Animal Intrusion Status Report for Fiscal Year 1989

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ANIMAL INTRUSION STATUS REPORT FOR FISCAL YEAR 1989

ABSTRACT

The Protective Barrier and Warning Marker System Development Plan identified tasks that need to be completed to design a final protective barrier to implement in-place disposal of radioactive waste. This report summarizes the animal intrusion tasks that were conducted by Westinghouse Hanford Company in fiscal years 1988 and 1989 with respect to small mammals and water infiltration.*

An animal intrusion lysimeter facility was constructed and installed in fiscal year 1988. The facility consists of two outer boxes buried at grade that serve as receptacles for six animal intrusion lysimeters. Small burrowing mammals common to the Hanford Site environs are introduced over a 3- to 4-month period. Supplemental precipitation is added to three of the lysimeters with a rainulator at a rate equivalent to a 100-year storm. Soil moisture samples are taken before and after each test and soil moisture measurements are also taken with a hydroprobe during the test period.

Two tests have been completed and a third test is in progress. Preliminary results from the first test indicate that the additional water, that was supplemented by the rainulator to the plots with burrowing animals, is being removed. Mechanisms that might account for this include evaporation loss caused by continuous soil turnover from burrow excavations and moisture loss from open burrows, which probably allow some air circulation.

Data from the second test, which was conducted during the winter, indicate that all the plots (control and animal) gained water. Plots with animal burrows gained almost twice as much water as the control plots. The greatest changes occurred at the 18-in. level in all the plots. Additional tests, scheduled to be conducted over the next few years, should substantiate or verify these preliminary observations.

*Adams, M. R. and N. R. Wing, 1986, Protective Barrier and Warning Marker System Development Plan, RHO-RE-PL-35P, Rockwell Hanford Operations, Richland, Washington.

EXECUTIVE SUMMARY

The Protective Barrier and Warning Marker System Development Plan identified tasks that need to be completed to design a final protective barrier to implement in-place disposal of radioactive waste. Some of the tasks focused on the need to evaluate the impacts that burrowing animals could have on the integrity of a protective barrier system. This report summarizes the animal intrusion tasks that were conducted by Westinghouse Hanford Company in fiscal years (FY) 1988 and 1989 with respect to small mammals and water infiltration.*

An animal intrusion lysimeter facility was constructed and installed near the Field Lysimeter Test Facility (FLTF) adjacent to the Hanford Meteorological Station in FY 1988. The FLTF consists of two outer boxes buried at grade that serve as receptacles for six animal intrusion lysimeters. At the beginning of each test the lysimeters are lined with a plastic liner and filled with a fine soil from the McGee Ranch, a soil site near the intersections of State Highway 24 and 240. Small burrowing mammals common to the Hanford Site environs are introduced over a 3- to 4-mo period and allowed to burrow. During the course of each test supplemental precipitation is added to three of the lysimeters with a rainulator, at a rate equivalent to a 100-yr storm. Soil moisture samples are taken before and after each test, while soil moisture measurements are taken with a hydroprobe during the test period.

**Adams, M. R. and N. R. Wing, 1986, Protective Barrier and Warning Marker System Development Plan, RH0-RE-PL-35P, Rockwell Hanford Operations, Richland, Washington.*

At the present time, two tests have been completed and a third test is in progress. Preliminary results from the first test indicate that the additional water, which was supplemented by the rainulator to the plots with burrowing animals, is being removed. The data do not indicate that water movement at depth is significantly greater in plots with burrows over a 3- to 4-mo period. The water does appear to go deeper initially in plots with open burrows, but is soon removed. Mechanisms that might account for this include evaporation loss caused by continuous soil turnover from burrow excavations and moisture loss from open burrows, which probably allow some air circulation.

Data from the second test, which was conducted during the winter, show that all plots (control and animal) gained water. Plots with animal burrows gained almost twice as much water as the control plots. The greatest changes occurred at the 18-in. level in all the plots. Additional tests that are scheduled to be conducted over the next few years should verify or substantiate these preliminary observations.

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ANIMAL INTRUSION STATUS REPORT FOR FISCAL YEAR 1989

1.0 INTRODUCTION

This report summarizes the work that has been conducted relative to small mammals and water infiltration at the animal intrusion lysimeter facility near the Hanford Meteorological Station (Figure 1). This task was identified in the *Protective Barrier and Warning Marker System Development Plan* (Adams and Wing 1986) as one of many tasks needed to design a final barrier to implement in-place disposal. The small-mammal work reported here was conducted by the Westinghouse Hanford Company and is one part of the overall animal intrusion work that will be conducted during the next few years (Figure 2).

At the present time, two tests have been conducted and a third is in progress. This report will summarize the work relative to the first two tests. This study is still in the data-collection phase and as a result only a limited portion of the data have been analyzed. The appendices contained in this report reflect the majority of the data that have been collected to date.

2.0 WATER INFILTRATION IN RESPONSE TO SMALL MAMMAL BURROWING

2.1 OBJECTIVE

The objective of the task is to determine the degree that small-mammal burrow systems affect the downward movement of water.

2.2 CONSTRUCTION AND INSTALLATION

Six animal lysimeters (5 ft x 5 ft x 6 ft deep) and two outer boxes big enough to hold three lysimeters each were constructed by the 200 West Area fabrication shops and carpenter shops in 1987. The six individual animal lysimeters are designed so that they can be disassembled and reused at the end of each test period. The outer boxes were installed in the ground at grade in December 1987, and the six animal intrusion lysimeters were installed in March 1988. The two outer boxes were buried approximately 100 ft apart.

Figure 1. Animal Intrusion Facility Location.

Figure 2. Barrier Design Flow Diagram.

3.0 TEST 1

The following discussion is a summary of the first test that was conducted and preliminary results.

Each lysimeter was lined with a 28-mil plastic liner and then filled with 6 to 8 in. of pea gravel. After the boxes were weighed a geotextile material was placed over the gravel and 4 ft of McGee Ranch soil was added in 6-in. lifts. The McGee Ranch is a soil site near the intersection of State Highways 24 and 240 (Figure 3). The fine soil from the McGee Ranch is the soil that has been chosen to construct protective barriers (Last et al. 1987).

The soil was wetted down with approximately 10% to 12% water by weight so that each lift could be compacted. A soil moisture sample was collected from every lift. These soil samples were oven dried to calculate percent moisture by weight (Table 1).

Pacific Northwest Laboratory (PNL) developed soil conductance probes that measure soil resistance. The rationale for using these probes was to obtain in situ nondestructive measurements of gross trends in water movement at depth in each box. The probes measured soil resistance, which is a reflection of soil moisture. The probes were not sensitive enough to measure actual soil moisture, but were only intended to show wetter or dryer conditions at depth. One probe per box was installed during April.

For the first test, two Great Basin pocket mice (*Perognathus parvus*) and two Townsend ground squirrels (*Spermophilus townsendii*) were trapped live and released into the lysimeters in June 1988. Figure 4 indicates what boxes the animals were placed into. Boxes 1A, 1B, and 1C received supplemental water treatments, and the other three boxes served as water controls (no water added). One box in each set (2A, 1B) served as animal controls (no animals introduced). Food and water were provided liberally on a regular basis.

Supplemental precipitation was added with a rainulator to one set of the lysimeters (1A, 1B, 1C) during July, August, and September of 1988. Water was applied at an intensity of 2.5 in/h for 13 min, which is the equivalent of the Hanford Site 100-yr storm. This has the effect of adding approximately 0.55 in. of water in 13 min. Rain gages were set out to measure how much actual water was added during these treatments. The three water treatments added 1.89 in. of total water during this test. One of these additional water treatments was witnessed by a local television station and later aired on the local news.

At the end of the test period, the animals were removed and the lysimeters were lifted out and disassembled by the 1100 Area rigging crew. Table 2 shows soil moisture samples that were collected again at 6-in. intervals. All excavated soil was collected and measured before the burrow systems were excavated and mapped (Table 3).

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Figure 3. Location of the McGee Ranch Soil Site.

Table 1. Soil Moisture Samples Collected April 13 and 14, 1988,
at the Installation. (Sheet 1 of 2)

Box number	Depth (in.)	Can number	Tare weight (g)	Wet weight (g)	Dry weight (g)	Moisture (g)	Moisture (%)
1A	59.00	170	45.57	254.30	219.50	34.80	16.67
1A	50.50	317	45.26	222.90	193.30	29.60	16.66
1A	45.50	190	45.42	236.50	204.10	32.40	16.96
1A	40.25	173	44.96	192.90	168.10	24.80	16.76
1A	34.50	304	45.06	242.80	210.80	32.00	16.18
1A	29.00	268	45.73	246.10	210.80	35.30	17.62
1A	24.00	243	42.98	236.80	206.10	30.70	15.84
1A	19.00	81A	45.80	203.50	178.70	24.80	15.73
1A	13.00	86	43.86	275.40	237.10	38.30	16.54
Average							16.55
1B	57.00	216	43.79	197.40	174.70	22.70	14.78
1B	51.00	67	45.99	307.60	271.30	36.30	13.88
1B	45.00	9	45.70	326.70	285.30	41.40	14.73
1B	36.00	146	45.77	257.70	221.00	36.70	17.32
1B	31.50	164	45.47	258.60	225.70	32.90	15.44
1B	26.25	321	45.58	248.70	218.10	30.60	15.06
1B	17.50	275	45.91	225.70	202.60	23.10	12.85
1B	13.00	68	46.27	227.90	202.20	25.70	14.15
Average							14.78
1C	58.50	265	45.73	236.20	206.90	29.30	15.38
1C	52.00	299	45.52	267.70	230.70	37.00	16.66
1C	44.50	215	43.4	256.70	222.80	33.90	15.89
1C	37.50	220	44.16	246.50	214.40	32.10	15.86
1C	31.00	165	44.81	198.50	175.60	22.90	14.90
1C	22.50	207	42.33	227.70	202.10	25.60	13.81
1C	16.50	73	43.66	247.80	221.70	26.10	12.79
1C	13.00	415	47.00	220.40	198.10	22.30	12.86
Average							14.77

