



MEMO

TO: Riverland Area II Ltd.
FROM: Derek Brunner, P.Geo.
SUBJECT: Hydrogeological Monitoring Program - Riverland Area II – Phase 5
DATE: December 17, 2021

WSP Canada (WSP) was retained by Riverland Area II Ltd. to complete the pre-construction groundwater monitoring at the Riverland Area II Phase 5 subdivision (the Site) located in the Township of Woolwich (Breslau) Ontario. WSP has prepared the following update of the groundwater monitoring program for the Riverland Area II Site.

MONITORING PROGRAM

CURRENT MONITORING LOCATIONS

Fourteen (14) wells are currently being monitored at the Riverland Area 2 Site as shown in the attached Figure 1 and listed in the attached well summary tables. WSP also installed five (5) staff gauges at selected wetland locations in September 2021 to allow for surface water monitoring. The wells are colour coded based on their year of construction and are as follows:

- 2011 Wells (White): MW11-1, MW11-2, MW11-3, MW11-5, MW11-6, MW11-7
- 2016 Wells (Orange): BH16-1
- 2020 Wells (Blue): MW20-1, MW20-2, MW20-3
- 2021 Wells (Black and White): BH21-1
- 2021 Staff Gauges (Yellow): WL 1, WL 2/3, WL 4, WL 6/8 & WL 7
- Wells of Unknown Origin (Green): MW2, MW3, MW4

The wells installed in 2011 were completed during the initial phase of field work at the site. These were supplemented with additional wells in 2016. A number of wells on the property were decommissioned in 2018 to allow for construction to proceed. The wells installed in 2020 were constructed to replace missing / destroyed wells to allow for further monitoring to be completed. Another monitoring well was installed in the Phase 5 study area as part of a soil and groundwater investigation in March 2021 by the WSP environmental team.

Several wells of unknown origin are also located on the property. There is also a shallow monitor located within a groundwater supported wetland on the property that forms a tributary to the Grand River. The surface water monitoring stations were installed in cooperation with the WSP ecological team, and the data will be



shared between the hydrogeology and ecology groups. Borehole logs for the wells that are monitored are attached in Appendix A.

MONITORING FREQUENCY

All wells and staff gauges are monitored manually on a seasonal basis by the hydrogeology team. The wetlands are monitored separately by the ecology team on a monthly basis. A datalogger is currently installed in BH20-1 adjacent to the groundwater-fed wetland, and another is installed at Wetland 1. The loggers are set to take readings hourly and are downloaded seasonally during monitoring events. Manual water levels have been summarized in the attached tables.

GROUNDWATER LEVEL TRENDS

Groundwater levels at the site generally follow seasonal weather trends, where the highest water levels are recorded in the winter and spring months and lower water levels in the summer and fall. This is most apparent in the datalogger data going back to 2017, where seasonal variations have been as much as 1 m or slightly higher. The trends are highlighted in the attached hydrographs, using the electronic pressure transducer (datalogger) data, for BH16-4s/d from 2017 to late 2019 and for MW20-1 from 2021. Manual water levels are presented in the attached tables in Appendix B.

Groundwater levels are highest at the eastern portion of the site with lower trends towards the Grand River. The highest measured level was 309.59 masl in the east, with several wells at 300 masl or lower towards the Grand River. Several wells have been noted to be dry at elevations of 301.5 and lower. Groundwater levels were noted to be less than 1 m below ground surface in several locations (BH16-1 to BH16-4s, BH16-5 and BH16-10). Of these, all but BH16-10 are near the surface water feature in the middle of the property.

Groundwater flow maps were prepared for three dates (April 2021, October 2021, and December 2021) as shown in Figures 2 to 4. In general, these show shallow water level flow to the west towards the Grand River.

SURFACE WATER LEVEL TRENDS

WSP is monitoring staff gauges within wetlands at this property to assess surface water trends. WSP installed gauges on September 7, 2021 to monitor five (5) wetland locations, which are shown on Figure 1. The wetland areas were noted to be dry during reconnaissance visits to identify potential gauge locations during the summer months and were still dry when the gauges were installed. However, water levels were measurable in two locations after heavy rainfalls (WL 1 and WL 2/3).

WL 1 is the location where surface water has been noted most often (September into December 2021) with water depths between 0.4 and greater than 1.8 m. The water level in this wetland topped the gauge in December 2021. A datalogger was also installed in this location, but it has not been downloaded since October 5, 2021 because of high water levels. WL 2/3 had water levels of 0.1 m in after heavy precipitation events in September and November 2021. The water level in this wetland increased to about 0.7 m in early December. The remainder of the wetland depressions have been without surface water throughout the monitoring period. Groundwater levels in wells near the wetlands suggest that the wetlands are fed by surface water rather than groundwater, as the wetlands are generally at higher elevations. Tables showing manual water levels along with plots showing manual and datalogger data are provided in Appendix C. The hydrogeological team shall continue to monitor these features on a seasonal basis along with datalogger downloads. More detailed discussion of the wetlands shall be provided by the ecological team.

DEWATERING POTENTIAL

Based on borehole data and cross-sectional data provided by SPL (2013), geological conditions across the Phase 5 lands are expected to consist of a thin surficial aquifer up to 6 m thick overlying a layer of till. This till overlies a thicker sand aquifer that may extend about 20 m deeper to bedrock. Thicker layers of clay and silty clay may also be present. Wells screened in the upper aquifer have measurable water levels, whereas wells screened in the sand beneath the till have been dry, suggesting downward hydraulic gradients and a potential “perched” water table in the upper aquifer.

The cross-sections and location map are provided in Appendix A. High groundwater levels taken from wells in the central and eastern portion of the site range from 0.13 m bgs to about 3.3 m bgs, with wells closest to the Grand River having much lower levels (7 m bgs or deeper). It is possible that this is due to these wells being screened in a deeper aquifer. Given that the upper aquifer may be saturated, it is possible that deeper excavations for site servicing may encounter groundwater during construction and may require construction dewatering. Given previous experience at the site, it is possible that dewatering can be managed through an Environmental Activity and Sector Registry (EASR). Dewatering volumes would be expected to be lower should construction be completed during the summer months, when levels are generally lower.

For residential properties, the footings are required to be a minimum of 0.6 m above the high water table. The designs shall be completed with these levels in mind, so dewatering for construction of the homes is not expected to be required.

CONCLUSIONS AND RECOMMENDATIONS

Groundwater levels fluctuate seasonally at the site based on a review of the collected data. Groundwater levels tend to be higher in the winter and spring months and lower in the summer and early fall. The general direction of ground water flow is locally towards the marsh and regionally towards the Grand River based on previous studies completed by WSP (WSP, 2017) and observed groundwater level trends. Generally, wells screened in the shallow aquifer had higher measured water levels than those screened in the deeper aquifer, suggesting downward hydraulic gradients. Given the water levels in the upper aquifer that tend to be between 0.13 and 3.2 m bgs, there is the potential for localized dewatering to be required during installation of site services.

We trust that this meets with your requirements. Should you have any additional questions or comments, please do not hesitate to contact the undersigned.



