%. CLAYSTONE: olive gray (5Y 3/2) with dark yellowish orange (10YR 6/6) stains; trace caliche; fractured; trace sand (3.5-4.0 Ø); weathered; damp to dry.	
			TOTAL DEPTH: 15.50'	
—				
—				
—				

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; 881 Hillside Area Well No. 6-87
 Coordinates N 35016.0238 E 22021.2950 Elevation: Ground Surface 5904.53'
 Total Depth: Well 7.06' Top of Casing 5906.46'
 Borehole 15.1'
 Formation of Completion Colluvium
 Casing Material Sch 5, Type 316 TFJ stainless steel Casing Diameter 2" ID
 Screen Material 0.010" wire wrap, Type 316 TFJ stainless steel Surface Casing Diameter 5" ID
 Date Installed May 14, 1987 Approved By S. Paschke
 Installed By K.D. Holliday Site Manager
 Geologist

CEARP Manager

Comments _____



02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

<u>WELL NUMBER</u>	<u>DATE</u>	<u>G. S. ELEVATION</u>	<u>TOC ELEVATION</u>	<u>STICK UP</u>	<u>SI BASE BELOW TOC</u>	<u>WATER DEPTH BELOW TOC</u>	<u>WATER SURFACE ELEVATION</u>
0687	06/24/87	5904.53	5906.42	1.89	8.77	5.67	5900.75
	07/28/87	5904.53	5906.42	1.89	8.77	6.90	5899.52
	08/06/87	5904.53	5906.42	1.89	8.77	7.40	5899.02
	10/05/87	5904.53	5906.42	1.89	8.77	4.70	5901.72
	11/10/87	5904.53	5906.42	1.89	8.77	3.70	5902.72
	12/16/87	5904.53	5906.42	1.89	8.77	3.70	5902.72
	01/08/88	5904.53	5906.42	1.89	8.77	2.90	5903.52
	02/04/88	5904.53	5906.42	1.89	8.77	2.49	5903.93

INDEX OF DATA

Boring No.: 6-87A

Completed as well? No

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
 Coordinates * N34980 E22455
 Total Depth 32.0'

Borehole/Well No. 6-87A
 Ground Surface Elevation * 5890.0'
 Water Level Encountered None
 Static N/A

Drilling Company Boyles Bros.
 Date Drilled May 13, 1987
 Drilling Method Hollow Stem Auger
 Logged By K. D. Holliway
 Geologist

Driller A. Shade
 Helper D. Jarvie
 Drilling Fluid None
 Checked By [Signature]
 Site Manager
[Signature]
 CEARP Manager

Comments Abandoned hole at 32.0'. Plugged with Portland Type I cement.
* Estimated values from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>COLLUVIUM</u> <u>VALLEY FILL ALLUVIUM</u>	HNu background = 2.8. No OVA readings. No HNu readings above background.
			0.0-5.0' - Sample. Recovered 1.4/5.0' = 28%. CLAY: dusky yellowish brown; (10YR 2/2); occasional quartzite cobbles/pebbles; grasses & roots; damp.	
5			5.0-9.0' - Sample. Recovered 4.0/4.0 = 100%. 5.0-6.5': CLAY: same as above; coarse-grained sandstone and quartzite cobbles; unconsolidated.	
			<u>ARAPAHOE FORMATION</u>	
			6.5-9.0': CLAYSTONE: light olive gray (5Y 5/2); dark yellowish orange (10YR 6/6) stains; unconsolidated; weathered; damp.	
10			9.0-14.0' - Sample. Recovered 5.0/5.0' = 100%. CLAYSTONE: olive gray (5Y 3/2); dark yellowish orange (10YR 6/6) stains; weathered; trace sand (3.5-4.0 ϕ); trace caliche; damp to dry.	
15			14.0-17.6' - Sample. Recovered 4.3/3.6' = 119%. CLAYEY SANDSTONE: grayish orange (10YR 7/4) 2.50-3.0 ϕ to 2.50-2.0 ϕ ; quartzose and feldspathic; subrounded; claystone interbeds; damp.	
20			17.6-22.6' - Sample. Recovered 1.0/5.0' = 20%. SANDSTONE: grayish orange (10YR 7/4); coarse- grained; dark yellowish orange (10YR 6/6) stains; poorly sorted; subrounded to subangular; dry.	

LOG OF BOREHOLE

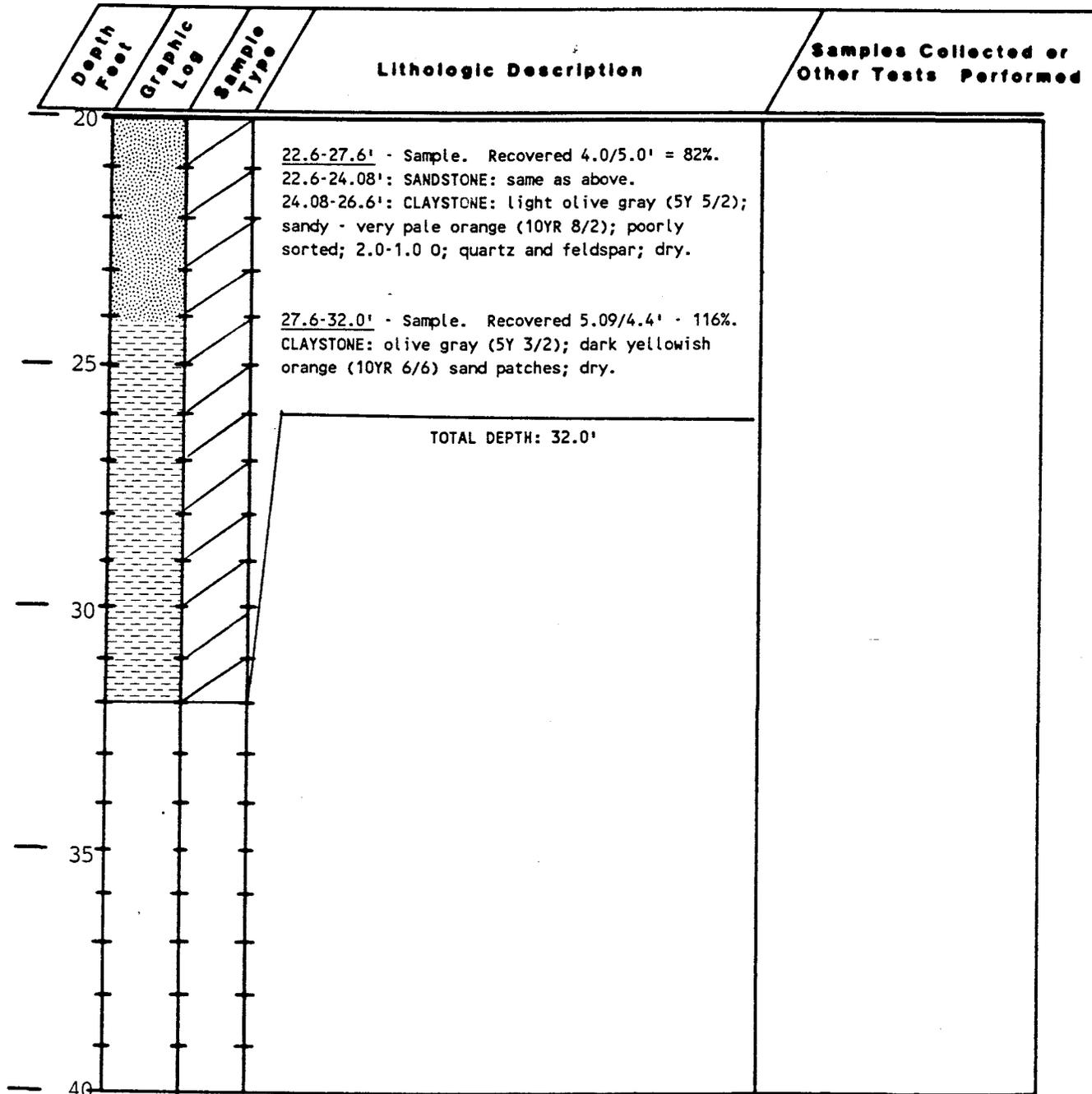
Location _____
 Coordinates _____
 Total Depth _____

Borehole/Well No. 6-87A (cont'd.)
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____

Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By [Signature]
Site Manager
[Signature]
CEARP Manager

Comments _____



INDEX OF DATA

Boring No.: 7-87BRA

Completed as well? No

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
 Coordinates N 35077.27 E 21689.17
 Total Depth 57.50'

Borehole/Well No. 7-87BRA
 Ground Surface Elevation 5928.21'
 Water Level Encountered None
 Static N/A

Drilling Company Boyles Bros.
 Date Drilled June 4, 5, and 6, 1987
 Drilling Method Hollow Stem Auger
 Logged By K. D. Holliway; J. B. Bergman
 Geologist

Driller A. Shade
 Helper T. Merritt
 Drilling Fluid None
 Checked By [Signature]
 Site Manager
[Signature]
 CEARP Manager

Comments No water encountered. Borehole plugged with Portland Type I cement.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>COLLUVIUM (DISTURBED)</u>	HNu background = 0.2. OVA background = 3.2. No readings above background.
0.0-0.55'			<u>0.0-0.55'</u> - Sample. Recovered 0.55/0.55' = 100%. CLAYEY SAND: grayish brown (5YR 3/2); abundant quartzite cobbles; subangular; grass and roots; (3.5-4.0 Ø); dry.	
1.0-2.5'			<u>1.0-2.5'</u> - Sample. Recovered 1.50'/2.0' = 75%. CLAYEY SAND: moderate yellowish brown (10YR 5/4); subrounded to subangular quartzite cobbles; sand (3.5-4.0 Ø); fracture with iron nodule at 1.15'; dry.	
2.5-5.5'			<u>2.5-5.5'</u> - Sample. Recovered 3.0/3.0 = 100%. SANDY CLAY: moderate yellowish brown (10YR 5/4); quartzite cobbles; subrounded to subangular (-1.0 Ø to .25" diameter); sand (3.5-4.0 Ø); dry to slightly damp.	
5.5-10.5'			<u>5.5-10.5'</u> - Sample. Recovered 5.0/5.0' = 100%. <u>5.5-5.7'</u> : CLAYEY SAND: moderate brown (5YR 4/4); quartzite gravel; subangular to subrounded; sand (2.0-1.5 Ø); dry . <u>5.7-6.3'</u> : CLAY: light olive gray (5Y 5/2); prominent dark yellowish orange (10YR 6/6) stains; weathered; dry.	
15				
20				

LOG OF BOREHOLE

Location _____

Borehole/Well No. 7-87BRA (cont'd.)

Coordinates _____

Ground Surface Elevation _____

Total Depth _____

Water Level Encountered _____

Static _____

Drilling Company _____

Driller _____

Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By J. J. [Signature]

Geologist

Site Manager

CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			ARAPAHOE FORMATION	
			6.3-10.5': CLAYSTONE: light olive gray (5Y 5/2); iron staining dark yellowish orange (10YR 6/6); caliche stringers; fractures; trace sand (3.5-4.0 Ø).	
25			10.5-15.5' - Sample. Recovered 4.4/5.0' = 88%. CLAYSTONE: olive gray (5Y 4/1); dark yellowish orange (10YR 6/6) stains; weathered; trace sand; dry to damp.	
			15.5-20.5' - Sample. Recovered 5.1/5.0' = 102%. CLAYSTONE: same as above; fractures from 15.5-18.0' and vertical fracture 16.1-17.2'; dry to slightly damp.	
30			20.5-25.5' - Sample. Recovered 5.0/5.0' = 100%. 20.5-21.6': CLAYEY SAND: olive black (5Y 2/1); weathered; small fractures; caliche; dry. 21.6-25.5': CLAYEY SAND: same as above; sand (3.5-4.0 Ø); dry.	
			25.5-30.5' - Sample. Recovered 5.0/5.0' = 100%. CLAYSTONE: olive gray (5Y 4/1); dusky red (10R 2/2) iron nodules; light brown (5YR5/6) mottles; trace sand (3.5-4.0 Ø); unweathered; dry.	
35			30.5-35.5' - Sample. Recovered 5.0/5.0 = 100%. CLAYSTONE: same as above.	
40				

INDEX OF DATA

Boring No.: 8-87BR

Completed as well? Yes

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location _____
 Coordinates _____
 Total Depth _____

Borehole/Well No. 8-87BR (cont'd.)
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____

Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By [Signature]
Site Manager
[Signature]
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			<p><u>15.2-17.7'</u> - Sample. Recovered 2.3/2.5' = 92%. CLAYSTONE: same as above; moist.</p> <p><u>17.7-18.9'</u> - Sample. Recovered 1.2/1.2' = 100%. CLAYSTONE: same as above; moist.</p>	
25			<p><u>18.9-20.3'</u> - Sample. Recovered 0.8/1.3' = 61%. SANDSTONE: light olive gray (5Y 6/1); clayey; some iron staining; well sorted; moderately well cemented; damp.</p>	
30			<p><u>20.3-22.7'</u> - Sample. Recovered 2.4/2.4' = 100%. SANDSTONE: same as above; damp.</p> <p><u>22.7-25.2'</u> - Sample. Recovered 2.5/2.5' = 100%. SANDSTONE: same as above; damp.</p>	
35			<p><u>25.2-27.7'</u> - Sample. Recovered 2.5/2.5' = 100%. SANDSTONE: same as above; iron concretions in lower section; damp.</p> <p><u>27.7-30.2'</u> - Sample. Recovered 2.5/2.5' = 100%. SANDSTONE: same as above; damp.</p>	
40			<p><u>30.2-31.2'</u> - Sample. Recovered 1.0/1.0' = 100%. SANDSTONE: same as above; damp.</p> <p><u>31.2-32.7'</u> - Sample. Recovered 1.0/1.5' = 67%. CLAYSTONE: medium gray (N 5); blocky texture; some iron stained stringers; consolidated; moist.</p>	

LOG OF BOREHOLE

Location _____

Borehole/Well No. 8-87BR (cont'd.)

Coordinates _____

Ground Surface Elevation _____

Total Depth _____

Water Level Encountered _____

Static _____

Drilling Company _____

Driller _____

Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By JPasolhe

Geologist

Site Manager

CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
40			<p><u>32.7-35.2'</u> - Sample. Recovered 2.5/2.5' = 100%. CLAYSTONE: medium gray (N 5); silty; blocky texture; iron stained stringers; consolidated; moist.</p>	
45			<p><u>35.2-37.7'</u> - Sample. Recovered 2.5/2.5' = 100%. CLAYSTONE: medium gray (N 5) to light olive gray (5Y 6/1); blocky texture; iron stained stringers; trace organic fragments; consolidated; moist.</p>	
50			<p><u>43.0-46.0'</u> - Sample. Recovered 2.5/3.0' = 83%. RQD=1.7/2.5' = 68%. CLAYSTONE: pale brown (5YR 5/2) with trace light brown (5YR 5/6) mottles; mottles frequency decreases with depth; damp.</p>	
55			<p><u>46.0-50.0'</u> - Sample. Recovered 3.7/4.0' = 93%. RQD=1.8/3.7' = 49%. CLAYSTONE: pale brown (5YR 5/2); trace organic fragments; no stains; consolidated; homogenous, damp.</p>	
60			<p><u>50.0-55.0'</u> - Sample. Recovered 5.0/5.0 = 100%. RQD=3.4/5.0' = 68%. CLAYSTONE: light olive gray (5Y 5/2) with abundant light brown (5YR 5/6) mottles; 45° fracture at 53.6'; abundant organic fragments, damp.</p>	

LOG OF BOREHOLE

Location _____
 Coordinates _____
 Total Depth _____

Borehole/Well No. 8-87BR (cont'd.)
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____

Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By J. Pascho
Site Manager
T. [Signature]
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
80			<u>77.0-81.0'</u> - Sample. Recovered 4.0/4.0 = 100%. RQD=4.0/4.0' = 100%. Interbedded SANDSTONE/ CLAYSTONE: olive gray (5Y 3/2); few organic fragments; sand percent increases with depth; sandstone is well sorted and rounded; very fine-grained; moist.	Packer Test Interval #1: 83.48-93.08'.
85	 		<u>81.0-85.0'</u> - Sample. Recovered 4.0/4.0' = 100%. RQD=3.6/4.0' = 90%. <u>81.0-82.1'</u> : SANDSTONE: olive gray (5Y 3/2); clay-rich; well sorted; subrounded; very fine-grained; consolidated; moist. <u>82.1-85.0'</u> : CLAYSTONE: olive black (5Y 2/1); organic-rich; consolidated; homogenous; moist.	
90			<u>85.0-88.0'</u> - Sample. Recovered 3.0/3.0 = 100%. RQD=0.5/3.0'=17%. LIGNITE: black (N 1/0); consolidated; moist to wet; dense; homogenous.	
95	  		<u>88.0-93.0'</u> - Sample. Recovered 5.0/5.0 = 100%. RQD=4.0/5.0'=80%. CLAYSTONE: olive gray (5Y 3/2); organic-rich; consolidated; abundant fractures; moist to wet. <u>93.0-98.0'</u> - Sample. Recovered 5.0/5.0' = 100%. RQD=4.1/5.0'=82%. <u>93.0-97.2'</u> : CLAYSTONE: olive gray (5Y 3/2); abundant light olive brown (5Y 5/6) siltstone nodules; some organic fragments; consolidated; moist. <u>97.2-98.0'</u> : SANDSTONE: grayish olive (10Y 4/2); clayey; rounded; very fine-grained; well sorted; consolidated; moist to wet.	
100				

LOG OF BOREHOLE

Location _____

Borehole/Well No. 8-87BR (cont'd.)

Coordinates _____

Ground Surface Elevation _____

Total Depth _____

Water Level Encountered _____

Static _____

Drilling Company _____

Driller _____

Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By J. Paschke

Geologist

Site Manager

CEARP Manager

Comments _____

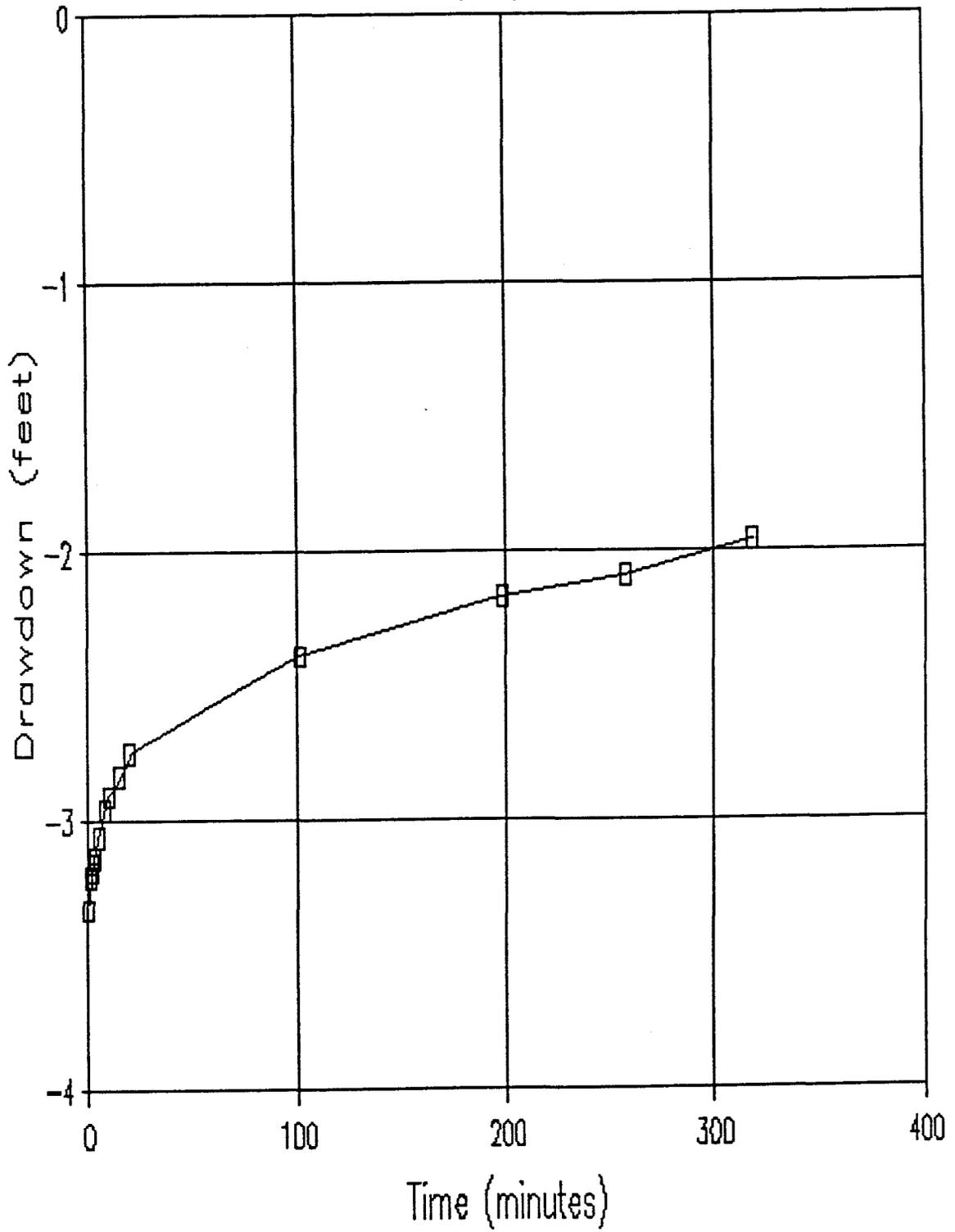
Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
100			<p>98.0-102.0' - Sample. Recovered 4.0/4.0 = 100%. RQD=0.7/4.0'=18%.</p> <p>98.0-98.7': CLAYSTONE: olive gray (5Y 3/2); organic-rich; dense; wet.</p> <p>98.7-100.4': SANDSTONE: grayish olive (10Y 4/2); very fine-grained; well sorted; clayey; rounded; moist.</p> <p>100.4-102.0': SANDSTONE/CLAYSTONE: grayish olive (WY 4/2); interbedded; unconsolidated; moist.</p>	
—105			<p>102.0-106.0' - Sample. Recovered 4.0/4.0 = 100%. RQD=3.8/4.0'=95%. CLAYSTONE/SANDSTONE: grayish olive (10Y 4/2); interbedded; very fine-grained silty sand; well sorted; moist.</p>	
—110			TOTAL DEPTH: 106.0'	
—115				
—120				

