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SJZ 12/16/13

EQUIPMENT USED

Barometric Probe: 121315 (6-12-13)

9b 7-24-13

Stop Watch: L 286 (6-14-13)

Date of Calibration: PARENTHESES

Calibration due:

MP-421	Z4	(B)	2013-07-24	10,29,01	W/SL
MP-421	Z4	(B)	2013-07-24	10,29,01	EXCEL
MP-421	Z4	(T)	2013-07-24	09,37,40	W/SL
MP-421	Z4	(T)	2013-07-24	09,37,40	EXCEL
MP-421	Z4	(M)	2013-07-24	09,38,57	W/SL
MP-421	Z4	(M)	2013-07-24	09,38,57	EXCEL
MP-421	Z4	(L)	2013-07-24	09,40,23	W/SL
MP-421	Z4	(L)	2013-07-24	09,40,23	EXCEL

PACKER TEST FLOW RATE GRAPHS

Boring MP-422

Packer Test Intervals:

- MP-422 Zone 1: 31.5 feet to 39.0 feet
- MP-422 Zone 2: 50.0 feet to 57.5 feet
- MP-422 Zone 3: 170.0 feet to 177.5 feet

Graphs of flow rate (gpm) vs time (minutes) have been created from Excel sheets containing data from field data sheets. For clarity, individual plots for each sequence within a tested interval are presented. Generally, plots are not provided if the field data sheets indicate no flow during a test sequence. ***Bechtel Field Instruction forms are provided. AMEC field data sheets are provided following the graphs for each zone. Transducer data file names are listed on the last field data sheet of each test interval. Transducer data files are furnished as electronic files in a data supplement submittal.***

BECHTEL POWER CORPORATION
Project No. 25847
Clinch River CPA Project- Site Subsurface Investigation
FIELD INSTRUCTION FORM

Specification Section: 5.3.7.2

Packer Testing in MP 422

Field Instruction: The following are the three (3) depth zones in which packer testing will be conducted in borehole MP 422:

- Zone 1: 31.5 to 39.0 feet below land surface. (Tolerance +/- 2 feet)
Zone 2: 50.0 to 57.5 feet below land surface. (Tolerance +/- 2 feet)
Zone 3: 170.0 to 177.5 feet below land surface. (Tolerance +/- 2 feet)

The desired pressure ranges that will be tested in each of the three zones are based on the calculation of the test pressures as provided in AMEC Project Procedure CRP-3 – Packer Pressure Testing in Boreholes, Attachment B (Bechtel Power InfoWorks 25847-601-V14-CY00-00018-006) or latest revision at time of testing. The test pressures will be determined just before the commencement of the tests by measuring the water level at the start of test.

Basis/Justification for Instruction:

The depth of the above zones was selected based on fracture zones identified from DRAFT geologic core logs, RQD analysis and from the acoustic televiewer logs. The bottom depth for packer testing is limited to approximately 250 feet due to the packer test assembly and maximum transducer cable length of approximately 285 feet. The justification of the pressure ranges that will be tested will be based on AMEC Project Procedure CRP-3 – Packer Pressure Testing in Boreholes, Attachment B (Bechtel Power InfoWorks 25847-601-V14-CY00-00018-006) or latest revision at time of testing.

Specification requires Contractor to provide test depths and pressures.

Prepared By:	<u>Garnett Day</u>	<u>[Signature]</u>	<u>7/6/13</u>
	Name	Signature	Date
Reviewed By:	<u>GERALD MELANE</u>	<u>[Signature]</u>	<u>7/6/13</u>
	Name	Signature	Date
Approved By:	<u>GERALD MELANE for J. DAMM for M. REIMNITZ</u>	<u>[Signature]</u>	<u>7/6/13</u>
	Name	Signature	Date
(see Section 1.2 for further instructions)			
Received By AMEC			
Site Mgr or Proj Mgr:	<u>S. Criscenzo</u>	<u>[Signature]</u>	<u>7/6/13</u>
	Name	Signature	Date

Boring: MP-422
Zone: Z1 31.5 feet to 39.0 below ground surface
Transducer Location: Middle

Sequence A (1/3 Po)				Sequence B (2/3 Po)				Sequence C (Po)			
Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)	Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)	Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)
8:20:30	0.0	28.96		8:33:00	0.0	36.50		8:44:30	0.0	46.79	
8:21:00	0.5	28.98	0	8:33:30	0.5	no reading		8:45:00	0.5	47.42	0
8:21:30	1.0	37.93	0	8:34:00	1.0	36.49	0	8:45:30	1.0	53.58	0
8:22:00	1.5	38.29	0	8:34:30	1.5	47.23	0	8:46:00	1.5	53.83	0
8:22:30	2.0	36.71	0	8:35:00	2.0	47.06	0	8:46:30	2.0	53.62	0
8:23:00	2.5	36.70	0	8:35:30	2.5	47.19	0	8:47:00	2.5	53.84	0
8:23:30	3.0	36.56	0	8:36:00	3.0	47.18	0	8:47:30	3.0	53.69	0
8:24:00	3.5	36.50	0	8:36:30	3.5	47.23	0	8:48:00	3.5	53.91	0
8:24:30	4.0	36.58	0	8:37:00	4.0	47.18	0	8:48:30	4.0	53.87	0
8:25:00	4.5	36.56	0	8:37:30	4.5	47.10	0	8:49:00	4.5	53.59	0
8:25:30	5.0	36.47	0	8:38:00	5.0	47.17	0	8:49:30	5.0	53.84	0
8:26:00	5.5	36.45	0	8:38:30	5.5	47.21	0	8:50:00	5.5	53.72	0
8:26:30	6.0	36.49	0	8:39:00	6.0	47.20	0	8:50:30	6.0	53.63	0
8:27:00	6.5	36.48	0	8:39:30	6.5	47.11	0				
8:27:30	7.0	36.47	0	8:40:00	7.0	47.22	0				
8:28:00	7.5	36.52	0								
8:28:30	8.0	36.54	0								
8:29:00	8.5	36.51	0								

Sequence D (1/2 Po)				Sequence E (Po)			
Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)	Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)
8:56:30	0.0	53.72		9:15:00	0.0	42.22	
8:57:00	0.5	53.57	0	9:15:30	0.5	54.17	0
8:57:30	1.0	42.66	0	9:16:00	1.0	54.03	0
8:58:00	1.5	42.56	0	9:16:30	1.5	53.78	0
8:58:30	2.0	42.66	0	9:17:00	2.0	53.70	0
8:59:00	2.5	42.55	0	9:17:30	2.5	53.76	0
8:59:30	3.0	42.40	0	9:18:00	3.0	54.00	0
9:00:00	3.5	42.34	0	9:18:30	3.5	53.66	0
9:00:30	4.0	42.15	0	9:19:00	4.0	53.64	0
9:01:00	4.5	42.04	0	9:19:30	4.5	53.79	0
9:01:30	5.0	41.97	0	9:20:00	5.0	53.72	0
9:02:00	5.5	41.86	0	9:20:30	5.5	53.76	0
9:02:30	6.0	41.73	0	9:21:00	6.0	53.65	0
9:03:00	6.5	41.69	0	9:21:30	6.5	53.70	0
9:03:30	7.0	41.50	0				
9:04:00	7.5	41.44	0				
9:04:30	8.0	41.28	0				
9:05:00	8.5	41.20	0				
9:05:30	9.0	41.11	0				
9:06:00	9.5	40.99	0				
9:06:30	10.0	40.93	0				
9:07:00	10.5	42.66	0				
9:07:30	11.0	42.71	0				
9:08:00	11.5	42.54	0				
9:08:30	12.0	42.60	0				
9:09:00	12.5	42.54	0				
9:09:30	13.0	42.61	0				
9:10:00	13.5	42.55	0				
9:10:30	14.0	42.55	0				
9:11:00	14.5	42.50	0				
9:11:30	15.0	42.56	0				
9:12:00	15.5	42.57	0				

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

Page 1 of 2

PROJECT NAME: Clinch River SMR Project

JOB NO. 6468-13-1072

DATE: 7-9-13

Boring No. MP-422 Borehole Diameter, in.: 3.8 Total Boring Depth, Ft. 320

Grnd Elev, Ft: 799.9

Casing Height above ground, Ft: 0.27

Elev. Top of Casing, Ft. (Grnd Elev + Casing Height): 800.2 = Datum

TEST ID: MP-422 Z1 Test length: 7.5 Test Section Depth (from Datum): From 31.5 To 39.0