Derek Brunner, P. Geo.
Hydrogeologist / Project Manager

Attachments:

Figures 1 to 4

Appendix A – Borehole Logs

Appendix B – GW Levels and Tables

Appendix C – Wetland Data

FIGURES





- LEGEND:
- Surface Water Monitoring Stations
 - Staff Gauge
 - Monitoring Well (Unknown Origin)
 - Monitoring Well (SPL 2011)
 - Monitoring Well (WSP 2016)
 - Monitoring Well (WSP 2020)
 - Monitoring Well (WSP 2021)
 - Decommissioned or Destroyed Monitoring Wells
 - Wetland Location
 - Development Plan

TITLE: SITE PLAN		
PROJECT: HYDROGEOLOGICAL ASSESSMENT RIVERLAND SUBDIVISION BRESLAU, ONTARIO		
CLIENT: EMPIRE COMMUNITIES (RIVERLAND AREA II LTD.)		
	PROJECT NO.: 151-63387-00	REVIEWED BY: DB
	DATE: DECEMBER 2021	FIGURE: 1



TITLE:

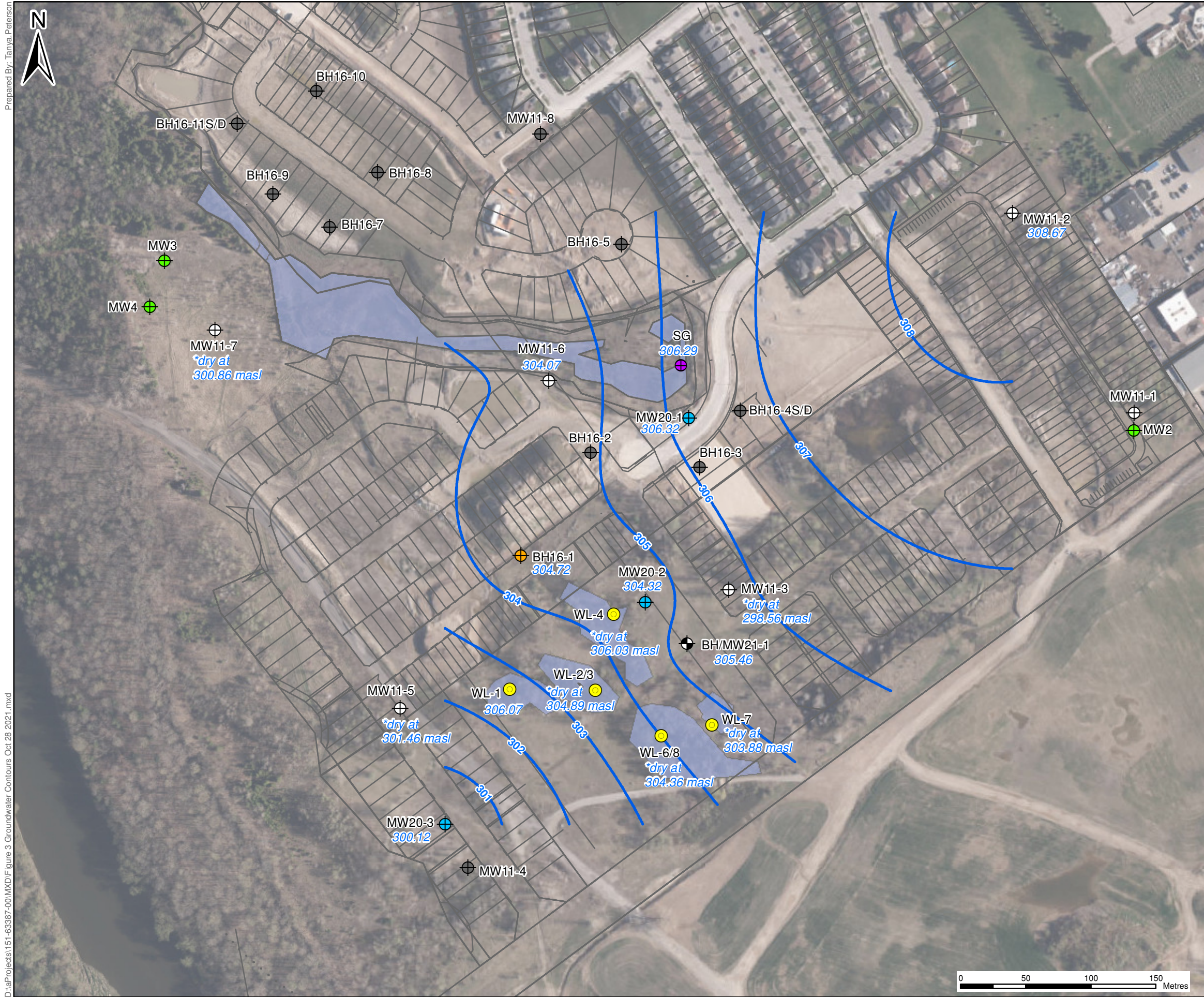
PROJECT:

CLIENT:

115

DATE:
DECEMBER 2021

FIGURE:
2



LEGEND:

- Development Plan
- Surface Water Monitoring Stations
- Staff Gauge
- Monitoring Well (Unknown Origin)
- Monitoring Well (SPL 2011)
- Monitoring Well (WSP 2016)
- Monitoring Well (WSP 2020)
- Monitoring Well (WSP 2021)
- Decommissioned or Destroyed Monitoring Wells
- Wetland Location
- Groundwater Contours (masl) Measured October 28, 2021

** Indicates monitoring location was dry on observation October 28, 2021 and excluded from groundwater contour model.

TITLE: GROUNDWATER CONTOURS OCTOBER 28, 2021		
PROJECT: HYDROGEOLOGICAL ASSESSMENT RIVERLAND SUBDIVISION BRESLAU, ONTARIO		
CLIENT: EMPIRE COMMUNITIES (MCCLUNG) LTD		
	PROJECT NO.: 151-63387-02	REVIEWED BY: DB
	DATE: DECEMBER 2021	FIGURE: 3



LEGEND:

- Development Plan
- Surface Water Monitoring Stations
- Staff Gauge
- Monitoring Well (Unknown Origin)
- ⊕ Monitoring Well (SPL 2011)
- ⊕ Monitoring Well (WSP 2016)
- ⊕ Monitoring Well (WSP 2020)
- ⊕ Monitoring Well (WSP 2021)
- ⊕ Decommissioned or Destroyed Monitoring Wells
- Wetland Location
- Groundwater Contours (masl) Measured December 9, 2021

*** Indicates monitoring location was dry on observation December 9, 2021 and excluded from groundwater contour model.*

** Indicates water level of wetland feature on December 2, 2021*

TITLE: GROUNDWATER CONTOURS DECEMBER 9, 2021		
PROJECT: HYDROGEOLOGICAL ASSESSMENT RIVERLAND SUBDIVISION BRESLAU, ONTARIO		
CLIENT: EMPIRE COMMUNITIES (MCCLUNG) LTD		
	PROJECT NO.: 151-63387-02	REVIEWED BY: DB
	DATE: DECEMBER 2021	FIGURE: 4

APPENDIX

A BOREHOLE LOGS



LOG OF BOREHOLE MW11-1

PROJECT: Hydrogeological Study and Wetland Investigation
CLIENT: Empire Communities (Riverland)
PROJECT LOCATION: Riverland Area 2, Breslau, Ontario
DATUM: Geodetic
BH LOCATION: N 4813007 E 547498

DRILLING DATA
Method: Hollow stem auger
Diameter: 200mm
Date: Dec/02/2011

REF. NO.: W.158-1102
ENCL NO.: 1

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (C _u) (kPa)	NATURAL UNIT WT (Mg/m ³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)										
								20	40	60	80	100						
								FIELD VANE & Sensitivity										
								LAB VANE										
								50	100	150	200	250						
310.8	TOPSOIL: 120mm		1	SPT	4													
310.0	FINE TO MED SAND: Some silt, trace gravel, light brown, moist to wet, loose																	
310.0	SANDY SILT: Trace gravel, trace clay, light brown, wet, compact		2	SPT	13													
309.3	SILTY SAND AND GRAVEL: Brown, wet, compact		3	SPT	16													
308.5	FINE SAND: Some silt, trace clay, brown, grey below 4.9m, wet, loose to compact		4	SPT	29													
			5	SPT	5													
			6	SPT	27													
304.7																		
6.1	SANDY SILT: Grey, wet, very dense		7	SPT	63													
304.2																		
6.6	END OF BOREHOLE																	
	50mm monitoring well installed																	

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

PROJECT: Hydrogeological Study and Wetland Investigation
CLIENT: Empire Communities (Riverland)
PROJECT LOCATION: Riverland Area 2, Breslau, Ontario
DATUM: Geodetic
BH LOCATION: N 4813159 E 547405