8-87BR
06/19/87
Bail-Down/Recovery Test
Q = 2.1 lit/4 min

Time (min)	Recovery Time (min)	Depth to Water (feet)	Draw- down (feet)
0		87.97	
4	0	91.30	3.33
5.25	1.25	91.18	3.21
6	2	91.16	3.19
6.4	2.4	91.13	3.16
7	3	91.11	3.14
9	5	91.03	3.06
12	8	90.93	2.96
14	10	90.88	2.91
19	15	90.81	2.84
24	20	90.72	2.75
106	102	90.36	2.39
202	198	90.14	2.17
262	258	90.06	2.09
322	318	89.93	1.96

8-87BR

06/19/87



PACKER TEST ANALYSIS

WELL NO. 8-87BR

ROCKY FLATS PLANT; 881 HILLSIDE

JOB NO. 2029-17-02

DATE TESTED: 5/20/87

BY: J.B. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 62.61 - 72.26

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 77.69

$$K = \frac{Q}{2(\pi)(L)(H)} \frac{L}{\ln(\frac{R}{r})}$$

1ST P1/3 TEST

Q = INJECTION RATE = 0.00000000 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 67.43 + 9.47 + 0.00 * 2.31 = 76.90

R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000000 FT/MIN

K = 0.00000000 CM/SEC

P2/3 TEST

Q = INJECTION RATE = 0.00250368 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 67.43 + 5.10 + 13.00 * 2.31 = 102.56

R = BOREHOLE RADIUS = 0.31 FEET

K = HYDRAULIC CONDUCTIVITY = 0.00000138 FT/MIN

K = 0.00000070 CM/SEC

2ND P1/3 TEST GAINED WATER IN TUBE; INVALID TEST

PACKER TEST ANALYSIS

WELL NO. 8-B7BR

ROCKY FLATS PLANT; 881 HILLSIDE JOB NO. 2029-17-02

DATE TESTED: 5/20/87 BY: J.B. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 83.43 - 93.08

MATERIAL TESTED: ARAPAHOE LIGNITE

DEPTH TO WATER (FEET BELOW G.S.): 77.69

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = 0.00026065 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.65 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 77.69 + 9.02 + 0.00 * 2.31 = 86.71
 R = BOREHOLE RADIUS = 0.31 FEET

 K = HYDRAULIC CONDUCTIVITY = 0.00000017 FT/MIN
 K = 0.00000009 CM/SEC

P2/3 TEST

Q = INJECTION RATE = 0.00002462 (FEET³/MIN)
 L = LENGTH OF TEST INTERVAL = 9.65 FEET
 TEST INTERVAL IS BELOW WATER TABLE
 HEAD = DEPTH TO WATER + GAGE HEIGHT
 + GAGE PRESSURE (IN FEET)
 = 77.69 + 5.10 + 17.00 * 2.31 = 122.06
 R = BOREHOLE RADIUS = 0.31 FEET

 K = HYDRAULIC CONDUCTIVITY = 0.00000001 FT/MIN
 K = 0.00000001 CM/SEC

2ND P1/3 TEST GAINED WATER IN TUBE; INVALID TEST

02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
0887	06/19/87	5919.70	5919.82	0.12	89.14	87.97	5831.85
	06/24/87	5919.70	5919.82	0.12	89.14	79.69	5840.13
	07/08/87	5919.70	5919.82	0.12	89.14	60.00	5859.82
	08/06/87	5919.70	5919.82	0.12	89.14	53.00	5866.82
	11/10/87	5919.70	5919.82	0.12	89.14	46.60	5873.22
	12/16/87	5919.70	5919.82	0.12	89.14	46.50	5873.32
	01/09/88	5919.70	5919.82	0.12	89.14	45.60	5874.22
	02/04/88	5919.70	5919.82	0.12	89.14	45.72	5874.10

INDEX OF DATA

Boring No.: 43-87/BH57-87

Completed as well? Yes

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data and Results
- Packer Test Data and Results
- Water Level Data

LOG
OF
BOREHOLE

Location Rocky Flats Plant; 881 Hillside Area
 Coordinates N 35043.82 E 21675.56
 Total Depth 32.00'

Borehole/Well No. 43-87/BH57-87
 Ground Surface Elevation 5924.92'
 Water Level Encountered None
 Static 5918.87' 2/4/88

Drilling Company Boyles Bros.
 Date Drilled October 7-9, 1987
 Drilling Method Hollow Stem Auger
 Logged By R.T. Treat
 Geologist

Driller S. Bradfield
 Helper P. Mesa
 Drilling Fluid None
 Checked By _____
 Site Manager
 CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>TOPSOIL</u>	
			<u>0.0-2.0' SAMPLE.</u> Recovered 1.7/2.0' = 85%. 0.0-0.25': TOPSOIL: silty sands with gravels; roots; dry.	HNu background=0.6 OVA background=0.0 No Ludlum readings above background on center core.
			<u>COLLUVIUM (Disturbed)</u>	Field screen readings: sample reading (field blank reading).
5			0.25-1.5': SILTY SAND WITH GRAVEL: grayish brown (5 YR 3/2) with angular and subangular gravels; sands fine-grained (3.5-3.0φ). 1.5-1.70': CLAY: dusky brown (5 YR 2/2) scattered gravels; low plastic; moderately cemented; slightly sandy; moist.	<u>0.0-1.7'</u> : Field screen readings: HNu = 0.0 (0.0); OVA = 0.0 (0.0). <u>2.0-3.2'</u> : Field screen readings: HNu = 0.0 (0.0); OVA = 0.0 (0.0).
10			<u>2.0-4.0' SAMPLE.</u> Recovered 1.2/2.0' = 60%. CLAY: dusky brown (5 YR 2/2) to moderate brown (5 YR 4/4); slightly sandy with little scattered gravels; moderate to highly cemented with angular and subangular gravels ranging 1.5 mm to 2.5 mm; massive; light moist.	<u>4.0-5.8'</u> : Readings on core: HNu = 2.5; OVA = 0.0. <u>4.0-5.8'</u> : Direct hit sample: BH578704DH. Duplicate sample: BH5787004D.
15			<u>4.0-6.0' SAMPLE.</u> Recovered 1.8/2.0' = 90%. 4.0-5.5': CLAY: same as above; scattered gravels; slightly sandy to sandy; moist. 5.5-5.8': SAND AND GRAVEL: light brown (5 YR 5/6); severely oxide (Fe) stained; medium to coarse-grained sand with 1.5 mm to 3.75 mm gravels; angular and subangular with few subrounded; weakly cemented; well sorted; moist.	<u>6.0-8.0'</u> : Field screen readings: Hnu = 0.0 (0.0); OVA = 0.0 (0.0). <u>8.0-10.0'</u> : Readings on core sample: HNu = 2.5; OVA = 8.4.
20				

LOG OF BOREHOLE

Location _____
 Coordinates _____
 Total Depth _____

Borehole/Well No. 43-87/BH57-87
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____

Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By _____
Site Manager
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			<p><u>6.0-8.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%.</p> <p>6.0-6.8': SAND AND GRAVEL: light brown (5 YR 5/6); varying fine-, medium-, and coarse-grained sands with gravels ranging 1.5 mm to 3.25 mm; sub-angular and subrounded; weakly cemented; well sorted; moist.</p> <p>6.8-8.0': CLAY: light gray (N 7/0) to moderate brown (5 YR 3/6) with noted sand and gravel streaks approximately 7.3 to 7.5'; otherwise highly to medium plastic clays; severely oxide stained; moderately cemented; moist.</p>	<p><u>8.0-10.0':</u> Direct hit sample: BH578708DH. Duplicate sample: BH5787008D.</p> <p><u>10.0-12.0':</u> Readings on core sample: HNu = 5.5; OVA = 2.8.</p> <p><u>10.0-12.0':</u> Upper contact and direct hit sample: BH578710UC. Duplicate sample: BH5787010D.</p>
25			<p><u>8.0-10.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%.</p> <p>8.0-9.7': CLAY: same as above with some scattered medium gravels; moist.</p> <p>9.7-10.0': SAND AND GRAVEL: moderate reddish brown (10 R 4/6); slightly clayey; medium- and coarse-grained sands; 3.75 mm-4.0 mm subangular gravel; weakly cemented; moist.</p>	<p><u>12.0-14.0':</u> Readings on core sample: HNu = 18.5; OVA = 8.5.</p> <p><u>12.0-14.0':</u> Contact and direct hit sample: BH578712CT. Duplicate sample: BH5787012D.</p>
30			<p><u>10.2-12.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%.</p> <p>10.0-11.5': SAND AND GRAVEL: moderate reddish brown (10 R 4/6); well sorted sands; fine-, medium-, and coarse-grained angular and subrounded gravels (.75mm up to 4.50 mm); massive; weakly cemented; moist.</p> <p>11.5-12.0': CLAY: light brown (5 YR 5/6) to light gray (N 7/0); moderately cemented; slightly sandy; severely oxide stained; medium plastic.</p>	<p><u>14.0-16.0':</u> Readings on core sample: HNu = 15.5; OVA = 32.5.</p> <p><u>14.0-16.0':</u> Bedrock. Direct hit sample: BH578714BR. Duplicate sample: BH5787014D.</p>
35				

**LOG
OF
BOREHOLE**

Location _____
 Coordinates _____
 Total Depth _____

Borehole/Well No. 43-87/BH57-87
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____

Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By _____
Site Manager
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			<u>ARAPAHOE FORMATION</u>	
			<u>12.0-14.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: light gray (N 7/0) to severely oxide stained browns; medium plastic; blocky; massive; moist.	<u>16.0-18.0':</u> Readings on core: HNu = 10.5; OVA = 55.8.
			<u>14.0-16.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: light gray (N 7/0) to medium dark gray (N 4/0); massive; blocky; moderately to severely oxide stained lenses; medium to highly plastic; moist.	<u>16.0-18.0':</u> Direct hit sample: BH578716DH. Duplicate sample: BH5787016D.
			<u>16.0-18.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: medium gray (N 5/0) to medium dark gray (N 4/0) at bottom; slightly oxide (Fe) stained; blocky; medium plastic; moist.	<u>18.0-20.0':</u> Readings on core sample: HNu = 22; OVA = 2.5.
			<u>18.0-20.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: medium gray (N 5/0); massive; blocky; moderately cemented; slightly oxide (Fe) stained in lenses; medium plastic; moist.	<u>18.0-20.0':</u> Direct hit sample: BH578718DH. Duplicate sample: BH5787018D.
			<u>20.0-22.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: same as above; Fe (oxide) stained; moist.	<u>20.0-22.0':</u> Readings on core sample: HNu = 265; OVA = 75.
				<u>20.0-22.0':</u> Direct hit sample: BH578720DH. Duplicate sample: BH5787020D.
				<u>22.0-24.0':</u> Readings on core sample: HNu = 9.0; OVA = 0.5.
				<u>22.0-24.0':</u> Direct hit sample: BH578722DH. Duplicate sample: BH5787022D.

LOG
OF
BOREHOLE

Location _____
 Coordinates _____
 Total Depth _____
 Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Borehole/Well No. 43-87/BH57-87
 Ground Surface Elevation _____
 Water Level Encountered _____
Static _____
 Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By _____
Site Manager
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
—			<u>22.0-24.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: medium gray (N 4/0) to medium dark gray (N 5/0); slightly sandy; fine-grained; massive; blocky; medium to slightly Fe (oxide) stained; medium plastic; moist.	<u>24.0-26.0':</u> Readings on core sample: HNu = 10.2; OVA = 2.8. <u>24.0-26.0':</u> Direct hit sample: BH578724DH. Duplicate sample: BH5787024D.
—			<u>24.0-26.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: medium dark gray (N 4/0); massive; blocky; moderately oxide stained; medium plastic; moist.	<u>26.0-28.0':</u> Readings on core sample: HNu = 6.5; OVA = 0.0.
—			<u>26.0-28.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: medium dark gray (N 4/0); massive; slightly oxide (Fe) stained; blocky; medium plastic; moist.	<u>26.0-28.0':</u> Direct hit sample: BH578726DH. Duplicate sample: BH5787026D.
—			<u>28.0-30.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: same as above.	<u>28.0-30.0':</u> Readings on core sample: HNu = 7.2; OVA = 0.0. <u>28.0-30.0':</u> Direct hit sample: BH578728DH. Duplicate sample: BH5787028D.
—			<u>30.0-32.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: medium gray (N 4/0) with a dark reddish brown (10 R 3/4) streak at approximately 31.7'; massive; slightly sandy to sandy streaks are fine-grained (3.0-2.5Ø); slightly oxide stained in streaks; blocky; medium plastic; moist to lightly moist in the streaks.	<u>30.0-32.0':</u> No readings above background on core for HNu, OVA, or Ludlum.
			TOTAL DEPTH: 32.00'	

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

<u>WELL NUMBER</u>	<u>DATE</u>	<u>G. S. ELEVATION</u>	<u>TOC ELEVATION</u>	<u>STICK UP</u>	<u>SI BASE BELOW TOC</u>	<u>WATER DEPTH BELOW TOC</u>	<u>WATER SURFACE ELEVATION</u>
4387	07/07/87	5924.92	5926.49	1.57	13.82	8.80	5917.69
	11/11/87	5924.92	5926.49	1.57	13.82	8.80	5917.69
	12/21/87	5924.92	5926.49	1.57	13.82	8.80	5917.69
	01/11/88	5924.92	5926.49	1.57	13.82	8.10	5918.39
	02/04/88	5924.92	5926.49	1.57	13.82	7.62	5918.87

INDEX OF DATA

Boring No.: 44-87/BH58-87

Completed as well? Yes

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location <u>Rocky Flats Plant; 881 Hillside Area</u> Coordinates <u>N 35317.96 E 22323.69</u> Total Depth <u>7.00'</u> Drilling Company <u>Boyles Bros.</u> Date Drilled <u>October 8-9, 1987</u> Drilling Method <u>Hollow Stem Auger</u> Logged By <u>J.L. Bannon</u> <div style="text-align: center;">Geologist</div>	Borehole/Well No. <u>44-87/BH58-87</u> Ground Surface Elevation <u>5949.53'</u> Water Level Encountered <u>None</u> <div style="text-align: right;">Static <u>5945.93' 2/4/88</u></div> Driller <u>T. High</u> Helper <u>B. Keeney</u> Drilling Fluid <u>None</u> Checked By _____ <div style="text-align: right;">Site Manager</div> <div style="text-align: right;">CEARP Manager</div>
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Comments _____

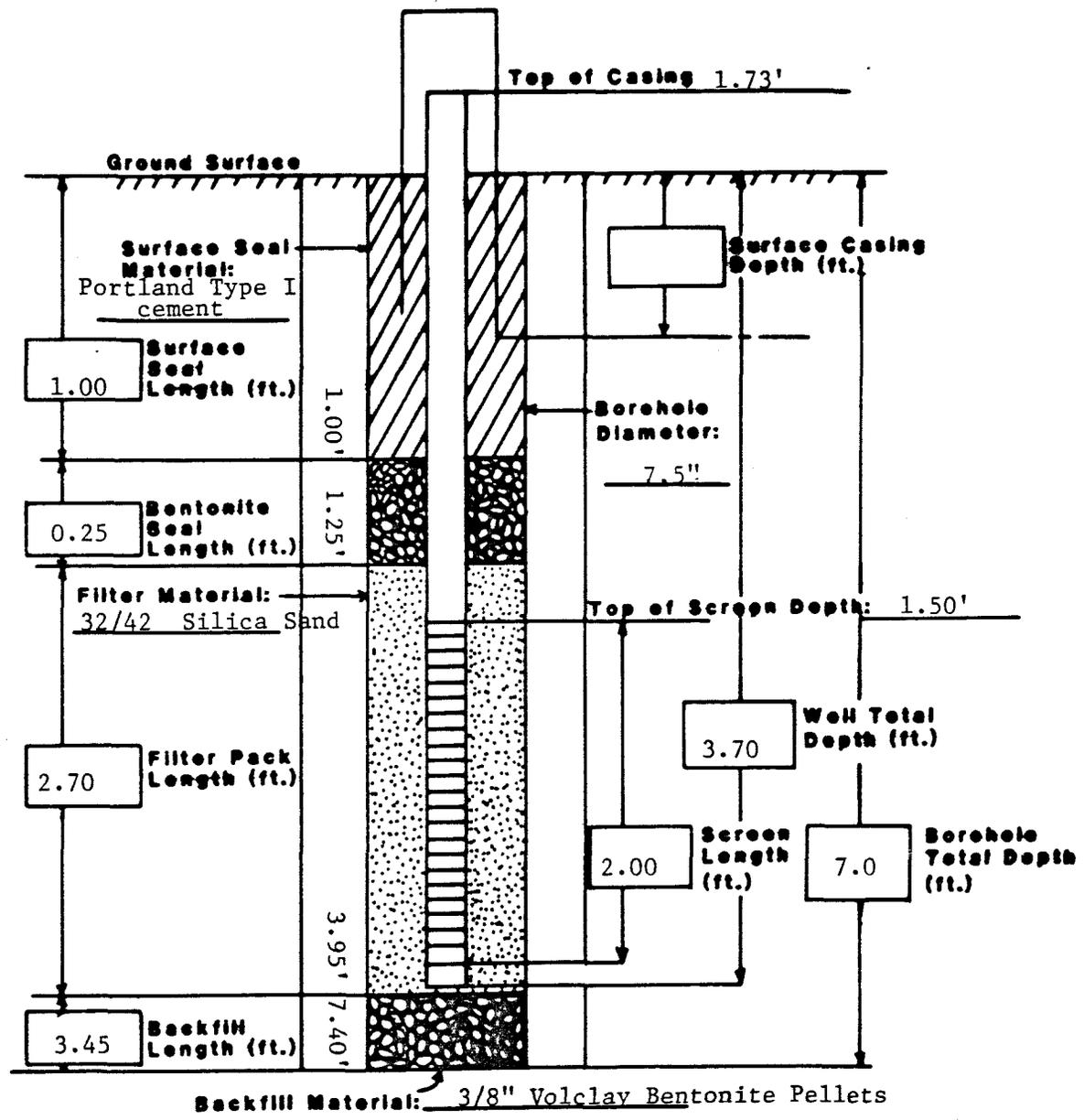
Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>TOPSOIL</u>	
			0.0-2.0' <u>SAMPLE.</u> Recovered 1.7/2.0' = 85%.	HNu background=0.2 OVA background=1.0
			0.0-0.2': TOPSOIL: blackish red (5 R 2/2); topsoil with flattened subangular to subrounded quartzite pebbles; unconsolidated; dry.	Field screen readings: sample reading (field blank reading).
5			<u>COLLUVIUM (DISTURBED)</u>	
			0.2-1.7': SILTY CLAY: dark yellowish orange (10 YR 6/6); dense; poorly sorted silty clay; caliche; consolidated; strong HCl reaction on caliche, weak on clay; damp.	0.0-1.7': Readings on core: HNu = 0.2 (0.2); OVA = 2.4 (1.0).
			2.0-4.0' <u>SAMPLE.</u> Recovered 1.9/2.0' = 95%.	0.0-1.7': Upper contact and direct hit sample: BH588700UC.
10			2.0-3.2': CLAY: weakly layered olive gray (5 Y 4/1) and dark yellowish brown (10 YR 4/2); very dense; oxidized; abundant caliche; well consolidated; damp.	2.0-3.9': Readings on core: HNu = 0.2 (0.2); OVA = 1.9 (1.4).
			<u>ARAPAHOE FORMATION</u>	
			3.2-3.9': CLAYSTONE: same as above.	2.0-3.9': Contact and direct hit sample: BH588702CT.
			4.0-7.0' <u>SAMPLE.</u> Recovered 3.1/3.0' = 103%.	4.0-7.0': Field screen readings: HNu = 0.2 (0.2); OVA = 0.8 (0.8).
		4.0-5.5': CLAYSTONE: brownish gray (5 YR 4/1); dense clay; no caliche; consolidated; slightly damp.		
		5.5-7.0': SILTY CLAYSTONE: weakly layered; moderate yellowish brown (10 YR 5/4) to dark yellowish orange (10 YR 6/6) silty clay; oxidized; no caliche; consolidated; damp.	4.0-7.0': Bedrock sample: BH588704BR.	
		TOTAL DEPTH: 7.00'		

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; 881 Hillside Area Well No. 44-87/BH58-87
 Coordinates N 35317.96 E 22323.69 Elevation: Ground Surface 5949.53'
 Total Depth: Well 3.70' Top of Casing 5951.26'
Borehole 7.00'

Formation of Completion Colluvium
 Casing Material Sch5, Type 316 TFJ stainless steel Casing Diameter 2" ID
 Screen Material 0.010" wire wrap, Type 316 TFJ stainless steel Surface Casing Diameter 5" ID
 Date Installed October 9, 1987 Approved By _____
 Installed By J.L. Bannon Site Manager _____
 Geologist Project Director _____

Comments _____



02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
4487	07/07/87	5949.53	5951.26	1.73	5.23	4.00	5947.26
	11/11/87	5949.53	5951.26	1.73	5.23	4.00	5947.26
	12/18/87	5949.53	5951.26	1.73	5.23	4.00	5947.26
	01/09/88	5949.53	5951.26	1.73	5.23	5.10	5946.16
	02/04/88	5949.53	5951.26	1.73	5.23	5.33	5945.93

INDEX OF DATA

Boring No.: 45-87BR/BH59-87

Completed as well? Yes

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

**LOG
OF
BOREHOLE**

Location Rocky Flats Plant; 881 Hillside Area
Coordinates N 35325.48 E 22340.05
Total Depth 112.00'

Borehole/Well No. 45-87BR/BH59-87
Ground Surface Elevation 5949.42'
Water Level Encountered _____

Drilling Company Boyles Bros.
Date Drilled October 5-8 and 12-15, 1987
Drilling Method Hollow Stem Auger; Rotary Core
Logged By J.L. Bannon; J.B. Bergman
Geologist

Static _____

Driller T. High; P. Bushkowski
Helper B. Keeney; K. Parker
Drilling Fluid None 0.0-59.7'
Water 59.7'-112.0'
Checked By _____
Site Manager

Comments Surface casing set on October 7-8, 1987 by J.L. Bannon to 58.77'.