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Table 1. Soil Moisture Samples Collected April 13 and 14, 1988,
at the Installation. (Sheet 2 of 2)

Box number	Depth (in.)	Can number	Tare weight (g)	Wet weight (g)	Dry weight (g)	Moisture (g)	Moisture (%)
2A	53.50	53	45.80	241.40	217.50	23.90	12.22
2A	45.25	280	45.45	240.80	218.40	22.40	11.47
2A	38.00	272	44.77	232.40	205.20	27.20	14.50
2A	31.75	328	45.59	217.40	193.50	23.90	13.91
2A	25.50	201	44.38	223.70	195.60	28.10	15.67
2A	19.75	33	45.20	263.00	233.00	30.00	13.77
2A	13.00	51	44.80	214.30	187.60	26.70	15.75
Average							13.90
2B	54.00	25	45.70	248.10	223.00	25.10	12.40
2B	45.50	126	45.60	238.50	215.80	22.70	11.77
2B	39.75	261	45.44	280.60	249.20	31.40	13.35
2B	33.50	189	43.10	255.90	228.30	27.60	12.97
2B	27.50	288	43.59	220.20	194.50	25.70	14.55
2B	20.50	105	46.03	217.20	191.90	25.30	14.78
2B	12.00	282	45.57	268.20	235.30	32.90	14.78
Average							13.51
2C	58.50	329	45.30	216.10	193.90	22.20	13.00
2C	51.50	271	44.21	236.60	213.40	23.20	12.06
2C	43.00	7A	45.50	250.10	225.20	24.90	12.17
2C	38.50	192	45.45	255.60	230.40	25.20	11.99
2C	33.00	10	45.47	204.40	184.20	20.20	12.71
2C	26.00	111	43.50	234.20	214.00	20.20	10.59
2C	21.00	226	45.17	195.40	178.10	17.30	11.52
2C	12.00	14	46.65	232.90	209.10	23.80	12.78
Average							12.10

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Figure 4. First Animal Intrusion Lysimeter Configuration.

Table 2. Soil Moisture Samples Collected in October 1988 at the Completion of Test 1. (Sheet 1 of 2)

Box number	Depth (in.)	Can number	Tare weight (g)	Wet weight (g)	Dry weight (g)	Moisture (g)	Moisture (%)
1A	0-6	51	44.80	125.50	120.30	5.20	6.44
1A	6-12	10	45.40	120.60	114.60	6.00	7.98
1A	12-18	26	46.20	137.80	130.00	7.80	8.52
1A	18-24	280	45.50	104.50	99.40	5.10	8.64
1A	24-30	47	45.40	145.10	135.30	9.80	9.83
1A	30-36	275	46.00	125.20	117.40	7.80	9.85
1A	36-42	63	43.70	139.60	130.30	9.30	9.70
1A	42-48	65	45.50	138.20	129.60	8.60	9.28
Average							8.78
1B	0-6	329	45.30	115.20	110.10	5.10	7.30
1B	6-12	157	44.60	146.50	137.70	8.80	8.64
1B	12-20	105	46.00	137.10	128.00	9.10	9.99
1B	20-28	173	44.90	149.30	138.30	11.00	10.54
1B	28-36	333	45.40	138.90	128.60	10.30	11.02
1B	36-44	312	45.60	155.70	143.50	12.20	11.08
1B	44-48	9	45.80	133.60	124.60	9.00	10.25
Average							9.83
1C	0-6	226	45.30	132.70	125.80	6.90	7.89
1C	6-12	277	45.40	140.90	132.30	8.60	9.01
1C	12-18	274	45.30	137.50	128.80	8.70	9.44
1C	18-24	42	45.70	133.30	124.30	9.00	10.27
1C	24-30	11	46.40	136.40	126.60	9.80	10.89
1C	30-36	124	45.60	141.60	131.10	10.50	10.94
1C	36-42	192	45.50	117.20	109.70	7.50	10.46
1C	42-48	299	45.60	110.20	103.90	6.30	9.75
Average							9.83

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Table 2. Soil Moisture Samples Collected in October 1988 at the Completion of Test 1. (Sheet 2 of 2)

Box number	Depth (in.)	Can number	Tare weight (g)	Wet weight (g)	Dry weight (g)	Moisture (g)	Moisture (%)
2A	0-6	73	43.80	127.50	123.00	4.50	5.38
2A	6-12	117	44.00	119.70	113.90	5.80	7.66
2A	12-18	271	44.30	142.80	134.30	8.50	8.63
2A	18-24	33	45.20	123.80	116.70	7.10	9.03
2A	24-30	25	45.80	120.40	113.20	7.20	9.65
2A	30-36	328	45.60	130.20	122.30	7.90	9.34
2A	36-42	268	45.80	99.50	94.80	4.70	8.75
2A	42-48	7A	45.60	85.70	82.70	3.00	7.48
Average							8.24
2B	0-6	717	47.10	125.10	120.60	4.50	5.77
2B	6-12	709	47.40	157.60	149.30	8.30	7.53
2B	12-18	710	47.70	140.00	131.80	8.20	8.88
2B	18-24	706	47.30	139.70	131.00	8.70	9.42
2B	24-30	707	46.90	131.50	123.60	7.90	9.34
2B	30-36	712	48.00	126.70	120.10	6.60	8.39
2B	36-42	713	47.60	113.20	107.30	5.90	8.99
2A	42-48	700	48.10	93.70	90.20	3.50	7.68
Average							8.25
2C	0-6	716	48.10	118.40	112.90	5.50	7.82
2C	6-12	702	46.90	98.60	96.20	2.40	4.64
2C	12-18	715	48.80	124.90	118.50	6.40	8.41
2C	18-24	714	48.60	143.30	134.60	8.70	9.19
2C	24-30	703	47.30	126.50	118.90	7.60	9.60
2C	30-36	701	48.10	129.90	121.90	8.00	9.78
2C	36-42	705	48.00	116.50	109.90	6.60	9.64
2C	42-48	704	47.40	69.20	67.50	1.70	7.80
Average							8.36

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Table 3. Amount of Excavated Soil Collected
at the End of Tests 1 and 2 in the
Animal Intrusion Lysimeters.

Box number	Test	Species	Soil collected (L)
1A	1	Pocket mouse	22
1C	1	Ground squirrel	13.5
2B	1	Ground squirrel	11.5
2C	1	Pocket mouse	34
1A	2	Pocket gopher	22.5
1C	2	Pocket mouse	22.6
2A	2	Pocket gopher	157.5
2C	2	Pocket gopher	90

3.1 RESULTS

Information collected from the first treatment combination using pocket mice and Townsend ground squirrels indicates that the 1.8 in. of additional precipitation, which was primarily applied with the rainulator, was removed from the lysimeters that contained burrows. The lysimeters with animal burrows ended up with soil moisture levels almost identical to the controls (no additional precipitation). This is illustrated in Figure 5, which compares a pocket mouse plot and a control plot that both received additional precipitation with the rainulator. The pocket mouse plot started with 16.55% moisture and ended up with 8.78% moisture (a net loss of 7.8%). The control plot started with 14.78% moisture and ended up with 9.83% (a net loss of 4.95%). The pocket mouse plot lost 3% more moisture than the control.

Appendix A contains the soil-conductance probe data that were collected. The graphs that have been generated from these data are presented in Appendix B.

3.2 SUMMARY OF TEST 1

Information collected from this first test (conducted during the summer) indicates that plots containing animals lost more water than did the control plots that did not contain animals. Mechanisms that might account for this include evaporation loss caused by continuous soil turnover as a result of burrowing activities, and moisture loss from open burrows, which allow some air circulation.

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Figure 5. Soil Moisture Profile with Rainulator.

4.0 TEST 2

The second test, using three pocket gophers (*Thomomys talpoides*) and one Great Basin pocket mouse (*Perognathus parvus*), was started in mid-November 1988 (Figure 6). Only one pocket mouse was captured because of inclement weather, so a pocket gopher was used instead. The lysimeters were again lined with a 28-mil plastic liner, filled with 6 to 8 in. of pea gravel, a geotextile, and 4 ft of McGee Ranch soil. In this test, two access ports per lysimeter were installed so that a hydroprobe could be used to take more accurate soil moisture measurements. Soil moisture samples were collected when the access tubes were installed (Table 4). Frozen soil conditions and frozen water lines during this particular test prevented the addition of supplemental water. However, 4.14 in. of supplemental moisture was added in the form of natural precipitation (rain and snow) that, according to the Hanford Meteorological Station, was 178% of normal by the end of March.

The lysimeters were pulled out and disassembled in early April. The excavated surface soil was collected and measured (Table 3) and the burrow systems were excavated and mapped. Soil moisture samples were again collected at 6-in. intervals (Table 5).

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Figure 6. Second Animal Intrusion Lysimeter Configuration.