DRILLING DATA
Method: Hollow stem auger
Diameter: 200mm
Date: Dec/05/2011

REF. NO.: W.158-1102
ENCL NO.: 2

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT			POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (Mg/m ³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)					W _p	W	W _L			
311.7								20 40 60 80 100										GR SA SI CL
0.0	FINE SAND: Brown, moist, loose		1	SPT	8													
310.9							311											
0.8	SAND AND GRAVEL: Light brown, moist, compact to very dense		2	SPT	25													
310.0							310											
1.7	SANDY SILT TO SILTY SAND: Brown, wet, compact		3	SPT	51													
	Clayey silt seam from 2.65 to 3.00m		4	SPT	14													
			5	SPT	22													
							W. L. 309.4 m Dec 12, 2011											
							W. L. 308.5 m Nov 13, 2012											
307.1																		
306.9	SILTY FINE SAND: Trace gravel, brown, wet		6	SPT	14		307											7 54 (39)
4.8	SAND AND GRAVEL: Brown, wet, loose, very dense below 6.0m																	
							306											
	very dense below 6.1 m																	
305.1			7	SPT	61													
6.6	END OF BOREHOLE 50mm monitoring well installed																	

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

PROJECT: Hydrogeological Study and Wetland Investigation
CLIENT: Empire Communities (Riverland)
PROJECT LOCATION: Riverland Area 2, Breslau, Ontario
DATUM: Geodetic
BH LOCATION: N 4812876 E 547216

DRILLING DATA
Method: Hollow stem auger
Diameter: 200mm
Date: Nov/30/2011

REF. NO.: W.158-1102
ENCL NO.: 3

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT LIMIT			POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (Mg/m ³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)				W _p	W	W _L			
309.1								20 40 60 80 100									GR SA SI CL
308.9	TOPSOIL: 90mm		1	SPT	4		309	50 100 150 200 250									
308.4	SANDY SILT: Trace cobbles, brown, moist, loose																
0.8	CLAYEY SILT: Trace fine sand veins, moist, very stiff		2	SPT	16		308										
			3	SPT	26		307										
306.8																	
2.3	CLAYEY SILT TILL: Trace sand, trace gravel, brown, damp to moist, hard grey below 3.1 m		4	SPT	28		306										
			5	SPT	33		305										
			6	SPT	50 for 100mm		304										
303.0																	
6.1	FINE TO MEDIUM SAND: Some silt, light brown, damp, very dense		7	SPT	50 for 75mm		303										8 70 (22)
302.1																	
7.0	END OF BOREHOLE 50mm monitoring well installed Dec 20, 2011 - dry; Nov 13, 2012 - dry.																

GRAPH
NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

PROJECT: Hydrogeological Study and Wetland Investigation
CLIENT: Empire Communities (Riverland)
PROJECT LOCATION: Riverland Area 2, Breslau, Ontario
DATUM: Geodetic
BH LOCATION: N 4812773 E 546912

DRILLING DATA
Method: Hollow stem auger
Diameter: 200mm
Date: Dec/02/2011
REF. NO.: W.158-1102
ENCL NO.: 5

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (Mg/m ³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa) ○ UNCONFINED + FIELD VANE & Sensitivity ● QUICK TRIAXIAL × LAB VANE		WATER CONTENT (%) W _p W W _L					
308.4 0.2	TOPSOIL: 150mm FILL: Sand, some gravel, occasional topsoil inclusions, brown, moist		1	SPT	24		308							1 69 23 7	
							307								
306.9 1.7	SAND AND GRAVEL Brown, wet, compact CLAYEY SILT: Trace sand, trace gravel, brown, moist, hard		3	SPT	34		306								
			4	SPT	55										
305.4 3.1	SILTY FINE SAND: Trace clay, trace gravel, brown, moist, hard		5	SPT	50		305								
	grey below 4.6m		6	SPT	50		304								
							303								
302.1 6.3	END OF BOREHOLE 50mm monitoring well installed Dec 20, 2011 - dry; Nov 13, 2012 - dry.		7	SPT	50										

GRAPH
NOTES

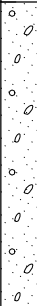
+ 3, × 3: Numbers refer
to Sensitivity

○ ε=3% Strain at Failure

PROJECT: Hydrogeological Study and Wetland Investigation
CLIENT: Empire Communities (Riverland)
PROJECT LOCATION: Riverland Area 2, Breslau, Ontario
DATUM: Geodetic
BH LOCATION: N 4813042 E 547053

DRILLING DATA
Method: Hollow stem auger
Diameter: 200mm
Date: Nov/30/2011

REF. NO.: W.158-1102
ENCL NO.: 6

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT					POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (Mg/m ³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)			
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)								WATER CONTENT (%)		
306.0								20	40	60	80	100	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L			
306.0	TOPSOIL: 90mm FILL Sandy silt, trace clay, trace to some gravel, occasional cobbles, topsoil inclusions, brown, moist		1	SPT	2									○				
304.5			2	SPT	2									○				
304.5	SANDY SILT: Trace clay, trace to some gravel, occasional cobbles, brown, moist,		3	SPT	34									○				
304.5	SILTY FINE SAND: Brown, wet, compact		4	SPT	14								○					
303.0																		
303.0	SAND AND GRAVEL: Trace to some silt, occasional cobbles, brown, wet, compact		5	SPT	10									○				
			6	SPT	17									○				
299.9																		
299.5	CLAYEY SILT TILL: Some gravel, some sand, damp to moist, hard		7	SPT	50									○				
6.5	END OF BOREHOLE 50mm monitoring well installed.																	

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

PROJECT: Hydrogeological Study and Wetland Investigation
CLIENT: Empire Communities (Riverland)
PROJECT LOCATION: Riverland Area 2, Breslau, Ontario
DATUM: Geodetic
BH LOCATION: N 4813111 E 546752

DRILLING DATA
Method: Hollow stem auger
Diameter: 200mm
Date: Nov/28/2011

REF. NO.: W.158-1102
ENCL NO.: 7

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT LIMIT			POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (Mg/m ³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)				W _p	W	W _L			
305.2								20 40 60 80 100									GR SA SI CL
0.0	MEDIUM TO FINE SAND: Some gravel, trace to some silt, trace clay, brown, moist, loose to compact		1	SPT	2		305										
			2	SPT	17		304										
			3	SPT	4		303										
			4	SPT	9		302										
			5	SPT	19		301										
			6	SPT	2		300										
			7	SPT	18		299										
							298										
297.5			8	SPT	50		297										
7.6	SILTY SAND: Trace clay, trace to some gravel, grey, moist, very dense						296										
			9	SPT	50		295										
			10	SPT	50		294										
			11	SPT	50		293										
							292										
291.1			12	SPT	50		291										
14.0	END OF BOREHOLE 50mm monitoring well installed.																

GRAPH
NOTES

+ 3 , × 3 : Numbers refer
to Sensitivity

○ ε=3% Strain at Failure

12 58 22 8

SPL SOIL LOG W-158-1102 BOREHOLE LOGS - HG.GPJ SPL.GDT 21/11/12

PROJECT: Hydrogeological Investigation	Method: Hollow Stem Auger	
CLIENT: Empire Communities	Diameter: 203 mm	REF. NO.: 151-63387-00
PROJECT LOCATION: Highway 27 & Kirby Road, Vaughan, Ontario	Date: Sep/28/2016	ENCL NO.: 1
DATUM: Geodetic		
BH LOCATION: N 4812897.079 E 547051.032		

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)		
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa) ○ UNCONFINED + FIELD VANE & Sensitivity ● QUICK TRIAXIAL × LAB VANE		WATER CONTENT (%) W _p W W _L						
306.3 0.0	Ground Surface SAND: Medium coarse sand, some silt and fine sand, trace gravel, brown, dry, loose						306							GR SA SI CL		
305.4 0.9	SAND AND GRAVEL: Stones, brown to grey, dry, loose						305									
302.3 4.0	SILTY SAND: Medium coarse sand, some clay, grey, moist, stiff						304									
301.7 4.6	END OF BOREHOLE Notes: 1) 50 mm diam. monitoring well installed upon completion, screened 3.05 to 4.57 mbgs 2) Water Level Record Date Depth (m) 10/14/2016 2.47 11/01/2016 2.47															

