

November 10, 2022

Project No. 20412072-3000-1

Craig Bellinger, Environmental and Land Project Manager

R.W. Tomlinson Limited

100 Citigate Drive

Ottawa, Ontario

K2J 6K7

**MAXIMUM PREDICTED WATER TABLE REPORT
PROPOSED STORYLAND PIT
HORTON TOWNSHIP, ONTARIO**

Mr. Bellinger:

R.W. Tomlinson Limited (Tomlinson) is applying for a Class 'A' licence for a Pit Below the Groundwater Table under the *Aggregate Resources Act* (ARA) for the proposed Storyland Pit located at 432 Storyland Road and on Part of Lot 20, Concession 6, Horton Township, Ontario (site). The area proposed to be licensed under the ARA is 69.5 hectares (ha) and the proposed extraction area is 55.9 ha. The proposed boundaries of the licensed area and limit of extraction are shown on Figure 1. The proposed pit would be extracted to an elevation between 149 and 152 metres above sea level (asl).

This report summarizes the results of the groundwater level monitoring completed on the site to fulfill the requirements of the Maximum Predicted Water Table Report as described in the Aggregate Resources Ontario: Technical Reports and Information Standards dated August 2020. The qualifications and experience of the report authors are presented in Attachment 1.

1.0 GROUNDWATER ELEVATIONS

Six monitoring wells were installed by Golder between May 12 and 15, 2021 along the perimeter of the proposed extraction area to measure groundwater levels over the period of one year on the site (Golder 2021). An additional three monitoring wells were installed previously by Paterson Group between December 6 and 7, 2017 as part of the preliminary aggregate resource assessment (Paterson Group 2017). Groundwater levels were measured on a monthly basis by Golder (May 2021) and Tomlinson staff (June 2021 to May 2022 and provided to Golder). The top of the piezometer at each monitoring well location was surveyed to a Geodetic datum in order to allow for calculation of the groundwater elevation based on the measured depth to groundwater. The locations of the monitoring wells included in the groundwater monitoring program are shown on Figure 1.

The available groundwater elevation data measured as part of the ongoing groundwater level monitoring program for the site are described in Section 1.1 below. Figure 2 shows the groundwater elevations plotted versus time at BH 1, BH 3, BH 4, BH21-01, BH21-02, BH21-03, BH21-04, BH21-05 and BH21-06. The groundwater elevation data used to generate Figure 2 is provided in Table 1.

Table 1: Groundwater Elevations

Date	Groundwater Elevations (metres above sea level)								
	BH 1	BH 3	BH 4	BH21-01	BH21-02	BH21-03	BH21-04	BH21-05	BH21-06
25-May-21	162.40	160.50	159.53	159.55	163.79	165.02	164.52	162.83	162.67
21-Jun-21	162.27	160.43	159.42	159.53	163.60	164.73	164.31	162.69	162.53
15-Jul-21	162.37	160.57	159.50	159.62	163.71	164.78	164.28	162.69	162.60
27-Aug-21	162.23	160.40	159.37	159.52	163.42	164.66	164.31	162.55	162.41
23-Sep-21	162.10	160.28	159.27	159.44	163.29	164.38	163.96	162.42	162.24
12-Oct-21	162.15	160.23	159.21	159.38	163.39	164.44	163.97	162.41	162.25
8-Nov-21	162.14	160.22	159.19	159.36	163.40	164.45	163.98	162.39	162.23
14-Dec-21	162.07	160.18	159.22	159.33	163.42	164.39	163.94	162.35	162.17
27-Jan-21	162.01	160.14	¹	159.22	163.24	164.09	163.93	162.32	162.13
23-Feb-22	162.14	160.19	¹	159.28	163.49	164.43	164.10	162.46	162.21
30-Mar-22	162.24	160.23	159.21	159.33	163.56	165.27	164.13	162.52	162.35
11-Apr-22	162.33	160.27	159.23	159.36	163.67	165.06	164.36	162.60	162.49
10-May-22	162.86	²	159.59	159.67	164.20	165.23	164.65	163.03	163.23
14-Jun-22	162.79	160.81	159.70	159.85	164.40	165.29	164.65	163.06	163.37
11-Jul-22	162.73	160.92	159.86	160.05	164.07	165.06	164.49	163.04	163.07
3-Aug-22	162.46	160.71	159.70	159.95	163.75	164.76	164.25	162.85	162.76

Notes:

1. BH 4 was frozen during the January and February 2022 monitoring sessions, therefore groundwater elevation data is unavailable.
2. BH 3 was blocked during the May 2022 monitoring session, therefore groundwater elevation data is unavailable.

