Depth 1m:20m	Orientation	Acoustic and Optical Televiewer Analysis							Caliper
	Tilt (ATV) 0 deg 90 Azimuth (ATV) 0 deg 360 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log 69°	Amplitude-NM Normalized 0° 90° 180° 270° 0° 0 350 Feature Picks 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 1500	Features - True North Orientation 0 90	Freq/meter 0 20	RQD Very Poor Poor Fair Good Excellent	Caliper - min from TT 50 mm 150 Caliper - max from TT 50 mm 150 Caliper - ave from TT 50 mm 150 Breakout
		15.60 16.00 16.40 16.80 17.20 17.60 18.00 18.40 18.80 19.20								

Depth 1m:20m	Orientation	Acoustic and Optical Televiewer Analysis								Caliper
	Tilt (ATV) 0 deg 90 Azimuth (ATV) 0 deg 360 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log 69°	Amplitude-NM Normalized 0° 90° 180° 270° 0° 0 350 Feature Picks 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 1500	Features - True North Orientation 0 90	Freq/meter 0 20	RQD Very Poor Poor Fair Good Excellent	Caliper - min from TT 50 mm 150 Caliper - max from TT 50 mm 150 Caliper - ave from TT 50 mm 150 Breakout
		19.60 20.00 20.40 20.80 21.20 21.60 22.00 22.40 22.80 23.20 23.60								

Depth 1m:20m	Orientation	Acoustic and Optical Televiewer Analysis								Caliper
	Tilt (ATV) 0 deg 90 Azimuth (ATV) 0 deg 360 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log 69°	Amplitude-NM Normalized 0° 90° 180° 270° 0° 0 350 Feature Picks 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 1500	Features - True North Orientation 0 90	Freq/meter 0 20	RQD Very Poor Poor Fair Good Excellent	Caliper - min from TT 50 mm 150 Caliper - max from TT 50 mm 150 Caliper - ave from TT 50 mm 150 Breakout
		24.00 24.40 24.80 25.20 25.60 26.00 26.40 26.80 27.20 27.60								

Depth 1m:20m	Orientation	Acoustic and Optical Televiewer Analysis									Caliper
	Tilt (ATV) 0 deg 90 Azimuth (ATV) 0 deg 360 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log 69°	Amplitude-NM Normalized 0° 90° 180° 270° 0° 0 350 Feature Picks 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 1500	Features - True North Orientation 0 90	Freq/meter 0 20	RQD Very Poor Poor Fair Good Excellent	Caliper - min from TT 50 mm 150 Caliper - max from TT 50 mm 150 Caliper - ave from TT 50 mm 150 Breakout	
		28.00 28.40 28.80 29.20 29.60 30.00 30.40 30.80 31.20 31.60 32.00									

Depth 1m:20m	Orientation	Acoustic and Optical Televiewer Analysis								Caliper
	Tilt (ATV) 0 deg 90 Azimuth (ATV) 0 deg 360 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log 69°	Amplitude-NM Normalized 0° 90° 180° 270° 0° 0 350 Feature Picks 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 1500	Features - True North Orientation 0 90	Freq/meter 0 20	RQD Very Poor Poor Fair Good Excellent	Caliper - min from TT 50 mm 150 Caliper - max from TT 50 mm 150 Caliper - ave from TT 50 mm 150 Breakout
		32.40 32.80 33.20 33.60 34.00 34.40 34.80 35.20 35.60 36.00								

Depth 1m:20m	Orientation	Acoustic and Optical Televiewer Analysis								Caliper
	Tilt (ATV) 0 deg 90 Azimuth (ATV) 0 deg 360 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log 69°	Amplitude-NM Normalized 0° 90° 180° 270° 0° 0 350 Feature Picks 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 1500	Features - True North Orientation 0 90	Freq/meter 0 20	RQD Very Poor Poor Fair Good Excellent	Caliper - min from TT 50 mm 150 Caliper - max from TT 50 mm 150 Caliper - ave from TT 50 mm 150 Breakout
36.40										
36.80										
37.20										
37.60										
38.00										
38.40										
38.80										
39.20										
39.60										
40.00										
40.40										

Depth 1m:20m	Orientation	Acoustic and Optical Televiewer Analysis							Caliper
	Tilt (ATV) 0 deg 90 Azimuth (ATV) 0 deg 360 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log 69°	Amplitude-NM Normalized 0° 90° 180° 270° 0° 0 350 Feature Picks 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 1500	Features - True North Orientation 0 90	Freq/meter 0 20	RQD Very Poor Poor Fair Good Excellent	Caliper - min from TT 50 mm 150 Caliper - max from TT 50 mm 150 Caliper - ave from TT 50 mm 150 Breakout
		40.80 41.20 41.60 42.00 42.40 42.80 43.20 43.60 44.00 44.40								

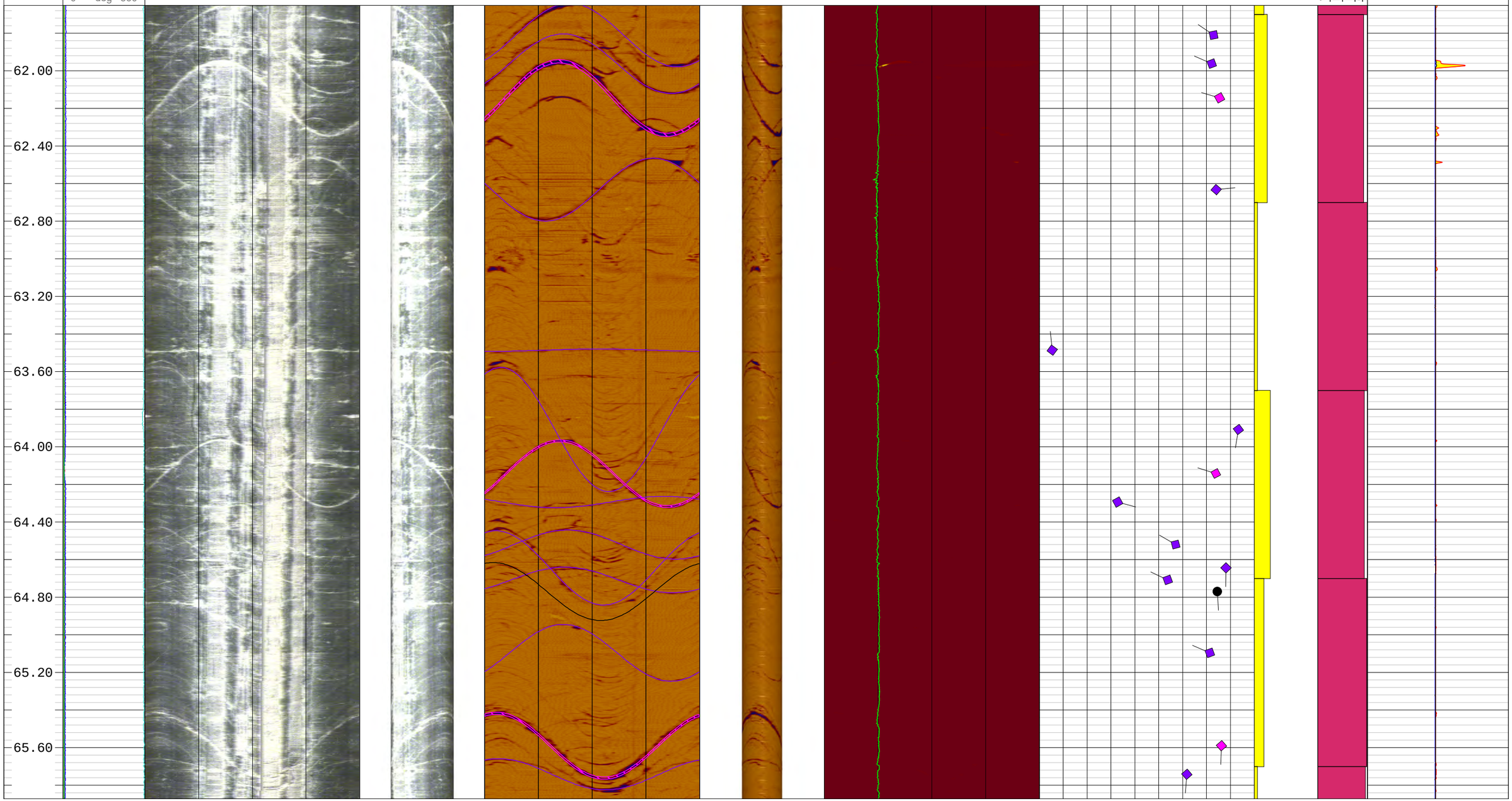
Depth 1m:20m	Orientation	Acoustic and Optical Televiewer Analysis								Caliper
	Tilt (ATV) 0 deg 90 Azimuth (ATV) 0 deg 360 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log 69°	Amplitude-NM Normalized 0° 90° 180° 270° 0° 0 350 Feature Picks 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 1500	Features - True North Orientation 0 90	Freq/meter 0 20	RQD Very Poor Poor Fair Good Excellent	Caliper - min from TT 50 mm 150 Caliper - max from TT 50 mm 150 Caliper - ave from TT 50 mm 150 Breakout
		44.80 45.20 45.60 46.00 46.40 46.80 47.20 47.60 48.00 48.40 48.80								

Depth 1m:20m	Orientation	Acoustic and Optical Televiewer Analysis							Caliper
	Tilt (ATV) 0 deg 90 Azimuth (ATV) 0 deg 360 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log 69°	Amplitude-NM Normalized 0° 90° 180° 270° 0° 0 350 Feature Picks 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 1500	Features - True North Orientation 0 90	Freq/meter 0 20	RQD Very Poor Poor Fair Good Excellent	Caliper - min from TT 50 mm 150 Caliper - max from TT 50 mm 150 Caliper - ave from TT 50 mm 150 Breakout
		49.20 49.60 50.00 50.40 50.80 51.20 51.60 52.00 52.40 52.80 53.20								

Depth 1m:20m	Orientation	Acoustic and Optical Televiewer Analysis								Caliper
	Tilt (ATV) 0 deg 90 Azimuth (ATV) 0 deg 360 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log 69°	Amplitude-NM Normalized 0° 90° 180° 270° 0° 0 350 Feature Picks 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 1500	Features - True North Orientation 0 90	Freq/meter 0 20	RQD Very Poor Poor Fair Good Excellent	Caliper - min from TT 50 mm 150 Caliper - max from TT 50 mm 150 Caliper - ave from TT 50 mm 150 Breakout
		53.60 54.00 54.40 54.80 55.20 55.60 56.00 56.40 56.80 57.20								

Depth 1m:20m	Orientation	Acoustic and Optical Televiewer Analysis								Caliper
	Tilt (ATV) 0 deg 90 Azimuth (ATV) 0 deg 360 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log 69°	Amplitude-NM Normalized 0° 90° 180° 270° 0° 0 350 Feature Picks 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 1500	Features - True North Orientation 0 90	Freq/meter 0 20	RQD Very Poor Poor Fair Good Excellent	Caliper - min from TT 50 mm 150 Caliper - max from TT 50 mm 150 Caliper - ave from TT 50 mm 150 Breakout
		57.60 58.00 58.40 58.80 59.20 59.60 60.00 60.40 60.80 61.20 61.60								

Depth 1m:20m	Orientation	Acoustic and Optical Televiewer Analysis							Caliper
	Tilt (ATV) 0 deg 90 Azimuth (ATV) 0 deg 360 Tilt (OTV) 0 deg 90 Azimuth (OTV) 0 deg 360	Image-NM 0° 90° 180° 270° 0°	3D Image Log 69°	Amplitude-NM Normalized 0° 90° 180° 270° 0° 0 350 Feature Picks 0° 90° 180° 270° 0°	3D Acoustic Log -0°	Centralized TT 0° 90° 180° 270° 0° Reflective Index 0 1500	Features - True North Orientation 0 90	Freq/meter 0 20	RQD Very Poor Poor Fair Good Excellent	Caliper - min from TT 50 mm 150 Caliper - max from TT 50 mm 150 Caliper - ave from TT 50 mm 150 Breakout



Depth 1m:20m	Orientation	Acoustic and Optical Televiewer Analysis	Caliper

Orientation: Tilt (ATV) 0 deg 90; Azimuth (ATV) 0 deg 360; Tilt (OTV) 0 deg 90; Azimuth (OTV) 0 deg 360

Image-NM: 0° 90° 180° 270° 0°

3D Image Log: 69°

Amplitude-NM Normalized: 0° 90° 180° 270° 0°; 0 – 350

Feature Picks: 0° 90° 180° 270° 0°

3D Acoustic Log: -0°

Centralized TT: 0° 90° 180° 270° 0°

Reflective Index: 0 – 1500

Features - True North Orientation: 0 – 90

Freq/meter: 0 – 20

RQD: Very Poor | Poor | Fair | Good | Excellent

Caliper - min from TT: 50 mm 150

Caliper - max from TT: 50 mm 150

Caliper - ave from TT: 50 mm 150

Breakout

66.00
66.40
66.80
67.20
67.60
68.00
68.40
68.80
69.20
69.60

APPENDIX

D HYDROGEOLOGICAL TEST REPORTS

APPENDIX

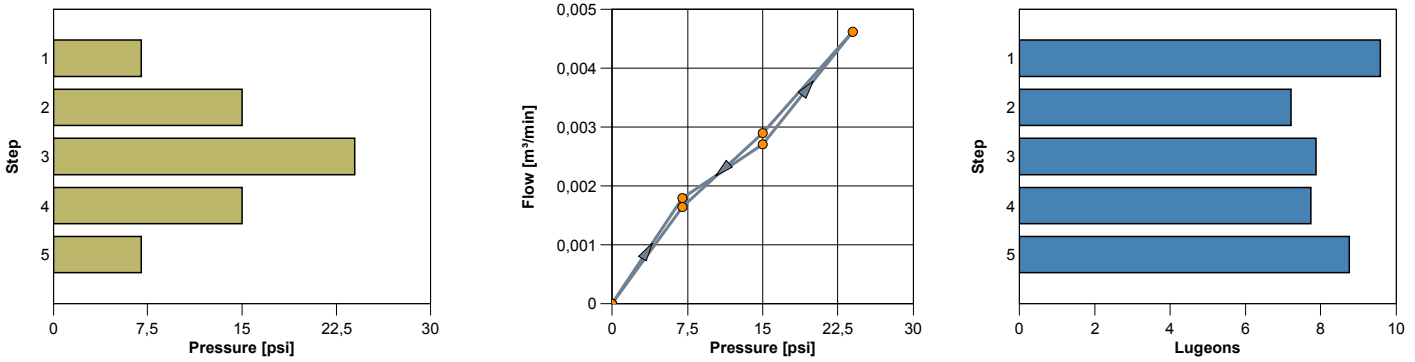
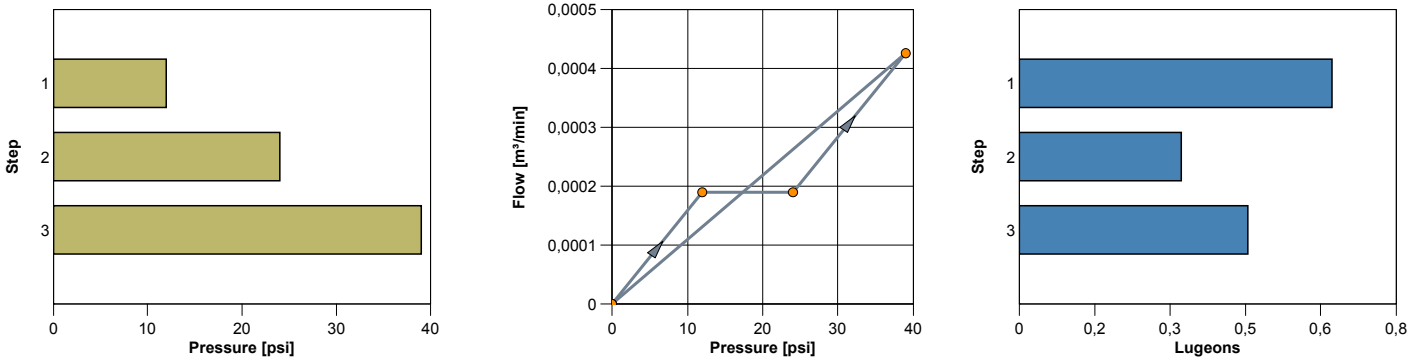
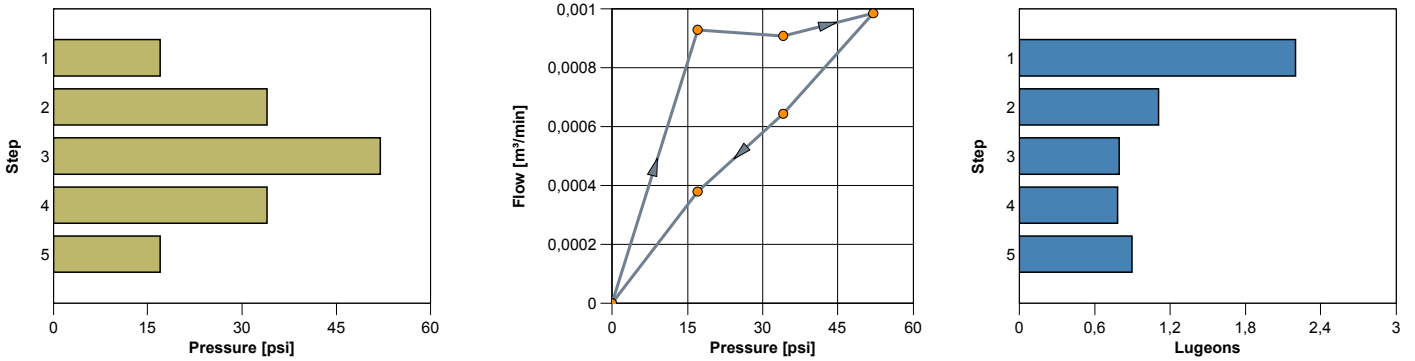
D-1 *PACKER TEST LUGEON REPORTS*

Lugeon Test Summary - BR-MET-17-02

Project: Goldborro

Number: 171-16980

Client: Anaconda

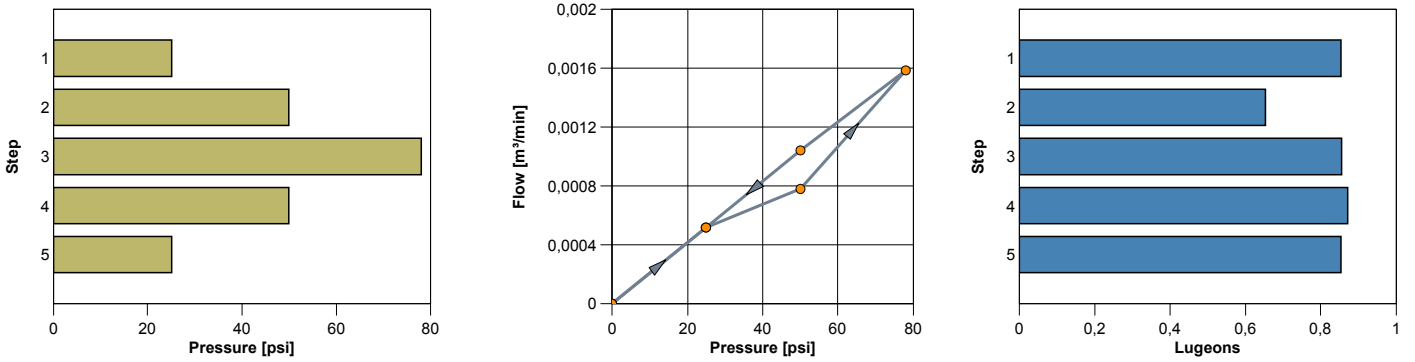
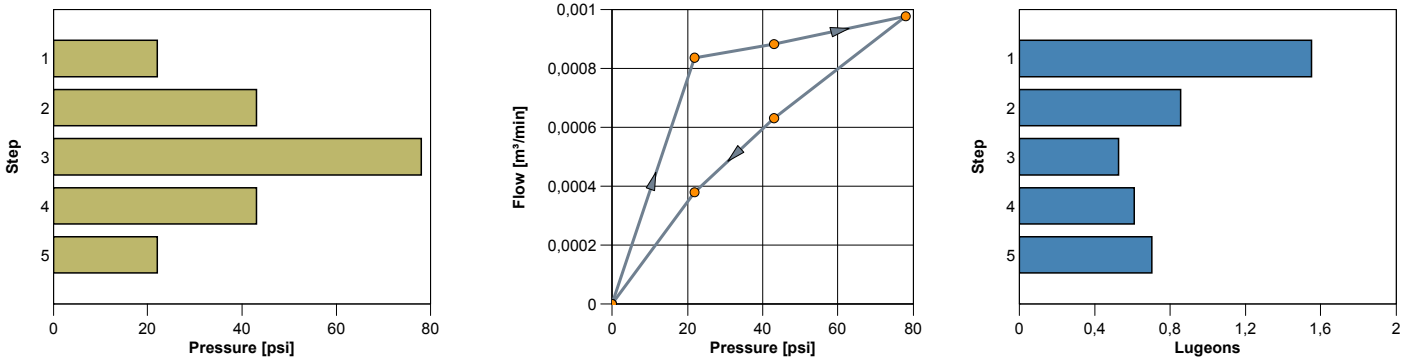
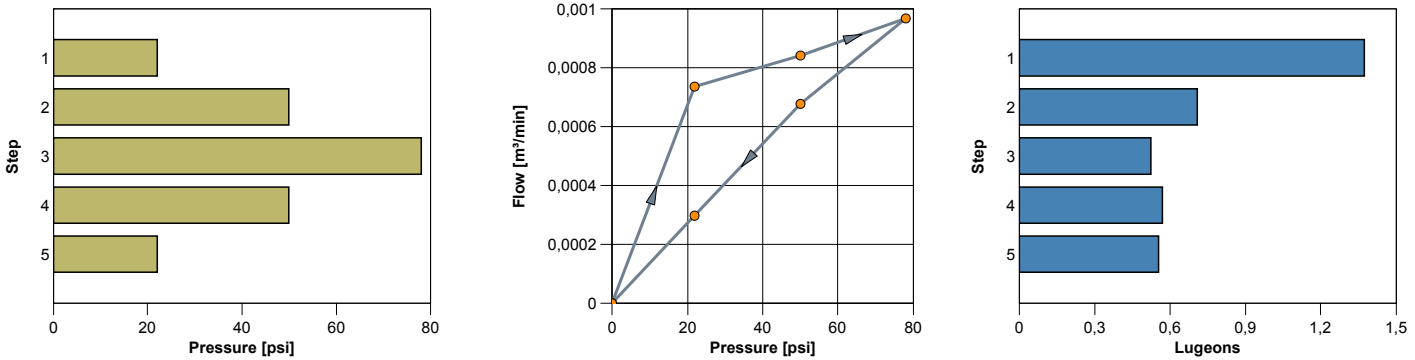
Test Interval Top Bottom	Graphs	Result
10,220 m 13,620 m		Laminar Lugeon: 8,2 Hydraulic Conductivity: 9E-7 m/s Hydraulic Conductivity: 0,078 m/d
13,250 m 16,650 m		Turbulent Lugeon: 0,6 Hydraulic Conductivity: 7E-8 m/s Hydraulic Conductivity: 0,006 m/d
18,640 m 22,040 m		Void filling Lugeon: 0,9 Hydraulic Conductivity: 1E-7 m/s Hydraulic Conductivity: 0,009 m/d

Lugeon Test Summary - BR-MET-17-02

Project: Goldborro

Number: 171-16980

Client: Anaconda

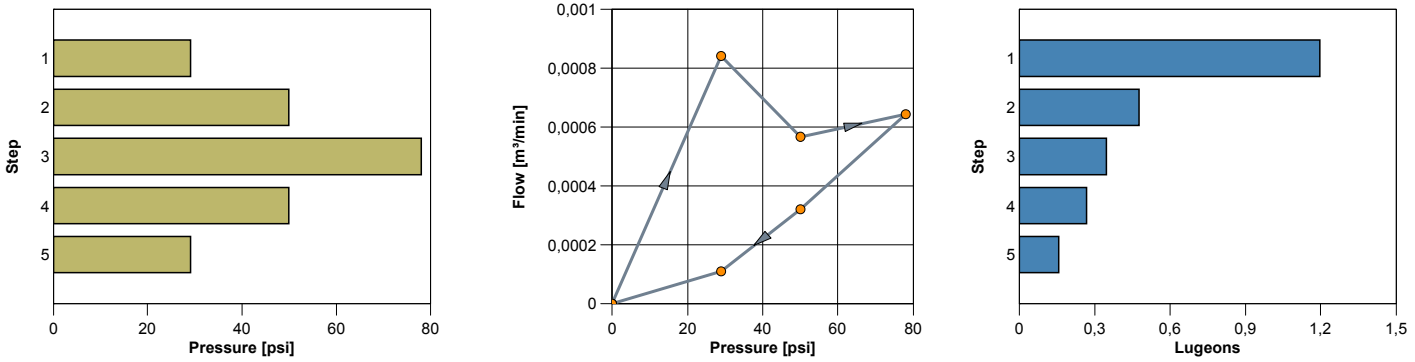
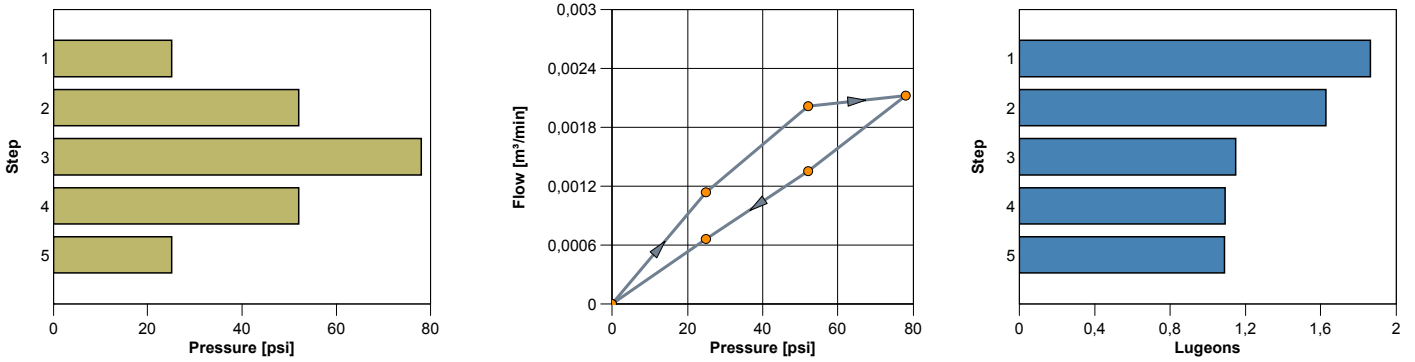
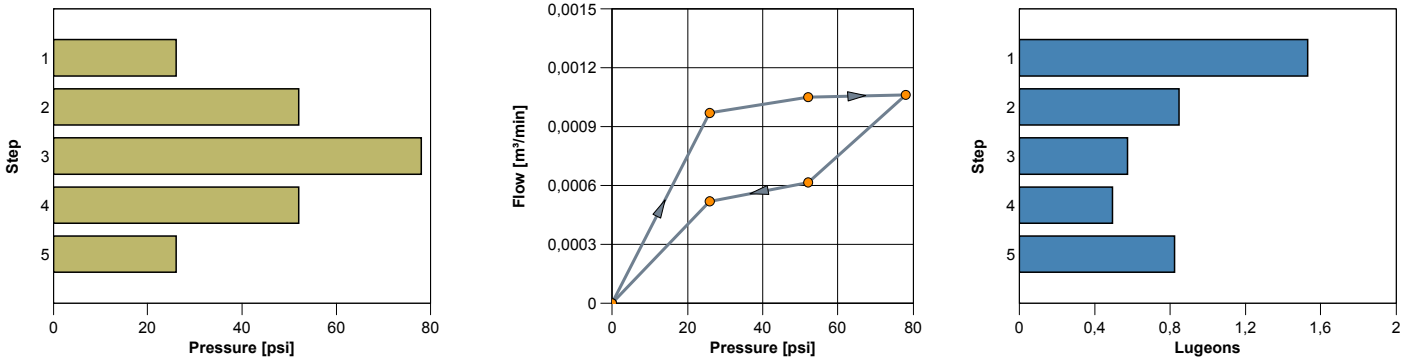
Test Interval Top Bottom	Graphs	Result
21,440 m 24,840 m		Laminar Lugeon: 0,8 Hydraulic Conductivity: 9E-8 m/s Hydraulic Conductivity: 0,008 m/d
29,260 m 32,660 m		Void filling Lugeon: 0,7 Hydraulic Conductivity: 8E-8 m/s Hydraulic Conductivity: 0,007 m/d
46,280 m 49,660 m		Void filling Lugeon: 0,6 Hydraulic Conductivity: 6E-8 m/s Hydraulic Conductivity: 0,005 m/d

Lugeon Test Summary - BR-MET-17-02

Project: Goldborro

Number: 171-16980

Client: Anaconda

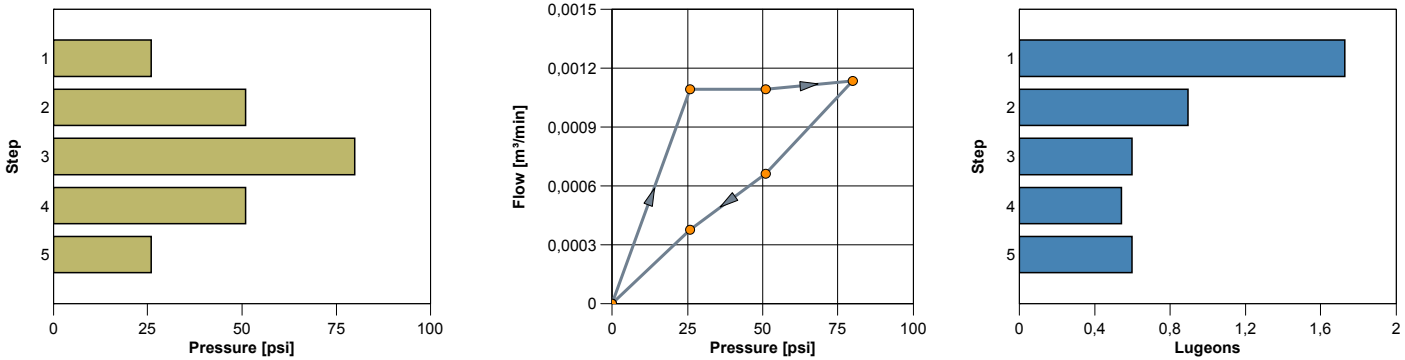
Test Interval Top Bottom	Graphs	Result
50,260 m 53,660 m		Void filling Lugeon: 0,2 Hydraulic Conductivity: 2E-8 m/s Hydraulic Conductivity: 0,001 m/d
69,640 m 73,040 m		Void filling Lugeon: 1,1 Hydraulic Conductivity: 1E-7 m/s Hydraulic Conductivity: 0,010 m/d
93,640 m 97,040 m		Void filling Lugeon: 0,8 Hydraulic Conductivity: 9E-8 m/s Hydraulic Conductivity: 0,008 m/d

Lugeon Test Summary - BR-MET-17-02

Project: Goldborro

Number: 171-16980

Client: Anaconda

Test Interval Top Bottom	Graphs	Result
105,660 m 109,060 m		Void filling Lugeon: 0,6 Hydraulic Conductivity: 7E-8 m/s Hydraulic Conductivity: 0,006 m/d

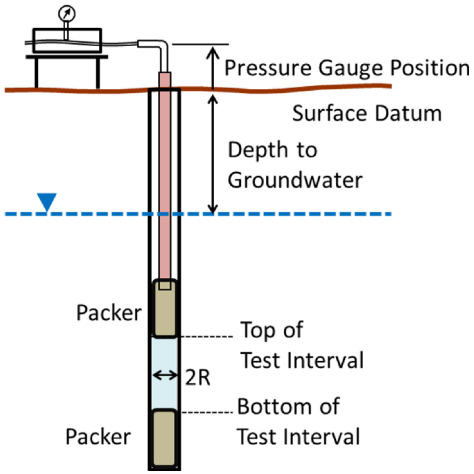
Lugeon Test Analysis Report

Project: Goldborro

Number: 171-16980

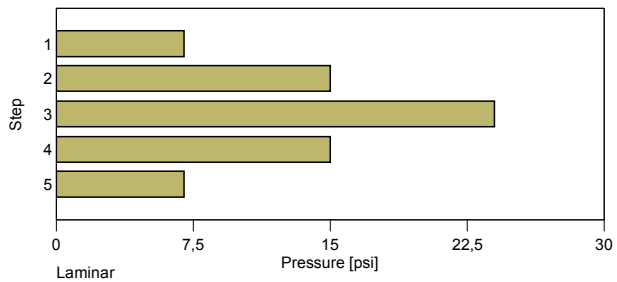
Client: Anaconda

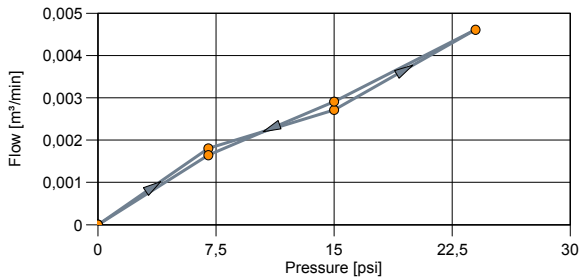
Location: Goldboro mine site	Lugeon Test: Test 1: 10,22-13,62m	Tested bore: BR-MET-17-02
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-12
Analysis Performed by: A. Denes		Analysis Date: 2018-02-09
Lithology: bedrock		

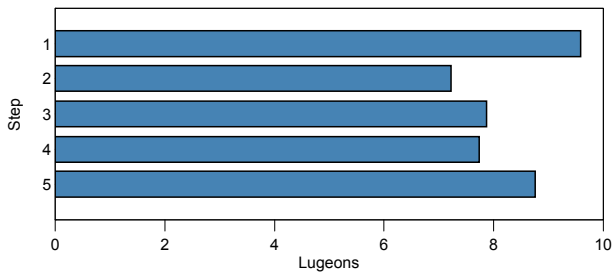


Top of Test Interval: 10,220 m
Bottom of Test Interval: 13,620 m
Length of Test Interval: 3,400 m
Gauge Position: 0,700 m
Depth to Groundwater: 0,000 m
Radius of Test Section: 0,049 m

Step	Pressure [psi]	Flow Meter Readings [m³/min]												Average Flow Rate [m³/min]	Hydraulic Conductivity		
		1	2	3	4	5	6	7	8	9	10	11	12		[m/s]	[m/d]	Lugeon
1	7,0	0,00227100	0,00189300	0,00189300	0,00170300	0,00170300	0,00170300	0,00132500	0,00170300	0,00151400	0,00151400	0,00170300	0,00263000	0,00179625	1×10^{-6}	0,091	9,6
2	15,0	0,00264979	0,00264979	0,00283906	0,00264979	0,00264979	0,00264979	0,00283906	0,00264979	0,00302833	0,00246052			0,00270657	8×10^{-7}	0,069	7,2
3	24,0	0,00454249	0,00492103	0,00492103	0,00454249	0,00492103	0,00473176	0,00511030	0,00454249	0,00473176	0,00473176	0,00473176	0,00290000	0,00461066	9×10^{-7}	0,075	7,9
4	15,0	0,00264979	0,00264979	0,00302833	0,00302833	0,00283906	0,00283906	0,00302833	0,00302833	0,00302833	0,00283906	0,00302833	0,00283906	0,00290215	9×10^{-7}	0,074	7,7
5	7,0	0,00151416	0,00151416	0,00151416	0,00189270	0,00132489	0,00170344	0,00151416	0,00189270	0,00170344	0,00170343	0,00151416	0,00189270	0,00164034	1×10^{-6}	0,083	8,8
													Average		9×10^{-7}	0,078	8,2







Laminar
Lugeon: 8,2
Hydraulic Conductivity: 9E-7 m/s
Hydraulic Conductivity: 0,078 m/d

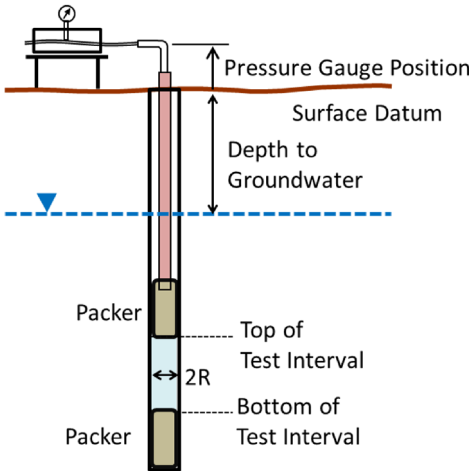
Lugeon Test Analysis Report

Project: Goldborro

Number: 171-16980

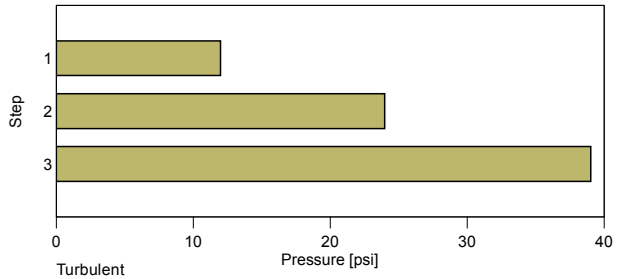
Client: Anaconda

Location: Goldboro mine site	Lugeon Test: Test 2: 13,25-16,65m	Tested bore: BR-MET-17-02
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-12
Analysis Performed by: A. Denes		Analysis Date: 2018-02-09
Lithology: bedrock		

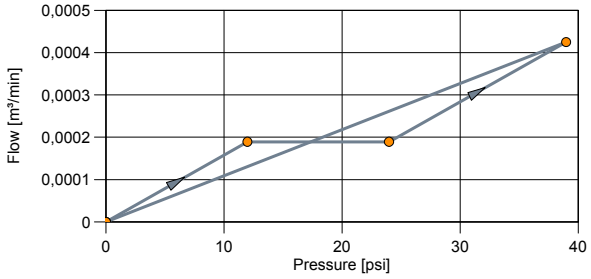


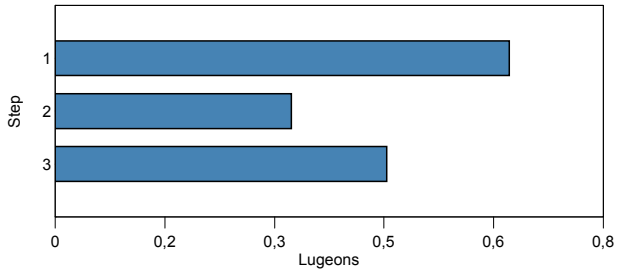
Top of Test Interval: 13,250 m
Bottom of Test Interval: 16,650 m
Length of Test Interval: 3,400 m
Gauge Position: 0,700 m
Depth to Groundwater: 0,000 m
Radius of Test Section: 0,049 m

Step	Pressure [psi]	Flow Meter Readings [m³/min]				Average Flow Rate [m³/min]	Hydraulic Conductivity		
		1	2	3	4		[m/s]	[m/d]	Lugeon
1	12,0	0,00018927	0,00018927	0,00018927	0,00018927	0,00018927	7×10^{-8}	0,006	0,6
2	24,0	0,00018927	0,00018927	0,00018927	0,00018927	0,00018927	4×10^{-8}	0,003	0,3
3	39,0	0,00037854	0,00037854	0,00056781	0,00037854	0,00042586	5×10^{-8}	0,004	0,5
						Average	5×10^{-8}	0,004	0,5



Turbulent
Lugeon: 0,6
Hydraulic Conductivity: 7E-8 m/s
Hydraulic Conductivity: 0,006 m/d





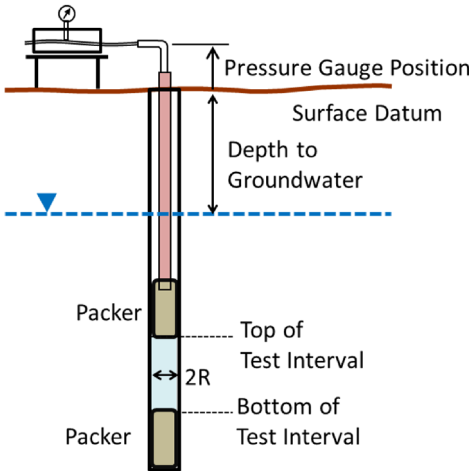
Lugeon Test Analysis Report

Project: Goldborro

Number: 171-16980

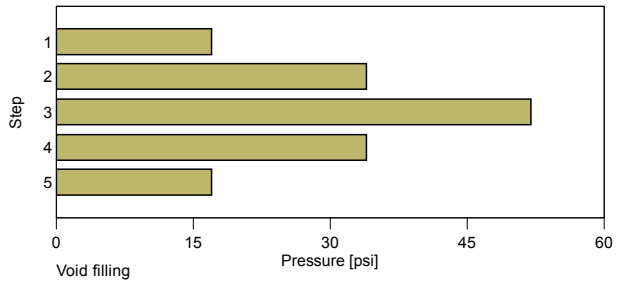
Client: Anaconda

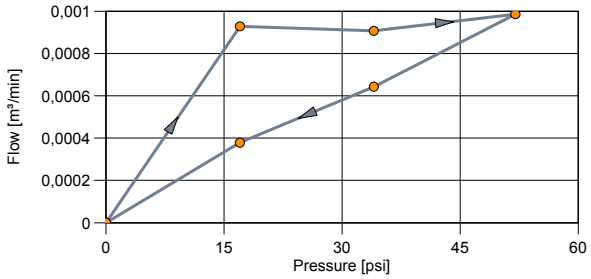
Location: Goldboro mine site	Lugeon Test: Test 3: 18,64-22,04m	Tested bore: BR-MET-17-02
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-12
Analysis Performed by: A. Denes		Analysis Date: 2018-02-09
Lithology: bedrock		

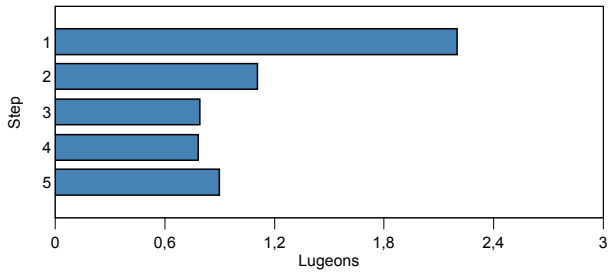


Top of Test Interval: 18,640 m
Bottom of Test Interval: 22,040 m
Length of Test Interval: 3,400 m
Gauge Position: 0,700 m
Depth to Groundwater: 0,000 m
Radius of Test Section: 0,049 m

Step	Pressure [psi]	Flow Meter Readings [m³/min]										Average Flow Rate [m³/min]	Hydraulic Conductivity		
		1	2	3	4	5	6	7	8	9	10		[m/s]	[m/d]	Lugeon
1	17,0	0,0015	0,0015	0,0011	0,0008	0,0009	0,0008	0,0008	0,0006	0,0008	0,0006	0,0009	2×10^{-7}	0,021	2,2
2	34,0	0,0011	0,0008	0,0011	0,0011	0,0009	0,0009	0,0008	0,0008	0,0008	0,0008	0,0009	1×10^{-7}	0,011	1,1
3	52,0	0,0008	0,0010	0,0009	0,0011	0,0009	0,0011	0,0009	0,0011	0,0009	0,0009	0,0010	9×10^{-8}	0,008	0,8
4	34,0	0,0008	0,0008	0,0008	0,0008	0,0004	0,0006	0,0006	0,0008	0,0004	0,0008	0,0006	9×10^{-8}	0,007	0,8
5	17,0	0,0004	0,0004	0,0004	0,0004	0,0004	0,0002	0,0006	0,0004	0,0004	0,0004	0,0004	1×10^{-7}	0,009	0,9
												Average	1×10^{-7}	0,011	1,2