Table 4. Soil Moisture Samples Collected November 18, 1988, at the Installation of the Hydroprobe in Test 2. (Sheet 1 of 4)

Box number	Depth (in.)	Can number	Tare weight (g)	Wet weight (g)	Dry weight (g)	Moisture (g)	Moisture (%)
1A-11	2	234	44.90	165.20	151.80	13.40	11.14
1A-11	6	226	45.30	181.60	168.80	12.80	9.39
1A-11	12	65	45.50	172.40	159.30	13.10	10.32
1A-11	18	708	47.40	197.90	183.50	14.40	9.57
1A-11	24	86	43.80	168.90	157.90	11.00	8.79
1A-11	30	709	47.40	190.40	178.10	12.30	8.60
1A-11	36	710	47.70	210.60	195.60	15.00	9.21
1A-11	42	25	45.80	158.60	148.10	10.50	9.31
1A-11	48	716	48.10	224.80	209.20	15.60	8.83
Average							9.46
1A-12	2	703	47.30	249.80	227.20	22.60	11.16
1A-12	6	702	46.90	247.30	227.40	19.90	9.93
1A-12	12	715	48.80	251.20	231.90	19.30	9.54
1A-12	18	706	47.30	207.20	193.30	13.90	8.69
1A-12	24	713	47.60	175.40	164.40	11.00	8.61
1A-12	30	274	45.30	148.80	141.10	7.70	7.44
1A-12	36	86	43.80	156.40	147.00	9.40	8.35
1A-12	42	277	45.40	170.20	158.90	11.30	9.05
1A-12	48	25	45.80	186.80	175.30	11.50	8.16
Average							8.99
Total Average Box 1A							9.23
1B-13	2	11	46.40	167.70	153.80	13.90	11.46
1B-13	6	707	46.90	222.30	204.40	17.90	10.21
1B-13	12	708	47.40	223.60	207.70	15.90	9.02
1B-13	18	715	48.80	214.70	200.10	14.60	8.80
1B-13	24	710	47.70	228.00	211.70	16.30	9.04
1B-13	30	33	45.20	182.00	169.20	12.80	9.36
1B-13	36	124	45.60	165.40	154.60	10.80	9.02
1B-13	42	328	45.60	174.90	163.00	11.90	9.20
1B-13	48	700	48.10	237.30	220.90	16.40	8.67
Average							9.42

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Table 4. Soil Moisture Samples Collected November 18, 1988, at the Installation of the Hydroprobe in Test 2. (Sheet 2 of 4)

Box number	Depth (in.)	Can number	Tare weight (g)	Wet weight (g)	Dry weight (g)	Moisture (g)	Moisture (%)
1B-14	2	117	44.00	175.40	161.50	13.90	10.58
1B-14	6	271	44.30	186.10	176.30	9.80	6.91
1B-14	12	234	44.90	162.80	152.70	10.10	8.57
1B-14	18	703	47.30	248.90	230.20	18.70	9.28
1B-14	24	63	43.70	176.30	164.80	11.50	8.67
1B-14	30	73	43.80	190.50	180.90	9.60	6.54
1B-14	36	333	45.40	172.80	162.20	10.60	8.32
1B-14	42	714	48.60	183.80	172.90	10.90	8.06
1B-14	48	704	47.40	204.30	189.90	14.40	9.18
Average							8.46
Total Average Box 1B							8.94
1C-15	2	702	46.90	273.70	250.40	23.30	10.27
1C-15	6	105	46.00	158.90	149.50	9.40	8.33
1C-15	12	111	43.60	167.20	156.40	10.80	8.74
1C-15	18	7A	45.60	173.50	162.50	11.00	8.60
1C-15	24	706	47.30	227.30	211.50	16.30	9.03
1C-15	30	173	44.90	155.20	144.70	10.50	9.52
1C-15	36	709	47.40	216.30	199.10	17.20	10.18
1C-15	42	192	45.50	156.80	147.20	9.60	8.63
1C-15	48	51	44.80	177.10	165.10	12.00	9.07
Average							9.15
1C-16	2	10	45.40	174.50	161.60	12.90	9.99
1C-16	6	716	48.10	229.40	216.40	13.00	7.17
1C-16	12	712	48.00	226.70	211.80	14.90	8.34
1C-16	18	47	45.40	163.60	153.70	9.90	8.38
1C-16	24	329	45.30	166.70	156.40	10.30	8.48
1C-16	30	701	48.10	219.80	204.50	15.30	8.91
1C-16	36	717	47.10	242.40	223.90	18.50	9.47
1C-16	42	705	48.00	266.30	246.90	19.40	8.89
1C-16	48	713	47.60	248.30	229.30	19.00	9.47
Average							8.79
Total Average Box 1C							8.97

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Table 4. Soil Moisture Samples Collected November 18, 1988, at the Installation of the Hydroprobe in Test 2. (Sheet 3 of 4)

Box number	Depth (in.)	Can number	Tare weight (g)	Wet weight (g)	Dry weight (g)	Moisture (g)	Moisture (%)
2A-21	2	26	46.20	143.20	132.30	10.90	11.24
2A-21	6	192	45.50	120.10	113.40	6.70	8.98
2A-21	12	275	46.00	132.70	125.50	7.20	8.30
2A-21	18	10	45.40	137.30	129.00	8.30	9.03
2A-21	24	234	44.90	132.00	123.80	8.20	9.41
2A-21	30	703	47.30	127.20	120.30	6.90	8.64
2A-21	36	11	46.40	122.60	116.30	6.30	8.27
2A-21	42	47	45.40	116.70	110.60	6.10	8.56
2A-21	48	105	46.00	127.90	120.50	7.40	9.04
Average							9.05
2A-22	2	111	43.60	127.60	118.30	9.30	11.07
2A-22	6	333	45.40	123.20	118.40	4.80	6.17
2A-22	12	280	45.50	160.70	153.80	6.90	5.99
2A-22	18	117	44.00	160.00	156.90	3.10	2.67
2A-22	24	73	43.80	134.90	127.70	7.20	7.90
2A-22	30	299	45.60	125.80	118.50	7.30	9.10
2A-22	36	157	44.60	136.30	130.40	5.90	6.43
2A-22	42	329	45.30	127.20	119.80	7.40	9.04
2A-22	48	146	45.70	128.30	121.60	6.70	8.11
Average							7.39
Total Average Box 2A							8.22
2B-23	2	9	45.80	139.80	129.30	10.50	11.17
2B-23	6	226	45.30	134.40	125.80	8.60	9.65
2B-23	12	710	47.70	167.30	156.40	10.90	9.11
2B-23	18	707	46.90	161.60	149.60	12.00	10.46
2B-23	24	715	48.80	155.80	144.10	11.70	10.93
2B-23	30	25	45.80	128.50	120.30	8.20	9.92
2B-23	36	277	45.40			0.00	0.00
2B-23	42	714	48.60	151.80	142.60	9.20	8.91
2B-23	48	51	44.80	124.70	117.60	7.10	8.89
Average							8.78

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Table 4. Soil Moisture Samples Collected November 18, 1988, at the Installation of the Hydroprobe in Test 2. (Sheet 4 of 4)

Box number	Depth (in.)	Can number	Tare weight (g)	Wet weight (g)	Dry weight (g)	Moisture (g)	Moisture (%)
2B-24	2	271	44.30	138.00	127.10	10.90	11.63
2B-24	6	7A	45.60	141.10	133.90	7.20	7.54
2B-24	12	63	43.70	124.10	120.20	3.90	4.85
2B-24	18	173	44.90	114.40	107.70	6.70	9.64
2B-24	24	42	45.70	127.70	119.30	8.40	10.24
2B-24	30	712	48.00	182.10	170.20	11.90	8.87
2B-24	36	65	45.50	123.20	116.30	6.90	8.88
2B-24	42	33	45.20	147.40	138.80	8.60	8.41
2B-24	48	124	45.60	138.90	131.30	7.60	8.15
Average							8.69
Total Average Box 2B							8.74
2C-25	2	705	47.30	185.00	172.10	12.90	9.37
2C-25	6	704	47.40	175.90	168.10	7.80	6.07
2C-25	12	700	48.10	182.80	171.20	11.60	8.61
2C-25	18	268	45.80	170.20	160.50	9.70	7.80
2C-25	24	117	44.00	153.10	143.00	10.10	9.26
2C-25	30	714	48.60	153.00	144.20	8.80	8.43
2C-25	36	63	43.70	176.80	163.80	13.00	9.77
2C-25	42	711	47.20	197.50	183.20	14.30	9.51
2C-25	48	704	47.40	217.60	201.20	16.40	9.64
Average							8.72
2C-26	2	701	48.10	173.90	162.60	11.30	8.98
2C-26	6	86	43.80	135.40	129.10	6.30	6.88
2C-26	12	274	45.30	122.90	118.10	4.80	6.19
2C-26	18	705	48.00	166.80	156.30	10.50	8.84
2C-26	24	713	47.60	153.00	144.30	8.70	8.25
2C-26	30	328	45.60	129.90	124.20	5.70	6.76
2C-26	36	716	48.10	181.00	170.60	10.40	7.83
2C-26	42	717	47.10	172.60	161.70	10.90	8.69
2C-26	48	702	46.90	182.60	172.70	9.90	7.30
Average							7.75
Total Average Box 1C							8.23

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Table 5. Soil Moisture Samples Collected in April 1989 at the End of Test 2. (Sheet 1 of 2)

Box number	Depth (in.)	Can number	Tare weight (g)	Wet weight (g)	Dry weight (g)	Moisture (g)	Moisture (%)
1A	0-6	709	0.00	0.00	0.00	0.00	ERR
1A	6-12	63	28.16	77.85	72.38	5.47	11.01
1A	12-18	7a	29.61	68.25	63.87	4.38	11.34
1A	18-24	47	29.67	86.76	80.85	5.91	10.35
1A	24-30	65	29.64	78.80	72.94	5.86	11.92
1A	30-36	51	29.17	88.50	82.15	6.35	10.70
1A	36-42	86	28.00	80.59	75.86	4.73	8.99
1A	42-48	117	27.63	94.82	88.91	5.91	8.80
Average							10.44
1B	0-6	716	34.71	79.81	75.81	4.00	8.87
1B	6-12	710	34.34	101.47	94.69	6.78	10.10
1B	12-18	33	29.35	81.89	75.84	6.07	11.55
1B	18-24	715	35.59	93.92	87.65	6.27	10.75
1B	24-30	268	29.66	90.00	83.58	6.42	10.64
1B	30-36	708	34.25	59.66	57.55	2.11	8.30
Average							10.04
1C	0-6	702	34.14	94.00	88.20	5.80	9.69
1C	6-12	274	29.18	95.58	88.34	7.24	10.90
1C	12-18	700	34.80	95.16	87.25	7.91	13.10
1C	18-24	280	29.45	93.02	85.26	7.76	12.21
1C	24-30	312	29.55	89.77	82.62	7.15	11.87
1C	30-36	714	34.92	86.60	81.17	5.43	10.51
1C	36-42	42	29.68	70.12	65.94	4.18	10.34
1C	42-48	25	29.84	50.40	48.44	1.96	9.53
Average							11.02
2A	0-6	11	29.85	75.76	71.41	4.35	9.48
2A	6-12	712	34.80	102.50	95.48	7.02	10.37