1.1 Discussion

Figure 2 presents groundwater elevation data measured at monitoring wells BH 1, BH 3, BH 4, BH21-01, BH21-02, BH21-03, BH21-04, BH21-05 and BH21-06 between May 25, 2021 and August 3, 2022. As shown on Figure 2, the groundwater elevations at all of the monitoring well locations are subject to seasonal fluctuations and varied between 0.7 and 1.3 metres. Groundwater depths range from 0.8 to 2.5 metres bgs along the western boundary (i.e., at BH21-03 and BH21-04) to 5.3 and 9.4 metres bgs along the eastern boundary of the site (i.e., at BH 3, BH 4 and BH21-01). Table 2 provides a summary of the maximum, minimum and total variation in groundwater elevations at each monitoring well.

Table 2: Groundwater Elevation Summary

	Maximum Groundwater Elevation (metres asl)	Minimum Groundwater Elevation (metres asl)	Variation in Groundwater Elevations (metres)
BH 1	162.86	162.01	0.85
BH 3	160.92	160.14	0.78
BH 4	159.86	159.19	0.67
BH21-01	160.05	159.22	0.83
BH21-02	164.40	163.24	1.16
BH21-03	165.29	164.09	1.20
BH21-04	164.65	163.93	0.72
BH21-05	163.06	162.32	0.74
BH21-06	163.38	162.13	1.25

The changes in groundwater elevations at all of the monitoring locations are considered to represent seasonal variations. Water levels are highest in the spring and generally lower during the summer and winter months. The June through August 2022 groundwater elevations are likely elevated compared to the same period in 2021 as a result of an increase in precipitation events throughout the monitoring period.

2.0 HORIZONTAL GROUNDWATER FLOW DIRECTION

Based on the results of the groundwater elevations collected at the site, the direction of groundwater flow in the shallow overburden is towards the east across the site, in the direction of the Ottawa River located off-site approximately 1.1 kilometers to the northeast. Based on a review of the available groundwater elevation data, the highest groundwater elevation occurred at most locations on June 14, 2022. The groundwater elevations within the shallow overburden measured on June 14, 2022 are shown schematically on Figure 1 along with groundwater elevation contours and arrows showing the interpreted shallow groundwater flow direction. Table 1 provides the available groundwater elevations for all monitoring wells. The highest groundwater elevations are found in the monitoring well installed along the western edge of the extraction area (i.e., BH21-03) and the lower groundwater elevations are found in the monitoring wells installed along the southeastern edge of the extraction area (i.e., BH 4).

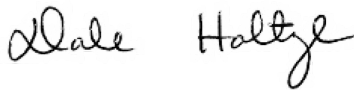
3.0 MAXIMUM PREDICTED WATER TABLE

Based on the available groundwater elevation data, the maximum predicted water table on the site is 165.3 metres asl on the western edge of the extraction area corner (as measured at BH21-03). Based on the groundwater elevation data measured at BH 4 located on the southeastern side of the site, the water table slopes down moving from west to southeast, and the maximum predicted water table on the east side of the site is approximately 159.9 metres asl.

4.0 CLOSURE

If you have any questions, please contact the undersigned.

Golder Associates Ltd.