Void filling
Lugeon: 0,9
Hydraulic Conductivity: 1E-7 m/s
Hydraulic Conductivity: 0,009 m/d

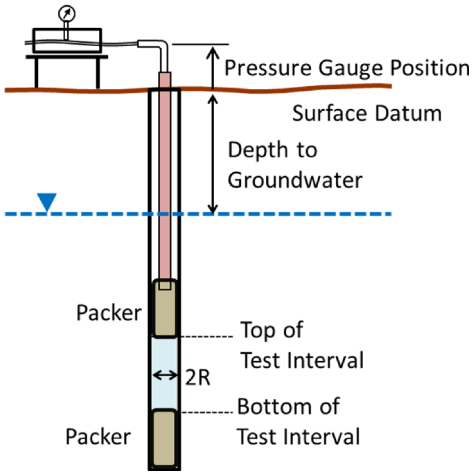
Lugeon Test Analysis Report

Project: Goldborro

Number: 171-16980

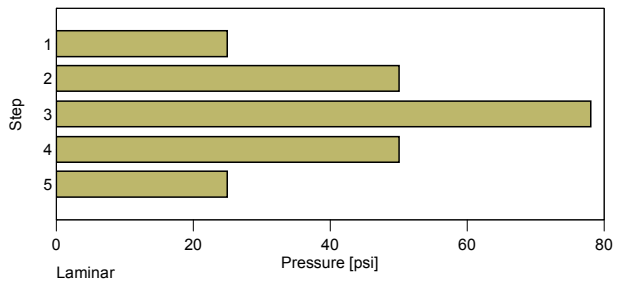
Client: Anaconda

Location: Goldboro mine site	Lugeon Test: Test 4: 21,44-24,84m	Tested bore: BR-MET-17-02
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-12
Analysis Performed by: A. Denes		Analysis Date: 2018-02-09
Lithology: bedrock		

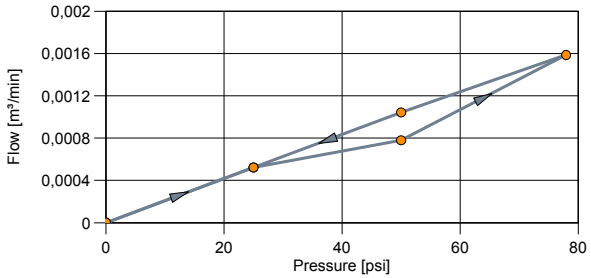


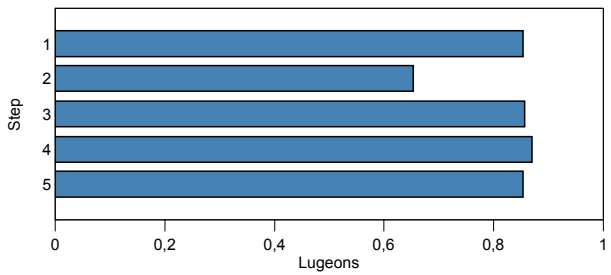
Top of Test Interval: 21,440 m
Bottom of Test Interval: 24,840 m
Length of Test Interval: 3,400 m
Gauge Position: 0,700 m
Depth to Groundwater: 0,000 m
Radius of Test Section: 0,049 m

Step	Pressure [psi]	Flow Meter Readings [m³/min]								Average Flow Rate [m³/min]	Hydraulic Conductivity		
		1	2	3	4	5	6	7	8		[m/s]	[m/d]	Lugeon
1	25,0	0,0011	0,0008	0,0004	0,0004	0,0002	0,0004	0,0006	0,0004	0,0005	9×10^{-8}	0,008	0,9
2	50,0	0,0004	0,0008	0,0011	0,0008	0,0008	0,0009	0,0008	0,0008	0,0008	7×10^{-8}	0,006	0,7
3	78,0	0,0011	0,0015	0,0015	0,0023	0,0015	0,0015	0,0017	0,0015	0,0016	9×10^{-8}	0,008	0,9
4	50,0	0,0011	0,0011	0,0011	0,0011	0,0009	0,0009	0,0009	0,0009	0,0010	1×10^{-7}	0,008	0,9
5	25,0	0,0004	0,0008	0,0008	0,0004	0,0004	0,0006	0,0004	0,0006	0,0005	9×10^{-8}	0,008	0,9
										Average	9×10^{-8}	0,008	0,8



Laminar
Lugeon: 0,8
Hydraulic Conductivity: 9E-8 m/s
Hydraulic Conductivity: 0,008 m/d





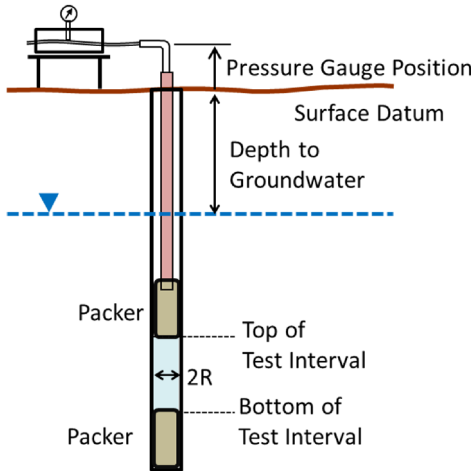
Lugeon Test Analysis Report

Project: Goldborro

Number: 171-16980

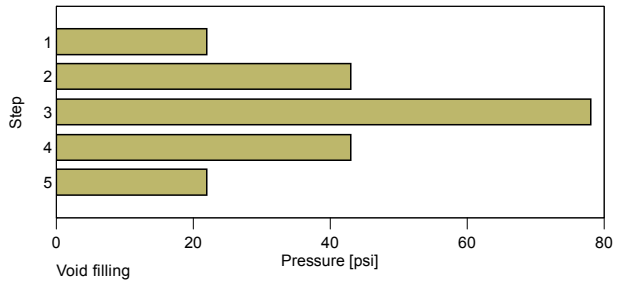
Client: Anaconda

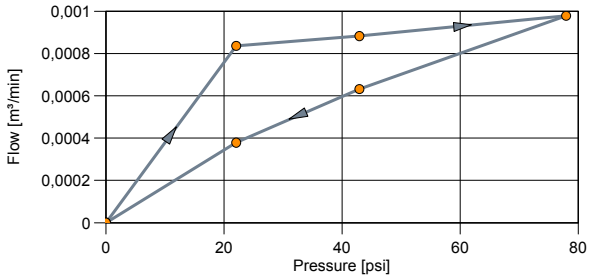
Location: Goldboro mine site	Lugeon Test: Test 5: 29,26-32,66 m	Tested bore: BR-MET-17-02
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-12
Analysis Performed by: A. Denes		Analysis Date: 2018-02-09
Lithology: bedrock		

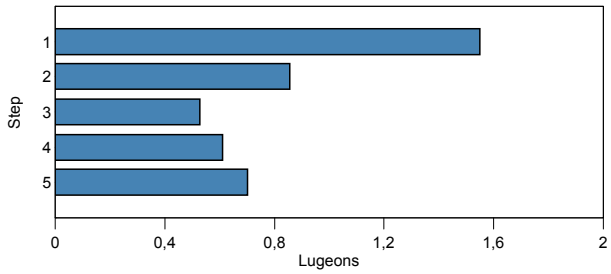


Top of Test Interval: 29,260 m
Bottom of Test Interval: 32,660 m
Length of Test Interval: 3,400 m
Gauge Position: 0,700 m
Depth to Groundwater: 0,000 m
Radius of Test Section: 0,049 m

Step	Pressure [psi]	Flow Meter Readings [m³/min]												Average Flow Rate [m³/min]	Hydraulic Conductivity		
		1	2	3	4	5	6	7	8	9	10	11	12		[m/s]	[m/d]	Lugeon
1	22,0	0,0015	0,0015	0,0008	0,0008	0,0009	0,0008	0,0008	0,0006	0,0008	0,0006	0,0006	0,0006	0,0008	2×10^{-7}	0,015	1,6
2	43,0	0,0011	0,0008	0,0011	0,0011	0,0009	0,0009	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008	0,0009	9×10^{-8}	0,008	0,9
3	78,0	0,0008	0,0010	0,0009	0,0011	0,0009	0,0011	0,0009	0,0011	0,0009	0,0009	0,0009	0,0009	0,0010	6×10^{-8}	0,005	0,5
4	43,0	0,0008	0,0008	0,0008	0,0008	0,0004	0,0006	0,0006	0,0008	0,0004	0,0008	0,0006	0,0006	0,0006	7×10^{-8}	0,006	0,6
5	22,0	0,0004	0,0004	0,0004	0,0004	0,0004	0,0002	0,0006	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	8×10^{-8}	0,007	0,7
													Average		9×10^{-8}	0,008	0,8







Void filling
Lugeon: 0,7
Hydraulic Conductivity: 8E-8 m/s
Hydraulic Conductivity: 0,007 m/d

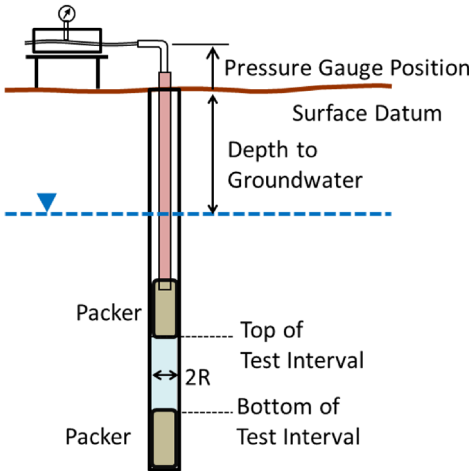
Lugeon Test Analysis Report

Project: Goldborro

Number: 171-16980

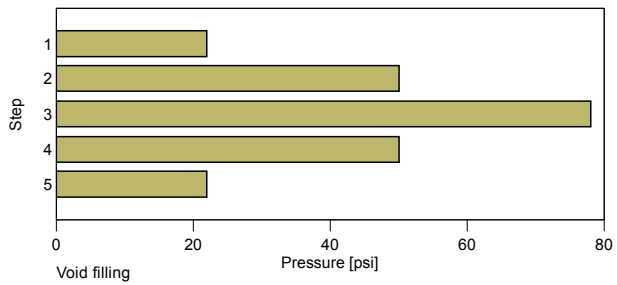
Client: Anaconda

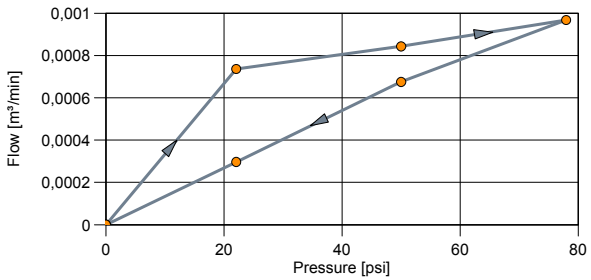
Location: Goldboro mine site	Lugeon Test: Test 6: 46,28-49,66 m	Tested bore: BR-MET-17-02
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-13
Analysis Performed by: A. Denes		Analysis Date: 2018-02-09
Lithology: bedrock		

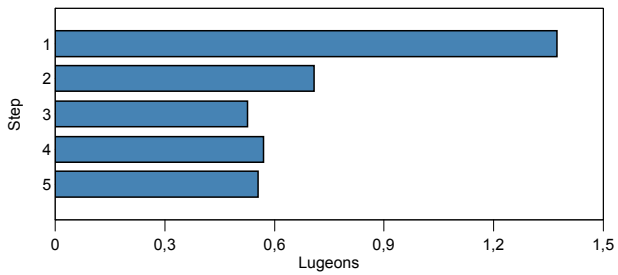


Top of Test Interval: 46,280 m
Bottom of Test Interval: 49,660 m
Length of Test Interval: 3,380 m
Gauge Position: 0,700 m
Depth to Groundwater: 0,000 m
Radius of Test Section: 0,049 m

Step	Pressure [psi]	Flow Meter Readings [m³/min]									Average Flow Rate [m³/min]	Hydraulic Conductivity		
		1	2	3	4	5	6	7	8	9		[m/s]	[m/d]	Lugeon
1	22,0	0,0008	0,0011	0,0009	0,0008	0,0008	0,0008	0,0006	0,0006	0,0004	0,0007	2×10^{-7}	0,013	1,4
2	50,0	0,0011	0,0008	0,0023	0,0004	0,0004	0,0008	0,0008	0,0004	0,0008	0,0008	8×10^{-8}	0,007	0,7
3	78,0	0,0008	0,0011	0,0011	0,0009	0,0009	0,0009	0,0009	0,0009	0,0009	0,0010	6×10^{-8}	0,005	0,5
4	50,0	0,0008	0,0008	0,0008	0,0006	0,0006	0,0008	0,0006			0,0007	6×10^{-8}	0,005	0,6
5	22,0	0,0004	0,0004	0,0002	0,0002	0,0002	0,0004	0,0004			0,0003	6×10^{-8}	0,005	0,6
											Average	8×10^{-8}	0,007	0,7







Void filling
Lugeon: 0,6
Hydraulic Conductivity: 6E-8 m/s
Hydraulic Conductivity: 0,005 m/d

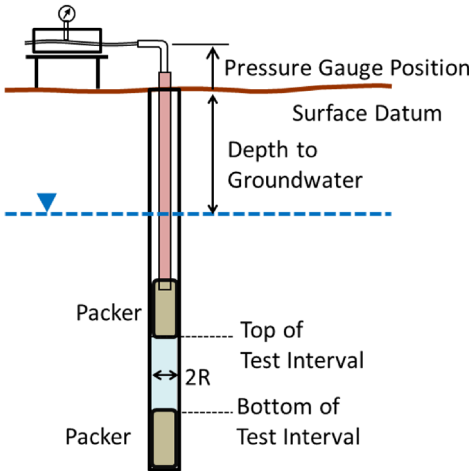
Lugeon Test Analysis Report

Project: Goldborro

Number: 171-16980

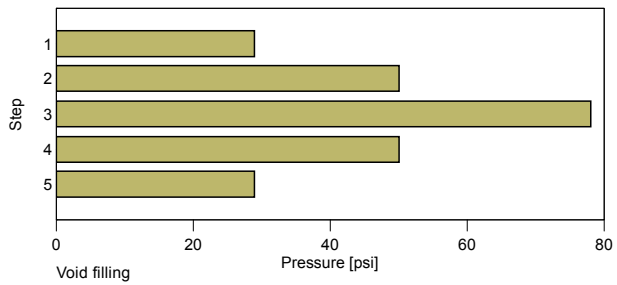
Client: Anaconda

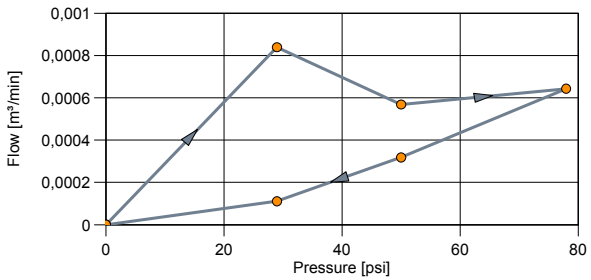
Location: Goldboro mine site	Lugeon Test: Test 7: 50,26-53,66 m	Tested bore: BR-MET-17-02
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-13
Analysis Performed by: A. Denes		Analysis Date: 2018-02-09
Lithology: bedrock		

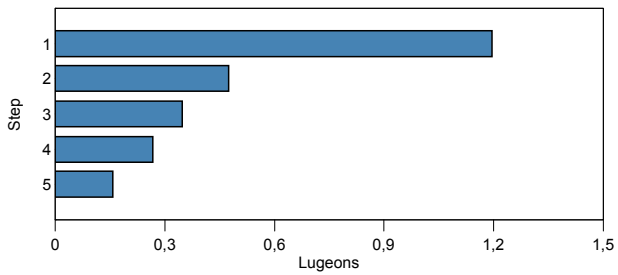


Top of Test Interval: 50,260 m
Bottom of Test Interval: 53,660 m
Length of Test Interval: 3,400 m
Gauge Position: 0,700 m
Depth to Groundwater: 0,000 m
Radius of Test Section: 0,049 m

Step	Pressure [psi]	Flow Meter Readings [m³/min]										Average Flow Rate [m³/min]	Hydraulic Conductivity		
		1	2	3	4	5	6	7	8	9	10		[m/s]	[m/d]	Lugeon
1	29,0	0,0019	0,0013	0,0008	0,0013	0,0005	0,0006	0,0006	0,0006	0,0005	0,0005	0,0008	1×10^{-7}	0,011	1,2
2	50,0	0,0004	0,0008	0,0008	0,0008	0,0006	0,0006	0,0006	0,0005	0,0005	0,0004	0,0006	5×10^{-8}	0,005	0,5
3	78,0	0,0008	0,0008	0,0008	0,0008	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	0,0006	4×10^{-8}	0,003	0,3
4	50,0	0,0002	0,0006	0,0002	0,0004	0,0002	0,0003	0,0004	0,0004			0,0003	3×10^{-8}	0,003	0,3
5	29,0	0,0002	0,0001	0,0001	0,0001	0,0001	0,0001					0,0001	2×10^{-8}	0,001	0,2
												Average	5×10^{-8}	0,005	0,5







Void filling
Lugeon: 0,2
Hydraulic Conductivity: 2E-8 m/s
Hydraulic Conductivity: 0,001 m/d

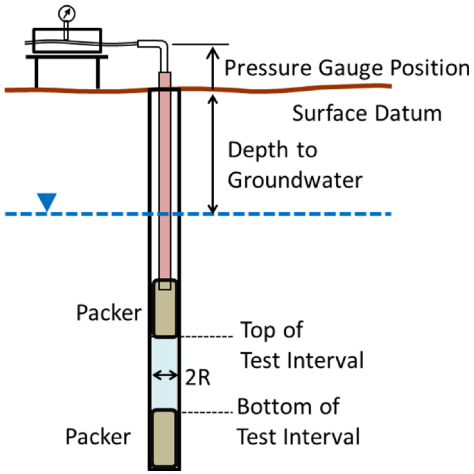
Lugeon Test Analysis Report

Project: Goldborro

Number: 171-16980

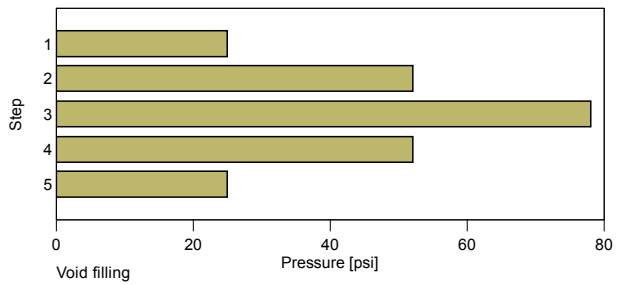
Client: Anaconda

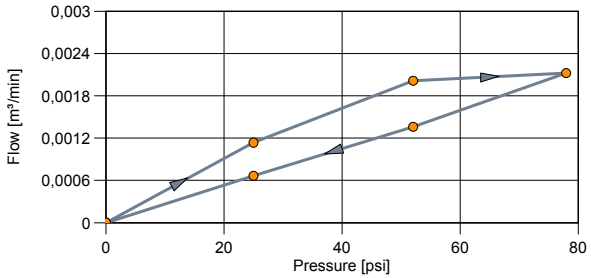
Location: Goldboro mine site	Lugeon Test: Test 9: 69,64-73,04 m	Tested bore: BR-MET-17-02
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-14
Analysis Performed by: A. Denes		Analysis Date: 2018-02-09
Lithology: bedrock		

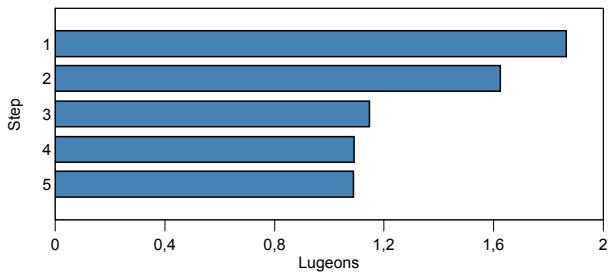


Top of Test Interval: 69,640 m
Bottom of Test Interval: 73,040 m
Length of Test Interval: 3,400 m
Gauge Position: 0,700 m
Depth to Groundwater: 0,000 m
Radius of Test Section: 0,049 m

Step	Pressure [psi]	Flow Meter Readings [m³/min]									Average Flow Rate [m³/min]	Hydraulic Conductivity		
		1	2	3	4	5	6	7	8	9		[m/s]	[m/d]	Lugeon
1	25,0	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	2×10^{-7}	0,018	1,9
2	52,0	0,0030	0,0015	0,0026	0,0019	0,0019	0,0021	0,0017	0,0017	0,0017	0,0020	2×10^{-7}	0,015	1,6
3	78,0	0,0023	0,0026	0,0019	0,0021	0,0021	0,0021	0,0021	0,0019	0,0021	0,0021	1×10^{-7}	0,011	1,1
4	52,0	0,0011	0,0015	0,0011	0,0015	0,0013	0,0015	0,0013	0,0014	0,0013	0,0014	1×10^{-7}	0,010	1,1
5	25,0	0,0004	0,0004	0,0008	0,0008	0,0008	0,0008	0,0008	0,0008		0,0007	1×10^{-7}	0,010	1,1
											Average	2×10^{-7}	0,013	1,4







Void filling
Lugeon: 1,1
Hydraulic Conductivity: 1E-7 m/s
Hydraulic Conductivity: 0,010 m/d

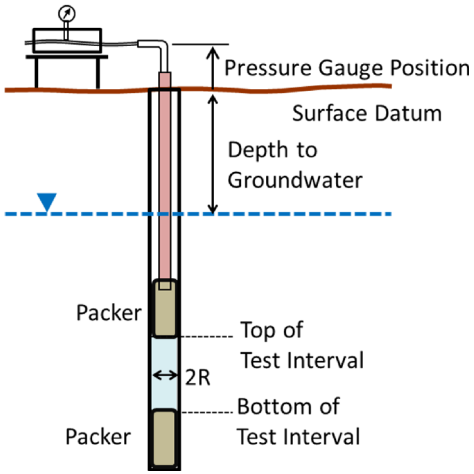
Lugeon Test Analysis Report

Project: Goldborro

Number: 171-16980

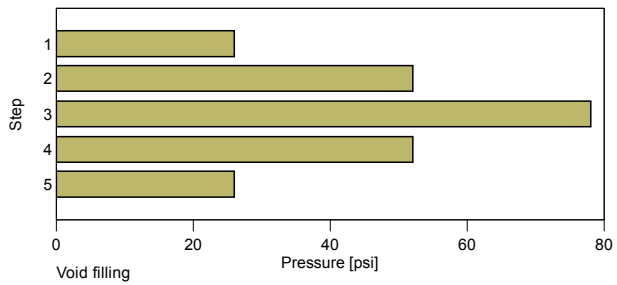
Client: Anaconda

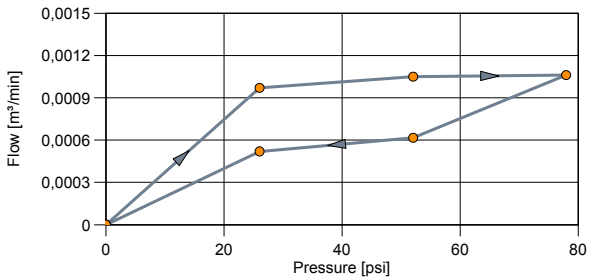
Location: Goldboro mine site	Lugeon Test: Test 10: 93,64-97,04 m	Tested bore: BR-MET-17-02
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-14
Analysis Performed by: A. Denes		Analysis Date: 2018-02-09
Lithology: bedrock		

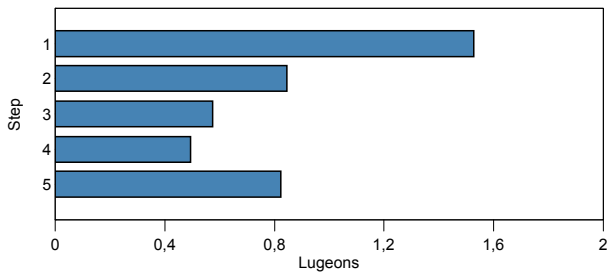


Top of Test Interval: 93,640 m
Bottom of Test Interval: 97,040 m
Length of Test Interval: 3,400 m
Gauge Position: 0,700 m
Depth to Groundwater: 0,000 m
Radius of Test Section: 0,049 m

Step	Pressure [psi]	Flow Meter Readings [m³/min]									Average Flow Rate [m³/min]	Hydraulic Conductivity		
		1	2	3	4	5	6	7	8	9		[m/s]	[m/d]	Lugeon
1	26,0	0,0011	0,0011	0,0011	0,0011	0,0009	0,0008	0,0008	0,0008	0,0009	0,0010	2×10^{-7}	0,015	1,5
2	52,0	0,0008	0,0015	0,0011	0,0011	0,0011	0,0009	0,0009	0,0009	0,0009	0,0011	9×10^{-8}	0,008	0,8
3	78,0	0,0013	0,0009	0,0011	0,0014	0,0011	0,0008	0,0009	0,0009	0,0009	0,0011	6×10^{-8}	0,005	0,6
4	52,0	0,0004	0,0008	0,0008	0,0008	0,0006	0,0006	0,0006	0,0006		0,0006	5×10^{-8}	0,005	0,5
5	26,0	0,0004	0,0004	0,0004	0,0004	0,0004	0,0008	0,0008	0,0008		0,0005	9×10^{-8}	0,008	0,8
											Average	9×10^{-8}	0,008	0,9







Void filling
Lugeon: 0,8
Hydraulic Conductivity: 9E-8 m/s
Hydraulic Conductivity: 0,008 m/d

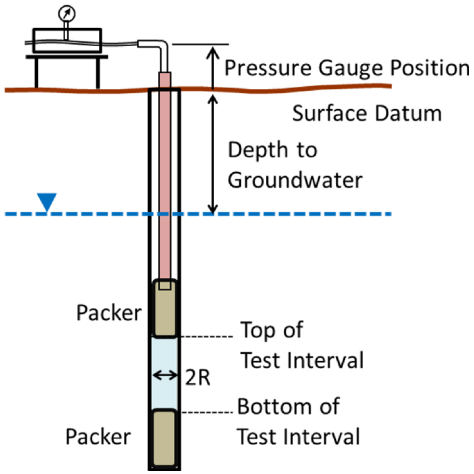
Lugeon Test Analysis Report

Project: Goldborro

Number: 171-16980

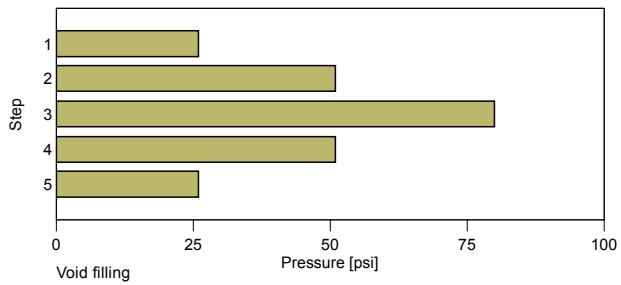
Client: Anaconda

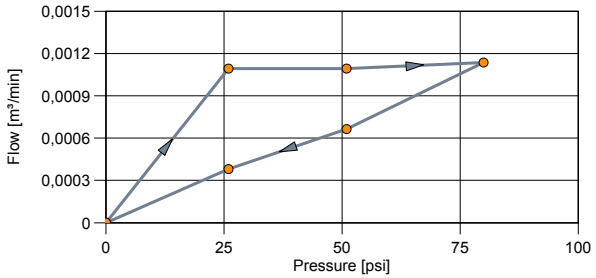
Location: Goldboro mine site	Lugeon Test: Test 11: 105,66-109,06 m	Tested bore: BR-MET-17-02
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-14
Analysis Performed by: A. Denes		Analysis Date: 2018-02-09
Lithology: bedrock		

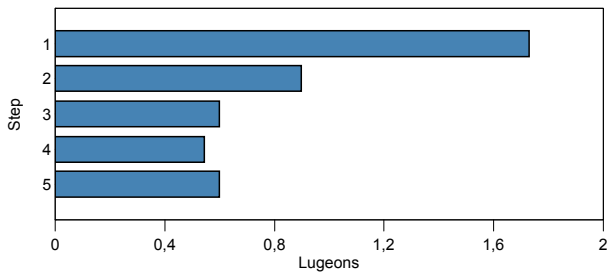


Top of Test Interval: 105,660 m
Bottom of Test Interval: 109,060 m
Length of Test Interval: 3,400 m
Gauge Position: 0,700 m
Depth to Groundwater: 0,000 m
Radius of Test Section: 0,049 m

Step	Pressure [psi]	Flow Meter Readings [m³/min]									Average Flow Rate [m³/min]	Hydraulic Conductivity		
		1	2	3	4	5	6	7	8	9		[m/s]	[m/d]	Lugeon
1	26,0	0,0015	0,0015	0,0011	0,0011	0,0011	0,0011	0,0008	0,0008	0,0008	0,0011	2×10^{-7}	0,016	1,7
2	51,0	0,0015	0,0011	0,0015	0,0015	0,0008	0,0009	0,0009	0,0008	0,0008	0,0011	1×10^{-7}	0,009	0,9
3	80,0	0,0011	0,0011	0,0011	0,0015	0,0011	0,0011	0,0009	0,0009	0,0011	0,0011	7×10^{-8}	0,006	0,6
4	51,0	0,0008	0,0008	0,0008	0,0008	0,0008	0,0005	0,0005	0,0006		0,0007	6×10^{-8}	0,005	0,5
5	26,0	0,0004	0,0004	0,0004	0,0004	0,0004	0,0003	0,0003	0,0006		0,0004	7×10^{-8}	0,006	0,6
											Average	1×10^{-7}	0,008	0,9







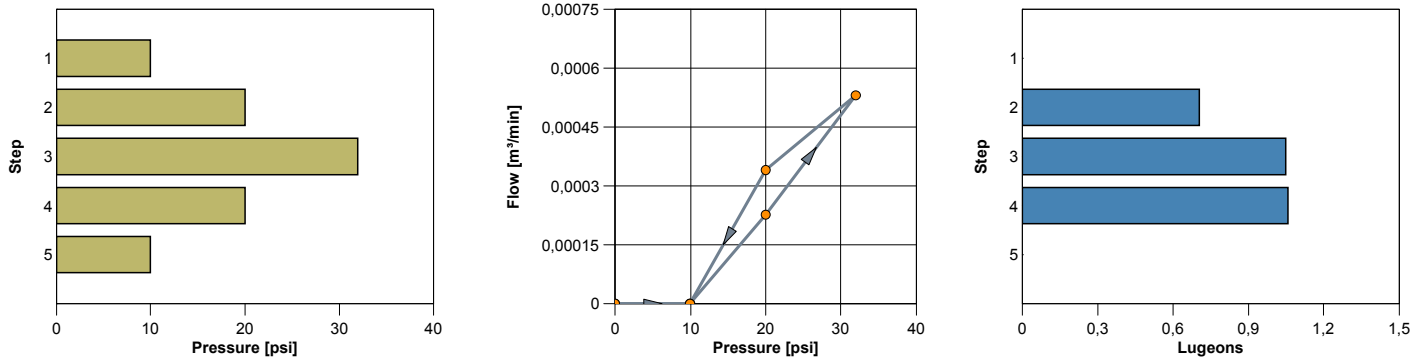
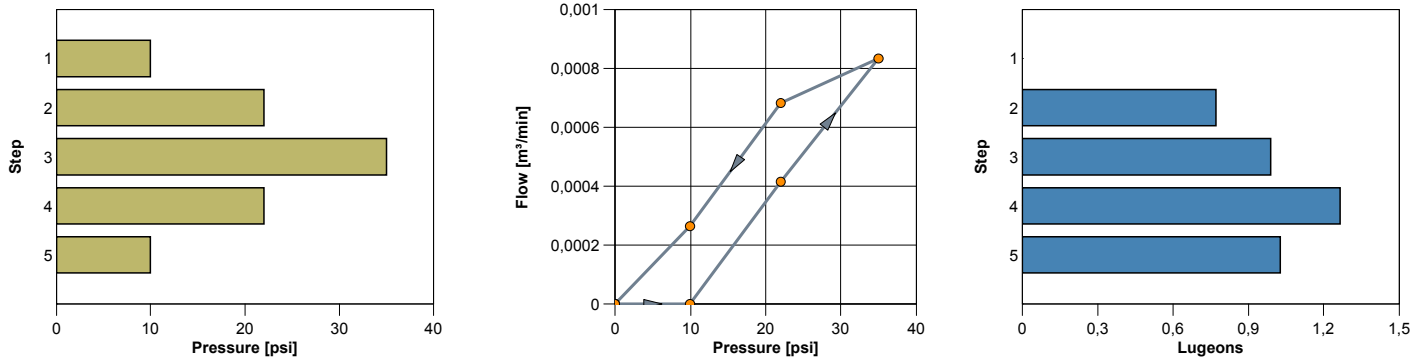
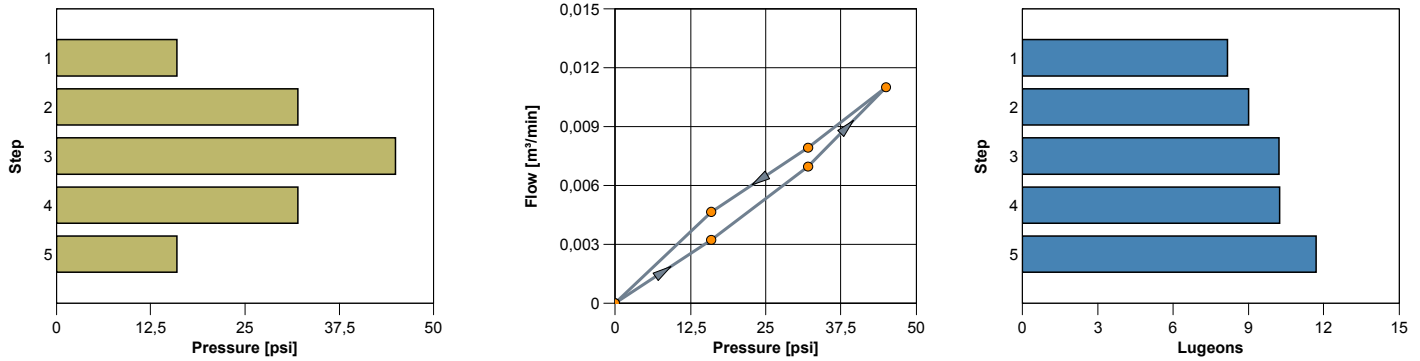
Void filling
Lugeon: 0,6
Hydraulic Conductivity: 7E-8 m/s
Hydraulic Conductivity: 0,006 m/d

Lugeon Test Summary - BR-MET-17-03

Project: Goldborro

Number: 171-16980

Client: Anaconda

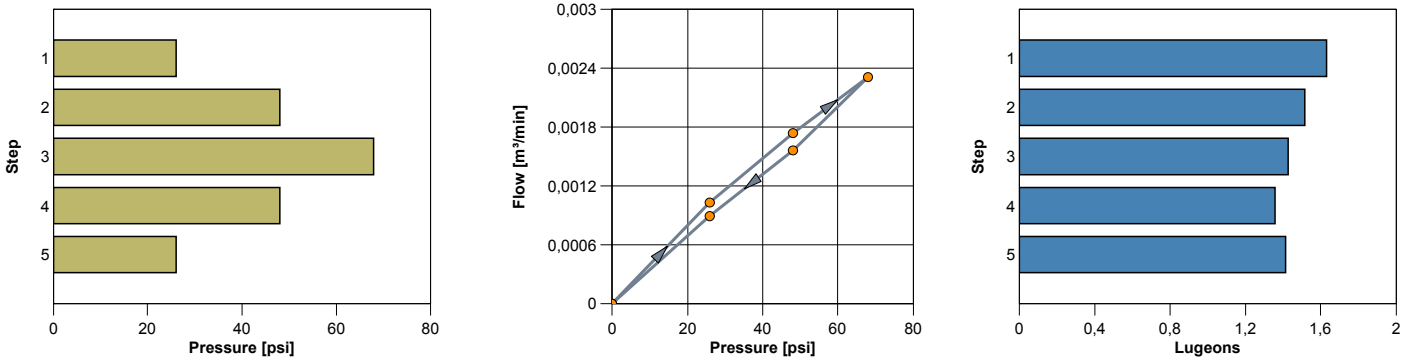
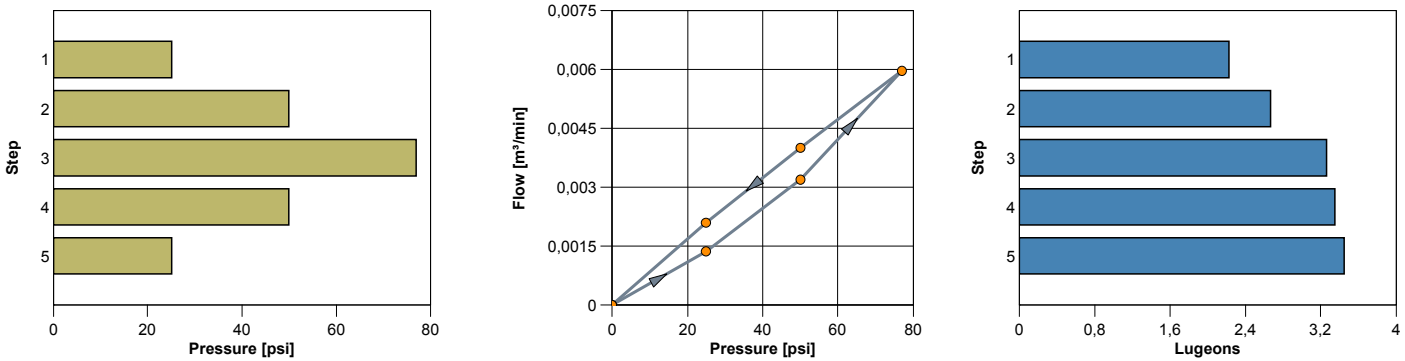
Test Interval Top Bottom	Graphs	Result
12,000 m 14,225 m		Dilation Lugeon: 0,0 Hydraulic Conductivity: 0E0 m/s Hydraulic Conductivity: 0,000 m/d
16,000 m 19,400 m		Dilation Lugeon: 0,0 Hydraulic Conductivity: 0E0 m/s Hydraulic Conductivity: 0,000 m/d
27,000 m 30,400 m		Laminar Lugeon: 9,9 Hydraulic Conductivity: 1E-6 m/s Hydraulic Conductivity: 0,094 m/d

Lugeon Test Summary - BR-MET-17-03

Project: Goldborro

Number: 171-16980

Client: Anaconda

Test Interval Top Bottom	Graphs	Result
46,650 m 50,050 m		Laminar Lugeon: 1,5 Hydraulic Conductivity: 2E-7 m/s Hydraulic Conductivity: 0,014 m/d
54,800 m 58,200 m		Laminar Lugeon: 3,0 Hydraulic Conductivity: 3E-7 m/s Hydraulic Conductivity: 0,028 m/d

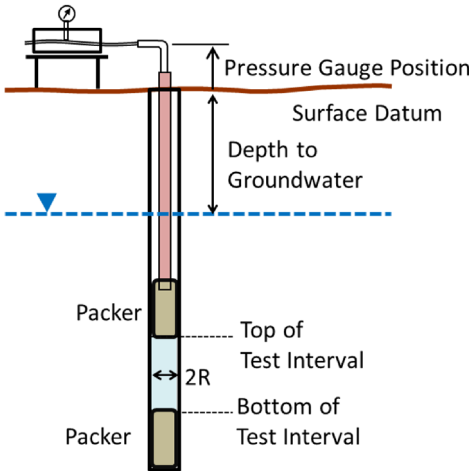
Lugeon Test Analysis Report

Project: Goldborro

Number: 171-16980

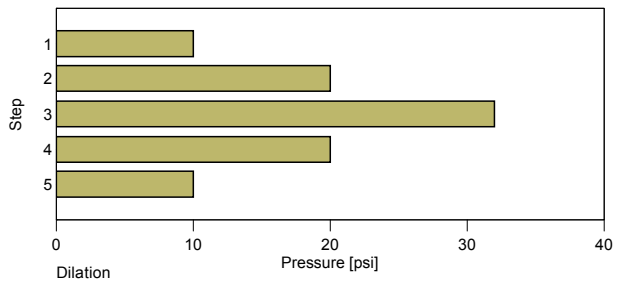
Client: Anaconda

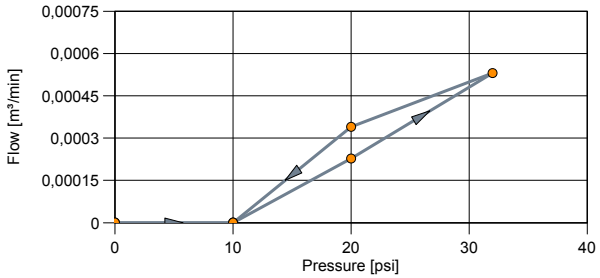
Location: Goldboro mine site	Lugeon Test: Test 1: 12-14,225 m	Tested bore: BR-MET-17-03
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-09
Analysis Performed by: A. Denes		Analysis Date: 2018-02-09
Lithology:		

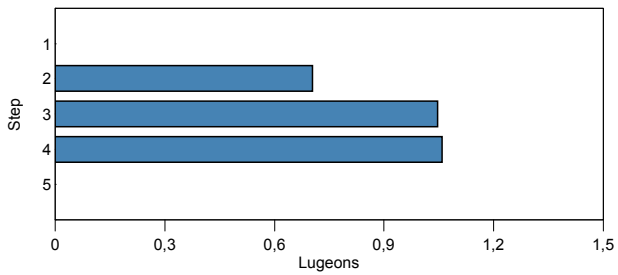


Top of Test Interval: 12,000 m
Bottom of Test Interval: 14,225 m
Length of Test Interval: 2,225 m
Gauge Position: 0,700 m
Depth to Groundwater: 0,000 m
Radius of Test Section: 0,049 m

Step	Pressure [psi]	Flow Meter Readings [m³/min]					Average Flow Rate [m³/min]	Hydraulic Conductivity		
		1	2	3	4	5		[m/s]	[m/d]	Lugeon
1	10,0	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0×10^{0}	0,000	0,0
2	20,0	0,0002	0,0001	0,0003	0,0004	0,0002	0,0002	7×10^{-8}	0,006	0,7
3	32,0	0,0004	0,0004	0,0008	0,0004	0,0008	0,0005	1×10^{-7}	0,009	1,0
4	20,0	0,0004	0,0004	0,0002	0,0004	0,0004	0,0003	1×10^{-7}	0,009	1,1
5	10,0	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0×10^{0}	0,000	0,0
							Average	6×10^{-8}	0,005	0,6







Dilation
Lugeon: 0,0
Hydraulic Conductivity: 0E0 m/s
Hydraulic Conductivity: 0,000 m/d

