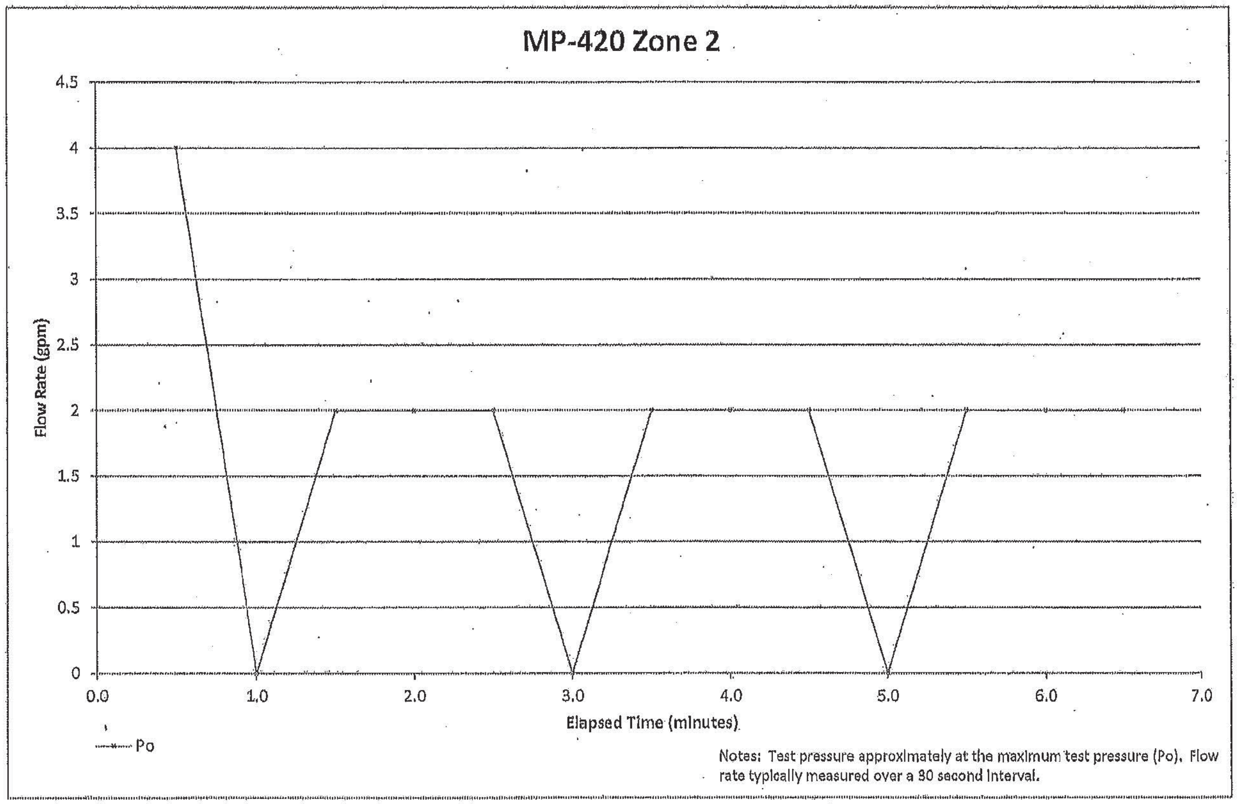


Notes: Test pressure approximately at the maximum test pressure (Po). Flow rate typically measured over a 30 second interval.

Prepared by/Date: KHL 1/4/14
Checked by/Date: JDZ 1/2/14

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: 7-30-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z2 Test length: 7.5 Test Section Depth (from Datum): From 79.66 To 87.16

(A) Depth to Water Table From Datum, Ft: 57.21 Test Water Temp: 72°F Baro Pressure, psi: 14.46

WELL WATER TEMP 63°F (17.47°C)

(B). Surface Gage Height Above Datum, Ft. 1.90 Depth to Center of Test Interval From Datum, Ft: 83.41

(C) Distance Water Table to Center of Test Interval Ft. 26.20 Static water pressure at center = (C*62.4/144) + Baro = 26

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 74] 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 = 25; 2/3 Po= 49; 1/2 Po= 37 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z2 Sequence No. A Planned Center Pressure: 51

Transducer Readings Before Packers Inflated: Top 16.31; Middle 25.06; Bottom: 28.89

Transducer Readings After Packers Inflated: Top 16.77; Middle 27.20; Bottom: 28.51

MP-420 Z2 SEQUENCE A

QJS. 7-30-13

QJS. 7-30-13

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
13:28:00	25121	----	----	----	27.26	0	BEGIN 1F (INCREASE FLOW)
13:28:30	25121	25121	0	0	27.25	0	
13:29:00	25121	25121	0	0	27.25	0	
13:29:30	25 121	25 121	0	0	27.28	0	
13:30:00	25 121	25 122	1 ~~0~~	2 ~~0~~	36.89	10	
13:30:30	25 122	25 122	0	0	49.57	10	1F
13:31:00	25 122	25 123	1	2	49.34	10	
13:31:30	25 123	25 123	0	0	50.82	11	
13:32:00	25 123	25 123	0	0	51.39	11	
13:32:30	25 123	25 123	0	0	51.27	11	
13:33:00	25 123	25 124	1	2	51.85	11	
13:33:30	25 124	25 124	0	0	51.30	11	
13:34:00	25 124	25 124	0	0	51.34	11	
13:34:30	25 124	25 125	1	2	51.28	11	
13:35:00	25 125	25 125	0	0	51.16	11	
13:35:30	25 125	25 125	0	0	51.53	11	END
				13:36:10	BOTTOM	TRANS =	28.46
				13:36:43	TOP	TRANS =	16.91

*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: 7-30-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z2 Test length: 7.5 Test Section Depth (from Datum): From 79.66 To 87.16

(A) Depth to Water Table From Datum, Ft: 57.21 Test Water Temp: 72°F Baro Pressure, psi: 14.46

WELL WATER TEMP 63°F (17.47°C)

(B) Surface Gage Height Above Datum, Ft. 1.90 Depth to Center of Test Interval From Datum, Ft: 83.41

(C) Distance Water Table to Center of Test Interval Ft. 26.20 Static water pressure at center = (C*62.4/144) + Baro = 26

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.67) [Po = 74] 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 = 25; 2/3 Po= 49; 1/2 Po= 37 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z2 Sequence No. B Planned Center Pressure: 75

Transducer Readings Before Packers Inflated: Top 16.31; Middle 25.06; Bottom: 28.89

Transducer Readings After Packers Inflated: Top 16.77; Middle 27.20; Bottom: 28.51

MP-420 Z 2 SEQUENCE B

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
13:38:30	25 127	----	----	----	51.55	11	BEGIN IF (INCREASE FLOW)
13:39:00	25 127	25 128	1	2	61.77	31	
13:39:30	25 128	25 129	1	2	75.68	31	
13:40:00	25 129	25 130	1	2	75.77	31	
13:40:30	25 130	25 130	0	0	75.99	31	
13:41:00	25 130	25 131	1	2	76.12	31	
13:41:30	25 131	25 131	0	0	76.23	31	
13:42:00	25 131	25 132	1	2	76.18	31	
13:42:30	25 132	25 132	0	0	76.07	31	
13:43:00	25 132	25 133	1	2	76.38	31	
13:43:30	25 133	25 133	0	0	76.16	31	
13:44:00	25 133	25 134	1	2	76.32	31	
13:44:30	25 134	25 135	1	2	76.29	31	END
				13:45:12	BOTTOM	TRANS =	28.49
				13:45:47	TOP	TRANS =	17.06

*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 12-16-17

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: 7-30-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z2 Test length: 7.5 Test Section Depth (from Datum): From 79.66 To 87.16

(A) Depth to Water Table From Datum, Ft: 57.21 Test Water Temp: 72°F Baro Pressure, psi: 14.46

WELL WATER TEMP 63°F (17.47°C).

(B). Surface Gage Height Above Datum, Ft. 1.90 Depth to Center of Test Interval From Datum, Ft: 83.41

(C) Distance Water Table to Center of Test Interval Ft. 26.20 Static water pressure at center = (C*62.4/144) + Baro = 26

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 74] 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 = 25; 2/3 Po= 49; 1/2 Po= 37 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z2 Sequence No. C Planned Center Pressure: 100

Transducer Readings Before Packers Inflated: Top 16.31; Middle 25.06; Bottom: 28.89

Transducer Readings After Packers Inflated: Top 16.77; Middle 27.20; Bottom: 28.51

MP-420 Z2 SEQUENCE C

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
13:48:30	25 139	----	----	----	76.11	31	BEGIN IF (INCREASE FLOW)
13:49:00	25 139	25 141	2	4	100.49	60	DF (DECREASE FLOW)
13:49:30	25 141	25 141	0	0	107.92	60	
13:50:00	25 141	25 142	1	2	98.52	51	
13:50:30	25 142	25 142	0	0	98.38	51	
13:51:00	25 142	25 143	1	2	98.63	51	
13:51:30	25 143	25 144	1	2	98.29	51	
13:52:00	25 144	25 144	0	0	98.42	51	
13:52:30	25 144	25 145	1	2	98.44	51	
13:53:00	25 145	25 145	0	0	98.73	51	
13:53:30	25 145	25 146	1	2	98.72	51	END
				13:54:17	BOTTOM	TRANS	= 28.46
				13:54:56	TOP	TRANS	= 17.24

*From Preliminary Boring Layout Survey

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

Form Rev 0 - Reviewed by STC 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: 7-30-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z2 Test length: 7.5 Test Section Depth (from Datum): From 79.66 To 87.16

(A) Depth to Water Table From Datum, Ft: 57.21

Test Water Temp: 72°F Baro Pressure, psi: 14.46

WELL WATER TEMP 63°F (17.47°C)

(B) Surface Gage Height Above Datum, Ft. 1.90

Depth to Center of Test Interval From Datum, Ft: 83.41

(C) Distance Water Table to Center of Test Interval Ft. 26.20 Static water pressure at center = (C*62.4/144) + Baro = 26

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 74] 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 = 25; 2/3 Po= 49; 1/2 Po= 37 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z2 Sequence No. D Planned Center Pressure: 63

Transducer Readings Before Packers Inflated: Top 16.31; Middle 25.06; Bottom: 28.89

Transducer Readings After Packers Inflated: Top 16.37; Middle 27.20; Bottom: 28.51

MP-420 Z2 SEQUENCE D

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
13:57:30	25 151	----	----	---	98.57	51	BEGIN DR (DECREASE FLOW)
13:58:00	25 151	25 151	0	0	71.93	19	
13:58:30	25 151	25 151	0	0	68.10	19	
13:59:00	25 151	25 151	0	0	65.56	19	
13:59:30	25 151	25 151	0	0	63.88	19	
14:00:00	25 151	25 152	1	2	63.99	19	
14:00:30	25 152	25 152	0	0	63.85	19	
14:01:00	25 152	25 152	0	0	63.85	19	
14:01:30	25 152	25 153	1	2	63.91	19	
14:02:00	25 153	25 153	0	0	63.70	19	
14:02:30	25 153	25 154	1	2	63.88	19	END
				14:03:10	BOTTOM	TRANS =	28.35
				14:03:45	TOP	TRANS =	17.40

*From Preliminary Boring Layout Survey

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

Form Rev 0 - Reviewed by SDZ 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: 7-30-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z2 Test length: 7.5 Test Section Depth (from Datum): From 79.66 To 87.16

(A) Depth to Water Table From Datum, Ft: 57.21 Test Water Temp: 72°F Baro Pressure, psi: 14.46

WELL WATER TEMP 63°F (17.47°C)

(B). Surface Gage Height Above Datum, Ft. 1.90 Depth to Center of Test Interval From Datum, Ft: 83.41

(C) Distance Water Table to Center of Test Interval Ft. 26.20 Static water pressure at center = (C*62.4/144) + Baro = 26

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 74] 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 = 25; 2/3 Po= 49; 1/2 Po= 37 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z2 Sequence No. E Planned Center Pressure: 100

Transducer Readings Before Packers Inflated: Top 16.31; Middle 25.06; Bottom: 28.89

Transducer Readings After Packers Inflated: Top 16.37; Middle 27.20; Bottom: 28.51

MP-420 Z2 SEQUENCE E

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
14:05:30	25 156	----	----	----	64.02	19	BEGIN IF (INCREASE FLOW)
14:06:00	25 156	25 158	2	4	83.09	45	IF
14:06:30	25 158	25 158	0	0	100.22	52	
14:07:00	25 158	25 159	1	2	100.67	52	
14:07:30	25 159	25 160	1	2	100.93	52	
14:08:00	25 160	25 161	1	2	100.62	52	
14:08:30	25 161	25 161	0	0	101.39	52	
14:09:00	25 161	25 162	1	2	100.81	52	
14:09:30	25 162	25 163	1	2	101.70	52	
14:10:00	25 163	25 164	1	2	101.28	52	
14:10:30	25 164	25 164	0	0	101.35	52	
14:11:00	25 164	25 165	1	2	101.54	52	
14:11:30	25 165	25 166	1	2	101.33	52	
14:12:00	25 166	25 167	1	2	101.20	52	END
				14:12:49	BOTTOM	TRANS =	28.38
				14:13:25	TOP	TRANS =	17.61

*From Preliminary Boring Layout Survey

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

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

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET

This Sheet Applies to
All Zone 2 Tests
STC 12/16/13

BORING: MP-420

DATE: 7-30-13

DATA COLLECTED BY: TOM McGILL / JIM GODDARD

SHUT-IN TEST PRESSURE: N/A STC 12/16/13 psi

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

NOT USED
SEE PAGE 1
QJ. 7-21-13

QJ.
7-30-13

EQUIPMENT USED

Transducers: Mini Trol Serial Numbers: 335896 (6-12-13) 142142 (6-20-13) 315381 (6-20-~~13~~ 13)

BACKFLOW: MW-3 (6-11-13)

Surface Pressure Gage: MW-4 & MW-5 (6-11-13) THERMOMETER: LT28 (5-1-13)

NITROGEN GAUGE: MW-1 & MW-2 (6-11-13)

Barometric Probe: 121315 (6-12-13)

Flow Meter: 8824788 (FIELD 7-8-13)

Stop Watch: L286 (6-10-13)

Date of Calibration: PARENTHESIS

Calibration due: POST TESTING

MP-420	Z2	(B)	2013-07-30	14.18.46	WSL
MP-420	Z2	(B)	2013-07-30	14.18.46	EXCEL
MP-420	Z2	(T)	2013-07-30	14.14.06	WSL
MP-420	Z2	(T)	2013-07-30	14.14.06	EXCEL
MP-420	Z2	(M)	2013-07-30	14.16.24	WSL
MP-420	Z2	(M)	2013-07-30	14.16.24	EXCEL
MP-420	Z2	(L)	2013-07-30	14.17.40	WSL
MP-420	Z2	(L)	2013-07-30	14.17.40	EXCEL

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

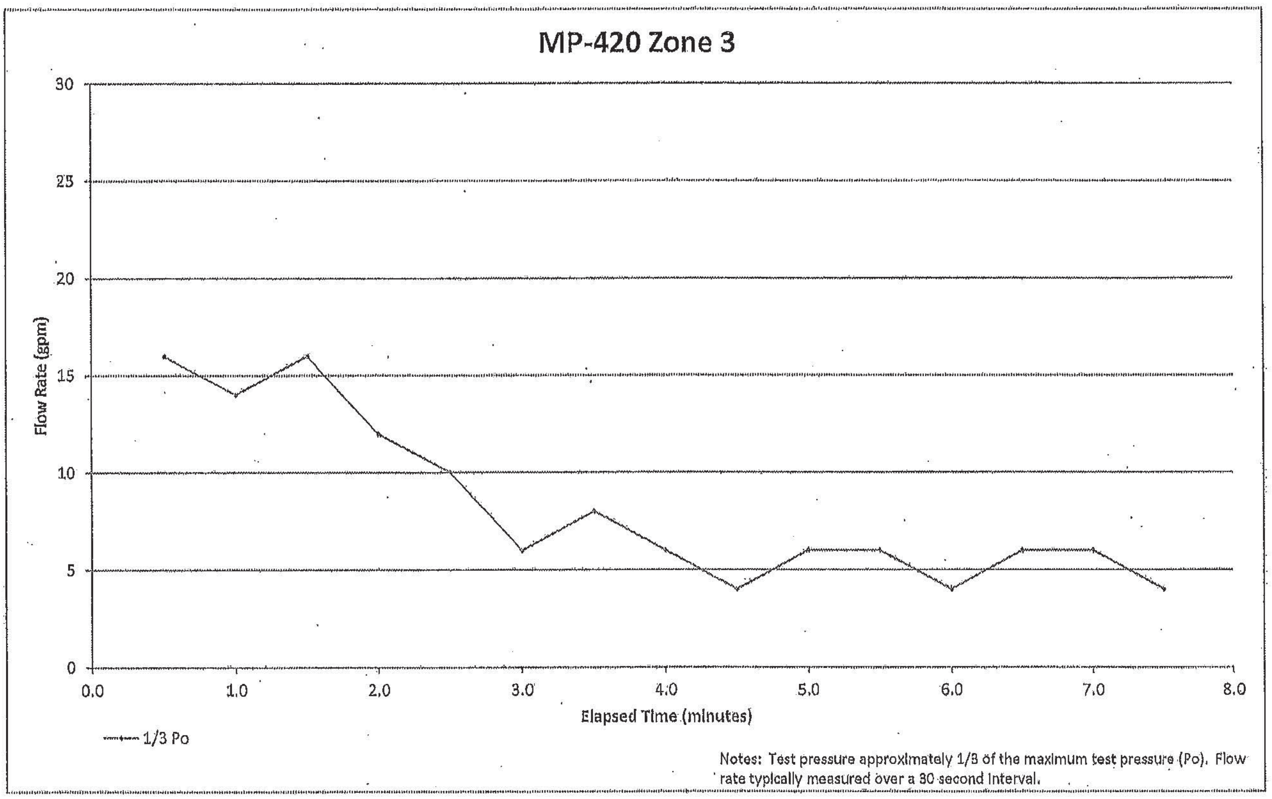
Clinch River SMR Project
Double Packer Borehole Permeability Test Data Sheet
AMEC Environment & Infrastructure, Inc.
AMEC Project # 6468-13-1072