(A) Depth to Water Table From Datum, Ft: 4.90

Test Water Temp: 78°F Baro Pressure, psi: 14.44

(B) Surface Gage Height Above Datum, Ft: 2.65

Depth to Center of Test Interval From Datum, Ft: 35.52

(C) Distance Water Table to Center of Test Interval Ft: 30.65

Static water pressure at center = $(C \cdot 62.4/144) + \text{Baro} =$ 28

MAXIMUM TEST PRESSURE, $P_o = ([A+B \cdot 1] + C \cdot 0.57)$ [$P_o =$ 25] Test Pressure sequence = 1/3 P_o , 2/3 P_o , P_o , 1/2 P_o , P_o

P_o Values: 1/3 $P_o =$ 8; 2/3 $P_o =$ 17; 1/2 $P_o =$ 13 Sequence ID: A B C D E Add Appropriate P_o value to static pressure at center of test interval

TEST NO. MP-422 Z1 Sequence No. A Planned Center Pressure: 36

Transducer Readings Before Packers Inflated: Top 20.79; Middle 24.68; Bottom: 28.53

Transducer Readings After Packers Inflated: Top 21.70; Middle 28.97; Bottom: 24.38

MP-422 Z1 SEQUENCE A

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
8:20:30	11077	---	---	---	28.98	0	BEGIN INCREASE FLOW
8:21:00	11077	11077	0	0	28.98	0.5	
8:21:30	11077	11077	0	0	37.93	10	DECREASE FLOW
8:22:00	11077	11077	0	0	38.29	9	
8:22:30	11077	11077	0	0	36.71	9	
8:23:00	11077	11077	0	0	36.70	9	
8:23:30	11077	11077	0	0	36.56	9	
8:24:00	11077	11077	0	0	36.50	9	
8:24:30	11077	11077	0	0	36.58	9	
8:25:00	11077	11077	0	0	36.56	9	
8:25:30	11077	11077	0	0	36.47	9	
8:26:00	11077	11077	0	0	36.45	9	
8:26:30	11077	11077	0	0	36.49	9	
8:27:00	11077	11077	0	0	36.48	9	
8:27:30	11077	11077	0	0	36.47	9	
8:28:00	11077	11077	0	0	36.52	9	
8:28:30	11077	11077	0	0	36.54	9	
8:29:00	11077	11077	0	0	36.51	9	END

*From Preliminary Boring Layout Survey

8:29:45 BOTTOM TRANS = 23.91

8:30:30 TOP TRANS = 21.99

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

Page 1 of 2

PROJECT NAME: Clinch River SMR Project

JOB NO. 6468-13-1072

DATE: 7-9-13

Boring No. MP-422 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320

Grd Elev, Ft: 399.9

Casing Height above ground, Ft: 0.27

Elev. Top of Casing, Ft. (Grd Elev + Casing Height): 800.2 = Datum

TEST ID: MP-422 Z1 Test length: 7.5 (7-10-13) Test Section Depth (from Datum): From 31.5 To 39.0

(A) Depth to Water Table From Datum, Ft: 4.90

Test Water Temp: 78°F Baro Pressure, psi: 14.44

(B) Surface Gage Height Above Datum, Ft. 2.65

Depth to Center of Test Interval From Datum, Ft: 35.52

(C) Distance Water Table to Center of Test interval Ft. 30.65 Static water pressure at center = $(C \cdot 62.4 / 144) + \text{Baro} =$ 28

MAXIMUM TEST PRESSURE, $P_o = ([A+B \cdot 1] + C \cdot 0.67)$ $[P_o =$ 25 $]$ Test Pressure sequence = 1/3 P_o , 2/3 P_o , P_o , 1/2 P_o , P_o

Po Values: 1/3 $P_o =$ 8 ; 2/3 $P_o =$ 17 ; 1/2 $P_o =$ 13 Sequence ID: A B C D E Add Appropriate P_o value to static pressure at center of test interval

TEST NO. MP-422 Z1 Sequence No. B Planned Center Pressure: 45

Transducer Readings Before Packers Inflated: Top 20.79 ; Middle 24.68 ; Bottom: 28.53

Transducer Readings After Packers Inflated: Top 21.70 ; Middle 28.97 ; Bottom: 24.38

MP-422 Z1 Sequence B

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
8:33:00	11077	----	----	----	36.50	19	BEGIN INCREASE PRES
8:33:30	No	READING					
8:34:00	11077	11077	0	0	36.49	19	
8:34:30	11077	11077	0	0	47.23	19	QA 7-9-13
8:35:00	11077	11077	0	0	47.06	19	
8:35:30	11077	11077	0	0	47.19	19	
8:36:00	11077	11077	0	0	47.18	19	
8:36:30	11077	11077	0	0	47.23	19	
8:37:00	11077	11077	0	0	47.18	19	
8:37:30	11077	11077	0	0	47.10	19	
8:38:00	11077	11077	0	0	47.17	19	
8:38:30	11077	11077	0	0	47.21	19	
8:39:00	11077	11077	0	0	47.20	19	
8:39:30	11077	11077	0	0	47.11	19	
8:40:00	11077	11077	0	0	47.22	19	END
				8:40:45	BOTTOM TRANS		23.62
				8:41:30	TOP TRANS		22.07

*From Preliminary Boring Layout Survey

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

Page 1 of 2

PROJECT NAME: Clinch River SMR Project

JOB NO. 6468-13-1072

DATE: 7-9-13

Boring No. MP-422 Borehole Diameter, in. 3.8 Total Boring Depth, Ft. 320

Grnd Elev, Ft. 799.9

Casing Height above ground, Ft. 0.27

Elev. Top of Casing, Ft. (Grnd Elev + Casing Height): 800.2 = Datum

TEST ID: MP-422 Z1 Test length: 7.5 08-7-10-13 GS
(Test Section Depth (from Datum): From 31.5 To 39.0

(A) Depth to Water Table From Datum, Ft. 4.90

Test Water Temp: 78°F Baro Pressure, psi: 14.44

(B) Surface Gage Height Above Datum, Ft. 2.65

Depth to Center of Test Interval From Datum, Ft. 35.52

(C) Distance Water Table to Center of Test Interval Ft. 30.65

Static water pressure at center = $(C \cdot 62.4 / 144) + \text{Baro} =$ 28

MAXIMUM TEST PRESSURE, $P_o = ((A+B \cdot 1) + C \cdot 0.57)$ [$P_o =$ 25] Test Pressure sequence = 1/3 P_o , 2/3 P_o , P_o , 1/2 P_o , P_o

Po Values: 1/3 $P_o =$ 8; 2/3 $P_o =$ 17; 1/2 $P_o =$ 13 Add Appropriate P_o value to static pressure at center of test interval
Sequence ID: A B C D E

TEST NO. MP-422 Z1 Sequence No. C Planned Center Pressure: 53

Transducer Readings Before Packers Inflated: Top 20.79; Middle 24.68; Bottom: 28.53

Transducer Readings After Packers Inflated: Top 21.70; Middle 28.97; Bottom: 24.38

MP-422 Z1 Sequence C

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
8:44:30	11077	---	---	---	46.79	19	BEGIN INCREASE Press
8:45:00	11077	11077	0	0	47.42	25	
8:45:30	11077	11077	0	0	53.58	25	
8:46:00	11077	11077	0	0	53.83	25	
8:46:30	11077	11077	0	0	53.62	25	
8:47:00	11077	11077	0	0	53.84	25	
8:47:30	11077	11077	0	0	53.69	25	
8:48:00	11077	11077	0	0	53.91	25	
8:48:30	11077	11077	0	0	53.87	25	
8:49:00	11077	11077	0	0	53.59	25	
8:49:30	11077	11077	0	0	53.84	25	
8:50:00	11077	11077	0	0	53.72	25	
8:50:30	11077	11077	0	0	53.63	25	END
				8:51:20	BOTTOM	TRANS	23.37
				8:52:00	TOP	TRANS	22.13

*From Preliminary Boring Layout Survey

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

Page 1 of 2

PROJECT NAME: Clinch River SMR Project

JOB NO. 6468-13-1072

DATE: 7-9-13

Boring No. MP-422 Borehole Diameter, in.: 3.8 Total Boring Depth, Ft. 320

Gnd Elev, Ft. 799.9

Casing Height above ground, Ft. 0.27 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 800.2 = Datum

