SPARTON

SPARTON TECHNOLOGY

December 6, 1988

HLA Job No. 6310,039.12

U.S. EPA Region VI
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202

Attention: Mr. Guy Tidmore

Reference: Monthly Report
Sparton Technology, Inc.

Dear Mr. Tidmore:

This is the monthly progress report for Sparton Technology, Inc.'s Coors Road Facility located in Albuquerque, New Mexico, as required in Section IV.C of the Consent Order. This report summarizes activities during the month of November 1988.

1) In accordance with Section IV.A.2 of the Consent Order, Sparton submitted the Task I report for the CAP/RFI on November 29, 1988.

2) Sparton has completed the installation of the recovery well network required in Section IV.A.1(a). We are proceeding with system tests to evaluate the mechanical and operational viability of the system.

3) In accordance with Section IV.A.1.(a).ii) of the Consent Order, Metric Corporation has completed a report titled "Aquifier Testing at the Sparton Technology, Inc. Coors Road Plant." A copy of this report is included in Attachment 1.

4) Harding Lawson Associates (HLA) has submitted a report titled "Installation of Additional Upper Flow Zone Recovery Wells and Upper and Lower Flow Zone Monitoring Wells." A copy of this report is included in Attachment 2.

5) In accordance with Section IV.E of the Consent Order, Sparton submitted a summary and analysis of their financial assurance instruments on November 23, 1988.

Sparton Technology, Inc. ☐ 4901 Rockaway Blvd., SE ☐ Rio Rancho, NM 87124 ☐ P.O. Box 1784 ☐ Albuquerque, NM 87103 ☐ (505) 892-5300 ☐ TWX 910-989-1657

6) We have received the permit from the City of Albuquerque to install monitor wells in the right-of-way along Irving Boulevard

7) On November 7, we received approval to discharge pump test water from the groundwater treatment system to the Albuquerque city sewer system.

8) On November 21, we received approval from the New Mexico State Engineer's office to test and operate the recovery wells.

This concludes our progress report for the month of November 1988. If you have any questions, please contact the undersigned.

Sincerely,

SPARTON TECHNOLOGY, INC.

Richard D. Mico
Vice President and General Manager

RDM/td

cc: Hazardous Waste Bureau
NM EID, Santa Fe, NM

B. Thompson
J. DeWitt
J. Mabrey
G. Richardson
V. Samala

OGC-002914

ATTACHMENT 1

RECEIVED
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HAZARDOUS WASTE SECTION

METRIC
Corporation

AQUIFER TESTING
AT THE
SPARTON TECHNOLOGY, INC.
COORS ROAD PLANT
ALBUQUERQUE, NEW MEXICO

PREPARED BY

METRIC CORPORATION
ALBUQUERQUE, NEW MEXICO

NOVEMBER 18, 1988

OGC-002916

AQUIFER TESTING
AT THE
SPARTON TECHNOLOGY, INC.
COORS ROAD PLANT
ALBUQUERQUE, NEW EMXICO

PREPARED BY

METRIC CORPORATON
ALBUQUERQUE, NEW MEXICO

NOVEMBER 18, 1988

T A B L E   O F   C O N T E N T S

L I S T   O F   T A B L E S

TABLE 1 - JACOB VALIDATION

TABLE 2 - CASING STORAGE EFFECT

TABLE 3 - AQUIFER TESTING - SPARTON TECHNOLOGY, INC., COORS ROAD PLANT

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L I S T   O F   A P P E N D I C E S

APPENDIX A - PUMP TEST DATA

APPENDIX B - SEMI-LOG PLOTS

AQUIFER TESTING
AT THE
SPARTON TECHNOLOGY, INC.
COORS ROAD PLANT

Aquifer tests were performed in four groundwater recovery wells at the Sparton Technology, Inc., Coors Road Plant during September and October 1988. The purpose of the testing was to estimate well capacity and further define aquifer permeability of the "upper flow zone". The well capacities were used to develope estimates of the total capacity of the groundwater recovery system for equipment sizing and water rights requirements. The "upper flow zone" consists generally of the upper 5 to 10 feet of the saturated zone at the Coors Road site separated from the remainder of the saturated zone by a fine grained aquitard unit.

Pumping tests were conducted in four wells, MW-23 and MW-26 located along the south side of the plant building, MW-27 located along the west side of the plant building and MW-28 located at the west property corner. Each of the four wells are included in the groundwater recovery system.

The tests were conducted as follows:

Well: MW-23
Test Type: Constant Discharge
Test Drawdown: 2.5 ft.
Available Drawdown: 7.7 ft.
Duration of Pumping: 72.0 hrs.
Average Discharge: 0.26gpm
Observations Taken in Wells: MW-23

Well: MW-26
Test Type: Constant Discharge
Test Drawdown: 2.5 ft.
Available Drawdown: 13.4 ft.
Duration of Pumping: 71.1 hrs.
Average Discharge: 0.019gpm
Observations Taken in Wells: MW-26

Well: MW-27
Test Type: Constant Discharge
Test Drawdown: 2.2 ft.
Available Drawdown: 8.0 ft.
Duration of Pumping: 70.0 hrs.
Average Discharge: 0.117gpm
Observations Taken In Wells: MW-27

Well: MW-28
Test Type: Constant Discharge
Test Drawdown: 2.67 ft.
Available Drawdown: 4.1 ft.
Duration of Pumping: 72.0 hrs.
Average Discharge: 0.0705gpm
Observations Taken in Wells: MW-28

Each of the pumped wells are 2-inch, i.d. PVC wells with wire-wound stainless steel screens. The wells were installed in 7-inch diameter hollow stem auguer borings. They were pumped with a 1.66-inch o.d. positive displacement piston pump having a maximum discharge of about 2.5gpm. Water levels in the pumped wells were monitored with an airline and a water monometer. All water level measurements were taken to the nearest 0.01 feet. Discharge measurements were made with a graduated cylinder and stop watch.

The water level and discharge data collected during each test are presented in APPENDIX A. The data were analyzed using semi-log plots of time-duration and residual drawdown data (see APPENDIX B).

The time-drawdown data were checked using a procedure suggested by Johnson, 1972 to ensure that $u<0.05$ and, thus, validate the use of the Jacob solution. In the equation $u = \frac{1,87r^2S}{Tt}$, u was set equal to 0.05, and the time, t, was determined after which the Jacob solution is valid. The effective radii of the wells were assumed to be 0.29 ft. because the wells were installed in

7-inch (0.58 ft.) diameter boreholes. TABLE 1 shows that all but the early data are valid. The selected hydraulic conductivities were all determined from data for which the Jacob solution is valid.

The data were also checked using a procedure suggested by Schafer, 1978 to determine which portion of the data might be casing storage affected. The early portion of the time-drawdown data is casing storage affected in each case as shown in TABLE 2.

For determination of aquifer permeability, the residual draw data were used rather than the time-drawdown data because the time-drawdown was affected by fluctuations in the pump discharge and because the residual drawdown data is generally considered to be more reliable when only pumped well data are available as is the case here. Additionally, the middle or late residual drawdown data were used because the early data appears to be casing storage affected.

Based on the above described testing, it is the opinion of the investigators that the best estimate for the permeability (hydraulic conductivity) of the upper flow zone in the vicinity of each of the wells tested is as follows (see TABLE 3):

Well	Hydraulic Conductivity (cm/sec)
MW-23	8.54×10^{-4}
MW-26	3.91×10^{-5}
MW-27	9.08×10^{-4}
MW-28	1.07×10^{-3}

TABLE 1

JACOB VALIDATION

Well	r (ft)	T (gpd/ft)	t days	t min.
MW-23	0.29	139	0.0045	6.52
MW-26	0.29	11.1	0.057	81.6
MW-27	0.29	154	0.0041	5.88
MW-28	0.29	93.1	0.0068	9.73

$$t = \frac{1.87\ r^2\ S}{uT} = \frac{1.87\ (.29)^2\ (.2)}{0.05(T)}$$

S = 0.20

u = 0.05

TABLE 2

CASING STORAGE AFFECT

Well	Q (gpm)	S (ft)	Q/S (gpm/ft)	tc (min)
MW-23	0.264	2.2	0.12	7.6
MW-26	0.019	2.3	0.0082	112
MW-27	0.117	3.0	0.0390	23.5
MW-28	0.0705	1.1	0.0641	14.3

$d_c = 2.07$

$d_p = 1.66$

$$tc = \frac{0.6\ (dc^2 - dp^2)}{Q/S} = \frac{0.6\ (2.07^2 - 1.66^2)}{Q/S}$$

$$= \frac{0.9176}{Q/S}$$

TABLE 3

AQUIFER TESTING
SPARTON TECHNOLOGY, INC. COORS ROAD PLANT

Pumped Well	Observations At	Curve	Apparent T (gpd/ft)	b (ft)	Hydraulic Conductivity ft/day	Hydraulic Conductivity cm/sec	Comments
MW-23	MW-23	Early T-D	33.0				Casing storage affected
		Late T-D	456				
		Early R-D	45.0				Casing storage affected
		Late R-D	139	7.7	2.42	8.54×10^{-4}	Selected
MW-26	MW-26	Early T-D	1.58				Casing storage affected*
		Late T-D	24.9				
		Early R-D	2.94				Casing storage affected
		Late R-D	11.1	13.4	0.11	3.91×10^{-5}	Selected
MW-27	MW-27	Early R-D	27.3				
		Late R-D	154	8.0	2.57	9.08×10^{-4}	Selected
MW-28	MW-28	Early T-D	18.1				Casing storage affected
		Middle T-D	62.0				
		Late T-D	19.6				Impermeable boundary
		Early R-D	27.8				Casing storage affected
		Middle R-D	93.1	4.1	3.04	1.07×10^{-3}	Selected
		Late R-D	12.0				Impermeable boundary

* Jacob Solution Not Valid

The residual-drawdown curves (APPENDIX B) for MW-23, MW-26, MW-27, and to a lesser extent MW-28, show evidence that a "recharge effect" may be occurring during the pumping period. The residual drawdown curves show a t/t' value greater than 2 at zero drawdown, suggesting a "recharge effect". Possible explanations of the apparent "recharge effect" include reduction or reversal of prevailing downward vertical leakage in the cone of depression during the test or induced flow from a more permeable burried channel(s) existing within the upper flow zone.

Estimated well capacities have been computed for each of the wells included in the groundwater recovery system (see TABLE 4). The capacities were computed based on specific capacities observed in testing to date (see METRIC Corp., April 1987 and May 1988) and assuming 100% drawdown. This would tend to yield conservatively high values, however, MW-24 has undergone additional development since it was tested. This might increase its capacity beyond that shown in TABLE 4.

TABLE 4

ESTIMATED WELL CAPACITIES

Well #	Pumping Time (hrs)	Drawdown (ft)	Discharge (gpm)	Specific Capacity (gpm/ft)	Available Drawdown (ft)	Estimated Capacity (gpm)
18	49.0	5.02	0.264	0.0526	12.6	0.66
23	72.0	2.47	0.260	0.1054	7.65	0.81
24	73.2	3.26	0.205	0.0629	8.1	0.51
25	68.8	3.0	0.317	0.106	7.3	0.77
26	71.1	2.53	0.019	0.008	13.4	0.10
27	70.0	2.21	0.117	0.053	8.0	0.42
28	72.0	2.67	0.070	0.026	4.1	0.11
PW-1	69.6	2.12	0.13	0.06	4.3	0.26
					Total	3.64

OGC-002926

BIBLIOGRAPHY

Johnson Division, Universal Oil Products Co., 1972, Ground Water and Wells.

METRIC Corporation April 1987, Aquifer Testing at Sparton Technology, Inc., Coors Road Plant.

METRIC Corporation, May 1981, Aquifer Testing at Sparton Technology, Inc., Coors Road Plant.

Schafer, David C., 1978, Casing Storage Can Affect Pump Testing Data, The Johnson Drillers Journal.

APPENDIX A
PUMP TEST DATA

Date: 9-27-88

METRIC Corporation

Pumped Well MW-23

Measurements at Well MW-23

Pump Speed: ________ Q: 0.26417 gpm

Static Water Level ________

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min.sec/ℓ)
9-27	8:15:00	0			0	
	15	.25			0.60	
	30	.5			0.59	
	45	.75			0.56	
	16:00	1.0			0.11	
	16:30	1.5			0.42	
	17:00	2.0			0.60	
	17:30	2.5			0.56	
	18:00	3.0			0.66	
	18:30	3.5			0.97	
	19:00	4.0			0.41	
	19:30	4.5			-	
	20:00	5.0			0.86	
	21	6			1.88	
	22	7			2.06	
	23	8			2.45	
	24	9			2.16	
	25	10			2.26	
	27	12			2.37	1'09"/ℓ
	29	14			2.43	
	31	16			2.42	
	33	18			2.19	
	35	20			1.93	1'09"/ℓ
	40	25			2.06	1'07"/ℓ
	45	30			2.08	1'07"/ℓ
	50	35			2.11	1'00"/ℓ
	9:00	45			2.41	1'00"/ℓ
	9:30	75			2.43	55"/ℓ
	10:00	105			2.31	1'09"
	10:30	135			2.16	1'05"

Date: 9-27-88

METRIC Corporation

Pumped Well MW-23

Measurements at Well MW-23

Pump Speed: ______ Q: ______ gpm

Static Water Level ______

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min·sec/ℓ)
7	11:00	165			2.75	1'0"
	12:00	225			2.75	47" adj 56"
	13:00	285			2.86	59" 58"
	14:00	345			3.00	49" adj
	15:00	405			3.01	49" adj
	16:00	465			2.89	59"
	17:00	525			2.51	1'3"
	18:00	585			2.52	1'5"
	19:00	645			2.46	1'16" adj 1'00"
	20:00	705			2.51	1'01"
	21:00	765			2.66	1'01"
	22:00	825			2.55	0'59"
	23:00	885			2.39	1'02"
	24:00	945			2.47	1'05"
8	1:00	1005			2.45	1'06"
	2:00	1065			2.46	1'05"
	3:00	1125			2.36	1'05"
	4:00	1185			2.42	1'03"
	5:00	1245			2.39	1'02"
	6:00	1305			2.44	1'01"
	7:00	1365			2.44	1'4"
	8:00	1425			2.54	1'6" adj
	9:00	1485			2.60	57"
	10:00	1545			2.58	55" adj
	11:00	1605			2.57	56" adj
	12:00	1665			2.66	1'0"
	13:00	1725			2.66	58"
	14:00	1785			2.70	55" adj
	15:00	1845			2.62	55" adj
	16:00	1905			2.63	55" adj

Date: 9-27-88

METRIC Corporation

Pumped Well MW-23

Measurements at Well MW-23

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min·sec/ℓ)
9-28	17:00	1965			2.51	60"
	18:00	2025			2.80	1'6" adj
	19:00	2085			2.37	1'01"
	20:00	2145			2.58	1'02"
	21:00	2205			2.51	1'05"
	22:00	2265			2.59	0'58"
	23:00	2325			2.44	1'00"
	24:00	2385			2.43	1'00"
9-29	1:00	2445			2.46	1'03"
	2:00	2505			2.48	1'01"
	3:00	2565			2.37	1'04"
	4:00	2625			2.53	0'58"
	5:00	2685			2.49	0'57"
	6:00	2745			2.45	1'02"
	7:00	2805			2.56	0'57"
	8:00	2865			2.71	1'2"
	9:00	2925			2.58	1'0"
	10:00	2985			2.52	1'0"
	11:00	3045			2.62	1'02"
	12:00	3105			2.64	58"
	13:00	3165			2.73	1'0"
	14:00	3225			2.88	52" adj
	15:00	3285			2.55	58"
	16:00	3345			2.59	56"
	17:00	3405			2.64	1'
	18:00	3465			2.71	1'6" adj
	19:00	3525			2.60	59"
	20:00	3585			2.49	59"
	21:00	3645			2.56	1'6"
	22:00	3705			2.44	58"

Date: 9-27-88

METRIC Corporation

Pumped Well MW-23

Measurements at Well MW-23

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min·sec/ℓ)
9-29	23:00	3765			2.34	1'03"
	24:00	3825			2.65	1'05"
	1:00	3885			2.53	56"
-30	2:00	3945			2.37	1'07" 1'01"
	3:00	4005			2.39	1'04"
	4:00	4065			2.58	1'02"
	5:00	4125			2.24	1'02"
	6:00	4185			2.27	1'06" adj
	7:00	4245			2.47	58"
	8:00	4305			2.46	1'04"
	8:15:15	4320.25	.25	17,281	1.39	Pump off @8:15
	:30	4320.50	.50	8,641	0.83	
	:45	4320.75	.75	5,761	0.68	
	8:16:00	4321.00	1.0	4,321	0.36	
	8:16:30	4321.5	1.5	2,881	0.19	
	8:17:00	4322.0	2.0	2,161	0.14	
	8: :30	4322.5	2.5	1,729	0.09	
	8:18:00	4323.0	3.0	1,441	0.07	
	:30	4323.5	3.5	1,235	0.07	
	19:00	4324.0	4.0	1,081	0.07	
	:30	4324.5	4.5	961	0.07	
	20:00	4325.0	5.0	865	0.08	
	21:00	4326	6	721	0.07	
	22:00	4327	7	618	0.06	
	23:00	4328	8	541	0.07	
	24:00	4329	9	481	0.08	
	25:00	4330	10	433	0.09	
	27:00	4332	12	361	0.07	
	29:00	4334	14	310	0.08	
	30:00	4336	16	271	0.08	

Date: 9-27-88

METRIC Corporation

Pumped Well MW-23

Measurements at Well MW-23

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min·sec/ℓ)
9-30	33:00	4338	18	241	0.05	
	35:00	4340	20	217	0.07	
	40:00	4345	25	174	0.07	
	45:00	4350	30	145	0.07	
	50:00	4355	35	124	0.07	
	55:00	4360	40	109	0.07	
	9:00	4365	45	97	0.07	
	9:15	4380	60	73	0.06	
	9:30	4395	75	59	0.06	
	10:00	4425	105	42	0.06	
	11:00	4485	165	27	0.04	
	11:30	4515	195	23	0.03	
	13:19	4624	304	15	0.03	
	15:10	4735	415	11	0.02	
	17:01	4846	526	9	0.00	

Date: 9-14-88

METRIC Corporation

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ________ Q: 0.01887 gpm

Static Water Level ________

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
9-14	8:05:00	0			0	
	:15	0.25			0.23	
	:30	0.50			0.47	
	:45	0.75			0.67	
	6:00	1.00			0.93	
	:30	1.50			1.37	
	7:00	2.00			1.76	
	:30	2.50			2.20	
	8:00	3.00			2.27	
	:30	3.50			2.28	
	9:00	4.00			2.28	
	:30	4.50			2.29	
	10:00	5.00			2.33	
	11:00	6			2.37	
	12	7			2.41	
	13	8			2.38	
	14	9			2.38	
	15	10			2.41	
	17	12			2.57	
	19	14			2.53	14 min/ℓ
	21	16			2.52	
	23	18			2.50	
	25	20			2.28	
	30	25			2.44	
	35	30			2.62	14
	40	35			2.77	
	50	45			3.03	14
	9:00	55			2.71	11
	9:20	75			2.61	14
	9:40	95	OGC-002934		2.48	12

Date: 9-14-88

METRIC Corporation

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
9-14 10:00	115			3.53	8
10:30	145			3.48	10
11:00	175			2.57	14, 12
11:30	205			2.25	11, 14
12:00	235			2.83	13, 11
13:00	295			2.15	12, 15
14:00	355			3.55	12, 11, 13, 12, 9
15:00	415			3.72	15, 15, 11, 9, 9, 16
16:00	475			3.25	16, 10, 12
17:00	535			3.25	11, 10, 9, 11, 11
18:00	595			2.85	10, 11, 11, 11
19:00	655			3.03	10, 13, 15, 11
20:00	715			2.55	10, 13, 15
21:00	775			2.42	11, 13, 11, 12
22:00	835			2.35	12, 11, 9, 9
23:00	895			2.47	13, 12, 14, 11
24:00	955			2.88	11, 9, 13, 10, 17
9-15 1:00	1015			2.07	16, 12, 17, 17
2:00	1075			1.68	12, 11, 16
3:00	1135			3.24	14, 13, 15, 13
4:00	1195			1.50	11, 9, 10, 9
5:00	1255			5.17	9, 8, 12, 10
6:00	1315			4.75	10, 11, 17, 10
7:00	1375			4.60	13, 11
8:00	1435			2.78	9, 12, 17
9:00	1495			2.26	
9:05	1500			2.18	
9:10	1505			2.10	15
9:15	1510			2.76	
9:20	1515			1.84	

Date: 9-14-88

METRIC Corporation

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
9-15	9:25	1520			2.57	14
	30	1525			3.30	
	35	1530			2.46	13
	40	1535			2.08	
	45	1540			2.00	
	50	1545			1.72	15
	55	1550			2.77	
	10:00	1555			2.63	
	05	1560			2.78	12
	10	1565			2.85	
	15	1570			2.83	
	20	1575			2.93	11
	25	1580			3.05	
	30	1585			2.82	11
	35	1590			2.78	
	40	1595			3.17	10
	45	1600			2.76	
	50	1605			2.05	
	55	1610			1.84	
	11:00	1615			1.92	
	05	1620			1.77	22
	10	1625			2.30	
	15	1630			2.65	
	20	1635			2.54	
	25	1640			2.20	
	30	1645			1.99	14
	35	1650			2.90	
	40	1655			3.14	
	45	1660			2.07	
	50	1665			2.44	14

Date: 9-14-88

METRIC Corporation

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ______ Q: ______ gpm

Static Water Level ______

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
9-15	11:55	1670			2.59	
	12:00	1675			2.70	12
	05	1680			2.53	
	10	1685			2.43	
	15	1690			2.55	13
	20	1695			2.53	
	25	1700			2.49	
	30	1705			2.52	14
	35	1710			2.30	
	40	1715			2.06	14
	45	1720			2.70	
	50	1725			2.35	
	55	1730			1.89	
	13:00	1735			2.10	
	05	1740			2.45	16
	10	1745			2.31	
	15	1750			2.29	
	20	1755			2.32	14
	25	1760			2.32	
	30	1765			2.21	
	35	1770			2.39	
	40	1775			2.47	12
	45	1780			2.58	
	50	1785			2.49	
	55	1790			2.54	
	14:00	1795			2.55	14
	14:05	1800			2.52	
	10	1805			2.80	
	15	1810			1.65	
	20	1815			2.80	15

Date: 9-14-88

METRIC Corporation

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
9-15 14:25	1820			2.18	
30	1825			2.77	
35	1830			3.36	9
40	1835			3.30	
45	1840			3.00	10
50	1845			2.83	
55	1850			1.83	
15:00	1855			2.74	12
05	1860			2.73	
10	1865			2.13	
15	1870			2.48	14
20	1875			3.48	
25	1880			3.44	
30	1885			2.92	
35	1890			3.15	15
40	1895			2.94	
45	1900			2.91	
50	1905			2.83	14
55	1910			2.32	
16:00	1915			2.07	
05	1920			2.16	15.5
10	1925			2.54	
15	1930			2.77	
20	1935			2.62	13.5
25	1940			2.68	
30	1945			2.44	
35	1950			2.37	14
40	1955			2.37	
45	1960			2.61	Start aerator
50	1965			2.55	12.5

