Jan 19, 2026 – 7504 McLeans Road

	Drawing/Document	Comment
CONVERSATION AUTHORITY – Grand River Conservation	- DDR7504 McLean - Report - FINAL - revised - Dec 2025.	See Attached.
Harden Environmental Services - Hydrogeology Stan Denhoed P. Eng	- Report 8296 - Hydrogeological Investigation Report - 7504 McLean Road, Puslinch, Ontario - Ver 4.0.pdf	We have no further comments.
Ecologist - Dougan Ecology Summer Graham sgraham@dougan.ca	- 8368 - 7504 McLean Road, Puslinch, Ontario - AA Comment Responses - 3rd Comments - December 2025	The landscape plan, TPP and EIS are considered to be complete. See any detailed comments in the memo provided on September 25, 2025.
Trace Associates Inc /XCG– Thomas Kolodziej, P. Eng.		See Attached.
Township of Puslinch Justine Brotherston Director of Corporate Services/Municipal Clerk		- In order for the Site Alteration Permit to be recommended to Council for approval, the application must include completion of all site alteration work to final grade, including the cap. If additional material that is not finishing material is required to be imported for the cap, additional permit fees may be required. - Staff will be recommending to Council that a condition of the agreement require the property owner to agree to and pay all costs associated with registering a Land Titles Act, s. 118 restriction to prohibit the movement of contaminated soil from the site.

Administration Centre: 400 Clyde Road, P.O. Box 729 Cambridge, ON N1R 5W6
Phone: 519-621-2761 Toll free: 1-866-900-4722 Fax: 519-621-4844 www.grandriver.ca

January 05, 2026
via email

Olive Zhang
Township of Puslinch
7404 County Road 34
Puslinch, Ontario, N0B 2J0

Dear Olive Zhang,

Re: Site Alteration Permit Application
7504 McLean Road E, Township of Puslinch
HBC Real Estate 1 Inc. c/o Ranbir Bhatti & Harbans Singh

Grand River Conservation Authority (GRCA) staff have reviewed the above-noted Site Alteration Permit Application to develop the property with a warehouse and transportation terminal.

Recommendation

Our previous comments have successfully been addressed. The GRCA has no objection to the approval of the site alteration permit application. A permit will be required for the development activity within the regulated area.

Documents Reviewed by Staff

Staff have reviewed the following documents submitted with this application:

- Site Development Documents, prepared by MTE Engineers, Scientist, Surveyors, revised September 20, 2025;

GRCA Comments

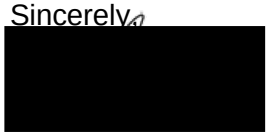
GRCA staff have reviewed this application under the Mandatory Programs and Services Regulation (Ontario Regulation 686/21), including acting on behalf of the Province regarding natural hazards identified in Section 5.2 of the Provincial Planning Statement (PPS, 2024), as a regulatory authority under Ontario Regulation 41/24 and as a public body under the *Planning Act* as per our CA Board approved policies.

We understand that that the floodplain limits are added to the site plan and engineering drawings, as such we have no objection to the approval of the site plan proposal. A permit will be required for the development activity within the GRCA regulated area.

A separate fee also will be required for a GRCA permit. An application can be submitted online using our website: https://www.grandriver.ca/planning-development/apply-for-a-permit/.

Should you have any questions, please contact me at 519-621-2761 extension 2231 or iezorlu@grandriver.ca

Sincerely,



Ismet Esgin Zorlu
Resource Planner
Grand River Conservation Authority

Copy: HBC Real Estate 1 Inc. c/o Ranbir Bhatti & Harbans Singh, owner – (via email)
A & A Environmental Consultants Inc. c/o Thomas Demers, agent - (via email)

820 Trillium Drive
Kitchener, Ontario
N2R 1K4

traceassociates.ca
info@traceassociates.ca
1.877.418.7223

January 13, 2026
Trace Project No. 900-0477-01

Submitted via email: ozhang@puslinch.ca

Township of Puslinch
7404 Wellington Road 34
Puslinch, Ontario N0B 2J0

Attention: Olive Zhang – Municipal Building Official

Dear Olive:

Re: Review of Additional Support Documents for Site Alteration Permit Application
7504 McLean Road West, Township of Puslinch, Ontario

1.0 INTRODUCTION, PURPOSE, AND USE

As requested by the Corporation of the Township of Puslinch (the Township), Trace Associates Inc. (Trace) has reviewed the information and data provided to the Township on December 23, 2025, in support of the Site Alteration Permit Application for the property located at 7504 McLean Road West, Township of Puslinch, Ontario (the Site). Trace understands that the Site is owned by HBC Real Estate 1 Inc. (the Applicant).

The documents provided by the Township that were reviewed by Trace included:

- 3rd Submission SAP Comments, prepared by A&A Environmental Consultants (A&A) (2025a)
- Small Scale Hydrogeological Assessment, prepared by A&A (2025b)

As instructed by the Township, the purpose of the review conducted by Trace was to determine if Trace's October 30, 2025 email comments regarding the risk management methods proposed for the Site have been addressed by the Applicant.

This document was prepared under Trace's Professional Report Conditions, provided as Appendix A. The scope of this document is limited to the matters expressly covered. This document was prepared for the sole benefit of the Township and may not be relied upon by any other person or entity without the express written consent of the Township and Trace. Any use or reuse of this document (or the findings, conclusions, and/or recommendations represented herein) by parties other than those listed above is at the sole risk of those parties.

2.0 TRACE ASSOCIATE INC. REVIEW COMMENTS

Based on review of the above-listed documents, Trace's October 30, 2025 email comments regarding the risk management methods proposed for the Site have been addressed by the Applicant and no further actions with regard to Trace's comments are required by the Applicant.

3.0 LIMITATIONS

The scope of this document is limited to the matters expressly covered. The Township, and any other party using this document with the express written consent of the Township and Trace, also acknowledge that the conclusions and recommendations set out in this document are based on information and data provided by others. The reviewed information and data were assumed to be accurate unless otherwise stated and were not independently verified by Trace. As such, Trace cannot be held responsible for environmental conditions at the Site that were not apparent from the reviewed information and data or due to errors and/or omissions in the information and data reviewed.

This document was prepared for the sole benefit of the Township and may not be relied upon by any other person or entity without the express written consent of the Township and Trace. Any use or reuse of this document (or the findings, conclusions, and/or recommendations represented herein) by parties other than those listed above is at the sole risk of those parties.

4.0 CLOSURE AND QUALITY MANAGEMENT

We trust this meets your requirements. Should you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Trace Associates Inc.

Jan. 13, 2026

Prepared by:
Thomas Kolodziej, B.A.Sc., P.Eng., QP
Senior Project Manager / Technical Advisor
519.741.5774
tkolodziej@traceassociates.ca

13-Jan-2026

Reviewed by:
D. Grant Walsom, B.A.Sc., P.Eng., QP
Partner / Principal Engineer
519.741.5774
gwalsom@traceassociates.ca

TK/sc

DOCUMENT CONTROL

Revision	Description	Project Manager	File Location	Date Issued
0	Issued for client use	Thomas Kolodziej	P: Drive (Secretary)	January 13, 2026

5.0 REFERENCES

A&A (A&A Environmental Consultants). (2025a). *7504 McLean Rd – 3rd submission SAP comments*.

A&A (A&A Environmental Consultants). (2025b). *Small scale hydrogeological assessment, proposed commercial development, 7504 McLean Road, Puslinch, Ontario*.

Appendix A

Trace Associates Inc.
Professional Report
Conditions

1.0 USE OF REPORT

This report pertains to a specific site, development, organization, or business and a specific scope of work, all as specifically identified in the within report (the "Report") (such site, development, organization or business and scope of work is hereinafter referred to as the "Subject"). It is not applicable to any other Subject. An assessment or evaluation of a Subject other than the one specifically identified in the within Report would necessitate a supplementary evaluation.

This Report and the assessments, evaluations, and recommendations contained in it are intended for the sole use of Trace Associates Inc.'s (Trace's) client, as specifically identified in the Report (the "Client"). If this Report is being read by any other person (other than from a regulatory body or government agency), such person is hereby advised that Trace is not making any observations, evaluations, or recommendations for such person's benefit and such person is unable to rely on the contents of this Report. Any such person would use this Report at their own risk, and liability is expressly declined to any person other than the Client. Accordingly, no responsibility is accepted by Trace for any damages suffered by any reader of this Report other than the Client. Diligence by all readers is assumed. Any use of or reliance on the Report by any person other than the Client is at the sole risk of the user.

This Report is subject to copyright and may not be reproduced either wholly or in part without the prior, written permission of Trace. The Client agrees that it shall use the Report for its own internal purposes, and it shall not provide the Report to another party (other than a regulatory body or government agency). The report provided is suitable for use by the client for the intended purpose only after accounts are settled for the work conducted.

2.0 LIMITATION OF REPORT

This Report is based solely on the information and conditions that existed and were presented to Trace at the time of Trace's evaluation. The Client acknowledges conditions affecting the contents of this Report can vary with time and that the conclusions and recommendations set out in this Report are time sensitive.

The Client also acknowledges that the conclusions and recommendations set out in this Report are based on limited observations and upon circumstances, assumptions and information presented or made available to Trace by the Client and, where applicable testing on the Subject site. Further, the Client acknowledges that conditions may vary across a site and with time which, in turn, could affect the conclusions and recommendations made.

The Client acknowledges that Trace is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the site, the decisions on which are the sole responsibility of the Client.

3.0 INFORMATION PROVIDED TO TRACE BY OTHERS

During the performance of the work and the preparation of this Report, Trace may have relied on information provided by persons (third parties) other than the Client if instructed to do so by the Client. Trace did not verify this information and accepts no responsibility for the accuracy or the reliability of such information and disclaims all liability with respect thereto.

4.0 LIMITATION OF LIABILITY

In consideration of Trace providing the services requested by the Client to complete the Report, and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged by the Client, the Client agrees that Trace's liability shall be limited as follows:

1. With respect to any claims brought against Trace by the Client for damages of any kind whatsoever, including without limitation, incidental, consequential, exemplary, or punitive damages, for any reason whatsoever arising out of the observations, conclusions, or recommendations contained in the Report, the amount of such claim and the extent of Trace's liability shall be limited to the amount of fees paid by the Client to Trace under this Agreement.

2. With respect to claims brought by any third parties arising out of the contents of this Report, the Client agrees to indemnify, defend, and hold harmless Trace from and against any and all claim or claims, action or actions, demands, damages, penalties, fines, losses, costs, and expenses of every nature and kind whatsoever, including solicitor-client costs, arising or alleged to arise either in whole or part out of services provided by Trace or the Report completed by Trace.

5.0 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that in conducting the scope of work (the “Scope”) and preparing the Report, Trace has relied on information provided by the Client. Trace, in conducting the Scope and preparing the Report, has assumed the accuracy, and has not attempted to verify the completeness of all such information. The Client acknowledges that Trace cannot be held liable for any damages to the Client resulting from any inaccuracies or incompleteness in the information provided by the Client to Trace.

6.0 STANDARD OF CARE

Services performed by Trace for this Report have been conducted in a manner consistent with the level of skill ordinarily exercised by members of the professional associations of which Trace's employees who worked on this Scope and this Report are members. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Report (or under separate cover). No further warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of this Report.

7.0 NOTIFICATION OF AUTHORITIES

The Client acknowledges that in certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed. The Client acknowledges and agrees that the notification of such bodies or persons remains wholly the responsibility of the Client; however, agrees that notification to such bodies or persons, as required, may be done by Trace in Trace’s reasonably exercised discretion.

8.0 OWNERSHIP OF INSTRUMENTS OF SERVICE

The Client acknowledges that all reports, plans, and data generated by Trace during the performance of the work and preparation of the Report and other documents prepared by Trace in the course of performing the scope are considered its professional work product and shall remain the copyright property of Trace. Any patents, methods, ideas, concepts, know-how, copyrights, trademarks, trade secrets, or other intellectual property rights developed by Trace prior to, during, and in the course of performing the Services

("IP") will be the exclusive property of Trace. The only exception to this is where Trace has prepared an Emergency Response Plan and associated training materials for a Client; in these cases, the Client owns these documents and is solely responsible for their implementation in an emergency.

9.0 ALTERNATE REPORT FORMAT

Where Trace submits both electronic file and hard copy versions of the Report, drawings, and other documents and deliverables (collectively termed "Trace's instruments of professional service"), the Client agrees that only the signed and stamped versions shall be considered final and legally binding. Trace shall keep the original electronic documents for record and working purposes, and, in the event of a dispute or discrepancies, Trace's electronic copy shall govern.

The Client agrees that both electronic file and hard copy versions of Trace's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party, except Trace. The Client warrants that Trace's instruments of professional service will be used only and exactly as submitted by Trace and for the purpose for which such instruments of professional service were intended.

The Client recognizes and agrees that electronic files submitted by Trace have been prepared and submitted using specific software and hardware systems. Trace makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

10.0 RECORDS RETENTION

Trace will, at its own cost and effort, retain project related Client data, including billing records, project files, documents, and final reports, for 12 years from the date of written authorization to proceed with the Scope. After 12 years, all data and information will be destroyed without notice to the Client. The Client may request in writing, within the 12-year period, copies of such information, and Trace will provide the information to the Client at the Client's cost.

11.0 GOVERNING LAW

The validity, construction, and performance of these General Conditions, which the Client shall be deemed to have accepted upon its acceptance of this Report, shall be governed by the laws in effect in the Province where the Subject site is located.

Dougan Ecology
3 - 7 Edinburgh Road South, Guelph, ON, N1H 5N8

September 25, 2025

Township of Puslinch
7404 Wellington Rd. 34
Puslinch, Ontario
N0B 2J0
Attn. Monika Farncombe

RE: 7504 McLean Rd. E. – 2nd Submission Ecology Comments

Dear Monika,

Dougan Ecology has completed a review of the 2nd submission Site Plan Application documents for 7504 McLean Rd E, including:

1. Scoped Environmental Impact Study (NRSI, May 2025)
2. Landscape Plan (MHBC, 29 July 2025)
3. Tree Preservation Plan (NRSI, 5 September 2025)
4. Comment Response Matrix (April 2025)

We offer the following comments, structured according to the Township's request.

1. Determination of Completeness

Complete.

2. Additional Requirements

n/a

3. Application Support - If the application can be deemed complete, then are you in support of the application?

Yes.

4. **If you support the application - What condition(s) of approval are required to be included in the site plan agreement?**

Enhancement/Restoration Plan for lands on the proponent's property following the direction provided in Section 7.6 of the scoped EIS, and as conceptualized on EIS Map 4.

5. **If you cannot support the application - why?**

n/a

6. **Are there any technical items required to support the application?**

All technical comments on the 1st submission have been adequately addressed in the applicant's comment response matrix and revised materials. For continuity purposes, comment responses are included in Appendix A.

Please do not hesitate to contact the undersigned with any questions on the above.

Regards,

Christina Olar, HBSc, Eco. Mgmt. Tech., ISA
Ecology Manager

Steven Hill, BEnvSc, MSc, PhD
Principal, Senior Ecologist

APPENDIX A. COMMENT RESPONSE MATRIX

Dougan Ecology 1st Submission Comment (May 12, 2025)	NRSI Response	Dougan Ecology Response (Sept. 26, 2025)
Section 5.3.4 states that the cultural meadow is not considered to be preferred habitat for butterflies due to its small size and poor quality. The Plant List contains Common Milkweed (Asclepias syriaca) which is the host plant for Monarch (Special Concern). It is recommended that enhancement seeding/plantings include Common Milkweed to mitigate potential impacts to this species.	Section 7.6 in the EIS report has been updated to include enhancement recommendations, including seeding with a native species mix including Common Milkweed in the cultural meadow ecosites.	Addressed.
Section 6.0 notes that the subject property contains loose gravel/sand fill. This substrate, coupled with the proximity to wetland habitat and sun exposure should be considered suitable for turtle nesting in the absence of formal field studies. Possible SWH for turtle nesting should be considered. It is acknowledged that section 7.4.2 recommends sediment barrier fencing that will	NRSI maintains that the subject property should not be considered a candidate SWH for turtle nesting, but can increase to Possible within the Subject Property to match the Study Area. No evidence of turtle nesting has been observed at the site and similar to the exclusion of road shoulders or embankments, man-made parking areas are not suitable to be significant wildlife habitat areas. It is possible that the occasional turtle may try to nest in the area, therefore mitigation has been provided.	Addressed.

Dougan Ecology 1st Submission Comment (May 12, 2025)	NRSI Response	Dougan Ecology Response (Sept. 26, 2025)
also function to prevent turtles and other wildlife from the work area during construction. The location of this fencing should be shown on a figure. The report should clarify that fencing should be in place prior to pre-grading. It is further recommended that a SAR (Species at Risk) encounter protocol be developed for on-site workers in the event that SAR are encountered within the work area.	Map 3 shows locations of sediment/turtle exclusion fencing as provided by MTE's ESC plan. Section 7.4.3 of the EIS report updated to specify that sediment fencing should be established prior to grading activities. NRSI provides a SAR/SCC (Wildlife) encounter protocol for any herpetological SAR/SCC encounters that occur on site in an appendix included in the updated EIS.	
Section 7.3.1 specifies that tree protective fencing and sediment barriers should be installed at the limit of development. Further, the report notes "the development will require the removal of the cultural meadow vegetation and individual trees across the subject property. Hedgerow trees along the east and south boundaries of the subject property will be protected by avoiding and minimizing grading and asphalt within the dripline and providing a 1m buffer	Site assessment by NRSI arborist only identified one tree adjacent to but outside of the subject property at potential risk. NRSI prepared a brief TPP.	Addressed. The TPP is acceptable.

Dougan Ecology 1st Submission Comment (May 12, 2025)	NRSI Response	Dougan Ecology Response (Sept. 26, 2025)
where possible." A Tree Preservation Plan should be prepared		
Section 7.4.1 – Please show the recommended Erosion & Sediment Control/Wildlife Exclusion Fencing on an EIS figure.	NRSI provides sediment and exclusion fencing locations as a layer within Map 3 of the EIS report.	Addressed.
Section 7.6 – the proposed enhancements are supported. Please show the conceptual enhancement area(s) on a figure. It is also recommended to include a pollinator friendly seed mix (including *Asclepias syriaca* – Monarch host plant, which was documented in the Cultural Meadow proposed to be impacted).	NRSI includes a conceptual enhancement plantings area in an attached map (Map 4), and includes Common Milkweed within a list of species to be included in a native seed mix for the cultural meadow ecosite. Section 7.6 in the EIS report updated to include enhancement recommendations.	Addressed. Enhancement/Restoration Plan required for lands on the proponent's property following the direction provided in Section 7.6 of the scoped EIS, and as conceptualized on EIS Map 4.
Section 8.0 - a summary of enhancement recommendations should be included in addition to the mitigation measures.	NRSI updated Section 8 to include details for the proposed enhancement plantings.	Addressed.
Significant Wildlife Habitat Screening Table Appendix: Woodland Area-Sensitive Bird Breeding Habitat: The Assessment Details note that there is no interior habitat within the subject	NRSI updated Significant Wildlife Screening Table Appendix to include Woodland Area- Sensitive Bird Breeding Habitat	Addressed.

Dougan Ecology 1st Submission Comment (May 12, 2025)	NRSI Response	Dougan Ecology Response (Sept. 26, 2025)
property or subject area. Based on our review of aerial imagery and LIO mapping, the adjacent natural feature appears to be much larger than 30 ha of contiguous habitat, and certainly contains interior forest habitat measured at least 200m from the forest edge. Please revise.		
Appendix IV Reptiles and Amphibians Species List: Jefferson Salamander (Endangered) is included in the background species records summary table. Given that targeted surveys were not undertaken and suitable habitat presence within the adjacent lands, the EIS should include a discussion of how potential impacts to this species will be avoided and mitigated	Jefferson Salamander requires fishless wetlands or vernal pools for breeding and deciduous or mixed forest for overwintering and foraging. They will travel through a variety of habitats to reach breeding or overwintering areas. The wooded natural area adjacent to the subject property may provide suitable habitat for this species. Movement through the subject property is unlikely given the nature of the site (open, exposed, etc.) and would likely be limited to nighttime hours during warm, rainy nights in March-April and September-October. Sediment and erosion control fencing encircling the work area is considered sufficient mitigation to prohibit salamanders from	Addressed.

Dougan Ecology 1st Submission Comment (May 12, 2025)	NRSI Response	Dougan Ecology Response (Sept. 26, 2025)
	entering the work area. NRSI included Jefferson's Salamander within the Species at Risk (SAR) Encounter Protocol and provided avoidance and mitigation recommendations in the event that the species is observed within the work area or adjacent lands.	
Map 2 displays a 10 m buffer from the feature boundary. Please revise to show the greater of either the PSW (30 m buffer) or woodland buffer (10 m). There appear to be some areas where the PSW is very close to the woodland edge, and therefore has not been afforded an adequate buffer. Further, section 6.0 should include a brief rationale on the proposed buffer widths shown on Map 2 in the context of the ecological sensitivities present in the adjacent natural area.	NRSI updated Map 2 to include a revised natural feature buffer that amalgamates the 10m woodland and 30m PSW buffer to show the greatest buffer extent along the natural feature. Section 6.0 of the EIS reported updated to provide rational for the revised buffer.	Addressed.
LP01/LP02 - There are a number of non-native / native cultivar species proposed. Given the proximity of the site to a high-quality natural area, it is recommended that	Where applicable, non-native cultivars have been replaced with equivalent native counterparts.	Addressed.

Dougan Ecology 1st Submission Comment (May 12, 2025)	NRSI Response	Dougan Ecology Response (Sept. 26, 2025)
the species list is revised to replace non-native/cultivars with suitable native species to maintain and enhance biodiversity. Suggestions for native replacement species are included in Table 1		

Comment	Response	
County of Wellington – Source Water		
As this application pertains to a Site Alteration, there are no legal requirements under the Clean Water Act, and this application would not require a Notice and is not subject to a Risk Management Plan or Prohibition. Please note that due to the property's location within a vulnerable area, we may provide comments on future applications related to this site. For your reference, I have attached a map showing the property and Wellhead Protection areas. See attached map.	Acknowledged.	A&A
Trace Associates Inc/XCG– Thomas Kolodziej, P. Eng.		
Please confirm the proposed risk management measures for addressing soil impacts. The DDRA indicates the placement of a 0.5-m thick soft (granular material) cap; however, during the meeting, A&A indicated that the site will be paved with asphalt, which is considered a hard cap (pavement). Although the two options are not mutually exclusive, it is not likely (it does not make economic sense) that both caps will be constructed over the Site.	Acknowledged. There is a requirement to cap the impacted soil with gravel, asphalt, building footprint or 0.5 m of soil meeting the Table 1 SCS. As long as there is a minimum of 0.5 m cap between impacted soil and human activities, it will mitigate potential risks. This cap will be built into the development of the site.	A&A
Also, the proponent should clarify if the DDRA findings and recommendations (the prohibition of use for potable purposes) only pertain to the shallow groundwater (which likely does, since deep groundwater was not sampled), or all (shallow and deep) groundwater.	The DDRA was updated that in the case of groundwater, no exceedances of the human health component value associated with the ingestion of potable groundwater were noted. The groundwater was resampled and found that that is no impact. There is no prohibition of use of potable groundwater on site and there is no impact to either the shallow or deep aquafers	A&A
Township of Puslinch Justine Brotherston Director of Corporate Services/Municipal Clerk		
The applicant is to amend the application to include the finished grade for the Site Alteration to be completed through the Site Alteration Application o If the importation of fill is required to complete the finished grade additional permit fees may be required	The importation of additional material will be done under another application permit (Site plan application). The cap on the impacted materials required as mentioned in the DDRA will be built into the development of the site.	A&A
The applicant is to provide comments on a mechanism to notify future property owners of the contaminated soils on site or proposed	The soil on the site will be capped and contained to the site. The contaminates in the soil were not found in the	A&A

monitoring program for the contaminated soils to ensure it is not entering the groundwater system	groundwater. The DDRA does not require monitoring of the groundwater and thus no that the soil contaminates would enter the groundwater.	
The applicant is to provide a plan for sampling wells on the site and potentially the surround sites for peer review by the Township's hydrogeologist to address the concerns raised at the Public Information Meeting by Council	The groundwater was resampled on site for the exceedances from a prior sampling. The updated results show there is no impact to the groundwater that will impact human health.	A&A
Harden Environmental Services Ltd		
We visited the site on October 28, 2025 and found free access to the site. We observed numerous loads of grey shale in the southeast area of the site. This shale is not mentioned in the March 26, 2025 report nor indicated on any of the 81 boreholes drilled at the site. It is also mentioned in Section 1.4.1 of the March 2025 A&A report that no stockpiles were tested. If these loads have not been approved by the site owner, then access should be restricted to prevent illegal dumping.	The shale that was dumped on site was unaware to us as well as the owners of the property. The shale that was dumped cannot contain contaminating materials as the rock cannot be analyzed for contaminates and will not have an impact or alter on current situation on the subject site. The owner is working to close the site off and restrict the access.	A&A
There is inconsistency between the depth of groundwater reported in the Scobie Report and that of the A&A July 2025 Hydrogeology Report. The Scobie report discusses a "minimum depth to groundwater" of 3.77 metres below ground surface (mbgs) whereas the A&A report at MW3(same as MW24-3) gives groundwater elevations 323.004 m AMSL with a top-of-monitor elevation of 323.653 m AMSL. There is no ground elevation provided but the monitor is not a flush mount, thus putting the ground water table within 0.65 metres of the ground surface. The Scobie report mentions the depth to groundwater as a reason not to pursue additional pathways of impact. Does the depth of water reported by A&A July 2025 affect this decision?	The 3.77 m depth was only in the area of the groundwater monitoring well 24-2. MW24-3 is shallower but that well had no impact on the groundwater and thus not mentioned as the depth to groundwater as a reason not to pursue additional pathways of impact.	A&A
All the local businesses rely on groundwater for their water supply. The Scobie report suggests a restriction on the installation of potable wells at the site to eliminate the risk from groundwater consumption. This is due to the Hazard Quotient of Cobalt exceeding the recommended value of 0.2 It is also concluded that the fill material is the likely source of exceedances noted in soil and groundwater (Section 2, Scobie,	1)The groundwater was resampled and found that that is no impact. There is no prohibition of use of potable groundwater on site and there is no impact to either the shallow or deep aquafers. There is no risk on the surrounding areas and businesses. 2) There is no risk as the groundwater showed no exceedances for human	A&A

2025). Our questions are: 1) The shallow groundwater is not generally targeted as a drinking water supply. The majority of local wells target either the bedrock Guelph Dolostone formation or the Gasport Formation. Should the restriction be that shallow dug wells are not recommended at the site or are all wells (even deep drilled wells) at risk? 2) Given that the area is also a Significant Groundwater Recharge Area, what are the risks associated with the transport of Cobalt to greater depths and being transported via subsurface pathways to other local wells?	health. It satisfies Table 2 of O. Reg 153/04.	
Harden still has concerns with the accuracy of the groundwater characterization at this site as detailed in our September 12, 2025 letter. included in the September 12, 2025 letter is a request to review the groundwater elevations at the site as a seven-metre water level difference is unlikely to be present at the site.	The groundwater elevations were monitored on site on November 28, 2025. These groundwater results are consistent with the previous monitoring results. The hydroG report has been updated with the new groundwater monitoring results. The previous monitored were reviewed thoroughly and the same consistencies were present.	A&A

HSGROUP

DUE DILIGENCE RISK ASSESSMENT REPORT

human health, ecological risk assessment, and toxicology

Prepared By:

Hugh Scobie, MSc., DABT, C.Chem, QP_{RA}

PROJECT TITLE:	Due Diligence Risk Assessment – 7504 McLean Road, Puslinch, Ontario
PREPARED FOR:	BVD Real Estate Inc.130 Delta Park Boulevard, Brampton, ON, L6T 5E7
DATE:	Revised December 12, 2025

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EXECUTIVE SUMMARY

Hugh Scobie o/a HS Group (HS Group) in association with BVD Real Estate Inc. ('the client') has prepared this due diligence risk assessment (DDRA) for the purpose of evaluating potential risks to human receptors for the property located at 7504 McLean Road, Puslinch, Ontario (the 'Site'). The RA is being conducted as part of due diligence and while the format generally follows that of a risk assessment conducted under Ontario Regulation 153/04 (O. Reg. 153/04) (as amended) that would be used to support a Record of Site Condition (RSC) the DDRA will not be submitted to the Ontario Ministry of the Environment, nor be used to support the filing of an RSC.

The subject site is a rectangular shaped lot located in the northwest area of Puslinch, Ontario at 7504 McLean Road. The site is bound by vacant land located northeast and northwest and industrial buildings to the southwest and southeast of the site. The site is currently vacant land. The subject site area is located within the Mill Creek-Grand River watershed which contains Mill Creek and the Grand River. The site is zoned as being "Industrial" as quoted from the Township of Puslinch Comprehensive Zoning By-law No. 023-18 as amended and is located on the northwest side of McLean Road. Sub-surface intrusive investigations have been conducted at the Site by A&A Environmental Consultants Inc.. The investigations noted impacts of soil. The impacts in soil were identified Electrical Conductivity (EC), Sodium Adsorption Ratio (SAR), zinc, lead and PHC F4. No impacts were identified in groundwater with the recent groundwater sampling.

The Table 1 Site Condition Standards have been used for the identification of impacts in soil and groundwater, as the Township of Puslinch requires its use as part of a bylaw issue. In the discussions presented below, soil and ground water are considered to be impacted or contaminated if they exceed the Table 1 Site Condition Standards. As previously noted, on this basis, EC, SAR, zinc, lead and PHC F4 were found to exceed their applicable MECP Table 1 Site Condition Standards (SCS) in soil. In the case of groundwater, copper was found to exceed its applicable MECP Table 1 Site Condition Standards (SCS). As a result, the above compounds in soil and groundwater were evaluated further in the DDRA.

As discussed, the Site is used for industrial/commercial use and is currently vacant. The Site is to be used for truck parking in the future, along with the construction of an on-site building. Therefore, the primary human receptors are workers at the Site. In the case of soil, there is the potential for direct contact with soil and the inhalation of dust. There is the potential for direct contact with groundwater as it may be used as a potable source. In the case of ecological receptors, the primary receptors are terrestrial plants, soil invertebrates, birds and mammals. In the case of soil, there is the potential for root uptake, direct contact, inhalation of dust, ingestion of food items and prey. In the case of groundwater given the minimum depth to groundwater (3.77 mbgs), there is no potential exposure for ecological receptors.

For the Human Health Risk Assessment (HHRA), further screening of the exceedances in soil was completed with a comparison to the applicable MECP Table 2 (industrial/commercial, coarse soil, potable groundwater) human health component values, as the Table 1 SCS were only applicable for the identification of impacts at the Site given the requirement of the Township of Puslinch. For soil, the values for direct contact were used for comparison. In the case of soil, no exceedances were noted. In the case of lead, no human health component values are currently available. The MEPC has released updated TRVs for lead and these will be used to determine potential risks to risks at the Site due to exposure to soil. In the case of groundwater, no exceedances of the

human health component value associated with the ingestion of potable groundwater were noted. As such. No further evaluation of groundwater was required in the HHRA.

For the Ecological Risk Assessment (ERA), further screening of the exceedances in soil was completed with a comparison to the applicable MECP Table 2 (industrial/commercial, coarse soil, potable groundwater) ecological component values. In the case of soil, lead exceeded for birds and mammals, while zinc exceeded for both terrestrial plants/soil invertebrates and birds and mammals requiring further assessment in the ERA. In the case of groundwater, no exceedances were noted, as such groundwater in association with ecological receptors will not be evaluated further in the ERA.

The HHRA concluded that no unacceptable risks were present in association with soil. As a result, there are no unacceptable risks to users of the site.