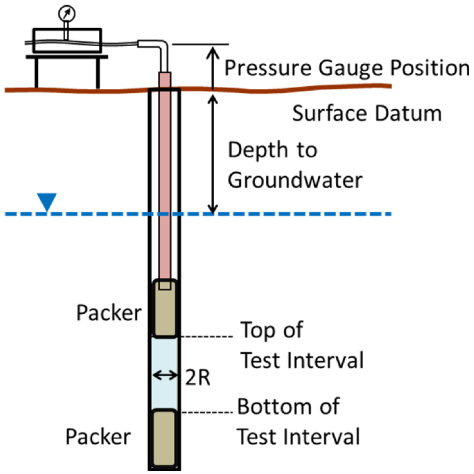
Lugeon Test Analysis Report

Project: Goldborro

Number: 171-16980

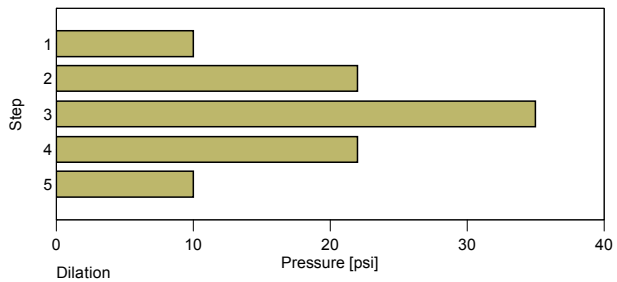
Client: Anaconda

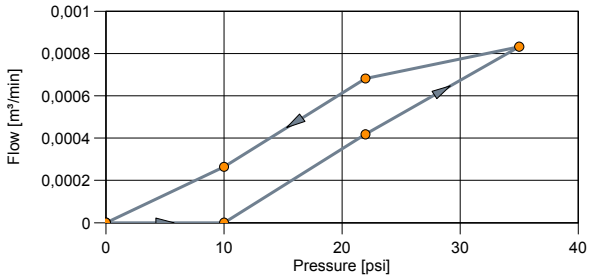
Location: Goldboro mine site	Lugeon Test: Test 2: 16-19.4 m	Tested bore: BR-MET-17-03
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-10
Analysis Performed by: A. Denes		Analysis Date: 2018-02-09
Lithology:		

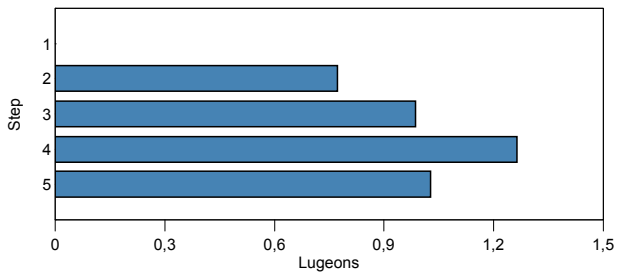


Top of Test Interval: 16,000 m
Bottom of Test Interval: 19,400 m
Length of Test Interval: 3,400 m
Gauge Position: 0,700 m
Depth to Groundwater: 0,000 m
Radius of Test Section: 0,049 m

Step	Pressure [psi]	Flow Meter Readings [m³/min]					Average Flow Rate [m³/min]	Hydraulic Conductivity		
		1	2	3	4	5		[m/s]	[m/d]	Lugeon
1	10,0	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0×10^{0}	0,000	0,0
2	22,0	0,0004	0,0004	0,0004	0,0006	0,0004	0,0004	9×10^{-8}	0,007	0,8
3	35,0	0,0008	0,0008	0,0009	0,0008	0,0009	0,0008	1×10^{-7}	0,009	1,0
4	22,0	0,0008	0,0008	0,0006	0,0007	0,0007	0,0007	1×10^{-7}	0,012	1,3
5	10,0	0,0002	0,0003	0,0001	0,0004	0,0004	0,0003	1×10^{-7}	0,010	1,0
							Average	9×10^{-8}	0,008	0,8







Dilation
Lugeon: 0,0
Hydraulic Conductivity: 0E0 m/s
Hydraulic Conductivity: 0,000 m/d

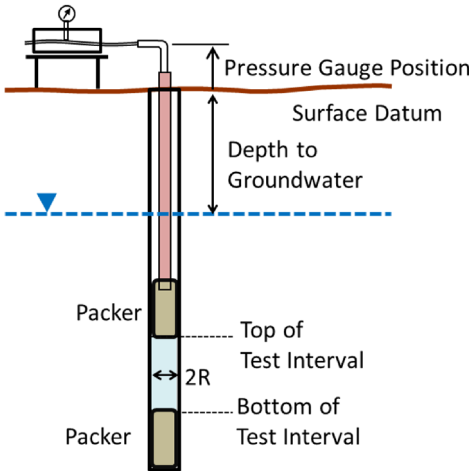
Lugeon Test Analysis Report

Project: Goldborro

Number: 171-16980

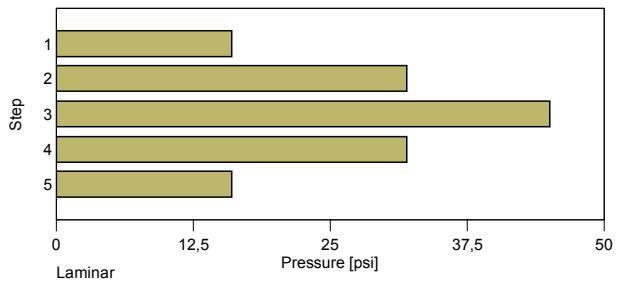
Client: Anaconda

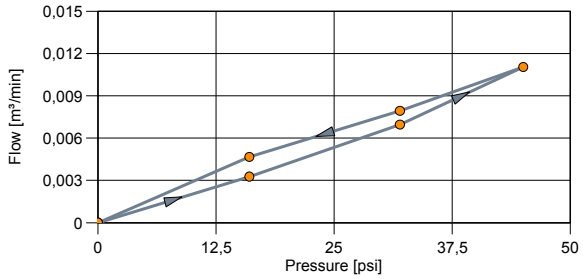
Location: Goldboro mine site	Lugeon Test: Test 3: 27-30,4 m	Tested bore: BR-MET-17-03
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-10
Analysis Performed by: A. Denes		Analysis Date: 2018-02-09
Lithology:		

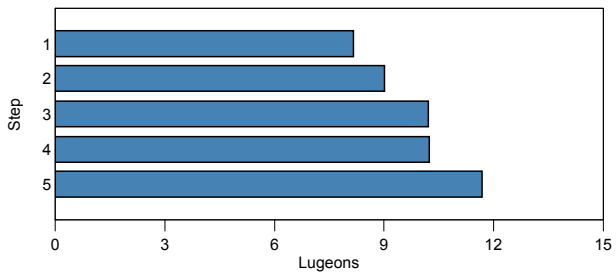


Top of Test Interval: 27,000 m
Bottom of Test Interval: 30,400 m
Length of Test Interval: 3,400 m
Gauge Position: 0,700 m
Depth to Groundwater: 0,000 m
Radius of Test Section: 0,049 m

Step	Pressure [psi]	Flow Meter Readings [m³/min]												Average Flow Rate [m³/min]	Hydraulic Conductivity		
		1	2	3	4	5	6	7	8	9	10	11	12		[m/s]	[m/d]	Lugeon
1	16,0	0,0038	0,0038	0,0030	0,0034	0,0032	0,0034	0,0032	0,0030	0,0030	0,0030	0,0032	0,0028	0,0032	9×10^{-7}	0,078	8,2
2	32,0	0,0098	0,0061	0,0068	0,0061	0,0068	0,0068	0,0070	0,0064	0,0070	0,0070	0,0070	0,0068	0,0070	1×10^{-6}	0,086	9,0
3	45,0	0,0140	0,0106	0,0110	0,0106	0,0102	0,0110	0,0110	0,0106	0,0106	0,0114	0,0102	0,0110	0,0110	1×10^{-6}	0,097	10,2
4	32,0	0,0098	0,0083	0,0083	0,0091	0,0079	0,0076	0,0076	0,0072	0,0072	0,0072	0,0072	0,0076	0,0079	1×10^{-6}	0,098	10,2
5	16,0	0,0038	0,0057	0,0045	0,0049	0,0047	0,0049	0,0045	0,0049	0,0045	0,0045	0,0042	0,0045	0,0047	1×10^{-6}	0,111	11,7
														Average	1×10^{-6}	0,094	9,9







Laminar
Lugeon: 9,9
Hydraulic Conductivity: 1E-6 m/s
Hydraulic Conductivity: 0,094 m/d

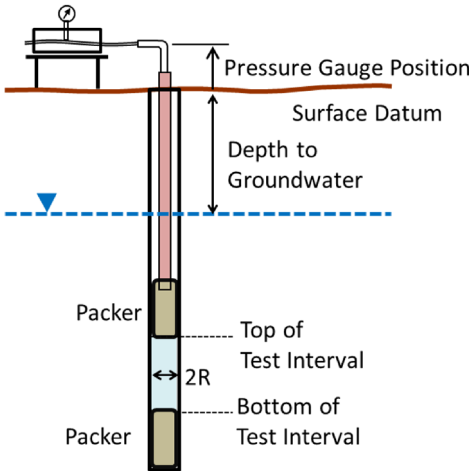
Lugeon Test Analysis Report

Project: Goldborro

Number: 171-16980

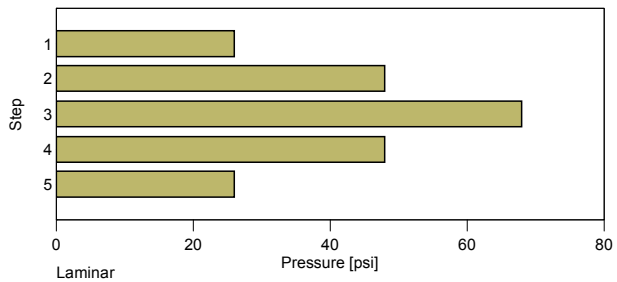
Client: Anaconda

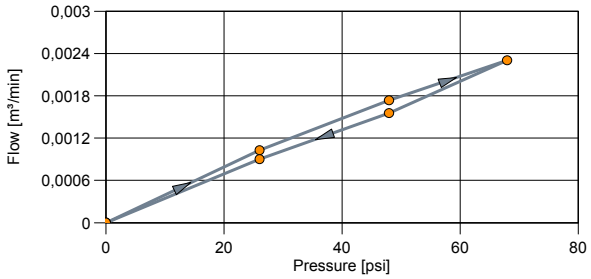
Location: Goldboro mine site	Lugeon Test: Test 4: 46,65-50,05 m	Tested bore: BR-MET-17-03
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-11
Analysis Performed by: A. Denes		Analysis Date: 2018-02-09
Lithology:		

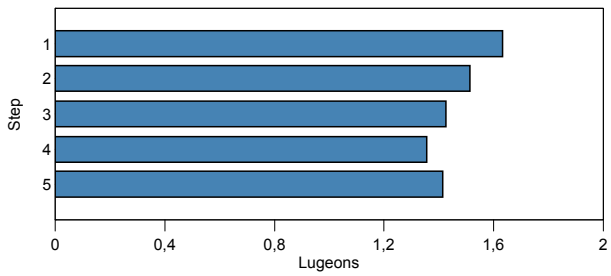


Top of Test Interval: 46,650 m
Bottom of Test Interval: 50,050 m
Length of Test Interval: 3,400 m
Gauge Position: 0,700 m
Depth to Groundwater: 0,000 m
Radius of Test Section: 0,049 m

Step	Pressure [psi]	Flow Meter Readings [m³/min]											Average Flow Rate [m³/min]	Hydraulic Conductivity		
		1	2	3	4	5	6	7	8	9	10	11		[m/s]	[m/d]	Lugeon
1	26,0	0,0015	0,0011	0,0011	0,0009	0,0009	0,0011	0,0008	0,0009	0,0009	0,0009	0,0010	0,0010	2×10^{-7}	0,016	1,6
2	48,0	0,0023	0,0015	0,0019	0,0019	0,0017	0,0019	0,0015	0,0015	0,0017	0,0015	0,0017	0,0017	2×10^{-7}	0,014	1,5
3	68,0	0,0023	0,0023	0,0023	0,0026	0,0019	0,0025	0,0023	0,0023	0,0024	0,0023	0,0023	0,0023	2×10^{-7}	0,014	1,4
4	48,0	0,0015	0,0015	0,0017	0,0016	0,0017	0,0015	0,0015	0,0015	0,0017	0,0015	0,0013	0,0016	1×10^{-7}	0,013	1,4
5	26,0	0,0008	0,0008	0,0008	0,0009	0,0006	0,0013	0,0009	0,0009	0,0009	0,0009	0,0009	0,0009	2×10^{-7}	0,013	1,4
												Average		2×10^{-7}	0,014	1,5







Laminar
Lugeon: 1,5
Hydraulic Conductivity: 2E-7 m/s
Hydraulic Conductivity: 0,014 m/d

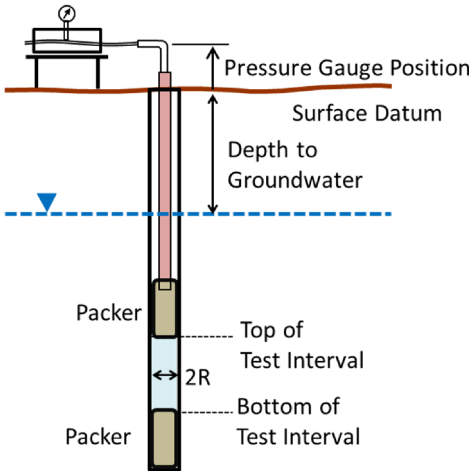
Lugeon Test Analysis Report

Project: Goldborro

Number: 171-16980

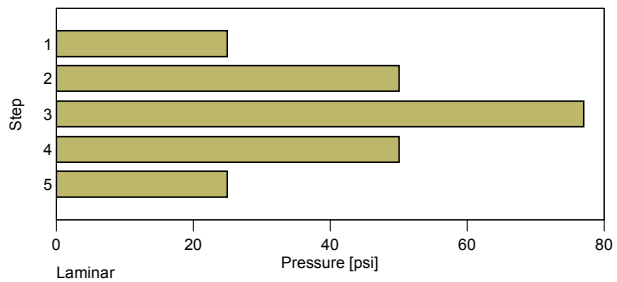
Client: Anaconda

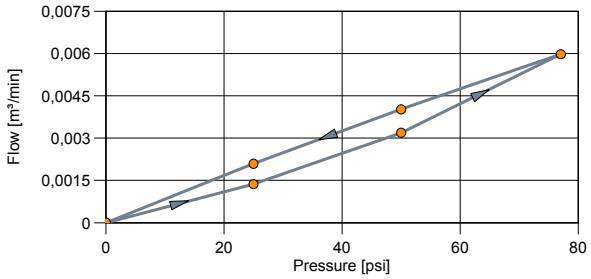
Location: Goldboro mine site	Lugeon Test: Test 5: 54.8-58.2 m	Tested bore: BR-MET-17-03
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-11
Analysis Performed by: A. Denes		Analysis Date: 2018-02-09
Lithology:		

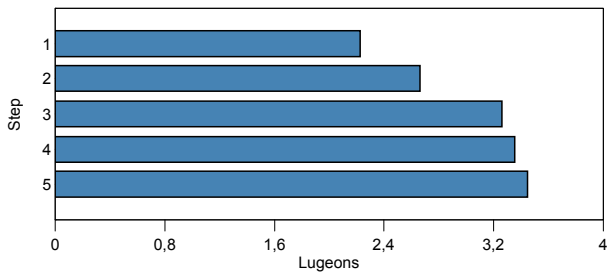


Top of Test Interval: 54,800 m
Bottom of Test Interval: 58,200 m
Length of Test Interval: 3,400 m
Gauge Position: 0,700 m
Depth to Groundwater: 0,000 m
Radius of Test Section: 0,049 m

Step	Pressure [psi]	Flow Meter Readings [m³/min]												Average Flow Rate [m³/min]	Hydraulic Conductivity		
		1	2	3	4	5	6	7	8	9	10	11	12		[m/s]	[m/d]	Lugeon
1	25,0	0,0015	0,0015	0,0011	0,0017	0,0013	0,0015	0,0013	0,0013	0,0011	0,0011	0,0013	0,0013	0,0014	2×10^{-7}	0,021	2,2
2	50,0	0,0023	0,0026	0,0045	0,0030	0,0034	0,0032	0,0032	0,0033	0,0029	0,0032	0,0032	0,0032	0,0032	3×10^{-7}	0,025	2,7
3	77,0	0,0049	0,0057	0,0064	0,0061	0,0059	0,0059	0,0062	0,0061	0,0061	0,0062	0,0061	0,0061	0,0060	4×10^{-7}	0,031	3,3
4	50,0	0,0038	0,0034	0,0038	0,0038	0,0042	0,0042	0,0042	0,0042	0,0040	0,0042	0,0044	0,0042	0,0040	4×10^{-7}	0,032	3,4
5	25,0	0,0023	0,0019	0,0019	0,0021	0,0020	0,0021	0,0021	0,0023	0,0021	0,0021	0,0023	0,0022	0,0021	4×10^{-7}	0,033	3,4
														Average	3×10^{-7}	0,028	3,0







Laminar
Lugeon: 3,0
Hydraulic Conductivity: 3E-7 m/s
Hydraulic Conductivity: 0,028 m/d

APPENDIX

D-2 *SLUG TEST ANALYSIS REPORTS*

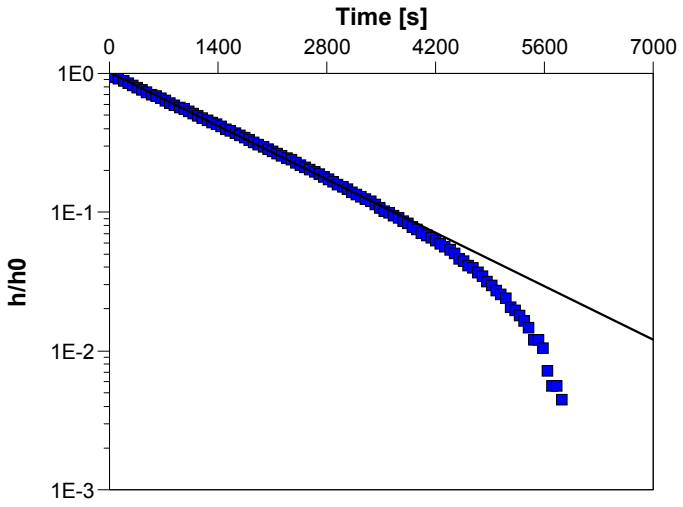
Slug Test Analysis Report

Project: Goldboro Mine - Hydrogeology Investigation

Number: 171-16980-00

Client: Anaconda Mining Inc.

Location: Goldboro, NS	Slug Test: MW1-A1	Test Well: MW1
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-17
Analysis Performed by: A. Dénes	MW1-A1-Hv	Analysis Date: 2018-02-13
Aquifer Thickness: 4,20 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
MW1	$4{,}73 \times 10^{-7}$	

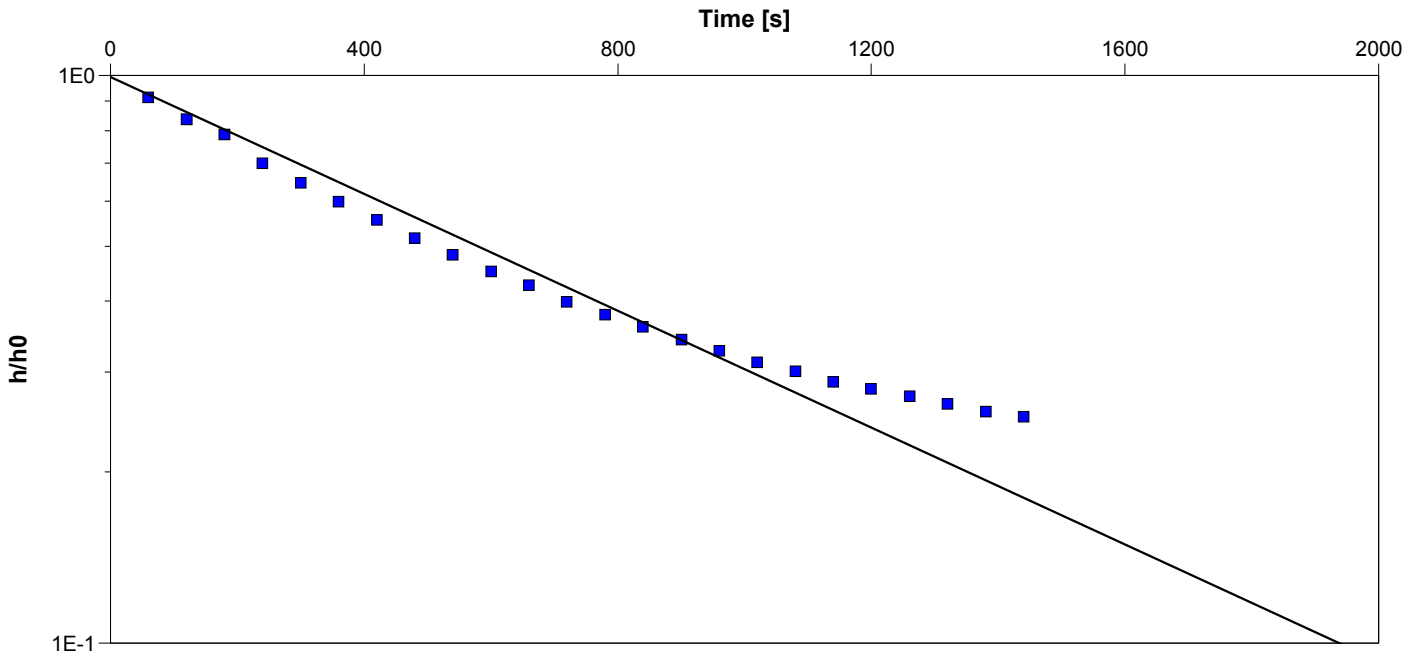
Slug Test Analysis Report

Project: Goldboro Mine - Hydrogelogy Investigation

Number: 171-16980-00

Client: Anaconda Mining Inc.

Location: Goldboro, NS	Slug Test: MW1-D1	Test Well: MW1
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-17
Analysis Performed by: A. Dénes	MW1-D1-HV	Analysis Date: 2018-02-13
Aquifer Thickness: 4,20 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
MW1	$8{,}84 \times 10^{-7}$	

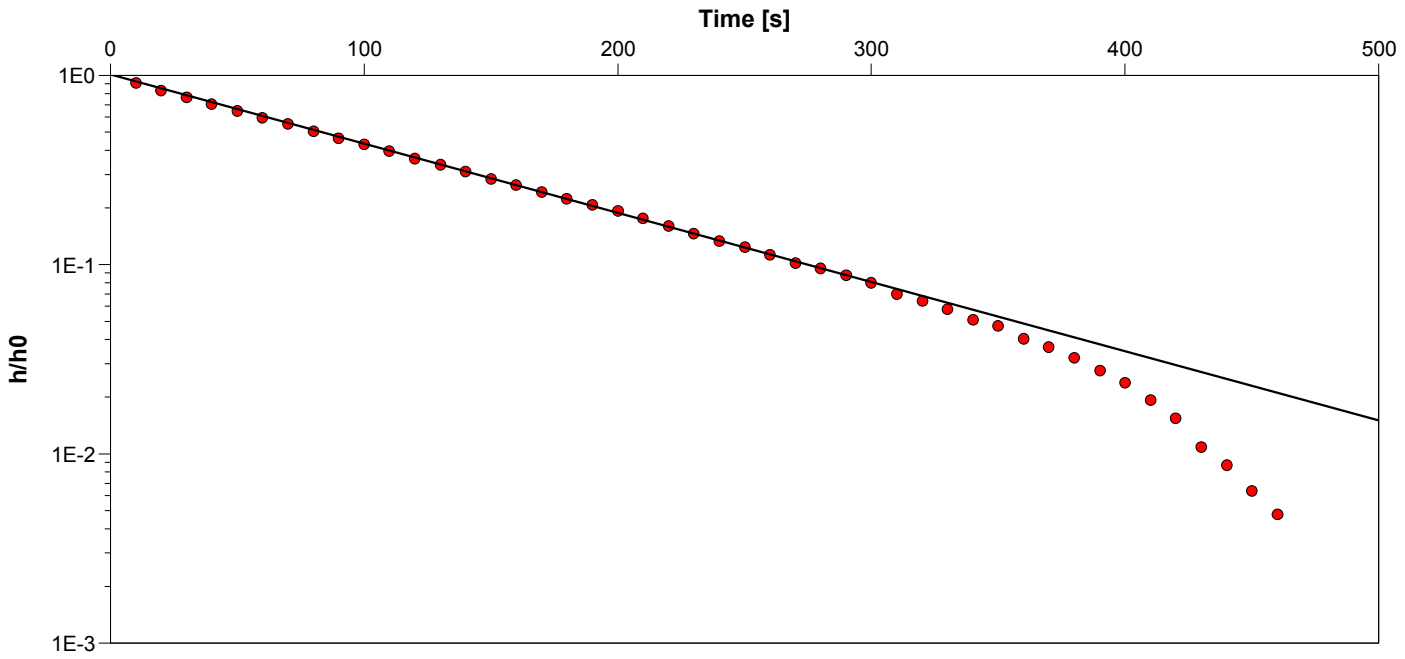
Slug Test Analysis Report

Project: Goldboro Mine - Hydrogeology Investigation

Number: 171-16980-00

Client: Anaconda Mining Inc.

Location: Goldboro, NS	Slug Test: MW2-A1	Test Well: MW2
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-19
Analysis Performed by: A. Dénes	MW2-A1-HV	Analysis Date: 2018-02-13
Aquifer Thickness: 3,40 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
MW2	$5{,}90 \times 10^{-6}$	

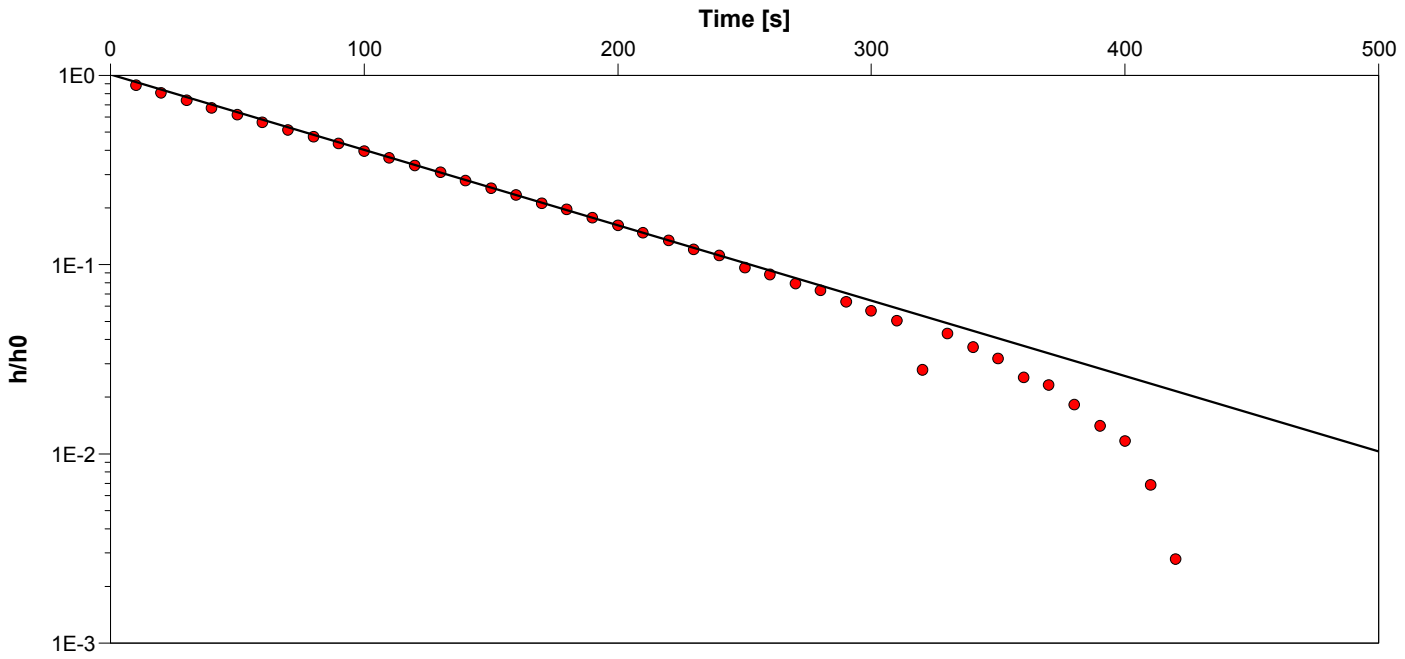
Slug Test Analysis Report

Project: Goldboro Mine - Hydrogeology Investigation

Number: 171-16980-00

Client: Anaconda Mining Inc.

Location: Goldboro, NS	Slug Test: MW2-A2	Test Well: MW2
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-19
Analysis Performed by: A. Dénes	MW2-A2-HV	Analysis Date: 2018-02-13
Aquifer Thickness: 3,40 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
MW2	$6{,}44 \times 10^{-6}$	

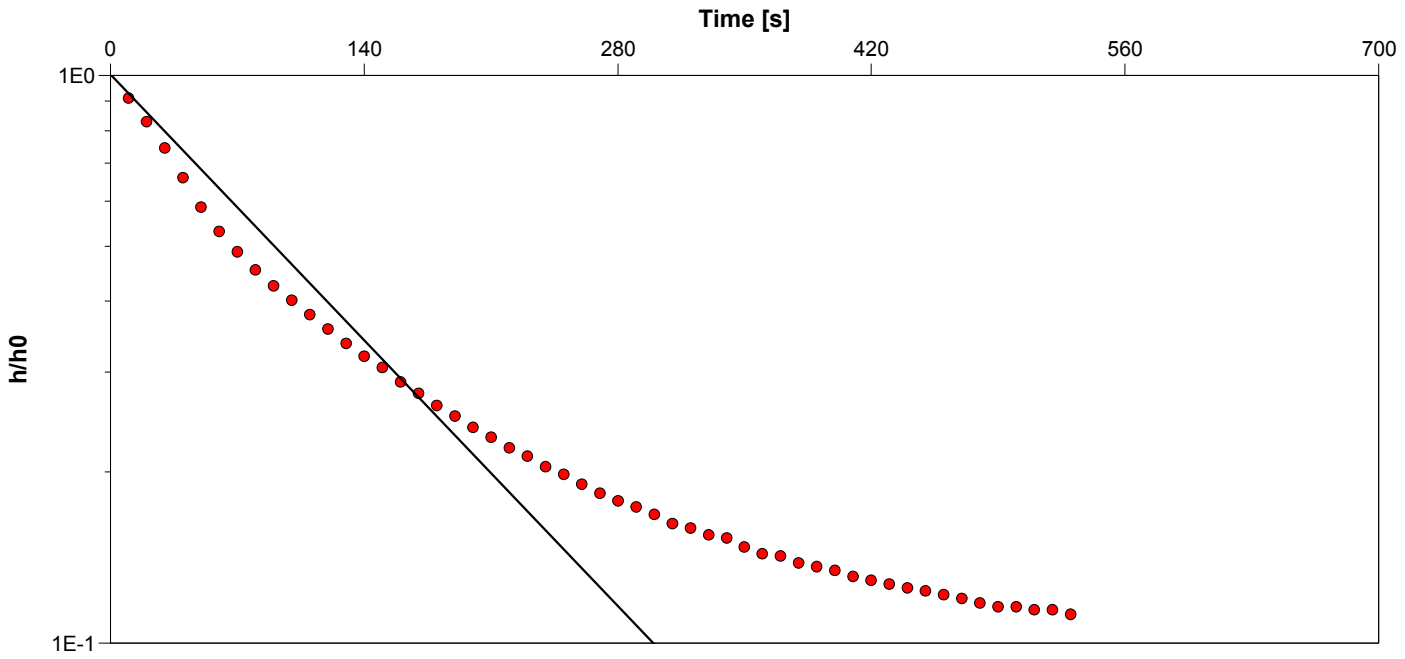
Slug Test Analysis Report

Project: Goldboro Mine - Hydrogeology Investigation

Number: 171-16980-00

Client: Anaconda Mining Inc.

Location: Goldboro, NS	Slug Test: MW2-D1	Test Well: MW2
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-19
Analysis Performed by: A. Dénes	MW2-D1-HV	Analysis Date: 2018-02-13
Aquifer Thickness: 3,40 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
MW2	$5{,}41 \times 10^{-6}$	

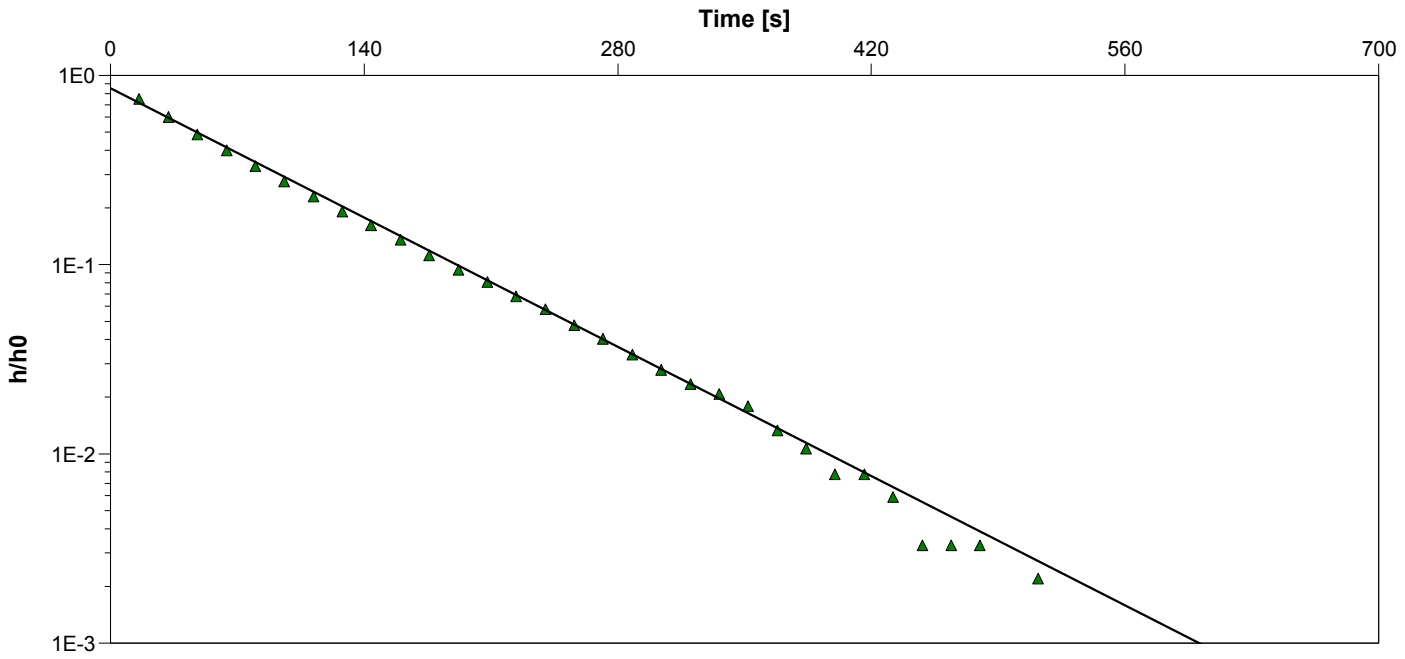
Slug Test Analysis Report

Project: Goldboro Mine - Hydrogelogy Investigation

Number: 171-16980-00

Client: Anaconda Mining Inc.

Location: Goldboro, NS	Slug Test: MW3D-A1	Test Well: MW3D
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-19
Analysis Performed by: JF Garceau	MW3D-A1-HV	Analysis Date: 2018-02-13
Aquifer Thickness: 3,00 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
MW3D	$8{,}05 \times 10^{-6}$	

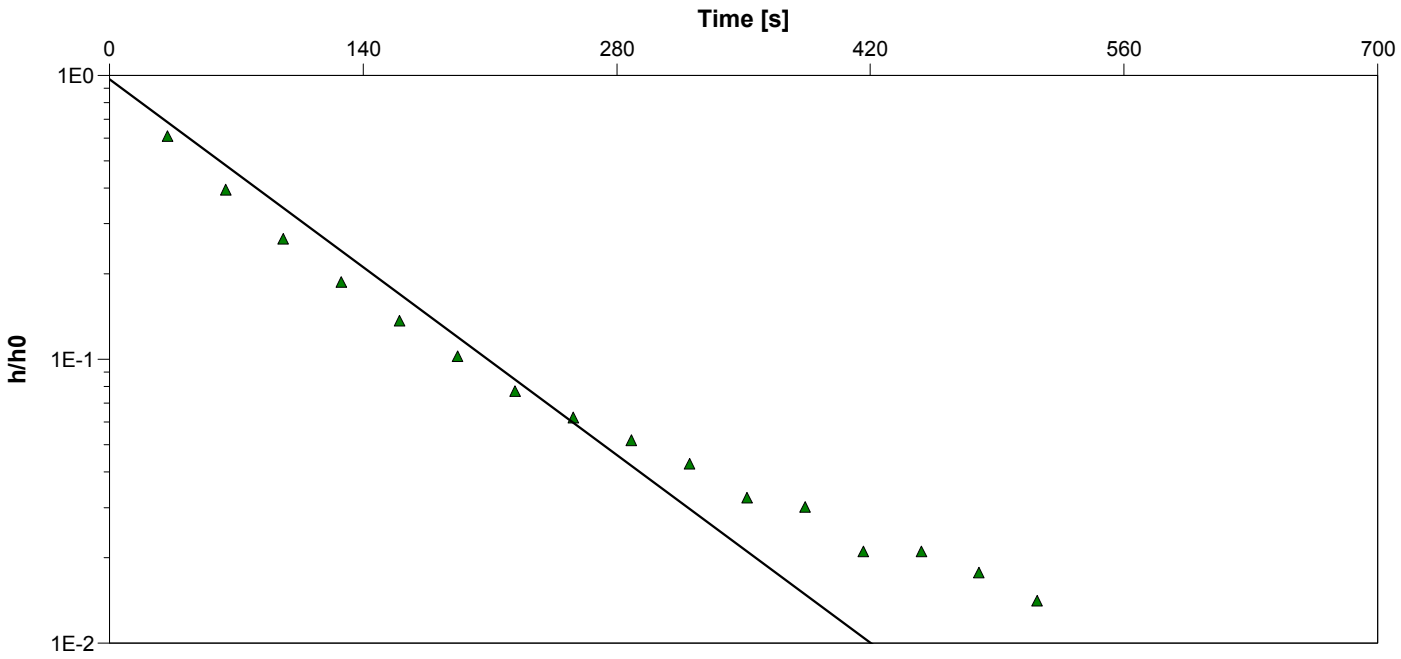
Slug Test Analysis Report

Project: Goldboro Mine - Hydrogelogy Investigation

Number: 171-16980-00

Client: Anaconda Mining Inc.

Location: Goldboro, NS	Slug Test: MW3D-D1	Test Well: MW3D
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-19
Analysis Performed by: JF Garceau	MW3D-D1	Analysis Date: 2018-02-13
Aquifer Thickness: 3,00 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
MW3D	$7{,}80 \times 10^{-6}$	

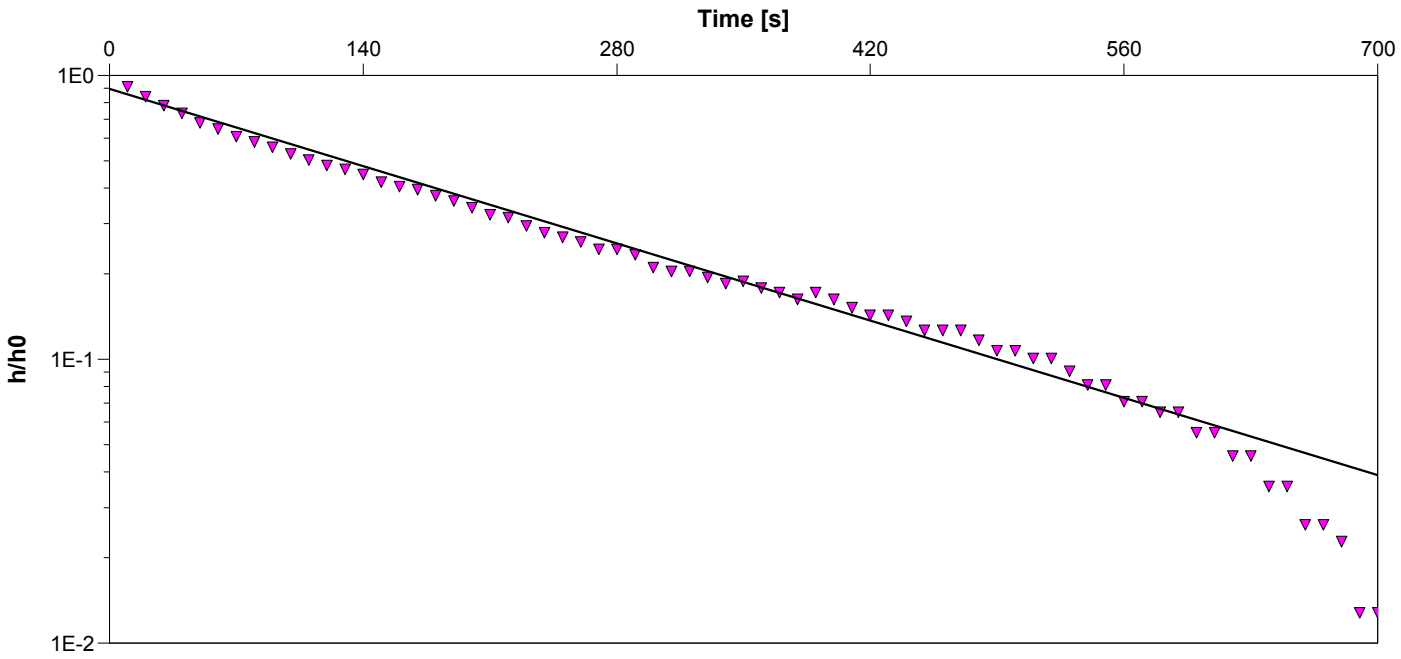
Slug Test Analysis Report

Project: Goldboro Mine - Hydrogeology Investigation

Number: 171-16980-00

Client: Anaconda Mining Inc.

Location: Goldboro, NS	Slug Test: MW3S-D1	Test Well: MW3S
Test Conducted by: Marc Mazerolle		Test Date: 2017-12-19
Analysis Performed by: A. Dénes	MW3S-D1-HV	Analysis Date: 2018-02-13
Aquifer Thickness: 6,00 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
MW3S	$3{,}34 \times 10^{-6}$	

APPENDIX

D-3 *PUMPING TEST ANALYSIS REPORT*

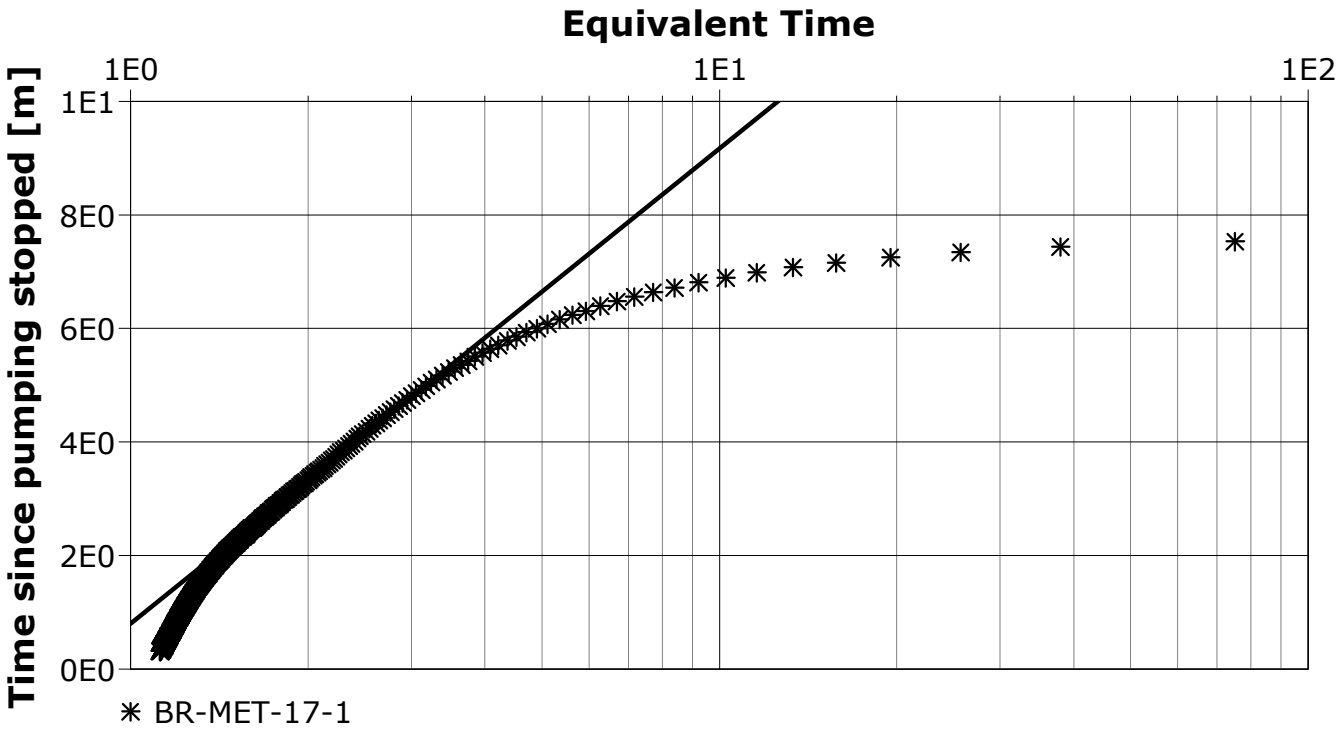
Pumping Test Analysis Report

Project: Goldboro Mine - Hydrogeology Investigation

Number: 171-16980-00

Client: Anaconda Mining Inc.