TEST ID: MP-422 Z1 Test length: 7.5 (Test Section Depth (from Datum): From 31.5 To 39.0)

(A) Depth to Water Table From Datum, Ft. 4.90 Test Water Temp: 78°F Baro Pressure, psi: 14.44

(B) Surface Gage Height Above Datum, Ft. 2.65 Depth to Center of Test Interval From Datum, Ft. 35.52

(C) Distance Water Table to Center of Test Interval Ft. 30.65 Static water pressure at center = $(C \cdot 62.4 / 144) + \text{Baro} =$ 28

MAXIMUM TEST PRESSURE, $P_o = (A+B \cdot 1) + C \cdot 0.57$ [$P_o =$ 25] Test Pressure sequence = 1/3 P_o , 2/3 P_o , P_o , 1/2 P_o , P_o

Po Values: 1/3 $P_o =$ 8; 2/3 $P_o =$ 17; 1/2 $P_o =$ 13 Add Appropriate P_o value to static pressure at center of test interval

TEST NO. MP-422 Z1 Sequence No. D Planned Center Pressure: 41

Transducer Readings Before Packers Inflated: Top 20.79; Middle 24.68; Bottom: 28.53

Transducer Readings After Packers Inflated: Top 21.70; Middle 28.97; Bottom: 24.34

MP-422 Z1 SEQUENCE D

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
81 56:30	11077	-----	-----	-----	53.72	25	BEGIN Decreasing Flow
81 57:00	11077	11077	0	0	53.57	25	
81 57:30	11077	11077	0	0	42.66	13	
81 58:00	11077	11077	0	0	42.56	13	
81 58:30	11077	11077	0	0	42.66	13	
81 59:00	11077	11077	0	0	42.55	13	
81 59:30	11077	11077	0	0	42.40	13	
9:00:00	11077	11077	0	0	42.34	13	
9:00:30	11077	11077	0	0	42.15	13	
9:01:00	11077	11077	0	0	42.04	13	
9:01:30	11077	11077	0	0	41.97	13	
9:02:00	11077	11077	0	0	41.86	13	
9:02:30	11077	11077	0	0	41.73	13	
9:03:00	11077	11077	0	0	41.69	13	
9:03:30	11077	11077	0	0	41.50	13	
9:04:00	11077	11077	0	0	41.44	13	
9:04:30	11077	11077	0	0	41.28	13	
9:05:00	11077	11077	0	0	41.20	13	

*From Preliminary Boring Layout Survey

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

Page 1 of 2

PROJECT NAME: Clinch River SMR Project

JOB NO. 6468-13-1072

DATE: 7-9-13

Boring No. MP-422 Borehole Diameter, in.: 3.8 Total Boring Depth, Ft. 320

Gnd Elev, Ft. 799.9

Casing Height above ground, Ft. 0.27 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 800.2 = Datum

TEST ID: MP-422 Z1 Test length: 7.5 ²⁵ 7-10-13 ⁶⁵ Test Section Depth (from Datum): From 31.5 To 39.0

(A) Depth to Water Table From Datum, Ft. 4.90 Test Water Temp: 78°F Baro Pressure, psi: 14.44

(B) Surface Gage Height Above Datum, Ft. 2.65 Depth to Center of Test Interval From Datum, Ft. 35.52

(C) Distance Water Table to Center of Test Interval Ft. 30.65 Static water pressure at center = $(C \cdot 62.4/144) + \text{Baro} =$ 28

MAXIMUM TEST PRESSURE, $P_o = [(A+B \cdot 1) + C \cdot 0.57]$ [$P_o =$ 25] Test Pressure sequence = 1/3 P_o , 2/3 P_o , P_o , 1/2 P_o , P_o

Po Values: 1/3 $P_o =$ 8; 2/3 $P_o =$ 17; 1/2 $P_o =$ 13 Add Appropriate P_o value to static pressure at center of test interval

TEST NO. MP-422 Z1 Sequence No. D Planned Center Pressure: 41

Transducer Readings Before Packers Inflated: Top 20.79; Middle 24.68; Bottom: 28.53

Transducer Readings After Packers Inflated: Top 21.70; Middle 28.97; Bottom: 24.34

MP-422 Z1 SEQUENCE D CONT'D

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
9109130	11077	11077	0	0	41.11	13	(CONTINUE)
9106100	11077	11077	0	0	40.99	13	INCREASE FLOW
9106130	11077	11077	0	0	40.93	13	
9107100	11077	11077	0	0	42.66	15	
9107130	11077	11077	0	0	42.71	15	
9108100	11077	11077	0	0	42.54	15	
9108130	11077	11077	0	0	42.60	15	
9109100	11077	11077	0	0	42.54	15	
9109130	11077	11077	0	0	42.61	15	
9110100	11077	11077	0	0	42.55	15	
9110130	11077	11077	0	0	42.55	15	
9111100	11077	11077	0	0	42.50	15	
9111130	11077	11077	0	0	42.56	15	
9112100	11077	11077	0	0	42.57	15	END
				9113100	BOTTOM	TRANS =	22.91
				9113130	TOP	TRANS =	22.19

*From Preliminary Boring Layout Survey

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

Page 1 of 2

PROJECT NAME: Clinch River SMR Project

JOB NO. 6468-13-1072

DATE: 7-9-13

Boring No. MP-422 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320

Gnd Elev, Ft. 799.9

Casing Height above ground, Ft. 0.27

Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 800.2 = Datum

TEST ID: MP-422 Z1 Test length: 7.5 Test Section Depth (from Datum): From 31.5 To 39.0

(A) Depth to Water Table From Datum, Ft. 4.90

Test Water Temp: 78°F Baro Pressure, psi: 14.44

(B) Surface Gage Height Above Datum, Ft. 2.65

Depth to Center of Test Interval From Datum, Ft. 35.52

(C) Distance Water Table to Center of Test Interval Ft. 30.65 Static water pressure at center = $(C \cdot 62.4 / 144) + \text{Baro} =$ 28

MAXIMUM TEST PRESSURE, $P_o = ((A+B \cdot 1) + C \cdot 0.57)$ [$P_o =$ 25] Test Pressure sequence = 1/3 P_o , 2/3 P_o , P_o , 1/2 P_o , P_o

Po Values: 1/3 $P_o =$ 8; 2/3 $P_o =$ 17; 1/2 $P_o =$ 13 Add Appropriate P_o value to static pressure at center of test interval

TEST NO. MP-422 Z1 Sequence No. E Planned Center Pressure: 53

Transducer Readings Before Packers Inflated: Top 20.79; Middle 24.68; Bottom: 28.53

Transducer Readings After Packers Inflated: Top 21.70; Middle 28.97; Bottom: 24.38

MP-422 Z1 SEQUENCE E

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
9:15:00	11077	---	---	---	42.22	15	BEGIN INCREASE FLOW
9:15:30	11077	11077	0	0	54.17	25	
9:16:00	11077	11077	0	0	54.03	25	
9:16:30	11077	11077	0	0	53.78	25	
9:17:00	11077	11077	0	0	53.70	25	
9:17:30	11077	11077	0	0	53.76	25	
9:18:00	11077	11077	0	0	54.00	25	
9:18:30	11077	11077	0	0	53.66	25	
9:19:00	11077	11077	0	0	53.64	25	
9:19:30	11077	11077	0	0	53.79	25	
9:20:00	11077	11077	0	0	53.72	25	
9:20:30	11077	11077	0	0	53.76	25	
9:21:00	11077	11077	0	0	53.65	25	
9:21:30	11077	11077	0	0	53.70	25	END
				9:22:30	BOTTOM	TRANS =	22.76
				9:23:00	TOP	TRANS =	22.21

*From Preliminary Boring Layout Survey

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET

Page 2

this Sheet Applies to
All Zone 1 Tests

BORING: MP-422

DATE: 7-9-13

DATA COLLECTED BY: Tom McGill/Jim Goddard

SHUT-IN TEST PRESSURE: N/A 52 12/6/13 psi

TIME, minute	SURFACE GAGE PRESSURE, psi	CENTER TRANSDUCER PRESSURE, psi

Not Used

Q2. 7-9-13

EQUIPMENT USED

Transducers: Level Troll 700 Serial Numbers: 335896/R24844 (shallow) 6/12/13; 315381/R24039 (intermediate) 6/20/13; 141142/R20367 (deep) 6/20/13; 315380/R24038 (spare) 6/20/13