The ERA concluded that in the absence of risk management measures, the calculated Screening Indices for terrestrial plants and soil invertebrates were greater than one for zinc in soil. It may be inferred from this result that growth and reproduction of sensitive plants and soil invertebrates may be inhibited in areas of the Site with concentrations of zinc exceeding their associated TRVs. In the case of mammals and birds exposed to soil at the soil, in the absence of risk management measures, the calculated Screening Indices were greater than one for lead and zinc in association with the American woodcock. It may be inferred from this result that there is the potential for unacceptable risks to birds at the Site. As a result, there is the requirement to cap the impacted soil with gravel, asphalt, building footprint or 0.5 m of soil meeting the Table 1 SCS is required to mitigate potential risks to ecological health. With this risk management measure in place no unacceptable risks are present due to soil at the Site.

With the recommended risk management measures in place, no unacceptable risks exist at the Site and the Site is suitable for continued commercial/industrial use without any remediation.

On this basis, the following property specific standards were developed based on the presence of risk management at the site for impacts in soil.

Table 4-6: Calculated Property Specific Standards for Soil

Parameter	Units	Maximum Soil Concentration	Calculated Property Specific Standard	Basis of Property Specific Standard
Lead	µg/g	130	**156**	Maximum concentration x 1.2
Zinc	µg/g	678	**814**	Maximum concentration x 1.2

1 INTRODUCTION

Hugh Scobie o/a HS Group (HS Group) in association with BVD Real Estate Inc. ('the client') has prepared this due diligence risk assessment (DDRA) for the purpose of evaluating potential risks to human receptors for the property located at 7504 McLean Road, Puslinch, Ontario (the 'Site'). The RA is being conducted as part of due diligence and while the format generally follows that of a risk assessment conducted under Ontario Regulation 153/04 (O. Reg. 153/04) (as amended) that would be used to support a Record of Site Condition (RSC) the DDRA will not be submitted to the Ontario Ministry of the Environment, nor be used to support the filing of an RSC.

The risk assessment format will follow the general approach, analysis and protocol utilized in conducting a risk assessment under O.Reg. 153/04 (as amended), however a formal risk assessment document will not be submitted to the MECP for review, nor will it be used to support the filing of an RSC.

1.1 Risk Assessment Assumptions

The RA was prepared using the following assumptions:

- The site is currently vacant but will be developed to include a track parking area and an on-site building.
- The Table 1 Site Condition Standards have been used for the identification of impacts in soil and groundwater, as the Township of Puslinch requires its use as part of a bylaw issue
- The Site is considered to have potable ground water with coarse-textured soil with use for commercial/industrial purposes as defined under O.Reg.153/04 (as amended) resulting in the use of the MECP Table 2 Site Condition Standards for further screening of the identified impacts in soil and groundwater within the Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA).

1.2 Risk Management Requirements

Capping of impacted soil with gravel, asphalt, building footprint or 0.5 m of soil meeting the Table 1 SCS is required to mitigate potential risks to ecological health.

2 PROPERTY INFORMATION, SUMMARY OF ENVIRONMENTAL CONDITIONS AND IDENTIFICATION OF COCS

Site characterization involves assessing the degree and extent of contamination at the Site. Information is provided in the following sections regarding the site history, neighboring properties, current and where required future land uses, the geologic conditions at the Site, and the identification of the contaminants of concern.

The subject site is a rectangular shaped lot located in the northwest area of Puslinch, Ontario at 7504 McLean Road. The site is bound by vacant land located northeast and northwest and industrial buildings to the southwest and southeast of the site. The site is currently vacant land. The subject site area is located within the Mill Creek-Grand River watershed which contains Mill Creek and the Grand River. The site is zoned as being "Industrial" as quoted from the Township of Puslinch Comprehensive Zoning By-law No. 023-18 as amended and is located on the northwest side of McLean Road (Figure 1). Sub-surface intrusive investigations have been conducted at the Site by A&A Environmental Consultants Inc.. The investigations noted impacts of both soil and ground water (Figure 2). The impacts in soil were identified Electrical Conductivity (EC), Sodium Adsorption Ratio (SAR), zinc, lead and PHC F4. The impacts in groundwater were identified as cobalt and copper. Importation of impacted fill has been identified as the likely source of the exceedances noted in soil and groundwater.

2.1 Contaminants of Concern

According to O. Reg. 153/04 (as amended), any chemical detected at the risk assessment (RA) property that exceeds the applicable site condition standards (SCS) are considered to be a chemical of concern and are required to be assessed in the RA. Observed concentrations of chemicals in soil or ground water numerically greater than the standard were considered to exceed the standard. Furthermore, any chemicals detected at the RA property for which no applicable SCS is prescribed under the Regulation were also assessed in the RA.

The contaminants of potential concern (COPC) were identified based on exceeding the Table 9 ground water and soil SCS, as outlined under the Ministry's *Soil, Ground Water and Sediment Standards for Use Under XV.1 of the Environmental Protection Act* (MOE 2011a). The criteria for coarse-textured soil for a residential land use was used in the identification of COPCs.

In the case where any analytical results were reported as “below detection limit” or “non- detect,” the chemical was dropped from further consideration in the RA if the chemical could not be linked to historical site use. There is also high confidence that these parameters are not present on-site, regardless of whether the laboratory-reporting limit was greater than the screening criteria. The COPCs identified through the chemical screening process presented below are further evaluated in Section 3 (Human Health Risk Assessment). Chemicals retained for either quantitative and/or qualitative analysis are discussed in the human health detailed chemical screening sub-sections.

2.1.1 Selection of COPCs in Soil

The identified COPCs for soil are summarized in Table 2-1.

Table 2-1: Identification of COPCs in Soil

Parameter	Maximum Conc. (µg/g)	Table 1 SCS (µg/g)
Metals		
Lead	130	120
Zinc	678	290
PHCs		
PHC F4	439	120
Inorganics		
EC (mS/cm)	0.92	0.57
SAR	3.07	2.4

It is noted that the concentrations of lead, zinc, PHC F4, EC and SAR were above their applicable MECP Table 1 SCS for soil, and as such were carried forward for formal quantitative screening and assessment.

2.1.2 Selection of COPCs in Ground Water

The identified COPCs for ground water are summarized in Table 2-2.

Table 2-2: Identification of COPCs in Groundwater

Parameter	Maximum Conc. (µg/L)	Table 1 SCS (µg/L)
Metals		
Copper	6.6	5

It is noted that the concentrations of copper were above their applicable MECP Table 1 SCS for groundwater, and as such were carried forward for formal quantitative screening and assessment.

3 HUMAN HEALTH RISK ASSESSMENT

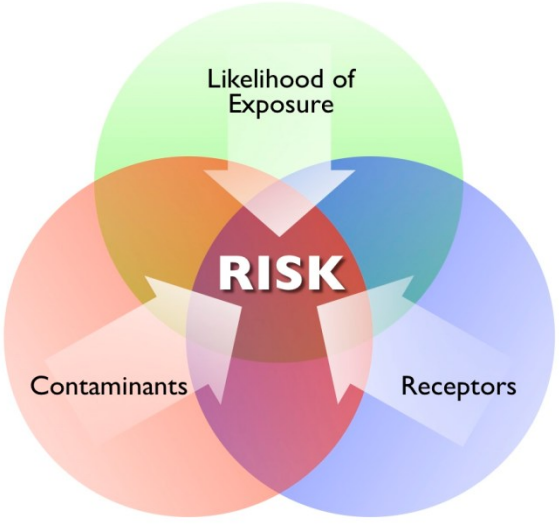
This section examines the potential human health risks associated with the presence of contaminants in soil and groundwater at the Site. While the risk assessment is not being used to support an RSC for the Site, the approach to completing a risk assessment at this contaminated site was still conducted according to risk assessment procedures outlined in Schedule C of O. Reg. 153/04.

3.1 Problem Formulation

Problem formulation provides the initial framework and methodology used to select compounds for evaluation in the human health risk assessment component and identifying the relevant components of the HHRA, including a qualitative description of exposed receptors and potential pathways that are summarized in the conceptual exposure model. In addition to providing a discussion of the human health conceptual site and exposure models, a discussion of the risk assessment objectives is also provided.

Risk assessment, in the context of properties potentially impacted by contaminants, is the process of estimating the likelihood of undesirable effects on human and ecological health resulting from exposure to chemical contaminants. Three components must be present for risks to human health to exist at contaminated sites impacted by chemicals (as illustrated in the graphic below):

- The chemical must be present at concentration sufficient to cause a possible adverse effect.
- A receptor (theoretical human receptor) must be present; and
- There must be a complete exposure pathway by which the receptor can come into contact with the chemical.



In general, there can only be a health concern or potential for risk when there is a complete link from a substance (e.g., a metal or volatile organic compound, etc.) through an environmental medium (e.g., air, water, soil) to a person (e.g., a visitor). Subsequently, for there to be a potential risk (i.e., represented

by the shaded section in the middle of the Venn diagram presented above), there must be three factors present: (1) a substance, (2) a receptor, and (3) an operable exposure pathway or route.

If there is no possible exposure to a chemical (e.g., an inorganic or non-volatile chemical found at significant depth), regardless of its inherent toxicity or potency or environmental concentration, there would be no potential for the development of an adverse human health effect. It is to say that without all three factors described above, there can be no risk. The Conceptual Exposure Model (CEM) for human receptors is predicted based on the above noted principles and is described in the following Section of the RA report.

3.1.1 Human Health Conceptual Site (Exposure) Model

The risk components identified above, namely contaminants of concern detected in on-Site media, exposure pathways, and receptors, as well as the current Site configuration, are combined to synthesize the CEM for the human health risk assessment. The CEM is used to focus the quantitative assessment to ensure that all the critical aspects of the RA are properly addressed. It uses the site-specific information as provided in Section 2 as its basis, combined with information presented in the following sections of the RA.

The development of the CEM was considered under the following headings in sections that follow:

- Contaminant screening for applicable human receptors.
- Release, transport, and intermediate transfer of COCs.
- Human exposure routes and pathways of concern; and
- Human health risk assessment receptors.

Based on the site characterization, chemistry, and the anticipated receptors on the Site, several exposure pathways will be assessed.

Figure 3 depicts the CEM in detail. The CEM identifies the complete exposure pathways where receptors may make direct contact with chemicals in soil or ground water through the three possible exposure pathways (ingestion, dermal contact, inhalation). The CEM was used as the basis for the quantitative, and qualitative risk assessment identifying the sources of chemicals, pathways or potential pathways, and receptor combinations that appear to be complete and, therefore, require an evaluation of the magnitude and nature of the risks present. Significant pathways were quantitatively assessed in the exposure assessment and risk characterization stages that follow.

As discussed, the Site is used for industrial/commercial use and is currently vacant. The Site is to be used for truck parking in the future, along with the construction of an on-site building. Therefore, the primary human receptors are workers at the Site. In the case of soil, there is the potential for direct contact with soil and the inhalation of dust. There is the potential for direct contact with groundwater as it may be used as a potable source.

From the environmental investigations conducted at the Site, some compounds were found to exceed the MECP Table 1 SCS in association with soil and groundwater. The maximum concentration of these compounds in soil and groundwater were used for the purposes of the identification of COCs for human

receptors. Further discussion of the relevant exposure pathways is provided in Section 3.2 (Exposure Assessment).

3.1.2 Identification of Chemicals of Concern for HHRA

In Section 2.3, COPCs were identified based on their presence in ground water at levels in excess of their applicable MECP Table 1 SCS. Additional screening for the identification of COCs was undertaken to establish those relevant for the HHRA. Additional screening was conducted by comparing the previously identified COPCs in soil and groundwater with the MECP Table 2 (industrial/commercial, coarse soil, potable groundwater) human health component values, as the Table 1 SCS were only applicable for the identification of impacts at the Site given the requirement of the Township of Puslinch. Table 3-1 provides the comparison of the COPCs to the MECP Table 2 SCS human health component values for the identification of the COCs for soil being carried forward in the HHRA, while Table 3-2 provides the comparison of the COPCs to the MECP Table 2 SCS human health component values for the identification of the COCs for groundwater being carried forward in the HHRA

Table 3-1: Identification of Contaminants of Concern in Soil for the HHRA

COPC	Maximum concentration detected in Soil (µg/g)	MECP Table 1 SCS (µg/g)	MECP Table 2 SCS - Human Health Component Value for Direct Contact (coarse-textured soil – Commercial) (µg/g)	COC for the HHRA?
Metals				
Lead	130	120	No Value	**Yes**
Zinc	678	290	57,000	No
PHCs				
PHC F4	439	120	42,000	No
Inorganics				No
EC (mS/cm)	0.92	0.57	Not applicable. Only relevant for terrestrial plants	No

COPC	Maximum concentration detected in Soil (µg/g)	MECP Table 1 SCS (µg/g)	MECP Table 2 SCS - Human Health Component Value for Direct Contact (coarse-textured soil – Commercial) (µg/g)	COC for the HHRA?
SAR	3.07	2.4	Not applicable. Only relevant for terrestrial plants	No

No exceedances were noted, however, in the case of lead, no human health component values are currently available. The MEPC has released updated TRVs for lead and these will be used to determine potential risks to risks at the Site due to exposure to soil.

Table 3-2: Identification of Contaminants of Concern in Groundwater for the HHRA

COPC	Maximum Groundwater Concentration (ug/L)	MECP Table 1 SCS (µg/g)	MECP Table 2 SCS - Human Health Component Value for the Ingestion of Potable GW (coarse-textured soil – Commercial)	COC for the HHRA?
Metals				
Copper	6.6	5	1000	No

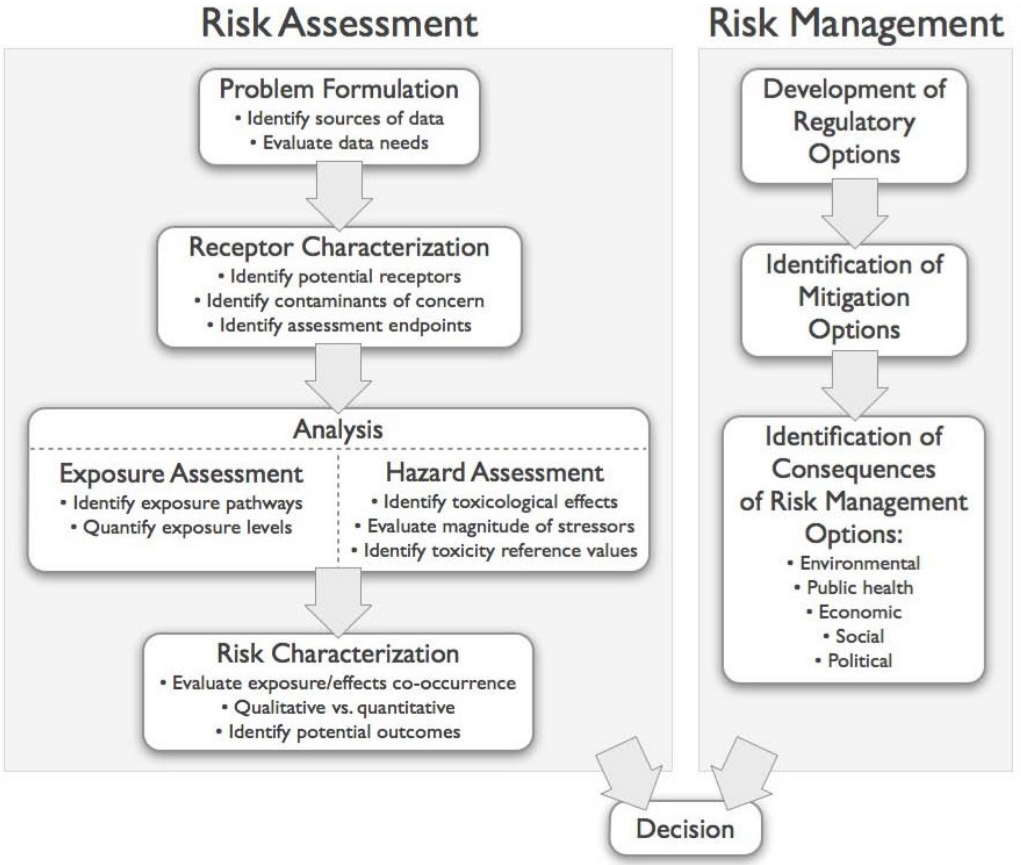
Copper was not noted to exceed the human health component value associated with the ingestion of potable groundwater and as such will not require further evaluation in the HHRA.

3.1.3 Risk Assessment Objectives (Human Health Component)

The objectives of the human health risk assessment component were to estimate the potential health risks and potential hazard estimates to human receptors that may be present at the Site. Following the formal determination of risk and hazard estimates for various receptors that may contact the chemicals of potential concern through the various source-to-receptor pathways.

Receptors to be considered in the HHRA included residents (all ages). Based on an understanding of the site characteristics and distribution of COCs in soil and ground water as described in Section 2, pathways of exposure included only the inhalation of indoor air as a complete pathway.

A quantitative estimate of potential exposure and commensurate risk was carried out for the receptors and pathways identified in the following sections of this RA. The framework for carrying out the risk assessment (represented in the graphic below) is considered to be standard, and follows guidance developed by MOECC (2011b), U.S EPA (2004).



Modified from U.S. EPA (2004)

A standard RA approach was used. Point-of-exposure doses/concentrations of COCs were modeled for the various human receptors using standard exposure models. As described above, the receptors examined in the HHRA were:

- Workers (i.e., adults).

The sole pathway of exposure examined in this HHRA was the inhalation of indoor air for workers. Exposure point concentrations received by resident receptors as exposure doses were compared to relevant toxicity reference values (TRV) obtained from MOECC (2011b), if not available, other recognized regulatory jurisdictions (e.g., US EPA).

3.2 Exposure Assessment

The exposure assessment component of the HHRA is intended to estimate potential exposure for individuals (i.e., receptors) that could be expected to inhale indoor air due to impacts identified in soil and groundwater. It identifies the receptors and the exposure pathways that could contribute to exposures and uses this information to estimate the potential exposure for each receptor. The exposure assessment also provides an indication of the relative contribution that each exposure pathway makes to the total daily exposure experienced by each receptor. The exposure assessment can be summarized by these three basic components:

1. Receptor Characteristics.
2. Pathway Analysis; and
3. Exposure Estimates.

Each of the three components of the exposure assessment are detailed below.

3.2.1 Receptor Characteristics and Pathway Analysis

As discussed, the Site is used for commercial use. Therefore, the primary receptors are workers at the Site. In the case of soil, as determined through the additional screening in Section 3.1.2 the only complete exposure pathway is the inhalation of indoor air due to impacts in both soil and groundwater.

Workers

As discussed previously, Workers may be exposed to the identified COCs in soil in association with direct contact and the inhalation of dust and groundwater via the ingestion of potable groundwater. The rationale for the identification of these exposure pathways for the Workers is provided in Table 3-3.

Table 3-3: Summary of Potential Pathways of Exposure for Workers

Potential pathway of exposure	Complete exposure pathway (Yes/No)	Comment
Soil Ingestion	Yes	No human health component value for direct contact with soil was available for lead
Soil Inhalation	Yes	No human health component value for direct contact with soil was available for lead
Soil Skin Contact	Yes	No human health component value for direct contact with soil was available for lead
Ground Water Ingestion	No	No COCs were identified in groundwater
Ground Water Skin Contact	No	No COCs were identified in groundwater
Surface Water Ingestion	No	It is unlikely that a worker would be exposed to surface water
Surface Water Skin Contact	No	It is unlikely that a worker would be exposed to surface water
Garden Produce Ingestion	No	There is no garden produce present at the Site for consumption.
Livestock Ingestion	No	As the Site is located in a mainly commercial area no livestock will be present.
Vapour Inhalation	No	No COCs are volatile
Vapour Skin Contact	No	No COCs are volatile
Other Pathways	No	

3.2.2 Exposure Estimates

As discussed previously, Workers may be exposed to the identified COCs in soil in association with direct contact and the inhalation of dust and groundwater via the ingestion of potable groundwater. Potential exposures for direct contact with soil as well as soil inhalation have been calculated.

3.2.3 Receptor Exposure Estimates

The estimated exposures of workers to soil have been provided in Table 3-4.

Table 3-4: Exposure Estimates from Soil COC – Ingestion, Dermal Contact and Dust Inhalation

COC	Soil Incidental Ingestion & Dermal Contact (mg/kg-day)	Soil Dust Inhalation (mg/kg-day)	Total Direct Contact Exposure from Soil (mg/kg-day)
Lead	7.57E-05	5.55E-09	7.57E-05

3.3 Toxicity Assessment

The purpose of the toxicity assessment is to identify both the types of adverse health effects a COC may potentially cause, as well as the relationship between the magnitude of COCs to which receptors may be exposed (dose) and the likelihood of an adverse effect (response). This is called the dose-response relationship. In addition, the toxicity assessment involves the classification of the potential toxicological effects of chemicals as carcinogenic or non-carcinogenic, and the subsequent estimation of the amounts of chemicals that can be received by human receptors without experiencing adverse effects on their health. A toxicity assessment is conducted for all COCs and considers possible modes of toxicity associated following different routes and durations of exposure. The toxicity assessment provides an estimate of how much chemical exposure may occur without unacceptable health effects occurring from lifetime exposure (or significant portion of a lifetime) and provides a basis to interpret exposure rates.

In general, carcinogenic chemicals are considered to work through a non-threshold mechanism of action. This implies that there is no dose below in which an adverse effect (i.e., the development of cancer) will not occur. Current regulatory guidance considers that any exposure to a genotoxic carcinogen is considered to be associated with some level of risk. At very low doses, the probability that an adverse effect (i.e., cancer) will occur is extremely small (e.g., 1 in 1 million lifetime cancer risk). The probability of developing cancer increases as the dose increases. Because it is possible for cancer to develop after exposure to a chemical has ceased (i.e., a latency period), the toxicity values are expressed as the probability of developing cancer over a lifetime. This is based on the assumption that the risk associated with an elevated exposure to a carcinogenic chemical for a short period of time is equivalent to the risk associated with a lower level of exposure over a longer period of time.

3.3.1 Hazard Assessment (Nature of Toxicity)

Chemicals are classified based on their mode of action (i.e., threshold versus non-threshold substance). For substances exhibiting a threshold for toxicity, an acceptable level of exposure at or below which no adverse effects are anticipated is established. For non-threshold-acting chemicals, any level of exposure is assumed to theoretically pose a potential risk, and a slope factor (or in the case of a volatile compound, a unit risk factor) is used to predict risks from estimated exposures. Carcinogenic substances, which act through a mechanism involving damage to the genetic material (i.e., DNA) are usually considered to be non-threshold-acting substances. The following sections provide a summary of the effects associated with exposure to each of the identified COCs.

3.3.2 Dose Response Assessment

Dose-response assessment is the process of characterizing the relationship between the dose of an agent administered or received and the incidence of an adverse health effect in the exposed population. The intensity of exposure and potency of the agent play key roles in understanding the potential adverse health effects.

Potency values, generally established by regulatory agencies, describe the relative toxicity of carcinogenic substances and are typically expressed as cancer slope factors (CSFs). For the non-carcinogenic substances, oral reference doses (RfDs) and tolerable daily intakes (TDIs) are used as an indicator of the relative toxicity of an agent.

The MOECC (2011b) and U.S. EPA were the primary source of all toxicological dose-response data for this assessment, in accordance with MOECC guidance (MOE 2011b). In several instances, U.S. EPA values were chosen over those published by MOECC because of the toxicity criteria were based on more recent studies or more robust assessments of the original toxicology data available for the chemical of concern. A list of TRV values used in the assessment is provided in Table 3-6.

Many chemicals exhibit both types of dose-response relationships, exhibiting different adverse effect end points. Some of the COCs that are the subject of this assessment are assumed to have shown both threshold and non-threshold adverse effects. It is appropriate to assess both health endpoints in this type of risk assessment, to ensure that both potential risk and hazard are properly addressed. A list of TRV values used in the assessment is provided in Table 3-5.

The following definitions have been extracted from the U.S. EPA's Integrated Risk Information System (IRIS) documentation:

- Reference Concentration (RfC): An estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. It can be derived from a No Observed Adverse Effect Level (NOAEL), Lowest Observed Adverse Effect Level (LOAEL), or benchmark concentration, with uncertainty factors generally applied to reflect limitations of the data used. This estimate is generally used in U.S. EPA's non-cancer health assessments.

- Reference Dose (RfD): An estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. It can be derived from a NOAEL, LOAEL, or benchmark dose, with uncertainty factors generally applied to reflect limitations of the data used. This estimate is generally used in U.S. EPA's non-cancer health assessments.

- Slope Factor: An upper bound, approximating a 95 percent confidence limit, on the increased cancer risk from a lifetime exposure to an agent. This estimate, usually expressed in units of proportion (of a population) affected per mg/kg/day, is generally reserved for use in the low-dose region of the dose-response relationship, that is, for exposures corresponding to risks less than 1 in 100.

- Unit Risk: The upper-bound excess lifetime cancer risk estimated to result from continuous exposure to an agent at a concentration of 1 μg/L in water, or 1 μg/m^3 in air. The interpretation of unit risk would be as follows: if unit risk = 1.5 x 10^{-6} per μg/L, 1.5 excess tumors are expected to develop per 1,000,000 people if exposed daily for a lifetime to 1 μg of the chemical in 1 litre of drinking water. Cancer slope factors (CSF) are generally derived using mathematical models that, in most cases, extrapolate results from animal studies conducted at high doses to low doses that may occur in human populations. This approach assumes that a threshold for the carcinogenic low dose response does not exist and that some risk is associated with any dose of the chemical. It should also be noted that for many compounds carcinogenicity has only been demonstrated in experimental animal models. Slope factors for each compound are derived for

the most sensitive or affected organ or system (the target) in the studied species. In cases where only animal data are available, it is generally assumed that the target organ or system would be the same for a human subject. The limitations of using animal data for dose response assessment have been discussed in many publications over the past 20 years (Paustenbach 1989; Paustenbach 1990; Crump 2000). In addition to CSFs, toxicity values for carcinogens can also be expressed in terms of risk per unit concentration of the substance in the medium in which human contact occurs (U.S. EPA 1989). The chemical-specific unit risk value (or unit risk factor: URF) defines the relationship between air concentration and carcinogenic response. This potency value represents the upper bound estimate of the probability of response per unit concentration of the chemical in air over a 70-year lifetime.

Many chemicals exhibit both types of dose-response relationships, exhibiting different adverse effect end points. Some of the COCs that are the subject of this assessment are assumed to have shown both threshold and non-threshold adverse effects. It is appropriate to assess both health endpoints in this type of risk assessment, to ensure that both potential risk and hazard is properly accounted for.

A full list of TRV values used in the HHRA are presented in Table 3-5 below:

Table 3-5: Summary of TRV Values Used in the HHRA

COC	RfD (mg/kg/d)	Endpoint	Source
Metals			
Lead	6.3E-04	increased prevalence of chronic kidney disease and increased systolic blood pressure as well as protecting the fetus from neurodevelop mental effects	EFSA, 2013

3.4 Risk Characterization

The purpose of the risk characterization is to estimate potential risks associated with Site contaminants for each exposure scenario. The findings of the dose-response assessment are integrated with the results of the exposure assessment to derive quantitative estimates of risk and hazard for carcinogenic and non-carcinogenic COCs, respectively. Therefore, risk characterization is the step in the risk assessment process that combines the results of the exposure assessment and the toxicity assessment for each COC to estimate the potential for carcinogenic and non-carcinogenic human health effects from chronic exposure to that constituent.

The risk characterization compares estimated site-specific risk levels to target risk levels. For this risk assessment, the allowable incremental lifetime target cancer risk is set at 10^{-6} (1 in 1,000,000). In addition, MOE's target non-cancer hazard index is set at 0.2 (0.5 for PHCs) to allow for the potential exposure to other contaminants unrelated to the site.

3.4.1 Approach to Risk Characterization

For the assessment of non-carcinogenic health effects, the calculated acceptable daily dose (ADD) is compared to the Tolerable Daily Intake (TDI). The TDI is defined as an estimate of compound intake that is unlikely to cause adverse health effects even if exposure occurs for an entire lifetime.

For each exposure pathway, the predicted concentration or dose rate is compared to the reference concentration (RfC) or tolerable daily intake/reference dose (TDI/RfD) for non-carcinogens. The ratio of the predicted exposure to the TDI is termed the hazard quotient (HQ):

$$HQ = ADD / TDI$$

where: ADD = Average daily dose; estimated daily intake averaged over the exposure period (mg kg^{-1} d^{-1})

TDI = Tolerable daily intake (mg kg^{-1} d^{-1} or mg m^{-3}).

In the absence of a multi-media exposure assessment, the limit for acceptable risk is set at 0.2 for all COCs. The use of an HQ of 0.2 for the majority of COCs assumes that 80% of allowable exposure occurs via other exposure pathways (i.e., exposure to the COCs from food, consumer products, etc.). While the allocation factor can be adjusted based on a multi-media exposure assessment, this was not included as part of this assessment and therefore the 20% source allocation factor was retained in the investigation.

For carcinogens that are assumed to operate via a non-threshold mechanism of action, the risk characterization identifies the incremental cancer risk associated with a particular exposure pathway. Incremental lifetime cancer risks are a unitless value that expresses the probability of developing cancer for a specified level of exposure averaged over a lifetime. Acceptable incremental lifetime risk is defined as 10^{-6}.

Cancer risks as a result of exposure to several of the chlorinated VOCs (e.g., tetrachloroethylene and trichloroethylene in ground water) were calculated as the product of the predicted exposures and the TRV. The risk characterization is expressed as:

$$ILCR = Dose\ Rate \times TRV$$

where: ILCR = Incremental lifetime cancer risk;

Dose rate = Absorbed dose rate received from a contaminant via an exposure pathway (mg/kg/day); and

TRV = Non-threshold acting toxicity reference value (ug/m^3 day)$^{-1}$.

As recommended by MOECC, an incremental lifetime cancer risk of less than 1 in one million (1 x 10^{-6}) is considered protective of human health and the associated risk from the contaminant of concern via that exposure pathway are considered to be acceptable.

3.4.2 Interpretation of Health Risks

In the following section, the risks attributable to each of the pathways of exposure are presented. These include all complete pathways determined in the Exposure Assessment section.

3.4.2.1 Quantitative Interpretation of Health Risks

Quantitative Interpretation of Health Risks – Workers

Table 3-6 provides the interpretation of risks due to direct contact with soil.

Table 3-6: Interpretation of Risks – Workers – Direct Contact with Soil

COC	Maximum Soil Concentration (µg/g)	Non-Cancer Hazard		
		Total Conc. (mg/kg/day)	Oral TRV (mg/kg/day)	HQ
Lead	130	7.57E-05	6.30E-04	1.20E-01

The calculated HQ is below the MECP's target HQ of 0.2 and as a result it can be concluded that there are no unacceptable risks from direct contact with soil.

4 ECOLOGICAL RISK ASSESSMENT (ERA)

An ecological risk assessment (ERA) was conducted to characterize the risks for ecological receptors from exposure to COCs in soil and groundwater at the Site. The ERA was conducted generally following the ecological risk assessment procedures as prescribed by the Ontario MOECC guidance document, Procedures for the Use of Risk Assessment under Part XV.1 of the Environmental Protection Act, and O. Reg. 153/04 (as amended).

4.1 Problem Formulation

The Problem Formulation step of the ERA defines the issues at the Site as they relate to ecological receptors. A risk assessment must be based on a fundamental understanding of the Site conditions, the potential exposure pathways, and the characteristics of the receptors present at the Site. The Site conditions were discussed previously in Section 2 of this report. A discussion is presented below concerning the development of the ecological Conceptual Site Model (CSM) for the Site, including examination of potential receptors and exposure pathways.

4.1.1 Ecological Conceptual Site Model

The site characterization (Section 2) indicated that lead, zinc, PHC F4, EC and SAR were present in soil at concentrations exceeding the Table 1 SCS. In the case of groundwater, copper was present above Table 1 SCS.