Location: Goldboro, NS	Pumping Test: BR-MET-17-1	Pumping Well: BR-MET-17-1
Test Conducted by: Adrienne Denes		Test Date: 2017-12-08
Analysis Performed by: A. Dénes	BR-MET-17-1-Recovery	Analysis Date: 2018-02-20
Aquifer Thickness: 45,00 m	Discharge: variable, average rate 1,72 [U.S. gal/min]	



Calculation using THEIS & JACOB

Observation Well	Transmissivity [m²/s]	Hydraulic Conductivity [m/s]	Radial Distance to PW [m]	
BR-MET-17-1	$2{,}37 \times 10^{-6}$	$5{,}28 \times 10^{-8}$	0,05	

Pumping Test Analysis Report

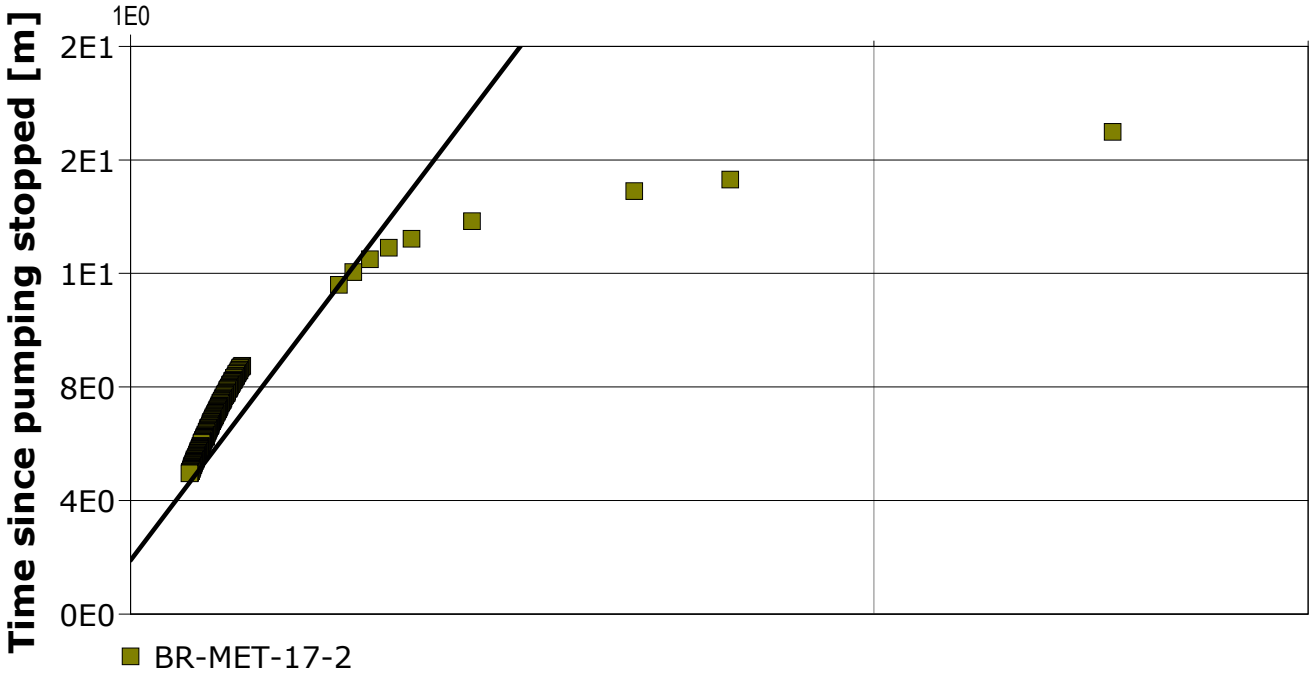
Project: Goldboro Mine - Hydrogeology Investigation

Number: 171-16980-00

Client: Anaconda Mining Inc.

Location: Goldboro, NS	Pumping Test: BR-MET-17-2	Pumping Well: BR-MET-17-2
Test Conducted by: Adrienne Denes		Test Date: 2017-12-07
Analysis Performed by: A. Dénes	BR-MET-17-2 recovery	Analysis Date: 2018-02-13
Aquifer Thickness: 45,00 m	Discharge: variable, average rate 16,9 [U.S. gal/min]	

Equivalent Time



Calculation using THEIS & JACOB

Observation Well	Transmissivity [m²/s]	Hydraulic Conductivity [m/s]	Radial Distance to PW [m]	
BR-MET-17-2	$1{,}70 \times 10^{-6}$	$3{,}78 \times 10^{-8}$	0,05	

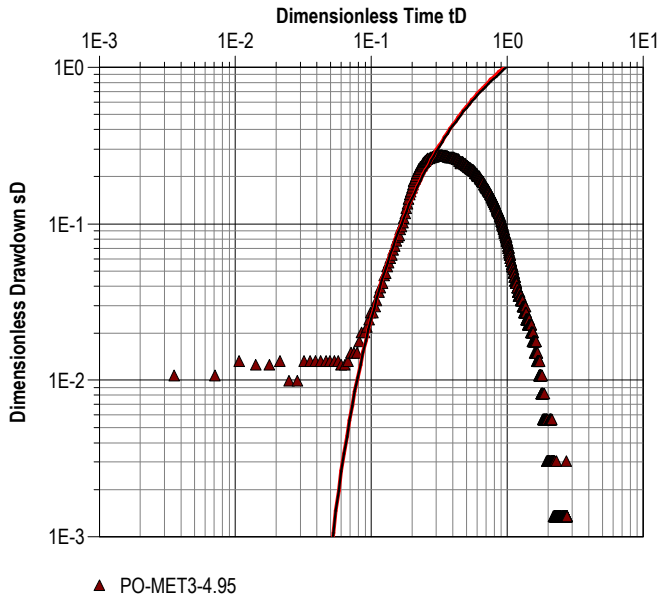
Pumping Test Analysis Report

Project: Goldboro Mine - Hydrogeology Investigation

Number: 171-16980-00

Client: Anaconda Mining Inc.

Location: Goldboro, NS	Pumping Test: BR-MET-17-3	Pumping Well: BR-MET-17-3
Test Conducted by: Adrienne Denes		Test Date: 2017-12-08
Analysis Performed by: A. Denes	BR-MET-17-3-Pump-Double Porosity	Analysis Date: 2018-02-15
Aquifer Thickness: 29,00 m	Discharge: variable, average rate 3,38 [U.S. gal/min]	



Calculation using Double Porosity

Observation Well	Transmissivity [m²/s]	Hydraulic Conductivity [m/s]	Storage coefficient	Sigma	Lambda	Radial Distance to PW [m]
PO-MET3-4.95	$2{,}49 \times 10^{-5}$	$8{,}59 \times 10^{-7}$	$2{,}87 \times 10^{-3}$	$4{,}06 \times 10^{2}$	$7{,}36 \times 10^{-2}$	4,95

Pumping Test Analysis Report

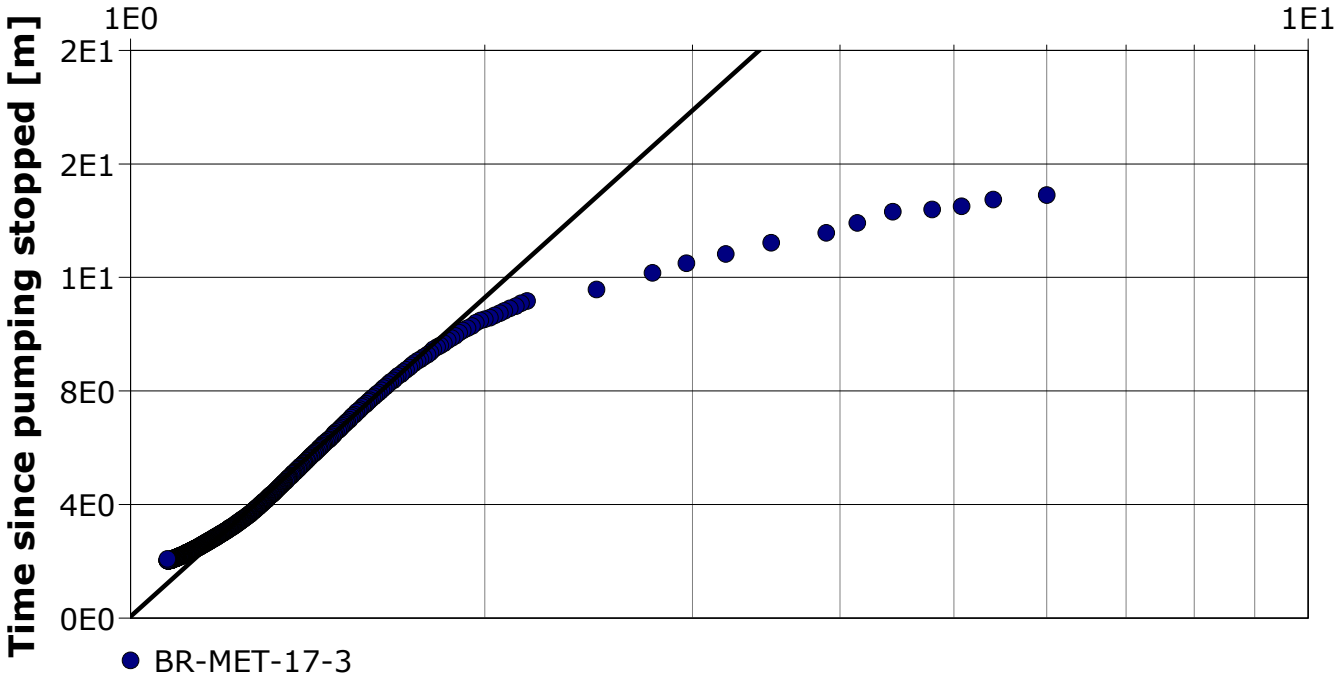
Project: Goldboro Mine - Hydrogelogy Investigation

Number: 171-16980-00

Client: Anaconda Mining Inc.

Location: Goldboro, NS	Pumping Test: BR-MET-17-3	Pumping Well: BR-MET-17-3
Test Conducted by: Adrienne Denes		Test Date: 2017-12-08
Analysis Performed by: JF Garceau	Recovery BR-MET-17-3	Analysis Date: 2018-02-21
Aquifer Thickness: 29,00 m	Discharge: variable, average rate 3,38 [U.S. gal/min]	

Equivalent Time



Calculation using THEIS & JACOB

Observation Well	Transmissivity [m²/s]	Hydraulic Conductivity [m/s]	Radial Distance to PW [m]	
BR-MET-17-3	$1{,}05 \times 10^{-6}$	$3{,}60 \times 10^{-8}$	0,05	

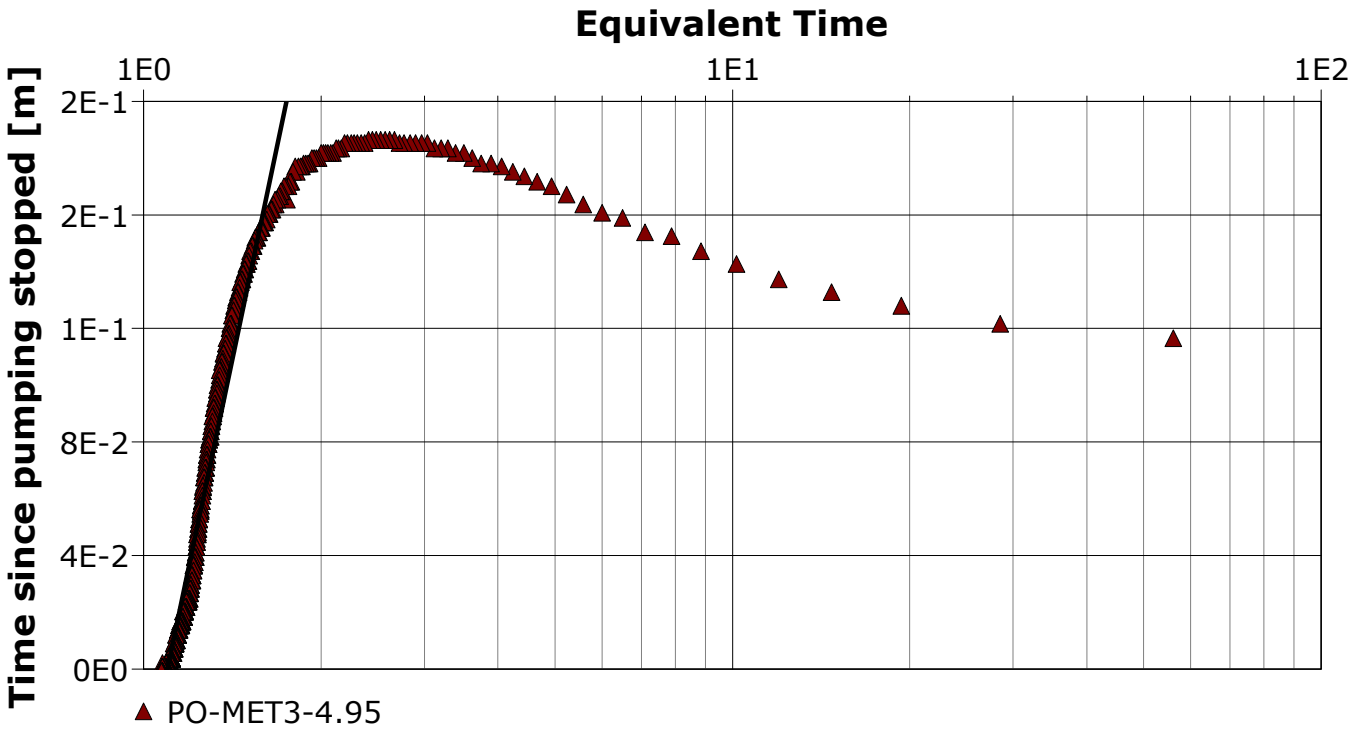
Pumping Test Analysis Report

Project: Goldboro Mine - Hydrogeology Investigation

Number: 171-16980-00

Client: Anaconda Mining Inc.

Location: Goldboro, NS	Pumping Test: BR-MET-17-3	Pumping Well: BR-MET-17-3
Test Conducted by: Adrienne Denes		Test Date: 2017-12-08
Analysis Performed by: JF Garceau	BR-MET-17-3-Recovery-Observation well	Analysis Date: 2018-02-21
Aquifer Thickness: 29,00 m	Discharge: variable, average rate 3,38 [U.S. gal/min]	



Calculation using THEIS & JACOB

Observation Well	Transmissivity [m²/s]	Hydraulic Conductivity [m/s]	Radial Distance to PW [m]	
PO-MET3-4.95	$3{,}95 \times 10^{-5}$	$1{,}36 \times 10^{-6}$	4,95	

Pumping Test Analysis Report

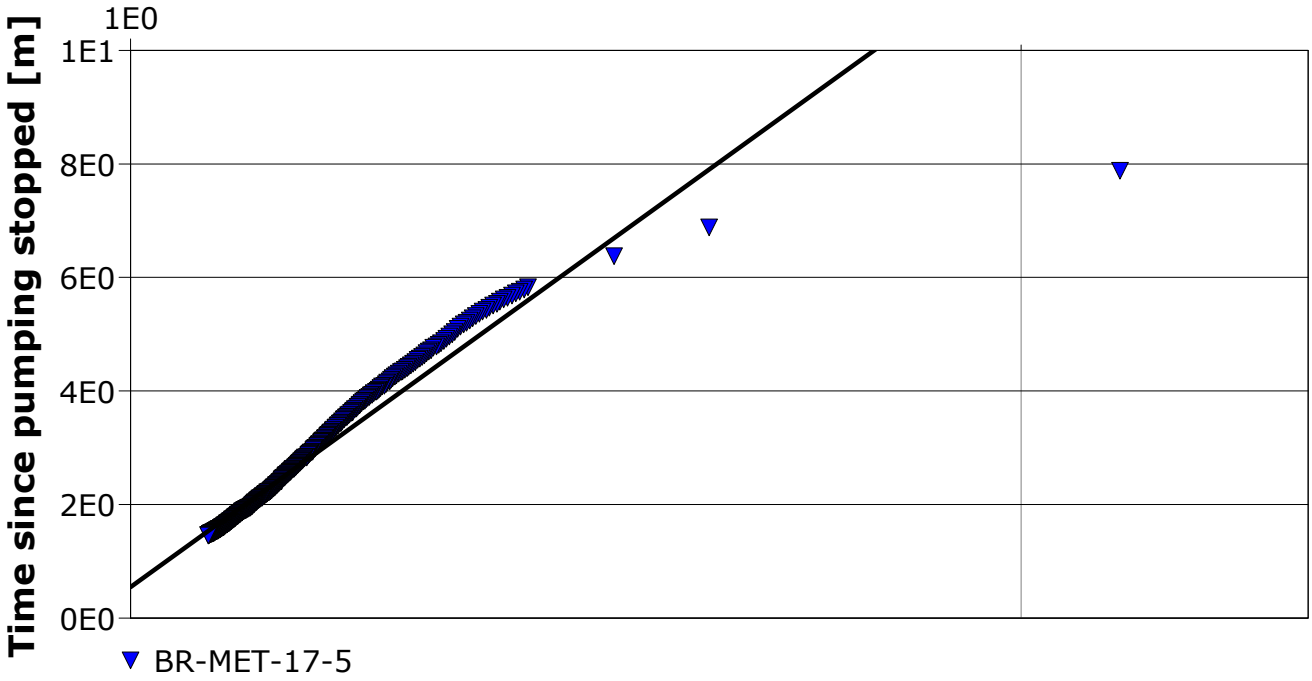
Project: Goldboro Mine - Hydrogeology Investigation

Number: 171-16980-00

Client: Anaconda Mining Inc.

Location: Goldboro, NS	Pumping Test: BR-MET-17-5	Pumping Well: BR-MET-17-5
Test Conducted by: Adrienne Denes		Test Date: 2018-02-15
Analysis Performed by: A. Dénes	BR-MET-17-5-Recovery	Analysis Date: 2018-02-15
Aquifer Thickness: 45,00 m	Discharge: variable, average rate 8,28 [U.K. gal/min]	

Equivalent Time



Calculation using THEIS & JACOB

Observation Well	Transmissivity [m²/s]	Hydraulic Conductivity [m/s]	Radial Distance to PW [m]	
BR-MET-17-5	$3{,}05 \times 10^{-6}$	$6{,}78 \times 10^{-8}$	0,05	

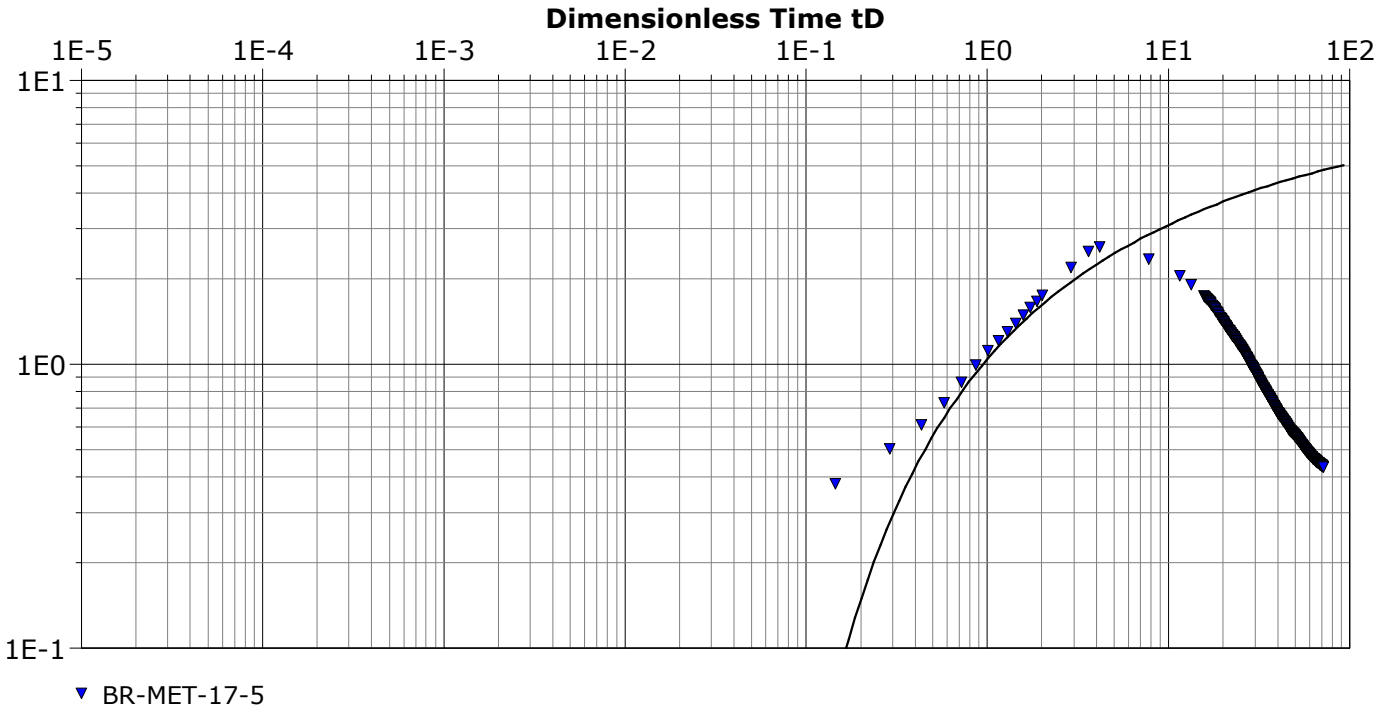
Pumping Test Analysis Report

Project: Goldboro Mine - Hydrogeology Investigation

Number: 171-16980-00

Client: Anaconda Mining Inc.

Location: Goldboro, NS	Pumping Test: BR-MET-17-5	Pumping Well: BR-MET-17-5
Test Conducted by: Adrienne Denes		Test Date: 2018-02-15
Analysis Performed by: A.Dénes	BR-MET-17-5-Pumping	Analysis Date: 2018-02-21
Aquifer Thickness: 45,00 m	Discharge: variable, average rate 8,28 [U.K. gal/min]	



Calculation using Moench Fracture Flow

Observation Well	Transmissivity [m²/s]	Hydraulic Conductivity [m/s]	Storage coefficient	Sigma	Gamma	SF	Radial Distance to PW [m]
BR-MET-17-5	$1{,}49 \times 10^{-5}$	$3{,}31 \times 10^{-7}$		$2{,}26 \times 10^{3}$	$3{,}96 \times 10^{-3}$	$3{,}47 \times 10^{-3}$	0,05

APPENDIX

E

ANALYTICAL LABORATORY RESULTS AND TABLES

APPENDIX

E-1 *SUMMARY TABLES – CHEMICAL ANALYSIS RESULTS*

TABLE

Dissolved Metals in Groundwater - Monitoring Wells - with NSE Tier 1 EQS and CDWQ Standards
Anaconda Mining Inc., Goldboro Mine Property
Project No.: 171-16980

Parameter	Units	RDL	Guideline[1]	Guideline[2]	Groundwater Samples (Till Wells)			
			Tier 1 EQS for Groundwater	CDWQ	MW17-01 FUW533 16-Dec-17	MW17-02 FUW534 19-Dec-17	MW17-03S FUW535 19-Dec-17	MW17-03D FUW536 19-Dec-17
Dissolved Aluminum (Al)	ug/L	5	-	-	7.2	36	470	47
Dissolved Antimony (Sb)	ug/L	1	6	6	ND	ND	ND	ND
Dissolved Arsenic (As)	ug/L	10	10	10	1.8	2.6	1.4	**11**
Dissolved Barium (Ba)	ug/L	1	1000	1000	5.6	13	9.3	3.3
Dissolved Beryllium (Be)	ug/L	1	4	-	ND	ND	ND	ND
Dissolved Bismuth (Bi)	ug/L	2	-	-	ND	ND	ND	ND
Dissolved Boron (B)	ug/L	50	5000	5000	ND	ND	ND	ND
Dissolved Cadmium (Cd)	ug/L	0.01	5	5	0.021	0.14	0.031	ND
Dissolved Calcium (Ca)	ug/L	100	-	-	11000	9800	2000	7000
Dissolved Chromium (Cr)	ug/L	1	50	50	ND	ND	ND	ND
Dissolved Cobalt (Co)	ug/L	0.4	10	-	1	3.6	2.1	ND
Dissolved Copper (Cu)	mg/L	2	-	-	ND	3	17	2.8
Cyanide (Strong Acid Dissoc.)	mg/L	0.001	0.2	0.2	0.0011	ND	ND	ND
Dissolved Iron (Fe)	ug/L	50	-	-	ND	620	410	ND
Dissolved Lead (Pb)	ug/L	0.5	10	10	ND	ND	0.56	ND
Dissolved Magnesium (Mg)	ug/L	100	-	-	1300	1300	680	2400
Dissolved Manganese (Mn)	ug/L	2	-	-	73	850	180	31
Dissolved Mercury	ug/L	0.013	-	-	ND	0.032	ND	ND
Dissolved Molybdenum (Mo)	ug/L	2	70	-	ND	ND	ND	ND
Dissolved Nickel (Ni)	ug/L	2	100	-	2.7	5	7.6	2.6
Dissolved Phosphorus (P)	ug/L	100	-	-	ND	ND	ND	ND
Dissolved Potassium (K)	ug/L	100	-	-	1700	1700	1800	2300
Dissolved Selenium (Se)	ug/L	1	10	50	ND	ND	ND	ND
Dissolved Silver (Ag)	ug/L	0.1	100	-	ND	ND	0.18	ND
Dissolved Sodium (Na)	ug/L	100	-	-	16000	9400	4600	6100
Dissolved Strontium (Sr)	ug/L	2	4400	-	35	24	12	46
Dissolved Thallium (Tl)	ug/L	0.1	2	-	ND	ND	ND	ND
Dissolved Tin (Sn)	ug/L	2	4400	-	ND	ND	ND	ND
Dissolved Titanium (Ti)	ug/L	2	-	-	ND	ND	17	2.2
Dissolved Uranium (U)	ug/L	0.1	20	20	ND	ND	ND	ND
Dissolved Vanadium (V)	ug/L	2	6.2	-	ND	ND	ND	ND
Dissolved Zinc (Zn)	ug/L	5	5000	-	ND	15	14	7.9

Notes:

[1] Nova Scotia Environment Tier 1 Environmental Quality Standards for Groundwater, 2013

[2] Guidelines for Canadian Drinking Water Quality Summary Table, 2017

shading denotes a guideline exceedance

RDL denotes laboratory reported detection limit

\- denotes no value/not analysed

* 5 µg/L if pH < 6.5 or 100 µg/L if pH ≥ 6.5

Guideline Details

Tier 1 EQS for Groundwater	
Land Use =	commercial/industrial
Receptor of Concern =	human
Sampled Media =	groundwater
Pathway of Concern =	n/a
Water Usage =	potable
Soil Type =	coarse-grained
Distance to SW Receptor =	n/a

Sample Details

MW17-01	WSP Sample ID
FUW533	Laboratory Sample ID
16-Dec-17	Sampling date

APPENDIX

E-2 *MAXXAM CERTIFICATE OF ANALYSIS*

TABLE

General Chemistry Results in Water Samples
Anaconda Mining Inc., Goldboro Mine Property
Project No.: 171-16980

Parameter	Units	RDL	Guideline[1]	Guideline[2]	Groundwater Samples (Bedrock)				Groundwater Samples (Till)				Surface Water Samples	
			NSE Tier 1 EQS (Groundwater)	CDWQ	MET-1 FUW527 07-Dec-17	MET-2 FUW528 07-Dec-17	MET-3 FUW529 08-Dec-17	MET-5 FUW531 08-Dec-17	MW-1 FUW533 16-Dec-17	MW-2 FUW534 19-Dec-17	MW-3S FUW535 19-Dec-17	MW-3D FUW536 19-Dec-17	Goldbrook Lake FUW530 16-Dec-17	Clarifying Pond FUW532 16-Dec-17
Anion Sum	me/L	N/A	-	-	0.62	1.35	1.03	2.83	1.48	1.19	0.41	0.95	0.21	0.52
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	-	-	18	30	37	110	42	39	12	28	ND	8.3
Calculated TDS	mg/L	1	-	500 (AO)	50	87	93	160	90	71	30	62	18	35
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cation Sum	me/L	N/A	-	-	0.76	1.36	1.8	2.76	1.38	1.08	0.43	0.88	0.28	0.62
Hardness (CaCO3)	mg/L	1	-	-	15	35	29	26	33	30	7.9	27	4.2	18
Ion Balance (% Difference)	%	N/A	-	-	10.1	0.37	27.2	1.25	3.5	4.85	2.38	3.83	14.3	8.77
Langelier Index (@ 20C)	N/A		-	-	-2.81	-2.07	-1.92	-0.647	-1.39	-1.39	-3.17	-1.91	NC	-3.07
Langelier Index (@ 4C)	N/A		-	-	-3.07	-2.32	-2.18	-0.898	-1.64	-1.64	-3.42	-2.16	NC	-3.32
Nitrate (N)	mg/L	0.05	-	45	ND	ND	ND	ND	0.13	ND	ND	0.071	ND	ND
Saturation pH (@ 20C)	N/A		-	-	9.45	8.8	8.93	8.4	8.67	8.74	9.91	9.03	NC	9.63
Saturation pH (@ 4C)	N/A		-	-	9.7	9.05	9.18	8.65	8.93	8.99	10.2	9.28	NC	9.88
Total Alkalinity (Total as CaCO3)	mg/L	5	-	-	18	30	37	120 (2)	42	39	12	28	ND	8.3
Dissolved Chloride (Cl)	mg/L	1	250	250 (AO)	6.6	9.2	8.5	9.5	9.5	9.6	6.3	7	7.5	9.8
Sodium	ug/L	100	200000	200000 (AO)	5600	6400	6300	51000	16000	9400	4600	6100	3900	5300
Colour	TCU	5	-	15 (AO)	ND	13	**17**	ND	ND	ND	**31**	6.8	**160 (2)**	**130 (1)**
Nitrate + Nitrite (N)	mg/L	0.05	-	1	ND	ND	ND	ND	0.15	ND	ND	0.071	ND	ND
Nitrite (N)	mg/L	0.01	-	3	ND	ND	ND	ND	0.018	ND	ND	ND	ND	ND
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	-	-	0.059	0.073	ND	0.083	ND	0.083	0.089	0.15	ND	ND
Total Organic Carbon (C)	mg/L	5	-	-	12 (1)	44 (1)	20 (1)	12 (1)	9.3 (1)	ND (1)	ND (1)	ND (1)	12 (1)	16 (2)
Orthophosphate (P)	mg/L	0.01	-	-	ND	0.011	ND	0.013	ND	ND	0.01	0.022	0.01	0.025
pH (lab)	pH	N/A	-	7.0-10.5	**6.64**	**6.73**	7	7.75	7.29	7.35	**6.75**	7.12	**5.76**	**6.57**
pH (field)	pH	N/A	-	7.0-10.5	7.02	-	**6.21**	7.56	**6.17**	**6.48**	**6.78**	**6.67**	**5.24**	**6.75**
Reactive Silica (SiO2)	mg/L	0.5	-	-	10	5.4	16	8	7.7	7.5	6.5	10	4.5	3.5
Dissolved Sulphate (SO4)	mg/L	2	-	500 (AO)	4.2	24	2.6	12	18	6.1	ND	9.5	ND	3.9
Turbidity*	NTU	1	-	-	>1000	170	270	80	70	45	>1000	>1000	0.87	27
Conductivity	uS/cm	1	-	-	64	140	99	270	150	120	48	99	37	68
Total Suspended Solids	mg/L	10	-	-	22000 (2)	240	93	270						

Notes:

[1] Nova Scotia Environment Tier 1 Environmental Quality Standards for Groundwater, 2013

[2] Guidelines for Canadian Drinking Water Quality Summary Table, 2017, AO refers to aesthetic objectives

(1) Reporting limit was increased due to turbidity.

(2) Elevated reporting limit due to sample matrix.

*Turbidity limits assume some form of water filtration has occurred

shading denotes a guideline exceedance

RDL denotes laboratory reported detection limit

\- denotes no value/not analysed

* 5 µg/L if pH < 6.5 or 100 µg/L if pH ≥ 6.5

Sample Details

MET-1	WSP Sample ID
FUW527	Laboratory Sample ID
7-Dec-17	Sampling date

APPENDIX

E-3 GEMTEC SAMPLING RESULTS

TABLE **Total Metals in Groundwater - Bedrock Wells - with NSE Tier 1 EQS and CDWQ Standards**
Anaconda Mining Inc., Goldboro Mine Property
Project No.: 171-16980

Parameter	Units	RDL	Guideline[1]	Guideline[2]	Groundwater Samples (Bedrock Wells)			
			Tier 1 EQS for Groundwater	CDWQ	MET-1 FUW527 07-Dec-17	MET-2 FUW528 07-Dec-17	MET-3 FUW529 08-Dec-17	MET-5 FUW531 08-Dec-17
Total Aluminum (Al)	ug/L	5	-	-	9500	3000	1600	5000
Total Antimony (Sb)	ug/L	1	6	6	ND	ND	ND	3.6
Total Arsenic (As)	ug/L	10	10	10	**970**	**170**	**140**	**370**
Total Barium (Ba)	ug/L	1	1000	1000	66	130	24	28
Total Beryllium (Be)	ug/L	1	4	-	ND	1.6	ND	4
Total Bismuth (Bi)	ug/L	2	-	-	ND	ND	ND	ND
Total Boron (B)	ug/L	50	5000	5000	ND	ND	ND	92
Total Cadmium (Cd)	ug/L	0.01	5	5	0.079	0.038	0.021	0.095
Total Calcium (Ca)	ug/L	100	-	-	5500	12000	7800	9500
Total Chromium (Cr)	ug/L	1	50	50	40	2.4	7	21
Total Cobalt (Co)	ug/L	0.4	10	-	10	2.1	1.4	2.2
Total Copper (Cu)	mg/L	2	-	-	40	72	44	230
Cyanide (Strong Acid Dissoc.)	mg/L	0.001	0.2	0.2	ND	ND	ND	ND
Total Iron (Fe)	ug/L	50	-	-	21000	14000	29000	18000
Total Lead (Pb)	ug/L	0.5	10	10	**17**	2.5	3.3	5.5
Total Magnesium (Mg)	ug/L	100	-	-	4300	1700	3100	2000
Total Manganese (Mn)	ug/L	2	-	-	910	650	750	280
Total Mercury (Hg)	ug/L	0.013	1	1	ND	ND	ND	ND
Total Molybdenum (Mo)	ug/L	2	70	-	ND	ND	ND	4.6
Total Nickel (Ni)	ug/L	2	100	-	16	6.1	5.3	10
Total Phosphorus (P)	ug/L	100	-	-	330	ND	220	160
Total Potassium (K)	ug/L	100	-	-	4800	1600	3200	2100
Total Selenium (Se)	ug/L	1	10	50	ND	ND	ND	ND
Total Silver (Ag)	ug/L	0.1	100	-	5.4	0.2	0.17	1.6
Total Sodium (Na)	ug/L	100	-	-	5900	6900	6200	49000
Total Strontium (Sr)	ug/L	2	4400	-	51	150	68	190
Total Thallium (Tl)	ug/L	0.1	2	-	0.16	ND	ND	ND
Total Tin (Sn)	ug/L	2	4400	-	ND	ND	ND	ND
Total Titanium (Ti)	ug/L	2	-	-	530	12	73	69
Total Uranium (U)	ug/L	0.1	20	20	0.59	0.4	0.15	1
Total Vanadium (V)	ug/L	2	6.2	-	**15**	ND	2.4	2.7
Total Zinc (Zn)	ug/L	5	5000	-	220	350	510	1500

Notes:

[1] Nova Scotia Environment Tier 1 Environmental Quality Standards for Groundwater, 2013

[2] Guidelines for Canadian Drinking Water Quality Summary Table, 2017

shading denotes a guideline exceedance

RDL denotes laboratory reported detection limit

\- denotes no value/not analysed

* 5 µg/L if pH < 6.5 or 100 µg/L if pH ≥ 6.5

Guideline Details

Tier 1 EQS for Groundwater	
Land Use =	commercial/industrial
Receptor of Concern =	human
Sampled Media =	groundwater
Pathway of Concern =	n/a
Water Usage =	potable
Soil Type =	coarse-grained

Sample Details

MET-1	WSP Sample ID
FUW527	Laboratory Sample ID
7-Dec-17	Sampling date

Your Project #: 171-16980
Site Location: GOLDBORO, NS
Your C.O.C. #: 641686-02-01

Attention: Marc Mazerolle

WSP Canada Inc
Dartmouth - Standing Offer
1 Spectacle Lake Dr
Halifax, NS
CANADA B3B 1X7

Report Date: 2018/01/16
Report #: R4938964
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B7T0630
Received: 2017/12/21, 10:42

Sample Matrix: Water
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Carbonate, Bicarbonate and Hydroxide	5	N/A	2017/12/28	N/A	SM 22 4500-CO2 D
Carbonate, Bicarbonate and Hydroxide	5	N/A	2018/01/02	N/A	SM 22 4500-CO2 D
Alkalinity	10	N/A	2017/12/29	ATL SOP 00013	EPA 310.2 R1974 m
Chloride	10	N/A	2018/01/02	ATL SOP 00014	SM 22 4500-Cl- E m
Str. Acid Diss. Cyanide water (1)	10	N/A	2017/12/28	ATL SOP 00040	EPA 335.3 m
Colour	10	N/A	2018/01/03	ATL SOP 00020	SM 22 2120C m
Conductance - water	5	N/A	2017/12/28	ATL SOP 00004	SM 22 2510B m
Conductance - water	5	N/A	2018/01/02	ATL SOP 00004	SM 22 2510B m
Hardness (calculated as CaCO3)	2	N/A	2017/12/28	ATL SOP 00048	SM 22 2340 B
Hardness (calculated as CaCO3)	7	N/A	2017/12/29	ATL SOP 00048	SM 22 2340 B
Hardness (calculated as CaCO3)	1	N/A	2018/01/04	ATL SOP 00048	SM 22 2340 B
Mercury - Dissolved (CVAA,LL)	5	2017/12/27	2017/12/28	ATL SOP 00026	EPA 245.1 R3 m
Mercury - Dissolved (CVAA,LL)	5	2017/12/28	2017/12/29	ATL SOP 00026	EPA 245.1 R3 m
Mercury - Total (CVAA,LL)	4	2017/12/28	2017/12/29	ATL SOP 00026	EPA 245.1 R3 m
Metals Water Diss. MS (2)	1	N/A	2018/01/04	ATL SOP 00058	EPA 6020A R1 m
Metals Water Diss. MS (as rec'd)	9	N/A	2017/12/28	ATL SOP 00058	EPA 6020A R1 m
Metals Water Total MS	1	2017/12/27	2017/12/27	ATL SOP 00058	EPA 6020A R1 m
Metals Water Total MS	1	2017/12/27	2017/12/28	ATL SOP 00058	EPA 6020A R1 m
Metals Water Total MS	2	2017/12/27	2018/01/02	ATL SOP 00058	EPA 6020A R1 m
Ion Balance (% Difference)	9	N/A	2018/01/02	N/A	Auto Calc.
Ion Balance (% Difference)	1	N/A	2018/01/04	N/A	Auto Calc.
Anion and Cation Sum	5	N/A	2017/12/29	N/A	Auto Calc.
Anion and Cation Sum	4	N/A	2018/01/02	N/A	Auto Calc.
Anion and Cation Sum	1	N/A	2018/01/04	N/A	Auto Calc.
Nitrogen Ammonia - water	10	N/A	2017/12/29	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite	10	N/A	2018/01/02	ATL SOP 00016	USGS SOPINCF0452.2 m
Nitrogen - Nitrite	10	N/A	2018/01/02	ATL SOP 00017	SM 22 4500-NO2- B m
Nitrogen - Nitrate (as N)	10	N/A	2018/01/02	ATL SOP 00018	ASTM D3867-16
pH (3)	5	N/A	2017/12/28	ATL SOP 00003	SM 22 4500-H+ B m

Your Project #: 171-16980
Site Location: GOLDBORO, NS
Your C.O.C. #: 641686-02-01

Attention: Marc Mazerolle

WSP Canada Inc
Dartmouth - Standing Offer
1 Spectacle Lake Dr
Halifax, NS
CANADA B3B 1X7

Report Date: 2018/01/16
Report #: R4938964
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B7T0630
Received: 2017/12/21, 10:42

Sample Matrix: Water
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
pH (3)	5	N/A	2018/01/02	ATL SOP 00003	SM 22 4500-H+ B m
Phosphorus - ortho	10	N/A	2018/01/02	ATL SOP 00021	SM 22 4500-P E m
Sat. pH and Langelier Index (@ 20C)	1	N/A	2018/01/02	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 20C)	8	N/A	2018/01/03	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 20C)	1	N/A	2018/01/04	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C)	1	N/A	2018/01/02	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C)	8	N/A	2018/01/03	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C)	1	N/A	2018/01/04	ATL SOP 00049	Auto Calc.
Reactive Silica	10	N/A	2018/01/02	ATL SOP 00022	EPA 366.0 m
Sulphate	10	N/A	2018/01/02	ATL SOP 00023	ASTM D516-16 m
Total Dissolved Solids (TDS calc)	9	N/A	2018/01/03	N/A	Auto Calc.
Total Dissolved Solids (TDS calc)	1	N/A	2018/01/04	N/A	Auto Calc.
Organic carbon - Total (TOC) (4)	10	N/A	2018/01/03	ATL SOP 00037	SM 22 5310C m
Total Suspended Solids	3	2017/12/29	2018/01/02	ATL SOP 00007	SM 22 2540D m
Total Suspended Solids	1	2018/01/04	2018/01/08	ATL SOP 00007	SM 22 2540D m
Turbidity	1	N/A	2017/12/28	ATL SOP 00011	EPA 180.1 R2 m
Turbidity	9	N/A	2018/01/02	ATL SOP 00011	EPA 180.1 R2 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Your Project #: 171-16980
Site Location: GOLDBORO, NS
Your C.O.C. #: 641686-02-01

Attention: Marc Mazerolle

WSP Canada Inc
Dartmouth - Standing Offer
1 Spectacle Lake Dr
Halifax, NS
CANADA B3B 1X7

Report Date: 2018/01/16
Report #: R4938964
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B7T0630
Received: 2017/12/21, 10:42

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Strong acid dissociable cyanide value may include contribution from thiocyanate.
(2) Sample filtered in laboratory prior to analysis for dissolved metals.
(3) The APHA Standard Method require pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.
(4) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Heather Macumber, Senior Project Manager
Email: HMacumber@maxxam.ca
Phone# (902)420-0203 Ext:226