Surface Pressure Gage: (Both Wika 213.53) - MW-3 (at pump); MW-4 (at totalizer) 6/11/13

Barometric Probe: (Baro Troll) 121315/R22669 6/12/13

Flow Meter: (Master Meter 1344) - 8824788 field checked 6/25/13

Stop Watch: (Sportline 220) - L286/2786 6/10/13

Date of Calibration: Dates in italics after equipment serial number

Calibration due: Post Testing

MP-422 Z1 FILES INCLUDE ALL SEQUENCES:

MP-422	Z1	(B)	2013-07-09	09.29.21	WSL
MP-422	Z1	(B)	2013-07-09	09.29.21	EXCEL
MP-422	Z1	(T)	2013-07-09	09.23.54	WSL
MP-422	Z1	(T)	2013-07-09	09.23.54	EXCEL
MP-422	Z1	(M)	2013-07-09	09.25.20	WSL
MP-422	Z1	(M)	2013-07-09	09.25.20	EXCEL
MP-422	Z1	(L)	2013-07-09	09.26.58	WSL
MP-422	Z1	(L)	2013-07-09	09.26.58	EXCEL

Form Approved for Use on Clinch River SMR Project - J. A. Tice, Technical Lead

Form Rev 0 - Reviewed by SR 12/6/13

Boring: MP-422
Zone: 2 **50.0 feet to 57.5 feet below ground surface**
Transducer Location: Middle

Sequence A (1/3 Po)				Sequence B (2/3 Po)				Sequence C (Po)			
Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)	Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)	Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)
15:54:00	0.0	47.18		16:04:00	0.0	48.19		16:14:00	0.0	59.50	
15:54:30	0.5	50.65		16:04:30	0.5	49.84	0	16:14:30	0.5	64.47	0
15:55:00	1.0	50.50	0	16:05:00	1.0	59.93	0	16:15:00	1.0	71.60	0
15:55:30	1.5	49.02	0	16:05:30	1.5	59.57	0	16:15:30	1.5	71.69	0
15:56:00	2.0	48.72	0	16:06:00	2.0	59.67	0	16:16:00	2.0	71.51	0
15:56:30	2.5	48.51	0	16:06:30	2.5	59.67	0	16:16:30	2.5	71.76	0
15:57:00	3.0	48.36	0	16:07:00	3.0	59.76	0	16:17:00	3.0	71.34	0
15:57:30	3.5	48.30	0	16:07:30	3.5	59.62	0	16:17:30	3.5	71.20	0
15:58:00	4.0	48.30	0	16:08:00	4.0	59.73	0	16:18:00	4.0	71.54	0
15:58:30	4.5	48.31	0	16:08:30	4.5	59.69	0	16:18:30	4.5	71.06	0
15:59:00	5.0	48.32	0	16:09:00	5.0	59.84	0	16:19:00	5.0	71.33	0
15:59:30	5.5	48.23	0	16:09:30	5.5	59.44	0	16:19:30	5.5	71.44	0
16:00:00	6.0	48.38	0	16:10:00	6.0	59.53	0	16:20:00	6.0	71.36	0
16:00:30	6.5	48.22	0								
16:01:00	7.0	48.16	0								

Sequence D (1/2 Po)				Sequence E (Po)			
Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)	Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)
16:23:30	0.0	71.43		16:33:30	0.0	55.13	
16:24:00	0.5	58.65	0	16:34:00	0.5	61.40	0
16:24:30	1.0	55.88	0	16:34:30	1.0	71.37	0
16:25:00	1.5	55.75	0	16:35:00	1.5	71.44	0
16:25:30	2.0	55.39	0	16:35:30	2.0	71.73	0
16:26:00	2.5	55.27	0	16:36:00	2.5	71.79	0
16:26:30	3.0	55.24	0	16:36:30	3.0	71.21	0
16:27:00	3.5	55.32	0	16:37:00	3.5	71.55	0
16:27:30	4.0	55.00	0	16:37:30	4.0	71.75	0
16:28:00	4.5	55.20	0	16:38:00	4.5	71.66	0
16:28:30	5.0	55.32	0	16:38:30	5.0	71.08	0
16:29:00	5.5	55.06	0	16:39:00	5.5	71.62	0
16:29:30	6.0	55.06	0	16:39:30	6.0	71.33	0
16:30:00	6.5	55.14	0				

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

Page 1 of 2

PROJECT NAME: Clinch River SMR Project

JOB NO. 6468-13-1072

DATE: 7-8-13

Boring No. MP-422

Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320

Gnd Elev, Ft: 799.9 *

Casing Height above ground, Ft. 0.27

Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 800.2 = Datum

TEST ID: MP-422 Z2

Test length: 7.5

Test Section Depth (from Datum): From 50.0 To 57.5

(A) Depth to Water Table From Datum, Ft. 4.81

Test Water Temp: 80°F Baro Pressure, psi: 14.45

(B) Surface Gage Height Above Datum, Ft. 2.65

Depth to Center of Test Interval From Datum, Ft. 53.1

(C) Distance Water Table to Center of Test Interval Ft. 49.2 Static water pressure at center = $(C \cdot 62.4 / 144) + \text{Baro} =$ 36

MAXIMUM TEST PRESSURE, Po = $[(A+B) \cdot 1] + C \cdot 0.57$ [Po = 36] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po

Sequence ID: A B C D E

Po Values: 1/3 Po = 12; 2/3 Po = 24; 1/2 Po = 18 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-422 Z2 Sequence No. A Planned Center Pressure: 48

Transducer Readings Before Packers Inflated: Top 21.35 Middle 35.54 Bottom: 39.38

Transducer Readings After Packers Inflated: Top 22.36 Middle 36.82 Bottom: 33.35

MP-422 Z2 SEQ A RERUN

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
15:54:00	11077	---	---	---	47.18	10	Begin
15:54:30	11077	11077	0	0	50.65	10	DECREASE FLOW
15:55:00	11077	11077	0	0	50.50	9	
15:55:30	11077	11077	0	0	49.02	9	
15:56:00	11077	11077	0	0	48.72	9	
15:56:30	11077	11077	0	0	48.51	9	
15:57:00	11077	11077	0	0	48.36	9	
15:57:30	11077	11077	0	0	48.30	9	
15:58:00	11077	11077	0	0	48.30	9	
15:58:30	11077	11077	0	0	48.31	9	
15:59:00	11077	11077	0	0	48.32	9	
15:59:30	11077	11077	0	0	48.23	9	Q.S. 7-8-13
16:00:00	11077	11077	0	0	48.38	9	
16:00:30	11077	11077	0	0	48.22	9	
16:01:00	11077	11077	0	0	48.16	9	END
				16:01:45	Bottom	TRANS	30.61
				16:02:30	Top	TRANS	23.06

*From Preliminary Boring Layout Survey

Q.S.
7-8-13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

Page 1 of 2

PROJECT NAME: Clinch River SMR Project

JOB NO. 6468-13-1072

DATE: 7-8-13

Boring No. MP-422

Borehole Diameter, in.: 3.8 Total Boring Depth, Ft. 320

Grd Elev, Ft. 799.9 *

Casing Height above ground, Ft. 0.27 Elev. Top of Casing, Ft. (Grd Elev + Casing Height): 800.2 = Datum

TEST ID: MP-422 Z2 ^{SR-121613} Test length: 7.5 ^{22.7-13.65} Test Section Depth (from Datum): From 50.0 To 57.5

(A) Depth to Water Table From Datum, Ft. 4.81 Test Water Temp: 80°F Baro Pressure, psi: 14.45

(B) Surface Gage Height Above Datum, Ft. 2.65 Depth to Center of Test Interval From Datum, Ft. 53

(C) Distance Water Table to Center of Test Interval Ft. 49.21 Static water pressure at center = (C*62.4/144) + Baro = 36

MAXIMUM TEST PRESSURE, Po = [(A+B*1) + C*0.57] [Po = 36] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po

Po Values: 1/3 Po = 12; 2/3 Po = 24; 1/2 Po = 18 Sequence ID: A B C D E Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-422 Z2 ^{SR-121613} Sequence No. B Planned Center Pressure: 59

Transducer Readings Before Packers Inflated: Top 21.35 Middle 35.54 Bottom: 39.38