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Table 5. Soil Moisture Samples Collected in April 1989 at the End of Test 2. (Sheet 2 of 2)

Box number	Depth (in.)	Can number	Tare weight (g)	Wet weight (g)	Dry weight (g)	Moisture (g)	Moisture (%)
2A	12-18	333	29.44	79.55	73.45	6.10	12.17
2A	18-24	271	29.78	91.15	82.66	8.49	13.83
2A	24-30	717	33.75	91.34	84.33	7.01	12.17
2A	30-36	711	34.08	101.95	94.27	7.68	11.32
2A	36-42	105	29.48	97.02	90.59	6.43	9.52
2A	42-48	713	34.02	72.40	69.12	3.28	8.55
Average							10.93
2B	0-6	111	27.36	86.30	81.90	4.40	7.47
2B	6-12	192	29.04	98.79	91.33	7.46	10.70
2B	12-18	21	30.16	91.25	83.64	7.61	12.46
2B	18-24	701	34.61	92.71	85.23	7.48	12.87
2B	24-30	707	33.64	81.00	76.16	4.84	10.22
2B	30-36	277	29.21	49.40	47.19	2.21	10.95
2B	36-42	226	29.18	72.65	68.67	3.98	9.16
Average							10.54
2C	0-6	146	29.94	87.85	82.83	5.02	8.67
2C	6-12	124	29.77	95.69	87.64	8.05	12.21
2C	12-18	173	29.08	116.49	105.20	11.29	12.92
2C	18-24	73	28.02	61.53	57.27	4.26	12.71
2C	24-30	299	29.59	102.12	94.72	7.40	10.20
2C	30-36	275	29.95	102.12	94.72	7.40	10.25
2C	36-42	703	34.59	97.28	91.39	5.89	9.40
2C	42-48	329	29.43	30.85	76.05	4.80	9.33
Average							10.71
1a	mound	706	34.16	259.85	239.76	20.09	8.90
1c	mound	704	34.25	260.60	241.86	18.74	8.28
2a	mound	705	34.60	259.22	238.80	20.42	9.09
2c	mound	234	29.20	212.20	202.87	9.33	5.10

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4.1 RESULTS

No detailed statistical analysis of the hydroprobe data has been conducted (Appendix C), but in general it appears that the soil moisture in the top 2 ft was slightly greater in plots with animal burrows and that from the 2-ft level down the control plots were wetter. It was observed that even in the winter time, and in particular in the pocket gopher burrows, freshly excavated soil would dry out by the end of the day.

This test provided a good comparison of soil moisture comparisons under natural precipitation conditions during the winter season. All six lysimeters had a net increase in soil moisture (Table 6). The four lysimeters that contained animals had an average gain of 2.71% soil moisture, whereas the two control lysimeters had an average increase of 1.42% soil moisture. The largest increases in soil moisture in all the lysimeters occurred from 18 to 30 in. with the 18-in. depth showing the most change. The least amount of change in soil moisture occurred from the 42-in. to 48-in. depth. At the 18-in. depth there was an average change of 3.78% soil moisture and at the 48-in. depth there was an average change of 0.38%. Figures 7 and 8 illustrate this point by showing initial soil moisture conditions at the beginning and at the end of Test 2 in two of the lysimeters. Other figures showing these relationships are contained in Appendix D.

The amount of soil excavated varied considerably between lysimeters (see Table 3). The pocket gopher in Box 1A excavated 22.5 L of soil, while the one in Box 2A excavated 157.5 L of soil, which is the highest amount collected thus far.

4.2 SUMMARY OF TEST 2

Information collected from the second test (conducted during the winter) indicates that the lysimeters containing animals gained more moisture than the control plots. The greatest change in moisture gain occurred at the 18-in. depth. Very little change in moisture content occurred from the 42- to 48-in. depths. The hydroprobe data have yet to be analyzed.

Table 6. Soil Moisture Profile Changes During
Test 2. (Sheet 1 of 2)

Box number	Depth (in.)	Species	Initial moisture (%)	Ending moisture (%)	Gain (%)
1A	6	P. Gopher	9.66		
1A	12		9.93	11.01	1.08
1A	18		9.13	11.34	2.21
1A	24		8.70	10.35	1.65
1A	30		8.02	11.92	3.90
1A	36		8.78	10.70	1.92
1A	42		9.18	8.99	-0.19
1A	48		8.49	8.80	0.31
Average			8.99	10.44	1.55
1B	6	Control	8.56	8.87	0.31
1B	12		8.79	10.10	1.31
1B	18		9.04	11.55	2.51
1B	24		8.85	10.75	1.90
1B	30		7.95	10.64	2.69
1B	36		8.67	8.30	-0.37
1B	42		8.63		
1B	48		8.92		
Average			8.68	10.04	1.39
1C	6	P. Mouse	7.75	9.69	1.94
1C	12		8.54	10.90	2.36
1C	18		8.49	13.10	4.61
1C	24		8.75	12.21	3.46
1C	30		9.21	11.87	2.66
1C	36		9.82	10.51	0.69
1C	42		8.76	10.34	1.58
1C	48		9.27	9.53	0.26
Average			8.82	11.02	2.20

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Table 6. Soil Moisture Profile Changes During Test 2. (Sheet 2 of 2)

Box number	Depth (in.)	Species	Initial moisture (%)	Ending moisture (%)	Gain (%)
2A	6	P. Gopher	7.57	9.48	1.91
2A	12		7.14	10.37	3.23
2A	18		5.85	12.17	6.32
2A	24		8.65	13.83	5.18
2A	30		8.87	12.17	3.30
2A	36		7.35	11.32	3.97
2A	42		8.80	9.52	0.72
2A	48		8.57	8.55	-0.02
Average			7.85	10.93	3.08
2B	6	Control	8.59	7.47	-1.12
2B	12		6.98	10.70	3.72
2B	18		10.05	12.46	2.41
2B	24		10.58	12.87	2.29
2B	30		9.39	10.22	0.83
2B	36				
2B	42		8.66	9.16	0.50
2B	48				
Average			9.04	10.48	1.44
2C	6	P. Gopher	6.47	8.67	2.20
2C	12		7.40	12.21	4.81
2C	18		8.32	12.92	4.60
2C	24		8.75	12.71	3.96
2C	30		7.59	10.20	2.61
2C	36		8.80	10.25	1.45
2C	42		9.10	9.40	0.30
2C	48		8.47	9.33	0.86
Average			8.11	10.71	2.60

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Figure 7. Soil Moisture Profile of the Pocket Mouse.

Figure 8. Soil Moisture Profile of the Pocket Gopher.

5.0 REFERENCES

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APPENDIX A
SOIL RESISTANCE DATA

Table A-1. Resistance Readings (Ohms) Taken May 12, 1988.

Depth (in.)	Box 2A	Log 2A	Box 2B	Log 2B	Box 2C	Log 2C
2.0	595000	5.8	2400000	6.4	22800	4.4
4.0	86900	4.9	2360000	6.4	25500	4.4
6.0	27900	4.4	19200	4.3	13800	4.1
8.0	16000	4.2	1520	3.2	13200	4.1
10.0	10600	4.0	7070	3.8	10700	4.0
12.0	8420	3.9	6570	3.8	8090	3.9
14.0	7970	3.9	6150	3.8	7360	3.9
16.0	8160	3.9	5900	3.8	6520	3.8
18.0	6520	3.8	6200	3.8	5610	3.7
20.0	5010	3.7	5710	3.8	5520	3.7
22.0	4880	3.7	4630	3.7	5750	3.8
24.0	5380	3.7	5380	3.7	5470	3.7
26.0	4450	3.6	5560	3.7	4690	3.7
28.0	4390	3.6	5380	3.7	11200	4.0
30.0	5280	3.7	6570	3.8	12300	4.1
32.0	6300	3.8	6620	3.8	3240	3.5
34.0	7780	3.9	6200	3.8	7240	3.9
36.0	7900	3.9	6520	3.8	6250	3.8
38.0	7420	3.9	6950	3.8	5610	3.7
40.0	6730	3.8	6620	3.8	4690	3.7
42.0	5560	3.7	5330	3.7	4170	3.6
44.0	5470	3.7	5710	3.8	4020	3.6

Table A-2. Resistance Readings (Ohms) Taken May 19, 1988.

Depth (in.)	Box 1A	Log 1A	Box 1B	Log 1B	Box 1C	Log 1C
2.0	809000	5.9	1280000	6.1		ERR
4.0		ERR	1300000	6.1		ERR
6.0		ERR	417000	5.6		ERR
8.0	6950	3.8	423000	5.6	112000	5.0
10.0	15600	4.2	1890000	6.3	12100	4.1
12.0	17100	4.2	2180000	6.3	20100	4.3
14.0	12400	4.1	18800	4.3	82200	4.9
16.0	10200	4.0	8690	3.9	67300	4.8
18.0	6250	3.8	1090	3.0	6840	3.8
20.0	13100	4.1	69500	4.8	6900	3.8
22.0	13400	4.1	65700	4.8	9690	4.0
24.0	6620	3.8		ERR	10100	4.0
26.0	9250	4.0		ERR	8030	3.9
28.0	9110	4.0	6680	3.8	8420	3.9
30.0	6200	3.8	8350	3.9	8550	3.9
32.0	5190	3.7	11100	4.0	7600	3.9
34.0	34500	4.5	9110	4.0	6680	3.8
36.0	36100	4.6	889000	5.9	191000	5.3
38.0	10600	4.0	1120000	6.0	192000	5.3
40.0	11200	4.0	65200	4.8	1090000	6.0
42.0	7970	3.9	11000	4.0	1510000	6.2
44.0	718000	5.9	7720	3.9		ERR

Table A-3. Resistance Readings (Ohms) Taken July 28, 1988
(Prerainulator).