CEARP Manager

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>COLLUVIUM</u>	
			<p><u>0.0-2.0' SAMPLE.</u> Recovered 0.9/2.0' = 45%. SAND AND GRAVEL, TOPSOIL: moderate brown (5 YR 3/4); poorly sorted sand and clay with very large subangular to subrounded quartzite cobbles; no caliche; unconsolidated; no HCl reaction; dry.</p>	<p>HNu background=0.2 OVA background=1.0 Field screen readings: sample readings (field blank reading).</p>
5			<p><u>2.0-4.0' SAMPLE.</u> Recovered 1.5/2.0' = 75%.</p> <p>2.0-2.4': CLAYEY SAND: pale yellowish brown (10 YR 6/2); clayey sand with subangular quartzite pebbles; unconsolidated; damp.</p> <p>2.4-3.5': SANDY CLAY: pale yellowish brown (10 YR 6/2) to moderate yellowish brown (10 YR 5/4) with dusky yellowish brown (10 YR 2/2) clay at very bottom; slight caliche; unconsolidated; strong HCl reaction; damp.</p>	<p>0.0-0.9': Field screen readings: HNu = 0.2 (0.2); OVA = 0.9 (0.0).</p> <p>2.0': No readings above background on cuttings, breathing zone, well head, and core.</p> <p>2.0-3.5': Field screen readings: HNu = 0.0 (0.0); OVA = 0.8 (0.8).</p> <p>2.0-3.5': Upper contact sample: BH598704UC.</p>
10			<u>ARAPAHOE FORMATION</u>	
			<p><u>4.0-7.0' SAMPLE.</u> Recovered 3.2/3.0' = 107%.</p> <p>CLAYSTONE: olive gray (5 Y 4/1); homogeneous clay; no caliche; minor oxidation; consolidated; no HCl reaction; slightly damp.</p>	<p>4.0-7.2': Field screen readings: HNu = 0.0 (0.0); OVA = 0.6 (0.6).</p> <p>4.0-7.2': Contact sample: BH598707CT.</p>
15			<p><u>7.0-9.5' SAMPLE.</u> Recovered 2.8/2.5' = 112%.</p> <p>CLAYSTONE: olive gray (5 Y 4/1); no pebbles; minor oxidation; no caliche; consolidated; slightly damp.</p>	<p>7.0-9.8': Field screen readings: HNu = 0.0 (0.0); OVA = 0.6 (0.6).</p> <p>7.0-9.8': Bedrock sample: BH598709BR.</p>
20				

LOG
OF
BOREHOLE

Location _____
 Coordinates _____
 Total Depth _____
 Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Borehole/Well No. 45-87BR/BH59-87
 Ground Surface Elevation _____
 Water Level Encountered _____
Static _____
 Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By _____
Site Manager
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			<u>9.5-12.0' SAMPLE.</u> Recovered 2.6/2.5' = 104%. 9.5-9.95': CLAYSTONE: same as above. 9.95-12.0': CLAYEY SILTSTONE: light olive gray (5 Y 6/1) with dark yellowish orange (10 YR 6/6) oxidation; moderately consolidated; very slight HCl reaction; slightly damp.	<u>14.5'</u> : HNu background on cuttings and breathing zone. <u>22.0'</u> : No readings above background on core.
25			<u>12.0-14.5' SAMPLE.</u> Recovered 2.7/2.5' = 108%. 12.0-13.4': CLAYSTONE: heavily oxidized dark yellowish orange (10 YR 6/6) and olive gray (5 Y 4/1) with iron growth and leaf impressions; consolidated; slight HCl reaction; dense; damp. 13.4-14.5': CLAYEY SILTSTONE: light olive gray (5 Y 6/1) and dark yellowish orange (10 YR 6/6); faintly laminated; clayey silt; moderately consolidated; oxidized; slightly damp.	No readings above background in well head, breathing zone, and cuttings.
30			<u>14.5-17.0' SAMPLE.</u> Recovered 3.3/2.5' = 132%. CLAYSTONE: light olive gray (5 Y 6/1) and dark yellowish orange (10 YR 6/6); heavily oxidized; clay with very heavy staining around plant fragments; consolidated; wet outer core, damp inner.	
35			<u>17.0-19.5' SAMPLE.</u> Recovered 3.15/2.5' = 126%. CLAYSTONE: same as above without the wet outer core; damp.	
40				

LOG OF BOREHOLE

Location _____
 Coordinates _____
 Total Depth _____

Borehole/Well No. 45-87BR/BH59-87
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____

Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By _____
Site Manager
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
40			<u>19.5-22.0' SAMPLE.</u> Recovered 2.9/2.5' = 116%. CLAYSTONE: light olive gray (5 Y 6/1); oxidized clay becoming progressively less stained to brownish gray (5 YR 4/1) with minor oxidation; consolidated; damp.	
45			<u>22.0-24.5' SAMPLE.</u> Recovered 3.2/2.5' = 128%. CLAYSTONE: dark gray (N 3/0) to brownish gray (5 YR 4/1); dense; containing a thick (0.2') coal seam at 24.5' and small coal fragments throughout; consolidated; damp.	
50			<u>24.5-27.0' SAMPLE.</u> Recovered 3.4/2.5' = 136%. CLAYSTONE: dark gray (N 3/0) to brownish gray (5 YR 4/1); dense; with coal pieces becoming more oxidized down-core to light olive gray (5 Y 6/1) and dark yellowish orange (10 YR 6/6) claystone with oxidized plant fragments; consolidated; damp.	
55			<u>27.0-29.5' SAMPLE.</u> Recovered 3.0/2.5' = 120%. CLAYSTONE: light olive gray (5 Y 6/1) mottled clay becoming less oxidized down-core to medium gray (N 5/0); contains small coal fragments; consolidated; damp.	
60			<u>29.5-32.0' SAMPLE.</u> Recovered 3.5/2.5' = 140%. CLAYSTONE: medium gray (N 5/0) to medium dark gray (N 4/0); clay with minor oxidation; consolidated; damp.	

LOG
OF
BOREHOLE

Location _____
 Coordinates _____
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Borehole/Well No. 45-87BR/BH59-87
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____

Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By _____
Site Manager
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
60			<u>32.0-34.5' SAMPLE.</u> Recovered 3.1/2.5' = 124%. SILTY CLAYSTONE: medium light gray (N 6/0) to yellowish gray (5 Y 8/1); silty clay becoming more oxidized down-core; contains dark yellowish orange (10 YR 6/6) mottling; consolidated; damp.	
65			<u>34.5-37.0' SAMPLE.</u> Recovered 2.3/2.5' = 92%. 34.5-34.9': CLAYEY SILTSTONE: medium gray (N 5/0); consolidated; damp. 34.9-35.3': CLAYEY SILTSTONE: grayish orange (10 YR 7/4) to dark yellowish orange (10 YR 6/6); heavily oxidized; clayey silt; consolidated; damp. 35.3-35.9': SILTY CLAYSTONE: olive gray (5 Y 4/1); oxidized; damp. 35.9-37.0': CLAYSTONE: moderate brown (5 YR 4/4) to dark yellowish orange (10 YR 6/6); extremely oxidized; clay with a very sharp upper contact; contains very dense, concentric iron nodules with a very dark, sugary texture; unconsolidated; damp.	
70				
75				<u>37.0-39.5' SAMPLE.</u> Recovered 2.2/2.5' = 90%. 37.0-38.05': CLAYSTONE: same as above; heavily oxidized; containing two large carbonate pebbles that react with HCl; unconsolidated; damp. 38.05-38.75': CLAYEY SILTSTONE: grayish orange (10 YR 7/4) to dark yellowish orange (10 YR 6/6); oxidized; clayey silt; sharp upper contact with the clay; consolidated.
80				

LOG OF BOREHOLE

Location _____
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 Total Depth _____
 Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

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 Ground Surface Elevation _____
 Water Level Encountered _____
Static _____
 Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By _____
Site Manager
CEARP Manager

Comments _____

	Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
80				<p>38.75-39.50': SILTY CLAYSTONE: medium gray (N 5/0); mottled; silty clay; oxidized; unconsolidated; damp.</p> <p><u>39.5-42.0' SAMPLE.</u> Recovered 2.5/2.5' = 100%. SILTY CLAYSTONE: pale yellowish brown (10 YR 6/2) to grayish orange (10 YR 7/4); dense; oxidized; silty clay; well consolidated; damp.</p> <p><u>42.0-44.5' SAMPLE.</u> Recovered 3.0/2.5' = 120%. 42.0-43.65': SILTY CLAYSTONE: oxidized grayish orange (10 YR 7/4) to pale yellowish brown (10 YR 6/2); silty clay; consolidated; damp. 43.65-44.5': SILTY CLAYSTONE: light olive gray (5 Y 6/1); very dense silty clay; less oxidation; very well consolidated.</p> <p><u>44.5-47.0' SAMPLE.</u> Recovered 2.75/2.5' = 110%. SILTY CLAYSTONE: grayish orange (10 YR 7/4) to pale yellowish brown (10 YR 6/2); very dense; oxidized silty clay; very well consolidated; damp.</p> <p><u>47.0-49.5' SAMPLE.</u> Recovered 2.0/2.5' = 80%. 47.0-47.4': SILTY CLAYSTONE: same as above. 47.4-49.5': CLAYEY SILTSTONE: grayish orange (10 YR 7/4) to pale yellowish brown (10 YR 6/2); oxidized; clayey silt; unconsolidated; dry to damp.</p>	
85					
90					
95					
100					

LOG
OF
BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 45-87BR/BH59-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
100			<p><u>49.5-52.0' SAMPLE.</u> Recovered 2.75/2.5' = 110%. SILTY CLAYSTONE: medium gray (N 5/0); very dense silty clay; minor oxidation; core wet from sitting overnight.</p>	
105			<p><u>52.0-54.5' SAMPLE.</u> Recovered 1.7/2.5' = 68%. CLAYSTONE AND SILTSTONE: laminated medium dark gray (N 4/0) unoxidized silty clay, down-core to grayish orange (10 YR 7/4) oxidized clayey silt; consolidated to unconsolidated down-core; damp.</p>	
110			<p><u>54.5-57.0' SAMPLE.</u> Recovered 3.0/3.5' = 120%. SILTY CLAYSTONE: medium dark gray (N 4/0) to dark gray (N 3/0); homogeneous, unweathered bedrock; minor coal fragments; very well consolidated; damp.</p>	
115			<p><u>57.0-59.5' SAMPLE.</u> Recovered 2.0/2.5' = 80%. SILTY CLAYSTONE: dark gray (N 3/0); very dense; slightly silty; with coal fragments throughout; very well consolidated.</p>	
			<p>TOTAL DEPTH WITH PLOPPER: 59.70' ADJUST TOTAL DEPTH: 59.70'</p>	<p>HNu background=0.4. OVA background=0.0 Ludlum background = 0.0. No readings above background.</p>

LOG
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BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 45-87BR/BH59-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
—			<u>60.0-64.0' SAMPLE.</u> Recovered 3.8/4.0' = 95%. RQD = 3.2/3.8' = 84%. CLAYSTONE: dark gray (N 3/0) with some brownish gray (5 YR 4/1) siltstone nodules; very thin (<.01') sandstone--dark gray (N 3/0); rounded; clayey; moderate sorting; very fine-grained; homogeneous; consolidated; moist to wet.	
—			<u>64.0-68.0' SAMPLE.</u> Recovered 3.6/4.0' = 90%. RQD = 2.9/3.6' = 81%. CLAYSTONE: same as above; abundant organic fragments; trace sand; abundant silt; dense; moist to wet.	
—			<u>68.0-72.0' SAMPLE.</u> Recovered 2.0/4.0' = 50%. RQD = 1.7/2.0' = 85%. CLAYSTONE: same as above.	
—			<u>72.0-74.0' SAMPLE.</u> Recovered 2.4/2.0' = 120%. RQD = 1.5/2.4' = 63%. CLAYSTONE: same as above.	
—			<u>74.0-78.0' SAMPLE.</u> Recovered 2.1/4.0' = 53%. RQD = 0.4/2.1' = 19%. CLAYSTONE: same as above.	

**LOG
OF
BOREHOLE**

Location _____
 Coordinates _____
 Total Depth _____
 Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____

Borehole/Well No. 45-87BR/BH59-87
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____
 Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By _____
 Site Manager
 CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
—			<u>78.0-82.0' SAMPLE.</u> Recovered 5.0/4.0' = 125%. RQD = 0/5.0' = 0%. CLAYSTONE: dark gray (N 3/0); abundant brownish gray (5 YR 4/1) siltstone pebbles; angular; dense; at 81.0' medium dark gray (N 4/0) very thin sandstone laminations; well sorted; rounded; very fine-grained; core very broken; abundant organic fragments; moist.	
—			<u>82.0-86.0' SAMPLE.</u> Recovery 4.0/4.0' = 100%. RQD = 4.0/4.0' = 100%. 82.0-84.0': SANDY CLAYSTONE: dark gray (N 3/0); fine- to medium-grained; rounded; quartzose sand; well sorted; abundant organics; moist. 84.0-86.0': CLAYSTONE: dark gray (N 3/0); gradual change; abundant organic fragments; unweathered; homogeneous; some sand similar to above; some siltstone; gradational changes to sandy siltstone, siltstone, sandy claystone, and claystone; dense; moist.	
—			<u>86.0-90.0' SAMPLE.</u> Recovered 4.0/4.0' = 100%. RQD = 4.0/4.0' = 100%. 86.0-89.5': CLAYSTONE: same as above. 89.5-90.0': SANDSTONE: medium dark gray (N 4/0); rounded; fine- to very fine-grained; well sorted; clay-rich; organics common; consolidated; dense; moist to wet.	

LOG
OF
BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 45-87BR/BH59-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager

CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
—			<p><u>90.0-94.0' SAMPLE.</u> Recovered 4.0/4.0' = 100%. RQD = 4.0/4.0' = 100%. SANDSTONE: medium dark gray (N 4/0); same as above with very stained zone at 93.0' to 93.5'; FeO stains; light brown (5 YR 5/6); from 90.0-93.0' small ($\leq 0.08'$) thick beds of claystone; very dense; homogeneous; wet.</p>	
—			<p><u>94.0-98.0' SAMPLE.</u> Recovered 2.1/4.0' = 53%. RQD = 1.7/2.1' = 81%. SANDSTONE: same as above; at 96.0' have medium-grained sandstone; light gray (N 7/0); very stained--light brown (5 YR 5/6); some Fe Mag minerals; quartzose sand; wet.</p>	
—			<p><u>98.0-102.0' SAMPLE.</u> Recovered 3.0/4.0' = 75%. RQD = 1.0/3.0' = 33%. 98.0-99.5': SANDSTONE: medium light gray (N 6/0); calcareous cement--reacts strongly with HCl; very dense; medium- to fine-grained; oxidized in areas; oxidized zone at 98.0-98.3'; very broken with claystone fragments; angular; wet.</p>	
—			<p>99.5-100.8': SANDSTONE: medium light gray (N 6/0) with light brown (5 YR 5/6) and moderate yellowish brown (10 YR 5/4) stains; fine- to very fine-grained; non-calcareous; FeO stains; moist. 100.8-101.0': SILTSTONE: medium light gray (N 6/0); trace very fine-grained sand; homogeneous; moist.</p>	

LOG
OF
BOREHOLE

Location _____
 Coordinates _____
 Total Depth _____

Borehole/Well No. 45-87BR/BH59-87
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____

Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By _____
Site Manager
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
—			<p><u>102.0-106.0' SAMPLE.</u> Recovered 4.0/4.0' = 100%. RQD = 4.0/4.0' = 100%. 102.0-103.0': SANDY SILTSTONE: same as above; more silt; moist. 103.0-106.0': SILTSTONE: medium light gray (N 6/0); alternating beds of sandstone, siltstone and claystone; sandstone layers up to 2" thick; siltstone and claystone layers ≤2" thick; moist.</p>	
—			<p><u>106.0-110.0' SAMPLE.</u> Recovered 4.0/4.0' = 100%. RQD = 4.0/4.0' = 100%. 106.0-108.0': SILTSTONE: medium light gray (N 6/0); some very fine-grained sand; some clay; some organics; moist. 108.0-110.0': SANDY SILTSTONE: medium light gray (N 6/0); fine- to medium-grained sand; rounded; well sorted; dense; some clay; moist.</p>	
—			<p><u>110.0-112.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. RQD = 2.0/2.0' = 100%. SANDY SILTSTONE: medium light gray (N 6/0); homogeneous; some very fine-grained sand; some clay; consolidated; moist.</p>	
			TOTAL DEPTH: 112.00'	

PACKER TEST ANALYSIS

WELL NO. 45-87BR

ROCKY FLATS PLANT; 881 HILLSIDE

JOB NO. 2029-17-02

DATE TESTED: 10/16/87

BY: J.B. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 79.85 - 89.50

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 89.12

$$K = \frac{Q}{2(\text{PI})(L)(H)} \text{LN}\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00001448 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 84.68 + 10.00 + .00 * 2.31 = 94.68

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000102 FT/MIN

K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00005792 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 84.68 + 6.80 + 16.00 * 2.31 = 128.43

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000302 FT/MIN

K = .00000002 CM/SEC

2ND P1/3 TEST

TEST ABORTED

PACKER TEST ANALYSIS

WELL NO. 45-87BR

ROCKY FLATS PLANT; 881 HILLSIDE JOB NO. 2029-17-02

DATE TESTED: 10/16/87 BY: J.B. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 70.20 - 79.85

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 89.12

$$K = \frac{Q}{2(\pi)(L)(H)} \ln\left(\frac{L}{R}\right)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00005792 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 75.02 + 12.10 + .00 * 2.31 = 87.12

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000445 FT/MIN

K = .00000002 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00293954 (FEET³/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 75.02 + 6.80 + 13.70 * 2.31 = 113.47

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000017345 FT/MIN

K = .00000088 CM/SEC

2ND P1/3 TEST

TEST ABORTED

02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
4587	07/07/87	5949.42	5951.00	1.58	102.63	91.04	5859.96
	11/11/87	5949.42	5951.00	1.58	102.63	91.00	5860.00
	12/21/87	5949.42	5951.00	1.58	102.63	91.40	5859.60
	01/11/88	5949.42	5951.00	1.58	102.63	91.10	5859.90
	02/04/88	5949.42	5951.00	1.58	102.63	90.70	5860.30

INDEX OF DATA

Boring No.: 47-87

Completed as well? Yes

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data and Results
- Packer Test Data and Results
- Water Level Data

**LOG
OF
BOREHOLE**

<p>Location <u>Rocky Flats Plant; 881 Hillside Area</u></p> <p>Coordinates <u>N 34792.68 E 21789.41</u></p> <p>Total Depth <u>22.00'</u></p> <p>Drilling Company <u>Boyles Bros.</u></p> <p>Date Drilled <u>September 30 & October 1, 1987</u></p> <p>Drilling Method <u>Hollow Stem Auger</u></p> <p>Logged By <u>J.L. Bannon</u> Geologist</p>	<p>Borehole/Well No. <u>47-87</u></p> <p>Ground Surface Elevation <u>5882.72'</u></p> <p>Water Level Encountered <u>None</u> Static: <u>5875.18' 2/4/88</u></p> <p>Driller <u>T. High</u></p> <p>Helper <u>B. Keeney</u></p> <p>Drilling Fluid <u>None</u></p> <p>Checked By _____ Site Manager CEARP Manager</p>
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Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>TOPSOIL</u>	
			<p><u>0.0-2.0' SAMPLE.</u> Recovered 1.2/2.0' = 60%. TOPSOIL: olive black (5 Y 2/1) grading down to moderate brown (5 YR 3/4); moderately sorted; sandy clay with sub-angular quartzite and subrounded quartz pebbles; roots and grass at top; consolidated; damp.</p>	<p>HNu background=0.2 OVA background=1.0</p> <p>No readings over background on cuttings, well head, breathing zone, and core.</p>
5			<u>COLLUVIUM (DISTURBED)</u>	
			<p><u>2.0-4.0' SAMPLE.</u> Recovered 1.9/2.0' = 95%. CLAY AND GRAVEL: dark yellowish brown (10 YR 4/2) dense clay with minor fine-grained sand and very small pebbles; lower 0.4' subangular to rounded rose quartz and quartzite in clay matrix; no HCl reactions at top to moderate at base; consolidated; damp.</p>	
10				
			<p><u>4.0-7.0' SAMPLE.</u> Recovered 0.4/3.0' = 13%. SANDY CLAY: poorly sorted; caliche; sandy clay; oxidized with few very small caliche-coated pebbles; strong HCl reaction; moderately consolidated; damp.</p>	
15				
20				

**LOG
OF
BOREHOLE**

Location _____

Borehole/Well No. 47-87

Coordinates _____

Ground Surface Elevation _____

Total Depth _____

Water Level Encountered _____

Static _____

Drilling Company _____

Driller _____

Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By _____

Geologist

Site Manager

CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			<u>ARAPAHOE FORMATION</u>	
			<p><u>7.0-9.5' SAMPLE.</u> Recovered 1.9/2.5' = 76%. SANDY CLAYSTONE: yellowish gray (5 Y 7/2) to light brown (5 YR 5/6) oxidized mottled; sandy clay with caliche and one large subangular quartzite cobble (from above); very strong HCl reaction; consolidated; damp.</p>	No readings over background on core.
25			<p><u>9.5-12.0' SAMPLE.</u> Recovered 2.65/2.5' = 106%. CLAYSTONE AND SANDSTONE: yellowish gray (5 Y 7/2) with abundant dark yellowish orange (10 YR 6/6) oxidized mottling; sandy clay grading down to clayey sand; very fine-grained sand; well sorted; caliche; no pebbles; weak to no HCl reaction on sand and clay, strong on caliche; moderately consolidated; damp.</p>	
			<p><u>12.0-14.5' SAMPLE.</u> Recovered 2.9/2.5' = 116%. CLAYEY SANDSTONE: dark yellowish orange (10 YR 6/6) with minor yellowish gray (5 Y 7/2); heavily oxidized; well sorted; caliche; very fine-grained sand; strong HCl reaction on caliche, weak on remaining core; moderately consolidated; damp.</p>	