Transducer Readings After Packers Inflated: Top 22.36 Middle 36.82 Bottom: 33.35

MP-422 Z2 Seq B RERUN

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
16:04:00	11077	---	---	---	48.19	9	BEGIN INCREASE FLOW
16:04:30	11077	11077	0	0	49.84	20	
16:05:00	11077	11077	0	0	59.93	20	
16:05:30	11077	11077	0	0	59.57	20	
16:06:00	11077	11077	0	0	59.67	20	
16:06:30	11077	11077	0	0	59.67	20	
16:07:00	11077	11077	0	0	59.76	20	
16:07:30	11077	11077	0	0	59.62	20	
16:08:00	11077	11077	0	0	59.73	20	
16:08:30	11077	11077	0	0	59.69	20	
16:09:00	11077	11077	0	0	59.84	20	
16:09:30	11077	11077	0	0	59.44	20	
16:10:00	11077	11077	0	0	59.53	20	END
				16:11:00	Bottom	TRANS =	30.43
				16:11:30	Top	TRANS =	23.05

*From Preliminary Boring Layout Survey

Page 1 of 2

DATE: 7-8-13

Gnd Elev, Ft: 799.9 *

Transducer Readings After Packers Inflated: Top 22.36; Middle 36.82; Bottom: 33.35

MP-422 Z2 SEQ C TRGUN

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
16:14:00	11077	---	---	---	59.50	20	BEGIN INCREASE FLOW
16:14:30	11077	11077	0	0	64.47	32	
16:15:00	11077	11077	0	0	71.60	32	
16:15:30	11077	11077	0	0	71.69	32	
16:16:00	11077	11077	0	0	71.51	32	
16:16:30	11077	11077	0	0	71.76	32	
16:17:00	11077	11077	0	0	71.34	32	
16:17:30	11077	11077	0	0	71.20	32	
16:18:00	11077	11077	0	0	71.54	32	
16:19:30	11077	11077	0	0	71.06	32	
16:19:00	11077	11077	0	0	71.33	32	Q ₂ . 7-8-13
16:19:30	11077	11077	0	0	71.44	32	
16:20:00	11077	11077	0	0	71.36	32	END
				16:21:00	Bottom	TRANS =	30.27
				16:22:00	Top	TRANS =	23.05

*From Preliminary Boring Layout Survey

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

Page 1 of 2

PROJECT NAME: Clinch River SMR Project

JOB NO. 6468-13-1072

DATE: 7-8-13

Boring No. MP-422

Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320

End Elev, Ft. 799.9 *

Casing Height above ground, Ft. 0.27

Elev. Top of Casing, Ft. (End Elev + Casing Height): 800.2 = Datum

TEST ID: MP-422 Z2 ^{SR 12/16/13} Test length: 7.5 Test Section Depth (from Datum): From 54.0 To 57.5

(A) Depth to Water Table From Datum, Ft. 4.81 Test Water Temp: 80°F Baro Pressure, psi: 14.45

(B) Surface Gage Height Above Datum, Ft. 2.65 Depth to Center of Test Interval From Datum, Ft. 53

(C) Distance Water Table to Center of Test Interval Ft. 49.21 Static water pressure at center = (C*62.4/144) + Baro = 36

MAXIMUM TEST PRESSURE, Po = (A+B*1) + C*0.57 [Po = 36] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po

Po Values: 1/3 Po = 12; 2/3 Po = 24; 1/2 Po = 18 Sequence ID: A B C D E Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-422 Z2 ^{SR 12/16/13} Sequence No. D Planned Center Pressure: 54

Transducer Readings Before Packers Inflated: Top 21.35 Middle 35.54 Bottom: 39.38

Transducer Readings After Packers Inflated: Top 22.36 Middle 36.82 Bottom: 33.35

MP-422 Z2 Seq D REUN

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
16:23:30	11077	----	----	----	71.43	32	BEGIN DECREASE FLOW
16:24:00	11077	11077	0	0	58.65	15	
16:24:30	11077	11077	0	0	55.88	15	
16:25:00	11077	11077	0	0	55.75	15	
16:25:30	11077	11077	0	0	55.39	15	
16:26:00	11077	11077	0	0	55.27	15	
16:26:30	11077	11077	0	0	55.24	15	
16:27:00	11077	11077	0	0	55.32	15	
16:27:30	11077	11077	0	0	55.40	15	
16:28:00	11077	11077	0	0	55.20	15	
16:28:30	11077	11077	0	0	55.32	15	
16:29:00	11077	11077	0	0	55.06	15	
16:29:30	11077	11077	0	0	55.06	15	
16:30:00	11077	11077	0	0	55.14	15	END
				16:30:45	BOTTOM	TRANS =	30.09
				16:31:30	TOP	TRANS =	23.05

*From Preliminary Boring Layout Survey

Form Approved for Use on Clinch River SMR Project - J. A. Tice, Technical Lead

Form Rev 0 - Reviewed by SR 12/16/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

Page 1 of 2

PROJECT NAME: Clinch River SMR Project

JOB NO. 6468-13-1072

DATE: 7-8-13

Boring No. MP-422

Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320

End Elev, Ft. 799.9 *

Casing Height above ground, Ft. 0.27

Elev. Top of Casing, Ft. (End Elev + Casing Height): 800.2 = Datum

TEST ID: MP-422 ZL ^{SR 12/16/13} Test length: 7.5 Test Section Depth (from Datum): From 50.0 To 57.5

(A) Depth to Water Table From Datum, Ft. 4.81

Test Water Temp: 80°F Baro Pressure, psi: 14.45

(B) Surface Gage Height Above Datum, Ft. 2.65

Depth to Center of Test Interval From Datum, Ft. 53.

(C) Distance Water Table to Center of Test Interval Ft. 49.21 Static water pressure at center = $(C \cdot 62.4 / 144) + \text{Baro} =$ 36

MAXIMUM TEST PRESSURE, $P_o = ([A+B \cdot 1] + C \cdot 0.57)$ $[P_o =$ 36] Test Pressure sequence = 1/3 P_o , 2/3 P_o , P_o , 1/2 P_o , P_o

Sequence ID: A B C D E

P_o Values: 1/3 $P_o =$ 12; 2/3 $P_o =$ 24; 1/2 $P_o =$ 18 Add Appropriate P_o value to static pressure at center of test interval

TEST NO. MP-422 ZL ^{SR 12/16/13} Sequence No. E Planned Center Pressure: 71

Transducer Readings Before Packers Inflated: Top 21.35; Middle 35.54; Bottom: 39.38

Transducer Readings After Packers Inflated: Top 22.36; Middle 36.82; Bottom: 33.35

MP-422 ZL Seq E R&LUN

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
16133130	11077	---	---	---	55.13	15	BEGIN INCREASE FLOW
16134100	11077	11077	0	0	61.40	32	
16134130	11077	11077	0	0	71.37	32	
16135100	11077	11077	0	0	71.44	32	
16135130	11077	11077	0	0	71.73	32	
16136100	11077	11077	0	0	71.79	32	
16136130	11077	11077	0	0	71.21	32	
16137100	11077	11077	0	0	71.55	32	
16137130	11077	11077	0	0	71.75	32	
16138100	11077	11077	0	0	71.66	32	
16138130	11077	11077	0	0	71.08	32	
16139100	11077	11077	0	0	71.62	32	
16139130	11077	11077	0	0	71.33	32	END
				16140100	BOTTOM	TRANS =	29.94
				16141100	TOP	TRANS =	23.05

*From Preliminary Boring Layout Survey

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

Page 1 of 2

PROJECT NAME: Clinch River SMR Project

JOB NO. 0468-13-1072

DATE: 7-8-13

Boring No. MP-422

Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320

Grd Elev, Ft. 799.9 *

Casing Height above ground, Ft. 0.27 Elev. Top of Casing, Ft. (Grd Elev + Casing Height): 800.2 = Datum

TEST ID: MP-422 Z2 ^{SL 12/16/17} Test length: 7.5 ^{92.7-10-13 GS} Test Section Depth (from Datum): From 50.0 To 57.5

(A) Depth to Water Table From Datum, Ft. 4.81

Test Water Temp: 80°F Baro Pressure, psi: 14.45

(B) Surface Gage Height Above Datum, Ft. 2.65

Depth to Center of Test Interval From Datum, Ft. 53.1

(C) Distance Water Table to Center of Test Interval Ft. 49.21

Static water pressure at center = $(C \cdot 62.4 / 144) + \text{Baro} =$ 36

MAXIMUM TEST PRESSURE, $P_o = ((A+B \cdot 1) \cdot C \cdot 0.57)$ [$P_o =$ 36] Test Pressure sequence = 1/3 P_o , 2/3 P_o , P_o , 1/2 P_o , P_o