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH
NOTES

+ 3 , × 3 : Numbers refer to Sensitivity

○ ε=3% Strain at Failure



LOG OF BOREHOLE MW20-1

1 OF 1

PROJECT: Riverland Area 2

CLIENT: Riverland Area II Ltd

PROJECT LOCATION: Woolwich (Breslau)

DATUM: UTM NAD 83 Zone

BH LOCATION: N 4813021 E 547184

Method:

Diameter:

Date: Oct/05/2020 to Oct/05/2020

Equipment: Landshark B48 Auger Rig, Track Mount

REF. NO.: 11M-00018-06

ENCL NO.:

ORIGINATED BY AH

COMPILED BY NN

CHECKED BY PH

SOIL PROFILE			SAMPLES			MONITORING WELL CONSTRUCTION	CHEMICAL ANALYSIS	Soil Head Space Vapors			POCKET PEN. (kg/sq cm)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)	
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			PID (ppm)	CGD (% LEL)	PLASTIC LIMIT W _P			NATURAL MOISTURE CONTENT W
308.8	Ground Surface												GR SA SI CL
	Coarse-fine SAND, PEBBLES, COBBLES												
308.2													
0.6	Medium SAND with clay, pebbles, cobbles												
307.6													
1.2	COBBLES, some fine sand												
307.0													
1.8	PEBBLES, CLAY, fine SAND												
306.4													
2.4	Dense silty CLAY												
305.8													
3.0	Dense silty CLAY, trace gravel and trace pebbles												
305.1													
3.7	Silty CLAY												
304.2													
4.6	Medium silty SAND and GRAVEL/PEBBLES												
302.7													
6.1	END OF BOREHOLE AT 6.1 mbgs												

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th



LOG OF BOREHOLE MW20-2

1 OF 1

PROJECT: Riverland Area 2

CLIENT: Riverland Area II Ltd

PROJECT LOCATION: Woolwich (Breslau)

DATUM: UTM NAD 83 Zone

BH LOCATION: N 4812866 E 547140

Method:

Diameter:

Date: Oct/05/2020 to Oct/05/2020

Equipment: Landshark B48 Auger Rig, Track Mount

REF. NO.: 11M-00018-06

ENCL NO.:

ORIGINATED BY AH

COMPILED BY NN

CHECKED BY PH

SOIL PROFILE			SAMPLES			MONITORING WELL CONSTRUCTION	CHEMICAL ANALYSIS	Soil Head Space Vapors		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (kg/sq cm)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			PID (ppm)	CGD (% LEL)					
306.5	Ground Surface													
305.9	Earth FILL, sandy silt and trace pebbles.													
0.6	Clayey SILT													
304.5	Clayey silt TILL													
2.0	TILL													
303.9	Clayey silt TILL													
2.6														
303.5														
3.0														
4.6	END OF BOREHOLE AT 4.6 mbgs													

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th



LOG OF BOREHOLE MW20-3

1 OF 1

PROJECT: Riverland Area 2

CLIENT: Riverland Area II Ltd

PROJECT LOCATION: Woolwich (Breslau)

DATUM: UTM NAD 83 Zone

BH LOCATION: N 4812711 E 547006

Method:

Diameter:

Date: Oct/06/2020 to Oct/06/2020

Equipment: Landshark B48 Auger Rig, Track Mount

REF. NO.: 11M-00018-06

ENCL NO.:

ORIGINATED BY AH

COMPILED BY NN

CHECKED BY PH

SOIL PROFILE			SAMPLES				MONITORING WELL CONSTRUCTION	CHEMICAL ANALYSIS	Soil Head Space Vapors				PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (kg/1sq cm)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	PID (ppm)			CGD (% LEL)	WATER CONTENT (%)							
307.1	Ground Surface																
	Earth FILL, gravel, medium sand and clay																
306.5	0.6	CLAY with some gravel (dark grey)															
305.9	1.2	Stiff CLAY															
304.7	2.4	CLAY with trace silt															
302.5	4.6	Silty SAND and GRAVEL															
299.8	7.3	Fine SAND and GRAVEL															
299.5	7.6	END OF BOREHOLE AT 7.6 mbgs															

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th



LOG OF BOREHOLE BH21-1

1 OF 1

PROJECT: Soil and Groundwater Investigation

CLIENT: Empire Communities

PROJECT LOCATION: Riverland Site, Breslau, Ontario

DATUM: UTM NAD 83 Zone 17

BH LOCATION:

Method: Hollow Stem Augers/SPT

Diameter: 0.2

Date: Mar-11-2021

Equipment: Landshark Drilling B57

REF. NO.: 211-00416-05

ENCL NO.:

ORIGINATED BY DW

COMPILED BY JS

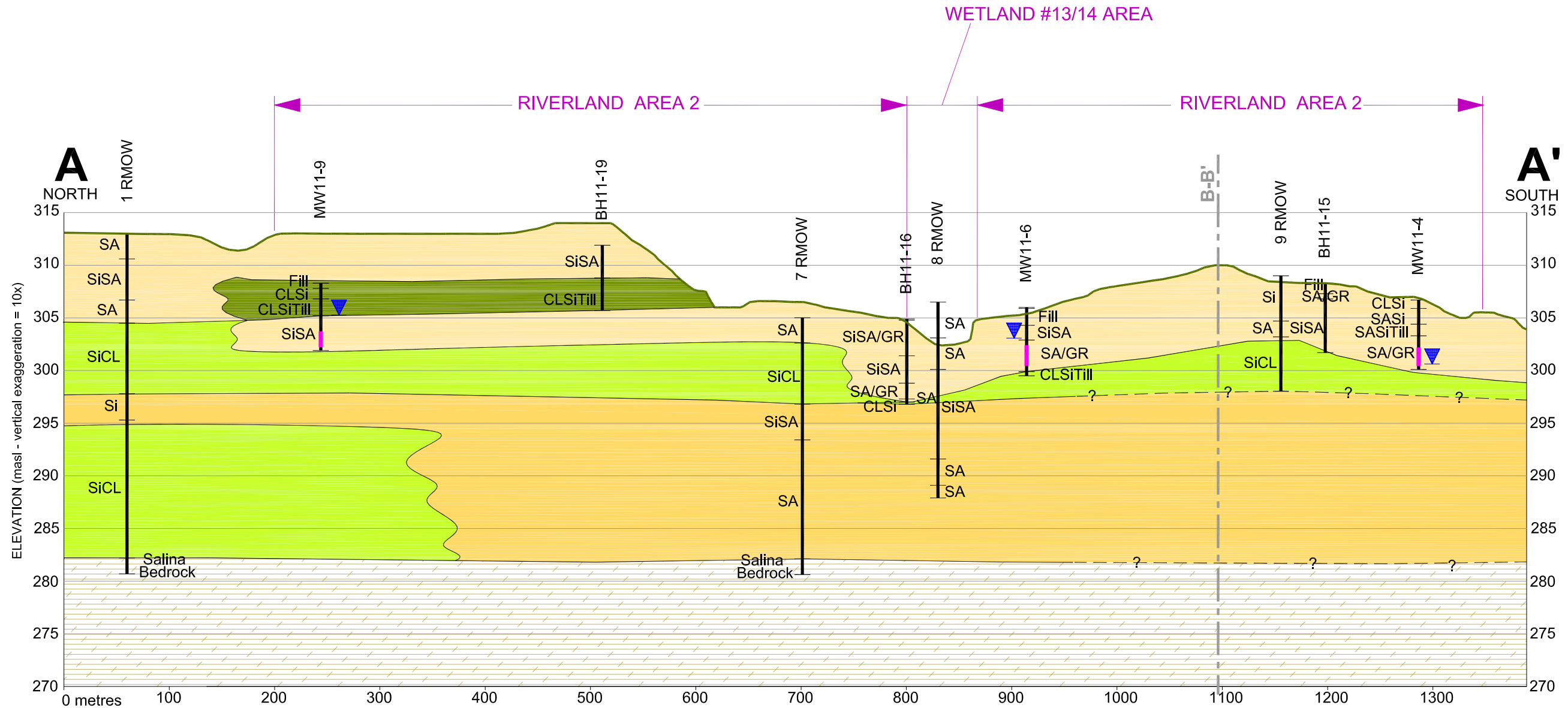
CHECKED BY BW

SOIL PROFILE			SAMPLES			MONITORING WELL CONSTRUCTION	CHEMICAL ANALYSIS	Soil Head Space Vapours		PLASTIC NATURAL LIQUID			POCKET PEN. (NPa)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			PID (ppm)	CGD (ppm)	LIMIT W _p	MOISTURE CONTENT W	LIMIT W _L		
100.0	Ground Surface													
	TOPSOIL													
99.8 0.2	SILT Brown, trace clay / sand, moist		1	SS	4									
99.2 0.8	FILL Light brown, sand/gravel, moist to wet		2	SS	9									
98.5 1.5	NO RECOVERY		3	SS	13									
97.7 2.3	SILT Light brown, trace sand/clay, saturated		4	SS	47									
	some sand		5	SS	17									
96.3 3.7	SANDY SILT TO SILTY SAND Light brown, saturated		6	SS	25									
95.4 4.6			7	SS	50									
			8	SS	33									
	END OF BOREHOLE AT 5.94 mbgs													

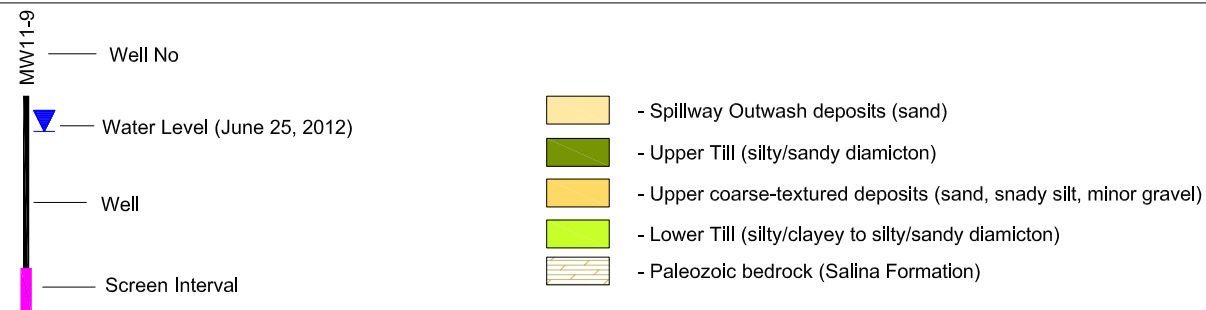
GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

\\Server\public\Hydrogeology\Projects\W-158 - 1102 Riverland Area 2\Drawings\Revision 1\W-158-x-sections-Rev1.dwg



LEGEND



Client: Empire Community Riverland Ltd		Project No.: W-158-1102	Figure No.: 4
Drawn: NS	Approved: NT	Title: CROSS-SECTION A-A'	
Date: January 2013	Scale: as shown	Project: HYDROGEOLOGICAL STUDY RIVERLAND AREA 2 Breslau, Township of Woolwich, Ontario	
Original Size: Tabloid	Rev: 1	 SPL Consultants Limited Geotechnical * Environmental * Materials * Hydrogeology T: 905-856-0065 F: 905-856-0025	

6221 Highway 7, Unit 16
Vaughan, ON L4H 0K8

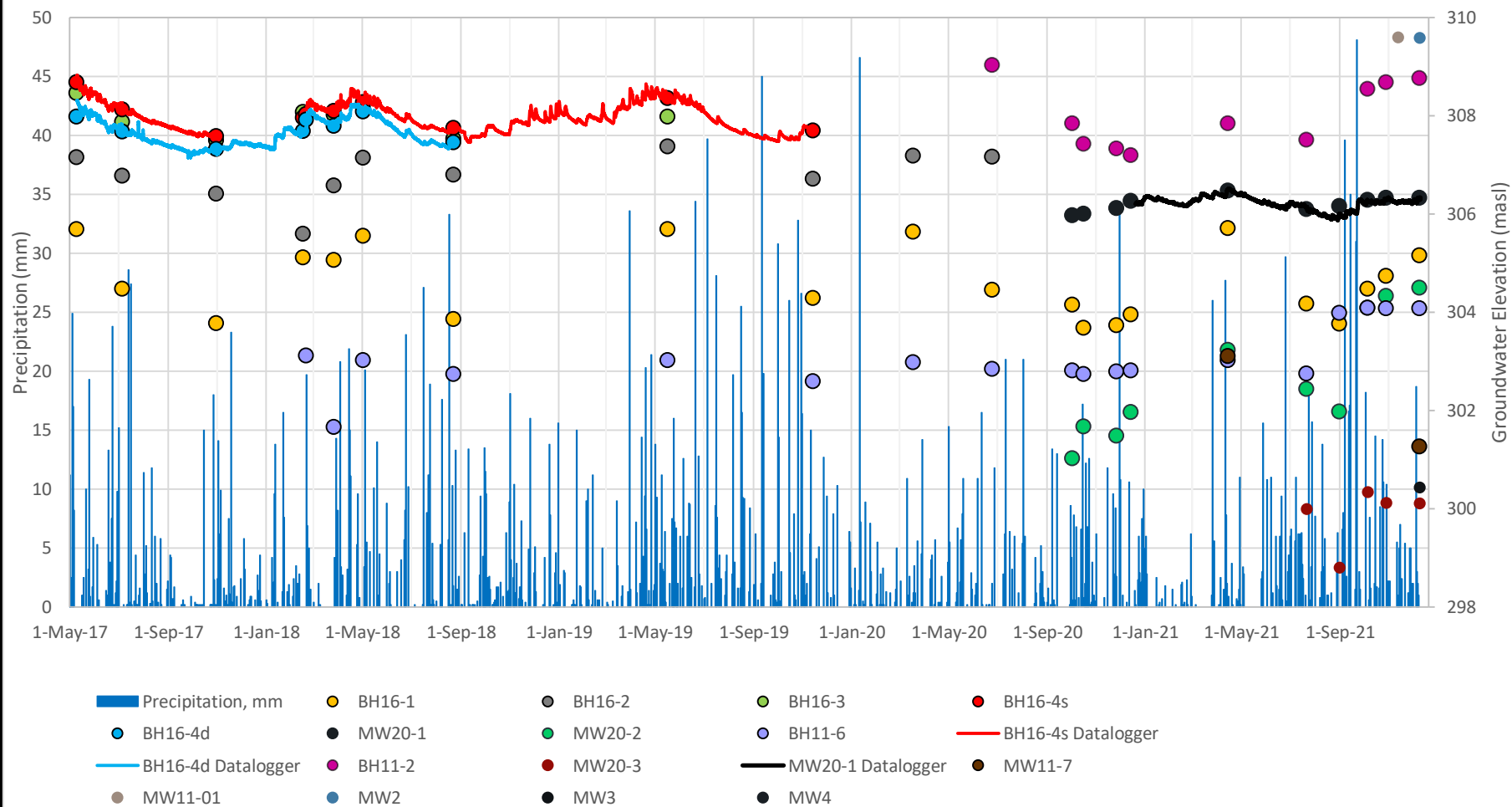
APPENDIX

B

GW LEVELS AND
TABLES

Water Level Hydrograph

Monitoring Well Water Levels - All



Note: Precipitation data obtained from the Kitchener-Waterloo Climate Station, Ontario



Water Level Monitoring
 Hydrogeological Study - Riverland Area 2
 Empire Communities Riverland Ltd.
 December 2021