LOG
OF
BOREHOLE

Location _____
 Coordinates _____
 Total Depth _____
 Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Borehole/Well No. 47-87
 Ground Surface Elevation _____
 Water Level Encountered _____
Static _____
 Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By _____
Site Manager
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
—			<u>14.5-17.0' SAMPLE.</u> Recovered 2.5/2.5' = 100%. SANDY CLAYSTONE: pale yellowish brown (10 YR 6/2) to moderate yellowish brown (10 YR 5/4); well sorted; very fine-grained sandy clay with small, dark organic fragments; weak HCl reaction; consolidated; damp.	
—			<u>17.0-19.5' SAMPLE.</u> Recovered 2.7/2.5' = 108%. SANDY CLAYSTONE: pale yellowish brown (10 YR 6/2) with dark yellowish brown (10 YR 4/2) oxidation; very minor caliche; consolidated; damp.	
—			<u>19.5-22.0' SAMPLE.</u> Recovered 2.75/2.5' = 110%. 19.50-20.45': SANDSTONE AND CLAYSTONE: dark yellowish orange (10 YR 6/6); completely oxidized; well sorted; very fine-grained clayey sand; consolidated; damp. 20.45-22.0': SANDSTONE AND CLAYSTONE: pale yellowish brown (10 YR 6/2); mottled sandy clay with very minor caliche; consolidated; damp.	
			TOTAL DEPTH: 22.00'	

02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

<u>WELL NUMBER</u>	<u>DATE</u>	<u>G. S. ELEVATION</u>	<u>TOC ELEVATION</u>	<u>STICK UP</u>	<u>SI BASE BELOW TOC</u>	<u>WATER DEPTH BELOW TOC</u>	<u>WATER SURFACE ELEVATION</u>
4787	11/10/87	5882.72	5884.83	2.11	9.36	8.60	5876.23
	12/16/87	5882.72	5884.83	2.11	9.36	-1.00	DRY
	01/09/88	5882.72	5884.83	2.11	9.36	-1.00	DRY
	02/04/88	5882.72	5884.83	2.11	9.36	9.65	5875.18

INDEX OF DATA

Boring No.: 48-87

Completed as well? Yes

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside Area
 Coordinates N 34844.28 E 21578.31
 Total Depth 14.70'

Borehole/Well No. 48-87
 Ground Surface Elevation 5909.94'
 Water Level Encountered None
 Static 5905.60' 2/4/88

Drilling Company Boyles Bros.
 Date Drilled October 2 & 5, 1987
 Drilling Method Hollow Stem Auger
 Logged By R.T. Treat
Geologist

Driller S. Bradfield
 Helper P. Mesa
 Drilling Fluid None
 Checked By _____
Site Manager

CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>TOPSOIL</u>	
			<u>0.0-2.0' SAMPLE.</u> Recovered 1.4/2.0' = 70%. 0.0-0.3': TOPSOIL: grayish brown (5 YR 3/2); silty sands; clayey.	HNu background=0.6 OVA background=0.2 No Ludlum readings taken. No readings over background on core, in breathing zone, or at head space with hollow stem auger set at 8.0', 10.0', and 14.7'.
5			<u>COLLUVIUM</u>	
			0.3-1.4': CLAY AND GRAVEL: dusky yellowish brown (10 YR 2/2) to moderate brown (5 YR 3/4); low plastic; slightly sandy with gravels up to 3.5 mm and few scattered cobbles; angular and subangular; moderately cemented; light moist.	
			<u>2.0-4.0' SAMPLE.</u> Recovered 0.95/2.0' = 48%. 2.0-3.8': SAND AND GRAVEL: grayish brown (5 YR 3/2); clayey; with medium- and coarse-grained sands of 1.0-0.5Ø up to 0.0 to 0.5Ø; gravel range 0.75 mm up to 5.5 mm with some scattered cobbles; moderately cemented; well sorted; angular and subangular; light moist.	
10			3.8-4.0': CLAY: medium light gray (N 6/0) to pale yellowish brown (10 YR 6/2); medium plastic; moderately cemented; slightly sandy; fine-grained; poorly sorted; slightly calcareous; moist.	
15			<u>4.0-6.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. CLAY: medium light gray (N 6/0) to grayish orange (10 YR 7/4); massive; moderately calcareous; blocky; medium plastic; moist.	

**LOG
OF
BOREHOLE**

Location _____
 Coordinates _____
 Total Depth _____
 Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Borehole/Well No. 48-87
 Ground Surface Elevation _____
 Water Level Encountered _____
Static _____
 Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By _____
Site Manager
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
—			<p><u>6.0-8.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. CLAY: light brown (5 YR 5/6); very calcareous; medium plastic; scattered subangular and subrounded gravels; slightly sandy; moist.</p>	
—			<p><u>8.0-10.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. 8.0-9.8': CLAY: light brown (5 YR 5/6); scattered gravels; low to medium plastic; calcareous streaked; massive; moist.</p> <p style="text-align: center;"><u>ARAPAHOE FORMATION</u></p> <p>9.8-10.0': WEATHERED CLAYSTONE: medium dark gray (N 4/0); medium plastic; blocky; oxide (Fe) stained; moist.</p>	
—			<p><u>10.0-12.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. 10.0-11.5': WEATHERED CLAYSTONE: medium dark gray (N 4/0); slightly sandy to very sandy; fine-grained; medium to low plastic; blocky; slightly calcareous streaked; moist. 11.5-12.0': WEATHERED SANDSTONE: pale yellowish brown (10 YR 6/2) to a light gray (N 7/0); fine-grained sand (2.0-1.5Ø); rounded and subrounded; weakly cemented; severely oxide (Fe) stained; slightly calcareous; massive; moist.</p>	

02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
4887	11/10/87	5909.94	5911.53	1.59	11.64	7.80	5903.73
	12/16/87	5909.94	5911.53	1.59	11.64	7.60	5903.93
	01/08/88	5909.94	5911.53	1.59	11.64	9.60	5901.93
	02/04/88	5909.94	5911.53	1.59	11.64	5.93	5905.60

INDEX OF DATA

Boring No.: 49-87

Completed as well? Yes

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data and Results
- Packer Test Data and Results
- Water Level Data

**LOG
OF
BOREHOLE**

<p>Location <u>Rocky Flats Plant; 881 Hillside Area</u></p> <p>Coordinates <u>N 35004.54 E 21891.49</u></p> <p>Total Depth <u>10.00'</u></p> <p>Drilling Company <u>Boyles Bros.</u></p> <p>Date Drilled <u>October 1, 1987</u></p> <p>Drilling Method <u>Hollow Stem Auger</u></p> <p>Logged By <u>R.T. Treat</u> Geologist</p>	<p>Borehole/Well No. <u>49-87</u></p> <p>Ground Surface Elevation <u>5912.68'</u></p> <p>Water Level Encountered <u>None</u> Static <u>5908.42' 2/4/88</u></p> <p>Driller <u>S. Bradfield</u></p> <p>Helper <u>P. Mesa</u></p> <p>Drilling Fluid <u>None</u></p> <p>Checked By _____ Site Manager CEARP Manager</p>
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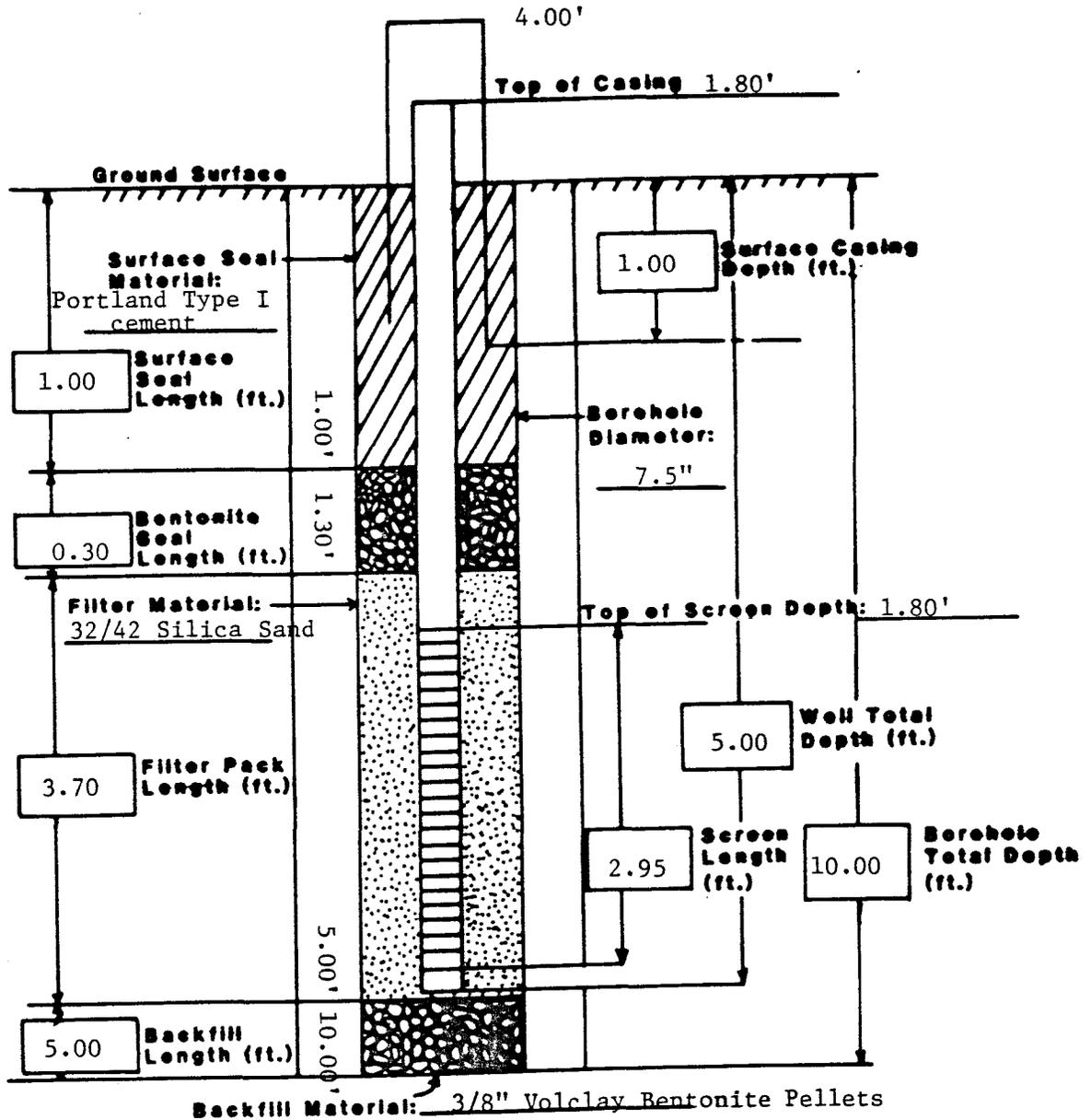
Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<p>TOPSOIL</p> <p><u>0.0-1.8' SAMPLE.</u> Recovered 1.5/1.8' = 83%. 0.0-0.25': TOPSOIL: silty clay.</p> <p style="text-align: center;">COLLUVIUM</p> <p>0.25-1.5': CLAY: grayish brown (5 YR 3/2) to dusky brown (5 YR 2/2); sandy with gravel; moderately cemented; low plastic; subrounded and subangular gravels range from 0.5 mm up to cobble size; poorly sorted, medium-grained sands (1.5-1.0Ø); light moist.</p> <p>Hole measured at 2.0'; readjust depth.</p>	<p>HNu background=0.6 OVA background=0.0 No Ludlum readings taken.</p> <p>No readings over background on core.</p>
5			<p><u>2.0-4.0' SAMPLE.</u> Recovered 0.75/2.0' = 38%. CLAYEY SANDS AND GRAVELS: moderate yellowish brown (10 YR 5/4) to dark yellowish orange (10 YR 6/6); poorly sorted, fine- to coarse-grained sands (2.0-1.5Ø up to 0.5-0.0Ø); angular and subangular gravels up to 2.5 mm with scattered cobbles; weakly cemented; light moist.</p>	
10			<p><u>4.0-7.0' SAMPLE.</u> Recovered 0.45/3.0' = 15%. 4.0-4.5': CLAY: moderate brown (5 YR 4/4); sandy with small size gravels; medium- and coarse-grained sands (1.5-1.0Ø up to 0.5-0.0Ø); subangular and subrounded gravels range from 0.25 mm up to 1.5 mm; moderately cemented; well sorted; low plastic; moist.</p>	

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; 881 Hillside Area Well No. 49-37
 Coordinates N 35004.54 E 21891.49 Elevation: Ground Surface 5912.68'
 Total Depth: Well 5.00' Top of Casing 5914.48'
 Borehole 10.00'
 Formation of Completion Colluvium
 Casing Material Sch 5, Type 316 TFJ stainless steel Casing Diameter 2" ID
 Screen Material 0.010" wire wrap 316 TFJ stainless steel Surface Casing Diameter 5" ID
 Date Installed October 2, 1987 Approved By _____
 Installed By R.T. Treat Site Manager
 Geologist Project Director

Comments _____



02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
4987	11/10/87	5912.68	5914.48	1.80	6.55	5.40	5909.08
	12/16/87	5912.68	5914.48	1.80	6.55	5.60	5908.88
	01/08/88	5912.68	5914.48	1.80	6.55	6.00	5908.48
	02/04/88	5912.68	5914.48	1.80	6.55	6.06	5908.42

INDEX OF DATA

Boring No.: 50-87

Completed as well? Yes

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data and Results
- Packer Test Data and Results
- Water Level Data

**LOG
OF
BOREHOLE**

Location <u>Rocky Flats Plant; 881 Hillside Area</u>	Borehole/Well No. <u>50-87</u>
Coordinates <u>N 35133.80 E 22222.15</u>	Ground Surface Elevation <u>5933.21'</u>
Total Depth <u>27.00'</u>	Water Level Encountered _____
	Static _____
Drilling Company <u>Boyles Bros.</u>	Driller <u>T. High</u>
Date Drilled <u>October 1-2, 1987</u>	Helper <u>B. Keeney</u>
Drilling Method <u>Hollow Stem Auger</u>	Drilling Fluid _____
Logged By <u>J.L. Bannon</u>	Checked By _____
<u>Geologist</u>	<u>Site Manager</u>
	<u>CEARP Manager</u>

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>TOPSOIL</u>	
			<u>0.0-2.0' SAMPLE.</u> Recovered 1.7/2.0' = 85%. 0.0-1.55': TOPSOIL: moderate brown (5 YR 3/4); sand and gravel; poorly sorted; very fine- to medium-grained clayey sand with abundant subangular to subrounded quartzite, quartz, and schist pebbles; no caliche; roots and grass in upper 0.2'; unconsolidated to moderately consolidated; dry at top to damp down-core.	HNu background=0.2 OVA background=1.0 2.0': Reading on core (background): HNu = 0.2 (0.2); OVA = 5.2 (1.0) on core. HNu = 0.6 (0.2); OVA = 6.0 (1.2) at well head. No readings over background in breathing zone and cuttings.
5			<u>COLLUVIUM</u>	
			1.55-1.7': CLAY: dark yellowish brown (10 YR 4/2); dense clay; consolidated; damp.	
			<u>2.0-4.0' SAMPLE.</u> Recovered 1.7/2.0' = 85%. 2.0-3.37': SANDY CLAY: pale yellowish brown (10 YR 6/2); dense; homogeneous clay with minor caliche and oxidation; consolidated; moderate HCl reaction; damp.	4.0': HNu = 0.2 (0.2); OVA = 4.4 (1.0) on core.
10			3.37-3.7': SANDY CLAY: dusky yellow (5 Y 6/4); well sorted with more caliche; consolidated; strong HCl reaction; damp.	
			<u>4.0-7.0' SAMPLE.</u> Recovered 3.1/3.0' = 103%. SANDY CLAY: dusky yellow (5 Y 6/4); homogeneous; rare very small quartzite pebbles; heavy caliche; consolidated; brittle; strong HCl reaction; damp.	
15				
20				

**LOG
OF
BOREHOLE**

Location _____
 Coordinates _____
 Total Depth _____
 Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Borehole/Well No. 50-87
 Ground Surface Elevation _____
 Water Level Encountered _____
Static _____
 Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By _____
Site Manager
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			<u>7.0-9.5' SAMPLE.</u> Recovered 2.6/2.5' = 104%. SANDY CLAY: dark yellowish orange (10 YR 6/6); few subangular to subrounded quartz and quartzite pebbles; caliche; well consolidated; strong HCl reaction; damp.	<u>9.5'</u> : HNu = 0.2 (0.2); OVA = 2.0 (1.0) on core. <u>12.0'</u> : No readings above background on core, breathing zone, and well head. <u>14.5'</u> : No readings above background at well head, breathing zone, and core.
25			<u>9.5-12.0' SAMPLE.</u> Recovered 2.7/2.5' = 108%. SANDY CLAY: moderate yellowish brown (10 YR 5/4); very fine- to fine-grained; some subangular to subrounded small quartz and quartzite pebbles; caliche staining; well consolidated; strong HCl reaction on caliche; damp.	
30			<u>12.0-14.5' SAMPLE.</u> Recovered 2.3/2.5' = 92%. 12.0-13.2': SAND AND CLAY: grayish orange (10 YR 7/4) to dark yellowish orange (10 YR 6/6); sandy clay (upper 0.3') to clayey; very fine-grained sand with rare very small quartz pebbles; heavy caliche staining, becomes more oxidized down-core; consolidated; strong HCl reaction on caliche; damp.	
			<u>ARAPAHOE FORMATION</u>	
			13.2-14.5': SANDSTONE AND CLAYSTONE: dark yellowish orange (10 YR 6/6) to moderate brown (5 YR 4/4); contains extremely oxidized hematite staining and nodules; clayey; well sorted; very fine-grained sand; moderately consolidated; damp.	

LOG
OF
BOREHOLE

Location _____

Borehole/Well No. 50-87

Coordinates _____

Ground Surface Elevation _____

Total Depth _____

Water Level Encountered _____

Static _____

Drilling Company _____

Driller _____

Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By _____

Geologist

Site Manager

CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
—			<p><u>14.5-17.0' SAMPLE.</u> Recovered 2.2/2.5' = 88%.</p> <p>14.5-15.1': CLAYEY SANDSTONE: dark yellowish orange (10 YR 6/6) to moderate brown (5 YR 4/4); oxidized clayey sand with hematite nodules and minor caliche; unconsolidated; strong HCl reaction on caliche; damp.</p> <p>15.1-15.6': CLAYEY SANDSTONE: light brown (5 YR 6/4); well sorted; clayey, very fine-grained sand; abundant caliche; unconsolidated; very strong HCl reaction; damp.</p> <p>15.6-16.7': CLAYEY SANDSTONE: grayish orange (10 YR 7/4) to dark yellowish orange (10 YR 6/6); well sorted; friable; clayey, very fine-grained sand; consolidated; no HCl reaction; damp.</p>	<p>17.0': No readings above background on core.</p> <p>19.5': No readings above background at well head, breathing zone, and core.</p> <p>24.5': No readings above background on core.</p>
—			<p><u>17.0-19.5' SAMPLE.</u> Recovered 1.9/2.5' = 76%.</p> <p>CLAYEY SANDSTONE: grayish orange (10 YR 7/4) to dark yellowish orange (10 YR 6/6); well sorted; clayey; very fine-grained sand; no pebbles; unconsolidated; damp.</p>	
—			<p><u>19.5-22.0' SAMPLE.</u> Recovered 2.05/2.5' = 82%.</p> <p>CLAYEY SANDSTONE: same as above; thin lamina visible in lower 0.7'; unconsolidated; damp.</p>	

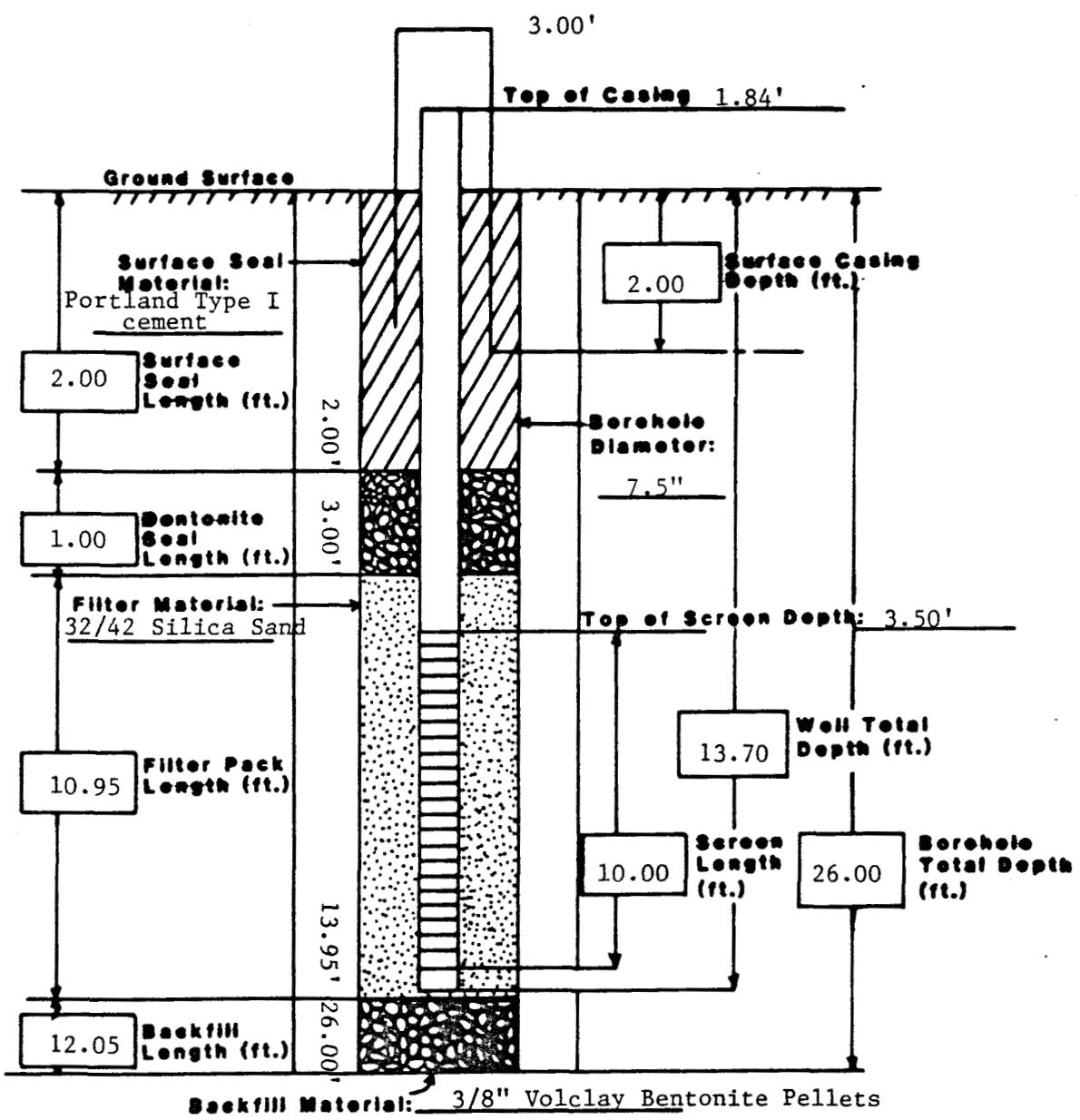
WELL COMPLETION INFORMATION

Location Rocky Flats Plant; 881 Hillside Area Well No. 50-87
 Coordinates N 35133.80 E 22222.15 Elevation: Ground Surface 5933.21'
 Total Depth: Well 13.70' Top of Casing 5935.05'
 Borehole 26.00'