Sequence ID: A B C D E

P_o Values: 1/3 $P_o =$ 12; 2/3 $P_o =$ 24; 1/2 $P_o =$ 18 Add Appropriate P_o value to static pressure at center of test interval

TEST NO. MP-422 Z2 ^{SL 12/16/17} Sequence No. A Planned Center Pressure: 48

Transducer Readings Before Packers Inflated: Top 21.35; Middle 35.54; Bottom: 39.38

Transducer Readings After Packers Inflated: Top 22.36; Middle 36.82; Bottom: 33.35

MP-422 Z2 Seq A VOID (RUGGED READER DID NOT RECORD)

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
13:44:30	10960	----	----	----	36.82	0	BEGIN
13:45:00		10960			36.65	0	
45:30		10968			36.65	0	
46:1		10967 ⁸⁷			36.65	0	
46:30		11010			36.64	0	
47:00		11030			36.64	5	
47:30		11047			36.64	5	
48		11067			36.64		
48:30							START OVER
13:50:00	11075	11075	----	----	36.77	7	
50:30	11075	11075			47.40	7	
51:00	11075	11075			47.33	7	INCREASE FLOW
51:30	11075	11075			47.53	10	
52:00	11075	11075			48.94	9	
52:30	11075	11075			48.60	9	
53:00	11075	11075			48.34	9	
53:30	11075	11075			48.22	9	
54:00	11075	11075			48.24	9	

*From Preliminary Boring Layout Survey

Page 1 of 2

DATE: 7-8-13

Gnd Elev, Ft. 799.9 *

Casing Height above ground, Ft. 0.27 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 800.2 = Datum

TEST ID: MP-422 z2 ^{500 (2/16/17)} Test length: 7.5 ⁹³ Test Section Depth (from Datum): From 50.0 To 57.5 ^{GS}

(A) Depth to Water Table From Datum, Ft: 4.81 Test Water Temp: 80°F Baro Pressure, psi: 14.45

(B) Surface Gage Height Above Datum, Ft. 2.65 Depth to Center of Test Interval From Datum, Ft. 53.

(C) Distance Water Table to Center of Test Interval Ft. 49.21 Static water pressure at center = $(C \cdot 62.4 / 144) + \text{Baro} =$ 36

MAXIMUM TEST PRESSURE, $P_o = ([A+B*1] + C*0.57)$ [$P_o = \underline{36}$] Test Pressure sequence = 1/3 P_o , 2/3 P_o , P_o , 1/2 P_o , P_o

Po Values: $1/3 P_o = 12$; $2/3 P_o = 24$; $1/2 P_o = 18$ Sequence ID: A B C D E
Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-422 ZL Sequence No. A Planned Center Pressure: _____

Transducer Readings Before Packers Inflated: Top _____; Middle _____; Bottom: _____

Transducer Readings After Packers Inflated: Top _____; Middle _____; Bottom: _____

MP-422 Z2 SEQ A VOID (RUGGED READER DID NOT RECORD)

[illegible]

*From Preliminary Boring Layout Survey

Form Approved for Use on Clinch River SMR Project - J. A. Tice, Technical Lead

Form Rev 0 - Reviewed by GR 12/16/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

Page 1 of 2

PROJECT NAME: Clinch River SMR Project

JOB NO. 6468-13-1072

DATE: 7-8-13

Boring No. MP-422

Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320

Grnd Elev, Ft: 799.9 *

Casing Height above ground, Ft. 0.27 Elev. Top of Casing, Ft. (Grnd Elev + Casing Height): 800.2 = Datum

TEST ID: MP-422 ZL ^{SR 12/16/13} Test length: 7.5 ^{95.7-10-13 GS} Test Section Depth (from Datum): From 50.0 To 57.5

(A) Depth to Water Table From Datum, Ft. 4.81 Test Water Temp: 80°F Baro Pressure, psi: 14.45

(B) Surface Gage Height Above Datum, Ft. 3.65 Depth to Center of Test Interval From Datum, Ft. 53.

(C) Distance Water Table to Center of Test Interval Ft. 49.21 Static water pressure at center = $(C*62.4/144) + \text{Baro} =$ 36

MAXIMUM TEST PRESSURE, $P_o = \{[A+B*1] + C*0.57\}$ [$P_o =$ 36] Test Pressure sequence = 1/3 P_o , 2/3 P_o , P_o , 1/2 P_o , P_o

Po Values: 1/3 $P_o =$ 12; 2/3 $P_o =$ 24; 1/2 $P_o =$ 18 Add Appropriate P_o value to static pressure at center of test interval

TEST NO. MP-422 ZL ^{SR 12/16/13} Sequence No. B Planned Center Pressure: 59

Transducer Readings Before Packers Inflated: Top 21.35; Middle 35.54; Bottom: 39.38

Transducer Readings After Packers Inflated: Top 22.36; Middle 36.82; Bottom: 33.35

MP-422 ZL SEQ B VOID (RUGGED READER DID NOT RECORD)

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
15:01:00		11076			48.24	9	BECAUSE INCREASE PRESS
15:01:30		11076			48.23	19	
15:02:00		11076			58.66	19	
15:02:30		11076			58.40	19	
15:03:00		11076			58.68	19	
15:03:30		11076			58.61	19	
15:04:00		11076			58.39	19	
15:04:30		11076			58.36	19	
15:05:00		11076			58.39	19	
15:05:30		11076			58.41	19	
15:06:00		11076			58.45	19	
15:06:30		11076			58.28	19	
15:07:00		11076			58.43	19	END
				15:08:00	BOTTOM	TRANS =	31.85
				15:08:30	TOP	TRANS =	23.07

*From Preliminary Boring Layout Survey

Form Approved for Use on Clinch River SMR Project - J. A. Tice, Technical Lead

Form Rev 0 - Reviewed by SR 12/16/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

Page 1 of 2

PROJECT NAME: Clinch River SMR Project

JOB NO. 6468-13-1072

DATE: 7-8-13

Boring No MP-422

Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320

Gnd Elev, Ft: 799.9 *

Casing Height above ground, Ft. 0.27

Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 800.2 = Datum

TEST ID: MP-422 Z2 ^{502 12/16/13}

Test length: 7.5

Test Section Depth (from-Datum): From 54.0 To 57.5

(A) Depth to Water Table From Datum, Ft. 4.81

Test Water Temp: 80°F Baro Pressure, psi: 14.45

(B) Surface Gage Height Above Datum, Ft. 3.65

Depth to Center of Test Interval From Datum, Ft. 53.

(C) Distance Water Table to Center of Test Interval Ft. 49.21

Static water pressure at center = (C*62.4/144) + Baro = 36

MAXIMUM TEST PRESSURE, Po = [(A+B*1) + C*0.57] [Po = 36] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po

Po Values: 1/3 Po = 12; 2/3 Po = 24; 1/2 Po = 18 Sequence ID: A B C D E Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-422 Z2 Sequence No. D Planned Center Pressure: 54

Transducer Readings Before Packers Inflated: Top _____; Middle _____; Bottom: _____

Transducer Readings After Packers Inflated: Top _____; Middle _____; Bottom: _____

MP-422 Z2 SEQ D VOID (RUGGED READER DID NOT RECORD)

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
15:22:00	11076	----	----	----	58.38	17	
15:22:30	11076	11076			57.54	17	
15:23	11076	11076			57.70	17	DECREASE FLOW
15:23:30	11076	11076			57.55	15	
15:24:00	11076	11076			55.07	15	
15:24:30		11076			55.08	15	
15:25:00		11076			55.00	15	
15:25:30		11076			55.17	15	
15:26:00		11076			55.25	15	
15:26:30		11076			55.16	15	
15:27:00		11076			54.99	15	
15:27:30		11076			55.09	15	
15:28:00		11076			55.02	15	
15:28:30		11076			54.94	15	15:28:13
15:29:00		11076			55.12	15	
				15:31:00	BOTTOM	TRANS =	31.25
				15:30:00	TOP	TRANS =	23.07
				15:32			