There are several environmental transport pathways that may apply at the Site. Volatile chemicals may evaporate from shallow soil and groundwater to the atmosphere. Once in the atmosphere, volatile chemicals are rapidly diluted such that exposure to ecological receptors is typically negligible. Chemicals with sufficient aqueous solubility, including some inorganic parameters, a few PAHs, and VOCs may undergo subsurface transport in groundwater.

The Site is an industrial property surrounded by predominantly industrial land uses. The site is currently vacant. The primary receptors are terrestrial plants, soil invertebrates, birds and mammals. In the case of soil, there is the potential for root uptake, direct contact, inhalation of dust, ingestion of food items and prey. As will be noted in Section 4.1.3.2, no COCs are present in groundwater at the Site with respect to the ERA, as such off-site aquatic receptors are not at risk due to the impacts identified at the risk assessment site.

The following terrestrial ecological receptors were identified as on-Site Valued Ecosystem Components (VECs):

- Terrestrial plants, including trees, shrubs, herbs, and grasses that potentially may be present under a future land use.

- Soil invertebrates, represented by earthworms.

- Mammals, represented by the herbivorous meadow vole, insectivorous short-tailed shrew and the red fox; and

- Birds, represented by the herbivorous red-winged blackbird, insectivorous American woodcock and the carnivorous red-tailed hawk.

Soil COCs are assumed to be (potentially) available to terrestrial plants and soil organisms via root uptake and direct contact pathways, and to wildlife via dermal contact and via ingestion of soil and food items that have accumulated COCs from soil. Terrestrial receptors may be exposed to COCs via the inhalation of dust. Based on the minimum depth to groundwater (3.77 mbgs), direct contact/root uptake pathways for groundwater are considered incomplete for terrestrial plants and soil organisms.

A graphical illustration of the ecological conceptual exposure model is presented in Figure 4.

4.1.2 Risk Assessment Objectives

The objectives of the ERA were to:

- Assess the potential risks, is any, related to COCs identified in on-Site soil and groundwater to on-Site terrestrial receptors (namely terrestrial plants, soil invertebrates, terrestrial mammals and terrestrial birds).

- Assess the risks due to direct contact with COCs in soil (invertebrates)

- Assess the risks to plants exposed to COCs in soil by root contact/uptake

- Assess the risks to terrestrial mammals and birds exposed to COCs in soil by direct contact and through prey/food ingestion

- The assessment of exposure and risks will be conducted both qualitatively and quantitatively

- The ERA assumes a full-depth approach for assessing exposures and risks.

- Both qualitative and quantitative assessment of risks were completed in the ERA with a qualitative assessment being completed for plants and soil invertebrates and a more quantitative assessment being completed for mammals and birds.

4.1.3 Contaminants of Concern for ERA

As described in Section 2, several contaminants in soil and groundwater were retained as COCs that exceeded the Table 1 SCS. COCs were compared to the Table 2 ecological component values, calculated through the MGRA model.

4.1.3.1 COCs in Soil

Soil COCs requiring quantitative evaluation in the ERA were identified by screening maximum concentrations against the applicable Table 2 SCS (coarse textured soil) component values for direct contact (plants and soil organisms), and ingestion (mammals and birds). The screening of soil parameters is summarized in Table 4-1. No screening to the soil leaching to groundwater component value as Section 4.1.3.2 notes no exceedances in groundwater at the Site.

Table 4-1: Screening of Soil COCs for Quantitative Evaluation in ERA

Chemical Parameter	Maximum Soil Concentration (ug/g)	Plants & Soil Org.	Mammals & Birds	COC (Yes/No)
Metals				
Lead	130	1,100	32	**Yes, mammals and birds**
Zinc	678	600	340	**Yes, plants/soil organisms, mammals and birds**
PHCs				
PHC F4	439	3,300	No value	No

Chemical Parameter	Maximum Soil Concentration (ug/g)	Plants & Soil Org.	Mammals & Birds	COC (Yes/No)
Inorganics				
EC (mS/cm)	0.92	1.4	Only applicable to terrestrial plants	No
SAR	3.07	12	Only applicable to terrestrial plants	No

It is noted that lead and zinc had exceedances of their ecological component values and will be assessed further in the ERA. In the case of PHC F4 for mammals and birds, PHCs are not of concern to these receptors as PHCs do not accumulate to any significant degree in these receptors. As a result, PHC F4 will not be evaluated further in the ERA.

4.1.3.2 COCs in Groundwater

To identify COCs requiring quantitative evaluation in the ERA, maximum concentrations of COCs were screened against the GW3 component value used to derive the Table 2 SCS (MOE 2011b). The GW3 component value refers to the pathway involving discharge of groundwater to surface water and is intended to protect aquatic receptors. The GW3 value also is considered to offer sufficient protection for terrestrial receptors (plants, soil invertebrates, mammals, birds). In developing the generic standards, the MOECC noted that GW3 values are "assumed to provide a sufficient degree of protection to plants, soil organisms, mammals and birds such that separate calculations for these receptors for ingestion or exposure to shallow ground water or ground water seeps is not needed" (MOE 2011b). However, given the minimum depth to groundwater at the site of 3.77 mbgs, direct contact with the groundwater is not expected, with this pathway not being examined further in the ERA.

The secondary screening of COCs using the ecological component value for groundwater is presented in Table 4-2.

Table 4-2: Screening of Groundwater COCs for Quantitative Evaluation in ERA

Chemical Parameter	Maximum Groundwater Concentration (ug/L)	Table 2 GW3	COC (Yes/No)
Copper	6.60	87	No

No exceedances were noted in association with groundwater at the Site. As a result, groundwater will not be examined further in the ERA as no unacceptable risks are present.

4.2 Receptor Characterization

4.2.1 Identification of Potential Receptors

Valued Ecosystem Components (VECs) are receptors that have an intrinsic, economic, or social value. VECs are typically selected based on surveys of the site and knowledge of receptors typically found in similar environments.

With the anticipated absence of ecological habitat at the Site following redevelopment for residential use, potential ecological receptors are limited to plants and soil organisms typically found in ornamental gardens or landscaping, as well as urban-adapted wildlife. The following ecological receptors were identified as VECs:

- Terrestrial plants.
- Soil invertebrates (earthworm).
- Mammals: herbivorous meadow vole, insectivorous short-tailed shrew and red fox.
- Birds: herbivorous red-winged blackbird; insectivorous American woodcock and carnivorous red-tailed hawk.

Descriptions of VECs are provided below.

4.2.1.1 Terrestrial Plants

Future land use is assumed to support typical urban plants including grass, ornamental shrubs, and trees. As autotrophs, plants are the foundation of any terrestrial ecosystem, including those heavily modified or influenced by humans. Consistent with MECP guidance, plants were assessed as a group, rather than a separate species. Plants are potentially exposed to COCs in soil via root uptake and root contact.

4.2.1.2 Soil Invertebrates

Soil at the Site is assumed to support indigenous soil invertebrates such as earthworms, grubs, arthropods, etc. In terms of sensitivity to toxicants, earthworms are considered to be one of the most sensitive receptors for soil contaminants. Earthworms are in near-constant direct dermal contact with soil. Earthworms are probably the most important soil invertebrate in promoting soil fertility (Edwards 1992). The feeding and burrowing activities of worms break down organic matter and release nutrients and improve aeration, drainage, and aggregation of soil. Earthworms are also important components of the diets of many higher animals. Due to their importance in a healthy ecosystem, as well as their ubiquity in the environment, earthworms were selected as a representative surrogate for all soil invertebrate species.

4.2.1.3 Meadow Vole

Portions of the Site under some future land use (i.e., landscaped areas) may be suitable for supporting small herbivorous mammals. Of the mammals that may be present, voles are most likely to receive relatively large doses of COCs, as they have a small home range (0.083 ha; U.S. EPA 1993) and therefore are likely to spend more time within contaminated areas and consume a relatively high proportion of soil in their diet.

The meadow vole (Microtus pennsylvanicus) was chosen as a representative surrogate for small herbivorous mammals that may be found at the Site. Voles are small (44 g; Sample and Suter 1994) herbivorous rodents found throughout Canada and the U.S. wherever there is grass cover. The meadow vole makes its burrows along surface runways in grasses or other herbaceous vegetation. Voles inhabit grassy fields, marshes, and bogs (Getz 1961). Microtus voles consume green vegetation, sedges, seeds, roots, bark, fungi, insects, and animal matter. Meadow voles favor green vegetation when it is available and consume other foods more when green vegetation is less available (Riewe 1973; Johnson and Johnson 1982; Getz 1985). Although there is some evidence of food selection, meadow voles generally eat the most common plants in their habitat (Zimmerman 1965). The overall ingestion rate of meadow voles has been estimated to be 0.005 kg/day (Sample and Suter 1994).

4.2.1.4 Short-tailed Shrew

The shrew is proposed as a VEC representative of small omnivorous mammals. The northern short-tailed shrew (Blarina brevicauda) is the most widespread shrew species in southern Canada and the north-central and northeastern U.S. (George et al. 1986)). Shrews are an important component of the diet of many raptors (Palmer and Fowler 1975) and are also prey for carnivores such as fox and weasels (Buckner 1966). Shrews inhabit a wide variety of habitats and are common in areas with abundant vegetative cover (Miller and Getz 1977). Shrews burrow in the upper layers of soil. Underground runways and nests are usually constructed within the upper 10 cm of soil (George et al. 1986). The diet of the short-tailed shrew consists of small arthropods such as grasshoppers and beetles, worms, and limited amounts of seeds and berries (Sample and Suter 1994).

4.2.1.5 Red Fox

The red fox (Vulpes vulpes) was selected as a VEC representing larger carnivorous/omnivorous mammals. Red foxes are abundant throughout North America, except in parts of the central and southwestern U.S. Red foxes are approximately 56 to 63 cm in length, and weigh 3 to 7 kg. Red fox prey extensively on small rodents such as meadow vole, field mice, and hare, but also consume game birds, insects, and occasionally fruit, berries, seeds, and nuts (Palmer and Fowler 1975). The home range of the red fox varies considerably according to landscape; in a non-urban area, home ranges can be as large as 3,000 ha (U.S. EPA 1993).

4.2.1.6 Red-winged Blackbird

The red-winged blackbird (Agelarius phoeniceus) is a passerine bird very common near fresh water marshes, lakes, and rivers across Ontario during summer months. The red-winged blackbird inhabits open grassy areas and prefers wetlands, particularly if cattail (Typha) is present. It is also found in dry upland areas, where it inhabits meadows, prairies, and old fields. Given that a Creek is located approximately 120m west of the Site, and the red-winged blackbird also inhabits upland areas, the presence of this

species at the Site is possible. The red-winged blackbird nests in cattails, rushes, grasses, sedge, or in alder or willow bushes over the water. The most sensitive life stage of this species (developmental stage) is spent in Ontario. During most of the year, the red-winged blackbird is herbivorous or granivorous, consuming primarily grains and seeds. However, during breeding seasons, insects such as dragonflies, damselflies, butterflies, moths, and flies form a significant fraction of the diet. Consistent with assumptions employed by the Ministry in the development of the generic SCS, the red-winged blackbird was assumed in the ERA to be strictly herbivorous. The red-winged blackbird was selected as a surrogate for all herbivorous passerine birds that may be found at the site.

4.2.1.7 American Woodcock

The American woodcock (Turdus migratorius) was selected to represent birds that would consume a diet comprised of a significant amount of soil invertebrates. The MECP has adopted the American woodcock to represent omnivorous birds in Ontario. The American woodcock inhabits "both woodlands and abandoned fields, particularly those with risk and moderately to poorly drained loamy soils, which then don't support abundant earthworm populations" (US EPA, 1993). The American woodcock was selected as a surrogate for all omnivorous or insectivorous passerine birds that may be found at the Site.

4.2.1.8 Red-Tailed Hawk

The red-tailed hawk was considered for assessment and was assumed to consume a diet entirely composed of small mammals. The red-tailed hawk was included in the derivation of the component values protective of mammals and birds. However, only the red-winged blackbird and American woodcock were selected for quantitative assessment in the ERA as these birds have smaller home ranges than larger birds (e.g., red-tailed hawk) and are anticipated to forage all food items from the site. Using smaller birds as a surrogate for other larger species potentially present on-site provides a conservative quantitative estimate of chemical dosage that is likely greater than other species present on the site.

4.3 Exposure Assessment

The exposure assessment consists of the pathway analysis, which provides a summary of the complete exposure pathways evaluated in the ERA, and the exposure estimate, which determines the exposure of the terrestrial VECs to the COCs identified at the Site.

4.3.1 Pathway Analysis

The potential exposure pathways for COCs in soil and groundwater to VECs are discussed in the following section.

4.3.1.1 Terrestrial Plants and Soil Invertebrates

The primary pathway from soil and groundwater exposure for terrestrial plants on the Site is through root uptake and/or direct contact with the impacted media. Incidental soil ingestion, and dermal contact by soil invertebrates is the predominant pathway. The vapour (sourced from volatile COCs in soil) inhalation by soil invertebrates is a potential pathway of exposure but expected to be negligible and therefore not considered further in the ERA. The dispersion of fugitive dust and inhalation of particulates is considered to be a potential exposure pathway, however there are no toxicological values upon which

to either qualitatively or quantitatively evaluate this exposure pathway. The uptake of soil by food items and the subsequent ingestion of food items by vegetation and/or soil organisms as well as mammals and birds are considered to be a potential exposure pathway and is included in the ERA. The following exposure pathways were quantitatively evaluated within the ERA:

- Root uptake from soil for terrestrial plants
- Incidental soil ingestion, and dermal contact with soil-by-soil invertebrates

4.3.1.2 Mammals and Birds

Although dermal exposure through direct contact with soil may be a complete exposure pathway for mammals and birds, it is generally considered to be insignificant due to the low frequency and duration of exposures. Additionally, the information required to estimate dermal exposure of mammals and birds is not available. Fur on mammals is believed to reduce exposure by limiting contact with skin and the contaminated media. Consequently, dermal contact will not be quantitatively assessed for mammals and birds. The dispersion of fugitive dust and inhalation of particulates are potential exposure pathways but considered to be negligible and therefore not considered further in the ERA. The primary route of exposure for mammals and birds is via the ingestion of food/prey that may have accumulated contaminants from soil and groundwater, as well as incidental ingestion of soil during the consumption of food items or through interactions with soil (e.g., burrowing activities). The following exposure pathways are qualitatively evaluated within the ERA:

- Ingestion of impacted food/prey (i.e., plant and animal tissue) by terrestrial mammals and birds
- Incidental ingestion of soil

4.3.1.3 Exposure Estimates

This section consists of assessing the exposure of aquatic and terrestrial VECs to the COCs identified in soil and groundwater. Table 5-4 provides the exposure estimates for COCs in soil at the site.

Table 4-3: Exposure Estimates for COCs in Soil

Chemical Parameter	Exposure Estimates for Soil (mg/kg)
Lead	130
Zinc	678

4.4 Hazard Assessment

The hazard assessment involves identifying screening benchmarks and TRVs used in the ERA. These were selected to be protective of ecological receptors and are based on changes to growth, reproduction, or survival. The relevant adverse ecological effects are provided in the MECP Rationale Document (MOE 2011b).

4.5 Risk Characterization

4.5.1 Interpretation of Ecological Risks

The assessment of potential risks to ecological receptors, defined as the screening index (SI), was determined by dividing the REM by the ecological component value as shown in the following equation:

Where:

SI = Screening Index [-]

REM = Reasonable Estimates of the Maximum Concentrations [µg/g or µg/L]

Ecological Component = Applicable ecological component value for the COC [µg/g or µg/L]

Conservative uncertainty factors have been incorporated into the ecological component values for each COC. The calculated SIs were compared with an acceptable value of 1. If the SI of a COC is less than or equal to 1, it is unlikely to pose an adverse health risk to the exposed ecological receptors on the site, while a further examination of the exposure pathways is needed if it exceeds.

4.5.2 Quantitative Interpretation of Ecological Risks

A quantitative evaluation of potential risk was undertaken for the on-site receptors (vegetation, soil organisms, mammals, and birds). Exposures to soil COCs were assessed using the SI approach. If the maximum concentrations of the COCs are greater than the applicable ecological component values (i.e. SI > 1), they would require measures to decrease or eliminate exposure.

4.5.3 Qualitative Interpretation of Ecological Risks

Terrestrial plants are potentially exposed to COC in soil via root uptake (direct contact) and soil invertebrates are exposed via direct contact. Exposure estimates for plants and soil invertebrates were based on the maximum concentrations of COCs at the Site. In the absence of risk management measures (RMM), SIs for terrestrial plants and soil invertebrates were greater than one for zinc (Table 4-4). It may be inferred from this result that growth and reproduction of sensitive plants and soil invertebrates may be inhibited in areas of the Site with concentrations of COCs exceeding their associated TRVs.

Table 4-4: Interpretation of Risks – Plants and Soil Invertebrates

Parameter	TRV (mg/kg)	Without RMM	
		Exposure Concentration (mg/kg)	SI (Screening Index)
Zinc	600	678	**1.13**

Table 5-5 presents the result of comparing the maximum soil concentrations with individual ecological component values for birds and mammals. Bolded and shaded values indicate an exceedance of an SI of greater than the acceptable level of 1.0. In the absence of RMMs, SIs for were greater than one for lead and zinc (Table 4-4) for the American woodcock. It may be inferred from this result that there is the potential for unacceptable risks to birds at the Site.

Table 4-5: Comparison of Maximum Soil Concentrations to Mammal and Bird Ecological Component Values

Parameter	Units	Maximum Soil Concentration	American Woodcock	Meadow Vole	Red Fox	Red Winged Black Bird	Red Tailed Hawk	Short-Tailed Shrew
Lead	µg/g	130	**32**	185000	88200	140	163000	1760
Zinc	µg/g	678	**337**	492000	36900	2770	79000	5520

NV – No value

5 CONCLUSIONS

As discussed, the Site is used for industrial/commercial use and is currently vacant. The Site is to be used for truck parking in the future, along with the construction of an on-site building. Therefore, the primary human receptors are workers at the Site. In the case of soil, there is the potential for direct contact with soil and the inhalation of dust. There is the potential for direct contact with groundwater as it may be used as a potable source. In the case of ecological receptors, the primary receptors are terrestrial plants, soil invertebrates, birds and mammals. In the case of soil, there is the potential for root uptake, direct contact, inhalation of dust, ingestion of food items and prey. In the case of groundwater given the minimum depth to groundwater (3.77 mbgs), there is no potential exposure for ecological receptors.

For the Human Health Risk Assessment (HHRA), further screening of the exceedances in soil and groundwater was completed with a comparison to the applicable MECP Table 2 (industrial/commercial, coarse soil, potable groundwater) human health component values, as the Table 1 SCS were only applicable for the identification of impacts at the Site given the requirement of the Township of Puslinch. For soil, the values for direct contact were used for comparison. In the case of soil, no exceedances were noted. In the case of lead, no human health component values are currently available. The

MEPC has released updated TRVs for lead and these will be used to determine potential risks to risks at the Site due to exposure to soil. In the case of groundwater, no exceedances of the human health component value were noted.

For the Ecological Risk Assessment (ERA), further screening of the exceedances in soil and groundwater was completed with a comparison to the applicable MECP Table 2 (industrial/commercial, coarse soil, potable groundwater) ecological component values. In the case of soil, lead exceeded for birds and mammals, while zinc exceeded for both terrestrial plants/soil invertebrates and birds and mammals requiring further assessment in the ERA. In the case of groundwater, no exceedances were noted, as such groundwater in association with ecological receptors will not be evaluated further in the ERA.

The HHRA concluded that no unacceptable risks were present in association with soil. As a result, there are no unacceptable risks to users of the site.

The ERA concluded that in the absence of risk management measures, the calculated Screening Indices for terrestrial plants and soil invertebrates were greater than one for zinc in soil. It may be inferred from this result that growth and reproduction of sensitive plants and soil invertebrates may be inhibited in areas of the Site with concentrations of zinc exceeding their associated TRVs. In the case of mammals and birds exposed to soil at the soil, in the absence of risk management measures, the calculated Screening Indices were greater than one for lead and zinc in association with the American woodcock. It may be inferred from this result that there is the potential for unacceptable risks to birds at the Site. As a result, there is the requirement to cap the impacted soil with gravel, asphalt, building footprint or 0.5 m of soil meeting the Table 1 SCS is required to mitigate potential risks to ecological health. With this risk management measure in place no unacceptable risks are present due to soil at the Site.

With the recommended risk management measures in place, no unacceptable risks exist at the Site and the Site is suitable for continued commercial/industrial use without any remediation

On this basis, the following property specific standards were developed based on the presence of risk management at the site for impacts in soil.

Table 4-6: Calculated Property Specific Standards for Soil

Parameter	Units	Maximum Soil Concentration	Calculated Property Specific Standard	Basis of Property Specific Standard
Lead	µg/g	130	**156**	Maximum concentration x 1.2
Zinc	µg/g	678	**814**	Maximum concentration x 1.2

6 CLOSURE

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Thank you for considering me for this project. If you have any questions regarding the content of this report, please feel free to contact me at 519-857-2777, or via email at: hscobie@hsgroupra.ca

Sincerely,

[redacted]

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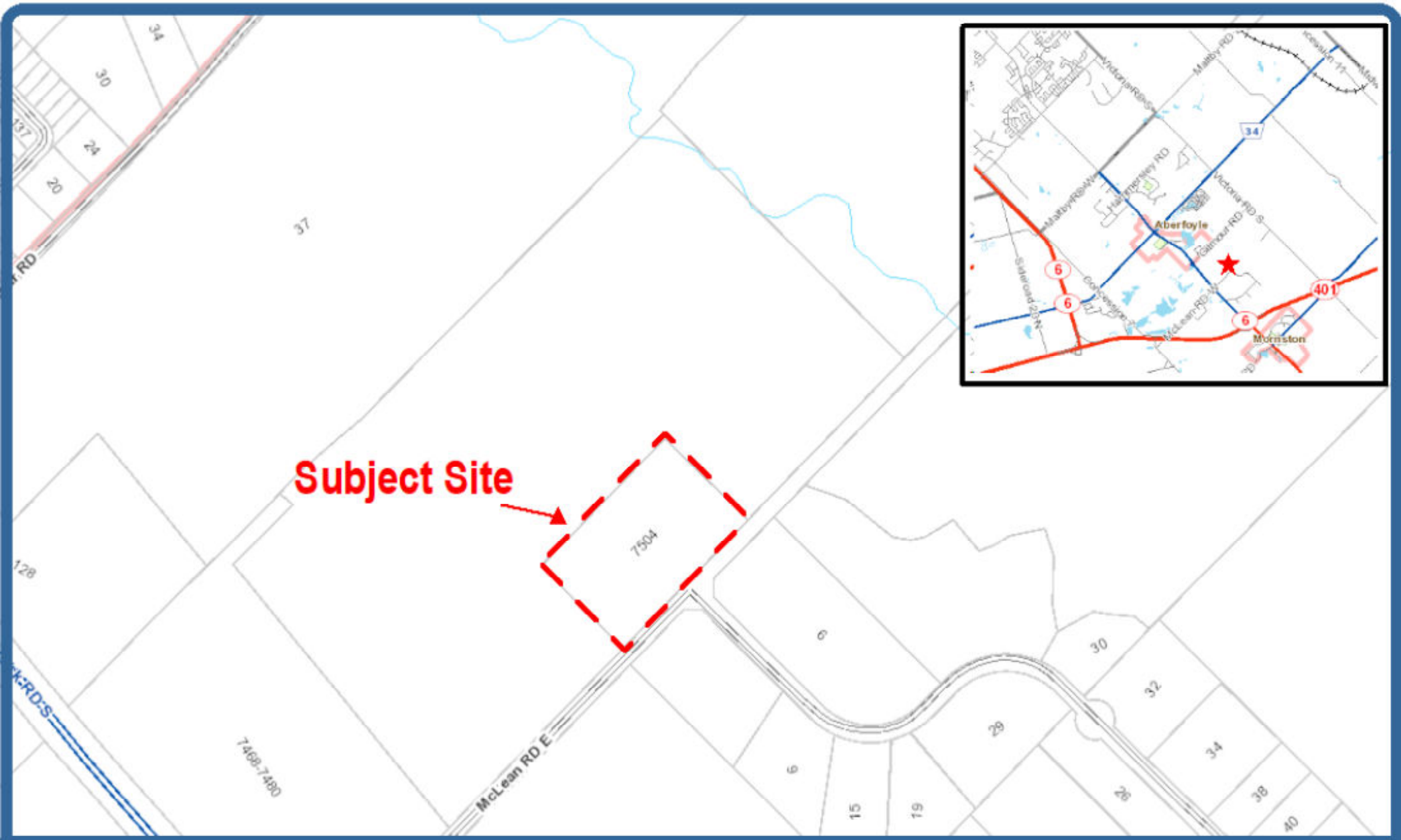
Figures



A&A ENVIRONMENTAL CONSULTANTS INC.
16 Young St,
Woodstock, ON, N4S 3L4
Tel: 519 266-4680

Site Location Map Located at 7504 McLean Road, Puslinch, Ontario

0 m — 200 m

Project #8296
June 2024

Map Source:
ERIS 2024

N
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A&A ENVIRONMENTAL CONSULTANTS INC.
16 Young St,
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Tel: 519 266-4680

Satellite Image of the Subject Site Indicating Monitoring Well Locations at 7504 McLean Road, Puslinch, Ontario

0 m — 60 m

Project #8296
June 2024

Map Source:
ERIS 2024

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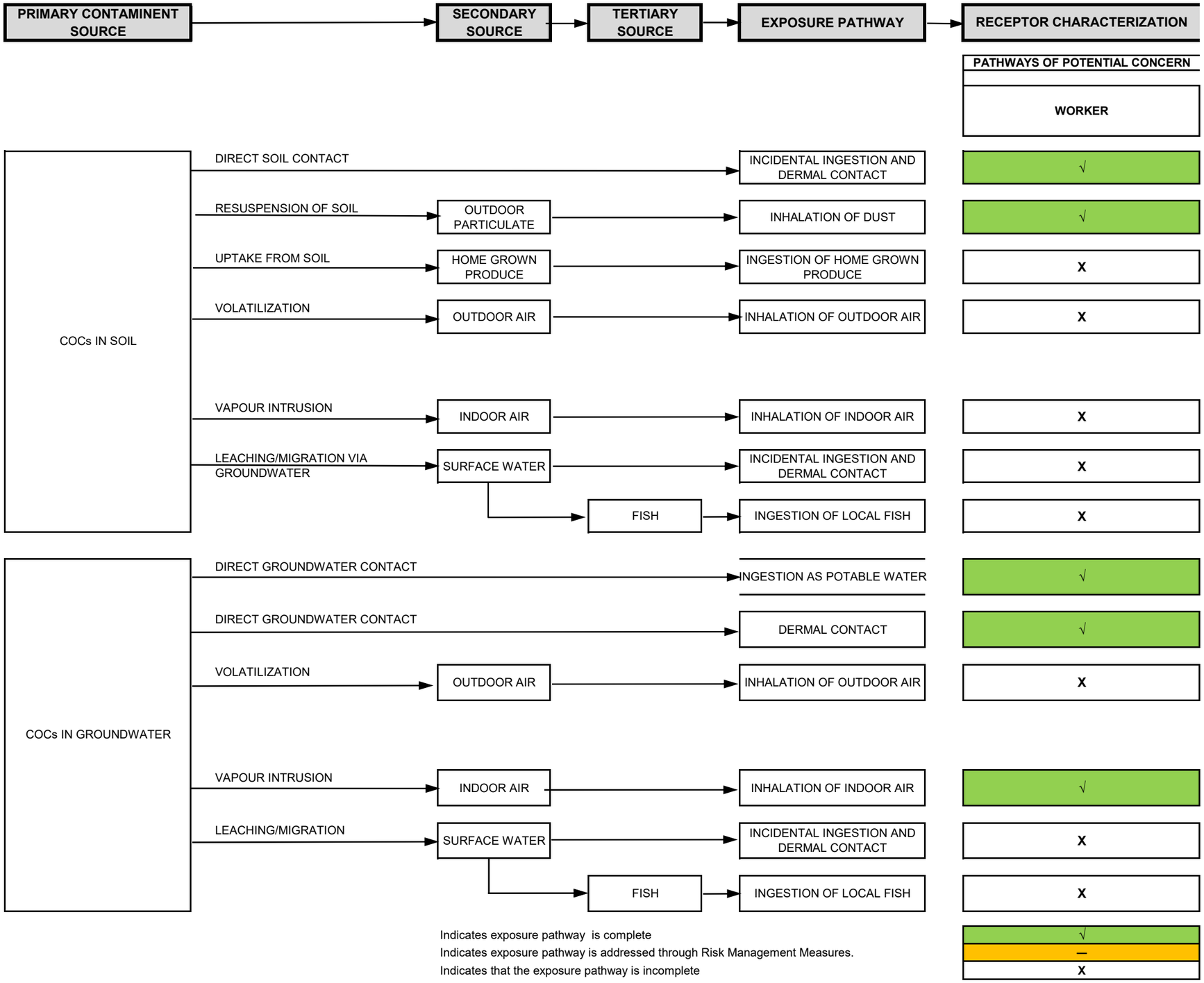
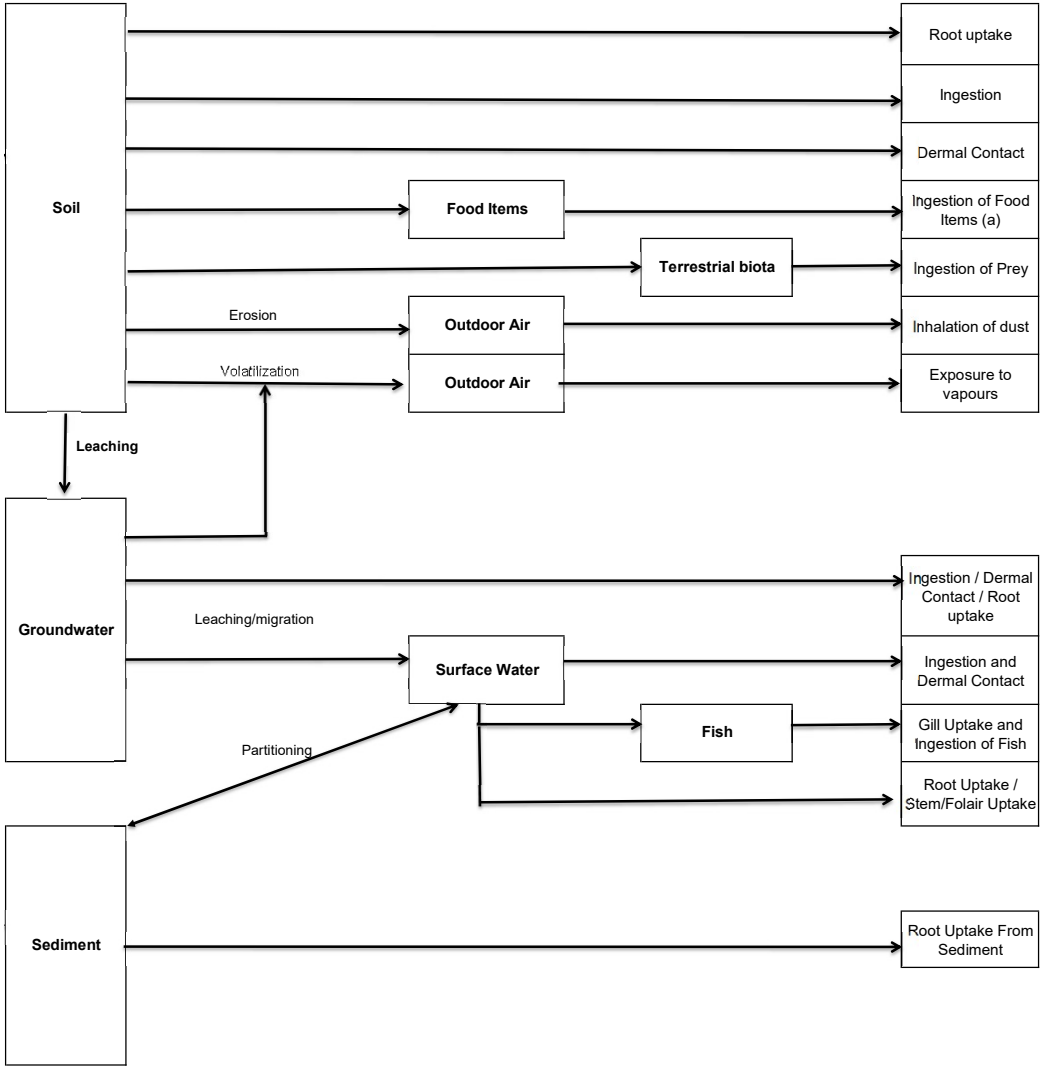


Figure 3. Human Health Conceptual Model - 7504 McLean Road, Puslinch, Ontario

Figure 4 - Ecological Conceptual Site Model - 7504 McLean Road, Puslinch, Ontario



Receptor Characterization		
On-Site		
Terrestrial Plants	Soil Invertebrates	Birds and Mammals
☑	X	X
X	☑	☑
X	☑	☑
X	X	☑
X	X	☑
X	X	X
X	X	X
X	X	X
X	X	X
X	X	X
X	X	X
X	X	X

Appendix A

HSGROUP

Hugh Scobie, MSc., DABT, C.Chem, QP_{RA}

E-mail: hscobie@hsgroupra.ca

Professional Summary

Mr. Scobie is a board-certified toxicologist and chartered chemist with over 25 years of experience in conducting human health and environmental risk assessment. Mr. Scobie provides expert advice in the fields of human health risk assessment and toxicology, site-specific risk assessment, environmental toxicology, probabilistic exposure assessment, multi-media risk assessment, review of risk assessments and toxicology and development of regulatory standards for chemicals in soil and other media. He was previously employed with the Ontario Ministry of the Environment (MOE) as a Regulatory Toxicologist in the Human Toxicology and Air Standards section of the Standards Development Branch. In his previous work at the MOE, he provided expert advice in assessing the risk of adverse effects resulting from exposure to a wide range of hazardous chemicals. He has experience in the assessment of human health risks associated with contaminants in air, water and soil from numerous investigations conducted at various contaminated sites and exposure situations. With his years of experience and expertise in conducting risk assessments in Ontario, Mr. Scobie has been designated by the MOE as a Qualified Person (QP_{RA}) for conducting risk assessments under Ontario Regulation 153/04 (as amended).