Prepared by: CDT Date: 4-8-14
Checked by: Jas Date: 4-8-14

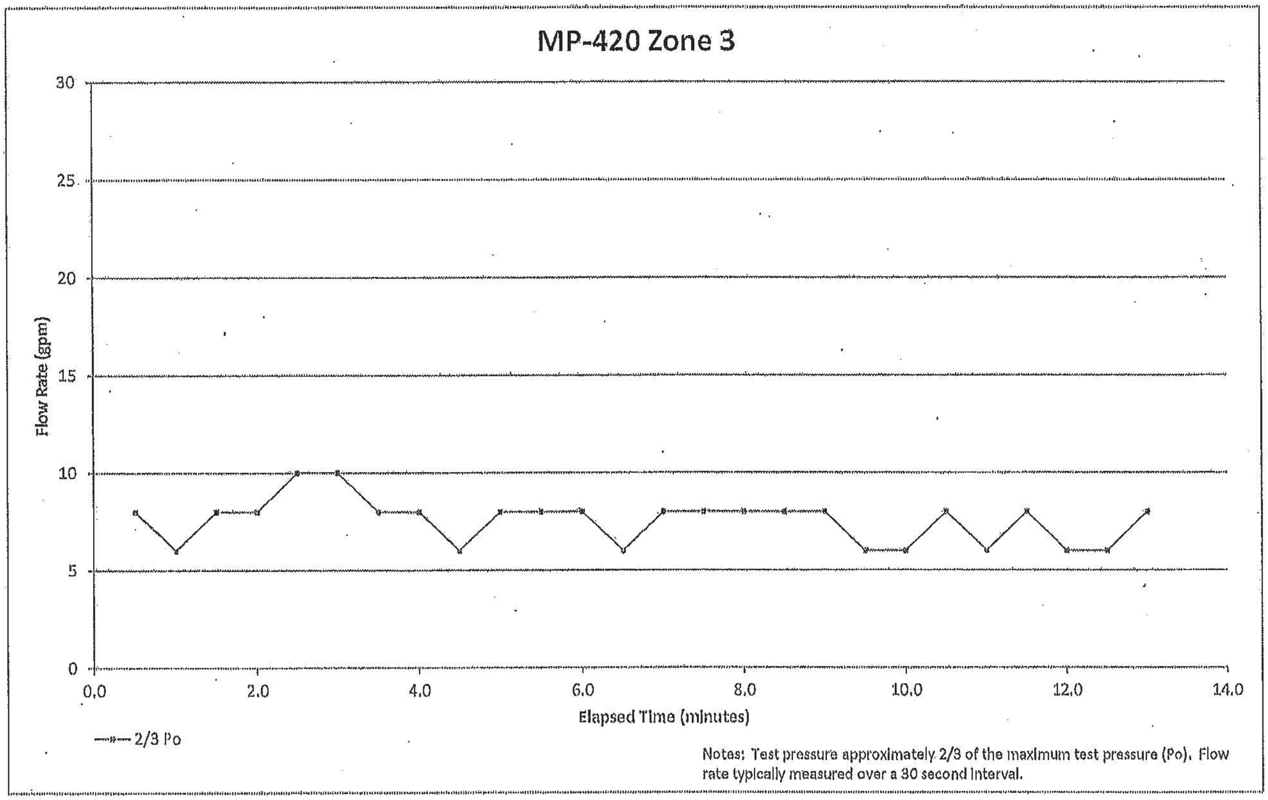
Boring: MP-420
Zone: Z3 ***100.0 feet to 107.5 feet below ground surface***
Transducer Location: Middle

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)
10:45:30	0.0	33.40		10:56:30	0.0	68.90		11:13:30	0.0	91.75	
10:46:00	0.5	37.07	16	10:57:00	0.5	68.97	8	11:14:00	0.5	100.05	12
10:46:30	1.0	77.35	14	10:57:30	1.0	78.61	6	11:14:30	1.0	102.98	10
10:47:00	1.5	82.64	16	10:58:00	1.5	79.60	8	11:15:00	1.5	110.03	14
10:47:30	2.0	75.98	12	10:58:30	2.0	82.61	8	11:15:30	2.0	111.99	14
10:48:00	2.5	76.91	10	10:59:00	2.5	83.67	10	11:16:00	2.5	115.92	24
10:48:30	3.0	71.15	6	10:59:30	3.0	85.44	10	11:16:30	3.0	118.67	8
10:49:00	3.5	71.13	8	11:00:00	3.5	86.78	8	11:17:00	3.5	119.96	10
10:49:30	4.0	68.52	6	11:00:30	4.0	87.20	8	11:17:30	4.0	121.45	18
10:50:00	4.5	68.26	4	11:01:00	4.5	87.68	6	11:18:00	4.5	122.08	12
10:50:30	5.0	68.26	6	11:01:30	5.0	88.07	8	11:18:30	5.0	122.70	16
10:51:00	5.5	68.34	6	11:02:00	5.5	88.37	8	11:19:00	5.5	123.55	18
10:51:30	6.0	68.39	4	11:02:30	6.0	88.62	8	11:19:30	6.0	122.83	12
10:52:00	6.5	68.49	6	11:03:00	6.5	89.82	6	11:20:00	6.5	123.18	12
10:52:30	7.0	68.51	6	11:03:30	7.0	89.96	8	11:20:30	7.0	123.54	14
10:53:00	7.5	68.59	4	11:04:00	7.5	90.27	8	11:21:00	7.5	121.79	10
				11:04:30	8.0	90.38	8	11:21:30	8.0	121.41	12
				11:05:00	8.5	90.64	8	11:22:00	8.5	121.19	10
				11:05:30	9.0	90.83	8	11:22:30	9.0	121.22	12
				11:06:00	9.5	91.09	6	11:23:00	9.5	121.42	10
				11:06:30	10.0	91.04	6	11:23:30	10.0	121.55	10
				11:07:00	10.5	91.22	8	11:24:00	10.5	121.58	12
				11:07:30	11.0	91.34	6	11:24:30	11.0	121.57	10
				11:08:00	11.5	91.31	8				
				11:08:30	12.0	91.35	6				
				11:09:00	12.5	91.46	6				
				11:09:30	13.0	91.49	8				

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)
11:28:30	0.0	122.32		11:40:30	0.0	77.44	
11:29:00	0.5	111.32	-8	11:41:00	0.5	98.71	22
11:29:30	1.0	83.21	-18	11:41:30	1.0	118.24	12
11:30:00	1.5	79.53	-12	11:42:00	1.5	118.65	16
11:30:30	2.0	75.56	-10	11:42:30	2.0	121.31	22
11:31:00	2.5	73.61	-6	11:43:00	2.5	122.73	14
11:31:30	3.0	75.21	0	11:43:30	3.0	118.99	16
11:32:00	3.5	78.51	0	11:44:00	3.5	118.78	10
11:32:30	4.0	78.78	4	11:44:30	4.0	118.51	12
11:33:00	4.5	78.73	2	11:45:00	4.5	119.22	6
11:33:30	5.0	78.56	4	11:45:30	5.0	119.42	12
11:34:00	5.5	78.41	2	11:46:00	5.5	119.84	24
11:34:30	6.0	***78.27***	2	11:46:30	6.0	120.03	12
11:35:00	6.5	78.15	4	11:47:00	6.5	120.46	10
11:35:30	7.0	77.99	4	11:47:30	7.0	120.52	10
				11:48:00	7.5	120.72	12
				11:48:30	8.0	120.92	10
				11:49:00	8.5	121.06	10
				11:49:30	9.0	121.38	14
				11:50:00	9.5	121.47	12
				11:50:30	10.0	121.55	10
				11:51:00	10.5	121.50	10
				11:51:30	11.0	121.69	10
				11:52:00	11.5	121.69	10
				11:52:30	12.0	121.87	10
				11:53:00	12.5	121.81	10
				11:53:30	13.0	121.83	10
				11:54:00	13.5	121.95	12
				11:54:30	14.0	121.95	10


MP-420 Zone 3

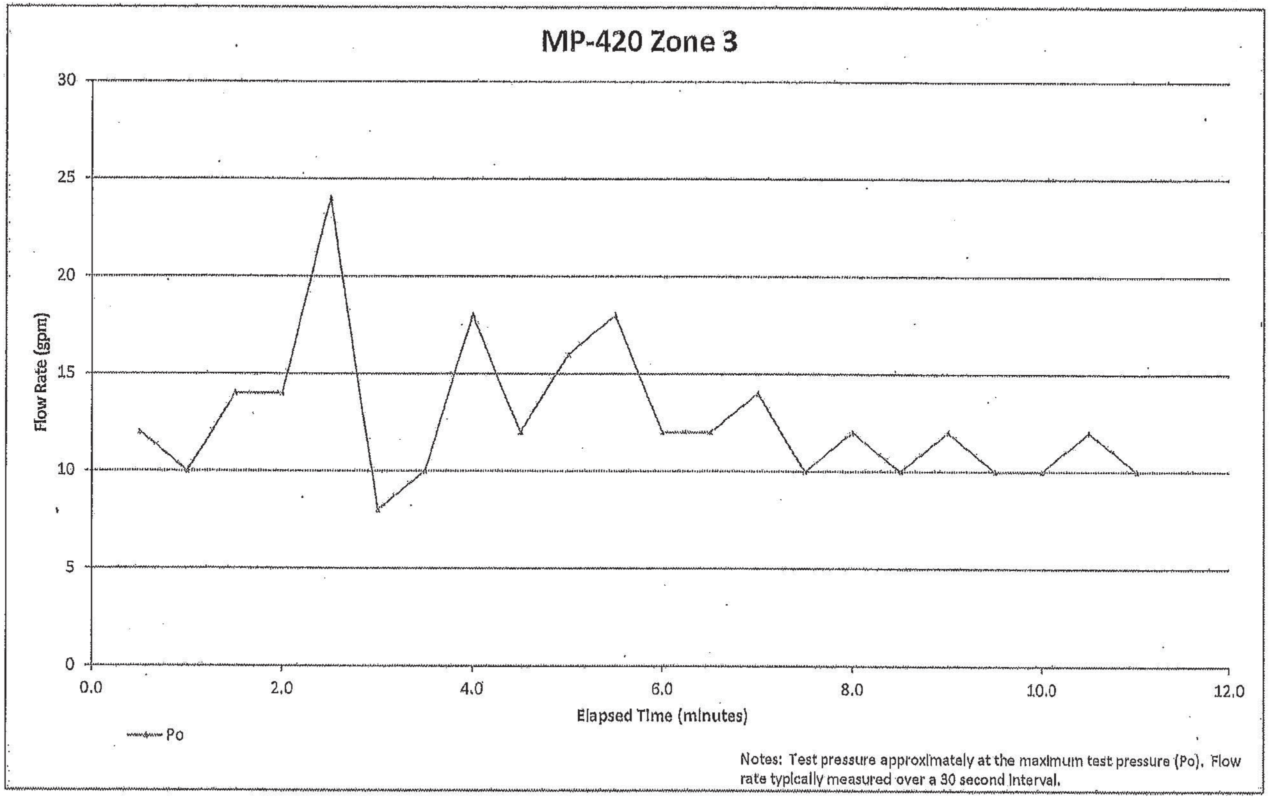
Notes: Test pressure approximately 1/3 of the maximum test pressure (Po). Flow rate typically measured over a 30 second interval.


MP-420 Zone 3

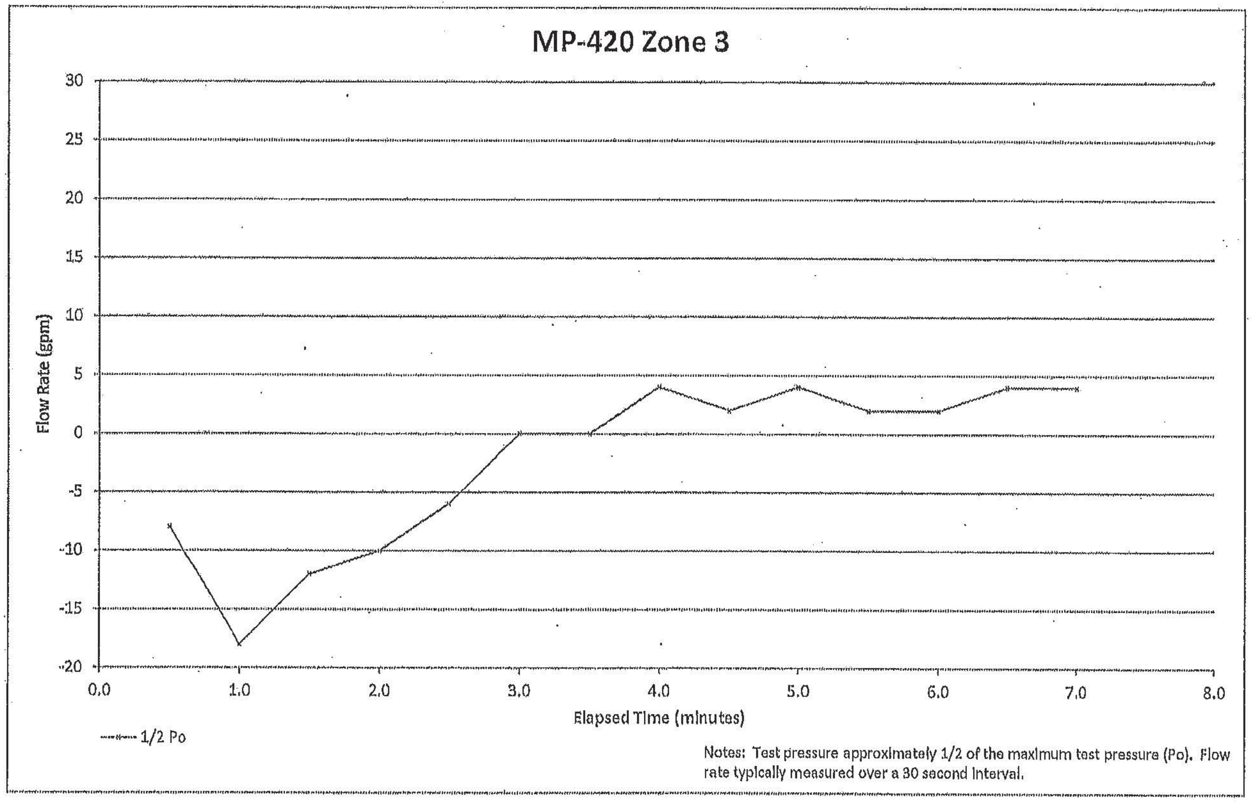
Notes: Test pressure approximately 2/3 of the maximum test pressure (Po). Flow rate typically measured over a 30 second interval.

Prepared by/Date: KAL 1/4/14

Checked by/Date: JaJ 4/12/14

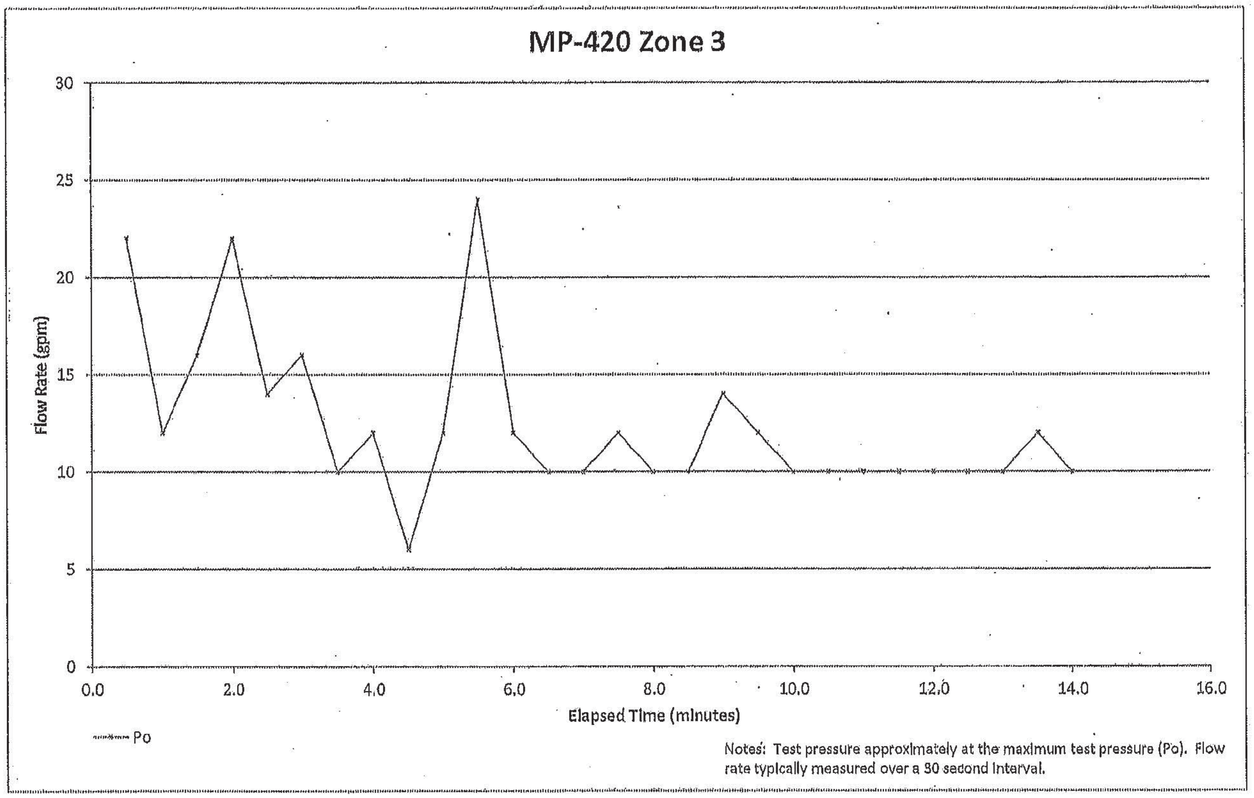


Notes: Test pressure approximately at the maximum test pressure (Po). Flow rate typically measured over a 30 second interval.



Notes: Test pressure approximately 1/2 of the maximum test pressure (Po). Flow rate typically measured over a 30 second interval.

Prepared by/Date: KWL 1/4/14
Checked by/Date: [illegible]



Notes: Test pressure approximately at the maximum test pressure (Po). Flow rate typically measured over a 30 second interval.