Date: 9-14-88

METRIC Corporation

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
9-15	16:55	1970			2.57	
	17:00	1975			2.29	
	05	1980			2.09	16
	10	1985			2.25	
	15	1990			2.26	
	20	1995			2.43	12
	25	2000			3.23	
	30	2005			3.24	
	35	2010			3.37	
	40	2015			3.15	
	45	2020			3.35	10
	50	2025			4.09	
	55	2030			4.09	10
	18:00	2035			3.78	
	05	2040			3.15	
	10	2045			3.05	15
	15	2050			2.70	
	20	2055			2.21	
	25	2060			1.98	
	30	2065			2.52	18
	35	2070			1.89	
	40	2075			2.05	
	45	2080			2.13	aerator off ready to siphon
	50	2085			2.52	14.5
	55	2090			2.56	
	19:00	2095			2.43	15
	05	2100			1.92	
	10	2105			1.48	
	15	2110			1.28	
	20	2115			1.87	12

Date: 9-14-88

METRIC Corporation

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
9-15	19:25	2120			2.73	
	30	2125			2.49	12
	35	2130			2.78	
	40	2135			2.98	11
	45	2140			3.10	
	50	2145			3.06	
	55	2150			3.00	12
	20:00	2155			3.03	
	05	2160			2.67	12
	10	2165			2.27	
	15	2170			2.25	
	20	2175			2.33	
	25	2180			1.84	
	30	2185			2.95	11
	35	2190			3.47	9
	40	2195			3.54	
	45	2200			2.95	
	50	2205			2.93	12
	55	2210			3.20	
	21:00	2215			3.10	11
	05	2220			3.17	
	10	2225			3.37	10
	15	2230			3.35	
	20	2235			3.20	11
	25	2240			3.09	
	30	2245			2.90	
	35	2250			2.78	12
	40	2255			2.61	
	45	2260			2.71	13
	50	2265			2.79	

OGC-002940

Date: 9-14-88

METRIC Corporation

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
9-15	21:55	2270			2.72	
	22:00	2275			2.85	13
	05	2280			2.81	
	10	2285			2.50	
	15	2290			2.43	14
	20	2295			2.16	
	25	2300			1.93	12
	30	2305			3.05	
	35	2310			3.10	12
	40	2315			2.96	
	45	2320			3.15	
	50	2325			3.12	12
	55	2330			3.48	
	23:00	2335			3.07	11
	05	2340			2.57	
	10	2345			3.26	12
	15	2350			3.60	
	20	2355			3.42	10
	25	2360			3.15	
	30	2365			3.26	11
	35	2370			3.23	
	40	2375			3.16	11
	45	2380			3.11	
	50	2385			2.97	12
	55	2390			2.43	Pump Off
	24:00	2395			1.88	
	03	2398			2.08	
	05	2400			2.20	
	10	2405			2.40	
	20	2415			2.35	

Date: 9-14-88

METRIC Corporation

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ______ Q: ______ gpm

Static Water Level ______

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
9-16	24:25	2420			2.18	15
	30	2425			2.40	
	35				3.01	11
	40				3.36	10
	45				3.39	
	50				3.48	
	55				3.71	10
	1:00				1.85	
	05				2.27	
	10				2.53	14
	15				2.55	
	20				2.75	
	25				2.80	
	30	2485			2.54	13
	35				2.61	
	40				2.50	
	45				2.65	12
	50				2.71	
	55				2.75	
	2:00				2.72	
	05				2.71	15
	10				2.40	
	15				2.66	
	20				2.70	12
	25				3.07	10
	30	2545			3.35	
	35				3.05	
	40				2.40	15
	45				2.43	
	50				2.55	13

Date: 9-14-88

METRIC Corporation

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
55				2.45	14
9/16 3:00				2.61	
05				2.47	
10				2.59	
15				2.65	11
20				2.72	
25				1.91	11
30	2605			2.05	12
35				2.39	13
40				2.51	
45				2.37	13
50				2.33	
55				1.99	
4:00				2.60	
05				2.10	12
10				2.98	
15				3.25	10
20				3.27	
25				3.25	11
30	2665			3.15	
35				3.18	11
40				3.11	
45				3.07	
50				2.50	12
55				3.02	
5:00				2.93	13
05				2.75	
10				2.80	
15				2.60	
20				3.28	11

25 3.59

METRIC Corporation

Date: 9-14-88

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
9-16	5:30	2725			2.50	13
	35				2.85	
	40				2.46	
	45				3.42	11
	50				3.01	
	55				3.54	12
	6:00				2.73	
	05				2.87	11
	10				3.35	
	15				2.92	12
	20				3.25	
	25				2.77	
	30	2785			2.63	13
	35				2.81	
	40				3.26	10
	45				3.57	
	50				2.56	
	55				3.14	12
	7:00				2.36	
	05				0.98	
	10				2.69	
	15				1.95	
	20				2.82	13
	25				2.68	
	30	2845			2.46	
	35				2.80	
	40				3.08	
	45				2.51	14
	50				2.08	
	55				1.90	

Date: 9-14-88

METRIC Corporation

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
9-16 8:00				2.00	
05				2.25	16
10				2.48	
15				3.30	10
20				3.40	
25				2.62	
30	2905			2.24	14
35				1.78	
40				1.53	
45				2.21	17
50				2.58	
55				2.90	11
9:00				3.12	
05				2.20	
10				2.03	
15				2.08	17
20				3.17	
25				2.29	
30	2965			2.32	
35				2.36	14
40				2.42	
45				2.38	
50				2.44	14
55				2.49	
10:00				2.46	
05				2.63	13
10				2.59	
15				2.83	12
20				2.59	
25				2.29	

METRIC Corporation

Date: 9-14-88

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
9-16	10:30	3025			2.12	
	35				2.05	15
	40				2.17	
	45				2.36	
	50				2.44	14
	55				2.27	
	11:00				2.09	
	05				2.17	15
	10				2.30	
	15				2.36	
	20				2.50	
	25				2.48	13
	30	3085			2.57	
	35				2.64	
	40				2.70	12
	45				2.26	
	50				2.17	
	55				1.93	17
	12:00				1.86	
	05				1.80	
	10				1.63	
	15				1.86	16
	20				2.29	
	25				2.53	
	30	3145			2.74	13
	35				2.43	
	40				2.46	
	45				2.43	14
	50				2.38	
	55				2.48	

Date: 9-14-88

METRIC Corporation

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
9-16	13:00				2.35	
	05				2.15	
	10				2.19	
	15				2.07	16
	20				1.91	
	25				1.18	
	30	3205				Pump started-adj chattering sucker rod
	35					
	40				2.80	
	45				2.50	
	50				2.07	18
	55				2.03	
	14:00				1.92	
	05				1.99	16
	10				1.95	
	15				1.97	
	20				1.93	
	25				1.74	18
	30	3265			2.33	
	35				2.62	10
	40				2.87	
	45				1.81	Power off 2:43:50-2:46:06
	50				2.44	12
	55				2.88	
	15:00				3.00	
	05				2.74	
	10				2.54	12
	15				2.43	
	20				2.44	
	25				2.47	

Date: 9-14-88

METRIC Corporation

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
9-16	15:30	3325			2.39	
	35				2.21	
	40				2.44	
	45				2.27	
	50				2.33	13
	55				2.40	
	16:00				2.39	
	05				2.18	
	10				2.28	15
	15				2.23	
	20				2.16	
	25				2.13	14
	30	3385			2.37	
	35				2.18	
	40				2.10	15
	45				2.14	
	50				2.07	
	55				2.10	15
	17:00				1.97	
	05				2.11	
	10				2.07	
	15				1.97	
	20				1.83	
	25				1.79	15
	30	3445			2.87	
	35				2.43	12
	40				2.46	
	45				2.56	
	50				2.76	
	55				2.19	15

Date: 9-14-88

METRIC Corporation

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
9-16	18:00				1.77	
	05				1.80	
	10				1.63	15
	15				2.87	
	20				3.23	
	25				2.30	12
	30	3505			2.52	
	35				2.22	
	40				2.18	14
	45				2.16	
	50				2.35	
	55				2.35	
	19:00				2.10	15
	05				1.85	
	10				1.57	15
	15				2.60	
	20				2.02	
	25				2.09	
	30	3565			2.37	14
	35				2.23	
	40				1.85	
	45				2.47	14
	50				2.48	
	55				2.34	13
	20:00				2.78	
	05				2.45	
	10				2.07	14
	15				2.70	
	20				2.03	
	25				2.17	

Date: 9-14-88

METRIC Corporation

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
9-16	30	3625			2.45	14
	35				2.33	
	40				2.18	14
	45				2.32	
	50				2.57	
	55				2.84	12
	21:00				2.95	
	05				2.62	13
	10				2.04	
	15				2.00	
	20				2.55	14
	25				2.69	
	30	3685			2.41	
	35				2.30	13
	40				2.20	
	45				2.35	14
	50				2.81	
	55				2.72	
	22:00				2.02	13
	05				1.92	
	10				2.10	
	15				2.20	15
	20				2.11	
	25				2.40	13
	30	3745			2.46	
	35				2.74	11
	40				3.38	
	45				3.15	15
	50				1.69	
	55				1.84	

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METRIC Corporation

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
23:00				1.65	
05				2.34	
10				2.43	14
15				2.28	
20				2.43	14
25				2.43	
30	3805			2.37	
35				2.60	15
40				2.50	
45				2.45	
50				2.43	14
55				2.28	
24:00				2.20	
05				2.25	14
10				2.30	
15				2.88	10
20				3.20	
25				3.18	11
30	3865			2.93	
35				2.81	
40				2.10	14
45				1.25	
50				1.94	
55				2.10	15
1:00				2.56	
05				3.50	N.R.
10				3.07	
15				2.16	
20				2.01	
25		OGC-002951		2.07	

METRIC Corporation

Date: 9-14-88

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
1:30	3925			1.92	N.R.
35				1.66	
40				2.15	
45				2.80	
50				1.30	14
55				2.43	
2:00				2.47	
05				2.27	
10				2.31	
15				2.26	
20				2.26	13
25				2.65	
30	3985			2.48	
35				2.23	14
40				2.57	
45				2.00	
50				2.32	14
55				2.54	
3:00				3.25	9
05				2.85	
10				2.90	
15				2.82	13
20				2.85	
25				2.29	14
30	4045			2.35	
35				2.90	11
40				2.32	
45				2.25	
50				2.08	
55		OGC-002952		1.97	N.R.

Date: 9-14-88

METRIC Corporation

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
4:00				1.88	
05				1.74	14
10				2.77	
15				2.20	
20				1.85	
25				2.53	15
30	4105			2.54	
35				2.39	14
40				2.41	
45				2.95	14
50				2.58	
55				2.60	
5:00				2.75	13
05				2.66	
10				3.45	
15				2.77	
20				2.49	
25				2.15	
30	4165			2.09	15
35				2.40	
40				1.69	
45				1.81	15
50				1.91	
55				2.09	
6:00				2.29	14
05				3.02	
10				2.15	
15				1.97	14
20				2.13	
25				1.98	

Date: 9-14-88

METRIC Corporation

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
30	4225			2.03	15
35				1.82	
40				2.06	
45				2.45	14
50				2.42	
55				2.49	13
7:00				2.52	
05				2.53	Stop Pump
10	4265			2.53	
15					
20					
25					
30					
35					
40					
45					
50					
55					
8:00					
05					
10					
15					
20					
25					
30					
35					
40					
45					
50					
55					

Date: 9-14-88

METRIC Corporation

RECOVERY

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
7:10:00	4265	0	-	2.53	
15	4265.25	0.25	17061	2.38	
30	4265.50	0.50	8531	2.28	
45	4265.75	0.75	5688	2.13	
11:00	4266.0	1.0	4266	2.01	
30	4266.5	1.5	2844	1.77	
12:00	4267.0	2.0	2134	1.63	
30	4267.5	2.5	1707	1.39	
13:00	4268.0	3.0	1423	1.29	
30	4268.5	3.5	1220	1.19	
14:00	4269.0	4.0	1067	1.10	
30	4269.5	4.5	949	1.00	
15:00	4270.0	5.0	854	0.95	
16	4271	6	712	0.77	
17	4272	7	610	0.65	
18	4273	8	534	0.57	
19	4274	9	475	0.53	
20	4275	10	428	0.46	
22	4277	12	356	0.33	
24	4279	14	306	0.27	
26	4281	16	268	0.23	
28	4283	18	238	0.20	
30	4285	20	214	0.15	
35	4290	25	172	0.15	
40	4295	30	143	0.10	
45	4300	35	123	0.06	
50	4305	40	108	0.04	
8:00	4315	50	86	0.09	
10	4325	60	72	0.05	
29	4335	70	62	0.07	

Date: 9-14-88

METRIC Corporation

Pumped Well MW-26

Measurements at Well MW-26

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min/ℓ)
8:30	4345	80	54	0.06	
9:00	4375	110	40	0.07	
9:30	4405	140	31	0.07	
10:00	4435	170	26	0.05	
11:00	4495	230	20	0.03	
12:00	4555	290	16	0.01	
13:00	4615	350	13	0.04	
14:00	4675	410	11	0.05	
15:00	4735	470	10	0.07	
18:00	4915	650	7.6	0.12	

Date: 9-20-88

METRIC Corporation

Pumped Well MW-27

Measurements at Well MW-27

Pump Speed: ________ **Q:** 0.11741 gpm

Static Water Level ________

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min.sec/ℓ)
9-20	10:10:00	0			0	
	15	.25			–	
	30	.5			0.43	
	45	.75			1.48	
	10:11:00	1			2.32	
	30	1.5			3.08	
	12:00	2.0			3.43	
	30	2.5			3.67	
	13:00	3.0			3.78	
	30	3.5			3.79	
	14:00	4.0			3.48	
	30	4.5			3.38	
	15:00	5			3.48	
	16:00	6			3.64	
	17:00	7			3.71	
	18:00	8			3.66	
	19:00	9			3.45	
	20:00	10			3.28	Discharge 2'16"/ℓ
	22	12			3.04	
	24	14			2.85	
	26	16			2.88	
	28	18			2.78	
	30	20			2.69	
	35	25			2.65	2'16"/ℓ
	40	30			2.86	
	45	35			2.80	2'10"/ℓ
	50	40			2.98	
	55	45			2.95	
	11:00:00	50			3.25	
	11:10:00	60			2.25	2'07"/ℓ

OGC-002957

Date: 9-20-88

METRIC Corporation

Pumped Well MW-27

Measurements at Well MW-27

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min·sec/ℓ)
9-20	11:20	70			2.98	2'15"/ℓ
	11:30	80			2.86	
	11:40	90			2.25	2'19"/ℓ
	11:50	100			2.58	
	12:00	110			2.90	2'12"/ℓ
	12:20	130			2.56	2'18"/ℓ
	40	150			3.03	2'19"/ℓ
	13:00	170			3.25	2'17"/ℓ
	30	200			3.13	2'13"/ℓ
	14:00	230			2.87	2'11"/ℓ
	30	260			2.72	2'23"/ℓ
	15:00	290			3.06	2'13",2'26",2'9",2'20"
	30	320			2.94	2'23", 2'14"
	16:00	350			2.73	2'23", 2'19"
	17:00	410			2.68	2'7", 26"
	30	440			2.79	2'13"
	18:00	470			2.68	2'35" adj 2'21"
	19:00	530			2.69	2'14", 2'12"
	20:00	590			2.85	2'10"
	21:00	650			2.48	2'3", 2'25"
	22:00	710			2.70	2'8"
	23:00	770			2.66	2'15"
	24:00	830			2.72	2'0" adj
	1:00	890			2.54	2'20"
	2:00	950			2.68	2'13"
	3:00	1010			2.75	2'10"
	4:00	1070			2.96	1'52" adj 2'16"
	5:00	1130			2.88	2'10"
	6:00	1190			3.01	2'17"
	7:00	1250	OGC-002958		3.38	1'48" adj 2'15"

Date: 9-20-88

METRIC Corporation

Pumped Well MW-27

Measurements at Well MW-27

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min·sec/ℓ)
9-21	8:00	1310			3.24	2'10"/ℓ
	9:00	1370			2.39	2'15"/ℓ
	10:00	1430			2.36	2'17"/ℓ
	11:00	1490			2.78	2'15"/ℓ
	12:00	1550			2.87	2'17"/ℓ
	13:00	1610			2.51	2'18"/ℓ
	14:00	1670			2.47	2'15"/ℓ
	15:00	1730			2.95	2'18"/ℓ
	16:00	1790			3.15	2'17"/ℓ
	17:00	1850			3.18	2'11"/ℓ
	18:00	1910			3.68	2'10"/ℓ
	19:00	1970			3.19	2'14"
	20:00	2030			3.04	2'3" adj
	21:00	2090			3.00	2'11"
	22:00	2150			3.18	2'10"
	23:00	2210			2.85	2'10"
	24:00	2270			2.77	2'22"
9-22	1:00	2330			2.81	2'11"
	2:00	2390			2.94	2'6"
	3:00	2450			2.83	2'15"
	4:00	2510			2.88	2'27" adj
	5:00	2570			2.66	2'14"
	6:00	2630			2.87	-
	7:00	2690			2.58	2'15"/ℓ
	8:00	2750			3.11	2'17"/ℓ
	9:00	2810			2.56	2'17"/ℓ
	10:00	2870			2.46	adj to 2'10"
	11:00	2930			2.61	2'14'
	12:00	2990			2.71	2'12"
	13:00	3050			2.98	

Date: 9-20-88

METRIC Corporation

Pumped Well MW-27

Measurements at Well MW-27

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min·sec/ℓ)
9-22	14:00	3110			2.61	2'19"/
	15:00	3170			2.61	2'29"/
	16:00	3230			2.86	2'8"/
	17:00	3290			2.48	2'23"/
	18:00	3350			2.54	2'9"/
	19:00	3410			2.87	2'11"
	20:00	3470			3.01	2'9"
	21:00	3530			2.83	2'28"
	22:00	3590			2.98	1'48" adj
	23:00	3650			2.75	2'18"
	24:00	3710			2.85	2'8"
9-23	1:00	3770			2.80	2'16"
	2:00	3830			2.54	2'17"
	3:00	3890			2.90	2'12"
	4:00	3950			3.11	2'10"
	5:00	4010			2.93	2'7" adj
	6:00	4070			2.80	2'19"
	7:00	4130			2.54	2'25" adj
	8:00	4190			2.22	2'14"
	8:10	4200			1.88	Stop pump

Date: 9-20-88

METRIC Corporation

RECOVERY

Pumped Well MW-27

Measurements at Well MW-27

Pump Speed: ________ **Q:** ________ gpm

Static Water Level ________

	time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min·sec/ℓ)
9-23	8:10:00	4200	0.0		1.88	
	8:10:15	4200.25	0.25	16801	1.10	
	30	4200.50	0.50	8401	0.73	
	45	4200.75	0.75	5601	0.47	
	11:00	4201.00	1.00	4201	0.35	
	11:30	4201.5	1.50	2801	0.20	
	12:00	4202.0	2.00	2101	0.11	
	12:30	4202.5	2.50	1681	0.09	
	13:00	4203.0	3.00	1401	0.07	
	13:30	4203.5	3.5	1201	0.05	
	14:00	4204.0	4.0	1051	0.04	
	14:30	4204.5	4.5	934	0.03	
	15:00	4205.0	5.0	841	0.03	
	16:00	4206	6	701	0.01	
	17	4207	7	601	0.01	
	18	4208	8	526	0.01	
	19	4209	9	468	0.00	
	20	4210	10	421	0.0	
	22	4212	12	351	0.0	
	24	4214	14	301	0.0	
	26	4216	16	264	0.0	
	28	4218	18	234	+0.01	
	8:30	4220	20	211	+0.02	
	35	4225	25	169	+0.02	
	40	4230	30	141	+0.02	
	45	4235	34	121	+0.03	
	50	4240	40	106	+0.03	
	55	4245	45	94	+0.02	
	9:00	4250	50	85	0.03	
	9:10	4260	60	71	0.03	

Date: 9-20-88

METRIC Corporation

Pumped Well MW-27

Measurements at Well MW-27

Pump Speed: ______ **Q:** ______ gpm

Static Water Level ______

time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min·sec/ℓ)
9:20	4270	70	61	+0.03	
9:30	4280	80	54	+0.03	
10:00	4310	110	39	+0.03	
11:27					
13:49	3497	197	22	+0.03	
16:47	4539	339	13	+0.07	
	4717	407	11	+0.09	

Date: 10-11-88

METRIC Corporation

Pumped Well MW-28

Measurements at Well MW-28

Pump Speed: ______ Q: 0.07045 gpm

Static Water Level ______

time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min·sec/ℓ)
12:20:00	0			0.05	
:15	.25			0.09	
:30	.50			0.16	
:45	.75			0.18	
21:00	1.0			0.21	
21:30	1.5			0.25	
22:00	2.0			0.31	
22:30	2.5			0.37	
23:00	3.0			0.42	
23:30	3.5			0.45	
24:00	4.0			0.49	
24:30	4.5			0.55	
25:30	5			0.56	
26	6			0.63	
27	7			0.70	
28	8			0.77	
29	9			0.83	Reduced motor speed
30	10			0.87	
12:32	12			0.93	
12:34	14			0.99	
36	16			1.04	
38	18			1.11	
40	20			1.13	
45	25			1.20	4'12"/ℓ
50	30			1.24	
55	35			1.23	
13:00	40			1.28	3'02"/ℓ
13:20	60			1.32	4'29'/ℓ
13:40	80			1.43	4'36"/ℓ
14:00	100				

OGC-002963

Date: 10-11-88

METRIC Corporation

Pumped Well MW-28

Measurements at Well MW-28

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min·sec/ℓ)
14:30	130			1.44	4'32" adj
15:00	160			1.68	3'36" adj
15:30	190			1.58	5'26" adj
16:00	220			1.71	4'50" adj
17:00	280			1.88	2'06" adj
18:00	240			1.86	3'39" adj
19:00	400			1.73	3'49" adj
20:00	460			1.82	5'23" adj
21:00	520			1.81	3'45" tech adj.
22:00	580			1.94	3'38"
23:00	640			2.11	3'32"
24:00	700			2.20	3'48"
1:00	760			2.20	4'00"
2:00	820			2.16	3'49"
3:00	880			2.11	4'06"
4:00	940			2.18	3'55"
5:00	1000			2.19	3'47"
6:00	1060			2.30	3'47"
7:00	1120			2.21	3'47"
8:00	1180			2.33	3'47"
9:00	1240			2.30	3'43"
10:00	1300			2.43	3'44"
11:00	1360			2.52	3'46"
12:00	1420			2.59	3'45"
13:00	1480			2.69	3'43"
14:00	1540			2.45	3'42"
15:00	1600			2.48	3'43"
16:00	1660			2.50	3'46"
17:00	1720			2.52	3'43"
18:00	1780			2.54	3'44"