Mr. Scobie has performed site-specific risk assessments throughout Canada associated with site contamination by various chemicals including a wide variety of metals. His work in the field of contaminated sites has provided him with extensive knowledge of both federal and a number of the province's environmental regulations.

Education

M.Sc., Pharmaceutical Science, University of Toronto, 2000
B.Sc., Biomedical Toxicology, University of Guelph, 1998
Professional Short Course: Advanced Probabilistic Risk Assessment, Syracuse Research Corporation, Syracuse, New York, 2003

Memberships / Affiliations

Associate Member, Society of Toxicology (SOT)
Member, Society for Risk Analysis
Diplomate of the American Board of Toxicology (DABT)
Chartered Chemist of Ontario (C.Chem)

Summary of Core Skills

Risk Assessment – Hugh provides expert advice in the fields of human health risk assessment, site-specific risk assessment, human health and environmental toxicology, probabilistic exposure assessment, multi-media risk assessment; and expert review of risk assessments. Hugh has a comprehensive understanding of the Ontario's amended Brownfield Regulation (O.Reg.511/09) and its requirements. In addition, he is knowledgeable on the MOE's internal risk assessment processes, internal procedures being an employee of the Ministry's Standards Development Branch

Hugh is also familiar with risk assessment procedures of the US EPA (i.e., RAGS – Risk Assessment Guidance for Superfund; Soil Screening Guidance, etc.), Health Canada, Canadian Council of Ministers of the Environment and Massachusetts Department of Environmental Protection brownfields programs.

Indoor Air Quality Assessments – Hugh has designed and reviewed the results of many indoor air sampling programs. He has been involved in worker exposure scenarios in cases when adverse health effects have been noted. He has been involved in emergency response situations, where rapid identification of the adverse volatile compound is critical. He has extensive knowledge of vapour intrusion, its modelling and its common sources and mitigation strategies. He has experience in both residential and commercial building applications dealing with both environmental and occupational source exposures. He has knowledge and experience with all of the available sampling technologies and can provide recommendations with respect to both efficacy as well as reliability for each of the methodologies.

Regulatory Guideline Development - As a regulatory toxicologist with the Ontario MOE, Hugh developed human health-based air quality standards for over 30 high priority air contaminants, including benzene, benzo(a)pyrene and the group of dioxins and furans. Used knowledge of toxicology and MOE policies and professional judgment and experience in creating the Information Draft documents to be made available to the public for comment. Additionally, Hugh authored the Ontario MOE's guidance concerning the submission of toxicological data in support of Basic Comprehensive Certificate of Approval application for air.

Regulatory Submission - Hugh has expertise in providing submissions to Health Canada, including pesticide formulations and products (Pest Management Regulatory Agency). Hugh also has extensive experience in the submission of air permitting approval documentation to the Ontario MOE.

Litigation Support - Hugh has provided litigation support in several cases both related to regulatory compliance (e.g., Ministry of the Environment offences) and personal injury. Dossier preparation and expert testimony in the area of human toxicology and exposure assessment have been provided in support of litigation.

Professional Experience

MGRA and Tier III Risk Assessment in Support of a Record of Site Condition, Block 60, Vaughan, Ontario

Conducted a MGRA and Tier III HHERA for a Record of Site Condition for separate sections of a large lot in Vaughan, Ontario for residential redevelopment. Concerns at the properties included elevated metal, inorganic, PAH, PHC, VOC, and PCB parameters in soil and elevated metals, inorganic, PAH, PHC, and VOC parameters in soil and groundwater. The risk assessment addressed vapour intrusion as well as direct contact pathways associated with a number of volatile organic compounds found to be present in on-site and groundwater and soil. In addition, a risk management plan was prepared to mitigate unacceptable risks present at the Site.

Risk Assessment in Support of a Record of Site Condition, 550 & 552 Booth Street, Ottawa, Ontario

Conducted a risk assessment for a Record of Site Condition at an industrial property for redevelopment as a residential building in Ottawa, Ontario. Concerns at the property were elevated VOC and SVOC parameters in groundwater. The risk assessment addressed vapour intrusion as well as direct contact pathways associated with a number of volatile organic compounds found to be present in on-site and groundwater. In addition, a risk management plan was prepared to mitigate unacceptable risks present at the Site.

Risk Assessment in Support of a Record of Site Condition, 71 Rebecca Street, Hamilton, Ontario

Conducted a risk assessment for a Record of Site Condition at a commercial use property for redevelopment as a community use in Hamilton, Ontario. The concerns at the RA property included elevated PHC parameters in soil and elevated VOC and PHC parameters in groundwater. The risk assessment addressed vapour intrusion as well as direct contact pathways associated with a number of volatile organic compounds found to be present in on-site and groundwater and soil. In addition, a risk management plan was prepared to mitigate unacceptable risks present at the Site.

Risk in Support of a Record of Site Condition, 693-713 Davis Drive, Newmarket, Ontario

Conducted a risk assessment for a Record of Site Condition at a commercial property in Newmarket, Ontario with elevated VOC and PHC parameters in soil and groundwater. The property is proposed to be redeveloped for residential uses. The risk assessment addressed vapour intrusion as well as direct contact pathways associated with a number of volatile organic compounds found to be present in on-site and groundwater and soil

Risk Assessment in Support of a Record of Site Condition, 1161 Kingston Road, Toronto, Ontario

Conducted a risk assessment for a Record of Site Condition at an industrial property for redevelopment for residential use in Toronto, Ontario. Concerns at the property include elevated PAH, VOC, and PHC parameters in soil and elevated VOC parameters in groundwater. The risk assessment addressed vapour intrusion as well as direct contact pathways associated with a number of volatile organic compounds found to be present in on-site and groundwater and soil. In addition, a risk management plan was prepared to mitigate unacceptable risks present at the Site.

Risk Assessment in Support of a Record of Site Condition, 1799 St. Clair Avenue West, Toronto, Ontario

Conducted a risk assessment for a Record of Site Condition at an industrial property for redevelopment for residential use in Toronto, Ontario. Concerns at the RA property included elevated metal, inorganic, PAH and PHC parameters in soil and elevated VOC and PAH parameters in groundwater. The risk assessment addressed vapour intrusion associated with a number of volatile organic compounds found to be present in on-site and groundwater and soil as well as direct contact pathways for all other contaminants of concern.

Modified Generic Risk Assessment in Support of a Record of Site Condition, 40 St. Clair Avenue West, Toronto, Ontario

Conducted a MGRA for a Record of Site Condition at an commercial property for redevelopment for parkland use in Toronto, Ontario. The primary concern at the RA property was elevated PHC parameters in soil. The approved MECP MGRA model was used to determine property specific standards for contaminants of concern and to apply approved risk management measures to mitigate undue risk estimated by the model

Municipality of Port Hope – Peer Reviewer, Various Projects

Provide peer reviewer support to the Municipality of Port Hope for all remediation and risk assessment projects related to Low Level Radioactive Waste and former industrial sites. Many large scale risk assessment projects going through O.Reg.153/04 risk assessments are being peer reviewed to ensure compliance with the regulation as well as assessing potential liabilities to the Municipality of Port Hope.

Pinnacle International (Dundas) Ltd. - Risk Assessment for Parts of 5421 – 5435, 5449 -5453, 5475 and 5481 Dundas Street West, Toronto

Completed a risk assessment as the Qualified Person for Risk Assessment (QPRA) for a contaminated site in Toronto for a parkland redevelopment to be conveyed to the City of Toronto. The risk assessment is being completed under the requirements of O.Reg.153/04 (as amended). The site had identified metals, PAHs and VOCs in soil and groundwater at the site that required further assessment in both the human health and ecological risk assessments. Risk management measures have been proposed for the site to mitigate potentially unacceptable risks to potential human and ecological receptors at the site.

Southbound Developments (Aurora) Inc. - Risk Assessment for 15186 Yonge Street, 55, 57, And 57A Temperance Street and 12 And 16 Tyler Street Aurora, Ontario

Completing a risk assessment for a contaminated site in Aurora for a redevelopment for a church and a retirement home. The risk assessment is being completed under the requirements of O.Reg.153/04 (as amended). The site had identified PHCs and BTEX in soil and groundwater at the site that required further assessment in both the human health and ecological risk assessments. Risk management measures have been proposed for the site to mitigate potentially unacceptable risks to potential human and ecological receptors at the site.

2, 16, 18 and 20 Cordova Ave, Toronto Ontario

Completing a risk assessment for a contaminated site in Toronto for a redevelopment for residential high-rise buildings. The risk assessment is being completed under the requirements of O.Reg.153/04 (as amended). The site had identified VOCs in groundwater at the site that required further assessment in both the human health and ecological risk assessments. Risk management measures have been proposed for the site to mitigate potentially unacceptable risks to potential human and ecological receptors at the site.

Human Health Risk Assessment Study - Remediation of the Sydney Tar Ponds and Coke Oven Sites - Worked on the team conducting the human health risk assessment of the remedial strategy for the Sydney Tar Ponds and Coke Ovens. Lead a group examining exposures and risks to workers involved in the various remedial activities at the site. In addition, provided support in evaluating the potential risks and exposure to nearby residential as a result of the proposed remedial activities. The study examined the risks associated with a number of compounds including PAHs, BTEX, various metals and PCBs.

Risk Assessment and Risk Communication, Northstar Aerospace, Cambridge, Ontario -Provided support and managed day-to-day activities in the areas of risk assessment and risk communication associated with significant indoor air impacts due to TCE plumes in a shallow sand and gravel aquifer beneath a residential area. Conducted in-home visits to hundreds of impacted residences in order to communicate the health issues related to TCE exposure. Provided communications with all regulatory agencies involved in the project including the City of Cambridge, Grand River Conservation Authority, Region of Waterloo Health Unit and the District Ontario Ministry of the Environment office.

Risk Assessment to Support a Record of Site Condition, R&W Timber Property, Red Lake, Ontario - Qualified Person for Risk Assessment (QP(RA)) in a human health and ecological risk assessment for the redevelopment of a commercial/industrial property for residential use. The risk assessment addressed petroleum hydrocarbon and mercury impacts in ground water, as well as petroleum hydrocarbon and metal impacts in soil. The risk assessment assessed as a key exposure pathway, vapour intrusion through the use of soil vapour data. In addition, a risk management plan was prepared that was accepted by the Ontario Ministry of the Environment to mitigate unacceptable risks present at the Site.

Risk Assessment to Support a Record of Site Condition, 3091 Appleby Line, Burlington, Ontario - Qualified Person for Risk Assessment (QP(RA)) in a human health and ecological risk assessment for the sale and redevelopment of commercial/industrial property for strictly commercial use. The risk assessment

addressed impacts of volatile organic compounds and petroleum hydrocarbons in ground water, as well as impacts of petroleum hydrocarbons, polycyclic aromatic hydrocarbons and metals in soil. In addition, a risk management plan was prepared that was accepted by the Ontario Ministry of the Environment to mitigate unacceptable risks present at the Site.

Risk Assessment to Support a Record of Site Condition, 5 Hanna Avenue, Toronto, Ontario - Qualified Person for Risk Assessment (QP(RA)) in a human health and ecological risk assessment for a residential redevelopment in Toronto. The risk assessment examined potential risks due to vapour intrusion as the result of impacted ground water under the foundation of a proposed high-rise condominium. The risk assessment provided expert advice on vapour intrusion and mitigation of risks to residents at the site due to potential inhalation of vapours from the impacted ground water.

Risk Assessment to Support a Record of Site Condition, 14 Algoma Street (Former Municipal Sewage Treatment Plant), Toronto, Ontario - Qualified Person for Risk Assessment (QP(RA)) in a human health and ecological risk assessment for a City of Toronto parkland redevelopment. The risk assessment addressed polycyclic aromatic hydrocarbons and metals impacts related to soil and ground water at the Site. In addition, a risk management plan was prepared that was accepted by the Ontario Ministry of the Environment to mitigate unacceptable risks present at the Site for recreational users.

Risk Assessment to Support a Record of Site Condition, 55 Columbia Street, Waterloo, Ontario - Qualified Person for Risk Assessment (QP(RA)) in a human health and ecological risk assessment for a mixed used (commercial/industrial property). The risk assessment addressed the flow through of volatile organic compounds in ground water due to an upgradient source. In addition, a risk management plan was prepared that was accepted by the Ontario Ministry of the Environment to mitigate unacceptable risks present at the Site.

Risk Assessment to Support a Record of Site Condition for the Phoenix Advanced Exploration Project, Red Lake, Ontario - Was retained by Rubicon Minerals to conduct a risk assessment to support the filing of a Record of Site Condition for the Phoenix Advanced Exploration Project near Red Lake, Ontario. The Site is an active mining camp, but an RSC was required by the Municipality of Red Lake to move into production phase. Waste rock from exploration activities used as fill at the site contained metals at concentrations greater than Table 3 standards. Completed an ecological risk assessment to demonstrate metals in waste rock fill exceeded ecological TRVs, but risks to plants, mammals, birds, and reptile populations were within acceptable limits. Metals at the site were found to pose some risk to various human receptors, and risk management measures were proposed to limit exposure of site workers. Submitted for regulatory review.

Risk Assessment in Support of a Record of Site Condition, 51-75 Bradford Street, Barrie, Ontario - Prepared a risk assessment to support a RSC filing for a 3.5-ha property for the proposed Blue Sails Redevelopment located in Barrie, Ontario. The Site was previously used for industrial purposes, and included historical rail sidings, coal and lumber yards, and leather tanning operations. The property was considered 'sensitive' under O. Reg. 153/04 due to the presence of a stream on-site. The potential contaminants of concern in soil included antimony, arsenic, mercury, copper, lead, petroleum hydrocarbons, vinyl chloride, and naphthalene. The RA was completed to support the redevelopment plans for the Site, which include residential land uses. Submitted for regulatory review.

Risk Assessment to Support a Record of Site Condition for 298 Lawrence Avenue, Kitchener, Ontario - Conducted a risk assessment in support of a filing a Record of Site Condition for a former commercial/industrial site to be redeveloped for use as a regional hospice. The risk assessment considered potential impacts in ground water in relation to the redevelopment. The risk assessment was accepted by the MOE with a RSC filed for the property.

Risk Assessment in Support of a Record of Site Condition, 301 Front Street, Toronto, Ontario - Completed a risk assessment on behalf of a developer at a vacant fill-impacted Site being redeveloped to house an

aquarium (commercial development). Intrusive investigations at the site revealed elevated levels of inorganics and PAHs in deep soil and ground water as a result of the use of poor quality fill when the site was originally developed over a century ago. Calculated risks for both ecological receptors and humans potentially exposed to contaminated soil and ground water, and proposed risk management measures to address residual concentrations following redevelopment.

Risk Assessment in Support of a Record of Site Condition, 300 West Hunt Club Road, Ottawa, Ontario - Conducted a risk assessment in support of a Record of Site Condition for a large property formerly used as a fuel depot in Ottawa, Ontario. The site is contaminated with petroleum hydrocarbons from on-site activities as well as migration of free phase product from adjacent properties. Critical ecological exposure pathways included direct exposure for soil organisms and vapour inhalation for small burrowing mammals. The ERA supported the development of Property Specific Standards (PSS) allowing redevelopment of the property while ensuring protection for ecological receptors. September 2009.

Risk Assessment in Support of a Record of Site Condition, Woodbine Avenue and 14th Avenue, Markham, Ontario - On behalf of a major developer in Toronto, completed a risk assessment for a former quarry being redeveloped for mixed commercial/residential use. This large property had elevated concentrations of heavy metals, PHC, PAHs, and other parameters distributed at various depths in a heterogeneous manner owing to the placement of fill at the site. Property Specific Standards for human health and ecological exposure pathways were developed using a stratified approach under O. Reg. 153/04.

Risk Assessment in Support of a Record of Site Condition, 15 Lake Street, Grimsby, Ontario - Conducted a risk assessment for a Record of Site Condition at a proposed residential development in Grimsby, Ontario. The site was considered "sensitive" due to its location adjacent to Lake Ontario. Soils at the site were impacted by petroleum hydrocarbons and metals as a result of historic activities from a marina and drydock. Sediment and surface water adjacent to the site were potentially impacted by upstream loading. A modified version of the Domenico subsurface transport model implemented by Atlantic RBCA was employed to estimate concentrations of contaminants in surface water and demonstrate that off-site impacts were negligible.

Risk Assessment to Support a Record of Site Condition, 76-86 Dalhousie Street, Brantford, Ontario - Qualified Person for Risk Assessment (QP(RA)) in a human health and ecological risk assessment for a mixed used (commercial/residential) property. The risk assessment addressed polycyclic aromatic hydrocarbons and metals impacts related to soil and ground water at the Site. In addition, a risk management plan was prepared that was accepted by the Ontario Ministry of the Environment to mitigate unacceptable risks present at the Site.

Risk Assessment to Support a Record of Site Condition, 80 Willow Street, Paris, Ontario - Qualified Person for Risk Assessment (QP(RA)) in a human health and ecological risk assessment for the redevelopment of a property for residential use. The risk assessment addressed a sensitive site (MOE Table 1) due to its proximity to a surface water body.

Risk Assessment in Support of a Record of Site Condition – 140 West River Street, Paris, Ontario - Qualified Person for Risk Assessment (QP(RA)) in a human health and ecological risk assessment for the redevelopment of a property for residential use. The risk assessment addressed polycyclic aromatic hydrocarbons and metals impacts related to soil and ground water at the Site.

Risk Assessment in Support of a Record of Site Condition, 41 Oliver Street, Hamilton, Ontario - Conducted a risk assessment for a Record of Site Condition at a heavy industrial property in Hamilton, Ontario with elevated inorganic parameters in soil. The primary concern at the site was elevated soil conductivity and beryllium concentrations exceeding provincial standards. A toxicological review of effects in non-agricultural plant species was used to demonstrate that soil could remain on-site with low likelihood of adverse effects to biota.

Risk Assessment in Support of a Record of Site Condition, 76-86 Dalhousie Street, Brantford, Ontario - Conducted a risk assessment for a Record of Site Condition at a residential/commercial property in Brantford, Ontario impacted by metals in soil.

Risk Assessment to Support a Record of Site Condition, 210-240 Canarctic Drive, North York, Ontario - Conducted human health and ecological risk assessments in support of a Record of Site Condition for a light industrial/commercial property in North York, Ontario with VOC contamination of groundwater.

Risk Assessment in Support of a Record of Site Condition – Schneider Electric – Toronto, Ontario - Lead human health toxicologist in preparing a risk assessment for the property located at 19 Waterman Avenue in Toronto, Ontario. The risk assessment was carried out in accordance with the relevant provisions and mandatory requirements of Schedule C – Risk Assessment of Ontario Regulation 153/04 ('O.Reg 153/04'), Records of Site Condition ('RSC'), following submission of, and the subsequent receipt of comments relating to a Risk Assessment Pre-submission Form (Appendix A) prepared for the Site. The risk assessment addressed vapour intrusion as well as direct contact pathways associated with a number of volatile organic compounds found to be present in both on-site and off-site ground water and soil.

Risk Assessment in Support of a Record of Site Condition – CCL Industries – Concord, Ontario - Qualified Person for Risk Assessment (QP(RA)) in a human health and ecological risk assessment for an industrial/commercial property located in Concord, Ontario. The risk assessment is addressing potential vapour intrusion issues related to elevated levels of chlorinated solvents present in soil and groundwater potential impacting both on-site and off-site receptors.

Risk Assessment in Support of a Record of Site Condition – City of Cambridge – Cambridge, Ontario - Qualified Person for Risk Assessment (QP(RA)) in a human health and ecological risk assessment for an industrial/commercial property located in Cambridge, Ontario. The risk assessment is addressing development of this Brownfield site as a municipal parking lot and issues surrounding petroleum hydrocarbon and metals impacted throughout the site.

Risk Assessment for Albert Street Area, Haileybury, Ontario – Prepared for the Ontario Ministry of the Environment - Was retained by the Ontario Ministry of the Environment to conduct a risk assessment at a petroleum-impacted site in Ontario to direct the development of remedial/risk management options. Worked as the Qualified Person for Risk Assessment (QP(RA)) on the project and provided a risk assessment compliant with the conditions of O.Reg153/04. Developed a number of property-specific standards for petroleum hydrocarbons and related compounds based on multi-pathway exposure (including vapour intrusion) to several potential receptors at the site (e.g., construction workers, residents). The property-specific standards in conjunction with the developed conceptual site exposure model were used to identify options to mitigate risks, in addition to further examination of each of the available remedial/risk management options for their feasibility.

Development of Preliminary Property Specific Standards (PSS), Lakeshore and Cherry St., Toronto, ON. - Compiled environmental information pertaining to the Site in Toronto in order to summarize the pertinent historical information as well as information on the current soil and ground water conditions as they relate to the redevelopment potential for the Site. As the objective of the risk assessment was to provide a preliminary understanding of the extent to which soil and/or ground water conditions would exceed risk-based target levels, the assessment relied on standard models for assessing exposure incorporating existing data.

Regulatory Review of Site-Specific Risk Assessments

As an MOE Regulatory Toxicologist was responsible for regulatory review of site specific risk assessments and remediation criteria to ensure compliance with Ontario's Guidelines for use at contaminated sites in Ontario (MOEE, 1997). Thorough knowledge of the scientific and policy based decisions regarding O.Reg

153/04 as well as the upcoming revisions of the regulation that will be promulgated in Ontario, and Ministry's overall site-specific risk assessment approval process. Participating in many MOE workshops related to the development of the revisions to the regulation and provided feedback on my issues related to its development (feasibility, scientific defensibility).

For many years under an ongoing standing offer, regulatory reviews of Risk Assessment Pre-Submission Forms and Risk Assessments have been conducted on behalf of the MOE.

Human Health and Ecological Risk Assessment - Transport Canada – Port Colborne Lands.

The project objectives included development of an interim risk assessment in order to address the current risk of contaminated soils and/or groundwater to humans; completion of a SSRA to address the potential human and ecological health risks; development of remedial options for various land use scenarios and for habitat management concerning an ecologically sensitive area present on the properties.

Ontario Municipal Board Hearing - Canadian Tire Real Estate Limited, 4100 Garden Rd., Whitby, ON

Initially, was retained by Canadian Tire Real Estate Limited ('CTREL') to provide a "Letter of opinion" concerning the potential risks to human health and the environment for a portion of the Canadian Tire property (designated to be severed) located at the northwest corner of Taunton Road and Garden Street in Whitby, Ontario. As part of the Approvals process to obtain severance of the subject Site, the Region of Durham insisted that an RSC be filed for the entire property (Civic address was 4100 Garden Road) prior to approving the severance of the parcel. It was recommended that CTREL file for a hearing with the Ontario Municipal Board (OMB) objecting to the need to complete a Record of Site Condition to support a land severance application and approvals process. Based on our interpretation of the Regulations, we determined that no "land use" change was occurring at the subject site, despite a change in municipal zoning. Hence, it was outr position that an RSC was not required to be filed to satisfy Provincial statutes. Provided expert testimony regarding sections of the RSC Regulations, in addition to a conclusory evidence that no adverse effects would result following severance of the Site based on on-going commercial Land Use. A decision on the hearing has not yet been received by CTREL.

Human Health Risk Assessment – City of Port Colborne, Ontario, Canada.

Risk Assessment Specialist responsible for conducting a comprehensive assessment related to metal and PAH impacted soil in an area to be developed as a recreational centre. Employed Toxic Equivalency Factor (TEF) approach to the assessment of carcinogenic PAHs and derived a novel inhalation unit risk factor specific for nickel oxide present in the area, which was accepted by the regulators.

Risk Assessment for Birchwood Park – City of Mississauga – Mississauga, ON

Conducted a human health and ecological risk assessment of former landfill containing coal fly ash to assess the potential exposures and risks based on its current use as parkland. The risk assessment examined metals exposure for various receptors and integrated the results in the development of a comprehensive risk management plan involving long-term monitoring/maintenance and installation of a cap at the site.

Expert Review – Human Health Risk Assessment for Chlorinated Solvent Exposure – 186 University Park Drive – Regina, Saskatchewan

Previous investigations at the University Park Mall in Regina, Saskatchewan had identified significant concentrations of chlorinated solvents in the subsurface soils. The delineation of the extent of the impacts had determined that the contamination had migrated to areas outside of the building. Westfield Real Estate Investment Trust requested an evaluation of the potential health risks to workers and patrons of University Park Mall from possible exposures to the chlorinated solvents. Conducted the expert final review of the

report prior to submission to the client. The risk assessment examined potential inhalation exposure as a result of vapour intrusion based on elevated levels of chlorinated solvents present in ground water.

Preliminary Quantitative Risk Assessment (PQRA), Building 107, 9 Wing Gander, Newfoundland and Labrador – Defence Construction Canada (DCC)

Was the lead toxicologist in conducting a Human Health Preliminary Quantitative Risk Assessment (PQRA) and a Screening Level ecological risk assessment for Building 107, 9 Wing Gander, Newfoundland and Labrador. The PQRA was requested in conjunction with a data gap analysis and a detailed testing program in support of the development of a remediation/risk management strategy for the Site. The PQRA addressed potential risks to Department of Defence staff present at the Site through all relevant exposure pathways in association with identified impacts in both soil and ground water based on available historical and current Site data.

Detailed Quantitative Risk Assessment (PQRA), Grand Falls Armoury Property in Grand Falls, Newfoundland and Labrador – Defence Construction Canada (DCC)

Was the lead toxicologist in conducting a Human Health Detailed Quantitative Risk Assessment (DQRA) for the Grand Falls Armoury Property in Grand Falls, Newfoundland and Labrador (NL). Within the Site to be assessed two distinct properties were identified. The first was the Grand Falls Armoury, which is owned by DND and is located off Memorial Drive, on the western side of the Town of Grand Falls-Windsor, Newfoundland. This property was approximately 0.5 hectares in size and is primarily used for Army Reserve and cadet training. The second, is the Woodland Primary School, which is located on the adjoining property to the north of the Armoury. The PQRA was requested in conjunction with a data gap analysis and a detailed testing program in support of the development of a remediation/risk management strategy for the Site. The PQRA addresses potential risks to human receptors present at both properties through all relevant exposure pathways in association with identified impacts in both soil and ground water based on available historical and current Site data. Given the different land use at each of the properties, separate PQRAs were conducted for each of the properties to appropriate address any potential risks to human receptors. The PQRA was submitted to Health Canada for review, with only minimal comments received.

Detailed Quantitative Risk Assessment (PQRA), Risk Assessment for the Airside Operations and Maintenance Centre, Edmonton International Airport Leduc County, AB – Public Works Government Services Canada

Was the lead toxicologist in conducting a Human Health Detailed Quantitative Risk Assessment (DQRA) for the Airside Operations and Maintenance Centre, Edmonton International Airport Leduc County, AB. The DQRA was requested in conjunction with a data gap analysis and a detailed testing program in support of the development of a remediation/risk management strategy for the Site. The DQRA addressed potential risks to human receptors present at the site through all relevant exposure pathways in association with identified impacts in both soil and ground water based on available historical and current Site data. Indoor air and soil vapour data were used in the conduct of the risk assessment to refine the assumptions associated with inhalation exposures to workers at the Site. Risk management and remediation strategies were proposed based on the results of the risk assessment to mitigate risks to due the inhalation of benzene at the site.

Human Health Risk Assessment in Support of the Development of a Remediation / Risk Management Strategy – Site 230, Shearwater, Nova Scotia – Defence Construction Canada

The human health risk assessment was requested in conjunction with a detailed testing program in support of the development of a remediation/risk management strategy for the Site. The PQRA addressed potential risks to human receptors present at the Site due to historical activities at the Site that resulted in BTEX and petroleum hydrocarbon as well as TCE, PAHs and several metals. The risk assessment examined direct contact with soil and ground water as well as potential vapour intrusion due to the identification of several volatile and semi-volatile compounds as potential COCs.

Screening Level Risk Assessment – Former Chamberlain Avenue Landfill – City of Ottawa

The purpose of the SLRA was to identify and characterize any potential health risks associated with the footprint of the former landfill, including that portion, which is comprised of private residences located at 35 through 45 Glendale Avenue, which is not City owned. The SLRA addressed potential human health risks in association with subsurface soil containing elevated levels of several metals and polycyclic aromatic hydrocarbons. Human health risks associated with the consumption of backyard garden produce were examined following the completion of a conceptual site model, which was used to identify relevant exposure pathways and human receptors. Based on the use of the maximum detected concentrations from the Site, the risks to receptors were noted to be unacceptable in association with lead and the carcinogenic PAHs. In the case of mercury only the risks to residents were noted to exceed the MOE target. Based on the results of the SLRA communication material was produced for distribution to the affected residents.

Human Health Risk Assessment in Reference to California EPA's Safe Cosmetics Act and California Safe Drinking Water and Toxics Enforcement Act (Proposition 65) – Three Bond International

Worked on a team at ChemRisk evaluating the potential health risks associated with the compliance of specific ingredients in cosmetic products with the California Safe Cosmetics Act & California' Proposition 65 regulations. Provided an estimation of potential exposure to various receptors related to the use of the products and its ingredients in demonstrating the potential risks to users in support of its compliance.

Indoor Air Quality Assessment, 165 Miler Holdings c/o Humbold Properties – North York, ON

Designed and conducted an indoor air quality sampling program in support of refinancing of a commercial/industrial property. Potential vapour intrusion due to historical activities resulting in chlorinated VOCs impacts in soil and ground water. The study involved both thermal desorption and sorbent charcoal tubes for the collection of samples with comparison to available regulatory benchmarks. The assessment was externally reviewed by the financial institution and accepted in support of the client's application for refinancing.

