UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of CROW BUTTE RESOURCES, INC. (Marsland Expansion Area)	Docket No. 40-8943-MLA-2 ASLBP No. 13-926-01-MLA-BD01

Hearing Exhibit

Exhibit Number: OST008

Exhibit Title: CBR, Inc. Aquifer Pump Test # 3

Aquifer Test #3

GROUND-WATER PUMPING TEST #3
DATA EVALUATION REPORT

Prepared for:

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October 15, 1996

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CROW BUTTE RESOURCES, INC.

1.0 INTRODUCTION

Crow Butte Resources, Inc. (CBR) operates an in-situ uranium mine (the Crow Butte Project) in Dawes County, Nebraska. Authorization to operate the mine according to the Underground Injection Control (UIC) regulations has been granted to CBR (UIC Permit Number NE 0122611) by the Nebraska Department of Environmental Quality (NDEQ). Part II, Paragraph A of the permit specifies that, prior to mine development within the existing permit area, ground-water pumping tests shall be conducted to demonstrate the integrity of the confining layer above the mining zone. Based on the pumping rate, test duration, and formation characteristics, the Radius of Influence (ROI) (i.e., the area over which drawdown occurs) can be determined for a given test. The permit also specifies that a pumping test must be conducted prior to wellfield construction in areas outside the ROI from previous pumping tests.

In accordance with the permit, CBR performed a ground-water pumping test (Test #3) from September 9th through September 15th, 1996 at the Crow Butte Project. The test consisted of pumping one well completed in the Chadron Sandstone and monitoring ground-water levels in three wells in the Chadron Sandstone, and in one well in the overlying Brule Formation. This test is the third in a series of long-term pumping tests conducted in the Chadron Sandstone between 1982 and present.

This report has been prepared (1) to document the methods used to perform Test #3, and (2) to present the results from that test with regard to ROI, confinement, and the hydraulic characteristics of the mining zone.

1.1 BACKGROUND

The Crow Butte Project is an in-situ uranium mine located southeast of Crawford, Nebraska. The mine was developed to recover uranium from the Chadron Sandstone. During the initial permitting and development of the mine, CBR performed two pumping tests (referred to as Tests #1 and #2) in the central portion of the permit area to (1) confirm the confinement of the ore-bearing horizon and (2) assess the hydraulic characteristics of the Chadron Sandstone. Based on the test results, a ROI was established for each test.

CBR is proceeding with development activities in the northern portion of the permit area (i.e., to the north of the area covered under the ROI from Tests #1 and #2). As noted, this new development requires that an additional pumping test be performed.

1.2 SITE CHARACTERIZATION

Ore-grade uranium deposits underlying the site are predominantly located in the Chadron Sandstone, which averages 50 feet in thickness (typically 35 feet net sand), and occurs at a depths ranging from 400 to 1,200 feet. The Upper Chadron Formation and the Brule Formation, consisting predominantly of clay, claystone, and siltstone, form a confining layer above the Chadron Sandstone. The thickness of this confining layer averages 300 feet across the site. The general stratigraphy underlying the site is summarized in Table 1. The depth of the respective formations indicated on Table 1 are representative of the northern portion of the permit area.

TABLE 1
GENERALIZED STRATIGRAPHIC SECTION WITHIN THE NORTHERN PORTION OF THE PERMIT AREA

Depth (feet)	Description
0 - 30	Topsoil and alluvial deposits
30 - 110	Brule Formation (interbedded siltstone, sandstone)
110 - 350	Chadron Formation (interbedded clay, claystone, and siltstone)
350 - 400	Chadron Sandstone (interbedded sandstone and clay)
400 +	Pierre Shale

Additional detailed information related to the characterization of the surface and subsurface geology in the vicinity of the Crow Butte Project has been presented in the report "*Application and Supporting Environmental Report for State of Nebraska Underground Injection Control Program Commercial Permit*" (Ferret of Nebraska, 1987).

1.3 SUMMARY OF PREVIOUS TESTING RESULTS

As noted, two previous ground-water pumping tests have been performed at the site. The results from those tests indicate that the Chadron Sandstone is relatively homogeneous and isotropic (i.e., the hydraulic conductivity [permeability] is consistent with respect to direction and location) within the permit area (Table 2).

TABLE 2
SUMMARY OF PREVIOUS PUMPING TEST RESULTS

Test	#1	#2
Date Conducted	November, 1982	June, 1987
Test Duration (hours)	51	72
Pumping Rate (gpm)	23.8	47.2
Transmissivity (ft^2/d)	400	360
Hydraulic Conductivity (ft/d)	9.0	9.1
Storativity	1×10^{-4}	1×10^{-4}
Radius of Influence (ft)	4,000	5,000

2.0 TEST #3 - DESCRIPTION

2.1 WELL INSTALLATION

CBR installed three new wells (CPW96.1, COW96.1, and BOW96.1) to be used during Test #3 (Table 3); two existing wells (A251/62 and RC-4) were also utilized (Figure 1). All of the wells are located in Township 31 North, Range 52 West, and were constructed with 4.5-inch nominal diameter casing. The nature and thickness of the subsurface formations encountered during the installation of the new wells were consistent with other wells in the northern portion of the permit area, and with the stratigraphic section presented in Table 1.

TABLE 3
MONITORING WELL INFORMATION

Well Number	CPW96.1	COW96.1	RC-4	A251/62	BOW96.1
Location (Section)	13	13	12	13	13
Location (1/4)	NW	NW	SW	NE	NW
Depth (ft)	430	430	400	470	110
Formation	Chadron SS	Chadron SS	Chadron SS	Chadron SS	Brule
Dist. From Pumping Well (ft)	0	400	670	1,987	75
Year Installed	1996	1996	1981	1981	1996
Screen Interval (ft)	350 - 400	350 - 400	340 - 360	425 - 465	30 - 60
Net Sand (ft)	27	35	32	35	25

2.2 TESTING EQUIPMENT

The test was performed using a 5 Hp electrical submersible pump powered by a portable generator; the pump was set at a depth of 200 feet in well CPW96.1. Flow from the pump was controlled with a manual ball valve. Surface flow monitoring equipment included a Blancett flow meter with a digital readout (Halliburton Model MC-2), and a Badger Recordall turbine flow meter. Discharge water was land applied to a pasture located approximately 1,300 feet to the east of the pumping well via a 2-inch diameter high density polyethylene line.

Water levels in each observation well were measured and recorded with an integrated pressure transducer and datalogger (referred to as a TROLL) manufactured by In-Situ, Inc. Each TROLL was programmed to automatically calibrate prior to the test, take an initial reference (head) reading prior to the start of the test, and measure and record water levels according to a logarithmic time schedule (i.e., rapid measurement/recording during the early stages of the test, and less frequent measurements thereafter).

The pressure rating for the TROLLs were either 15 psi (Model TR1300; wells COW96.1 and BOW96.1) or 30 psi (Model TR3100; wells RC-4 and A251/62). Water levels in the pumping well (CPW96.1) were measured manually with a battery-powered level meter.

2.3 TEST PROCEDURES

The testing equipment was installed and checked for proper operation on September 10, 1996. To assess the potential for fluctuations in background ground water levels, baseline level information was collected during the night (Appendix A).

The test was started at 0930 hours on September 11, 1996, and continued until 1630 hours on September 13, resulting in a pumping duration of 55 hours. The recovery period monitoring began at 1630 hours on September 13 and continued for 44 hours; the test was terminated at 1400 hours on September 15th. The average pumping rate recorded by the surface monitoring equipment was 51.2 gallons per minute (gpm); the two surface flow meters agreed to within 0.1%.

The drawdown in the pumping well at the end of the pumping period was 65 feet. No drawdown was observed in the Brule well (BOW96.1) (Appendix B). The drawdowns in the Chadron observation wells (COW96.1, RC-4, and A251/62) were 11.3, 9.2, and 4.5 feet, respectively (Appendix C).

3.0 ANALYTICAL METHODS AND TEST RESULTS

3.1 ANALYTICAL METHODS

Conventional analytical techniques (i.e., log-log, semi-log, and distance-drawdown methods developed by Theis, Jacob, and Cooper and Jacob, respectively) were used to evaluate the response of the aquifer to pumping, and to assess the hydraulic characteristics of the Chadron Sandstone. The analyses were performed using the Aquifer Test software package (Waterloo Hydrogeologic, Inc.). The analytical results are summarized in this section, and presented in detail in Appendix C.

3.2 TESTING RESULTS

In general, the test results demonstrate the integrity of the confining layer above the mining zone, and indicate that the Chadron Sandstone is relatively homogeneous and isotropic within the northern portion of the permit area. As expected, these results are consistent with those from Tests #1 and #2.

Radius of Influence

The Radius of Influence (ROI) for Test #3 was evaluated based on a distance-drawdown analysis of the drawdown data from wells COW96.1, RC-4, and A251/62 at the end of the pumping period. Based on these data, the ROI for Test #3 is about 5,700 feet (Figure 2). This ROI covers all of the northern portion of the permit area (Figure 3).

Formation Characteristics

The formation characteristics were evaluated with respect to transmissivity (T), hydraulic conductivity (k), and storativity (S) (Table 4). The results from the three observation wells, located at different distances and orientations with respect to the pumping well, are similar. In

addition these results (i.e., from Test #3) are consistent with the results from Tests #1 and #2 (Table 5).

TABLE 4
SUMMARY OF PUMPING TEST RESULTS
CROW BUTTE RESOURCES, INC. - TEST #3

Observation Well	Log-Log Analysis (Theis Method)	Semi-log Analysis (Jacob Method)	Recovery Analysis (Theis-Jacob Method)	Mean
COW96.1				
Transmissivity (T; ft^2/day)	350	270	340	320
Hyd. Cond. (k; ft/day)	10.1	7.9	9.7	9.2
Storativity	7.3×10^{-5}	1.6×10^{-4}	NA	1.2×10^{-4}
RC-4				
Transmissivity (T; ft^2/day)	370	310	330	340
Hyd. Cond. (k; ft/day)	11.5	9.5	10.4	10.5
Storativity	5.9×10^{-5}	9.6×10^{-5}	NA	7.8×10^{-5}
A251/62				
Transmissivity (T; ft^2/day)	310	320	380	340
Hyd. Cond. (k; ft/day)	8.9	9.2	10.9	9.7
Storativity	7.7×10^{-5}	6.6×10^{-5}	NA	7.2×10^{-5}
Mean (all wells)				
Transmissivity (T; ft^2/day)	340	300	350	
Hyd. Cond. (k; ft/day)	10.2	8.9	10.3	
Storativity	7.0×10^{-5}	1.1×10^{-4}	NA	

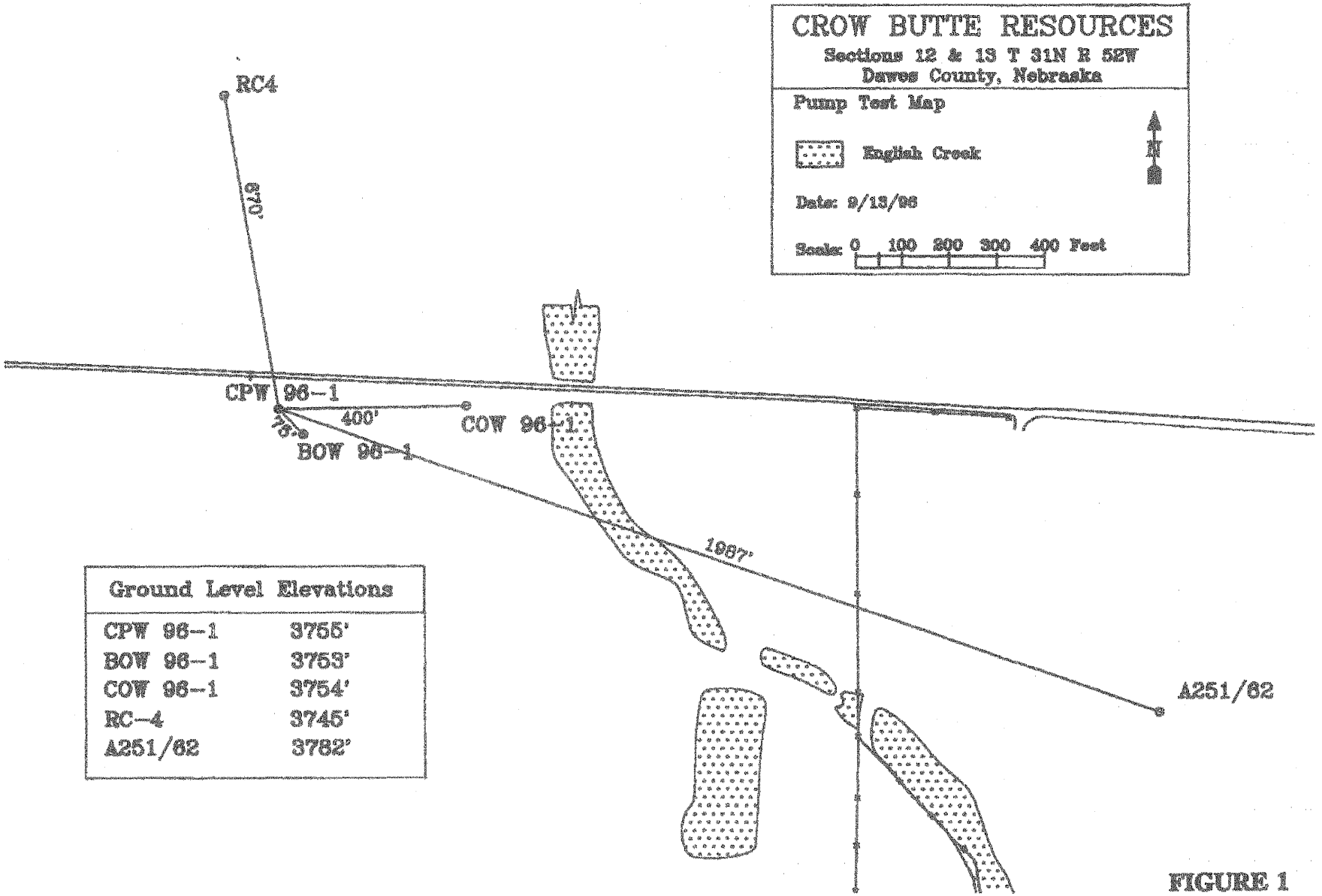
The results presented in Table 4 are based type-curve matches from the Aquifer Test program. Consistent with accepted practices, the type-curve match points were derived from the late-time data during both the pumping and recovery periods. An example of the type curve match for well COW96.1 (log-log and semi-log methods, respectively) is shown on Figures 4 and 5. The detailed analyses for each well, including both the pumping and recovery periods, are included in Appendix C.

TABLE 5 COMPARISON OF RESULTS FROM TESTS #1, #2 AND #3 (Arithmetic Mean)			
Test	#1	#2	#3
Transmissivity (T; ft^2/day)	400	360	330
Hyd. Cond. (k; ft/day)	9.0	9.1	9.8
Storativity	1×10^{-4}	1×10^{-4}	9.0×10^{-5}

3.3 INTEGRITY OF THE CONFINING LAYER

As shown on Figures 6 and 7, no response to either the pumping or recovery period was observed in the observation well completed in the Brule Formation (BOW96.1). The minor fluctuations observed can be attributed to barometric variations and changes in ambient temperature. Such results are expected based on the results from Tests #1 and #2, and the fact that the Chadron Sandstone and the Brule Formation are separated by about 300 feet of clay, claystone, and siltstone.

Test #3 was not performed to quantitatively assess the nature of the confining layer above the Chadron Sandstone. However, it is expected that the hydraulic characteristics of the confining layer in the central portion of the permit area (presented in detail after Test #2 [Ferret of Nebraska, 1987]) also apply to the confining layer in the northern portion of the permit area. This information, combined with the results from Test #3, further demonstrates the integrity of the confining layer between the Brule Formation and the Chadron Sandstone.

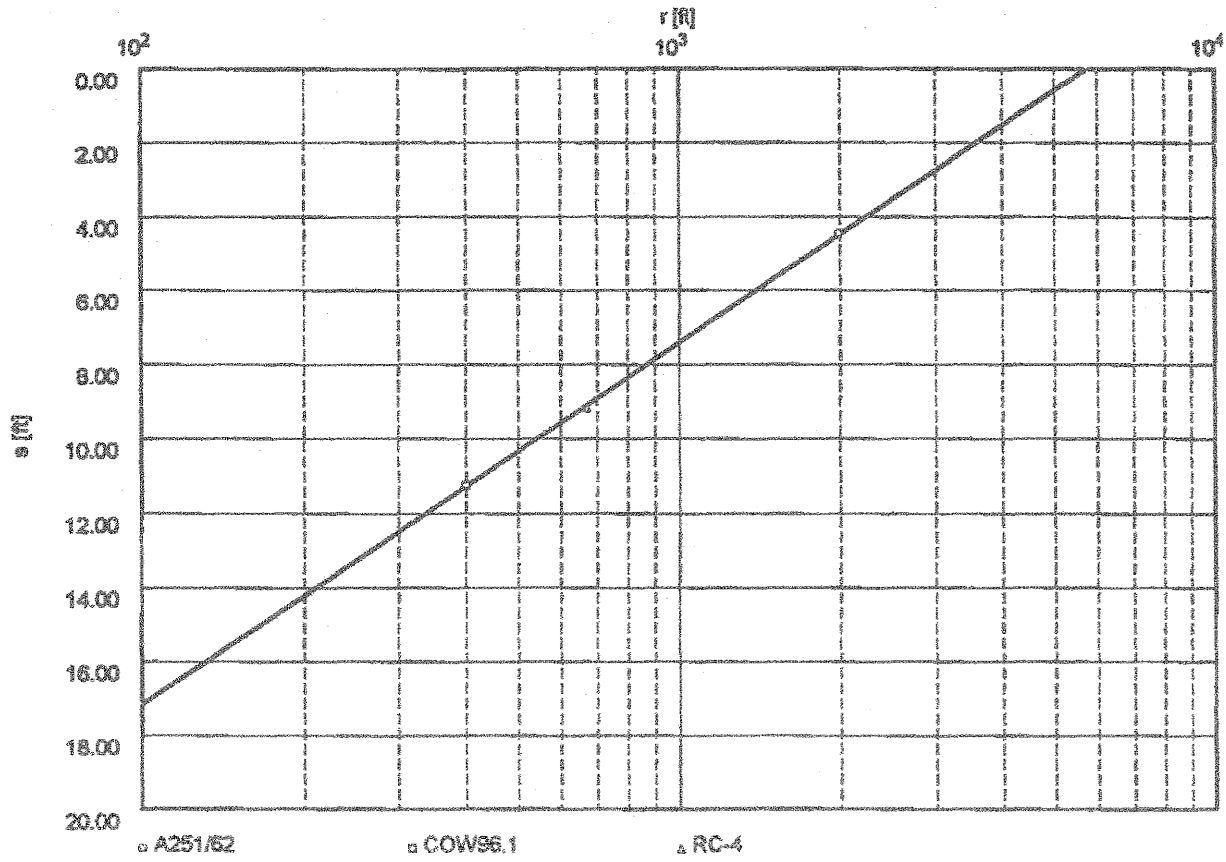


Ground Level Elevations	
CPW 96-1	3755'
BOW 96-1	3753'
COW 96-1	3754'
RC-4	3745'
A251/62	3782'