Date: 10-11-88

METRIC Corporation

Pumped Well MW-28

Measurements at Well MW-28

Pump Speed: ______ Q: ______ gpm

Static Water Level ______

time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min·sec/ℓ)
10/12 19:00	1840			2.49	3'45"
20:00	1900			2.66	3'44"
21:00	1960			2.59	3'46"
22:00	2020			2.67	3'48"
23:00	2080			2.39	3'52"
24:00	2140			2.29	4'00"
1:00	2200			2.17	4'08"
2:00	2260			2.62	3'46"
3:00	2320			2.74	3'44"
4:00	2380			2.74	3'45"
5:00	2440			2.63	3'48"
6:00	2500			2.58	3'48"
7:00	2560			2.61	3'48"
8:00	2620			2.68	3'48"
9:00	2680			2.42	3'47"
10:00	2740			2.59	3'49"
11:00	2800			2.68	3'47"
12:00	2860			2.53	3'47"
13:00	2920			2.53	3'46"
14:00	2980			2.51	3'46"
15:00	3040			2.53	3'45"
16:00	3100			2.50	3'45"
17:00	3160			2.69	3'44"
18:00	3220			2.71	3'43"
19:00	3280			2.61	3'45"
20:00	3340			2.65	3'42"
21:00	3400			2.70	3'44"
22:00	3460			2.56	3'44"
23:00	3520			2.66	3'44"
24:00	3580			2.63	3'45"

Date: 10-11-88

METRIC Corporation

Pumped Well MW-28

Measurements at Well MW-28

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min.sec/ℓ)
1:00	3640			2.68	3'48"
2:00	3700			2.59	3'48"
3:00	3760			2.54	3'49"
4:00	3820			2.57	3'49"
5:00	3880			2.66	3'50"
6:00	3940			2.46	3'54" Hole Cleaned
7:00	4000			2.77	3'36"
8:00	4060			2.72	3'43"
9:00	4120			2.63	3'43"
10:00	4180			2.64	3'43"
11:00	4240			2.65	3'43"
12:00	4300			2.67	3'45"
12:20	4320	0		2.56	Pump Off
12:20:15	4320.25	.25	17,281	2.45	
:20:30	4320.50	.5	8,641		
:20:45	4320.75	.75	5,761	2.15	
:21:00	4321.0	1.0	4,321	2.14	
:21:30	4321.5	1.5	2,881	2.11	
:22:00	4322.0	2.0	2,161	2.10	
:22:30	4322.5	2.5	1,729	2.08	
:23:00	4323.0	3.0	1,444	2.06	
:23:30	4323.5	3.5	1,235	2.05	
:24:00	4324.0	4.0	1,081	2.03	
:24:30	4324.5	4.5	961	2.01	
:25:00	4325	5.0	865	2.00	
:26	4326	6	721	1.97	
:27	4327	7	618	1.94	
:28	4328	8	541	1.92	
:29	4329	9	481	1.89	
:30	4330	10	433	1.87	

Date: 10-11-88

METRIC Corporation

Pumped Well MW-28

Measurements at Well MW-28

Pump Speed: ________ Q: ________ gpm

Static Water Level ________

time (h:m:s)	t (min)	t' (min)	t/t'	Drawdown (ft)	Discharge (min·sec/ℓ)
12:32	4332	12	361	1.82	
34	4334	14	310	1.77	
36	4336	16	271	1.71	
38	4338	18	241	1.66	
40	4340	20	217	1.62	
50	4350	30	145	1.44	
55	4355	35	124	1.33	
13:00	4360	40	109	1.26	
13:30	4390	70	63	0.85	
14:00	4420	100	44	0.56	
14:30	4450	130	34	0.32	
15:00	4480	160	28	0.20	
16:00	4540	220	21	0.07	
17:00	4600	280	16	0.01	
18:00	4660	340	14	0.00	
19:00	4720	400	12	0.00	

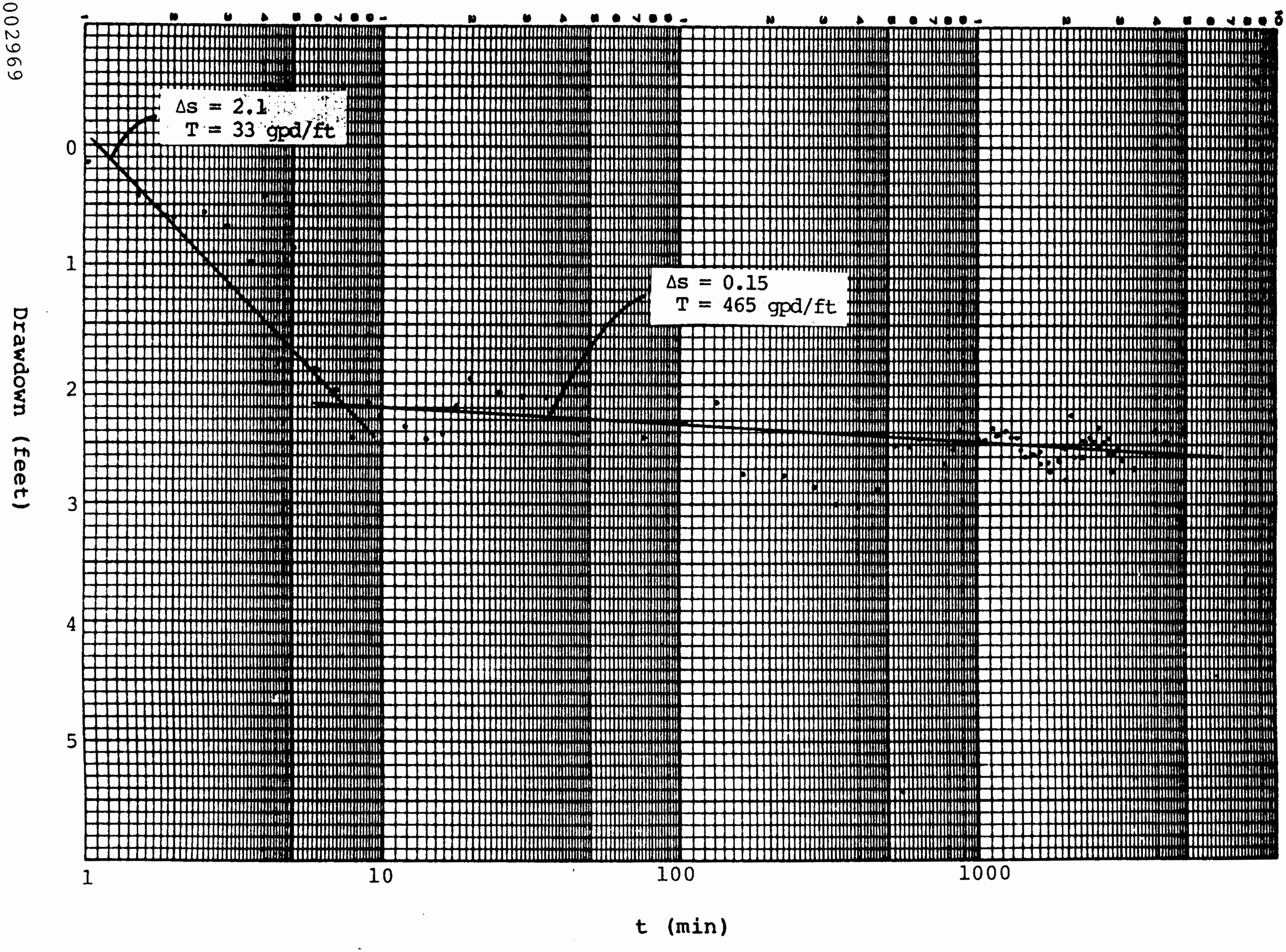
APPENDIX B

SEMI-LOG PLOTS

Pumped Well : MW-23
Observations at Well :MW-23

Time-Drawdown
Q = 0.264gpm

METRIC Corporation
Date: 9-27-88

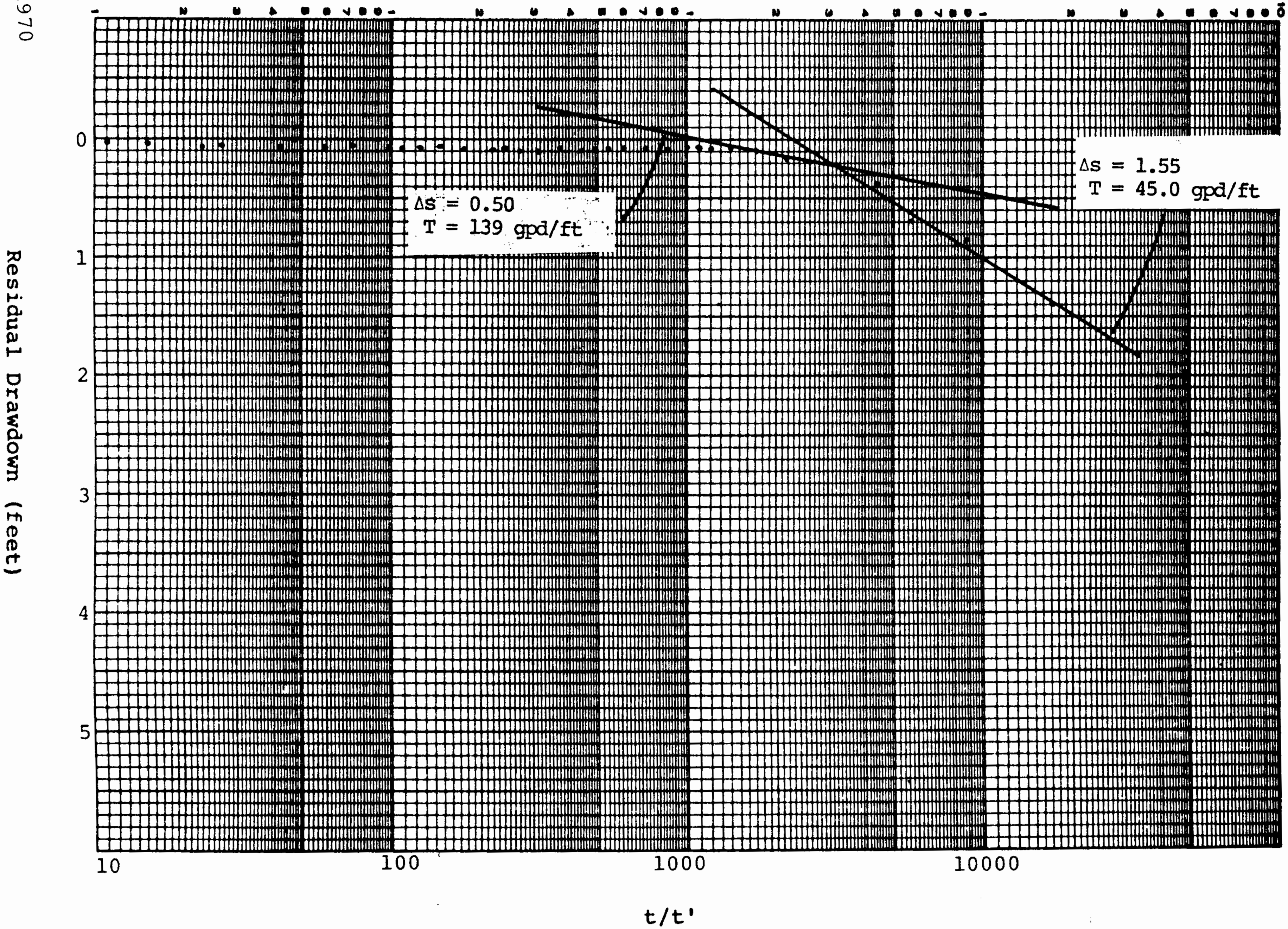


OGC-002970

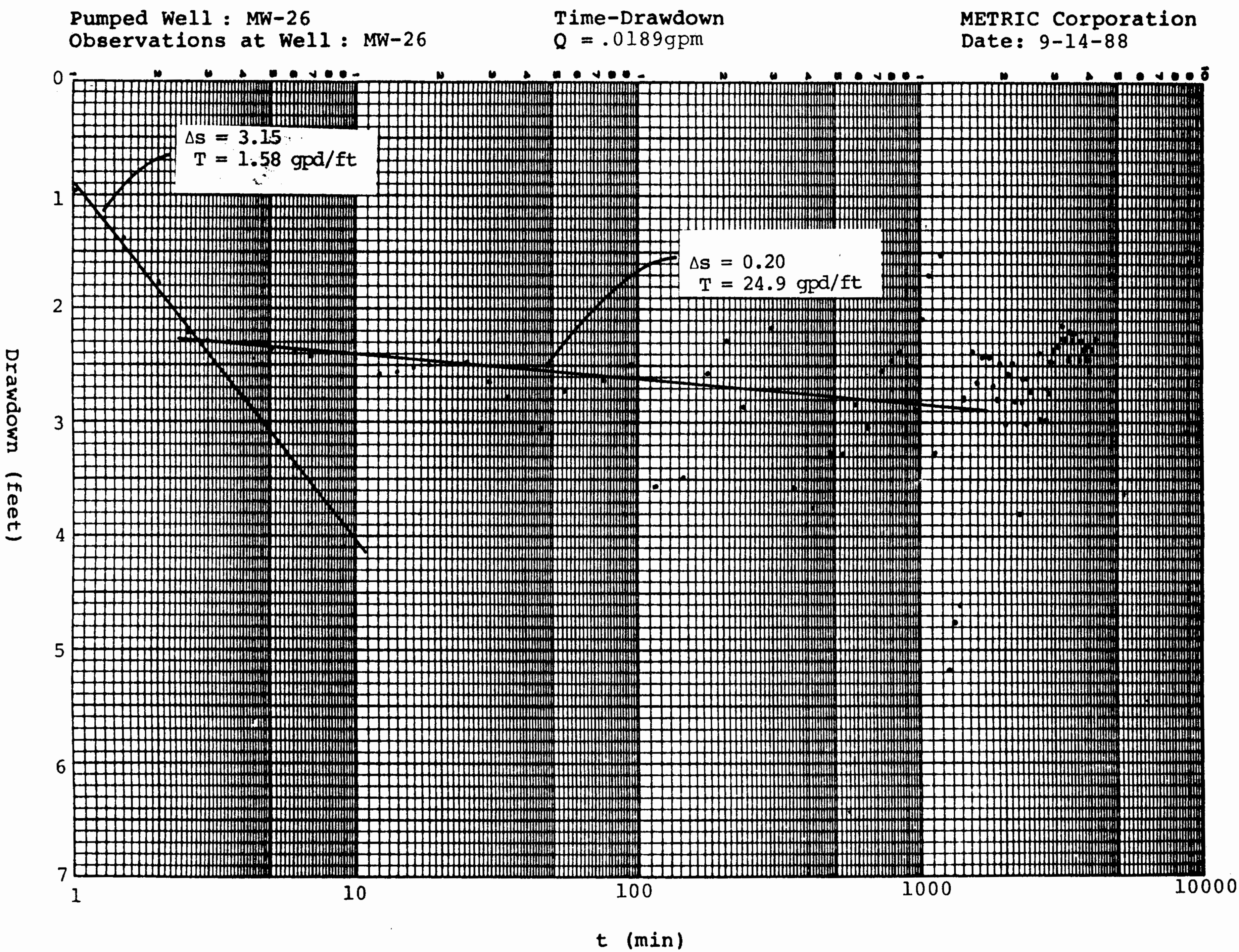
Pumped Well : MW-23
Observations at Well : MW-23

Residual-Drawdown
Q = 0.264gpm

METRIC Corporation
Date: 9-27-88



OGC-002971

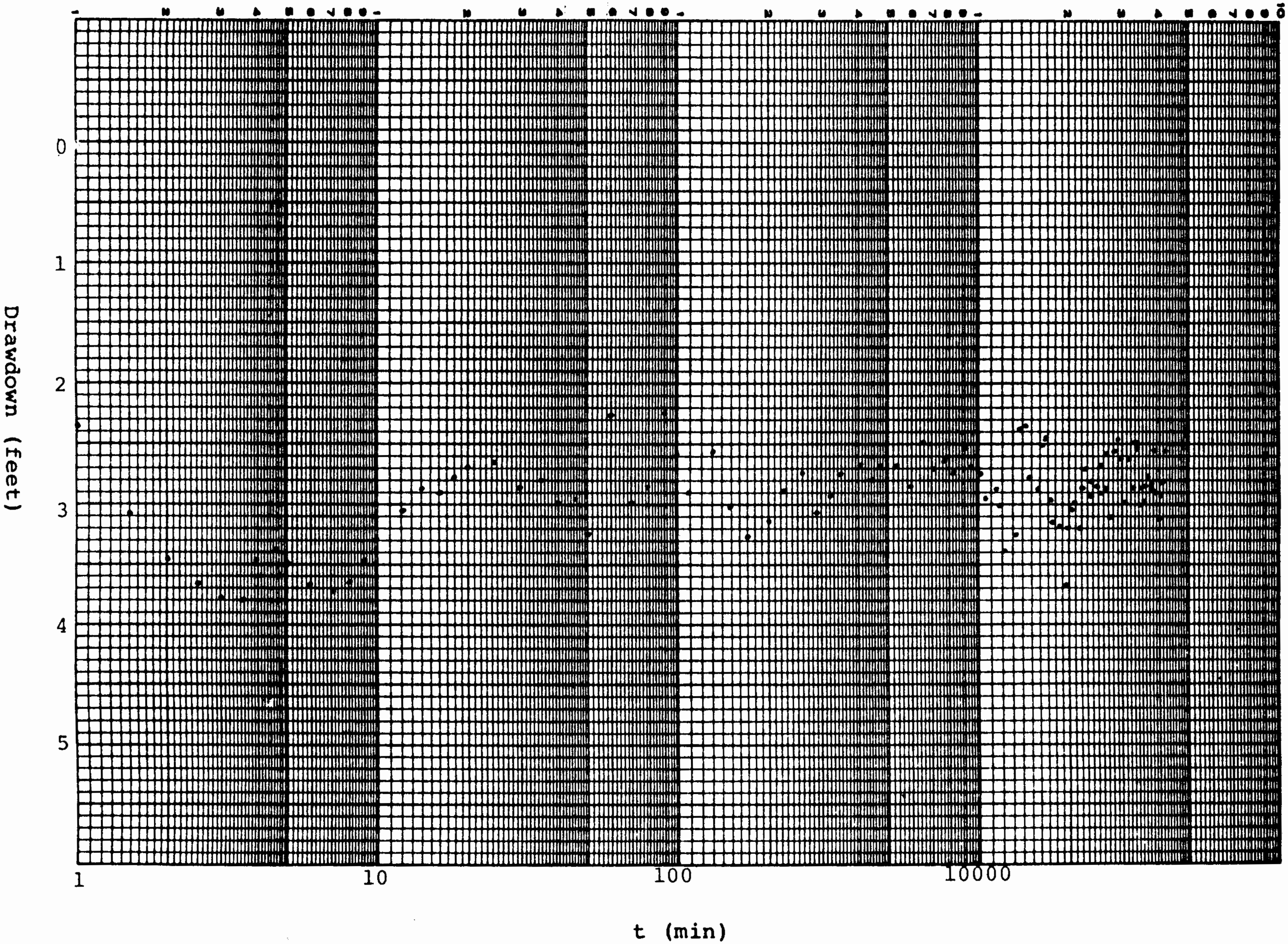


Pumped Well : MW-26
Observations at Well : MW-26
Time-Drawdown
Q = .0189gpm
METRIC Corporation
Date: 9-14-88
Δs = 3.15
T = 1.58 gpd/ft
Δs = 0.20
T = 24.9 gpd/ft
Drawdown (feet)
0
1
2
3
4
5
6
7
1
10
100
1000
10000
t (min)