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B7T0630
Report Date: 2018/01/16

WSP Canada Inc
Client Project #: 171-16980
Site Location: GOLDBORO, NS

ATL. RCAP-MS DISSOLVED (LABFILT) IN W

Maxxam ID		FUW532		
Sampling Date		2017/12/16 08:20		
COC Number		641686-02-01		
	UNITS	CLARIFYING POND	RDL	QC Batch
Calculated Parameters				
Anion Sum	me/L	0.520	N/A	5328733
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	8.3	1.0	5328730
Calculated TDS	mg/L	35	1.0	5328737
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	5328730
Cation Sum	me/L	0.620	N/A	5328733
Hardness (CaCO3)	mg/L	18	1.0	5328731
Ion Balance (% Difference)	%	8.77	N/A	5328732
Langelier Index (@ 20C)	N/A	-3.07		5328735
Langelier Index (@ 4C)	N/A	-3.32		5328736
Nitrate (N)	mg/L	ND	0.050	5328712
Saturation pH (@ 20C)	N/A	9.63		5328735
Saturation pH (@ 4C)	N/A	9.88		5328736
Inorganics				
Total Alkalinity (Total as CaCO3)	mg/L	8.3	5.0	5333532
Dissolved Chloride (Cl)	mg/L	9.8	1.0	5333534
Colour	TCU	130 (1)	25	5333545
Nitrate + Nitrite (N)	mg/L	ND	0.050	5333553
Nitrite (N)	mg/L	ND	0.010	5333556
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.050	5333090
Total Organic Carbon (C)	mg/L	16 (2)	5.0	5338154
Orthophosphate (P)	mg/L	0.025	0.010	5333552
pH	pH	6.57	N/A	5336502
Reactive Silica (SiO2)	mg/L	3.5	0.50	5333543
Dissolved Sulphate (SO4)	mg/L	3.9	2.0	5333540
Turbidity	NTU	27	0.10	5336610
Conductivity	uS/cm	68	1.0	5336503
Metals				
Dissolved Aluminum (Al)	ug/L	120	5.0	5337713
Dissolved Antimony (Sb)	ug/L	ND	1.0	5337713
Dissolved Arsenic (As)	ug/L	93	1.0	5337713
Dissolved Barium (Ba)	ug/L	5.0	1.0	5337713

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
ND = Not detected
(1) Elevated reporting limit due to sample matrix.
(2) Reporting limit was increased due to turbidity.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7T0630
Report Date: 2018/01/16

WSP Canada Inc
Client Project #: 171-16980
Site Location: GOLDBORO, NS

ATL. RCAP-MS DISSOLVED (LABFILT) IN W

Maxxam ID		FUW532		
Sampling Date		2017/12/16 08:20		
COC Number		641686-02-01		
	UNITS	CLARIFYING POND	RDL	QC Batch
Dissolved Beryllium (Be)	ug/L	ND	1.0	5337713
Dissolved Bismuth (Bi)	ug/L	ND	2.0	5337713
Dissolved Boron (B)	ug/L	ND	50	5337713
Dissolved Cadmium (Cd)	ug/L	ND	0.010	5337713
Dissolved Calcium (Ca)	ug/L	5600	100	5337713
Dissolved Chromium (Cr)	ug/L	ND	1.0	5337713
Dissolved Cobalt (Co)	ug/L	ND	0.40	5337713
Dissolved Copper (Cu)	ug/L	ND	2.0	5337713
Dissolved Iron (Fe)	ug/L	370	50	5337713
Dissolved Lead (Pb)	ug/L	ND	0.50	5337713
Dissolved Magnesium (Mg)	ug/L	950	100	5337713
Dissolved Manganese (Mn)	ug/L	2.4	2.0	5337713
Dissolved Molybdenum (Mo)	ug/L	ND	2.0	5337713
Dissolved Nickel (Ni)	ug/L	ND	2.0	5337713
Dissolved Phosphorus (P)	ug/L	ND	100	5337713
Dissolved Potassium (K)	ug/L	890	100	5337713
Dissolved Selenium (Se)	ug/L	ND	1.0	5337713
Dissolved Silver (Ag)	ug/L	ND	0.10	5337713
Dissolved Sodium (Na)	ug/L	5300	100	5337713
Dissolved Strontium (Sr)	ug/L	25	2.0	5337713
Dissolved Thallium (Tl)	ug/L	ND	0.10	5337713
Dissolved Tin (Sn)	ug/L	ND	2.0	5337713
Dissolved Titanium (Ti)	ug/L	ND	2.0	5337713
Dissolved Uranium (U)	ug/L	ND	0.10	5337713
Dissolved Vanadium (V)	ug/L	ND	2.0	5337713
Dissolved Zinc (Zn)	ug/L	5.3	5.0	5337713

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7T0630
Report Date: 2018/01/16

WSP Canada Inc
Client Project #: 171-16980
Site Location: GOLDBORO, NS

AT. RCAP-MS DISSOLVED (FIELDFILT) IN W

Maxxam ID		FUW527		FUW528		FUW529		
Sampling Date		2017/12/07 10:00		2017/12/07 16:30		2017/12/08 12:30		
COC Number		641686-02-01		641686-02-01		641686-02-01		
	UNITS	MET-1	QC Batch	MET-2	QC Batch	MET-3	RDL	QC Batch
Calculated Parameters								
Anion Sum	me/L	0.620	5328733	1.35	5328733	1.03	N/A	5328733
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	18	5328730	30	5328730	37	1.0	5328730
Calculated TDS	mg/L	50	5328737	87	5328737	93	1.0	5328737
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	5328730	ND	5328730	ND	1.0	5328730
Cation Sum	me/L	0.760	5328733	1.36	5328733	1.80	N/A	5328733
Hardness (CaCO3)	mg/L	15	5328731	35	5328731	29	1.0	5328731
Ion Balance (% Difference)	%	10.1	5328732	0.370	5328732	27.2	N/A	5328732
Langelier Index (@ 20C)	N/A	-2.81	5328735	-2.07	5328735	-1.92		5328735
Langelier Index (@ 4C)	N/A	-3.07	5328736	-2.32	5328736	-2.18		5328736
Nitrate (N)	mg/L	ND	5328712	ND	5328712	ND	0.050	5328712
Saturation pH (@ 20C)	N/A	9.45	5328735	8.80	5328735	8.93		5328735
Saturation pH (@ 4C)	N/A	9.70	5328736	9.05	5328736	9.18		5328736
Inorganics								
Total Alkalinity (Total as CaCO3)	mg/L	18	5333532	30	5333532	37	5.0	5333532
Dissolved Chloride (Cl)	mg/L	6.6	5333534	9.2	5333534	8.5	1.0	5333534
Colour	TCU	ND	5333545	13	5333545	17	5.0	5333545
Nitrate + Nitrite (N)	mg/L	ND	5333553	ND	5333553	ND	0.050	5333553
Nitrite (N)	mg/L	ND	5333556	ND	5333556	ND	0.010	5333556
Nitrogen (Ammonia Nitrogen)	mg/L	0.059	5333090	0.073	5333090	ND	0.050	5333090
Total Organic Carbon (C)	mg/L	12 (1)	5338154	44 (1)	5338154	20 (1)	5.0	5338154
Orthophosphate (P)	mg/L	ND	5333552	0.011	5333552	ND	0.010	5333552
pH	pH	6.64	5336502	6.73	5332932	7.00	N/A	5332932
Reactive Silica (SiO2)	mg/L	10	5333543	5.4	5333543	16	0.50	5333543
Dissolved Sulphate (SO4)	mg/L	4.2	5333540	24	5333540	2.6	2.0	5333540
Turbidity	NTU	>1000	5336610	170	5336619	270	1.0	5332957
Conductivity	uS/cm	64	5336503	140	5332934	99	1.0	5332934
Metals								
Dissolved Aluminum (Al)	ug/L	5.0	5333034	110	5333034	6.6	5.0	5333034
Dissolved Antimony (Sb)	ug/L	ND	5333034	ND	5333034	ND	1.0	5333034
Dissolved Arsenic (As)	ug/L	170	5333034	39	5333034	44	1.0	5333034
Dissolved Barium (Ba)	ug/L	4.9	5333034	96	5333034	17	1.0	5333034
Dissolved Beryllium (Be)	ug/L	ND	5333034	ND	5333034	ND	1.0	5333034

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
ND = Not detected
(1) Reporting limit was increased due to turbidity.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7T0630
Report Date: 2018/01/16

WSP Canada Inc
Client Project #: 171-16980
Site Location: GOLDBORO, NS

AT. RCAP-MS DISSOLVED (FIELDFILT) IN W

Maxxam ID		FUW527		FUW528		FUW529		
Sampling Date		2017/12/07 10:00		2017/12/07 16:30		2017/12/08 12:30		
COC Number		641686-02-01		641686-02-01		641686-02-01		
	UNITS	MET-1	QC Batch	MET-2	QC Batch	MET-3	RDL	QC Batch
Dissolved Bismuth (Bi)	ug/L	ND	5333034	ND	5333034	ND	2.0	5333034
Dissolved Boron (B)	ug/L	ND	5333034	ND	5333034	ND	50	5333034
Dissolved Cadmium (Cd)	ug/L	ND	5333034	0.013	5333034	ND	0.010	5333034
Dissolved Calcium (Ca)	ug/L	4100	5333034	11000	5333034	7100	100	5333034
Dissolved Chromium (Cr)	ug/L	ND	5333034	ND	5333034	ND	1.0	5333034
Dissolved Cobalt (Co)	ug/L	3.4	5333034	2.0	5333034	0.49	0.40	5333034
Dissolved Copper (Cu)	ug/L	ND	5333034	14	5333034	ND	2.0	5333034
Dissolved Iron (Fe)	ug/L	4700	5333034	9400	5333034	25000	50	5333034
Dissolved Lead (Pb)	ug/L	ND	5333034	ND	5333034	ND	0.50	5333034
Dissolved Magnesium (Mg)	ug/L	1200	5333034	1600	5333034	2700	100	5333034
Dissolved Manganese (Mn)	ug/L	690	5333034	640	5333034	670	2.0	5333034
Dissolved Molybdenum (Mo)	ug/L	ND	5333034	ND	5333034	ND	2.0	5333034
Dissolved Nickel (Ni)	ug/L	2.9	5333034	5.3	5333034	ND	2.0	5333034
Dissolved Phosphorus (P)	ug/L	ND	5333034	ND	5333034	ND	100	5333034
Dissolved Potassium (K)	ug/L	1500	5333034	1500	5333034	2800	100	5333034
Dissolved Selenium (Se)	ug/L	ND	5333034	ND	5333034	ND	1.0	5333034
Dissolved Silver (Ag)	ug/L	ND	5333034	ND	5333034	ND	0.10	5333034
Dissolved Sodium (Na)	ug/L	5600	5333034	6400	5333034	6300	100	5333034
Dissolved Strontium (Sr)	ug/L	30	5333034	140	5333034	61	2.0	5333034
Dissolved Thallium (Tl)	ug/L	ND	5333034	ND	5333034	ND	0.10	5333034
Dissolved Tin (Sn)	ug/L	ND	5333034	ND	5333034	ND	2.0	5333034
Dissolved Titanium (Ti)	ug/L	ND	5333034	ND	5333034	ND	2.0	5333034
Dissolved Uranium (U)	ug/L	ND	5333034	ND	5333034	ND	0.10	5333034
Dissolved Vanadium (V)	ug/L	ND	5333034	ND	5333034	ND	2.0	5333034
Dissolved Zinc (Zn)	ug/L	83	5333034	220	5333034	26	5.0	5333034

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B7T0630
Report Date: 2018/01/16

WSP Canada Inc
Client Project #: 171-16980
Site Location: GOLDBORO, NS

AT. RCAP-MS DISSOLVED (FIELDFILT) IN W

Maxxam ID		FUW530			FUW531			FUW533		
Sampling Date		2017/12/16 07:50			2017/12/08 15:30			2017/12/16 09:30		
COC Number		641686-02-01			641686-02-01			641686-02-01		
	UNITS	GOLDBROOK LAKE	RDL	QC Batch	MET-5	RDL	QC Batch	MW-1	RDL	QC Batch
Calculated Parameters										
Anion Sum	me/L	0.210	N/A	5328733	2.83	N/A	5328733	1.48	N/A	5328733
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	5328730	110	1.0	5328730	42	1.0	5328730
Calculated TDS	mg/L	18	1.0	5328737	160	1.0	5328737	90	1.0	5328737
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	5328730	ND	1.0	5328730	ND	1.0	5328730
Cation Sum	me/L	0.280	N/A	5328733	2.76	N/A	5328733	1.38	N/A	5328733
Hardness (CaCO3)	mg/L	4.2	1.0	5328731	26	1.0	5328731	33	1.0	5328731
Ion Balance (% Difference)	%	14.3	N/A	5328732	1.25	N/A	5328732	3.50	N/A	5328732
Langelier Index (@ 20C)	N/A	NC		5328735	-0.647		5328735	-1.39		5328735
Langelier Index (@ 4C)	N/A	NC		5328736	-0.898		5328736	-1.64		5328736
Nitrate (N)	mg/L	ND	0.050	5328712	ND	0.050	5328712	0.13	0.050	5328712
Saturation pH (@ 20C)	N/A	NC		5328735	8.40		5328735	8.67		5328735
Saturation pH (@ 4C)	N/A	NC		5328736	8.65		5328736	8.93		5328736
Inorganics										
Total Alkalinity (Total as CaCO3)	mg/L	ND	5.0	5333532	120 (1)	25	5333532	42	5.0	5333532
Dissolved Chloride (Cl)	mg/L	7.5	1.0	5333534	9.5	1.0	5333534	9.5	1.0	5333534
Colour	TCU	160 (1)	25	5333545	ND	5.0	5333545	ND	5.0	5333545
Nitrate + Nitrite (N)	mg/L	ND	0.050	5333553	ND	0.050	5333553	0.15	0.050	5333553
Nitrite (N)	mg/L	ND	0.010	5333556	ND	0.010	5333556	0.018	0.010	5333556
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.050	5333090	0.083	0.050	5333090	ND	0.050	5333090
Total Organic Carbon (C)	mg/L	12 (2)	5.0	5338154	12 (2)	5.0	5338154	9.3 (2)	5.0	5338154
Orthophosphate (P)	mg/L	0.010	0.010	5333552	0.013	0.010	5333552	ND	0.010	5333552
pH	pH	5.76	N/A	5332932	7.75	N/A	5336502	7.29	N/A	5332932
Reactive Silica (SiO2)	mg/L	4.5	0.50	5333543	8.0	0.50	5333543	7.7	0.50	5333543
Dissolved Sulphate (SO4)	mg/L	ND	2.0	5333540	12	2.0	5333540	18	2.0	5333540
Turbidity	NTU	0.87	0.10	5336619	80	0.10	5336610	70	0.10	5336619
Conductivity	uS/cm	37	1.0	5332934	270	1.0	5336503	150	1.0	5332934
Metals										
Dissolved Aluminum (Al)	ug/L	360	5.0	5333034	29	5.0	5333034	7.2	5.0	5333034
Dissolved Antimony (Sb)	ug/L	ND	1.0	5333034	ND	1.0	5333034	ND	1.0	5333034
Dissolved Arsenic (As)	ug/L	22	1.0	5333034	160	1.0	5333034	1.8	1.0	5333034
Dissolved Barium (Ba)	ug/L	3.1	1.0	5333034	5.5	1.0	5333034	5.6	1.0	5333034

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
ND = Not detected
(1) Elevated reporting limit due to sample matrix.
(2) Reporting limit was increased due to turbidity.

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Maxxam Job #: B7T0630
Report Date: 2018/01/16

WSP Canada Inc
Client Project #: 171-16980
Site Location: GOLDBORO, NS

AT. RCAP-MS DISSOLVED (FIELDFILT) IN W

Maxxam ID		FUW530			FUW531			FUW533		
Sampling Date		2017/12/16 07:50			2017/12/08 15:30			2017/12/16 09:30		
COC Number		641686-02-01			641686-02-01			641686-02-01		
	UNITS	GOLDBROOK LAKE	RDL	QC Batch	MET-5	RDL	QC Batch	MW-1	RDL	QC Batch
Dissolved Beryllium (Be)	ug/L	ND	1.0	5333034	ND	1.0	5333034	ND	1.0	5333034
Dissolved Bismuth (Bi)	ug/L	ND	2.0	5333034	ND	2.0	5333034	ND	2.0	5333034
Dissolved Boron (B)	ug/L	ND	50	5333034	89	50	5333034	ND	50	5333034
Dissolved Cadmium (Cd)	ug/L	0.018	0.010	5333034	ND	0.010	5333034	0.021	0.010	5333034
Dissolved Calcium (Ca)	ug/L	730	100	5333034	8100	100	5333034	11000	100	5333034
Dissolved Chromium (Cr)	ug/L	ND	1.0	5333034	ND	1.0	5333034	ND	1.0	5333034
Dissolved Cobalt (Co)	ug/L	ND	0.40	5333034	ND	0.40	5333034	1.0	0.40	5333034
Dissolved Copper (Cu)	ug/L	ND	2.0	5333034	ND	2.0	5333034	ND	2.0	5333034
Dissolved Iron (Fe)	ug/L	480	50	5333034	130	50	5333034	ND	50	5333034
Dissolved Lead (Pb)	ug/L	0.54	0.50	5333034	ND	0.50	5333034	ND	0.50	5333034
Dissolved Magnesium (Mg)	ug/L	570	100	5333034	1300	100	5333034	1300	100	5333034
Dissolved Manganese (Mn)	ug/L	25	2.0	5333034	140	2.0	5333034	73	2.0	5333034
Dissolved Molybdenum (Mo)	ug/L	ND	2.0	5333034	2.9	2.0	5333034	ND	2.0	5333034
Dissolved Nickel (Ni)	ug/L	ND	2.0	5333034	ND	2.0	5333034	2.7	2.0	5333034
Dissolved Phosphorus (P)	ug/L	ND	100	5333034	ND	100	5333034	ND	100	5333034
Dissolved Potassium (K)	ug/L	350	100	5333034	1600	100	5333034	1700	100	5333034
Dissolved Selenium (Se)	ug/L	ND	1.0	5333034	ND	1.0	5333034	ND	1.0	5333034
Dissolved Silver (Ag)	ug/L	ND	0.10	5333034	ND	0.10	5333034	ND	0.10	5333034
Dissolved Sodium (Na)	ug/L	3900	100	5333034	51000	100	5333034	16000	100	5333034
Dissolved Strontium (Sr)	ug/L	8.5	2.0	5333034	150	2.0	5333034	35	2.0	5333034
Dissolved Thallium (Tl)	ug/L	ND	0.10	5333034	ND	0.10	5333034	ND	0.10	5333034
Dissolved Tin (Sn)	ug/L	ND	2.0	5333034	ND	2.0	5333034	ND	2.0	5333034
Dissolved Titanium (Ti)	ug/L	3.8	2.0	5333034	ND	2.0	5333034	ND	2.0	5333034
Dissolved Uranium (U)	ug/L	ND	0.10	5333034	ND	0.10	5333034	ND	0.10	5333034
Dissolved Vanadium (V)	ug/L	ND	2.0	5333034	ND	2.0	5333034	ND	2.0	5333034
Dissolved Zinc (Zn)	ug/L	7.5	5.0	5333034	14	5.0	5333034	ND	5.0	5333034

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B7T0630
Report Date: 2018/01/16

WSP Canada Inc
Client Project #: 171-16980
Site Location: GOLDBORO, NS

AT. RCAP-MS DISSOLVED (FIELDFILT) IN W

Maxxam ID		FUW534			FUW535			FUW536		
Sampling Date		2017/12/19 14:00			2017/12/19 15:45			2017/12/19 15:50		
COC Number		641686-02-01			641686-02-01			641686-02-01		
	UNITS	MW-2	RDL	QC Batch	MW-3S	RDL	QC Batch	MW-3D	RDL	QC Batch
Calculated Parameters										
Anion Sum	me/L	1.19	N/A	5328733	0.410	N/A	5328733	0.950	N/A	5328733
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	39	1.0	5328730	12	1.0	5328730	28	1.0	5328730
Calculated TDS	mg/L	71	1.0	5328737	30	1.0	5328737	62	1.0	5328737
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	5328730	ND	1.0	5328730	ND	1.0	5328730
Cation Sum	me/L	1.08	N/A	5328733	0.430	N/A	5328733	0.880	N/A	5328733
Hardness (CaCO3)	mg/L	30	1.0	5328731	7.9	1.0	5328731	27	1.0	5328731
Ion Balance (% Difference)	%	4.85	N/A	5328732	2.38	N/A	5328732	3.83	N/A	5328732
Langelier Index (@ 20C)	N/A	-1.39		5328735	-3.17		5328735	-1.91		5328735
Langelier Index (@ 4C)	N/A	-1.64		5328736	-3.42		5328736	-2.16		5328736
Nitrate (N)	mg/L	ND	0.050	5328712	ND	0.050	5328712	0.071	0.050	5328712
Saturation pH (@ 20C)	N/A	8.74		5328735	9.91		5328735	9.03		5328735
Saturation pH (@ 4C)	N/A	8.99		5328736	10.2		5328736	9.28		5328736
Inorganics										
Total Alkalinity (Total as CaCO3)	mg/L	39	5.0	5333532	12	5.0	5333532	28	5.0	5333532
Dissolved Chloride (Cl)	mg/L	9.6	1.0	5333534	6.3	1.0	5333534	7.0	1.0	5333534
Colour	TCU	ND	5.0	5333545	31	5.0	5333545	6.8	5.0	5333545
Nitrate + Nitrite (N)	mg/L	ND	0.050	5333553	ND	0.050	5333553	0.071	0.050	5333553
Nitrite (N)	mg/L	ND	0.010	5333556	ND	0.010	5333556	ND	0.010	5333556
Nitrogen (Ammonia Nitrogen)	mg/L	0.083	0.050	5333090	0.089	0.050	5333096	0.15	0.050	5333096
Total Organic Carbon (C)	mg/L	ND (1)	5.0	5338154	ND (1)	50	5338154	ND (1)	50	5338154
Orthophosphate (P)	mg/L	ND	0.010	5333552	0.010	0.010	5333552	0.022	0.010	5333552
pH	pH	7.35	N/A	5336502	6.75	N/A	5332932	7.12	N/A	5336502
Reactive Silica (SiO2)	mg/L	7.5	0.50	5333543	6.5	0.50	5333543	10	0.50	5333543
Dissolved Sulphate (SO4)	mg/L	6.1	2.0	5333540	ND	2.0	5333540	9.5	2.0	5333540
Turbidity	NTU	45	0.10	5336610	>1000	1.0	5336619	>1000	0.10	5336610
Conductivity	uS/cm	120	1.0	5336503	48	1.0	5332934	99	1.0	5336503
Metals										
Dissolved Aluminum (Al)	ug/L	36	5.0	5333034	470	5.0	5333034	47	5.0	5333034
Dissolved Antimony (Sb)	ug/L	ND	1.0	5333034	ND	1.0	5333034	ND	1.0	5333034
Dissolved Arsenic (As)	ug/L	2.6	1.0	5333034	1.4	1.0	5333034	11	1.0	5333034
Dissolved Barium (Ba)	ug/L	13	1.0	5333034	9.3	1.0	5333034	3.3	1.0	5333034
Dissolved Beryllium (Be)	ug/L	ND	1.0	5333034	ND	1.0	5333034	ND	1.0	5333034

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
ND = Not detected
(1) Reporting limit was increased due to turbidity.

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Maxxam Job #: B7T0630
Report Date: 2018/01/16

WSP Canada Inc
Client Project #: 171-16980
Site Location: GOLDBORO, NS

AT. RCAP-MS DISSOLVED (FIELDFILT) IN W

Maxxam ID		FUW534			FUW535			FUW536		
Sampling Date		2017/12/19 14:00			2017/12/19 15:45			2017/12/19 15:50		
COC Number		641686-02-01			641686-02-01			641686-02-01		
	UNITS	MW-2	RDL	QC Batch	MW-3S	RDL	QC Batch	MW-3D	RDL	QC Batch
Dissolved Bismuth (Bi)	ug/L	ND	2.0	5333034	ND	2.0	5333034	ND	2.0	5333034
Dissolved Boron (B)	ug/L	ND	50	5333034	ND	50	5333034	ND	50	5333034
Dissolved Cadmium (Cd)	ug/L	0.14	0.010	5333034	0.031	0.010	5333034	ND	0.010	5333034
Dissolved Calcium (Ca)	ug/L	9800	100	5333034	2000	100	5333034	7000	100	5333034
Dissolved Chromium (Cr)	ug/L	ND	1.0	5333034	ND	1.0	5333034	ND	1.0	5333034
Dissolved Cobalt (Co)	ug/L	3.6	0.40	5333034	2.1	0.40	5333034	ND	0.40	5333034
Dissolved Copper (Cu)	ug/L	3.0	2.0	5333034	17	2.0	5333034	2.8	2.0	5333034
Dissolved Iron (Fe)	ug/L	620	50	5333034	410	50	5333034	ND	50	5333034
Dissolved Lead (Pb)	ug/L	ND	0.50	5333034	0.56	0.50	5333034	ND	0.50	5333034
Dissolved Magnesium (Mg)	ug/L	1300	100	5333034	680	100	5333034	2400	100	5333034
Dissolved Manganese (Mn)	ug/L	850	2.0	5333034	180	2.0	5333034	31	2.0	5333034
Dissolved Molybdenum (Mo)	ug/L	ND	2.0	5333034	ND	2.0	5333034	ND	2.0	5333034
Dissolved Nickel (Ni)	ug/L	5.0	2.0	5333034	7.6	2.0	5333034	2.6	2.0	5333034
Dissolved Phosphorus (P)	ug/L	ND	100	5333034	ND	100	5333034	ND	100	5333034
Dissolved Potassium (K)	ug/L	1700	100	5333034	1800	100	5333034	2300	100	5333034
Dissolved Selenium (Se)	ug/L	ND	1.0	5333034	ND	1.0	5333034	ND	1.0	5333034
Dissolved Silver (Ag)	ug/L	ND	0.10	5333034	0.18	0.10	5333034	ND	0.10	5333034
Dissolved Sodium (Na)	ug/L	9400	100	5333034	4600	100	5333034	6100	100	5333034
Dissolved Strontium (Sr)	ug/L	24	2.0	5333034	12	2.0	5333034	46	2.0	5333034
Dissolved Thallium (Tl)	ug/L	ND	0.10	5333034	ND	0.10	5333034	ND	0.10	5333034
Dissolved Tin (Sn)	ug/L	ND	2.0	5333034	ND	2.0	5333034	ND	2.0	5333034
Dissolved Titanium (Ti)	ug/L	ND	2.0	5333034	17	2.0	5333034	2.2	2.0	5333034
Dissolved Uranium (U)	ug/L	ND	0.10	5333034	ND	0.10	5333034	ND	0.10	5333034
Dissolved Vanadium (V)	ug/L	ND	2.0	5333034	ND	2.0	5333034	ND	2.0	5333034
Dissolved Zinc (Zn)	ug/L	15	5.0	5333034	14	5.0	5333034	7.9	5.0	5333034

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B7T0630
Report Date: 2018/01/16

WSP Canada Inc
Client Project #: 171-16980
Site Location: GOLDBORO, NS

RESULTS OF ANALYSES OF WATER

Maxxam ID		FUW527			FUW528		FUW529		
Sampling Date		2017/12/07 10:00			2017/12/07 16:30		2017/12/08 12:30		
COC Number		641686-02-01			641686-02-01		641686-02-01		
	UNITS	MET-1	RDL	QC Batch	MET-2	RDL	MET-3	RDL	QC Batch
Inorganics									
Strong Acid Dissoc. Cyanide (CN)	mg/L	ND (1)	0.0010	5333513	ND (1)	0.0010	ND (2)	0.0010	5333513
Total Suspended Solids	mg/L	22000 (3)	100	5339585	240	10	93	5.0	5334585

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) The sample exceeds recommended hold time by 7 days. Result may be bias low.
(2) The sample exceeds recommended hold time by 6 days. Result may be bias low.
(3) Sample analysed past recommended hold time.

Maxxam ID		FUW530			FUW531		
Sampling Date		2017/12/16 07:50			2017/12/08 15:30		
COC Number		641686-02-01			641686-02-01		
	UNITS	GOLDBROOK LAKE	RDL	QC Batch	MET-5	RDL	QC Batch
Inorganics							
Strong Acid Dissoc. Cyanide (CN)	mg/L	ND	0.0010	5333513	ND (1)	0.0010	5333513
Total Suspended Solids	mg/L				270	5.0	5334585

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected
(1) The sample exceeds recommended hold time by 6 days. Result may be bias low.

Maxxam ID		FUW532	FUW533	FUW534	FUW535	FUW536		
Sampling Date		2017/12/16 08:20	2017/12/16 09:30	2017/12/19 14:00	2017/12/19 15:45	2017/12/19 15:50		
COC Number		641686-02-01	641686-02-01	641686-02-01	641686-02-01	641686-02-01		
	UNITS	CLARIFYING POND	MW-1	MW-2	MW-3S	MW-3D	RDL	QC Batch
Inorganics								
Strong Acid Dissoc. Cyanide (CN)	mg/L	0.0021	0.0011	ND	ND	ND	0.0010	5333513

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B7T0630
Report Date: 2018/01/16

WSP Canada Inc
Client Project #: 171-16980
Site Location: GOLDBORO, NS

MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		FUW527	FUW528	FUW529			FUW530		
Sampling Date		2017/12/07 10:00	2017/12/07 16:30	2017/12/08 12:30			2017/12/16 07:50		
COC Number		641686-02-01	641686-02-01	641686-02-01			641686-02-01		
	UNITS	MET-1	MET-2	MET-3	RDL	QC Batch	GOLDBROOK LAKE	RDL	QC Batch
Metals									
Dissolved Mercury (Hg)	ug/L	ND	ND	ND	0.013	5331492	0.013	0.013	5331492
Total Mercury (Hg)	ug/L	ND	ND	0.020	0.013	5333088			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam ID		FUW531			FUW532	FUW533	FUW534		
Sampling Date		2017/12/08 15:30			2017/12/16 08:20	2017/12/16 09:30	2017/12/19 14:00		
COC Number		641686-02-01			641686-02-01	641686-02-01	641686-02-01		
	UNITS	MET-5	RDL	QC Batch	CLARIFYING POND	MW-1	MW-2	RDL	QC Batch
Metals									
Dissolved Mercury (Hg)	ug/L	ND	0.013	5331492	0.017	ND	0.032	0.013	5333093
Total Mercury (Hg)	ug/L	0.028	0.013	5333088					

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam ID		FUW535	FUW536		
Sampling Date		2017/12/19 15:45	2017/12/19 15:50		
COC Number		641686-02-01	641686-02-01		
	UNITS	MW-3S	MW-3D	RDL	QC Batch
Metals					
Dissolved Mercury (Hg)	ug/L	ND	ND	0.013	5333093

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B7T0630
Report Date: 2018/01/16

WSP Canada Inc
Client Project #: 171-16980
Site Location: GOLDBORO, NS

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		FUW527		FUW528	FUW529		FUW531		
Sampling Date		2017/12/07 10:00		2017/12/07 16:30	2017/12/08 12:30		2017/12/08 15:30		
COC Number		641686-02-01		641686-02-01	641686-02-01		641686-02-01		
	UNITS	MET-1	RDL	MET-2	MET-3	QC Batch	MET-5	RDL	QC Batch
Metals									
Total Aluminum (Al)	ug/L	9500	5.0	3000	1600	5331372	5000	5.0	5331643
Total Antimony (Sb)	ug/L	ND	1.0	ND	ND	5331372	3.6	1.0	5331643
Total Arsenic (As)	ug/L	970	10	170	140	5331372	370	1.0	5331643
Total Barium (Ba)	ug/L	66	1.0	130	24	5331372	28	1.0	5331643
Total Beryllium (Be)	ug/L	ND	1.0	1.6	ND	5331372	4.0	1.0	5331643
Total Bismuth (Bi)	ug/L	ND	2.0	ND	ND	5331372	ND	2.0	5331643
Total Boron (B)	ug/L	ND	50	ND	ND	5331372	92	50	5331643
Total Cadmium (Cd)	ug/L	0.079	0.010	0.038	0.021	5331372	0.095	0.010	5331643
Total Calcium (Ca)	ug/L	5500	100	12000	7800	5331372	9500	100	5331643
Total Chromium (Cr)	ug/L	40	1.0	2.4	7.0	5331372	21	1.0	5331643
Total Cobalt (Co)	ug/L	10	0.40	2.1	1.4	5331372	2.2	0.40	5331643
Total Copper (Cu)	ug/L	40	2.0	72	44	5331372	230	2.0	5331643
Total Iron (Fe)	ug/L	21000	50	14000	29000	5331372	18000	50	5331643
Total Lead (Pb)	ug/L	17	0.50	2.5	3.3	5331372	5.5	0.50	5331643
Total Magnesium (Mg)	ug/L	4300	100	1700	3100	5331372	2000	100	5331643
Total Manganese (Mn)	ug/L	910	2.0	650	750	5331372	280	2.0	5331643
Total Molybdenum (Mo)	ug/L	ND	2.0	ND	ND	5331372	4.6	2.0	5331643
Total Nickel (Ni)	ug/L	16	2.0	6.1	5.3	5331372	10	2.0	5331643
Total Phosphorus (P)	ug/L	330	100	ND	220	5331372	160	100	5331643
Total Potassium (K)	ug/L	4800	100	1600	3200	5331372	2100	100	5331643
Total Selenium (Se)	ug/L	ND	1.0	ND	ND	5331372	ND	1.0	5331643
Total Silver (Ag)	ug/L	5.4	0.10	0.20	0.17	5331372	1.6	0.10	5331643
Total Sodium (Na)	ug/L	5900	100	6900	6200	5331372	49000	100	5331643
Total Strontium (Sr)	ug/L	51	2.0	150	68	5331372	190	2.0	5331643
Total Thallium (Tl)	ug/L	0.16	0.10	ND	ND	5331372	ND	0.10	5331643
Total Tin (Sn)	ug/L	ND	2.0	ND	ND	5331372	ND	2.0	5331643
Total Titanium (Ti)	ug/L	530	2.0	12	73	5331372	69	2.0	5331643
Total Uranium (U)	ug/L	0.59	0.10	0.40	0.15	5331372	1.0	0.10	5331643
Total Vanadium (V)	ug/L	15	2.0	ND	2.4	5331372	2.7	2.0	5331643
Total Zinc (Zn)	ug/L	220	5.0	350	510	5331372	1500	5.0	5331643

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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WSP Canada Inc
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Site Location: GOLDBORO, NS

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	7.0°C

Revised Report - Changed site location from Goldbrook to Goldboro as per request from Adrienne. HWS Jan 16/17

Sample FUW527 [MET-1] : RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample FUW529 [MET-3] : Poor RCAp Ion Balance due to sample matrix. Possibly due to fine particulate matter.

Sample FUW530 [GOLDBROOK LAKE] : TSS:Used all of the sample provided, DL raised. RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample FUW532 [CLARIFYING POND] : RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Results relate only to the items tested.

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WSP Canada Inc
Client Project #: 171-16980
Site Location: GOLDBORO, NS

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5331372	LKE	Matrix Spike	Total Aluminum (Al)	2017/12/27		101	%	80 - 120
			Total Antimony (Sb)	2017/12/27		103	%	80 - 120
			Total Arsenic (As)	2017/12/27		97	%	80 - 120
			Total Barium (Ba)	2017/12/27		95	%	80 - 120
			Total Beryllium (Be)	2017/12/27		100	%	80 - 120
			Total Bismuth (Bi)	2017/12/27		102	%	80 - 120
			Total Boron (B)	2017/12/27		100	%	80 - 120
			Total Cadmium (Cd)	2017/12/27		98	%	80 - 120
			Total Calcium (Ca)	2017/12/27		102	%	80 - 120
			Total Chromium (Cr)	2017/12/27		97	%	80 - 120
			Total Cobalt (Co)	2017/12/27		98	%	80 - 120
			Total Copper (Cu)	2017/12/27		95	%	80 - 120
			Total Iron (Fe)	2017/12/27		102	%	80 - 120
			Total Lead (Pb)	2017/12/27		98	%	80 - 120
			Total Magnesium (Mg)	2017/12/27		102	%	80 - 120
			Total Manganese (Mn)	2017/12/27		100	%	80 - 120
			Total Molybdenum (Mo)	2017/12/27		101	%	80 - 120
			Total Nickel (Ni)	2017/12/27		97	%	80 - 120
			Total Phosphorus (P)	2017/12/27		101	%	80 - 120
			Total Potassium (K)	2017/12/27		101	%	80 - 120
			Total Selenium (Se)	2017/12/27		96	%	80 - 120
			Total Silver (Ag)	2017/12/27		99	%	80 - 120
			Total Sodium (Na)	2017/12/27		95	%	80 - 120
			Total Strontium (Sr)	2017/12/27		100	%	80 - 120
			Total Thallium (Tl)	2017/12/27		101	%	80 - 120
			Total Tin (Sn)	2017/12/27		104	%	80 - 120
			Total Titanium (Ti)	2017/12/27		99	%	80 - 120
			Total Uranium (U)	2017/12/27		104	%	80 - 120
			Total Vanadium (V)	2017/12/27		100	%	80 - 120
			Total Zinc (Zn)	2017/12/27		97	%	80 - 120
5331372	LKE	Spiked Blank	Total Aluminum (Al)	2017/12/27		103	%	80 - 120
			Total Antimony (Sb)	2017/12/27		104	%	80 - 120
			Total Arsenic (As)	2017/12/27		99	%	80 - 120
			Total Barium (Ba)	2017/12/27		96	%	80 - 120
			Total Beryllium (Be)	2017/12/27		101	%	80 - 120
			Total Bismuth (Bi)	2017/12/27		102	%	80 - 120
			Total Boron (B)	2017/12/27		100	%	80 - 120
			Total Cadmium (Cd)	2017/12/27		99	%	80 - 120
			Total Calcium (Ca)	2017/12/27		103	%	80 - 120
			Total Chromium (Cr)	2017/12/27		101	%	80 - 120
			Total Cobalt (Co)	2017/12/27		101	%	80 - 120
			Total Copper (Cu)	2017/12/27		100	%	80 - 120
			Total Iron (Fe)	2017/12/27		105	%	80 - 120
			Total Lead (Pb)	2017/12/27		100	%	80 - 120
			Total Magnesium (Mg)	2017/12/27		105	%	80 - 120
			Total Manganese (Mn)	2017/12/27		103	%	80 - 120
			Total Molybdenum (Mo)	2017/12/27		102	%	80 - 120
			Total Nickel (Ni)	2017/12/27		101	%	80 - 120
			Total Phosphorus (P)	2017/12/27		102	%	80 - 120
			Total Potassium (K)	2017/12/27		102	%	80 - 120
			Total Selenium (Se)	2017/12/27		98	%	80 - 120
			Total Silver (Ag)	2017/12/27		102	%	80 - 120
			Total Sodium (Na)	2017/12/27		101	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Strontium (Sr)	2017/12/27		104	%	80 - 120
			Total Thallium (Tl)	2017/12/27		102	%	80 - 120
			Total Tin (Sn)	2017/12/27		103	%	80 - 120
			Total Titanium (Ti)	2017/12/27		103	%	80 - 120
			Total Uranium (U)	2017/12/27		104	%	80 - 120
			Total Vanadium (V)	2017/12/27		104	%	80 - 120
			Total Zinc (Zn)	2017/12/27		103	%	80 - 120
5331372	LKE	Method Blank	Total Aluminum (Al)	2017/12/27	ND, RDL=5.0		ug/L	
			Total Antimony (Sb)	2017/12/27	ND, RDL=1.0		ug/L	
			Total Arsenic (As)	2017/12/27	ND, RDL=1.0		ug/L	
			Total Barium (Ba)	2017/12/27	ND, RDL=1.0		ug/L	
			Total Beryllium (Be)	2017/12/27	ND, RDL=1.0		ug/L	
			Total Bismuth (Bi)	2017/12/27	ND, RDL=2.0		ug/L	
			Total Boron (B)	2017/12/27	ND, RDL=50		ug/L	
			Total Cadmium (Cd)	2017/12/27	ND, RDL=0.010		ug/L	
			Total Calcium (Ca)	2017/12/27	ND, RDL=100		ug/L	
			Total Chromium (Cr)	2017/12/27	ND, RDL=1.0		ug/L	
			Total Cobalt (Co)	2017/12/27	ND, RDL=0.40		ug/L	
			Total Copper (Cu)	2017/12/27	ND, RDL=2.0		ug/L	
			Total Iron (Fe)	2017/12/27	ND, RDL=50		ug/L	
			Total Lead (Pb)	2017/12/27	ND, RDL=0.50		ug/L	
			Total Magnesium (Mg)	2017/12/27	ND, RDL=100		ug/L	
			Total Manganese (Mn)	2017/12/27	ND, RDL=2.0		ug/L	
			Total Molybdenum (Mo)	2017/12/27	ND, RDL=2.0		ug/L	
			Total Nickel (Ni)	2017/12/27	ND, RDL=2.0		ug/L	
			Total Phosphorus (P)	2017/12/27	ND, RDL=100		ug/L	
			Total Potassium (K)	2017/12/27	ND, RDL=100		ug/L	
			Total Selenium (Se)	2017/12/27	ND, RDL=1.0		ug/L	
			Total Silver (Ag)	2017/12/27	ND, RDL=0.10		ug/L	
			Total Sodium (Na)	2017/12/27	ND, RDL=100		ug/L	