Formation of Completion Colluvium
 Casing Material Sch 5, Type 316 TFJ stainless steel Casing Diameter 2" ID
 Screen Material 0.010" wire wrap, 316 TFJ Surface Casing Diameter 5" ID
 Date Installed October 2, 1987 stainless steel Approved By _____
 Installed By J.L. Bannon Site Manager _____
 Geologist

Project Director _____

Comments _____



02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

<u>WELL NUMBER</u>	<u>DATE</u>	<u>G. S. ELEVATION</u>	<u>TOC ELEVATION</u>	<u>STICK UP</u>	<u>SI BASE BELOW TOC</u>	<u>WATER DEPTH BELOW TOC</u>	<u>WATER SURFACE ELEVATION</u>
5087	11/10/87	5933.21	5935.05	1.84	15.34	11.50	5923.55
	12/16/87	5933.21	5935.05	1.84	15.34	11.10	5923.95
	01/08/88	5933.21	5935.05	1.84	15.34	-1.00	DRY
	02/04/88	5933.21	5935.05	1.84	15.34	-1.00	DRY

INDEX OF DATA

Boring No.: 51-87/BH62-87

Completed as well? Yes

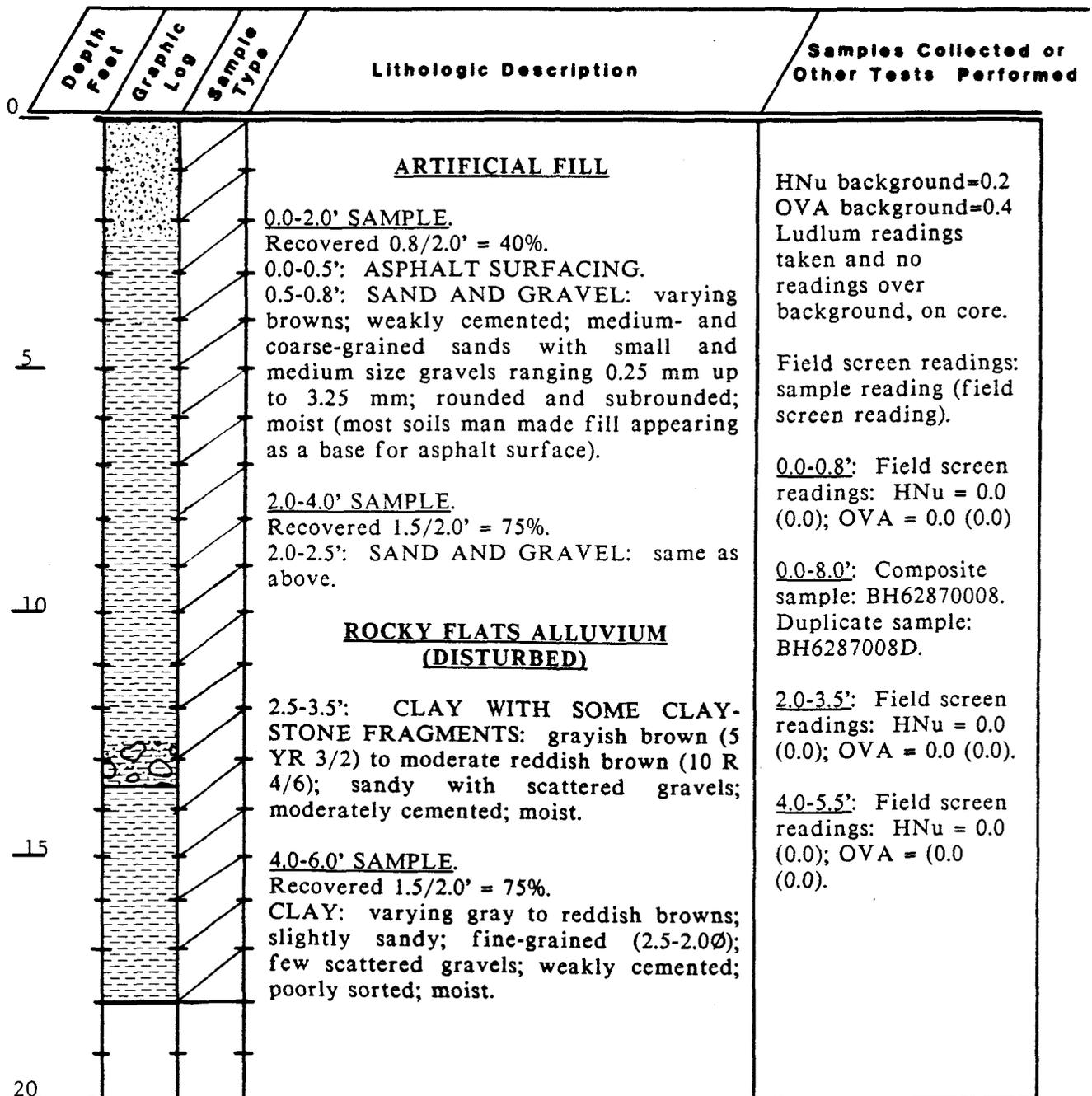
Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

**LOG
OF
BOREHOLE**

<p>Location <u>Rocky Flats Plant; 881 Hillside Area</u></p> <p>Coordinates <u>N 35120.00 E 20738.10</u></p> <p>Total Depth <u>18.00'</u></p> <p>Drilling Company <u>Boyles Bros.</u></p> <p>Date Drilled <u>October 21, 1987</u></p> <p>Drilling Method <u>Hollow Stem Auger</u></p> <p>Logged By <u>R.T. Treat</u> Geologist</p>	<p>Borehole/Well No. <u>51-87/BH62-87</u></p> <p>Ground Surface Elevation <u>5963.30'</u></p> <p>Water Level Encountered <u>12.00'</u> Static <u>5948.76' 2/4/88</u></p> <p>Driller <u>S. Bradfield</u></p> <p>Helper <u>P. Mesa</u></p> <p>Drilling Fluid <u>None</u></p> <p>Checked By _____ Site Manager CEARP Manager</p>
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Comments _____



LOG
OF
BOREHOLE

Location _____

Borehole/Well No. 51-87/BH62-87

Coordinates _____

Ground Surface Elevation _____

Total Depth _____

Water Level Encountered _____

Static _____

Drilling Company _____

Driller _____

Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By _____

Geologist

Site Manager

CEARP Manager

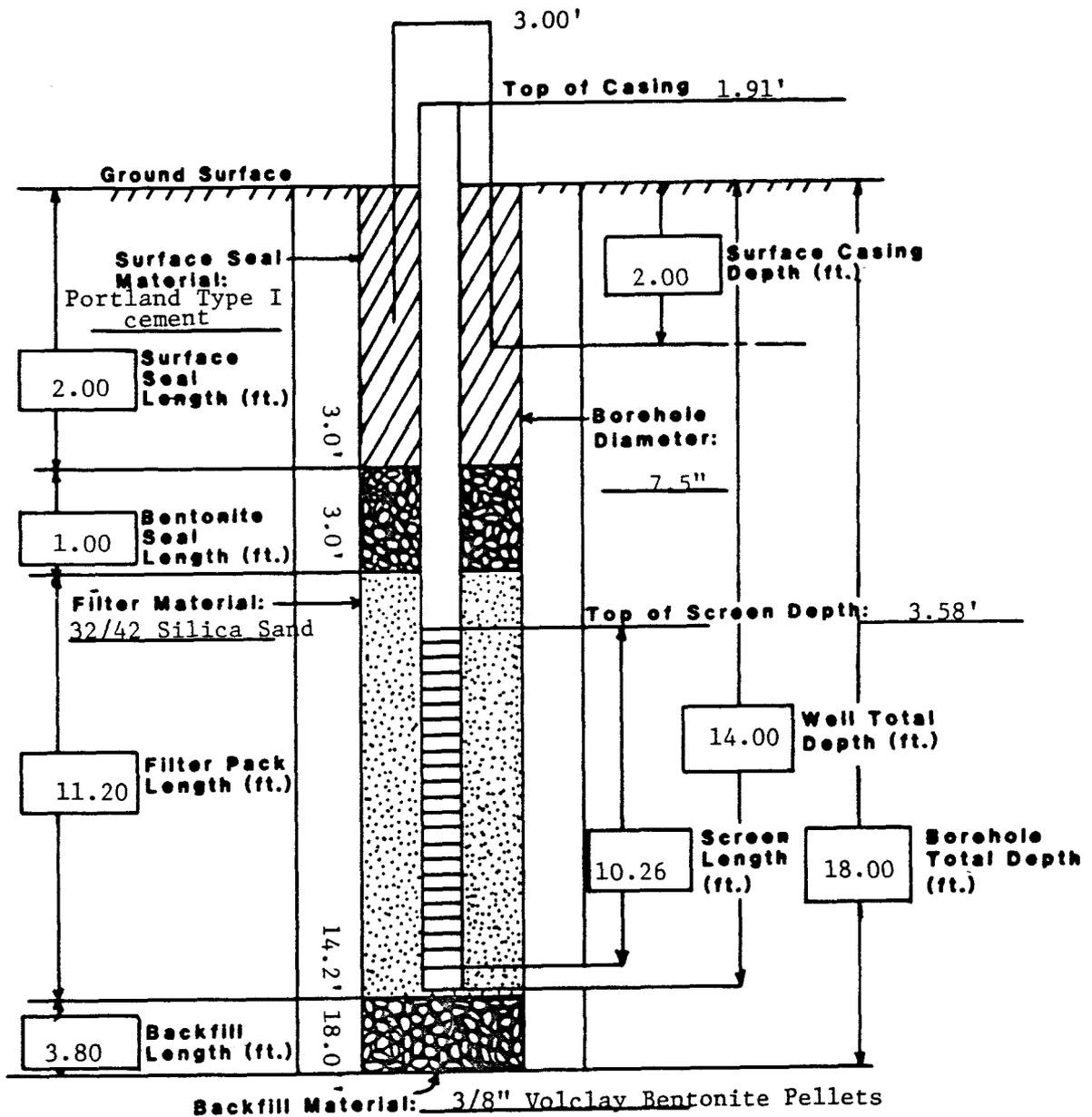
Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
—			<u>14.0-16.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. CLAYSTONE: dark gray (N 3/0); blocky; medium plastic; oxide stained in thin streaks; weathered; moist.	<u>14.0-16.0':</u> Bedrock sample: BH628714BR.
—			<u>16.0-18.0' SAMPLE.</u> Recovered 2.0/2.0' = 100% CLAYSTONE: same as above; weathered; moist.	<u>16.0-18.0':</u> Field screen readings: HNu = 0.0 (0.0); OVA = 0.0 (0.0).
			TOTAL DEPTH: 18.00'	

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; 881 Hillside Area Well No. 51-87/BH62-87
 Coordinates N 35120.00 E 20738.10 Elevation: Ground Surface 5963.30'
 Total Depth: Well 14.08' Top of Casing _____
 Borehole 18.00'
 Formation of Completion Rocky Flats Alluvium
 Casing Material Sch 5, Type 316 TFJ stainless steel Casing Diameter 2" ID
 Screen Material 0.010" wire wrap Type 316 TFJ stainless steel Surface Casing Diameter 5" ID
 Date Installed October 22, 1987 Approved By _____
 Installed By R.T. Treat Site Manager _____
 Geologist CEARP Manager _____

Comments _____



02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
5187	11/11/87	5963.30	5965.21	1.91	15.75	14.00	5951.21
	12/21/87	5963.30	5965.21	1.91	15.75	14.00	5951.21
	01/11/88	5963.30	5965.21	1.91	15.75	15.40	5949.81
	02/04/88	5963.30	5965.21	1.91	15.75	16.45	5948.76

INDEX OF DATA

Boring No.: 52-87/BH63-87

Completed as well? Yes

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data and Results
- Packer Test Data and Results
- Water Level Data

**LOG
OF
BOREHOLE**

Location Rocky Flats Plant; 881 Hillside Area Borehole/Well No. 52-87/BH63-87
 Coordinates N 35161.94 E 20954.54 Ground Surface Elevation 5967.57'
 Total Depth 28.00' Water Level Encountered 15.2'

Drilling Company Boyles Bros.
 Date Drilled October 16 & 19, 1987
 Drilling Method Hollow Stem Auger
 Logged By R.T. Treat
 Geologist

Static _____
 Driller S. Bradfield
 Helper P. Mesa
 Drilling Fluid None
 Checked By _____
 Site Manager
 CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>ARTIFICIAL FILL</u>	
			<u>0.0-2.0' SAMPLE.</u> Recovered 1.6/2.0' = 80%. 0.0-1.4': CLAY: varying browns; sandy to very sandy with gravel and noted roots; slightly calcareous; slightly moist.	HNu background=0.2 OVA background=2.4 No Ludlum readings over background along core samples recovered.
5			<u>ROCKY FLATS ALLUVIUM (DISTURBED)</u>	Field screen readings: sample reading (field blank reading).
			1.4-1.6': CLAY: grayish brown (5 YR 3/2) to dusky brown (5 YR 2/2); slightly sandy; moderately cemented; very stiff; low plastic; slightly moist.	<u>0.0-1.6':</u> Field screen reading: HNu = 0.0 (0.0); OVA = 0.0 (0.0).
10			<u>2.0-4.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. CLAY: pale brown (5 YR 5/2) to light brown (5 YR 5/6); slightly sandy to very sandy (3.0-2.5 Ø); slightly calcareous streaked; moderately cemented; low plastic; moist.	<u>2.0-4.0':</u> Field screen reading: HNu = 0.0 (0.0); OVA = 0.0 (0.0).
			<u>4.0-6.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. CLAY: light brown (5 YR 5/6); low plastic; slightly sandy to sandy; fine-grained; weakly cemented; moist.	<u>0.0-8.0':</u> Composite sample: BH63870008. <u>4.0-6.0':</u> Field screen reading: HNu = 0.0 (0.0); OVA = 0.0 (0.0).
15			<u>6.0-8.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. CLAY: light brown (5 YR 5/6) to varying grayish brown; sandy (3.0-2.5 Ø) and fine-grained with scattered coarse sands; weakly cemented; low plastic; moist to very moist at bottom.	<u>6.0-8.0':</u> Field screen reading: HNu = 0.0 (0.0); OVA = 0.0 (0.0).
20				

LOG
OF
BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 52-87/BH63-87
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			<p><u>8.0-10.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. CLAY: moderate yellowish brown (10 YR 5/4) to pale brown (5 YR 5/2); fine-grained sand (3.0-3.5 Ø up to 2.5-2.0 Ø); few scattered subangular and subrounded gravels 0.5 mm up to 2.5 mm; medium plastic; moderately cemented; moderately oxide (Fe) stained; moist.</p>	<p><u>8.0-10.0':</u> Field screen reading: HNu = 0.0 (0.0); OVA = 0.0 (0.0).</p>
25			<p><u>10.0-12.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. CLAY: moderate yellowish brown (10 YR 5/4) to pale brown (5 YR 5/2); slightly sandy to sandy with small size scattered gravels; moderately to weakly cemented; moist.</p>	<p><u>10.0-12.0':</u> Field screen reading: HNu = 0.0 (0.0); OVA = 0.0 (0.0).</p>
30			<p><u>12.0-14.0' SAMPLE.</u> Recovered 1.7/2.0' = 85%. 12.0-12.2': CLAY: same as above. 12.2-13.7': CLAYEY SAND AND GRAVEL: moderate brown (5 Y 4/4) to moderate yellowish brown (10 YR 5/4); fine-grained sand, well sorted, ranging from 3.0-2.5Ø up to 0.5-1.0Ø; gravel range 0.25 mm up to 3.75 mm; subangular with some subrounded; weakly cemented; very moist to moist.</p>	<p><u>12.0-13.7':</u> Field screen reading: HNu = 0.0 (0.0); OVA = 0.6 (0.0).</p> <p><u>12.0-13.7':</u> Sample taken: BH638712DH.</p>
—			<p><u>14.0-16.0' SAMPLE.</u> Recovered 1.5/2.0' = 75%. CLAYEY SAND AND GRAVEL: moderate reddish brown (10 R 4/6) to a dark reddish brown (10 R 3/4); well graded sand and gravel ranging from 0.5 mm up to 2.75 mm; weakly cemented; moist to wet streak at 15.2-15.5'.</p>	<p><u>14.0-15.5':</u> Field screen reading: HNu = 18.0 (21.0); OVA = 0.0 (0.0).</p> <p><u>16.0-17.8':</u> Field screen reading: HNu = 0.0 (0.0); OVA = 0.0 (0.0).</p>
—				

02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

<u>WELL NUMBER</u>	<u>DATE</u>	<u>G. S. ELEVATION</u>	<u>TOC ELEVATION</u>	<u>STICK UP</u>	<u>SI BASE BELOW TOC</u>	<u>WATER DEPTH BELOW TOC</u>	<u>WATER SURFACE ELEVATION</u>
5287	11/11/87	5967.57	5967.57	0.00	20.25	9.70	5957.87
	12/21/87	5967.57	5967.57	0.00	20.25	9.70	5957.87
	01/11/88	5967.57	5967.57	0.00	20.25	9.70	5957.87
	02/04/88	5967.57	5967.57	0.00	20.25	10.13	5957.44

INDEX OF DATA

Boring No.: 53-87

Completed as well? Yes

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data and Results
- Packer Test Data and Results
- Water Level Data

**LOG
OF
BOREHOLE**

Location Rocky Flats Plant: 881 Hillside Area
 Coordinates N 35002.12 E 20799.61
 Total Depth 14.00'

Borehole/Well No. 53-87
 Ground Surface Elevation 5959.82'
 Water Level Encountered 0.00'

Drilling Company Boyles Bros.
 Date Drilled October 12 & 13, 1987
 Drilling Method Hollow Stem Auger
 Logged By R.T. Treat
Geologist

Static _____
 Driller S. Bradfield
 Helper P. Mesa
 Drilling Fluid None
 Checked By _____
Site Manager

CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			ARTIFICIAL FILL	
			<p><u>0.0-2.0' SAMPLE.</u> Recovered 1.7/2.0' = 85%.</p> <p>0.0-1.5': CLAY AND SAND: grayish brown (5 YR 3/2) to light olive gray (5 Y 5/2); silty sands in upper formation to rounded and subrounded scattered gravel (1.50 mm to 3.25 mm); weakly to moderately cemented; low plastic; moist.</p>	<p>HNu background=0.4 OVA background=0.2 Ludlum readings taken indicating 0.0 readings.</p>
5			COLLUVIUM (DISTURBED)	
			<p>1.5-1.7': CLAYEY SAND: subrounded and subangular gravel up to 2.50 mm; medium- and coarse-grained sand (2.0-1.5 Ø to 0.5-0.0 Ø); weakly cemented; well sorted sand and poorly sorted gravel; light moist.</p>	<p><u>0.0-1.7'</u>: No readings over background along core sample.</p>
10				<p><u>2.0-2.81'</u>: Readings along core: OVA = 3.2; HNu = 0.0.</p>
			<p><u>2.0-4.0' SAMPLE.</u> Recovered 0.8/2.0' = 40%.</p> <p>CLAY: light brown (5 YR 5/6) to light olive gray (5 Y 5/2); some oxide staining; fine-grained sand (3.0-2.5 Ø); scattered subrounded and subangular gravel (0.5 mm up to 2.5 mm) of quartzite composition; low to medium plastic; fill; moist.</p>	<p>No readings in breathing zone.</p>
15				<p><u>4.0-5.5'</u>: No readings over background along core.</p>

**LOG
OF
BOREHOLE**

Location _____
 Coordinates _____
 Total Depth _____

Borehole/Well No. 53-87
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____

Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By _____
Site Manager
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
—			<p><u>4.0-6.0' SAMPLE.</u> Recovered 1.5/2.0' = 75%. CLAY AND GRAVEL: dusky yellowish brown (10 YR 2/2) to moderate reddish brown (10 R 4/6); angular, subangular, and subrounded gravel up to 5.50 mm; medium- to coarse-grained sand (1.0-0.5 Ø); some coarser-grained sand; low plastic; moderately to weakly cemented; at 4.0-4.3', zone of organic clay; moist to light moist.</p>	
—			<p><u>6.0-8.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. CLAY: moderate yellowish brown (10 YR 5/4) to pale brown (5 YR 5/2); medium plastic; slightly sandy; angular and subangular gravel (0.02 mm up to 1.50 mm); moderately cemented; moist.</p>	<p><u>6.0-8.0'</u>: No reading over background along core.</p>
—			<p><u>8.0-10.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. 8.0-8.8': CLAY WITH SCATTERED GRAVEL: same as above.</p> <p style="text-align: center;"><u>ARAPAHOE FORMATION</u></p> <p>8.8-10.0': WEATHERED CLAYSTONE: medium light gray (N 6/0) to medium gray (N 5/0); massive; blocky; slightly calcareous; somewhat oxide (Fe) stained; medium plastic; moist.</p>	<p><u>8.0-10.0'</u>: No readings over background along core.</p>

LOG
OF
BOREHOLE

Location _____

Borehole/Well No. 53-87

Coordinates _____

Ground Surface Elevation _____

Total Depth _____

Water Level Encountered _____

Static _____

Drilling Company _____

Driller _____

Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By _____

Geologist

Site Manager

CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
—			<p><u>10.0-12.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: medium light gray (N 6/0); massive; blocky; medium plastic; slightly calcareous pockets noted at 11.5'; very slightly oxide stained; moist.</p>	<p><u>10.0-12.0':</u> No readings over background along core.</p>
—			<p><u>12.0-14.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: medium light gray (N 6/0); massive; blocky; medium plastic; moderately oxide stained at 13.8'; noted lignite streaks at 13.0'; moist.</p>	<p><u>12.0-14.0':</u> No readings over background along core.</p>
—			<p>TOTAL DEPTH: 14.00'</p>	

02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

<u>WELL NUMBER</u>	<u>DATE</u>	<u>G. S. ELEVATION</u>	<u>TOC ELEVATION</u>	<u>STICK UP</u>	<u>SI BASE BELOW TOC</u>	<u>WATER DEPTH BELOW TOC</u>	<u>WATER SURFACE ELEVATION</u>
5387	11/10/87	5959.82	5961.84	2.02	11.07	6.40	5955.44
	12/16/87	5959.82	5961.84	2.02	11.07	8.60	5953.24
	01/09/88	5959.82	5961.84	2.02	11.07	8.50	5953.34
	02/04/88	5959.82	5961.84	2.02	11.07	8.16	5953.68

INDEX OF DATA

Boring No.: 54-87

Completed as well? Yes

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data and Results
- Packer Test Data and Results
- Water Level Data

LOG
OF
BOREHOLE

Location <u>Rocky Flats Plant; 881 Hillside Area</u>	Borehole/Well No. <u>54-87</u>
Coordinates <u>N 35001.45 E 20919.36</u>	Ground Surface Elevation <u>5955.85'</u>
Total Depth <u>10.00'</u>	Water Level Encountered <u>None</u>
	Static _____
Drilling Company <u>Bovles Bros.</u>	Driller <u>S. Bradfield</u>
Date Drilled <u>October 13, 1987</u>	Helper <u>P. Mesa</u>
Drilling Method <u>Hollow Stem Auger</u>	Drilling Fluid <u>None</u>
Logged By <u>R.T. Treat</u> Geologist	Checked By _____ Site Manager
	_____ CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			ARTIFICIAL FILL	
			<u>0.0-2.0' SAMPLE.</u> Recovered 1.8/2.0' = 90%. 0.0-0.7': CLAY AND GRAVEL: grayish orange (10 YR 7/4); roots noted; slightly sandy; weakly cemented; very calcareous; light moist. 0.7-1.8': CLAY: medium gray (N 5/0); blocky; moderately oxide stained; few scattered roots noted; moist.	HNu background=0.0 OVA background=0.0 Ludlum readings taken. No readings above background on core or in breathing zone.
5			<u>2.0-4.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. 2.0-3.2': CLAY: moderate yellowish brown (10 YR 5/4); fill; low plastic; moderately cemented; slightly sandy with medium-grained sands (1.0-0.5Ø).	No readings above background.
10			COLLUVIUM (DISTURBED)	
			3.2-4.0': CLAY: dark yellowish orange (10 YR 6/6) to pale yellowish brown (10 YR 6/2); slightly sandy to very sandy; fine-grained (2.0-1.5Ø); low plastic; moderately cemented; severely oxide (Fe) stained; moist.	
			<u>4.0-6.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. 4.0-4.2': CLAY: same as above; transition into a weathered claystone.	