Pumped Well : MW-27
Observations at Well : MW-27

Time-Drawdown
Q = 0.117gpm

METRIC Corporation
Date: 9-20-88

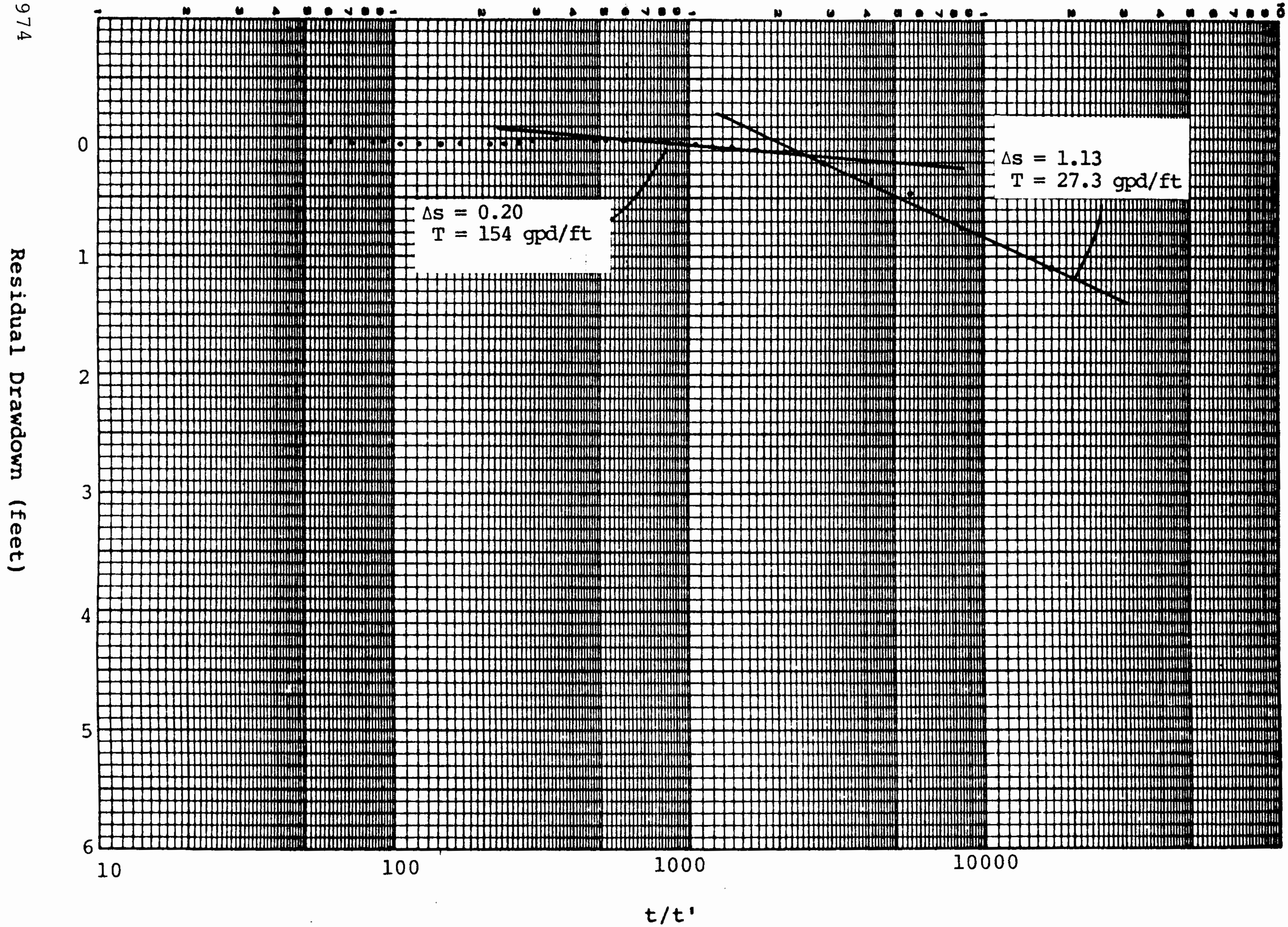


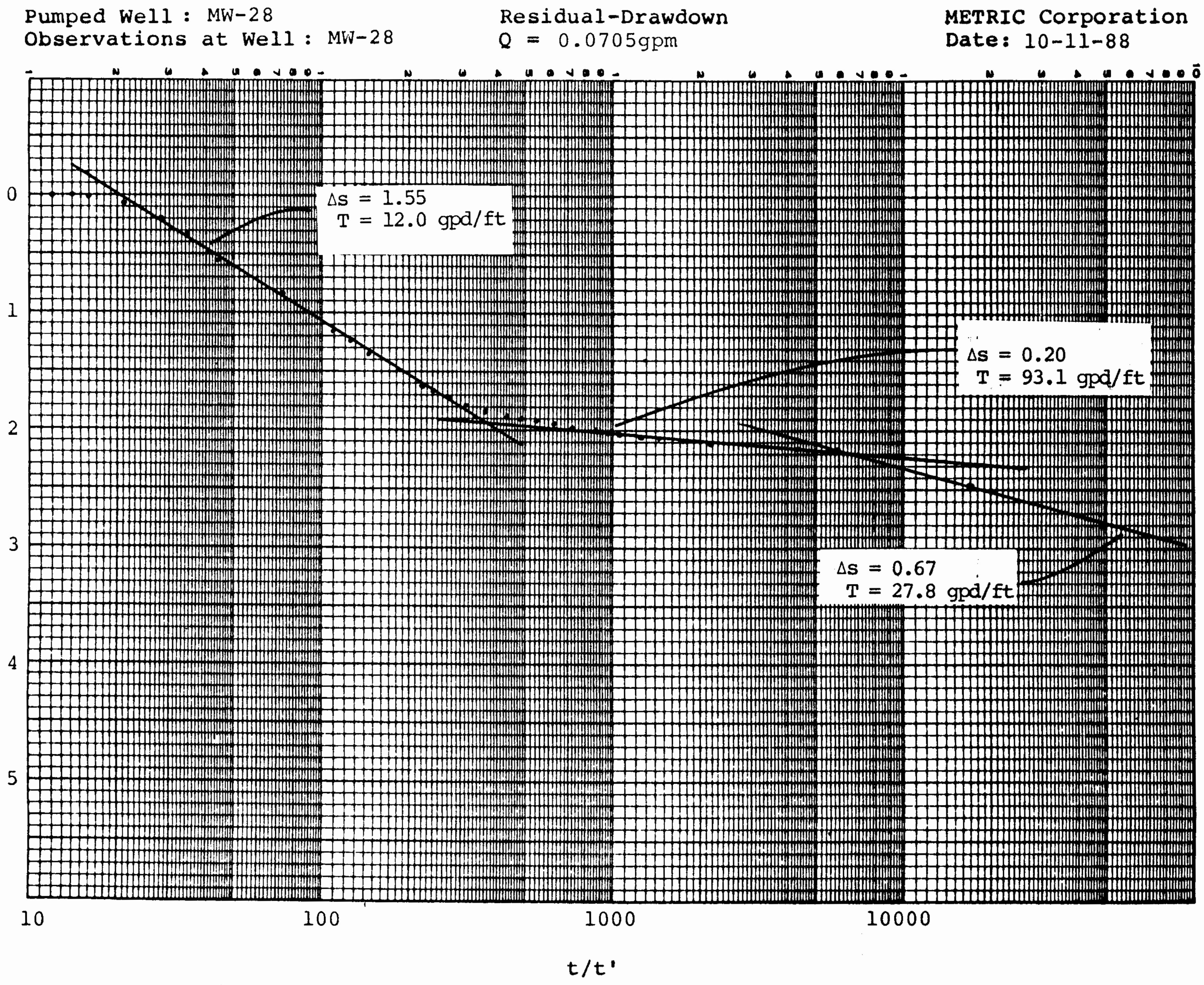
OGC-002974

Pumped Well : MW-27
Observations at Well : MW-27

Residual-Drawdown
Q = 0.117gpm

METRIC Corporation
Date: 1-20-88





Pumped Well : MW-28
Observations at Well : MW-28
Residual-Drawdown
Q = 0.0705gpm
METRIC Corporation
Date: 10-11-88
Δs = 1.55
T = 12.0 gpd/ft
Δs = 0.20
T = 93.1 gpd/ft
Δs = 0.67
T = 27.8 gpd/ft
Residual Drawdown (feet)
t/t'
0
1
2
3
4
5
10
100
1000
10000

OGC-002976

ATTACHMENT 2

A Report Prepared for:

Sparton Technology, Inc.
4901 Rockaway Boulevard, SE
Rio Rancho, New Mexico 87124

INSTALLATION OF ADDITIONAL UPPER FLOW ZONE RECOVERY WELLS AND UPPER AND LOWER FLOW ZONE MONITORING WELLS SPARTON TECHNOLOGY, INC. COORS ROAD FACILITY ALBUQUERQUE, NEW MEXICO

HLA Job No. 6310,035.12

by

Kevin C. Snyder
Kevin Snyder
Geologist

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November 22, 1988

OGC-002978

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EXECUTIVE SUMMARY

In order to further control the migration of contaminants in the upper flow zone and to determine if contamination exists in the lower flow zone, EPA requested Sparton to install additional recovery wells and monitoring wells in the upper and lower flow zones, respectively.

Three additional recovery well MW-26, MW-27 and MW-28 were installed in the upper flow zone during May 16 to May 20, 1988. The borings were drilled using hollow-stem augers. The wells were con-constructed of 2-inch stainless steel screens with PVC riser pipe. These wells will be used to augment the five existing wells which were designated to be used as recovery wells.

Four lower flow zone monitoring wells were installed along the south and west property lines during June 13 to June 24, 1988. These wells were designated MW-29, MW-30, MW-31, and MW-32. The borings for these wells were drilled using rotary wash methods. A large diameter boring was first drilled to within approximately five feet of the zone to be screened. Steel casing was set and grouted in place to prevent the cross movement of fluids from the upper to the lower flow zones. Fresh drilling fluid was then used to complete the borings. The wells were constructed of 4-inch stainless steel screen with PVC riser pipe.

These monitoring wells will be used to indicate if contamination in the lower flow zone exists, and to monitor the lower flow zone during remediation of the upper flow zone.

One additional upper flow zone monitoring well (MW-33) was installed adjacent to MW-30 along the south property line on October 19, 1988. The boring was drilled using hollow-stem augers. The well was constructed of 2-inch stainless steel screen with PVC riser pipe. This well will be used to augment the existing upper flow zone monitoring system.

I ADDITIONAL NEW UPPER FLOW ZONE RECOVERY WELLS

A. Introduction

Three new wells were installed at the Sparton site to augment the existing wells for use in the groundwater recovery system. The new wells were designated MW-26, MW-27 and MW-28. Well MW-26 was installed near the loading dock along the south side of the plant building. Well MW-27 was installed approximately midway along the west side of the plant between the plant building and the drum storage building. Well MW-28 was installed near the present monitoring well MW-14 which is located at the southwest corner of the Sparton property (based on the plant north direction). The location of these wells is shown on Plate I-1.

B. Equipment Set-Up

Prior to the set-up of the drilling rig on the prospective well site, all underground utilities were located to assure that the borings would not encounter any buried power, gas, or telephone lines. Additionally, the drill rig and all drilling equipment was cleaned with a high pressure steam cleaner prior to the start up of drilling and between each of the borings to remove any material which could contaminate the well.

C. Drilling and Soil Sample Collection

Borings MW-26 through MW-28 were drilled using a Central Mining Equipment (CME) 55 hollow-stem auger drilling rig. The borings were advanced using 7.5-inch diameter hollow-stem augers. Soil samples were collected with a 60-inch continuous sampler (3-inch O.D., 2.75-inch I.D.) that extended below the drill bit and was driven downward by turning the auger. Each boring was advanced to the top of the aquitard between the upper and lower flow zones. Soil samples were obtained from the saturated zone above the aquitard, and from the aquitard itself. These samples were monitored for volatile organic vapors with a photoinization detector (PID) manufactured by HNu Systems, Inc. (Model 101, benzene referenced). Several readings were taken on each sample, and the highest reading was recorded. The PID readings are presented in the boring logs. Boring depths, which where dependent upon the depth to the aquitard were 71-feet at MW-28, 73-foot at MW-27, and 81-feet at MW-26. After the aquitard was sampled, it was sealed with bentonite.

The boring logs and recovery well construction details are shown on Plates I-2 through I-4.

D. Well Construction

The recovery wells were constructed using 5 feet of 2-inch diameter, stainless steel, 0.10 inch, continuous slot (wire wrapped) screen and 2-inch diameter Schedule 40, flush-joint threaded PVC riser pipe. Once the pipe and screen were in place, the hollow-stem auger was pulled and the natural formation was allowed to collapse around the well screen. A neat bentonite/cement grout was placed from the top of the collapsed formation to within one to two feet of the ground surface. Protective steel covers were then placed around the well standpipe. The covers were concreted in place with a 3-foot by 3-foot by 4-inch pad for wells MW-27 and MW-28. Since MW-26 was drilled through asphalt, the protective cover was set with a 1.5-foot diameter by 4-inch high conical pad.

E. Well Development

Each well was developed by the surging technique using a surge block to create an inward and outward surging action on the formation. After surging, the well was bailed to remove any sediments brought through the screen. This procedure was repeated until essentially sediment-free water was produced. All development fluids and sediments were disposed of according to the procedures for handling of drill cuttings and fluids (Section F).

F. Handling of Drill Cuttings and Fluids

Since no disposal had taken place in the well locations, it was anticipated that the soil cuttings from the unsaturated zone would not be contaminated. However, all cuttings produced from the drilling and sampling procedures were containerized in 55-gallon plastic drums. After completion of the monitoring well installation, the drums were opened and the cuttings were monitored with the PID. The PID indicated no contamination (zero PID reading) on the cuttings from the unsaturated zone. These cuttings were therefore spread evenly on the ground surface of the plant. The three barrels of cuttings from the saturated zone (one barrel at each well) registered a reading on the PID and were disposed of as hazardous waste.

The water produced from development of the wells was stored in a tank and disposed of at the completion of the project through the sanitary sewer as approved by the City of Alburquerque.

G. Decontamination Procedures

Drilling and sampling equipment were cleaned with a portable, high-pressure steam cleaner prior to any field work and between each boring to prevent cross-contamination between the boreholes. Soil sampling tools were decontaminated after each use. Prior to leaving the work site, the drilling and sampling equipment were steam cleaned so that no contamination was carried off the site. Decontamination fluids and sediments were disposed of according to the procedures for handling of drill cuttings and fluids (Section F).

II ADDITIONAL LOWER FLOW ZONE MONITORING WELLS

A. Introduction

Four additional lower flow zone monitoring wells were installed at the Sparton site. The new wells were designated MW-29, MW-30, MW-31, and MW-32. The locations of the monitoring wells are shown on Plate II-1.

B. Equipment Set-Up

Prior to the set-up of the drilling rig on the prospective well site, all underground utilities were located to assure that the borings would not encounter any buried power, gas, or telephone lines. Additionally, all drilling equipment was cleaned with a high pressure steam cleaner prior to the start up of drilling activities and between each of the borings to remove any material which could contaminate the well.

C. Drilling and Soil Sample Collection

Borings MW-29 through MW-32 were drilled using a Gardner-Denver 1500 rotary wash drill rig. The rotary wash drilling process involves the use of drilling fluid to suspend and remove drill cuttings obtained by the advancement of a tri-cone drill bit into unconsolidated formations. A bentonite and water mixture was used as a drilling fluid for Borings MW-29 through MW-32.

The borings were advanced using a 12-inch diameter tri-cone drill bit to within approximately 5 feet of the zone to be screened. An 8-5/8-inch diameter steel surface casing was then installed from the surface to 2 feet above the bottom of the borehole. Grout was then placed around the casing and allowed to flow beneath and up into the casing about two feet. The grout was allowed to set overnight. The following day, the old drilling fluid was replaced and the boring was drilled to the desired depth using an 8-inch diameter tri-cone drill bit and new drilling fluid. Upon reaching completion depth, the drilling fluid was thinned to allow placement of the screen, casing, and sand filter pack.

This procedure should permit the collection of groundwater representative of the screened zone. The screened zones were selected based upon the depth where the first significant groundwater producing zone would be found in the lower flow zone.

Samples of the formations encountered during drilling were obtained by collecting cuttings suspended in the drilling fluid. Additional data was obtained by noting the rate and ease of drilling penetration. The boring logs and monitoring well construction details are shown on Plates II-2 through II-5.

D. Well Contruction

Following completion of each boring, a monitoring well was installed using Schedule 40, flush-jointed PVC casing. Ten feet of 4-inch, 0.020-inch continuous slot (wire wrap) stainless steel well screen was installed beneath the PVC casing. A 2-foot stainless steel slit trap was installed at the bottom of each well screen.

Specially graded (10-20) sand was placed in the annular space from the bottom of the boring to a minimum of 3-1/2 feet above the bottom of the 8-5/8-inch steel surface casing. A bentonite pellet seal, a minimum of 1-foot thick over 4 to 6 inches of fine sand was placed above the filter pack. The remainder of the annulus was then grouted with a cement/bentonite grout to preclude any surface water from entering the well. A protective steel casing with a locking cap was placed over the top of each well. A 4-foot by 4-foot by 4-inch thick concrete pad was placed around the protective casing. The surface of the pad was sloped away from the well to prevent water from accumulating at the monitoring well.

E. Well Development

Each well was developed using compressed air and pumping to create an inward and outward surging action on the formation. These procedures were repeated until essentially sediment-free water was produced. All development fluids and sediments were disposed of according to the procedures for handling of drill cuttings and fluids (Section F).

F. Handling of Drill Cuttings and Fluids

Cuttings from the drilling activities were allowed to settle out of the drilling fluid and were containerized in 55-gallon plastic drums. The cuttings were then scanned with the PID to determine if any contamination was evident. Four barrels of cuttings from MW-32 indicated a reading on the PID and were disposed of a hazardous waste. The remainder of the cuttings were spread evenly on the ground surface of the plant.

The drilling fluid and water produced from the development of the monitoring wells was stored in a tank and disposed of at the completion of the project through the sanitary sewer as approved by the City of Albuquerque.

G. Decontamination Procedures

Drilling equipment was cleaned with a portable, high pressure steam cleaner prior to any field work and between each boring to prevent cross-contamination between the boreholes. Prior to leaving the work site, the drilling equipment was steam cleaned so that no possible contamination was carried off the site. Decontamination fluids and sediments were disposed of according to the procedures for handling of drill cuttings and fluids (Section F).

III ADDITIONAL NEW UPPER FLOW ZONE MONITORING WELL

A. Introduction

One new well was installed at the Sparton site to augment the existing upper flow zone monitoring system. The new well was designated MW-33. This monitoring well was installed along the south boundary of the site to monitoring groundwater conditions in the area between MW-14 and MW-13. The location of MW-33 is shown on Plate III-1.

B. Equipment Set-Up

Prior to the set-up of the drilling rig on the prospective well site, all underground utilities were located to assure that the borings would not encounter any buried power, gas, or telephone lines. Additionally, the drill rig and all drilling equipment was cleaned with a high pressure steam cleaner prior to the start up of drilling and between each of the borings to remove any material which could contaminate the well.

C. Drilling and Soil Sample Collection

Boring MW-33 was drilled using a Central Mining Equipment (CME) 55 hollow stem auger drilling rig. The boring was advanced using 7.5-inch diameter hollow stem augers. Soil samples were collected with a 60-inch continuous sampler (3-inch O.D., 2.75-inch I.D.) that extended below the drill bit and was driven downward by turning the auger. The boring was advanced to the top of the aquitard between the upper and low flow zones. Soil samples were obtained from the saturated zone above the aquitard, and from the aquitard itself. These samples were monitored for volatile organic vapors with a photo-ionization detector (PID) manufactured by HNu Systems, Inc. (model 101, benzene referenced). Several readings were taken on each sample, and the highest reading was recorded. The PID readings are presented in the boring logs. The boring depth was 73 feet. Since the aquitard was penetrated only 0.3 feet, the well was set at 73 feet.

D. Well Construction

The monitor well was constructed using 10 feet of two-inch diameter, stainless steel, 0.012 inch, continuous slot (wire wrapped) screen, 6.6 feet of Schedule 40 stainless steel pipe above the screen, and two-inch diameter Schedule 40, flush joint threaded PVC riser pipe to the ground surface. Once the pipe and screen were in place, the hollow stem auger was pulled and the natural formation was allowed to collapse around the well screen. A neat bentonite/cement grout was placed from the top of the collapsed formation to within one to two feet of the ground surface. A protective steel cover was then placed around the well standpipe. The cover was concreted in place with a 3-foot by 3-foot by 4-inch pad.

E. Well Development

The well was developed by the surging technique using a surge block to create an inward and outward surging action on the formation. After surging, the well was bailed to remove any sediments brought through the screen. This procedure was repeated until essentially sediment-free water was produced. All development fluids and sediments were disposed of according to the procedures for handling of drill cuttings and fluids (Section F).

F. Handling of Drill Cuttings and Fluids

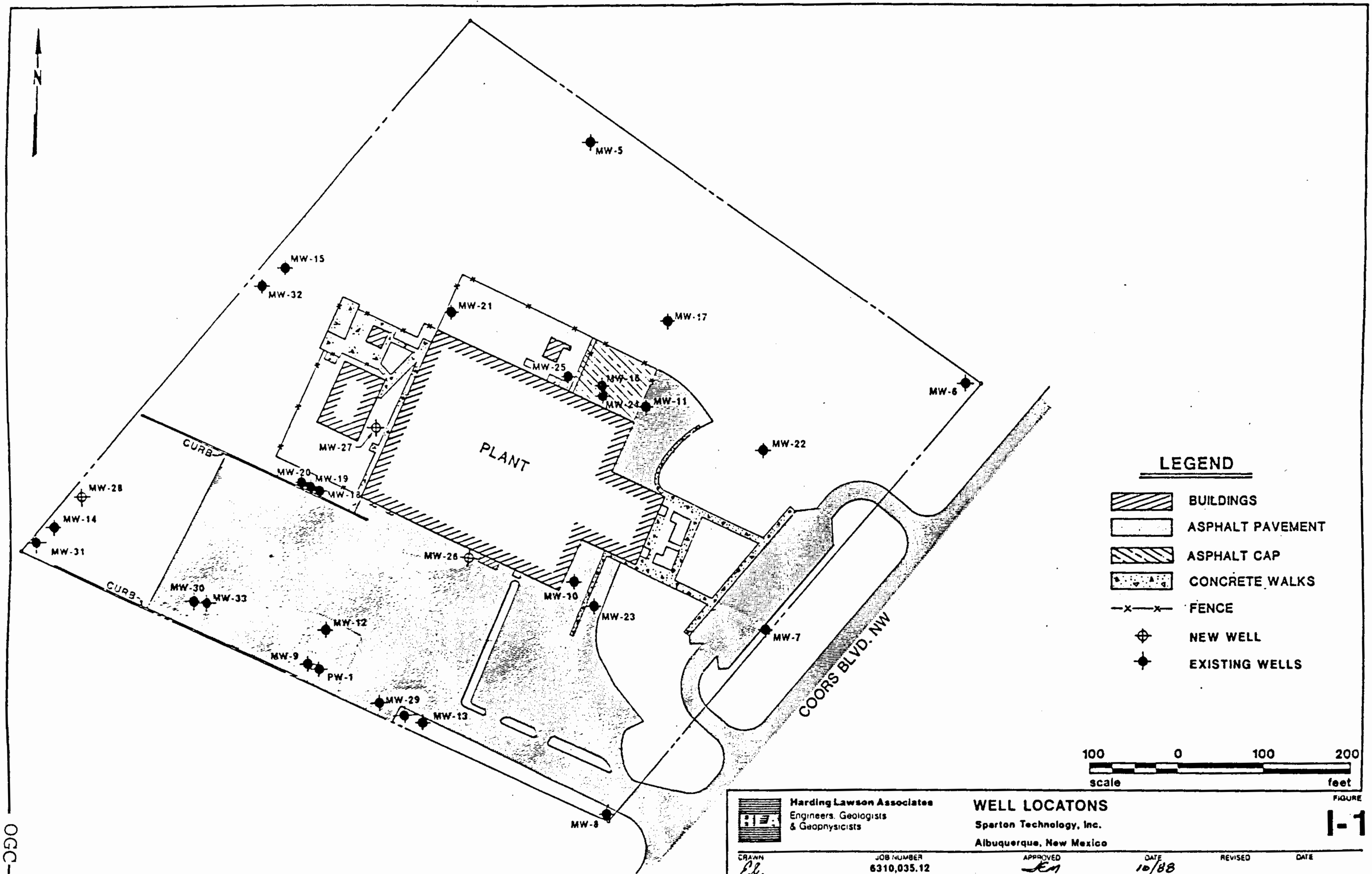
Since no disposal had taken place in the well location, it was anticipated that the soil cuttings from the unsaturated zone would not be contaminated. However, all cuttings produced from the drilling and sampling procedures were containerized in 55-gallon plastic drums. After completion of the monitoring well installation, the drums were opened and the cuttings were monitored with the PID. The PID indicated no contamination (zero PID reading) on the cuttings from the three barrels of cutting from the unsaturated zone. These cuttings were therefore spread evenly on the ground surface of the plant. The one barrel of cuttings from the saturated zone registered a reading on the PID and was disposed of as hazardous waste.

The water produced from development of the wells was stored in a tank and disposed of at the completion of the project through the sanitary sewer as approved by the City of Alburquerque.

G. Decontamination Procedures

Drilling and sampling equipment were cleaned with a portable, high-pressure steam cleaner prior to any field work and between each boring to prevent cross-contamination between the boreholes. Soil sampling tools were decontaminated after each use. Prior to leaving the work site, the drilling and sampling equipment were steam cleaned so that no contamination was carried off the site. Decontamination fluids and sediments were disposed of according to the procedures for handling of drill cuttings and fluids (Section F).