Dale Holtze, M.Sc., P.Geo.
Hydrogeologist



Jaime Oxtobee, M.Sc., P.Geo.
Senior Hydrogeologist, Associate



DH/JPAO/KAM/rk

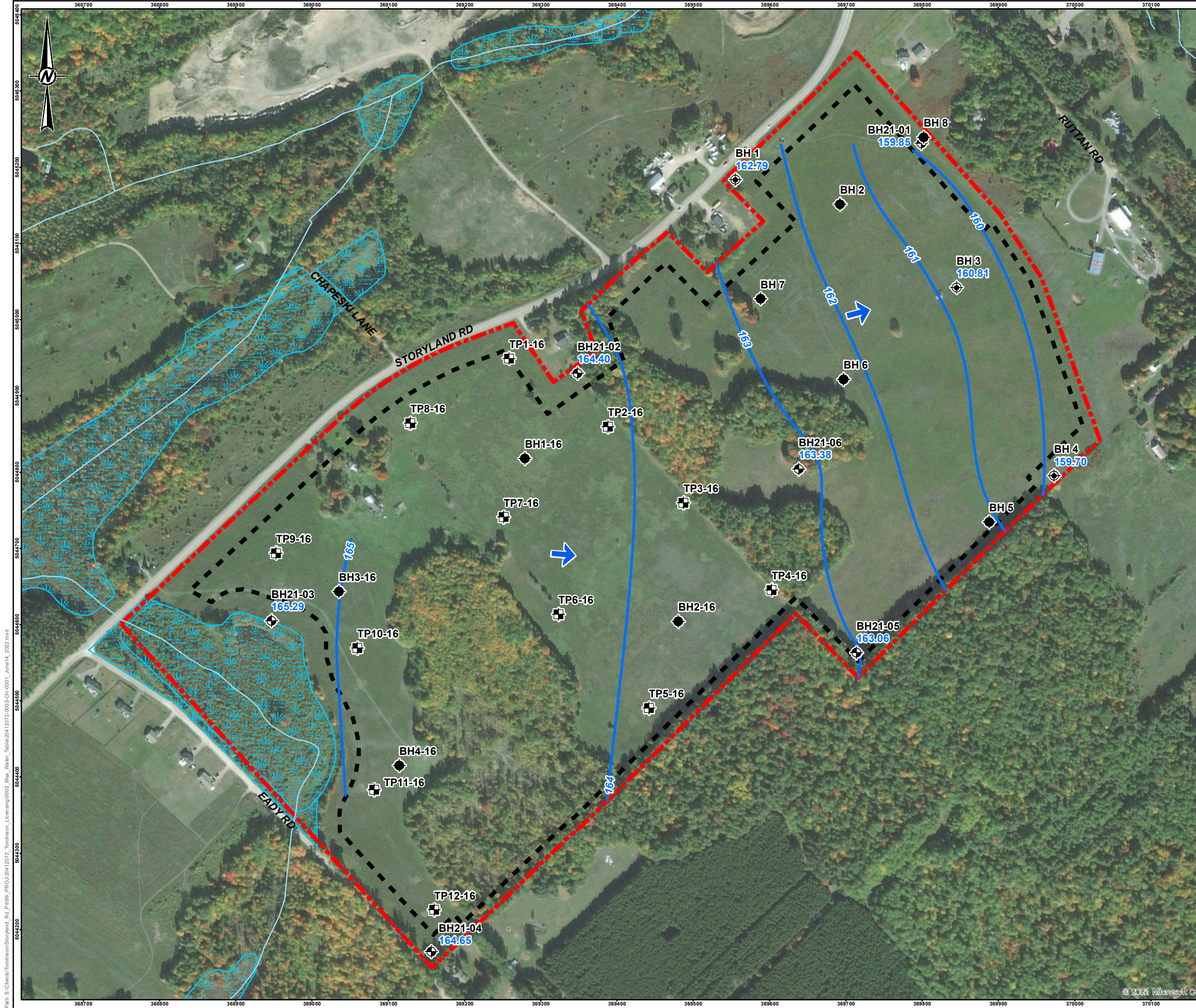
[https://golderassociates.sharepoint.com/sites/136741/project files/6 deliverables/phase 3000/max wt rpt/20412072-001-r-rev0_max_water_table_10nov2022.docx](https://golderassociates.sharepoint.com/sites/136741/project%20files/6%20deliverables/phase%203000/max%20wt%20rpt/20412072-001-r-rev0_max_water_table_10nov2022.docx)

Attachments: Figures 1 and 2
Attachment 1: Qualifications and Experience of Report Authors

References

Golder Associates Ltd. (Golder, member of WSP). Field Hydrogeological Investigation Program in Support of Aggregate Resources Act Licensing Application, Storyland Road Pit, Horton Township, Ontario. Technical Memorandum No. 20412072. December 2, 2021.

Paterson Group Inc. (Paterson Group) 2017. Preliminary Aggregate Resource Assessment Proposed Pit Development Site, Part of Lot 20, Concession 6 – Horton Township. Report No. PG4018-1. January 9, 2017.