Well ID	Stick up (m)	Ground Surface Elevation (m ASL)	Total Well Depth (mBGS)	24-Oct-16			01-Nov-16			10-May-17			06-Jul-17			31-Oct-17		
				WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)	WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)	WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)	WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)	WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)
BH 16-1	1.20	306.37	4.57	3.672	2.47	303.9	3.67	2.468	303.902	1.825	0.623	305.747	3.04	1.838	304.532	3.74	2.538	303.832
BH 16-2	0.99	307.5	4.57	3.073	2.087	305.413	2.608	1.622	305.878	1.34	0.354	307.146	1.72	0.734	306.766	2.09	1.104	306.396
BH 16-3	0.65	309	4.57	2.346	1.7	307.3	3.34	2.694	306.306	1.2	0.554	308.446	1.78	1.134	307.866	2.16	1.514	307.486
BH 16-4S*	1.03	309.5	3.96	2.982	1.955	307.545	3.015	1.988	307.512	1.86	0.833	308.667	2.41	1.383	308.117	2.96	1.933	307.567
BH 16-4D*	0.91	309.5	7.62	3.212	2.304	307.196	3.231	2.323	307.177	2.44	1.532	307.968	2.74	1.832	307.668	3.1	2.192	307.308
BH 16-5	1.11	307.5	4.57	2.408	1.296	306.204	2.44	1.328	306.172	1.67	0.558	306.942	decom	decom	decom	decom	decom	decom
BH 16-6	0.94	307.7	4.57	3.521	2.582	305.118	3.51	2.571	305.129	2.47	1.531	306.169	decom	decom	decom	decom	decom	decom
BH 16-7	0.94	305	4.57	4.562	3.626	301.374	4.558	3.622	301.378	4.205	3.269	301.731	decom	decom	decom	decom	decom	decom
BH 16-8	1.12	305.7	4.57	4.366	3.247	302.453	4.342	3.223	302.477	3.13	2.011	303.689	decom	decom	decom	decom	decom	decom
BH 16-9	0.98	303.5	4.57	3.571	2.596	300.904	3.556	2.581	300.919	3.21	2.235	301.265	decom	decom	decom	decom	decom	decom
BH 16-10	1.07	305.6	4.57	4.443	3.372	302.228	4.568	3.497	302.103	1.7	0.629	304.971	decom	decom	decom	decom	decom	decom
BH16-11s	1.06	305.4	4.57	dry	dry	<300.83	dry	dry	<300.83	3.27	2.21	303.19	decom	decom	decom	decom	decom	decom
BH16-11d	0.97	305.4	7.62	dry	dry	<297.78	dry	dry	<297.78	dry	dry	<297.78	decom	decom	decom	decom	decom	decom
BH 16-12	1.06	305.3	4.57	4.686	3.622	301.678	4.896	3.832	301.468	2.22	1.156	304.144	decom	decom	decom	decom	decom	decom
BH 16-13	1.02	304.8	4.57	dry	dry	<300.23	dry	dry	<300.23	dry	dry	<300.23	decom	decom	decom	decom	decom	decom
BH 16-14	0.80	304.2	7.62	6.088	5.287	298.913	6.126	5.325	298.875	3.49	2.689	301.511	decom	decom	decom	decom	decom	decom
BH 11-6	0.80	306.101	5.93													-	-	-
SG	0.87	306.227	0													0.835	-0.035	306.262
MW11-1	0.69	310.9	6.62													-	-	-
MW11-2	0.82	311.809	6.9															
MW20-1	0.93	308.836	7															
MW20-2	0.83	308.059	7															
MW20-3	0.93	307.509	8.42															
MW11-5	0.81	308.688	6.94															
MW11-7	0.87	304.049	4.34															
MW11-3	0.87	306.4	7.84															
BH21-1	0.79	307.232	5.2															
MW2	0.72	310.856	5.14															
MW3	0.87	303.707	5.13															
MW4	0.70	305.154	14.46															

Notes:

m- meters

mBGS- metres below ground;

mBTOC- meters below top of casing

WL – water level;

WL Elev – water level elevation.

*Datalogger installed

decom- well has been decommissioned

Well ID	Stick up (m)	Ground Surface Elevation (m ASL)	Total Well Depth (mBGS)	16-Feb-18			20-Feb-18			27-Mar-18			02-May-18			23-Aug-18		
				WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)	WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)	WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)	WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)	WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)
BH 16-1	1.20	306.37	4.57	2.4	1.198	305.172	-	-	-	2.45	1.248	305.122	1.96	0.758	305.612	3.65	2.448	303.922
BH 16-2	0.99	307.5	4.57	2.9	1.914	305.586	-	-	-	1.92	0.934	306.566	1.35	0.364	307.136	1.7	0.714	306.786
BH 16-3	0.65	309	4.57	1.58	0.934	308.066	-	-	-	1.63	0.984	308.016	1.49	0.844	308.156	2.13	1.484	307.516
BH 16-4S*	1.03	309.5	3.96	2.58	1.553	307.947	2.51	1.483	308.017	2.44	1.413	308.087	2.26	1.233	308.267	2.79	1.763	307.737
BH 16-4D*	0.91	309.5	7.62	2.73	1.822	307.678	2.5	1.592	307.908	2.63	1.722	307.778	2.33	1.422	308.078	2.96	2.052	307.448
BH 16-5	1.11	307.5	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-6	0.94	307.7	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-7	0.94	305	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-8	1.12	305.7	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-9	0.98	303.5	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-10	1.07	305.6	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH16-11s	1.06	305.4	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH16-11d	0.97	305.4	7.62	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-12	1.06	305.3	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-13	1.02	304.8	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-14	0.80	304.2	7.62	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 11-6	0.80	306.101	5.93	-	-	-	2.59	1.79	304.311	3.25	3.25	302.851	2.69	1.89	304.211	2.97	2.17	303.931
SG	0.87	306.227	0	0.82	-0.05	306.277	-	-	-	0.83	-0.04	306.267	0.5	-0.37	306.597	0.02	-0.85	307.077
MW11-1	0.69	310.9	6.62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW11-2	0.82	311.809	6.9															
MW20-1	0.93	308.836	7															
MW20-2	0.83	308.059	7															
MW20-3	0.93	307.509	8.42															
MW11-5	0.81	308.688	6.94															
MW11-7	0.87	304.049	4.34															
MW11-3	0.87	306.4	7.84															
BH21-1	0.79	307.232	5.2															
MW2	0.72	310.856	5.14															
MW3	0.87	303.707	5.13															
MW4	0.70	305.154	14.46															

Notes:

m- meters

mBGS- metres below ground;

mBTOC- meters below top of casing

WL – water level;

WL Elev – water level elevation.

*Datalogger installed

decom- well has been decommissioned

Well ID	Stick up (m)	Ground Surface Elevation (m ASL)	Total Well Depth (mBGS)	17-May-19			14-Nov-19			18-Mar-20			24-Jun-20			06-Oct-20		
				WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)	WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)	WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)	WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)	WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)
BH 16-1	1.20	306.37	4.57	1.82	0.618	305.752	3.23	2.028	304.342	1.88	0.678	305.692	3.06	1.858	304.512	3.36	2.158	304.212
BH 16-2	0.99	307.5	4.57	1.12	0.134	307.366	1.78	0.794	306.706	1.31	0.324	307.176	1.33	0.344	307.156	Well Destroyed	Well Destroyed	Well Destroyed
BH 16-3	0.65	309	4.57	1.68	1.034	307.966	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-4S*	1.03	309.5	3.96	2.18	1.153	308.347	2.84	1.813	307.687	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed
BH 16-4D*	0.91	309.5	7.62	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed
BH 16-5	1.11	307.5	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-6	0.94	307.7	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-7	0.94	305	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-8	1.12	305.7	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-9	0.98	303.5	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-10	1.07	305.6	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH16-11s	1.06	305.4	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH16-11d	0.97	305.4	7.62	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-12	1.06	305.3	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-13	1.02	304.8	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-14	0.80	304.2	7.62	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 11-6	0.80	306.101	5.93	2.69	1.89	304.211	3.12	2.32	303.781	2.73	1.93	304.171	2.87	2.07	304.031	2.9	2.1	304.001
SG	0.87	306.227	0	0.04	-0.83	307.057	DRY	DRY	<304.95	DRY	DRY	<304.95	DRY	DRY	<304.95	DRY	DRY	<304.95
MW11-1	0.69	310.9	6.62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW11-2	0.82	311.809	6.9										3.6	2.78	309.029	3.79	2.97	308.839
MW20-1	0.93	308.836	7													3.8	2.87	305.966
MW20-2	0.83	308.059	7													6.31	5.48	302.579
MW20-3	0.93	307.509	8.42													DRY	DRY	<298.7
MW11-5	0.81	308.688	6.94													DRY	DRY	<301.46
MW11-7	0.87	304.049	4.34													DRY	DRY	<300.86
MW11-3	0.87	306.4	7.84															
BH21-1	0.79	307.232	5.2															
MW2	0.72	310.856	5.14															
MW3	0.87	303.707	5.13															
MW4	0.70	305.154	14.46															

Notes:

m- meters

mBGS- metres below ground;

mBTOC- meters below top of casing

WL – water level;

WL Elev – water level elevation.