FIGURE 1

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-989-7270	Pumping test analysis Distance-Drawdown-method after COOPER & JACOB Confined aquifer	Figure 2.	
		Project: Crow Butte Resources	
		Evaluated by: HPD	Date: 15.09.1996

Pumping Test No. Test 3	Test conducted on: 9-11 to 9-13, 1996
Wells A251/62, COW96.1, and RC-4	
Discharge 51.20 U.S.gal/min	Analysis at time (t) 3219.00 min



Transmissivity [ft²/min]: 2.56×10^{-1}

Storativity: 5.64×10^{-5}

Radius of Influence = 5,700 feet

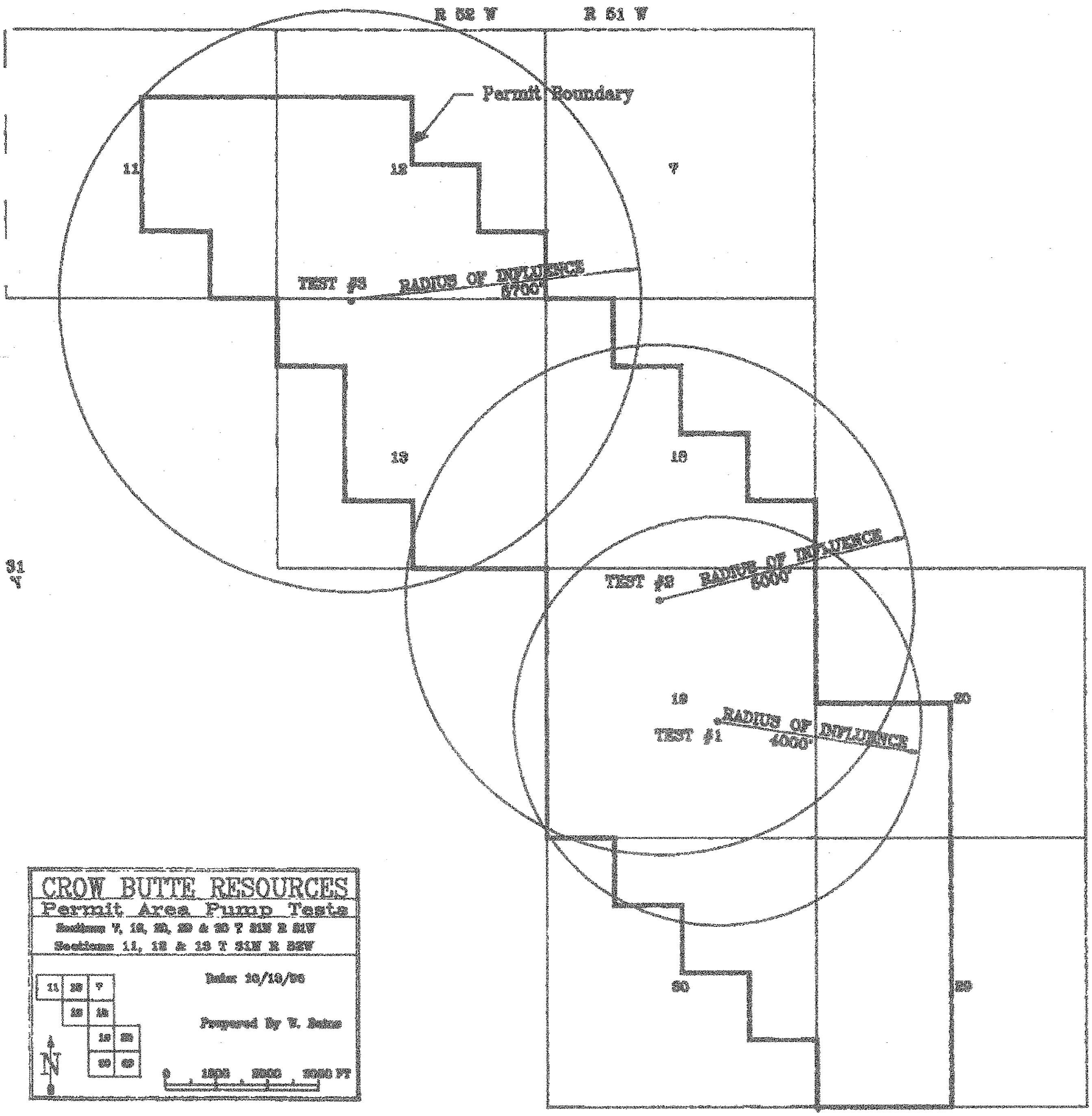
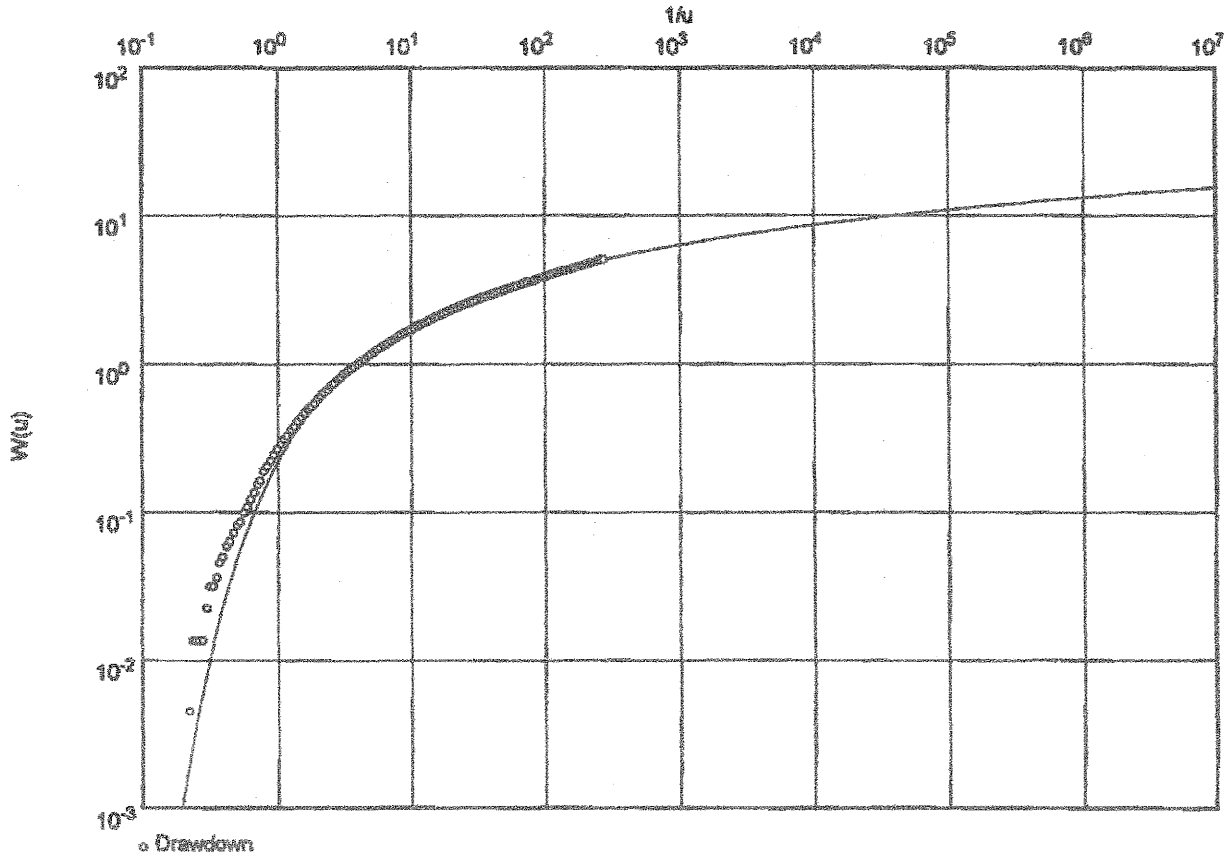

R 52 W
R 51 W
Permit Boundary
11
12
7
TEST #3
RADIUS OF INFLUENCE
5700'
13
18
TEST #2
RADIUS OF INFLUENCE
5000'
19
20
TEST #1
RADIUS OF INFLUENCE
4000'
30
29
CROW BUTTE RESOURCES
Permit Area Pump Tests
N

FIGURE 3

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-989-7270	Pumping test analysis Theis method Confined aquifer	Figure 4 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.09.1996

Pumping Test No. Test 3	Test conducted on: 9-11 to 9-13, 1996
COW96.1	
Discharge 51.20 U.S.gal/min	



Transmissivity [ft²/min]: 2.45×10^{-1}

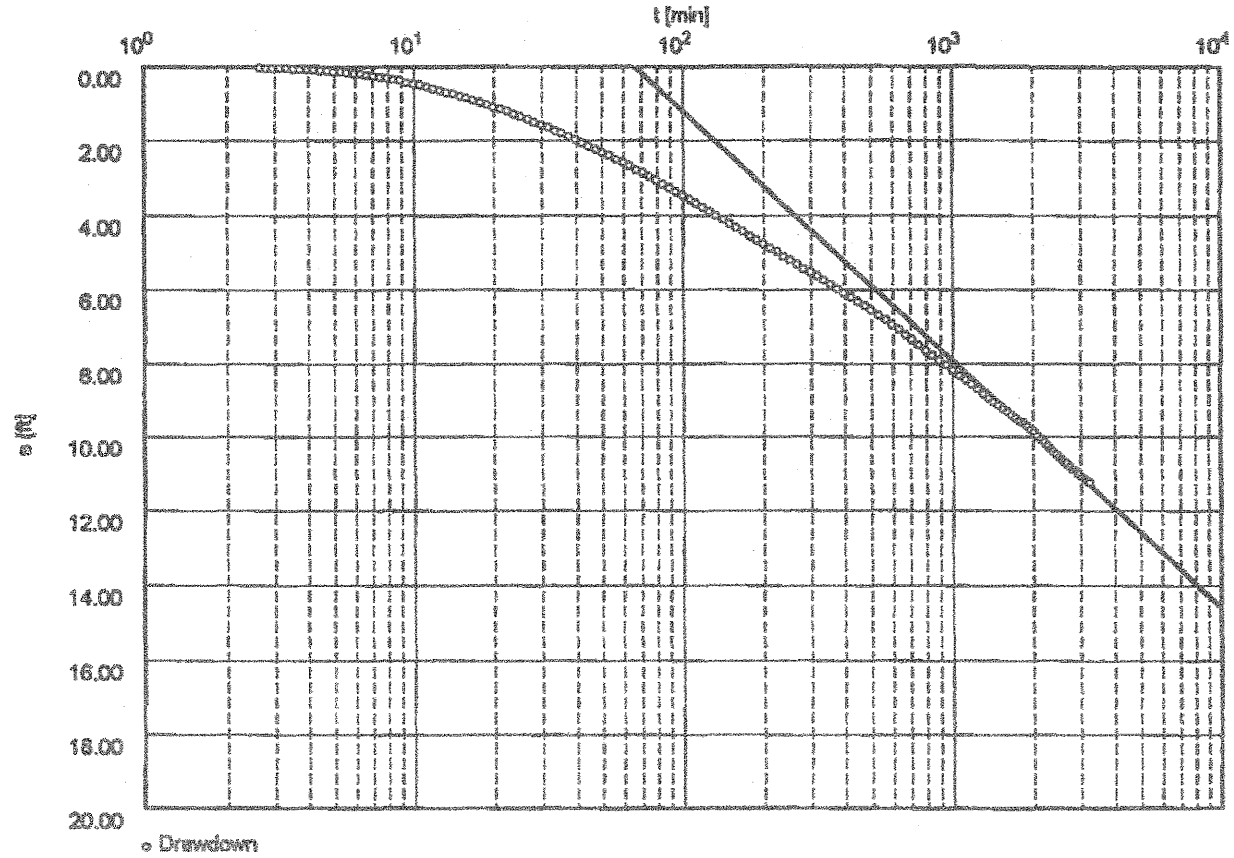
Hydraulic conductivity [ft/min]: 7.00×10^{-3}

Aquifer thickness [ft]: 35.00

Storativity: 7.29×10^{-5}

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-986-7270	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Figure 5	
		Project: Crow Butte Resources	
		Evaluated by: HPD	Date: 15.09.1996

Pumping Test No. Test 3	Test conducted on: 9-11 to 9-13, 1996
COW96.1	
Discharge 51.20 U.S.gal/min	



Transmissivity [ft²/min]: 1.86×10^{-1}

Hydraulic conductivity [ft/min]: 5.33×10^{-3}

Aquifer thickness [ft]: 35.00

Storativity: 1.74×10^{-4}

BOW96.1 - WATER LEVELS DURING PUMPING PERIOD

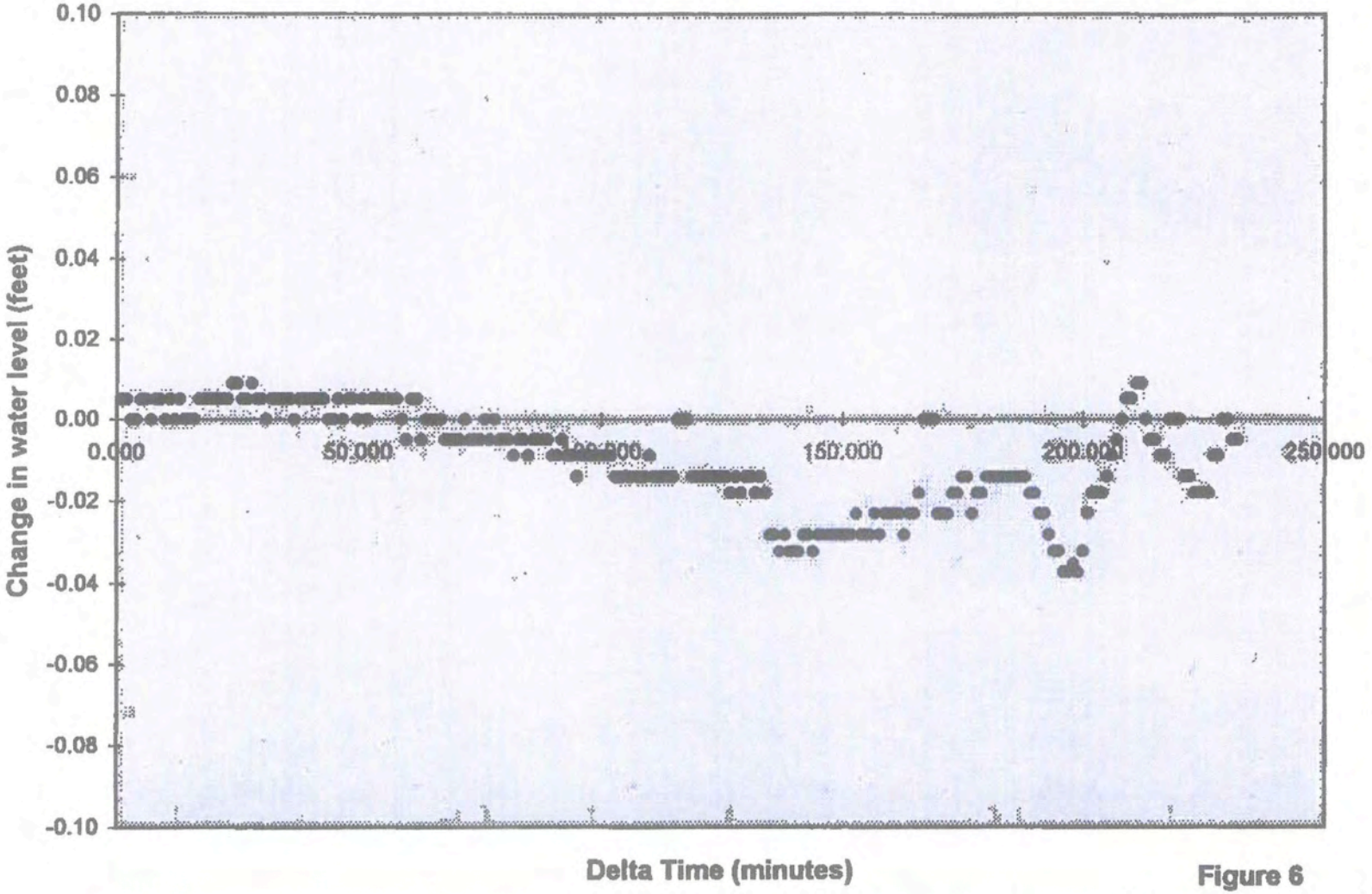


Figure 6

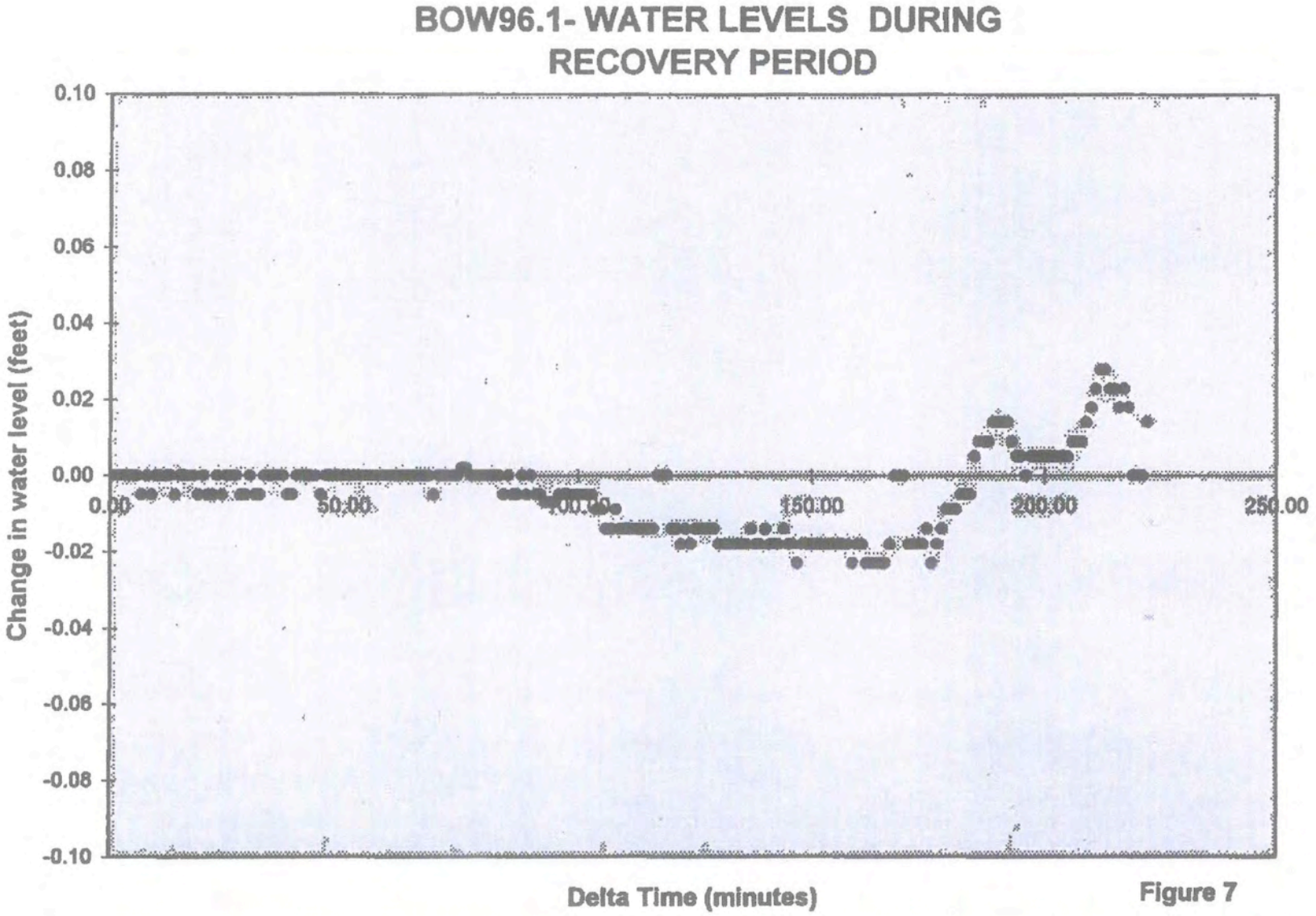

BOW96.1- WATER LEVELS DURING RECOVERY PERIOD
0.10
0.08
0.06
0.04
0.02
0.00
-0.02
-0.04
-0.06
-0.08
-0.10
0.00
50.00
100.00
150.00
200.00
250.00
Change in water level (feet)
Delta Time (minutes)