Depth (in.)	Box 1A	Log 1A	Box 1B	Log 1B	Box 1C	Log 1C
2.0	288000	5.5		ERR	1440000	6.2
4.0	313000	5.5	109000	5.0	191000	5.3
6.0	266000	5.4	155000	5.2	149000	5.2
8.0	12800	4.1	186000	5.3	16200	4.2
10.0	23200	4.4	366000	5.6	16400	4.2
12.0	23200	4.4	370000	5.6	8760	3.9
14.0	18400	4.3	114000	5.1	21600	4.3
16.0	15100	4.2	25100	4.4	27100	4.4
18.0	7840	3.9	46300	4.7	18100	4.3
20.0	39200	4.6	134000	5.1	18600	4.3
22.0	38800	4.6	104000	5.0	1550000	6.2
24.0	9540	4.0	4500000	6.7	1510000	6.2
26.0	189000	5.3	4200000	6.6	11700	4.1
28.0	186000	5.3	16800	4.2	11300	4.1
30.0	10200	4.0	168000	5.2	17600	4.2
32.0	8220	3.9	203000	5.3	36100	4.6
34.0	222000	5.3	34900	4.5	24600	4.4
36.0	216000	5.3	143000	5.2	27400	4.4
38.0	13400	4.1	469000	5.7	42300	4.6
40.0	12500	4.1	316000	5.5	91800	5.0
42.0	8610	3.9	15500	4.2	947000	6.0
44.0	34500	4.5	11400	4.1	1240000	6.1

Table A-4. Resistance Readings (Ohms) Taken July 28, 1988
(Prerainulator).

Depth (in.)	Box 2A	Log 2A	Box 2B	Log 2B	Box 2C	Log 2C
2.0	3210000	6.5	220000	5.3	463000	5.7
4.0	41200	4.6	186000	5.3	165000	5.2
6.0	20300	4.3	86900	4.9	47500	4.7
8.0	13800	4.1	97700	5.0	25800	4.4
10.0	10800	4.0	70100	4.8	25300	4.4
12.0	9850	4.0	32000	4.5	17100	4.2
14.0	9390	4.0	31600	4.5	12600	4.1
16.0	10000	4.0	26600	4.4	9920	4.0
18.0	8420	3.9	30000	4.5	8420	3.9
20.0	6680	3.8	24100	4.4	8090	3.9
22.0	7240	3.9	16200	4.2	8550	3.9
24.0	7420	3.9	22000	4.3	7840	3.9
26.0	6840	3.8	22200	4.3	6790	3.8
28.0	8160	3.9	19600	4.3	14700	4.2
30.0	9180	4.0	20700	4.3	16400	4.2
32.0	9540	4.0	17500	4.2	9320	4.0
34.0	12900	4.1	18900	4.3	8760	3.9
36.0	14700	4.2	31000	4.5	8290	3.9
38.0	14900	4.2	33800	4.5	7900	3.9
40.0	12600	4.1	18900	4.3	6900	3.8
42.0	10200	4.0	9030	4.0	6200	3.8
44.0	10900	4.0	8160	3.9	5850	3.8

Table A-5. Soil Resistance Readings (Ohms) Taken July 28, 1988
(2-Hour Postrainulator).

Depth (in.)	Box 1A	Log 1A	Box 1B	Log 1B	Box 1C	Log 1C
2.0	20100	4.3	69500	4.8	226000	5.4
4.0	220000	5.3	34900	4.5	143000	5.2
6.0	216000	5.3	134000	5.1	96900	5.0
8.0	13700	4.1	205000	5.3	45700	4.7
10.0	25100	4.4	397000	5.6	29400	4.5
12.0	25300	4.4	402000	5.6	26100	4.4
14.0	20100	4.3	122000	5.1	36100	4.6
16.0	16400	4.2	27100	4.4	28200	4.5
18.0	8550	3.9	73600	4.9	11700	4.1
20.0	46300	4.7	145000	5.2	12200	4.1
22.0	45700	4.7	114000	5.1	1030000	6.0
24.0	10300	4.0	4680000	6.7	992000	6.0
26.0	214000	5.3	4500000	6.7	19200	4.3
28.0	212000	5.3	17400	4.2	18800	4.3
30.0	10900	4.0	198000	5.3	28500	4.5
32.0	8610	3.9	235000	5.4	22200	4.3
34.0	248000	5.4	37000	4.6	8820	3.9
36.0	244000	5.4	157000	5.2	16900	4.2
38.0	13700	4.1	552000	5.7	16900	4.2
40.0	12900	4.1	341000	5.5	172000	5.2
42.0	9390	4.0	15600	4.2	212000	5.3
44.0	44500	4.6	13500	4.1	2090000	6.3

Table A-6. Soil Resistance Readings (Ohms) Taken July 30, 1988
(48-Hour Postrainulator).

Depth (in.)	Box 1A	Log 1A	Box 1B	Log 1B	Box 1C	Log 1C
2.0	96200	5.0	108000	5.0	428000	5.6
4.0	282000	5.5	102000	5.0	172000	5.2
6.0	248000	5.4	155000	5.2	88900	4.9
8.0	14400	4.2	186000	5.3	44500	4.6
10.0	26800	4.4	374000	5.6	30600	4.5
12.0	27400	4.4	383000	5.6	28200	4.5
14.0	23200	4.4	120000	5.1	37400	4.6
16.0	19100	4.3	30300	4.5	29100	4.5
18.0	9620	4.0	81600	4.9	12400	4.1
20.0	74200	4.9	161000	5.2	12900	4.1
22.0	74700	4.9	128000	5.1	772000	5.9
24.0	11300	4.1	4530000	6.7	790000	5.9
26.0	226000	5.4	4240000	6.6	21000	4.3
28.0	220000	5.3	19200	4.3	19800	4.3
30.0	11800	4.1	214000	5.3	31000	4.5
32.0	9390	4.0	255000	5.4	24600	4.4
34.0	279000	5.4	41200	4.6	9710	4.0
36.0	274000	5.4	188000	5.3	18100	4.3
38.0	14400	4.2	657000	5.8	18100	4.3
40.0	13300	4.1	374000	5.6	198000	5.3
42.0	9770	4.0	18400	4.3	241000	5.4
44.0	42300	4.6	15100	4.2	3130000	6.5

Table A-7. Resistance Readings (Ohms) Taken August 2, 1988
(96-Hour Postrainulator).

Depth (in.)	Box 1A	Log 1A	Box 1B	Log 1B	Box 1C	Log 1C
2.0	106000	5.0	153000	5.2	392000	5.6
4.0	428000	5.6	130000	5.1	276000	5.4
6.0	379000	5.6	207000	5.3	119000	5.1
8.0	16200	4.2	239000	5.4	87600	4.9
10.0	29400	4.5	433000	5.6	34100	4.5
12.0	26700	4.4	445000	5.6	30000	4.5
14.0	25500	4.4	137000	5.1	39200	4.6
16.0	20700	4.3	32700	4.5	30000	4.5
18.0	10400	4.0	87600	4.9	13000	4.1
20.0	87600	4.9	175000	5.2	13500	4.1
22.0	85500	4.9	139000	5.1	152000	5.2
24.0	12100	4.1	3440000	6.5	889000	5.9
26.0	268000	5.4	3470000	6.5	23000	4.4
28.0	266000	5.4	20700	4.3	20500	4.3
30.0	12600	4.1	239000	5.4	33800	4.5
32.0	10100	4.0	282000	5.5	27100	4.4
34.0	267000	5.4	44500	4.6	10200	4.0
36.0	291000	5.5	205000	5.3	18900	4.3
38.0	15500	4.2	718000	5.9	19200	4.3
40.0	13900	4.1	397000	5.6	220000	5.3
42.0	9690	4.0	20800	4.3	271000	5.4
44.0	57100	4.8	14400	4.2	194000	5.3

Table A-8. Resistance Readings (Ohms) Taken August 29, 1988
(Prerainulator).

Depth (in.)	Box 1A	Log 1A	Box 1B	Log 1B	Box 1C	Log 1C
2.0	291000	5.5	3210000	6.5	3810000	6.6
4.0	615000	5.8	180000	5.3	1460000	6.2
6.0	495000	5.7	266000	5.4	138000	5.1
8.0	18400	4.3	258000	5.4	104000	5.0
10.0	42800	4.6	463000	5.7	40700	4.6
12.0	72400	4.9	547000	5.7	36600	4.6
14.0	33400	4.5	153000	5.2	42300	4.6
16.0	27400	4.4	37000	4.6	33400	4.5
18.0	12000	4.1	92500	5.0	15700	4.2
20.0	95400	5.0	183000	5.3	17700	4.2
22.0	96200	5.0	151000	5.2	4000000	6.6
24.0	13900	4.1	6360000	6.8	4120000	6.6
26.0	294000	5.5	6560000	6.8	32300	4.5
28.0	291000	5.5	24400	4.4	29400	4.5
30.0	14900	4.2	239000	5.4	43900	4.6
32.0	12200	4.1	279000	5.4	33000	4.5
34.0	276000	5.4	74200	4.9	12200	4.1
36.0	276000	5.4	208000	5.3	23000	4.4
38.0	19900	4.3	797000	5.9	22600	4.4
40.0	18300	4.3	451000	5.7	244000	5.4
42.0	12300	4.1	28200	4.5	310000	5.5
44.0	43300	4.6	18400	4.3	8280000	6.9

Table A-9. Resistance Readings (Ohms) Taken August 29, 1988
(Prerainulator).