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Maxxam Job #: B7T0630
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WSP Canada Inc
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Site Location: GOLDBORO, NS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Strontium (Sr)	2017/12/27	ND, RDL=2.0		ug/L	
			Total Thallium (Tl)	2017/12/27	ND, RDL=0.10		ug/L	
			Total Tin (Sn)	2017/12/27	ND, RDL=2.0		ug/L	
			Total Titanium (Ti)	2017/12/27	ND, RDL=2.0		ug/L	
			Total Uranium (U)	2017/12/27	ND, RDL=0.10		ug/L	
			Total Vanadium (V)	2017/12/27	ND, RDL=2.0		ug/L	
			Total Zinc (Zn)	2017/12/27	ND, RDL=5.0		ug/L	
5331372	LKE	RPD	Total Aluminum (Al)	2017/12/27	1.0		%	20
			Total Antimony (Sb)	2017/12/27	NC		%	20
			Total Arsenic (As)	2017/12/27	NC		%	20
			Total Barium (Ba)	2017/12/27	4.0		%	20
			Total Boron (B)	2017/12/27	NC		%	20
			Total Cadmium (Cd)	2017/12/27	NC		%	20
			Total Calcium (Ca)	2017/12/27	0.42		%	20
			Total Chromium (Cr)	2017/12/27	NC		%	20
			Total Copper (Cu)	2017/12/27	0.98		%	20
			Total Iron (Fe)	2017/12/27	NC		%	20
			Total Lead (Pb)	2017/12/27	NC		%	20
			Total Magnesium (Mg)	2017/12/27	0.66		%	20
			Total Manganese (Mn)	2017/12/27	1.8		%	20
			Total Nickel (Ni)	2017/12/27	NC		%	20
			Total Potassium (K)	2017/12/27	2.1		%	20
			Total Selenium (Se)	2017/12/27	NC		%	20
			Total Sodium (Na)	2017/12/27	0.20		%	20
			Total Strontium (Sr)	2017/12/27	1.9		%	20
			Total Uranium (U)	2017/12/27	NC		%	20
			Total Zinc (Zn)	2017/12/27	1.7		%	20
5331492	ARS	Matrix Spike	Dissolved Mercury (Hg)	2017/12/28		96	%	80 - 120
5331492	ARS	Spiked Blank	Dissolved Mercury (Hg)	2017/12/28		100	%	80 - 120
5331492	ARS	Method Blank	Dissolved Mercury (Hg)	2017/12/28	ND, RDL=0.013		ug/L	
5331492	ARS	RPD	Dissolved Mercury (Hg)	2017/12/28	NC		%	20
5331643	MLB	Matrix Spike	Total Aluminum (Al)	2017/12/28		103	%	80 - 120
			Total Antimony (Sb)	2017/12/28		108	%	80 - 120
			Total Arsenic (As)	2017/12/28		99	%	80 - 120
			Total Barium (Ba)	2017/12/28		97	%	80 - 120
			Total Beryllium (Be)	2017/12/28		102	%	80 - 120
			Total Bismuth (Bi)	2017/12/28		102	%	80 - 120
			Total Boron (B)	2017/12/28		102	%	80 - 120
			Total Cadmium (Cd)	2017/12/28		99	%	80 - 120
			Total Calcium (Ca)	2017/12/28		NC	%	80 - 120
			Total Chromium (Cr)	2017/12/28		97	%	80 - 120
			Total Cobalt (Co)	2017/12/28		98	%	80 - 120
			Total Copper (Cu)	2017/12/28		95	%	80 - 120
			Total Iron (Fe)	2017/12/28		104	%	80 - 120
			Total Lead (Pb)	2017/12/28		99	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Magnesium (Mg)	2017/12/28		103	%	80 - 120
			Total Manganese (Mn)	2017/12/28		102	%	80 - 120
			Total Molybdenum (Mo)	2017/12/28		105	%	80 - 120
			Total Nickel (Ni)	2017/12/28		98	%	80 - 120
			Total Phosphorus (P)	2017/12/28		105	%	80 - 120
			Total Potassium (K)	2017/12/28		103	%	80 - 120
			Total Selenium (Se)	2017/12/28		97	%	80 - 120
			Total Silver (Ag)	2017/12/28		100	%	80 - 120
			Total Sodium (Na)	2017/12/28		97	%	80 - 120
			Total Strontium (Sr)	2017/12/28		102	%	80 - 120
			Total Thallium (Tl)	2017/12/28		101	%	80 - 120
			Total Tin (Sn)	2017/12/28		108	%	80 - 120
			Total Titanium (Ti)	2017/12/28		100	%	80 - 120
			Total Uranium (U)	2017/12/28		106	%	80 - 120
			Total Vanadium (V)	2017/12/28		100	%	80 - 120
			Total Zinc (Zn)	2017/12/28		100	%	80 - 120
5331643	MLB	Spiked Blank	Total Aluminum (Al)	2017/12/28		106	%	80 - 120
			Total Antimony (Sb)	2017/12/28		105	%	80 - 120
			Total Arsenic (As)	2017/12/28		97	%	80 - 120
			Total Barium (Ba)	2017/12/28		96	%	80 - 120
			Total Beryllium (Be)	2017/12/28		101	%	80 - 120
			Total Bismuth (Bi)	2017/12/28		102	%	80 - 120
			Total Boron (B)	2017/12/28		101	%	80 - 120
			Total Cadmium (Cd)	2017/12/28		100	%	80 - 120
			Total Calcium (Ca)	2017/12/28		102	%	80 - 120
			Total Chromium (Cr)	2017/12/28		99	%	80 - 120
			Total Cobalt (Co)	2017/12/28		100	%	80 - 120
			Total Copper (Cu)	2017/12/28		97	%	80 - 120
			Total Iron (Fe)	2017/12/28		103	%	80 - 120
			Total Lead (Pb)	2017/12/28		99	%	80 - 120
			Total Magnesium (Mg)	2017/12/28		105	%	80 - 120
			Total Manganese (Mn)	2017/12/28		102	%	80 - 120
			Total Molybdenum (Mo)	2017/12/28		103	%	80 - 120
			Total Nickel (Ni)	2017/12/28		99	%	80 - 120
			Total Phosphorus (P)	2017/12/28		102	%	80 - 120
			Total Potassium (K)	2017/12/28		102	%	80 - 120
			Total Selenium (Se)	2017/12/28		97	%	80 - 120
			Total Silver (Ag)	2017/12/28		100	%	80 - 120
			Total Sodium (Na)	2017/12/28		98	%	80 - 120
			Total Strontium (Sr)	2017/12/28		103	%	80 - 120
			Total Thallium (Tl)	2017/12/28		102	%	80 - 120
			Total Tin (Sn)	2017/12/28		104	%	80 - 120
			Total Titanium (Ti)	2017/12/28		99	%	80 - 120
			Total Uranium (U)	2017/12/28		106	%	80 - 120
			Total Vanadium (V)	2017/12/28		101	%	80 - 120
			Total Zinc (Zn)	2017/12/28		102	%	80 - 120
5331643	MLB	Method Blank	Total Aluminum (Al)	2017/12/28	ND, RDL=5.0		ug/L	
			Total Antimony (Sb)	2017/12/28	ND, RDL=1.0		ug/L	
			Total Arsenic (As)	2017/12/28	ND, RDL=1.0		ug/L	

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WSP Canada Inc
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Site Location: GOLDBORO, NS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Barium (Ba)	2017/12/28	ND, RDL=1.0		ug/L	
			Total Beryllium (Be)	2017/12/28	ND, RDL=1.0		ug/L	
			Total Bismuth (Bi)	2017/12/28	ND, RDL=2.0		ug/L	
			Total Boron (B)	2017/12/28	ND, RDL=50		ug/L	
			Total Cadmium (Cd)	2017/12/28	ND, RDL=0.010		ug/L	
			Total Calcium (Ca)	2017/12/28	ND, RDL=100		ug/L	
			Total Chromium (Cr)	2017/12/28	ND, RDL=1.0		ug/L	
			Total Cobalt (Co)	2017/12/28	ND, RDL=0.40		ug/L	
			Total Copper (Cu)	2017/12/28	ND, RDL=2.0		ug/L	
			Total Iron (Fe)	2017/12/28	ND, RDL=50		ug/L	
			Total Lead (Pb)	2017/12/28	ND, RDL=0.50		ug/L	
			Total Magnesium (Mg)	2017/12/28	ND, RDL=100		ug/L	
			Total Manganese (Mn)	2017/12/28	ND, RDL=2.0		ug/L	
			Total Molybdenum (Mo)	2017/12/28	ND, RDL=2.0		ug/L	
			Total Nickel (Ni)	2017/12/28	ND, RDL=2.0		ug/L	
			Total Phosphorus (P)	2017/12/28	ND, RDL=100		ug/L	
			Total Potassium (K)	2017/12/28	ND, RDL=100		ug/L	
			Total Selenium (Se)	2017/12/28	ND, RDL=1.0		ug/L	
			Total Silver (Ag)	2017/12/28	ND, RDL=0.10		ug/L	
			Total Sodium (Na)	2017/12/28	ND, RDL=100		ug/L	
			Total Strontium (Sr)	2017/12/28	ND, RDL=2.0		ug/L	
			Total Thallium (Tl)	2017/12/28	ND, RDL=0.10		ug/L	
			Total Tin (Sn)	2017/12/28	ND, RDL=2.0		ug/L	
			Total Titanium (Ti)	2017/12/28	ND, RDL=2.0		ug/L	
			Total Uranium (U)	2017/12/28	ND, RDL=0.10		ug/L	
			Total Vanadium (V)	2017/12/28	ND, RDL=2.0		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Zinc (Zn)	2017/12/28	ND, RDL=5.0		ug/L	
5331643	MLB	RPD	Total Aluminum (Al)	2017/12/28	0.15		%	20
			Total Antimony (Sb)	2017/12/28	NC		%	20
			Total Arsenic (As)	2017/12/28	NC		%	20
			Total Barium (Ba)	2017/12/28	2.7		%	20
			Total Beryllium (Be)	2017/12/28	NC		%	20
			Total Boron (B)	2017/12/28	NC		%	20
			Total Cadmium (Cd)	2017/12/28	1.8		%	20
			Total Calcium (Ca)	2017/12/28	0.56		%	20
			Total Chromium (Cr)	2017/12/28	NC		%	20
			Total Cobalt (Co)	2017/12/28	NC		%	20
			Total Copper (Cu)	2017/12/28	1.5		%	20
			Total Iron (Fe)	2017/12/28	0.80		%	20
			Total Lead (Pb)	2017/12/28	1.5		%	20
			Total Magnesium (Mg)	2017/12/28	1.3		%	20
			Total Manganese (Mn)	2017/12/28	1.5		%	20
			Total Molybdenum (Mo)	2017/12/28	NC		%	20
			Total Nickel (Ni)	2017/12/28	1.8		%	20
			Total Potassium (K)	2017/12/28	0.41		%	20
			Total Selenium (Se)	2017/12/28	NC		%	20
			Total Silver (Ag)	2017/12/28	NC		%	20
			Total Sodium (Na)	2017/12/28	0.85		%	20
			Total Strontium (Sr)	2017/12/28	4.9		%	20
			Total Thallium (Tl)	2017/12/28	NC		%	20
			Total Tin (Sn)	2017/12/28	NC		%	20
			Total Titanium (Ti)	2017/12/28	NC		%	20
			Total Uranium (U)	2017/12/28	NC		%	20
			Total Vanadium (V)	2017/12/28	NC		%	20
			Total Zinc (Zn)	2017/12/28	1.3		%	20
5332932	KMC	QC Standard	pH	2017/12/28		101	%	97 - 103
5332932	KMC	RPD	pH	2017/12/28	1.5		%	N/A
5332934	KMC	Spiked Blank	Conductivity	2017/12/28		102	%	80 - 120
5332934	KMC	Method Blank	Conductivity	2017/12/28	1.3, RDL=1.0		uS/cm	
5332934	KMC	RPD	Conductivity	2017/12/28	0.61		%	25
5332957	KMC	QC Standard	Turbidity	2017/12/28		101	%	80 - 120
5332957	KMC	Spiked Blank	Turbidity	2017/12/28		92	%	80 - 120
5332957	KMC	Method Blank	Turbidity	2017/12/28	ND, RDL=0.10		NTU	
5332957	KMC	RPD	Turbidity	2017/12/28	8.7		%	20
5333034	BAN	Matrix Spike	Dissolved Aluminum (Al)	2017/12/29		NC	%	80 - 120
			Dissolved Antimony (Sb)	2017/12/29		90	%	80 - 120
			Dissolved Arsenic (As)	2017/12/29		97	%	80 - 120
			Dissolved Barium (Ba)	2017/12/29		89	%	80 - 120
			Dissolved Beryllium (Be)	2017/12/29		100	%	80 - 120
			Dissolved Bismuth (Bi)	2017/12/29		94	%	80 - 120
			Dissolved Boron (B)	2017/12/29		98	%	80 - 120
			Dissolved Cadmium (Cd)	2017/12/29		96	%	80 - 120
			Dissolved Calcium (Ca)	2017/12/29		NC	%	80 - 120
			Dissolved Chromium (Cr)	2017/12/29		99	%	80 - 120
			Dissolved Cobalt (Co)	2017/12/29		NC	%	80 - 120
			Dissolved Copper (Cu)	2017/12/29		92	%	80 - 120

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Iron (Fe)	2017/12/29		NC	%	80 - 120
			Dissolved Lead (Pb)	2017/12/29		93	%	80 - 120
			Dissolved Magnesium (Mg)	2017/12/29		NC	%	80 - 120
			Dissolved Manganese (Mn)	2017/12/29		NC	%	80 - 120
			Dissolved Molybdenum (Mo)	2017/12/29		107	%	80 - 120
			Dissolved Nickel (Ni)	2017/12/29		NC	%	80 - 120
			Dissolved Phosphorus (P)	2017/12/29		104	%	80 - 120
			Dissolved Potassium (K)	2017/12/29		102	%	80 - 120
			Dissolved Selenium (Se)	2017/12/29		102	%	80 - 120
			Dissolved Silver (Ag)	2017/12/29		70 (1)	%	80 - 120
			Dissolved Sodium (Na)	2017/12/29		NC	%	80 - 120
			Dissolved Strontium (Sr)	2017/12/29		NC	%	80 - 120
			Dissolved Thallium (Tl)	2017/12/29		98	%	80 - 120
			Dissolved Tin (Sn)	2017/12/29		102	%	80 - 120
			Dissolved Titanium (Ti)	2017/12/29		99	%	80 - 120
			Dissolved Uranium (U)	2017/12/29		101	%	80 - 120
			Dissolved Vanadium (V)	2017/12/29		102	%	80 - 120
			Dissolved Zinc (Zn)	2017/12/29		NC	%	80 - 120
5333034	BAN	Spiked Blank	Dissolved Aluminum (Al)	2017/12/28		103	%	80 - 120
			Dissolved Antimony (Sb)	2017/12/28		100	%	80 - 120
			Dissolved Arsenic (As)	2017/12/28		96	%	80 - 120
			Dissolved Barium (Ba)	2017/12/28		91	%	80 - 120
			Dissolved Beryllium (Be)	2017/12/28		97	%	80 - 120
			Dissolved Bismuth (Bi)	2017/12/28		106	%	80 - 120
			Dissolved Boron (B)	2017/12/28		101	%	80 - 120
			Dissolved Cadmium (Cd)	2017/12/28		99	%	80 - 120
			Dissolved Calcium (Ca)	2017/12/28		102	%	80 - 120
			Dissolved Chromium (Cr)	2017/12/28		96	%	80 - 120
			Dissolved Cobalt (Co)	2017/12/28		97	%	80 - 120
			Dissolved Copper (Cu)	2017/12/28		95	%	80 - 120
			Dissolved Iron (Fe)	2017/12/28		103	%	80 - 120
			Dissolved Lead (Pb)	2017/12/28		100	%	80 - 120
			Dissolved Magnesium (Mg)	2017/12/28		106	%	80 - 120
			Dissolved Manganese (Mn)	2017/12/28		100	%	80 - 120
			Dissolved Molybdenum (Mo)	2017/12/28		106	%	80 - 120
			Dissolved Nickel (Ni)	2017/12/28		98	%	80 - 120
			Dissolved Phosphorus (P)	2017/12/28		105	%	80 - 120
			Dissolved Potassium (K)	2017/12/28		102	%	80 - 120
			Dissolved Selenium (Se)	2017/12/28		100	%	80 - 120
			Dissolved Silver (Ag)	2017/12/28		102	%	80 - 120
			Dissolved Sodium (Na)	2017/12/28		104	%	80 - 120
			Dissolved Strontium (Sr)	2017/12/28		99	%	80 - 120
			Dissolved Thallium (Tl)	2017/12/28		107	%	80 - 120
			Dissolved Tin (Sn)	2017/12/28		105	%	80 - 120
			Dissolved Titanium (Ti)	2017/12/28		103	%	80 - 120
			Dissolved Uranium (U)	2017/12/28		107	%	80 - 120
			Dissolved Vanadium (V)	2017/12/28		96	%	80 - 120
			Dissolved Zinc (Zn)	2017/12/28		102	%	80 - 120
5333034	BAN	Method Blank	Dissolved Aluminum (Al)	2017/12/28	ND, RDL=5.0		ug/L	
			Dissolved Antimony (Sb)	2017/12/28	ND, RDL=1.0		ug/L	

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Arsenic (As)	2017/12/28	ND, RDL=1.0		ug/L	
			Dissolved Barium (Ba)	2017/12/28	ND, RDL=1.0		ug/L	
			Dissolved Beryllium (Be)	2017/12/28	ND, RDL=1.0		ug/L	
			Dissolved Bismuth (Bi)	2017/12/28	ND, RDL=2.0		ug/L	
			Dissolved Boron (B)	2017/12/28	ND, RDL=50		ug/L	
			Dissolved Cadmium (Cd)	2017/12/28	ND, RDL=0.010		ug/L	
			Dissolved Calcium (Ca)	2017/12/28	ND, RDL=100		ug/L	
			Dissolved Chromium (Cr)	2017/12/28	ND, RDL=1.0		ug/L	
			Dissolved Cobalt (Co)	2017/12/28	ND, RDL=0.40		ug/L	
			Dissolved Copper (Cu)	2017/12/28	ND, RDL=2.0		ug/L	
			Dissolved Iron (Fe)	2017/12/28	ND, RDL=50		ug/L	
			Dissolved Lead (Pb)	2017/12/28	ND, RDL=0.50		ug/L	
			Dissolved Magnesium (Mg)	2017/12/28	ND, RDL=100		ug/L	
			Dissolved Manganese (Mn)	2017/12/28	ND, RDL=2.0		ug/L	
			Dissolved Molybdenum (Mo)	2017/12/28	ND, RDL=2.0		ug/L	
			Dissolved Nickel (Ni)	2017/12/28	ND, RDL=2.0		ug/L	
			Dissolved Phosphorus (P)	2017/12/28	ND, RDL=100		ug/L	
			Dissolved Potassium (K)	2017/12/28	ND, RDL=100		ug/L	
			Dissolved Selenium (Se)	2017/12/28	ND, RDL=1.0		ug/L	
			Dissolved Silver (Ag)	2017/12/28	ND, RDL=0.10		ug/L	
			Dissolved Sodium (Na)	2017/12/28	ND, RDL=100		ug/L	
			Dissolved Strontium (Sr)	2017/12/28	ND, RDL=2.0		ug/L	
			Dissolved Thallium (Tl)	2017/12/28	ND, RDL=0.10		ug/L	
			Dissolved Tin (Sn)	2017/12/28	ND, RDL=2.0		ug/L	
			Dissolved Titanium (Ti)	2017/12/28	ND, RDL=2.0		ug/L	
			Dissolved Uranium (U)	2017/12/28	ND, RDL=0.10		ug/L	

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Vanadium (V)	2017/12/28	ND, RDL=2.0		ug/L	
			Dissolved Zinc (Zn)	2017/12/28	ND, RDL=5.0		ug/L	
5333034	BAN	RPD	Dissolved Aluminum (Al)	2017/12/29	8.0		%	20
			Dissolved Iron (Fe)	2017/12/29	0.15		%	20
			Dissolved Manganese (Mn)	2017/12/29	0.13		%	20
			Dissolved Nickel (Ni)	2017/12/29	3.1		%	20
5333088	ARS	Matrix Spike	Total Mercury (Hg)	2017/12/29		104	%	80 - 120
5333088	ARS	Spiked Blank	Total Mercury (Hg)	2017/12/29		103	%	80 - 120
5333088	ARS	Method Blank	Total Mercury (Hg)	2017/12/29	ND, RDL=0.013		ug/L	
5333088	ARS	RPD	Total Mercury (Hg)	2017/12/29	NC		%	20
5333090	JHY	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2017/12/29		99	%	80 - 120
5333090	JHY	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2017/12/28		92	%	80 - 120
5333090	JHY	Method Blank	Nitrogen (Ammonia Nitrogen)	2017/12/28	ND, RDL=0.050		mg/L	
5333090	JHY	RPD	Nitrogen (Ammonia Nitrogen)	2017/12/29	NC		%	20
5333093	ARS	Matrix Spike	Dissolved Mercury (Hg)	2017/12/29		104	%	80 - 120
5333093	ARS	Spiked Blank	Dissolved Mercury (Hg)	2017/12/29		104	%	80 - 120
5333093	ARS	Method Blank	Dissolved Mercury (Hg)	2017/12/29	ND, RDL=0.013		ug/L	
5333093	ARS	RPD	Dissolved Mercury (Hg)	2017/12/29	NC		%	20
5333096	JHY	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2017/12/28		91	%	80 - 120
5333096	JHY	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2017/12/29		97	%	80 - 120
5333096	JHY	Method Blank	Nitrogen (Ammonia Nitrogen)	2017/12/29	ND, RDL=0.050		mg/L	
5333096	JHY	RPD	Nitrogen (Ammonia Nitrogen)	2017/12/28	NC		%	20
5333513	CRA	Matrix Spike [FUW527-04]	Strong Acid Dissoc. Cyanide (CN)	2017/12/28		96	%	80 - 120
5333513	CRA	Spiked Blank	Strong Acid Dissoc. Cyanide (CN)	2017/12/28		98	%	80 - 120
5333513	CRA	Method Blank	Strong Acid Dissoc. Cyanide (CN)	2017/12/28	ND, RDL=0.0010		mg/L	
5333513	CRA	RPD [FUW527-04]	Strong Acid Dissoc. Cyanide (CN)	2017/12/28	NC (2)		%	25
5333532	JHY	Matrix Spike	Total Alkalinity (Total as CaCO3)	2017/12/29		NC	%	80 - 120
5333532	JHY	Spiked Blank	Total Alkalinity (Total as CaCO3)	2017/12/29		109	%	80 - 120
5333532	JHY	Method Blank	Total Alkalinity (Total as CaCO3)	2017/12/29	ND, RDL=5.0		mg/L	
5333532	JHY	RPD	Total Alkalinity (Total as CaCO3)	2017/12/29	1.4		%	25
5333534	JHY	Matrix Spike	Dissolved Chloride (Cl)	2018/01/02		104	%	80 - 120
5333534	JHY	QC Standard	Dissolved Chloride (Cl)	2018/01/02		110	%	80 - 120
5333534	JHY	Spiked Blank	Dissolved Chloride (Cl)	2018/01/02		108	%	80 - 120
5333534	JHY	Method Blank	Dissolved Chloride (Cl)	2018/01/02	ND, RDL=1.0		mg/L	
5333534	JHY	RPD	Dissolved Chloride (Cl)	2018/01/02	7.0		%	25
5333540	JHY	Matrix Spike	Dissolved Sulphate (SO4)	2018/01/02		NC	%	80 - 120
5333540	JHY	Spiked Blank	Dissolved Sulphate (SO4)	2018/01/02		99	%	80 - 120
5333540	JHY	Method Blank	Dissolved Sulphate (SO4)	2018/01/02	ND, RDL=2.0		mg/L	
5333540	JHY	RPD	Dissolved Sulphate (SO4)	2018/01/02	3.0 (3)		%	25
5333543	JHY	Matrix Spike	Reactive Silica (SiO2)	2018/01/02		99	%	80 - 120
5333543	JHY	Spiked Blank	Reactive Silica (SiO2)	2018/01/02		98	%	80 - 120

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5333543	JHY	Method Blank	Reactive Silica (SiO2)	2018/01/02	ND, RDL=0.50		mg/L	
5333543	JHY	RPD	Reactive Silica (SiO2)	2018/01/02	0.24		%	25
5333545	JHY	Spiked Blank	Colour	2018/01/03		95	%	80 - 120
5333545	JHY	Method Blank	Colour	2018/01/03	ND, RDL=5.0		TCU	
5333545	JHY	RPD	Colour	2018/01/03	5.2		%	20
5333552	JHY	Matrix Spike	Orthophosphate (P)	2018/01/02		93	%	80 - 120
5333552	JHY	Spiked Blank	Orthophosphate (P)	2018/01/02		95	%	80 - 120
5333552	JHY	Method Blank	Orthophosphate (P)	2018/01/02	ND, RDL=0.010		mg/L	
5333552	JHY	RPD	Orthophosphate (P)	2018/01/02	NC		%	25
5333553	JHY	Matrix Spike	Nitrate + Nitrite (N)	2018/01/02		97	%	80 - 120
5333553	JHY	Spiked Blank	Nitrate + Nitrite (N)	2018/01/02		89	%	80 - 120
5333553	JHY	Method Blank	Nitrate + Nitrite (N)	2018/01/02	ND, RDL=0.050		mg/L	
5333553	JHY	RPD	Nitrate + Nitrite (N)	2018/01/02	17		%	25
5333556	JHY	Matrix Spike	Nitrite (N)	2018/01/02		100	%	80 - 120
5333556	JHY	Spiked Blank	Nitrite (N)	2018/01/02		100	%	80 - 120
5333556	JHY	Method Blank	Nitrite (N)	2018/01/02	ND, RDL=0.010		mg/L	
5333556	JHY	RPD	Nitrite (N)	2018/01/02	NC		%	25
5334585	AM6	QC Standard	Total Suspended Solids	2018/01/02		99	%	80 - 120
5334585	AM6	Method Blank	Total Suspended Solids	2018/01/02	ND, RDL=1.0		mg/L	
5334585	AM6	RPD [FUW528-01]	Total Suspended Solids	2018/01/02	7.2		%	25
5336502	JMV	QC Standard	pH	2018/01/02		100	%	97 - 103
5336502	JMV	RPD	pH	2018/01/02	2.3		%	N/A
5336503	JMV	Spiked Blank	Conductivity	2018/01/02		102	%	80 - 120
5336503	JMV	Method Blank	Conductivity	2018/01/02	2.4, RDL=1.0		uS/cm	
5336503	JMV	RPD	Conductivity	2018/01/02	0.90		%	25
5336610	JMV	QC Standard	Turbidity	2018/01/02		95	%	80 - 120
5336610	JMV	Spiked Blank	Turbidity	2018/01/02		91	%	80 - 120
5336610	JMV	Method Blank	Turbidity	2018/01/02	ND, RDL=0.10		NTU	
5336610	JMV	RPD	Turbidity	2018/01/02	8.7		%	20
5336619	JMV	QC Standard	Turbidity	2018/01/02		95	%	80 - 120
5336619	JMV	Spiked Blank	Turbidity	2018/01/02		93	%	80 - 120
5336619	JMV	Method Blank	Turbidity	2018/01/02	ND, RDL=0.10		NTU	
5336619	JMV	RPD	Turbidity	2018/01/02	4.5		%	20
5337713	BAN	Matrix Spike	Dissolved Aluminum (Al)	2018/01/03		100	%	80 - 120
			Dissolved Antimony (Sb)	2018/01/03		99	%	80 - 120
			Dissolved Arsenic (As)	2018/01/03		97	%	80 - 120
			Dissolved Barium (Ba)	2018/01/03		97	%	80 - 120
			Dissolved Beryllium (Be)	2018/01/03		97	%	80 - 120
			Dissolved Bismuth (Bi)	2018/01/03		103	%	80 - 120
			Dissolved Boron (B)	2018/01/03		102	%	80 - 120
			Dissolved Cadmium (Cd)	2018/01/03		98	%	80 - 120
			Dissolved Calcium (Ca)	2018/01/03		100	%	80 - 120
			Dissolved Chromium (Cr)	2018/01/03		96	%	80 - 120
			Dissolved Cobalt (Co)	2018/01/03		97	%	80 - 120

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Maxxam Job #: B7T0630
Report Date: 2018/01/16

WSP Canada Inc
Client Project #: 171-16980
Site Location: GOLDBORO, NS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Copper (Cu)	2018/01/03		95	%	80 - 120
			Dissolved Iron (Fe)	2018/01/03		101	%	80 - 120
			Dissolved Lead (Pb)	2018/01/03		97	%	80 - 120
			Dissolved Magnesium (Mg)	2018/01/03		106	%	80 - 120
			Dissolved Manganese (Mn)	2018/01/03		98	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/01/03		102	%	80 - 120
			Dissolved Nickel (Ni)	2018/01/03		97	%	80 - 120
			Dissolved Phosphorus (P)	2018/01/03		106	%	80 - 120
			Dissolved Potassium (K)	2018/01/03		101	%	80 - 120
			Dissolved Selenium (Se)	2018/01/03		95	%	80 - 120
			Dissolved Silver (Ag)	2018/01/03		98	%	80 - 120
			Dissolved Sodium (Na)	2018/01/03		101	%	80 - 120
			Dissolved Strontium (Sr)	2018/01/03		98	%	80 - 120
			Dissolved Thallium (Tl)	2018/01/03		104	%	80 - 120
			Dissolved Tin (Sn)	2018/01/03		104	%	80 - 120
			Dissolved Titanium (Ti)	2018/01/03		98	%	80 - 120
			Dissolved Uranium (U)	2018/01/03		103	%	80 - 120
			Dissolved Vanadium (V)	2018/01/03		99	%	80 - 120
			Dissolved Zinc (Zn)	2018/01/03		102	%	80 - 120
5337713	BAN	Spiked Blank	Dissolved Aluminum (Al)	2018/01/03		102	%	80 - 120
			Dissolved Antimony (Sb)	2018/01/03		98	%	80 - 120
			Dissolved Arsenic (As)	2018/01/03		97	%	80 - 120
			Dissolved Barium (Ba)	2018/01/03		98	%	80 - 120
			Dissolved Beryllium (Be)	2018/01/03		98	%	80 - 120
			Dissolved Bismuth (Bi)	2018/01/03		103	%	80 - 120
			Dissolved Boron (B)	2018/01/03		102	%	80 - 120
			Dissolved Cadmium (Cd)	2018/01/03		98	%	80 - 120
			Dissolved Calcium (Ca)	2018/01/03		100	%	80 - 120
			Dissolved Chromium (Cr)	2018/01/03		96	%	80 - 120
			Dissolved Cobalt (Co)	2018/01/03		98	%	80 - 120
			Dissolved Copper (Cu)	2018/01/03		95	%	80 - 120
			Dissolved Iron (Fe)	2018/01/03		102	%	80 - 120
			Dissolved Lead (Pb)	2018/01/03		95	%	80 - 120
			Dissolved Magnesium (Mg)	2018/01/03		108	%	80 - 120
			Dissolved Manganese (Mn)	2018/01/03		99	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/01/03		102	%	80 - 120
			Dissolved Nickel (Ni)	2018/01/03		97	%	80 - 120
			Dissolved Phosphorus (P)	2018/01/03		105	%	80 - 120
			Dissolved Potassium (K)	2018/01/03		101	%	80 - 120
			Dissolved Selenium (Se)	2018/01/03		95	%	80 - 120
			Dissolved Silver (Ag)	2018/01/03		97	%	80 - 120
			Dissolved Sodium (Na)	2018/01/03		101	%	80 - 120
			Dissolved Strontium (Sr)	2018/01/03		98	%	80 - 120
			Dissolved Thallium (Tl)	2018/01/03		103	%	80 - 120
			Dissolved Tin (Sn)	2018/01/03		107	%	80 - 120
			Dissolved Titanium (Ti)	2018/01/03		101	%	80 - 120
			Dissolved Uranium (U)	2018/01/03		103	%	80 - 120
			Dissolved Vanadium (V)	2018/01/03		99	%	80 - 120
			Dissolved Zinc (Zn)	2018/01/03		102	%	80 - 120
5337713	BAN	Method Blank	Dissolved Aluminum (Al)	2018/01/03	ND, RDL=5.0		ug/L	
			Dissolved Antimony (Sb)	2018/01/03	ND, RDL=1.0		ug/L	

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WSP Canada Inc
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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Arsenic (As)	2018/01/03	ND, RDL=1.0		ug/L	
			Dissolved Barium (Ba)	2018/01/03	ND, RDL=1.0		ug/L	
			Dissolved Beryllium (Be)	2018/01/03	ND, RDL=1.0		ug/L	
			Dissolved Bismuth (Bi)	2018/01/03	ND, RDL=2.0		ug/L	
			Dissolved Boron (B)	2018/01/03	ND, RDL=50		ug/L	
			Dissolved Cadmium (Cd)	2018/01/03	ND, RDL=0.010		ug/L	
			Dissolved Calcium (Ca)	2018/01/03	ND, RDL=100		ug/L	
			Dissolved Chromium (Cr)	2018/01/03	ND, RDL=1.0		ug/L	
			Dissolved Cobalt (Co)	2018/01/03	ND, RDL=0.40		ug/L	
			Dissolved Copper (Cu)	2018/01/03	ND, RDL=2.0		ug/L	
			Dissolved Iron (Fe)	2018/01/03	ND, RDL=50		ug/L	
			Dissolved Lead (Pb)	2018/01/03	ND, RDL=0.50		ug/L	
			Dissolved Magnesium (Mg)	2018/01/03	ND, RDL=100		ug/L	
			Dissolved Manganese (Mn)	2018/01/03	ND, RDL=2.0		ug/L	
			Dissolved Molybdenum (Mo)	2018/01/03	ND, RDL=2.0		ug/L	
			Dissolved Nickel (Ni)	2018/01/03	ND, RDL=2.0		ug/L	
			Dissolved Phosphorus (P)	2018/01/03	ND, RDL=100		ug/L	
			Dissolved Potassium (K)	2018/01/03	ND, RDL=100		ug/L	
			Dissolved Selenium (Se)	2018/01/03	ND, RDL=1.0		ug/L	
			Dissolved Silver (Ag)	2018/01/03	ND, RDL=0.10		ug/L	
			Dissolved Sodium (Na)	2018/01/03	ND, RDL=100		ug/L	
			Dissolved Strontium (Sr)	2018/01/03	ND, RDL=2.0		ug/L	
			Dissolved Thallium (Tl)	2018/01/03	ND, RDL=0.10		ug/L	
			Dissolved Tin (Sn)	2018/01/03	ND, RDL=2.0		ug/L	
			Dissolved Titanium (Ti)	2018/01/03	ND, RDL=2.0		ug/L	
			Dissolved Uranium (U)	2018/01/03	ND, RDL=0.10		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Vanadium (V)	2018/01/03	ND, RDL=2.0		ug/L	
			Dissolved Zinc (Zn)	2018/01/03	ND, RDL=5.0		ug/L	
5337713	BAN	RPD	Dissolved Aluminum (Al)	2018/01/03	NC		%	20
			Dissolved Antimony (Sb)	2018/01/03	NC		%	20
			Dissolved Arsenic (As)	2018/01/03	NC		%	20
			Dissolved Barium (Ba)	2018/01/03	NC		%	20
			Dissolved Beryllium (Be)	2018/01/03	NC		%	20
			Dissolved Bismuth (Bi)	2018/01/03	NC		%	20
			Dissolved Boron (B)	2018/01/03	NC		%	20
			Dissolved Cadmium (Cd)	2018/01/03	NC		%	20
			Dissolved Calcium (Ca)	2018/01/03	NC		%	20
			Dissolved Chromium (Cr)	2018/01/03	NC		%	20
			Dissolved Cobalt (Co)	2018/01/03	NC		%	20
			Dissolved Copper (Cu)	2018/01/03	NC		%	20
			Dissolved Iron (Fe)	2018/01/03	NC		%	20
			Dissolved Lead (Pb)	2018/01/03	NC		%	20
			Dissolved Magnesium (Mg)	2018/01/03	NC		%	20
			Dissolved Manganese (Mn)	2018/01/03	NC		%	20
			Dissolved Molybdenum (Mo)	2018/01/03	NC		%	20
			Dissolved Nickel (Ni)	2018/01/03	NC		%	20
			Dissolved Phosphorus (P)	2018/01/03	NC		%	20
			Dissolved Potassium (K)	2018/01/03	NC		%	20
			Dissolved Selenium (Se)	2018/01/03	NC		%	20
			Dissolved Silver (Ag)	2018/01/03	NC		%	20
			Dissolved Sodium (Na)	2018/01/03	NC		%	20
			Dissolved Strontium (Sr)	2018/01/03	NC		%	20
			Dissolved Thallium (Tl)	2018/01/03	NC		%	20
			Dissolved Tin (Sn)	2018/01/03	NC		%	20
			Dissolved Titanium (Ti)	2018/01/03	NC		%	20
			Dissolved Uranium (U)	2018/01/03	NC		%	20
			Dissolved Vanadium (V)	2018/01/03	NC		%	20
			Dissolved Zinc (Zn)	2018/01/03	NC		%	20
5338154	LMP	Matrix Spike	Total Organic Carbon (C)	2018/01/03		103	%	80 - 120
5338154	LMP	Spiked Blank	Total Organic Carbon (C)	2018/01/03		107	%	80 - 120
5338154	LMP	Method Blank	Total Organic Carbon (C)	2018/01/03	ND, RDL=0.50		mg/L	
5338154	LMP	RPD	Total Organic Carbon (C)	2018/01/03	NC		%	20
5339585	AM6	QC Standard	Total Suspended Solids	2018/01/08		100	%	80 - 120
5339585	AM6	Method Blank	Total Suspended Solids	2018/01/08	ND, RDL=1.0		mg/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5339585	AM6	RPD	Total Suspended Solids	2018/01/08	19		%	25

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Violation is not applicable. Parameter is not requested in the sample.

(2) The sample exceeds recommended hold time by 7 days. Result may be bias low.

(3) Elevated reporting limit due to sample matrix.

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Kevin MacDonald, Inorganics Supervisor

Mike MacGillivray, Scientific Specialist (Inorganics)

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Appendix I

Water Quality Results

Table 1: Water Sample Locations

Sample ID	GPS Point	
	Latitude	Longitude
WS1	45.205142	-61.650432
WS2	45.204030	-61.645058
WS3	45.200898	-61.648194
WS4	45.199178	-61.638394
WS5	45.200846	-61.635811
WS6	45.201275	-61.641517
WS7	45.201364	-61.638269
WS8	45.202060	-61.636861
WS9	45.202539	-61.636737
WS10	45.206935	-61.634972
WS11	45.196201	-61.637666
WS12	45.203210	-61.642181
MS1	45.201184	-61.627129

Table 2 - Petroleum Hydrocarbons

Parameter	NSE Tier 1 EQS[3]	RDL[2]	Units	Sample Location						
				WS1	WS2	WS3	WS4	WS5	WS6	WS7
				11-Jun-17	11-Jun-17	11-Jun-17	11-Jun-17	11-Jun-17	11-Jun-17	11-Jun-17
Benzene	2.1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	0.77	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	0.32	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Xylenes	0.33	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
VPH C6-C10 (Less BTEX)	-	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPH >C10 - C16	-	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
EPH >C16 - C21	-	0.10	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
EPH >C21-C32	-	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Modified TPH Tier 1	15, 0.1[4]	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			Resemblance	NR[1]	NR	NR	NR	NR	NR	NR

Collection of samples by GEMTEC.

Analysis provided by AGAT Laboratories

Notes:

1. No Resemblance
2. Reported Detection Limit
3. NSE Tier 1 EQS = Nova Scotia
Environment Tier 1 Envionmental Quality Standards for Surface Water
4. Gas, Fuel / Lube
FD= Field Duplicate

Results that exceed the NSE Tier 1 EQS guidelines are shaded and bolded.

Table 2 - Petroleum Hydrocarbons

Parameter	NSE Tier 1 EQS[3]	RDL[2]	Units	Sample Location						
				WS8	WS9	WS10	WS11	WS12	MS1	WS3 FD (Duplicate)
				11-Jun-17	11-Jun-17	10-Jun-17	11-Jun-17	11-Jun-17	11-Jun-17	11-Jun-17
Benzene	2.1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	0.77	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	0.008	<0.001
Ethylbenzene	0.32	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Xylenes	0.33	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
VPH C6-C10 (Less BTEX)	-	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPH >C10 - C16	-	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
EPH >C16 - C21	-	0.10	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
EPH >C21-C32	-	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Modified TPH Tier 1	15, 0.1[4]	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			Resemblance	NR	NR	NR	NR	NR	NR	NR

Collection of samples by GEMTEC.

Analysis provided by AGAT Laboratories

Notes:

1. No Resemblance
2. Reported Detection Limit
3. NSE Tier 1 EQS = Nova Scotia Environment Tier 1 Envionmental Quality Standards for Surfac
4. Gas, Fuel / Lube

FD= Field Duplicate

Results that exceed the NSE Tier 1 EQS guidelines are shaded and bolded.

Table 3 - General Chemistry

Sample Location:	Units	CCME FWAL[1]	RDL[2]	WS1	WS2	WS3	WS4	WS5	WS6	WS7	WS8
Date Sampled:				**11-Jun-17**	**11-Jun-17**	**11-Jun-17**	**11-Jun-17**	**11-Jun-17**	**11-Jun-17**	**11-Jun-17**	**11-Jun-17**
pH	-	6.5-9.0		**5**	**4.43**	**4.33**	**5.89**	**4.94**	7.35	**5.41**	**5**
Reactive Silica as SiO2	mg/L	–	0.5	3.20	3	2.5	0.8	2	3.9	5.4	2.20
Chloride	mg/L	120 [4]	1	4.0	4	3	5	4	5	8	5.0
Fluoride	mg/L	0.12	0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12
Sulphate	mg/L	–	2	<2	<2	<2	6	<2	2	11	<2
Alkalinity	mg/L	–	5	<5	<5	<5	<5	<5	34	<5	<5
True Color	TCU	-	5	251	249	259	83	120	58	22	120
Turbidity	NTU	–	0.1	2.1	2.4	1.6	3.4	2	2.2	2.2	1.1
Electrical Conductivity	umho/cm	–	1	32.0	33	30	42	26	93	81	26.0
Nitrate + Nitrite as N	mg/L	–	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.23	0.14
Nitrate as N	mg/L	13 [4]	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.23	0.14
Nitrite as N	mg/L	0.06	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ammonia as N	mg/L	varies[3]	0.03	<0.03	0.05	<0.03	0.03	<0.03	<0.03	<0.03	<0.03
Ammonia as N Guideline	*mg/L*	*varies* [3]	-	*n/a*	*n/a*	*n/a*	*69.7*	*n/a*	*1.54*	*n/a*	*n/a*
Total Organic Carbon	mg/L	–	0.5	26.2	26.9	25.2	11.4	10	7.1	5.2	9.5
Ortho-Phosphate as P	mg/L	Fact Sheet	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.47	<0.01
Total Sodium	mg/L	–	0.1	2.7	2.8	2.3	3.5	2.5	4.4	6.7	3.2
Total Potassium	mg/L	–	0.1	0.2	0.2	<0.1	0.4	0.3	0.8	0.7	0.3
Total Calcium	mg/L	–	0.1	0.5	0.5	0.5	2.8	0.5	11.4	4.8	0.6
Total Magnesium	mg/L	–	0.1	0.4	0.4	0.3	0.6	0.3	1	1	0.4
Bicarb. Alkalinity (as CaCO3)	mg/L	–	5	<5	<5	<5	<5	<5	34	<5	<5
Carb. Alkalinity (as CaCO3)	mg/L	–	10	<10	<10	<10	<10	<10	<10	<10	<10
Hydroxide	mg/L	–	5	<5	<5	<5	<5	<5	<5	<5	<5
Calculated TDS	mg/L	-	1	9	9	8	19	8	46	34	12
Hardness	mg/L	–	–	2.9	2.9	2.5	9.5	2.5	32.6	16.1	3.1
Langelier Index (@20C)	-	–	–	-6.22	-6.68	-6.77	-4.49	-6.16	-1.61	-4.75	-6.05
Langelier Index (@ 4C)	-	–	–	-6.54	-7	-7.09	-4.81	-6.48	-1.93	-5.07	-6.37
Saturation pH (@ 20C)	-	–	–	11.10	11.1	11.1	10.4	11.1	8.96	10.2	11.00
Saturation pH (@ 4C)	-	–	–	11.40	11.4	11.4	10.7	11.4	9.28	10.5	11.40
Anion Sum	me/L	–	–	0.11	0.11	0.08	0.27	0.11	0.86	0.47	0.15
Cation sum	me/L	–	–	0.26	0.31	0.27	0.4	0.22	0.9	0.67	0.29
% Difference/ Ion Balance (NS	%	–	–	39.80	46	51.6	20.6	31.4	2.1	17.4	32.00
Kjeldahl Nitrogen	mg/L	–	0.4	0.6	0.6	0.5	0.6	<0.4	<0.4	<0.4	<0.4
Sulphide	mg/L	–	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

Collection of samples conducted by GEMTEC.

Analysis provided by AGAT Laboratories.

Notes:

1. CCME FWAL = CCME Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life Summary Table (CCME, 2015).
2. RDL = Reported Detection Limit.
3. Guideline is pH and temperature-dependent.
4. Long-Term Exposure.

"-" = None established / not measured.

Results that exceed the guideline are bold and shaded.