LEGEND

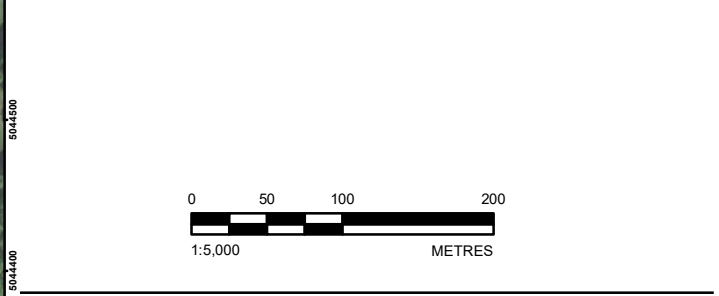
- APPROXIMATE BOREHOLE WITH MONITORING WELL LOCATION, CURRENT INVESTIGATION
- APPROXIMATE BOREHOLE LOCATION WITH MONITORING WELL LOCATION, PREVIOUS INVESTIGATION
- APPROXIMATE BOREHOLE LOCATION, PREVIOUS INVESTIGATION
- APPROXIMATE TEST PIT LOCATION, PREVIOUS INVESTIGATION
- WATERCOURSE
- WETLAND
- PROPOSED LICENSED BOUNDARY (69.6 ha)
- PROPOSED LIMIT OF EXTRACTION (56.1 ha)
- 99.99 GROUNDWATER ELEVATION, mASL (JUNE 14, 2022)
- INTERPRETED SHALLOW GROUNDWATER FLOW DIRECTION IN THE GRANULAR LAYER (JUNE 14, 2022)
- GROUNDWATER ELEVATION CONTOUR, mASL (JUNE 14, 2022)

NOTE(S)

- ALL LOCATIONS ARE APPROXIMATE
- BH 3 GROUNDWATER LEVEL UNAVAILABLE

REFERENCE(S)

- LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2020
- BING IMAGERY SUPPLIED BY ESRI AND MICROSOFT © 2020 MICROSOFT CORPORATION AND ITS DATA SUPPLIERS
- PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: UTM ZONE 18, VERTICAL DATUM: CGVD28