*Datalogger installed

decom- well has been decommissioned

Well ID	Stick up (m)	Ground Surface Elevation (m ASL)	Total Well Depth (mBGS)	16-Oct-20			26-Nov-20			14-Dec-20			14-Apr-21			21-Jul-21		
				WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)	WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)	WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)	WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)	WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)
BH 16-1	1.20	306.37	4.57	3.83	2.628	303.742	3.78	2.578	303.792	3.56	2.358	304.012	1.8	0.598	305.772	3.34	2.14	304.23
BH 16-2	0.99	307.5	4.57	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed
BH 16-3	0.65	309	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-4S*	1.03	309.5	3.96	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed
BH 16-4D*	0.91	309.5	7.62	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed
BH 16-5	1.11	307.5	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-6	0.94	307.7	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-7	0.94	305	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-8	1.12	305.7	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-9	0.98	303.5	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-10	1.07	305.6	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH16-11s	1.06	305.4	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH16-11d	0.97	305.4	7.62	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-12	1.06	305.3	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-13	1.02	304.8	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-14	0.80	304.2	7.62	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 11-6	0.80	306.101	5.93	2.97	2.17	303.931	2.92	2.12	303.981	2.9	2.1	304.001	2.69	1.89	304.211	2.96	2.16	302.74
SG	0.87	306.227	0	DRY	DRY	<304.95	0.8	-0.07	306.297	0.81	-0.06	306.287	0.81	-0.06	306.287	0.81	-0.06	305.01
MW11-1	0.69	310.9	6.62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW11-2	0.82	311.809	6.9	4.21	3.39	308.419	4.3	3.48	308.329	4.44	3.62	308.189	3.79	2.97	308.839	4.12	3.30	307.50
MW20-1	0.93	308.836	7	3.77	2.84	305.996	3.65	2.72	306.116	3.51	2.58	306.256	3.3	2.37	306.466	3.67	2.74	306.10
MW20-2	0.83	308.059	7	5.66	4.83	303.229	5.85	5.02	303.039	5.37	4.54	303.519	4.1	3.27	304.789	4.895	4.07	302.43
MW20-3	0.93	307.509	8.42	DRY	DRY	<298.7	DRY	DRY	<298.7	DRY	DRY	<298.7	DRY	DRY	<298.7	8.06	7.13	299.99
MW11-5	0.81	308.688	6.94	DRY	DRY	<301.46	DRY	DRY	<301.46	DRY	DRY	<301.46	DRY	DRY	<301.46	DRY	DRY	<301.46
MW11-7	0.87	304.049	4.34	DRY	DRY	<300.86	DRY	DRY	<300.86	DRY	DRY	<300.86	2.98	2.11	301.939	DRY	DRY	<300.86
MW11-3	0.87	306.4	7.84				DRY	DRY	<298.56	DRY	DRY	<298.56	DRY	DRY	<298.56	DRY	DRY	<298.56
BH21-1	0.79	307.232	5.2													3.08	2.29	304.94
MW2	0.72	310.856	5.14													-	-	-
MW3	0.87	303.707	5.13													-	-	-
MW4	0.70	305.154	14.46													-	-	-

Notes:

m- meters

mBGS- metres below ground;

mBTOC- meters below top of casing

WL – water level;

WL Elev – water level elevation.

*Datalogger installed

decom- well has been decommissioned

Well ID	Stick up (m)	Ground Surface Elevation (m ASL)	Total Well Depth (mBGS)	31-Aug-21			23-Sep-21			05-Oct-21			28-Oct-21			12-Nov-21		
				WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)	WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)	WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)	WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)	WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)
BH 16-1	1.20	306.37	4.57	3.82	2.62	303.75	-	-	-	3.11	1.91	304.46	2.85	1.65	304.72	2.85	-0.82	3.29
BH 16-2	0.99	307.5	4.57	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed
BH 16-3	0.65	309	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-4S*	1.03	309.5	3.96	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed
BH 16-4D*	0.91	309.5	7.62	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed	Well Destroyed
BH 16-5	1.11	307.5	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-6	0.94	307.7	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-7	0.94	305	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-8	1.12	305.7	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-9	0.98	303.5	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-10	1.07	305.6	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH16-11s	1.06	305.4	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH16-11d	0.97	305.4	7.62	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-12	1.06	305.3	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-13	1.02	304.8	4.57	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 16-14	0.80	304.2	7.62	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom	decom
BH 11-6	0.80	306.101	5.93	2.93	2.13	303.97	-	-	-	2.82	2.02	304.08	2.83	2.03	304.07	-	-	-
SG	0.87	306.227	0	0.82	-0.05	306.28	-	-	-	0.815	-0.06	306.28	0.81	-0.06	306.29	-	-	-
MW11-1	0.69	310.9	6.62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW11-2	0.82	311.809	6.9	-	-	-	-	-	-	4.09	3.27	308.54	3.96	3.14	308.67	-	-	-
MW20-1	0.93	308.836	7	3.52	2.69	306.15	-	-	-	3.495	2.57	306.27	3.45	2.52	306.32	-	-	-
MW20-2	0.83	308.059	7	5.23	4.40	303.66	-	-	-	4.81	3.98	304.08	4.57	3.74	304.32	-	-	-
MW20-3	0.93	307.509	8.42	8.33	7.40	300.11	-	-	-	8.11	7.18	300.33	8.32	7.39	300.12	-	-	-
MW11-5	0.81	308.688	6.94	DRY	DRY	<301.46	-	-	-	DRY	DRY	<301.46	DRY	DRY	<301.46	-	-	-
MW11-7	0.87	304.049	4.34	DRY	DRY	<300.86	-	-	-	DRY	DRY	<300.86	DRY	DRY	<300.86	-	-	-
MW11-3	0.87	306.4	7.84	DRY	DRY	<298.56	-	-	-	DRY	DRY	<298.56	DRY	DRY	<298.56	-	-	-
BH21-1	0.79	307.232	5.2	3.75	2.96	304.27	-	-	-	2.84	2.05	305.18	2.56	1.77	305.46	-	-	-
MW2	0.72	310.856	5.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3	0.87	303.707	5.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW4	0.70	305.154	14.46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

m- meters

mBGS- metres below ground;

mBTOC- meters below top of casing

WL – water level;

WL Elev – water level elevation.