Depth (in.)	Box 2A	Log 2A	Box 2B	Log 2B	Box 2C	Log 2C
2.0	6720000	6.8	334000	5.5	695000	5.8
4.0	79700	4.9	300000	5.5	153000	5.2
6.0	27900	4.4	117000	5.1	87600	4.9
8.0	18400	4.3	136000	5.1	80300	4.9
10.0	13900	4.1	98500	5.0	26700	4.4
12.0	12600	4.1	72400	4.9	23200	4.4
14.0	12200	4.1	81600	4.9	16100	4.2
16.0	12700	4.1	41200	4.6	12900	4.1
18.0	10700	4.0	44500	4.6	11200	4.0
20.0	8820	3.9	33800	4.5	10900	4.0
22.0	9690	4.0	23700	4.4	11200	4.0
24.0	10000	4.0	32000	4.5	10100	4.0
26.0	9390	4.0	32300	4.5	8610	3.9
28.0	10800	4.0	27900	4.4	19600	4.3
30.0	11500	4.1	29400	4.5	21800	4.3
32.0	12000	4.1	25300	4.4	12600	4.1
34.0	16400	4.2	30000	4.5	11500	4.1
36.0	18600	4.3	66200	4.8	10400	4.0
38.0	18600	4.3	74200	4.9	10000	4.0
40.0	15100	4.2	27100	4.4	8820	3.9
42.0	11800	4.1	13000	4.1	8030	3.9
44.0	10600	4.0	12100	4.1	6950	3.8

Table A-10. Resistance Readings (Ohms) Taken August 30, 1988
(2-Hour Postrainulator).

Depth (in.)	Box 1A	Log 1A	Box 1B	Log 1B	Box 1C	Log 1C
2.0	32300	4.5	172000	5.2	947000	6.0
4.0	493000	5.7	133000	5.1	954000	6.0
6.0	451000	5.7	267000	5.4	161000	5.2
8.0	19900	4.3	294000	5.5	121000	5.1
10.0	47500	4.7	556000	5.7	44500	4.6
12.0	79700	4.9	600000	5.8	38300	4.6
14.0	37400	4.6	161000	5.2	43900	4.6
16.0	30600	4.5	39200	4.6	34500	4.5
18.0	12500	4.1	97700	5.0	16400	4.2
20.0	100000	5.0	196000	5.3	18400	4.3
22.0	99900	5.0	159000	5.2	3640000	6.6
24.0	14300	4.2	6400000	6.8	3700000	6.6
26.0	320000	5.5	6610000	6.8	34500	4.5
28.0	316000	5.5	25500	4.4	31300	4.5
30.0	15200	4.2	266000	5.4	46300	4.7
32.0	12300	4.1	306000	5.5	34500	4.5
34.0	310000	5.5	78400	4.9	12300	4.1
36.0	306000	5.5	224000	5.4	23500	4.4
38.0	20700	4.3	816000	5.9	23500	4.4
40.0	18900	4.3	463000	5.7	274000	5.4
42.0	12600	4.1	30000	4.5	341000	5.5
44.0	67300	4.8	19200	4.3	4240000	6.6

Table A-11. Resistance Readings (Ohms) Taken September 1, 1988
(48-Hour Postrainulator).

Depth (in.)	Box 1A	Log 1A	Box 1B	Log 1B	Box 1C	Log 1C
2.0	150000	5.2	357000	5.6	1390000	6.1
4.0	690000	5.8	226000	5.4	1180000	6.1
6.0	590000	5.8	320000	5.5	171000	5.2
8.0	21600	4.3	285000	5.5	128000	5.1
10.0	51000	4.7	585000	5.8	83500	4.9
12.0	44500	4.6	630000	5.8	42800	4.6
14.0	34500	4.5	162000	5.2	74700	4.9
16.0	34900	4.5	43300	4.6	37400	4.6
18.0	13400	4.1	106000	5.0	18000	4.3
20.0	123000	5.1	214000	5.3	20500	4.3
22.0	122000	5.1	177000	5.2	2800000	6.4
24.0	15300	4.2	8720000	6.9	2820000	6.5
26.0	338000	5.5	9040000	7.0	40200	4.6
28.0	334000	5.5	28800	4.5	36600	4.6
30.0	16100	4.2	310000	5.5	86100	4.9
32.0	13000	4.1	357000	5.6	39200	4.6
34.0	349000	5.5	86900	4.9	13000	4.1
36.0	345000	5.5	253000	5.4	25800	4.4
38.0	22400	4.4	889000	5.9	25500	4.4
40.0	20300	4.3	489000	5.7	323000	5.5
42.0	12500	4.1	34500	4.5	407000	5.6
44.0	78400	4.9	21600	4.3	5040000	6.7

Table A-12. Resistance Readings (Ohms) Taken September 10, 1988.

Depth (in.)	Box 1A	Log 1A	Box 1B	Log 1B	Box 1C	Log 1C
2.0	157000	5.2	707000	5.8	1160000	6.1
4.0	695000	5.8	210000	5.3	1050000	6.0
6.0	600000	5.8	327000	5.5	159000	5.2
8.0	21000	4.3	282000	5.5	120000	5.1
10.0	51000	4.7	566000	5.8	80900	4.9
12.0	47500	4.7	610000	5.8	43300	4.6
14.0	36600	4.6	167000	5.2	76000	4.9
16.0	33800	4.5	41700	4.6	37400	4.6
18.0	13200	4.1	102000	5.0	18300	4.3
20.0	112000	5.0	205000	5.3	21600	4.3
22.0	112000	5.0	169000	5.2	4500000	6.7
24.0	15200	4.2	6960000	6.8	4560000	6.7
26.0	334000	5.5	7200000	6.9	42800	4.6
28.0	330000	5.5	29400	4.5	41200	4.6
30.0	16100	4.2	268000	5.4	91100	5.0
32.0	12900	4.1	316000	5.5	40700	4.6
34.0	285000	5.5	85500	4.9	13300	4.1
36.0	285000	5.5	230000	5.4	25300	4.4
38.0	22400	4.4	876000	5.9	25800	4.4
40.0	20800	4.3	495000	5.7	294000	5.5
42.0	13600	4.1	36100	4.6	370000	5.6
44.0	78400	4.9	21800	4.3	7320000	6.9

Table A-13. Resistance Readings (Ohms) Taken September 19, 1988.

Depth (in.)	Box 1A	Log 1A	Box 1B	Log 1B	Box 1C	Log 1C
2.0	139000	5.1	199000	5.3	701000	5.8
4.0	423000	5.6	282000	5.5	673000	5.8
6.0	320000	5.5	463000	5.7	216000	5.3
8.0	27100	4.4	379000	5.6	159000	5.2
10.0	99200	5.0	760000	5.9	106000	5.0
12.0	89600	5.0	816000	5.9	100000	5.0
14.0	73000	4.9	203000	5.3	102000	5.0
16.0	44500	4.6	86900	4.9	78400	4.9
18.0	16500	4.2	130000	5.1	23500	4.4
20.0	210000	5.3	258000	5.4	28500	4.5
22.0	207000	5.3	216000	5.3	3720000	6.6
24.0	18600	4.3	7010000	6.8	3780000	6.6
26.0	248000	5.4	7320000	6.9	100000	5.0
28.0	246000	5.4	39200	4.6	103000	5.0
30.0	20500	4.3	407000	5.6	130000	5.1
32.0	16000	4.2	475000	5.7	89600	5.0
34.0	266000	5.4	105000	5.0	16900	4.2
36.0	268000	5.4	303000	5.5	34500	4.5
38.0	29100	4.5	939000	6.0	33800	4.5
40.0	26800	4.4	701000	5.8	306000	5.5
42.0	17700	4.2	77200	4.9	353000	5.5
44.0	96900	5.0	30600	4.5	4200000	6.6

Table A-14. Resistance Readings (Ohms) Taken September 19, 1988.

Depth (in.)	Box 2A	Log 2A	Box 2B	Log 2B	Box 2C	Log 2C
2.0	279000	5.4	255000	5.4	267000	5.4
4.0	95400	5.0	338000	5.5	201000	5.3
6.0	38300	4.6	178000	5.3	92500	5.0
8.0	26600	4.4	205000	5.3	83500	4.9
10.0	20300	4.3	144000	5.2	84800	4.9
12.0	18100	4.3	104000	5.0	34500	4.5
14.0	17700	4.2	121000	5.1	23000	4.4
16.0	18400	4.3	105000	5.0	18300	4.3
18.0	15600	4.2	96900	5.0	15700	4.2
20.0	12700	4.1	76000	4.9	15600	4.2
22.0	13600	4.1	34100	4.5	16000	4.2
24.0	14300	4.2	46900	4.7	13900	4.1
26.0	13200	4.1	47500	4.7	11800	4.1
28.0	14700	4.2	40700	4.6	29100	4.5
30.0	15000	4.2	41700	4.6	32300	4.5
32.0	15500	4.2	38800	4.6	17100	4.2
34.0	21800	4.3	74700	4.9	15700	4.2
36.0	24800	4.4	98500	5.0	14100	4.1
38.0	24400	4.4	108000	5.0	13500	4.1
40.0	19600	4.3	42300	4.6	12000	4.1
42.0	15200	4.2	19600	4.3	10900	4.0
44.0	15600	4.2	19200	4.3	9770	4.0

Table A-15. Resistance Readings (Ohms) Taken September 21, 1988.

Depth (in.)	Box 1A	Log 1A	Box 1B	Log 1B	Box 1C	Log 1C
2.0	169000	5.2	175000	5.2	1740000	6.2
4.0	918000	6.0	330000	5.5	1620000	6.2
6.0	803000	5.9	580000	5.8	230000	5.4
8.0	29100	4.5	397000	5.6	175000	5.2
10.0	124000	5.1	835000	5.9	120000	5.1
12.0	116000	5.1	889000	5.9	109000	5.0
14.0	87600	4.9	216000	5.3	106000	5.0
16.0	85500	4.9	93200	5.0	79700	4.9
18.0	17400	4.2	139000	5.1	24600	4.4
20.0	263000	5.4	267000	5.4	30600	4.5
22.0	255000	5.4	248000	5.4	3310000	6.5
24.0	19800	4.3	9480000	7.0	3310000	6.5
26.0	736000	5.9	9930000	7.0	110000	5.0
28.0	760000	5.9	43300	4.6	115000	5.1
30.0	21600	4.3	457000	5.7	140000	5.1
32.0	16800	4.2	600000	5.8	96200	5.0
34.0	439000	5.6	113000	5.1	18000	4.3
36.0	433000	5.6	334000	5.5	35700	4.6
38.0	31000	4.5	1210000	6.1	35300	4.5
40.0	28800	4.5	718000	5.9	353000	5.5
42.0	18400	4.3	85500	4.9	463000	5.7
44.0	80300	4.9	31600	4.5	4040000	6.6

Table A-16. Resistance Readings (Ohms) Taken September 21, 1988.

