22-189-402 **April 21, 2025**

Integricon Property Restoration and Construction Group Inc. (IPCG)
219 Westcreek Drive
Vaughan, ON
L4L 9T7

RE: Surface Water and Groundwater Level Monitoring, Wetland Risk Evaluation and Feature Based Water Balance Study – 11476 Highway 26, Collingwood, ON

In December 2014, SPL Consultants Ltd. advanced eleven (11) boreholes and installed four (4) monitoring wells at the Site. In July 2022, DS installed an additional two (2) monitoring wells at the Site. It is understood that additional hydrogeological assessments are required to address comments from the Town and the Conservation Authority in support of future Site Plan Approvals.

1.0 Groundwater and Surface Water Conditions

A coastal wetland feature was identified on the northern portion of the Site. In May 2024, a site reconnaissance of the site was conducted to assess the wetland feature. To assess recharge/discharge conditions within the coastal wetland, two (2) surface water stations were installed at the inlet and outlet locations of the wetland. The locations of the surface water stations are presented in **Figure 1.** Each surface water station was equipped with a staff gauge (SG1 & SG2) to monitor surface water levels, and a shallow and deep piezometer (PZ1S/D & PZ2S/D) to assess the vertical gradient at the wetland. Automated data loggers were installed at each staff gauge and deep piezometer locations set to record water levels on a continuous daily basis. In addition, automated data loggers were installed at two (2) select monitoring well locations (BH14-1 & BH14-7). Groundwater and surface water levels were monitored between May 2024 and April 2025 monthly to obtain manual water level readings and download data loggers.

Based on continuous and manual groundwater level data collected to date, groundwater levels remained below the ground surface throughout the monitoring period, ranging from approximately 0.4 to 1.4 meters below ground surface (mbgs), corresponding to elevations between 177.0 and 178.9 meters above sea level (masl). Seasonal trends in groundwater levels were observed, with highest levels occurring during the spring (May–June). This was followed by a gradual decline through the fall, and a subsequent increase during the winter months, leading into seasonal highs in the following spring. Groundwater levels also exhibited positive responses to major precipitation events, reflecting a dynamic interaction between climatic inputs and subsurface hydrology. Groundwater levels are presented in **Table 1** in **Appendix A**, and groundwater level hydrographs are presented in **Appendix B.** Borehole logs are presented in **Appendix C.**

Based on the review of the monitoring data to date for the Wetland the following groundwater and surface water conditions are noted. SG1 & SG2 water levels generally remained slightly above the base of the wetland, 180.1 and 179.7 masl, respectively. At Station 1 (inlet), water levels generally remained at or near the ground surface throughout the monitoring period. Increased surface water levels were observed during the summer months (June to August 2024), with additional brief increases occurring in December 2024, January 2025, and from March to April 2025. These elevated levels appear to correlate with periods of increased precipitation and potential spring snowmelt. Groundwater levels in the piezometers located near SG1 remained consistently below the surface water levels throughout the monitoring period. The shallow piezometer typically recorded groundwater levels slightly higher than those in the deep piezometer, indicating a downward vertical hydraulic gradient consistent with recharge conditions, where water is infiltrating into the groundwater system. Furthermore, groundwater levels in both piezometers consistently remained below the base of the wetland, suggesting that groundwater is not discharging into the surface water feature at this location. This supports the interpretation that the feature is primarily surface water-fed, with limited or no groundwater contribution at this station.

At Station 2 (outlet), water levels generally remained above the ground surface throughout the monitoring period. Elevated water levels were observed from spring (May 2024) through summer (August 2024), with a gradual decline occurring into the fall (September 2024). This decline continued through to the winter months (December 2024), during which water levels reached their lowest points, often corresponding with dry periods. Following this decline, a gradual increase in water levels was observed and sustained throughout the remainder of the monitoring period (January to April 2025). Notably, incremental increases in surface water levels were recorded in response to major precipitation events, indicating a strong correlation between rainfall and short-term fluctuations in water levels. This trend suggests a seasonal pattern influenced by climatic conditions, with higher water levels during wetter spring and summer months and lower levels during the drier fall and early winter, followed by a slow recovery influenced by precipitation inputs.

Groundwater levels in the piezometers near SG2 were generally observed to be below surface water levels throughout the monitoring period. It is noted that the station was inaccessible during the September 2024, December 2024, and January 2025 monitoring events, and therefore no manual data is available for those periods. The shallow piezometer (PZ2S) typically recorded higher groundwater levels than the deep piezometer (PZ2D), indicating a downward vertical hydraulic gradient and suggesting recharge conditions at this location. Occasionally, groundwater levels rose above the bottom of the wetland base during the spring months (May–June 2024 and March–April 2025), indicating potential groundwater contributions to the wetland during these periods. Despite these seasonal increases, groundwater levels remained below surface water levels for much of the monitoring period, suggesting that surface water is the dominant water source at this location.

Based on the observed data, there is a general increase in water levels from the upstream station (Station 1) to the downstream station (Station 2), suggesting a net accumulation of water through the wetland system.

The data indicate that both groundwater recharge processes are generally occurring within the wetland, with some groundwater discharge evident at the outlet (Station 2) during the spring months. Additionally, vegetation uptake is expected to play a significant role in reducing groundwater contributions, particularly during the spring and summer growing seasons, when evapotranspiration rates are elevated. This mechanism likely contributes to the observed seasonal decline in water levels following spring peaks.

A summary of the water levels in each of the surface water monitoring station is provided in **Table 2** in **Appendix A**. The hydrographs are provided in **Appendix B.**

2.0 Surface Water Quality

In May 2024, two (2) surface water quality samples were obtained from the wetland near each of the surface water monitoring stations (SG1 & SG2) and analyzed for general chemistry parameters and metals and inorganics to establish pre-construction baseline conditions. Results were compared to Provincial Water Quality Objectives (PWQO). Results indicate that phosphorus and iron exceeded at both locations. Groundwater quality results reported in the Preliminary Hydrogeological Investigation completed by DS dated February 13, 2023, indicate that groundwater exceeded multiple parameters against PWQO. Therefore, groundwater will be required to be treated to meet or exceed surface water quality to discharge groundwater overland during dewatering activities. The laboratory certificate of analysis is presented in **Appendix D.**

3.0 Wetland Risk Evaluation & Feature Water Balance Study

A Wetland Risk Evaluation was conducted by GeoBase Solutions (GBS) Ltd. in March 2025 for the coastal wetland located on the Site. The evaluation was carried out in accordance with the *Wetland Water Balance Risk Evaluation* guidelines developed by the Toronto and Region Conservation Authority (TRCA, November 2014).

The findings of the assessment determined that the wetland catchment was categorized as *low risk* in relation to the proposed development area. No risks were identified in terms of potential changes to the size of the wetland's catchment. Comprehensive details of the Wetland Risk Assessment can be found in **Appendix E**.

Additionally, GBS Ltd. completed a *Feature-Based Water Balance* for the wetland (March 2025). The assessment incorporated a Low Impact Development (LID) strategy, which included the implementation of a rain garden. With this strategy in place, the total annual site infiltration was estimated to increase by approximately 982 m^3/year, along with an associated runoff deficit increase of 631 m^3/year. Based on these results, potential risks to the wetland remain low. Further information and calculations related to this assessment are also provided in **Appendix E**.

Should you have any questions regarding these findings, please contact the undersigned.

Sincerely,
DS Consultants Limited

Prepared By:

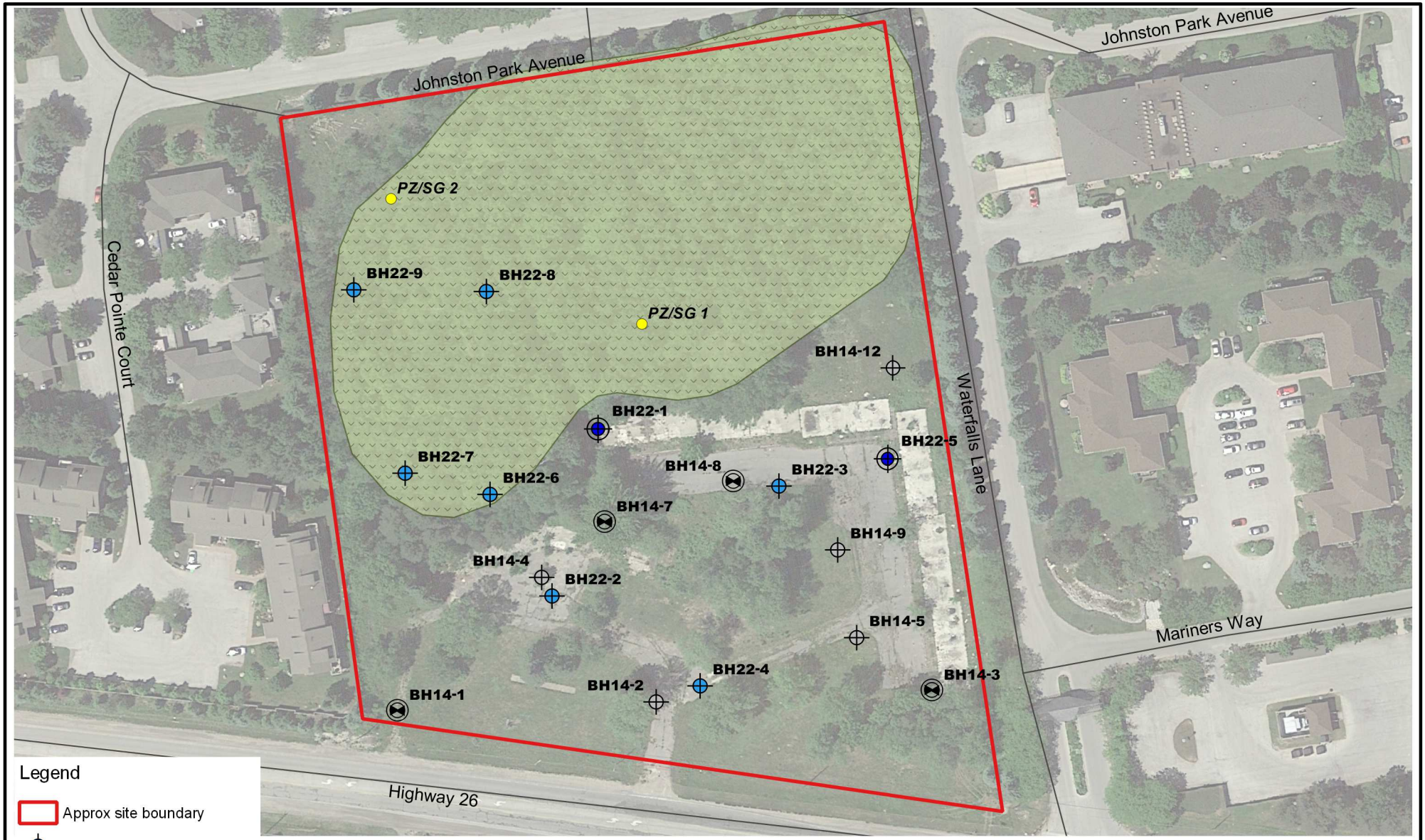
Dorothy Santos, M.Sc.
Project Manager

Reviewed By:

Martin Gedeon, M.Sc., P.Geo.
Vice President

Enclosures:
Figure 1- Borehole/Monitoring Well and Surface Water Station Locations
Appendix A- Groundwater and Surface Water Tables (Table 1 & Table 2)
Appendix B- Groundwater and Surface Water Level Hydrographs
Appendix C- Borehole Logs
Appendix D- Laboratory Certificate of Analysis
Appendix E- Wetland Risk Evaluation and Feature Based Water Balance Study (GBS Ltd., 2025)

Figures



Legend

- Approx site boundary
- Borehole-DS
- Monitoring Well-DS
- Borehole-SPL
- Monitoring Well-SPL
- Wetland
- Surface Water Station (Staff Gauge & Piezometers)

DS CONSULTANTS LTD.
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Project: HYDROGEOLOGICAL INVESTIGATION
11476 Highway 26, Collingwood, Ontario

Title: **BOREHOLE/MONITORING WELL & SURFACE WATER STATION LOCATION PLAN**

N

Client: Integricon Property Restoration And Construction Group

Size:	Approved By:	Drawn By:	Date:
8.5 x 11	P.P	L.G/S.Y	October 2024
Rev: 0	Scale: As Shown	Project No.: 22-189-400	Figure No.: 1