Review of Available Information Concerning Estimated Daily Intakes (EDIs) for the Canadian Population - Health Canada, Environmental Health Assessment Services

Provided Health Canada with information concerning estimated daily intakes (EDIs) for environmental contaminants for the Canadian population. These values are essential in establishing risks to receptors in the conduct of human health risk assessments for contaminated sites across Canada.

Identification of Information and Probabilistic Assessment of Estimated Daily Intakes for the Canadian Population – Health Canada, Contaminated Sites Division

The objective was to review information pertinent for determining likely background exposures (Estimated Daily Intakes, EDI) of the Canadian population for several compounds. The results of the work were intended to provide information to Health Canada for updating EDI values for the development of new or updating of existing Soil Quality Guidelines (SQG) in conjunction with the Canadian Council of Ministers of the Environment (CCME). In addition to the identification of pertinent information and conducting an assessment of a deterministic estimate of the EDI for each compound, a probabilistic assessment was undertaken to determine the uncertainties and underlying distributions for each of the media.

Preparation of Background Summary Fact Sheets and Screening Level Risk Assessment of Priority Substances, Health Canada, Existing Substances Division, Ottawa, Ontario

A comprehensive search, review and compilation of toxicity and exposure data for priority substances on Canada's Domestic Substances List (DSL) was conducted for Health Canada. Contract required expert review and summary of authoritative studies outlining exposure and effects data for various chemical

compounds. The fact sheets were part of a pilot project to assist Health Canada's Healthy Environments and Consumer Safety Branch with the health risk assessment component of screening level risk assessments (SLRAs) for chemical agents that were in commerce in Canada between January 1984 and December 1986.

Indoor Air Quality Assessment - Former C.P.R. John Street Roundhouse, located at 255 Bremner Boulevard, Toronto, Ontario

Carried out indoor air testing within the interior areas of the on-site building to investigate the potential for vapour intrusion associated with any potential soil and ground water impacts beneath the Roundhouse building. The indoor air results from the sampling program were compared to the Ontario Ministry of Labour (MOL) Time Weighted Average Exposure Values (TWAEV) limits, as well as Ministry of the Environment (MOE) Ambient Air Quality Criteria (AAQC) and human health risk-based limits as recommended by the Canadian Council of Ministers of the Environment (CCME) with respect to petroleum hydrocarbon compounds (PHCs). The laboratory analyses were reviewed and interpreted with respect to their potential to result in adverse effects on human health.

Analysis Of Uncertainties in the Delineation of a Reference Exposure Level (REL) For Mercury Vapour- Health Canada, Environmental Health Assessment Services

Was contracted by Health Canada to critically and quantitatively evaluate those scientific data and issues that may contribute to the uncertainty in the establishment of a Reference Exposure Level (REL) for mercury vapour. As part of the project we examined in detail the methods and means of establishing appropriate uncertainty factors (UFs) in the REL derivation process, the inter-conversion between various dose measurement methods and the application of probabilistic methods to quantify uncertainties. The recommendations made will be used by Health Canada in recommending an exposure limit for mercury vapour at Federal contaminated sites located across Canada.

Revisions & Updates to Draft Manuscript - Pulmonary Bioavailability of Particle-Bound Contaminants: A Review – Health Canada

The project scope involved expanding, updating and completion of a draft manuscript related to in vitro lung fluid solubility tests as a surrogate for respiratory bioavailability of particle-bound contaminants. The manuscript evaluated the available data in this area and its potential impacts on environmental risk assessment as it pertained to exposure and uptake of contaminants via particulate inhalation. The review of the draft manuscript included an examination of all pertinent peer reviewed literature that was deemed to be critical for updating the draft manuscript to allow its submission and acceptance by a peer-reviewed journal.

Human Health Assessment of Lead due to a Baghouse Explosion, Confidential Client

Was requested to provide an assessment of the potential health effects associated with lead as a result of the upset conditions at a battery plant. As the main focus of the assessment, a review of the results of predictive air modelling for lead were examined (based on ICRP) during the upset conditions and assessed the potential for adverse effects on human health for potential receptors located at the maximum concentration of lead resulting off-site. The modeling of resulting blood lead levels in determining the potential risks to exposed individuals was conducted using a sophisticated biokinetic model to address the short-term exposure of receptors as a result of the upset conditions.

Indoor Air Quality Assessment, Fond du Lac, Saskatchewan - Health Canada

Provided support in the study design and expert review in the interpretation of the results of the indoor air sampling related to BTEX and petroleum impacted dwellings. Historical spills of fuel resulted in the potential for adverse impacts on indoor air quality. The indoor air study examined ambient air concentrations of a number of volatile compounds with the concentrations compared to available Health Canada TRVs. Based on the assessment recommendations were made with respect to the need for additional sampling and potential risk management strategies.

Expert Review – Chromium in Blood Evaluation due to a Chromic Acid Spill – Fredericton, NB

Provided expert review of a report prepared for the New Brunswick Medical Officer of Health regarding the interpretation of plasma and erythrocyte chromium levels in blood in association with a chromic acid spill nearby a residential community. The interpretation was based on summaries of data obtained following collection of blood samples from residents that live in proximity to a residential community that was potentially impacted by a chromic acid spill. Based on the statistical assessment and evaluation, and based on the information currently available and provided to us, no statistical difference in chromium levels was found in either the plasma or erythrocytes for residents that live in proximity to the spill Site when compared to a control population that lives outside of the spill area. The report indicated that residential exposure to chromium was no different than that found in the normal control population.

Expert Review – Human Health Risk Assessment for the Proposed Gahcho Kué Project – De Beers Canada Inc.

Conducted final expert review of the multimedia risk assessment examining potential impacts associated with a proposed mining project. Issues related to exposure to First Nations community were carefully examining given their potential for increased exposure with the consumption of wild game, fish and vegetation in the area. The report was submitted to Health Canada for regulatory approval.

Human Health Risk Assessment in Support of a Closure Plan - Victoria Junction Coal Preparation Plant, Nova Scotia.

A screening level human health risk assessment was conducted to support the closure of the former coal preparation facility. The Victoria Junction Coal Preparation Plant processed coal from the mid 1970's to the late 1990's. A human health risk assessment was undertaken for the closure plan to determine the need for additional remediation measures and/or site use limitations based on the need to address acid mine drainage, contaminated soil, groundwater and surface water. The risk assessment utilized information from a multi-disciplinary closure planning project team to provide suitable site-specific recommendations.

Town of Walkerton

Worked on a team conducting a multimedia risk assessment to identify the sources, pathways and risks in the town of Walkerton resulting from the contamination of drinking water. The results of the site-specific risk assessment were used in the completion of the O'Connor report (Walkerton Inquiry) in delineating the risks due to contamination of drinking water and have led to the development of the number of new initiatives within the Ontario Ministry of the Environment.

Development of Air Standards for the Ontario Ministry of the Environment (MOE)

Worked as the lead toxicologist both while a staff member of the MOE and as an external consult in providing toxicological expertise in the development of ambient air quality standards (AAQCs) for the MOE. Human health-based air quality standards for over 30 high priority air contaminants were completed, including benzene, benzo(a)pyrene, chromium, arsenic and the group of dioxins and furans.

Review and Summary of Approaches to Risk Assessment of Air Pollutants – Health Canada, Air Health Effects Division

Examined the available approaches to conducting risk assessment for air contaminants by identified and summarizing policies and procedures used by regulatory agencies worldwide. The report produced identified all agencies with guidance, summarized their approach and provided a critical analysis of the technical approach used (e.g., robustness of database required to conduct a risk assessment, data sources examined, application of risk assessment outcomes)

Expert Review – Health Canada Risk Assessment Guidance Documents – Defence Construction Canada

Conducted a review of the draft Health Canada documents entitled "Supplemental Guidance on Developing a Contract Statement of Work (SOW) for Human Health Preliminary Quantitative Risk Assessment (PQRA) and Site Specific Risk Assessment (SSRA)" and "Guidance on Using Soil Quality Guidelines from Sources other than CCME". Provided feedback based on experience concerning feasibility and scientific rigor of the proposed guidance from Health Canada on aspects related to the conduct of human health risk assessments.

Expert Review – Risk Assessment in Support of A Record of Site Condition – Lakeshore Drive and Bradford Street in Barrie

Provided expert review of a risk assessment in support of a Record of Site Condition for the proposed Blue Sails Development site located at Lakeshore Drive and Bradford Street in Barrie, Ontario. The Site contains an area within 30m of a water body requiring further assessment against the MOE Table 1 SCS and the filing of two RSCs. The assessment examined a number of metals and PHCs.

Indoor Air Quality Assessment – Rio Tinto – Toronto, ON

Designed and conducted an indoor air sampling program for a residential area potentially impacted with chlorinated VOCs. Vacuum canisters, passive sampling devices (3M OVM) and sorbent charcoal tubes were used for the collection of samples from a number of locations within potentially impacted homes. Performed the analysis of the results with comparison to acceptable regulatory benchmarks from the Ontario Ministry of the Environment in producing a letter report for each of the homes tested. Where required risk management measures were recommended to reduce the exposure to the residents.

Comprehensive Human Health Risk Assessment – Community in New Brunswick, Canada – Confidential Client

Risk Assessment Specialist responsible for conducting a comprehensive assessment related to potential human health impacts associated with soil contamination with metals due to historical industrial emissions with a community.

Indoor Air Quality Assessment – TDL – Various Sites in Ontario

Designed and conducted indoor air quality assessments for various sites across Ontario for TDL due to potential environmental liabilities based on known environmental conditions at the Site. Where it was identified that there may be a potential issue as a result of vapour intrusion, a sampling program was developed in consultation with TDL to evaluate the potential risks to both workers and customers at the site. Where the potential for unacceptable risks may be present a risk management plan was developed to mitigate exposure.

Human Health Risk Assessment – City of Halifax, Nova Scotia, Canada

Used Risk Based Corrective Action (RBCA) modelling in conducting a site- specific risk assessment in a residential community. Assessed the potential health risks due to chlorinated solvent contamination of groundwater and provided advice as to potential remediation strategies and risk mitigation.

Site-Specific Risk Assessment - McNaughton Road Alignment - York Major Holdings Inc., Vaughan, Ontario

Lead risk assessor in conducting a Site-Specific Risk Assessment (SSRA) related to a former landfill in Vaughan. The SSRA evaluated the potential human health and ecological impacts associated with the placement of contaminated materials present in soil at the Site within a roadway allowance. The SSRA determined feasibility and potential human health/ecological impacts of managing contaminated materials on site.

Peer Review – Risk Assessments – City of Toronto – Toronto, ON

Conducted expert review of incoming risk assessments on behalf of the City of Toronto. Reviews were conducted to ensure regulatory compliance as well as to ensure potential environmental liabilities to the City were mitigated and appropriately addressed.

Environmental Impact Assessment – Human Health Risk Assessment – Proposed Avon Energy Centre – Invenergy

Conducted a multi-media human health risk assessment to determine potential risks associated with a proposed natural gas powered generating station to be built in the City of Oakville. Results of the assessment were provided to stakeholders via public meetings. The assessment included an analysis of potential health outcomes using the Canadian Medical Association's ICAP for Ontario. The risk assessment was presented to the Ontario Ministry of the Environment as well as regional health units for review and discussion.

Environmental Assessment of Proposed Ethanol Production Facility – Human Health Risk Assessment – Suncor Energy Products Inc.

Conducted a human health risk assessment to examine the potential impacts associated with a proposed ethanol production plant to supply ethanol for blending in their gasoline products in the Township of St. Clair in southwestern Ontario. To assess the potential effects associated with exposure, a range of toxicity benchmark values for non-cancer effects and Inhalation Unit Risk (IUR) values for cancer effects were identified for each COC in order to address uncertainties in the available science pertaining to the assessment of the potential for adverse human health risks. These toxicity values (both cancer and non-cancer) were used to determine potential risks to exposed individuals in the surrounding area. Based on an examination of the potential receptors and the environmental fate of the identified COCs from the facility, the sole route of exposure was determined to be via inhalation from air. In determining the potential human health risks with exposure to the identified receptors, the maximum modelled air concentrations (using AERMOD) at the property line (Resident – property line) and at the location of the closest resident (Closest Resident) were compared to the toxicity benchmark values (non-cancer effects) and/or Inhalation Unit Risk (IUR) values (cancer effects) for each COC. The assessment was submitted and accepted by the Ontario Ministry of the Environment for regulatory approval of the project.

Expert Peer Review – Preliminary Quantitative Risk Assessment and Risk Management Plan, Former Landfill – Ottawa, ON – City of Ottawa

Provided an expert peer review of human health related issues within the preliminary quantitative risk assessment and risk management plan on behalf of the City of Ottawa. The purpose of the review was to identify any technical issues in the conduct of the risk assessment or the design of the risk management plan, which may have resulted in liabilities for the City. Based on the review, a plan to address the issues was formulated and recommendations made to ensure a scientifically sound approach to the risk assessment and associated risk management plan.

Indoor Air Quality Assessment – Goodwill Amity – Hamilton, ON

Designed and conducted an indoor air quality sampling program in support of refinancing of a property. Potential vapour intrusion due to historical activities resulting in chlorinated VOCs, BTEX and petroleum hydrocarbon impacts in ground water. The study involved both thermal desorption and sorbent charcoal tubes for the collection of samples with comparison to available regulatory benchmarks. The assessment was externally reviewed by the financial institution and accepted in support of the client's application for refinancing.

QRA Document Review, Soil Sampling and Remedial Action Plan Update Site 1107B Dockyard Annex, Dartmouth, NS - Maritime Forces Atlantic – Defence Construction Canada

Was the lead human health toxicologist retained by Defence Construction Canada (DCC), and the Department of National Defence (DND), to complete a review of the quantitative risk assessment (QRA) document, collect soil (fill) samples, and update the remedial action plan (RAP) for Site 1107B, located at the Dockyard Annex. The review noted issues with respect to the risk assessment outcome and the need for additional sampling and risk management considerations. Additional work was conducted to revise the risk assessment and previously proposed risk management measures.

Indoor Air Quality Assessment and Speciation of Particulate – Home Depot Canada – Toronto, ON

In conjunction with AirZone Inc., designed and conducted an indoor air sampling program to determine potential worker exposure and speciation of particulate related to some consumer products present in the store. Due to worker complaints the sampling program and speciation was conducted to determine if indoor air quality was being impacted by some identified consumer products. Review of associated symptoms of exposure from workers was examined in conjunction with the resulting concentrations of compounds found in indoor air and as a result of particulate matter to determine if it was the source of the reported adverse health effects. Based on the analysis of the available data, recommendations were made to Home Depot.

Confidential Client

Appeared as an expert witness in court and was responsible for providing expert opinion evidence and testimony to assist the trial Judge in determining an issue before the Court concerning pesticide exposure and adverse effects.

Confidential Client

Appeared as an expert witness in a case related to potential provincial environmental offences. Argued regulatory and toxicology based points on behalf of the client in defending against the charge related to formaldehyde exposure in a residential scenario via stack emissions and waste water discharge.

Confidential Client

Preparation of an emergency preparedness plan for a U.S. fertilizer manufacturer. Prepared air modelling simulations of accidental spill scenarios and assessed the potential for off-site impacts on human health and the surrounding ecosystem. Provided advice to the company in mitigating the potential human health risks associated with an accidental release.

5 Wing Goose Bay, Risk/Exposure Assessment related to Ingestion of Berries and Mushrooms

As the lead risk assessment, completed an exposure assessment and risk assessment of individuals consuming various native foods potentially impacted with metals due to historical activities at an adjacent military base. The assessment was conducted on behalf on Health Canada in support of public communication with the adjacent residents.

Revisions & Updates to Draft Manuscript - Pulmonary Bioavailability of Particle-Bound Contaminants: A Review – Health Canada

The project scope involved expanding, updating and completion of a draft manuscript related to in vitro lung fluid solubility tests as a surrogate for respiratory bioavailability of particle-bound contaminants. The manuscript evaluated the available data in this area and its potential impacts on environmental risk assessment as it pertained to exposure and uptake of contaminants via particulate inhalation. The review of the draft manuscript included an examination of all pertinent peer reviewed literature that was deemed to be critical for updating the draft manuscript to allow its submission and acceptance by a peer- reviewed journal.

Peer Review - enHealth Guidance Documents - Review of Environmental Health Risk Assessment - Guidelines for assessing human health risks from environmental hazards & Australian Exposure Factors Guidance

Provided a peer review of Australia's regulatory guidelines with respect to risk assessment, as well as their guidance on the use of specific exposure factors.

Peer Review - Review of HSLs for Petroleum Hydrocarbons in Soil and Groundwater: Part 1: Technical Development Document

Provided a peer review of Australia's petroleum hydrocarbon guidance on behalf of the Petroleum Programme of CRC CARE Pty Ltd. Was asked to provide a critical review of the risk assessment methodologies used in the development of the guidance document as it related to petroleum hydrocarbon compounds in the environment.

Peer Review - CCME Soil Quality Guidelines for PAHs

While a regulatory toxicologist at the Ontario Ministry of the Environment, conducted a peer review of the draft SQG for PAHs on behalf of the CCME.

Select Publications

Richardson, G.M., Brecher, R., **Scobie, H**., Hamblen, J., Philips, K., Samuelian, J. and Smith, C. 2009. Mercury Vapour (Hgo): Continuing Toxicological Uncertainties and Establishing a Canadian Reference Exposure Level. Regul Toxicol Pharmacol 53(1):32-8

Moridani, M.Y., Siraki, A., Chevaldina, T., **Scobie, H**. and O'Brien, P.J. 2004. Quantitative structure toxicity relationships for catechols in isolated rat hepatocytes. Chem Biol Inter 147: 297-307.

Moridani, M.Y., **Scobie, H**. and O'Brien, P.J. 2002. Metabolism of caffeic acid by isolated rat hepatocytes and subcellular fractions. Toxicol Lett 133:141-151.

Chan, T.S., Moridani, M., Siraki, A., **Scobie, H.,** Beard, K., Eghbal, M.A., Galati, G. and O'Brien, P.J. 2001. Hydrogen peroxide supports hepatocyte P450 catalysed xenobiotic/drug metabolic activation to form cytotoxic reactive intermediates. Adv Exp Med Biol 500:233-236.

Moridani, M.Y., **Scobie, H**., Jamshidzadeh, A., Salehi, P. and O'Brien, P.J. 2001. Caffeic acid, chlorogenic acid, and dihydrocaffeic acid metabolism: glutathione conjugate formation. Drug Metab Dispos 29:1432-1439.

Moridani, M.Y., **Scobie, H**., Salehi, P. and O'Brien, P.J. 2001. Catechin metabolism: glutathione conjugate formation catalyzed by tyrosinase, peroxidase, and cytochrome P450. Chem Res Toxicol 14:841-848.

Select Presentations

Cumulative Effects Assessment in Support of a C of A Application (Air). Presented at AWMA Ontario Meeting.

Introduction to the Threshold of Toxicological Concern: Presented to Health Canada Staff under contract with the Canadian Network of Toxicology Centres.

Air Abatement in Ontario: Effects of Air Pollution and the Development of Air Standards in Ontario. Training module presented to Environmental Officers, Ontario Ministry of the Environment.

Antimicrobial Residues in Food and Risks to Human Health: Application of the Risk Assessment Paradigm. Prepared for the First International Conference on Antimicrobial Agents in Veterinary Medicine, Helsinki, Finland.

Hydrogen peroxide supports hepatocyte P450 catalysed xenobiotic/drug metabolism to form cytotoxic reactive intermediates. Poster presented at the Biological Reactive Intermediates Sixth International Symposium, Paris, France.

Metabolism of dietary antioxidants: GSH conjugate formation by dietary plant phenolics. Poster presented at the Canadian Federation of Biological Societies Annual Meeting, Ottawa, Ontario.

Small Scale Hydrogeological Assessment
Proposed Commercial Development
7504 McLean Road,
Puslinch, Ontario

Report #8296 – BVD Puslinch HG – VER 4.0
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EXECUTIVE SUMMARY

A & A Environmental Consultants Inc. (A&A) was retained by BVD (the client), to evaluate the potential impact from the proposed development of a commercial property (Transportation Depot) on local groundwater/surface water resources by conducting a small-scale hydrogeological study. The site is bound by vacant land to the northeast and northwest and industrial buildings to the southwest and southeast. The subject site is located at 7504 McLean Road, Puslinch, Ontario. The area of the site is approximately 27,923 m^2 (6.90 acres). At the time of the investigation, the site was vacant land.

The topography in the vicinity of the subject site (a 100-meter radius) ranges from approximately 330 masl to the southeast to 320 masl to the northwest of the site and was observed to be generally flat with a gentle slope towards the southwest corner of the site. A tributary of Mill Creek-Grand River is southwest of the southwest boundary of the subject site. The tributary flows southwest and drains into Grand River. Groundwater flow direction may also be influenced by utility trenches or other subsurface structures and may preferentially migrate in these subsurface utility trenches.

Geological maps identified the site to be terminal moraine characterized by sandy-silt and silty-sand deposits. The physiographic landform of the site is identified as Till Moraines within the Horseshoe Moraines Region. The surficial geology identified the site as till characterized by stone-poor, and sandy silt to silty sand- textured till on Paleozoic terrain. Bedrock in the area of the site is part of the Guelph formation characterized by sandstone, shale, dolostone and siltstone.

A search of the Ministry of Environment, Conservation, and Parks (MECP) well records show a total of 27 wells located within 500 meters of the subject site, consisting of two no use, two commercial, 6 domestic, one domestic commercial, one domestic industrial, three industrial, nine monitoring, one livestock domestic, one other well and one test hole.

It is clear from the MECP water well database and the information obtained during the field survey that the local residents obtain their water from domestic wells in Puslinch, ON. The subject

site is also expected to utilize the domestic wells when redeveloped. The MECP well records show groundwater was found between 3.96 – 6.71 mbgs, for a well drilled in the unconfined aquifer to approximately between 3.96 – 7.62 mbgs. The drilling program completed at this site shows the groundwater was measured between 2.1 – 6.5 mbgs for monitoring wells drilled between 4.57-7.521 mbgs.

The water table in the study area was defined by installing a total of three monitoring wells and one existing monitoring well in the area of the proposed redevelopment and monitoring those wells on the subject site. The selection of the monitoring wells was based on the predicted water flow direction, taking into consideration the site location and accessibility for the drill crew. The three monitoring wells installed by A&A was drilled to a maximum depth of 7.521 mbgs. There were four groundwater monitoring events that took place on June 25, 2024, July 17, 2024, July 30, 2024, and August 23, 2024. Not all wells contained water in each of the seven monitoring events as MW24-1 was dry at every monitoring event. It was concluded that the seasonally high groundwater levels present on site were at elevations between 255.536 – 315.323 masl. A&A understands that four seasons of groundwater monitoring is needed and will continue monitoring on site. The monitoring will continue in September 2024 and repeat every month until the last monitoring in May/June 2025.

A groundwater contour map was plotted using “Golden Software” (Surfer 8) and the measurements of groundwater levels taken on July 17, 2024 from three monitoring wells. This map shows well EMW-1 being at the lowest water elevation compared with the other wells used. The general direction of groundwater flow was found to be in a southwest direction.

The total precipitation (rainfall plus snowfall) in 2023 was 826 mm, with the greatest amounts falling in March and July. July and August show the highest mean daily temperatures during the year and the lowest temperatures were recorded in February. The average annual precipitation from 1981 – 2010 was calculated using historical data collected at the meteorological station “Waterloo Wellington A” located in Breslau, Ontario. The average annual precipitation over the thirty-year period was 916 mm. For the same period, it was calculated that approximately 553

mm/year would be lost to evapotranspiration (Environment Canada, 2024); leaving a total of approximately 363 mm/year available for groundwater recharge and surface runoff.

Based on the water balance assessment, high changes are anticipated in the infiltration and runoff due to the proposed redevelopment at the subject site. A stormwater management plan, is recommended to manage the increased stormwater runoff on site.

The analysis results indicate that all health and non-health related parameters recorded levels below the ODWS (Ontario Drinking Water Standards (Objectives)) except for: hardness, turbidity, total sodium, arsenic, chromium, iron, lead, and manganese. These parameters are known to be naturally occurring in hard rock areas of Ontario and would not have a negative impact on the groundwater. There was a risk assessment completed on site, dated December 12, 2025, where it stated, *"no impacts were identified in groundwater no exceedances of the human health component value associated with the ingestion of potable groundwater were noted. As such. No further evaluation of groundwater was required in the HHRA."*

RECOMMENDATION

Based on the obtained information from this study, A&A has the following recommendations:

1. Due to the increased runoff rate on site post development, a stormwater management plan is recommended. Proper planning as well as implementing LIDs will mitigate the stormwater that accumulates. This SWM report confirms that there will be a deficit in the infiltration and a surplus in the runoff. The Source Water Protection will only permit the infiltration of roofs and landscape areas. Due to this, excess water is directed to the Aberfoyle Business Park Stormwater Management Facility (SWMF) but ultimately the SWMF discharges to the wetland. This will allow for the deficit to infiltration and increase in runoff. Full details on the SWM plan are detailed fully in the Dec 15, 2025 Report.

2. Due to the water levels being below the foundation bottom, the excavation area will NOT need to undergo short-term dewatering. The groundwater levels are below the finished floor elevation and footings; therefore, long-term dewatering will NOT be required.

3. No adverse impact on the groundwater resources is expected to occur during the redevelopment of the subject site with the implementations of these recommended actions.

4. Upon completion of on-site investigation activities, any unused wells, including existing monitoring wells, must be and will be abandoned by a licensed well contractor in accordance with R.R.O. 1990, Reg. 903: Wells.

5. Any import/export of fill/soil from the site must be conducted in accordance with O. Reg. 406/19: On-Site and Excess Soil Management, the Rules for Soil Management and Excess Soil Quality Standards (Soil Rules) and O. Reg. 153/04, as amended.

1.0 INTRODUCTION

A & A Environmental Consultants Inc. (A&A) was retained by BVD (the client), to evaluate the potential impact from the proposed commercial development (Transportation Depot) on local groundwater/surface water resources by conducting a small-scale hydrogeological study. The subject site is located at 7504 McLean Road, Puslinch, Ontario (Figure 1). The area of the site is approximately 27,923 m^2 (6.90 acres). At the time of the investigation, the site was vacant land.

This study describes a small-scale hydrogeological study to obtain a better understanding of the groundwater resources within the study area and includes the characterization of the site using all available geological and hydrogeological information; a discussion of the groundwater quality and a report for the site with conclusions and recommendations.

There is no relationship between the client and A&A other than third-party independent assessor.

1.1 Scope of Work

The scope of work included the following where applicable:

- Perform visual/olfactory examination of the site and a walk-through inspection of the property to look for signs of any environmental issues.
- Characterize the site's geological, topography, meteorology, hydrogeology, and groundwater conditions.
- Determination of current activities at the site.
- Obtain utility line locates for all public and private utility lines.
- Drill five boreholes to a maximum depth of 7.521 m in selected locations. The boreholes will be drilled with a hydraulic soil drill fitted with 4-inch augers. Two boreholes were used solely for the geotechnical investigation completed by A&A on the site.
- Install three groundwater monitoring wells. The wells will be constructed of 38 mm (1.5") PVC risers with 3.05m long Schedule 40 PVC slotted well screen. EMW1 was constructed with 51 mm (2") PVC risers. Slip end cap will be installed at the end of the riser pipe with threaded drive-points at the bottom of the well. The borehole annulus will be backfilled

with silica sand to approximately 0.3 m above the well screen. A bentonite seal will be placed on the sand pack with a second seal at about 0.3 mbgs. The well will be fitted with a dedicated peristaltic low-flow sample tubing. The well will be installed by a licensed well technician, tagged in accordance with Regulation 903 and recorded on the Ministry of the Environment, Conservation and Park's (MECP) water well information system (WWIS).

- A level survey will be conducted at the site, which consists of measuring the elevation of the top of the well, relative to an arbitrary benchmark. This level survey will be conducted to provide the information used to calculate the groundwater table elevation.
- The groundwater will be sampled and analyzed for selected parameters of concerns.
- Groundwater samples will be evaluated using information obtained from the newly installed monitoring wells following MECP sampling protocol and procedures.
- Evaluate the potential impact of the proposed development on the ground water and surface water resources and their users.
- Provision of a reasonable conclusion regarding the environmental condition of the site.
- Development of recommendations for follow-up investigations if needed.

1.2 Changes to Scope of Work

One monitoring well, EMW-1, was found in the west corner of the subject site. This allowed A&A to only install three monitoring wells and not four as it was planned.

2.0 DESCRIPTION OF THE SUBJECT SITE

The subject site is a rectangular shaped lot with an area of 27,923 m^2. The site lies in the central area of Puslinch, Ontario at 7504 McLean Road. The site is bound by vacant land located northeast and northwest and industrial buildings to the southwest and southeast of the site. The subject study area is located within the Grand River watershed, Mill Creek Sub-watershed which contains Mill Creek and the Grand River.

The approximate UTM coordinates are Zone 17T; 570380.95 m Easting; 4812857.13 m Northing. The site is zoned as being "Industrial" as quoted from the Township of Puslinch Comprehensive Zoning By-law No. 023-18 as amended, and is located on the northwest side of McLean Road. The site is currently vacant land.

3.0 DEVELOPMENT PLAN

It is understood that the proposed commercial property will consist of the following:

- A two-storey building with a warehouse on the first floor, offices on the second floor, and no basement
- A water pond
- Infrastructure: Includes roads, parking areas, sewer system, and watermains.

The general arrangement of the proposed development is illustrated in Figure 6 (Appendix A).

The total site area is 27,923 m^2 with a total of 20,980 m^2 being developed as impermeable surfaces.

4.0 PHYSICAL SETTING

4.1 Topography

The regional area (RA) topography, which is an area within a 5 km radius from the site, has an overall slope towards Mill Creek. This RA would slope towards Mill Creek, which is west to southwest of the subject site. The site sits in the Mill Creek-Grand River watershed that consists of the Mill Creek, Grand River, and its small tributaries. The Mill Creek-Grand River Watershed drains an area of 105 km^2 and flows southwest to empty into the Grand River near Cambridge and eventually will drain into Lake Erie (Lake Erie Source Protection Region Technical Team, 2008). Mill Creek - Grand River Watershed ranges from 320 meters above sea level (masl) to 174 masl (Grand River Conservation Authority, 2024).

The topography in the vicinity of the subject site (a 100-meter radius) ranges from approximately 330 masl to the southeast to 320 masl to the north, northeast, and northwest and the site was observed to be generally flat with a slight slope towards the southwest corner of the site. Aberfoyle creek is located northeast of the subject site with surface topography sloping towards Aberfoyle creek. A tributary of Mill Creek is southwest of the southwest boundary. The tributary flows southwest and drains into the Grand River.

4.2 Geology

The surface deposit in this region, like all of Ontario, was once covered by massive glaciers during the late Wisconsin glacial period. The grinding action of the moving ice masses produced a considerable amount of rock materials, ranging in size from boulders to rock flour which was distributed over the landscape.

Quaternary Geology: The sedimentary record of southern Ontario provides evidence for three distinct climatic stages during the Quaternary period: the Illinoisan glacial stage (130-180,000 years before present (y.b.p), Sangamonian interglacial stage (110-130,000 y.b.p.) and the Wisconsinan glacial stage (110-10,000 y.b.p; Johnson et al, 1997).

The Quaternary geology identified the site to be terminal moraine characterized by sandy-silt and silty-sand deposits.

Paleozoic Geology: Bedrock in the area of the site is part of the Guelph formation characterized by sandstone, shale, dolostone and siltstone.

Physiography of Southern Ontario: The physiography of southern Ontario was altered considerably by the glacial and interglacial episodes that took place throughout the Quaternary period (2 million years to present). Southern Ontario's glacial history is very complex and has been interpreted and discussed by many (Barnett 1992; Karrow 1967; Chapman and Putnam 1984; Dreimanis and Goldthwait 1973; etc.). The site is in the Till Moraines within the Horseshoe Moraines region.