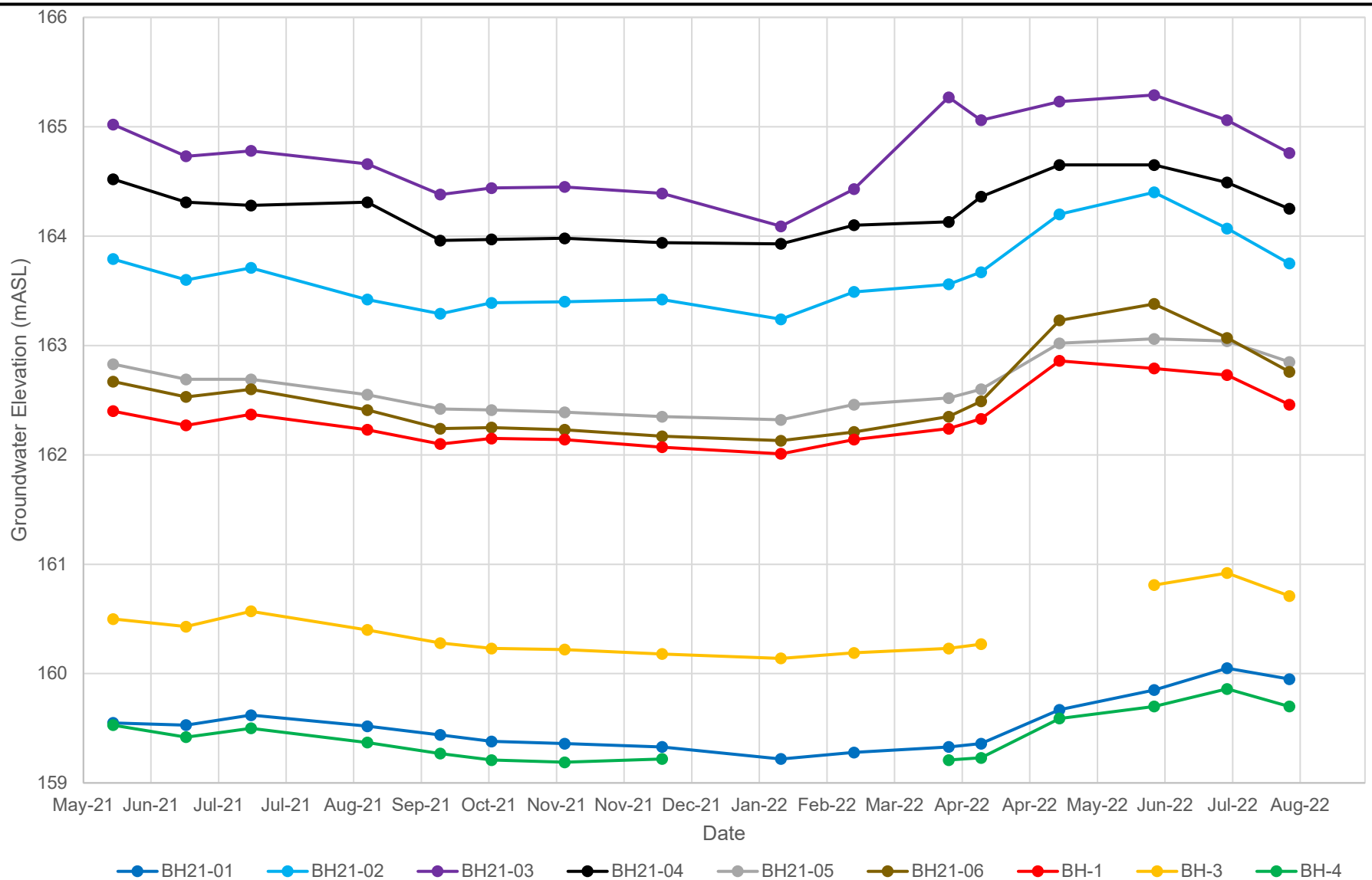
CLIENT
R.W. TOMLINSON LIMITED

PROJECT
STORYLAND ROAD PIT PROPERTY, 432 STORYLAND ROAD AND PART OF LOT 20, CONCESSION 6, HORTON TOWNSHIP, ON

TITLE
SITE PLAN

CONSULTANT	YYYY-MM-DD	2022-08-26
DESIGNED	---	
PREPARED	JEM	
REVIEWED	DH	
APPROVED	JPAO	

PROJECT NO. 20412072 **CONTROL** 0002 **REV.** 0 **FIGURE** 1



Notes:

- 1) mASL = metres above sea level
- 2) Monitoring well BH-4 was frozen during the January and February 2022 monitoring sessions.
- 3) Monitoring well BH 3 was blocked during the May 2022 monitoring session.

CLIENT
R.W. TOMLINSON LIMITED

CONSULTANT

wsp GOLDER

YYYY-MM-DD 2022-08-23

PREPARED DH

DESIGN DH

REVIEW JPAO

APPROVED JPAO

PROJECT
STORYLAND ROAD PIT PROPERTY, 432 STORYLAND ROAD AND PART OF LOT 20,
CONCESSION 6, HORTON TOWNSHIP, ONTARIO

TITLE
GROUNDWATER ELEVATIONS AT MONITORING WELLS BH 1, BH 3, BH 4, BH21-01,
BH21-02, BH21-03, BH21-04, BH21-05 and BH21-06

PROJECT No.
20412072

Rev.

FIGURE 2

ATTACHMENT 1

Qualifications and Experience of Report Authors

Education

*M.Sc. Civil Engineering:
Hydrogeology
Queen's University
Kingston, Ontario, 2001*

*B.Sc. Environmental
Science: Earth Sciences
Stream, Honours
Brock University
St. Catharines, Ontario
1998*

Certifications

*Registered Professional
Geoscientist Ontario*

Golder Associates Ltd. – Ottawa**Senior Hydrogeologist**

Jaime Oxtobee has over 20 years of broad experience in the field of physical hydrogeology that includes hydrogeological impact assessments in support of the licensing of pits and quarries under the *Aggregate Resources Act*, water supply development and regional scale groundwater studies.

Employment History**Golder Associates Ltd. – Ottawa***Associate and Senior Hydrogeologist (2001 to Present)*

Jaime is responsible for project management, technical analysis and reporting for a variety of hydrogeological and environmental projects. Jaime is also often responsible for senior technical review of hydrogeological investigations.

Projects have included groundwater resources studies; hydrogeological investigation programs in support of licensing/permitting pits and quarries and in support of Permit to Take Water applications for local construction dewatering projects, ready-mix concrete plants, golf courses and quarries; communal water supply investigations; wellhead protection studies; contaminated site investigations; and, providing senior review for landfill, pit and quarry monitoring reports.

Queen's University – Kingston, Ontario*Teaching Assistant (2000 to 2001)*

Teaching assistant for university courses relating to groundwater flow and contaminant transport in porous media and fractured rock environments.