Table 3 - General Chemistry

Sample Location:	Units	CCME FWAL[1]	RDL[2]	WS9	WS10	WS11	WS12	MS1	WS3 FD (Duplicate)
Date Sampled:				**11-Jun-17**	**11-Jun-17**	**11-Jun-17**	**11-Jun-17**	**11-Jun-17**	**11-Jun-17**
pH	-	6.5-9.0		**4.78**	**4.87**	6.53	7.49	**5.54**	**4.37**
Reactive Silica as SiO2	mg/L	–	0.5	2.1	2.1	3.2	1.4	1.9	2.7
Chloride	mg/L	120 [4]	1	4	5	4	6	11	4
Fluoride	mg/L	0.12	0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12
Sulphate	mg/L	–	2	<2	<2	<2	3	<2	<2
Alkalinity	mg/L	–	5	<5	<5	6	23	<5	<5
True Color	TCU	-	5	101	119	178	12	159	257
Turbidity	NTU	–	0.1	1.9	3.6	2.4	2.1	2.5	2.6
Electrical Conductivity	umho/cm	–	1	26	25	35	74	56	30
Nitrate + Nitrite as N	mg/L	–	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrate as N	mg/L	13 [4]	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrite as N	mg/L	0.06	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ammonia as N	mg/L	varies[3]	0.03	0.04	0.07	<0.03	<0.03	<0.03	0.03
Ammonia as N Guideline	*mg/L*	*varies* [3]	-	*n/a*	*n/a*	*32.4*	*1.54*	*102*	*n/a*
Total Organic Carbon	mg/L	–	0.5	10.6	10.2	18.8	4.1	23.3	25.7
Ortho-Phosphate as P	mg/L	Fact Sheet	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Sodium	mg/L	–	0.1	3.2	2.9	3.6	5.5	7.6	2.8
Total Potassium	mg/L	–	0.1	0.3	0.3	0.3	1.3	2	<0.1
Total Calcium	mg/L	–	0.1	0.5	0.4	3.4	7	0.8	0.5
Total Magnesium	mg/L	–	0.1	0.4	0.3	0.7	1.1	0.8	0.3
Bicarb. Alkalinity (as CaCO3)	mg/L	–	5	<5	<5	6	23	<5	<5
Carb. Alkalinity (as CaCO3)	mg/L	–	10	<10	<10	<10	<10	<10	<10
Hydroxide	mg/L	–	5	<5	<5	<5	<5	<5	<5
Calculated TDS	mg/L	-	1	9	10	17	38	24	9
Hardness	mg/L	–	–	2.9	2.2	11.4	22.0	5.3	2.5
Langelier Index (@20C)	-	–	–	-6.33	-6.33	-3.67	-1.85	-5.39	-6.74
Langelier Index (@ 4C)	-	–	–	-6.64	-6.65	-3.99	-2.17	-5.71	-7.06
Saturation pH (@ 20C)	-	–	–	11.1	11.2	10.2	9.34	10.9	11.1
Saturation pH (@ 4C)	-	–	–	11.4	11.5	10.5	9.66	11.3	11.4
Anion Sum	me/L	–	–	0.11	0.14	0.23	0.69	0.31	0.11
Cation sum	me/L	–	–	0.27	0.24	0.46	0.73	0.58	0.29
% Difference/ Ion Balance (NS	%	–	–	40.5	25.4	32.6	2.7	29.9	43.8
Kjeldahl Nitrogen	mg/L	–	0.4	<0.4	<0.4	0.5	0.4	0.6	0.5
Sulphide	mg/L	–	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

Collection of samples conducted by GEMTEC.

Analysis provided by AGAT Laboratories.

Notes:

1. CCME FWAL = CCME Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life Summary Table (CCME, 2015).
2. RDL = Reported Detection Limit.
3. Guideline is pH and temperature-dependent.
4. Long-Term Exposure.

"-" = None established / not measured.

Results that exceed the guideline are bold and shaded.

Table 4 - Total Metals

Sample Location:	Units	NSE Tier 1 EQS[1]	RDL[2]	WS1	WS2	WS3	WS4	WS5	WS6
Date Sampled:				**11-Jun-17**	**11-Jun-17**	**11-Jun-17**	**11-Jun-17**	**11-Jun-17**	**11-Jun-17**
Aluminium	µg/L	5	5	**409**	**462**	**230**	**120**	**209**	**87**
Antimony	µg/L	20	2	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	5.0	2	<2	5	**13**	**128**	**33**	**85**
Barium	µg/L	1000	5	<5	<5	<5	<5	<5	<5
Beryllium	µg/L	5.3	2	<2	<2	<2	<2	<2	<2
Bismuth	µg/L	-	2	<2	<2	<2	<2	<2	<2
Boron	µg/L	1200	5	5	6	<5	7	5	12
Cadmium[3]	µg/L	0.01	0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017
Chromium	µg/L	-	1	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	10	1	<1	<1	<1	<1	<1	<1
Copper	µg/L	2	1	<1	<1	<1	<1	<1	<1
Total Cyanide	mg/L	5	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Iron	µg/L	300	50	**593**	**765**	**1160**	**916**	**411**	**574**
Lead	µg/L	1	1	**1.2**	1	**1.2**	<0.5	<0.5	<0.5
Manganese	µg/L	820	2	51	27	19	73	19	153
Mercury	µg/L	0.026	0.026	<0.026	<0.026	**0.029**	<0.026	<0.026	<0.026
Molybdenum	µg/L	73	2	<2	<2	<2	<2	<2	<2
Nickel	µg/L	25	2	<2	<2	<2	<2	<2	<2
Phosphorus	mg/L	-	0.02	0.03	0.03	0.03	0.04	0.03	0.03
Selenium	µg/L	1.0	1	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	21000	5	6	6	<5	19	5	87
Thallium	µg/L	0.8	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Tin	µg/L	-	2	<2	<2	<2	<2	<2	<2
Titanium	µg/L	-	2	5	6	3	<2	3	<2
Uranium	µg/L	300	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Vanadium	µg/L	6	2	<2	<2	<2	<2	<2	<2
Zinc	µg/L	30	5	<5	<5	30	5	<5	<5

Collection of samples by GEMTEC.
Analysis provided by AGAT Laboratories.
Notes:
1. NSE Tier 1 EQS = Nova Scotia Environment Tier 1 Environmental Quality Standards for Surface
2. RDL = Reported Detection Limit.
3. The laboratory detection limit is greater than the NSE Tier 1 EQS guideline.

Results that exceed the NSE Tier 1 EQS guidelines are bolded and shaded.

Table 4 - Total Metals

Sample Location:	Units	NSE Tier 1 EQS[1]	RDL[2]	WS7	WS8	WS9	WS10	WS11	WS12
Date Sampled:				11-Jun-17	11-Jun-17	11-Jun-17	10-Jun-17	11-Jun-17	11-Jun-17
Aluminium	µg/L	5	5	**72**	**284**	**245**	**238**	**351**	**24**
Antimony	µg/L	20	2	<2	<2	<2	<2	<2	<2
Arsenic	µg/L	5.0	2	**1610**	**288**	**7**	3	**44**	**52**
Barium	µg/L	1000	5	5	<5	<5	<5	<5	<5
Beryllium	µg/L	5.3	2	<2	<2	<2	<2	<2	<2
Bismuth	µg/L	-	2	<2	<2	<2	<2	<2	<2
Boron	µg/L	1200	5	9	<5	<5	<5	6	11
Cadmium[3]	µg/L	0.01	0.017	**0.036**	<0.017	<0.017	<0.017	<0.017	<0.017
Chromium	µg/L	-	1	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	10	1	2	<1	<1	<1	<1	<1
Copper	µg/L	2	1	2	<1	<1	<1	<1	<1
Total Cyanide	mg/L	5	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Iron	µg/L	300	50	**591**	**1140**	**410**	**372**	**740**	**323**
Lead	µg/L	1	1	<0.5	1	<0.5	<0.5	0.5	<0.5
Manganese	µg/L	820	2	138	21	18	17	26	29
Mercury	µg/L	0.026	0.026	<0.026	**0.034**	<0.026	<0.026	<0.026	<0.026
Molybdenum	µg/L	73	2	<2	<2	<2	<2	<2	<2
Nickel	µg/L	25	2	4	<2	<2	<2	<2	<2
Phosphorus	mg/L	-	0.02	0.03	0.04	0.03	0.03	0.03	0.02
Selenium	µg/L	1.0	1	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	µg/L	21000	5	27	6.0	5	<5	25	74
Thallium	µg/L	0.8	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Tin	µg/L	-	2	<2	<2	<2	<2	<2	<2
Titanium	µg/L	-	2	<2	6.0	3	3	4	<2
Uranium	µg/L	300	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Vanadium	µg/L	6	2	<2	<2	<2	<2	<2	<2
Zinc	µg/L	30	5	17	<5	<5	<5	<5	**53**

Collection of samples by GEMTEC.
Analysis provided by AGAT Laboratories.
Notes:
1. NSE Tier 1 EQS = Nova Scotia Environment Tier 1 Environmental Quality Standards for Surface
2. RDL = Reported Detection Limit.
3. The laboratory detection limit is greater than the NSE Tier 1 EQS guideline.

Results that exceed the NSE Tier 1 EQS guidelines are bolded and shaded.

Table 4 - Total Metals

Sample Location:	Units	NSE Tier 1 EQS[1]	RDL[2]	MS1	WS3 FD (Duplicate)
Date Sampled:				**11-Jun-17**	**11-Jun-17**
Aluminium	µg/L	5	5	**434**	**276**
Antimony	µg/L	20	2	<2	<2
Arsenic	µg/L	5.0	2	<2	**15**
Barium	µg/L	1000	5	<5	<5
Beryllium	µg/L	5.3	2	<2	<2
Bismuth	µg/L	-	2	<2	<2
Boron	µg/L	1200	5	13	<5
Cadmium[3]	µg/L	0.01	0.017	<0.017	<0.017
Chromium	µg/L	-	1	1	<1
Cobalt	µg/L	10	1	<1	<1
Copper	µg/L	2	1	<1	<1
Total Cyanide	mg/L	5	0.002	<0.002	<0.002
Iron	µg/L	300	50	**963**	**1160**
Lead	µg/L	1	1	<0.5	**1.1**
Manganese	µg/L	820	2	70	18
Mercury	µg/L	0.026	0.026	<0.026	<0.026
Molybdenum	µg/L	73	2	<2	<2
Nickel	µg/L	25	2	<2	<2
Phosphorus	mg/L	-	0.02	0.09	0.03
Selenium	µg/L	1.0	1	<1	<1
Silver	µg/L	0.1	0.1	<0.1	<0.1
Strontium	µg/L	21000	5	7	<5
Thallium	µg/L	0.8	0.1	<0.1	<0.1
Tin	µg/L	-	2	<2	<2
Titanium	µg/L	-	2	8	4
Uranium	µg/L	300	0.1	<0.1	<0.1
Vanadium	µg/L	6	2	<2	<2
Zinc	µg/L	30	5	7	<5

Collection of samples by GEMTEC.
Analysis provided by AGAT Laboratories.
Notes:
1. NSE Tier 1 EQS = Nova Scotia Environment Tier 1 Environmental Quality Standards for Surface
2. RDL = Reported Detection Limit.
3. The laboratory detection limit is greater than the NSE Tier 1 EQS guideline.

Results that exceed the NSE Tier 1 EQS guidelines are bolded and shaded.

Table 5 - Field Parameters

Sample Location	Date	Temperature	Dissolved Oxygen	Conductivity	pH
		°C	mg/L	µS/cm	-
Project Area Water Quality					
WS1	11-Jun-17	13.3	10.1	24.9	3.92
WS2	11-Jun-17	15.7	8.7	26.9	4.48
WS3	11-Jun-17	11.5	7.8	22.6	3.88
WS4	11-Jun-17	15.6	6.6	32.3	5.67
WS5	11-Jun-17	15.2	9.5	20.9	4.83
WS6	11-Jun-17	20.1	7.7	84.2	6.79
WS7	11-Jun-17	15.3	9.4	63.0	5.38
WS8	11-Jun-17	15.5	10.1	12.2	4.85
WS9	11-Jun-17	15.5	7.7	21.4	4.81
WS10	10-Jun-17	19.0	9.0	23.3	4.27
WS11	11-Jun-17	10.4	10.9	25.4	6.21
WS12	11-Jun-17	18.8	8.1	63.1	6.77
MS1	11-Jun-17	10.5	3.8	38.8	4.98
Gold Brook Water Quality					
Point 1	7-Jun-17	13.3	9.6	19.7	5.07
Point 2	7-Jun-17	13.4	10.4	19.5	4.93
Point 3	7-Jun-17	13.3	10.5	19.6	4.95
Point 4	7-Jun-17	14.0	10.3	19.7	4.96
Point 5	7-Jun-17	14.5	11.6	19.6	4.97
Point 6	7-Jun-17	15.2	10.2	19.8	4.98
Point 7A	7-Jun-17	15.6	10.4	10.3	5.03
Point 7B	7-Jun-17	17.0	11.0	21.1	4.81
Point 7C	7-Jun-17	17.1	10.2	21.2	4.87
Point 8A	7-Jun-17	20.7	8.9	23.0	5.04
Point 8B	7-Jun-17	18.3	10.3	21.7	4.96
Point 8C	7-Jun-17	18.3	10.4	21.7	4.95
Point 8D	7-Jun-17	18.3	9.8	21.7	4.97
Point 9	7-Jun-17	19.0	10.1	22.1	4.97
Point 10A	7-Jun-17	20.0	9.6	22.6	4.98
Point 10B	7-Jun-17	20.1	7.9	22.7	4.99
Point 11A	7-Jun-17	20.5	9.4	22.2	5.69
Point 11B	7-Jun-17	20.7	9.2	22.3	5.22
Point 11C	7-Jun-17	20.7	8.5	23.0	4.99
Point 12A	7-Jun-17	21.0	8.6	22.5	5.66
Point 12B	7-Jun-17	21.2	9.2	22.6	5.20
Point 12C	7-Jun-17	21.0	8.3	23.3	5.01

Parameters collected by GEMTEC.

Legend

WATER QUALITY SAMPLE

STUDY AREA BOUNDARY

Note

1. THIS DRAWING IS A SCHEMATIC REPRESENTATION. SIZES, LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

Drawn By	Checked By
CHG	JH
Calculations By	**Checked By**
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Date: SEPTEMBER 2017

Project: GOLDBORO BASELINE STUDIES
NOVA SCOTIA

Drawing: WATER QUALITY SAMPLING LOCATIONS

Scale: 1:7500

0 150 300 450m

File No.	Drawing	Revision No.
800160801	FIGURE 7	0

GEMTEC
CONSULTING ENGINEERS AND SCIENTISTS

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1.0 PURPOSE

This guideline presents the requirements for construction activities in the vicinity of Maritimes and Northeast Pipeline's pipeline(s) or pipeline right-of-way and the movement of heavy vehicles or mobile equipment within or across the right-of-way by parties other than Maritimes and Northeast Pipeline. Maritimes and Northeast Pipeline is herein referred to as the Company and includes Spectra Energy as the operator. These requirements are general in nature whereby specific circumstances may necessitate special considerations.

These requirements have been developed to meet Section 5 of the National Energy Board's (NEB) Pipeline Crossing Regulations, Part II. Information regarding the approval and timing of applications depend on the nature of the encroachment under consideration and is included in this document.

If you have any questions regarding this information, how it relates to your encroachment request, or for any other assistance, please call the Company at the nearest Operations Centre listed below:

Fredericton Operations Centre
26 Alison Boulevard
Fredericton, NB
E3C 2N3

(506) 462-4800 (telephone)
(506) 462-4811 (fax)

Attention: Lands, Emergency Planning and Public Awareness Coordinator

Or

New Glasgow Operations Centre

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80 Terra Cotta Drive
New Glasgow, NS
B2H 6A7

(902) 755-1910 (telephone)
(902) 755-3330 (fax)

Attention: Lands, Emergency Planning and Public Awareness Coordinator

Contractors considering excavation activities within 30 metres of the Company's pipeline right-of-way are encouraged to obtain a copy of the NEB Pipeline Crossing Regulations and Excavation and Construction Near Pipelines documents available on the NEB website (**www.neb-one.gc.ca**).

In accordance with Section 112 of the National Energy Board ("NEB") Act, the unauthorized crossing or construction or excavation across, on, along or under a right-of-way or excavation using power-operated (mechanical) equipment or explosives within the 30 metre (100 ft) safety zone is illegal.

The following areas are addressed.

1.0 Purpose
2.0 Pre-Construction Approvals and Notifications
3.0 Site Visits To Locate Facilities
4.0 Items to be Provided for Review Process
5.0 General Requirements
6.0 Excavation
7.0 Blasting
8.0 Facility Crossings
Appendix A – Drawing Requirements
Appendix B – Typical Crossing Drawings

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Appendix C – Forms and Agreements

Appendix D – Summary Checklist For Potential Excavators

If any of the conditions stated in this document can not be satisfied, the Company representative shall be advised immediately.

2.0 PRE-CONSTRUCTION APPROVALS AND NOTIFICATIONS

2.1 Activities Requiring Company Approval

Prior to commencing work, the encroaching party (Encroacher) will require the Company's written permission for any proposed excavation, construction or temporary crossing upon, along, over, under or across the Company's pipeline or pipeline right-of-way as described below.

- Crossing with anything larger than a standard passenger vehicle or mobile equipment outside the traveled portion of a highway or public road. (Normal farming activities are not covered by this guideline. Refer to the Company's TG-113, "Evaluation of Shallow Cover in Cultivated Fields" and the Company's Lands, Emergency Planning and Public Awareness Coordinator.)

- Construction of a facility such as:
  - New permanent buried facilities – water, gas, oil, sewer, electrical, fiber optic, drains, etc.
  - New permanent aboveground facilities – power, telecommunication, cable tv, etc.
  - New road or railroad installations or improvements
  - New developments, grade changes, structures, parking areas, ditches, etc.

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  - Minor excavation activities – fences, trees, facility maintenance, etc.

- Excavation using explosives or power-operated (mechanical) equipment within the Company's pipeline right-of-way or within the NEB 30 metre safety zone.

- Seismic activity within 40 metres of the Company's pipeline right-of-way

If the Encroacher is considering an activity which is not listed above, they should contact the Company representative to determine if their activity requires written permission and subsequent approval.

2.2 Request for Encroachment

The Encroacher shall contact the Company to discuss details of the proposed construction or crossing activity and the information required for the Company's review.

Copies of any proposed plans and/or drawings prepared in accordance with Appendix A - Drawing Requirements may be required for certain construction or encroachment activities and shall be submitted to the Company for review with the Encroacher's request. Examples of various types of crossing drawings are shown in Appendix B – Typical Crossing Drawings.

2.3 Company Response for Encroachment Requests

Where the Company receives a request for permission for construction, excavation or crossing activities pursuant to paragraph 4(b) or 6(b) of the National Energy Board Pipeline Crossing Regulations, Part I, the Company will inform the

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Encroacher within 10 working days of receiving the request, of whether or not permission is granted. Additional time for technical analysis may be needed for certain construction projects affecting the integrity of the Company's pipeline(s).

The Company representative will make a determination of the complexity of the proposed activity and the level of Company approval required.

2.3.1 High Risk or Complex Activity Approval

If the encroachment is approved, the Encroacher will be required to execute an Encroachment Agreement outlining the Company's requirements and conditions prior to beginning any work (See Appendix C).

If the encroachment is refused, the Encroacher will be provided with the reasons for refusal. The Encroacher then has the right to contact the NEB to review the request as provided by the NEB Act, Section 112.

The Encroachment Agreement must be completed, executed by both parties and returned to the Company prior to initiating any work. Additionally, three (3) working days (72 hours) notice is required before any activities can begin on site so that the Company may locate its pipeline(s) and have a field representative present during any excavation or construction activities.

2.3.2 Low Risk Activity Approval

Approval for certain low risk encroachment activities will require the Encroacher to complete an On-Site Approval Agreement (Form 142) outlining the Company's requirements

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and conditions prior to beginning any work.

The On-Site Approval Agreement form must be completed, executed by both parties and returned to the Company prior to initiating any work. Additionally, three (3) working days (72 hours) notice is required before any activities can begin on site so that the Company may locate its pipeline(s) and have a field representative present during any excavation or construction activities.

2.3.3 Emergency Activity Approval

In the case of emergency repairs to critical public infrastructure or for public safety where it is not practicable to undergo the standard 72 hour notification process, the Encroacher will be required to complete an Emergency Work Request Agreement (Form 200).

3.0 SITE VISITS TO LOCATE FACILITIES

3.1 The Company considers it essential that landowners, builders, utility companies, developers and contractors know the location and depth of the Company's pipeline(s) and requires that the pipeline(s) be shown on any plans or drawings.

3.2 If requested, the Company will field locate and mark its pipeline(s) at selected points in accordance with federal, provincial and local requirements at no cost to the contractor, developer, builder, utility company, or landowner. However, if the Company representative requires the pipeline be located by excavation, the cost to excavate the pipeline and restore surface

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improvements (e.g., pavement, landscaping, and sidewalks) shall be the responsibility of the contractor, developer, builder, utility company, or landowner. Note: A Company representative must be present during any excavation to expose the pipeline. During this period, accurate survey data of the Company's pipeline(s) shall be obtained by a qualified surveyor provided by the contractor, builder, developer, utility company, or landowner for the preparation of plans, sections, and profile drawings.

3.3 In addition to complying with the above requirements, developers, contractors, builders, utility companies, and landowners shall comply with the provisions of all federal, provincial and/or local one-call regulations relating to excavation and demolition work in the vicinity of underground facilities.

4.0 ITEMS TO BE PROVIDED FOR REVIEW PROCESS

Simple residential driveways or utility crossings of the pipeline right-of-way may not be subject to all of the requirements of this section. The Company's Lands, Emergency Planning and Public Awareness Coordinator will determine what information is required to be submitted for review by the Company on a case by case basis.

At a minimum the following information shall be provided with a request to the Company to determine if equipment crossings and associated construction activity can be approved.

- a drawing or sketch showing the pipeline in relation to the proposed construction activity
- excavation plan including the method of installation of all

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foreign facility crossings

- equipment description with weights and track/tire dimensions of any equipment that may be need to cross the pipeline during construction activity

In addition, any construction activity that requires the submission of drawings to a permitting agency for construction adjacent to or encroaching on the Company's pipeline or pipeline right-of-way must include the information regarding Company facilities and pipeline right-of-way specified in this section.

4.1 Upon review of this specification and the incorporation of all applicable requirements, a complete set of design drawings showing existing conditions and proposed alterations shall be submitted to the Company for review.

4.2 Upon final approval from the Company, four (4) sets of the final (definitive) design drawings and an electronic copy shall be provided to the Company. The Encroacher shall provide as-built drawings of all installations to the Company within 45 days after completion of the project.

4.3 The Company's pipeline(s) and pipeline right-of-way limits shall be accurately shown on all drawings. Upon 72 hours advance notice, Company personnel will locate and mark the location of the Company's pipeline(s). The Encroacher's survey crew can then accurately locate the facility by a field survey.

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4.4 The Encroacher's survey crew will be responsible for laying out the proposed foreign facility in the field and locating the Company's facility horizontally and vertically, accurately representing it in the plan and profile views on the drawing(s) per the requirements in Appendix A. The Company's Region Technical Staff will evaluate field data to determine whether additional design requirements are necessary for areas of proposed equipment/vehicular travel.

5.0 GENERAL REQUIREMENTS

5.1 For encroachments within the Company's pipeline right-of-way, the Encroacher shall maintain the integrity of the Company's pipeline(s) by ensuring the Company's pipeline is in compliance with the specifications and requirements of the current edition of CSA Z662 and other local/provincial regulations.

5.2 No buildings, structures or other obstructions may be erected within, above or below the pipeline right-of-way. If requested, the Company will furnish pipeline easement information which describes the pipeline right-of-way width.

5.3 Wire type, stockade, decorative and similar type fencing that can be easily removed and replaced may cross the pipeline right-of-way at or near right angles. Fences crossing the pipeline right-of-way must have a 3.7 m (12 ft) gate for access. No fence shall be allowed within the Company's pipeline right-of-way parallel to the Company's pipeline(s).

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5.4 Planting of trees is not permitted on the pipeline right-of-way. The Company may side trim trees that overhang the Company pipeline right-of-way to eliminate obstruction of right-of-way visibility from the ground or air. In certain situations, some trees may be allowed as defined in the landowner letter of commitments.

5.5 Planting of shrubs, bushes or other plants associated with landscaping on the Company's pipeline right-of-way is subject to Company approval and shall not exceed 1.2 m (4 ft) in height at maturity.

5.6 No drainage swales and no reductions in grade are permitted on the Company's pipeline right-of-way. Limited additional fill may be deposited with prior written approval from the Company.

Proposed landscaping grades shall provide 0.9 m (3 ft) minimum cover over the Company's facility. The Company shall determine the maximum cover allowed over a Company facility based on pipeline specifications and local conditions, including such issues as soil types. Proposed landscaping grades shall not exceed the Company's maximum allowable slope of 4:1 longitudinal with the facility and/or 8:1 cross-slope.

The Company reserves the right to modify these cover/grade requirements if deemed necessary. Proposed grades shall not restrict Company access to the right-of-way or cause ponding of surface water on the

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Company's pipeline right-of-way. Proposed grades shall not redirect the flow of water on to the Company's pipeline right-of-way or generate any amount of erosion on or near the Company's pipeline right-of-way.

5.7 A Company representative shall give prior approval for mobile equipment/vehicles to cross the Company's pipeline(s) at any location.

Maximum and minimum depths of cover for all areas of equipment/vehicular travel (e.g., highways, roads, railroads, construction access, driveways, parking lots, etc.) will be determined by the Company and local, state, provincial and federal requirements. For this purpose, cover can be defined as the distance from the top of the pipe to the finished grade. Mitigative methods where the cover is insufficient will be determined on a case by case basis.

Temporary bridging such as additional cover, construction mats, or temporary structural spans shall be installed for the protection of the Company pipeline at any point of construction equipment crossing unless approval to cross without protection is specifically granted by the Company.

5.8 Test pits are performed to supply the contractor/developer with accurate elevations of the Company's pipeline(s) and to determine the quality of the fill material around the pipeline(s). At the discretion of the Company, test pits may be required in

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areas where equipment/vehicle crossings and/or foreign facility crossings are proposed. For additional information on test pits reference Section 6.0.

5.9 Parking areas should be planned so as to avoid covering the pipeline right-of-way if possible.

5.10 No roads, foreign lines, or utilities may be installed parallel to the Company's pipeline(s) within the Company's pipeline(s) right-of-way.

5.11 All foreign lines, roads, electrical cables and other utilities shall cross the Company's pipeline right-of-way at an angle at or near right angles, if practical.

5.12 If, in the judgment of the Company, the proposed work necessitates the installation of casing pipe and/or other alterations to protect the Company pipeline(s), the contractor, developer, builder, utility company, or landowner may be required to pay the Company the estimated cost prior to the Company beginning the alterations. Once the actual costs have been incurred and tabulated by the Company, cost variances shall be settled.

5.13 At the discretion of the Company, concrete slabs or other protective devices may be installed over the Company's pipeline(s) to provide necessary protection. Drawings for the concrete slabs/devices and their installation will be provided upon request.

5.14 All design standards mandated by federal, provincial,

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and/or local government agencies shall be satisfied. A letter shall be submitted to the Company stating that all appropriate federal, provincial, and/or local permits, authorizations and/or approvals have been granted or obtained for the subject project. The Company's final approval is contingent upon compliance with this requirement.

6.0 EXCAVATION

Excavation operations shall be performed in accordance with the guidelines set forth below.

6.1 **No excavation, crossing, backfilling or construction operations near the Company's pipeline or pipeline right-of-way shall be performed unless the Company representative is on site. The Company representative shall have full authority to stop the work if it is determined that the work is being performed in an unsafe manner or if a foreign object is spotted.**

6.2 During the period of April 15 - November 1 test pits may be performed by the Encroacher provided Company personnel are present. Test pits can be scheduled by contacting the Lands, Emergency Planning and Public Awareness Coordinator. The Company will make every effort to accommodate the Encroacher's schedule for excavation of test pits. Such scheduling however, may be subject to availability of Company personnel, weather, field operating conditions, etc.

6.3 During the period of November 1 - April 15 test pit excavation of the pipeline by means of mechanical

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equipment is not allowed. In instances where the developer must expedite the design process, pipeline elevations may be obtained, depending on field conditions, by hand digging or soft digging equipment. The developer must contact the Company's Lands, Emergency Planning and Public Awareness Coordinator to coordinate these activities.

6.4 Excavation shall not be permitted within the Company's pipeline right-of-way or the 30 metre NEB safety zone until an excavation plan has been reviewed and approved by the Company representative. The excavation plan may be a written document or a verbal discussion with the Company representative. At a minimum, the excavation plan shall include but not be limited to the following:

- Backhoe set-up position in relationship to the pipeline
- Need for benching to level backhoe
- Required excavation depth and length
- Sloping and shoring requirements
- Ingress/egress ramp locations
- Minimum clearance requirements for mechanical equipment
- Pipeline location and depth
- Verify bar has been welded onto backhoe teeth and side cutters have been removed
- Spoil pile location
- Compliance with Canada Occupational Health and Safety regulations

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6.5 The use of mechanical equipment in the vicinity of the Company's pipelines shall be directed by the Company representative in accordance with Company procedures and applicable regulations. The tolerance zone for excavation by third party personnel using mechanical equipment is 3 m (10 ft) until the pipeline is visually located. Hand tools or soft dig equipment shall be used to complete the final excavation of the pipeline inside the "restricted" mechanical equipment limits of the excavation.

6.6 The use of a trenchless excavation method (i.e., bored crossings) shall be employed in such a way as to ensure a minimum radial clearance required by applicable standards is obtained between the new facility and the Company's pipeline(s).

6.7 Federal regulations require that the Company's pipeline be inspected whenever it is exposed. Canada Occupational Health and Safety regulations pertaining to excavations must therefore be met to ensure the safety of the Company representative who must enter the excavation. Furthermore ample time should be provided to allow the Company to perform relevant inspections prior to proceeding with backfill operations.

7.0 BLASTING

Blasting operations shall be performed in accordance with the minimum guidelines set forth below.

7.1 The Company shall be advised of any blasting proposed

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within 60 metres (200 ft) of the Company's pipeline, 150 metres (500 ft) for large scale quarry-type blasting. No blasting is permitted within the Company's pipeline right-of-way, and no blasting shall occur outside the Company's pipeline right-of-way if the Company determines that such blasting may be detrimental to its facilities.

7.2 The Company reserves the right to require the party responsible for blasting furnish a detailed blasting plan at least ten (10) working days prior to blasting to allow for evaluation and to make arrangements for a Company representative to witness the blasting operation including drilling and loading holes. Blasting codes shall be followed in all cases.

8.0 FACILITY CROSSINGS

All buried facilities shall be installed as noted below and as stated in Sections 5.10 and 5.11, as appropriate.

8.1 Buried facilities shall be installed below the Company's pipeline(s). The Company requires a minimum of 30 cm (12 in) of clearance however in some situations this may need to be increased in circumstances, such as bored crossings. Additional separation may be required in marshy areas or other areas where insufficient clearance would have a potential to cause future problems.

8.2 If the normal crossing requirements present undue difficulties, buried facilities may be installed above

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the Company's pipeline(s) with prior approval from the Company representative. All such facilities shall be installed with a minimum of 30 cm (12 in.) of clearance. The Company will not be responsible for any damage or required repairs which are caused by the Company's operating and maintenance activities when foreign facilities are installed above the pipeline(s). Protective measures such as a concrete encasement, ditch marking tape, and/ or above ground markers may be required as deemed necessary by the Company representative.

8.3 Suitable backfill shall be placed between the foreign facility and the Company's pipeline(s). Suitable backfill is backfill free of rocks, refuse and any foreign material including, but not limited to, skids, welding rods, pipe rings, trash, trees and shrubbery limbs. In the case of anticipated crossing by mobile equipment/vehicles the contractor, developer, builder or utility company shall provide specific material and compaction specifications for review by the Company.

8.4 The installation of test leads (two No. 10 THWN black insulated copper wires) attached at the point of crossing for corrosion control monitoring may be required for metallic lines as directed by the Company representative. Test wires shall be routed underground and terminated at a point specified by the Company.

8.5 The following requirements shall be met for fiber optic cables which encroach upon the Company's pipeline

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right-of-way.

8.5.1 High capacity fiber optic cable shall be installed in a rigid non-metallic conduit or covered in 15-20 cm (6-8 in) of concrete which has been colored with an orange dye extending across the entire pipeline right-of-way. Other protective measures may be considered for non-high capacity cables.

8.5.2 The fiber optic cable shall be installed a minimum of 30 cm (12 in) below the Company's pipeline(s) across the entire width of the pipeline right-of-way, unless approved by the Company representative.

8.5.3 Orange warning tape shall be buried a minimum of 45 cm (18 in) directly above the fiber optic cable across the entire width of the Company's pipeline right-of-way, where practical.

8.5.4 The fiber optic cable crossing shall be clearly and permanently marked with identification signs on both sides of the Company's pipeline right-of-way. Markings shall be maintained by the foreign party for the lifetime of the facility.

8.6 The information listed below shall be furnished to the Company for all proposed electrical cables which will encroach upon the Company's pipeline right-of-way.

- Number, spacing and voltage of cables

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- Line loading and phase relationship of cables
- Grounding system
- Position of cables and load facilities relative to pipeline(s)

8.7 Specific installation requirements for cables carrying less than 600 volts shall be determined by the Company on a case by case basis.

8.8 The following installation requirements shall be met for buried electrical cables carrying over 600 volts but less than 7,600 volts. The Company's Region Technical Staff will determine the installation procedures for buried electrical lines carrying voltages over 7,600 volts on a case by case basis.

8.8.1 The electrical cable shall be installed in a rigid non-metallic conduit covered in a minimum thickness of 5 cm (2 in) of concrete which has been colored with a red dye extending across the entire width of the Company's pipeline right-of-way.

8.8.2 The electrical cable shall be installed a minimum of 30 cm (12 in) below the Company's pipeline(s) across the entire width of the Company's pipeline right-of-way, unless approved by the Company representative.

8.8.3 Each phase conductor should be surrounded with a spirally wound, concentric neutral conductor. The

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neutral may be within the outer cable jacket.

8.8.4 Red warning tape shall be buried a minimum of 45 cm (18 in) directly above the electric cable across the entire width of the Company's pipeline right-of-way, where practical.

8.8.5 The electric cable crossing shall be clearly and permanently marked with identification signs on both sides of the Company's pipeline right-of-way.

8.9 Overhead power line and telephone line, telecommunication installations shall be reviewed by the Company on an individual basis.

8.9.1 Prior to construction, the Encroacher shall determine if electrical interference between its facilities and the Company's Pipeline(s) will occur. If so, the Encroacher shall be responsible for providing mitigation design to a level 15 volts maximum A.C. Steady State; in accordance with CSA Standard C22.3 No 6M (most recent version), "Principles and Practices of Electrical Coordination Between Pipelines and Electric Supply Lines".

8.9.2 The vertical distance between the lowest wire of an overhead line catenary and the surface of the ground within the pipeline easement shall not be less than the minimum vertical clearance distance set out in that part of the Canadian Electrical

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Code Part III (CSA Standard C22.3, "Overhead Systems and Underground Systems").

8.9.3 Overhead lines shall be installed with a minimum clearance of 7.62 m (25 ft) above the grade of the Company's pipeline right-of-way. The installation of poles and guys will not be permitted on the Company's pipeline right-of-way, and not within ten (10) metres from a Company appurtenance, unless assurances are made that the encroachment will not affect the Company appurtenance as a result of a fault or failure.

8.9.4 The Encroacher, where directed by the Company, shall install aerial warning devices on an overhead line for the protection of the Company's personnel and equipment conducting aerial patrols.

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APPENDIX A

Drawing Requirements

The following information is required when preparing drawings for encroachment approval applications. The Encroacher should contact the Company at an early date for information and to discuss requirements with respect to the proposed activity.

The Encroacher shall provide the Company four (4) copies of all drawings, in addition to PDF or other standard electronic format document.

PLAN VIEW

Show and Identify:

- In Metric – scale of 1:500 or at a scale which clearly defines all details of the Encroacher's facility;
- Accuracy to one tenth (0.1) meter or better;
- Facilities which tie dimensions to lot or survey line (preferably along the Company's pipeline and/or pipeline right-of-way boundary). Show location of Company's pipeline(s), pipeline appurtenances, markers, cathodic test facilities and right-of-way and other utilities and utility easements;
- Angle of the crossing (measured to the Company's pipeline easement);
- Property lines;
- Width of road and road limits in the vicinity of the Encroacher's facility;

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- For parking lots, storage yards: show nearest building which tie dimensions to nearest Company pipeline and/or pipeline right-of-way boundary;
- For parking lots, storage yards: describe barrier preventing access to unaffected portion(s) of Company's right-of-way (e.g., fence or concrete curb).

PROFILE/CROSS SECTION VIEW(S)

The section view is to be along the proposed utility that crosses the Company's pipeline.

The profile view is to be along the Company's Pipeline(s) and is only required if the Encroacher's facility is on the Company's pipeline easement for a definable distance (i.e., parallel encroachments such as roads and any grading of the easement, etc.)

Show and Identify:

- In Metric - vertical 1:100, horizontal 1:200 or to a scale that clearly identifies all details of the Encroacher's facility;
- Accuracy to one tenth (0.1) meter or better;
- Any relevant Company pipeline appurtenances;
- location of cathodic test facilities (if applicable)
- Existing and proposed grades
- Depth of the Company's pipeline;
- Vertical distance of the proposed utility below grade;
- Clearance to the Company's pipeline(s);
- Diameter of each of the Company's pipeline;
- Diameter(s) of pipeline casing (if applicable)

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- Company pipeline right-of-way limits;
- If elevations are assumed, then reference the point of the assumed datum;
- Distance of the Company's pipeline(s) in relation to the Company pipeline right-of-way limits;
- Ground surface profile for the 20 metres on either side of the Encroacher's facility;
- Details of Encroacher's facilities with minimum clearances from each to the Company's pipeline(s) [minimum clearances – roads/parking lots/storage yards – 1.3 m (4.26 ft); railways – 2.0 m (6.56 ft); ditches – 0.8 m (2.62 ft); underground utilities – 0.3 m (1 ft)]
- Details of any protective devices for Company's pipeline or Encroacher's facility (i.e., concrete slabs, casings, pads, temporary structures, etc.) if requested by the Company and shown on the plan and profile.

LOCATION PLAN VIEW

Show and Identify:

- In metric, scale of 1:12000 or to a scale that clearly identifies the location;
- Distance to the nearest town of major geographic feature to 0.1 of a kilometer;
- Relevant streets, highways, roads, etc.

TITLE BLOCK

Show:

- Name of the Encroacher and the name of the engineering company who compiled the drawing (where applicable);
- Drawing number and the date of the drawing;

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- Revision dates (if applicable);
- Signature of the Encroacher and the engineering company;
- Legal description of the location of Encroacher's facility;
- Date of the survey

ADDITIONAL INFORMATION

Show:

- All specifications of the Encroacher's facility (i.e., diameter, wall thickness, material to be conveyed, minimum yield strength, operating pressure, field test pressure, mill test pressure, materials, protective devices to be installed and the method of installation);
- Note referencing compliance with all applicable CSA standards and the National Energy Board Pipeline Crossing Regulations;
- Include a North Arrow and Scale on all drawings;
- Legal description of location of the Encroacher's facility (i.e., property metes and bounds, PID, parish, town, village, etc.) on all drawings.

ENCROACHER'S FACILITY DESCRIPTION

Show and Identify:

- Roads, parking lots, storage yards: wheel loading, surface, subgrade, name or number designation of roads (if any), materials to be stored (if any);
- Ditches, open drainage systems: width – top and bottom (existing and proposed), name or designation (if any);
- Underground facilities: materials; diameter; maximum voltage; pressure; conduit structure – duct size, use and configuration – size and reinforcement (if any).

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NOTE: The Encroacher's drawing(s) must be available for reference on site. For reference, typical crossing drawings with these minimum requirements are included in Appendix B.