Surficial Geology: The site is identified as Till characterized by stone-poor, and sandy silt to silty sand-textured till on Paleozoic terrain.

Bedrock Geology of Ontario: The site is part of the Guelph Formation, characterized as dolomitic limestones.

4.2.1 Overburden Detailed Summary

The drilling program conducted for this study indicates the overburden deposits are generally consistent across the property. All boreholes revealed underlain the surface to be characterized as follows:

- **Fill**
  - Fill material was encountered in all boreholes (BH24-1 to 5), extending to depths ranging from 1.5 to 2.0 m (mbgl). Fill material was loose to compact, consists of gravel and sand to gravelly silty sand, with trace clay, damp to moist and no odour. This fill comprised clayey silt to sandy silt/sand, moist to wet, firm to stiff in consistency, and compact. The data provided here pertaining to the fill thickness is confirmed at the borehole locations only and may vary between and beyond the boreholes.

- **Glacial Till Deposits**
  - Underneath the fill material, glacial till deposits were encountered in all the boreholes at depths ranging from 1.5 to 2.5 m (mbgl), extending to the maximum explored depth of 7.62 m (mbgl). These deposits consisted of gravelly silty sand trace clay to silty sand some gravel trace clay, occasionally cobble and cobble fragments, moist to wet, and compact to very dense. Auger refusal encountered at BH24-1 at a depth of 7.62 m (mbgl).

5.0 HYDROGEOLOGICAL CONDITIONS

5.1 Hydrogeology

Groundwater and surface water are expected to flow towards the natural slope of the ground surface. Although the surface topography typically has great influence on the groundwater flow it has been observed in several areas that lithology also has a significant influence on the flow, in some cases more so than surface topography. In the latter case, this is believed to be due to relatively transmissive bedrock underlying a silt overburden. Based on the regional topography, groundwater flow is inferred to be in a north-northwest direction towards Aberfoyle Creek. After groundwater was monitored, it was found that groundwater flows in a southwest direction. The groundwater flow direction may also be influenced by future developments to the subject site by utility trenches and other subsurface structures.

During the hydrogeological investigation on the site, three groundwater monitoring wells and one existing monitoring well were installed within the annulus of five boreholes (Figure 4). The well was constructed of 38 mm (1.5") PVC risers with a 3.05m long Schedule 40 PVC slotted well screen. The existing monitoring well was constructed with 51 mm (2”) PVC risers. A ‘J-plug’ secure end cap was installed at the top of the riser pipe with a threaded drive-point at the bottom of the well screen. The borehole annulus was backfilled with silica sand to approximately 0.3m above the well screen. A bentonite seal was placed on the sand pack to about 0.3mbgs. The well was fitted with a dedicated low-flow sampling tubing and a protective, a steel well protector was installed around the riser. The wells were installed by A&A Environmental Consultants, licensed well technicians in accordance with Ontario Regulation 903.

These wells are used to determine the direction of groundwater flow and quality of the groundwater. A level survey was conducted at the site, which consisted of measuring the elevation of the top of the well casings, relative to a benchmark. This level survey was conducted to provide information used to calculate the groundwater table elevation, hydraulic gradient and flow direction. Groundwater levels were obtained from each monitoring well during the year-long monitoring as shown in Table 2. They were recorded to the nearest 0.01 m accuracy, using

an electronic water-table level tape. The total depth of each well was measured and recorded. The groundwater elevations are shown in the well logs (see Tables 1-2 below). These show the highest elevation near MW24-3 on the north west corner of the site and the lowest at EMW-1 on the west corner of the subject site.

Groundwater flow direction was determined using the groundwater elevation of the of the site on July 17, 2024 groundwater monitoring event.

Table 1 – Monitoring Well Details July 17, 2024

Project #8296-BVD Puslinch				
7504 McLean Road, Puslinch, Ontario				
Date Logged: July 17, 2024		**Logged by: E. Fulsom**		
Monitoring Well #	**MW24-1**	**MW24-2**	**MW24-3**	**EMW-1**
Location	South Corner of Site	East Corner of Site	North Corner of Site	West Corner of the site
Pipe Size (mm)	38	38	38	51
UTM Zone	17T	17T	17T	17T
Easting	570329	570427	570309	570246
Northing	4812824	4812938	4812988	4812875
Top of Pipe (masl)	323.668	323.656	323.653	322.161
Water Level (m)	Dry	2.938	0.649	6.25
Water Level (masl)	Dry	320.718	323.004	315.911
Total Depth (m)	7.521	5.49	3.773	6.406
BM = 322.90 masl, Culvert at site entrance				

Table 2 – Groundwater Monitoring Program Levels

Monitoring Well	Elevation (masl)	Groundwater Elevations (masl)						
		24-Jun-24	17-Jul-24	30-Jul-24	23-Aug-24	20-Sep-24	25-Oct-24	22-Nov-24
MW24-1	323.668	316.147*	316.147*	316.147*	316.147*	316.147*	316.147*	316.147*
MW24-2	323.656	319.076	320.718	319.026	318.322	318.236	318.296	318.388
MW24-3	323.653	322.941	323.004	322.808	322.880	322.378	322.083	322.980
EMW-1	322.161	315.835	315.911	315.946	315.755*	315.952	315.755*	315.755*

Monitoring Well	Elevation (masl)	Groundwater Elevations (masl)							
		20-Dec-24	24-Jan-25	20-Feb-25	21-Mar-25	10-Apr-25	25-Apr-25	01-Jun-25	28-Nov-25
MW24-1	323.668	316.147*	316.147*	316.147*	316.147*	316.147*	316.147*	316.147*	316.147*
MW24-2	323.656	318.166*	318.232	318.166*	319.638	319.815	318.467	318.275	318.317
MW24-3	323.653	322.965	322.377	322.623	322.879	322.965	322.821	322.866	322.829
EMW-1	322.161	315.755*	315.755*	315.755*	315.755*	315.755*	315.755*	315.755*	315.755*

*Denotes Dry Measurement, water level inferred to be below bottom elevation of well

The seasonal change in groundwater hydraulic gradient due to rainfall and spring runoff have a significant influence on the groundwater flow velocities. The groundwater flow velocities were calculated using a hydraulic gradient of 0.155 m/m (MW-3 to EMW-1) using July 17, 2024 groundwater elevation and the hydraulic conductivity of 1 x 10^{-5} cm/s for silty sand materials, with an estimated porosity of 35% (Fetter 2001). The average linear velocity can thus be calculated using the following equation:

$$v = \frac{ki}{n}$$

Where "k" is the hydraulic conductivity, "i" is the hydraulic gradient, and "n "the porosity. By using the above information, the average linear velocities for the silty sand materials are estimated to be 1.40 m/year.

A groundwater contour map, shown below in Figure 5, Appendix A, was plotted using Golden Surfer™ (Surfer 8) and the measurements of groundwater levels taken on July 17, 2024 from three monitoring wells installed in the unconfined aquifer. This map shows well EMW-1 being at the lowest water elevation compared with the other wells used. The general direction of groundwater flow was found to be in a southwest direction.

Due to the importation of unknown fill to the subject site, this non-native soil can influence the subject site groundwater in unpredictable ways such as MW24-1 being dry during every water monitoring. The yearly monitoring does confirm that the groundwater does flow southwest.

5.2 Meteorological Conditions

Meteorological conditions, such as precipitation (rainfall and snowfall) and temperature are of particular interest for understanding the existing surface water regime; the amount of water available for groundwater recharge; and for developing a surface water management system at the subject site. Data for 2023 describing the climatic variables was obtained from the Environment Canada meteorological station "Guelph Turfgrass Institute", located in Guelph, Ontario (Table 3). However, climate varies across large area both spatially and temporally with

local variation created by such factors as topography and prevailing winds. Human activities can also affect local climate. Deforestation may increase stream and peak flood flows while decreasing evapotranspiration. Urbanization can increase cloudiness, precipitation and extreme winter temperatures while decreasing relative humidity, incident radiation and wind speed (Phillips and McCulloch, 1972).

The total precipitation (rainfall plus snowfall) in 2023 was 826 mm, with the greatest amounts falling in March and July. July and August show the highest mean daily temperatures during the year and the lowest temperatures were recorded in February.

Table 3 – 2023 Meteorological Data (Guelph, ON)

MONTH	TOTAL PRECIPITATION (mm)	MEAN TEMPERATURE (°C)
JANUARY	**63.0**	**-2.1**
FEBRUARY	**73.9**	**-2.9**
MARCH	**90.2**	**-0.6**
APRIL	**82.2**	**7.6**
MAY	**30.8**	**11.9**
JUNE	**81.7**	**17.2**
JULY	**149.7**	**19.6**
AUGUST	**81.6**	**17.8**
SEPTEMBER	**17.8**	**16.4**
OCTOBER	**42.3**	**10.8**
NOVEMBER	**49.2**	**2.4**
DECEMBER	**63.4**	**1.7**
SUM	**826**	
AVERAGE		**8.3**

*Denotes incomplete data

Climate is usually defined as normals (or averages) of weather variable over a 30-year period as defined by the World Meteorological Organization (WMO). These "climate normals" refer to arithmetic calculations based on observed climate values for a given location over a specified time period. Climate normals are often used to classify a region's climate and for research in many environmental fields. There are many ways to calculate "climate normals" and the most

useful ones adhere to accepted standards. The WMO considers thirty years long enough to eliminate year-to-year variations. Thus, the WMO climatological standard period for normals' s calculations are computed over a 30-year period of consecutive records, starting January 1st and ending December 31st. In addition, the WMO established that normal's should be arithmetic means calculated for each month of the year form daily data with a limited number of allowable missing values.

The average annual precipitation from 1981-2010 was calculated using historical data collected at the "Waterloo Wellington A" meteorological station, located in Breslau, ON. The average annual precipitation was used to estimate the total amount of water available for surface water and groundwater resources. The average annual precipitation over the thirty-year period was 916mm. For the same period, it was calculated that approximately 553 mm/year would be lost to evapotranspiration leaving a total of approximately 363 mm/year available for groundwater recharge and surface runoff (Environment Canada, 2024).

The natural freeze-thaw cycle, which occurs each year in southern Ontario, significantly impacts the rate and timing of surface water runoff and groundwater recharge. Typically, watercourses in the Puslinch area are frozen over by late January and clear by late March to mid April. There is usually snow on the ground by the end of December, with the greatest accumulations in January and February. By late March, warmer spring temperatures melt the snow pack and normally there is little or no snow cover remaining by the end of April. From January to early March surficial soils are normally frozen and relatively impervious to infiltration. Most of the spring melt waters end up as surface runoff, contributing to high flows in the water bodies near the site.

Climate change has had a significant impact on this region and other regions of Canada. In recent years, it has been noted that snow does not accumulate on the ground until January, rather than in late December. In a warming climate, more precipitation will fall in the form of rain rather than snow, filling reservoirs to capacity earlier than normal. Additionally, a warming climate will result in snow melting earlier in the year than in previous decades, disrupting the traditional timing of melt water runoff. Together, these changes mean less snow accumulation in the winter and

earlier snow-derived water runoff in the spring, challenging the capacities of existing water reservoirs.

5.3 Groundwater Recharge

Recharge or infiltration to the groundwater system occurs by the migration of precipitation through the surficial soil. The amount of recharge or infiltration at a specific site depends on the amount of precipitation evaporated back into the atmosphere, the amount of water transpired from natural vegetation to the air, site topography, type of vegetation and surficial soil type. Surficial geology influences recharge rates. Areas of hummocky topography exhibit higher recharge rates since soil run-off collects in depressions where it can then infiltrate through the surficial soils. Reduction in recharge within urban settings occur due to paved driveways/roads or impermeable rooftop surfaces. As stated in the previous section, 363 mm/year available for groundwater recharge.

5.4 Hydraulic Properties

The amount and rate of groundwater flow through porous media is determined by the hydraulic properties of the unit, particularly hydraulic conductivity (K), the hydraulic gradient and porosity. The response of a flow system to various stresses is largely determined by the previously mentioned parameters along with storage. Hydraulic conductivity is a key hydraulic parameter that can be estimated by numerous field and laboratory methods including formula calculation, documentation, slug tests, and pumping tests.

5.5 Site-Level Water Balance

The basic water balance for a particular area can be expressed as:

$P = ET + R + I + \Delta S$

(Thornthwaite and Mather, 1957)

Where:

P = Precipitation (mm/year)

ET = Evapotranspiration (mm/year)

R = Runoff (mm/year)

I = Infiltration (mm/year)

ΔS = Change in groundwater storage (taken as zero under steady state conditions) (mm/year)

Based on the Thornthwaite and Mather methodology, the water balance is accounting water in the hydrologic cycle. Precipitation (P) falls as rain and snow. It can run off towards lakes and streams (R), infiltrate to the groundwater table (I), or evaporate from surface water and vegetation (ET). When long-term average values of P, R, I, and ET are used there is minimal or no net change to groundwater storage (ΔS).

5.5.1 Precipitation and Evapotranspiration

Based on the Canada Climate Normals data from Environment Canada for "Waterloo Wellington A" station between 1981 and 2010 (Environment Canada, 2024); the average annual precipitation was 916 mm. For the same period, it was calculated that approximately 553 mm/year would be lost to evapotranspiration; leaving a total of approximately 363 mm/year available for groundwater recharge and surface runoff.

5.5.2 Infiltration and Runoff

As indicated, there is a water surplus of 363 mm/year at the site, which becomes the infiltration and runoff components of the water balance. The rate of infiltration at a site is expected to vary, based on a number of factors to be considered in any infiltration model. To partition the available water surpluses into infiltration and surface runoff, the MECP infiltration factor was used. The MECP Stormwater Management (SWM) Planning and Design Manual (2003) methodology for calculating total infiltration based on topography, soil type and land cover was used and a corresponding runoff component was calculated for the soil moisture storage conditions. The calculated volumes of infiltration and runoff in the stage of pre-development and post-development are presented in Appendix F and are discussed as follows.

5.5.2.1 Pre – Development

Considering the fact that the site is fairly level, a combination of silt, sand and gravel, and is currently a vacant property; the site may have an infiltration factor of 0.5, i.e., 50% of water

surplus (181.5 mm/year). In the meantime, a total of 181.8 mm/year will become the runoff. Based on the site's area of 27,923 m^2, a total of 5068 m^3 per year will infiltrate, while a total volume of 5068 m^3 per year will become runoff.

5.5.2.2 Post – Development

Based on the information provided by the site plan, it is anticipated that after development, approximately 75% of the site area will be the impervious and hard surface area occupied by the buildings and parking area and 25% will be the pervious area, unpaved areas represent landscaped and green area.

Assuming that 20% of the precipitation will become the evaporation in the non-permeable surface areas, the infiltration volume was calculated to be 1260.2 m^3 per year, which is a deficit of 3807.9 m^3 per year after the development, while the runoff volume was calculated to be 16634 m^3 per year, which is a surplus of 11566.3 m^3 per year after the development.

Based on the water balance assessment, high changes are anticipated in the infiltration and runoff due to the proposed redevelopment at the subject site. There will be an increase in surface runoff due to the redevelopment on-site. A stormwater management plan, will be needed to manage the stormwater runoff on site.

5.5.2.3 Low Impact Developments (LIDs)

Low impact development (LID) practices have been used to reduce peak storm flows, provide water retention and water quality treatment. From a SWM plan, an LID can be used to alter the post development water balance. A stormwater management plan was completed by MTE Consultants, dated Dec 15, 2025, confirmed that there will be a deficit in the infiltration and a surplus in the runoff. The Source Water Protection will only permit the infiltration of roofs and landscape areas. Due to this, excess water is directed to the Aberfoyle Business Park Stormwater Management Facility (SWMF) but ultimately the SWMF discharges to the wetland. This will allow for the deficit to infiltration and increase in runoff. Full details on the SWM plan are detailed fully in the Dec 15, 2025 Report.

5.6 Groundwater Discharge

As part of the water cycle, groundwater is a major contributor to flow in many streams and rivers and strongly influences river and wetland habitats for plants and animals. Groundwater enters the ground in recharge areas and leaves the ground at discharge points. Discharge is continuous as long as sufficient water is available above the discharge point. The most visible evidence of groundwater discharge occurs as seepage or springs along watercourse banks and is also noted within stream beds as upwellings and boiling creek bed sediments. The natural cycle of discharge and recharge of an aquifer will impact the groundwater elevations on the subject site. Using the understanding of natural recharge and natural discharge, construction dewatering can be estimated based upon the groundwater elevation fluctuations and the proposed site plan. Based on the groundwater elevation encountered during this investigation, pumping groundwater discharge will not be required during the construction at this site.

5.6.1 Construction Dewatering Requirements

Construction dewatering is intended to lower the groundwater levels in the excavation areas in order to provide a “dry” working condition for excavations and construction of foundations and/or associated sewer systems.

The construction dewatering generally depends on the design specifications of the foundation and footings, and the proposed sewer system (invert elevation, length and size of underground utility pipes), and the site hydrogeological conditions such as existing ground water levels and flow regime. Drawdown levels are not required and dewatering discharge rates are not needed to achieve the required drawdown levels for maintaining a dry working condition and stable excavation bottom and slopes for the subject site.

5.6.2 Pre-construction Dewatering

Based on the proposed design plan, the new development consists of construction of a two (2) storey building consisting of a warehouse on the first floor and offices on the second floor, a water pond, and infrastructure. The building will be built with no basement. The developed area

at the site is approximately 27,923 m^2. The ground surface is estimated to be at between 323.5 masl.

5.6.3 In-Construction (Short – Term) Dewatering

Based on the proposed development, the excavation for construction will mainly take place in the glaciofluvial deposits. The glaciofluvial deposit as described before is characterized by predominantly silty sand matrix. The lowest proposed underside footing elevation is at 322.3 masl. The highest water level measured in the till deposits within the vicinity of the building was 316.147 masl at Monitoring Well EMW-1, which is below the proposed underside of footing elevation and the target water level for construction. Given this, there will be no groundwater intrusion into the excavation pit, no in-construction (short term) dewatering is needed.

5.6.4 Post-Construction (Long – Term) Dewatering

Based on the proposed development, the excavation for construction will mainly take place in the glaciofluvial deposits. The glaciofluvial deposit as described before is characterized by predominantly silty sand matrix. The highest water level measured in the till deposits within the vicinity of the building was 316.147 masl at Monitoring Well EMW-1, which is above the proposed finished floor elevation. Given this, there will be no groundwater intrusion into the excavation pit, no post-construction (long term) dewatering is needed.

5.7 Permit-To-Take-Water/EASR Posting

Any construction dewatering or water takings in Ontario is governed by Ontario Regulation 387/04 – the Water Taking and Transfer, an Ontario Regulation made under the Ontario Water Resources Act (OWRA), and/or Ontario Regulation 63/16 – Registrations under Part II.2 of the Act – Water Taking, made under Environmental Protection Act.

According to O. Reg. 387/04, any water taking over 50,000 litres per day should not take place without a valid permit, which shall be applied in accordance with the MECP's Permit-to-Take-Water (PTTW) Manual, dated April 2005. According to O. Reg. 63/16, the construction site

dewatering between 50,000 L/day and 400,000 L/day shall be registered through Environmental Activity and Sector Registry (EASR).

Based on the site condition, positive dewatering will not be workable at the site for the building footings construction. The construction dewatering (likely by sump pumping) and post construction drainage were evaluated to be in an amount below 50,000 L/day. Therefore, a PTTW or EASR posting will not be required.

5.8 Soil Characteristics for Drainage, Infiltration and Percolation

Using the geotechnical soil sample results from the geotechnical investigation prepared by A&A, the grain size analysis and moisture content can give us details on the soil characteristics for drainage, infiltration and percolation. This report also had details from a previous geotechnical report and a sample analyzed by Terraprobe. Laboratory data can be found in Appendix D.

Table 4 – Soil Characteristics and Grain Size Analysis

BH #	Moisture Content (%)	Grain Size Content (%)				Sample Depth	Sample Description
		Gravel	Sand	Silt	Clay	Ft (m)	
BH24-1 (SS2)	10.7	44	38	13	5	2.6-4.6 (0.8-1.4)	Gravel and sand, some silt, trace clay
BH24-4 (SS5)	9.3	28	44	24	4	9.8-11.8 (3.0-3.6)	Gravelly silty sand, trace clay
Terraprobe BH-1 (SS5)	9.2	15	43	33	9	10.8 (3.3)	Silty Sand, some gravel, trace clay

The soil in this area can be seen as silty sand with some gravel.

Using the laboratory results above, hydraulic conductivity can be calculated using Hazen's empirical formula (Fetter, 2007):

$$K = C(d_{10})^2$$

Where K = hydraulic conductivity (cm/s)

d_{10} = grain size of the 10th percentile (cm)

C = constant according to the following table:

Very fine sand, poorly sorted = 40-80

Fine sand with many fines = 40-80

Medium sand, well sorted = 80-120

Coarse sand, poorly sorted = 80-120

Coarse sand, well sorted = 120-150

If your sample is poorly sorted, you will have relatively equal mass fractions in a variety of different sizes and your histogram will look fairly even. The values for the borehole locations and depth can be seen in Table 5. *C* for this sample will be between 40-80 as they are considered fine sands, silts and clays. The *T-time* or *percolation time* can be calculated from the hydraulic conductivity. This is using the following formulas:

$$Approximate\ infiltration\ rate^{(1)} = \left(\frac{K}{6 \times 10^{-11}}\right)^{\frac{1}{3.7363}} \quad mm/hr$$

$$Percolation\ Time\ = (infilration\ rate\ )^{-1} \times (60\ min/hr) \times (10\ mm/cm)\ \ min/cm$$

Note (1) Ontario Ministry of Municipal Affairs and Housing (OMMAH). 1997.

Table 5 – Hydraulic Conductivity and Percolation Time

BH #	Depth (m)	D_{10} (cm)	C	K (cm/s)	Approximate Infiltration Rate (mm/hr)	T-time/ Percolation Time (min/cm)	Notes
BH24-1 (SS2)	1.4	0.001	80	$8.0x10^{-5}$	43.581	13.767	Gravel and sand, some silt, trace clay
BH24-4 (SS5)	3.6	0.001	80	$8.0x10^{-5}$	43.581	13.767	Gravelly silty sand, trace clay
Terrap robe BH-1 (SS5)	3.3	0.0035	80	$1.2x10^{-5}$	26.372	22.755	Silty Sand, some gravel, trace clay

The infiltration rate of 26 mm/hr and percolation time of 23 min/cm can be used for design purposes based upon the values above.

6.0 POTENTIAL CONSTRUCTION DEWATERING IMPACTS

6.1 Local Water Use

A search of the MECP well records show a total of 27 wells located within 500 meters of the subject site as follows:

- Two wells with no use listed,
- Two commercial wells,
- Six domestic wells,
- One domestic commercial well,
- One domestic industrial well,
- Three industrial wells,
- Nine monitoring wells,
- One livestock domestic well,
- One other well, and
- One test hole

It is clear from the MECP water well database and the information obtained during the field survey that the local residents obtain their water from domestic wells in Puslinch. Table 6 presents the summary of the wells from the well records, showing the UTM coordinates, drilling date, total depth and water found elevation. The MECP well records show groundwater was found between 3.96 – 6.71 mbgs, for a well drilled in the unconfined aquifer to approximately between 3.96 – 7.62 mbgs. It should be noted that the water levels provided in these tables do not represent current water level depths because those wells more likely measured at the time of drilling. However, the drilling program completed at this site show the groundwater was found between 2.1– 6.5 mbgs for monitoring wells drilled between 4.57 – 7.62 mbgs. Newly constructed supply wells for the site should be either installed in the upper bedrock aquifer or appropriately cased and sealed into the lower aquifer, in accordance with R.R.O. 1990, Reg. 903: Wells, to minimize potential groundwater movement between the upper and lower bedrock aquifers. This ensures no wells are installed that connect the two aquifers.

The site and the surrounding properties are expected to be serviced by the domestic wells. Therefore, the domestic wells need to be taken into consideration during construction to make sure they are not impacted by the development.

Table 6 – Water Wells on and within 0.5 km of the Proposed Development

Well No.	UTM Coordinate Zone 17T		Date Drilled	Total Depth	Water Level	Water Use
	Easting	Northing		(mbgs)	(mbgs)	
7291402	569850	4812531	2017	N/A	N/A	Not listed
7199708	569956	4812447	2012	N/A	N/A	Not listed
6709384	570809	4812624	1988	50.29	48.77	Commercial
6708700	570797	4812633	1986	40.54	39.62	Commercial
6703496	569944	4812433	1969	25.91	25.30	Domestic
6709478	570658	4812485	1988	56.69	38.10	Domestic
7214833	570123	4812596	2013	61.26	48.77	Domestic
7214832	570160	4812622	2013	60.96	60.96	Domestic
6715246	570450	4812869	2004	42.98	31.39	Domestic
6716008	570566	4812683	2006	74.37	74.37	Domestic
7341679	570718	4812446	2019	79.25	54.86	Domestic Commercial
6714198	570790	4812414	2002	48.77	48.16	Domestic Industrial
6710048	570834	4812414	1989	37.49	36.58	Industrial
6711872	570240	4812553	1995	73.15	67.06	Industrial
7046280	570583	4812680	2007	42.67	42.67	Industrial
7122497	569890	4812610	2008	7.62	N/A	Monitoring
7214719	570082	4813059	2013	3.96	N/A	Monitoring
7214720	570126	4813068	2013	3.96	N/A	Monitoring
7214721	570071	4813023	2013	3.96	N/A	Monitoring
7214722	570126	4813068	2013	5.79	N/A	Monitoring
7394717	569861	4812403	2021	10.67	6.40	Monitoring
7412599	570282	4812616	2022	15.24	12.80	Monitoring
7412600	570246	4812408	2022	16.76	15.24	Monitoring
7412601	570380	4812541	2022	16.76	N/A	Monitoring
7201847	569892	4812501	2013	21.95	N/A	Other
6707585	569874	4812423	1981	28.96	27.43	Livestock Domestic
7159585	570072	4812572	2011	8.84	N/A	Test hole

6.2 Hydrological Evaluation

6.2.1 Wellhead Protection Sensitivity Area

The site and the neighbouring properties are located within the City of Guelph well head protection area, WHPA-Q. This area can impact the groundwater quality of the drinking water system for the City of Guelph. On-site activities such as fuel handling and vehicle maintenance pose a potential impact on the groundwater aquifer. Proper procedures, safe practices with fuel handling, and spill management is crucial in order to mitigate any impact to the WHPA.

6.2.2 Surface Water

During the site visits, no standing water was visible. After redevelopment of this site, a high increase to the amount of runoff water will be created. This should be considered during the creation of a SWM plan.

6.2.3 Potential Sources of Contamination

There was a risk assessment completed on site, dated December 12, 2025, where it stated, *"no impacts were identified in groundwater no exceedances of the human health component value associated with the ingestion of potable groundwater were noted. As such. No further evaluation of groundwater was required in the HHRA."* The due diligence risk assessment executive summary can be found in appendix G.

6.2.4 Ground Subsidence in Adjacent Structures

Under certain conditions, dewatering activities can cause ground settlement which results from the increase in effective stresses caused by the lowering of groundwater level and subsequent decrease in pore pressure. Based on obtained groundwater levels during this investigation, no influence is anticipated due to the new development.

6.2.5 Hydrological Features and Measures

Within the vicinity of the subject site, the feature that could be impacted by development is a tributary of Mill creek, Aberfoyle Creek, and the provincially significant wetland (PSW) located to the north of the subject site. This tributary creek is downgradient and approximately 3.53 km

southwest from the subject site. Silt fences at the southwest boundary of the subject site should mitigate any overland flow of run-off water and any transfer of soils. The distance alone from the subject site should allow for no ill-effect on the tributary. Aberfoyle creek is located north of the subject site. The PSW is located north of the subject site and is at a lower elevation. Ensuring the proper stormwater management on site will mitigate the impact of the surface water runoff to Aberfoyle creek and the PSW. The groundwater flow direction is to the southwest so no impact to either of these features from the groundwater will occur. This development should not have any adverse effects on the Hydrological Feature or on the related ecological functions.

7.0 GROUNDWATER QUALITY

7.1 Groundwater Sampling Protocol

Groundwater samples were collected from the monitoring wells using dedicated inertial samplers. Clean nitrile gloves were used to minimize the potential for secondary contamination of the samples. Sampling of the monitoring well, MW-3 was conducted July 30, 2024. The groundwater sampling was compared to Ontario Drinking Water Standards (ODWS).

Specific Quality Assurance/Quality Control (QA/QC) measures were undertaken to ensure that the groundwater samples collected and the subsequent chemical analysis of the samples provided representative results. Upon arrival at each well site, the well was inspected for signs of damage or interference, the well cap removed and the top-of-pipe depth to the water table and to the bottom of the well measured using a Solinst electric depth meter. The top-of-pipe to ground level was also measured. This data was recorded on the field monitoring log sheets and any abnormalities were noted. The volume of the water in the well was calculated and three times this volume was purged from the well using the pre-installed Waterra low-flow tubing. The samples were taken using low-flow peristaltic pumps. All samples were collected into the appropriate bottles, each supplied by the laboratory. Groundwater samples were kept on ice in coolers until delivered to AGAT Laboratories Ltd. (AGAT), of Mississauga, Ontario. AGAT is accredited by the Standards Council of Canada (SCC) and Canadian Association of Laboratory Accreditation (CALA) and is licensed for these tests by the MECP. All samples submitted to the laboratory were identified by a unique sample number. In addition, the laboratory carried out its own internal QA/QC procedures. The results of the chemical analyses are shown in the Certificates of Analysis in Appendix C**.**

7.2 Assessment of Water Quality

The health-related parameters tested were Arsenic; Cadmium; Chromium; Lead; and Fluoride. The non-health related parameters tested were pH; Total dissolved Solids; Aluminum; Copper; Manganese; Titanium and Zinc. Results of analysis were compared to the ODWS.

7.2.1 Health Related Parameters

- **Total Arsenic:** Arsenic is a semi-metal, a member of the nitrogen family occurring naturally in the environment. It is odorless and tasteless. Consumption in food and water are the major sources of arsenic exposure for the majority of North American citizens. People may also be exposed from industrial sources, as arsenic is used in semiconductor manufacturing, petroleum refining, wood preservatives, animal feed additives, and herbicides. Arsenic can combine with other elements to form inorganic and organic arsenicals. In general, inorganic derivatives are regarded as more toxic than the organic forms and it is primarily the inorganic forms which are present in water. Exposure to arsenic at high levels poses serious health effects as it is a known human carcinogen. In addition, it has been reported to affect the vascular system in humans and has been associated with the development of diabetes. MW-3 have levels above the guideline standard but due to no current or historical sources, this is naturally occurring and would not have a negative impact on the groundwater.
- **Total Cadmium:** Cadmium is a rare element that is extremely unlikely to be present as a significant natural contaminant in drinking water. Cadmium compounds used in electroplated materials and electroplating wastes may be a significant source of drinking water contamination. Other than occupational exposure and inhalation from cigarette smoke, food is the main source of cadmium intake. In the monitoring well, indication of levels of cadmium were below the ODWS.
- **Total Chromium:** If Chromium is present in raw water, it may be oxidized to a more harmful hexavalent form during chlorination. Chromium in the more highly oxidized form may be present in older yellow paints and in residues from plating operations and around old re-circulating water cooling systems. In the monitoring well, indication of levels of cadmium were below the ODWS.
- **Lead:** Lead is typically only present as a result of corrosion of lead solder, lead containing brass fittings or lead pipes which are found close to or in domestic plumbing and the service connection to buildings. Lead ingestion should be avoided particularly by pregnant women and young children, who are the most susceptible. It is recommended that only

the cold-water supply be used for drinking/consumption and only after five minutes of flushing to rid the system of standing water. Corrosion inhibitor addition or other water chemistry adjustments may be made at the treatment plant to reduce lead corrosion rates where necessary. MW-3 have levels above the guideline standard but due to no current or historical sources, this is naturally occurring and would not have a negative impact on the groundwater.