Prepared by/Date: KHL 1/4/14
Checked by/Date: DS 9/12/14

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: 7-30-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z3 Test length: 7.5 Test Section Depth (from Datum): From 100.66 To 108.16

(A) Depth to Water Table From Datum, Ft: 61.80 Test Water Temp: 73 °F Baro Pressure, psi: 14.47

WELL WATER TEMP 66 (17.58 C)

(B) Surface Gage Height Above Datum, Ft. 1.90 Depth to Center of Test Interval From Datum, Ft: 104.41

(C) Distance Water Table to Center of Test Interval Ft. 42.61 Static water pressure at center = (C*62.4/144) + Baro = 33

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 88] 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 = 29; 2/3 Po= 59; 1/2 Po= 44 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z3 Sequence No. A Planned Center Pressure: 62

Transducer Readings Before Packers Inflated: Top 19.24; Middle 33.07; Bottom: 36.90

Transducer Readings After Packers Inflated: Top 19.09; Middle 33.36; Bottom: 36.49

MP-420 Z3 SEQUENCE A

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
10:45:30	24 542	----	----	----	33.40	0	BEGIN IF (INCREASE FLOW)
10:46:00	24 542	24 550	8	16	37.07	12	
10:46:30	24 550	24 557	7	14	77.35	22	DF (DECREASE FLOW)
10:47:00	24 557	24 565	8	16	82.64	14	
10:47:30	24 565	24 571	6	12	79.98	15	DF
10:48:00	24 571	24 576	5	10	76.91	8	
10:48:30	24 576	24 579	3	6	71.15	8	
10:49:00	24 579	24 583	4	8	71.13	8	DF
10:49:30	24 583	24 586	3	6	68.52	5	
10:50:00	24 586	24 588	2	4	68.26	5	
10:50:30	24 588	24 591	3	6	68.26	5	
10:51:00	24 591	24 594	3	6	68.34	5	
10:51:30	24 594	24 596	2	4	68.39	5	
10:52:00	24 596	24 599	3	6	68.49	5	
10:52:30	24 599	24 ~~24~~ 602	3	6	68.51	5	
10:53:00	24 ~~24~~ 602	24 ~~24~~ 604	2	4	68.59	5	END
				10:53:46	BOTTOM	TRANS	= 36.56
				10:54:33			= 21.42

7-30-13

*From Preliminary Boring Layout Survey

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

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

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

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PROJECT NAME: Clinch River SMR Project   JOB NO. 6468-13-1072   DATE: 7-30-13

Boring No MP-420   Borehole Diameter, In.: 3.8   Total Boring Depth, Ft. 320   Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66   Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z3   Test length: 7.5   Test Section Depth (from Datum): From 100.66 To 108.16

(A) Depth to Water Table From Datum, Ft: 61.80   Test Water Temp: 73°F   Baro Pressure, psi: 14.47

WELL WATER TEMP 66 (17.55°C)

(B) Surface Gage Height Above Datum, Ft. 1.90   Depth to Center of Test Interval From Datum, Ft: 104.41

(C) Distance Water Table to Center of Test Interval Ft. 42.61   Static water pressure at center = (C*62.4/144) + Baro = 33

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 88] 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 = 29; 2/3 Po = 59; 1/2 Po = 44 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z3 Sequence No. B   Planned Center Pressure: 92

Transducer Readings Before Packers Inflated: Top 19.24; Middle 33.07; Bottom: 36.90

Transducer Readings After Packers Inflated: Top 19.09; Middle 33.36; Bottom: 36.49

MP-420 Z3 SEQUENCE B

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
10:56:30	24 621	----	----	—	68.90	5	BEGIN (INCREASE FLOW) IF
10:57:00	24 621	24 625	4	8	68.97	15	
10:57:30	24 625	24 628	3	6	78.61	16	
10:58:00	24 628	24 632	4	8	79.60	16	IF
10:58:30	24 632	24 636	4	8	82.61	21	
10:59:00	24 636	24 641	5	10	83.67	21	IF
10:59:30	24 641	24 646	5	1.0	85.44	25	
11:00:00	24 646	24 650	4	8	86.78	25	
11:00:30	24 650 ~~66~~	24 654	4	8	87.20	25	
11:01:00	24 654	24 657	3	6	87.68	25	
11:01:30	24 657	24 661	4	8	88.07	25	
11:02:00	24 661	24 665	4	8	88.37	25	IF
11:02:30	24 665	24 669	4	8	88.62	27	
11:03:00	24 669	24 672	3	6	89.82	27	
11:03:30	24 672	24 676	4	8	89.96	27	
11:04:00	24 676	24 680	4	8	90.27	28	
11:04:30	24 680	24 684	4	8	90.38	28	
11:05:00	24 684	24 688	4	8	90.64	28	

QD
7-30-16

*From Preliminary Boring Layout Survey

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

Form Rev 0 - Reviewed by QD 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: 7-30-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z3 Test length: 7.5 Test Section Depth (from Datum): From 100.66 To 108.16

(A) Depth to Water Table From Datum, Ft: 61.80 Test Water Temp: 73°F Baro Pressure, psi: 14.47

WELL WATER TEMP 66 (17.95°C)

(B) Surface Gage Height Above Datum, Ft. 1.90 Depth to Center of Test Interval From Datum, Ft: 104.41

(C) Distance Water Table to Center of Test Interval Ft. 42.61 Static water pressure at center = (C*62.4/144) + Baro = 33

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 88] 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 = 29; 2/3 Po = 59; 1/2 Po = 44. Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z3 Sequence No. B Planned Center Pressure: 92

Transducer Readings Before Packers Inflated: Top 19.24; Middle 33.07; Bottom: 36.90

Transducer Readings After Packers Inflated: Top 19.09; Middle 33.36; Bottom: 36.49

MP-420 Z3 SEQUENCE B (CONT'D)

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
11:05:30	24 688	24 692	4	8	90.83	29	
11:06:00	24 692	24 695	3	6	91.09	29	
11:06:30	24 695	24 698	3	6	91.04	29	
11:07:00	24 698	24 702	4	8	91.22	29	
11:07:30	24 702	24 705	3	6	91.34	29	
11:08:00	24 705	24 709	4	8	91.31 ~~91.31~~	29	7-30-13
11:08:30	24 709	24 712	3	6	91.35	29	
11:09:00	24 712	24 715	3	6	91.46	29	
11:09:30	24 715	24 719	4	8	91.49	29	END
				11:10:15	BOTTOM	TRANS =	36.54
				11:10:59	TOP	TRANS =	23.99

*From Preliminary Boring Layout Survey

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

Form Rev 0 - Reviewed by 12/16/17

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: 7-30-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z3 Test length: 7.5 Test Section Depth (from Datum): From 100.66 To 108.16

(A) Depth to Water Table From Datum, Ft: 61.80

Test Water Temp: 73°F Baro Pressure, psi: 14.47

WELL WATER TEMP 66 (17.58C)

(B) Surface Gage Height Above Datum, Ft. 1.90

Depth to Center of Test Interval From Datum, Ft: 104.41

(C) Distance Water Table to Center of Test Interval Ft. 42.61

Static water pressure at center = (C*62.4/144) + Baro = 33

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.67) [Po = 88] 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 = 29; 2/3 Po= 59; 1/2 Po= 44 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z3 Sequence No. C Planned Center Pressure: 121

Transducer Readings Before Packers Inflated: Top 19.24; Middle 33.07; Bottom: 36.90

Transducer Readings After Packers Inflated: Top 19.09; Middle 33.36; Bottom: 36.49

MP-420 Z3 SEQUENCE C

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
11: 13:30	24 745	----	----	---	91.75	30	BEGIN IF (INCREASE FLOW)
11: 14:00	24 745	24 751	6	12	100.05	42	
11: 14:30	24 751	24 756	5	10	102.98	43	IF
11: 15:00	24 756	24 763	7	14	110.03	51	
11: 15:30	24 763	24 770	7	14	111.99	53	IF
11: 16:00	24 770	24 782	12	24	115.92	60	
11: 16:30	24 782	24 786	4	8	118.67	60	
11: 17:00	24 786	24 791	5	10	119.96	60	
11: 17:30	24 791	24 800	9	18	121.45	62	
11: 18:00	24 800	24 806	6	12	122.08	63	
11: 18:30	24 806	24 814	8	16	122.70	64	DF (DECREASE FLOW)
11: 19:00	24 814	24 823	9	18	123.55	62	
11: 19:30	24 823	24 829	6	12	122.83	63	
11: 20:00	24 829	24 835	6	12	123.18	63	
11: 20:30	24 835	24 842	7	14	123.54	64	DF
11: 21:00	24 842	24 847	5	10	121.79	61	
11: 21:30	24 847	24 853	6	12	121.41	61	
11: 22:00	24 853	24 858	5	10	121.19	61	

*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.

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PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7-30-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z3 Test length: 7.5 Test Section Depth (from Datum): From 100.66 To 108.16

(A) Depth to Water Table From Datum, Ft: 61.80 Test Water Temp: 73°F Baro Pressure, psi: 14.47

WELL WATER TEMP 66 (17.98°C)

(B) Surface Gage Height Above Datum, Ft. 1.90 Depth to Center of Test Interval From Datum, Ft: 104.41

(C) Distance Water Table to Center of Test Interval Ft. 42.61 Static water pressure at center = (C*62.4/144) + Baro = 33

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 88] 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 = 29; 2/3 Po= 59; 1/2 Po= 44 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z3 Sequence No. C Planned Center Pressure: 121

Transducer Readings Before Packers Inflated: Top 19.24; Middle 33.07; Bottom: 36.90

Transducer Readings After Packers Inflated: Top 19.09; Middle 33.36; Bottom: 36.49

MP-420 Z3 SEQUENCE C (CONT'D)

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
11:22:30	24 858	24 864	6	12	121.22	61	
11:23:00	24 864	24 869	5	10	121.42	61	
11:23:30	24 869	24 874	5	10	121.55	61	
11:24:00 ~~23:30~~	24 874	24 880	6	12	121.58	61	
11:24:30	24 880	24 885	5	10	121.57	61	END
				11:25:11	BOTTOM	TRANS =	36.62
				11:25:45	TOP	TRANS =	25.09

7-30-13

*From Preliminary Boring Layout Survey

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

Form Rev 0 - Reviewed by 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: 7-30-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420 Z 3 Test length: 7.5 Test Section Depth (from Datum): From 100.66 To 108.16

(A) Depth to Water Table From Datum, Ft: 61.80

Test Water Temp: 73°F Baro Pressure, psi: 14.47

WELL WATER TEMP 66 (17.9°C)

(B) Surface Gage Height Above Datum, Ft. 1.90

Depth to Center of Test Interval From Datum, Ft: 104.41

(C) Distance Water Table to Center of Test Interval Ft. 42.61

Static water pressure at center = (C*62.4/144) + Baro = 33

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 88] 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 = 29 ; 2/3 Po= 59 ; 1/2 Po= 44 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420 Z 3 Sequence No. D Planned Center Pressure: 77

Transducer Readings Before Packers Inflated: Top 19.24 ; Middle 33.07 ; Bottom: 36.90

Transducer Readings After Packers Inflated: Top 19.09 ; Middle 33.36 ; Bottom: 36.49

MP-420 Z 3 SEQUENCE D

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
11:28:30	24 931	----	----	----	122.34	62	BEGIN DF (DECREASE FLOW)
11:29:00	24 931	24 927	-4	-8	111.32	20	DF
11:29:30	24 927	24 918	-9	-18	83.21	15	
11:30:00	24 918	24 912	-6	-12	79.53	12	
11:30:30	24 912	24 907	-5	-10	75.50	11	IF (INCREASE
11:31:00	24 907	24 904	-3	-6	73.61	11	
11:31:30	24 904	24 904	0	0	75.21	15	
11:32 00	24 904	24 904	0	0	78.51	15	
11:32:30	24 904	24 906	2	4	78.78	15	
11:33 00	24 906	24 907	1	2	78.73	15	
11:33:30	24 907	24 909	2	4	78.56	15	
11:34:00	24 909	24 910	1	2	78.41	15	
11:34:30	24 910	24 911	1	2	78.27	15	
11:35:00	24 911	24 913	2	4	78.15	15	
11:35:30	24 913	24 915	2	4	77.99	15	END
				11:36:30	BOTTOM	TRANS =	36.30
				11:37:08	TOP	TRANS =	25.02

*From Preliminary Boring Layout Survey

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

Form Rev 0 - Reviewed by SJC 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: 7-30-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z3 Test length: 7.5 Test Section Depth (from Datum): From 100.66 To 108.16

(A) Depth to Water Table From Datum, Ft: 61.80 Test Water Temp: 73°F Baro Pressure, psi: 14.47

WELL WATER TEMP 66 (17.95°C)

(B) Surface Gage Height Above Datum, Ft. 1.90 Depth to Center of Test Interval From Datum, Ft: 104.41

(C) Distance Water Table to Center of Test Interval Ft. 42.61 Static water pressure at center = (C*62.4/144) + Baro = 33

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 88] 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 = 29; 2/3 Po = 59; 1/2 Po = 44 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z3 Sequence No. E Planned Center Pressure: 121

Transducer Readings Before Packers Inflated: Top 19.24; Middle 33.07; Bottom: 36.90

Transducer Readings After Packers Inflated: Top 19.09; Middle 33.34; Bottom: 36.49

MP-420 Z3 SEQUENCE E

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
11:40:30	24 933	----	----	----	77.44	15	BEGIN IF (INCREASE FLOW)
11:41:00	24 933	24 946	11	22	98.71	49	IF
11:41:30	24 946	24 952	6	12	118.24	61	
11:42:00	24 952	24 960	8	16	118.65	61	
11:42:30	24 960	24 971	11	22	121.31	62	
11:43:00	24 971	24 978	7	14	122.73	65	DF (DECREASE FLOW)
11:43:~~00~~ 30	24 978	24 986	8	16	118.99	59	
11:44:00	24 986	24 991	5	10	118.78	59	
11:44:30	24 991	24 997	6	12	118.51	59	
11:45:00	24 997	25 000	3	6	119.22	59	
11:45:30	25 000	25 006	6	12	119.42	59	
11:46:00	25 006	25 012	12	24	119.84	59	
11:46:30	25 012	25 018	6	12	120.03	60	
11:47:00	25 018	25 023	5	10	120.46	60	
11:47:30	25 023	25 028	5	10	120.52	60	
11:48:00	25 028	25 034	6	12	120.72	60	
11:48:30	25 034	25 039	5	10	120.92	60	
11:49:00	25 039	25 044	5	10	121.06	60	

gd 7-30-13

gd 7-30-13

*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: 7-30-13

Boring No MP-420   Borehole Diameter, In.: 3.8   Total Boring Depth, Ft. 320   Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66   Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z3   Test length: 7.5   Test Section Depth (from Datum): From 100.66 To 108.16

(A) Depth to Water Table From Datum, Ft: 61.80   Test Water Temp: 73°F   Baro Pressure, psi: 14.47

WELL WATER TEMP 66 (17.5°C)

(B) Surface Gage Height Above Datum, Ft. 1.90   Depth to Center of Test Interval From Datum, Ft: 104.41

(C) Distance Water Table to Center of Test Interval Ft. 42.61   Static water pressure at center = (C*62.4/144) + Baro = 33

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57)   [Po = 88]   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 = 29 ; 2/3 Po= 59 ; 1/2 Po= 44   Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z3 Sequence No. E   Planned Center Pressure: 121

Transducer Readings Before Packers Inflated: Top 19.24 ; Middle 33.07 ; Bottom: 36.90

Transducer Readings After Packers Inflated: Top 19.09 ; Middle 33.36 ; Bottom: 36.49

MP-420 Z3 SEQUENCE E (CONT'D)

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
11:49:30	25044	25049	5	10	121.38	60	
11:50:00	25049	25055	6	12	121.47	60	
11:50:30	25055	25060	5	10	121.55	60	
11:51:00	25060	25065	5	10	121.50	60	
11:51:30	25065	25070	5	10	121.69	60	
11:52:00	25070	25075	5	10	121.69	60	
11:52:30	25075	25080	5	10	121.87	60	
11:53:00	25080	25085	5	10	121.81	60	
11:53:30	25085	25090	5	10	121.83	60	
11:54:00	25090	25096	6	12	121.95	60	
11:54:30	25096	25101	5	10	121.95 ~~121.2~~	60	END
				11:55:22	BOTTOM	TRANS =	36.48
				11:55:59	TOP	TRANS =	25.29

*From Preliminary Boring Layout Survey

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

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

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET

This Sheet Applies to
All Zone 3 Tests
SSR 12/16/13

BORING: MP-420

DATE: 7-30-13

DATA COLLECTED BY: TOM McGILL / JIM GODDARD

~~SHUT-IN TEST PRESSURE:~~ N/A SSR 12/16/13 psi

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

NOT USED

SEE PAGE 1

7-21-13

7-30-13

EQUIPMENT USED

Transducers: Mini Trol Serial Numbers: 335896 (6-12-13) 142142 (6-20-13) 315381 (6-20-~~12~~ 13)

BACKFLOW: MW-3 (6-11-13)

Surface Pressure Gage: MW-4 & MW-5 (6-11-13) THERMOMETER: LT28 (5-1-13)

NITROGEN GAUGE: MW-1 & MW-2 (6-11-13)

Barometric Probe: 121315 (6-12-13)

Flow Meter: 8824788 (FIELD 7-8-13)

Stop Watch: L286 (6-10-13)

Date of Calibration: PARENTHESIS

Calibration due: POST TESTING

MP-420	Z3	(B)	2013-07-30	12.02.22	WSL
MP-420	Z3	(B)	2013-07-30	12.02.22	EXCEL
MP-420	Z3	(T)	2013-07-30	11.57.~~04~~ 04	WSL
MP-420	Z3	(T)	2013-07-30	11.57.04	EXCEL
MP-420	Z3	(M)	2013-07-30	11.58.43	WSL
MP-420	Z3	(M)	2013-07-30	11.58.43	EXCEL
MP-420	Z3	(L)	2013-07-30	12.01.12	WSL
MP-420	Z3	(L)	2013-07-30	12.01.12	EXCEL

7-30-13

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

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

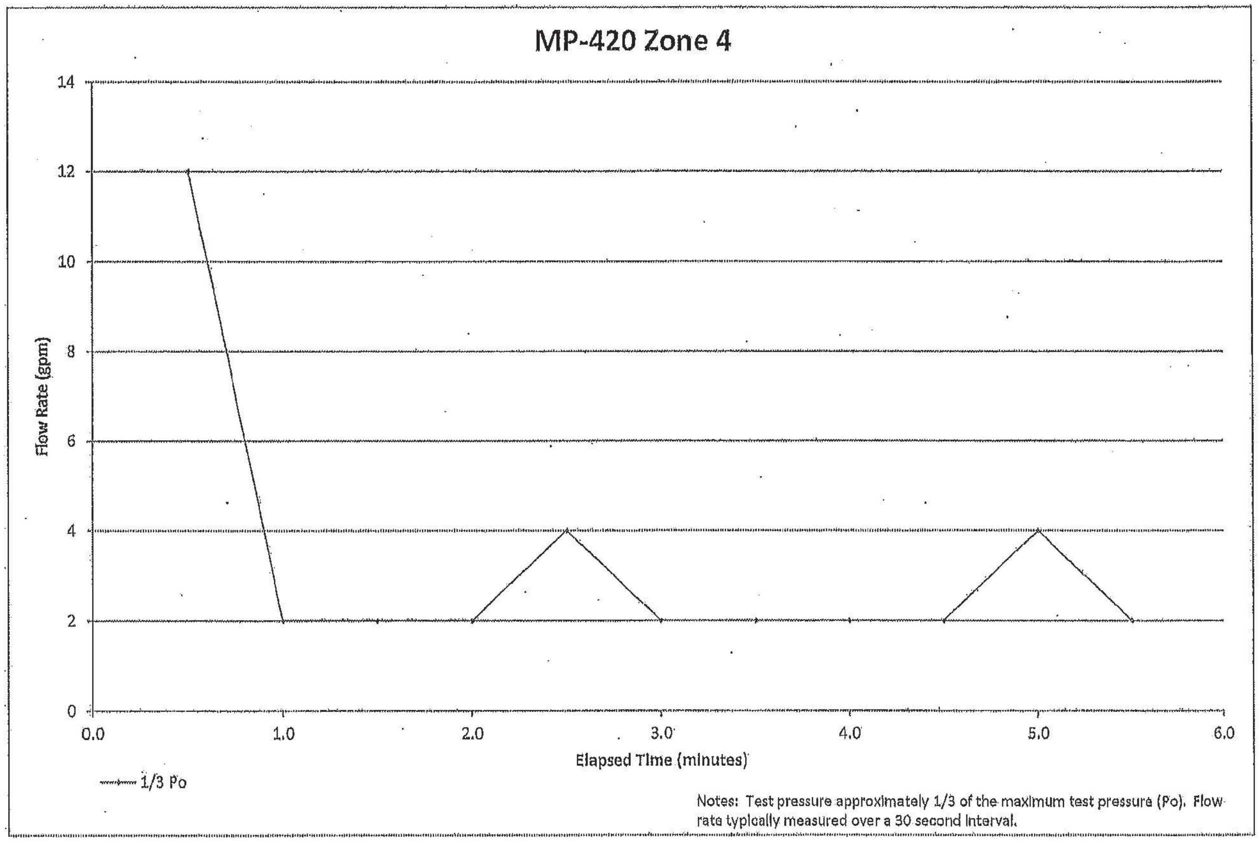
Clinch River SMR Project
Double Packer Borehole Permeability Test Data Sheet
AMEC Environment & Infrastructure, Inc.
AMEC Project # 6468-13-1072