Image/Map Source: *Google Satellite Image*

Appendix A

Table 1: Groundwater Monitoring Data

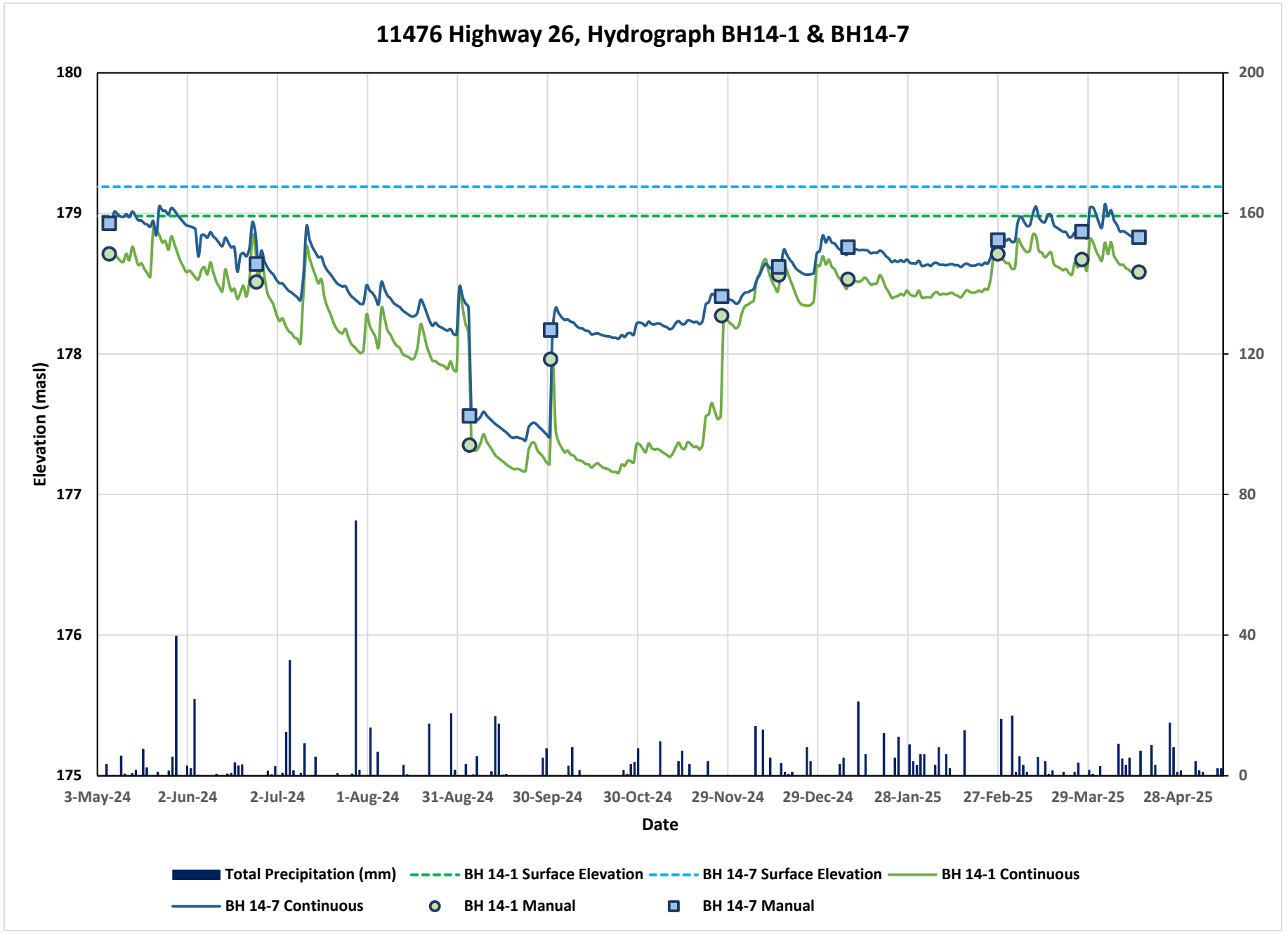
Location: 11476 Hwy 26, Collingwood

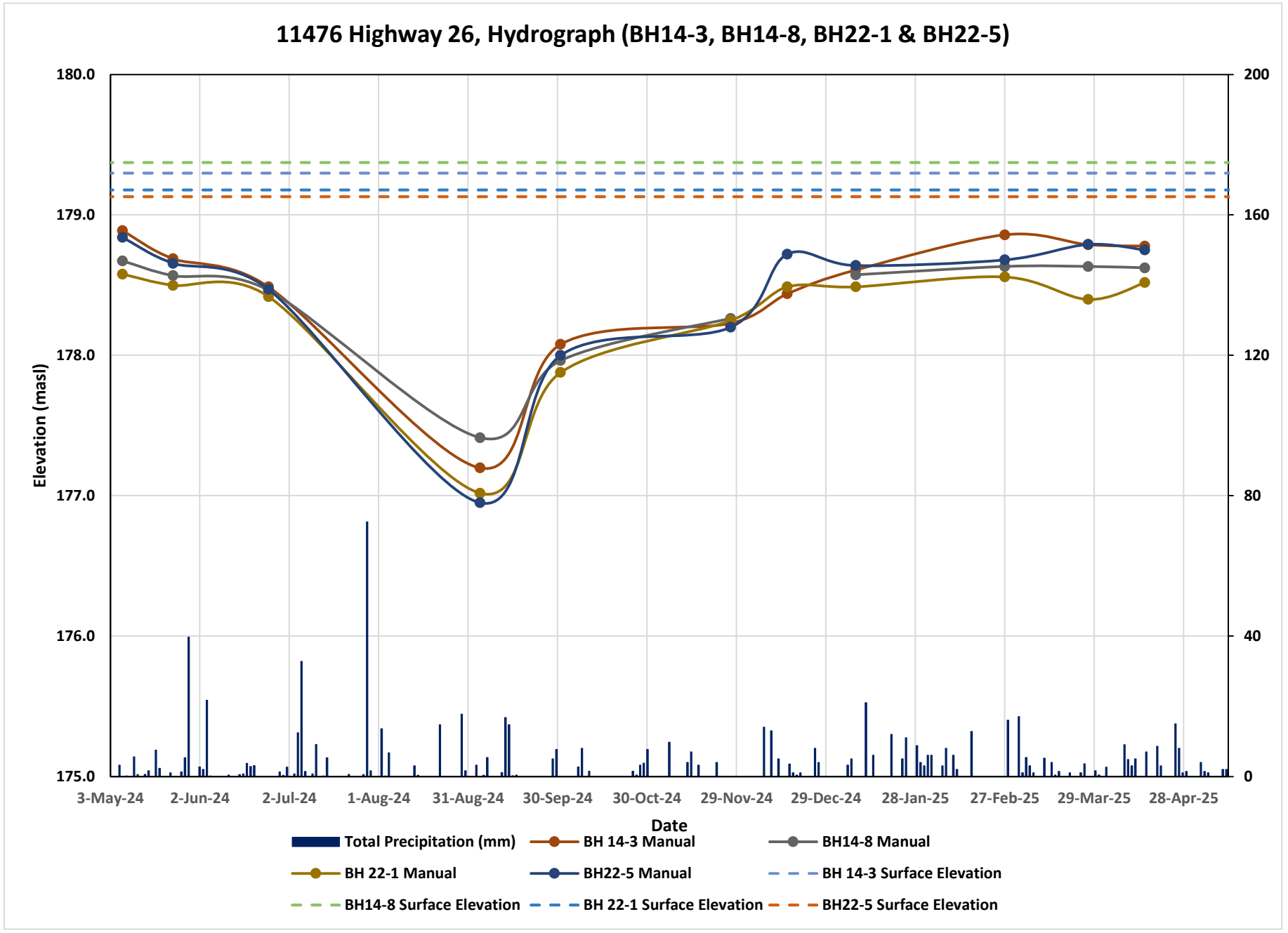
Date					May 7, 2024			June 25, 2024			September 4, 2024			October 1, 2024			November 27, 2024			December 16, 2024			January 8, 2025			February 27, 2025			March 27, 2025			April 15, 2025		
Well ID	Surface Elevation	S.Up	Well Depth (m)	Well Depth (m)	Water level	Water level	Water Level Elev.	Water level	Water level	Water Level Elev.	Water level	Water level	Water Level Elev.	Water level	Water level	Water Level Elev.	Water level	Water level	Water Level Elev.	Water level	Water level	Water Level Elev.	Water level	Water level	Water Level Elev.	Water level	Water level	Water Level Elev.	Water level	Water level	Water Level Elev.	Water level	Water level	Water Level Elev.
			T.O.P	(mbgs)	T.O.P	(mbgs)	(masl)	T.O.P	(mbgs)	(masl)	T.O.P	(mbgs)	(masl)	T.O.P	(mbgs)	(masl)	T.O.P	(mbgs)	(masl)	T.O.P	(mbgs)	(masl)	T.O.P	(mbgs)	(masl)	T.O.P	(mbgs)	(masl)	T.O.P	(mbgs)	(masl)	T.O.P	(mbgs)	(masl)
BH 14-1	178.98	0.75	2.12	1.4	1.02	0.27	178.71	1.22	0.5	178.5	1.63	0.88	177.351	1.77	1.02	177.961	1.46	0.71	178.271	1.17	0.42	178.561	1.2	0.45	178.531	1.02	0.27	178.711	1.06	0.31	178.671	1.15	0.40	178.581
BH 14-3	179.30	0.99	2.40	1.4	1.40	0.41	178.89	1.80	0.8	178.5	2.1	1.11	177.198	2.21	1.22	178.078	2.06	1.07	178.228	1.85	0.86	178.438	1.68	0.69	178.608	1.43	0.44	178.858	1.5	0.51	178.788	1.51	0.52	178.778
BH 14-7	179.19	0.77	6.20	5.4	1.03	0.26	178.93	1.32	0.6	178.6	1.63	0.86	177.559	1.79	1.02	178.169	1.55	0.78	178.409	1.34	0.57	178.619	1.2	0.43	178.759	1.151	0.38	178.808	1.09	0.32	178.869	1.13	0.36	178.829
BH14-8	179.37	0.73	2.56	1.8	1.43	0.70	178.67	1.64	0.9	178.5	1.96	1.23	177.413	2.14	1.41	177.963	1.84	1.11	178.263				1.53	0.80	178.573	1.47	0.74	178.633	1.47	0.74	178.633	1.48	0.75	178.623
BH 22-1	179.18	1.08	2.46	1.4	1.68	0.60	178.58	1.84	0.8	178.4	2.16	1.08	177.018	2.38	1.30	177.878	2.01	0.93	178.248	1.77	0.69	178.488	1.77	0.69	178.488	1.7	0.62	178.558	1.86	0.78	178.398	1.74	0.66	178.518
BH22-5	179.13	1.21	2.89	1.7	1.50	0.29	178.84	1.87	0.7	178.5	2.18	0.97	176.950	2.34	1.13	178.000	2.14	0.93	178.200	1.62	0.41	178.720	1.7	0.49	178.640	1.66	0.45	178.680	1.55	0.34	178.790	1.59	0.38	178.750
BH 1	179.20	0.79	2.29	1.5	1.20	0.41	178.79	1.51	0.7	178.5	1.83	1.04	177.366	2.01	1.22	177.976	1.8	1.01	178.186	1.57	0.78	178.416	1.27	0.48	178.716	1.37	0.58	178.616	1.24	0.45	178.746	1.27	0.48	178.716
BH 2	179.27	0.83	2.28	1.5	1.25	0.42	178.85	1.61	0.8	178.5	1.92	1.09	177.349	2.1	1.27	177.999	1.93	1.10	178.169	1.69	0.86	178.409	1.47	0.64	178.629	1.47	0.64	178.629	1.32	0.49	178.779	1.35	0.52	178.749
BH 3	179.14	0.68	2.14	1.5	1.05	0.37	178.77	1.42	0.7	178.4	1.74	1.06	177.401	1.92	1.24	177.901	1.7	1.02	178.121	1.46	0.78	178.361	1.2	0.52	178.621	1.23	0.55	178.591	1.11	0.43	178.711	1.15	0.47	178.671
BH 4	179.06	0.73	2.16	1.4	1	0.27	178.79	1.36	0.6	178.4	1.67	0.94	177.389	1.85	1.12	177.939	1.61	0.88	178.179	1.36	0.63	178.429	1.38	0.65	178.409	1.13	0.40	178.659	1.06	0.33	178.729	1.11	0.38	178.679
BH 5	179.11	0.75	6.04	5.3	1.17	0.42	178.69	1.48	0.7	178.4	1.8	1.05	177.310	1.93	1.18	177.930	1.75	1.00	178.110	1.56	0.81	178.300	1.41	0.66	178.450	1.34	0.59	178.520	1.24	0.49	178.620	1.25	0.50	178.610

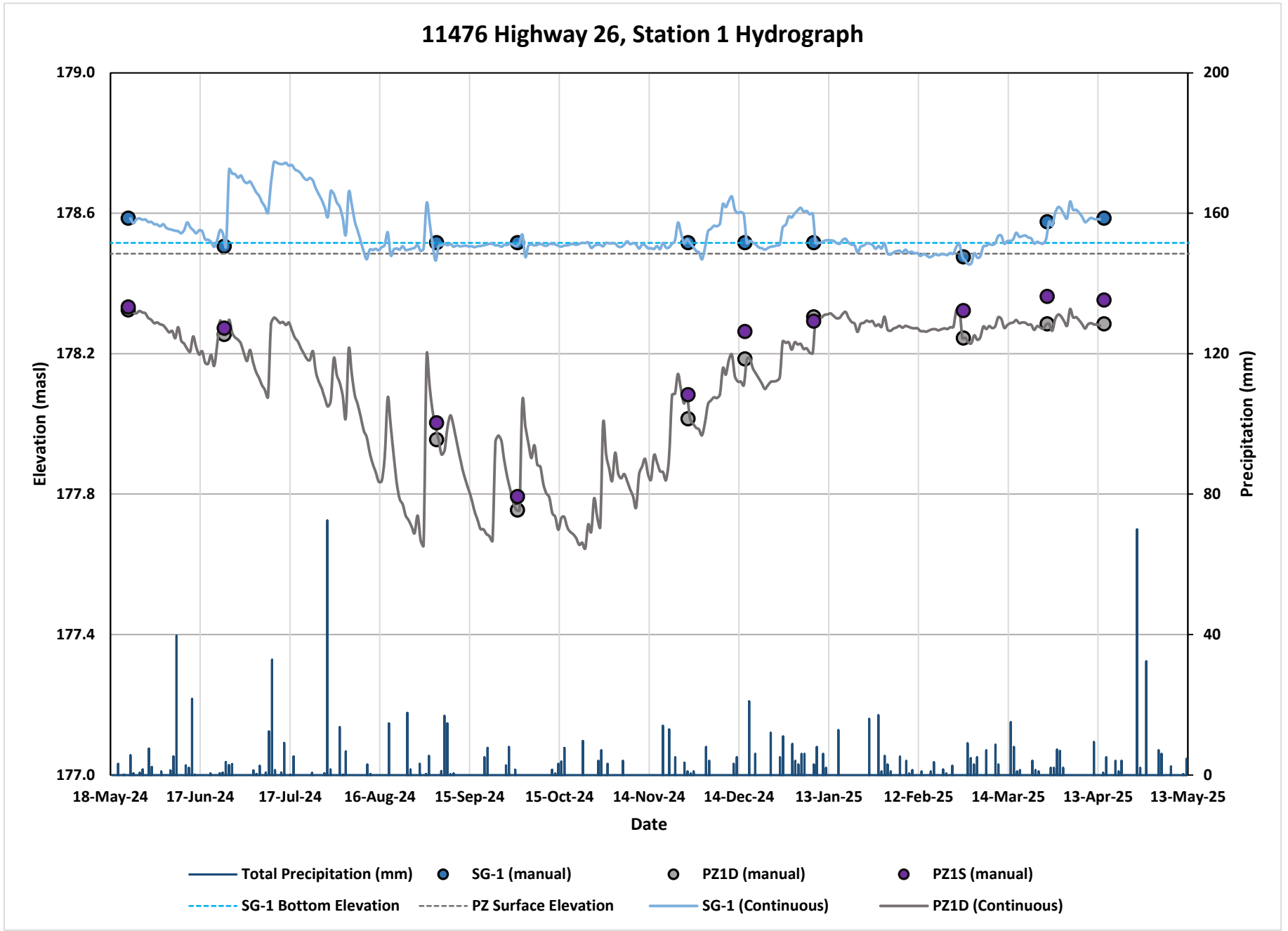
Table 2: Surface Water Level Monitoring
Location: 11476 Highway 26, Collingwood

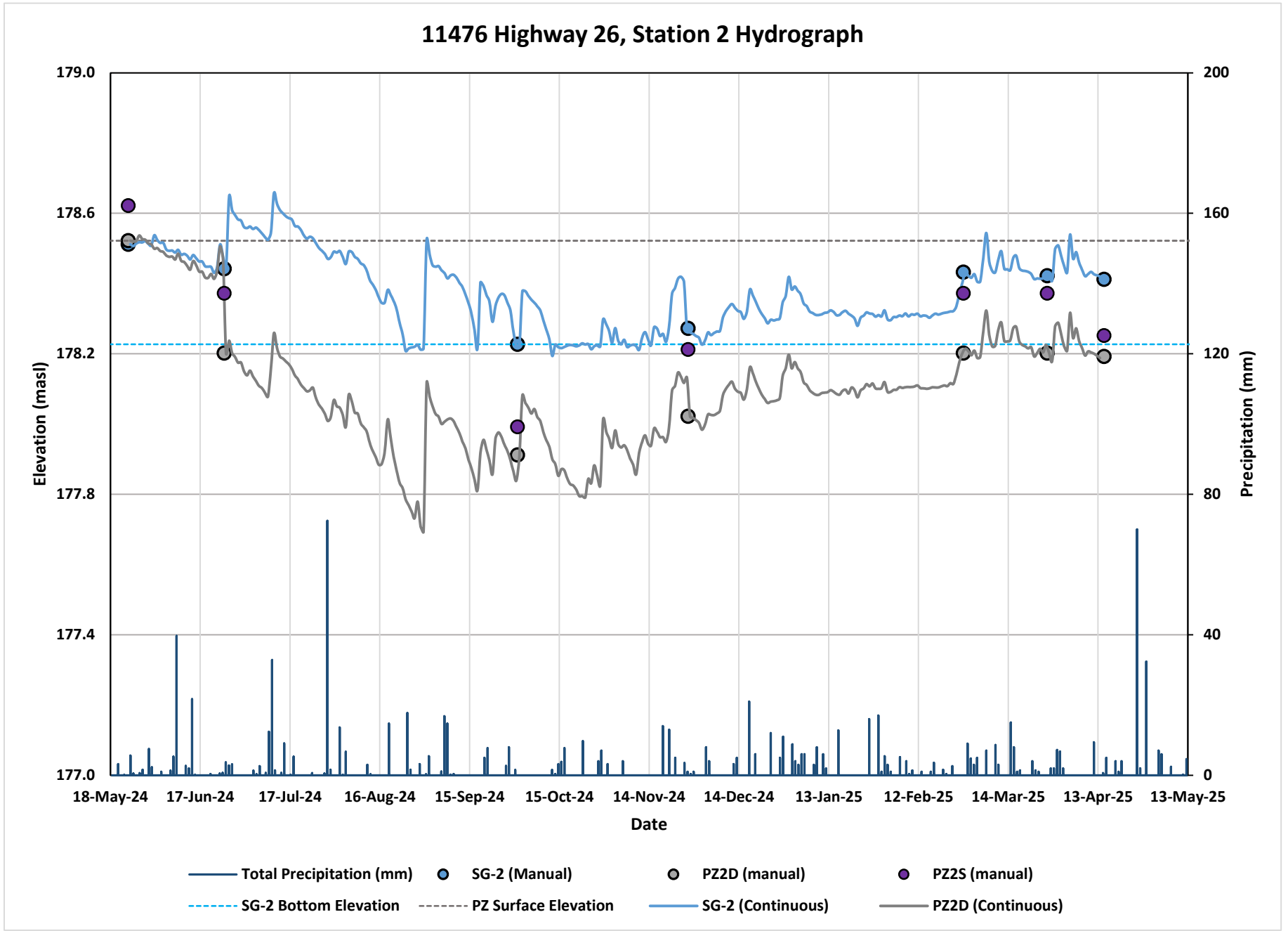
SG					24-May-24		25-Jun-24		04-Sep-24		01-Oct-24		27-Nov-24		16-Dec-24		08-Jan-25		27-Feb-25		27-Mar-25		14-Apr-25	
SG ID	TOP Elevation (masl)	Depth (top of Casing) Inside	Stick-up (m)	Surface Elev. (masl)	Depth to Water (TOP)	Depth to Water (masl)	Depth to Water (TOP)	Depth to Water (masl)	Depth to Water (TOP)	Depth to Water (masl)	Depth to Water (TOP)	Depth to Water (masl)	Depth to Water (TOP)	Depth to Water (masl)	Depth to Water (TOP)	Depth to Water (masl)	Depth to Water (TOP)	Depth to Water (masl)	Depth to Water (TOP)	Depth to Water (masl)	Depth to Water (TOP)	Depth to Water (masl)	Depth to Water (TOP)	Depth to Water (masl)
SG-1	180.07			178.52	1.48	178.59	1.56	178.51	Dry	178.52	Dry	178.52	Dry	178.52	Dry	178.52	Dry	178.52	1.59	178.48	1.49	178.58	1.48	178.59
SG-2	179.65			178.23	1.14	178.51	1.21	178.44	inaccessible		Dry	178.23	1.38	178.27	inaccessible		inaccessible		1.22	178.43	1.23	178.42	1.24	178.41
PZ1D		1.82	1.05	178.49	1.21	178.33	1.28	178.26	1.58	177.96	1.78	177.76	1.52	178.02	1.35	178.19	1.23	178.31	1.29	178.25	1.25	178.29	1.25	178.29
PZ1S		1.76	0.77	178.48	0.92	178.33	0.98	178.27	1.25	178.00	1.46	177.79	1.17	178.08	0.99	178.26	0.96	178.29	0.93	178.32	0.89	178.36	0.90	178.35
PZ2D		3.36	1.38	178.52		178.52	1.70	178.20	inaccessible		1.99	177.91	1.88	178.02	inaccessible		inaccessible		1.70	178.20	1.70	178.20	1.71	178.19
PZ2S		1.92	0.60	178.62		178.62	0.85	178.37	inaccessible		1.23	177.99	1.01	178.21	inaccessible		inaccessible		0.85	178.37	0.85	178.37	0.97	178.25

Appendix B


11476 Highway 26, Hydrograph BH14-1 & BH14-7
180
179
178
177
176
175
200
160
120
80
40
0
Elevation (masl)
3-May-24
2-Jun-24
2-Jul-24
1-Aug-24
31-Aug-24
30-Sep-24
30-Oct-24
29-Nov-24
29-Dec-24
28-Jan-25
27-Feb-25
29-Mar-25
28-Apr-25
Date
Total Precipitation (mm)
BH 14-1 Surface Elevation
BH 14-7 Surface Elevation
BH 14-1 Continuous
BH 14-7 Continuous
BH 14-1 Manual
BH 14-7 Manual


11476 Highway 26, Hydrograph (BH14-3, BH14-8, BH22-1 & BH22-5)
Elevation (masl)
180.0
179.0
178.0
177.0
176.0
175.0
200
160
120
80
40
0
3-May-24
2-Jun-24
2-Jul-24
1-Aug-24
31-Aug-24
30-Sep-24
30-Oct-24
29-Nov-24
29-Dec-24
28-Jan-25
27-Feb-25
29-Mar-25
28-Apr-25
Date
Total Precipitation (mm)
BH 14-3 Manual
BH14-8 Manual
BH 22-1 Manual
BH22-5 Manual
BH 14-3 Surface Elevation
BH14-8 Surface Elevation
BH 22-1 Surface Elevation
BH22-5 Surface Elevation


11476 Highway 26, Station 1 Hydrograph
179.0
178.6
178.2
177.8
177.4
177.0
Elevation (masl)
200
160
120
80
40
0
Precipitation (mm)
18-May-24
17-Jun-24
17-Jul-24
16-Aug-24
15-Sep-24
15-Oct-24
14-Nov-24
14-Dec-24
13-Jan-25
12-Feb-25
14-Mar-25
13-Apr-25
13-May-25
Date
Total Precipitation (mm)
SG-1 (manual)
PZ1D (manual)
PZ1S (manual)
SG-1 Bottom Elevation
PZ Surface Elevation
SG-1 (Continuous)
PZ1D (Continuous)