Phase IV Bedrock Remediation Program – Smithville, Ontario*Project Manager (1999)*

Coordinated and conducted a groundwater/surface water interaction study downgradient from the PCB-contaminated site in Smithville, Ontario. The study involved detailed numerical modelling, as well as an extensive field program including stream surveys, stream gauging, construction and installation of mini-piezometers, seepage meters and weirs, fracture mapping, groundwater and surface water sampling.

SELECTED PROJECT EXPERIENCE – AGGREGATE INDUSTRY**Hydrogeological and
Hydrological
Assessments for
Quarry Licensing**

Township of Drummond-
North Elmsley, Ontario,
Canada

Golder carried out the necessary hydrogeological, hydrological ecological and archaeological studies to support an application under the *Aggregate Resource Act* for licensing the extension of an existing quarry. The application was for two new below water quarries on either side of an existing below water quarry. Jaime led the hydrogeological and hydrological assessment component of the project, and was responsible for coordinating the multi-disciplinary team. Jaime was responsible for the development and execution of the hydrogeology field program, development of the site conceptual model and completion of the hydrogeological impact assessment/reporting. Jamie also provided input to the integration of the findings from the multiple disciplines.

**Hydrogeological
Assessments for Pit
Licensing**

Township of Lanark,
Ontario, Canada

Golder carried out the necessary hydrogeological, ecological and archaeological studies to support an application under the *Aggregate Resource Act* for licensing a new pit above the water table. Jaime led the hydrogeological assessment component of the project and was responsible for coordinating the multi-disciplinary team. Jaime was responsible for the development and execution of the hydrogeology field program and preparing the required reporting.

**Hydrogeological and
Hydrological
Assessments for
Quarry Licensing**

Ramara, Ontario,
Canada

Golder carried out the necessary hydrogeological, hydrological and archaeological studies to support an application under the *Aggregate Resource Act* for licensing the extension of an existing quarry. The application was for one new below water quarry adjacent to an existing below water quarry. Jaime led the hydrogeological and hydrological assessment component of the project. Jaime was responsible for development and execution of the hydrogeology field program, development of the site conceptual model and completion of the hydrogeological impact assessment/reporting.

**Hydrogeological
Assessments for Pit
Licensing**

Township of Leeds
and Thousand Islands,
Ontario, Canada

Golder carried out the necessary hydrogeological studies to support an application under the *Aggregate Resource Act* for licensing a new pit below the water table. Jaime led the hydrogeological assessment component of the project. Jaime was responsible for the development and execution of the hydrogeology field program and completing the hydrogeological impact assessment/reporting.

**Hydrogeological
Assessment for
Quarry Permitting**

Township of Bomby

Golder carried out the necessary hydrogeological, ecological and archaeological studies to support an application under the *Aggregate Resource Act* for permitting a new quarry. The application was for a below water quarry located on Crown Land. Jaime led the hydrogeological assessment component of the project and was responsible for coordinating the multi-disciplinary team. Jaime was responsible for the development and execution of the hydrogeology field program, development of the site conceptual model and completion of the hydrogeological impact assessment/reporting. Jamie also provided input to the integration of the findings from the multiple disciplines.

Hydrogeological Assessment for Pit PermittingDistrict of Kenora,
Ontario, Canada

Golder carried out the necessary hydrogeological, ecological and archaeological studies to support an application under the *Aggregate Resource Act* for permitting a new pit. The application was for a below water pit located on Crown Land. Jaime provided input to the hydrogeological assessment component of the project and was responsible for coordinating the multi-disciplinary team. Jaime was responsible for the development of the site conceptual model in the vicinity of the pit and completion of the hydrogeological impact assessment/reporting. Jamie also provided input to the integration of the findings from the multiple disciplines.

Hydrogeological Assessment for Quarry PermittingDistrict of Kenora,
Ontario, Canada

Golder carried out the necessary hydrogeological, ecological and archaeological studies to support an application under the *Aggregate Resource Act* for permitting a new quarry. The application was for a below water quarry located on Crown Land. Jaime provided input to the hydrogeological assessment component of the project and was responsible for coordinating the multi-disciplinary team. Jaime was responsible for the development of the site conceptual model in the vicinity of the quarry and completion of the hydrogeological impact assessment/reporting. Jamie also provided input to the integration of the findings from the multiple disciplines.