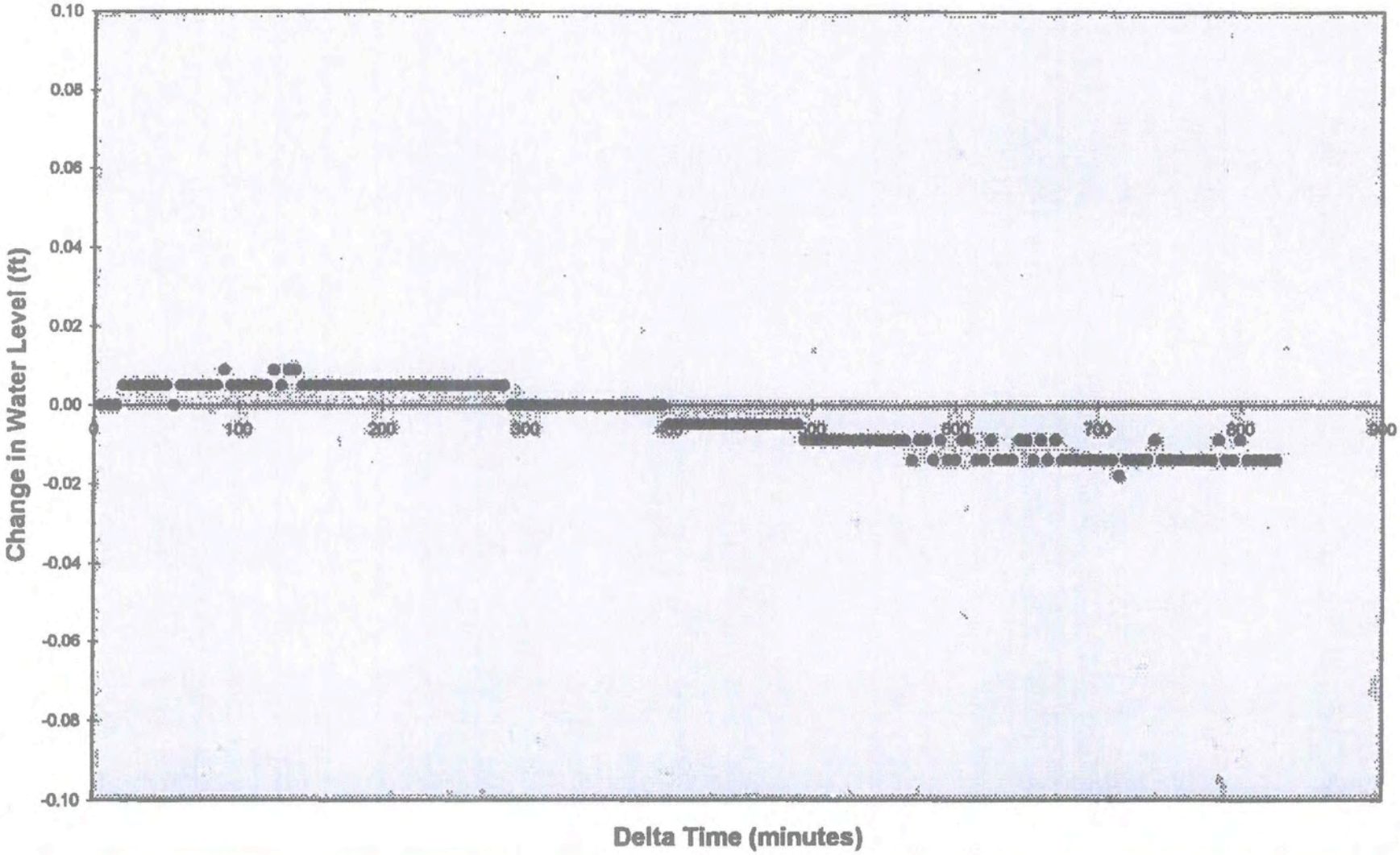
Figure 7

APPENDIX A

Background Water-level Information

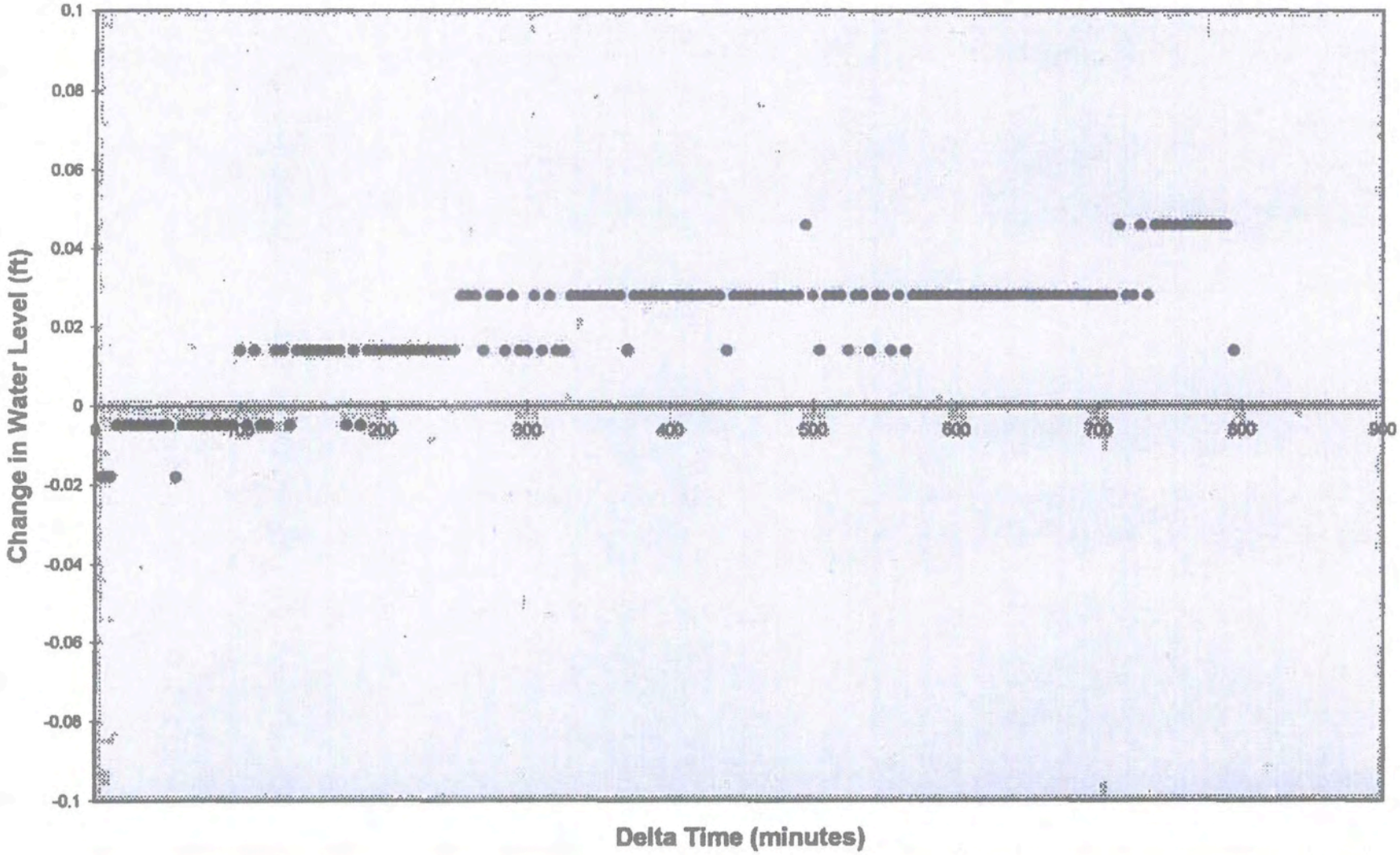
Appendix A
Background Water Levels

WELL BOW96.1



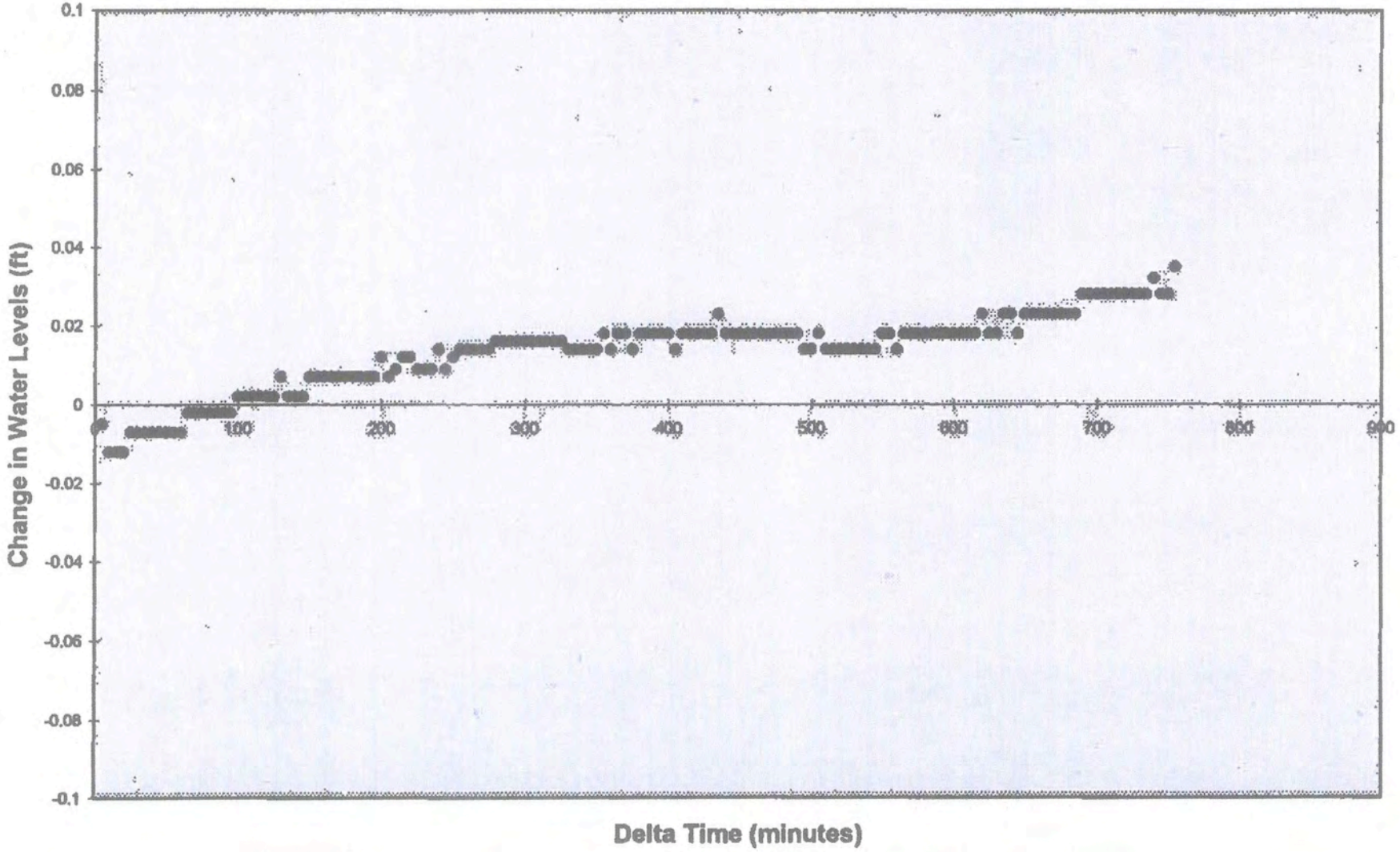
Appendix A
Background Water Levels

WELL COW96.1



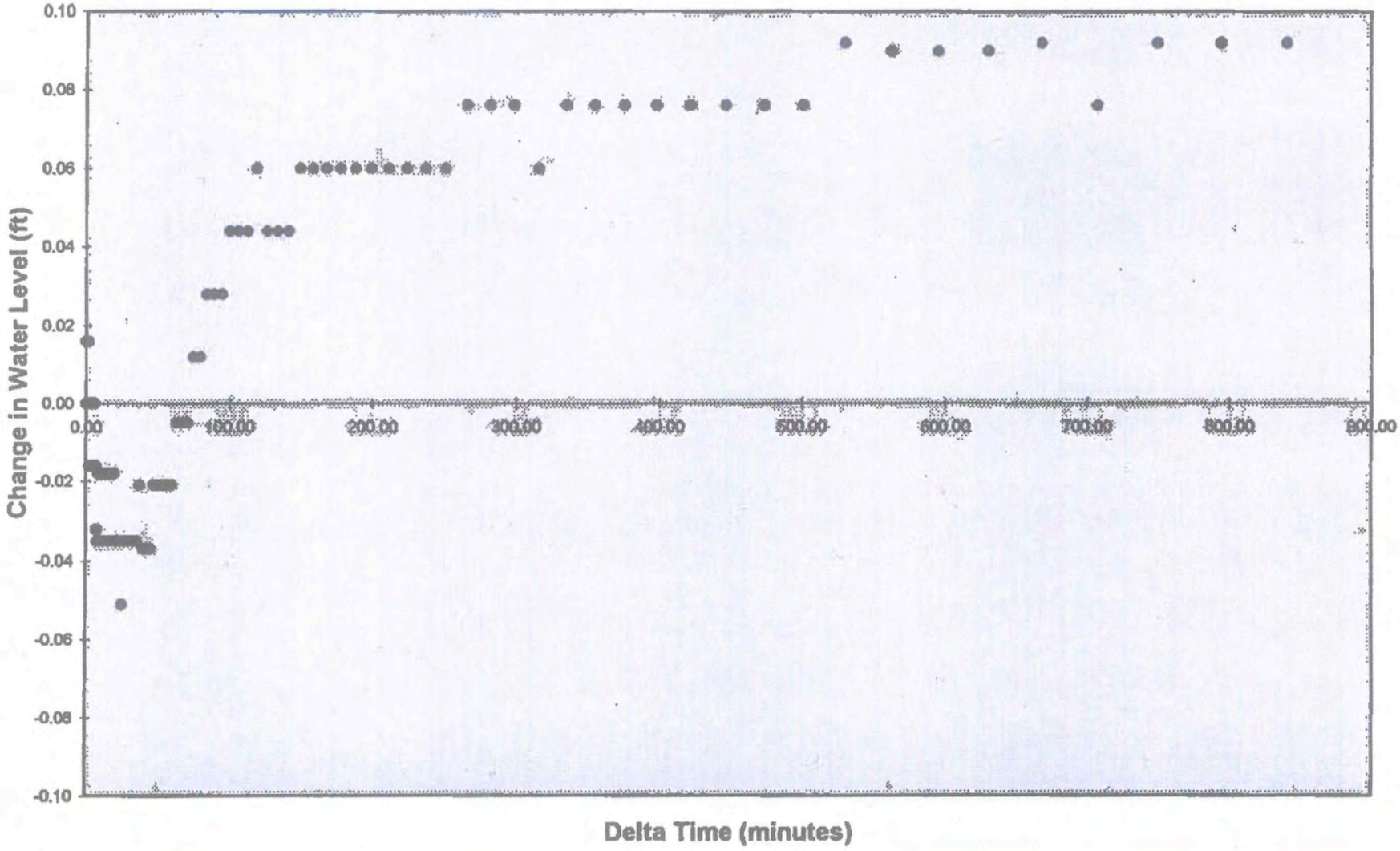
Appendix A
Background Water Levels

WELL RC-4



Appendix A
Background Water Levels

WELL A251/61



APPENDIX B

Water Level Data: Well BOW96.1

Appendix B
BOW96.1 Pumping Period

IN_SITU INC.	TROLL			
Serial number:	720			
Unit name:	Observation Well BOW96.1			
Formation	Brule			
Report generated:	9/13/96	16:07:05		
Report from file:	TMP13.$$$			
Test name:	BOW96.1 - PUMPING PERIOD			
Test defined on:	9/11/96	8:18:42		
Test scheduled for:	9/11/96	9:30:00		
Test started on:	9/11/96	9:30:00		
Test stopped on:	9/13/96	16:06:48		
Test extracted on:	9/13/96	16:07:05		
Data gathered using Logarithmic testing				
Maximum time between data points:	Minutes.			
Number of data samples:	218			
Channel number [2]				
Measurement type:	Pressure/Level			
Channel name:	OnBoard Pressure			
Specific gravity:	1			
Mode:	TOC			
User-defined reference:	0	Feet H2O		
Referenced on:	test start			
Pressure head at reference:	23.51	Feet H2O		
Channel number [1]				
Measurement type:	Temperature			
Channel name:	OnBoard Temp			
			Channel[2]	Channel[1]
Date	Time	ET (min)	Feet H2O	Celsius
9/11/96	9:30:00	0.000	0.00	10.98
9/11/96	9:30:00	0.005	0.01	10.98
9/11/96	9:30:00	0.010	0.01	11.00
9/11/96	9:30:00	0.015	0.00	11.00
9/11/96	9:30:01	0.020	0.00	11.00
9/11/96	9:30:01	0.025	0.01	11.00
9/11/96	9:30:01	0.030	0.01	11.01
9/11/96	9:30:02	0.035	0.00	11.01
9/11/96	9:30:02	0.040	0.01	11.01
9/11/96	9:30:02	0.045	0.01	11.02
9/11/96	9:30:03	0.050	0.00	11.03
9/11/96	9:30:03	0.055	0.01	11.03
9/11/96	9:30:03	0.060	0.00	11.03
9/11/96	9:30:03	0.065	0.01	11.03