Prepared by: CDJ Date: 4-8-14
Checked by: JAJ Date: 4-9-14

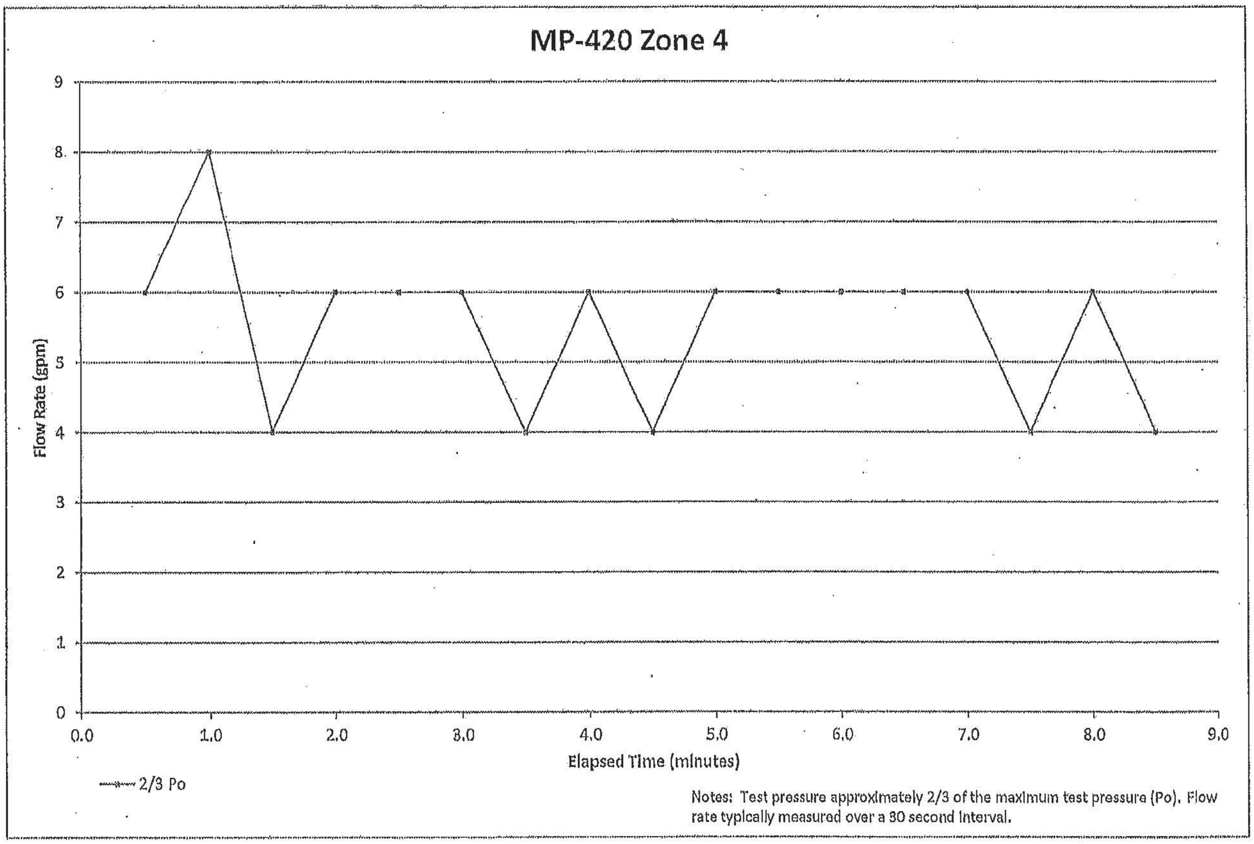
Boring: MP-420
Zone: Z4 ***132.5 feet to 140.00 feet below ground surface***
Transducer Location: Middle

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)
8:38:30	0.0	46.50		8:47:00	0.0	88.39		8:59:30	0.0	123.37	
8:39:00	0.5	69.74	12	8:47:30	0.5	116.03	6	9:00:00	0.5	139.23	12
8:39:30	1.0	81.84	2	8:48:00	1.0	120.12	8	9:00:30	1.0	145.70	8
8:40:00	1.5	80.49	2	8:48:30	1.5	120.52	4	9:01:00	1.5	149.68	8
8:40:30	2.0	88.84	2	8:49:00	2.0	121.82	6	9:01:30	2.0	150.94	10
8:41:00	2.5	86.93	4	8:49:30	2.5	121.74	6	9:02:00	2.5	151.62	8
8:41:30	3.0	87.25	2	8:50:00	3.0	122.43	6	9:02:30	3.0	152.41	10
8:42:00	3.5	87.98	2	8:50:30	3.5	124.16	4	9:03:00	3.5	154.21	10
8:42:30	4.0	88.14	2	8:51:00	4.0	126.03	6	9:03:30	4.0	156.13	8
8:43:00	4.5	87.99	2	8:51:30	4.5	123.33	4	9:04:00	4.5	155.61	8
8:43:30	5.0	88.46	4	8:52:00	5.0	123.52	6	9:04:30	5.0	156.45	10
8:44:00	5.5	88.31	2	8:52:30	5.5	123.58	6	9:05:00	5.5	156.34	10
				8:53:00	6.0	123.46	6	9:05:30	6.0	154.92	10
				8:53:30	6.5	123.85	6	9:06:00	6.5	154.06	8
				8:54:00	7.0	123.60	6	9:06:30	7.0	153.50	10
				8:54:30	7.5	124.35	4	9:07:00	7.5	154.00	8
				8:55:00	8.0	124.00	6	9:07:30	8.0	155.15	10
				8:55:30	8.5	123.77	4				

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)
9:11:30	0.0	155.42		9:21:30	0.0	106.09	
9:12:00	0.5	110.46	6	9:22:00	0.5	134.07	12
9:12:30	1.0	109.80	6	9:22:30	1.0	155.73	10
9:13:00	1.5	109.80	6	9:23:00	1.5	157.39	12
9:13:30	2.0	107.88	4	9:23:30	2.0	153.84	6
9:14:00	2.5	107.59	6	9:24:00	2.5	153.38	10
9:14:30	3.0	107.37	6	9:24:30	3.0	153.45	6
9:15:00	3.5	106.02	4	9:25:00	3.5	153.05	10
9:15:30	4.0	105.85	6	9:25:30	4.0	153.35	8
9:16:00	4.5	106.07	6	9:26:00	4.5	153.49	10
9:16:30	5.0	105.84	4	9:26:30	5.0	153.24	10
9:17:00	5.5	105.83	6	9:27:00	5.5	153.47	10
9:17:30	6.0	105.66	6				
9:18:00	6.5	106.08	6				
9:18:30	7.0	105.81	6				

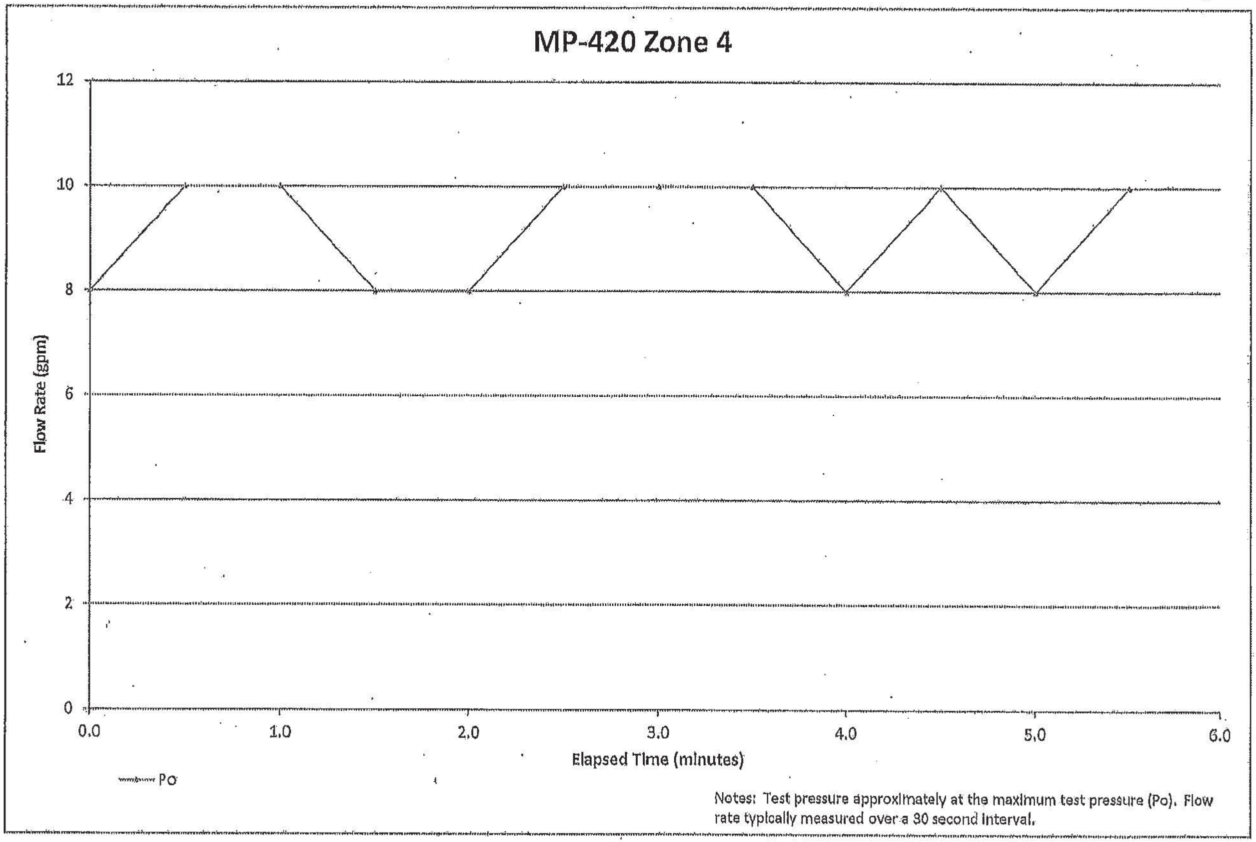


Notes: Test pressure approximately 1/3 of the maximum test pressure (Po). Flow rate typically measured over a 30 second interval.

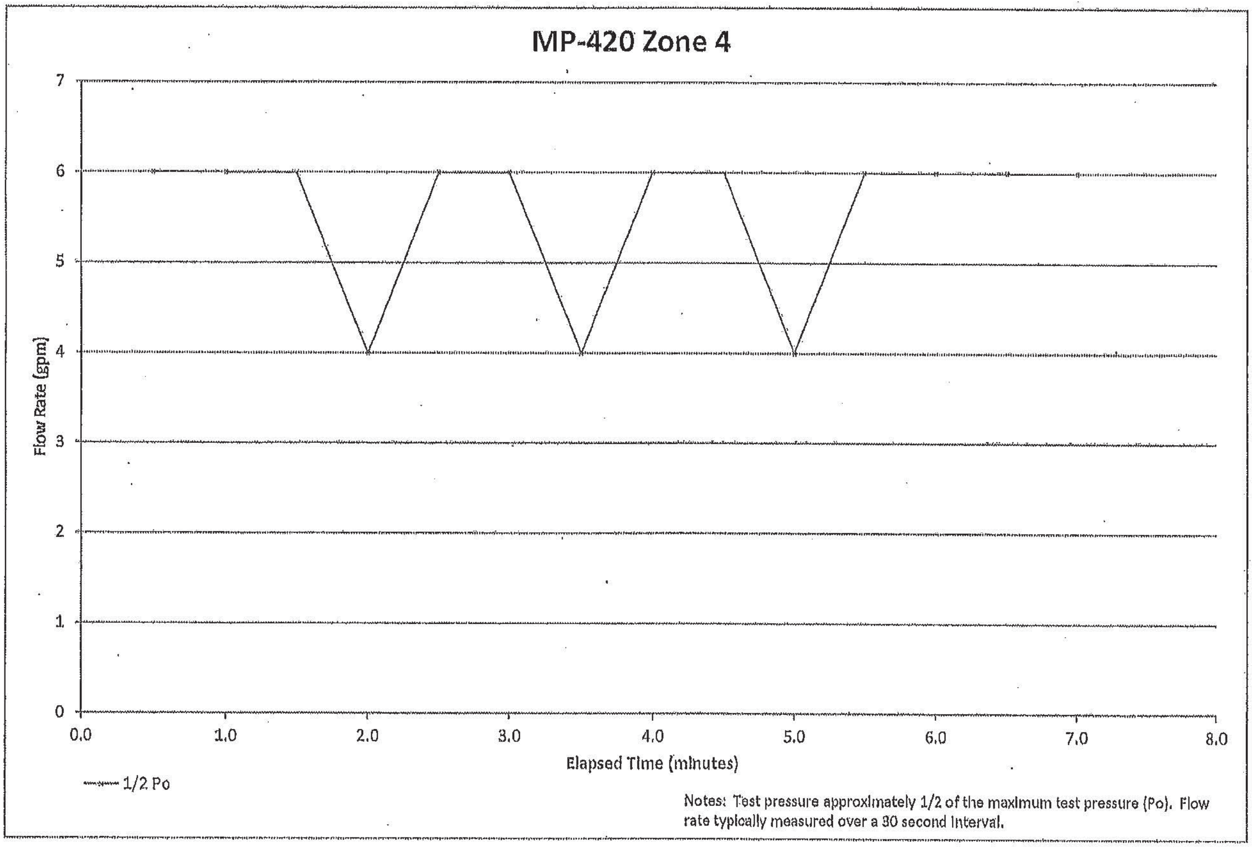


Notes: Test pressure approximately 2/3 of the maximum test pressure (Po). Flow rate typically measured over a 30 second interval.

Prepared by/Date: KAL 1/4/14
Checked by/Date: 2/11/14

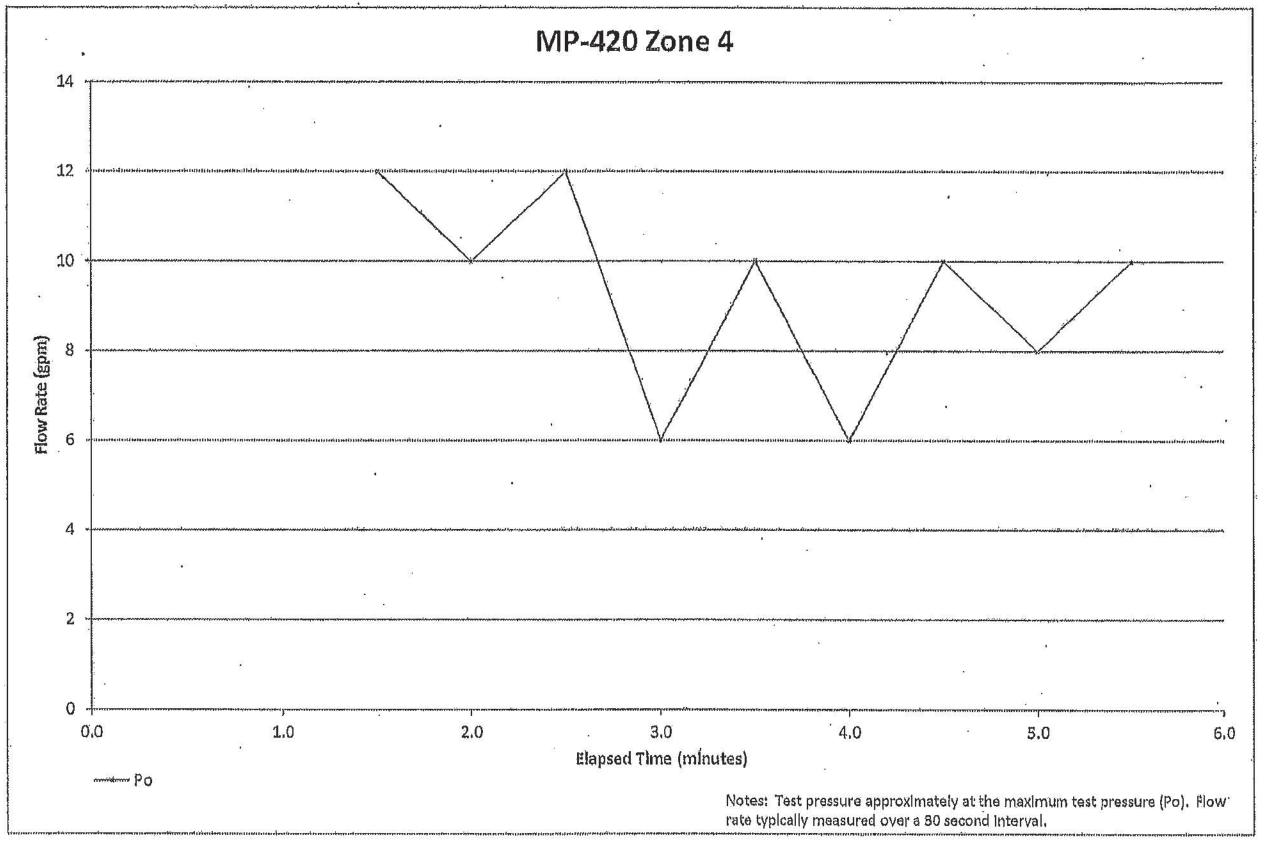

MP-420 Zone 4

Notes: Test pressure approximately at the maximum test pressure (Po). Flow rate typically measured over a 30 second interval.


MP-420 Zone 4

Notes: Test pressure approximately 1/2 of the maximum test pressure (Po). Flow rate typically measured over a 30 second interval.