- **Fluoride:** When fluoride is added to drinking water, it is recommended that the concentration be adjusted to 0.5-0.8 mg/L, the optimum level for control of tooth decay. Where supplies contain naturally occurring fluoride at levels higher than 1.5 mg/L but less than 2.4 mg/L the Ministry of the Health and Long-Term Care recommends an approach through local boards of health to raise public and professional awareness to control excessive exposure to fluoride from other sources. In the monitoring well, indication of levels of fluoride where non-detect of the laboratory's reporting detection limit (RDL).

7.2.2 Non-health Related Parameters

- **pH:** pH is a parameter that indicates the acidity of a water sample. The principal objective in controlling pH is to produce a water that is neither corrosive nor produces incrustation. In the monitoring well tested, indication of pH levels fell within the appropriate range set out by the ODWS.
- **Total Dissolved Solids (TDS):** TDS comprise of inorganic salts and small amount of organic matter that is dissolved in water. TDS can originate from natural sources, sewage, urban and agricultural runoff and industrial wastewater. High TDS levels can change the taste and texture of the water making it unfit for consumption. In the monitoring well tested, indication of TDS levels fell within the appropriate range set out by the ODWS.
- **Total Aluminum:** Aluminum in untreated water is present in the form of fine particles of alumino-silicate clay. These clay particles are effectively removed in coagulation/filtration. Aluminum found in coagulant treated water is due to the presence of aluminum left over from use of the coagulant. High aluminum can cause coating of the pipes resulting in increased energy requirements for pumping, interference with certain industrial processes and flocculation. Medical studies have not provided clear evidence

that residual aluminum has any effect on health. MW-3 have levels above the guideline standard but due to no current or historical sources, this is naturally occurring and would not have a negative impact on the groundwater.

- **Total Copper:** Copper occurs naturally in the environmental but is rarely present in raw water. Copper is used extensively in domestic plumbing in tubing and fittings and is an essential trace component in food. Although the intake of large doses of copper has resulted in adverse health effects such as stomach upsets, the levels at which this occurs are much higher than regulated limits. In the monitoring well tested, indication of copper levels fell within the appropriate range set out by the ODWS.
- **Total Manganese:** Manganese is objectionable in water supplies because it stains black and produces an undesirable taste. Manganese is present in some groundwater because of chemically reducing underground conditions coupled with presence of manganese mineral deposits. Manganese is also occasionally present, seasonally, in surface waters when anaerobic decay processes in sediments occurring. The monitoring well has levels above the guideline standard but due to no current or historical sources, this is naturally occurring and would not have a negative impact on the groundwater.
- **Total Titanium:** Titanium is an element found naturally in many igneous and sedimentary rocks. Titanium compounds are stable in soil, so only small amounts of titanium end up in water from the weathering of rocks. Titanium may also be present in groundwater due to manufacturing effluent. Titanium is relatively non-toxic. It does not accumulate in the human body. In the monitoring well tested, indication of titanium levels fell within the appropriate range set out by the ODWS.
- **Total Zinc:** Zinc occurs in small amounts in almost all igneous rocks. The natural zinc content in soil is estimated to be 1-300 mg/kg. Zinc can impart an undesirable taste to drinking water. In natural surface water the concentration of zinc is usually below 10µg/L and in groundwater is between 10-40 µg/L. Acute toxicity can occur in humans if excessive amounts of zinc are ingested. In the monitoring well tested, indication of zinc levels fell within the appropriate range set out by the ODWS.

Results of analysis were compared to ODWS The results can be found below in Table 8.

Table 7 – Summary of Groundwater Samples

Sample Description	6040869			
Date Sampled	07/30/2024			
Parameter	Unit	G / S	RDL	MW-3
Water Quality Assessment				
Electrical Conductivity	µS/cm		2	1070
pH	pH Units	6.5-8.5[1]	NA	7.52
Saturation pH (Calculated)				6.64
Langelier Index (Calculated)				0.877
Hardness (as CaCO3) (Calculated)	mg/L	80-100[1]	0.5	468
Total Dissolved Solids	mg/L	500[1]	10	620
Alkalinity (as CaCO3)	mg/L	30-500[1]	5	377
Bicarbonate (as CaCO3)	mg/L		5	377
Carbonate (as CaCO3)	mg/L		5	<5
Hydroxide (as CaCO3)	mg/L		5	<5
Fluoride	mg/L	1.5[2]	0.02	<0.05
Chloride	mg/L	250[1]	0.10	19.1
Nitrate as N	mg/L	10[2]	0.02	<0.05
Nitrite as N	mg/L	1[2]	0.000002	<0.05
Bromide	mg/L		0.05	<0.05
Sulphate	mg/L	500[1]	0.05	181
Ortho Phosphate as P	mg/L		0.05	<0.10
Ammonia as N	mg/L		0.12	4.82
Total Phosphorus	mg/L		0.10	0.72
True Colour	TCU	5[1]	2.50	13.4
Turbidity	NTU	5[1]	0.87	507
Total Calcium	mg/L		0.004	102
Total Magnesium	mg/L		0.003	51.9
Total Potassium	mg/L		0.006	46.3
Total Sodium	mg/L	200[1] 20[2]	0.004	35.6
Aluminum-dissolved	mg/L	0.1[1]	0.002	41.1
Total Antimony	mg/L	0.006[2]	0.020	<0.003
Total Arsenic	mg/L	0.01[2]	0.0002	0.028
Total Barium	mg/L	1.0[2]	0.40	0.280
Total Beryllium	mg/L		0.006	<0.002
Total Boron	mg/L	5[2]	0.0010	0.208
Total Cadmium	mg/L	0.005[2]	0.004	0.0009
Total Chromium	mg/L	0.05[2]	0.100	0.048
Total Cobalt	mg/L		0.0010	0.0282
Total Copper	mg/L	1[1]	0.20	0.077
Total Iron	mg/L	0.3[1]	0.004	61.5

Sample Description	6040869			
Date Sampled	07/30/2024			
Parameter	**Unit**	**G / S**	**RDL**	**MW-3**
Total Lead	mg/L	0.010[2]	0.0001	0.189
Total Manganese	mg/L	0.05[1]	0.004	4.10
Dissolved Mercury	mg/L	0.001[2]	0.006	<0.0001
Total Molybdenum	mg/L		1.00	0.013
Total Nickel	mg/L		0.004	0.045
Total Selenium	mg/L	0.05[2]	0.20	<0.004
Total Silver	mg/L		0.0002	<0.0002
Total Strontium	mg/L		0.010	0.325
Total Thallium	mg/L		0.0006	<0.0006
Total Tin	mg/L		0.004	<0.004
Total Titanium	mg/L		0.20	0.526
Total Tungsten	mg/L		0.020	<0.020
Total Uranium	mg/L	0.02[2]	0.0010	0.0016
Total Vanadium	mg/L		0.004	0.070
Total Zinc	mg/L	5[1]	0.040	0.882
Total Zirconium	mg/L		0.008	<0.008

[1] Ontario Regulation 169/03 Aesthetic Objectives (AO) & Operational Guidelines (OG) Standards
[2] Ontario Regulation 169/03 Maximum Acceptable Concentration (MAC) Interim Maximum Acceptable Concentration (IMAC) Standards
NOTE: Exceedances to either standard is hi-lighted in red

The analysis results indicate that all health and non-health related parameters recorded levels below the ODWS (Ontario Drinking Water Standards (Objectives)) except for: hardness, turbidity, total sodium, arsenic, chromium, iron, lead, and manganese. There was a risk assessment completed on site, dated May 14, 2025 detailing that the groundwater on the subject site not be used as a potable water source. This risk assessment would mitigate any impacts from the groundwater sources of arsenic, chromium, and lead. The due diligence risk assessment executive summary can be found in appendix G.

8.0 SEPTIC SERVICING STRATEGY

A septic system will be used to service the proposed development's wastewater. A water quality impact assessment will be completed to assess the risk of the presence of the septic system on site and if it impacts off-site.

8.1 Water Quality Impact Risk Assessment

According to the MECP's "Individual On-Site Sewage System: Water Quality Impact Risk Assessment" (Procedure D-5-4), which is in place to protection of the environment and public health by ensuring that development utilizing individual on-site sewage systems proceeds at a density and scale which will not cause degradation of the surface and groundwater resources in exceedance of acceptable limits. The lot size plays a vital role in the impact assessment and since the size of the proposed development is more than one hectare the guideline indicates that a detailed hydrogeological assessment may not be required if the study area is not hydrogeological sensitive. Compliance with acceptable limits shall be demonstrated through a prediction of the development's nitrate impact on the groundwater at the development boundary.

The groundwater impact assessment will address the ability of the lands to treat sewage effluent to meet acceptable limits. This will require determination of the representative existing background nitrate levels in the receiving groundwater. This determination will involve the collection of groundwater samples from various locations on the development site. A discussion of the existing background nitrate concentrations relative to nitrate sources, and susceptibility of groundwater to contamination will be provided. For the purposes of this assessment the ODWS of 10 mg/L of nitrate will be used as an indicator of groundwater impact potential.

8.2 Lot Size Consideration

The entire subject site is 27,923 m^2. For the proposed development of the building, the area is approximately 1,316 m^2.

8.3 Results of Analysis of Nitrate

Groundwater samples were collected from the monitoring wells on July 30, 2024. The groundwater sampling was compared to the ODWS. The groundwater sampling was compared to the ODWS.

Table 8 – Summary of Results of Analysis for Nitrate Compared to ODWS

Parameter	Unit	ODWS	RUC	MW-3
Inorganic Water Chemistry				
Nitrate as N	mg/L	10	6.3	<0.05

8.4 Nitrate Dilution Calculations

The study area for this investigation is one lot that is undeveloped with one sewage systems on site. The lot area is 27,923 m^2. Table 8 shows the concentrations of nitrate on the subject site from MW-3. The highest concentration is all monitoring wells is <0.05 mg/L, therefore the value of 0.05 mg/L will be used. This allows the following calculations to be made:

$$Property\ Area\ (Lot)\ = 27{,}923\ m^2$$

$$Recharge\ Rate = \ 0.181 \frac{m}{year}$$

$$Recharge\ = 27{,}923\ m^2 \times 0.181\ m/yr = 5{,}054.06\ m^3/year = 13.85\ m^3/day$$

$$Existing\ Nitrate\ level\ of\ groundwater\ = 0.05\ mg/L\ as\ N$$

$$Natural\ Nitrate\ Loading\ = 69.2\ g/day\text{o}$$

$$Sewage\ Output = 3500\ l/day = 35\ m^3/day$$

$$Nitrate\ Loading\ from\ sewage\ system = 50\ g/day$$

$$Average\ Nitrate\ level\ of\ water\ leaving\ the\ property$$

$$= \frac{50 \frac{g}{day} + 69.2 \frac{g}{day}}{13.85 \frac{m^3}{day}} = 8.60\ mg/l$$

According to the nitrate loading assessment, average nitrate levels in water leaving the study area are 8.6 mg/L. This level is below the 10 mg/L ODWS indicating there is no significant impact on the water quality. From this assessment, as well as the soil characteristics and percolation time, ideal conditions exist on-site to allow for the installation of an on-site septic system.

8.5 Conclusions of the Impact Risk Assessment

Due to the lot size consideration, groundwater flow direction and the current levels of nitrate, A&A believes that the groundwater system would not be impacted by the development of an on-site sewage system.

9.0 CONCLUSIONS AND RECOMMENDATION

The assessment of the available data indicates that:

- A & A Environmental Consultants Inc. (A&A) was retained by BVD (the client), to evaluate the potential impact from the proposed development of a commercial development (Transportation depot) on local groundwater/surface water resources by conducting a small-scale hydrogeological study. The subject site is located at 7504 McLean Road, Puslinch, Ontario. The area of the site is approximately 27,923 m^2 (6.90 acres). At the time of the investigation, the site was vacant.

- The topography in the vicinity of the subject site (a 100-meter radius) ranges from approximately 330 masl to the southeast to 320 masl to the northwest of the site and was observed to be generally flat with a slight slope toward the southwest corner of the site.

- The MECP well records show groundwater was found between 3.96 – 6.71 mbgs, for a well drilled in the unconfined aquifer to approximately between 3.96 – 7.62 mbgs. The drilling program completed at this site shows the groundwater was measured between 2.1– 6.5 mbgs for monitoring wells drilled between 4.57-7.521 mbgs.

- The water table in the study area was defined by installing a total of three monitoring wells and one existing monitoring well in the area of the proposed redevelopment and monitoring those wells on the subject site. The three monitoring wells installed by A&A were drilled to a maximum depth of 7.521 mbgs. Not all wells contained water in each of the seven monitoring events as MW24-1 was dry at every monitoring event. It was concluded that the seasonally high groundwater levels present on site were at elevations between 255.536 – 315.323 masl. A&A understands that four seasons of groundwater monitoring is needed and will continue monitoring on site. The monitoring will continue in September 2024 and repeat every month until the last monitoring in May/June 2025.

- A groundwater contour map was plotted using "Golden Software" (Surfer 8) and the measurements of groundwater levels taken on July 17, 2024 from three monitoring wells and one existing monitoring well. This map shows well EMW-1 being at the lowest water elevation compared with the other wells used. The general direction of groundwater flow was found to be in a southwest direction.
- The total precipitation (rainfall plus snowfall) in 2023 was 826 mm. The average annual precipitation over the thirty-year period was 916.5 mm. For the same period, it was calculated that approximately 553 mm/year would be lost to evapotranspiration; leaving a total of approximately 363.5 mm/year available for groundwater recharge and surface runoff.
- Based on the water balance assessment, high changes are anticipated in the infiltration and runoff due to the proposed redevelopment at the subject site. A stormwater management plan, is recommended to manage the increased stormwater runoff on site.
- The analysis results indicate that all health and non-health related parameters recorded levels below the ODWS (Ontario Drinking Water Standards (Objectives)) except for: hardness, turbidity, total sodium, arsenic, chromium, iron, lead, and manganese. These parameters are known to be naturally occurring in hard rock areas of Ontario and would not have a negative impact on the groundwater. There was a risk assessment completed on site, dated December 12, 2025, where it stated, *"no impacts were identified in groundwater no exceedances of the human health component value associated with the ingestion of potable groundwater were noted. As such. No further evaluation of groundwater was required in the HHRA."*

Based on the obtained information from this study, A&A has the following recommendations:

1. Due to the increased runoff rate on site post development, a stormwater management plan is recommended. Proper planning as well as implementing LIDs will mitigate the stormwater that accumulates. This SWM report confirms that there will be a deficit in the infiltration and a surplus in the runoff. The Source Water Protection will only permit the

infiltration of roofs and landscape areas. Due to this, excess water is directed to the Aberfoyle Business Park Stormwater Management Facility (SWMF) but ultimately the SWMF discharges to the wetland. This will allow for the deficit to infiltration and increase in runoff. Full details on the SWM plan are detailed fully in the Dec 15, 2025 Report.

2. Due to the water levels being below the foundation bottom, the excavation area will NOT need to undergo short-term dewatering. The groundwater levels are below the finished floor elevation and footings; therefore, long-term dewatering will NOT be required.

3. No adverse impact on the groundwater resources is expected to occur during the redevelopment of the subject site with the implementations of these recommended actions.

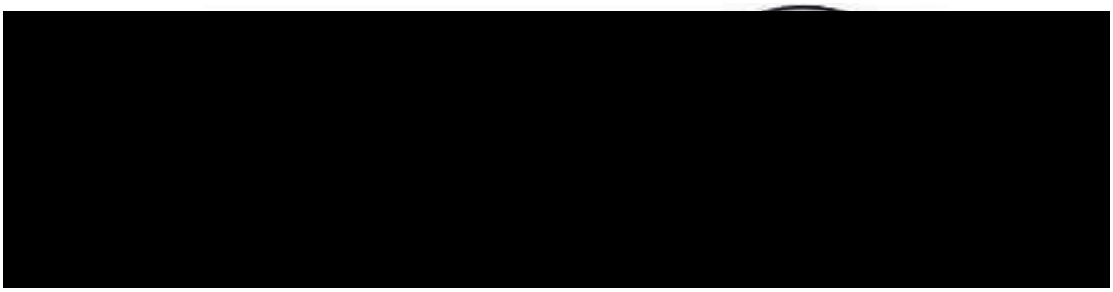
4. Any unused wells must be abandoned by a licensed well contractor in accordance with R.R.O. 1990, Reg. 903: Wells.

5. Any import/export of fill/soil from the site must be conducted in accordance with O. Reg. 406/19: On-Site and Excess Soil Management, the Rules for Soil Management and Excess Soil Quality Standards (Soil Rules) and O. Reg. 153/04, as amended.

SIGNED:

Thomas Demers, P. Eng., QP_{ESA}
Project Manager

SIGNED:



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11.0 QUALIFICATIONS OF THE ASSESSORS

A & A Environmental Consultants Inc. is a multi-disciplinary environmental consulting firm offering consulting services in the fields of site assessments (Phase I-II), cleanups, water resource studies, aggregate permitting, landfill design and monitoring, geotechnical studies, air quality studies, designated substances surveys and environmental impact studies. A&A has more than 20 years of experience in environmental consulting in the province of Ontario, Alberta, Saskatchewan, British Columbia and have preformed thousands of projects from small scale Phase I ESAs to large scale landfill design, hydro-geological studies and groundwater management plans. We have a number of senior, experienced staff who consult in a variety of disciplines and offer our clients expert knowledge in both the technical aspects of a project and the environmental regulations applicable.

Dr. Ali A. Rasoul, Ph.D., EP, P. Geo., QP

Principal Consultant

The report was reviewed by Dr. Ali A. Rasoul, a Principal Consultant with A&A. He has over 20 years experience in his field. He has completed hundreds of environmental projects including Phase I/II/III ESAs, mould assessments, hydrogeological investigations, designated substances surveys and water management plans. He is a licensed Professional Geoscientist with the Association of Professional Geoscientists of Ontario and a licensed Well Technician in the Province of Ontario (Ministry of the Environment, Conservation and Parks). He is also a licensed Professional Geoscientist in Alberta, Saskatchewan and British Columbia. Dr. Rasoul is registered as a “Qualified Person” for conducting ESAs as defined under Ontario Regulation 153/04 and 511/09.

12.0 LIMITATIONS

The report was prepared for the exclusive use of the client. 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 the third party. Should additional parties require reliance on this report, written authorization from A&A will be required. With respect to third parties, A&A has no liability or responsibility for losses of any kind whatsoever including direct or consequential financial effects on transactions or property values, or requirement for follow-up actions and costs.

The investigation undertaken by A&A with respect to this report and any conclusions or recommendations made in this report reflect A&A's judgment based on the site conditions observed at the time of the site inspection on the date(s) set out in this report and on information available at the time of preparation of this report. This report has been prepared for specific application to this site and it is based, in part, upon visual observations of the site as described in this report. Unless otherwise stated, the findings cannot be extended to previous or future site conditions, or portions of the site, which were unavailable for direct investigation. A&A has used professional judgment in analysing this information and formulating these conclusions.

A&A makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.