11476 Highway 26, Station 2 Hydrograph
179.0
178.6
178.2
177.8
177.4
177.0
Elevation (masl)
200
160
120
80
40
0
Precipitation (mm)
18-May-24
17-Jun-24
17-Jul-24
16-Aug-24
15-Sep-24
15-Oct-24
14-Nov-24
14-Dec-24
13-Jan-25
12-Feb-25
14-Mar-25
13-Apr-25
13-May-25
Date
Total Precipitation (mm)
SG-2 (Manual)
PZ2D (manual)
PZ2S (manual)
SG-2 Bottom Elevation
PZ Surface Elevation
SG-2 (Continuous)
PZ2D (Continuous)

Appendix C

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH22-1

PROJECT: Geotechnical Investigation
CLIENT: Integricon Property Restoration and Construction Group Inc.
PROJECT LOCATION: 11476 Highway 26, Collingwood, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4929716.695 E 559282.851

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Jun-02-2022

REF. NO.: 22-189-400
ENCL NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
181.0												
0.0 180.8	**TOPSOIL:** 150mm											
0.2 180.2	**FILL:** silty sand, trace gravel, some roots/organics, wet, very loose		1	SS	2	▽			○			
							W. L. 180.3 m Aug 05, 2022					
0.8	**SAND:** some silt, trace rootlets, trace clay, trace gravel, wet, very dense		2	SS	50/ 100 mm				○			5 76 15 4
							180					
179.4			3	SS	50/ 100 mm				○			
1.6	**END OF BOREHOLE:** Notes: 1) Auger refusal at depth of 1.6m on inferred bedrock. 2) 50mm dia. monitoring well installed upon completion. 3) Water Level Readings: Date: Water Level(mbgl): July 22, 2022 0.86 Aug 5, 2022 0.64											

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH22-2

PROJECT: Geotechnical Investigation
CLIENT: Integricon Property Restoration and Construction Group Inc.
PROJECT LOCATION: 11476 Highway 26, Collingwood, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4929674.096 E 559271.109

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Jun-02-2022

REF. NO.: 22-189-400
ENCL NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
179.0												
0.0 / 179.0	**ASPHALT:** 50 mm						179					
0.1 / 178.7	**GRANULAR BASE:** sand and gravel, 250mm											
0.3 / 178.2	**FILL:** silty sand, some gravel, brown, moist, compact		1	SS	10							
0.8 / 178.1	**SILTY SAND:** trace gravel, brown, wet, very dense		2	SS	50/ 100 mm				○			
0.9	**END OF BOREHOLE:** Notes: 1) Augar refusal at depth of 0.9m on inferred bedrock. 2) Water at depth of 0.8m during drilling.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 22-189-400.GPJ DS.GDT 22-8-15

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH22-3

PROJECT: Geotechnical Investigation
CLIENT: Integricon Property Restoration and Construction Group Inc.
PROJECT LOCATION: 11476 Highway 26, Collingwood, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4929702.12 E 559328.961

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Jun-02-2022

REF. NO.: 22-189-400
ENCL NO.: 4

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT (w_P w w_L) WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"							
179.0												
0.0 / 178.9	**ASPHALT:** 50 mm											
0.1 / 178.7	**GRANULAR:** sand and gravel, 200 mm											
0.3 / 178.2	**FIL:** silty sand with topsoil, trace gravel, brown, moist, loose		1	SS	6							
0.8 / 178.1	**SAND:** trace gravel, yellowish brown, wet, very dense		2	SS	50/ 150 mm							
0.9	**END OF BOREHOLE:** Notes: 1) Augar refusal at depth of 0.9m on inferred bedrock. 2) Water at depth of 0.8m during drilling.											

DS SOIL LOG-2021-FINAL 22-189-400.GPJ DS.GDT 22-8-15

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

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Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH22-4

PROJECT: Geotechnical Investigation
CLIENT: Integricon Property Restoration and Construction Group Inc.
PROJECT LOCATION: 11476 Highway 26, Collingwood, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4929651.171 E 559308.876

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Jun-02-2022

REF. NO.: 22-189-400
ENCL NO.: 5

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" / 0.3 m							
178.9												
0.0 / 178.8	**ASPHALT:** 50 mm											
0.1 / 178.6	**GRANULAR:** sand and gravel, 250 mm											
0.3	**SILTY SAND:** trace clay, trace gravel, yellowish brown, wet, dense to very dense		1	SS	30				○			
			2	SS	50/ 100 mm							
178.0							178					
0.9	**END OF BOREHOLE:** Notes: 1) Augar refusal at depth 0.9m on inferred bedrock.											

DS SOIL LOG-2021-FINAL 22-189-400.GPJ DS.GDT 22-8-15

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH22-5

PROJECT: Geotechnical Investigation
CLIENT: Integricon Property Restoration and Construction Group Inc.
PROJECT LOCATION: 11476 Highway 26, Collingwood, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4929709.071 E 559356.738

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Jun-02-2022

REF. NO.: 22-189-400
ENCL NO.: 6

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
179.1 0.0 179.0	**ASPHALT:** 50 mm											
0.1	**GRANULAR:** sand and gravel, 550 mm		1	SS	10		179					
178.5 0.6	**GRAVELLY SAND:** some silt, trace clay, yellowish brown, wet, very dense					W. L. 178.4 m Aug 05, 2022						
177.7			2	SS	60		178					25 54 16 5
1.4	**END OF BOREHOLE:** Notes: 1) Augar refusal at depth of 1.4m on inferred bedrock. 2) 50mm dia. monitoring well installed upon completion. 3) Water Level Readings: Date: Water Level(mbgl): July 22, 2022 0.74 Aug 5, 2022 0.69											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +³, ×³: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 22-189-400.GPJ DS.GDT 22-8-15

LOG OF BOREHOLE BH14-01

PROJECT: Geotechnical Investigation
CLIENT: C.C. Tatham & Associates Ltd.
PROJECT LOCATION: 11476 Highway 26, Collingwood, Ontario
DATUM: Geodetic
BH LOCATION: N 0 E 1

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150mm
Date: Dec/12/2014

REF. NO.: 10001104
DRG. NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT W_P / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
178.8												
178.8 / 0.0	**ASPHALT:** 50mm											
0.1 / 178.6	**GRANULAR BASE/SUBBASE:** 150mm, sand and gravel											
0.2	**FILL:** silty sand, some clay, trace gravel, light brown to brown, moist o very moist, loose		1	SS	15				○			
178.0							W. L. 178.3 m Jan 19, 2015 W. L. 178.2 m Dec 12, 2014					
0.8	**SAND:** some silt, trace clay, trace gravel, oxidized, light brown, wet, loose		2	SS	6		178		○			4 80 11 5
177.3												
1.5	**END OF BOREHOLE ON ASSUMED BEDROCK**											

Notes:
1. Auger refusal at 1.46m on assumed bedrock
2. Installed 50 mm diameter monitoring well upon completion
3. Water Level Measurements in Monitoring Well:

Date	W.L. Depth (m)	W.L. Elev. (m)
Dec. 12, 2014	0.63	178.17
Jan. 19, 2015	0.46	178.34

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH14-02

PROJECT: Geotechnical Investigation

CLIENT: C.C. Tatham & Associates Ltd.

PROJECT LOCATION: 11476 Highway 26, Collingwood, Ontario

DATUM: Geodetic

BH LOCATION: N 0 E 2

DRILLING DATA

Method: Hollow Stem Auger

Diameter: 150mm

Date: Dec/12/2014

REF. NO.: 10001104

DRG. NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa): ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE & Sensitivity, × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
178.9 / 0.0	**ASPHALT:** 25mm										
178.8 / 0.1	**GRANULAR BASE/SUBBASE:** 150mm, sand and gravel										
178.7 / 0.2	**FILL:** silty sand, some gravel, trace clay, brown, moist to very moist, compact		1	SS	15				○		
178.1 / 0.8	**SAND:** some silt, some gravel, trace clay, light brown, very moist to wet, compact		2	SS	14		178		○		
177.8 / 1.1	25mm seam of organic material, wet										
	END OF BOREHOLE ON ASSUMED BEDROCK										

Notes:
1. Auger refusal at 1.07m on assumed bedrock
2. Borehole was wet at bottom upon completion of drilling

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH14-03

PROJECT: Geotechnical Investigation
CLIENT: C.C. Tatham & Associates Ltd.
PROJECT LOCATION: 11476 Highway 26, Collingwood, Ontario
DATUM: Geodetic
BH LOCATION: N 0 E 3

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150mm
Date: Dec/11/2014

REF. NO.: 10001104
DRG. NO.: 4

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
179.1								
0.0 / 179.0	**TOPSOIL:** 100mm							
0.1	**FILL:** sand, trace silt, trace gravel, trace organics, light brown, moist, very loose to loose		1	SS	4		179	
178.4								
0.8	**SAND:** trace silt, trace clay, trace gravel, oxidized, brown, wet, loose		2	SS	9	W. L. 178.3 m Jan 19, 2015	178	1 90 4 5
177.6								
1.5	**END OF BOREHOLE ON ASSUMED BEDROCK**							

Notes:
1. Auger refusal at 1.52m on assumed bedrock
2. Installed 50 mm diameter monitoring well upon completion
3. Water Level Measurements in Monitoring Well:

Date	W.L. Depth (m)	W.L. Elev. (m)
Dec. 12, 2014	0.99	178.14
Jan. 19, 2015	0.87	178.26

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)
SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE
PLASTIC LIMIT W_P | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W_L
WATER CONTENT (%) (10 20 30)
POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH14-04

PROJECT: Geotechnical Investigation
CLIENT: C.C. Tatham & Associates Ltd.
PROJECT LOCATION: 11476 Highway 26, Collingwood, Ontario
DATUM: Geodetic
BH LOCATION:

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150mm
Date: Dec/12/2014

REF. NO.: 10001104
DRG. NO.: 5

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
179.2												
179.0 / 0.0	**ASPHALT:** 25mm											
	FILL: silty sand, trace clay, trace gravel, dark brown, trace topsoil, very moist, very loose		1	SS	3		179		○			
178.7 / 0.5	some clay, wet											
178.5 / 0.8	compact											
178.4 / 0.9	**SAND:** trace silt, trace clay, trace gravel, oxidized, brown, wet, compact		2	SS	13				○			
1							178					
177.9 / 1.4	**END OF BOREHOLE ON ASSUMED BEDROCK**											

Notes:
1. Auger refusal at 1.37m on assumed bedrock
2. Borehole was wet at bottom upon completion of drilling

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH14-05

PROJECT: Geotechnical Investigation
CLIENT: C.C. Tatham & Associates Ltd.
PROJECT LOCATION: 11476 Highway 26, Collingwood, Ontario
DATUM: Geodetic
BH LOCATION:

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150mm
Date: Dec/11/2014

REF. NO.: 10001104
DRG. NO.: 6

ELEV / DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
179.1 / 0.0	**TOPSOIL:** 100mm						179
179.0 / 0.1	**FILL:** sand and gravel, trace silt, trace clay, trace topsoil, reddish brown, dense		1	SS	31		
178.8 / 0.3	some clay, dark brown, moist to very moist						
178.4 / 0.8	silty sand, some gravel, some clay, wet, compact		2	SS	16		178
178.1 / 1.1	**SAND:** trace silt, trace clay, trace gravel, oxidized, brown, wet, compact						
177.5 / 1.7	**END OF BOREHOLE ON ASSUMED BEDROCK** Notes: 1. Auger refusal at 1.65m on assumed bedrock 2. Borehole was wet at bottom upon completion of drilling						

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT W_P | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W_L

WATER CONTENT (%): 10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

SPL SOIL LOG 10001104 BH LOGS.GPJ SPL.GDT 2/5/15

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH14-07

PROJECT: Geotechnical Investigation
CLIENT: C.C. Tatham & Associates Ltd.
PROJECT LOCATION: 11476 Highway 26, Collingwood, Ontario
DATUM: Geodetic
BH LOCATION:

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150mm
Date: Dec/11/2014

REF. NO.: 10001104
DRG. NO.: 7

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS
178.8					
0.0 / 178.7	**TOPSOIL:** 100mm				
0.1 / 178.4	**FILL:** silty sand, some gravel to gravelly, trace to some clay, trace topsoil, light brown, moist, compact	1	SS	13	
0.5 / 178.1	**SAND:** some silt, trace clay, trace gravel, oxidized, brown, moist to very moist, compact				W. L. 178.3 m Jan 19, 2015
0.8 / 177.5	some clay, wet	2	SS	12	
1.4 / 177.1	**AUGER REFUSAL / ROCK CORING STARTED** Refer Log of Rock Core BH14-07 **RUN 1**				
1.8	**RUN 2**				
175.5 / 3.3	**RUN 3**				
174.0 / 4.8	**RUN 4**				

ELEVATION: 178

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT W_P | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W_L

WATER CONTENT (%): 10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

SPL SOIL LOG 10001104 BH LOGS.GPJ SPL.GDT 2/5/15

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

PROJECT: Geotechnical Investigation
CLIENT: C.C. Tatham & Associates Ltd.
PROJECT LOCATION: 11476 Highway 26, Collingwood, Ontario
DATUM: Geodetic
BH LOCATION:

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150mm
Date: Dec/11/2014

REF. NO.: 10001104
DRG. NO.: 7

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT W_P / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m							GR SA SI CL
	RUN 4(Continued)											
172.5 6.3	**END OF BOREHOLE** Notes: 1. Auger refusal at 1.37m on assumed bedrock 2. Installed 50 mm diameter monitoring well upon completion 3. Water Level Measurements in Monitoring Well: Date W.L. Depth (m) W.L. Elev. (m) Dec. 12, 2014 0.57 178.25 Jan. 19, 2015 0.48 178.34											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

LOG OF ROCK CORE BH14-07

PROJECT: Geotechnical Investigation
CLIENT: C.C. Tatham & Associates Ltd.
LOCATION: 11476 Highway 26, Collingwood, Ontario
DATUM: Geodetic
BH LOCATION:

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150mm
Date: Dec/11/2014

REF. NO.: 10001104
DRG. NO.: 7

(m) ELEV / DEPTH	ROCK DESCRIPTION	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES	Weathering Index	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm^3) E (GPa)
177.5	Rock Surface															
177.4 1.4	**LIMESTONE:** slightly weathered to fresh, fine- to coarse-grained, fossiliferous, argillaceous, grey		1	NQ	87	0		0	>25							
177.1 1.8									>25							
			2	NQ	100	93		83	15 6 3 0 4							
175.5 3.3										Soft Layer at 3.36m for 30mm						
			3	NQ	100	92		77	1 1 5 0 3							
174.0 4.8																
			4	NQ	100	98		98	0 1 0 1 0							
172.5 6.3	**END OF BOREHOLE**															

SPL ROCK CORE-2014 10001104 BH LOGS.GPJ SPL.GDT 2/12/15

Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered θ = angle to the core axis E = Modulus of Elasticity

*: UCS [Mpa]≈ 24 $I_{S(50)}$

LOG OF BOREHOLE BH14-08

PROJECT: Geotechnical Investigation
CLIENT: C.C. Tatham & Associates Ltd.
PROJECT LOCATION: 11476 Highway 26, Collingwood, Ontario
DATUM: Geodetic
BH LOCATION:

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150mm
Date: Dec/11/2014

REF. NO.: 10001104
DRG. NO.: 8

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
179.2									
0.0 / 179.0	**TOPSOIL:** 125mm								
0.1	**FILL:** fine sand, trace to some gravel, trace silt, trace clay, trace topsoil, trace organics, light brown, moist to very moist, very loose	1	SS	3		179			
178.4									
0.8	**SAND:** trace silt, trace clay, trace gravel, trace mollusks, oxidized, brown, very moist to wet, compact	2	SS	13	W. L. 178.3 m Jan 19, 2015	178			
1 / 177.7									
1.5	some gravel to gravelly, light brown	3	SS	19					19 64 11 6
2 / 177.1									
2.1	**END OF BOREHOLE ON ASSUMED BEDROCK**								

Notes:
1. Auger refusal at 2.10m on assumed bedrock
2. Installed 50 mm diameter monitoring well upon completion
3. Water Level Measurements in Monitoring Well:

Date	W.L. Depth (m)	W.L. Elev. (m)
Dec. 12, 2014	0.90	178.27
Jan. 19, 2015	0.85	178.35

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)
SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE
PLASTIC LIMIT W_P — NATURAL MOISTURE CONTENT W — LIQUID LIMIT W_L
WATER CONTENT (%) (10 20 30)

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

SPL SOIL LOG 10001104 BH LOGS.GPJ SPL.GDT 2/5/15

LOG OF BOREHOLE BH14-09

PROJECT: Geotechnical Investigation
CLIENT: C.C. Tatham & Associates Ltd.
PROJECT LOCATION: 11476 Highway 26, Collingwood, Ontario
DATUM: Geodetic
BH LOCATION:

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150mm
Date: Dec/11/2014

REF. NO.: 10001104
DRG. NO.: 9

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa): ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE & Sensitivity, × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT W_P / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
179.9											
179.8 / 0.1	**ASPHALT:** 50mm										
179.7 / 0.2	**GRANULAR BASE/SUBBASE:** 150mm, sand and gravel										
	FILL: silty sand, some gravel, trace to some clay, light brown, moist to very moist, compact		1	SS	21						
179.2 / 0.8	**SAND:** trace silt, trace clay, trace gravel, trace mollusks, light brown, wet, compact		2	SS	14		179				
178.6 / 1.4	**END OF BOREHOLE ON ASSUMED BEDROCK**										

Notes:
1. Auger refusal at 1.37m on assumed bedrock
2. Water level was 1.05m upon completion of drilling

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

SPL SOIL LOG 10001104 BH LOGS.GPJ SPL.GDT 2/5/15

LOG OF BOREHOLE BH14-12

PROJECT: Geotechnical Investigation
CLIENT: C.C. Tatham & Associates Ltd.
PROJECT LOCATION: 11476 Highway 26, Collingwood, Ontario
DATUM: Geodetic
BH LOCATION:

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150mm
Date: Dec/11/2014

REF. NO.: 10001104
DRG. NO.: 10

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION
179.7 / 0.0	**TOPSOIL:** 100mm						
179.6 / 0.1	**FILL:** sand and gravel, some silt, trace clay, pieces of pvc piping, light grey, moist, loose		1	SS	7		179
178.9 / 0.8	**SAND:** some silt, trace clay, trace gravel, oxidized, light brown, very moist to wet, compact		2	SS	12		178
177.4 / 2.3	**GRAVELLY SAND:** some silt, trace clay, greyish brown, wet, compact		3	SS	14		
176.6 / 3.1	**END OF BOREHOLE ON ASSUMED BEDROCK** Notes: 1. Auger refusal and spoon bouncing at 3.05m on assumed bedrock 2. Water level was 2.42m upon completion of drilling		4	SS	23		177

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE — 20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ε=3%: Strain at Failure

SPL SOIL LOG 10001104 BH LOGS.GPJ SPL.GDT 2/5/15

Appendix D

FINAL REPORT

CA40211-MAY24 R1

22-189-402, 11476 Highway 26, Collingwood ON

Prepared for

DS Consultants

FINAL REPORT

CA40211-MAY24 R1

First Page

CLIENT DETAILS

Client	DS Consultants
Address	6221 Highway 7 Unit 16 Vaughan, Ontario L4H 0K8. Canada
Contact	Dorothy Santos
Telephone	905-329-2735
Facsimile	905-264-2685
Email	dsantos@dsconsultants.ca
Project	22-189-402, 11476 Highway 26, Collingwood ON
Order Number	
Samples	Solution (2)

LABORATORY DETAILS

Project Specialist	Jill Campbell, B.Sc.,GISAS
Laboratory	SGS Canada Inc.
Address	185 Concession St., Lakefield ON, K0L 2H0
Telephone	2165
Facsimile	705-652-6365
Email	jill.campbell@sgs.com
SGS Reference	CA40211-MAY24
Received	05/24/2024
Approved	05/31/2024
Report Number	CA40211-MAY24 R1
Date Reported	06/03/2024

COMMENTS

MAC - Maximum Acceptable Concentration
AO/OG - Aesthetic Objective / Operational Guideline
NR - Not reportable under applicable Provincial drinking water regulations as per client.