LIST OF PLATES



Harding Lawson Associates
Engineers, Geologists & Geophysicists

WELL LOCATONS
Sparton Technology, Inc.
Albuquerque, New Mexico

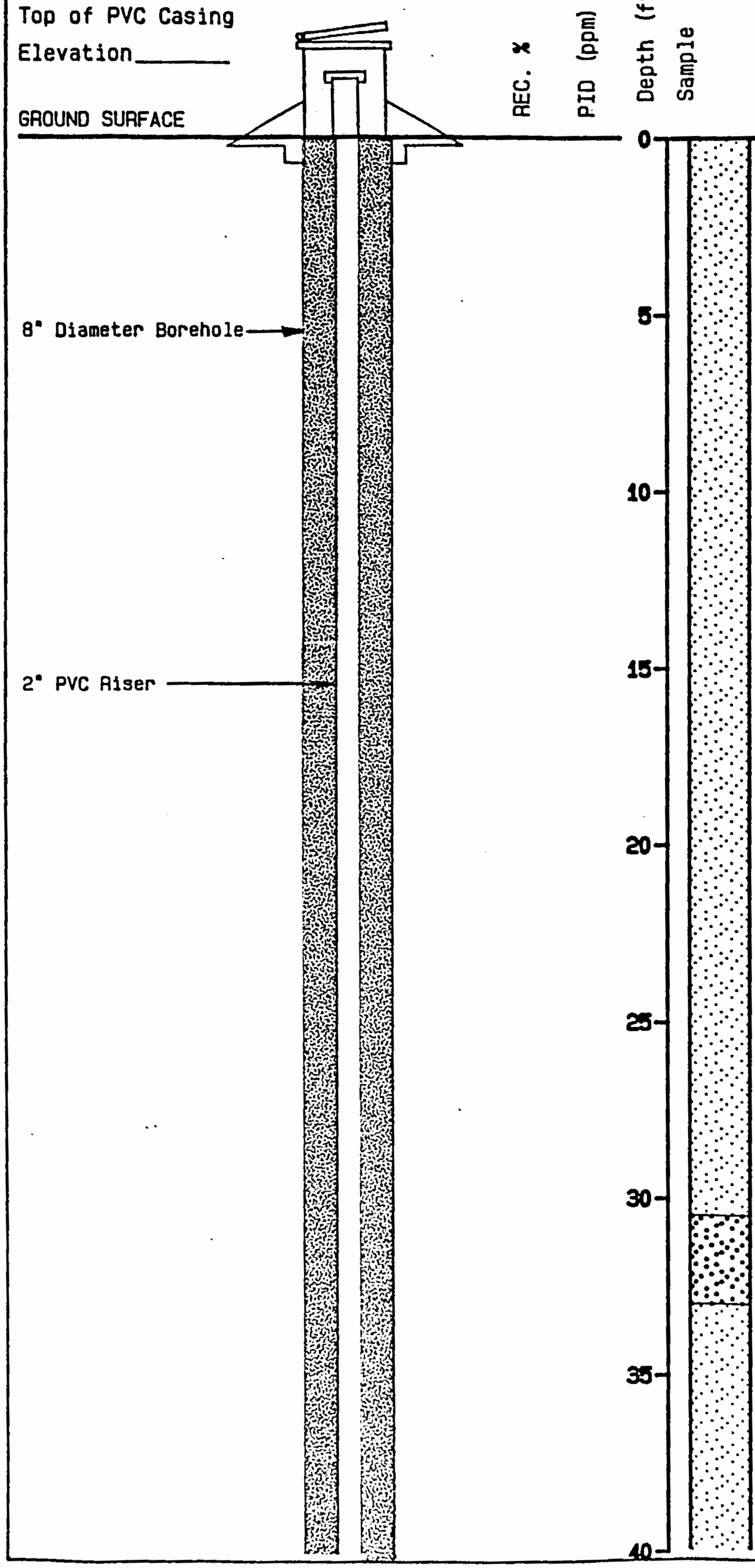
FIGURE 1-1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
EL	6310,035.12	[illegible]	10/88		

OGC-002997

Top of PVC Casing
Elevation________

Equipment Hollow Stem Auger
Elevation ft Date 5/17/88



LIGHT BROWN FINE TO MEDIUM SAND (SP)

gray fine sand seam at 5.0 - 5.5'

caliche lamination at 14.5'

clayey sand seam at 30.0' - 30.3'

LIGHT BROWN FINE-COARSE SAND (SW) with fine gravel at 31.5' -31.7'

LIGHT BROWN TO BROWN FINE-MEDIUM SAND (SP) with occasional clayey sand laminations to 39.0'

Harding Lawson Associates
Engineers and Geoscientists

Log of Boring and Well Completion Detail MW-26
Sparton Technology Inc.
Albuquerque, New Mexico

FIGURE
I-2

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
E.S.	6310,035.12	[signature]	9/88		

OGC-002998

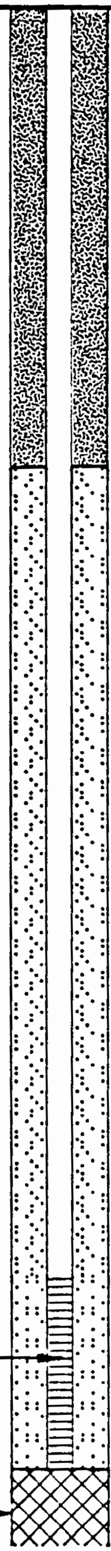
Top of PVC Casing
Elevation_______

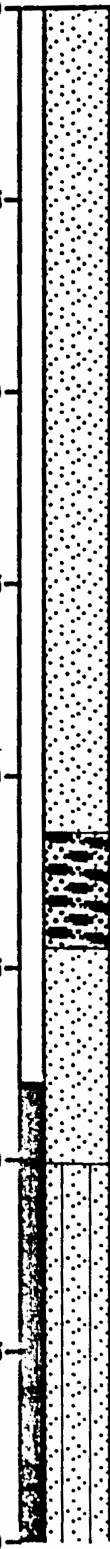
GROUND SURFACE

Equipment Hollow Stem Auger

Elevation ft Date 5/17/88

REC. %	PID (ppm)	Depth (ft)
		40
		45
		50
		55
		60
		65
54	2	70
	6	
		75
	6	
60	1	
100	8	80





gray gravel seam 42.0' - 42.2'

gray gravel seam 45.8' - 46.3'
gray gravel seam 46.5' - 46.7'

BROWN AND GRAY SANDY GRAVEL (GW)

GRAY FINE-MEDIUM SAND (SP)

▽ 5/18/88
saturated at 67.0'

with occasional cemented inclusions to 70.3'

GRAY SILTY FINE SAND (SM)
with clay at 70.8'

med. sand seam 78.0' - 78.5'
dry silty sand seam at 78.8' - 79.1'
(aquitard)

Harding Lawson Associates
Engineers and Geoscientists

Log of Boring and Well Completion Detail MW-26
Sparton Technology Inc.
Albuquerque, New Mexico

FIGURE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
E.S.	6310,035.12	[signature]	9/88		

OGC-002999

Top of PVC Casing
Elevation________

GROUND SURFACE

REC. %

PID (ppm)

Depth (ft)

Sample

Equipment Hollow Stem Auger

Elevation ft Date 5/17/88

80

End of Boring - 81.0 ft.

85

90

95

100

105

110

115

120

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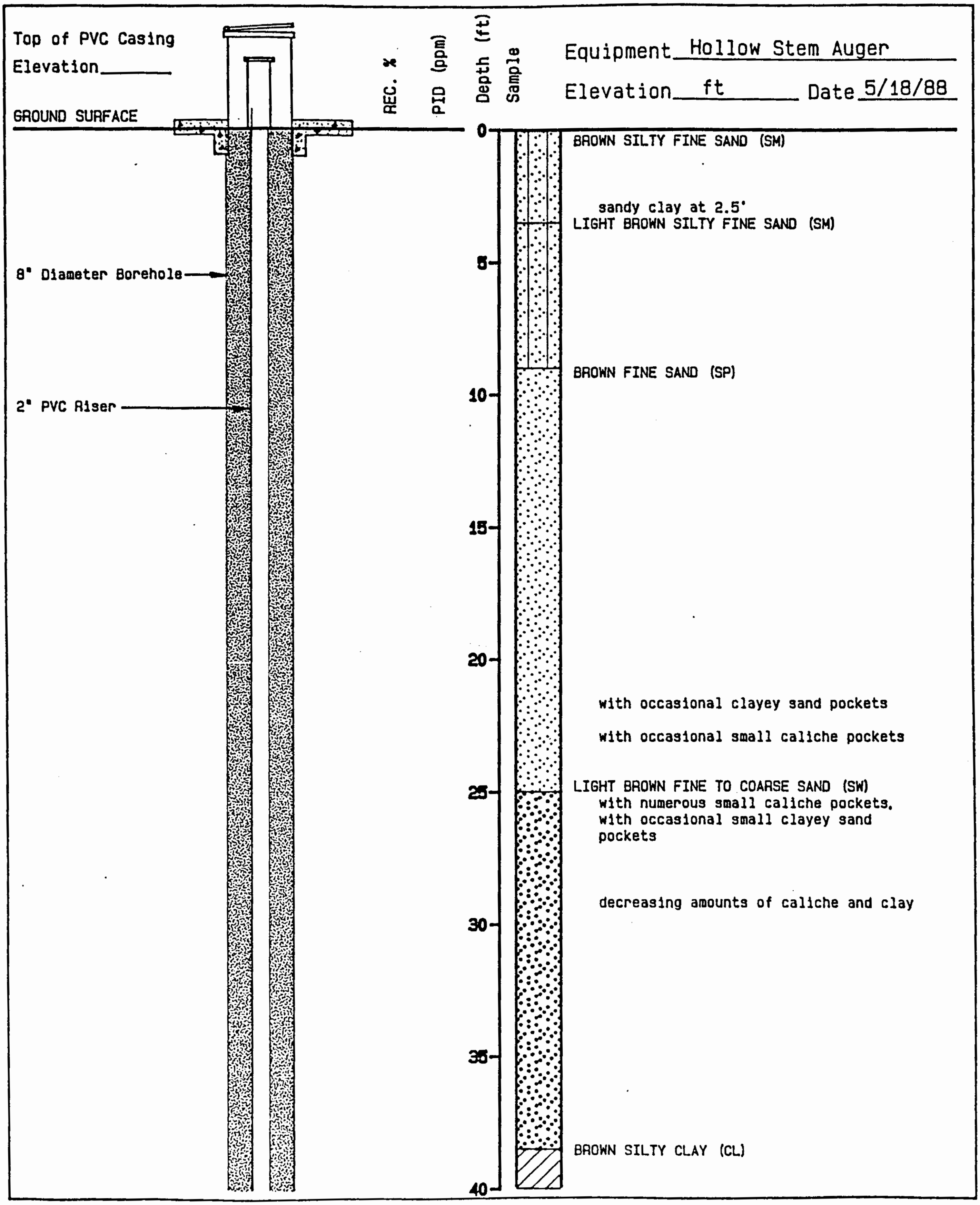
Log of Boring and Well Completion Detail MW-26 FIGURE

Sparton Technology Inc.
Albuquerque, New Mexico

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
ES	6310,035.12	SDD	9/88		

OGC-003000



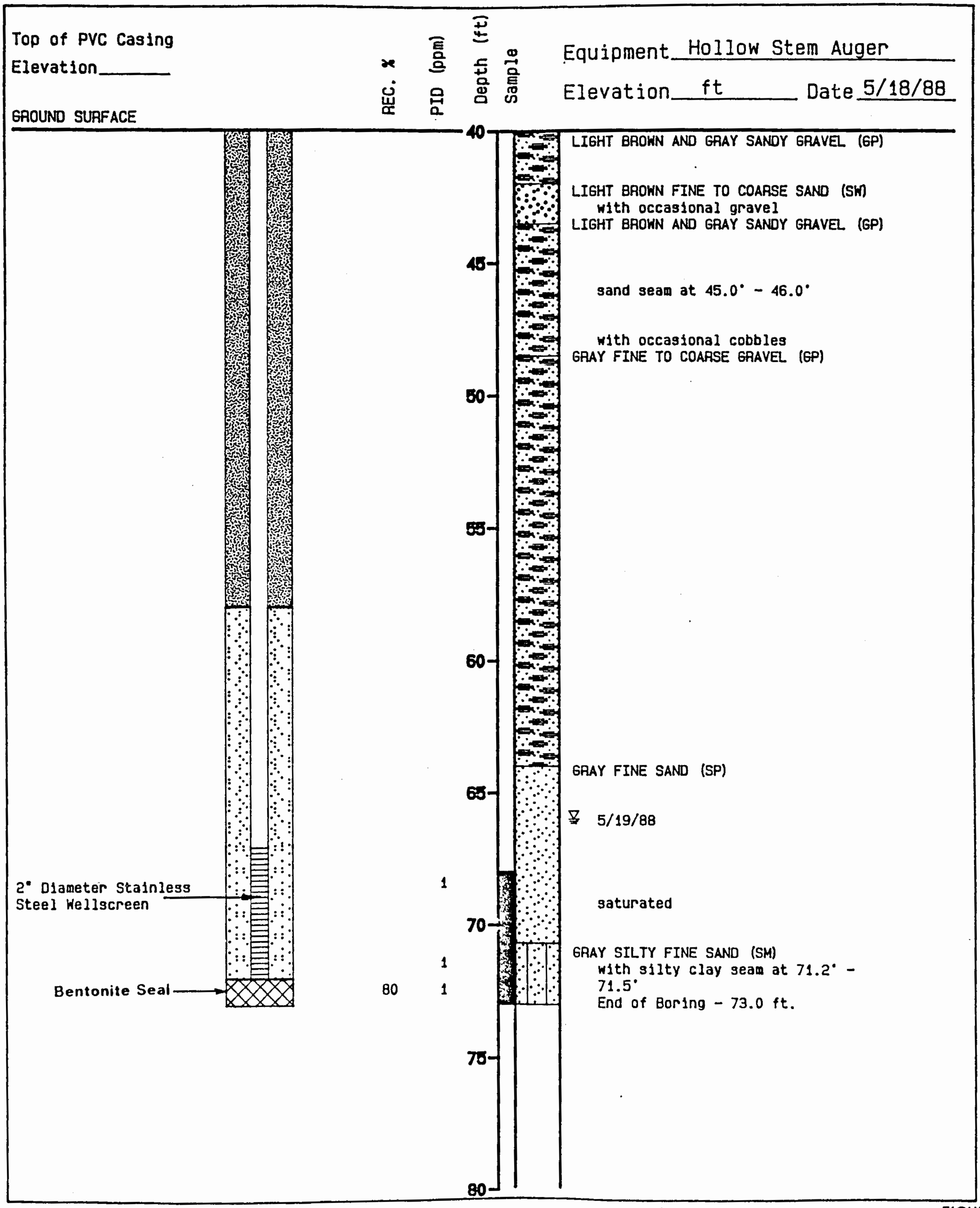
Harding Lawson Associates
Engineers and Geoscientists

Log of Boring and Well Completion Detail MW-27
Sparton Technology Inc.
Albuquerque, New Mexico

FIGURE
I-3

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
ES	6310,035.12	[signature]	9/88		

OGC-003001



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Log of Boring and Well Completion Detail MW-27
Sparton Technology Inc.
Albuquerque, New Mexico

FIGURE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
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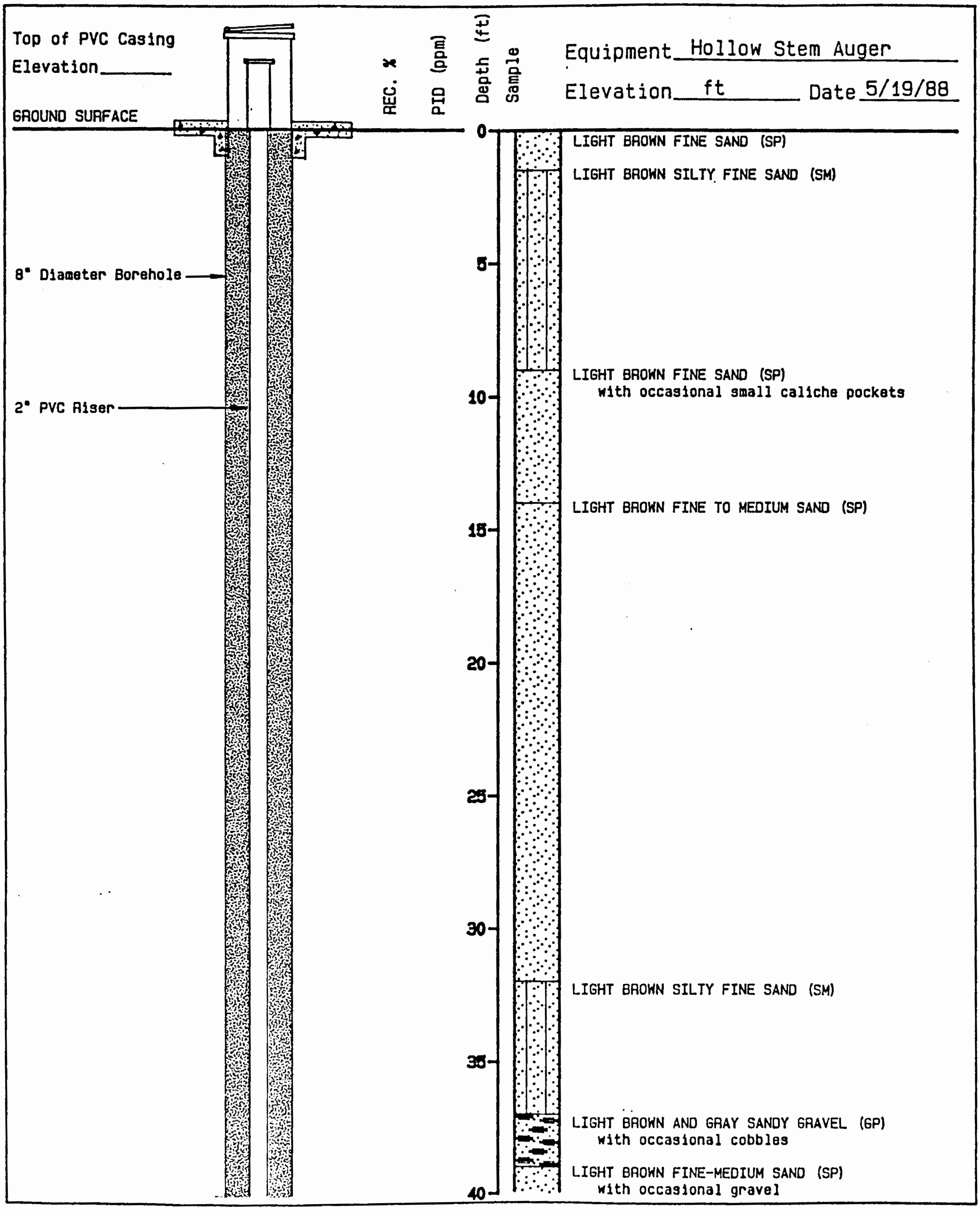
OGC-003002



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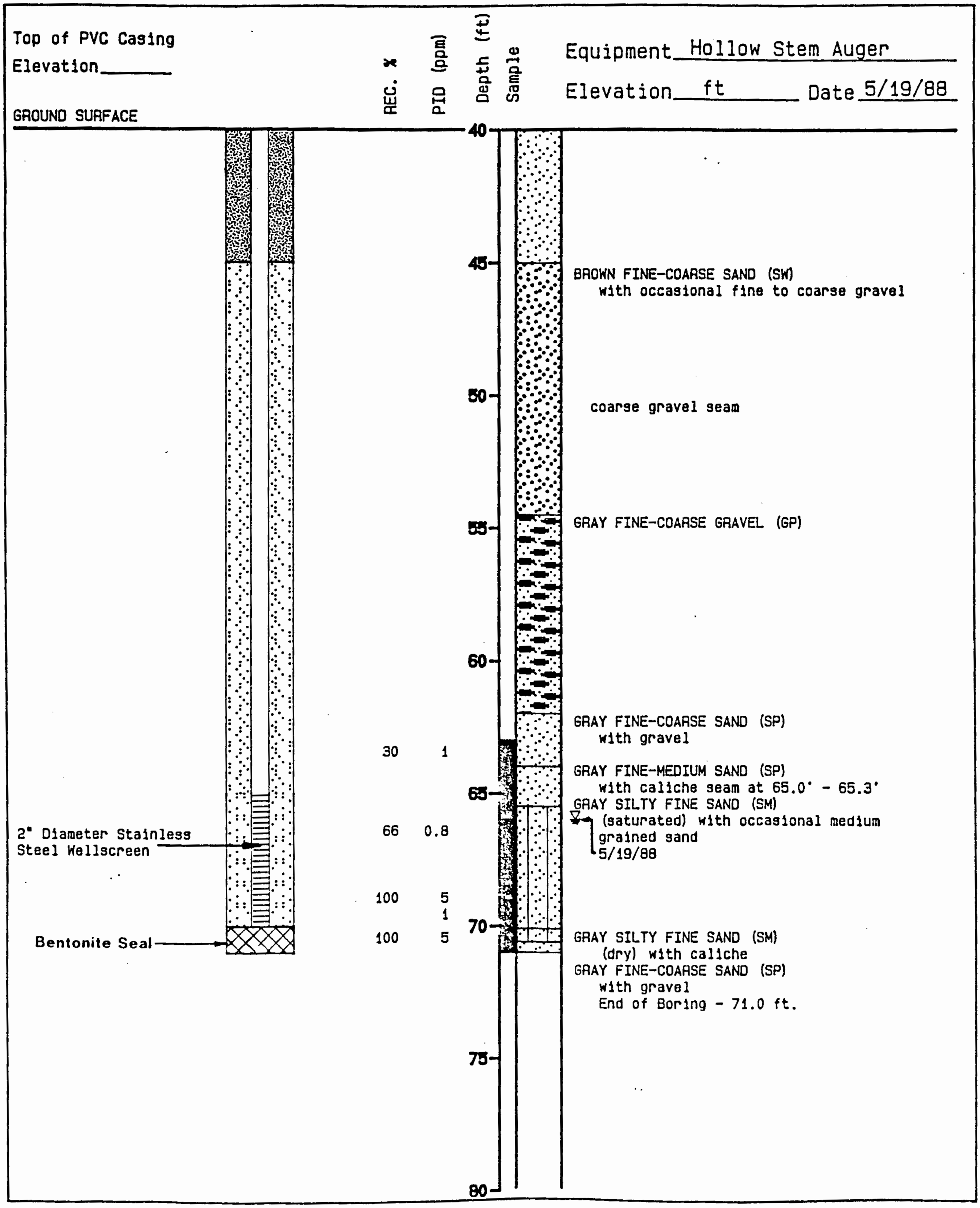
Engineers and Geoscientists

Log of Boring and Well Completion Detail MW-28
Sparton Technology Inc.
Albuquerque, New Mexico

FIGURE
I-4

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
E.S.	6310,035.12	[signature]	9/88		