Prepared by/Date: KHL 1/4/14
Checked by/Date: JCP 1/21/16



Prepared by/Date: KHL 1/4/14
Checked by/Date: JD 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: 7-30-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5*

Casing Height above ground, Ft: 0.66 Elev, Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z4 Test length: 7.5 Test Section Depth (from Datum): From ~~136.16~~ 133.16 SJZ 4/9/14 To 140.66

(A) Depth to Water Table From Datum, Ft: 51.21 Test Water Temp: 75°F Baro Pressure, psi: 14.47

(B) Surface Gage Height Above Datum, Ft. 1.90 WELL WATER TEMP 59 (14.7°C)

Depth to Center of Test Interval From Datum, Ft: 136.91

(C) Distance Water Table to Center of Test Interval Ft. 85.70 Static water pressure at center = (C*62.4/144) + Baro = 52

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.67) [Po = 102] 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 = 34; 2/3 Po= 68; 1/2 Po= 51 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z4 Sequence No. A Planned Center Pressure: 86

Transducer Readings Before Packers Inflated: Top 20.10; Middle 46.54; Bottom: 50.36

Transducer Readings After Packers Inflated: Top 20.70; Middle 46.52; Bottom: 50.22

MP-420 Z4 SEQUENCE A

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
08:38:30	24218	----	----	----	46.50	0	BEGIN (INCREASE IF FLOW)
08:39:00	24218	24 224	6	12	69.74	19	
08:39:30	24 224	24 225	1	2	81.84	19	IF
08:40:00	24 225	24 226	1	2	80.49	19	
08:40:30	24 226	24 227	1	2	88.84	24	
08:41:00	24 227	24 229	2	4	86.93	24	
08:41:30	24 229	24 230	1	2	87.25	24	
08:42:00	24 230	24 231	1	2	87.98	24	
08:42:30	24 231	24 232	1	2	88.14	24	
08:43:00	24 232	24 233	1	2	87.99	24	
08:43:30	24 233	24 235	2	4	88.46	24	
08:44:00	24 235	24 236	1	2	88.31	24	END
				08:44:45	BOTTOM	TRANS	51.54
				08:45:24	TOP	TRANS	20.93

*From Preliminary Boring Layout Survey

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

Form Rev 0 - Reviewed by SJZ 12/16/17

Form Prepared By: J. Goddard
Work Procedure: Project Procedure CRP-3 Rev 6

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: 7-30-13

Boring No. MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5*

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z4 Test length: 7.5 Test Section Depth (from Datum): From ~~[illegible]~~ 133.16 SR2 4/9/14 To 140.66

(A) Depth to Water Table From Datum, Ft: 51.21 Test Water Temp: 75°F Baro Pressure, psi: 14.47

WELL WATER TEMP 59°F (14.9°C)

(B) Surface Gage Height Above Datum, Ft. 1.90 Depth to Center of Test Interval From Datum, Ft: 136.91

(C) Distance Water Table to Center of Test Interval Ft. 85.70 Static water pressure at center = (C*62.4/144) + Baro = 52

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.67) [Po = 102] 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 = 34; 2/3 Po = 68; 1/2 Po = 51 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z4 Sequence No. B Planned Center Pressure: 120

Transducer Readings Before Packers Inflated: Top 20.10; Middle 46.54; Bottom: 50.36

Transducer Readings After Packers Inflated: Top 20.70; Middle 46.52; Bottom: 50.22

MP-420 Z4 SEQUENCE B

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
08:47:00	24 245	-----	-----	----	88.39	24	BEGIN IF (INCREASE FLOW)
08:47:30	24 245	24 248	3	6	116.03	51	~~IF~~ 7-30-13
08:48:00	24 248	24 252	4	8	120.12	51	
08:48:30	24 252	24 254	2	4	120.52	51	
08:49:00	24 254	24 257	3	6	121.82	51	
08:49:30	24 257	24 260	3	6	121.74	51	
8:50:00	24 260	24 263	3	6	122.43	51	
8:50:30	24 263	24 265	2	4	124.16	51	DF (DECREASE FLOW)
8:51:00	24 265	24 268	3	6	126.03	48	
8:51:30	24 268	24 270	2	4	123.33	48	
8:52:00	24 270	24 273	3	6	123.52	48	
8:52:30	24 273	24 276	3	6	123.58	48	
8:53:00	24 276	24 279	3	6	123.40	48	
8:53:30	24 279	24 281	3	6	123.85	48	
8:54:00	24 281	24 284	3	6	123.60	48	
8:54:30	24 284	24 286	2	4	124.35	48	
8:55:00	24 286	24 289	3	6	124.00	48	
8:55:30	24 289	24 291	2	4	123.77	48	END

*From Preliminary Boring Layout Survey

08:56:19 BOTTOM TRANS = 53.84

08:56:55 TOP TRANS = 21.12

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

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

Form Prepared By: J. Goddard
Work Procedure: Project Procedure CRP-3 Rev 6

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: 7-30-13

Boring No. MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420 Z 4 Test length: 7.5 Test Section Depth (from Datum): From ~~136.66~~ 133.16 SJZ 4/9/14 To 140.66

(A) Depth to Water Table From Datum, Ft: 51.21

Test Water Temp: 75°F Baro Pressure, psi: 14.47

WELL WATER TEMP 59°F (14.7°C)

(B) Surface Gage Height Above Datum, Ft. 1.90

Depth to Center of Test Interval From Datum, Ft: 136.91

(C) Distance Water Table to Center of Test Interval Ft. 85.70 Static water pressure at center = (C*62.4/144) + Baro = 52

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.67) [Po = 102] 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 = 34; 2/3 Po = 68; 1/2 Po = 51 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z4 Sequence No. C Planned Center Pressure: 154

Transducer Readings Before Packers Inflated: Top 20.10; Middle 46.54; Bottom: 50.36

Transducer Readings After Packers Inflated: Top 20.70; Middle 46.52; Bottom: 50.22

MP-420 Z 4 SEQUENCE C

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
8:59:30	24 311	----	----	----	123.37	48	BEGIN IF (INCREASE FLOW)
9:00:00	24 311	24 317	6	12	139.23	72	
9:00:30	24 317	24 321	4	8	145.70	72	IF
9:01:00	24 321	24 325	4	8	149.68	76	
9:01:30	24 325	24 330	5	10	150.94	78	
9:02:00	24 330	24 334	4	8	151.62	78	IF
9:02:30	24 334	24 339	5	10	152.41	81	
9:03:00	24 339	24 344	5	10	154.21	81	
9:03:30	24 344	24 348	4	8	156.13	81	
9:04:00	24 348	24 352	4	8	155.61	81	
9:04:30	24 352	24 357	5	10	156.45	81	
9:05:00	24 357	24 362	5	10	156.34	81	
9:05:30	24 362	24 367	5	10	154.92	81	
9:06:00	24 367	24 371	4	8	154.06	81	
9:06:30	24 371	24 376	5	10	153.50	81	
9:07:00	24 376	24 380	4	8	154.00	81	
9:07:30	24 380	24 385	5	10	155.15	81	END

*From Preliminary Boring Layout Survey

9:08:26 BOTTOM TRANS = 57.71

9:09:00 TOP TRANS = 21.60

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

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

Form Prepared By: J. Goddard

Work Procedure: Project Procedure CRP-3 Rev 6

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: 7-30-13

Boring No. MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev, Top of Casing, Ft, (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z4 Test length: 7.5 Test Section Depth (from Datum): From ~~136.16~~ 133.16 SSC 4/9/14 To 140.66

(A) Depth to Water Table From Datum, Ft: 51.21 Test Water Temp: 75°F Baro Pressure, psi: 14.47

WELL WATER TEMP 59 (14.9°C)

(B) Surface Gage Height Above Datum, Ft. 1.90 Depth to Center of Test Interval From Datum, Ft: 136.91

(C) Distance Water Table to Center of Test Interval Ft. 85.70 Static water pressure at center = (C*62.4/144) + Baro = 52

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.67) [Po = 102] 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 = 34; 2/3 Po = 68; 1/2 Po = 51 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z4 Sequence No. D Planned Center Pressure: 103

Transducer Readings Before Packers Inflated: Top 20.10; Middle 46.54; Bottom: 50.36

Transducer Readings After Packers Inflated: Top 20.70; Middle 46.52; Bottom: 50.22

MP-420 Z4 SEQUENCE D

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
9:11:30	24 422	----	----	----	155.42	81	BEGIN DF (DECREASE FLOW)
9:12:00	24 422	24 425	3	6	110.46	34	
9:12:30	24 425	24 428	3	6	109.80	34	DF
9:13:00	24 428	24 431	3	6	109.80	32	
9:13:30	24 431	24 433	2	4	107.88	82	
9:14:00	24 433	24 436	3	6	107.59	32	DF
9:14:30	24 436	24 439	3	6	107.37	30	
9:15:00	24 439	24 441	2	4	106.02	30	
9:15:30	24 441	24 444	3	6	105.85	30	
9:16:00	24 444	24 447	3	6	106.07	30	
9:16:30	24 447	24 449	2	4	105.84	30	
9:17:00	24 449	24 452	3	6	105.83	30	
9:17:30	24 452	24 455	3	6	105.66	30	
9:18:00	24 455	24 458	3	6	106.08	30	
9:18:30	24 458	24 461	3	6	105.81	30	END
				9:19:13	BOTTOM	TRANS	= 55.64
				9:19:54	TOP	TRANS	= 21.05

*From Preliminary Boring Layout Survey

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

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

Form Prepared By: J. Goddard
Work Procedure: Project Procedure CRP-3 Rev 6

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: 7-30-13

Boring No. MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z4 Test length: 7.5 Test Section Depth (from Datum): From ~~136.16~~ 133.16 SJZ 4/9/14 To 140.66

(A) Depth to Water Table From Datum, Ft: 51.21 Test Water Temp: 75°F Baro Pressure, psi: 14.47

WELL WATER TEMP 59 (14.7°C)

(B) Surface Gage Height Above Datum, Ft. 1.90 Depth to Center of Test Interval From Datum, Ft: 136.91

(C) Distance Water Table to Center of Test Interval Ft. 85.70 Static water pressure at center = (C*62.4/144) + Baro = 52.

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 102] 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 = 34; 2/3 Po = 68; 1/2 Po = 51 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z4 Sequence No. E Planned Center Pressure: 154

Transducer Readings Before Packers Inflated: Top 20.10; Middle 46.54; Bottom: 50.36

Transducer Readings After Packers Inflated: Top 20.70; Middle 46.52; Bottom: 50.22

MP-420 Z4 SEQUENCE E

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
9:21:30	24 478	----	----	----	106.09 2	30	BEGIN IF (INCREASE FLOW)
9:22:00	24 478	24 484	6	12	134.07	81	
9:22:30	24 484	24 489	5	10	155.73	81	DF (DECREASE FLOW)
9:23:00	24 489	24 495	6	12	157.39	80	
9:23:30	24 495	24 498	3	6	153.84	80	
9:24:00	24 498	24 503	5	10	153.38	80	
9:24:30	24 503	24 506	3	6	153.45	80	
9:25:00	24 506	24 511	5	10	153.05	80	
9:25:30	24 511	24 515	4	8	153.35	80	
9:26:00	24 515	24 520	5	10	153.49	80	
9:26:30	24 520	24 525	5	10	153.24	80	
9:27:00	24 525	24 530	5	10	15347	80	END
				9:27:43	BOTTOM	TRANS.	= 58.13
				9:28:19	TOP	TRANS.	= 21.47

*From Preliminary Boring Layout Survey

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

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

Form Prepared By: J. Goddard
Work Procedure: Project Procedure CRP-3 Rev 6

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET

This Sheet Applies to
All Zone 4 Test
SJR 12/16/13

BORING: MP-420
DATE: 7-30-13
DATA COLLECTED BY: TOM MCGILL / JIM GODDARD
~~SHUT-IN TEST PRESSURE:~~ N/A SJR 12/16/13 psi

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

NOT USED
SEE PAGE 1
QJ. 7-21-13

7-30-13
QJ.

EQUIPMENT USED

Transducers: Mini Trol Serial Numbers: 335896 (6-12-13) 142142 (6-20-13) 315381 (6-20-~~12~~ 13)
BACKFLOW: MW-7 (6-11-13)
Surface Pressure Gage: MW-4 & MW-5 (6-11-13) THERMOMETER: LT28 (5-1-13)
NITROGEN GAUGE: MW-1 & MW-2 (6-11-13)
Barometric Probe: 121315 (6-12-13)

Flow Meter: 8824788 (FIELD 7-8-13)

Stop Watch: L286 (6-10-13)

Date of Calibration: PARENTHESIS

Calibration due: POST TESTING

MP-420	Z4	(B)	2013-07-30	09.33.15	WSL
MP-420	Z4	(B)	2013-07-30	09.33.15	EXCEL
MP-420	Z4	(T)	2013-07-30	09.29.05	WSL
MP-420	Z4	(T)	2013-07-30	09.29.05	EXCEL
MP-420	Z4	(M)	2013-07-30	09.30.21	WSL
MP-420	Z4	(M)	2013-07-30	09.30.21	EXCEL
MP-420	Z4	(L)	2013-07-30	09.31.37	WSL
MP-420	Z4	(L)	2013-07-30	09.31.37	EXCEL

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

Form Rev 0 - Reviewed by SJR ~~12-14~~ 12-16-13 SJR

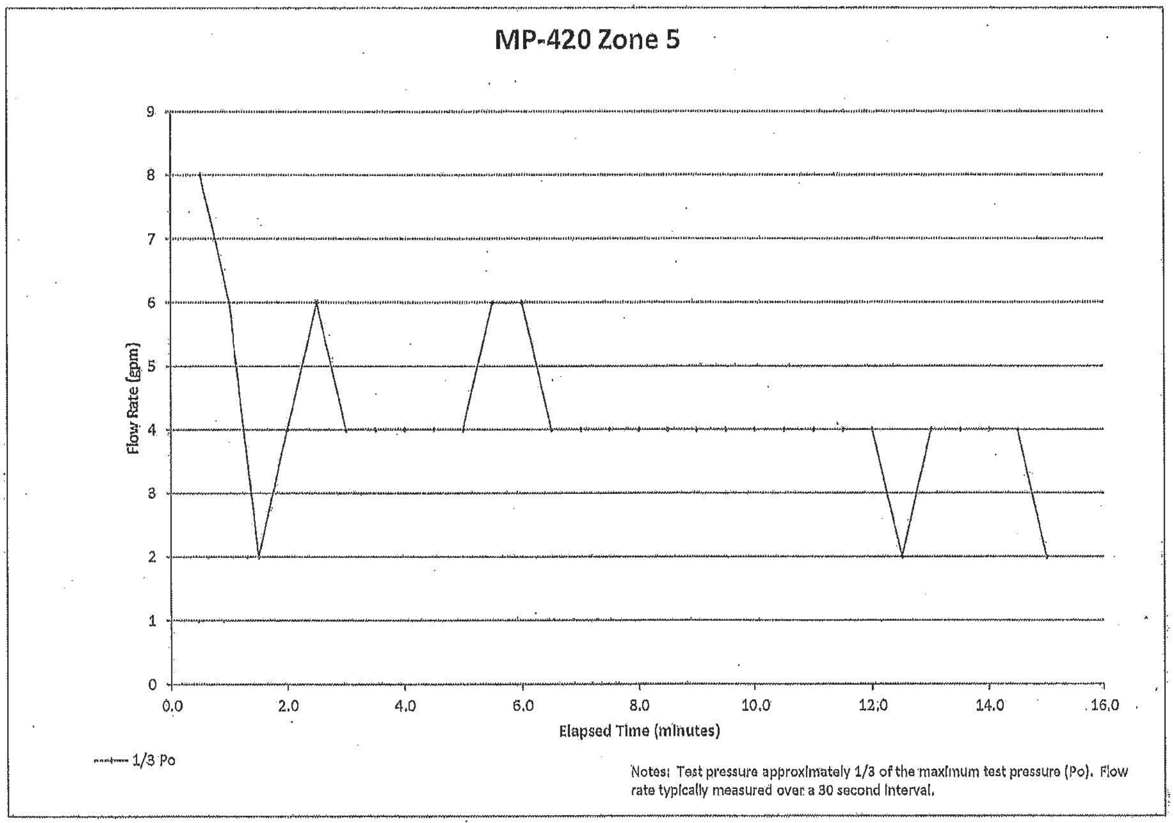
Clinch River SMR Project
Double Packer Borehole Permeability Test Data Sheet
AMEC Environment & Infrastructure, Inc.
AMEC Project # 6468-13-1072

Prepared by: CDT Date: 4-8-14
Checked by: JBL Date: 4-8-14

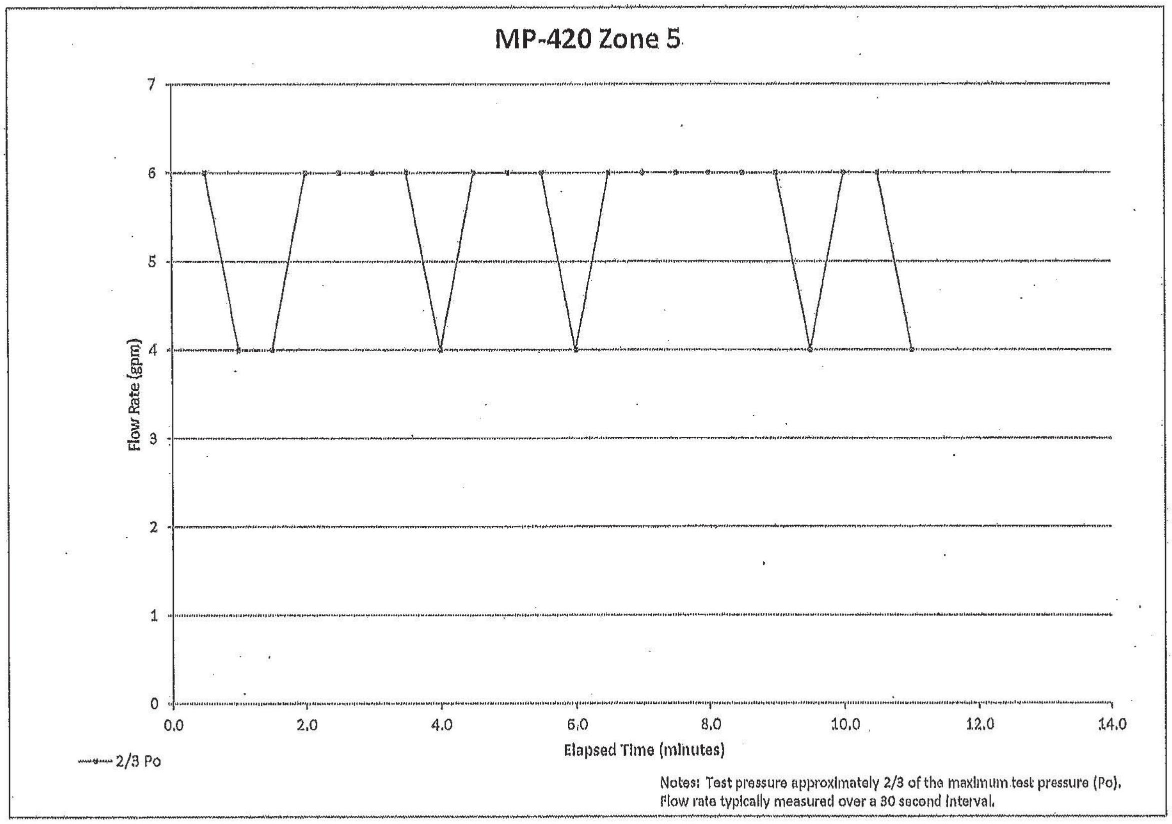
Boring: MP-420
Zone: Z5 **166.0 feet to 173.5 feet below ground surface**
Transducer Location: Middle