Appendix B
BOW96.1 Pumping Period

			Channel[2]	Channel[1]
Date	Time	ET (min)	Feet H2O	Celsius
9/11/96	9:30:04	0.070	0.01	11.04
9/11/96	9:30:04	0.075	0.01	11.04
9/11/96	9:30:04	0.080	0.01	11.04
9/11/96	9:30:05	0.085	0.01	11.05
9/11/96	9:30:05	0.090	0.01	11.05
9/11/96	9:30:05	0.095	0.01	11.05
9/11/96	9:30:06	0.100	0.01	11.06
9/11/96	9:30:06	0.106	0.01	11.06
9/11/96	9:30:06	0.112	0.01	11.06
9/11/96	9:30:07	0.119	0.01	11.07
9/11/96	9:30:07	0.126	0.01	11.07
9/11/96	9:30:07	0.133	0.01	11.07
9/11/96	9:30:08	0.141	0.01	11.07
9/11/96	9:30:08	0.149	0.01	11.10
9/11/96	9:30:09	0.158	0.00	11.10
9/11/96	9:30:10	0.167	0.01	11.10
9/11/96	9:30:10	0.177	0.01	11.10
9/11/96	9:30:11	0.188	0.01	11.10
9/11/96	9:30:11	0.199	0.01	11.10
9/11/96	9:30:12	0.210	0.01	11.11
9/11/96	9:30:13	0.223	0.00	11.11
9/11/96	9:30:14	0.236	0.01	11.11
9/11/96	9:30:14	0.250	0.01	11.11
9/11/96	9:30:15	0.265	0.01	11.12
9/11/96	9:30:16	0.280	0.01	11.11
9/11/96	9:30:17	0.297	0.01	11.12
9/11/96	9:30:18	0.315	0.01	11.12
9/11/96	9:30:20	0.333	0.00	11.12
9/11/96	9:30:21	0.353	0.00	11.12
9/11/96	9:30:22	0.374	0.01	11.12
9/11/96	9:30:23	0.396	0.00	11.12
9/11/96	9:30:25	0.420	0.01	11.12
9/11/96	9:30:26	0.445	0.01	11.12
9/11/96	9:30:28	0.470	0.00	11.12
9/11/96	9:30:29	0.496	0.01	11.12
9/11/96	9:30:31	0.525	0.00	11.12
9/11/96	9:30:33	0.555	0.01	11.13
9/11/96	9:30:35	0.586	0.01	11.12
9/11/96	9:30:37	0.621	0.01	11.13
9/11/96	9:30:39	0.658	0.01	11.13
9/11/96	9:30:41	0.696	0.01	11.13
9/11/96	9:30:44	0.738	0.01	11.13
9/11/96	9:30:46	0.781	0.00	11.13
9/11/96	9:30:49	0.828	-0.01	11.13
9/11/96	9:30:52	0.876	0.01	11.13
9/11/96	9:30:55	0.928	0.01	11.13
9/11/96	9:30:58	0.983	-0.01	11.13
9/11/96	9:31:02	1.041	0.00	11.13

Appendix B
BOW96.1 Pumping Period

Date	Time	ET (min)	Channel[2] Feet H2O	Channel[1] Celsius
9/11/96	9:31:06	1.103	-0.01	11.13
9/11/96	9:31:10	1.168	-0.01	11.13
9/11/96	9:31:14	1.238	-0.01	11.13
9/11/96	9:31:18	1.311	-0.01	11.13
9/11/96	9:31:23	1.390	0.00	11.12
9/11/96	9:31:28	1.473	-0.01	11.13
9/11/96	9:31:33	1.561	-0.01	11.12
9/11/96	9:31:39	1.655	-0.01	11.12
9/11/96	9:31:45	1.753	0.00	11.12
9/11/96	9:31:51	1.858	-0.01	11.12
9/11/96	9:31:58	1.968	0.00	11.12
9/11/96	9:32:05	2.085	-0.01	11.12
9/11/96	9:32:12	2.210	-0.01	11.12
9/11/96	9:32:20	2.341	-0.01	11.12
9/11/96	9:32:28	2.481	-0.01	11.12
9/11/96	9:32:37	2.630	-0.01	11.12
9/11/96	9:32:47	2.786	-0.01	11.11
9/11/96	9:32:57	2.953	-0.01	11.11
9/11/96	9:33:07	3.130	-0.01	11.11
9/11/96	9:33:18	3.316	-0.01	11.11
9/11/96	9:33:30	3.515	-0.01	11.10
9/11/96	9:33:43	3.725	-0.01	11.10
9/11/96	9:33:56	3.946	-0.01	11.10
9/11/96	9:34:10	4.181	-0.01	11.10
9/11/96	9:34:25	4.430	-0.01	11.10
9/11/96	9:34:41	4.693	-0.01	11.10
9/11/96	9:34:58	4.973	-0.01	11.09
9/11/96	9:35:16	5.270	-0.01	11.09
9/11/96	9:35:34	5.583	-0.01	11.09
9/11/96	9:35:54	5.915	-0.01	11.09
9/11/96	9:36:15	6.266	-0.01	11.09
9/11/96	9:36:38	6.640	-0.01	11.08
9/11/96	9:37:02	7.035	-0.01	11.07
9/11/96	9:37:27	7.453	-0.01	11.07
9/11/96	9:37:53	7.896	-0.01	11.06
9/11/96	9:38:21	8.366	-0.01	11.06
9/11/96	9:38:51	8.865	-0.01	11.06
9/11/96	9:39:23	9.391	-0.01	11.06
9/11/96	9:39:56	9.950	-0.01	11.05
9/11/96	9:40:32	10.541	-0.01	11.05
9/11/96	9:41:10	11.168	-0.01	11.05
9/11/96	9:41:49	11.831	-0.01	11.04
9/11/96	9:42:32	12.535	-0.01	11.04
9/11/96	9:43:16	13.280	-0.01	11.04
9/11/96	9:44:04	14.070	-0.01	11.03
9/11/96	9:44:54	14.906	-0.01	11.03
9/11/96	9:45:47	15.791	-0.01	11.03
9/11/96	9:46:43	16.730	-0.01	11.03

Appendix B
BOW96.1 Pumping Period

			Channel[2]	Channel[1]
Date	Time	ET (min)	Feet H2O	Celsius
9/11/96	9:47:43	17.723	-0.01	11.03
9/11/96	9:48:46	18.776	-0.01	11.03
9/11/96	9:49:53	19.891	-0.01	11.03
9/11/96	9:51:04	21.073	-0.01	11.02
9/11/96	9:52:19	22.325	-0.01	11.02
9/11/96	9:53:38	23.650	-0.01	11.01
9/11/96	9:55:03	25.055	-0.01	11.01
9/11/96	9:56:32	26.543	-0.01	11.01
9/11/96	9:58:07	28.118	-0.02	11.01
9/11/96	9:59:47	29.786	-0.01	11.01
9/11/96	10:01:33	31.555	-0.02	11.01
9/11/96	10:03:25	33.428	-0.01	11.01
9/11/96	10:05:24	35.411	-0.01	11.01
9/11/96	10:07:30	37.513	-0.02	11.01
9/11/96	10:09:44	39.740	-0.01	11.01
9/11/96	10:12:05	42.098	-0.02	11.01
9/11/96	10:14:35	44.596	-0.03	11.01
9/11/96	10:17:14	47.243	-0.03	11.09
9/11/96	10:20:02	50.046	-0.03	11.07
9/11/96	10:23:00	53.015	-0.03	11.06
9/11/96	10:26:09	56.160	-0.03	11.04
9/11/96	10:29:29	59.491	-0.03	11.02
9/11/96	10:33:01	63.020	-0.03	11.02
9/11/96	10:36:45	66.758	-0.03	11.01
9/11/96	10:40:43	70.718	-0.03	11.01
9/11/96	10:44:54	74.911	-0.03	11.01
9/11/96	10:49:21	79.355	-0.03	11.01
9/11/96	10:54:03	84.061	-0.03	11.01
9/11/96	10:59:02	89.046	-0.03	11.01
9/11/96	11:04:19	94.326	-0.03	11.01
9/11/96	11:09:55	99.920	-0.03	11.01
9/11/96	11:15:50	105.845	-0.03	11.01
9/11/96	11:22:07	112.120	-0.03	11.01
9/11/96	11:28:46	118.768	-0.03	11.01
9/11/96	11:35:48	125.810	-0.02	11.01
9/11/96	11:43:16	133.268	-0.03	11.01
9/11/96	11:51:10	141.168	-0.03	11.01
9/11/96	11:59:32	149.536	-0.03	11.01
9/11/96	12:08:24	158.401	-0.02	11.01
9/11/96	12:17:47	167.791	-0.03	11.01
9/11/96	12:27:44	177.738	-0.02	11.01
9/11/96	12:38:18	188.275	-0.02	11.01
9/11/96	12:49:26	199.435	-0.02	11.01
9/11/96	13:01:15	211.256	-0.02	11.01
9/11/96	13:13:46	223.778	-0.03	11.01
9/11/96	13:27:02	237.043	-0.02	11.01
9/11/96	13:41:05	251.093	-0.02	11.01
9/11/96	13:55:58	265.976	-0.02	11.01

Appendix B
BOW96.1 Pumping Period

Date	Time	ET (min)	Channel[2] Feet H2O	Channel[1] Celsius
9/11/96	14:11:44	281.741	-0.02	11.01
9/11/96	14:28:26	298.440	-0.02	11.01
9/11/96	14:46:07	316.128	-0.02	11.00
9/11/96	15:04:51	334.865	-0.02	11.01
9/11/96	15:24:42	354.711	-0.02	11.01
9/11/96	15:45:44	375.735	-0.01	11.01
9/11/96	16:08:00	398.003	-0.01	11.01
9/11/96	16:31:35	421.591	-0.02	11.04
9/11/96	16:56:34	446.578	-0.02	11.01
9/11/96	17:23:02	473.045	-0.02	11.01
9/11/96	17:51:04	501.080	-0.01	11.01
9/11/96	18:20:46	530.776	-0.01	11.01
9/11/96	18:52:13	562.233	-0.01	11.01
9/11/96	19:25:33	595.553	-0.01	11.01
9/11/96	20:00:50	630.848	-0.01	11.01
9/11/96	20:38:13	668.233	-0.01	11.01
9/11/96	21:17:50	707.835	-0.01	11.01
9/11/96	21:59:46	749.783	-0.01	11.01
9/11/96	22:44:12	794.216	-0.01	11.01
9/11/96	23:31:16	841.283	-0.02	11.01
9/12/96	0:21:08	891.138	-0.02	11.01
9/12/96	1:13:56	943.946	-0.02	11.01
9/12/96	2:09:53	999.885	-0.02	11.01
9/12/96	3:09:08	1059.138	-0.03	11.01
9/12/96	4:09:08	1119.138	-0.03	11.01
9/12/96	5:09:08	1179.138	-0.03	11.00
9/12/96	6:09:08	1239.138	-0.04	11.01
9/12/96	7:09:08	1299.138	-0.04	11.00
9/12/96	8:09:08	1359.138	-0.04	11.10
9/12/96	9:09:08	1419.138	-0.04	11.00
9/12/96	10:09:08	1479.138	-0.03	11.00
9/12/96	11:09:08	1539.138	-0.02	11.00
9/12/96	12:09:08	1599.138	-0.02	11.00
9/12/96	13:09:08	1659.138	-0.02	11.00
9/12/96	14:09:08	1719.138	-0.02	11.00
9/12/96	15:09:08	1779.138	-0.01	11.01
9/12/96	16:09:08	1839.138	-0.01	11.01
9/12/96	17:09:08	1899.138	-0.01	11.01
9/12/96	18:09:08	1959.138	0.00	11.01
9/12/96	19:09:08	2019.138	0.01	11.01
9/12/96	20:09:08	2079.138	0.01	11.00
9/12/96	21:09:08	2139.138	0.01	11.00
9/12/96	22:09:08	2199.138	0.01	11.00
9/12/96	23:09:08	2259.138	0.00	11.00
9/13/96	0:09:08	2319.138	-0.01	11.01
9/13/96	1:09:08	2379.138	-0.01	11.01
9/13/96	2:09:08	2439.138	-0.01	11.00
9/13/96	3:09:08	2499.138	-0.01	11.00

Appendix B
BOW96.1 Pumping Period

			Channel[2]	Channel[1]
Date	Time	ET (min)	Feet H2O	Celsius
9/13/96	4:09:08	2559.138	-0.01	11.00
9/13/96	5:09:08	2619.138	-0.01	11.01
9/13/96	6:09:08	2679.138	-0.02	11.01
9/13/96	7:09:08	2739.138	-0.02	11.01
9/13/96	8:09:08	2799.138	-0.02	11.10
9/13/96	9:09:08	2859.138	-0.02	11.01
9/13/96	10:09:08	2919.138	-0.01	11.00
9/13/96	11:09:08	2979.138	-0.01	11.00
9/13/96	12:09:08	3039.138	0.00	11.00
9/13/96	13:09:08	3099.138	0.00	11.01
9/13/96	14:09:08	3159.138	-0.01	11.01
9/13/96	15:09:08	3219.138	-0.01	11.01

APPENDIX B
BOW96.1 Recovery Period

IN_SITU INC.	TROLL			
Serial number:	720			
Unit name:	bow96.1			
Report generated:	9/15/96	13:02:07		
Report from file:	TMP3.$$$			
Test name:	BOW96.1 - RECOVERY PERIOD			
Test defined on:	9/13/96	16:12:05		
Test scheduled for:	9/13/96	16:30:00		
Test started on:	9/13/96	16:30:00		
Test stopped on:	9/15/96	13:01:38		
Test extracted on:	9/15/96	13:02:09		
Data gathered using Logarithmic testing				
Maximum time between data points: 60	Minutes.			
Number of data samples:	208			
Channel number [1]				
Measurement type:	Temperature			
Channel name:	OnBoard Temp			
Channel number [2]				
Measurement type:	Pressure/Level			
Channel name:	OnBoard Pressure			
Specific gravity:	1			
Mode:	TOC			
User-defined reference:	0	Feet H2O		
Referenced on:	test start			
Pressure head at reference:	23.51	Feet H2O		
			Channel[2]	Channel[1]
Date	Time	ET (min)	Feet H2O	Celsius
9/13/96	16:30:00	0.00	0.00	10.99
9/13/96	16:30:00	0.01	0.00	10.99
9/13/96	16:30:00	0.01	0.00	11.00
9/13/96	16:30:00	0.02	0.00	11.00
9/13/96	16:30:01	0.02	0.00	11.00
9/13/96	16:30:01	0.03	0.00	11.01
9/13/96	16:30:01	0.03	0.00	11.01
9/13/96	16:30:02	0.04	-0.01	11.01
9/13/96	16:30:02	0.04	0.00	11.02
9/13/96	16:30:02	0.05	-0.01	11.03
9/13/96	16:30:03	0.05	0.00	11.03
9/13/96	16:30:03	0.06	0.00	11.03
9/13/96	16:30:03	0.06	0.00	11.03
9/13/96	16:30:03	0.07	0.00	11.03
9/13/96	16:30:04	0.07	-0.01	11.04

APPENDIX B
BOW96.1 Recovery Period

			Channel[2]	Channel[1]
Date	Time	ET (min)	Feet H2O	Celsius
9/13/96	16:30:04	0.08	0.00	11.04
9/13/96	16:30:04	0.08	-0.01	11.04
9/13/96	16:30:05	0.09	0.00	11.05
9/13/96	16:30:05	0.09	-0.01	11.05
9/13/96	16:30:05	0.10	-0.01	11.05
9/13/96	16:30:06	0.10	0.00	11.06
9/13/96	16:30:06	0.11	-0.01	11.06
9/13/96	16:30:06	0.11	0.00	11.06
9/13/96	16:30:07	0.12	0.00	11.07
9/13/96	16:30:07	0.13	0.00	11.07
9/13/96	16:30:07	0.13	-0.01	11.07
9/13/96	16:30:08	0.14	-0.01	11.08
9/13/96	16:30:08	0.15	0.00	11.12
9/13/96	16:30:09	0.16	-0.01	11.12
9/13/96	16:30:10	0.17	-0.01	11.12
9/13/96	16:30:10	0.18	0.00	11.12
9/13/96	16:30:11	0.19	0.00	11.12
9/13/96	16:30:11	0.20	0.00	11.12
9/13/96	16:30:12	0.21	0.00	11.13
9/13/96	16:30:13	0.22	0.00	11.13
9/13/96	16:30:14	0.24	-0.01	11.13
9/13/96	16:30:14	0.25	-0.01	11.13
9/13/96	16:30:15	0.26	0.00	11.13
9/13/96	16:30:16	0.28	0.00	11.13
9/13/96	16:30:17	0.30	0.00	11.13
9/13/96	16:30:18	0.31	0.00	11.13
9/13/96	16:30:20	0.33	0.00	11.13
9/13/96	16:30:21	0.35	-0.01	11.13
9/13/96	16:30:22	0.37	0.00	11.13
9/13/96	16:30:23	0.40	0.00	11.13
9/13/96	16:30:25	0.42	0.00	11.14
9/13/96	16:30:26	0.44	0.00	11.13
9/13/96	16:30:28	0.47	0.00	11.14
9/13/96	16:30:29	0.50	0.00	11.15
9/13/96	16:30:31	0.52	0.00	11.15
9/13/96	16:30:33	0.55	0.00	11.15
9/13/96	16:30:35	0.59	0.00	11.15
9/13/96	16:30:37	0.62	0.00	11.15
9/13/96	16:30:39	0.66	0.00	11.15
9/13/96	16:30:41	0.70	0.00	11.15
9/13/96	16:30:44	0.74	0.00	11.15
9/13/96	16:30:46	0.78	0.00	11.15
9/13/96	16:30:49	0.83	0.00	11.15
9/13/96	16:30:52	0.88	0.00	11.15
9/13/96	16:30:55	0.93	0.00	11.15
9/13/96	16:30:58	0.98	0.00	11.15
9/13/96	16:31:02	1.04	0.00	11.15
9/13/96	16:31:06	1.10	0.00	11.15