LOG
OF
BOREHOLE

Location _____

Borehole/Well No. 54-87

Coordinates _____

Ground Surface Elevation _____

Total Depth _____

Water Level Encountered _____

Static _____

Drilling Company _____

Driller _____

Date Drilled _____

Helper _____

Drilling Method _____

Drilling Fluid _____

Logged By _____

Checked By _____

Geologist

Site Manager

CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
—			<u>ARAPAHOE FORMATION</u>	
			4.2-6.0': WEATHERED CLAYSTONE: pale brown (5 Y 3/2) to a light gray (N 7/0); sandy to very sandy at 4.7-5.2'; fine-grained sand (2.5-2.0Ø); slightly calcareous; severely oxide stained; medium to low plastic; blocky; slightly porous with noted few roots; moist.	
			<u>6.0-8.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: medium light gray (N 6/0) varying with olive grays; slightly oxide stained; few roots still noted; slightly sandy; fine-grained; blocky; medium to low plastic; moist.	
			<u>8.0-10.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. WEATHERED CLAYSTONE: same as above; moist.	
			TOTAL DEPTH: 10.00'	

02/22/88

ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

<u>WELL NUMBER</u>	<u>DATE</u>	<u>G. S. ELEVATION</u>	<u>TOC ELEVATION</u>	<u>STICK UP</u>	<u>SI BASE BELOW TOC</u>	<u>WATER DEPTH BELOW TOC</u>	<u>WATER SURFACE ELEVATION</u>
5487	11/10/87	5955.85	5957.72	1.87	6.40	2.50	5955.22
	12/16/87	5955.85	5957.72	1.87	6.40	3.70	5954.02
	01/09/88	5955.85	5957.72	1.87	6.40	3.10	5954.62
	02/04/88	5955.85	5957.72	1.87	6.40	3.23	5954.49

INDEX OF DATA

Boring No.: 55-87A

Completed as well? No

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

LOG
OF
BOREHOLE

Location <u>Rocky Flats Plant; 881 Hillside Area</u>	Borehole/Well No. <u>55-87A</u>
Coordinates <u>N 31940 E 21700 (estimated)</u>	Ground Surface Elevation <u>Not available</u>
Total Depth <u>12.00'</u>	Water Level Encountered <u>None</u>
	Static <u>None</u>
Drilling Company <u>Boyles Bros.</u>	Driller <u>T. High</u>
Date Drilled <u>October 12, 1987</u>	Helper <u>B. Keeney</u>
Drilling Method <u>Hollow Stem Auger</u>	Drilling Fluid <u>None</u>
Logged By <u>J. Bacchus</u> Geologist	Checked By _____ Site Manager
	CEARP Manager

Comments Borehole backfilled with Portland Type I cement and abandoned

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>TOPSOIL</u>	
			<u>0.0-2.0' SAMPLE.</u> Recovered 1.9/2.0' = 95%. 0.0-0.8': TOPSOIL, SANDY CLAY: pale yellowish brown (10 YR 6/2); plant roots; clasts up to an inch in diameter; caliche.	HNu background=0.5 OVA background=1.0 Ludlum (alpha) background = 0.0. No readings above background along core.
5			<u>COLLUVIUM</u>	
			0.8-1.9': CLAY: pale yellowish brown (10 YR 6/2); caliche. <u>2.0-4.0' SAMPLE.</u> Recovered 1.8/2.0' = 90%. 2.0-2.5': CLAY: pale yellowish brown (10 YR 6/2); small pebbles; clasts of hematite.	
10			<u>ARAPAHOE FORMATION</u>	
			2.5-3.8': CLAYSTONE: pale yellowish brown (10 YR 6/2) clasts of hematite up to one-half inch in diameter; pockets of sand. <u>4.0-7.0' SAMPLE.</u> Recovered 2.9/3.0' = 97%. 4.0-6.6': CLAYSTONE: pale yellowish brown (10 YR 6/2); dense; caliche; pockets of sand; dry. 6.6-6.9': CLAYSTONE: brownish gray (5 YR 4/1); unweathered; similar to clay above; dry.	
15				

LOG
OF
BOREHOLE

Location _____
Coordinates _____
Total Depth _____

Borehole/Well No. 55-87A
Ground Surface Elevation _____
Water Level Encountered _____
Static _____

Drilling Company _____
Date Drilled _____
Drilling Method _____
Logged By _____
Geologist

Driller _____
Helper _____
Drilling Fluid _____
Checked By _____
Site Manager
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
—			<p><u>7.0-9.5' SAMPLE.</u> Recovered 2.7/2.5' = 108%. CLAYSTONE: brownish gray (5 YR 4/1); dense; pockets of caliche; slightly mottled; yellow; clasts of coal; some sand.</p>	
—			<p><u>9.5-12.0' SAMPLE.</u> Recovered 2.6/2.5' = 104%. SANDY CLAYSTONE: light brownish gray (5 YR 6/1); pockets of caliche; pockets of hematite and limonite; small clasts of coal.</p>	
			TOTAL DEPTH: 12.00'	

INDEX OF DATA

Boring No.: 55-87

Completed as well? Yes

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data and Results
- Packer Test Data and Results
- Water Level Data

LOG
OF
BOREHOLE

Location <u>Rocky Flats Plant; 881 Hillside Area</u>	Borehole/Well No. <u>55-87</u>
Coordinates <u>N 34633.09 E 21805.12</u>	Ground Surface Elevation <u>5858.08'</u>
Total Depth <u>12.00'</u>	Water Level Encountered <u>4.00'</u>
	Static _____
Drilling Company <u>Boyles Bros.</u>	Driller <u>T. High</u>
Date Drilled <u>October 13, 1987</u>	Helper <u>B. Keeney</u>
Drilling Method <u>Hollow Stem Auger</u>	Drilling Fluid <u>None</u>
Logged By <u>J. Bacchus</u> Geologist	Checked By _____ Site Manager
	CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>TERRACE</u> ^{JB 2/23/88} <u>COLLUVIUM</u>	
			<u>0.0-2.0' SAMPLE.</u> Recovered 2.0/2.0' = 100%. GRAVELLY, SANDY, SILTY CLAY: dusky yellowish brown (10 YR 2/2); roots; slightly moist.	
5			<u>2.0-4.0' SAMPLE.</u> Recovered 0.8/2.0' = 40%. SAND: moderate brown (5 YR 3/4); grains are subrounded to angular and range in size from small cobbles to very fine-grained; very poorly sorted; dry.	HNu background=0.9 OVA background=0.2 No Ludlum readings taken. No readings over background, unless noted.
10		<u>4.0-7.0' SAMPLE.</u> Recovered 1.5/3.0' = 150%. SAND: moderate yellowish brown (10 YR 5/4); coarse grains are angular to suban- gular; occurrence of some large pebbles; sand becomes finer at the bottom (2.0-1.5 Ø); some oxidation; weakly consolidated; wet.		
		<u>ARAPAHOE FORMATION</u>		
15			<u>7.0-9.5' SAMPLE.</u> Recovered 2.8/2.5' = 112%. CLAYSTONE: pale yellowish brown (10 YR 6/2); blocky structure; reacts weakly with HCl; large clasts of coal up to one- half inch in diameter; spots of oxidation; wet.	<u>7.0-9.5':</u> Readings on core: HNu = 3.0; OVA = 0.6.

BORHOLE

Coordinates _____
 Total Depth _____
 Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
 Geologist _____

Borehole/Well No. 55-87
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____
 Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By _____
 Site Manager _____
 CEARP Manager _____

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
			<p><u>9.5-12.0' SAMPLE.</u> Recovered 2.8/2.5' = 112%. 9.5-10.6': CLAYSTONE: moderate yellowish brown (10 YR 5/4); dense; blocky structure; oxidized; interspersed with clasts of coal. 10.6-12.0': CLAYSTONE: grayish brown (5 YR 3/2); similar to the clay above but with much less oxidation.</p> <p>TOTAL DEPTH: 12.00'</p>	

WELL COMPLETION INFORMATION

Location Rocky Flats Plant; 881 Hillside Area

Well No. 55-87

Coordinates N 34633.09 E 21805.12

Elevation: Ground Surface 5858.08'

Total Depth: Well 7.50'

Top of Casing 5860.13'

Borehole 12.00'

Formation of Completion Colluvium

Casing Material Sch 5, Type 316 TFJ stainless steel

Casing Diameter 2" ID

Screen Material 0.010" wire wrap Type 316 TFJ stainless steel

Surface Casing Diameter 5" ID

Date Installed October 15, 1987

Approved By _____

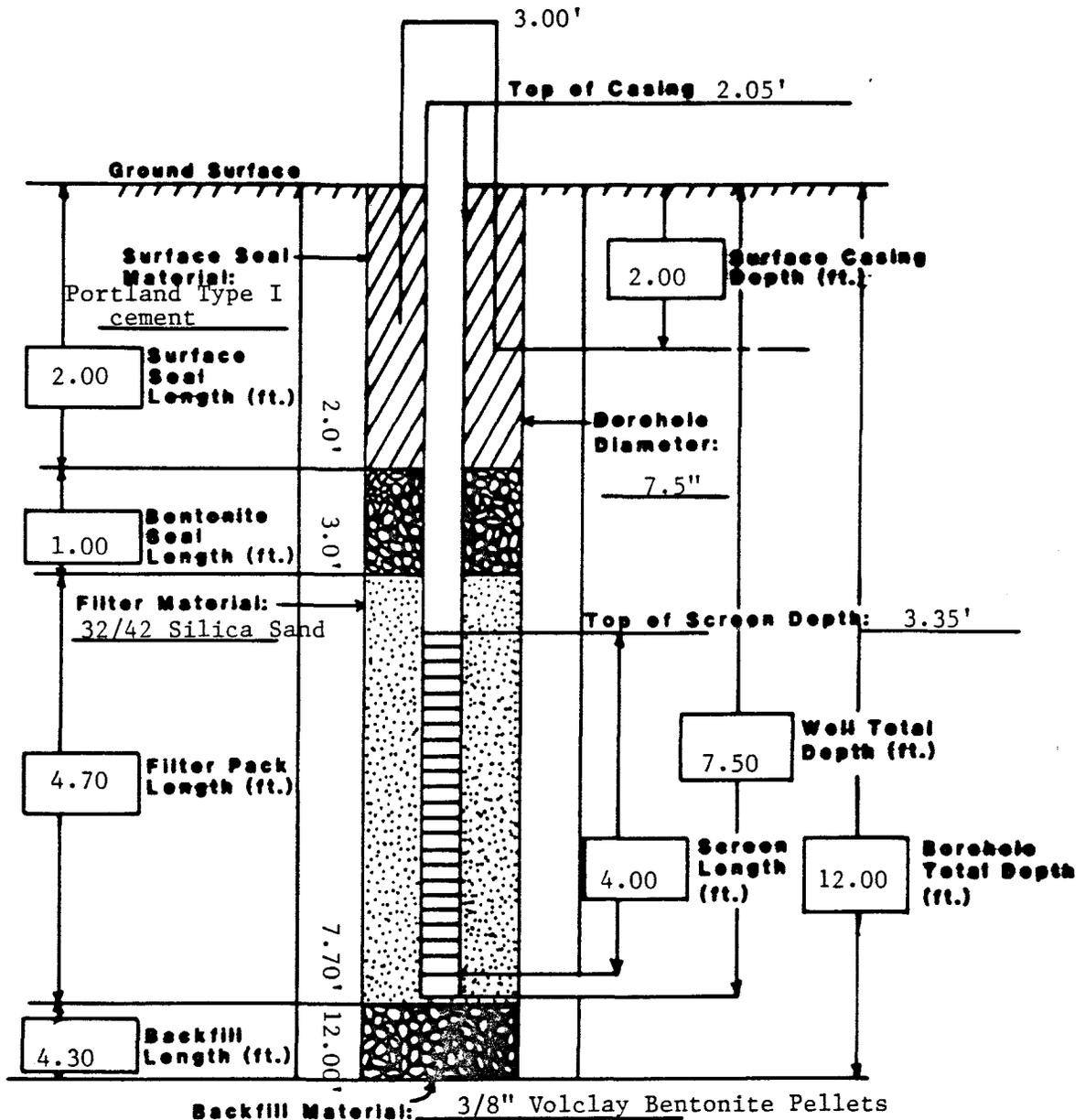
Installed By J. Bacchus and S. Paschke

Site Manager

Geologist

Project Director

Comments _____



02/22/88

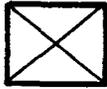
ROCKY FLATS PLANT
WATER LEVEL DATA SUMMARY

WELL NUMBER	DATE	G. S. ELEVATION	TOC ELEVATION	STICK UP	SI BASE BELOW TOC	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
5587	11/10/87	5858.08	5860.13	2.05	9.40	7.70	5852.43
	12/18/87	5858.08	5860.13	2.05	9.40	8.50	5851.63
	01/09/88	5858.08	5860.13	2.05	9.40	9.10	5851.03
	02/04/88	5858.08	5860.13	2.05	9.40	7.38	5852.75

APPENDIX E-4
1987 BOREHOLES

EXPLANATION OF SYMBOLS AND TERMS ON 881 HILLSIDE-1987 BORING LOGS

SAMPLE TYPE



Split Spoon

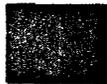


NC Core

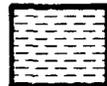


Continuous Drive

GRAPHIC LOG



Lignite



Clay or Claystone or Shale



Clayey Sand or Sandy Clay



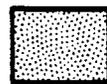
Clay and Gravel



Gravel



Sand and Gravel



Sand or Sandstone



Silt or Siltstone

INDEX OF DATA

Boring No.: BH1-87

Completed as well? No

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
 Coordinates N35065.7 E20744.9
 Total Depth 12.0'

Borehole/Well No. BH1-87
 Ground Surface Elevation * 5965.0'
 Water Level Encountered 0.2'
 Static N/A

Drilling Company Boyles Bros.
 Date Drilled June 4, 1987
 Drilling Method Hollow Stem Auger
 Logged By M. D. Gard
 Geologist

Driller R. Sharp
 Helper A. Boday
 Drilling Fluid None
 Checked By [Signature]
 Site Manager
 CEARP Manager

Comments Borehole backfilled with Portland Type I cement.
* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>ARTIFICIAL FILL</u>	HNu background = 3.0. OVA background = 3.0.
			0.0-2.0' - Sample. Recovered 1.2/2.0' = 60%. 0.0-0.2': GRAVEL: moderate yellowish brown (5YR 4/4); asphalt; sandy; cobbles of quartzite; subrounded, wet at 0.2'.	0.2-1.4': Water table Sample: BH018701WT.
5			2.0-4.0' - Sample. Recovered 2.0/2.0' = 100%. GRAVEL: same as above; wet.	2.0': OVA=75 on core.
			<u>ARAPHAOE FORMATION</u>	4.5-5.7': Waste Sample/ Contact Sample: BH018704WS.
			4.0-7.4' - Sample. Recovered 2.89/3.4' = 85%. CLAYSTONE: olive gray (5Y 3/2); limonite stains; moist.	5.0': Field Screening Sample: OVA=20; HNu=3.0.
10			7.4-9.6' - Sample. Recovered 2.2/2.2' = 100%. CLAYSTONE: same as above.	5.0': OVA=70 on core.
			9.6-12.0' - Sample. Recovered 4.4/4.4' = 100%. CLAYSTONE: same as above.	4.0-7.0': OVA=100 downhole.
			TOTAL DEPTH: 12.0'	10.0-11.5': Waste Sample/ Bedrock Sample: BH018710WS. 10.0': OVA=70 on core.
15				
20				

INDEX OF DATA

Boring No.: BH2-87

Completed as well? No

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
 Coordinates N34768.9 E20678.8
 Total Depth 20.4'

Borehole/Well No. BH2-87
 Ground Surface Elevation * 5936.0'
 Water Level Encountered None
 Static N/A

Drilling Company Boyles Bros.
 Date Drilled May 27, 1987
 Drilling Method Hollow Stem Auger
 Logged By K. D. Holliday
 Geologist

Driller R. Sharp
 Helper A. Boday
 Drilling Fluid None
 Checked By [Signature]
 Site Manager

CEARP Manager

Comments No water encountered during drilling. Borehole backfilled with Portland type I cement.

* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>COLLUVIUM (Disturbed)</u> 888 2/23/88	
			<u>0.0-3.40'</u> - Sample. Recovered 3.4/3.4 = 100%. SANDY CLAY: moderate yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/2) with some dark yellowish orange iron staining; occasional cobbles of quartzite from - 1.0 Ø to 1" diameter; caliche <10%; damp	HNu background = 0.8. No OVA readings. <u>0.0-11.80'</u> : Composite Sample: BH02870012.
5			<u>3.40-8.0'</u> - Sample. Recovered 4.0/4.6' = 87%. <u>3.40-6.40'</u> : SANDY CLAY: moderate yellowish brown (10YR 5/4) with some dark yellowish orange (10YR 6/6) and light brown (5YR 5/6) iron staining; occasional cobbles of quartzite; caliche <10%; damp. <u>6.40-7.40'</u> : SANDY CLAY: dark yellowish brown (10YR 4/2); occasional quartzite cobbles; damp to slightly moist.	<u>5.0'</u> : Field Screening Sample: HNu = 1.4.
10			<u>8.0-13.0'</u> - Sample. Recovered 1.2/5.0 = 24%. <u>7.40-11.80'</u> : Lost core. <u>11.80-13.0'</u> : SANDY CLAY: dark yellowish brown (10YR 5/4); occasional quartzite cobbles; caliche in fractures; damp.	<u>11.8'</u> : Field Screening Sample: HNu = 1.4. <u>11.8-14.3'</u> : Composite Sample: BH02871214.
15			<u>13.0-15.0'</u> - Sample. Recovered 1.13/2.0 = 56%. <u>13.0-13.87'</u> : Lost core. <u>13.87-14.3'</u> : CLAY: dark yellowish brown (10YR 5/4) weathered; trace very fine-grained sand and small quartzite pebbles, caliche in fractures (10%); damp.	<u>11.8-12.1'</u> : Waste Sample: BH02871214S (VDAS only). JDL <u>12.0-14.3'</u> : Contact Sample: BH028714CT.
20				

LOG OF BOREHOLE

Location _____
 Coordinates _____
 Total Depth _____

Borehole/Well No. BH2 -87 (cont'd.)
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____

Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By J.P. Pascho
Site Manager
TC
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20	[Hatched Box]		<u>ARAPAHOE FORMATION</u>	
			14.3-14.70': CLAYSTONE: dark yellowish orange (10YR 6/6) iron staining (30%) and light olive gray (5Y 5/2); weathered, caliche (10-15%); damp.	14.3-20.4'. Composite Sample: BH02871420.
25			15.0-18.0' - Sample. Recovered 2.45/3.0 = 81%. CLAYSTONE: light olive gray (5Y 5/2) to olive gray (5Y 5/2) TO OLIVE GRAY (5Y 4/1); weathered; caliche (10%); iron staining (20%); damp to dry.	15.15', Field Screening Sample: HNu - 1.3.
			18.0-20.4' - Sample. Recovered 2.8/2.4 = 116% CLAYSTONE: same as above.	17.9-18.6'. Bedrock Sample: BH0287188R.
			TOTAL DEPTH: 20.4'	20.0'. Field Screening Sample: HNu - 1.4.
30				
35				
40				

INDEX OF DATA

Boring No.: BH3-87

Completed as well? No

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside

Coordinates N34725.8 E20819.7

Total Depth 16.0'

Borehole/Well No. 2-87/BH3-87

Ground Surface Elevation 5930.56

Water Level Encountered 2.45'

Static 5929.59' (6/24/87)

Drilling Company Boyles Bros.