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)
11:51:30	0.0	61.74		12:10:00	0.0	106.21		12:24:00	0.0	146.00	
11:52:00	0.5	81.64	8	12:10:30	0.5	106.14	6	12:24:30	0.5	157.37	6
11:52:30	1.0	77.27	6	12:11:00	1.0	126.83	4	12:25:00	1.0	162.52	6
11:53:00	1.5	99.49	2	12:11:30	1.5	127.59	4	12:25:30	1.5	164.66	6
11:53:30	2.0	100.15	4	12:12:00	2.0	136.42	6	12:26:00	2.0	178.55	6
11:54:00	2.5	101.13	6	12:12:30	2.5	141.37	6	12:26:30	2.5	180.34	8
11:54:30	3.0	104.89	4	12:13:00	3.0	140.85	6	12:27:00	3.0	180.75	8
11:55:00	3.5	105.17	4	12:13:30	3.5	143.70	6	12:27:30	3.5	187.20	10
11:55:30	4.0	106.06	4	12:14:00	4.0	147.81	4	12:28:00	4.0	189.44	4
11:56:00	4.5	105.43	4	12:14:30	4.5	147.95	6	12:28:30	4.5	190.21	8
11:56:30	5.0	106.42	4	12:15:00	5.0	148.84	6	12:29:00	5.0	187.55	8
11:57:00	5.5	107.22	6	12:15:30	5.5	150.20	6	12:29:30	5.5	189.76	6
11:57:30	6.0	107.47	6	12:16:00	6.0	149.82	4	12:30:00	6.0	189.43	8
11:58:00	6.5	108.07	4	12:16:30	6.5	147.42	6	12:30:30	6.5	190.67	8
11:58:30	7.0	***105.89***	4	12:17:00	7.0	146.45	6	12:31:00	7.0	189.77	6
11:59:00	7.5	105.85	4	12:17:30	7.5	144.86	6				
11:59:30	8.0	106.58	4	12:18:00	8.0	146.86	6				
12:00:00	8.5	107.07	4	12:18:30	8.5	145.81	6				
12:00:30	9.0	107.41	4	12:19:00	9.0	144.83	6				
12:01:00	9.5	106.25	4	12:19:30	9.5	146.50	4				
12:01:30	10.0	106.72	4	12:20:00	10.0	146.54	6				
12:02:00	10.5	106.87	4	12:20:30	10.5	144.92	6				
12:02:30	11.0	107.37	4	12:21:00	11.0	146.54	4				
12:03:00	11.5	107.09	4	12:21:30	11.5	no reading					
12:03:30	12.0	105.58	4								
12:04:00	12.5	105.88	2								
12:04:30	13.0	105.53	4								
12:05:00	13.5	105.22	4								
12:05:30	14.0	106.24	4								
12:06:00	14.5	106.37	4								
12:06:30	15.0	105.72	2								

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)
12:34:30	0.0	190.07		12:45:00	0.0	127.11	
12:35:00	0.5	139.66	6	12:45:30	0.5	191.85	10
12:35:30	1.0	132.02	2	12:46:00	1.0	191.87	6
12:36:00	1.5	131.93	4	12:46:30	1.5	192.72	8
12:36:30	2.0	131.76	6	12:47:00	2.0	187.59	6
12:37:00	2.5	129.36	4	12:47:30	2.5	190.12	6
12:37:30	3.0	129.09	4	12:48:00	3.0	189.13	4
12:38:00	3.5	129.80	4	12:48:30	3.5	188.68	8
12:38:30	4.0	125.34	4	12:49:00	4.0	189.07	10
12:39:00	4.5	***125.10***	6	12:49:30	4.5	190.48	6
12:39:30	5.0	125.76	4	12:50:00	5.0	188.82	6
12:40:00	5.5	125.99	4	12:50:30	5.5	188.62	8
12:40:30	6.0	125.32	4	12:51:00	6.0	190.22	8
12:41:00	6.5	***125.70***	4				
12:41:30	7.0	125.93	4				



Notes: Test pressure approximately 1/3 of the maximum test pressure (Po). Flow rate typically measured over a 30 second interval.

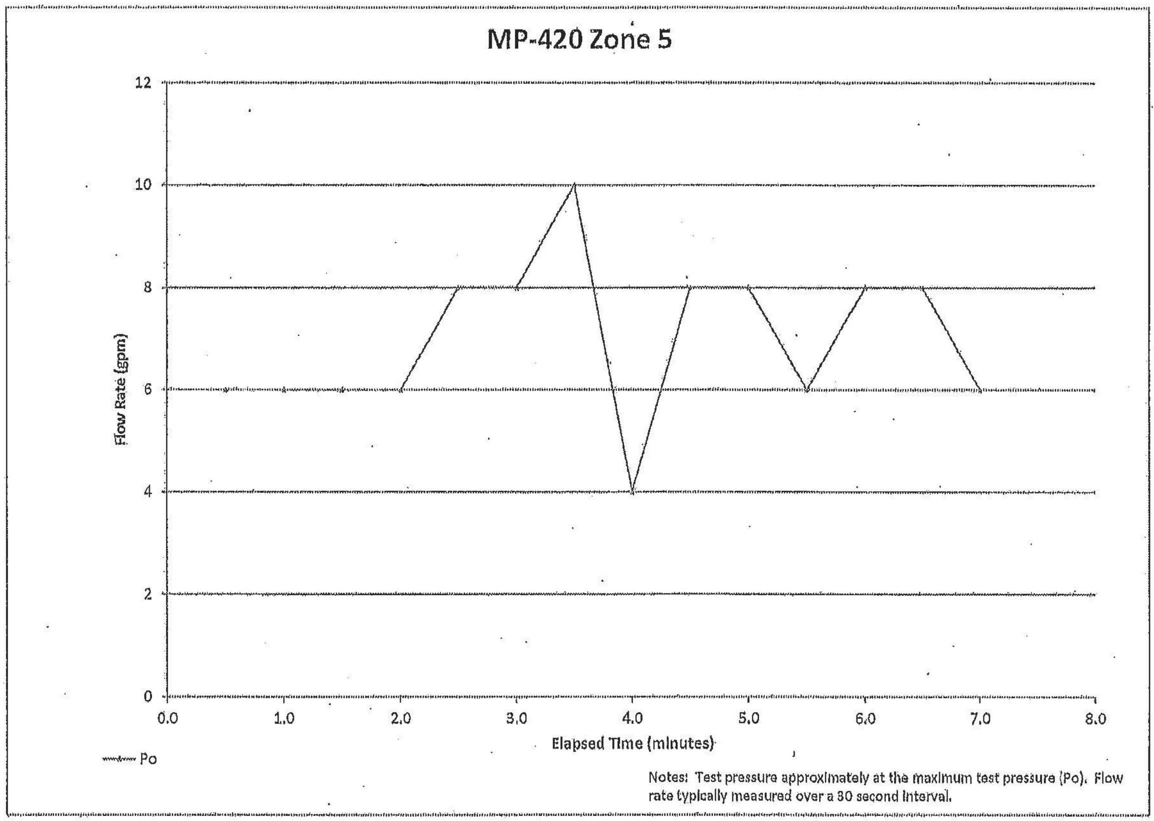


Notes: Test pressure approximately 2/3 of the maximum test pressure (Po). Flow rate typically measured over a 30 second interval.

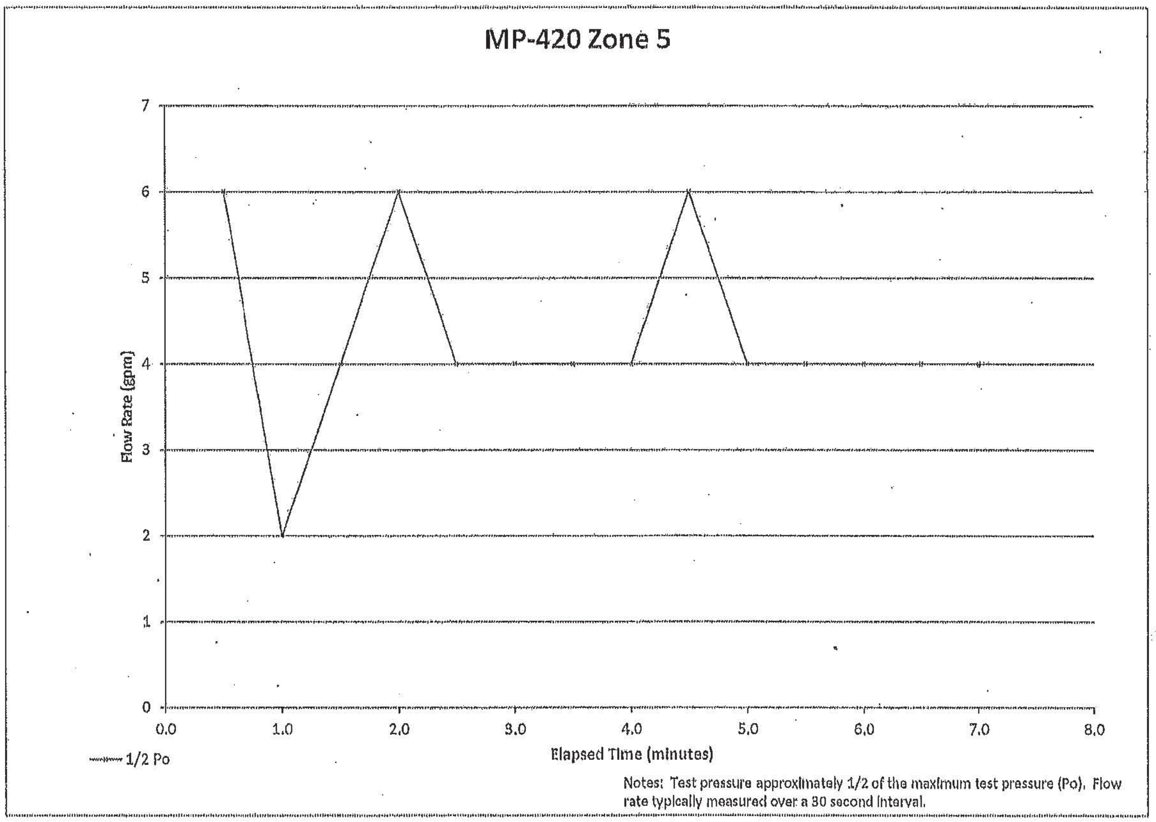
1/4/19 KML

Prepared by/Date: KML ~~1/14/19~~

Checked by/Date: JBB 1/12/18

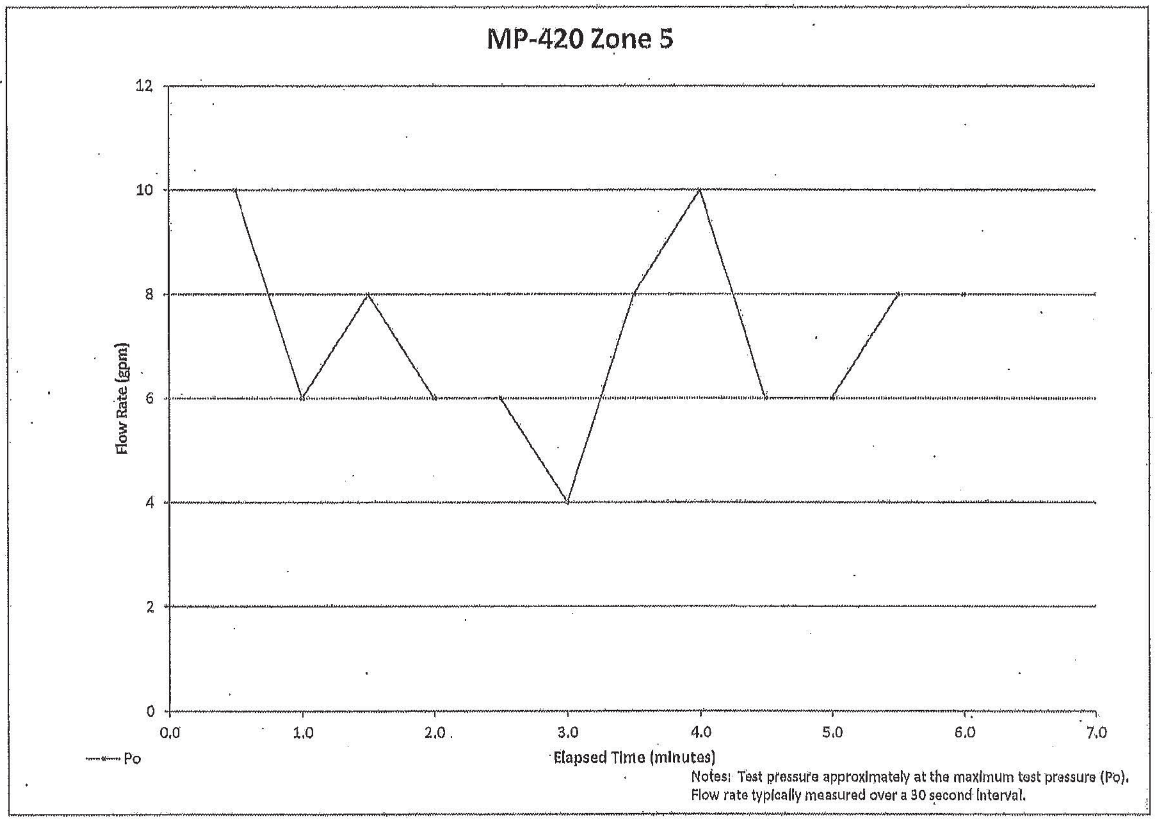


Notes: Test pressure approximately at the maximum test pressure (Po). Flow rate typically measured over a 30 second interval.



Notes: Test pressure approximately 1/2 of the maximum test pressure (Po). Flow rate typically measured over a 30 second interval.

Prepared by/Date: KHC 1/4/14 ~~1/14/14~~ KHL
Checked by/Date: 1/12/14



Notes: Test pressure approximately at the maximum test pressure (Po).
Flow rate typically measured over a 30 second interval.

Prepared by/Date: KHL 1/4/14
Checked by/Date: 2/12/14

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: 7-25-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5*

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z5 Test length: 7.5 Test Section Depth (from Datum): From 166.66 To 174.16

(A) Depth to Water Table From Datum, Ft: 58.00 Test Water Temp: 73°F Baro Pressure, psi: 14.34

WELL WATER TEMP 64°F (18.05°C)

(B) Surface Gage Height Above Datum, Ft. 1.90 Depth to Center of Test Interval From Datum, Ft: 170.41

(C) Distance Water Table to Center of Test Interval Ft. 112.41 Static water pressure at center = (C*62.4/144) + Baro = 63

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 124] 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 = 41; 2/3 Po = 83; 1/2 Po = 62 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z5 Sequence No. A Planned Center Pressure: 104

Transducer Readings Before Packers Inflated: Top 19.37; Middle 62.31; Bottom: 66.12

Transducer Readings After Packers Inflated: Top 19.80; Middle 61.74; Bottom: 65.55

MP-420 Z5 SEQUENCE A

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
11:51:30	23888	----	----	----	61.74	0	BEGIN IF (INCREASE FLOW)
11:52:00	23 888	23 892	4	8	81.64	0	
11:52:30	23 892	23 895	3	6	77.27	15	
11:53:00	23 895	23 891	1	2	99.49	18	
11:53:30	23 896	23 898	2	4	100.15	18	IF
11:54:00	23 898	23 901	3	6	101.13	21	
11:54:30	23 901	23 903	2	4	104.89	21	
11:55:00	23 903	23 905	2	4	105.17	21	
11:55:30	23 905	23 907	2	4	106.06	21	
11:56:00	23 907	23 909	2	4	105.43	21	
11:56:30	23 909	23 911	2	4	106.42	21	
11:57:00	23 911	23 914	3	6	107.22	21	
11:57:30	23 914	23 917	3	6	107.47	21	DF (DECREASE FLOW)
11:58:00	23 917	23 919	2	4	108.07	19	
11:58:30	23 919	23 921	2	4	105.89	19	
11:59:00	23 921	23 923	2	4	105.85	19	
11:59:30	23 923	23 925	2	4	106.58	19	
12:00:00	23 925	23 927	2	4	107.07	19	

*From Preliminary Boring Layout Survey

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

Form Rev 0 - Reviewed by 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. 6488-13-1072 DATE: 7-25-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5*

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z5 Test length: 7.5 Test Section Depth (from Datum): From 166.66 To 174.16

(A) Depth to Water Table From Datum, Ft: 58.00

Test Water Temp: 73°F Baro Pressure, psi: 14.34

Well Water Temp 64°F (18.05°C)

(B) Surface Gage Height Above Datum, Ft. 1.90

Depth to Center of Test Interval From Datum, Ft: 170.41

(C) Distance Water Table to Center of Test Interval Ft. 112.41 Static water pressure at center = (C*62.4/144) + Baro = 63

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 124] 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 = 41; 2/3 Po = 83; 1/2 Po = 62 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z5 Sequence No. A Planned Center Pressure: 104

Transducer Readings Before Packers Inflated: Top 19.37; Middle 62.31; Bottom: 66.12

Transducer Readings After Packers Inflated: Top 19.80; Middle 61.74; Bottom: 65.55

MP-420 Z5 SEQUENCE A (CONT'D)

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
12:00:30	23 927	23 929	2	4	107.41	19	DF
12: 01 00	23 929	23 931	2	4	106.25	18	
12	23 931	23 933	2	4	106.72	18	
12 02 00	23 933	23 935	2	4	106.87	18	
12 02:30	23 935	23 937	2	4	107.37	18	DF
12:03 00	23 937	23 939	2	4	107.09	17	
12:03:30	23 939	23 941	2	4	105.58	17	
12:04 00	23 941	23 942	1	2	105.88	17	
12:04:30	23 942	23 944	2	4	105.53	17	
12:05:00	23 944	23 946	2	4	105.22	17	
12:05:30	23 946	23 948	2	4	106.24	17	
12:06:00	23 948	23 950	2	4	106.37	17	
12:06:30	23 950	23 951	1	2	105.72	17	END
				12:07:16	Bottom	Trans =	68.39
				12:07:48	Top	Trans =	21.21

*From Preliminary Boring Layout Survey

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

Form Rev 0 - Reviewed by STR 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: 7-25-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z5 Test length: 7.5 Test Section Depth (from Datum): From 166.66 To 174.16

(A) Depth to Water Table From Datum, Ft: 58.00 Test Water Temp: 73°F Baro Pressure, psi: 14.34

WELL WATER TEMP 64°F (18.05°C)

(B) Surface Gage Height Above Datum, Ft. 1.90 Depth to Center of Test Interval From Datum, Ft: 170.41

(C) Distance Water Table to Center of Test interval Ft: 112.41 Static water pressure at center = (C*62.4/144) + Baro = 63

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 124] 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 = 41; 2/3 Po = 83; 1/2 Po = 62 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z5 Sequence No. B Planned Center Pressure: 146

Transducer Readings Before Packers Inflated: Top 19.37; Middle 62.31; Bottom: 66.12

Transducer Readings After Packers Inflated: Top 19.80; Middle 61.74; Bottom: 65.55