APPENDIX B
BOW98.1 Recovery Period

Date	Time	ET (min)	Channel[2] Feet H2O	Channel[1] Celsius
9/13/96	16:31:10	1.17	-0.01	11.15
9/13/96	16:31:14	1.24	0.00	11.15
9/13/96	16:31:18	1.31	0.00	11.15
9/13/96	16:31:23	1.39	0.00	11.15
9/13/96	16:31:28	1.47	0.00	11.14
9/13/96	16:31:33	1.56	0.00	11.15
9/13/96	16:31:39	1.65	0.00	11.15
9/13/96	16:31:45	1.75	0.00	11.15
9/13/96	16:31:51	1.86	0.00	11.14
9/13/96	16:31:58	1.97	0.00	11.14
9/13/96	16:32:05	2.08	0.00	11.14
9/13/96	16:32:12	2.21	0.00	11.13
9/13/96	16:32:20	2.34	0.00	11.13
9/13/96	16:32:28	2.48	0.00	11.13
9/13/96	16:32:37	2.63	0.00	11.13
9/13/96	16:32:47	2.79	-0.01	11.13
9/13/96	16:32:57	2.95	0.00	11.13
9/13/96	16:33:07	3.13	-0.01	11.13
9/13/96	16:33:18	3.32	-0.01	11.13
9/13/96	16:33:30	3.51	0.00	11.12
9/13/96	16:33:43	3.72	-0.01	11.12
9/13/96	16:33:56	3.95	0.00	11.12
9/13/96	16:34:10	4.18	-0.01	11.12
9/13/96	16:34:25	4.43	-0.01	11.16
9/13/96	16:34:41	4.69	-0.01	11.20
9/13/96	16:34:58	4.97	-0.01	11.18
9/13/96	16:35:16	5.27	-0.01	11.16
9/13/96	16:35:34	5.58	-0.01	11.15
9/13/96	16:35:54	5.91	-0.01	11.15
9/13/96	16:36:15	6.27	-0.01	11.14
9/13/96	16:36:38	6.64	-0.01	11.13
9/13/96	16:37:02	7.03	-0.01	11.12
9/13/96	16:37:27	7.45	-0.01	11.12
9/13/96	16:37:53	7.90	-0.01	11.12
9/13/96	16:38:21	8.37	-0.01	11.11
9/13/96	16:38:51	8.86	-0.01	11.10
9/13/96	16:39:23	9.39	-0.01	11.10
9/13/96	16:39:56	9.95	-0.01	11.09
9/13/96	16:40:32	10.54	-0.01	11.09
9/13/96	16:41:10	11.17	-0.01	11.08
9/13/96	16:41:49	11.83	-0.01	11.07
9/13/96	16:42:32	12.53	-0.01	11.07
9/13/96	16:43:16	13.28	-0.01	11.06
9/13/96	16:44:04	14.07	-0.01	11.06
9/13/96	16:44:54	14.91	-0.01	11.05
9/13/96	16:45:47	15.79	-0.01	11.05
9/13/96	16:46:43	16.73	-0.01	11.05
9/13/96	16:47:43	17.72	-0.01	11.04

APPENDIX B
BOW98.1 Recovery Period

Date	Time	ET (min)	Channel[2] Feet H2O	Channel[1] Celsius
9/13/96	16:48:46	18.78	-0.01	11.04
9/13/96	16:49:53	19.89	-0.01	11.04
9/13/96	16:51:04	21.07	-0.02	11.03
9/13/96	16:52:19	22.32	-0.01	11.03
9/13/96	16:53:38	23.65	-0.02	11.03
9/13/96	16:55:03	25.05	-0.01	11.03
9/13/96	16:56:32	26.54	-0.01	11.03
9/13/96	16:58:07	28.12	-0.01	11.03
9/13/96	16:59:47	29.79	-0.01	11.03
9/13/96	17:01:33	31.55	-0.01	11.03
9/13/96	17:03:25	33.43	-0.02	11.03
9/13/96	17:05:24	35.41	-0.02	11.03
9/13/96	17:07:30	37.51	-0.02	11.03
9/13/96	17:09:44	39.74	-0.02	11.02
9/13/96	17:12:05	42.10	-0.02	11.03
9/13/96	17:14:35	44.60	-0.02	11.03
9/13/96	17:17:14	47.24	-0.02	11.03
9/13/96	17:20:02	50.05	-0.01	11.02
9/13/96	17:23:00	53.01	-0.02	11.02
9/13/96	17:26:09	56.16	-0.02	11.02
9/13/96	17:29:29	59.49	-0.01	11.02
9/13/96	17:33:01	63.02	-0.02	11.02
9/13/96	17:36:45	66.76	-0.02	11.02
9/13/96	17:40:43	70.72	-0.02	11.02
9/13/96	17:44:54	74.91	-0.01	11.02
9/13/96	17:49:21	79.35	-0.02	11.02
9/13/96	17:54:03	84.06	-0.02	11.02
9/13/96	17:59:02	89.05	-0.02	11.02
9/13/96	18:04:19	94.33	-0.02	11.02
9/13/96	18:09:55	99.92	-0.02	11.01
9/13/96	18:15:50	105.84	-0.02	11.02
9/13/96	18:22:07	112.12	-0.02	11.01
9/13/96	18:28:46	118.77	-0.02	11.01
9/13/96	18:35:48	125.81	-0.02	11.01
9/13/96	18:43:16	133.27	-0.02	11.02
9/13/96	18:51:10	141.17	-0.02	11.01
9/13/96	18:59:32	149.54	-0.02	11.01
9/13/96	19:08:24	158.40	-0.02	11.01
9/13/96	19:17:47	167.79	-0.02	11.01
9/13/96	19:27:44	177.74	-0.02	11.01
9/13/96	19:38:16	188.27	-0.02	11.01
9/13/96	19:49:26	199.43	-0.02	11.01
9/13/96	20:01:15	211.26	-0.02	11.01
9/13/96	20:13:46	223.78	-0.02	11.01
9/13/96	20:27:02	237.04	-0.02	11.01
9/13/96	20:41:05	251.09	-0.02	11.01
9/13/96	20:55:58	265.98	-0.02	11.01
9/13/96	21:11:44	281.74	-0.02	11.01

APPENDIX B
BOW96.1 Recovery Period

Date	Time	ET (min)	Channel[2] Feet H2O	Channel[1] Celsius
9/13/96	21:28:26	298.44	-0.02	11.01
9/13/96	21:46:07	316.13	-0.02	11.01
9/13/96	22:04:51	334.86	-0.02	11.01
9/13/96	22:24:42	354.71	-0.02	11.01
9/13/96	22:45:44	375.73	-0.01	11.02
9/13/96	23:08:00	398.00	-0.02	11.02
9/13/96	23:31:35	421.59	-0.02	11.01
9/13/96	23:56:34	446.58	-0.01	11.01
9/14/96	0:23:02	473.04	-0.01	11.02
9/14/96	0:51:04	501.08	-0.01	11.02
9/14/96	1:20:46	530.78	-0.01	11.01
9/14/96	1:52:13	562.23	-0.01	11.01
9/14/96	2:25:33	595.55	-0.01	11.02
9/14/96	3:00:50	630.85	-0.01	11.02
9/14/96	3:38:13	668.23	0.01	11.01
9/14/96	4:17:50	707.83	0.01	11.01
9/14/96	4:59:46	749.78	0.01	11.01
9/14/96	5:44:12	794.22	0.01	11.01
9/14/96	6:31:16	841.28	0.01	11.01
9/14/96	7:21:08	891.14	0.01	11.02
9/14/96	8:13:56	943.95	0.01	11.01
9/14/96	9:09:53	999.88	0.01	11.01
9/14/96	10:09:08	1059.14	0.01	11.01
9/14/96	11:09:08	1119.14	0.01	11.01
9/14/96	12:09:08	1179.14	0.01	11.01
9/14/96	13:09:08	1239.14	0.00	11.01
9/14/96	14:09:08	1299.14	0.01	11.02
9/14/96	15:09:08	1359.14	0.01	11.01
9/14/96	16:09:08	1419.14	0.01	11.02
9/14/96	17:09:08	1479.14	0.01	11.02
9/14/96	18:09:08	1539.14	0.01	11.01
9/14/96	19:09:08	1599.14	0.01	11.02
9/14/96	20:09:08	1659.14	0.01	11.01
9/14/96	21:09:08	1719.14	0.01	11.02
9/14/96	22:09:08	1779.14	0.01	11.02
9/14/96	23:09:08	1839.14	0.01	11.02
9/15/96	0:09:08	1899.14	0.01	11.01
9/15/96	1:09:08	1959.14	0.01	11.02
9/15/96	2:09:08	2019.14	0.01	11.02
9/15/96	3:09:08	2079.14	0.02	11.02
9/15/96	4:09:08	2139.14	0.02	11.01
9/15/96	5:09:08	2199.14	0.03	11.02
9/15/96	6:09:08	2259.14	0.03	11.02
9/15/96	7:09:08	2319.14	0.02	11.02
9/15/96	8:09:08	2379.14	0.02	11.02
9/15/96	9:09:08	2439.14	0.02	11.01
9/15/96	10:09:08	2499.14	0.02	11.01
9/15/96	11:09:08	2559.14	0.02	11.02

APPENDIX B
BOW96.1 Recovery Period

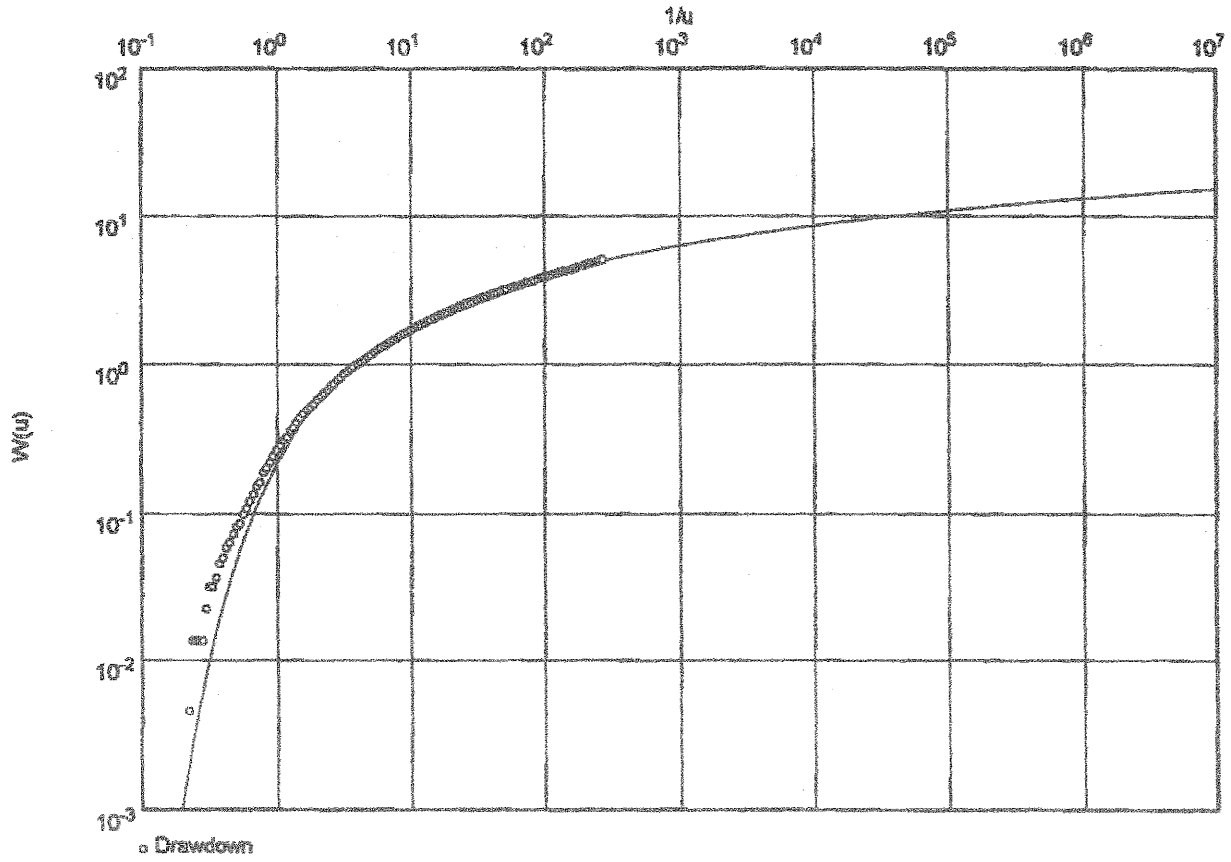
Date	Time	ET (min)	Channel[2] Feet H2O	Channel[1] Celsius
9/15/96	12:09:08	2618.14	0.01	11.01

APPENDIX C

Water Level Data and Analytical Results: Chadron Sandstone Observation Wells

Harlan & Associates, Inc. 3600 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-988-7270	Pumping test analysis Theis method Confined aquifer	Appendix C Page 1	
		Project: Crow Butte Resources	
		Evaluated by: HPD	Date: 15.09.1996

Pumping Test No. Test 3	Test conducted on: 9-11 to 9-13, 1996
COW96.1	
Discharge 51.20 U.S.gal/min	



Transmissivity [ft²/min]: 2.45×10^{-1}

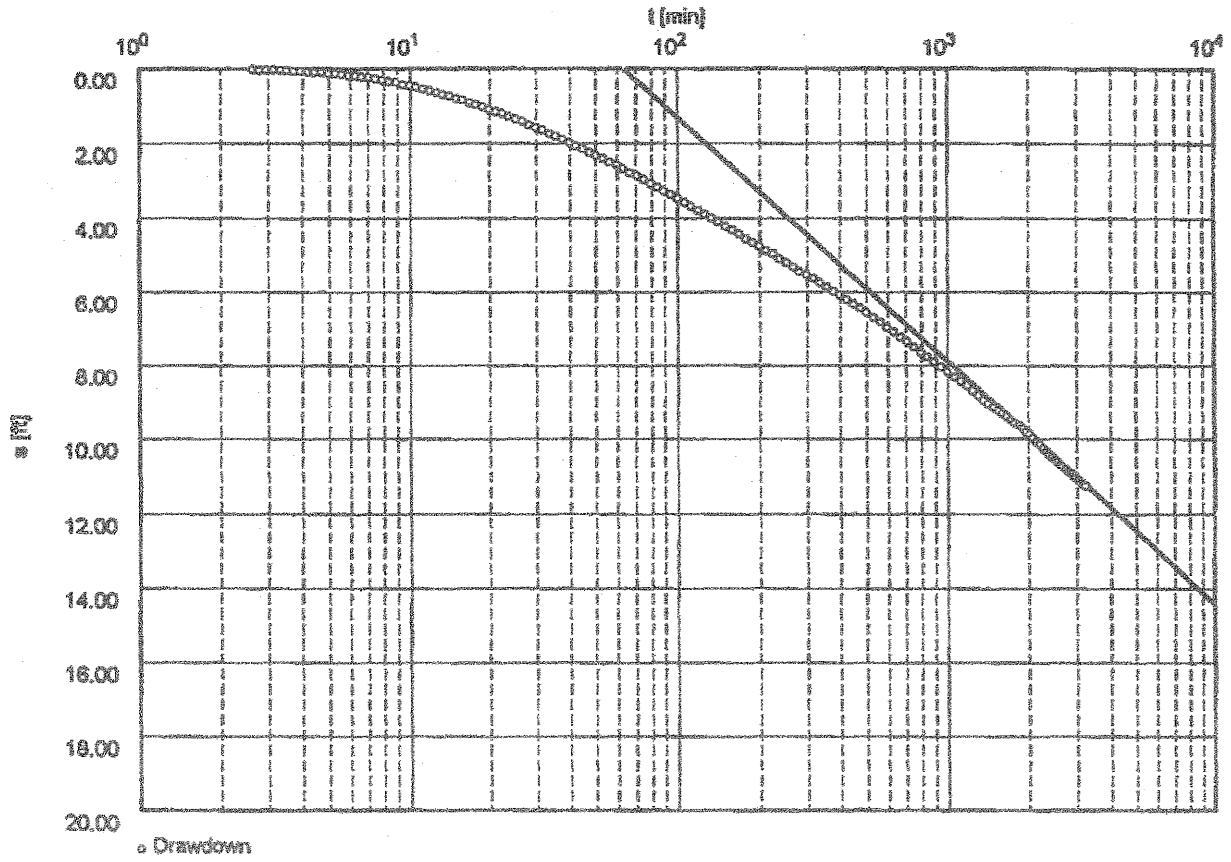
Hydraulic conductivity [ft/min]: 7.00×10^{-3}

Aquifer thickness [ft]: 35.00

Storativity: 7.29×10^{-5}

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-988-7270	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Appendix C Page 1 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.09.1996

Pumping Test No. Test 3	Test conducted on: 9-11 to 9-13, 1996
COW96.1	
Discharge 51.20 U.S.gal/min	



Transmissivity [ft²/min]: 1.90×10^{-1}

Hydraulic conductivity [ft/min]: 5.45×10^{-3}

Aquifer thickness [ft]: 35.00

Storativity: 1.69×10^{-4}

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-988-7270	Pumping test analysis Theis method Confined aquifer	Appendix C Page 2 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.09.1996

Pumping Test No. Test 3	Test conducted on: 9-11 to 9-13, 1996
COW96.1	Drawdown
Discharge 51.20 U.S.gal/min	Distance from the pumping well 400.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	
1	2.63	0.01	0.01	
2	2.79	0.03	0.03	
3	2.95	0.03	0.03	
4	3.13	0.03	0.03	
5	3.32	0.03	0.03	
6	3.51	0.05	0.05	
7	3.72	0.07	0.07	
8	3.95	0.07	0.07	
9	4.18	0.09	0.09	
10	4.43	0.10	0.10	
11	4.69	0.11	0.11	
12	4.97	0.13	0.13	
13	5.27	0.14	0.14	
14	5.58	0.16	0.16	
15	5.92	0.18	0.18	
16	6.27	0.19	0.19	
17	6.64	0.22	0.22	
18	7.04	0.24	0.24	
19	7.45	0.27	0.27	
20	7.90	0.30	0.30	
21	8.37	0.34	0.34	
22	8.87	0.36	0.36	
23	9.39	0.42	0.42	
24	9.95	0.45	0.45	
25	10.54	0.49	0.49	
26	11.17	0.54	0.54	
27	11.83	0.59	0.59	
28	12.54	0.64	0.64	
29	13.28	0.69	0.69	
30	14.07	0.73	0.73	
31	14.91	0.80	0.80	
32	15.79	0.84	0.84	
33	16.73	0.91	0.91	
34	17.72	0.97	0.97	
35	18.78	1.04	1.04	
36	19.89	1.10	1.10	
37	21.07	1.15	1.15	
38	22.33	1.21	1.21	
39	23.65	1.29	1.29	
40	25.05	1.36	1.36	
41	26.54	1.42	1.42	
42	28.12	1.50	1.50	
43	29.79	1.58	1.58	
44	31.55	1.64	1.64	
45	33.43	1.74	1.74	
46	35.41	1.80	1.80	
47	37.51	1.90	1.90	
48	39.74	1.98	1.98	
49	42.10	2.06	2.06	
50	44.60	2.15	2.15	