*From Preliminary Boring Layout Survey

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

Page 1 of 2

PROJECT NAME: Clinch River SMR Project

JOB NO. 8488-13-1072

DATE: 7-8-13

Boring No. MP-422

Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320

Grnd Elev, Ft. 799.2 *

Casing Height above ground, Ft. 0.27

Elev. Top of Casing, Ft. (Grnd Elev + Casing Height): 800.2 = Datum

TEST ID: MP-422 ZL Seq 12/16/13

Test length: 7.5

Test Section Depth (from Datum): From 50.0 To 57.5

(A) Depth to Water Table From Datum, Ft. 4.81

Test Water Temp: 80°F Baro Pressure, psi: 14.45

(B) Surface Gage Height Above Datum, Ft. 2.65

Depth to Center of Test Interval From Datum, Ft. 53.0

(C) Distance Water Table to Center of Test Interval Ft. 49.21

Static water pressure at center = (C*62.4/144) + Baro = 36

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 36] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po

Po Values: 1/3 Po = 12; 2/3 Po = 24; 1/2 Po = 18 Sequence ID: A B C D E

TEST NO. MP-422 ZL Sequence No. E Planned Center Pressure: 71

Transducer Readings Before Packers Inflated: Top 21.35; Middle 35.54; Bottom: 39.38

Transducer Readings After Packers Inflated: Top 22.36; Middle 36.82; Bottom: 33.35

MP-422 ZL Seq E VOID (RUGGED READER DID NOT RECORD)

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
15:32:00	11076	----	----		55.00	15	BEGIN INCREASE FLOW
15:32:30	11076	11077	0	0	67.72	30	
15:33:00	11077	11077	0	0	68.63	30	INCREASE FLOW
15:33:30	11077	11077	0	0	69.02	34.38	
15:34:30	11077	11077	0	0	72.40	34	
15:34:30	11077	11077	0	0	72.35	34	
15:35:30	11077	11077	0	0	72.74	34	
15:35:30	11077	11077	0	0	72.49	34	
15:36:30	11077	11077	0	0	72.94	34	
15:36:30	11077	11077	0	0	72.52	34	
15:37:00	11077	11077	0	0	72.26	34	
15:37:30	11077	11077	0	0	72.77	34	
15:38:00	11077	11077	0	0	72.88	34	
15:38:30	11077	11077	0	0	72.23	34	
15:39:00	11077	11077	0	0	72.66	34	
15:39:30	11077	11077	0	0	72.36	34	END
				15:40:00	BOTTOM	TRANS	31.04
				15:41:00	TOP	TRANS	23.07

*From Preliminary Boring Layout Survey

Form Approved for Use on Clinch River SMR Project - J. A. Tice, Technical Lead

Form Rev 0 - Reviewed by

SR 12/16/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET

Page 2

BORING: MP-422

DATE: 7-8-13

DATA COLLECTED BY: Tom McGill / Jim Goodard

SHUT-IN TEST PRESSURE: N/A @ 21613 psi

*This sheet applies to
All Zone 2 Tests
SR 12/16/13*

TIME, minute	SURFACE GAGE PRESSURE, psi	CENTER TRANSDUCER PRESSURE, psi

*NOT USED
Q2, 7-8-13*

EQUIPMENT USED

Transducers: Level Troll 700 Serial Numbers: 335896/R24844 (shallow) 6/12/13; 315381/R24039 (intermediate) 6/20/13; 141142/R20367 (deep) 6/20/13; 315380/R24038 (spare) 6/20/13

Surface Pressure Gage: (Both Wika 213.53) - MW-3 (at pump); MW-4 (at totalizer) 6/11/13

Barometric Probe: (Baro Troll) 121315/R22669 6/12/13

Flow Meter: (Master Meter 1344) - 8824788 field checked 6/25/13

Stop Watch: (Sportline 220) - L286/2786 6/10/13

Date of Calibration: Dates in italics after equipment serial number

Calibration due: Post Testing

FILES INCLUDE ALL SEQUENCES:

Q2, 7-8-13

MP-422 ZR (B)	2013-07-08	16.47.28	WSL
MP-422 ZR (B)	2013-07-08	16.47.28	EXCEL
MP-422 ZR (T)	2013-07-08	16.46.03	WSL
MP-422 ZR (T)	2013-07-08	16.46.03	EXCEL
MP-422 ZR (M)	2013-07-08	16.44.36	WSL
MP-422 ZR (M)	2013-07-08	16.44.36	EXCEL
MP-422 ZR (L)	2013-07-08	16.42.21	WSL
MP-422 ZR (L)	2013-07-08	16.42.21	EXCEL

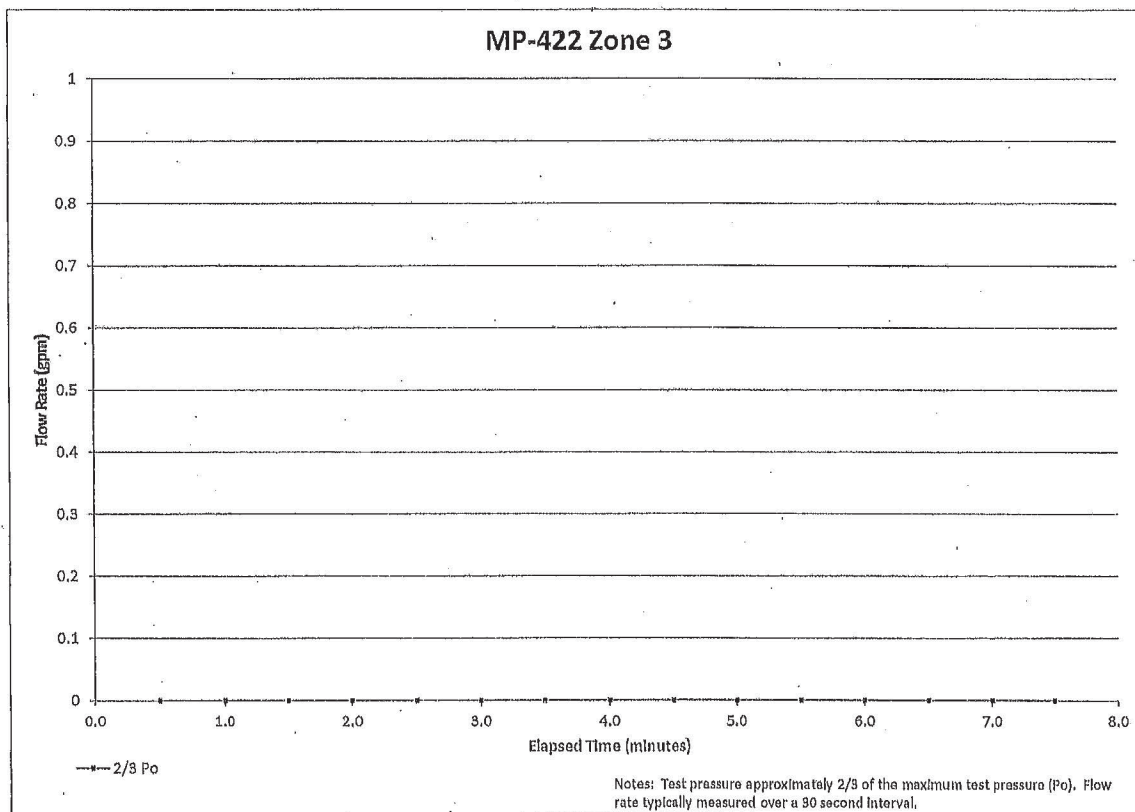
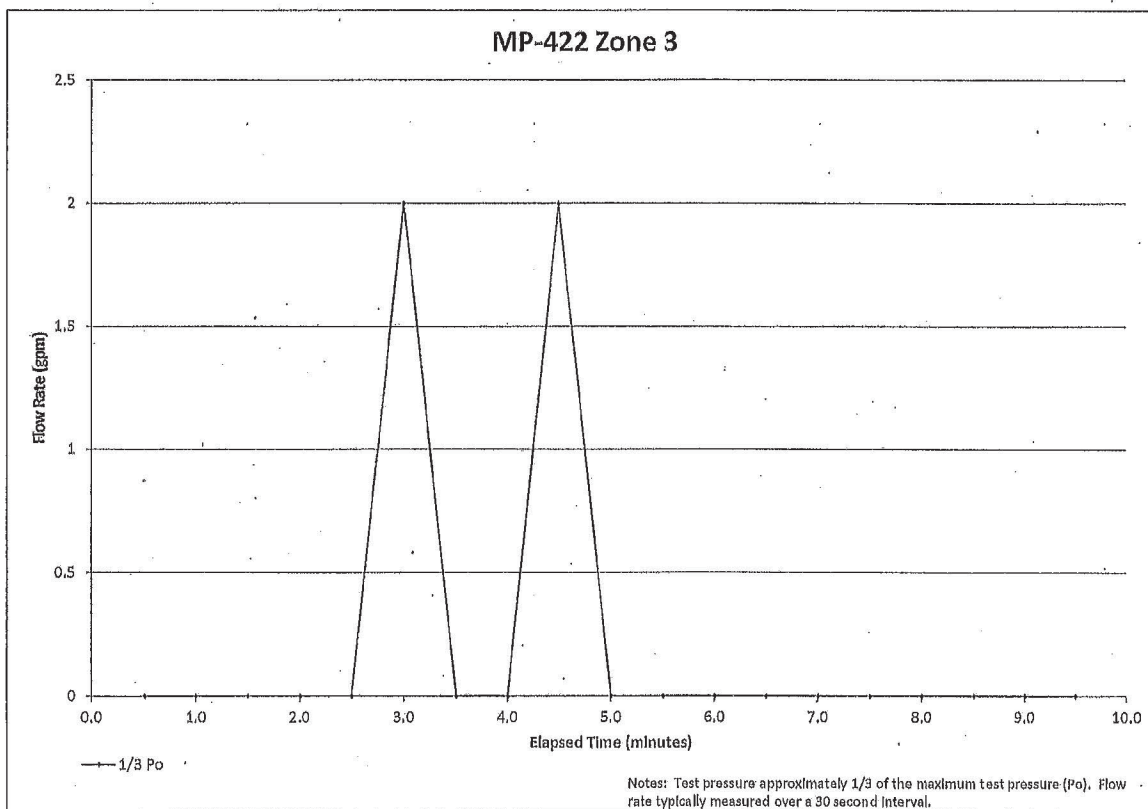
Form Approved for Use on Clinch River SMR Project - J. A. Tice, Technical Lead