MP-420 Z5 SEQUENCE B

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
12:10:00	23964	----	----	----	106.21	17	BEGIN (INCREASE FLOW)
12:10:30	23 964	23-967	3	6	106.14	17	
12:11:00	23 967	23 969	2	4	126.83	39	
12:11:30	23 969	23 971	2	4	127.59	39	IF
12:12:00	23 971	23 974	3	6	136.42	51	
12:12:30	23 974	23 977	3	6	141.37	52	IF
12:13:00	23 977	23 980	3	6	140.85	52	
12:13:30	23 980	23 983	3	6	143.70	57	
12:14:00	23 983	23 985	2	4	147.81	58	
12:14:30	23 985	23 988	3	6	147.95	59	
12:15:00	23 988	23 991	3	6	148.84	59	DF
12:15:30	23 991	23 994	3	6	150.20	60	DF
12:16:00	23 994	23 996	2	4	149.82	56	
12:16:30	23 996	23 999	3	6	147.42	56	
12:17:00	23 999	24 002	3	6	146.45	56	
12:17:30	24 002	24 005	3	6	144.86	56	
12:18:00	24 005	24 008	3	6	146.86	56	
12:18:30	24 008	24 011	3	6	14581	56	

*From Preliminary Boring Layout Survey

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

Form Rev 0 - Reviewed by SSL 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: 7-25-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z5 Test length: 7.5 Test Section Depth (from Datum): From 166.66 To 174.16

(A) Depth to Water Table From Datum, Ft: 58.00 Test Water Temp: 73°F Baro Pressure, psi: 14.34

WELL WATER TEMP 64°F (18.05°C)

(B) Surface Gage Height Above Datum, Ft. 1.90 Depth to Center of Test Interval From Datum, Ft: 170.41

(C) Distance Water Table to Center of Test Interval Ft. 112.41 Static water pressure at center = (C*62.4/144) + Baro = 63

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 124] 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 = 41; 2/3 Po= 83; 1/2 Po= 62 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z5 Sequence No. B Planned Center Pressure: 146

Transducer Readings Before Packers Inflated: Top 19.37; Middle 62.31; Bottom: 66.12

Transducer Readings After Packers Inflated: Top 19.80; Middle 61.74; Bottom: 65.55

MP-420 Z5 SEQUENCE B (CONT'D)

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
12:19:00	24 011	24 014	3	6	144.83	56	
12:19:30	24 014	24 016	2	4	146.50	56	
12:20:00	24 016	24 019	3	6	146.54	56	
12:20:30	24 019	24 022	3	6	144.92	56	
12:21:00	24 022	24 024	2	4	146.54	56	END
12:21:34							
				12:21:56	BOTTOM	TRANS =	69.97
				12:22:31	TOP	TRANS =	22.01

*From Preliminary Boring Layout Survey

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

Form Rev 0 - Reviewed by SJL 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: 7-25-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z5 Test length: 7.5 Test Section Depth (from Datum): From 166.66 To 174.16

(A) Depth to Water Table From Datum, Ft: 58.00 Test Water Temp: 73°F Baro Pressure, psi: 14.34

WELL WATER TEMP 64°F (18.05°C)

(B) Surface Gage Height Above Datum, Ft. 1.90 Depth to Center of Test Interval From Datum, Ft: 170.41

(C) Distance Water Table to Center of Test Interval Ft. 112.41 Static water pressure at center = (C*62.4/144) + Baro = 63

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 124] 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 = 41; 2/3 Po= 83; 1/2 Po= 62 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z5 Sequence No. C Planned Center Pressure: 187

Transducer Readings Before Packers Inflated: Top 19.37; Middle 62.31; Bottom: 66.12

Transducer Readings After Packers Inflated: Top 19.80; Middle 61.74; Bottom: 65.55

MP-420 Z5 SEQUENCE C

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
12:24:00	24 040	----	----	----	146.00	56	BEGIN IF (INCREASE FLOW)
12:24:30	24 040	24 043	3	6	157.37	74	
12:25:00	24 043	24 046	3	6	162.52	75	IF
12:25:30	24 046	24 049	3	6	164.66	75	
12:26:00	24 049	24 ~~062~~ 052	3	6	178.55	92	
12:26:30	24 052	24 056	4	8	180.34	92	IF
12:27:00	24 056	24 060	4	8	180.75	100	
12:27:30	24 060	24 065	5	10	187.20	100	
12:28:00	24 065	24 067	2	4	189.44	100	
12:28:30	24 067	24 071	4	8	190.21	100	
12:29:00	24 071	24 075	4	8	187.55	101	
12:29:30	24 075	24 078	3	6	189.76	101	
12:30:00	24 078	24 082	4	8	189.43	101	
12:30:30	24 082	24 086	4	8	190.67	102	
12:31:00	24 086	24 089	3	6	189.77	102	END
				12:31:49	BOTTOM	TRANS =	71.72
				12:32:25	TOP	TRANS =	22.77

GDS 7-25-13

*From Preliminary Boring Layout Survey

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

Form Rev 0 - Reviewed by SJZ 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: 7-25-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z5 Test length: 7.5 Test Section Depth (from Datum): From 166.66 To 174.16

(A) Depth to Water Table From Datum, Ft: 58.00 Test Water Temp: 73°F Baro Pressure, psi: 14.34

WELL WATER TEMP 64°F (18.05°C)

(B) Surface Gage Height Above Datum, Ft. 1.90 Depth to Center of Test Interval From Datum, Ft: 170.41

(C) Distance Water Table to Center of Test Interval Ft. 112.41 Static water pressure at center = (C*62.4/144) + Baro = 63

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 124] 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 = 41 ; 2/3 Po= 83 ; 1/2 Po= 62 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z5 Sequence No. D Planned Center Pressure: 125

Transducer Readings Before Packers Inflated: Top 19.37 ; Middle 62.31 ; Bottom: 66.12

Transducer Readings After Packers Inflated: Top 19.80 ; Middle 61.74 ; Bottom: 65.55

MP-420 Z5 SEQUENCE D

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
12:34:30	24 114	----	----	----	190.07	102	BEGIN DF (DECREASE FLOW)
12:35:00	24 114	24 117	3	6	139.66	41	
12:35:30	24 117	24 118	1	2	132.02	41	
12:36:00	24 118	24 120	2	4	131.93	41	DF
12:36:30	24 120	24 123	3	6	131.76	38	
12:37:00	24 123	24 125	2	4	129.36	38	
12:37:30	24 125	24 127	2	4	129.07	38	
12:38:00	24 127	24 129	2	4	129.80	38	DF
12:38:30	24 129	24 131	2	4	125.34	35	
12:39:00	24 131	24 134	3	6	125.10	35	
12:39:30	24 134	24 136	2	4	125.76	35 ~~36~~	QD 7-25-13
12:40:00	24 136	24 138	2	4	125.99	35	
12:40:30	24 138	24 140	2	4	125.32	35	
12:41:00	24 140	24 142	2	4	125.70	35	
12:41:30	24 142	24 144	2	4	125.93	35	END
				12:42:07	BOTTOM	TRANS =	69.47
				12:42:37	TOP	TRANS =	22.24

*From Preliminary Boring Layout Survey

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

Form Rev 0 - Reviewed by SSL 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: 7-25-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z5 Test length: 7.5 Test Section Depth (from Datum): From 166.66 To 174.16

(A) Depth to Water Table From Datum, Ft: 58.00 Test Water Temp: 73°F Baro Pressure, psi: 14.34

WELL WATER TEMP 64°F (18.03°C)

(B) Surface Gage Height Above Datum, Ft. 1.90 Depth to Center of Test Interval From Datum, Ft: 170.41

(C) Distance Water Table to Center of Test Interval Ft. 112.41 Static water pressure at center = (C*62.4/144) + Baro = 63

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 124] 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 = 41; 2/3 Po = 83; 1/2 Po = 62 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z5 Sequence No. E Planned Center Pressure: 187

Transducer Readings Before Packers Inflated: Top 19.37; Middle 62.31; Bottom: 66.12

Transducer Readings After Packers Inflated: Top 79.80; Middle 61.74; Bottom: 65.55

MP-420 Z5 SEQUENCE E

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
12:45:00	24 158	----	----	----	127.11	35	BEGIN IF (INCREASE FLOW)
12:45:30	24 158	24 163	5	10	191.85	101	
12:46:00	24 163	24 166	3	6	191.87	101	DF
12:46:30	24 166	24 170	4	8	192.72	101	
12:47:00	24 170	24 173	3	6	187.59	100	
12:47:30	24 173	24 176	3	6	190.12	100	
12:48:00	24 176	24 178	2	4	189.13	100	
12:48:30	24 178	24 182	4	8	188.68	100	
12:49:00	24 182	24 187	5	10	189.07	100	
12:49:30	24 187	24 190	3	6	190.48	100	
12:50:00	24 190	24 193	3	6	188.82	100	
12:50:30	24 193	24 197	4	8	188.62	100	
12:51:00	24 197	24 201	4	8	190.22	100	END
				12:51:48	BOTTOM	TRANS =	71.78
				12:52:33	TOP	TRANS =	22.87

*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 12-16-17

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET

Page 2

This Sheet Applies to
All Zone 5 Tests
SJC 12-16-13

BORING: MP-420

DATE: 7-25-13

DATA COLLECTED BY: TOM MCGILL / JIM GODDARD

~~SHUT-IN TEST PRESSURE:~~ N/A SJC 12-16-13 psi

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

NOT USED
SEE PAGE 1
QJD 7-21-13

EQUIPMENT USED

Transducers: Mini Trol Serial Numbers: 142142 (6-20-13) 315381 (6-20-13)
335896 (6-12-13)

BACKFLOW GAUGE: MW-3 (6-11-13)

Surface Pressure Gage: MW-4 & MW-5 (6-11-13)

THERMOMETER: L728 (5-1-13)

NITROGEN GAUGE: MW-1 & MW-2 (6-11-13)

Barometric Probe: 121315 (6-12-13)

Flow Meter: 8824788 (FIELD 7-8-13)

Stop Watch: L286 (6-10-13)

Date of Calibration: PARENTHESIS

Calibration due: POST TESTING

MP-420	Z5	(B)	2013-07-25	12,58,06	WSL
MP-420	Z5	(B)	2013-07-25	12,58,06	EXCEL
MP-420	Z5	(T)	2013-07-25	12,53,23	WSL
MP-420	Z5	(T)	2013-07-25	12,53,23	EXCEL
MP-420	Z5	(M)	2013-07-25	12,54,58	WSL
MP-420	Z5	(M)	2013-07-25	12,54,58	EXCEL
MP-420	Z5	(L)	2013-07-25	12,56,53	WSL
MP-420	Z5	(L)	2013-07-~~26~~ 25	12,56,53	EXCEL

QJD 7-25-13

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

Form Rev 0 - Reviewed by SJC - 12-16-13

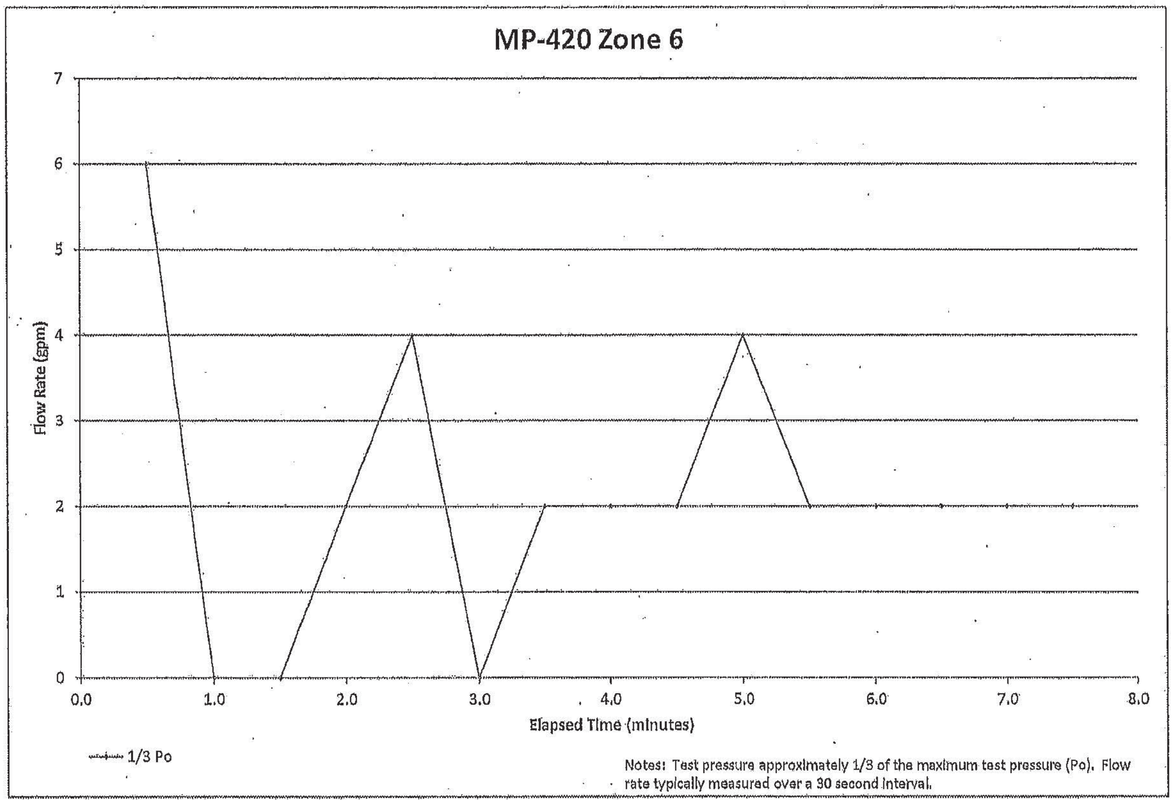
Clinch River SMR Project
Double Packer Borehole Permeability Test Data Sheet
AMEC Environment & Infrastructure, Inc.
AMEC Project # 6468-13-1072

Prepared by: CDT Date: 4-8-14
Checked by: JOJ Date: 4-8-14

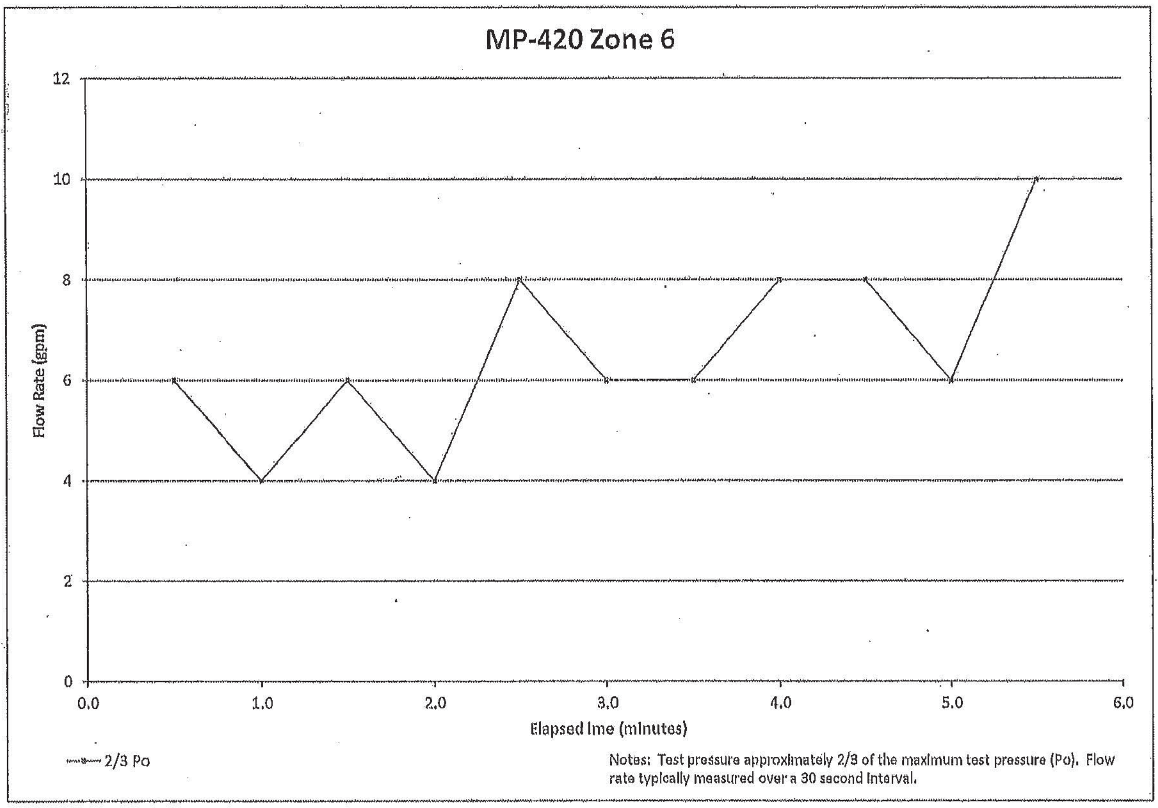
Boring: MP-420
Zone: Z6 ***186.0 feet to 193.5 feet below ground surface***
Transducer Location: Middle

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)
10:00:00	0.0	70.07		10:11:00	0.0	117.53		10:19:30	0.0	163.17	
10:00:30	0.5	74.76	6	10:11:30	0.5	143.72	6	10:20:00	0.5	184.15	8
10:01:00	1.0	94.34	0	10:12:00	1.0	145.51	4	10:20:30	1.0	185.22	6
10:01:30	1.5	104.08	0	10:12:30	1.5	145.48	6	10:21:00	1.5	181.90	10
10:02:00	2.0	103.08	2	10:13:00	2.0	160.43	4	10:21:30	2.0	196.20	6
10:02:30	2.5	113.06	4	10:13:30	2.5	163.36	8	10:22:00	2.5	195.79	8
10:03:00	3.0	114.35	0	10:14:00	3.0	163.67	6	10:22:30	3.0	203.82	14
10:03:30	3.5	114.26	2	10:14:30	3.5	162.89	6	10:23:00	3.5	205.13	6
10:04:00	4.0	116.47	2	10:15:00	4.0	162.13	8	10:23:30	4.0	207.99	12
10:04:30	4.5	116.21	2	10:15:30	4.5	161.90	8	10:24:00	4.5	207.24	12
10:05:00	5.0	116.66	4	10:16:00	5.0	162.94	6	10:24:30	5.0	206.79	10
10:05:30	5.5	116.65	2	10:16:30	5.5	163.79	10	10:25:00	5.5	206.66	12
10:06:00	6.0	116.58	2					10:25:30	6.0	206.50	12
10:06:30	6.5	116.61	2					10:26:00	6.5	205.91	12
10:07:00	7.0	117.12	2					10:26:30	7.0	210.58	14
10:07:30	7.5	116.65	2					10:27:00	7.5	209.64	12
								10:27:30	8.0	209.86	14
								10:28:00	8.5	209.68	12
								10:28:30	9.0	208.54	12
								10:29:00	9.5	207.25	14
								10:29:30	10.0	208.11	8
								10:30:00	10.5	208.68	10
								10:30:30	11.0	208.87	14
								10:31:00	11.5	205.48	16
								10:31:30	12.0	205.46	12
								10:32:00	12.5	208.21	12
								10:32:30	13.0	207.90	12
								10:33:00	13.5	207.87	12
								10:33:30	14.0	207.46	14
								10:34:00	14.5	207.95	14