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-988-7270	Pumping test analysis Theis method Confined aquifer	Appendix C Page 3 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.06.1996

Pumping Test No. Test 3	Test conducted on: 9-11 to 9-13, 1996
COW96.1	Drawdown
Discharge 51.20 U.S.gal/min	Distance from the pumping well 400.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	
51	47.24	2.23	2.23	
52	50.05	2.32	2.32	
53	53.02	2.39	2.39	
54	56.16	2.51	2.51	
55	59.49	2.58	2.58	
56	63.02	2.68	2.68	
57	66.76	2.79	2.79	
58	70.72	2.87	2.87	
59	74.91	2.97	2.97	
60	79.35	3.06	3.06	
61	84.06	3.17	3.17	
62	89.05	3.27	3.27	
63	94.33	3.37	3.37	
64	99.92	3.48	3.48	
65	105.84	3.58	3.58	
66	112.12	3.67	3.67	
67	118.77	3.78	3.78	
68	125.81	3.89	3.89	
69	133.27	3.99	3.99	
70	141.17	4.10	4.10	
71	149.54	4.21	4.21	
72	158.40	4.31	4.31	
73	167.79	4.42	4.42	
74	177.74	4.55	4.55	
75	188.27	4.65	4.65	
76	199.44	4.76	4.76	
77	211.26	4.87	4.87	
78	223.76	4.96	4.96	
79	237.04	5.09	5.09	
80	251.09	5.20	5.20	
81	265.98	5.32	5.32	
82	281.74	5.43	5.43	
83	298.44	5.52	5.52	
84	316.13	5.63	5.63	
85	334.87	5.74	5.74	
86	354.71	5.86	5.86	
87	375.73	5.97	5.97	
88	398.00	6.08	6.08	
89	421.59	6.19	6.19	
90	446.58	6.32	6.32	
91	473.04	6.43	6.43	
92	501.08	6.56	6.56	
93	530.78	6.69	6.69	
94	562.23	6.81	6.81	
95	595.55	6.94	6.94	
96	630.85	7.07	7.07	
97	668.23	7.22	7.22	
98	707.83	7.34	7.34	
99	749.78	7.49	7.49	
100	794.22	7.63	7.63	

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-988-7270	Pumping test analysis Theis method Confined aquifer	Appendix C Page 4 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.09.1996

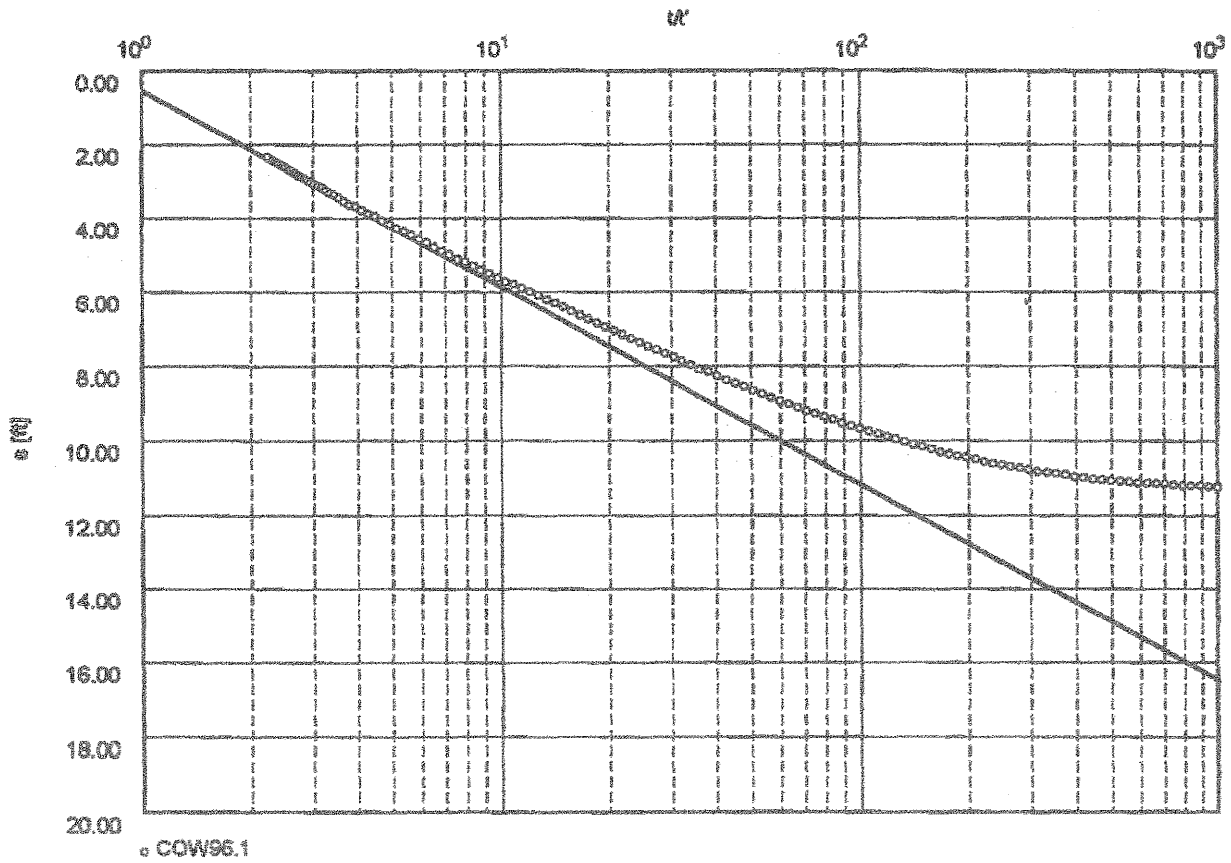
Pumping Test No. Test 3	Test conducted on: 9-11 to 9-13, 1996
COW96.1	Drawdown
Discharge 51.20 U.S.gal/min	Distance from the pumping well 400.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	
101	841.28	7.76	7.76	
102	891.14	7.90	7.90	
103	943.95	8.03	8.03	
104	999.88	8.17	8.17	
105	1059.14	8.32	8.32	
106	1119.14	8.44	8.44	
107	1179.14	8.56	8.56	
108	1239.14	8.68	8.68	
109	1299.14	8.83	8.83	
110	1359.14	8.94	8.94	
111	1419.14	9.05	9.05	
112	1479.14	9.13	9.13	
113	1539.14	9.23	9.23	
114	1599.14	9.31	9.31	
115	1659.14	9.40	9.40	
116	1719.14	9.48	9.48	
117	1779.14	9.56	9.56	
118	1839.14	9.62	9.62	
119	1899.14	9.71	9.71	
120	1959.14	9.80	9.80	
121	2019.14	9.88	9.88	
122	2079.14	9.97	9.97	
123	2139.14	10.07	10.07	
124	2199.14	10.15	10.15	
125	2259.14	10.25	10.25	
126	2319.14	10.33	10.33	
127	2379.14	10.41	10.41	
128	2439.14	10.49	10.49	
129	2499.14	10.55	10.55	
130	2559.14	10.62	10.62	
131	2619.14	10.69	10.69	
132	2679.14	10.74	10.74	
133	2739.14	10.82	10.82	
134	2799.14	10.89	10.89	
135	2859.14	10.93	10.93	
136	2919.14	11.00	11.00	
137	2979.14	11.04	11.04	
138	3039.14	11.11	11.11	
139	3099.14	11.16	11.16	
140	3159.14	11.21	11.21	
141	3219.14	11.25	11.25	

Harlan & Associates, inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-986-7270	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Appendix E Page 1 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.09.1996

Pumping Test No. Test # 3	Test conducted on: 9-13 to 9-15, 1996
COW96.1; Recovery	
Discharge 51.20 U.S.gal/min	
Pumping test duration: 3300.00 min	



Transmissivity [ft²/min]: 2.35×10^{-1}

Hydraulic conductivity [ft/min]: 6.72×10^{-3}

Aquifer thickness [ft]: 35.00

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-988-7270	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Appendix C Page 2 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.09.1996

Pumping Test No. Test # 3	Test conducted on: 9-13 to 9-15, 1996
COW96.1; Recovery	COW96.1
Discharge 51.20 U.S.gal/min	Distance from the pumping well 400.00 ft
Static water level: 0.00 ft below datum	Pumping test duration: 3300.00 min

	Time from end of pumping [min]	Water level [ft]	Residual drawdown [ft]	
2	0.01	11.25	11.25	
3	0.01	11.25	11.25	
4	0.02	11.25	11.25	
5	0.02	11.25	11.25	
6	0.03	11.25	11.25	
7	0.03	11.26	11.26	
8	0.04	11.25	11.25	
9	0.04	11.25	11.25	
10	0.05	11.25	11.25	
11	0.05	11.25	11.25	
12	0.06	11.25	11.25	
13	0.06	11.25	11.25	
14	0.07	11.25	11.25	
15	0.07	11.25	11.25	
16	0.08	11.26	11.26	
17	0.08	11.25	11.25	
18	0.09	11.25	11.25	
19	0.09	11.26	11.26	
20	0.10	11.25	11.25	
21	0.10	11.25	11.25	
22	0.11	11.26	11.26	
23	0.11	11.25	11.25	
24	0.12	11.26	11.26	
25	0.13	11.25	11.25	
26	0.13	11.25	11.25	
27	0.14	11.26	11.26	
28	0.15	11.25	11.25	
29	0.16	11.25	11.25	
30	0.17	11.25	11.25	
31	0.18	11.25	11.25	
32	0.19	11.25	11.25	
33	0.20	11.23	11.23	
34	0.21	11.23	11.23	
35	0.22	11.25	11.25	
36	0.24	11.25	11.25	
37	0.25	11.23	11.23	
38	0.26	11.25	11.25	
39	0.28	11.25	11.25	
40	0.30	11.23	11.23	
41	0.32	11.25	11.25	
42	0.33	11.25	11.25	
43	0.35	11.25	11.25	
44	0.37	11.23	11.23	
45	0.40	11.25	11.25	
46	0.42	11.25	11.25	
47	0.45	11.25	11.25	
48	0.47	11.25	11.25	
49	0.50	11.25	11.25	
50	0.52	11.25	11.25	

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-989-7270	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Appendix E Page 3 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.09.1996

Pumping Test No. Test # 3	Test conducted on: 9-13 to 9-15, 1996
COW96.1; Recovery	COW96.1
Discharge 51.20 U.S.gal/min	Distance from the pumping well 400.00 ft
Static water level: 0.00 ft below datum	Pumping test duration: 3300.00 min

	Time from end of pumping [min]	Water level [ft]	Residual drawdown [ft]	
51	0.56	11.25	11.25	
52	0.59	11.25	11.25	
53	0.62	11.25	11.25	
54	0.66	11.26	11.26	
55	0.70	11.25	11.25	
56	0.74	11.25	11.25	
57	0.78	11.25	11.25	
58	0.83	11.25	11.25	
59	0.88	11.23	11.23	
60	0.93	11.25	11.25	
61	0.98	11.25	11.25	
62	1.04	11.25	11.25	
63	1.10	11.25	11.25	
64	1.17	11.25	11.25	
65	1.24	11.25	11.25	
66	1.31	11.25	11.25	
67	1.39	11.25	11.25	
68	1.47	11.25	11.25	
69	1.56	11.25	11.25	
70	1.66	11.23	11.23	
71	1.75	11.25	11.25	
72	1.86	11.25	11.25	
73	1.97	11.23	11.23	
74	2.08	11.25	11.25	
75	2.21	11.23	11.23	
76	2.34	11.23	11.23	
77	2.48	11.22	11.22	
78	2.63	11.23	11.23	
79	2.79	11.22	11.22	
80	2.95	11.22	11.22	
81	3.13	11.22	11.22	
82	3.32	11.22	11.22	
83	3.51	11.22	11.22	
84	3.72	11.20	11.20	
85	3.95	11.20	11.20	
86	4.18	11.19	11.19	
87	4.43	11.17	11.17	
88	4.69	11.15	11.15	
89	4.97	11.15	11.15	
90	5.27	11.12	11.12	
91	5.58	11.12	11.12	
92	5.92	11.09	11.09	
93	6.27	11.08	11.08	
94	6.64	11.06	11.06	
95	7.04	11.04	11.04	
96	7.45	11.01	11.01	
97	7.90	10.98	10.98	
98	8.37	10.95	10.95	
99	8.87	10.91	10.91	
100	9.39	10.88	10.88	

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-986-7270	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Appendix C Page 4 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.09.1996

Pumping Test No. Test # 3	Test conducted on: 9-13 to 9-15, 1996
COW96.1; Recovery	COW96.1
Discharge 51.20 U.S.gal/min	Distance from the pumping well 400.00 ft
Static water level: 0.00 ft below datum	Pumping test duration: 3300.00 min

	Time from end of pumping [min]	Water level [ft]	Residual drawdown [ft]	
101	9.95	10.84	10.84	
102	10.54	10.82	10.82	
103	11.17	10.77	10.77	
104	11.83	10.72	10.72	
105	12.54	10.69	10.69	
106	13.28	10.64	10.64	
107	14.07	10.60	10.60	
108	14.91	10.55	10.55	
109	15.79	10.48	10.48	
110	16.73	10.43	10.43	
111	17.72	10.39	10.39	
112	18.78	10.34	10.34	
113	19.89	10.29	10.29	
114	21.07	10.21	10.21	
115	22.33	10.15	10.15	
116	23.65	10.10	10.10	
117	25.05	10.02	10.02	
118	26.54	9.94	9.94	
119	28.12	9.88	9.88	
120	29.79	9.80	9.80	
121	31.55	9.73	9.73	
122	33.43	9.67	9.67	
123	35.41	9.59	9.59	
124	37.51	9.51	9.51	
125	39.74	9.41	9.41	
126	42.10	9.35	9.35	
127	44.60	9.27	9.27	
128	47.24	9.19	9.19	
129	50.05	9.10	9.10	
130	53.02	9.01	9.01	
131	56.16	8.92	8.92	
132	59.49	8.84	8.84	
133	63.02	8.73	8.73	
134	66.76	8.65	8.65	
135	70.72	8.53	8.53	
136	74.91	8.45	8.45	
137	79.35	8.36	8.36	
138	84.06	8.27	8.27	
139	89.05	8.15	8.15	
140	94.33	8.07	8.07	
141	99.92	7.96	7.96	
142	105.84	7.86	7.86	
143	112.12	7.75	7.75	
144	118.77	7.66	7.66	
145	125.81	7.55	7.55	
146	133.27	7.45	7.45	
147	141.17	7.35	7.35	
148	149.54	7.24	7.24	
149	158.40	7.14	7.14	
150	167.79	7.05	7.05	

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-988-7270	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Appendix E, Page 5 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.09.1998

Pumping Test No. Test # 3	Test conducted on: 9-13 to 9-15, 1996
COW96.1; Recovery	COW96.1
Discharge 51.20 U.S.gal/min	Distance from the pumping well 400.00 ft
Static water level: 0.00 ft below datum	Pumping test duration: 3300.00 min

	Time from end of pumping [min]	Water level [ft]	Residual drawdown [ft]	
151	177.74	6.94	6.94	
152	188.27	6.83	6.83	
153	199.44	6.73	6.73	
154	211.26	6.62	6.62	
155	223.78	6.52	6.52	
156	237.04	6.40	6.40	
157	251.09	6.30	6.30	
158	265.96	6.22	6.22	
159	281.74	6.09	6.09	
160	298.44	6.00	6.00	
161	316.13	5.90	5.90	
162	334.87	5.79	5.79	
163	354.71	5.70	5.70	
164	375.73	5.60	5.60	
165	398.00	5.49	5.49	
166	421.59	5.41	5.41	
167	446.58	5.28	5.28	
168	473.04	5.18	5.18	
169	501.08	5.09	5.09	
170	530.78	4.98	4.98	
171	562.23	4.88	4.88	
172	595.55	4.77	4.77	
173	630.85	4.66	4.66	
174	668.23	4.57	4.57	
175	707.83	4.45	4.45	
176	749.78	4.35	4.35	
177	794.22	4.26	4.26	
178	841.28	4.16	4.16	
179	891.14	4.07	4.07	
180	943.95	3.95	3.95	
181	999.88	3.87	3.87	
182	1059.14	3.78	3.78	
183	1119.14	3.68	3.68	
184	1179.14	3.62	3.62	
185	1239.14	3.54	3.54	
186	1299.14	3.44	3.44	
187	1359.14	3.36	3.36	
188	1419.14	3.30	3.30	
189	1479.14	3.22	3.22	
190	1539.14	3.15	3.15	
191	1599.14	3.11	3.11	
192	1659.14	3.04	3.04	
193	1719.14	3.00	3.00	
194	1779.14	2.93	2.93	
195	1839.14	2.88	2.88	
196	1899.14	2.84	2.84	
197	1959.14	2.80	2.80	
198	2019.14	2.74	2.74	
199	2079.14	2.71	2.71	
200	2139.14	2.66	2.66	