OGC-003003



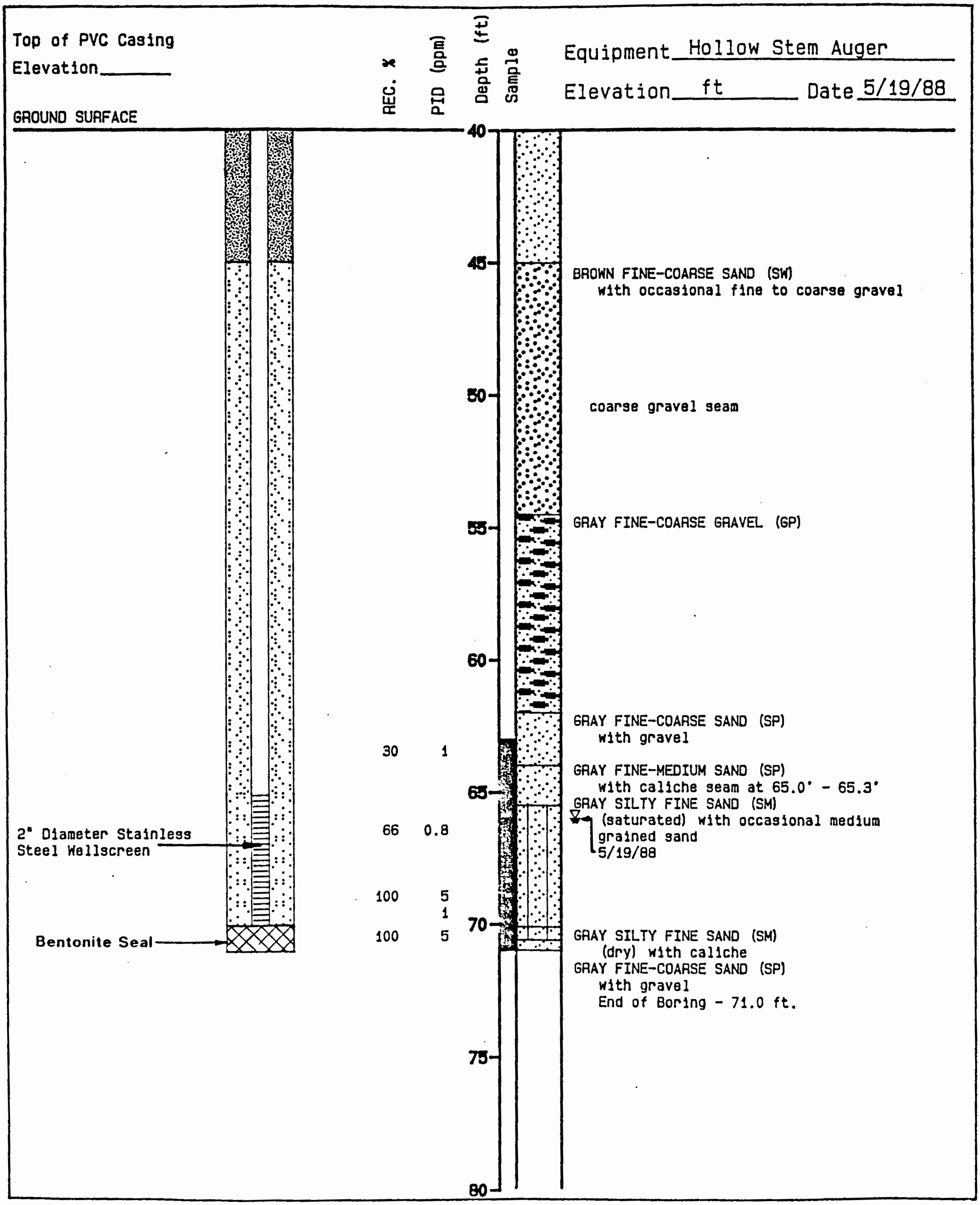
Harding Lawson Associates
Engineers and Geoscientists

Log of Boring and Well Completion Detail MW-28 FIGURE

Sparton Technology Inc.
Albuquerque, New Mexico

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
ES	6310,035.12	SDB	9/88		

OGC-003004



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Engineers and Geoscientists

Log of Boring and Well Completion Detail MW-28 FIGURE
Sparton Technology Inc.
Albuquerque, New Mexico

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
ES	6310,035.12	[signature]	9/88		

OGC-003005

MAJOR DIVISIONS				TYPICAL NAMES
COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN No. 4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, SILTY GRAVELS WITH SAND
			GC	CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS WITH OR WITHOUT GRAVEL
			SC	CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50% OR LESS		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS
			OL	ORGANIC SILTS OR CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS, FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC SILTS OR CLAYS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

UNIFIED SOIL CLASSIFICATION - ASTM D2487-85

- Bentonite Seal
- Cement/Bentonite Grout
- Filter Sand
- Pea Gravel
- Well Screen
- Solid Casing

KEY TO WELL CONSTRUCTION

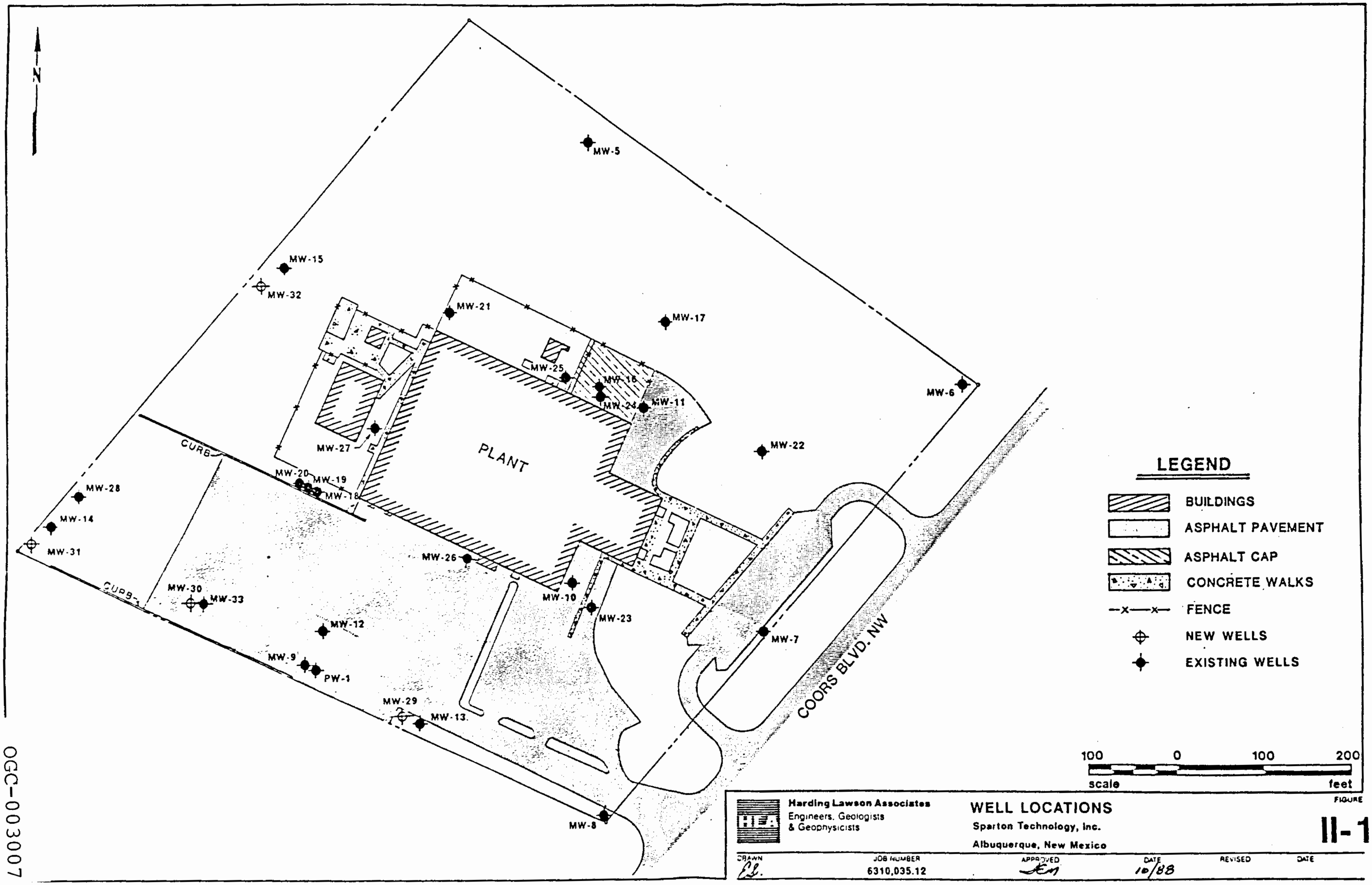
Harding Lawson Associates
Engineers and Geoscientists

SOIL CLASSIFICATION CHART AND KEY TO MONITORING WELL CONSTRUCTION
Sparton Technology Inc.
Albuquerque, New Mexico

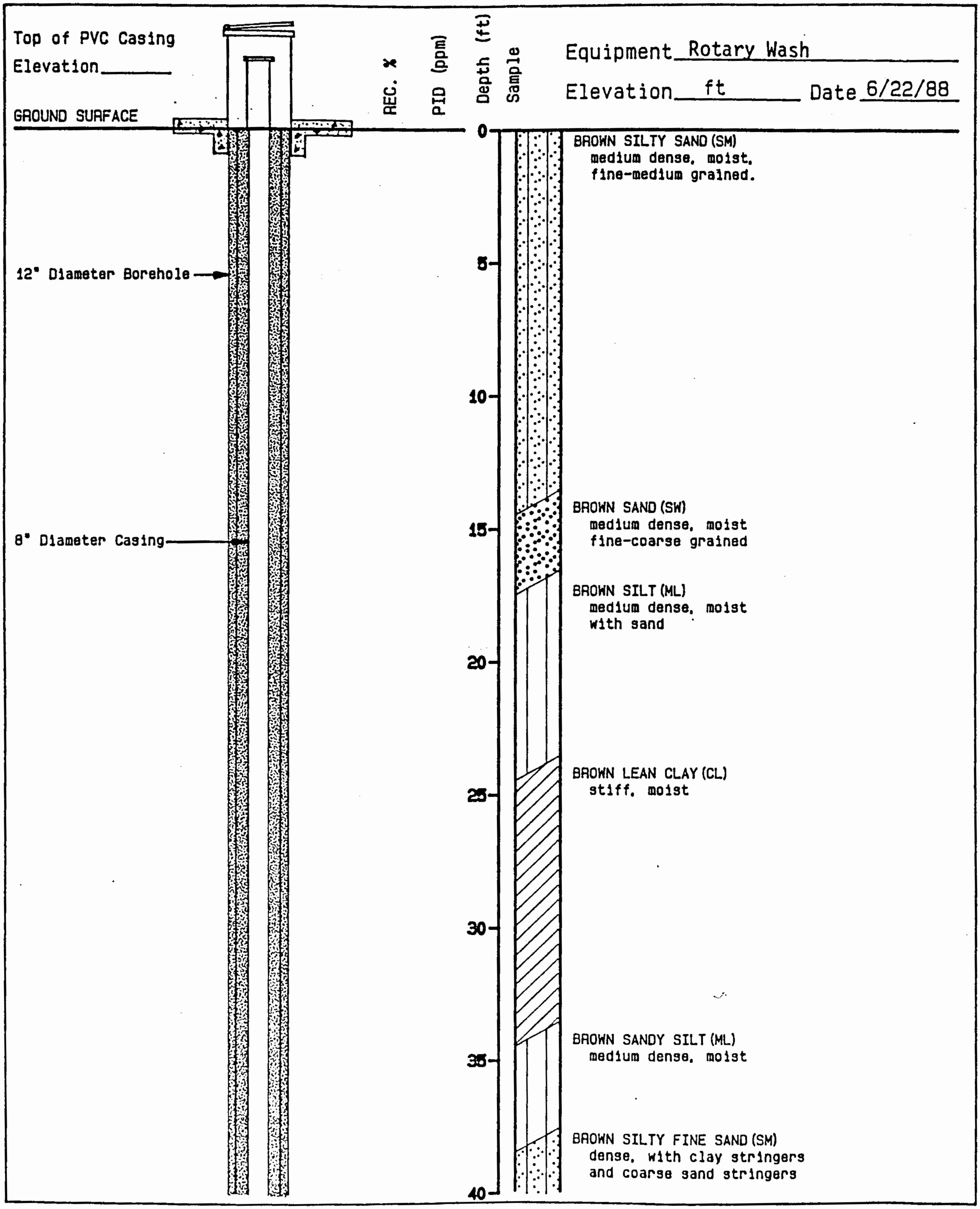
PLATE **I-5**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
EL	6310,035.12	SDB	9/88		

OGC-003006


N
MW-5
MW-15
MW-32
MW-21
MW-17
MW-25
MW-16
MW-24
MW-11
MW-6
MW-22
PLANT
MW-27
CURB
MW-20
MW-19
MW-18
MW-28
MW-14
MW-31
MW-26
MW-10
MW-23
MW-7
COORS BLVD. NW
CURB
MW-30
MW-33
MW-12
MW-9
PW-1
MW-29
MW-13
MW-8
LEGEND
BUILDINGS
ASPHALT PAVEMENT
ASPHALT CAP
CONCRETE WALKS
FENCE
NEW WELLS
EXISTING WELLS
100 0 100 200
scale
feet
HLA
Harding Lawson Associates
Engineers, Geologists & Geophysicists
WELL LOCATIONS
Sparton Technology, Inc.
Albuquerque, New Mexico
FIGURE
II-1
DRAWN
JOB NUMBER
6310,035.12
APPROVED
DATE
10/88
REVISED
DATE

OGC-003007



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Engineers and Geoscientists

Log of Boring and Well Completion Detail MW-29
Sparton Technology Inc.
Albuquerque, New Mexico

FIGURE
II-2

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
ES	6310,035.12	SDD	9/88		

OGC-003008

Top of PVC Casing

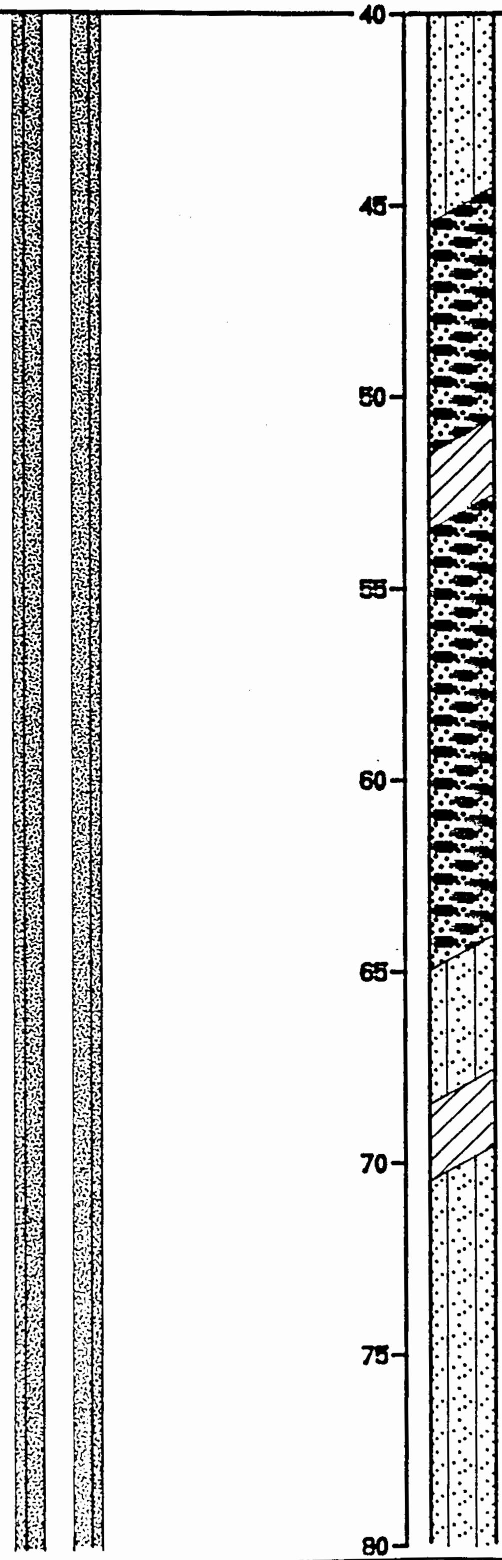
Elevation_______

GROUND SURFACE

REC. % | PID (ppm) | Depth (ft) | Sample

Equipment Rotary Wash

Elevation ft Date 6/22/88



DARK GRAY & BROWN GRAVEL (GW)
with sand

BROWN LEAN CLAY (CL)
very stiff, moist

DARK GRAY & BROWN GRAVEL (GW)
with sand and with
clay stringers

BROWN SILTY SAND (SM)
dense, fine-coarse grained
with gravel stringers

GRAY SANDY CLAY (CL)
stiff, moist

BROWN SILTY FINE SAND (SM)
dense, with sandy silt
stringers

10"-12" gravel layer at 73.0'

14"-16" gravel layer at 75.0'

No silt stringers below 76.0'

with gravel and gravel stringers below
77.5'

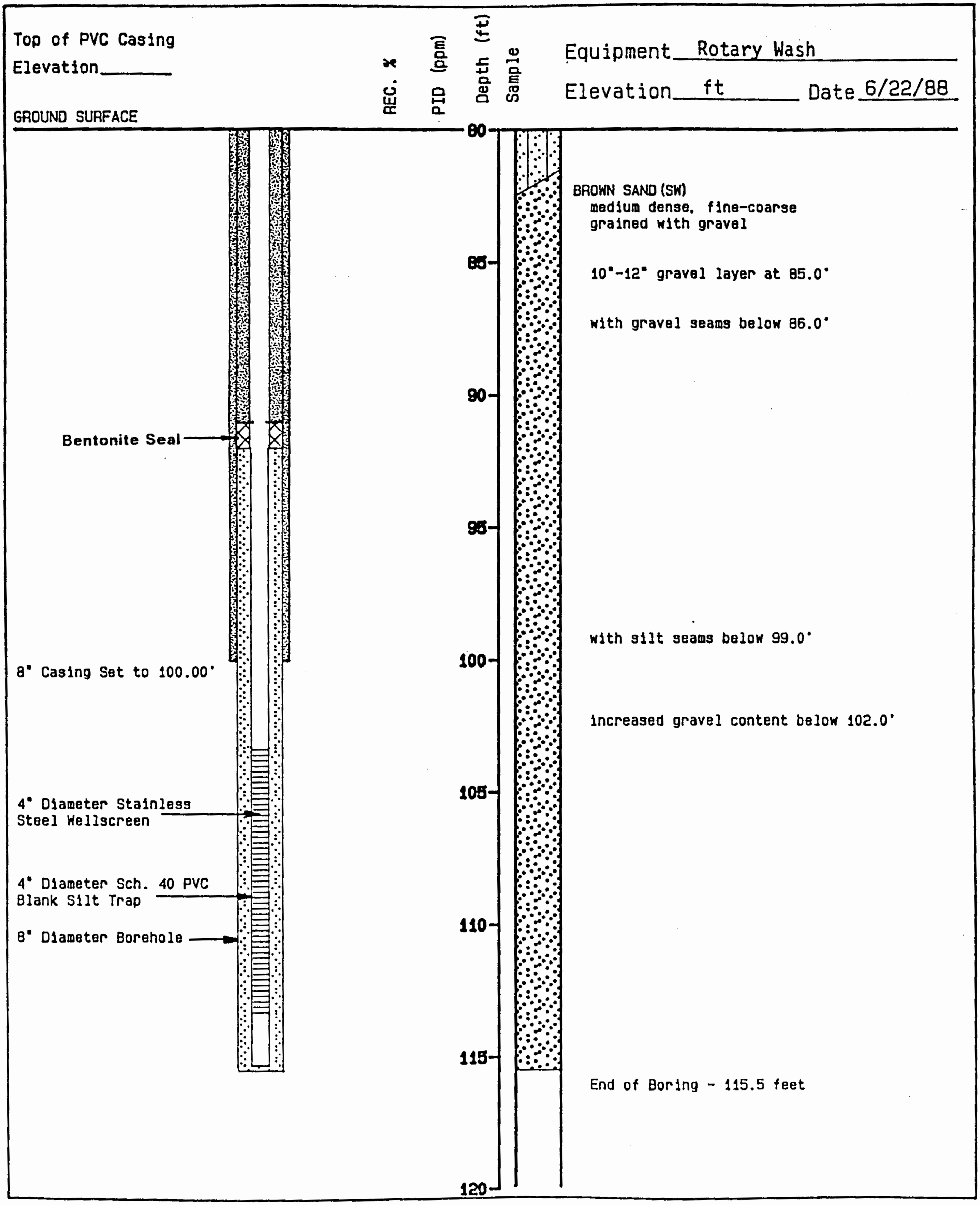
Harding Lawson Associates
Engineers and Geoscientists

Log of Boring and Well Completion Detail MW-29 FIGURE

Sparton Technology Inc.
Albuquerque, New Mexico

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
ES	6310,035.12	[signature]	9/88		

OGC-003009



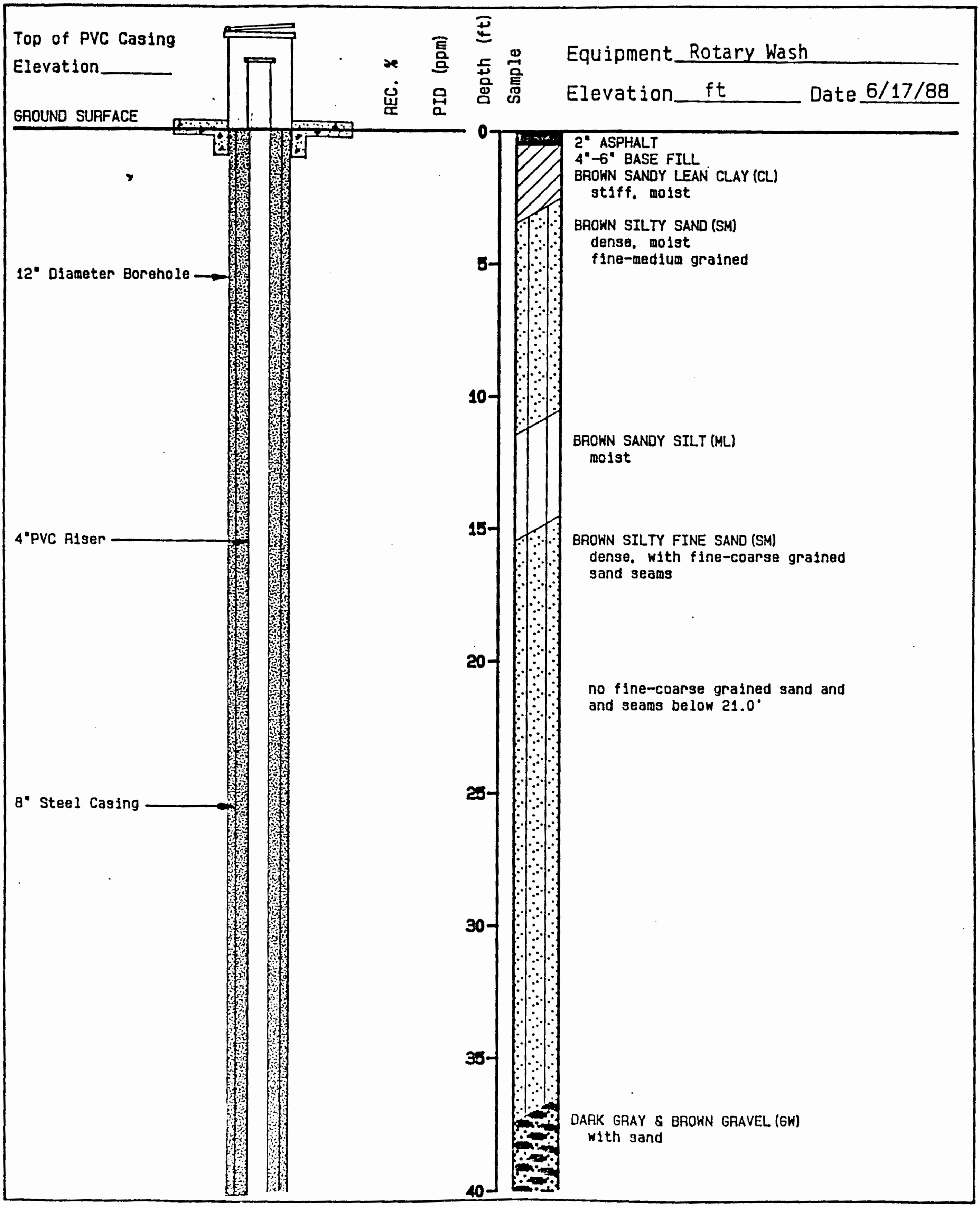
Harding Lawson Associates
Engineers and Geoscientists