*Datalogger installed

decom- well has been decommissioned

Well ID	Stick up (m)	Ground Surface Elevation (m ASL)	Total Well Depth (mBGS)	09-Dec-21		
				WL (mBTOC)	WL (mBGS)	WL Elev (m ASL)
BH 16-1	1.20	306.37	4.57	2.425	1.22	305.15
BH 16-2	0.99	307.5	4.57	Well Destroyed	Well Destroyed	Well Destroyed
BH 16-3	0.65	309	4.57	decom	decom	decom
BH 16-4S*	1.03	309.5	3.96	Well Destroyed	Well Destroyed	Well Destroyed
BH 16-4D*	0.91	309.5	7.62	Well Destroyed	Well Destroyed	Well Destroyed
BH 16-5	1.11	307.5	4.57	decom	decom	decom
BH 16-6	0.94	307.7	4.57	decom	decom	decom
BH 16-7	0.94	305	4.57	decom	decom	decom
BH 16-8	1.12	305.7	4.57	decom	decom	decom
BH 16-9	0.98	303.5	4.57	decom	decom	decom
BH 16-10	1.07	305.6	4.57	decom	decom	decom
BH16-11s	1.06	305.4	4.57	decom	decom	decom
BH16-11d	0.97	305.4	7.62	decom	decom	decom
BH 16-12	1.06	305.3	4.57	decom	decom	decom
BH 16-13	1.02	304.8	4.57	decom	decom	decom
BH 16-14	0.80	304.2	7.62	decom	decom	decom
BH 11-6	0.80	306.101	5.93	2.83	2.03	304.07
SG	0.87	306.227	0	0.8	-0.07	306.30
MW11-1	0.69	310.9	6.62	2.0	1.31	309.59
MW11-2	0.82	311.809	6.9	3.88	3.06	308.75
MW20-1	0.93	308.836	7	3.45	2.52	306.32
MW20-2	0.83	308.059	7	4.4	3.57	304.49
MW20-3	0.93	307.509	8.42	8.34	7.41	300.10
MW11-5	0.81	308.688	6.94	DRY	DRY	<301.46
MW11-7	0.87	304.049	4.34	3.66	2.79	301.259
MW11-3	0.87	306.4	7.84	DRY	DRY	<298.56
BH21-1	0.79	307.232	5.2	2.33	1.54	305.69
MW2	0.72	310.856	5.14	2.0	1.28	309.58
MW3	0.87	303.707	5.13	4.15	3.28	300.43
MW4	0.70	305.154	14.46	8.3	7.64	297.51

Notes:

m- meters

mBGS- metres below ground;

mBTOC- meters below top of casing

WL – water level;

WL Elev – water level elevation.

*Datalogger installed

decom- well has been decommissioned

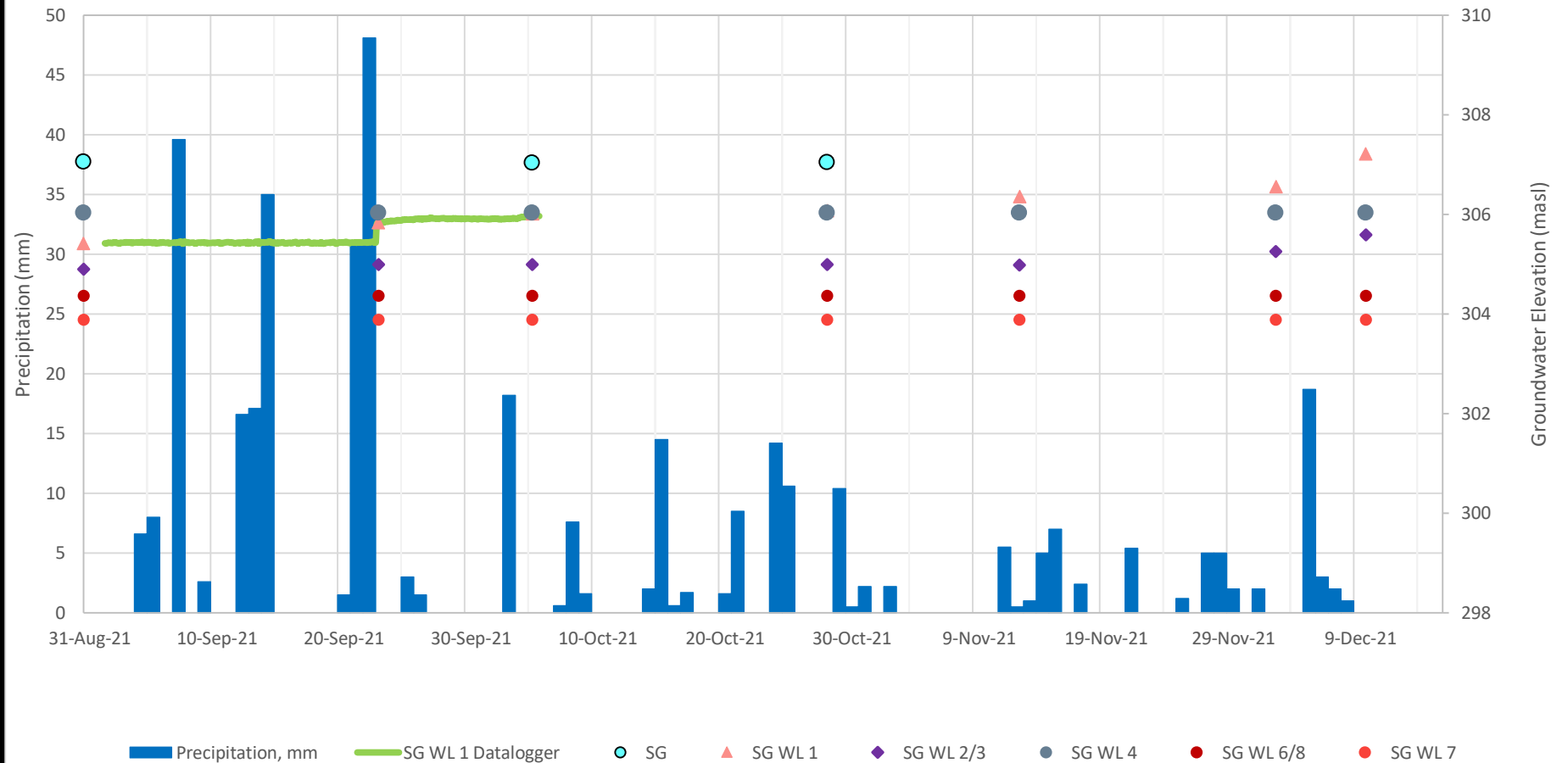
APPENDIX

C WETLAND DATA



Water Level Hydrograph

Staff Gauge Water Levels - All



Note: Precipitation data obtained from the Kitchener-Waterloo Climate Station, Ontario



Water Level Monitoring
 Hydrogeological Study - Riverland Area 2
 Empire Communities Riverland Ltd.
 November 2021

Well ID	Stick up (m)	Ground Surface Elevation (m ASL)	Total Well Depth (mBGS)	31-Aug-21			23-Sep-21			05-Oct-21			28-Oct-21			12-Nov-21			02-Dec-21			09-Dec-21		
				Gauge Reading (in)	WL (m ags)	WL Elev (m ASL)	Gauge Reading (in)	WL (m ags)	WL Elev (m ASL)	Gauge Reading (in)	WL (m ags)	WL Elev (m ASL)	Gauge Reading (in)	WL (m ags)	WL Elev (m ASL)	Gauge Reading (in)	WL (m ags)	WL Elev (m ASL)	Gauge Reading (in)	WL (m ags)	WL Elev (m ASL)	Gauge Reading (in)	WL (m ags)	WL Elev (m ASL)
SG WL1 (New)	1.21	305.41	0	*DRY	DRY	DRY	16.5	0.419	305.83	21.5	0.6	306.01	26.0	0.660	306.07	37.0	0.940	306.35	45.0	1.143	306.55	>70.87**	>1.8	>307.21
SG WL 2/3(New)	1.21	304.89	0	DRY	DRY	DRY	4.0	0.102	304.99	DRY	DRY	DRY	DRY	DRY	DRY	3.5	0.089	304.98	14.0	0.356	305.25	27.5	0.699	305.59
SG WL 4 (New)	1.21	306.028	0	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
SG WL 6/8 (New)	1.21	304.363	0	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
SG WL 7 (New)	1.21	303.881	0	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY

Notes:

m- meters;

in - inches;

m ags- metres above ground surface;

m ASL - metres above sea level;

WL – water level;

WL Elev – water level elevation.

*Datalogger installed

**Waterlevel above top of gauge