Hydrogeological and Hydrological Assessment for Quarry LicensingCity of Kawartha Lakes,
Ontario, Canada

Golder carried out the necessary hydrogeological, hydrological and ecological studies to support an application under the *Aggregate Resource Act* for licensing a new quarry. The application was for a below water quarry located adjacent to a provincially significant wetland. Jaime provided input to the hydrogeological assessment component of the project, which included the installation of over 80 monitoring intervals and the completing of three pumping tests. Jaime was involved in data analysis and the completion of the impact assessment and reporting for the hydrogeology assessment.

TRAINING***Beyond Data: Conceptual Site Models in Environmental Site Assessments***

Golder U, 2011

Health and Safety Modules 1, 2, 3 and 4

Golder U, various years

Critical Thinking in Aquifer Test Interpretation

Golder U, 2011

HydroBench (Proprietary Aquifer Test Interpretation Software)

Golder U, 2011

Project Management

Golder U, 2007

Short course: Environmental Isotopes in Groundwater Resource and Contaminant Hydrogeology

2007

Short course: Hydrogeology of Fractured Rock – Characterization, Monitoring, Assessment and Remediation

2002

OSHA 40 Hour Hazardous Waste Site Worker Training
2002

PROFESSIONAL AFFILIATIONS

Member, Association of Professional Geoscientist of Ontario Member,
Ottawa Geotechnical Group

PUBLICATIONS

Conference Proceedings

West, A.L., K.A. Marentette and J.P.A. Oxtobee. 2009. *Quantifying Cumulative Effects of Multiple Rock Quarries on Aquifers*. 2009 Joint Assembly, May. Toronto, Canada.

Novakowski, K.S., P.A. Lapcivic, J.P.A. Oxtobee and L. Zanini. 2000. *Groundwater Flow in the Lockport Formation Underlying the Smithville Ontario Area*. 1st IAH-CNC and CGS Groundwater Specialty Conference, October. Montreal, Canada.

Oxtobee, J.P.A. and K.S. Novakowski. 2001. *A Study of groundwater/Surface Water Interaction in a Fractured Bedrock Environment*. Fractured Rock 2001 Conference, March. Toronto, Canada.

Journal Articles

Oxtobee, J.P.A. and K.S. Novakowski. Groundwater/Surface Water Interaction in a Fractured Rock Aquifer. *Journal of Ground Water*, 41(5) (2003), 667-681.

Oxtobee, J.P.A. and K.S. Novakowski. A Field Investigation of Groundwater/Surface Water Interaction in a Fractured Bedrock Environment. *Journal of Hydrology*, 269 (2002), 169-193.

Other

Oxtobee, J.P.A., 1998. Environmental Assessment of Grapeview, Francis and Richardson's Creeks, St. Catharines, Ontario. B.Sc. Thesis, Brock University, Earth Sciences Department pp.119.

Education

Master of Science Earth Sciences, Hydrogeology, University of Waterloo, Waterloo, ON, 2011

Bachelor of Science Honours Environmental Sciences, University of Waterloo, Waterloo, ON, 2007

Diploma in Environmental Assessment, University of Waterloo, Waterloo, ON, 2007

Professional Affiliations

Registered Professional Geoscientist, Association of Professional Geoscientists of Ontario and Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists

Golder Associates Ltd. – Ottawa**Hydrogeologist**

Dale Holtze has over 12 years of consulting experience in the field of physical hydrogeology that includes hydrogeological impact assessments in support of water supply and construction dewatering projects, environmental compliance monitoring related to mining, landfills, aggregate sites and hydrogeological investigations related to the licensing of pits and quarries under the Aggregate Resources Act.

Employment History**Golder Associates Ltd. (Golder, member of WSP) – Ottawa, ON**
Hydrogeologist (2010 to Present)

Dale is responsible for project management, field investigations, technical analysis and reporting for a variety of hydrogeological and environmental projects.

Projects have included hydrogeological investigation programs in support of licensing/permitting pits below the water table, Permit to Take Water applications for local construction dewatering projects and water supply studies, hydrogeological and environmental compliance monitoring investigations and reporting for various mining, landfill, pits and quarries.

University of Waterloo – Waterloo, ON
Contaminant Hydrogeology M.Sc. Graduate Student (2007 to 2010)**Watters Environmental Group Inc. – Concord, Ontario**
Environmental Consultant Co-op Student (May 2006 to Aug 2006)

Supported senior staff in preparation of Phase 1 and 2 Environmental Site Assessment investigations and reporting.