Log of Boring and Well Completion Detail MW-29
Sparton Technology Inc.
Albuquerque, New Mexico

FIGURE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
E.S	6310,035.12	SOB	9/88		

OGC-003010



Harding Lawson Associates
Engineers and Geoscientists

Log of Boring and Well Completion Detail MW-30
Sparton Technology Inc.
Albuquerque, New Mexico

FIGURE
II-3

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
E.S.	6310,035.12	SCB	9/88		

OGC-003011

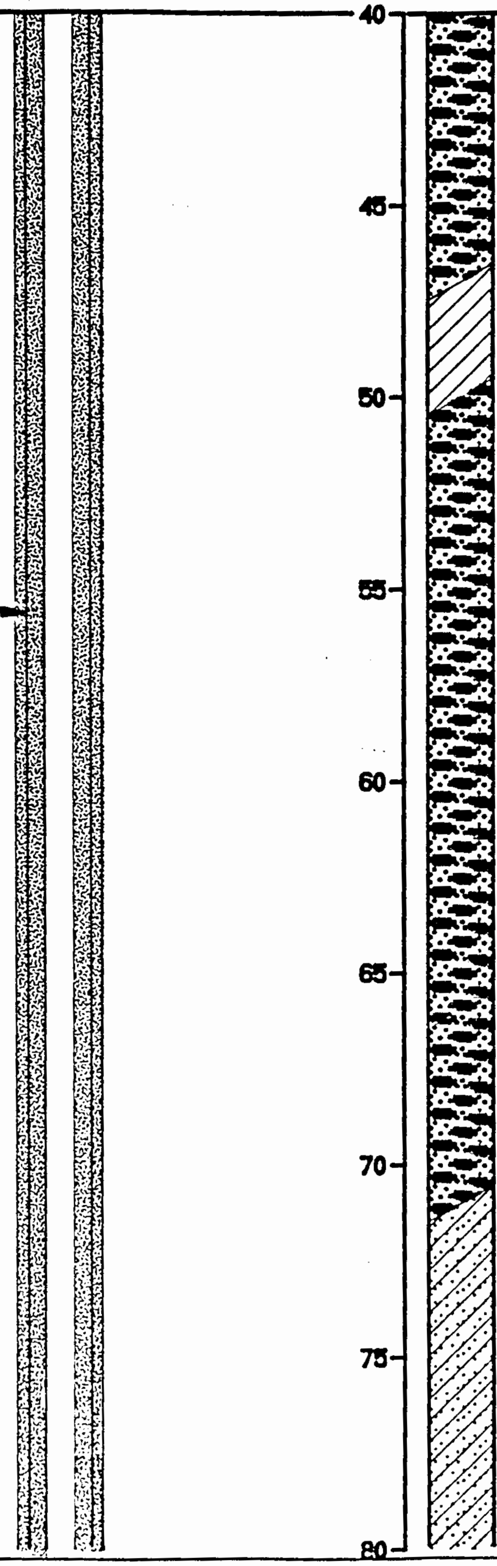
Top of PVC Casing
Elevation________

GROUND SURFACE

REC. % | PID (ppm) | Depth (ft) | Sample

Equipment Rotary Wash
Elevation ft Date 6/17/88

8" Steel Casing



BROWN SANDY LEAN CLAY (CL)
stiff, moist with gravel

with interbedded gravel below 49.0'
DARK GRAY & BROWN GRAVEL (GW)
with sand, with sandy
clay seams

6"-8" light brown clayey sand layer at
69.5'

LIGHT BROWN CLAYEY SAND (SC)
with interbedded coarse
sand and gravel

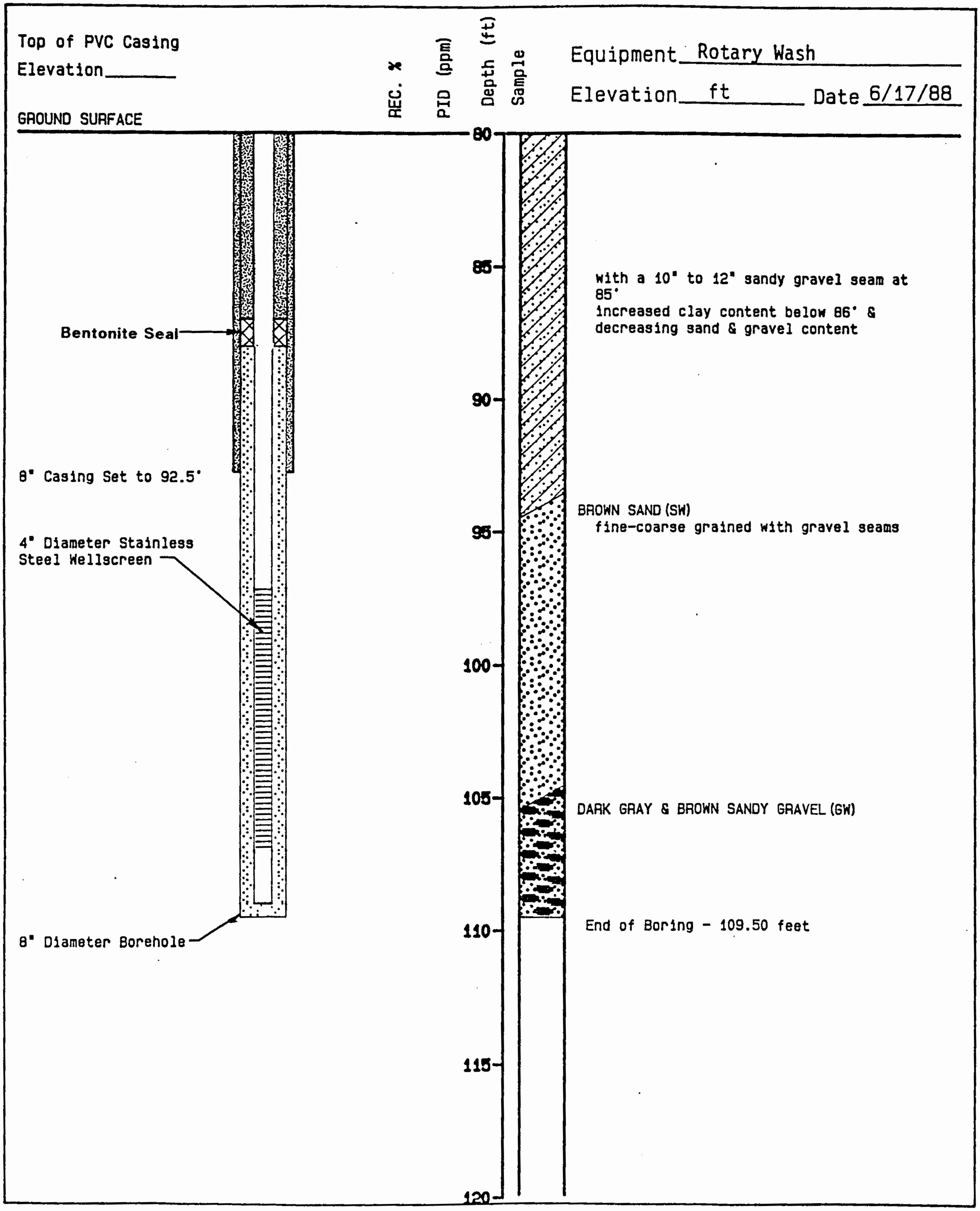
Harding Lawson Associates
Engineers and Geoscientists

Log of Boring and Well Completion Detail MW-30
Sparton Technology Inc.
Albuquerque, New Mexico

FIGURE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
M.K.	6310,035.12	[signature]	9/88		

OGC-003012



Harding Lawson Associates
Engineers and Geoscientists

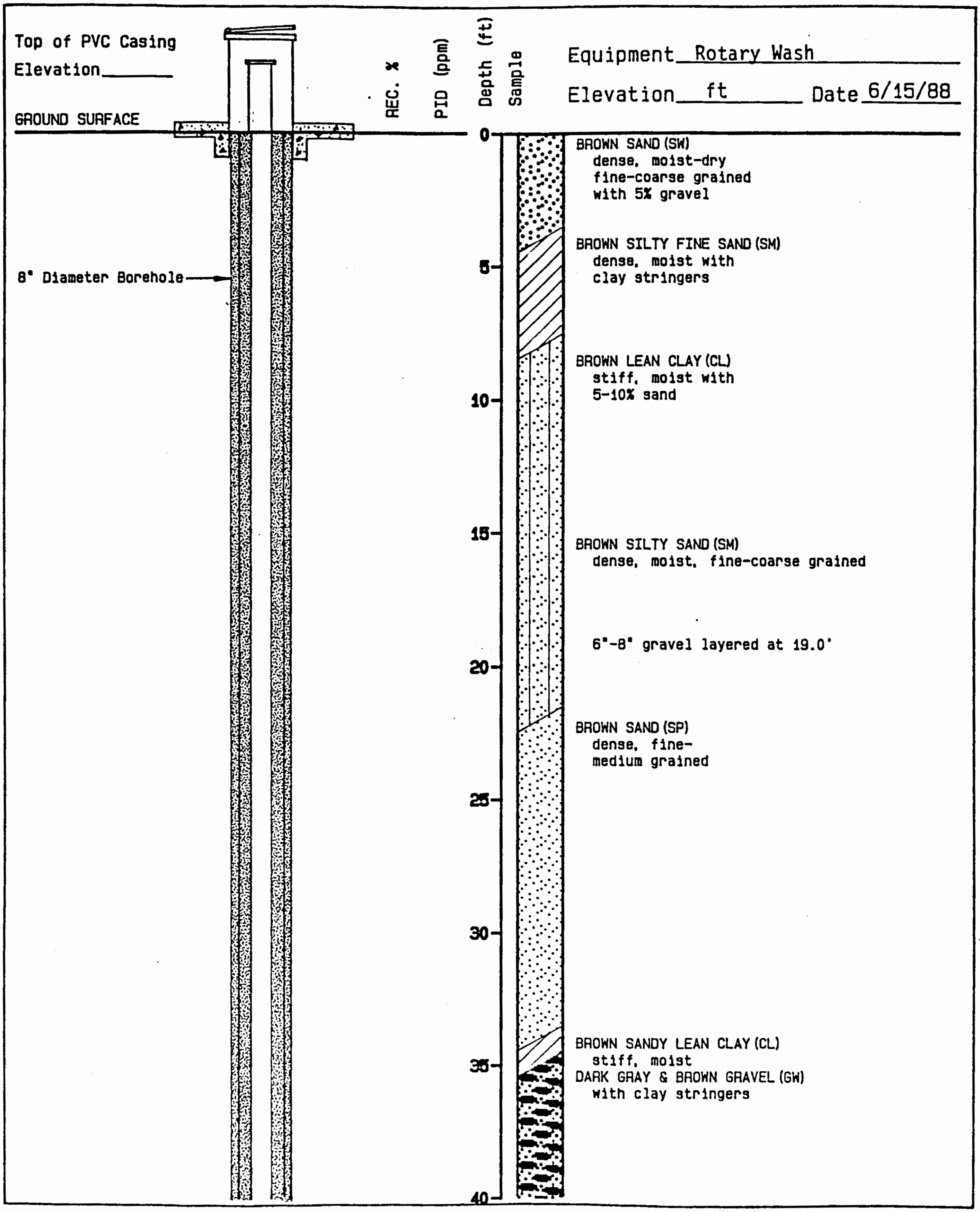
Log of Boring and Well Completion Detail MW-30

Sparton Technology Inc.
Albuquerque, New Mexico

FIGURE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
M.K.	6310,035.12	SOB	9/88		

OGC-003013



Harding Lawson Associates
Engineers and Geoscientists

Log of Boring and Well Completion Detail MW-31
Sparton Technology Inc.
Albuquerque, New Mexico

FIGURE **II-4**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
M.K.	6310,035.12	[signature]	9/88		

OGC-003014

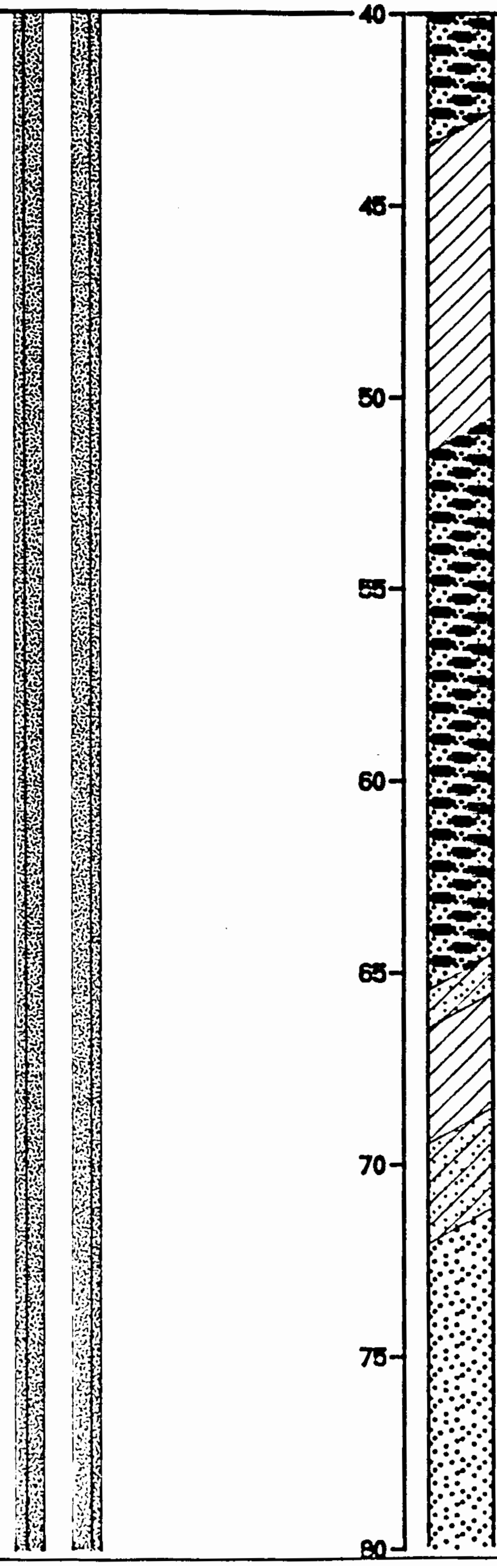
Top of PVC Casing
Elevation_______

GROUND SURFACE

REC. %	PID (ppm)	Depth (ft)	Sample

Equipment Rotary Wash

Elevation ft Date 6/15/88



BROWN LEAN CLAY (CL)
stiff, moist, with 15-20% sand
with 6"-8" gravel layer at 43.5'

DARK GRAY & BROWN GRAVEL (GW)
with 5-10% sand and clay
stringers

LIGHT BROWN & BROWN CLAYEY SAND (SC)
dense, moist

BROWN LEAN CLAY (CL)
stiff, moist with
5% sand to gravel

BROWN & LIGHT BROWN CLAYEY SAND (SC)
dense, fine-medium grained with
gravel and clay stringers

BROWN SAND (SW)
dense, fine-coarse
grained with gravel
and clay stringers

Harding Lawson Associates
Engineers and Geoscientists

Log of Boring and Well Completion Detail MW-31
Sparton Technology Inc.
Albuquerque, New Mexico

FIGURE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
M.K.	6310,035.12	SRD	9/88		

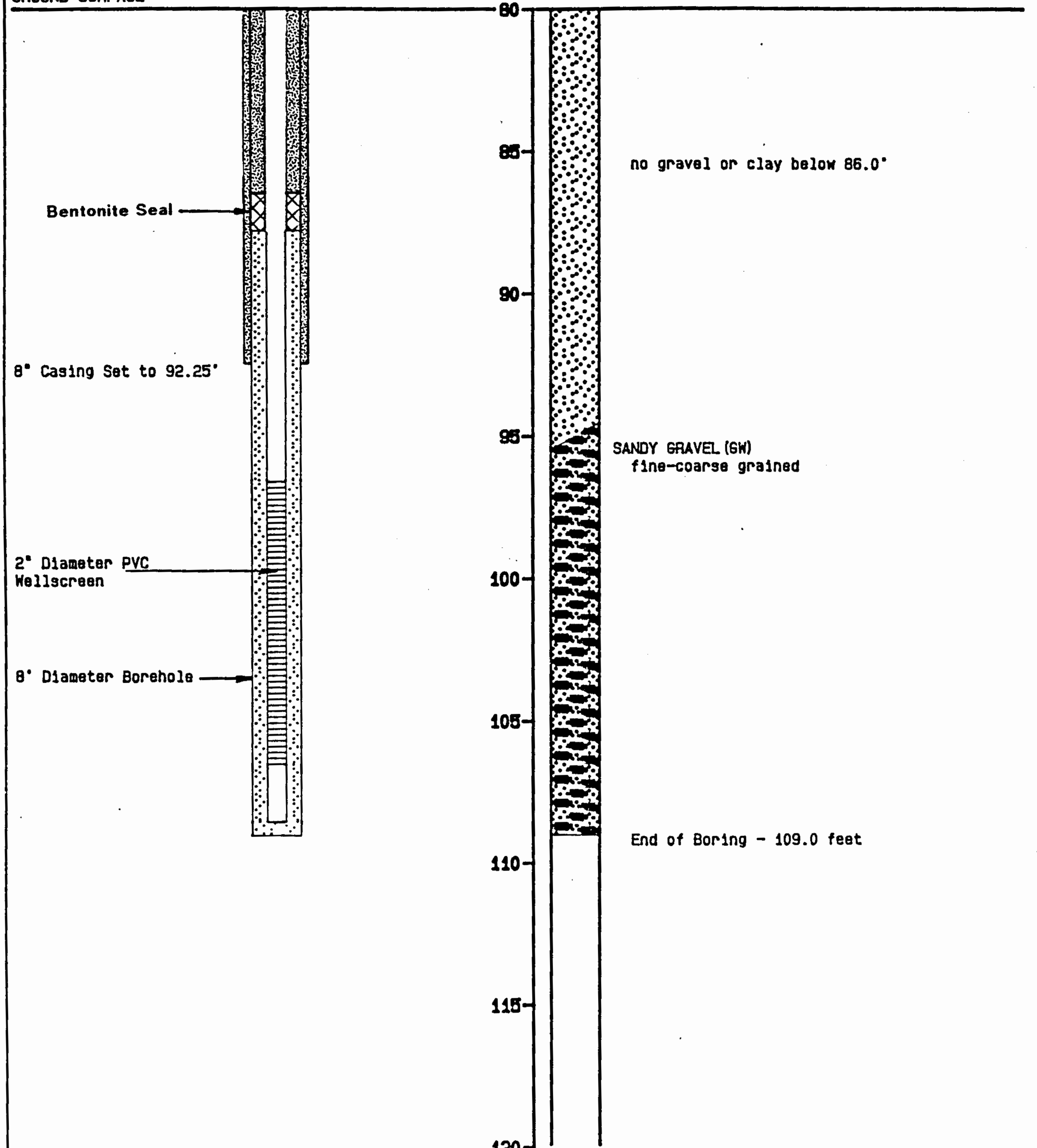
OGC-003015

Top of PVC Casing
Elevation________

GROUND SURFACE

REC. % | PID (ppm) | Depth (ft) | Sample

Equipment Rotary Wash
Elevation ft   Date 6/15/88



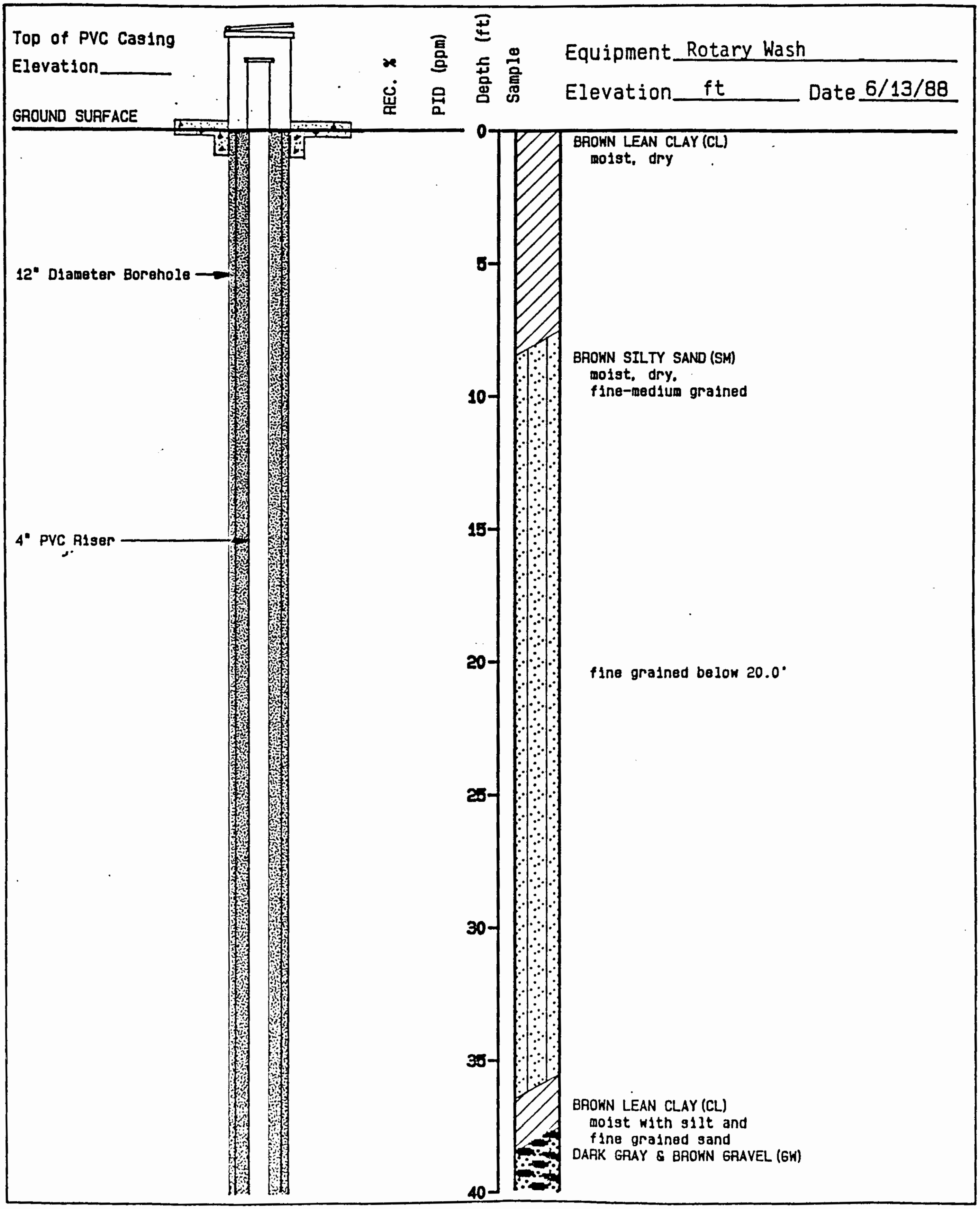
Harding Lawson Associates
Engineers and Geoscientists