Temperature of Sample upon Receipt: 9 degrees C
Cooling Agent Present:yes
Custody Seal Present:yes

Chain of Custody Number:036148

Phos TR spk low due to sample matrix

SIGNATORIES

Jill Campbell, B.Sc.,GISAS

TABLE OF CONTENTS

Client: DS Consultants
Project: 22-189-402, 11476 Highway 26, Collingwood ON
Project Manager: Dorothy Santos
Samplers: Chaitonya

MATRIX: WATER

L1 = PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E

Sample Number	7	8
Sample Name	SG-1	SG-2
Sample Matrix	Solution	Solution
Sample Date	24/05/2024	24/05/2024

Parameter	Units	RL	L1	Result	Result
General Chemistry					
Alkalinity	mg/L as CaCO3	2		226	183
Bicarbonate	mg/L as CaCO3	2		226	183
Carbonate	mg/L as CaCO3	2		< 2	< 2
OH	mg/L as CaCO3	2		< 2	< 2
Colour	TCU	3		46	38
Conductivity	uS/cm	2		466	925
Turbidity	NTU	0.10		40	8.5
Ammonia+Ammonium (N)	as N mg/L	0.1		< 0.1	< 0.1
Total Reactive Phosphorous (o-phosphate as P)	mg/L	0.03		< 0.03	< 0.03
Total Organic Carbon	mg/L	1		19	12
Metals and Inorganics					
Fluoride	mg/L	0.06		0.14	0.09
Bromide	mg/L	0.3		< 0.3	< 0.3
Nitrite (as N)	as N mg/L	0.03		< 0.03	< 0.03
Nitrate (as N)	as N mg/L	0.06		< 0.06	< 0.06
Sulphate	mg/L	2		< 2	< 2
Hardness	mg/L as CaCO3	0.05		218	213
Aluminum (total)	mg/L	0.001		0.029	0.038
Arsenic (total)	mg/L	0.0002	0.005	0.0013	0.0012
Boron (total)	mg/L	0.002	0.2	0.021	0.012
Barium (total)	mg/L	0.00008		0.0177	0.0205

Client: DS Consultants
Project: 22-189-402, 11476 Highway 26, Collingwood ON
Project Manager: Dorothy Santos
Samplers: Chaitonya

MATRIX: WATER

L1 = PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E

Sample Number	7	8
Sample Name	SG-1	SG-2
Sample Matrix	Solution	Solution
Sample Date	24/05/2024	24/05/2024

Metals and Inorganics (continued)

Parameter	Units	RL	L1	Result	Result
Beryllium (total)	mg/L	0.000007	1.1	< 0.000007	< 0.000007
Cobalt (total)	mg/L	0.000004	0.0009	0.000552	0.000446
Calcium (total)	mg/L	0.01		69.9	69.4
Cadmium (total)	mg/L	0.000003	0.0005	0.000005	< 0.000003
Copper (total)	mg/L	0.001	0.005	< 0.001	< 0.001
Chromium (total)	mg/L	0.00008	0.1	0.00020	0.00020
Iron (total)	mg/L	0.007	0.3	2.69	2.13
Potassium (total)	mg/L	0.009		5.66	3.26
Magnesium (total)	mg/L	0.001		10.6	9.64
Manganese (total)	mg/L	0.00001		0.149	0.346
Molybdenum (total)	mg/L	0.0004	0.04	< 0.0004	< 0.0004
Nickel (total)	mg/L	0.0001	0.025	0.0015	0.0008
Sodium (total)	mg/L	0.01		14.7	117
Phosphorus (total)	mg/L	0.003	0.01	0.094	0.095
Lead (total)	mg/L	0.00009	0.025	0.00016	0.00010
Silicon (total)	mg/L	0.02		0.93	2.04
Silver (total)	mg/L	0.00005	0.0001	< 0.00005	< 0.00005
Strontium (total)	mg/L	0.00008		0.215	0.204
Thallium (total)	mg/L	0.000005	0.0003	0.000005	< 0.000005
Tin (total)	mg/L	0.00006		0.00006	0.00008
Titanium (total)	mg/L	0.0001		0.0018	0.0022
Antimony (total)	mg/L	0.0009	0.02	< 0.0009	< 0.0009

Client: DS Consultants
Project: 22-189-402, 11476 Highway 26, Collingwood ON
Project Manager: Dorothy Santos
Samplers: Chaitonya

MATRIX: WATER

L1 = PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E

Sample Number	7	8
Sample Name	SG-1	SG-2
Sample Matrix	Solution	Solution
Sample Date	24/05/2024	24/05/2024

Parameter	Units	RL	L1	Result	Result
Metals and Inorganics (continued)					
Selenium (total)	mg/L	0.00004	0.1	0.00016	0.00010
Uranium (total)	mg/L	0.000002	0.005	0.000029	0.000028
Vanadium (total)	mg/L	0.00001	0.006	0.00014	0.00008
Zinc (total)	mg/L	0.002	0.02	< 0.002	< 0.002
Cation sum	meq/L	-9999		5.31	9.58
Anion Sum	meq/L	-9999		5.22	9.58
Anion-Cation Balance	% difference	-9999		0.79	-0.02
Ion Ratio	-	-9999		1.02	1
Total Dissolved Solids (calculated)	mg/L	-9999		262	519
Conductivity (calculated)	uS/cm	-9999		527	958
Langeliers Index 4° C	@ 4° C	-9999		0.22	0.19
Saturation pH 4°C	pHs @ 4°C	-9999		7.75	7.87
Other (ORP)					
pH	No unit	0.05	8.6	7.97	8.06
Chloride	mg/L	1		25	210
Mercury (total)	mg/L	0.00001	0.0002	0.00001	< 0.00001

EXCEEDANCE SUMMARY

Parameter	Method	Units	Result	PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E L1
SG-1				
Iron	SM 3030/EPA 200.8	mg/L	2.69	0.3
Phosphorus	SM 3030/EPA 200.8	mg/L	0.094	0.01
SG-2				
Iron	SM 3030/EPA 200.8	mg/L	2.13	0.3
Phosphorus	SM 3030/EPA 200.8	mg/L	0.095	0.01

QC SUMMARY

Alkalinity

Method: SM 2320 I Internal ref.: ME-CA-IENVIEWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Alkalinity	EWL0665-MAY24	mg/L as CaCO3	2	< 2	2	20	102	80	120	NA		

Ammonia by SFA

Method: SM 4500 I Internal ref.: ME-CA-IENVISFA-LAK-AN-007

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Ammonia+Ammonium (N)	SKA0257-MAY24	as N mg/L	0.1	<0.1	0	10	94	90	110	103	75	125

QC SUMMARY

Anions by discrete analyzer

Method: US EPA 325.2 | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-026

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chloride	DIO8084-MAY24	mg/L	1	<1	ND	20	99	80	120	98	75	125
Sulphate	DIO8084-MAY24	mg/L	2	<2	ND	20	109	80	120	109	75	125

Anions by IC

Method: EPA300/MA300-Ions1.3 | Internal ref.: ME-CA-[ENVIIC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Bromide	DIO0646-MAY24	mg/L	0.3	<0.3	ND	20	101	90	110	107	75	125
Nitrite (as N)	DIO0646-MAY24	mg/L	0.03	<0.03	ND	20	97	90	110	97	75	125
Nitrate (as N)	DIO0646-MAY24	mg/L	0.06	<0.06	ND	20	97	90	110	100	75	125
Bromide	DIO0682-MAY24	mg/L	0.3	<0.3	ND	20	97	90	110	94	75	125
Nitrite (as N)	DIO0682-MAY24	mg/L	0.03	<0.03	ND	20	98	90	110	107	75	125
Nitrate (as N)	DIO0682-MAY24	mg/L	0.06	<0.06	ND	20	98	90	110	91	75	125

QC SUMMARY

Carbon by SFA

Method: SM 5310 | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-009

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Organic Carbon	SKA0265-MAY24	mg/L	1	<1	3	20	102	90	110	100	75	125

Carbonate/Bicarbonate

Method: SM 2320 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Carbonate	EWL0665-MAY24	mg/L as CaCO3	2	< 2	ND	10	NA	90	110	NA		
Bicarbonate	EWL0665-MAY24	mg/L as CaCO3	2	< 2	2	10	NA	90	110	NA		
OH	EWL0665-MAY24	mg/L as CaCO3	2	< 2	ND	10	NA	90	110	NA		

QC SUMMARY

Colour

Method: SM 2120 I Internal ref.: ME-CA-IENVIEWL-LAK-AN-002

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Colour	EWL0711-MAY24	TCU	3	< 3	0	10	105	80	120	NA		

Conductivity

Method: SM 2510 I Internal ref.: ME-CA-IENVIEWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Conductivity	EWL0665-MAY24	uS/cm	2	< 2	0	20	99	90	110	NA		

Fluoride by Specific Ion Electrode

Method: SM 4500 I Internal ref.: ME-CA-IENVIEWL-LAK-AN-014

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Fluoride	EWL0667-MAY24	mg/L	0.06	<0.06	0	10	97	90	110	78	75	125

QC SUMMARY

Mercury by CVAAS

Method: EPA 7471A/SM 3112B | Internal ref.: ME-CA-[ENVISPE-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Mercury (total)	EHG0057-MAY24	mg/L	0.00001	< 0.00001	9	20	107	80	120	93	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Silver (total)	EMS0279-MAY24	mg/L	0.00005	<0.00005	ND	20	100	90	110	80	70	130
Aluminum (total)	EMS0279-MAY24	mg/L	0.001	<0.001	5	20	98	90	110	109	70	130
Arsenic (total)	EMS0279-MAY24	mg/L	0.0002	<0.0002	ND	20	100	90	110	102	70	130
Barium (total)	EMS0279-MAY24	mg/L	0.00008	<0.00008	1	20	96	90	110	102	70	130
Beryllium (total)	EMS0279-MAY24	mg/L	0.000007	<0.000007	ND	20	96	90	110	95	70	130
Boron (total)	EMS0279-MAY24	mg/L	0.002	<0.002	ND	20	98	90	110	95	70	130
Calcium (total)	EMS0279-MAY24	mg/L	0.01	<0.01	2	20	98	90	110	101	70	130
Cadmium (total)	EMS0279-MAY24	mg/L	0.000003	<0.000003	0	20	98	90	110	96	70	130
Cobalt (total)	EMS0279-MAY24	mg/L	0.000004	<0.000004	8	20	101	90	110	100	70	130
Chromium (total)	EMS0279-MAY24	mg/L	0.00008	<0.00008	ND	20	101	90	110	101	70	130
Copper (total)	EMS0279-MAY24	mg/L	0.001	<0.001	ND	20	101	90	110	105	70	130
Iron (total)	EMS0279-MAY24	mg/L	0.007	<0.007	0	20	100	90	110	100	70	130
Potassium (total)	EMS0279-MAY24	mg/L	0.009	<0.009	2	20	99	90	110	107	70	130
Magnesium (total)	EMS0279-MAY24	mg/L	0.001	<0.001	3	20	100	90	110	100	70	130
Manganese (total)	EMS0279-MAY24	mg/L	0.00001	<0.00001	0	20	101	90	110	103	70	130
Molybdenum (total)	EMS0279-MAY24	mg/L	0.0004	<0.0004	ND	20	101	90	110	99	70	130
Sodium (total)	EMS0279-MAY24	mg/L	0.01	<0.01	0	20	109	90	110	107	70	130
Nickel (total)	EMS0279-MAY24	mg/L	0.0001	<0.0001	1	20	106	90	110	104	70	130
Lead (total)	EMS0279-MAY24	mg/L	0.00009	<0.00009	ND	20	99	90	110	99	70	130
Phosphorus (total)	EMS0279-MAY24	mg/L	0.003	<0.003	0	20	98	90	110	NV	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS (continued)

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-[ENV]SPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Antimony (total)	EMS0279-MAY24	mg/L	0.0009	<0.0009	ND	20	106	90	110	97	70	130
Selenium (total)	EMS0279-MAY24	mg/L	0.00004	<0.00004	2	20	98	90	110	98	70	130
Silicon (total)	EMS0279-MAY24	mg/L	0.02	<0.02	4	20	93	90	110	NV	70	130
Tin (total)	EMS0279-MAY24	mg/L	0.00006	<0.00006	11	20	97	90	110	NV	70	130
Strontium (total)	EMS0279-MAY24	mg/L	0.00008	<0.00008	1	20	99	90	110	100	70	130
Titanium (total)	EMS0279-MAY24	mg/L	0.0001	<0.0001	2	20	96	90	110	NV	70	130
Thallium (total)	EMS0279-MAY24	mg/L	0.000005	<0.000005	ND	20	99	90	110	82	70	130
Uranium (total)	EMS0279-MAY24	mg/L	0.000002	<0.000002	1	20	104	90	110	102	70	130
Vanadium (total)	EMS0279-MAY24	mg/L	0.00001	<0.00001	4	20	101	90	110	101	70	130
Zinc (total)	EMS0279-MAY24	mg/L	0.002	<0.002	1	20	99	90	110	130	70	130

pH

Method: SM 4500 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0665-MAY24	No unit	0.05	NA	1		101			NA		

QC SUMMARY

Reactive Phosphorus by SFA

Method: SM 4500-P F | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Reactive Phosphorous (o-phosphate as P)	SKA0262-MAY24	mg/L	0.03	<0.03	ND	10	101	90	110	67	75	125

Turbidity

Method: SM 2130 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-003

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Turbidity	EWL0754-MAY24	NTU	0.10	< 0.10	0	10	99	90	110	NA		

QC SUMMARY

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

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

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS	Insufficient sample for analysis.
RL	Reporting Limit.
↑	Reporting limit raised.
↓	Reporting limit lowered.
NA	The sample was not analysed for this analyte
ND	Non Detect

Results relate only to the sample tested.
Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.
"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

This report supersedes all previous versions.

-- End of Analytical Report --

Request for Laboratory Services and CHAIN OF CUSTODY

SGS Industries & Environment - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Fax: 705-652-6365 Web: www.sgs.com/environment
- London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361

No: 036148

Page 1 of 1

Laboratory Information Section - Lab use only

Received By: Ari Goodman
Received Date: 05/24/24 (mm/dd/yy)
Received Time: 17:20 (hr : min)
Received By (signature): Ari Goodman
Custody Seal Present: Yes ☑ No ☐
Custody Seal Intact: Yes ☑ No ☐
Cooling Agent Present: Yes ☑ No ☐ Type: ice
Temperature Upon Receipt (°C) 9.9
LAB LIMS #: CA40211-may 24

REPORT INFORMATION

Company: DS Consultants Ltd.
Contact: Dorothy Santos
Address: 6221 Hwy 7, Unit 16 Vaughan
Phone: 905-329-2735
Fax:
Email: DSantos@dsconsultants.ca

INVOICE INFORMATION

☑ (same as Report Information)
Company:
Contact: Accounting
Address:
Phone:
Email:

Quotation #:
P.O. #:
Project #: 22-189-402
Site Location/ID: 11476 Highway 26, Collingwood, ON

TURNAROUND TIME (TAT) REQUIRED

☑ Regular TAT (5-7days)
TAT's are quoted in business days (exclude statutory holidays & weekends).
Samples received after 6pm or on weekends: TAT begins next business day

RUSH TAT (Additional Charges May Apply): ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 4 Days
PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

Specify Due Date:

*NOTE: DRINKING (POTABLE) WATER SAMPLES FOR HUMAN CONSUMPTION MUST BE SUBMITTED WITH SGS DRINKING WATER CHAIN OF CUSTODY

REGULATIONS

☐ O.Reg 153/04 ☐ O.Reg 406/19
☐ Table 1 ☐ Res/Park Soil Texture: ☐ Coarse
☐ Table 2 ☐ Ind/Com ☐ Medium/Fine
☐ Table 3 ☐ Agri/Other
☐ Table ____ Appx. ____
Soil Volume ☐ <350m3 ☐ >350m3

Other Regulations:
☐ Reg 347/558 (3 Day min TAT)
☐ PWQO ☐ MMER
☐ CCME ☑ Other:
☐ MISA
☐ ODWS Not Reportable *See note

Sewer By-Law:
☐ Sanitary
☐ Storm
Municipality:

RECORD OF SITE CONDITION (RSC) ☐ YES ☐ NO

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	Field Filtered (Y/N)	M&I: Metals & Inorganics (incl CrVI, CN, Hg pH,(B(HWS),EC,SAR–soil) (Cl, Na–water)	M&I: Full Metals Suite (ICP metals plus B(HWS-soil only) Hg, CrVI	M&I: ICP Metals only Sb,As,Ba,Be,B,Cd, Cr,Co,Cu,Pb,Mo,Ni,Se,Ag,Tl,U,V,Zn	SVOC: PAHs only	SVOC: SVOCs all incl PAHs, ABNs, CPs	PCB: PCBs Total ☐ Aroclor ☐	PHC: F1-F4 + BTEX	PHC: F1-F4 only no BTEX	VOC: VOCs all incl BTEX	VOC: BTEX only	Pest: Pesticides Organochlorine or specify other	Other (please specify): General waters Characterization Pkg	Other	Other	Other	Sewer Use: Specify pkg:	Water Characterization Pkg ☐ General Extended	SPLP: Specify tests ☐ Metals ☐ VOC ☐ 1,4-Dioxane ☐ OCP ☐ ABN	TCLP: Specify tests ☐ M&I ☐ VOC ☐ PCB ☐ B(a)P ☐ ABN ☐ Ignit.	COMMENTS:
1	SG-1	5/24/24	pm	11	stream	✓												✓								Non filtered
2																										
3	SG-2	5/24/24	pm	11	stream	✓												✓								Non filtered
4																										
5																										
6																										
7																										
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9																										
10																										
11																										
12																										

Observations/Comments/Special Instructions

Sampled By (NAME): Chaitanya Signature: Date: 5/24/24 (mm/dd/yy)
Relinquished by (NAME): Chaitanya Signature: Date: 5/24/24 (mm/dd/yy)

Pink Copy - Client
Yellow & White Copy - SGS

Revision #: 1.7
Date of Issue: 07 JUNE 2023

Appendix E

REPORT ON

Wetland Risk Evaluation &
Feature Water Balance Study
Proposed Development
11476 Highway 26, Collingwood, Ontario

Prepared For:
DS Consultants Ltd.