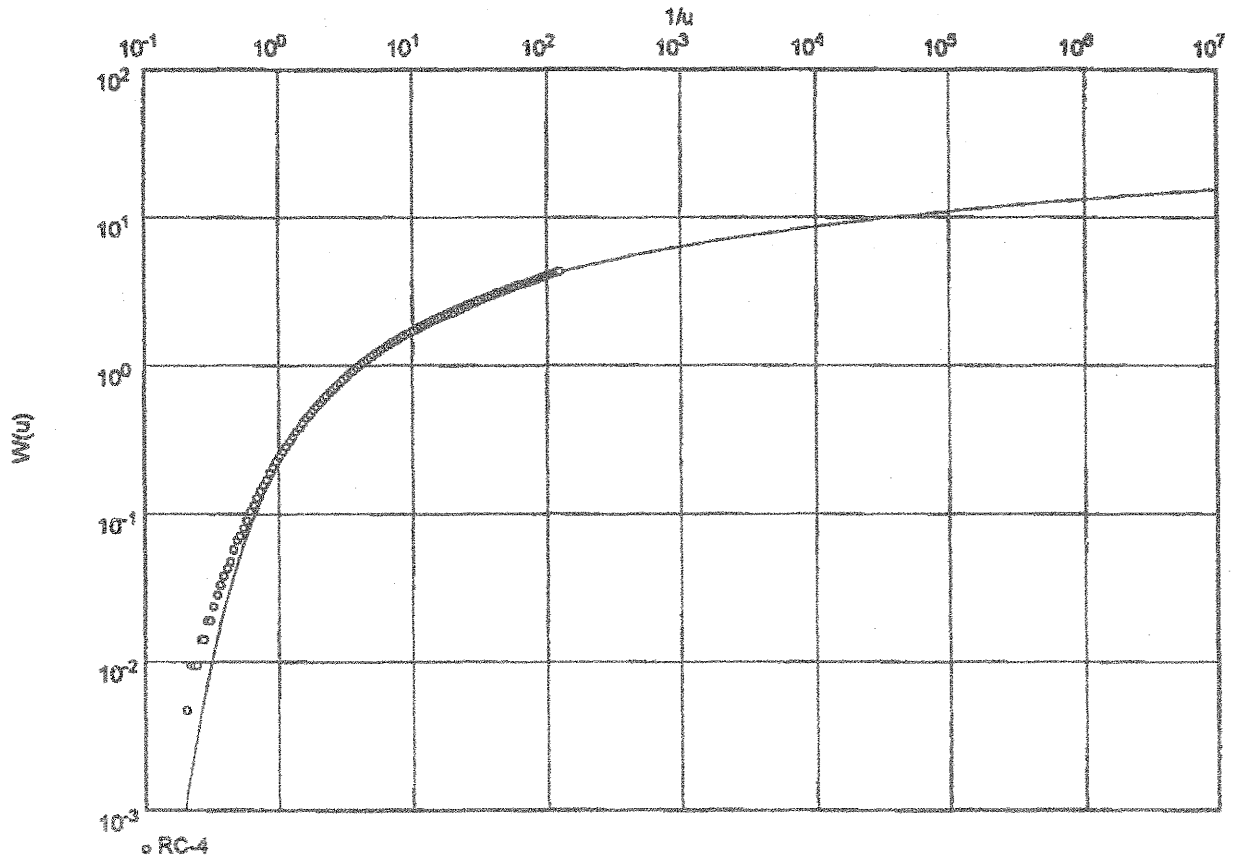
Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-988-7270	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Appendix C Page 6 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.09.1996

Pumping Test No. Test # 3	Test conducted on: 9-13 to 9-15, 1996
COW96.1; Recovery	COW96.1
Discharge 51.20 U.S.gal/min	Distance from the pumping well 400.00 ft
Static water level: 0.00 ft below datum	Pumping test duration: 3300.00 min

	Time from end of pumping [min]	Water level [ft]	Residual drawdown [ft]	
201	2199.14	2.61	2.61	
202	2259.14	2.58	2.58	
203	2319.14	2.53	2.53	
204	2379.14	2.50	2.50	
205	2439.14	2.47	2.47	
206	2499.14	2.44	2.44	
207	2559.14	2.41	2.41	
208	2619.14	2.39	2.39	
209	2679.14	2.34	2.34	

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-988-7270	Pumping test analysis Theis method Confined aquifer	Appendix C Page 1	
		Project: Crow Butte Resources	
		Evaluated by: HPD	Date: 15.09.1996

Pumping Test No. Test 3	Test conducted on: 9-11 to 9-13, 1996
RC-4	
Discharge 51.20 U.S.gal/min	



Transmissivity [ft²/min]: 2.55×10^{-1}

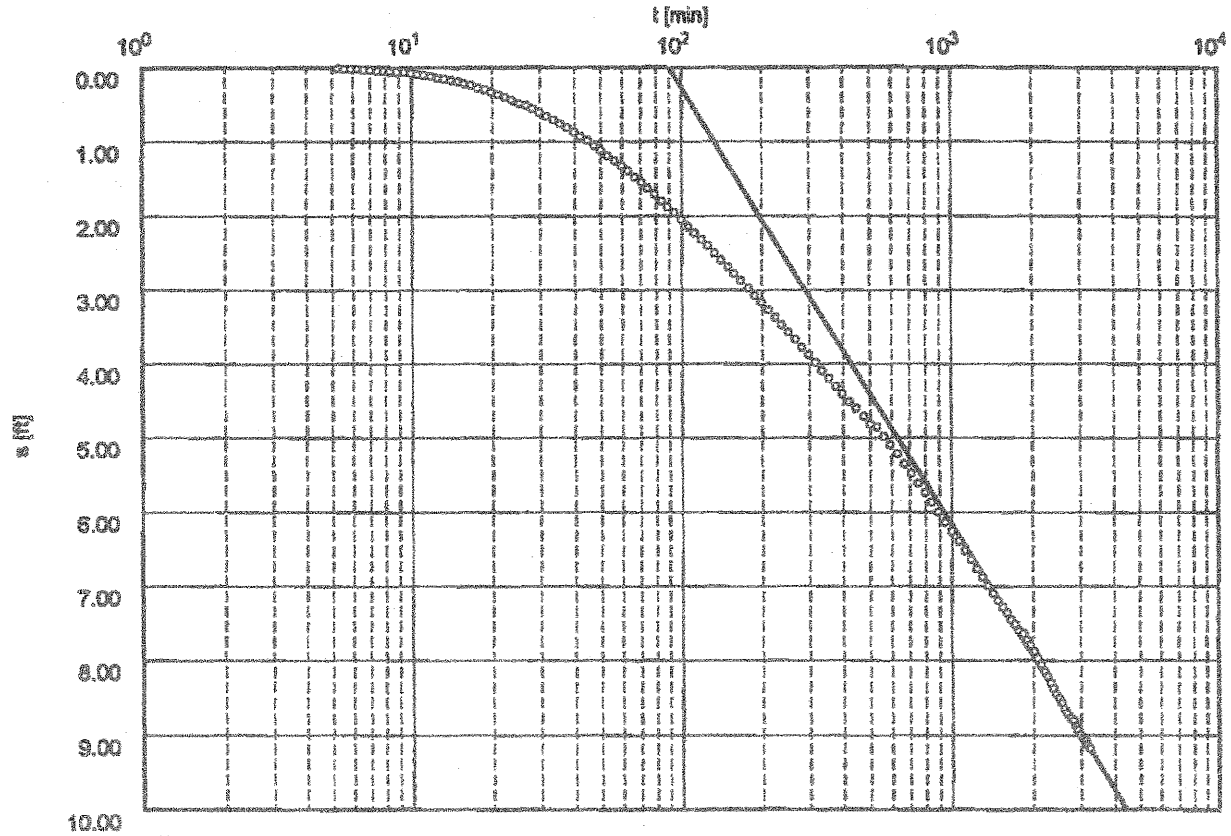
Hydraulic conductivity [ft/min]: 7.99×10^{-3}

Aquifer thickness [ft]: 32.00

Storativity: 5.87×10^{-5}

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-988-7270	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Appendix C, Page 1 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.09.1996

Pumping Test No. Test 3	Test conducted on: 9-11 to 9-13, 1996
RC-4	
Discharge 51.20 U.S.gal/min	



○ RC-4

Transmissivity [ft²/min]: 2.12×10^{-1}

Hydraulic conductivity [ft/min]: 6.62×10^{-3}

Aquifer thickness [ft]: 32.00

Storativity: 9.60×10^{-5}

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-988-7270	Pumping test analysis Theis method Confined aquifer	Appendix CPage 2 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.09.1996

Pumping Test No. Test 3	Test conducted on: 9-11 to 9-13, 1996
RC-4	RC-4
Discharge 51.20 U.S.gal/min	Distance from the pumping well 670.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	
1	5.27	0.01	0.01	
2	5.58	0.02	0.02	
3	5.92	0.02	0.02	
4	6.27	0.02	0.02	
5	6.64	0.03	0.03	
6	7.04	0.03	0.03	
7	7.45	0.04	0.04	
8	7.90	0.04	0.04	
9	8.37	0.05	0.05	
10	8.87	0.06	0.06	
11	9.39	0.07	0.07	
12	9.95	0.08	0.08	
13	10.54	0.09	0.09	
14	11.17	0.10	0.10	
15	11.83	0.12	0.12	
16	12.54	0.14	0.14	
17	13.28	0.15	0.15	
18	14.07	0.17	0.17	
19	14.91	0.19	0.19	
20	15.79	0.22	0.22	
21	16.73	0.24	0.24	
22	17.72	0.27	0.27	
23	18.78	0.30	0.30	
24	19.89	0.33	0.33	
25	21.07	0.36	0.36	
26	22.33	0.40	0.40	
27	23.65	0.44	0.44	
28	25.05	0.48	0.48	
29	26.54	0.52	0.52	
30	28.12	0.56	0.56	
31	29.79	0.61	0.61	
32	31.55	0.66	0.66	
33	33.43	0.71	0.71	
34	35.41	0.76	0.76	
35	37.51	0.81	0.81	
36	39.74	0.87	0.87	
37	42.10	0.93	0.93	
38	44.60	0.99	0.99	
39	47.24	1.06	1.06	
40	50.05	1.12	1.12	
41	53.02	1.19	1.19	
42	56.16	1.26	1.26	
43	59.49	1.33	1.33	
44	63.02	1.40	1.40	
45	66.76	1.48	1.48	
46	70.72	1.55	1.55	
47	74.91	1.63	1.63	
48	79.35	1.71	1.71	
49	84.06	1.80	1.80	
50	89.05	1.88	1.88	

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-988-7270	Pumping test analysis Theis method Confined aquifer	Appendix C Page 3 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.09.1996

Pumping Test No. Test 3	Test conducted on: 9-11 to 9-13, 1996
RC-4	RC-4
Discharge 51.20 U.S.gal/min	Distance from the pumping well 670.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	
51	94.33	1.96	1.96	
52	99.92	2.05	2.05	
53	105.84	2.14	2.14	
54	112.12	2.23	2.23	
55	118.77	2.31	2.31	
56	125.81	2.40	2.40	
57	133.27	2.50	2.50	
58	141.17	2.59	2.59	
59	149.54	2.68	2.68	
60	158.40	2.78	2.78	
61	167.79	2.87	2.87	
62	177.74	2.97	2.97	
63	188.27	3.07	3.07	
64	199.44	3.17	3.17	
65	211.26	3.27	3.27	
66	223.78	3.37	3.37	
67	237.04	3.47	3.47	
68	251.09	3.57	3.57	
69	265.98	3.67	3.67	
70	281.74	3.78	3.78	
71	298.44	3.88	3.88	
72	316.13	3.98	3.98	
73	334.87	4.09	4.09	
74	354.71	4.19	4.19	
75	375.73	4.30	4.30	
76	398.00	4.40	4.40	
77	421.59	4.51	4.51	
78	446.58	4.60	4.60	
79	473.04	4.71	4.71	
80	501.08	4.82	4.82	
81	530.78	4.85	4.85	
82	562.23	4.98	4.98	
83	595.55	5.10	5.10	
84	630.85	5.22	5.22	
85	668.23	5.35	5.35	
86	707.83	5.48	5.48	
87	749.76	5.61	5.61	
88	794.22	5.74	5.74	
89	841.28	5.87	5.87	
90	891.14	6.00	6.00	
91	943.95	6.14	6.14	
92	999.88	6.27	6.27	
93	1059.14	6.40	6.40	
94	1119.14	6.53	6.53	
95	1179.14	6.65	6.65	
96	1239.14	6.77	6.77	
97	1299.14	6.88	6.88	
98	1359.14	6.99	6.99	
99	1419.14	7.10	7.10	
100	1479.14	7.20	7.20	

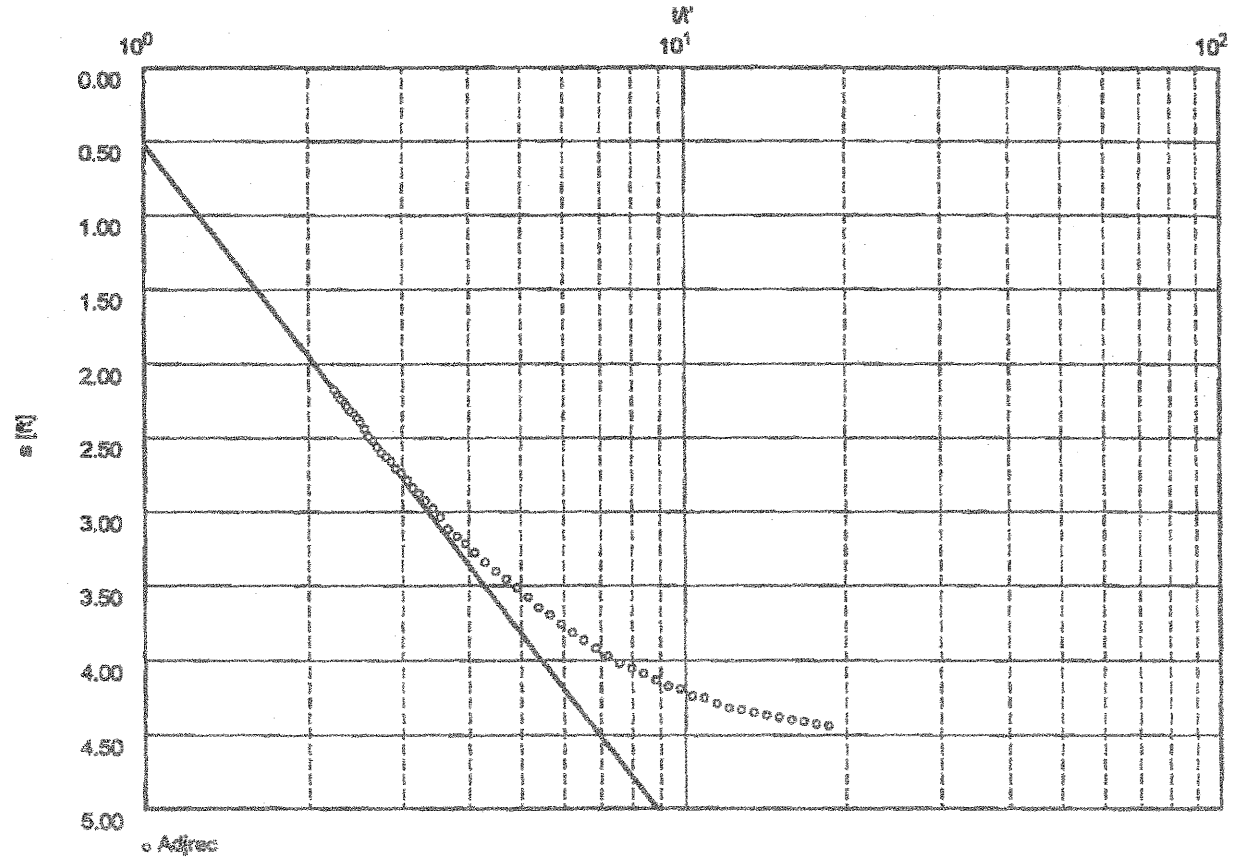
Harlan & Associates, Inc. 3600 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-988-7270	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Appendix E, Page 2 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.09.1996

Pumping Test No. Test # 3	Test conducted on: 9-13 to 9-15, 1996
A62/251	Adjrec
Discharge 51.20 U.S.gal/min	Distance from the pumping well 1987.00 ft
Static water level: 0.00 ft below datum	Pumping test duration: 3300.00 min

	Time from end of pumping [min]	Water level [ft]	Residual drawdown [ft]	
1	186.27	4.44	4.44	
2	199.43	4.43	4.43	
3	211.26	4.41	4.41	
4	223.78	4.40	4.40	
5	237.04	4.38	4.38	
6	251.09	4.37	4.37	
7	265.98	4.35	4.35	
8	281.74	4.33	4.33	
9	298.44	4.32	4.32	
10	316.13	4.29	4.29	
11	334.86	4.25	4.25	
12	354.71	4.24	4.24	
13	375.73	4.19	4.19	
14	398.00	4.17	4.17	
15	421.59	4.13	4.13	
16	446.58	4.09	4.09	
17	473.04	4.05	4.05	
18	501.08	4.02	4.02	
19	530.78	3.97	3.97	
20	562.23	3.92	3.92	
21	595.55	3.87	3.87	
22	630.85	3.82	3.82	
23	668.23	3.76	3.76	
24	707.83	3.70	3.70	
25	749.78	3.65	3.65	
26	794.22	3.58	3.58	
27	841.28	3.52	3.52	
28	891.14	3.46	3.46	
29	943.95	3.41	3.41	
30	999.88	3.35	3.35	
31	1059.14	3.28	3.28	
32	1119.14	3.22	3.22	
33	1179.14	3.17	3.17	
34	1239.14	3.12	3.12	
35	1299.14	3.04	3.04	
36	1359.14	2.98	2.98	
37	1419.14	2.93	2.93	
38	1479.14	2.88	2.88	
39	1539.14	2.84	2.84	
40	1599.14	2.79	2.79	
41	1659.14	2.74	2.74	
42	1719.14	2.71	2.71	
43	1779.14	2.66	2.66	
44	1839.14	2.63	2.63	
45	1899.14	2.60	2.60	
46	1959.14	2.56	2.56	
47	2019.14	2.52	2.52	
48	2079.14	2.49	2.49	
49	2139.14	2.44	2.44	
50	2199.14	2.39	2.39	

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-986-7270	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Appendix E, Page 1 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.08.1996

Pumping Test No. Test # 3	Test conducted on: 9-13 to 9-15, 1996
A62/251 Recovery	
Discharge 51.20 U.S.gal/min	
	Pumping test duration: 3300.00 min



Transmissivity [ft²/min]: 2.65×10^{-1}

Hydraulic conductivity [ft/min]: 7.59×10^{-3}

Aquifer thickness [ft]: 35.00

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-988-7270	Pumping test analysis Theis method Confined aquifer	Appendix C Page 2 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.09.1996