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)
10:41:00	0.0	204.46		10:51:30	0.0	139.92	
10:41:30	0.5	146.89	14	10:52:00	0.5	201.43	14
10:42:00	1.0	146.87	10	10:52:30	1.0	203.57	16
10:42:30	1.5	146.70	10	10:53:00	1.5	207.72	16
10:43:00	2.0	142.07	10	10:53:30	2.0	209.52	16
10:43:30	2.5	142.15	10	10:54:00	2.5	209.89	14
10:44:00	3.0	140.50	10	10:54:30	3.0	209.15	12
10:44:30	3.5	140.19	10	10:55:00	3.5	209.65	14
10:45:00	4.0	140.60	10	10:55:30	4.0	209.83	16
10:45:30	4.5	140.01	10	10:56:00	4.5	209.01	16
10:46:00	5.0	140.14	10	10:56:30	5.0	209.27	16
10:46:30	5.5	140.43	8	10:57:00	5.5	210.08	14
10:47:00	6.0	140.22	10	10:57:30	6.0	209.11	10
10:47:30	6.5	140.36	10				

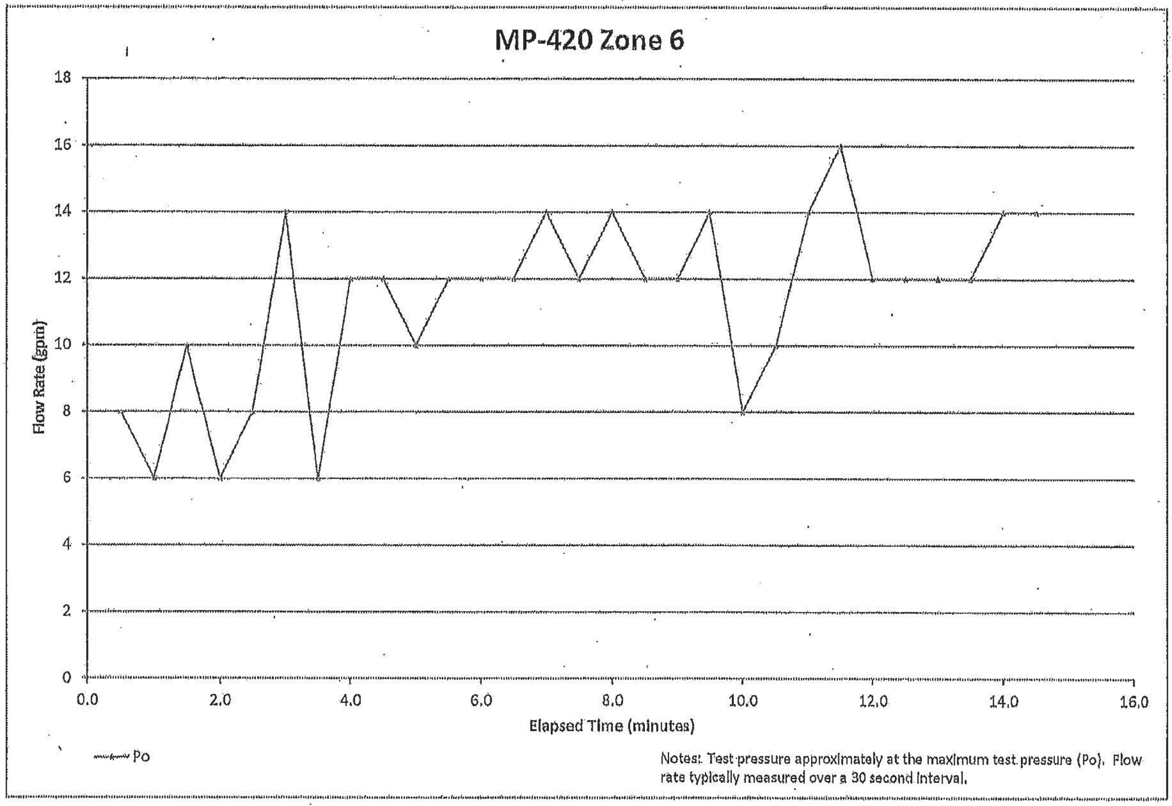


Notes: Test pressure approximately 1/3 of the maximum test pressure (Po). Flow rate typically measured over a 30 second interval.

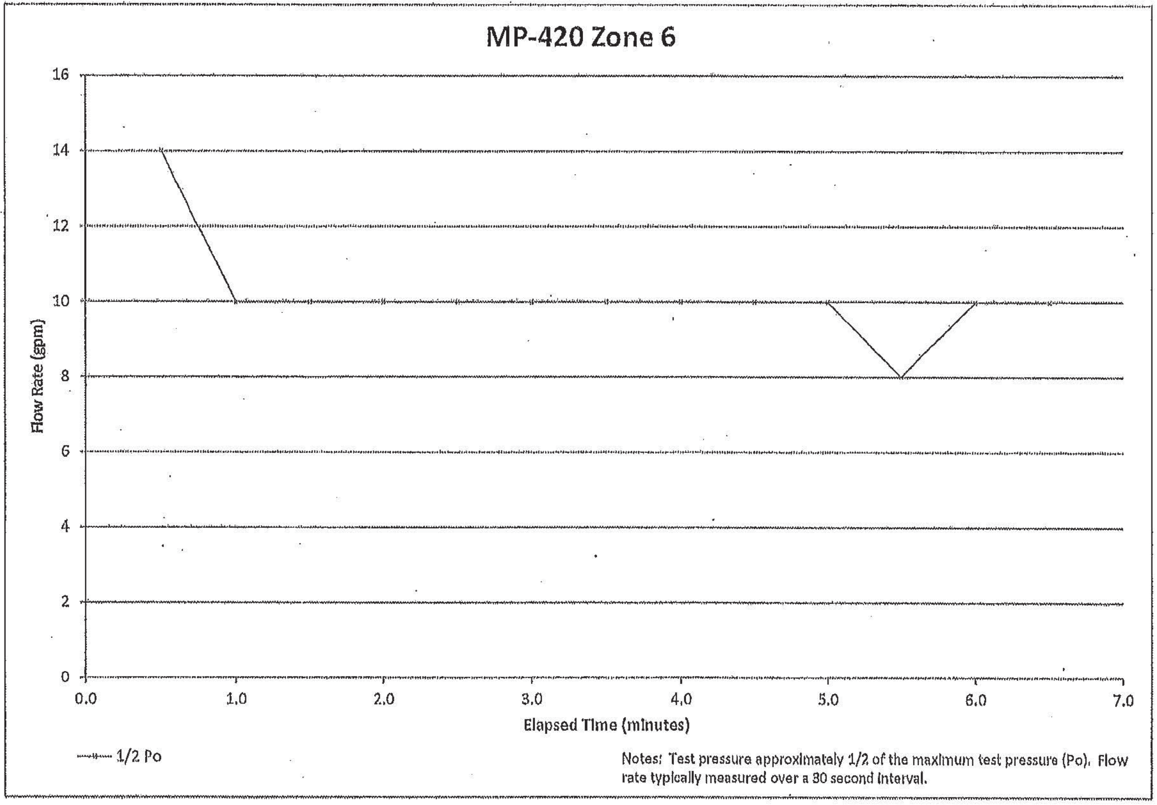


Notes: Test pressure approximately 2/3 of the maximum test pressure (Po). Flow rate typically measured over a 30 second interval.

Prepared by/Date: KAZ 1/9/14
Checked by/Date: DCJ 1/10/14

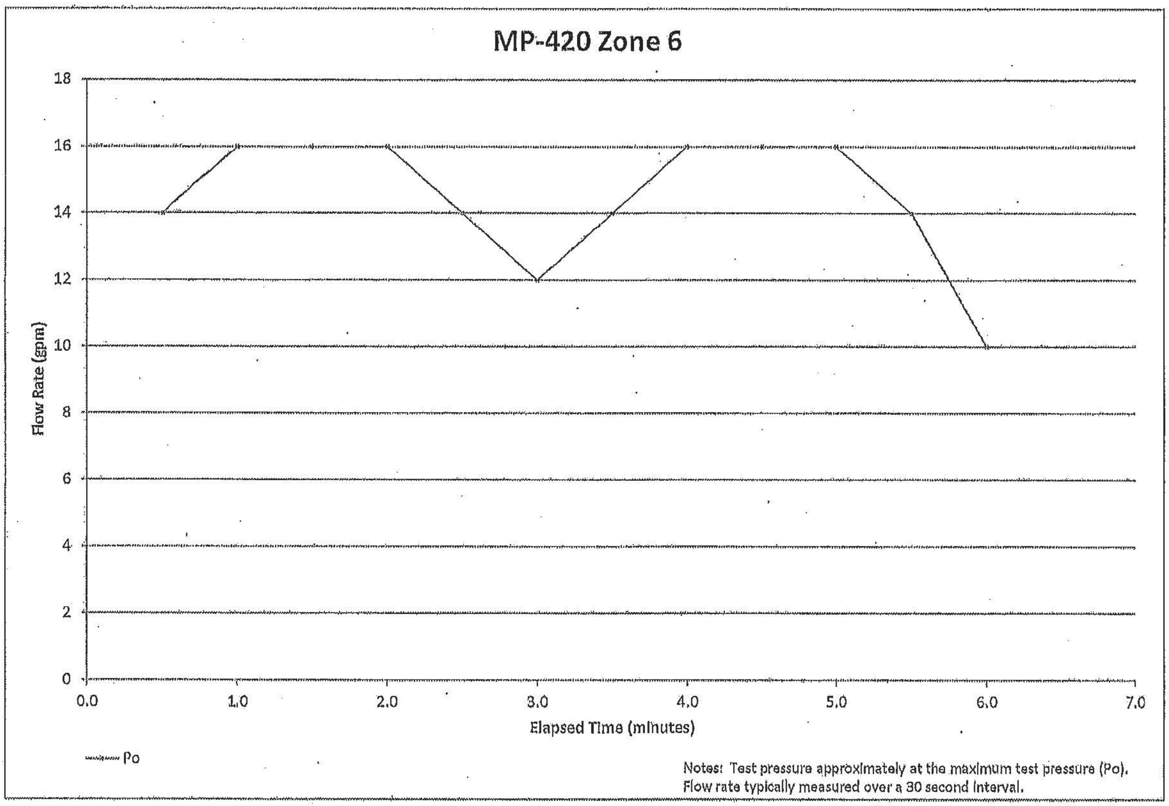


Notes: Test pressure approximately at the maximum test pressure (Po). Flow rate typically measured over a 30 second interval.



Notes: Test pressure approximately 1/2 of the maximum test pressure (Po). Flow rate typically measured over a 30 second interval.

Prepared by/Date: KHC 1/4/14
Checked by/Date: JO2 1/12/14



Notes: Test pressure approximately at the maximum test pressure (Po). Flow rate typically measured over a 30 second interval.

Prepared by/Date: KAZ 1/4/14
Checked by/Date: JAJ 1/2/14

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: 7-25-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z6 Test length: 7.5 Test Section Depth (from Datum): From 186.66 To 194.16

(A) Depth to Water Table From Datum, Ft: 60.15 Test Water Temp: 70°F Baro Pressure, psi: 14.35

WELL WATER TEMP 59°F (15.12°C)

(B) Surface Gage Height Above Datum, Ft. 1.90 Depth to Center of Test Interval From Datum, Ft: 190.41

(C) Distance Water Table to Center of Test Interval Ft. 130.26 Static water pressure at center = (C*62.4/144) + Baro = 71

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 136] 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 = 45; 2/3 Po= 91; 1/2 Po= 68 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z6 Sequence No. A Planned Center Pressure: 116

Transducer Readings Before Packers Inflated: Top 20.86; Middle 70.04; Bottom: 73.88

Transducer Readings After Packers Inflated: Top 22.92 Middle 70.08; Bottom: 73.80

MP-420 Z 6 SEQUENCE A

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
10:00:00	23327	----	----	----	70.07	0	BEGIN (INCREASE IF FLOW)
10:00:30	23327	23 330	3	6	74.76	0	
10:01:00	23 330	23 330	0	0	94.34	17	
10:01:30	23 330	23 330	0	0	104.08	17	
10:02:00	23 330	23 331	1	2	103.08	17	IF
10:02:30	23 331	23 333	2	4	113.06	26	
10:03:00	23 333	23 333	0	0	114.35	26	IF
10:03:30	23 333	23 334	1	2	114.26	28	
10:04:00	23 334	23 335	1	2	116.47	28	
10:04:30	23 335	23 336	1	2	116.21	28	
10:05:00	23 336	23 338	2	4	116.66	27	
10:05:30	23 338	23 339	1	2	116.65	27	
10:06:00	23 339	23 340	1	2	116.58	28	
10:06:30	23 340	23 341	1	2	116.61	28	
10:07:00	23 341	23 342	1	2	117.12	28	
10:07:30	23 342	23 343	1	2	116.65	28	END
				10:08:03	BOTTOM	TRANS	= 74.13
				10:08:36	TOP	TRANS	= 24.55

*From Preliminary Boring Layout Survey

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

Form Rev 0 - Reviewed by STC 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: 7-25-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z6 Test length: 7.5 Test Section Depth (from Datum): From 186.66 To 194.16

(A) Depth to Water Table From Datum, Ft: 60.15 Test Water Temp: 70°F Baro Pressure, psi: 14.35

WELL WATER TEMP 59°F (15.12°C)

(B) Surface Gage Height Above Datum, Ft. 1.90 Depth to Center of Test Interval From Datum, Ft: 190.41

(C) Distance Water Table to Center of Test Interval Ft. 130.26 Static water pressure at center = (C*62.4/144) + Baro = 71

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 136] 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 = 45; 2/3 Po= 91; 1/2 Po= 68 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z6 Sequence No. B Planned Center Pressure: 162

Transducer Readings Before Packers Inflated: Top 20.86; Middle 70.04; Bottom: 73.88

Transducer Readings After Packers Inflated: Top 22.92; Middle 70.08; Bottom: 73.80

MP-420 Z6 SEQUENCE B

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
10:11:00	23 350	----	----	----	117.53	28	BEGIN IF (INCREASE FLOW)
10:11:30	23 350	23 353	3	6	143.72	53	
10:12:00	23 353	23 355	2	4	145.51	52	IF
10:12:30	23 355	23 358	3	6	145.48	68	
10:13:00	23 358	23 360	2	4	160.43	66	IF
10:13:30	23 360	23 364	4	8	163.36	70	
10:14:00	23 364	23 367	3	6	163.67	69	
10:14:30	23 367	23 370	3	6	162.89	68	
10:15:00	23 370	23 374	4	8	162.13	68	
10:15:30	23 374	23 378	4	8	161.90	68	
10:16:00	23 378	23 381	3	6	162.94	68	
10:16:30	23 381	23 386	5	10	163.79	68	END
				10:17:15	BOTTOM	TRANS	74.76
				10:17:48	TOP	TRANS	28.69

*From Preliminary Boring Layout Survey

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

Form Rev 0 - Reviewed by STC 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: 7-25-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420Z6 Test length: 7.5 Test Section Depth (from Datum): From 186.66 To 194.16

(A) Depth to Water Table From Datum, Ft: 60.15 Test Water Temp: 70°F Baro Pressure, psi: 14.35

WELL WATER TEMP 59°F (15.12°C)

(B) Surface Gage Height Above Datum, Ft. 1.90 Depth to Center of Test Interval From Datum, Ft: 190.41

(C) Distance Water Table to Center of Test Interval Ft. 130.26 Static water pressure at center = (C*62.4/144) + Baro = 71

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 136] 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 = 45; 2/3 Po= 91; 1/2 Po= 68 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420Z6 Sequence No. C Planned Center Pressure: 207

Transducer Readings Before Packers Inflated: Top 20.86; Middle 70.04 Bottom: 73.88

Transducer Readings After Packers Inflated: Top 22.92; Middle 70.08; Bottom: 73.80

MP-420 Z6 SEQUENCE C

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
10:19:30	23 410	----	----	---	163.17	66	BEGIN IF (INCREASE FLOW)
10:20:00	23 410	23 414	4	8	184.15	88	
10:20:30	23 414	23 417	3	6	185.22	88	
10:21:00	23 417	23 422	5	10	181.90	88	IF
10:21:30	23 422	23 428	3	6	196.20	100	
10:22:00	23 428	23 432	4	8	195.79	100	IF
10:22:30	23 432	23 439	7	14	203.92	110	
10:23:00	23 439	23 442	3	6	205.13	110	IF
10:23:30	23 442	23 448	6	12	207.99	~~110~~ 113	7-25-13
10:24:00	23 448	23 454	6	12	207.24	112	
10:24:30	23 454	23 459	5	10	206.79	112	
10:25:00	23 459	23 465	6	12	206.66	112	
10:25:30	23 465	23 471	6	12	206.50	111	~~IF~~ 7-25-13
10:26:00	23 471	23 477	6	12	205.91	110	IF
10:26:30	23 477	23 484	7	14	214.58	115	
10:27:00	23 484	23 490	6	12	209.64	115	
10:27:30	23 490	23 497	7	14	209.86	115	
10:28:00	23 497	23 503	6	12	209.68	115	

*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: 7-25-13

Boring No MP-420 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320 Gnd Elev, Ft: 802.5 *

Casing Height above ground, Ft: 0.66 Elev, Top of Casing, Ft. (Gnd Elev + Casing Height): 803.16 = Datum

TEST ID: MP-420 Z 6 Test length: 7.5 Test Section Depth (from Datum): From 186.66 To 194.16

(A) : Depth to Water Table From Datum, Ft: 60.15 Test Water Temp: 70°F Baro Pressure, psi: 14.35

WELL WATER TEMP 59°F (15.12°C)

(B) Surface Gage Height Above Datum, Ft. 1.90 Depth to Center of Test Interval From Datum, Ft: 190.41

(C) Distance Water Table to Center of Test Interval Ft. 130.26 Static water pressure at center = (C*62.4/144) + Baro = 71

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 136] 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 = 45 ; 2/3 Po = 91 ; 1/2 Po = 68 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-420 Z 6 Sequence No. C Planned Center Pressure: 207

Transducer Readings Before Packers Inflated: Top 20.86 ; Middle 70.04 Bottom: 73.88

Transducer Readings After Packers Inflated: Top 22.92 ; Middle 70.08 ; Bottom: 73.80

MP-420 Z 6 SEQUENCE C (CONT'D)

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
10:28:30	23 503	23 509	6	12	208.54	115	
10:29:00	23 509	23 516	7	14	207.25	115	
10:29:30	23 516	23 520	4	8	208.11	115	
10:30:00	23 520	23 525	5	10	208.68	115	
10:30:30	23 525	23 532	7	14	208.87	115	
10:31:00	23 532	23 540	8	16	205.48	110	IF
10:31:30	23 540	23 546	6	12	205.46	115	
10:32:00	23 546	23 552	6	12	208.21	115	
10:32:30	23 552	23 558	6	12	207.90	115	
10:33:00	23 558	23 564	6	12	207.87	115	
10:33:30	23 564	23 571	7	14	207.46	115	
10:34:00	23 571	23 578	7	14	207.95	115	END
				10:34:42	BOTTOM	TRANS =	75.44
				10:35:30	TOP	TRANS =	30.25

*From Preliminary Boring Layout Survey

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

Form Rev 0 - Reviewed by SJ2 12-16-17