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APPENDIX B

Typical Crossing Drawings

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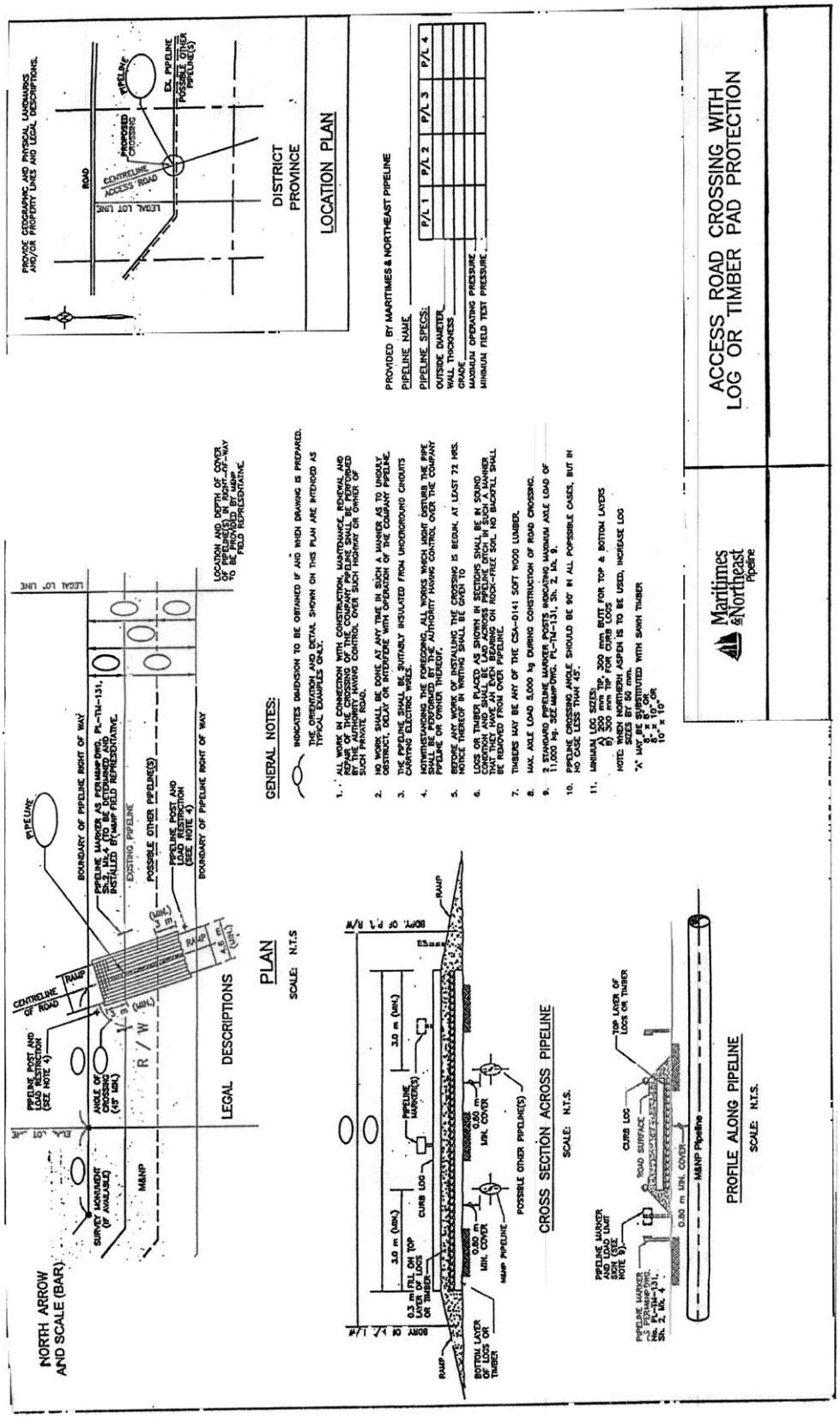

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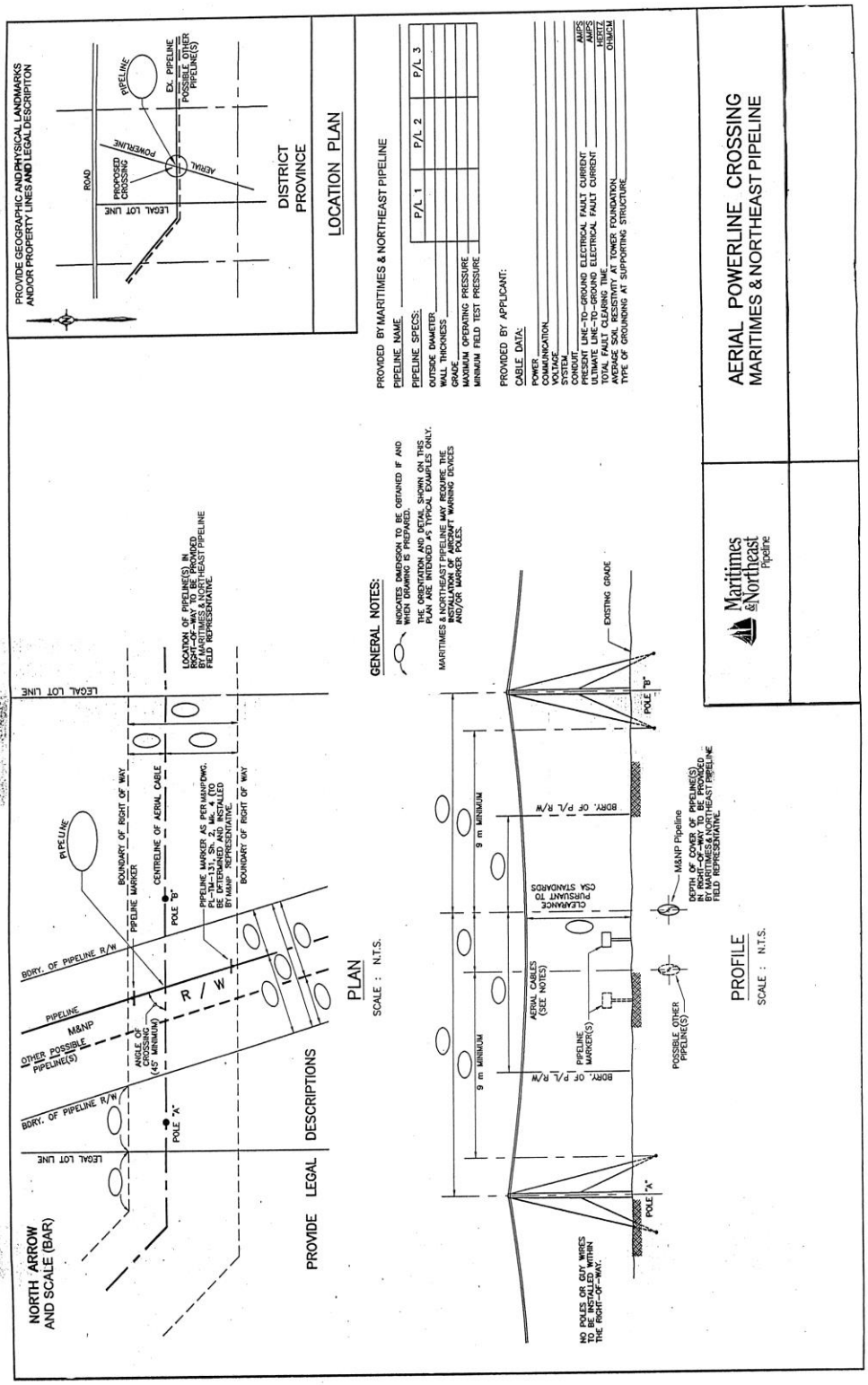

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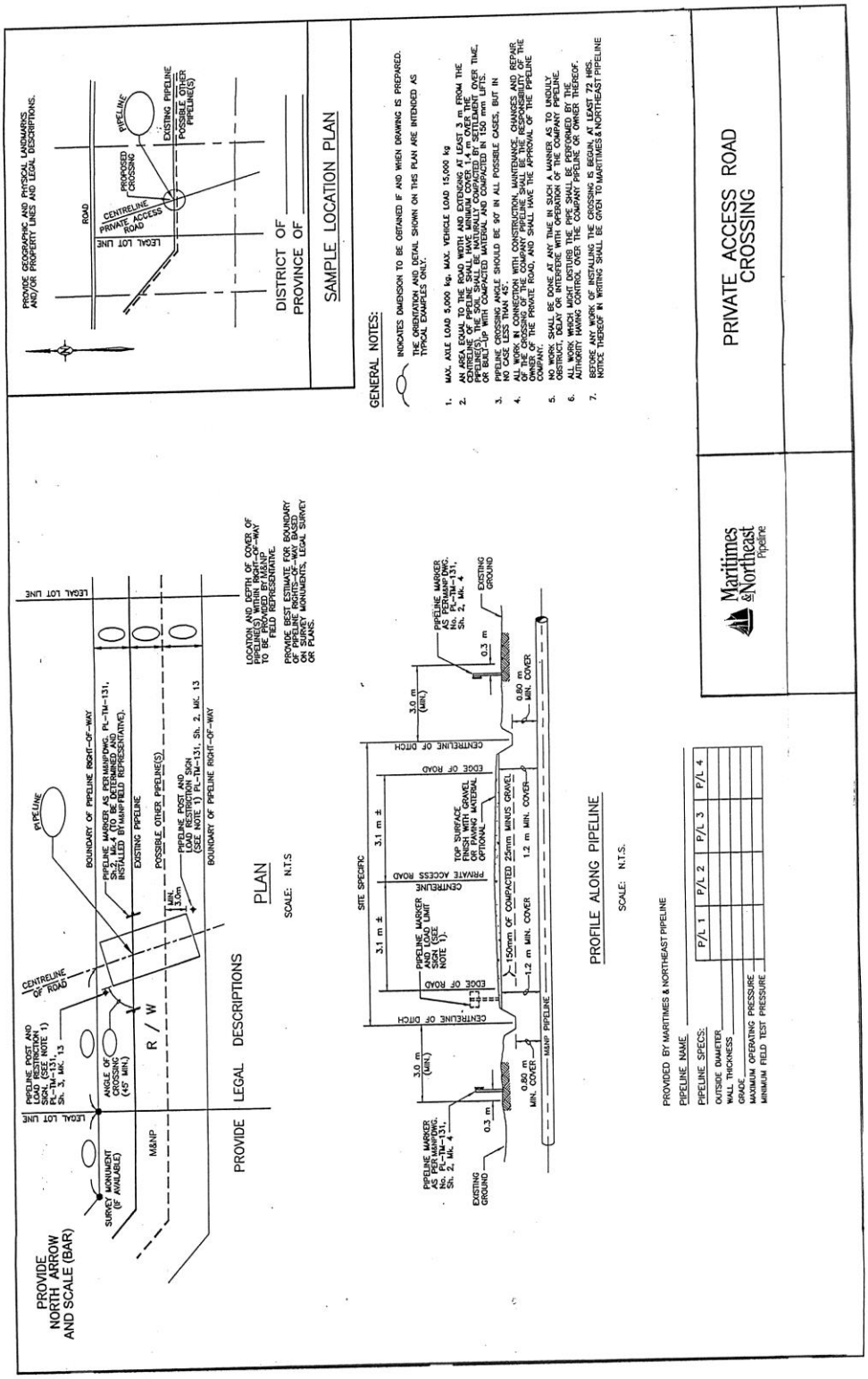

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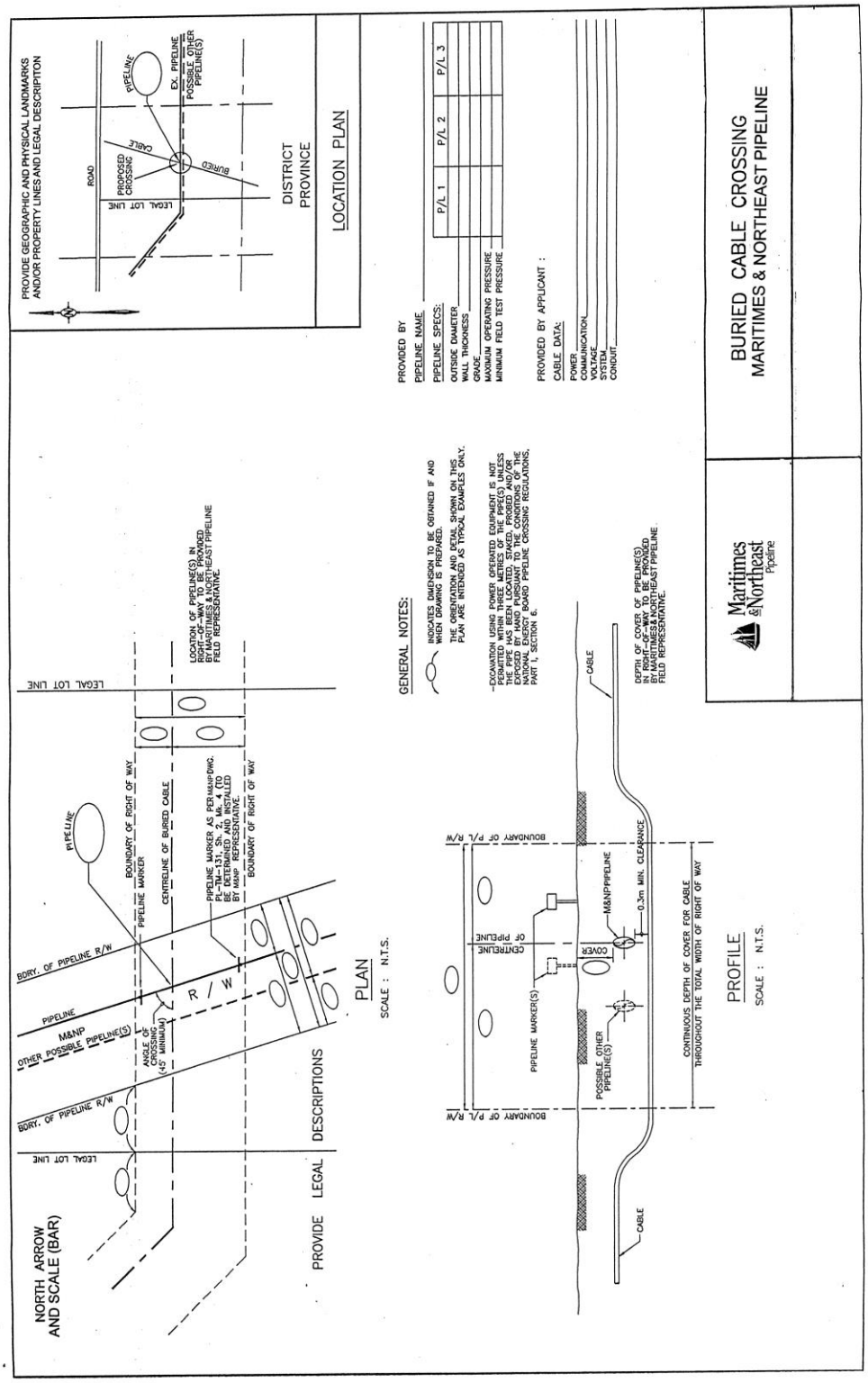

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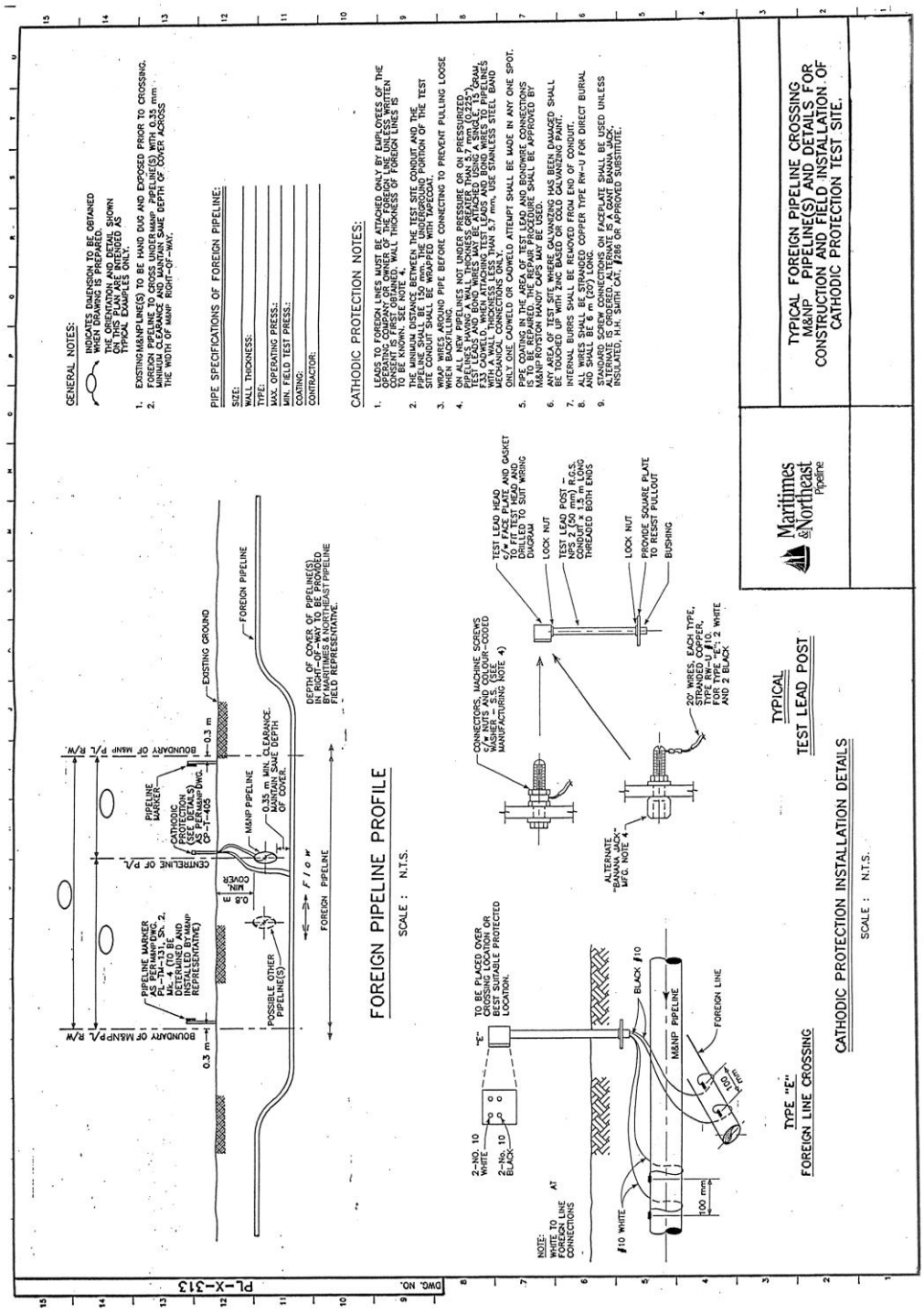

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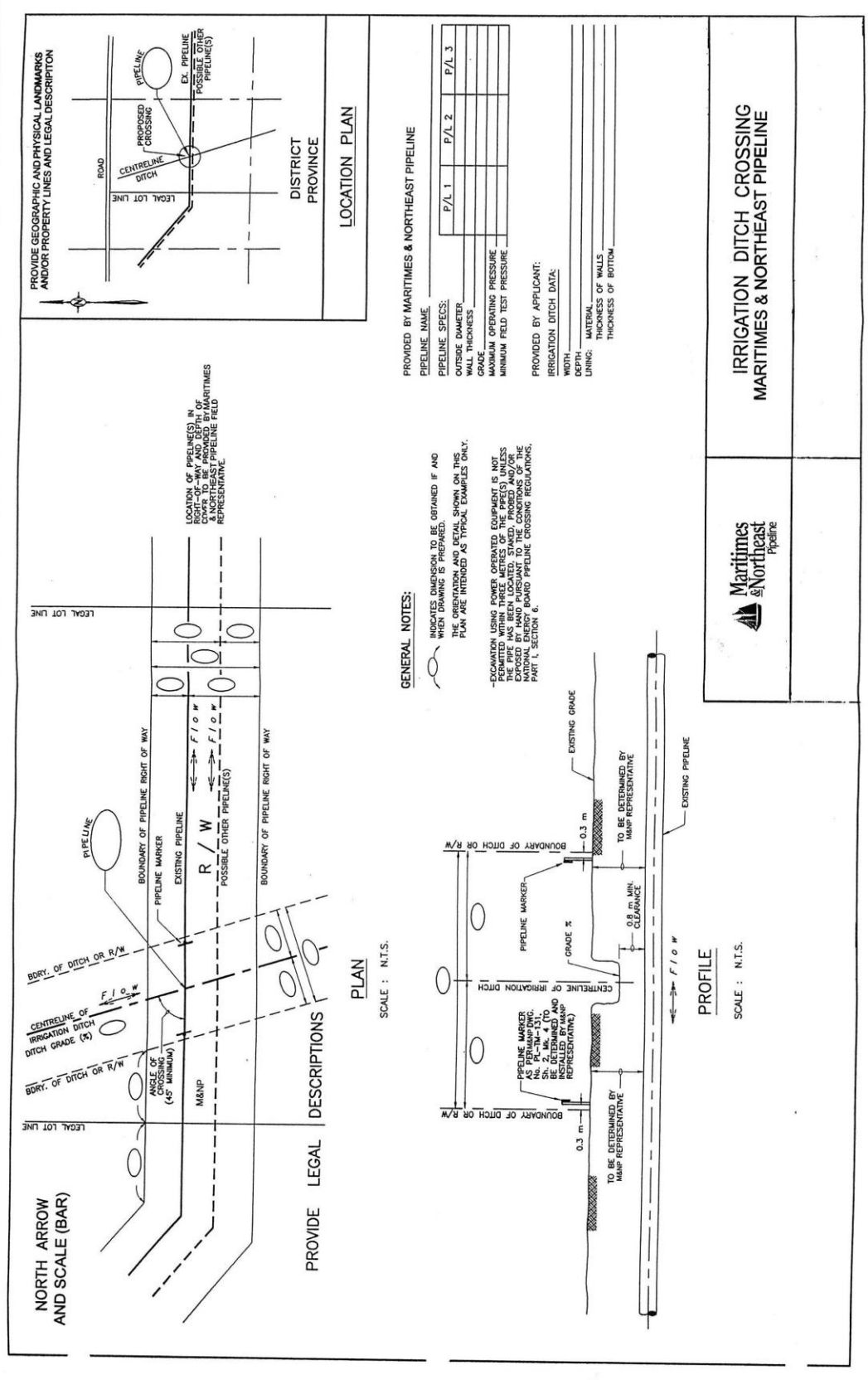

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APPENDIX C

Forms and Agreements

- On-Site Approval Agreement (Form 142)
- Emergency Work Request Agreement (Form 200)
- Encroachment Agreement Sample

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Form 142 (Page 1)

Maritimes & Northeast

On-Site Approval Agreement

Line No. _____ KP _____ PID _____ ☐ Sketch/Drawing Attached

Line Size _____ Province _____ County _____ ☐ Photo Attached

PERSON/COMPANY REQUESTING PERMISSION ("ENCROACHER")

Name/Company _____

Address _____

Telephone _____ Fax _____

Email _____ Locate Request No. _____

Work Type _____

Conditions of Approval _____

_____

_____

It is hereby acknowledged that:

1. Work is not to take place in the vicinity of Maritimes and Northeast Pipeline's (Company) facilities, including the pipeline right-of-way unless a Company representative is on site to monitor any excavation and backfill activities; and
2. Work must comply with the requirements of Company's Guideline TG-10C, and have been deemed not to require an Encroachment Agreement; and
3. The Company has provided a copy of the National Energy Board Pipeline Crossing Regulations to the Encroacher; and
4. The Encroacher clearly understands all markings left by the Company, and the area in which work is not permitted, without a Company representative being present to witness said work; and
5. The Encroacher shall provide the Company three (3) working days notice prior to initiating any work in the vicinity of the Company's facilities, including the pipeline right-of-way.

The Company grants its permission to the Encroacher to construct and maintain the Encroacher's Works subject to the following terms and conditions:

(1) Encroacher understands and agrees to the General Terms and Conditions for Pipeline Encroachments (Schedule "A" attached); and

(2) Pursuant to the National Energy Board Pipeline Crossing Regulations, Part 1, Section 4 (n)(i), the Encroacher may assign the agreement to a third party.

☐ NEB Pipeline Crossing Regulations and Company Guidelines TG-10C Provided

AGREED AND CONSENTED to this _____ day of _____, 20____,

at the Municipality of _____, Province of _____, for the period

effective _____ to _____ only.
Date **Date**

_____ _____

Encroacher's Representative ***Maritimes & Northeast Pipeline Representative***
(signature & title) (signature & title)

White: Lands and Public Awareness Coordinator Yellow: Applicant Pink: Lands Public Awareness File

Form 142 - On-Site Approval Agreement (Maritimes)-Rev Jul-2012_cw.xls

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Form 142 (Page 2)

SCHEDULE "A"
GENERAL TERMS AND CONDITIONS FOR PIPELINE ENCROACHMENTS
ON-SITE APPROVAL AGREEMENT

1. Capitalized words and terms used in these Terms and Conditions that are defined in the On-Site Approval Agreement and not otherwise defined herein shall have the same meaning as set forth in the On-Site Approval Agreement.

2. Encroacher shall:

   (a) diligently carry out all activities in relation to Encroachers Works in accordance with good engineering and construction practices and in accordance with all laws, regulations, rules, orders, permits, licenses and other authorizations of any government or regulatory authority having jurisdiction;

   (b) comply with all reasonable instructions given by the Company to the Encroacher from time to time including any instructions in respect of procedures required to lessen any detrimental effect that Encroachers Works may have on the pipeline(s) of the Company;

   (c) subject to any contrary provision in the On-Site Approval Agreement, give the Company at least three days notice, excluding Saturdays, Sundays and statutory holidays, by telephone or in writing, of any activities the Encroacher intends to undertake in respect of the Encroachers Works;

   (d) ensure that a complete copy of the On-Site Approval Agreement with all attachments including these Terms and Conditions is provided to Encroacher's contractors and/or excavators and that such contractors and/or excavators comply with all the terms and conditions of the On-Site Approval Agreement and such attachments including these Terms and Conditions.

   (e) as soon as is reasonably practical after completion of construction of Encroacher's Works, restore the surface of the Encroachment Location as nearly as is practicable to the condition it was in immediately prior to the commencement of construction of Encroacher's Works;

   (f) if required by the Company, have Encroacher's Works inspected by representatives of the Company before any regular use of Encroacher's Works;

   (g) at its sole cost, maintain and repair Encroacher's Works and at all times keep Encroacher's Works in good condition and repair; and

   (h) reimburse the Company upon request in respect of any costs incurred by the Company in exercising its rights or obligations under the On-Site Approval Agreement including these Terms and Conditions. The Encroacher acknowledges that the Company may utilize third party service providers in respect of any or all of such rights or obligations.

3. Encroacher shall immediately notify the Company's representative of any emergency that occurs at the Encroachment Location. The Company's representative and Encroacher shall mutually determine the procedures to be followed to minimize the impact of such emergency on Encroacher's Works and the pipeline. If Encroacher is unable to contact the Company representative, Encroacher shall call the Company's emergency number (1-888-444-6677) and give the Company's representative full particulars of the emergency. For the purposes of this paragraph, "emergency" means an unexpected situation that could endanger life or cause substantial property or environmental damage and that requires immediate action.

4. Encroacher shall indemnify and save harmless the Company from and against all actions, proceedings, claims, demands and costs which may be brought against or suffered by the Company or which it may sustain, pay or incur, by reason of or as a result of or in connection with Encroacher's Works at the Encroachment Location or the construction, operation, maintenance, repair, replacement or removal of such Encroacher's Works. Further, Encroacher shall indemnify and save the Company harmless from and against all taxes and assessments of any description whatsoever levied by any authority in respect of Encroacher's Works.

5. If Encroacher fails to complete any work or otherwise defaults in carrying out any of its obligations under the On-Site Approval Agreement including these Terms and Conditions, and Encroacher fails to complete any such work or otherwise to remedy any such default within 15 days after receiving notice from the Company to do so, the Company may, but shall not be obliged to, take such steps as it considers appropriate to complete such work or remedy such default and Encroacher shall pay to the Company on demand all costs incurred by the Company to complete such work and remedy any such default. Further, upon Encroacher's failure to remedy such default within 15 days after receiving notice from the Company to do so, the Company may, at its option, suspend for such period as it considers necessary the permission(s) given to Encroacher under the On-Site Approval Agreement, to terminate the On-Site Approval Agreement and all permission granted by the Company under the On-Site Approval Agreement, in either case by notice to Encroacher, all without prejudice to any other rights and remedies of the Company.

6. On the expiration or any termination of the On-Site Approval Agreement, Encroacher shall, at its expense remove such of the Encroacher's Works as the Company shall require and Encroacher shall restore the surface of the Encroachment Location as nearly as is practicable to the condition it was in immediately prior to the commencement of the construction of Encroacher's Works. The Company shall not be responsible for any cost of such removal or restoration.

7. The On-Site Approval Agreement and these Terms and Conditions set forth the entire agreement between the Company and Encroacher respecting the Encroachment of the pipeline(s) of the Company by Encroacher's Works at the Encroachment Location.

8. The Encroacher shall not sell, transfer, assign, lease or otherwise dispose of the land of Encroachment where the Encroachment Location is located, or any part thereof or interest therein, any interest in the Encroacher's Works or the benefit of the On-Site Approval Agreement and these Terms and Conditions, without in each case first obtaining and delivering to the Company an agreement in favour of the Company and in form and substance satisfactory to the Company whereby the purchaser, transferee, assignee, lessee or other person taking a disposition shall agree with the Company to assume, perform, observe and be bound by all the obligations and liabilities of Encroacher under the On-Site Approval Agreement and these Terms and Conditions, including this paragraph 8. Encroacher shall not grant any mortgage, charge or other encumbrance over the land of Encroacher where the Encroaching Location is located without obtaining from the mortgagee, chargee or other person taking the encumbrance an acknowledgement in form and substance satisfactory to the Company of the rights and obligations of the Company and Encroacher under the On-Site Approval Agreement and these Terms and Conditions. Subject to the foregoing, the On-Site Approval Agreement and these Terms and Conditions shall enure to the benefit of and be binding upon the parties hereto and their respective heirs, executors, administrators, successors and assigns.

9. No waiver of any breach of a covenant or provision of the On-Site Approval Agreement and these Terms and Conditions shall take effect or be binding upon a party unless it is expressed in writing. A waiver by a party of any breach shall not limit or affect that party's rights with respect of any other or future breach.

10. The On-Site Approval Agreement and these Terms and Conditions shall be interpreted by and construed in accordance with the laws of the Provinces of Nova Scotia & New Brunswick and the federal laws of Canada applicable therein.

11. If a party is comprised of more than one legal entity, references in the On-Site Approval Agreement and these Terms and Conditions to that party are references to each and all of such entities, jointly and severally.

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Form 200 (Page 1)

Maritimes & Northeast Pipeline

Emergency Work Request Agreement

Line No. _____ KP _____ PID _____ ☐ Sketch/Drawing Attached

Line Size _____ Province _____ County _____ ☐ Photo Attached

PERSON/COMPANY REQUESTING PERMISSION ("ENCROACHER")

Name/Company _____

Address _____

Telephone _____ Fax _____

Email _____ Locate Request No. _____

Work Type _____

Conditions of Approval _____

It is hereby acknowledged that:

1. The Encroacher is not in possession of a signed Encroachment Agreement; and
2. Maritimes & Northeast Pipeline (Company) has provided a copy of the National Energy Board Pipeline Crossing Regulations to the Encroacher; and
3. The Encroacher requests **immediate** permission to conduct construction activities in the vicinity of Company's facilities, including pipeline right-of-way; and
4. Work being conducted under this agreement is "emergency work" and is being conducted to repair critical public infrastructure, or for public safety and **it is not practicable to undergo the standard 72 hour notification process; and**
5. The Encroacher shall give as much notice as practicable to the Company any time work is to take place on the Company's pipeline right-of-way, and work shall not take place on the right-of-way unless a Company representative is present to observe any excavation and backfill activities; and
6. The Encroacher clearly understands all markings left by the Company, and the area in which work is not permitted, without a Company representative being present to witness said work.

The Company grants its permission to the Encroacher to construct and maintain the Encroacher's Works subject to the following terms and conditions:

(1) Encroacher understands and agrees to the General Terms and Conditions for Pipeline Encroachments (Schedule "A" attached); and

(2) Pursuant to the National Energy Board Pipeline Crossing Regulations, Part 1, Section 4 (n)(i), the Encroacher may assign the agreement to a third party.

☐ NEB Pipeline Crossing Regulations and Company Guidelines TG-10C Provided

AGREED AND CONSENTED to this _____ day of _____, 20____,

at the Municipality of _____, Province of _____, for the period

effective _____ to _____ only.
Date **Date**

_____ _____

Encroacher's Representative ***Maritimes & Northeast Pipeline Representative***

(signature & title) (signature & title)

White: Lands and Public Awareness Coordinator Yellow: Applicant Pink: Lands Public Awareness File

Form 200 - Emergency Work Request Agreement (Maritimes)-Rev Jul-2012_cw.xls

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Form 200 (Page 2)

SCHEDULE "A"
GENERAL TERMS AND CONDITIONS FOR PIPELINE ENCROACHMENTS
EMERGENCY WORK REQUEST AGREEMENT

1. Capitalized words and terms used in these Terms and Conditions that are defined in the Emergency Work Request Agreement and not otherwise defined herein shall have the same meaning as set forth in the Emergency Work Request Agreement.

2. Encroacher shall:

   (a) diligently carry out all activities in relation to Encroachers Works in accordance with good engineering and construction practices and in accordance with all laws, regulations, rules, orders, permits, licenses and other authorizations of any government or regulatory authority having jurisdiction;

   (b) comply with all reasonable instructions given by the Company to the Encroacher from time to time including any instructions in respect of procedures required to lessen any detrimental effect that Encroachers Works may have on the pipeline(s) of the Company;

   (c) subject to any contrary provision in the Emergency Work Request Agreement, give the Company at least three days notice, excluding Saturdays, Sundays and statutory holidays, by telephone or in writing, of any activities the Encroacher intends to undertake in respect of the Encroachers Works;

   (d) ensure that a complete copy of the Emergency Work Request Agreement with all attachments including these Terms and Conditions is provided to Encroacher's contractors and/or excavators and that such contractors and/or excavators comply with all the terms and conditions of the Emergency Work Request Agreement and such attachments including these Terms and Conditions.

   (e) as soon as is reasonably practical after completion of construction of Encroacher's Works, restore the surface of the Encroachment Location as nearly as is practicable to the condition it was in immediately prior to the commencement of construction of Encroacher's Works;

   (f) if required by the Company, have Encroacher's Works inspected by representatives of the Company before any regular use of Encroacher's Works;

   (g) at its sole cost, maintain and repair Encroacher's Works and at all times keep Encroacher's Works in good condition and repair; and

   (h) reimburse the Company upon request in respect of any costs incurred by the Company in exercising its rights or obligations under the Emergency Work Request Agreement including these Terms and Conditions. The Encroacher acknowledges that the Company may utilize third party service providers in respect of any or all of such rights or obligations.

3. Encroacher shall immediately notify the Company's representative of any emergency that occurs at the Encroachment Location. The Company's representative and Encroacher shall mutually determine the procedures to be followed to minimize the impact of such emergency on Encroacher's Works and the pipeline. If Encroacher is unable to contact the Company representative, Encroacher shall call the Company's emergency number (1-888-410-2220) and give the Company's representative full particulars of the emergency. For the purposes of this paragraph, "emergency" means an unexpected situation that could endanger life or cause substantial property or environmental damage and that requires immediate action.

4. Encroacher shall indemnify and save harmless the Company from and against all actions, proceedings, claims, demands and costs which may be brought against or suffered by the Company or which it may sustain, pay or incur, by reason of or as a result of or in connection with Encroacher's Works at the Encroachment Location or the construction, operation, maintenance, repair, replacement or removal of such Encroacher's Works. Further, Encroacher shall indemnify and save the Company harmless from and against all taxes and assessments of any description whatsoever levied by any authority in respect of Encroacher's Works.

5. If Encroacher fails to complete any work or otherwise defaults in carrying out any of its obligations under the Emergency Work Request Agreement including these Terms and Conditions, and Encroacher fails to complete any such work or otherwise to remedy any such default within 15 days after receiving notice from the Company to do so, the Company may, but shall not be obliged to, take such steps as it considers appropriate to complete such work or remedy such default and Encroacher shall pay to the Company on demand all costs incurred by the Company to complete such work and remedy any such default. Further, upon Encroacher's failure to remedy such default within 15 days after receiving notice from the Company to do so, the Company may, at its option, suspend for such period as it considers necessary the permission(s) given to Encroacher under the Emergency Work Request Agreement, to terminate the Emergency Work Request Agreement and all permission granted by the Company under the Emergency Work Request Agreement, in either case by notice to Encroacher, all without prejudice to any other rights and remedies of the Company.

6. On the expiration or any termination of the Emergency Work Request Agreement, Encroacher shall, at its expense remove such of the Encroacher's Works as the Company shall require and Encroacher shall restore the surface of the Encroachment Location as nearly as is practicable to the condition it was in immediately prior to the commencement of the construction of Encroacher's Works. The Company shall not be responsible for any cost of such removal or restoration.

7. The Emergency Work Request Agreement and these Terms and Conditions set forth the entire agreement between the Company and Encroacher respecting the Encroachment of the pipeline(s) of the Company by Encroacher's Works at the Encroachment Location.

8. The Encroacher shall not sell, transfer, assign, lease or otherwise dispose of the land of Encroachment where the Encroachment Location is located, or any part thereof or interest therein, any interest in the Encroacher's Works or the benefit of the Emergency Work Request Agreement and these Terms and Conditions, without in each case first obtaining and delivering to the Company an agreement in favour of the Company and in form and substance satisfactory to the Company whereby the purchaser, transferee, assignee, lessee or other person taking a disposition shall agree with the Company to assume, perform, observe and be bound by all the obligations and liabilities of Encroacher under the Emergency Work Request Agreement and these Terms and Conditions, including this paragraph 8. Encroacher shall not grant any mortgage, charge or other encumbrance over the land of Encroacher where the Encroaching Location is located without obtaining from the mortgagee, chargee or other person taking the encumbrance an acknowledgement in form and substance satisfactory to the Company of the rights and obligations of the Company and Encroacher under the Emergency Work Request Agreement and these Terms and Conditions. Subject to the foregoing, the Emergency Work Request Agreement and these Terms and Conditions shall enure to the benefit of and be binding upon the parties hereto and their respective heirs, executors, administrators, successors and assigns.

9. No waiver of any breach of a covenant or provision of the Emergency Work Request Agreement and these Terms and Conditions shall take effect or be binding upon a party unless it is expressed in writing. A waiver by a party of any breach shall not limit or affect that party's rights with respect of any other or future breach.

10. The Emergency Work Request Agreement and these Terms and Conditions shall be interpreted by and construed in accordance with the laws of the Province of New Brunswick and the federal laws of Canada applicable therein.

11. If a party is comprised of more than one legal entity, references in the Emergency Work Request Agreement and these Terms and Conditions to that party are references to each and all of such entities, jointly and severally.

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Encroachment Agreement (Page 1)

(Date)

(Encroacher)
(Title)
(Department)
(Address)

SUBJECT: Consent Agreement for your proposed Encroachment of Maritimes & Northeast Pipeline _____, KP_____ to KP_____, in the County of _____, in the Province of _____

Brunswick Pipeline "The Company" has reviewed the proposed Encroachment and will consent to it.

In consideration of the Company consenting to the Encroachment, we ask that you agree to the following conditions precedent:

1. That you will comply with the general conditions for consent in Schedule "A", attached hereto;
2. That you and your contractor will install the Encroachment strictly in the manner described in the Company's Transmission Guideline TG-10C, attached hereto;
3. That the Encroachment will be designed and constructed strictly in accordance with your (**Drawing Number**) approved by the Company attached as hereto;
4. That the Encroachment will be completed within one (1) year of the date of this letter, otherwise this consent will terminate and a new application will be required.
5. That as per Schedule "A", Section 5, Encroacher shall submit certificates or other evidence of such current insurance to the Company prior to any work commencing for the Encroachment.

Please sign and return all three (3) copies of the agreement, including the four (4) copies of the enclosed drawing and schedules. We will subsequently sign the copies of the agreement and will return two (2) for your use. Please ensure that a copy is sent to the persons who will be performing this work and that it is available "on-site". Installation of the Encroachment can then proceed after giving a minimum of three (3) business days advance notice to _____ at _____.

This Encroachment Agreement and Schedule "A", TG-10C and any attachments constitute the entire Encroachment Agreement between the Company and the Encroacher and any change or alteration hereof shall be made in writing between the parties.

Yours very truly,

MARITIMES & NORTHEAST PIPELINE

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Encroachment Agreement (Page 2)

(name of approver).
(title)

Read and agreed to at _____this _____ day of

ENCROACHER:

_____
(Encroacher name)

I have the authority to bind the corporation

WITNESSED BY:
( )
( )
( )
( )
( )

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Encroachment Agreement (Page 3)

SCHEDULE 'A'

General Conditions for Encroachment Consent

1. In this agreement:

   (a) the term "Encroacher" refers to the person(s) who will own, operate and maintain the Facility;
   (b) the term "Contractor" means the person(s) who constructs and installs the Facility;
   (c) the term "Facility" refers to the works of the Encroacher as described in the covering letter-agreement to this Schedule;
   (d) the term " Encroachment" refers to the Encroachment of the Company's pipeline(s) by the Facility at the location described in the covering letter-agreement to this Schedule.

2. The Company consents to the Encroachment to the extent that it has the right to do so and the Encroacher shall be responsible for obtaining all other applicable approvals, permits, orders and permissions required to construct and install the Facility.

3. Encroacher agrees to comply with all applicable rules, orders, regulations, codes and guidelines of any competent government body or organization affecting the design, installation, construction and operation of the Facility.

4. Encroacher agrees to indemnify and save harmless the Company against any claims, demands, actions, suits, proceedings, damages, injuries (including injuries resulting in death) that may arise as a result of the construction, installation and operation of the Facility.

5. In connection with Clause 4, above, Encroacher, or Contractor, at its own expense shall carry and keep in full force and effect;

   (a) Comprehensive General Liability insurance with an inclusive limit for personal injury and property damage of Five Million dollars ($5,000,000.00), and;
   (b) Automobile Liability Insurance ("owned" and "non-owned") with an inclusive limit for bodily injury (including passengers) and property damage of One Million dollars ($1,000,000.00).

   Encroacher shall submit certificates or other evidence of such insurance to the Company prior to any work commencing for the Encroachment.

6. Encroacher agrees to personally perform the installation and construction of the Facility or else to closely supervise its installation and construction by a duly qualified contractor(s) and to ensure that said contractor(s) complies with all terms and conditions of this agreement.

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Encroachment Agreement (Page 4)

7. The Encroacher shall pay forthwith upon presentation of an invoice by the Company, all reasonable costs incurred by the Company for:

   (a) Review, approval and inspection of the Encroachment;
   (b) Reinforcing, modifying or relocating the Company's pipeline(s) to accommodate the installation of Encroacher's Facility or the maintenance and repair of its Facility;
   (c) Any reasonable incremental costs inured by the Company in the operation, maintenance, replacement and repair of its pipeline(s) which are caused by the Encroachment.

8. The terms and conditions of this consent shall apply to the construction and installation of the Facility and any future maintenance work that may be required.

9. This consent is for the Facility only as approved by the Company and any additional works or facilities proposed by the Encroacher shall be the subject of a separate agreement.

10. Encroacher hereby agrees and acknowledges that its rights in the Encroachment are subordinate to the easement agreement(s) of the Company that have been registered or obtained prior to this date and Encroacher shall cooperate with all reasonable requests made by the Company related to the operation, maintenance and repair of the Company's pipeline(s) within the easement(s).

11. In the case of default by the Encroacher to carry out any of the provisions of this agreement or if the condition of Encroacher's Facility has deteriorated and adversely affects the operation of the Company's pipeline(s), the Company may give written notice thereof. If the Encroacher fails to take all reasonable steps to remedy the default or the deterioration of the Facility within fifteen (15) days after receipt of the written notice by the Company, the Company may take such steps necessary to remedy the default or deterioration and Encroacher shall be liable for and shall pay forthwith all reasonable costs incurred by the Company in this regard.

12. All notices required to be given hereunder shall be delivered by registered mail or facsimile to the addresses shown on the covering letter-agreement and shall be deemed to be received on the fifth (5^{th}) day following mailing thereof or upon confirmation of facsimile transmission.

13. This agreement shall be governed in accordance with the laws of the province in which the Encroachment is situated.

14. Neither party to this agreement shall assign or transfer their rights and obligations hereunder to a third party without first obtaining the written consent of the other party.

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Encroachment Agreement (Page 5)

15. The rights and obligations of the parties hereto shall terminate upon the earlier of:

    (a) two (2) years from the date hereof if the Encroacher has not completed the construction and installation of the Facility and restoration of the lands affected by the Encroachment; or
    (b) upon the proper abandonment or removal of the Facility and restoration of the lands to a condition acceptable to the Company and the owner of the property where the Encroachment is situated.

16. If any part of this agreement shall become null and void by virtue of law or governmental regulation, it shall be severed from the agreement, but the remaining terms and conditions shall remain in full force and effect.

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APPENDIX D

SUMMARY CHECKLIST FOR POTENTIAL EXCAVATORS

An Encroachment Agreement or an On-Site Approval Agreement is required by the Company for all third party excavations occurring within the Company's pipeline right-of-way or 30 metre National Energy Board (NEB) Safety Zone. The third party shall adhere to the requirements of the Company's TG-10C, "Requirements For Construction Near Company Pipelines" and the NEB Pipeline Crossing Regulations. A minimum of 10 days notification is required prior to beginning any construction activities within the 30 metre NEB Safety Zone.

No excavation or backfill activities are to occur without the Company representative onsite to monitor these activities.

Preliminary Third Party Responsibilities

- The third party shall ensure notification is submitted to the Company via one-call where available or by calling 1-888-444-6677 to allow the appropriate time for response by the involved parties.
- The third party shall designate a spotter dedicated solely to excavation and backfill activities.
- The third party shall provide an excavation plan to the Company representative for approval prior to beginning any excavation activities as outlined in this document.
- The third party shall review this document with all participants in the excavation and ensure the understanding of the requirements.

Third Party Excavation & Backfill Activities

- Bucket teeth shall be barred and side cutters removed.
- The third party shall ensure the excavation is in compliance with COSH and NEB regulations.

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- The excavator shall be positioned parallel to the Company's pipeline to safely excavate the pipeline.
- A line locator and/or probe bar shall be used to maintain the minimum tolerance zone until the top and side of the pipeline is exposed.
- Soft digging equipment shall be required at the third party's expense for excavating within the minimum tolerance zone unless otherwise agreed.
- The third party shall continue to probe during the excavation process to ensure no unknown facilities are damaged until the final ditch grade is achieved.
- Ample time shall be provided to allow the Company representative to perform relevant inspections prior to proceeding with backfill operations.

Third Party Documentation

- An as-built drawing/sketch of the final completed foreign facility shall be provided to the Company as outlines in this document.

Company Responsibilities

- The Company's representative will ensure the excavation plan and safety requirements are reviewed with the third party equipment operator prior to any excavation activity.
- Provide third party with a copy of this document and the NEB Pipeline Crossing Regulations.
- The Company representative shall have the authority to stop work at any time.

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- The Company representative shall establish the tolerance zone for use of mechanical equipment in the vicinity of the Company's pipeline as outlined in this document.
- The Company is required to notify the National Energy Board of any unauthorized excavations within the NEB 30 metre safety zone or an unauthorized crossing of the Company's pipeline.

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