Form Rev 0 - Reviewed by SR 12/16/13

Boring: MP-422
Zone: Z3 170.0 feet to 177.5 feet below ground surface
Transducer Location: Middle

Sequence A (1/3 Po)				Sequence B (2/3 Po)				Sequence C (Po)			
Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)	Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)	Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)
11:57:00	0.0	91.32		12:09:00	0.0	136.24		12:19:30	0.0	182.02	
11:57:30	0.5	91.32	0	12:09:30	0.5	136.48	0	12:20:00	0.5	187.87	0
11:58:00	1.0	95.40	0	12:10:00	1.0	136.36	0	12:20:30	1.0	192.84	0
11:58:30	1.5	95.42	0	12:10:30	1.5	145.18	0	12:21:00	1.5	194.73	0
11:59:00	2.0	100.86	0	12:11:00	2.0	149.83	0	12:21:30	2.0	194.02	0
11:59:30	2.5	107.75	0	12:11:30	2.5	159.36	0	12:22:00	2.5	194.94	0
12:00:00	3.0	119.01	2	12:12:00	3.0	159.34	0	12:22:30	3.0	195.75	0
12:00:30	3.5	118.81	0	12:12:30	3.5	159.13	0	12:23:00	3.5	193.86	0
12:01:00	4.0	118.67	0	12:13:00	4.0	158.15	0	12:23:30	4.0	193.95	0
12:01:30	4.5	127.57	2	12:13:30	4.5	159.66	0	12:24:00	4.5	195.32	0
12:02:00	5.0	127.68	0	12:14:00	5.0	158.90	0	12:24:30	5.0	196.51	0
12:02:30	5.5	127.45	0	12:14:30	5.5	159.13	0	12:25:00	5.5	194.28	0
12:03:00	6.0	127.13	0	12:15:00	6.0	158.27	0	12:25:30	6.0	195.86	0
12:03:30	6.5	127.38	0	12:15:30	6.5	159.41	0	12:26:00	6.5	194.22	0
12:04:00	7.0	127.32	0	12:16:00	7.0	159.49	0				
12:04:30	7.5	127.13	0	12:16:30	7.5	159.27	0				
12:05:00	8.0	126.96	0								
12:05:30	8.5	127.14	0								
12:06:00	9.0	127.22	0								
12:06:30	9.5	127.15	0								

Sequence D (1/2 Po)				Sequence E (Po)			
Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)	Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)
12:29:30	0.0	157.33		12:41:30	0.0	141.20	
12:30:00	0.5	157.50	0	12:42:00	0.5	186.56	0
12:30:30	1.0	157.35	0	12:42:30	1.0	194.40	0
12:31:00	1.5	148.87	0	12:43:00	1.5	193.53	0
12:31:30	2.0	148.33	0	12:43:30	2.0	193.27	0
12:32:00	2.5	145.65	0	12:44:00	2.5	194.03	0
12:32:30	3.0	146.29	0	12:44:30	3.0	194.24	0
12:33:00	3.5	142.96	0	12:45:00	3.5	195.17	0
12:33:30	4.0	141.75	0	12:45:30	4.0	194.45	0
12:34:00	4.5	141.50	0	12:46:00	4.5	195.54	0
12:34:30	5.0	141.48	0	12:46:30	5.0	195.07	0
12:35:00	5.5	141.41	0	12:47:00	5.5	196.84	0
12:35:30	6.0	141.86	0	12:47:30	6.0	196.90	0
12:36:00	6.5	141.77	0	12:48:00	6.5	195.12	2
12:36:30	7.0	142.01	0	12:48:30	7.0	196.23	0
12:37:00	7.5	141.29	0				
12:37:30	8.0	140.97	0				
12:38:00	8.5	141.75	0				
12:38:30	no reading						
12:39:00	no reading						



Prepared by/Date: KRL 1/9/14
 Checked by/Date: GA 1/12/14

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

Page 1 of 2

PROJECT NAME: Clinch River SMR Project

JOB NO. 6468-13-1072

DATE: 7-8-13

Boring No. MP-422

Borehole Diameter, in. 8.8 Total Boring Depth, Ft. 320

End Elev, Ft. 799.9

Casing Height above ground, Ft. 0.27

Elev. Top of Casing, Ft. (End Elev + Casing Height): 800.2 = Datum

TEST ID: MP-422 Z3 Test length: 7.5

Test Section Depth (from Datum): From 170.0 To 177.5

(A) Depth to Water Table From Datum, Ft. 1.81

Test Water Temp: 70°F Baro Pressure, psi: 14.6 14.46

(B) Surface Gage Height Above Datum, Ft. 2.65

Depth to Center of Test Interval From Datum, Ft. 174.0

(C) Distance Water Table to Center of Test Interval Ft. 172.21

Static water pressure at center = $(C \cdot 62.4 / 144) + \text{Baro} =$ 89.1

MAXIMUM TEST PRESSURE, $P_o = ((A+B \cdot 1) + C \cdot 0.57) [P_o = 102.1]$

Test Pressure sequence = 1/3 P_o , 2/3 P_o , P_o , 1/2 P_o , P_o

P_o Values: 1/3 $P_o = 34.0$; 2/3 $P_o = 68.1$; 1/2 $P_o = 51.0$

Sequence ID: A B C D E

Add Appropriate P_o value to static pressure at center of test interval

TEST NO. MP-422 Z3 Sequence No. A

Planned Center Pressure: 123.1

Transducer Readings Before Packers Inflated: Top 15.67

Middle 87.80 Bottom: 91.55

Transducer Readings After Packers Inflated: Top 16.67

Middle 91.36 Bottom: 85.71

MP-422 Z3 Seq A

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
11:57:10	10956	----	----	----	91.32	0	BEGIN
11:57:30	10956	10956	0	0	91.32	0	
11:58:00	10956	10956	0	0	95.40	0	INCREASE PRES
11:58:30	10956	10956	0	0	95.42	10	
11:59:00	10956	10956	0	0	100.86	15	
11:59:30	10956	10956	0	0	107.75	30	
12:00:00	10956	10957	1	2	119.01	29	
12:00:30	10957	10957	0	0	118.81	29	
12:01:00	10957	10957	0	0	118.67	37	
12:01:30	10957	10958	1	2	127.57	37	
12:02:00	10958	10958	0	0	127.68	37	
12:02:30	10958	10958	0	0	127.45	37	
12:03:00	10958	10958	0	0	127.13	37	
12:03:30	10958	10958	0	0	127.38	37	
12:04:00	10958	10958	0	0	127.32	37	
12:04:30	10958	10958	0	0	127.13	37	
12:05:00	10958	10958	0	0	126.96	37	
12:05:30	10958	10958	0	0	127.14	37	

*From Preliminary Boring Layout Survey