PREPARED BY:
GeoBase Solutions (GBS) Ltd.

Project No: 25-008-100
Date: March 18, 2025

GeoBase Solutions (GBS) Ltd.
73 Pear Blossom Way, Holland Landing,
ON, L9N 0T1

Table of Contents

FIGURES

APPENDICES:

1. INTRODUCTION

GeoBase Solutions Ltd. (GBS) was retained by DS Consultants (Client), to complete a wetland risk evaluation and water balance study for the proposed development located at 11476 Highway 26 in Collingwood, Ontario (Site). The Site has a total area of approximately 2.7 hectares (ha) and was previously developed as a motel with amenities and paved parking in the south half of the property. A coastal wetland (Subject Wetland), known to be part of the Silver Creek Wetland Complex (CL7), is present in the north portion of the Site.

It is understood that the proposed development will consist of two 6 storey residential buildings consisting of 100 and 94 units with facilities and a private driveway. The development will occupy the south portion of the Site in the location of the vacant motel.

This report provides a wetland risk evaluation using Wetland Water Balance Risk Evaluation guidelines (TRCA, Nov 2017), to assess the magnitude of hydrologic change proposed to the Subject Wetland. The report also provides a feature-based water balance assessment using the Thornthwaite and Mather Soil-Moisture Balance methodology (1957). The water balance was completed within the boundaries of the Subject Wetland catchment to provide support for overall servicing and the integration of Low Impact Development (LID) measures.

2. WETLAND CATCHMENT

2.1 Pre-development Wetland Catchment

Pre-development drainage boundaries were provided by Tatham Engineering (Tatham), in their Stormwater Management Report for the Site, as prepared for Integricon Property Restoration and Construction Group Inc., dated February 17, 2023.

The pre-development mapping provided in drawing ODP-1 (Appendix A), shows drainage areas including catchment 101 which captures the entire Site and external drainage areas 1,3,4,5,6,9,10,20,21,22 and 23. Drainage areas 6 and 10 were found to bypass the Subject Wetland via a ditch and culvert along Lighthouse Lane and were excluded from the hydrologic model prepared to quantify pre-development peak flows and storage estimates within the Subject Wetland. For the purposes of this report, drainage areas 6 and 10 were also excluded resulting in a total catchment area of about 9.0 ha. **Figure 1** shows the total catchment area for the Subject Wetland.

2.2 Post-Development Wetland Catchment

Post-development drainage boundaries were also provided by Tatham Engineering (Tatham), in their Stormwater Management Report. Under proposed conditions, external and internal drainage areas will be maintained. Post-development mapping is provided in drawing DP-2 (Appendix B), and shows that

catchment 201, which captures the same area as pre-development catchment 101, has an increased percent imperviousness from 25% (existing condition) to 29% (proposed condition). As a result, there is an increased impervious area of 0.124 ha in the proposed condition. **Figure 2** shows the total post-development catchment area for the Subject Wetland.

3. WETLAND RISK EVALUATION

To aid in determining the level of risk and evaluation requirements for the Subject Wetland, an assessment was completed using the Wetland Water Balance Risk Evaluation guidelines provided by the Toronto and Region Conservation Authority (TRCA, Nov 2017). The guideline provides criteria used to evaluate the magnitude of potential hydrological impact on a wetland. The criteria include:

- The proportion of impervious cover in the catchment of the wetland that would result from the proposal;
- The degree of change in the size of the wetland catchment;
- Water taking from, or discharge to, surface water bodies or aquifers directly connected to the wetland, and;
- The impact on locally significant recharge areas.

Considering the above criteria, increases to impervious cover and changes to wetland catchment size were evaluated.

3.1 Impervious Cover Score

An increase in the percent of impervious cover within a wetland catchment has the effect of reducing infiltration and potentially decreasing baseflow and/or interflow contributions to the wetland. It further increases runoff contributions and risks of flooding and potentially increases stormwater sediment and contaminant loading. To assess the risk of the proposed impervious surfaces on sensitive features including the subject wetland, the Impervious Cover Score (S) was calculated for the wetland catchment. The equation defining S is as follows:

$$S = \frac{IC \cdot Cdev}{C}$$

where,
IC - is the proportion of impervious cover proposed within the specific catchment (as a percentage between 0 and 100)
Cdev - is the total proposed development area within the catchment (in ha)
C - is the size of the wetland's catchment (in ha).

Results of the calculation of impervious cover (IC) are provided in **Table 3-1** and show that the catchment for the Subject Wetland is presented with low risk based on the proposed development area with a 65% imperviousness.

Table 3-1 –Impervious Cover Score - Probability and Magnitude of Hydrological Change

Subcatchment Area Name	Pre-development Catchment Size (m2)	Proposed Impervious Cover (m2)	Impervious Cover (S)	Sensitive Feature	Expected magnitude of hydrological change
Subject Wetland	89,950	1,240	0.01	Wetland	Low

Note: * Impervious Cover Score (S) calculated using equation 1 (TRCA - Wetland Water Balance Risk Evaluation, Nov 2017)

3.2 Change in Catchment Size

Changes to catchment size directly effects the volume and timing of stormwater contributions to downgradient features. To evaluate the magnitude of hydrological change these effects can have, pre-development and post-development catchments were compared. **Table 3-2** provides the area breakdown for pre and post-development conditions. The same magnitude thresholds used for impervious cover (10% and 25 %) are used as thresholds to define catchment size alteration. As a result, changes to catchment size for the Subject Wetland is considered to have no risk.

Table 3-2 –Changes to Catchment Size - Probability and Magnitude of Hydrological Change

Subcatchment Area Name	Pre-development catchment area (m2)	Post-Development Catchment Area (m2)	% Change in Catchment Area	Sensitive Feature	Magnitude of Hydrological Change *
Subject Wetland	89,950	89,950	0	Wetland	None

Note: * Based on Table 2: Criteria used to evaluate the probability and magnitude of hydrological change (TRCA - Wetland Water Balance Risk Evaluation, Nov 2017)

3.3 Water Taking from Aquifers Directly Connected to Wetland

When wetlands are directly connected to surface water bodies or to unconfined aquifers, water takings from the contributing water source have the potential to impact wetland hydrology. For the purposes of this evaluation, any water taking which is likely to result in direct alteration of wetland water levels is of potential concern. Permanent or temporary dewatering estimates for the development should be considered. Risk to the Subject Wetland can potentially be mitigated by directing discharged water to the wetland following treatment.

3.4 Recharge Areas

Certain areas within a wetland's surface water and groundwater catchments may be more sensitive to change than others, particularly where these areas act as locally significant groundwater recharge areas.

Considering the water balance in the following section of the report, risks associated with a reduction in groundwater recharge are considered mitigated.

4. WATER BALANCE ASSESSMENT

4.1 Existing Conditions

The Subject Wetland has a total catchment area of 89,950 m^2 and currently consists of developed and undeveloped areas. **Figure 1** shows the pre-development conceptual model considered for establishing current hydrologic conditions. A summary of pre-development wetland catchment land uses is provided below in **table 4-1.**

Table 4-1 –Summary of Pre-development Conditions

Subcatchment Area Name	Pre-development Catchment Size (ha)	Mature Forest (m2)	Pasture & Shrub (m2)	Landscaped Surface (m2)	Impervious Surface (m2)
Subject Wetland	89,950	28,814	10,074	22,865	28,814

4.2 Proposed Development

The post-development catchment for area for the Subject Wetland will be maintained. It is proposed that the development will increase the amount of impervious surface by 1,240 m^2. A summary of post-development wetland catchment land uses is provided below in **table 4-2.**

Table 4-2 –Summary of Post-Development Conditions

Subcatchment Area Name	Pre-development Catchment Size (ha)	Mature Forest (m2)	Pasture & Shrub (m2)	Landscaped Surface (m2)	Impervious Surface (m2)
Subject Wetland	89,950	28,814	8,431	22,650	30,054

4.3 Water Balance Components (Thornthwaite Monthly Water Balance Model)

The Thornthwaite water balance (Thornthwaite, 1948; Mather, 1978; 1979) is an accounting type method used to analyze the allocation of water among various components of the hydrologic cycle. Inputs to the model are monthly temperature, site latitude, and precipitation. Outputs include monthly potential and actual evapotranspiration, evaporation, water surplus, total infiltration, and total runoff. For ease of calculation, a spreadsheet model was used for the computation.

When precipitation (P) occurs, it can either runoff (R) through the surface water system, infiltrate (I) to the water table, or evaporate/evapotranspiration (ET) from the earth's surface and vegetation. The sum of R and I is termed as the water surplus (S). When long-term averages of P, R, I and ET are used, there

is no net change in groundwater storage (ST). Annually, however, there is a potential for small changes in ST. The annual water budget can be stated as:

P = ET + R + I + ST

the components are discussed in Section 4.3.1 below.

4.3.1 Pre-development Water Balance

To predict outputs of the pre-development water balance, various inputs were entered into the Thornthwaite model including monthly precipitation and temperature, Site latitude, water holding capacity values for native soils and factors of infiltration. Various inputs and outputs of the model are described in detail below. The detailed calculations are presented in **Appendix C**.

Precipitation (P)

Based on Egbert Climate Station Climate Normals, the average precipitation for the area is about 793 mm/year for the period between 1991 and 2020. Average monthly temperature from this climate data set has been used. The monthly distribution of precipitation is presented in **Table 1, Appendix C**.

Storage (St) and Evapotranspiration / Evaporation (Et)

Groundwater storage (ST) of native soils for the existing Site was estimated using values of Water Holding Capacity (mm) of respective land use and soil types identified in Table 3.1 of the Storm Water Management (SWM) Planning & Design Manual (MOE, March 2003). The land uses, soil types (fine sandy loam) and respective water holding capacities shown in **Table 4-3** were chosen to represent existing conditions and applied to March for monthly calculations.

Table 4-3 Existing Conditions – Water Holding Capacity and AET of Native Soils in Pervious Areas

Land uses / soil types	Water Holding Capacity (mm/year)	AET (mm/year)
Pervious Area (Forest)	300	556
Pervious Area (Pasture / Shrub)	150	535
Pervious Area (Landscaped)	75	503

Using the procedures outlined in the SWM Planning & Design Manual for each of the above land uses and soil types, the annual change in storage is 0. Groundwater storage is the lowest in September for all land use types, and highest from March to May and December to February. The monthly distributions of ST are presented in **Table 2, Appendix C**.

Evapotranspiration (Et)

Monthly Potential Evapotranspiration (PET) is estimated using monthly temperature data and is defined as a water loss from a homogeneous vegetation-covered area that never lacks water (Thornthwaite,1948; Mather, 1978). In the Thornthwaite water balance model, PET is calculated using the Thornthwaite equation (1948);

PET = 16 (L/12) x (N/30) x (10T/I)a

Where:

T = the monthly mean temperature in degrees Celsius

N = the number of days in the month

L = the mean monthly hours of daylight

a = (6.75x10-7)I3 - (7.71x10-5)I2 + (1.792 x 10-2)I + 0.49239

I = Sum of 12 monthly heat index values = (T/5)1.514

The calculated unadjusted annual PET for the study area is 495.6 mm/year. Applying daylight correction values for a latitude of 44o, a total adjusted PET is calculated at 576 or about 73% of the total precipitation. A comparison between PET and Precipitation (P) produces a soil moisture deficit in the order of 110 mm by September.

The calculated Actual Evapotranspiration (AET) is based on PET and changes in ST (Δ ST). Where there is not enough P to satisfy PET, a reduction in ST occurs. As a result, volumes of AET are less than PET. The monthly distribution of ST for the land use/soil types representing existing conditions over the wetland catchment produced an annual AET of 556 mm/yr (Forest), 535 mm/yr (Pasture & Shrub) and 503 mm/yr (Landscaped surface).

Precipitation Surplus (S)

Precipitation surplus for pervious surfaces is calculated as P-AET. A surplus of 238 to 290 mm/year is calculated for the various pervious surfaces. Precipitation surplus for impervious surfaces is calculated as P-ET. A surplus of 674 mm/year (85% of P) is calculated for impervious areas and 119 mm/year (15% of P), is considered for evaporation.

Infiltration (I) and Runoff (R)

For pervious areas, precipitation surplus has two (2) components in the Thornthwaite model: a runoff component (overland flow that occurs when soil moisture capacity is exceeded), and an infiltration component. The accumulation of infiltration factors for topography, soil types and cover as detailed in

Table 3.1 of the SWM Planning & Design Manual, give infiltration factors for existing conditions on the Site as described below in **Table 4-4**.

Table 4-4 Existing Conditions – Infiltration Factor

Land uses / soil types	Topography	Soil	Cover	Total infiltration factor
Pervious Area (Forest) / Fine Sandy Loam	0.30	0.30	0.20	0.80
Pervious Area (Pasture & Shrub) / Fine Sandy Loam	0.30	0.30	0.15	0.75
Pervious Area (Landscaped) / Fine Sandy Loam	0.30	0.30	0.05	0.65

Considering the above infiltration factors, the respective total annual volume of infiltration for the wetland catchment is estimated to be 11,738 m^3/year.

The runoff component calculated in the pre-development model is the remaining volume of precipitation surplus following infiltration. Considering the precipitation surpluses and the total infiltration volume, the total annual volume of runoff directed to the wetland catchment is estimated as 23,772 m^3/year.

Detailed calculations and the monthly distribution of infiltration and runoff are presented in **Table 2, Appendix C**.

4.3.2 Post-development Water Balance

The majority of the post-development wetland catchment stays the same with the exception of an increase of impervious surface (1,240 m2) and a decrease in pasture & shrub and Landscaped surface (1,643 and 214 m2), respectively. A summary of post-development wetland catchment land uses is provided in table 4-2. To predict outputs of the post-development water balance, the same 30-year average climate data and Site latitude inputs were used. Various inputs and outputs of the post-development model are presented in **Table 3, Appendix C**.

Storage (St), Evaporation/Evapotranspiration (Et/AET) and Precipitation Surplus (S)

The same land uses, soil types and respective water holding capacities used in the pre-development water balance were chosen to represent proposed conditions and applied to March for monthly calculations. The calculated Evaporation and Actual Evapotranspiration (Et/AET) for each of the pervious land uses in the post-development water balance is also the same as those described in the pre-development water balance. The monthly distributions of ST are presented in **Table 3, Appendix C**.

Infiltration (I) and Runoff (R)

In the post-development water balance, the accumulation of infiltration factors for topography, soil types and cover are the same as those described in the pre-development water balance. A 10% reduction in the infiltration factor is included to account for soil compaction during construction post-development infiltration factors are provided below in **Table 4-5**.

Table 4-5 Existing Conditions – Infiltration Factor

Land uses / soil types	Topography	Soil	Cover	10% Reduction	Total infiltration factor
Pervious Area (Forest) / Fine Sandy Loam	0.30	0.30	0.20	-	0.80
Pervious Area (Pasture & Shrub) / Fine Sandy Loam	0.30	0.30	0.15	-	0.75
Pervious Area (Landscaped) / Fine Sandy Loam	0.30	0.30	0.05	-	0.65
Pervious Area (Landscaped) / Fine Sandy Loam	0.30	0.30	0.05	- 0.065	0.585

Considering the above infiltration factors, the respective total annual volume of infiltration for the post-development wetland catchment is estimated to be 11,303 m^3/year.

The runoff component calculated in the post-development model is the remaining volume of precipitation surplus following infiltration. Considering the precipitation surpluses and the total infiltration volume, the total runoff directed to the post-development wetland catchment is estimated at 24,557 m^3/year. Detailed calculations and the monthly distribution of infiltration and runoff are presented in **Table 3, Appendix C**.

4.3.3 Water Balance Summary

The results of the pre and post-development water balance shows there is a small infiltration deficit within the developable area of the Site of 435 m^3/yr. This area is completely within the wetland catchment. The water balance also shows there to be an increase in the volume of runoff directed to the wetland estimated at 785 m^3/yr. These changes to wetland hydrology are the result of increases in impervious surface following development. Results of the analysis are summarised below in **Table 4-6**. The detailed calculations are presented in **Table 5, Appendix C**.

Table 4-6 Summary of Water Balance Analysis- Pre-Development and Post-Development

Characteristic	Pre-Development	Post-Development	Change (Pre- to Post Development)
Proposed Development Area (m^2)	89,950	89,950	0
Precipitation (m^3/year)	71,366	71,366	0
Total Evapotranspiration (m^3/year)	0	448	-448
Total Evaporation (m^3/year)	541	438	103
Total Infiltration (m^3/year)	306	128	179
Total Runoff (m^3/year)	2,758	2,591	167

Note: - ve values represent an increase pre to post-development

4.3.4 Post-development Water Balance With Mitigation

To maintain infiltration across the Site and the wetland catchment, a LID strategy has been provided by Tatham in their Stormwater Management Report for the Site. The strategy relies on the use of a rain garden with a stone storage reservoir with the following dimensions.

Length: 90m
Width: 1.5m
Depth: 0.6m
Void Ratio: 40%
Storage: 27m^3 (reported)

Sizing of the facility considered an assumed 15mm/hr infiltration rate including a safety factor of 2. Considering the facilities depth and void ratio, there is a total water depth of 0.24m. Applying the 15mm/hr infiltration rate, the calculated total drawdown time is 1.6 hours and is considered suitable.