Date Drilled May 19, 1987

Drilling Method Hollow Stem Auger

Logged By K. D. Holliday

Geologist

Driller A. Shade

Helper T. Merritt

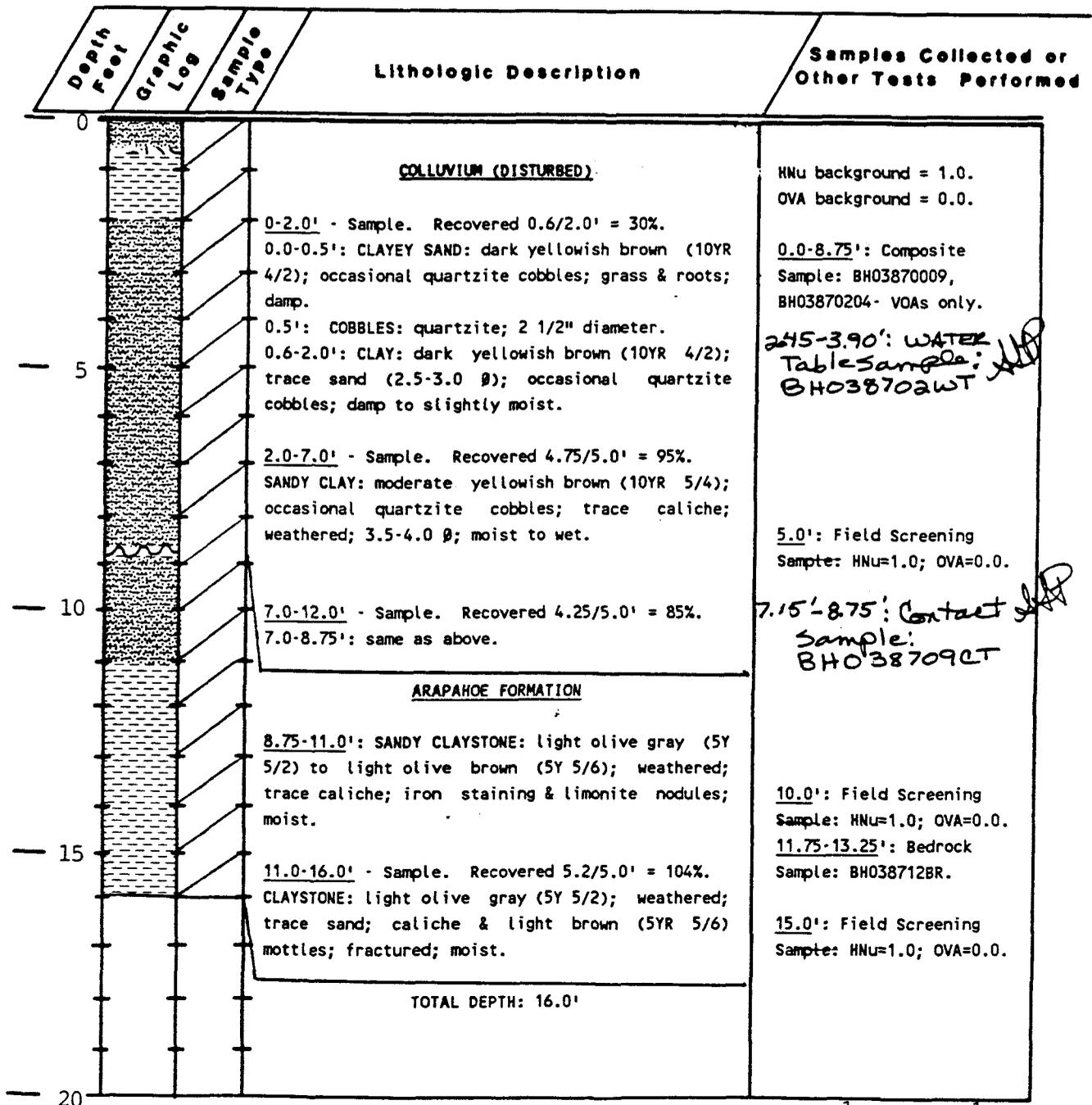
Drilling Fluid None

Checked By J. Paschke

Site Manager

CEARP Manager

Comments _____



INDEX OF DATA

Boring No.: BH4-87

Completed as well? No

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
 Coordinates N34993.7 E20920.7
 Total Depth 20.3'

Borehole/Well No. BH4-87
 Ground Surface Elevation * 5967.0'
 Water Level Encountered 10.3'
 Static N/A

Drilling Company Boyles Bros.
 Date Drilled June 5, 1987
 Drilling Method Hollow Stem Auger
 Logged By M. D. Gard
Geologist

Driller R. Sharp
 Helper A. Boday
 Drilling Fluid None
 Checked By [Signature]
Site Manager
[Signature]
CEARP Manager

Comments Borehole backfilled with Portland Type I cement.
 * Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>ARTIFICIAL FILL</u>	HNu background = 2.0. OVA background = 3.0.
			0.0-1.7' - Sample. Recovered 1.53/1.7' = 90%. SAND AND GRAVEL: light olive brown (5Y 5/6); quartz and quartzite cobbles; subangular; clay; moist.	0.0-10.0': Composite Sample: BH04870610.
5			1.7-2.0' - Sample. Recovered 0/0.3' = 0%.	
			2.0-3.1' - Sample. Recovered 1.1/1.1' = 100%. SAND AND GRAVEL: same as above.	
			3.1-6.0' - Sample. Recovered 1.45'/2.9' = 50%. SAND AND GRAVEL: same as above.	
10			6.0-7.8' - Sample. Recovered 1.26/1.8' = 70%. SAND AND GRAVEL: same as above.	5.0': Field Screening Sample: HNu=2; OVA=3.
			7.8-10.3' - Sample. Recovered 2.13/2.5' = 85%. SAND AND GRAVEL: same as above.	
			10.3-12.8' - Sample. Recovered 2.3/2.5' = 90%. SAND AND GRAVEL: same as above; wet.	10.0': Field Screening Sample: HNu=2; OVA=8.
15			12.8-15.3' - Sample. Recovered 2.13/2.5' = 85%. SAND AND GRAVEL: same as above.	10.3-12.8': Water Table Sample: BH048710WT.
			15.3-17.8' - Sample. Recovered 2.0/2.5' = 80%. 15.3-15.7': same as above.	15.0': Field Screening Sample: HNu=2; OVA=3.
20				15.3-15.7': Contact Sample: BH048715CT.

LOG OF BOREHOLE

Location _____
 Coordinates _____
 Total Depth _____

Borehole/Well No. BH4-87 (cont)
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____

Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By J. Pasella
Site Manager
T. J. [Signature]
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			<u>ARAPAHOE FORMATION</u> <u>15.7-17.8'</u> : CLAYSTONE: moderate olive brown (5Y 4/4); moist. <u>17.8-20.3'</u> - Sample. Recovered 2.5/2.5' = 100%. CLAYSTONE: same as above.	<u>20.0'</u> : Field Screening Sample: HNu=2; OVA=3. <u>19.3-20.3'</u> : Bedrock Sample: BH048719BR.
25			TOTAL DEPTH: 20.3'	
30				
35				
40				

INDEX OF DATA

Boring No.: BH5-87

Completed as well? No

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside

Coordinates N34993.7 E20920.7

Total Depth 11.8' 13.0' *JB*

Borehole/Well No. BH5-87

Ground Surface Elevation * 5954.2'

Water Level Encountered None

Static N/A

Drilling Company Boyles Bros.

Driller D. Jarvie

Date Drilled May 19, 1987

Helper P. Bushkovski

Drilling Method Hollow Stem Auger

Drilling Fluid None

Logged By M. D. Gard

Checked By *M. Paschke*

Geologist

Site Manager

CEARP Manager

Comments No water encountered during drilling. Borehole backfilled with Portland Type I cement.

* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>COLLUVIUM (DISTURBED)</u>	
			0.0-2.0' - Sample. Recovered 2.0/2.0' = 100%. CLAY: yellowish brown (5YR 4/4); sandy; some gravels and cobbles up to 3" diameter; some roots, moist.	HNu background = 2.0. OVA background = 3.0.
			2.0-4.0' - Sample. Recovered 2.0/2.0' = 100%. 2.0-28.5': CLAY: same as above. 2.85-4.0': CLAY: olive brown (5Y 5/6); some sand; occasional pebbles; moist.	0.0-4.5': Composite Sample: BH05870005.
5			4.0-5.0' - Sample. Recovered 1.0/1.0' = 100%. 4.0-4.5': CLAY: same as above.	2.0-4.5': Contact Sample: BH058705CT.
			<u>ARAPAHOE FORMATION</u>	5.0': Field Screening Sample: HNu=2; OVA=3.
			4.5-5.0': CLAYSTONE: dark yellowish orange (10YR 6/6); moist.	
			5.0-8.0' - Sample. Recovered 3.0/3.0' = 100%. CLAYSTONE: medium light gray (N6); abundant limonite stains; fractured; moist.	7.5-9.3': Bedrock Sample: BH058708BR.
			8.0-13.0' - Sample. Recovered 3.8/5.0' = 76%. CLAYSTONE: same as above.	10.0': Field Screening Sample. HNu=2; OVA=3.
10				
15				
			TOTAL DEPTH: <u>11.8'</u> <u>13.0' <i>all</i></u>	
20				

INDEX OF DATA

Boring No.: BH6-87

Completed as well? No

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
 Coordinates N34819.3 E20980.8
 Total Depth 30.0'

Borehole/Well No. BH6-87
 Ground Surface Elevation * 5935.9'
 Water Level Encountered None
 Static N/A

Drilling Company Boyles Bros.
 Date Drilled May 20, 1987
 Drilling Method Hollow Stem Auger
 Logged By M. D. Gard
 Geologist

Driller D. Jarvie
 Helper T. Merritt
 Drilling Fluid None
 Checked By J. Pasche
 Site Manager

Comments No water encountered during drilling. Borehole backfilled with Portland Type I cement.

* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>COLLUVIUM (DISTURBED)</u>	
			0.0-2.0' - Sample. Recovered 1.7/2.0 = 85%.	HNu background = 2.0. OVA background = 3.0.
			0.0-0.8: TOPSOIL: moderate brown (5YR 4/4); clay-rich; sandy; abundant organics; moist.	0.0-10.0': Composite
			0.8-2.0': CLAY: moderate yellowish brown (10YR 5/4); gravels; cobbles up to 3"; moist.	Sample: BH06870010.
5			2.0-4.0' - Sample. Recovered 0.7/2.0' = 35%. CLAY: same as above.	5.0': Field Screening
			4.0-8.0' - Sample. Recovered 3.8/4.0' = 95%.	Sample: HNu=2; OVA=3.
			4.0-4.5': CLAY: same as above.	
			4.5-7.75': CLAY: dusky yellowish brown (10YR 2/2); silty; peat at top; moist.	
			7.75-8.0': CLAY: moderate yellowish brown (10YR 4/2); silty; sandy; cobbles up to 2"; grades to light brown (5YR 5/6); moist.	10.0': Field Screening
10			8.0-13.0' - Sample. Recovered 4.5/5.0' = 90%. CLAY: same as above.	Sample: HNu=2; OVA=3.
			13.0-18.0' - Sample. Recovered 4.5/5.0' = 90%.	10.0-20.0': Composite
			13.0-14.3': CLAY: same as above.	Sample: BH06871020.
			14.3-18.0': CLAY: moderate yellowish brown (10YR 4/2); abundant gravel; cobbles up to 4"; quartzite; subangular; moist.	15.0': Field Screening
15		18.0-23.0' - Sample. Recovered 1.0/5.0' = 20%. CLAY: same as above.	Sample: HNu=2; OVA=3.	
		23.0-28.0': Sample. Recovered 5.0/5.0 = 100%.	20.0': Field Screening	
		23.0-25.5': CLAY: same as above.	Sample: HNu=2; OVA=3.	
20			24.1-25.5': Contact Sample: BH068726CT.	

INDEX OF DATA

Boring No.: BH7-87

Completed as well? No

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
 Coordinates N35304.9 E21214.4
 Total Depth 13.0'

Borehole/Well No. BH7-87
 Ground Surface Elevation * 5997.8'
 Water Level Encountered None
 Static N/A

Drilling Company Boyles Bros.
 Date Drilled May 26, 1987
 Drilling Method Hollow Stem Auger
 Logged By K. D. Holliday
 Geologist

Driller A. Shade
 Helper T. Merritt
 Drilling Fluid None
 Checked By [Signature]
 Site Manager

Comments No water encountered during drilling. Borehole backfilled with Portland Type I cement.

* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>ARTIFICIAL FILL</u>	
			0.0-1.3' - Sample. Recovered 1.2/1.3 = 92%. CLAYEY SAND: dusky brown (5YR 2/2); quartzite gravel, quartzite cobble at @ 0.8'; grass & roots; damp.	HNu background = 1.0-1.2. No OVA readings. 0.0-10.0' VOA Composite Sample: BH0787010. <i>KDH 1/25/88 Not sent to lab</i>
5			2.0-5.0' - Sample. Recovered 1.78/3.0 = 59%. 2.0-3.1': Lost core; 3.10-4.80': CLAY: moderate brown (5YR 4/4); sandy to gravelly (quartzite) gravel; subangular; sand 2.5-2.0 Ø; damp to slightly moist.	4.3-4.8': Contact Sample: BH078705CT. 5.0': Field Screening Sample: HNu=1.2.
			<u>ARAPAHOE FORMATION</u>	
			<i>5.0 HP</i> 5.8-8.0' - Sample. Recovery 3.2/ 3.2 = 100%. 4.80-6.60': CLAYSTONE: light olive gray (5Y 5/2) with dark yellowish orange (10YR 6/6) iron staining in fractures; damp. 6.5-7.5' CLAYSTONE: light olive gray (5Y 7/2) weathered; slightly damp. 7.5-8.0' CLAYSTONE: moderate olive brown (5Y 4/4) with dark yellowish orange (10YR 6/6) iron staining; weathered; dry to slightly damp.	5.0-10.0': Composite Sample: BH07870510. 7.8-9.68': Bedrock Sample: BH078708BR.
10				
			8.0-13.0' - Sample. Recovery 5.0/5.0' = 100%. CLAYSTONE: olive gray (5Y 4/1) to olive black (5Y 2/1) with iron staining weathered; slight damp.	9.68-10.35': Waste Sample: BH078710WS 10.0': Field Screening Sample: HNu=1.3. 10.35-13.0': Composite Sample: BH07871013.
15				
			TOTAL DEPTH: 13.0'	
20				

INDEX OF DATA

Boring No.: BH8-87

Completed as well? No

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
 Coordinates N35299.6 E21937.4
 Total Depth 15.0'

Borehole/Well No. BH8-87
 Ground Surface Elevation * 5951.5'
 Water Level Encountered None
 Static N/A

Drilling Company Boyles Bros.
 Date Drilled June 3, 1987
 Drilling Method Hollow Stem Auger
 Logged By K. D. Holliday
 Geologist

Driller R. Sharp
 Helper A. Boday
 Drilling Fluid None
 Checked By [Signature]
 Site Manager

Comments No water encountered during drilling. Borehole backfilled with Portland Type I cement.

* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>COLLUVIUM</u>	
			0-2.0' - Sample. Recovered 1.2/2.0' - 60%. SAND AND GRAVEL: moderate brown (5YR 4/4); clay-rich; quartzite gravel; grass and roots; sand 3.0-2.5 ϕ ; angular; dry.	HNu background = 0.2.0.4 OVA background = 0.2 . 0.0
5			2.0-4.0' - Sample. Recovered 1.2/2.0' = 60%. SAND AND GRAVEL: moderate brown (5YR 4/4), (5YR 3/4); quartzite gravel; 3.0-2.5 ϕ ; subangular.	0.0-6.1': Composite Sample: BH08870007.
			4.0-7.0' - Sample. Recovered 2.8/3.0' = 93%. 4.0-4.7: SAND AND GRAVEL: same as above. 4.7-6.8: SANDY CLAY: moderate yellowish brown (10YR 5/4); light brown (5YR 5/6) stains in fractures; occasional quartzite cobbles (4.0 ϕ to 4' diameter); 150% sand; fine-grained (3.5-4.0 ϕ); trace caliche; damp to dry.	5.0': Field Screening Sample: HNu=0.2; OVA=0.2. 6.1-7.0': Contact Sample: BH088707CT.
10			7.0-9.5': Sample. Recovered 3.0/2.5' = 120%. 7.0-7.2': same as above.	
			<u>ARAPAHOE FORMATION</u>	
			7.2-9.5': CLAYSTONE: light olive gray (5Y 5/2); trace sand 3.5-4.0 ϕ ; trace caliche; dark yellowish orange (10YR 6/6) stains; small fractures; weathered; damp to dry.	10.0': Field Screening Sample: HNu=0.2; OVA=0.1.
15			9.5-12.0' - Sample. Recovered 2.4/2.5' = 96%. CLAYSTONE: same as above.	10.2-12.1': Bedrock Sample: BH088710BR.
20				

*808
11/11*

LOG OF BOREHOLE

Location _____
 Coordinates _____
 Total Depth _____

Borehole/Well No. BH8-87 (cont'd.)
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____

Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By J. Pascher
Site Manager
TC
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			12.0-15.0' - Sample. Recovered 3.2/3.0' = 107%. CLAYSTONE: same as above. TOTAL DEPTH: 15.0'	15.0': Field Screening Sample: HNu=0.2; OVA=0.2.
— 25				
— 30				
— 35				
— 40				

INDEX OF DATA

Boring No.: BH9-87

Completed as well? No

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
 Coordinates N35292.4 E21587.7
 Total Depth 15.0'

Borehole/Well No. BH9-87
 Ground Surface Elevation * 5966.0'
 Water Level Encountered 6.03'
 Static N/A

Drilling Company Boyles Bros.
 Date Drilled May 29, 1987
 Drilling Method Hollow Stem Auger
 Logged By K. D. Holliday
 Geologist

Driller R. Sharp
 Helper A. Boday
 Drilling Fluid None
 Checked By [Signature]
 Site Manager
 CEARP Manager

Comments Borehole backfilled with Portland Type I cement.
* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>COLLUVIUM</u>	
			0.0-2.0' - Sample. Recovered 1.2/2.0 = 60%.	
			0-0.85: SANDY CLAY: moderate yellowish brown (10YR 5/4); some quartzite cobbles; some grass and roots; damp.	
5			0.85-1.2': SANDY GRAVEL: light brown (5YR 5/6); clayey matrix; unconsolidated; trace caliche; quartzite pebbles and cobbles; damp.	
			2.0-4.0' - Sample. Recovered 1.8/2.0 = 90%.	
			SANDY CLAY: dark yellowish brown (10YR 4/2) with grayish orange iron staining (10YR 7/4); quartzite cobbles; trace caliche; damp to dry.	
10			4.0-8.0' - Sample. Recovered 3.2/4.0 = 80%.	
			3.0-4.40': CLAY: dark yellowish brown (10YR 4/2) with pale yellowish brown (10YR 6/2) and dark yellowish orange (10YR 6/6) iron staining; some quartzite cobbles; damp.	5.0': Field Screening Sample: HNu=1.1; OVA=0.0
			4.40-5.30': CLAY: light olive gray (5Y 5/2) with dark yellowish orange (10YR 6/6) iron staining; 35% caliche; damp.	
			5.30-6.03': CLAY: light olive gray (5Y 5/2) with 70% dark yellowish orange (10YR 6/6) iron staining; quartzite cobbles - 1.0 to 1" diameter; damp.	
15			6.03-7.0': SANDY CLAY: dusky yellowish brown (10YR 2/2); trace quartzite cobbles; moist to wet.	6.03-6.60': Water Table Sample: BH098706WT.
			7.0-7.26': CLAY: dark yellowish brown (10YR 4/2); trace quartzite cobbles - 1.0 to 1/2" diameter; trace caliche; damp.	
20				

LOG OF BOREHOLE

Location _____

Coordinates _____

Total Depth _____

Drilling Company _____

Date Drilled _____

Drilling Method _____

Logged By _____

Geologist

Borehole/Well No. BH9-87 (cont'd.)

Ground Surface Elevation _____

Water Level Encountered _____

Static _____

Driller _____

Helper _____

Drilling Fluid _____

Checked By _____

J. Pasaka
Site Manager
[Signature]
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			<p>8.0-11.0' - Sample. Recovered 3.0/3.0 = 100%. 8.45-11.0': CLAY: light olive gray (5Y 5/2) with dark yellowish orange (10YR 6/6) iron staining; trace quartzite cobbles - 1.0 to 1/2" diameter; trace caliche; damp.</p> <p>11.0-15.0' - Sample. Recovered 4.0/4.0 = 100%. 11.0-11.3: CLAY: light olive gray (5Y 5/2) with quartzite cobbles, trace caliche; damp.</p> <p style="text-align: center;"><u>ARAPAHOE FORMATION</u></p> <p>11.3-15.0': CLAYSTONE: light olive brown (5YR 5/6) weathered, caliche and iron staining in small fractures; damp to dry.</p>	<p>10.0': Field Screening Sample: HNU=1.0; OVA=0.1.</p> <p>10.08-11.3': Contact Sample: BH098711CT</p> <p>14.3-14.75': Bedrock Sample: BH098714BR.</p> <p>15.0': Field Screening Sample: HNU=1.0; OVA=0.1.</p>
25				
30			TOTAL DEPTH: 15.0' 15.0'	
35				
40				

INDEX OF DATA

Boring No.: BH10-87

Completed as well? No

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside

Coordinates N35110.9 E21375.4

Total Depth ~~25.5'~~ 25.4' JDP

Borehole/Well No. BH10-87

Ground Surface Elevation * 5964.3'

Water Level Encountered None

Static N/A

Drilling Company Boyles Bros.

Driller R. Sharp

Date Drilled June 1, 1987

Helper A. Boday

Drilling Method Hollow Stem Auger

Drilling Fluid None

Logged By K. D. Holliway
Geologist

Checked By [Signature]
Site Manager

CEARP Manager

Comments No water encountered during drilling. Borehole backfilled with Portland Type I cement.

* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>ARTIFICIAL FILL</u>	HNu background = 0.4. $\frac{0.8}{8}$ OVA background = 0.0.
0-2.0'			Sample. Recovered $0.4/2.0 = 20\%$. CLAYEY SAND: pale yellowish brown (10YR 6/2); quartzite cobbles; subangular; grasses & roots; trace caliche; dry.	0.0-10.0': Composite Sample: BH10870010.
2-4.5'			Sample. Recovered $0/2.5 = 0\%$.	
4.5-6.5'			Sample. Recovered $0.95/2.0' = 48\%$. CLAYEY SAND: moderate yellowish brown (10YR 5/4); quartzite cobbles & pebbles (0.0 \emptyset to 2" diameter); trace caliche; dry to slightly damp.	5.0': Field Screening Sample: HNu=0.4; OVA=0.0.
6.5-8.5'			Sample. Recovered $0.95/2.0' = 48\%$ (5YR 6/2), dry to slightly damp.	
8.5-10.5'			Sample. Recovered $2.0/2.0 = 100\%$. CLAYEY SAND: Pale yellowish brown (5YR 6/2), dry to slightly damp.	10.0': Field Screening Sample: HNu=0.4; OVA=0.0.
10			<u>COLLUVIUM</u>	10.0-18.95': Composite Sample: BH10871020 JDP
10.5-12.5'			Sample. Recovered $0.5/2.0' = 25\%$. SANDY CLAY: light olive gray (5Y 5/2) with trace light brown (5YR 5/6) stains; weathered; quartzite cobbles; slightly damp.	
12.5-14.5'			Sample. Recovered $0.45/2.0' = 23\%$. Same as above; trace caliche; dry.	15.0': Field Screening Sample: HNu=0.4; OVA=0.0.
14.5-16.5'			Sample. Recovered $2.1/2.0' = 105\%$. SANDY CLAY: pale yellowish brown (10YR 6/2) to dusky yellow (5Y 6/4); occasional quartzite cobbles; trace caliche and Fe stains; weathered; damp.	
20				

LOG OF BOREHOLE

Location _____
 Coordinates _____
 Total Depth _____

Borehole/Well No. BH10-87 (cont'd.)
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____

Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By [Signature]
Site Manager
CEARR Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20	[Hatched Pattern]		<p>16.5-19.5' - Sample. Recovered 3.0/3.0' = 100%. CLAYEY SAND/SANDY CLAY: moderate yellowish brown (10YR 5/4) to dusky yellowish brown (10YR 2/2); occasional quartzite cobbles; sand 3.5-4.0 Ø; trace caliche; subrounded; sand/gravel lens at 17.3'; damp.</p> <p>19.5-22.0' - Sample. Recovered 2.6/2.5' = 104%. 19.5-20.0': same as above.</p>	<p>18.95-20.0': Contact Sample: BH108720CT..</p>
25	[Hatched Pattern]		<p><u>ARAPAHOE FORMATION</u></p>	
30			<p>20.0-22.0': CLAYSTONE: light olive gray (5Y 5/2) with dark yellowish orange (10YR 6/6) stains; nodules dusky red (10YR 2/2); trace fine-grained sand; weathered; trace caliche; dry to slightly damp.</p> <p>22.0-25.5' - Sample. Recovered 3.4/3.5' = 97%. CLAYSTONE: light olive gray (5Y 5/2); with light brown (5YR 5/6) stains and dusky red (10YR 2/2) iron nodules; trace caliche; trace very fine-grained sand (3.5-4.0 Ø); weathered; dry.</p>	<p>20.0': Field Screening Sample: HNu=0.4; OVA=0.0.</p> <p>23.0-25.4': Bedrock Sample: BH108723BR.</p>
			<p>TOTAL DEPTH: 25.5' 25.4'</p>	
35				
40				

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Boring No.: BH11-87

Completed as well? No

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
 Coordinates N35213.6 E21340.4
 Total Depth 19.40'

Borehole/Well No. BH11-87
 Ground Surface Elevation * 5969.8'
 Water Level Encountered 13.90'
 Static N/A

Drilling Company Boyles Bros.
 Date Drilled June 2, 1987
 Drilling Method Hollow Stem Auger
 Logged By K. D. Holliday
 Geologist

Driller R. Sharp
 Helper A. Boday
 Drilling Fluid None
 Checked By [Signature]
 Site Manager
 CEARP Manager

Comments Borehole backfilled with Portland Type I cement.
* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>ARTIFICIAL FILL</u>	
0-2.5'			0-2.5' - Sample. Recovered 2.0/2.5' = 80%. CLAYEY SAND: moderate yellowish brown (10Y 5/4); quartzite cobbles; subangular; some asphalt (20%); grasses & roots; moist.	HNu background = 0.6. OVA background = 0.6. 0.0-10.0': Composite Sample: BH11870010.
5			2.5-5.5' - Sample. Recovered 3.0/3.0' = 100%. CLAY: light olive gray (5Y 6/1); occasional quartzite cobbles (<0.5"); subangular; trace asphalt to 2.75'; caliche in fractures; laminated; iron stains; damp to moist.	5.0': Field Screening Sample: HNu=0.6; OVA=3.5.
10			<u>COLLUVIUM</u>	
5.5-8.0'			5.5-8.0' - Sample. Recovered 2.95/2.5' = 118%. SANDY CLAY: dark yellowish orange (10YR 6/6) with light olive gray (5Y 5/2); iron stains; quartzite cobbles; subangular to subrounded; damp to moist.	
8.0-10.5'			8.0-10.5' - Sample. Recovered 2.0/2.5' = 80%. CLAY: dark yellowish brown (10YR 4/2); to dusky yellowish brown (10YR 2/2); quartzite cobble; subrounded to angular; damp.	8.7-10.7': Contact/Waste Sample: BH118711CT.
15			10.5-13.0' - Sample. Recovered 3.2/2.5' = 138%. 10.5-10.7: same as above.	10.0': Field Screening Sample: HNu=0.6; OVA=10.0.
20			<u>ARAPHOE FORMATION</u>	
10.7-13.0'			10.7-13.0': CLAYSTONE: light olive gray (5Y 5/2) with dark yellowish orange (10YR 6/6) stains; weathered; damp to dry.	13.9-17.0': Water Table/ Bedrock Sample: BH118714WT.

LOG OF BOREHOLE

Location _____
 Coordinates _____
 Total Depth _____

Borehole/Well No. BH11-87 (cont'd.)
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____

Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By [Signature]
Site Manager
[Signature]
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			<p>13.0-16.0' - Sample. Recovered 3.0/3.0 = 100%. CLAYSTONE: same as above; wet zone of iron modules; dark yellowish brown (10YR 2/2) at 13.9-14.25'.</p> <p>16.0-19.5' - Sample. Recovered 3.4/3.5' = 97%. CLAYSTONE: light olive gray (5Y 5/2) with dark yellowish orange (10YR 6/6) stains; caliche and iron stains; weathered; dry.</p> <p style="text-align: center;">TOTAL DEPTH: 19.40'</p>	<p>15.0': Field Screening Sample: HNu=0.6; OVA-0.6.</p>
25				
30				
35				
40				

INDEX OF DATA

Boring No.: BH12-87

Completed as well? No

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
 Coordinates N35123 2 E21643 1
 Total Depth 17.0'

Borehole/Well No. BH12-87
 Ground Surface Elevation * 5934.8'
 Water Level Encountered None
 Static N/A

Drilling Company Boyles Bros.
 Date Drilled May 27, 1987
 Drilling Method Hollow Stem Auger
 Logged By M. D. Gard
 Geologist

Driller A. Shade
 Helper T. Merritt
 Drilling Fluid None
 Checked By [Signature]
 Site Manager

Comments No water encountered during drilling. Borehole backfilled with Portland Type I cement.

* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>COLLUVIUM (DISTURBED)</u>	
			0.0-2.0' - Sample. Recovered 1.9/2.0 = 95%. SANDY CLAY: moderate brown (5YR 4/4); sand 2.0-2.5 Ø; subangular; moist.	HNu background = 2.0. OVA background = 3.6. Gamma background = 0.09 counts/minute. No readings above background.
5			2.0-4.0' - Sample. Recovered 2.0/2.0 = 100%. 2.0-3.35 CLAY: dark yellowish brown (10YR 4/2); moist.	0.0-2.25': Contact Sample: BH128702CT
			<u>ARAPAHOE FORMATION</u>	
			3.35-4.0: CLAYSTONE: olive gray (5Y 3/2); limonite stains; moist.	
10			4.0-7.0' - Sample. Recovered 2.49/3.0 = 83%. CLAYSTONE: same as above; moist.	
			7.0-12.0' - Sample. Recovered 5.0/5.0 = 100%. 7.0-10.0': same as above; moist. 10.0-10.5': SANDY CLAYSTONE: olive gray (5Y 3/2); sand 3.5-3.0 Ø; very moist. 10.5-12.0': CLAYSTONE: olive gray (5Y 3/2); fractured; numerous limonite stains; moist.	5.25-6.5': Bedrock Sample: BH128705BR.
15			12.0-17.0' - Sample. Recovered 5.0/5.0 = 100%. CLAYSTONE: same as above; moist.	
			TOTAL DEPTH: 17.0'	
20				

INDEX OF DATA

Boring No.: BH13-87

Completed as well? No

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
 Coordinates N34940.3 E21342.1
 Total Depth 17.3'

Borehole/Well No. BH13-87
 Ground Surface Elevation * 5937.0'
 Water Level Encountered None
 Static N/A

Drilling Company Boyles Bros.
 Date Drilled May 29, 1987
 Drilling Method Hollow Stem Auger
 Logged By K. D. Holliday
 Geologist

Driller R. Sharp
 Helper A. Boday
 Drilling Fluid None
 Checked By [Signature]
 Site Manager

Comments No water encountered during drilling. Borehole backfilled with Portland Type I cement.
 * Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>COLLUVIUM (DISTURBED)</u>	
0.0-2.0'			0.0-2.0' - Sample. Recovered 1.8/2.0 = 90%. SANDY CLAY: dark yellowish brown (10YR 4/2); trace sand fine-grained; occasional quartzite pebbles and cobbles up to 2 cm in diameter; subrounded; some roots; damp.	HNu background = 0.6-0.8. OVA background = 2.0-2.2. 0.0-10.10': Composite Sample: BH13870010.
5			2.0-4.0' - Sample. Recovered 1.6/2.0 = 80%. 2.0-3.3': QUARTZITE COBBLE: with caliche deposits; subangular; 5 cm diameter. 3.3-3.6: SANDY CLAY: dark yellowish brown (10YR 4/2); quartzite pebbles up to 2.5 cm diameter; subangular to subrounded; damp.	
10			4.0-7.0' - Sample. Recovered 3.0/3.0 = 100%. SANDY CLAY: moderate brown (5YR 4/4) with quartzite pebbles and gravel up to 4 cm diameter; subrounded to subangular; trace fine-grained sand; damp.	5.0': Field Screening Sample: HNu=0.6; OVA=0.2.
15			7.0-10.0' - Sample. Recovered 2.9/3.0 = 96%. SILTY CLAY: grayish orange (10YR 7/4) to very pale orange (10YR 8/2) with quartzite pebbles at 7.2-7.4' up to 2 cm diameter; subangular to subrounded; occasional quartzite pebbles; damp.	10.0': Field Screening Sample: HNu=1.0; OVA=1.8.
17.3			10.0-12.0' - Sample. Recovered 2.0/2.0 = 100%. 10.55-11.56': SANDY CLAY: moderate brown (5YR 4/4) to light brown (5YR 5/6) with quartzite gravel and pebbles up to 4cm diameter; subangular to subrounded; damp.	10.10-11.56': Contact Sample: BH138711CT.

LOG OF BOREHOLE

Location _____
 Coordinates _____
 Total Depth _____

Borehole/Well No. BH13-87 (cont'd.)
 Ground Surface Elevation _____
 Water Level Encountered _____
 Static _____

Drilling Company _____
 Date Drilled _____
 Drilling Method _____
 Logged By _____
Geologist

Driller _____
 Helper _____
 Drilling Fluid _____
 Checked By [Signature]
Site Manager
[Signature]
CEARP Manager

Comments _____

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
20			<u>ARAPHOE FORMATION</u>	
			11.56-12.0': CLAYSTONE: light olive brown (5Y 5/6); weathered; caliche stringers (horizontal from 11.56-12.0'); damp. <i>HP</i>	
— 25			12.0-14.0' - Sample. Recovered 2.0/2.0 = 100%. CLAYSTONE: light olive brown (5Y 5/6); weathered with caliche stringers; damp.	
			14.0-17.5 - Sample. Recovered 3.3/3.5 = 94%. CLAYSTONE: dark yellowish orange (10YR 6/6); weathered; trace silt and iron staining; damp.	15.0': Field Screening Sample: HNu=0.6; OVA=2.2.
			TOTAL DEPTH: 17.3'	14.56-16.2': Bedrock Sample: BH138714BR.
— 30				
— 35				
— 40				

INDEX OF DATA

Boring No.: BH14-87

Completed as well? No

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
 Coordinates N35304.9 E21214.4
 Total Depth 16.7'

Borehole/Well No. BH14-87
 Ground Surface Elevation * 5928.0'
 Water Level Encountered None
 Static N/A

Drilling Company Boyles Bros.
 Date Drilled May 28, 1987
 Drilling Method Hollow Stem Auger
 Logged By M. D. Gard
 Geologist

Driller A. Shade
 Helper T. Merritt
 Drilling Fluid None
 Checked By J.P. Pauley
 Site Manager
 CEARR Manager

Comments No water encountered during drilling. Borehole backfilled with Portland Type I cement.

* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>COLLUVIUM</u>	
			0.0-2.0' - Sample. Recovered 1.1/2.0 = 55%. CLAY: dusky brown (5YR 2/2); silty; large cobbles; topsoil; moist.	HNu background = 0.2. OVA background = 3.0. Alpha background = 0.1 counts/minute.
5			2.0-4.0' - Sample. Recovered 2.0/2.0 = 100%. 2.0-3.3: SANDY GRAVEL; dusky brown (5YR 2/2); large cobbles; moist.	2.0': HNu=2.0 on core. 2.0-2.9': Waste Sample: BH148703WS. <i>W.P. Pauley</i>
			3.3-4.0: SANDY CLAY: dusky brown (5YR 2/2); moist.	
			4.0-7.0' - Sample. Recovered 2.91/3.0 = 97%. 4.0-6.5: SANDY GRAVEL: dark yellowish orange (10YR 6/6); gravel; sandy; large cobbles; interbedded clay; moist.	
10			<u>ARAPAHOE FORMATION</u>	5.5-6.5': Contact Sample: BH148706CT.
			6.5-7.0': CLAYSTONE: olive gray (5Y 3/2); moist.	
			7.0-12.0' - Sample. Recovered 2.0/5.0 = 40%. CLAYSTONE: same as above; moist.	8.0': HNu=1.0 on core.
15			12.0-17.0 - Sample. Recovered 4.7/5.0 = 94%. CLAYSTONE: same as above; moist.	7.75-8.0': Waste Sample BH148703W2. (Doubled as bedrock sample.)
			TOTAL Depth: 16.7'	6.5-9.0': Bedrock Sample: BH148709BR
20				

INDEX OF DATA

Boring No.: BH15-87

Completed as well? No

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside

Coordinates N35421.2 E21822.2

Total Depth 25.5' 26.0' JB

Drilling Company Boyles Bros.

Date Drilled June 3, 1987

Drilling Method Hollow Stem Auger

Logged By M. D. Gard
Geologist

Borehole/Well No. BH15-87

Ground Surface Elevation * 5985.0'

Water Level Encountered None

Static N/A

Driller A. Shade

Helper T. Merritt

Drilling Fluid None

Checked By [Signature]

Site Manager
CEARP Manager

Comments No water encountered during drilling. Borehole backfilled with Portland Type I cement.

* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>ROCKY FLATS ALLUVIUM</u> <u>COLLUVIUM/ARTIFICIAL FILL</u>	
			0.0-2.0' - Sample. Recovered 2.0/2.0 = 100%. SANDY CLAY: moderate yellowish brown (10YR 5/4); gravelly; some cobbles; moist.	HNu background = 0.2. OVA background = 1.0. Gamma background = 0.05 counts/minute.
			2.0-4.0' - Sample. Recovered 2.0/2.0 = 100%. SANDY CLAY: same as above; moist.	0.0-5.0': Composite Sample: BH15870005.
5			4.0-7.0' - Sample. Recovered 1.5/3.0 = 50%. SANDY CLAY: same as above; moist.	5.0-10.0': Composite Sample BH15870010.
			7.0-12.0' - Sample. Recovered 3.8/5.0 = 76%. 7.0-9.5': same as above; moist. 9.5-12.0': SANDY CLAY: moderate reddish brown (10YR 4/6); very sandy; numerous iron nodules; moist.	KDH 1/25/88
10			12.0-17.0' - Sample. Recovered 0.0/5.0 = 0%. SANDY CLAY: dark yellowish brown (10YR 4/2); cuttings clay, sandy, gravelly; moist.	
			17.0-19.0' - Sample. Recovered 0.8/2.0 = 40%. SANDY CLAY: same as above; moist.	
15			<u>ARAPAHOE FORMATION</u>	Insufficient recovery to sample contact.
			19.0-24.0' - Sample. Recovered 2.0/5.0 = 40%. CLAYSTONE: olive gray (5Y 3/2); moist.	
20				

INDEX OF DATA

Boring No.: BH16-87

Completed as well? No

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data and Results
- Packer Test Data and Results
- Water Level Data

LOG OF BOREHOLE

Location Rocky Flats Plant; 881 Hillside
 Coordinates N35299.8 E22180.3
 Total Depth 12.0'

Borehole/Well No. BH16-87
 Ground Surface Elevation * 5950.0'
 Water Level Encountered None
 Static N/A

Drilling Company Boyles Bros
 Date Drilled June 2, 1987
 Drilling Method Hollow Stem Auger
 Logged By M. D. Gard
Geologist

Driller A. Shade
 Helper T. Merritt
 Drilling Fluid None
 Checked By [Signature]
Site Manager
CEARP Manager

Comments No water encountered during drilling. Borehole backfilled with Portland Type I cement.

* Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>COLLUVIUM</u>	
			0.0-2.0' - Sample. Recovered 1.0/2.0 = 50%. CLA YEY SAND: dusky brown (5YR 2/2); topsoil; clay; sand; gravelly; moist.	HNu background = 0.8. OVA background = 1.0. 0.0-1.8': Contact Sample: BH168702CT.
5			<u>ARAPAHOE FORMATION</u>	2.0-6.0': Composite Sample: BH16870206.
			2.0-4.0' - Sample. Recovered 2.0/2.0 = 100%. 2.0-2.5': CLAY: light olive brown (5Y 5/6); fill; moist. <i>STONE</i>	
			2.5-3.3': SANDY CLAY: dark yellowish brown (10YR 4/2); buried topsoil; moist.	
			3.3-4.0': CLAY: light olive brown (5Y 5/6); moist. <i>STONE</i>	
10			4.0-7.0' - Sample. Recovered 2.4/3.0 = 82%. <i>STONE</i>	
			4.0-5.0': CLAY: light olive brown (5Y 5/5); moist.	
			5.0-7.0': CLAY: olive gray (5Y 3/2). <i>STONE</i>	6.0-6.5': Bedrock Sample: BH1687068R.
			7.0-12.0' - Sample. Recovered 5.0/5.0 = 100%. <i>STONE</i>	
			7.0-9.9': CLAY: olive gray (5Y 3/2); moist.	
			9.9-11.0': CLAY: light olive gray (5Y 5/2); very moist. <i>STONE</i>	
15			11.0-12.0'; CLAY: olive gray (5Y 3/2); moist. <i>STONE</i>	
			TOTAL DEPTH: 12.0'	
20				

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Boring No.: BH17-87

Completed as well? No

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data and Results
- Packer Test Data and Results
- Water Level Data

**LOG
OF
BOREHOLE**

Location Rocky Flats Plant; 881 Hillside
 Coordinates N35359.5 E22121.2
 Total Depth 11.9'

Borehole/Well No. BH17-87
 Ground Surface Elevation * 5956.0'
 Water Level Encountered None
 Static N/A

Drilling Company Boyles Bros.
 Date Drilled June 3, 1987
 Drilling Method Hollow Stem Auger
 Logged By K. D. Holliday
 Geologist

Driller R. Sharp
 Helper A. Boday
 Drilling Fluid None
 Checked By [Signature]
 Site Manager
 CEARP Manager

Comments No water encountered during drilling. Borehole backfilled with Portland Type I cement.
 * Estimated value from topographic map.

Depth Feet	Graphic Log	Sample Type	Lithologic Description	Samples Collected or Other Tests Performed
0			<u>COLLUVIUM</u>	
0-2.0'			Sample. Recovered 1.4/2.0' = 70%. CLAYEY SAND: dark yellowish brown (10YR 4/2); occasional quartzite cobbles up to 0.25" diameter, subrounded; grass & roots 0.0.2. Dry.	HNu background = 0.4. OVA background = 2.0.
2.0-4.0'			Sample. Recovered 1.9/2.0 = 95%. CLAY: moderate yellowish brown (10YR 5/4); occasional quartzite cobbles subrounded up to 1.0' diameter; trace sand 3.5-4.0 φ; Trace iron staining dark yellowish orange (10YR 6/6), dry.	0.0-3.9': Composite Sample: BH17870005.
4.0-7.0'			Sample. Recovered 3.5/3.0 = 116%. 4.0-5.25': SANDY CLAYSTONE: moderate yellowish brown (10YR 5/4) occasional quartzite cobbles, caliche stringers; dry.	5.0': Field Screening Sample: HNu=0.4; OVA=2.0.
10			<u>ARAPAHOE FORMATION</u>	3.9-5.25': Contact Sample: BH178705CT.
5.25-6.70'			CLAYSTONE: light olive brown (5Y 5/6) weathered, trace caliche, iron staining - light brown (5Y5/6); dry.	
6.70-7.00'			CLAYSTONE: light olive gray (5Y 5/2) weathered; iron staining (10%) light brown (5Y5/6); dry.	
15			7.0-9.5' - Sample. Recovered 2.6/2.5 = 104%. 7.0-8.70': CLAYSTONE: light olive gray (5Y 5/2) to light olive brown (5Y 5/6) with 20% iron staining; dark yellowish orange (10YR 6/6) weathered, caliche; dry.	8.7' 8.25-9.5': Bedrock Sample: HNu=0.4, OVA=2.0. BH178708BR (VOAs only) 8.7-9.5': Bedrock Sample: BH178708BR (other parameters)
20				

INDEX OF DATA

Boring No.: BH61-87

Completed as well? No

Data in File

- Log of Borehole
- Well Construction Summaries
- Well Development Summaries
- Hydraulic Conductivity Test Data
and Results
- Packer Test Data and Results
- Water Level Data