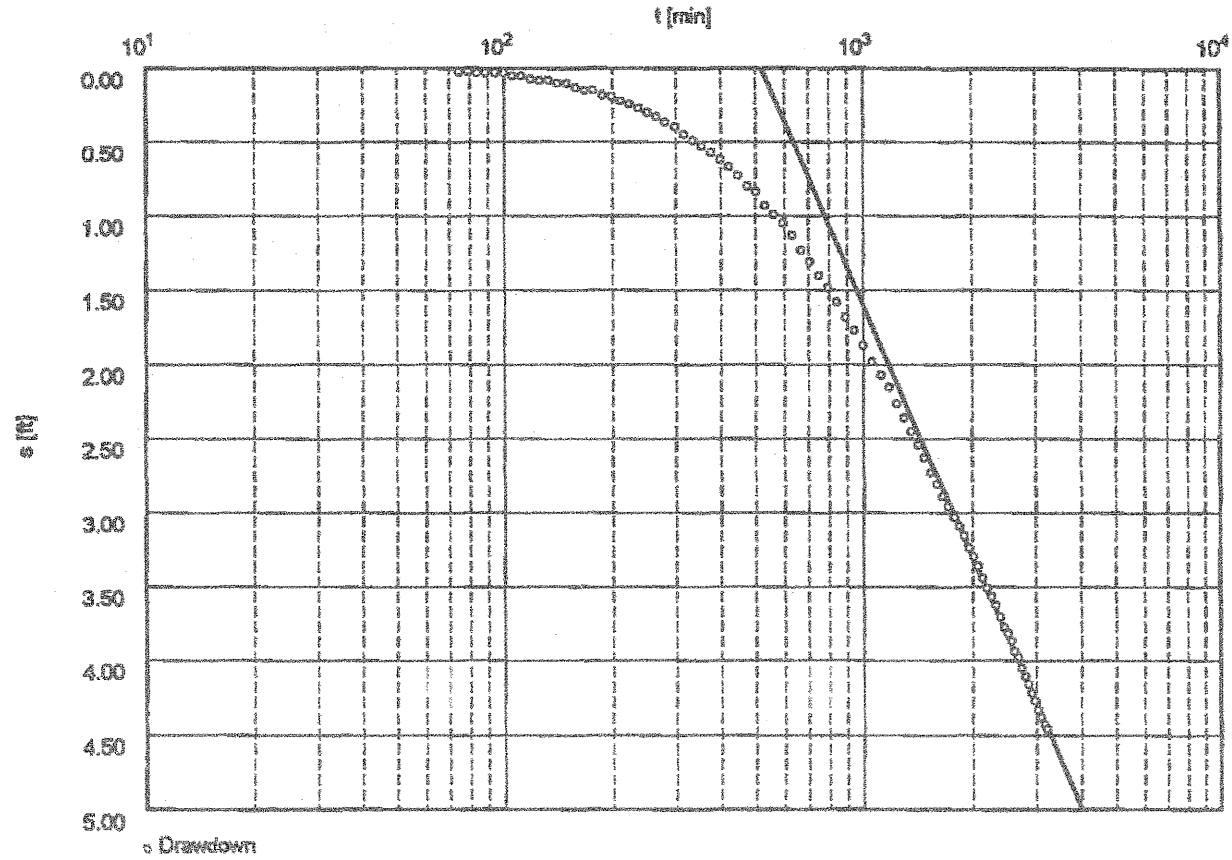
Pumping Test No. Test 3	Test conducted on: 9-11 to 9-13, 1996
A251/62	Drawdown
Discharge 51.20 U.S.gal/min	Distance from the pumping well 1987.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	
1	74.91	0.02	0.02	
2	79.35	0.02	0.02	
3	84.06	0.03	0.03	
4	89.05	0.03	0.03	
5	94.33	0.03	0.03	
6	99.92	0.03	0.03	
7	105.84	0.05	0.05	
8	112.12	0.05	0.05	
9	118.77	0.07	0.07	
10	125.81	0.08	0.08	
11	133.27	0.08	0.08	
12	141.17	0.10	0.10	
13	149.54	0.10	0.10	
14	158.40	0.13	0.13	
15	167.79	0.15	0.15	
16	177.74	0.15	0.15	
17	188.27	0.18	0.18	
18	199.44	0.19	0.19	
19	211.26	0.22	0.22	
20	223.78	0.24	0.24	
21	237.04	0.27	0.27	
22	251.09	0.30	0.30	
23	265.98	0.33	0.33	
24	281.74	0.37	0.37	
25	298.44	0.40	0.40	
26	316.13	0.45	0.45	
27	334.87	0.49	0.49	
28	354.71	0.53	0.53	
29	375.73	0.57	0.57	
30	398.00	0.62	0.62	
31	421.59	0.67	0.67	
32	446.58	0.73	0.73	
33	473.04	0.80	0.80	
34	501.08	0.84	0.84	
35	530.78	0.93	0.93	
36	562.23	0.99	0.99	
37	595.55	1.05	1.05	
38	630.85	1.13	1.13	
39	668.23	1.23	1.23	
40	707.83	1.31	1.31	
41	749.78	1.40	1.40	
42	794.22	1.48	1.48	
43	841.26	1.58	1.58	
44	891.14	1.68	1.68	
45	943.95	1.77	1.77	
46	999.88	1.87	1.87	
47	1059.14	1.98	1.98	
48	1119.14	2.07	2.07	
49	1179.14	2.15	2.15	
50	1239.14	2.26	2.26	

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-988-7270	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Appendix C Page 1 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.09.1996

Pumping Test No. Test 3	Test conducted on: 9-11 to 9-13, 1996
A251/62	
Discharge 51.20 U.S.gal/min	



Transmissivity [ft²/min]: 2.22×10^{-1}

Hydraulic conductivity [ft/min]: 6.36×10^{-3}

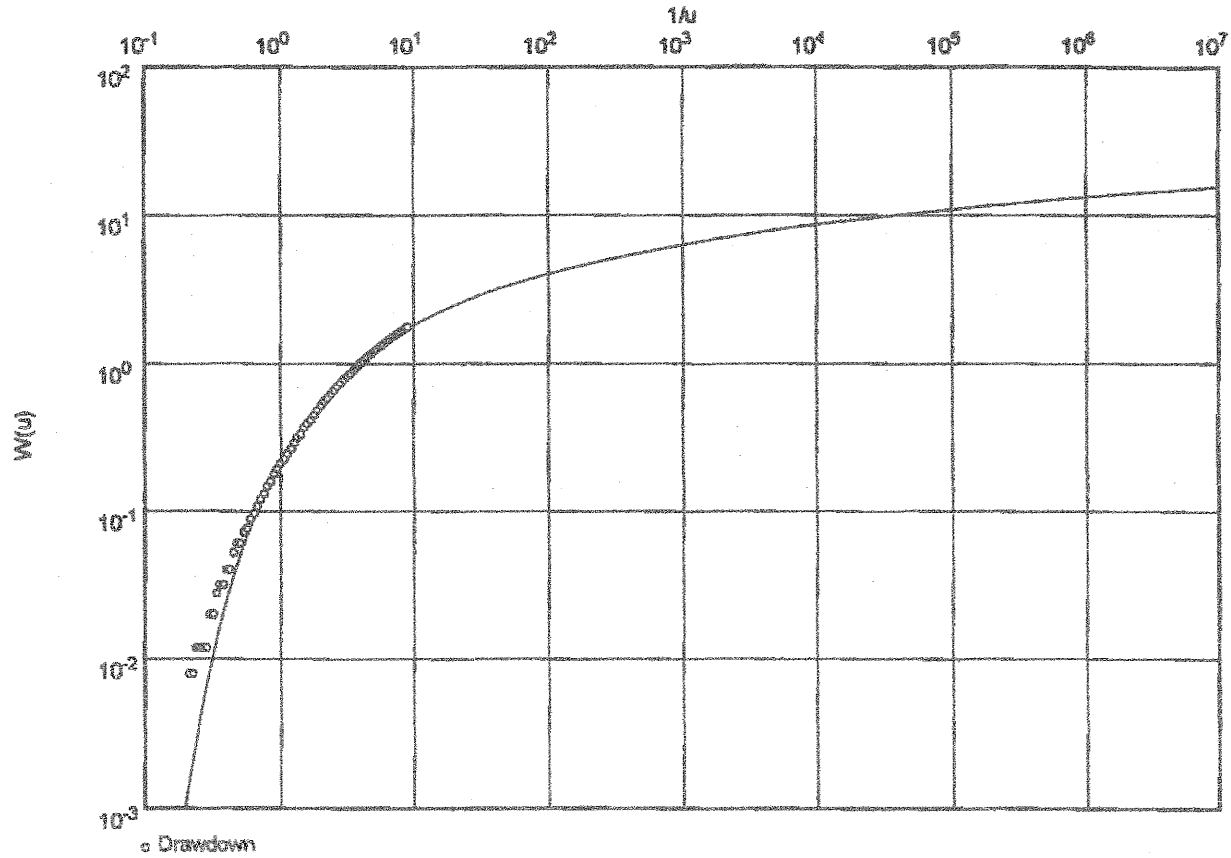
Aquifer thickness [ft]: 35.00

Storativity: 6.59×10^{-5}

Note: The 'u' assumption is not satisfied.

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-988-7278	Pumping test analysis Theis method Confined aquifer	Appendix CPage 1 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.09.1996

Pumping Test No. Test 3	Test conducted on: 9-11 to 9-13, 1996
A251/62	
Discharge 51.20 U.S.gal/min	



Transmissivity [ft²/min]: 2.16×10^{-1}

Hydraulic conductivity [ft/min]: 6.19×10^{-3}

Aquifer thickness [ft]: 35.00

Storativity: 7.73×10^{-5}

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-986-7270	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Appendix E; Page 4 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.09.1996

Pumping Test No. Test # 3	Test conducted on: 9-13 to 9-15, 1996
RC-4; Recovery	RC-4
Discharge 51.20 U.S.gal/min	Distance from the pumping well 670.00 ft
Static water level: 0.00 ft below datum	Pumping test duration: 3300.00 min

	Time from end of pumping [min]	Water level [ft]	Residual drawdown [ft]	
101	2199.14	2.39	2.39	
102	2259.14	2.35	2.35	
103	2319.14	2.31	2.31	
104	2379.14	2.28	2.28	
105	2439.14	2.25	2.25	
106	2499.14	2.22	2.22	
107	2559.14	2.19	2.19	
108	2619.14	2.17	2.17	
109	2679.14	2.13	2.13	

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-988-7270	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Appendix E, Page 3 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.09.1996

Pumping Test No. Test # 3	Test conducted on: 9-13 to 9-15, 1996
RC-4; Recovery	RC-4
Discharge 51.20 U.S.gal/min	Distance from the pumping well 670.00 ft
Static water level: 0.00 ft below datum	Pumping test duration: 3300.00 min

	Time from end of pumping [min]	Water level [ft]	Residual drawdown [ft]	
51	177.74	6.42	6.42	
52	186.27	6.32	6.32	
53	199.44	6.23	6.23	
54	211.26	6.15	6.15	
55	223.78	6.04	6.04	
56	237.04	5.96	5.96	
57	251.09	5.86	5.86	
58	265.98	5.77	5.77	
59	281.74	5.68	5.68	
60	298.44	5.57	5.57	
61	316.13	5.48	5.48	
62	334.87	5.39	5.39	
63	354.71	5.30	5.30	
64	375.73	5.20	5.20	
65	398.00	5.11	5.11	
66	421.59	5.02	5.02	
67	446.58	4.92	4.92	
68	473.04	4.82	4.82	
69	501.08	4.72	4.72	
70	530.78	4.64	4.64	
71	562.23	4.54	4.54	
72	595.55	4.44	4.44	
73	630.85	4.34	4.34	
74	668.23	4.25	4.25	
75	707.83	4.15	4.15	
76	749.78	4.05	4.05	
77	794.22	3.96	3.96	
78	841.28	3.86	3.86	
79	891.14	3.77	3.77	
80	943.95	3.68	3.68	
81	999.88	3.59	3.59	
82	1059.14	3.50	3.50	
83	1119.14	3.42	3.42	
84	1179.14	3.34	3.34	
85	1239.14	3.26	3.26	
86	1299.14	3.19	3.19	
87	1359.14	3.11	3.11	
88	1419.14	3.04	3.04	
89	1479.14	2.97	2.97	
90	1539.14	2.91	2.91	
91	1599.14	2.85	2.85	
92	1659.14	2.81	2.81	
93	1719.14	2.75	2.75	
94	1779.14	2.71	2.71	
95	1839.14	2.66	2.66	
96	1899.14	2.61	2.61	
97	1959.14	2.57	2.57	
98	2019.14	2.52	2.52	
99	2079.14	2.48	2.48	
100	2139.14	2.44	2.44	

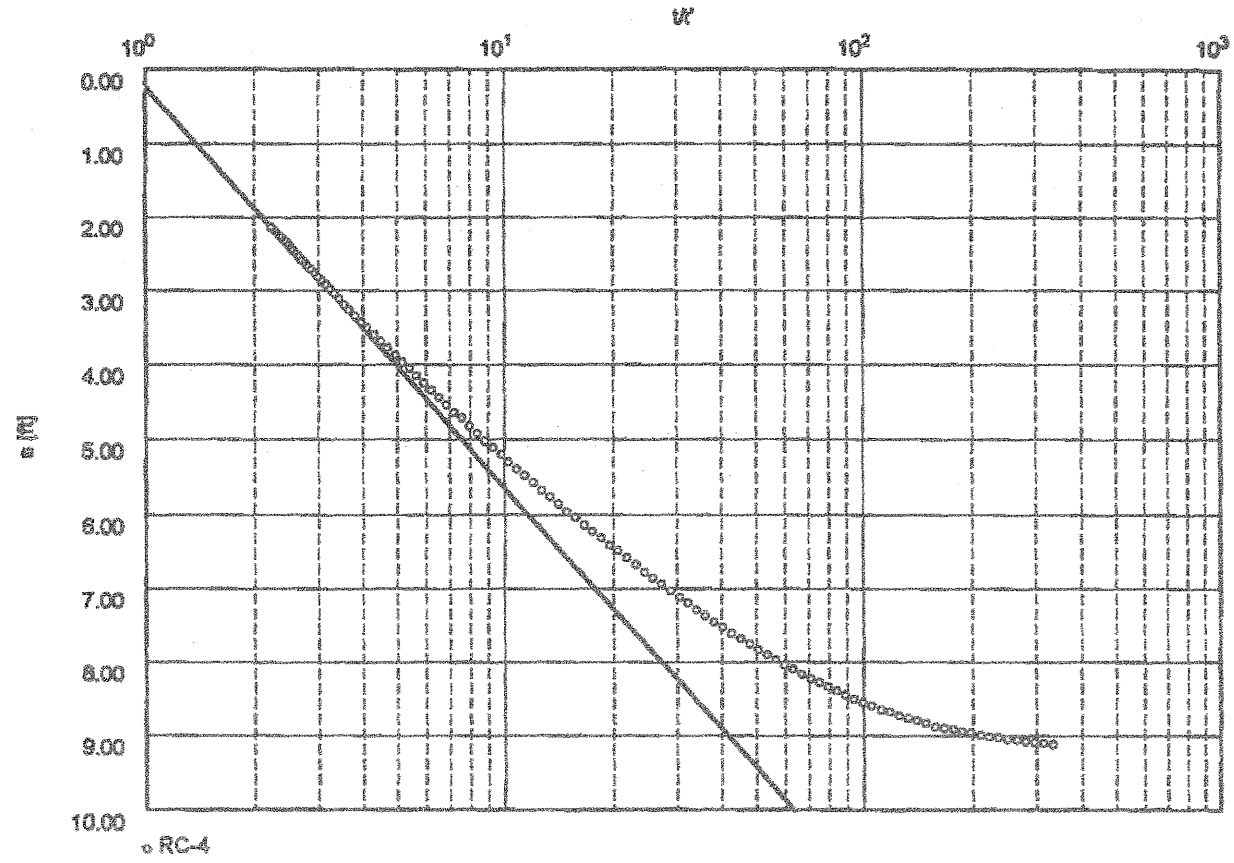
Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-988-7270	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Appendix C Page 2 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.09.1996

Pumping Test No. Test # 3	Test conducted on: 9-13 to 9-15, 1996
RC-4; Recovery	RC-4
Discharge 51.20 U.S.gal/min	Distance from the pumping well 670.00 ft
Static water level: 0.00 ft below datum	Pumping test duration: 3300.00 min

	Time from end of pumping [min]	Water level [ft]	Residual drawdown [ft]	
1	9.95	9.12	9.12	
2	10.54	9.10	9.10	
3	11.17	9.09	9.09	
4	11.83	9.08	9.08	
5	12.54	9.06	9.06	
6	13.28	9.05	9.05	
7	14.07	9.03	9.03	
8	14.91	9.02	9.02	
9	15.79	8.99	8.99	
10	16.73	8.96	8.96	
11	17.72	8.95	8.95	
12	18.78	8.92	8.92	
13	19.89	8.90	8.90	
14	21.07	8.88	8.88	
15	22.33	8.83	8.83	
16	23.65	8.80	8.80	
17	25.05	8.76	8.76	
18	26.54	8.73	8.73	
19	28.12	8.68	8.68	
20	29.79	8.65	8.65	
21	31.55	8.60	8.60	
22	33.43	8.56	8.56	
23	35.41	8.51	8.51	
24	37.51	8.45	8.45	
25	39.74	8.40	8.40	
26	42.10	8.34	8.34	
27	44.60	8.28	8.28	
28	47.24	8.23	8.23	
29	50.05	8.17	8.17	
30	53.02	8.10	8.10	
31	56.16	8.04	8.04	
32	59.49	7.97	7.97	
33	63.02	7.90	7.90	
34	66.76	7.83	7.83	
35	70.72	7.76	7.76	
36	74.91	7.69	7.69	
37	79.35	7.61	7.61	
38	84.06	7.53	7.53	
39	89.05	7.46	7.46	
40	94.33	7.37	7.37	
41	99.92	7.29	7.29	
42	105.84	7.20	7.20	
43	112.12	7.12	7.12	
44	118.77	7.04	7.04	
45	125.81	6.94	6.94	
46	133.27	6.86	6.86	
47	141.17	6.78	6.78	
48	149.54	6.68	6.68	
49	158.40	6.59	6.59	
50	167.79	6.49	6.49	

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-986-7279	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Appendix E, Page 1 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.09.1996

Pumping Test No. Test # 3	Test conducted on: 9-13 to 9-15, 1996
RC-4; Recovery	
Discharge 51.20 U.S.gal/min	
	Pumping test duration: 3300.00 min



Transmissivity [ft²/min]: 2.31×10^{-1}

Hydraulic conductivity [ft/min]: 7.23×10^{-3}

Aquifer thickness [ft]: 32.00

Harlan & Associates, Inc. 3900 S. Wadsworth Blvd. Suite 155 Lakewood, CO 80235 303-969-7270	Pumping test analysis Theis method Confined aquifer	Appendix C Page 4 Project: Crow Butte Resources Evaluated by: HPD | Date: 15.09.1996

Pumping Test No. Test 3	Test conducted on: 9-11 to 9-13, 1996
RC-4	RC-4
Discharge 51.20 U.S.gal/min	Distance from the pumping well 670.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	
101	1539.14	7.29	7.29	
102	1599.14	7.37	7.37	
103	1659.14	7.46	7.46	
104	1719.14	7.53	7.53	
105	1779.14	7.61	7.61	
106	1839.14	7.65	7.65	
107	1899.14	7.73	7.73	
108	1959.14	7.80	7.80	
109	2019.14	7.88	7.88	
110	2079.14	7.98	7.98	
111	2139.14	8.06	8.06	
112	2199.14	8.15	8.15	
113	2259.14	8.22	8.22	
114	2319.14	8.31	8.31	
115	2379.14	8.38	8.38	
116	2439.14	8.45	8.45	
117	2499.14	8.51	8.51	
118	2559.14	8.57	8.57	
119	2619.14	8.65	8.65	
120	2679.14	8.71	8.71	
121	2739.14	8.77	8.77	
122	2799.14	8.81	8.81	
123	2859.14	8.89	8.88	
124	2919.14	8.93	8.93	
125	2979.14	8.99	8.99	
126	3039.14	9.04	9.04	
127	3099.14	9.08	9.08	
128	3159.14	9.13	9.13	
129	3219.14	9.17	9.17	