The rain garden is designed to accept runoff from the proposed building roofs with a total area of 3000 m^2. Given the size of the drainage area and the storage volume of the rain garden (27 m^3), it is estimated that the reservoir is sized to store a rainfall depth of approximately 9 mm. Using estimated values from Figure 1a - % of Total Annual Average Rainfall Depth Vs. Daily Rainfall Amounts (Wet Weather Flow Management Guidelines, City of Toronto, 2006), the gallery will store roof runoff totally about 67% of the total annual rainfall depth.

Based on the above details, it is estimated that the runoff available for infiltration via the rain garden is 1,416 m^3/yr. Detailed calculations and the monthly distribution of the mitigated water balance for areas contributing to the rain garden are provided in **Table 4, Appendix C**.

As a result of applying the infiltration benefits of the rain garden, the total site infiltration deficit is removed and an increase in annual site infiltration of 982 m^3/yr is estimated. The increased infiltration has a negative effect on available runoff to the wetland with a pre to post-development runoff deficit estimated at 631 m^3/yr. A summary of water balance results is provided in **Table 5, Appendix C**.

5. CONCLUSIONS AND RECOMMENDATIONS

Based on results of this Wetland Risk Evolution, the proposed development will maintain the size of the wetland catchment and will slightly increase impervious surfaces by approximately 1%. Using Wetland Water Balance Risk Evaluation guidelines (TRCA, Nov 2017), the magnitude of hydrologic change is considered low risk. As a result, the feature based water balance assessment completed in this report is considered acceptable given the low level of risk to the wetland.

The mitigated water balance completed for the wetland catchment shows there is an increase in annual site infiltration of 982 m^3/yr and a decrease in runoff estimated at 631 m^3/yr. Considering that the reduction in runoff is small (2.7% of the total annual runoff available to the wetland), and the increase in infiltration upgradient of the wetland provides additional groundwater contributions, potential risks to the wetland are considered very low. The LID design provided by Tatham appears to provide a suitable amount of mitigation to mitigate potential risks to the wetland.

6. GENERAL COMMENTS AND LIMITATIONS OF REPORT

GBS should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, GBS will assume no responsibility for interpretation of the recommendations in the report.

This report is intended solely for the Client named and the owner of the Site who is understood to be Integricon Property Restoration and Construction Group Inc. The material in it reflects our best judgment in light of the information available to GBS at the time of preparation. Unless otherwise agreed in writing by GBS, it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

The conclusions and recommendations given in this report are based on designs and information made available to GBS at the time of writing. The information contained herein in no way reflects on the environmental aspects of the project, including any subsurface and/or groundwater conditions.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. GBS accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

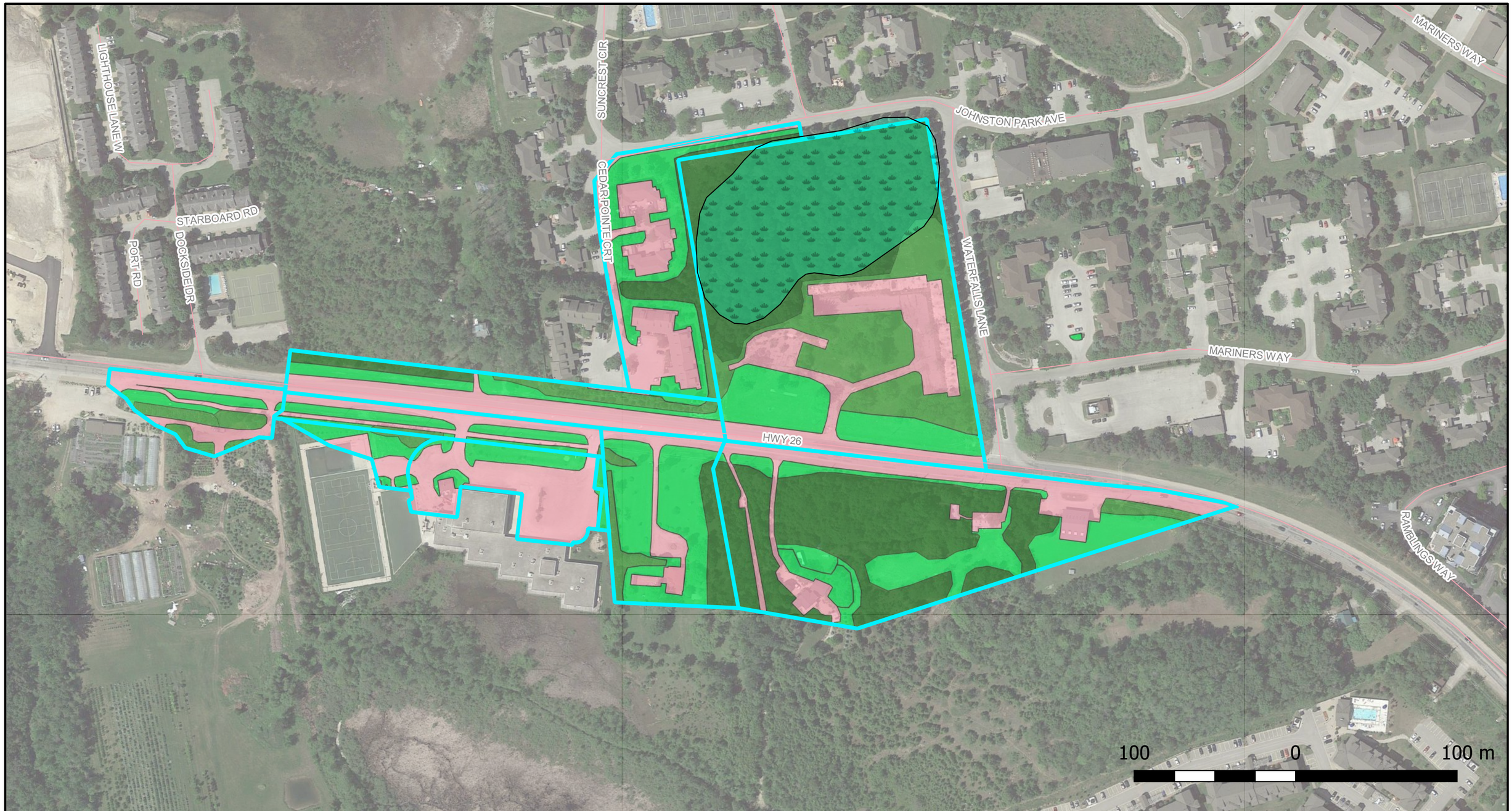
We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact this office.

GeoBase Solutions (GBS) Ltd.

Prepared By:

Scott Watson, B.A.T .
Principal

Figures



Legend

- Pre-Development Wetland Catchment
- Subject Wetland
- Impervious Surface
- Landscaped Surface
- Pasture & Shrub
- Mature Forest

GeoBase Solutions Ltd.
73 Pear Blossom Way
Holland Landing, ON L9N 0T1
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info@geobasesolutions.ca

Project: Wetland Water Balance Study
11476 Highway 26, Collingwood, Ontario

Title: Pre-Development Conceptual Model

N

Client: DS Consultants Ltd.

Size:	Approved By:	Drawn By:	Date:
11x17	N.E	S.W	March 2025
Rev. 0	Scale: As Shown	Project No.: 25-008-100	Figure No.: 1
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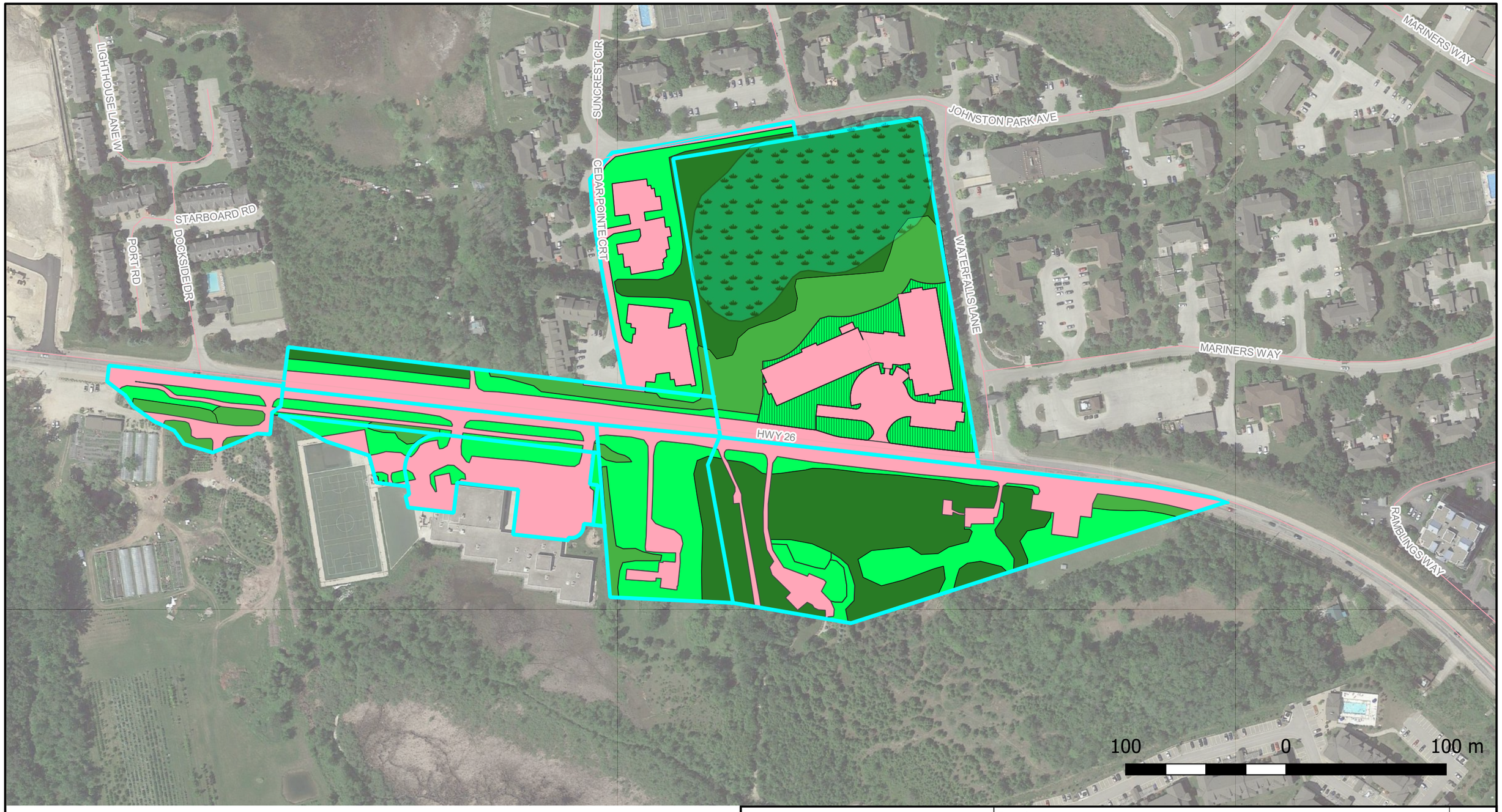

Legend

- Post-Development Wetland Catchment
- Subject Wetland
- Impervious Surface
- Mature Forest
- Pasture & Shrub
- Landscaped Surface
- Landscaped Surface (10% reduction in infiltration)

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info@geobasesolutions.ca

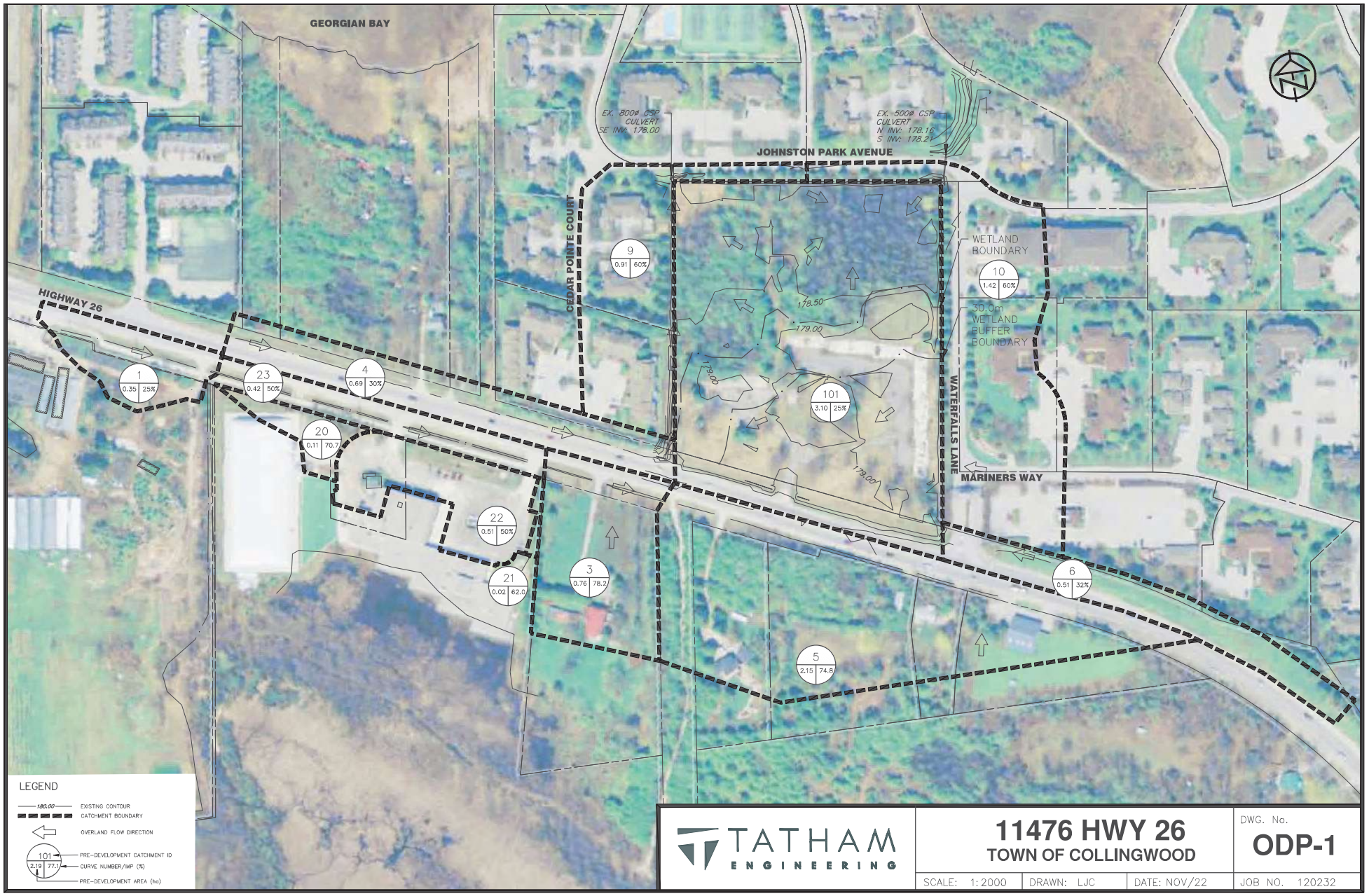
Project: Wetland Water Balance Study
11476 Highway 26, Collingwood, Ontario

Title: Post-Development Conceptual Model

Client: DS Consultants Ltd.

Size:	Approved By:	Drawn By:	Date:
11x17	N.E	S.W	March 2025
Rev. 0	Scale: As Shown	Project No.: 25-008-100	Figure No.: 2
	Image/Map Source: Google Satellite Image		

Appendix A



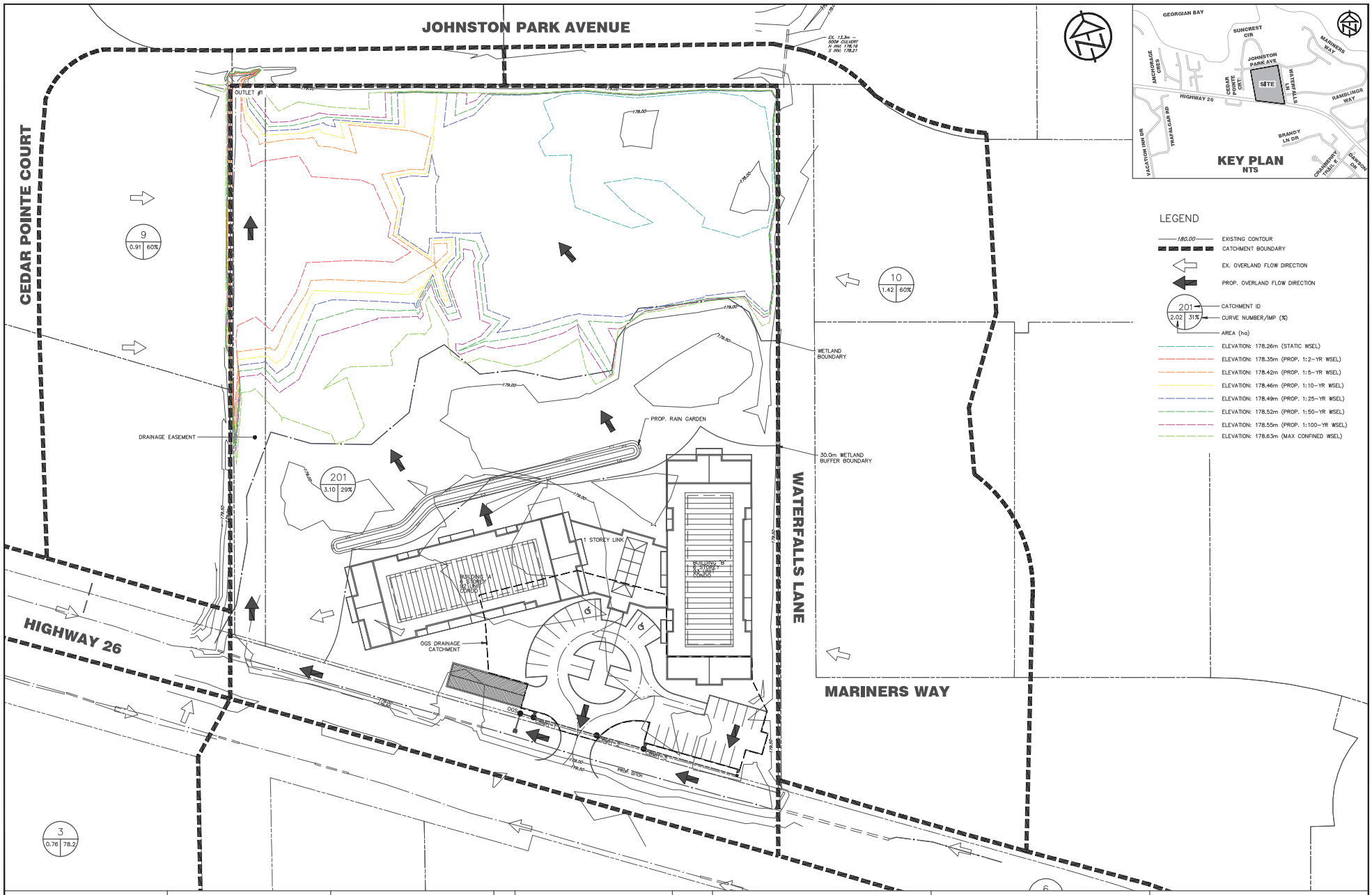
TATHAM ENGINEERING

11476 HWY 26
TOWN OF COLLINGWOOD

DWG. No. **ODP-1**

SCALE: 1:2000	DRAWN: LJC	DATE: NOV/22	JOB NO. 120232

Appendix B



BENCHMARKS

NOTES
REFER TO OVERALL DRAINAGE PLAN (DRAWING ODP-1) FOR EXTERNAL CATCHMENT AREAS.