Aqua Terre Solutions Inc. – Toronto, Ontario
Environmental Field Technician Co-op Student (Sep 2005 to Dec 2005)

Conducted groundwater monitoring and soil sampling programs and supervised contractors during remediation programs for Phase 2 and/or 3 Environmental Site Assessments.

Stantec Consulting Ltd. – Guelph, Ontario
Soil Toxicologist Co-op Student (Jan 2004 to Sep 2004)

Performed regulatory terrestrial toxicity testing of invertebrate and plants.

Stantec Consulting Ltd. – Aberfoyle, Ontario
Aquatic Toxicologist Co-op Student (May 2003 to Sep 2003)

Performed regulatory aquatic toxicity testing of Daphnia Magna and Fat Head Minnows for various industrial effluents and maintained organism cultures.

SELECTED PROJECT EXPERIENCE – AGGREGATE INDUSTRY**Hydrogeological
Assessment for Pit
Licensing**
Kemptville, Ontario,
Canada

Golder carried out the necessary hydrogeological, hydrological, ecological and archeological studies to support an application under the Aggregate Resource Act for licensing a new pit below the water table. Dale was responsible for the execution of the hydrogeology field program and prepared the required reporting with support from senior staff.

Hydrogeological and Hydrological Assessment for Quarry Licensing Goulbourn Township, Ontario, Canada	Golder carried out the necessary hydrogeological, hydrogeological and ecological studies to support an application under the Aggregate Resources Act and the Planning Act for a site plan license for a new quarry. Dale coordinated field staff and/or conducted the hydrogeological field investigation which involved borehole drilling, groundwater level monitoring and an aquifer testing program, data analysis and technical reporting to address regulatory agency comments. The data was used to develop a detailed conceptual and numerical groundwater flow model. The model results were used to demonstrate potential impacts to local environment and proposed mitigative measures.
Environmental Compliance Monitoring Programs Ottawa, Canada	Golder carried out environmental compliance monitoring programs for various aggregate and municipal clients. Dale managed groundwater and surface water monitoring programs; conducted field work, technical data review and analysis, and preparation of comprehensive annual environmental compliance monitoring reports for various landfill and quarry sites.
Proposed New Waste Disposal Site Ottawa, Ontario, Canada	Managed groundwater and surface water monitoring programs; conducted field work, technical data review and analysis, and preparation of comprehensive baseline environmental report in support of Class Environmental Assessment for a proposed new waste disposal site.
MTO Highway 401 and Boundary Road Tire Derived Aggregate Bridge Embankments Cornwall, Ontario, Canada	Managed hydrogeological and environmental investigation for the construction of tire derived aggregate bridge embankments located at Boundary Road and Highway in Cornwall, Ontario. The project involved groundwater and surface water monitoring during pre-construction, construction and post-construction. Provided hydrogeological input to assess potential impacts related to the leaching of TDA fill materials on surface water features and groundwater receptors during construction and post-construction.
Town of Carleton Place Pumping Station and Sanitary Sewer Collection System Expansion Carleton Place, ON, Canada	Project manager and conducted hydrogeological investigation for the construction of a sewage pumping station and related sewer and forcemain lines as part of the expansion of the sanitary sewer collection system in Carleton Place, Ontario. Provided hydrogeological input to design and construction, conducted a pumping test and prepared a Permit to Take Water application with supporting documentation. Analytical and numerical groundwater modelling was carried out to evaluate rates of water taking and impacts to nearby structures founded in sensitive clay deposits.
Township of North Dundas Water Supply Expansion Class EA ON, Canada	Task hydrogeologist for Class Environmental Assessment Water Supply Expansion for the Township of North Dundas. Conducted desktop hydrogeological study, aquifer pumping test program of proposed new municipal well, support of groundwater modeling of wellhead protection area study and reporting.
Combined Sewage Storage Tunnel Ottawa, Ontario	Project included geotechnical and hydrogeological investigations for a new 6 km combined sewer storage tunnel system in Ottawa. A field investigation and reporting program was completed through the downtown core to support the preliminary and detail design team. Assisted with the implementation of the hydrogeological field program, carried out the packer test data analysis, compiled and interpreted data and completed pumping tests which were challenging due to the location on the streets of downtown Ottawa. Results of the hydrogeological assessment were included in a report used as a supporting document for a Permit to Take Water application for construction dewatering for the project. Supervised contractors during drilling and hydrogeological testing.