Log of Boring and Well Completion Detail MW-31
Sparton Technology Inc.
Albuquerque, New Mexico

FIGURE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
M.K.	6310,035.12	[signature]	9/88		

OGC-003016



Harding Lawson Associates
Engineers and Geoscientists

Log of Boring and Well Completion Detail MW-32
Sparton Technology Inc.
Albuquerque, New Mexico

FIGURE
II-5

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
M.K.	6310,035.12	SDD	9/88		

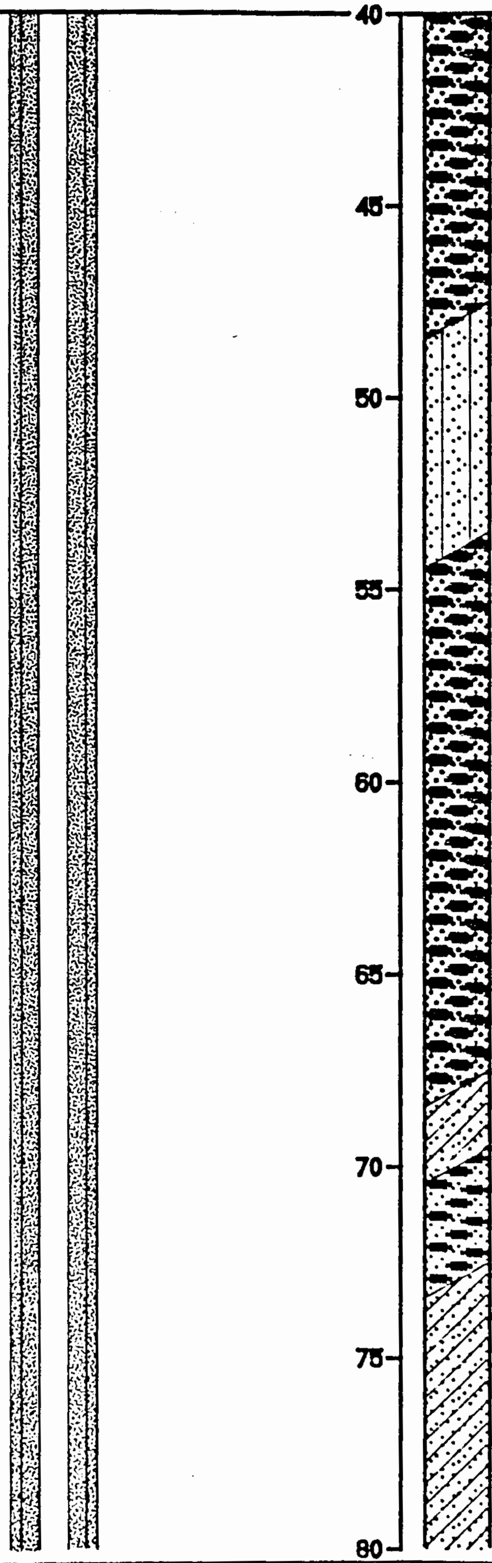
OGC-003017

Top of PVC Casing
Elevation________

GROUND SURFACE

REC. % | PID (ppm) | Depth (ft) | Sample

Equipment Rotary Wash
Elevation ft Date 6/13/88



BROWN SILTY SAND (SM)
medium dense,
fine grained with
clay seams

DARK GRAY & BROWN GRAVEL (GW)

BROWN CLAYEY SAND (SC)
dense, moist, fine grained

DARK GRAY & BROWN GRAVEL (GP)

6"-8" light brown sand seam at 72.0'

BROWN & LIGHT BROWN CLAYEY SAND (SC)
dense, moist to wet, fine grained,
with gravel

Harding Lawson Associates
Engineers and Geoscientists

Log of Boring and Well Completion Detail MW-32
Sparton Technology Inc.
Albuquerque, New Mexico

FIGURE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
M.K.	6310.035.12	[signature]	9/88		

OGC-003018

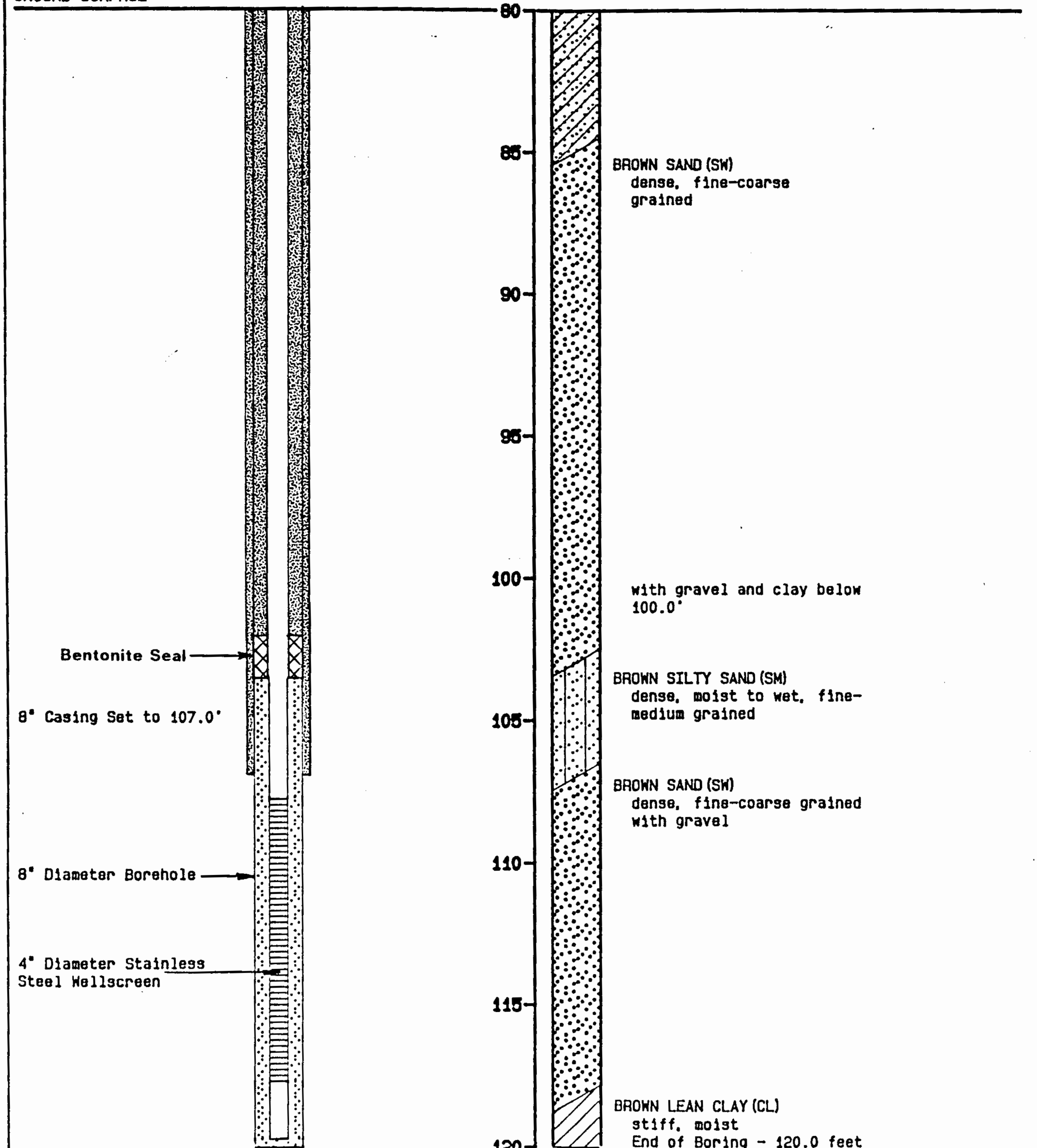
Top of PVC Casing
Elevation________

GROUND SURFACE

REC. %	PID (ppm)	Depth (ft)	Sample

Equipment Rotary Wash

Elevation ft Date 6/13/88



Harding Lawson Associates
Engineers and Geoscientists

Log of Boring and Well Completion Detail MW-32
Sparton Technology Inc.
Albuquerque, New Mexico

FIGURE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
M.K.	6310,035.12	SB	9/88		

OGC-003019

MAJOR DIVISIONS					TYPICAL NAMES
COARSE–GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN No. 4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW		WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
			GP		POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM		SILTY GRAVELS, SILTY GRAVELS WITH SAND
			GC		CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW		WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
			SP		POORLY GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	SM		SILTY SANDS WITH OR WITHOUT GRAVEL
			SC		CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE–GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50% OR LESS		ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS
			CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS
			OL		ORGANIC SILTS OR CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		MH		INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS, FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH		ORGANIC SILTS OR CLAYS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			Pt		PEAT AND OTHER HIGHLY ORGANIC SOILS

UNIFIED SOIL CLASSIFICATION – ASTM D2487-85

- Bentonite Seal
- Cement/Bentonite Grout
- Filter Sand
- Pea Gravel
- Well Screen
- Solid Casing

KEY TO WELL CONSTRUCTION

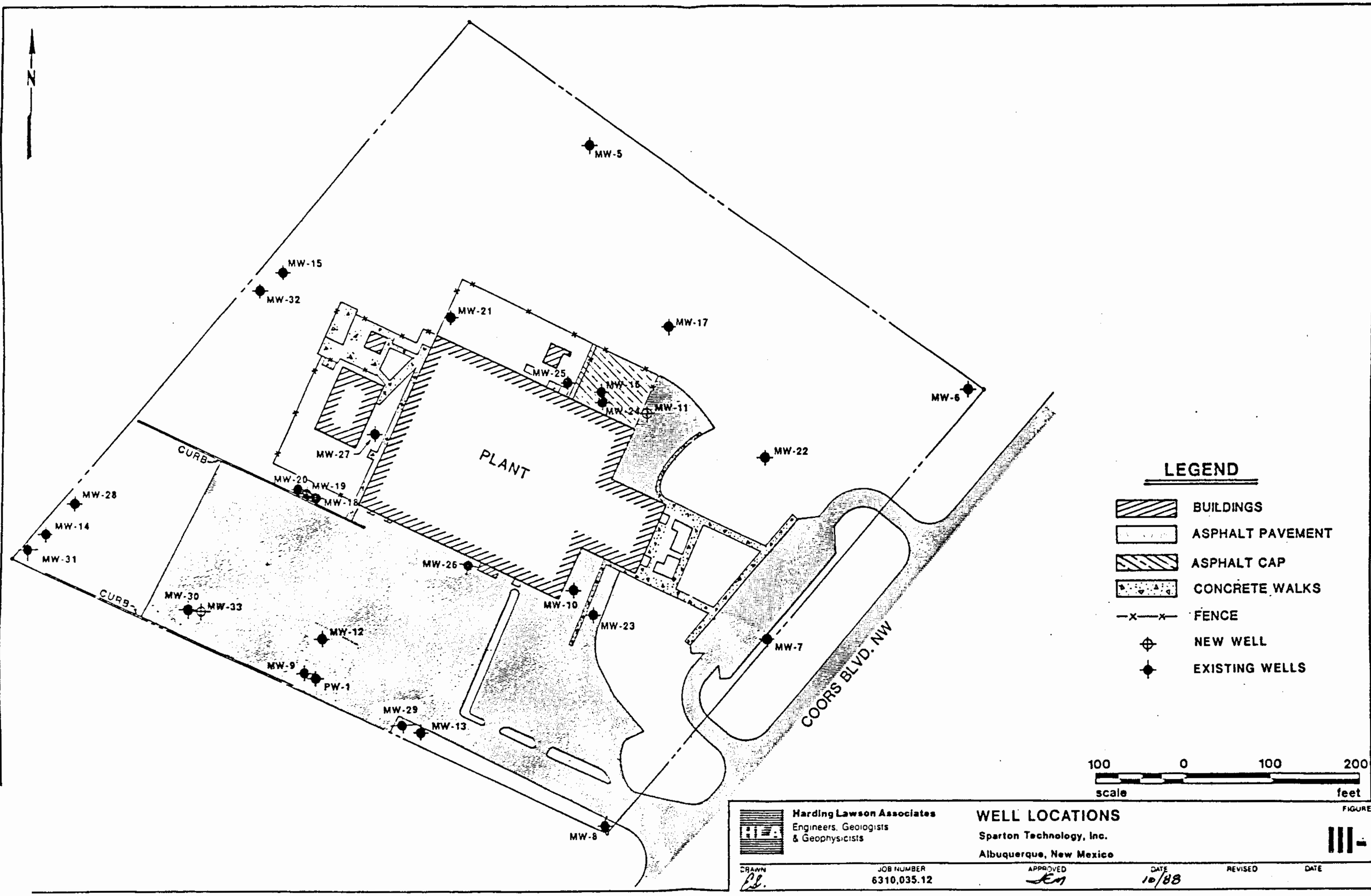
Harding Lawson Associates
Engineers and Geoscientists

SOIL CLASSIFICATION CHART AND KEY TO MONITORING WELL CONSTRUCTION
Sparton Technology Inc.
Albuquerque, New Mexico

PLATE **II-6**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
EL	6310,035.12	SOB	9/89		

OGC–003020



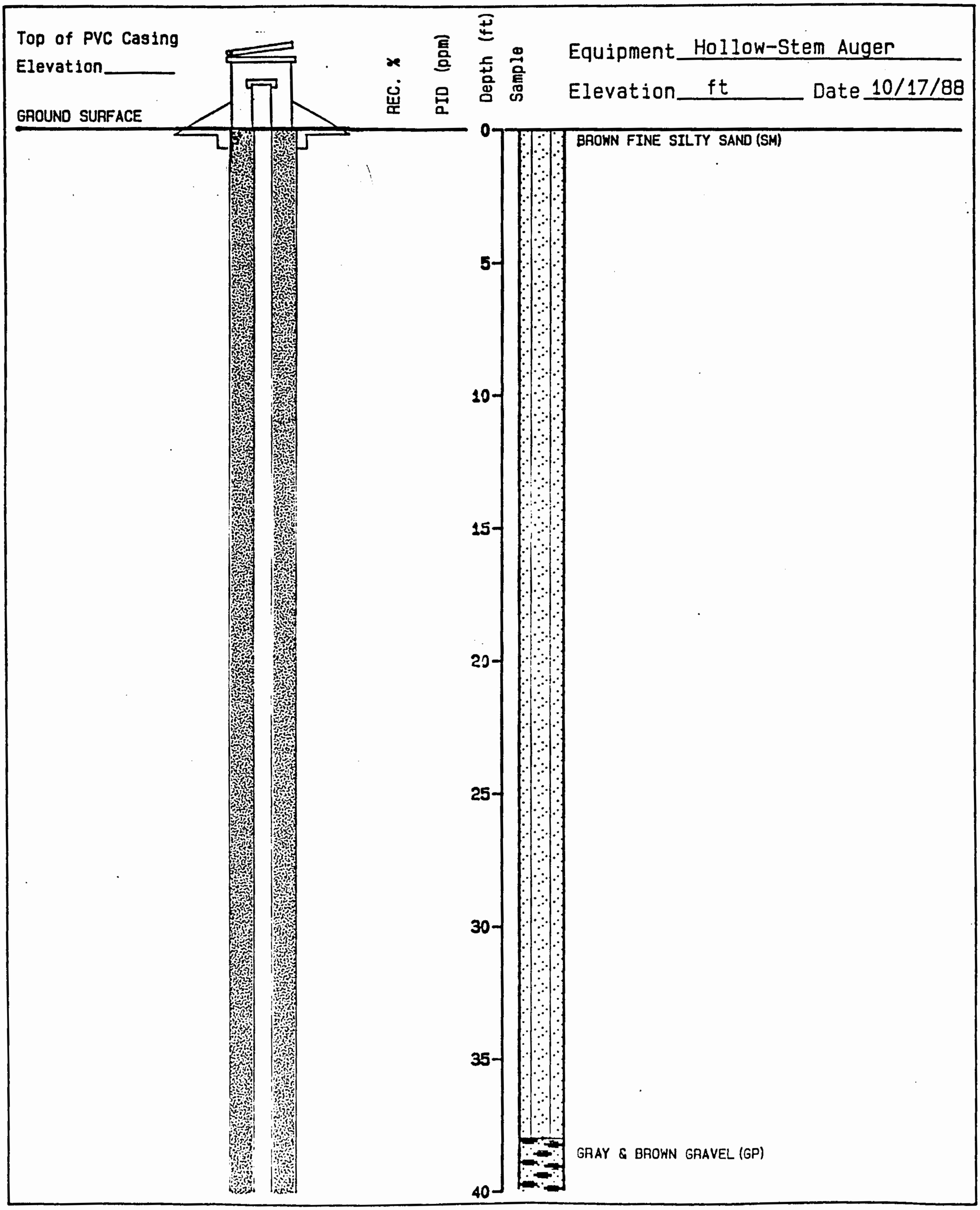
Harding Lawson Associates
Engineers, Geologists & Geophysicists

WELL LOCATIONS
Sparton Technology, Inc.
Albuquerque, New Mexico

FIGURE III-1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
EL	6310,035.12		10/88		

OGC-003021



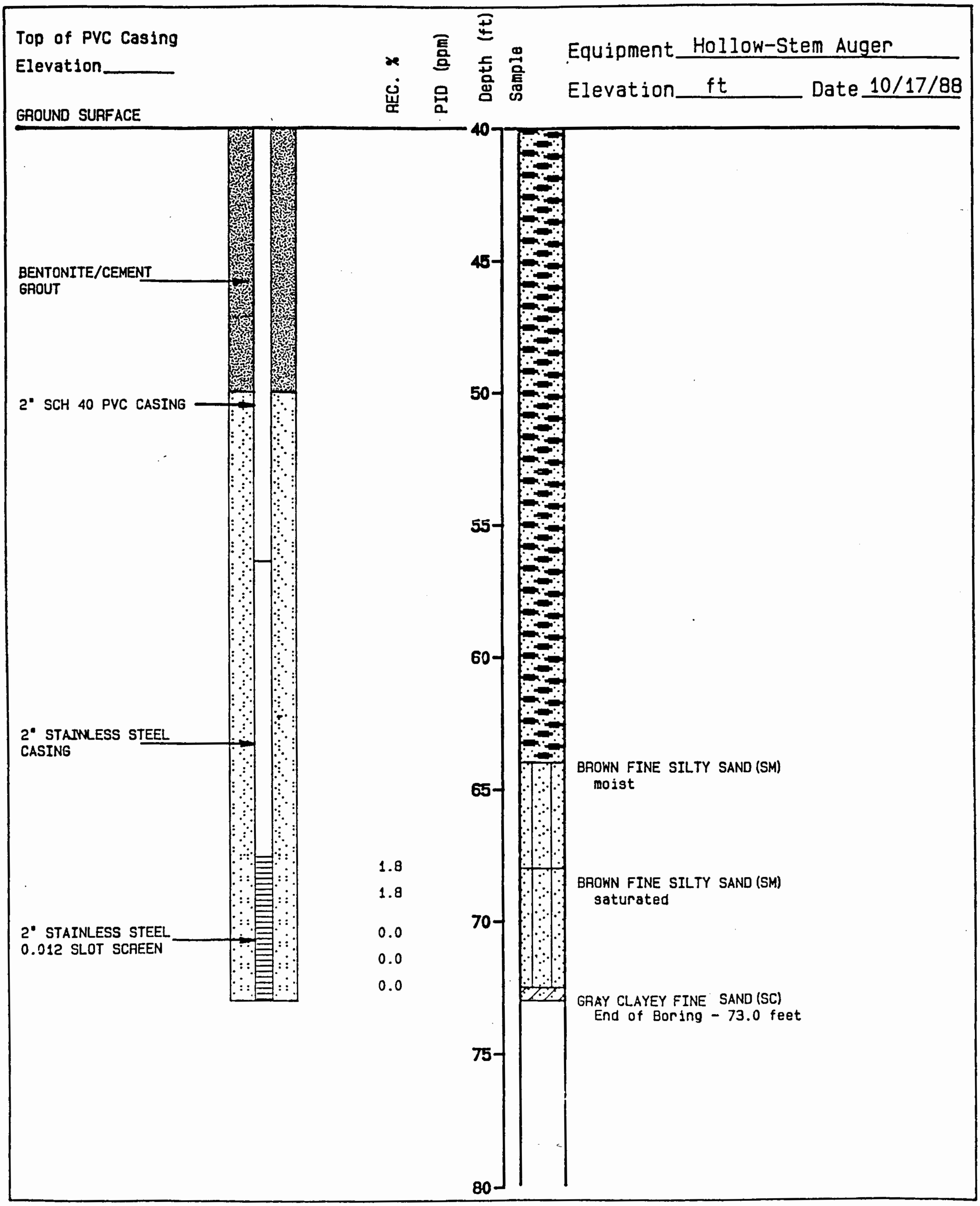
Harding Lawson Associates
Engineers and Geoscientists

Log of Boring and Well Completion Detail MW-33
Sparton Technology Inc.
Albuquerque, New Mexico

FIGURE **III-2**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	6310,035.12	SPP	10/88		

OGC-003022



Harding Lawson Associates
Engineers and Geoscientists

Log of Boring and Well Completion Detail MW-33

FIGURE

Sparton Technology Inc.
Albuquerque, New Mexico

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	6310,035.12	SDD	10/88		

OGC-003023

MAJOR DIVISIONS					TYPICAL NAMES
COARSE–GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN No. 4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW		WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
			GP		POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM		SILTY GRAVELS, SILTY GRAVELS WITH SAND
			GC		CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW		WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
			SP		POORLY GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	SM		SILTY SANDS WITH OR WITHOUT GRAVEL
			SC		CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE–GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50% OR LESS		ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS
			CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS
			OL		ORGANIC SILTS OR CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		MH		INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS, FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH		ORGANIC SILTS OR CLAYS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			Pt		PEAT AND OTHER HIGHLY ORGANIC SOILS

UNIFIED SOIL CLASSIFICATION - ASTM D2487-85

- **Bentonite Seal**
- **Cement/Bentonite Grout**
- **Filter Sand**
- **Pea Gravel**
- **Well Screen**
- **Solid Casing**

KEY TO WELL CONSTRUCTION

Harding Lawson Associates
Engineers and Geoscientists

SOIL CLASSIFICATION CHART AND KEY TO MONITORING WELL CONSTRUCTION
Sparton Technology Inc.
Albuquerque, New Mexico

PLATE **III-3**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
EL	6310,035.12	SDP	10/88		

OGC-003024