No.	REVISION DESCRIPTION	DATE

ENGINEER STAMP

11476 HWY 26
TOWN OF COLLINGWOOD

POST-DEVELOPMENT DRAINAGE PLAN

TATHAM ENGINEERING

DESIGN: LB	FILE: 120232	DWG: DP-2
DRAWN: LJC	DATE: OCT 2022	
CHECK: RS	SCALE: 1:500	

Drawing Name: 120232-DP02.dwg, Plotted: Dec 12, 2023

Appendix C

TABLE 1

CLIMATE NORMALS 1991-2020 (EGBERT CLIMATE STATION)

11476 Highway 26, Collingwood, ON

Station	Climate ID	WMO ID	TC ID	Latitude	Longitude	Elevation (m)
EGBERT	6.11E+03	71296	XET	44°14'00.0	79°47'00.000" W	251

	Thornthwaite (1948)					
Month	Mean Temperature (°C)	Heat Index	Unadjusted Potential Evapotranspiration (mm)	Daylight Correction Value	Adjusted Potential Evapotranspiration (mm)	Total Precipitation (mm)
January	-7.2	0.0	0.0	0.77	0.0	54.7
February	-6.4	0.0	0.0	0.87	0.0	44.7
March	-1.3	0.0	0.0	0.99	0.0	47.9
April	5.6	1.2	25.7	1.12	28.7	61.6
May	12.3	3.9	59.4	1.23	72.9	73.9
June	17.5	6.7	86.4	1.29	111.0	83.0
July	20.1	8.2	100.1	1.26	126.0	77.9
August	19.2	7.7	95.3	1.16	111.0	82.6
September	15.3	5.4	74.9	1.04	78.1	72.3
October	8.9	2.4	42.1	0.92	38.6	65.4
November	2.7	0.4	11.8	0.81	9.5	71.8
December	-3.2	0.0	0.0	0.75	0.0	57.6
TOTALS		**35.9**	**495.6**		**576.0**	**793.4**

Notes: Daylight Correction values obtained from Instruction and Tables For Computing Potential Evapotranspiration and The Water Balance (Thornthwaite & Mather, 1957)

TABLE 2
PRE-DEVELOPMENT SITE WATER BALANCE
11476 Highway 26, Collingwood, ON

Catchments and Hydrologic Components		Month												Total
		March	April	May	June	July	August	September	October	November	December	January	February	
PET - Adjusted Potential Evapotranspiration (mm)		0.00	28.75	72.93	111.04	125.97	111.03	78.08	38.64	9.54	0.00	0.00	0.00	**576**
P - Total Precipitation (mm)		47.90	61.60	73.90	83.00	77.90	82.60	72.30	65.40	71.80	57.60	54.70	44.70	**793**
P-PET (mm)		47.90	32.85	0.97	-28.04	-48.07	-28.43	-5.78	26.76	62.26	57.60	54.70	44.70	-
Soil Moisture Deficit (mm)		0.00	0.00	0.00	-28.04	-76.10	-104.53	-110.32	-83.55	-21.29	0.00	0.00	0.00	-
Wetland Catchment	Pervious Area (Forest)													
	Soil Moisture Storage (mm)	300.00	300.00	300.00	271.96	223.90	195.47	189.68	216.45	278.71	300.00	300.00	300.00	-
	Actual Potential Evapotranspiration (mm)	0.00	28.75	72.93	109.73	117.62	102.47	76.01	38.64	9.54	0.00	0.00	0.00	**556**
	P-AET (mm)	47.90	32.85	0.97	-26.73	-39.72	-19.87	-3.71	26.76	62.26	57.60	54.70	44.70	**238**
	Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-26.73	-66.45	-86.32	-90.03	-63.27	-1.00	0.00	0.00	0.00	-
	Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	26.73	39.72	19.87	3.71	-26.76	-62.26	-1.00	0.00	0.00	-
	Precipitation Surplus (mm)	47.90	32.85	0.97	0.00	0.00	0.00	0.00	0.00	0.00	56.60	54.70	44.70	**238**
	MECP Infiltration Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	-
	Run-Off Coefficient	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-
	Infiltration (mm)	38.32	26.28	0.78	0.00	0.00	0.00	0.00	0.00	0.00	45.28	43.76	35.76	**190**
	Run-Off (mm)	9.58	6.57	0.19	0.00	0.00	0.00	0.00	0.00	0.00	11.32	10.94	8.94	**48**
	Catchment Area (m^2) = 28814	Monthly Volumes (Pervious Area)												
	AET (m^3)	0.00	828.38	2101.33	3161.69	3389.26	2952.59	2190.23	1113.25	274.80	0.00	0.00	0.00	**16012**
	Infiltration (m^3)	1104.16	757.26	22.44	0.00	0.00	0.00	0.00	0.00	0.00	1304.60	1260.91	1030.40	**5480**
	Run-Off (m^3)	276.04	189.32	5.61	0.00	0.00	0.00	0.00	0.00	0.00	326.15	315.23	257.60	**1370**
	Pervious Area (Pasture / Shrub)													
	Soil Moisture Storage (mm)	150.00	150.00	150.00	121.96	73.90	45.47	39.68	66.45	128.71	150.00	150.00	150.00	-
	Actual Potential Evapotranspiration (mm)	0.00	28.75	72.93	108.42	109.28	93.91	73.94	38.64	9.54	0.00	0.00	0.00	**535**
	P-AET (mm)	47.90	32.85	0.97	-25.42	-31.38	-11.31	-1.64	26.76	62.26	57.60	54.70	44.70	**258**
	Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-25.42	-56.80	-68.11	-69.75	-42.99	0.00	0.00	0.00	0.00	-
	Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	25.42	31.38	11.31	1.64	-26.76	-42.99	0.00	0.00	0.00	-
	Precipitation Surplus (mm)	47.90	32.85	0.97	0.00	0.00	0.00	0.00	0.00	19.28	57.60	54.70	44.70	**258**
	MECP Infiltration Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	-
	Run-Off Coefficient	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	-
	Infiltration (mm)	35.93	24.64	0.73	0.00	0.00	0.00	0.00	0.00	14.46	43.20	41.03	33.53	**194**
	Run-Off (mm)	11.98	8.21	0.24	0.00	0.00	0.00	0.00	0.00	4.82	14.40	13.68	11.18	**65**
	Catchment Area (m^2) = 10074	Monthly Volumes (Pervious Area)												
	AET (m^3)	0.00	289.61	734.63	1092.14	1100.86	946.02	744.86	389.20	96.07	0.00	0.00	0.00	**5393**
	Infiltration (m^3)	361.89	248.20	7.35	0.00	0.00	0.00	0.00	0.00	145.65	435.18	413.27	337.72	**1949**
	Run-Off (m^3)	120.63	82.73	2.45	0.00	0.00	0.00	0.00	0.00	48.55	145.06	137.76	112.57	**650**
	Pervious Area (Landscaped)													
	Soil Moisture Storage (mm)	75.00	75.00	75.00	46.96	0.00	0.00	0.00	26.76	75.00	75.00	75.00	75.00	-
	Actual Potential Evapotranspiration (mm)	0.00	28.75	72.93	105.80	92.95	82.60	72.30	38.64	9.54	0.00	0.00	0.00	**503**
	P-AET (mm)	47.90	32.85	0.97	-22.80	-15.05	0.00	0.00	26.76	62.26	57.60	54.70	44.70	**290**
	Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-22.80	-37.85	-37.85	-37.85	-11.08	0.00	0.00	0.00	0.00	-
	Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	22.80	15.05	0.00	0.00	-26.76	-11.08	0.00	0.00	0.00	-
	Precipitation Surplus (mm)	47.90	32.85	0.97	0.00	0.00	0.00	0.00	0.00	51.18	57.60	54.70	44.70	**290**
	MECP Infiltration Factor	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	-
	Run-Off Coefficient	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	-
	Infiltration (mm)	31.14	21.35	0.63	0.00	0.00	0.00	0.00	0.00	33.27	37.44	35.56	29.06	**188**
	Run-Off (mm)	16.77	11.50	0.34	0.00	0.00	0.00	0.00	0.00	17.91	20.16	19.15	15.65	**101**
	Catchment Area (m^2) = 22865	Monthly Volumes (Pervious Area)												
	AET (m^3)	0.00	657.33	1667.43	2418.98	2125.25	1888.61	1653.11	883.38	218.06	0.00	0.00	0.00	**11512**
	Infiltration (m^3)	711.89	488.23	14.47	0.00	0.00	0.00	0.00	0.00	760.67	856.05	812.95	664.33	**4309**
	Run-Off (m^3)	383.32	262.89	7.79	0.00	0.00	0.00	0.00	0.00	409.59	460.95	437.74	357.72	**2320**
	Impervious Area (Buildings and Driveway)													
	Precipitation Surplus (mm)	47.90	61.60	73.90	83.00	77.90	82.60	72.30	65.40	71.80	57.60	54.70	44.70	**793**
	Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
	Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
	Evaporation (mm)	7.19	9.24	11.09	12.45	11.69	12.39	10.85	9.81	10.77	8.64	8.21	6.71	**119**
	Run-Off (mm)	40.72	52.36	62.82	70.55	66.22	70.21	61.46	55.59	61.03	48.96	46.50	38.00	**674**
	Catchment Area (m^2) = 28814	Monthly Volumes (Impervious Area)												
	Evaporation (m^3)	207.03	266.24	319.41	358.74	336.69	357.01	312.49	282.67	310.33	248.96	236.42	193.20	**3429**
	Run-Off (m^3)	1173.17	1508.71	1809.97	2032.85	1907.94	2023.05	1770.78	1601.78	1758.53	1410.75	1339.72	1094.80	**19432**
		Total Catchment Volumes												
	Total AET (m^3)	0.00	1775.32	4503.39	6672.81	6615.37	5787.23	4588.19	2385.82	588.92	0.00	0.00	0.00	**32917**
	Total Evaporation (m^3)	207.03	266.24	319.41	358.74	336.69	357.01	312.49	282.67	310.33	248.96	236.42	193.20	**3429**
	Total Infiltration (m^3)	2177.94	1493.68	44.26	0.00	0.00	0.00	0.00	0.00	906.31	2595.82	2487.13	2032.44	**11738**
	Total Runoff (m^3)	1953.17	2043.65	1825.82	2032.85	1907.94	2023.05	1770.78	1601.78	2216.67	2342.90	2230.44	1822.69	**23772**

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TABLE 3
POST-DEVELOPMENT SITE WATER BALANCE
11476 Highway 26, Collingwood, ON

Catchments and Hydrologic Components			Month											Total
			March	April	May	June	July	August	September	October	November	December	January	February	
		PET - Adjusted Potential Evapotranspiration (mm)	0.00	28.75	72.93	111.04	125.97	111.03	78.08	38.64	9.54	0.00	0.00	0.00	**576**
		P - Total Precipitation (mm)	47.90	61.60	73.90	83.00	77.90	82.60	72.30	65.40	71.80	57.60	54.70	44.70	**793**
		P-PET (mm)	47.90	32.85	0.97	-28.04	-48.07	-28.43	-5.78	26.76	62.26	57.60	54.70	44.70	-
		Soil Moisture Deficit (mm)	0.00	0.00	0.00	-28.04	-76.10	-104.53	-110.32	-83.55	-21.29	0.00	0.00	0.00	-
Wetland Catchment	Pervious Area (Forest)	Soil Moisture Storage (mm)	300.00	300.00	300.00	271.96	223.90	195.47	189.68	216.45	278.71	300.00	300.00	300.00	-
		Actual Potential Evapotranspiration (mm)	0.00	28.75	72.93	109.73	117.62	102.47	76.01	38.64	9.54	0.00	0.00	0.00	**556**
		P-AET (mm)	47.90	32.85	0.97	-26.73	-39.72	-19.87	-3.71	26.76	62.26	57.60	54.70	44.70	**238**
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-26.73	-66.45	-86.32	-90.03	-63.27	-1.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	26.73	39.72	19.87	3.71	-26.76	-62.26	-1.00	0.00	0.00	-
		Precipitation Surplus (mm)	47.90	32.85	0.97	0.00	0.00	0.00	0.00	0.00	0.00	56.60	54.70	44.70	**238**
		MECP Infiltration Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	-
		Run-Off Coefficient	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-
		Infiltration (mm)	38.32	26.28	0.78	0.00	0.00	0.00	0.00	0.00	0.00	45.28	43.76	35.76	**190**
		Run-Off (mm)	9.58	6.57	0.19	0.00	0.00	0.00	0.00	0.00	0.00	11.32	10.94	8.94	**48**
		Catchment Area (m^2) = 28814	Monthly Volumes (Pervious Area)												
		AET (m^3)	0.00	828.38	2101.33	3161.69	3389.26	2952.59	2190.23	1113.25	274.80	0.00	0.00	0.00	**16012**
		Infiltration (m^3)	1104.16	757.26	22.44	0.00	0.00	0.00	0.00	0.00	0.00	1304.60	1260.91	1030.40	**5480**
		Run-Off (m^3)	276.04	189.32	5.61	0.00	0.00	0.00	0.00	0.00	0.00	326.15	315.23	257.60	**1370**
	Pervious Area (Pasture / Shrub)	Soil Moisture Storage (mm)	150.00	150.00	150.00	121.96	73.90	45.47	39.68	66.45	128.71	150.00	150.00	150.00	-
		Actual Potential Evapotranspiration (mm)	0.00	28.75	72.93	108.42	109.28	93.91	73.94	38.64	9.54	0.00	0.00	0.00	**535**
		P-AET (mm)	47.90	32.85	0.97	-25.42	-31.38	-11.31	-1.64	26.76	62.26	57.60	54.70	44.70	**258**
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-25.42	-56.80	-68.11	-69.75	-42.99	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	25.42	31.38	11.31	1.64	-26.76	-42.99	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	47.90	32.85	0.97	0.00	0.00	0.00	0.00	0.00	19.28	57.60	54.70	44.70	**258**
		MECP Infiltration Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	-
		Run-Off Coefficient	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	-
		Infiltration (mm)	35.93	24.64	0.73	0.00	0.00	0.00	0.00	0.00	14.46	43.20	41.03	33.53	**194**
		Run-Off (mm)	11.98	8.21	0.24	0.00	0.00	0.00	0.00	0.00	4.82	14.40	13.68	11.18	**65**
		Catchment Area (m^2) = 8431	Monthly Volumes (Pervious Area)												
		AET (m^3)	0.00	242.37	614.81	914.01	921.30	791.72	623.36	325.72	80.40	0.00	0.00	0.00	**4514**
		Infiltration (m^3)	302.87	207.71	6.15	0.00	0.00	0.00	0.00	0.00	121.89	364.20	345.86	282.63	**1631**
		Run-Off (m^3)	100.96	69.24	2.05	0.00	0.00	0.00	0.00	0.00	40.63	121.40	115.29	94.21	**544**
	Pervious Area (Landscaped)	Soil Moisture Storage (mm)	75.00	75.00	75.00	46.96	0.00	0.00	0.00	26.76	75.00	75.00	75.00	75.00	-
		Actual Potential Evapotranspiration (mm)	0.00	28.75	72.93	105.80	92.95	82.60	72.30	38.64	9.54	0.00	0.00	0.00	**503**
		P-AET (mm)	47.90	32.85	0.97	-22.80	-15.05	0.00	0.00	26.76	62.26	57.60	54.70	44.70	**290**
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-22.80	-37.85	-37.85	-37.85	-11.08	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	22.80	15.05	0.00	0.00	-26.76	-11.08	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	47.90	32.85	0.97	0.00	0.00	0.00	0.00	0.00	51.18	57.60	54.70	44.70	**290**
		MECP Infiltration Factor	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	-
		Run-Off Coefficient	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	-
		Infiltration (mm)	31.14	21.35	0.63	0.00	0.00	0.00	0.00	0.00	33.27	37.44	35.56	29.06	**188**
		Run-Off (mm)	16.77	11.50	0.34	0.00	0.00	0.00	0.00	0.00	17.91	20.16	19.15	15.65	**101**
		Catchment Area (m^2) = 18595	Monthly Volumes (Pervious Area)												
		AET (m^3)	0.00	534.60	1356.09	1967.32	1728.43	1535.97	1344.44	718.44	177.34	0.00	0.00	0.00	**9363**
		Infiltration (m^3)	578.97	397.07	11.77	0.00	0.00	0.00	0.00	0.00	618.64	696.21	661.16	540.29	**3504**
		Run-Off (m^3)	311.75	213.81	6.34	0.00	0.00	0.00	0.00	0.00	333.11	374.88	356.01	290.92	**1887**

GeoBase Solutions (GBS) Ltd.