Depth (in.)	Box 2A	Log 2A	Box 2B	Log 2B	Box 2C	Log 2C
2.0	261000	5.4	316000	5.5	210000	5.3
4.0	112000	5.0	412000	5.6	244000	5.4
6.0	42800	4.6	212000	5.3	110000	5.0
8.0	29400	4.5	235000	5.4	97700	5.0
10.0	22200	4.3	156000	5.2	95400	5.0
12.0	19600	4.3	112000	5.0	37900	4.6
14.0	19100	4.3	134000	5.1	24600	4.4
16.0	19900	4.3	121000	5.1	19200	4.3
18.0	16700	4.2	108000	5.0	16500	4.2
20.0	13500	4.1	80900	4.9	16400	4.2
22.0	14500	4.2	37400	4.6	16800	4.2
24.0	15100	4.2	79000	4.9	14600	4.2
26.0	14000	4.1	82900	4.9	12200	4.1
28.0	15700	4.2	43900	4.6	32000	4.5
30.0	16100	4.2	45100	4.7	35700	4.6
32.0	16500	4.2	42800	4.6	17800	4.3
34.0	23200	4.4	83500	4.9	16700	4.2
36.0	26600	4.4	109000	5.0	15000	4.2
38.0	26300	4.4	118000	5.1	14000	4.1
40.0	21400	4.3	46300	4.7	12500	4.1
42.0	16800	4.2	20700	4.3	11300	4.1
44.0	15700	4.2	19800	4.3	10200	4.0

Table A-17. Resistance Readings (Ohms) Taken September 30, 1988.

Depth (in.)	Box 1A	Log 1A	Box 1B	Log 1B	Box 1C	Log 1C
2.0	268000	5.4	251000	5.4	1670000	6.2
4.0	889000	5.9	330000	5.5	1510000	6.2
6.0	742000	5.9	585000	5.8	228000	5.4
8.0	29400	4.5	397000	5.6	174000	5.2
10.0	129000	5.1	790000	5.9	122000	5.1
12.0	123000	5.1	855000	5.9	112000	5.0
14.0	97700	5.0	210000	5.3	108000	5.0
16.0	91800	5.0	94700	5.0	79700	4.9
18.0	17700	4.2	143000	5.2	25800	4.4
20.0	246000	5.4	267000	5.4	32700	4.5
22.0	237000	5.4	251000	5.4	3130000	6.5
24.0	20100	4.3	9560000	7.0	3110000	6.5
26.0	712000	5.9	9840000	7.0	117000	5.1
28.0	718000	5.9	46300	4.7	124000	5.1
30.0	22400	4.4	43300	4.6	151000	5.2
32.0	17500	4.2	489000	5.7	103000	5.0
34.0	402000	5.6	117000	5.1	19400	4.3
36.0	402000	5.6	330000	5.5	37900	4.6
38.0	32700	4.5	1310000	6.1	36100	4.6
40.0	30000	4.5	822000	5.9	345000	5.5
42.0	19100	4.3	91800	5.0	457000	5.7
44.0	68400	4.8	33400	5.5	3260000	6.5

Table A-18. Resistance Readings (Ohms) Taken September 30, 1988.

Depth (in.)	Box 2A	Log 2A	Box 2B	Log 2B	Box 2C	Log 2C
2.0	327000	5.5	349000	5.5	210000	5.3
4.0	111000	5.0	417000	5.6	244000	5.4
6.0	41200	4.6	214000	5.3	103000	5.0
8.0	28500	4.5	239000	5.4	91800	5.0
10.0	21600	4.3	160000	5.2	96900	5.0
12.0	19200	4.3	115000	5.1	38800	4.6
14.0	19100	4.3	140000	5.1	25300	4.4
16.0	20100	4.3	127000	5.1	19800	4.3
18.0	16900	4.2	114000	5.1	16900	4.2
20.0	13800	4.1	85500	4.9	17100	4.2
22.0	15000	4.2	40700	4.6	17500	4.2
24.0	15700	4.2	84800	4.9	15200	4.2
26.0	14600	4.2	88200	4.9	12800	4.1
28.0	16200	4.2	78400	4.9	34500	4.5
30.0	16700	4.2	76600	4.9	38800	4.6
32.0	17100	4.2	46900	4.7	18800	4.3
34.0	23900	4.4	92500	5.0	17500	4.2
36.0	27400	4.4	120000	5.1	15700	4.2
38.0	27100	4.4	124000	5.1	14700	4.2
40.0	22000	4.3	72400	4.9	13100	4.1
42.0	17100	4.2	23500	4.4	11900	4.1
44.0	16200	4.2	22200	4.3	10600	4.0

Table A-19. Resistance Readings (Ohms) Taken October 3, 1988
(4-Hour Postrainulator).

Depth (in.)	Box 1A	Log 1A	Box 1B	Log 1B	Box 1C	Log 1C
2.0	31000	4.5	73600	4.9	1210000	6.1
4.0	402000	5.6	90300	5.0	1130000	6.1
6.0	383000	5.6	224000	5.4	203000	5.3
8.0	26100	4.4	285000	5.5	167000	5.2
10.0	121000	5.1	712000	5.9	114000	5.1
12.0	117000	5.1	778000	5.9	106000	5.0
14.0	94700	5.0	199000	5.3	102000	5.0
16.0	88200	4.9	89600	5.0	76600	4.9
18.0	16800	4.2	133000	5.1	24100	4.4
20.0	212000	5.3	274000	5.4	30600	4.5
22.0	207000	5.3	232000	5.4		ERR
24.0	19100	4.3	8120000	6.9		ERR
26.0	566000	5.8	7570000	6.9	112000	5.0
28.0	502000	5.7	43300	4.6	117000	5.1
30.0	21200	4.3	357000	5.6	139000	5.1
32.0	16700	4.2	407000	5.6	97700	5.0
34.0	357000	5.6	111000	5.0	18800	4.3
36.0	366000	5.6	300000	5.5	35300	4.5
38.0	30300	4.5	1180000	6.1	34100	4.5
40.0	27900	4.4	784000	5.9	285000	5.5
42.0	18800	4.3	86100	4.9	379000	5.6
44.0	101000	5.0	33000	4.5	7320000	6.9

Table A-20. Resistance Readings (Ohms) Taken October 4, 1988
(24-Hour Postrainulator).

Depth (in.)	Box 1A	Log 1A	Box 1B	Log 1B	Box 1C	Log 1C
2.0	106000	5.0	111000	5.0	1450000	6.2
4.0	668000	5.8	160000	5.2	1310000	6.1
6.0	615000	5.8	300000	5.5	224000	5.4
8.0	27400	4.4	303000	5.5	177000	5.2
10.0	127000	5.1	718000	5.9	116000	5.1
12.0	124000	5.1	772000	5.9	106000	5.0
14.0	99200	5.0	198000	5.3	102000	5.0
16.0	92500	5.0	90300	5.0	48200	4.7
18.0	16800	4.2	13300	4.1	23200	4.4
20.0	212000	5.3	274000	5.4	30000	4.5
22.0	207000	5.3	230000	5.4	8960000	7.0
24.0	19100	4.3	9560000	7.0	8410000	6.9
26.0	561000	5.7		ERR	112000	5.0
28.0	502000	5.7	43300	4.6	118000	5.1
30.0	21200	4.3	357000	5.6	144000	5.2
32.0	16500	4.2	402000	5.6	98500	5.0
34.0	370000	5.6	108000	5.0	18800	4.3
36.0	379000	5.6	310000	5.5	34900	4.5
38.0	30300	4.5	1180000	6.1	33400	4.5
40.0	27900	4.4	790000	5.9	291000	5.5
42.0	18600	4.3	88200	4.9	383000	5.6
44.0	76600	4.9	32300	4.5	7250000	6.9

APPENDIX B
TEST 1 GRAPHS

Soil Moisture Profile Pocket Mouse (Box 1A)

Soil Moisture Profile Control (Box 1B)

Soil Moisture Profile Townsend (Box 1C)

Soil Moisture Profile Control (Box 2A)

Soil Moisture Profile Townsend (Box 2B)

Soil Moisture Profile Pocket Mouse (Box 2C)

Soil Moisture Profile April to October 1988 (0-6 in.)

Soil Moisture Profile April to October 1988 (6-12 in.)

Soil Moisture Profile April to October 1988 (12-18 in.)

Soil Moisture Profile April to October 1988 (18-24 in.)

Soil Moisture Profile April to October 1988 (24-30 in.)

Soil Moisture Profile April to October 1988 (30-36 in.)

Soil Moisture Profile April to October 1988 (36-42 in.)

Soil Moisture Profile April to October 1988 (42-48 in.)