TABLE 3
POST-DEVELOPMENT SITE WATER BALANCE
11476 Highway 26, Collingwood, ON

Catchments and Hydrologic Components			Month											Total
			March	April	May	June	July	August	September	October	November	December	January	February	
		PET - Adjusted Potential Evapotranspiration (mm)	0.00	28.75	72.93	111.04	125.97	111.03	78.08	38.64	9.54	0.00	0.00	0.00	**576**
		P - Total Precipitation (mm)	47.90	61.60	73.90	83.00	77.90	82.60	72.30	65.40	71.80	57.60	54.70	44.70	**793**
		P-PET (mm)	47.90	32.85	0.97	-28.04	-48.07	-28.43	-5.78	26.76	62.26	57.60	54.70	44.70	-
		Soil Moisture Deficit (mm)	0.00	0.00	0.00	-28.04	-76.10	-104.53	-110.32	-83.55	-21.29	0.00	0.00	0.00	-
Wetland Catchment	Pervious Area (Landscaped with 10% reduction in infiltration)	Soil Moisture Storage (mm)	75.00	75.00	75.00	46.96	0.00	0.00	0.00	26.76	75.00	75.00	75.00	75.00	-
		Actual Potential Evapotranspiration (mm)	0.00	28.75	72.93	105.80	92.95	82.60	72.30	38.64	9.54	0.00	0.00	0.00	**503**
		P-AET (mm)	47.90	32.85	0.97	-22.80	-15.05	0.00	0.00	26.76	62.26	57.60	54.70	44.70	**290**
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-22.80	-37.85	-37.85	-37.85	-11.08	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	22.80	15.05	0.00	0.00	-26.76	-11.08	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	47.90	32.85	0.97	0.00	0.00	0.00	0.00	0.00	51.18	57.60	54.70	44.70	**290**
		MECP Infiltration Factor	0.585	0.585	0.585	0.585	0.585	0.585	0.585	0.585	0.585	0.585	0.585	0.585	-
		Run-Off Coefficient	0.415	0.415	0.415	0.415	0.415	0.415	0.415	0.415	0.415	0.415	0.415	0.415	-
		Infiltration (mm)	28.02	19.22	0.57	0.00	0.00	0.00	0.00	0.00	29.94	33.70	32.00	26.15	**170**
		Run-Off (mm)	19.88	13.63	0.40	0.00	0.00	0.00	0.00	0.00	21.24	23.90	22.70	18.55	**120**
		Catchment Area (m^2) = **4055**	**Monthly Volumes (Pervious Area)**												
		AET (m^3)	0.00	116.58	295.72	429.00	376.91	334.94	293.18	156.67	38.67	0.00	0.00	0.00	**2042**
		Infiltration (m^3)	113.63	77.93	2.31	0.00	0.00	0.00	0.00	0.00	121.41	136.64	129.76	106.04	**688**
		Run-Off (m^3)	80.61	55.28	1.64	0.00	0.00	0.00	0.00	0.00	86.13	96.93	92.05	75.22	**488**
	Impervious Area (Buildings and Driveway)	Precipitation Surplus (mm)	47.90	61.60	73.90	83.00	77.90	82.60	72.30	65.40	71.80	57.60	54.70	44.70	**793**
		Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
		Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
		Evaporation (mm)	7.19	9.24	11.09	12.45	11.69	12.39	10.85	9.81	10.77	8.64	8.21	6.71	**119**
		Run-Off (mm)	40.72	52.36	62.82	70.55	66.22	70.21	61.46	55.59	61.03	48.96	46.50	38.00	**674**
		Catchment Area (m^2) = **30054**	**Monthly Volumes (Impervious Area)**												
		Evaporation (m^3)	215.94	277.70	333.15	374.18	351.18	372.37	325.94	294.83	323.68	259.67	246.60	201.51	**3577**
		Run-Off (m^3)	1223.66	1573.64	1887.86	2120.33	1990.04	2110.11	1846.98	1670.72	1834.21	1471.46	1397.37	1141.91	**20268**
			Total Catchment Volumes												
		Total AET (m^3)	0.00	1721.93	4367.95	6472.01	6415.90	5615.23	4451.21	2314.07	571.21	0.00	0.00	0.00	**31929**
		Total Evaporation (m^3)	215.94	277.70	333.15	374.18	351.18	372.37	325.94	294.83	323.68	259.67	246.60	201.51	**3577**
		Total Infiltration (m^3)	2099.62	1439.97	42.67	0.00	0.00	0.00	0.00	0.00	861.94	2501.64	2397.69	1959.35	**11303**
		Total Runoff (m^3)	1993.01	2101.28	1903.49	2120.33	1990.04	2110.11	1846.98	1670.72	2294.08	2390.82	2275.95	1859.87	**24557**

GeoBase Solutions (GBS) Ltd.

TABLE 4
POST-DEVELOPMENT SITE WATER BALANCE WITH MITIGATION
11476 Highway 26, Collingwood, ON

Catchments and Hydrologic Components			Month											Total
			March	April	May	June	July	August	September	October	November	December	January	February	
		PET - Adjusted Potential Evapotranspiration (mm)	0.00	28.75	72.93	111.04	125.97	111.03	78.08	38.64	9.54	0.00	0.00	0.00	**576**
		P - Total Precipitation (mm)	47.90	61.60	73.90	83.00	77.90	82.60	72.30	65.40	71.80	57.60	54.70	44.70	**793**
		P-PET (mm)	47.90	32.85	0.97	-28.04	-48.07	-28.43	-5.78	26.76	62.26	57.60	54.70	44.70	-
		Soil Moisture Deficit (mm)	0.00	0.00	0.00	-28.04	-76.10	-104.53	-110.32	-83.55	-21.29	0.00	0.00	0.00	-
Wetland Catchment	Pervious Area (Forest)	Soil Moisture Storage (mm)	300.00	300.00	300.00	271.96	223.90	195.47	189.68	216.45	278.71	300.00	300.00	300.00	-
		Actual Potential Evapotranspiration (mm)	0.00	28.75	72.93	109.73	117.62	102.47	76.01	38.64	9.54	0.00	0.00	0.00	**556**
		P-AET (mm)	47.90	32.85	0.97	-26.73	-39.72	-19.87	-3.71	26.76	62.26	57.60	54.70	44.70	**238**
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-26.73	-66.45	-86.32	-90.03	-63.27	-1.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	26.73	39.72	19.87	3.71	-26.76	-62.26	-1.00	0.00	0.00	-
		Precipitation Surplus (mm)	47.90	32.85	0.97	0.00	0.00	0.00	0.00	0.00	0.00	56.60	54.70	44.70	**238**
		MECP Infiltration Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	-
		Run-Off Coefficient	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-
		Infiltration (mm)	38.32	26.28	0.78	0.00	0.00	0.00	0.00	0.00	0.00	45.28	43.76	35.76	**190**
		Run-Off (mm)	9.58	6.57	0.19	0.00	0.00	0.00	0.00	0.00	0.00	11.32	10.94	8.94	**48**
		Catchment Area (m^2) = 28814	Monthly Volumes (Pervious Area)												
		AET (m^3)	0.00	828.38	2101.33	3161.69	3389.26	2952.59	2190.23	1113.25	274.80	0.00	0.00	0.00	**16012**
		Infiltration (m^3)	1104.16	757.26	22.44	0.00	0.00	0.00	0.00	0.00	0.00	1304.60	1260.91	1030.40	**5480**
		Run-Off (m^3)	276.04	189.32	5.61	0.00	0.00	0.00	0.00	0.00	0.00	326.15	315.23	257.60	**1370**
	Pervious Area (Pasture / Shrub)	Soil Moisture Storage (mm)	150.00	150.00	150.00	121.96	73.90	45.47	39.68	66.45	128.71	150.00	150.00	150.00	-
		Actual Potential Evapotranspiration (mm)	0.00	28.75	72.93	108.42	109.28	93.91	73.94	38.64	9.54	0.00	0.00	0.00	**535**
		P-AET (mm)	47.90	32.85	0.97	-25.42	-31.38	-11.31	-1.64	26.76	62.26	57.60	54.70	44.70	**258**
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-25.42	-56.80	-68.11	-69.75	-42.99	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	25.42	31.38	11.31	1.64	-26.76	-42.99	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	47.90	32.85	0.97	0.00	0.00	0.00	0.00	0.00	19.28	57.60	54.70	44.70	**258**
		MECP Infiltration Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	-
		Run-Off Coefficient	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	-
		Infiltration (mm)	35.93	24.64	0.73	0.00	0.00	0.00	0.00	0.00	14.46	43.20	41.03	33.53	**194**
		Run-Off (mm)	11.98	8.21	0.24	0.00	0.00	0.00	0.00	0.00	4.82	14.40	13.68	11.18	**65**
		Catchment Area (m^2) = 8431	Monthly Volumes (Pervious Area)												
		AET (m^3)	0.00	242.37	614.81	914.01	921.30	791.72	623.36	325.72	80.40	0.00	0.00	0.00	**4514**
		Infiltration (m^3)	302.87	207.71	6.15	0.00	0.00	0.00	0.00	0.00	121.89	364.20	345.86	282.63	**1631**
		Run-Off (m^3)	100.96	69.24	2.05	0.00	0.00	0.00	0.00	0.00	40.63	121.40	115.29	94.21	**544**
	Pervious Area (Landscaped)	Soil Moisture Storage (mm)	75.00	75.00	75.00	46.96	0.00	0.00	0.00	26.76	75.00	75.00	75.00	75.00	-
		Actual Potential Evapotranspiration (mm)	0.00	28.75	72.93	105.80	92.95	82.60	72.30	38.64	9.54	0.00	0.00	0.00	**503**
		P-AET (mm)	47.90	32.85	0.97	-22.80	-15.05	0.00	0.00	26.76	62.26	57.60	54.70	44.70	**290**
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-22.80	-37.85	-37.85	-37.85	-11.08	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	22.80	15.05	0.00	0.00	-26.76	-11.08	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	47.90	32.85	0.97	0.00	0.00	0.00	0.00	0.00	51.18	57.60	54.70	44.70	**290**
		MECP Infiltration Factor	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	-
		Run-Off Coefficient	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	-
		Infiltration (mm)	31.14	21.35	0.63	0.00	0.00	0.00	0.00	0.00	33.27	37.44	35.56	29.06	**188**
		Run-Off (mm)	16.77	11.50	0.34	0.00	0.00	0.00	0.00	0.00	17.91	20.16	19.15	15.65	**101**
		Catchment Area (m^2) = 18595	Monthly Volumes (Pervious Area)												
		AET (m^3)	0.00	534.60	1356.09	1967.32	1728.43	1535.97	1344.44	718.44	177.34	0.00	0.00	0.00	**9363**
		Infiltration (m^3)	578.97	397.07	11.77	0.00	0.00	0.00	0.00	0.00	618.64	696.21	661.16	540.29	**3504**
		Run-Off (m^3)	311.75	213.81	6.34	0.00	0.00	0.00	0.00	0.00	333.11	374.88	356.01	290.92	**1887**

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GeoBase Solutions (GBS) Ltd.

TABLE 4
POST-DEVELOPMENT SITE WATER BALANCE WITH MITIGATION
11476 Highway 26, Collingwood, ON

Catchments and Hydrologic Components			Month											Total
			March	April	May	June	July	August	September	October	November	December	January	February	
		PET - Adjusted Potential Evapotranspiration (mm)	0.00	28.75	72.93	111.04	125.97	111.03	78.08	38.64	9.54	0.00	0.00	0.00	**576**
		P - Total Precipitation (mm)	47.90	61.60	73.90	83.00	77.90	82.60	72.30	65.40	71.80	57.60	54.70	44.70	**793**
		P-PET (mm)	47.90	32.85	0.97	-28.04	-48.07	-28.43	-5.78	26.76	62.26	57.60	54.70	44.70	-
		Soil Moisture Deficit (mm)	0.00	0.00	0.00	-28.04	-76.10	-104.53	-110.32	-83.55	-21.29	0.00	0.00	0.00	-
Wetland Catchment	Pervious Area (Landscaped with 10% reduction in infiltration)	Soil Moisture Storage (mm)	75.00	75.00	75.00	46.96	0.00	0.00	0.00	26.76	75.00	75.00	75.00	75.00	-
		Actual Potential Evapotranspiration (mm)	0.00	28.75	72.93	105.80	92.95	82.60	72.30	38.64	9.54	0.00	0.00	0.00	**503**
		P-AET (mm)	47.90	32.85	0.97	-22.80	-15.05	0.00	0.00	26.76	62.26	57.60	54.70	44.70	**290**
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-22.80	-37.85	-37.85	-37.85	-11.08	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	22.80	15.05	0.00	0.00	-26.76	-11.08	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	47.90	32.85	0.97	0.00	0.00	0.00	0.00	0.00	51.18	57.60	54.70	44.70	**290**
		MECP Infiltration Factor	0.585	0.585	0.585	0.585	0.585	0.585	0.585	0.585	0.585	0.585	0.585	0.585	-
		Run-Off Coefficient	0.415	0.415	0.415	0.415	0.415	0.415	0.415	0.415	0.415	0.415	0.415	0.415	-
		Infiltration (mm)	28.02	19.22	0.57	0.00	0.00	0.00	0.00	0.00	29.94	33.70	32.00	26.15	**170**
		Run-Off (mm)	19.88	13.63	0.40	0.00	0.00	0.00	0.00	0.00	21.24	23.90	22.70	18.55	**120**
		Catchment Area (m^2) = **4055**	**Monthly Volumes (Pervious Area)**												
		AET (m^3)	0.00	116.58	295.72	429.00	376.91	334.94	293.18	156.67	38.67	0.00	0.00	0.00	**2042**
		Infiltration (m^3)	113.63	77.93	2.31	0.00	0.00	0.00	0.00	0.00	121.41	136.64	129.76	106.04	**688**
		Run-Off (m^3)	80.61	55.28	1.64	0.00	0.00	0.00	0.00	0.00	86.13	96.93	92.05	75.22	**488**
	Impervious Area (Buildings and Driveway)	Precipitation Surplus (mm)	47.90	61.60	73.90	83.00	77.90	82.60	72.30	65.40	71.80	57.60	54.70	44.70	**793**
		Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
		Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
		Evaporation (mm)	7.19	9.24	11.09	12.45	11.69	12.39	10.85	9.81	10.77	8.64	8.21	6.71	**119**
		Run-Off (mm)	40.72	52.36	62.82	70.55	66.22	70.21	61.46	55.59	61.03	48.96	46.50	38.00	**674**
		Catchment Area (m^2) = **27054**	**Monthly Volumes (Impervious Area)**												
		Evaporation (m^3)	194.38	249.98	299.90	336.83	316.13	335.20	293.40	265.40	291.37	233.75	221.98	181.40	**3220**
		Run-Off (m^3)	1101.51	1416.56	1699.41	1908.68	1791.40	1899.48	1662.62	1503.95	1651.12	1324.58	1257.89	1027.93	**18245**
	Impervious Area (Buildings to Infiltration Chamber 2)	Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
		Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
		Evaporation (mm)	7.19	9.24	11.09	12.45	11.69	12.39	10.85	9.81	10.77	8.64	8.21	6.71	**119**
		Run-Off (mm)	40.72	52.36	62.82	70.55	66.22	70.21	61.46	55.59	61.03	48.96	46.50	38.00	**674**
		Catchment Area (m^2) = **3000**	**Monthly Volumes (Impervious Area)**												
		Evaporation (m^3)	21.56	27.72	33.26	37.35	35.06	37.17	32.54	29.43	32.31	25.92	24.62	20.12	**357**
		Infiltration - Efficiency ~ 67%	85.50	109.96	131.91	148.16	139.05	147.44	129.06	116.74	128.16	102.82	97.64	79.79	**1416**
		Run-Off (m^3)	36.64	47.12	56.53	63.50	59.59	63.19	55.31	50.03	54.93	44.06	41.85	34.20	**607**
			Total Catchment Volumes												
		Total AET (m^3)	0.00	1721.93	4367.95	6472.01	6415.90	5615.23	4451.21	2314.07	571.21	0.00	0.00	0.00	**31929**
		Total Evaporation (m^3)	215.94	277.70	333.15	374.18	351.18	372.37	325.94	294.83	323.68	259.67	246.60	201.51	**3577**
		Total Infiltration (m^3)	2185.12	1549.93	174.58	148.16	139.05	147.44	129.06	116.74	990.10	2604.46	2495.33	2039.14	**12719**
		Total Runoff (m^3)	1907.51	1991.33	1771.58	1972.17	1850.99	1962.67	1717.93	1553.98	2165.92	2288.00	2178.31	1780.08	**23140**

GeoBase Solutions (GBS) Ltd.

TABLE 5
WATER BUDGET SUMMARY
11476 Highway 26, Collingwood, ON

Total Site	Month												Total
	March	April	May	June	July	August	September	October	November	December	January	February	
Pre-Development													
Total AET (m^3)	0	1775	4503	6673	6615	5787	4588	2386	589	0	0	0	**32917**
Total ET (m^3)	207	266	319	359	337	357	312	283	310	249	236	193	**3429**
Total Infiltration (m^3)	2178	1494	44	0	0	0	0	0	906	2596	2487	2032	**11738**
Total Runoff (m^3)	1953	2044	1826	2033	1908	2023	1771	1602	2217	2343	2230	1823	**23772**
Post-Development without Mitigation													
Total AET (m^3)	0	1722	4368	6472	6416	5615	4451	2314	571	0	0	0	**31929**
Total ET (m^3)	216	278	333	374	351	372	326	295	324	260	247	202	**3577**
Total Infiltration (m^3)	2100	1440	43	0	0	0	0	0	862	2502	2398	1959	**11303**
Total Runoff (m^3)	1993	2101	1903	2120	1990	2110	1847	1671	2294	2391	2276	1860	**24557**
Post-Development Deficit without Mitigation (-ve value implies a net gain)													
Total AET (m^3)	0	53	135	201	199	172	137	72	18	0	0	0	**988**
Total ET (m^3)	-9	-11	-14	-15	-14	-15	-13	-12	-13	-11	-10	-8	**-148**
Total Infiltration (m^3)	78	54	2	0	0	0	0	0	44	94	89	73	**435**
Total Runoff (m^3)	-40	-58	-78	-87	-82	-87	-76	-69	-77	-48	-46	-37	**-785**
Post-Development Deficit with Mitigation													
Total AET (m^3)	0	1722	4368	6472	6416	5615	4451	2314	571	0	0	0	**31929**
Total ET (m^3)	216	278	333	374	351	372	326	295	324	260	247	202	**3577**
Total Infiltration (m^3)	2185	1550	175	148	139	147	129	117	990	2604	2495	2039	**12719**
Total Runoff (m^3)	1908	1991	1772	1972	1851	1963	1718	1554	2166	2288	2178	1780	**23140**
Post-Development Deficit with Mitigation (-ve value implies a net gain)													
Total AET (m^3)	0	53	135	201	199	172	137	72	18	0	0	0	**988**
Total ET (m^3)	-9	-11	-14	-15	-14	-15	-13	-12	-13	-11	-10	-8	**-148**
Total Infiltration (m^3)	-7	-56	-130	-148	-139	-147	-129	-117	-84	-9	-8	-7	**-982**
Total Runoff (m^3)	46	52	54	61	57	60	53	48	51	55	52	43	**631**

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