Soil Moisture Profile October 1988 Data

Soil Moisture Profile October 1988 Data

Soil Moisture Profile October 1988 Data

Soil Moisture Profile October 1988 Readings

Soil Moisture Profile October 1988 (no water added)

Soil Moisture Profile October 1988 (rainulator treated)

APPENDIX C
TEST 2 HYDROPROBE DATA

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TABLE SUMMARY OF HYDROPROBE READINGS DURING TEST #2

		NOV18	DEC8	JAN5	JAN31	MAR10	MAR20	MAR28	APR7	APR12
BOX 1A PQ	DEPTH									
PROBE 11	5	3591	3243	3195	2158	3531	2969	2943	2003	2467
	11	4782	4091	4896	4283	8223	7329	6668	5394	5127
	17	4589	4194	4467	4447	7692	7428	7110	5750	5358
	23	4556	4537	4942	4519	6101	7363	7070	6406	6181
	29	4622	4371	4647	4465	4598	5940	6193	6097	6338
	35	4704	4421	4719	4594	4689	4878	5207	5365	5625
BOX 1A PQ	DEPTH									
PROBE 12	5	3750	2185	3730	1764	5172	2857	3746	2740	2780
	11	4550	4365	4766	4326	9032	8034	7010	5942	5490
	17	4486	4314	4291	4348	8826	8379	7542	6896	6462
	23	4208	4254	4456	4331	7379	7669	7505	7001	6601
	29	4050	4155	4327	4318	5672	6236	6213	6246	6234
	35	4229	4412	4285	4179	4468	4731	4996	5209	5403
BOX 1A PQ	DEPTH									
AVERAGE	5	3671	2714	3463	1961	4352	2913	3345	2372	2624
	11	4666	4220	4831	4305	8628	7782	6839	5668	5309
	17	4538	4254	4379	4398	8259	7904	7326	6323	5910
	23	4382	4396	4699	4425	6740	7516	7288	6704	6391
	29	4336	4263	4487	4392	5135	6088	6203	6172	6286
	35	4467	4417	4502	4387	4579	4805	5102	5287	5514
BOX 1B CO	DEPTH									
PROBE 13	5	3922	2610	3364	3007	4793	2793	3864	2647	2575
	11	4759	4673	5123	4659	9772	8513	7517	6333	5806
	17	4695	4645	4964	4674	9689	8853	8144	7105	6806
	23	4679	4795	4996	4734	9890	9051	8583	7831	7476
	29	4762	4747	5035	4822	9961	8710	8198	7546	7340
	35	4934	4890	5169	4873	6060	7146	7297	7150	6899
BOX 1B CO	DEPTH									
PROBE 14	5	3319	1868	2991	1754	5850	4302	3887	3232	2632
	11	4194	3899	4382	4148	6586	6713	6135	5276	5020
	17	4660	4435	4792	4643	5133	5663	5957	5983	5933
	23	4620	4701	4862	4501	4736	4766	5291	5681	5595
	29	4386	4379	4374	4280	4388	4384	4568	4593	4838
	35	4626	4803	4839	4870	4973	4793	4781	4776	4925

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BOX 1B CO	DEPTH									
AVERAGE	5	3621	2239	3178	2381	5322	3548	3876	2940	2604
	11	4477	4286	4753	4404	8179	7613	6826	5805	5413
	17	4678	4540	4878	4659	7411	7258	7051	6544	6370
	23	4650	4748	4929	4620	7313	6909	6937	6756	6536
	29	4574	4563	4705	4551	7175	6547	6383	6070	6089
	35	4780	4847	5004	4872	5517	5970	6039	5963	5912

BOX 1C PM	DEPTH									
PROBE 15	5	2858	3513	3348	2641	5987	3874	4718	3321	1678
	11	4424	4537	4670	4581	9148	8141	7477	6077	5208
	17	4271	4298	4510	4492	8339	8239	7468	6616	6258
	23	4652	4362	4404	4383	5369	7059	7060	6561	6444
	29	4442	4562	4604	4503	4696	6142	6563	6220	6196
	35	4772	4920	4987	4680	5009	5091	5595	5683	5716

BOX 1C PM	DEPTH									
PROBE 16	5	3019	3163	3194	2674	7740	3601	3288	2593	2862
	11	4257	4204	4190	4041	8184	7442	6622	5920	5690
	17	4685	4648	4610	4448	7895	8130	7558	7257	7036
	23	4657	4597	4702	4698	5446	7030	7113	6775	6600
	29	4569	4555	4722	4557	4586	5352	5711	5939	6080
	35	4753	4808	4589	4642	4739	4567	4836	5188	5313

BOX 1C PM	DEPTH									
AVERAGE	5	2939	3338	3271	2658	6364	3738	4003	2957	2270
	11	4341	4371	4430	4311	8666	7792	7050	5999	5449
	17	4478	4473	4560	4470	8117	8185	7513	6937	6647
	23	4655	4480	4553	4541	5408	7045	7087	6668	6522
	29	4506	4559	4663	4530	4641	5747	6137	6080	6138
	35	4763	4864	4788	4661	4874	4829	5216	5436	5515

NOV18 DEC8 JAN5 JAN31 MAR10 MAR20 MAR28 APR7 APR12

BOX 2A PG	DEPTH									
PROBE 21	5	2363	3208	4357	2141	4798	3349	3397	3176	1742
	11	4178	4058	4183	4150	8238	7379	6586	5744	4845
	17	4351	4454	4394	4326	7526	7562	7122	6458	6316
	23	4690	4575	4375	4561	5271	6874	6758	6547	6643
	29	4614	4491	4101	4401	4778	5462	5976	6114	6187
	35	4337	4412	4234	4496	4730	4690	4990	5362	5413

BOX 2A PQ PROBE 22	DEPTH									
	5	2952	1879	2769	2524	8133	5963	5366	3683	3763
	11	3250	2803	2945	2975	8225	7315	6291	5435	4935
	17	3213	2984	2896	3022	6120	6215	5724	5354	5190
	23	4076	3963	3973	4000	4392	4773	5049	5437	5499
	29	4631	4212	4465	4409	4520	4525	5047	5298	5454
	35	4386	3961	4094	4112	4231	4425	4382	4529	4686

BOX 2A PQ AVERAGE	DEPTH									
	5	2658	2544	3563	2333	6466	4656	4382	3430	2753
	11	3714	3431	3564	3563	8232	7347	6439	5590	4890
	17	3782	3719	3645	3674	6823	6889	6423	5906	5753
	23	4383	4269	4174	4281	4832	5824	5904	5992	6071
	29	4623	4352	4283	4405	4649	4994	5512	5706	5821
	35	4362	4187	4164	4304	4481	4558	4686	4946	5050

BOX 2B CO PROBE 23	DEPTH									
	5	4085	4195	4360	4040	5440	4452	5612	4096	3696
	11	4862	5065	5595	5388	9590	8484	7733	6825	6526
	17	5220	5133	5549	5291	8767	8442	8002	7366	7002
	23	5109	5028	5169	5046	6288	7744	7408	7126	6858
	29	4747	4999	5002	4947	5322	6813	7038	6912	6793
	35	5140	5275	5121	5047	5199	5976	6697	6708	6820

BOX 2B CO PROBE 24	DEPTH									
	5	3691	3652	3301	2679	7177	3520	5206	3329	3218
	11	4007	4148	4479	4349	10351	8843	7633	6811	6556
	17	4847	4750	4831	4704	11419	9418	8466	7950	7596
	23	5014	5140	5430	5010	8301	8502	8054	7707	7620
	29	4612	4694	4669	4752	6336	6600	6739	6673	6615
	35	4932	4897	4696	4748	5394	5101	5369	5913	5886

BOX 2B CO AVERAGE	DEPTH									
	5	3888	3924	3831	3360	6309	3986	5409	3713	3457
	11	4435	4607	5037	4869	9971	8664	7683	6818	6541
	17	5034	4942	5190	4998	10093	8930	8234	7658	7299
	23	5062	5084	5300	5028	7295	8123	7731	7417	7239
	29	4680	4847	4836	4850	5829	6707	6889	6793	6704
	35	5036	5086	4909	4898	5297	5539	6033	6311	6353

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BOX 2C PQ	DEPTH								
PROBE 25	5	2695	2646	3611	3091	5727	4472	3558	2183
	11	3977	4099	4130	4051	7232	7285	6687	5603
	17	4172	4123	4272	3988	5428	7076	6976	6712
	23	4598	4361	4542	4385	4407	5680	6302	6335
	29	4435	4366	4657	4418	4550	4657	5252	5785
	35	4598	4705	4813	4775	4824	4835	4914	5407

BOX 2C PQ	DEPTH								
PROBE 26	5	2636	2539	2841	1315	5064	3134	3884	2594
	11	3370	3293	3384	3037	7419	6801	6350	5517
	17	4084	3984	3713	3708	5702	6969	6897	6581
	23	4204	4319	4167	4218	4490	5501	6214	6585
	29	3614	3770	3610	3667	3702	3792	4384	4979
	35	3810	3904	3988	3993	4082	4095	4106	4456

BOX 2C PQ	DEPTH								
AVERAGE	5	2666	2593	3226	2203	5396	3803	3721	2389
	11	3674	3696	3757	3544	7326	7043	6519	5560
	17	4128	4054	3993	3848	5565	7023	6937	6647
	23	4401	4340	4355	4302	4449	5591	6258	6460
	29	4025	4068	4134	4043	4126	4225	4818	5278
	35	4204	4305	4401	4384	4453	4465	4510	4932

APPENDIX D
TEST 2 SOIL MOISTURE GRAPHS

**Soil Moisture Profile (2nd test)
Pocket Gopher (Box 1A)**

**Soil Moisture Profile (2nd test)
Pocket Gopher (Box 2C)**

Soil Moisture Profile (2nd test) Control (Box 1B)

Soil Moisture Profile (2nd test) Control (Box 2B)

Soil Moisture Profile (2nd test) November 1988 to April 1989 (0-6 in.)

Soil Moisture Profile (2nd test) November 1988 to April 1989 (6-12 in.)

**Soil Moisture Profile (2nd test)
November 1988 to April 1989 (12-18 in.)**

**Soil Moisture Profile (2nd test)
November 1988 to April 1989 (18-24 in.)**

Soil Moisture Profile (2nd test)
November 1988 to April 1989 (24-30 in.)

Soil Moisture Profile (2nd test)
November 1988 to April 1989 (30-36 in.)

**Soil Moisture Profile (2nd test)
November 1988 to April 1989 (36-42 in.)**

**Soil Moisture Profile (2nd test)
November 1988 to April 1989 (42-48 in.)**

Soil Moisture Profile April 1989 (end 2nd test)

Soil Moisture Profile April 1989 (end 2nd test)

Soil Moisture Profile April 1989 (end 2nd test)

Soil Moisture Profile April 1989 (end 2nd test)

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Soil Moisture Profile
April 1989 (end 2nd test)

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