APPENDIX A – Site Maps

Figure 1 – Map Showing the Site Location

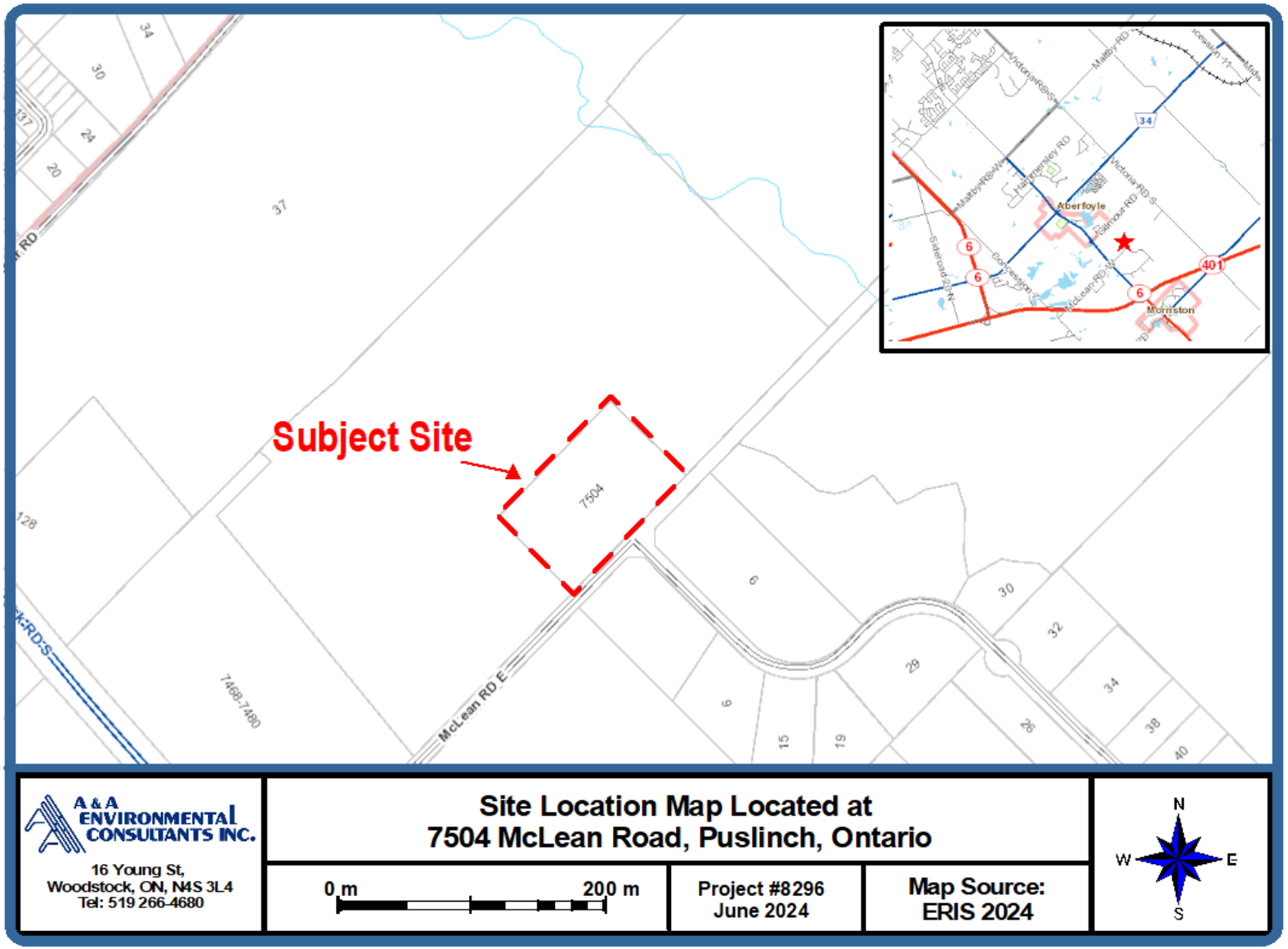


Figure 2 – Satellite Map of Site and Subject Study Area

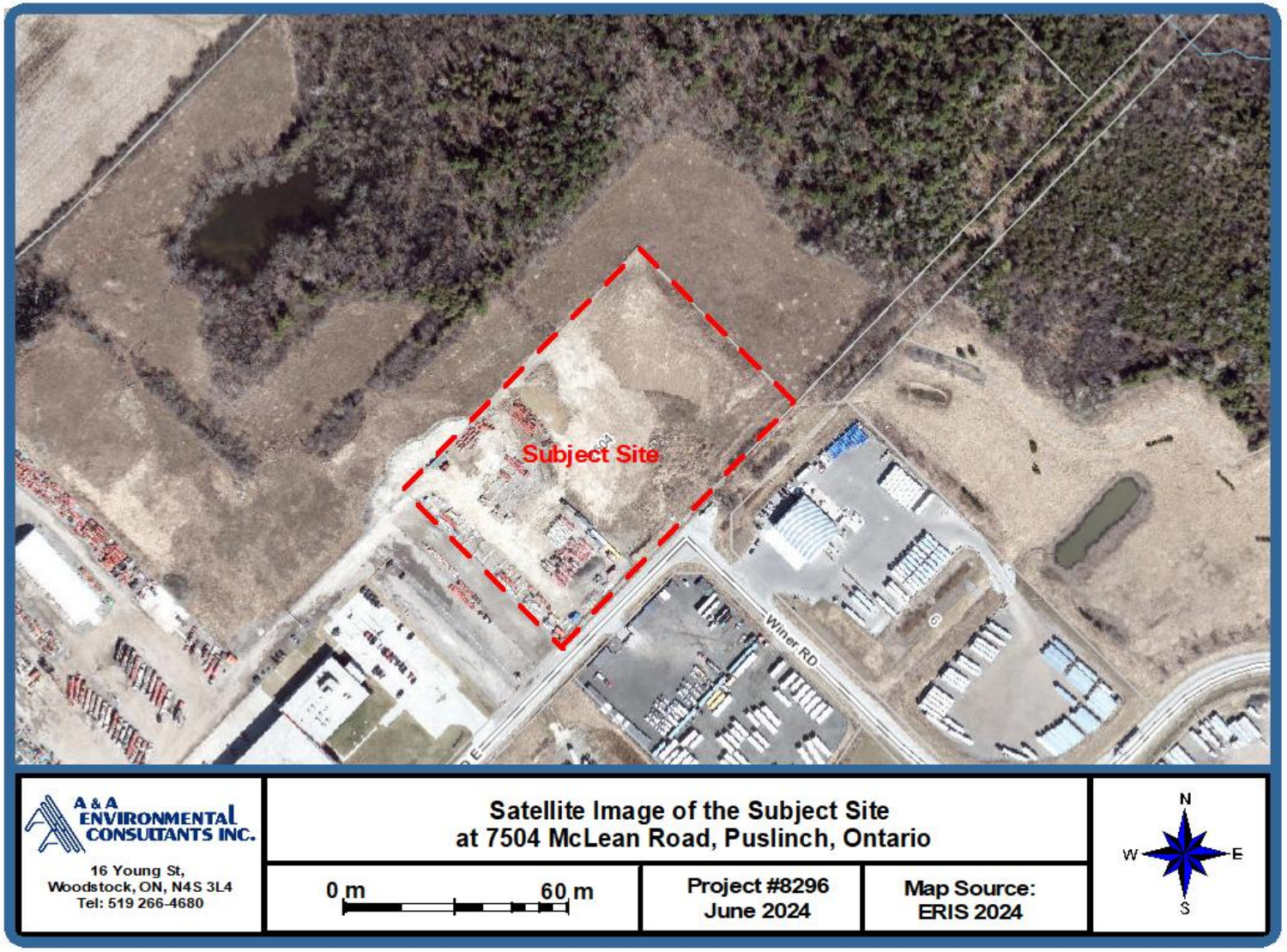


Figure 3 – Topographic Map

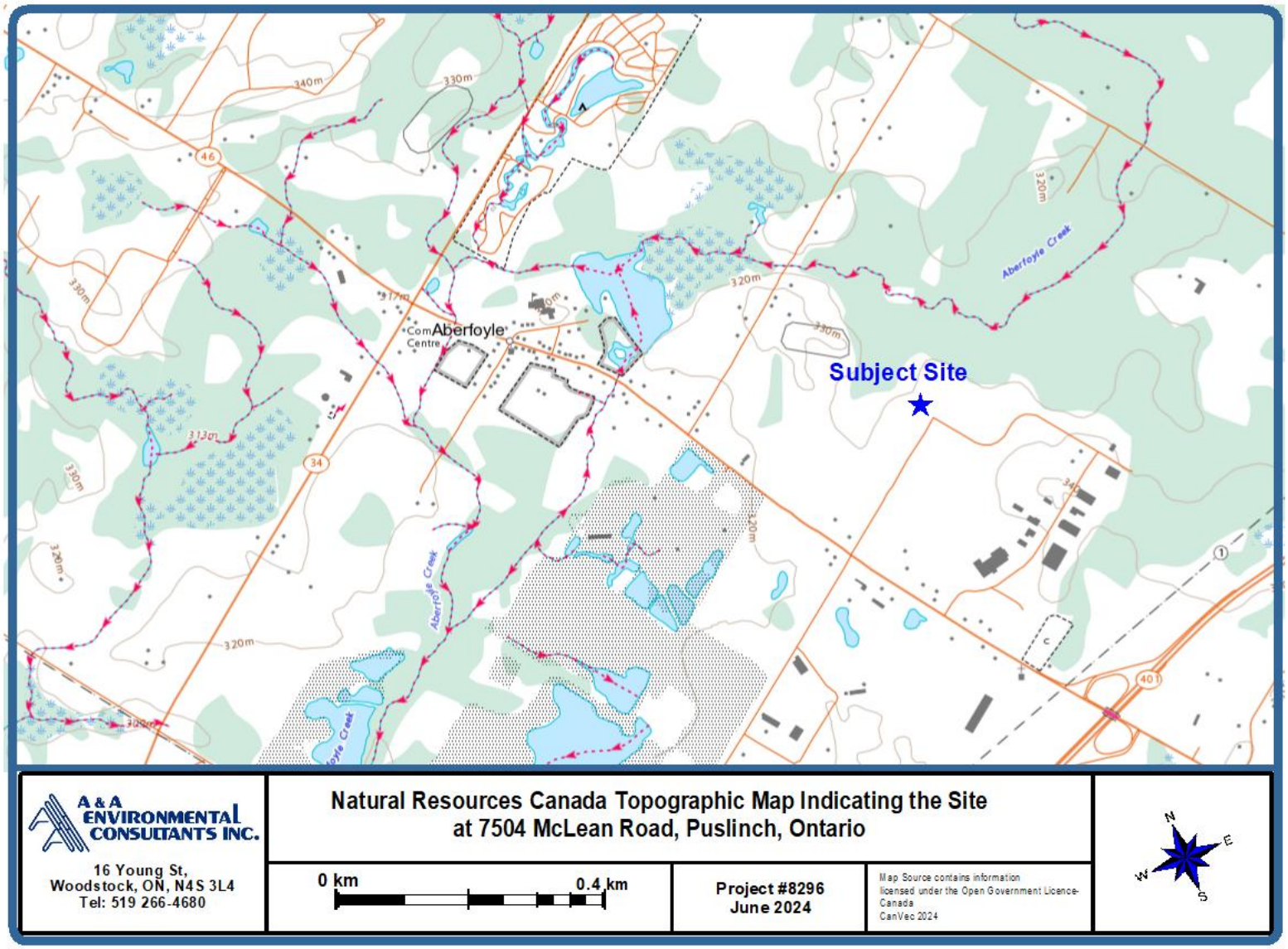


Figure 4 – Monitoring Wells Location Map – Satellite Image

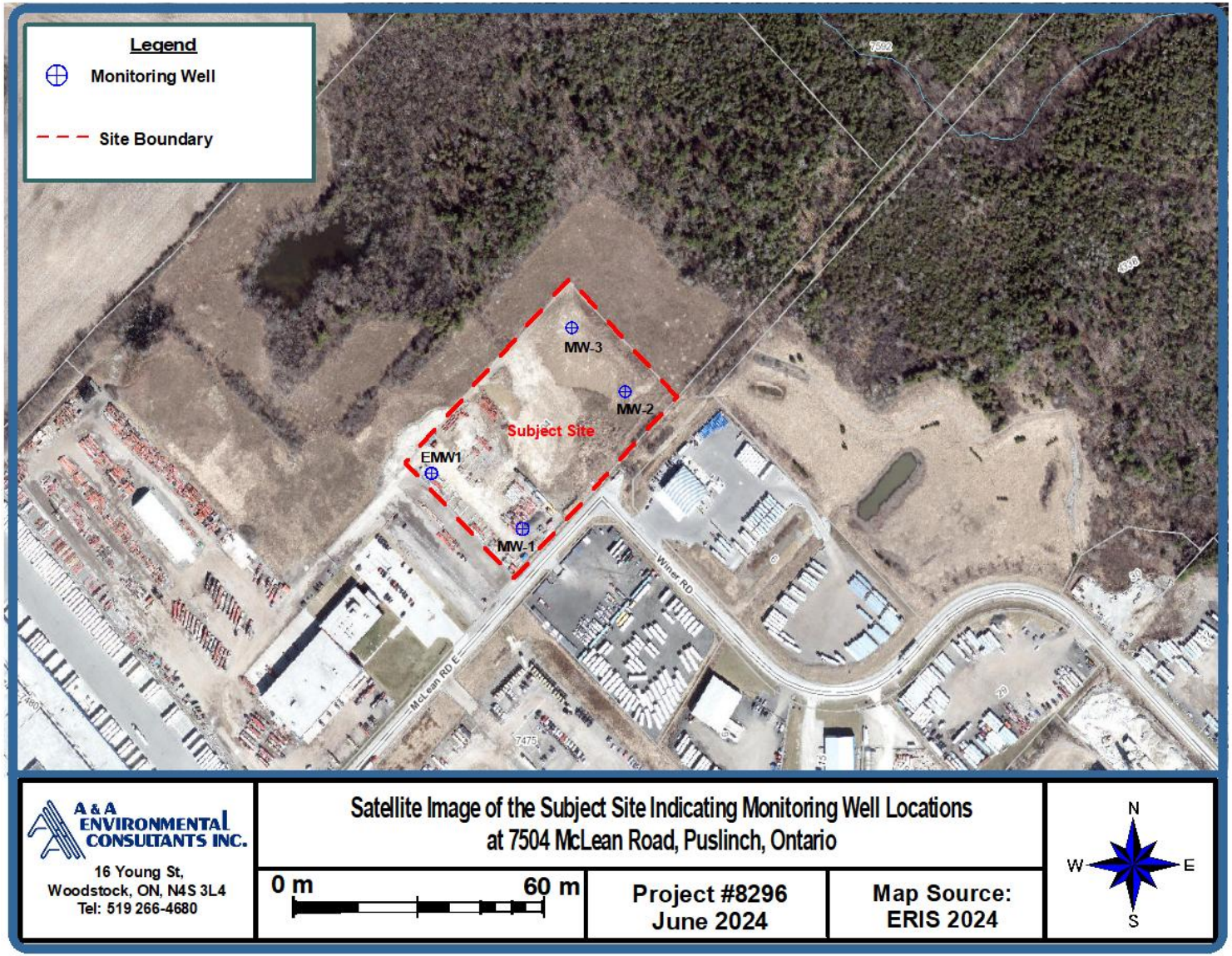


Figure 5 – Groundwater Contour Map

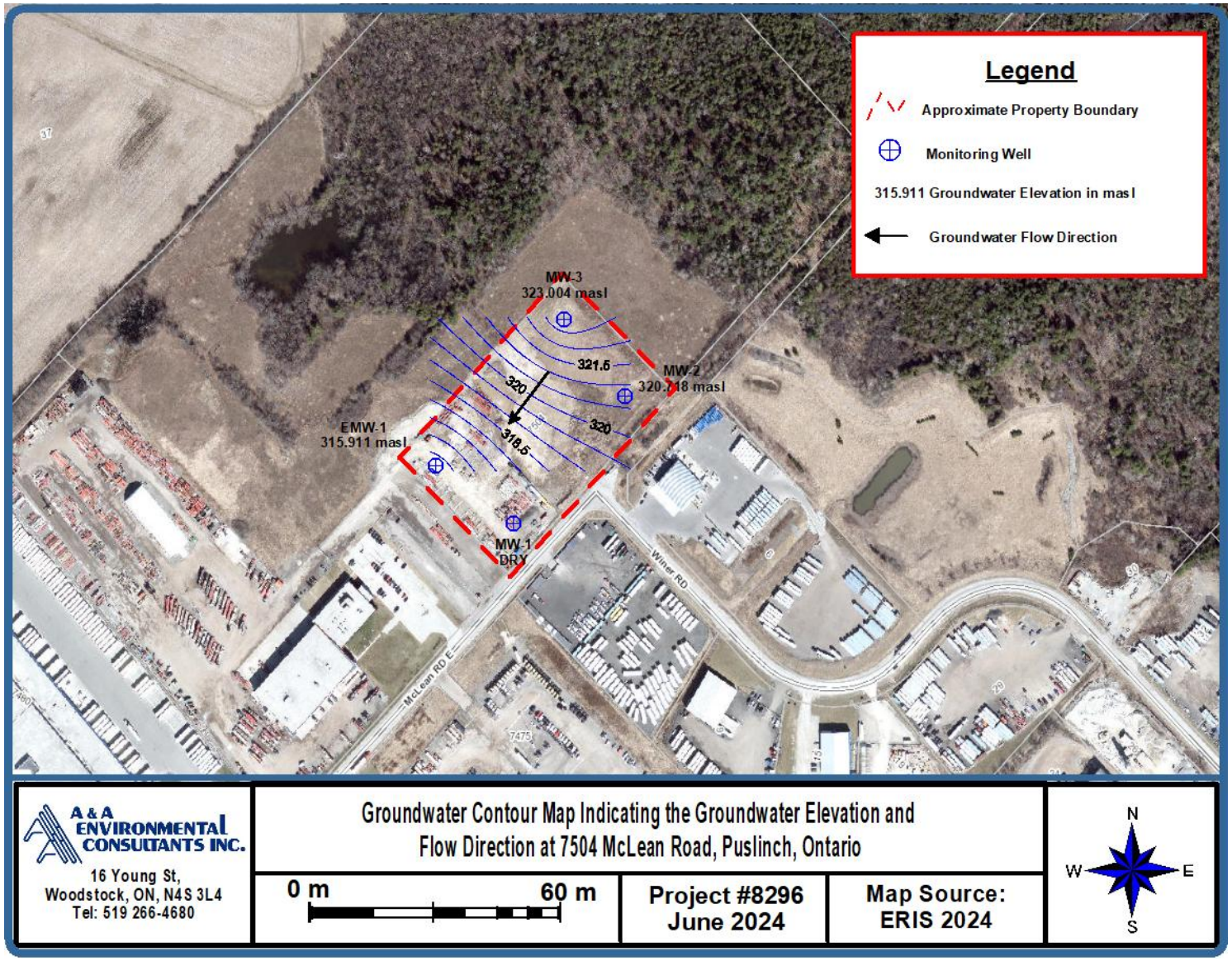
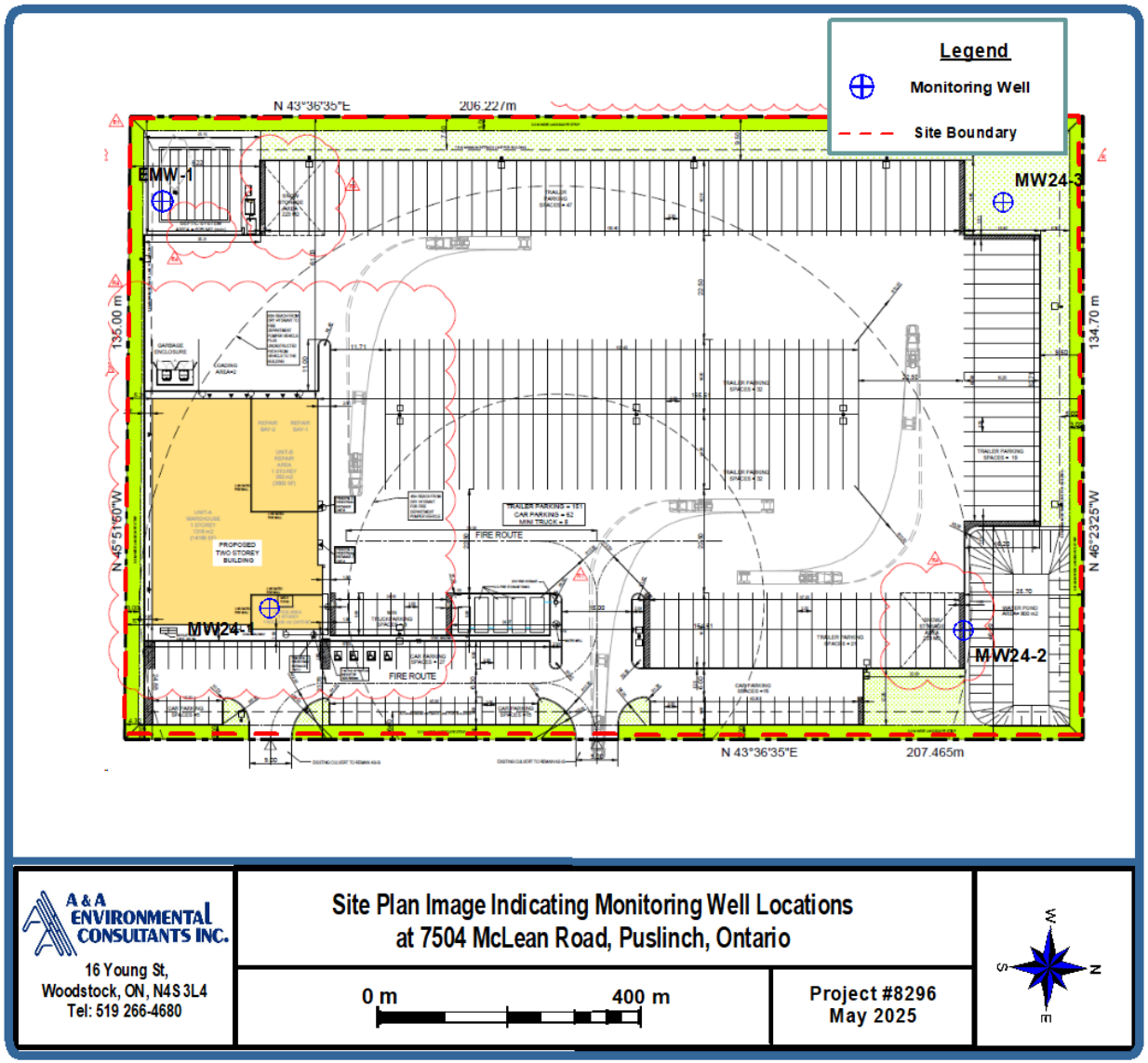
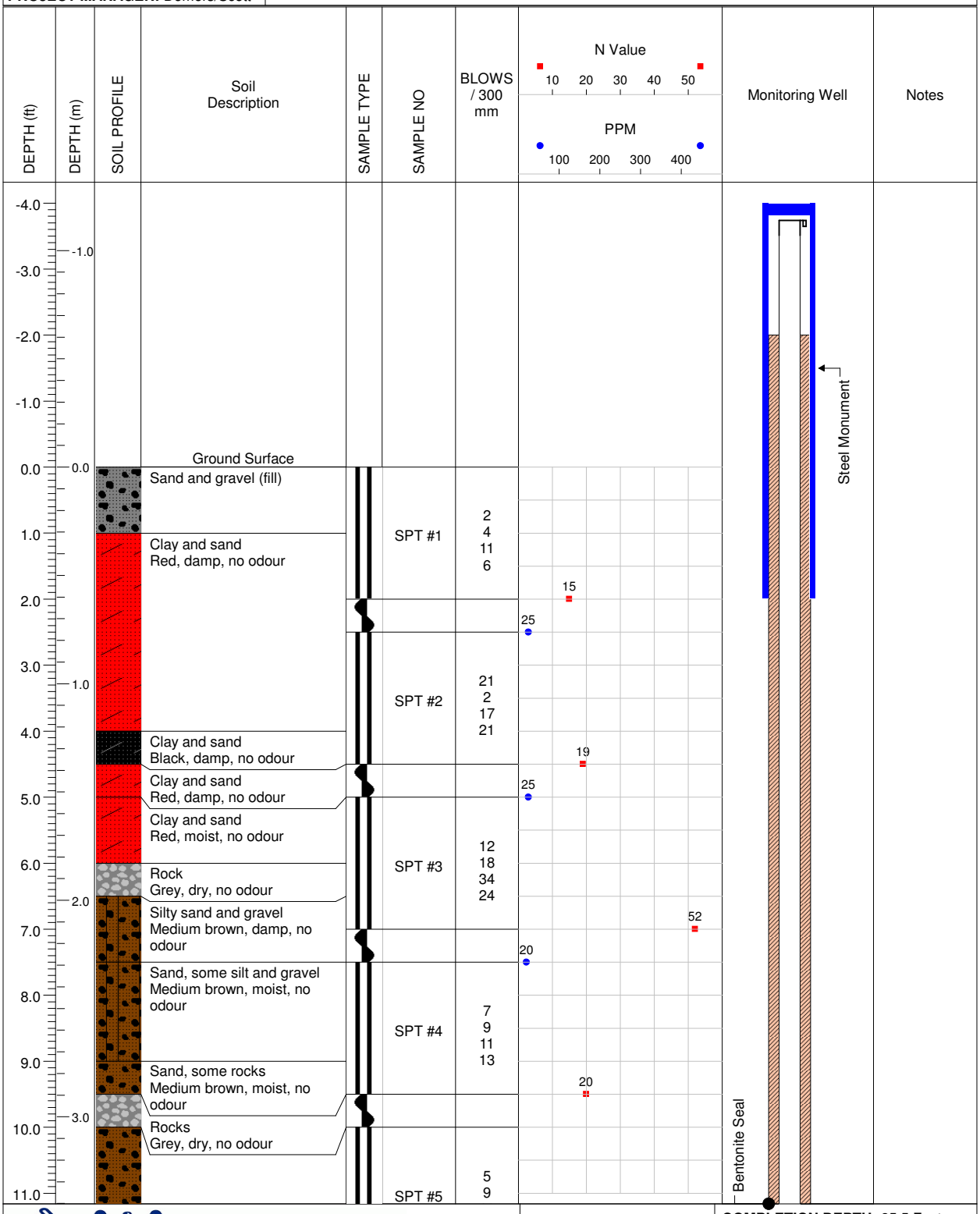


Figure 6 – Monitoring Wells Location Map – Site Plan Image



APPENDIX B – Borehole Logs

PROJECT: BVD Puslinch	**BH LOCATION:** SW corner of site, in line w/ storage facility entrance	**BOREHOLE NO: BH/MW1**
PROJECT NO: 8296/8368	**LOCATION:** 7504 McLean Rd., Puslinch	
PROJECT MANAGER: Demers/Scott	**COMPANY NAME:** A&A Environmental Consultants Inc.	



LOGGED BY: E. Fulsom	**COMPLETION DEPTH:** 25.5 Feet
REVIEWED BY: A. Rasoul	**DRILL METHOD:** SPT
DRILL DATE: Jun 24, 2024	**PAGE:** 1 of 2

A & A ENVIRONMENTAL CONSULTANTS INC.
16 Young Street Woodstock, ON

PROJECT: BVD Puslinch	**BH LOCATION:** SW corner of site, in line w/ storage facility entrance	**BOREHOLE NO: BH/MW1**
PROJECT NO: 8296/8368	**LOCATION:** 7504 McLean Rd., Puslinch	
PROJECT MANAGER: Demers/Scott	**COMPANY NAME:** A&A Environmental Consultants Inc.	

DEPTH (ft)	DEPTH (m)	Soil Description	SAMPLE NO	BLOWS / 300 mm	N Value / PPM	Monitoring Well	Notes
12.0		Sand, some rocks Medium brown, moist, no odour	SPT #5	10 6	19	Bentonite Seal	
13.0	4.0	Sand, some gravel Medium brown, moist, no odour	SPT #6	9 10 12 18			
14.0		Sand, some gravel Medium brown, moist-to-wet, no odour			22		
15.0							
16.0			SPT #7	12 17 14 12			
	5.0	Gravel Grey, damp, no odour			31	Silica Sand	
17.0		Sand, trace gravel Medium brown, moist-to-wet, no odour					
18.0		Sand, trace gravel Medium brown, wet, no odour	SPT #8	4 5 6 7			
19.0							
					11		
	6.0	Rock Grey, dry, no odour					
20.0							
21.0			SPT #9	35 50+			
22.0					>60		
	7.0	No recovery @ 22.5-25ft. SPT refusal @ 21ft., augered through SPT refusal @ 22.5ft., augered through, SPT ref @ 25ft.					
23.0							
24.0			SPT #10	50+	>60		
25.0			SPT #11	50+	>60	10 ft Well Screen	
26.0		End of Log					

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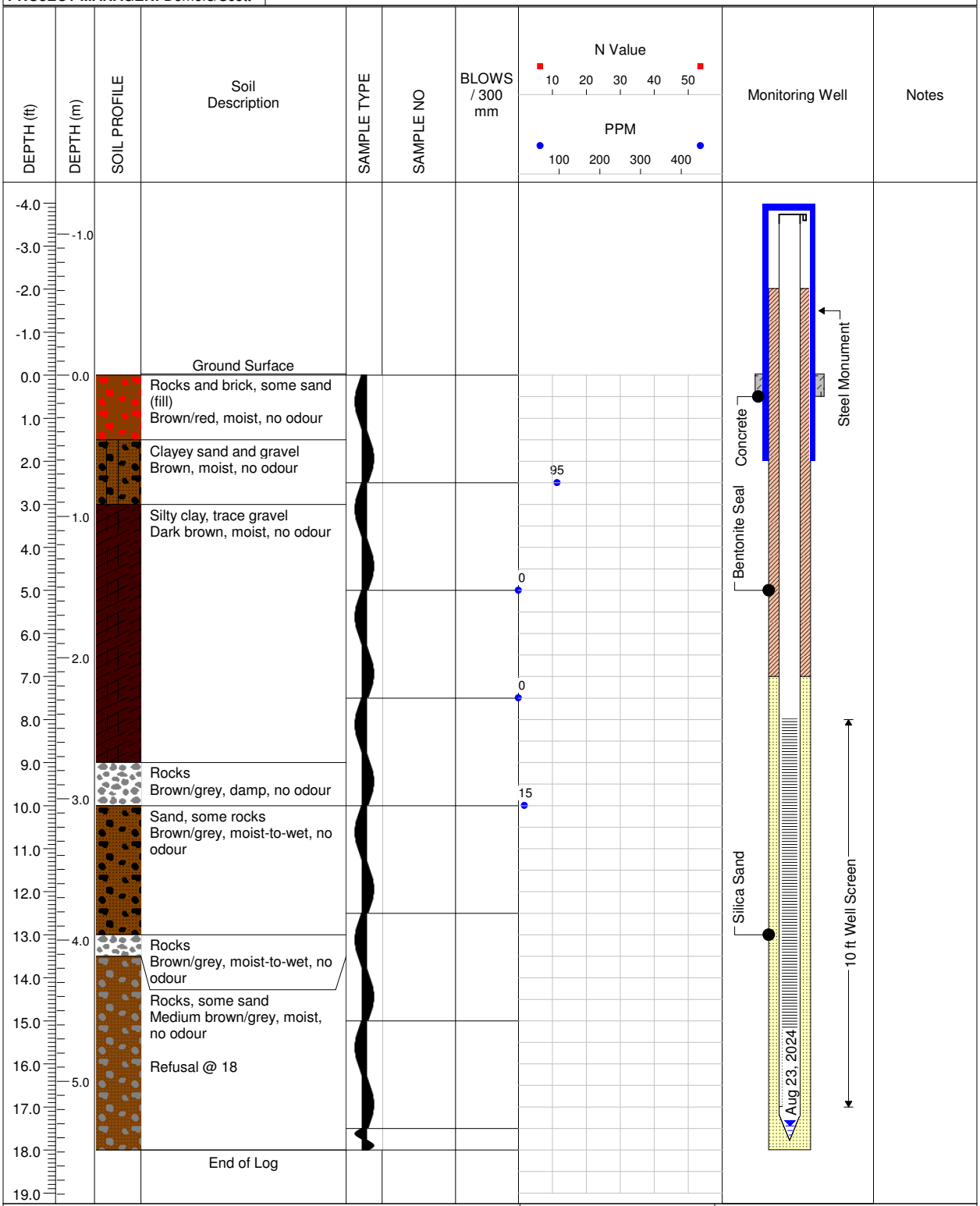
16 Young Street Woodstock, ON

LOGGED BY: E. Fulsom	**COMPLETION DEPTH:** 25.5 Feet
REVIEWED BY: A. Rasoul	**DRILL METHOD:** SPT
DRILL DATE: Jun 24, 2024	**PAGE:** 2 of 2

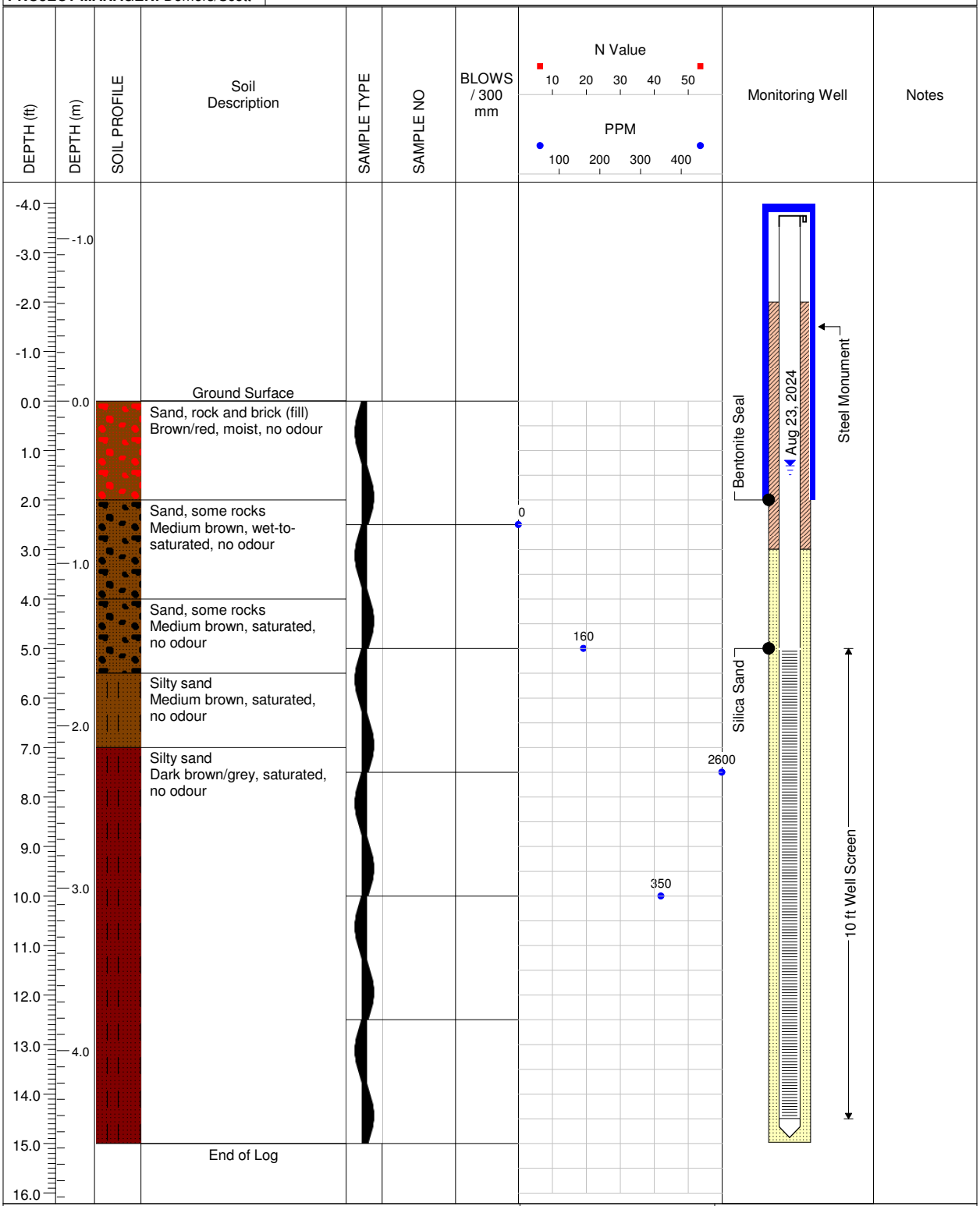
PROJECT: BVD Puslinch	**BH LOCATION:** NE corner of site	**BOREHOLE NO: BH/MW2**
PROJECT NO: 8296/8368	**LOCATION:** 7504 McLean Rd., Puslinch	
PROJECT MANAGER: Demers/Scott	**COMPANY NAME:** A&A Environmental Consultants Inc.	



LOGGED BY: E. Fulsom	**COMPLETION DEPTH:** 18 Feet
REVIEWED BY: A. Rasoul	**DRILL METHOD:** S.S.A.
DRILL DATE: Jun 24, 2024	**PAGE:** 1 of 1

A & A ENVIRONMENTAL CONSULTANTS INC.
16 Young Street Woodstock, ON

PROJECT: BVD Puslinch	**BH LOCATION:** N corner of site	**BOREHOLE NO: BH/MW3**
PROJECT NO: 8296/8368	**LOCATION:** 7504 McLean Rd., Puslinch	
PROJECT MANAGER: Demers/Scott	**COMPANY NAME:** A&A Environmental Consultants Inc.	



LOGGED BY: E. Fulsom	**COMPLETION DEPTH:** 15 Feet
REVIEWED BY: A. Rasoul	**DRILL METHOD:** S.S.A.
DRILL DATE: Jun 24, 2024	**PAGE:** 1 of 1

A & A ENVIRONMENTAL CONSULTANTS INC.
16 Young Street Woodstock, ON

APPENDIX C – Certificate of Chemical Analysis

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC
16 Young Street
WOODSTOCK, ON N4S3L4
(519) 266-4680

ATTENTION TO: Ali Rasoul

PROJECT: 8296 BVD Puslinch

AGAT WORK ORDER: 24T179849

WATER ANALYSIS REVIEWED BY: Amanjot Bhela, Lab Operation Manager

DATE REPORTED: Aug 08, 2024

PAGES (INCLUDING COVER): 10

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

Disclaimer:

- All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.
- All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.
- AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.
- This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
- The test results reported herewith relate only to the samples as received by the laboratory.
- Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.
- All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.

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Certificate of Analysis

AGAT WORK ORDER: 24T179849

PROJECT: 8296 BVD Puslinch

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

ATTENTION TO: Ali Rasoul

SAMPLING SITE:7504 McLean Rd., Puslinch

SAMPLED BY:E. Fulson

TOC

DATE RECEIVED: 2024-07-30 **DATE REPORTED: 2024-08-08**

		SAMPLE DESCRIPTION:		MW 3
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2024-07-30
Parameter	Unit	G / S	RDL	6040869
Total Organic Carbon	mg/L		0.5	23

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ON 169/03 AO&OG
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Analysis performed at AGAT Halifax (unless marked by *)

Certified By: [redacted]

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Certificate of Analysis

AGAT WORK ORDER: 24T179849

PROJECT: 8296 BVD Puslinch

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

ATTENTION TO: Ali Rasoul

SAMPLING SITE:7504 McLean Rd., Puslinch

SAMPLED BY:E. Fulson

Water Quality Assessment (mg/L)

DATE RECEIVED: 2024-07-30

DATE REPORTED: 2024-08-08

		SAMPLE DESCRIPTION:		MW 3
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2024-07-30
Parameter	Unit	G / S	RDL	6040869
Electrical Conductivity	µS/cm		2	1070
pH	pH Units	6.5-8.5	NA	7.52
Saturation pH (Calculated)				6.64
Langelier Index (Calculated)				0.877
Hardness (as CaCO3) (Calculated)	mg/L	80-100	0.5	468
Total Dissolved Solids	mg/L	500	10	620
Alkalinity (as CaCO3)	mg/L	30-500	5	377
Bicarbonate (as CaCO3)	mg/L		5	377
Carbonate (as CaCO3)	mg/L		5	<5
Hydroxide (as CaCO3)	mg/L		5	<5
Fluoride	mg/L		0.05	<0.05
Chloride	mg/L	250	0.12	19.1
Nitrate as N	mg/L		0.05	<0.05
Nitrite as N	mg/L		0.05	<0.05
Bromide	mg/L		0.05	<0.05
Sulphate	mg/L	500	0.10	181
Ortho Phosphate as P	mg/L		0.10	<0.10
Ammonia as N	mg/L		0.03	4.82
Total Phosphorus	mg/L		0.02	0.72
True Colour	TCU	5	2.50	13.4
Turbidity	NTU	5	0.5	507
Total Calcium	mg/L		0.40	102
Total Magnesium	mg/L		0.20	51.9
Total Potassium	mg/L		1.00	46.3
Total Sodium	mg/L	200	0.20	35.6
Total Aluminum	mg/L	0.1	0.10	41.1
Total Antimony	mg/L		0.003	<0.003
Total Arsenic	mg/L		0.006	0.028
Total Barium	mg/L		0.004	0.280
Total Beryllium	mg/L		0.002	<0.002

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 24T179849

PROJECT: 8296 BVD Puslinch

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

ATTENTION TO: Ali Rasoul

SAMPLING SITE:7504 McLean Rd., Puslinch

SAMPLED BY:E. Fulson

Water Quality Assessment (mg/L)

DATE RECEIVED: 2024-07-30

DATE REPORTED: 2024-08-08

		SAMPLE DESCRIPTION:		MW 3
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2024-07-30
Parameter	Unit	G / S	RDL	6040869
Total Boron	mg/L		0.020	0.208
Total Cadmium	mg/L		0.0002	0.0009
Total Chromium	mg/L		0.006	0.048
Total Cobalt	mg/L		0.0010	0.0282
Total Copper	mg/L	1	0.004	0.077
Total Iron	mg/L	0.3	0.100	61.5
Total Lead	mg/L		0.0010	0.189
Total Manganese	mg/L	0.05	0.004	4.10
Total Mercury	mg/L		0.0001	<0.0001
Total Molybdenum	mg/L		0.004	0.013
Total Nickel	mg/L		0.006	0.045
Total Selenium	mg/L	0.01	0.004	<0.004
Total Silver	mg/L		0.0002	<0.0002
Total Strontium	mg/L		0.010	0.325
Total Thallium	mg/L		0.0006	<0.0006
Total Tin	mg/L		0.004	<0.004
Total Titanium	mg/L		0.020	0.526
Total Tungsten	mg/L		0.020	<0.020
Total Uranium	mg/L		0.0010	0.0016
Total Vanadium	mg/L		0.004	0.070
Total Zinc	mg/L	5	0.040	0.882
Total Zirconium	mg/L		0.008	<0.008

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ON 169/03 AO&OG
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

6040869 Dilution required, RDL has been increased accordingly.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: [redacted]

AGAT Laboratories

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Exceedance Summary

AGAT WORK ORDER: 24T179849

PROJECT: 8296 BVD Puslinch

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

ATTENTION TO: Ali Rasoul

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
6040869	MW 3	ON 169/03 AO&OG	Water Quality Assessment (mg/L)	Hardness (as CaCO3) (Calculated)	mg/L	80-100	468
6040869	MW 3	ON 169/03 AO&OG	Water Quality Assessment (mg/L)	Total Aluminum	mg/L	0.1	41.1
6040869	MW 3	ON 169/03 AO&OG	Water Quality Assessment (mg/L)	Total Dissolved Solids	mg/L	500	620
6040869	MW 3	ON 169/03 AO&OG	Water Quality Assessment (mg/L)	Total Iron	mg/L	0.3	61.5
6040869	MW 3	ON 169/03 AO&OG	Water Quality Assessment (mg/L)	Total Manganese	mg/L	0.05	4.10
6040869	MW 3	ON 169/03 AO&OG	Water Quality Assessment (mg/L)	True Colour	TCU	5	13.4
6040869	MW 3	ON 169/03 AO&OG	Water Quality Assessment (mg/L)	Turbidity	NTU	5	507

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Quality Assurance

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

AGAT WORK ORDER: 24T179849

PROJECT: 8296 BVD Puslinch

ATTENTION TO: Ali Rasoul

SAMPLING SITE:7504 McLean Rd., Puslinch

SAMPLED BY:E. Fulson

Water Analysis

RPT Date: Aug 08, 2024			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Water Quality Assessment (mg/L)															
Electrical Conductivity	6039135		298	303	1.7%	< 2	104%	90%	110%						
pH	6039135		7.50	7.66	2.1%	NA	100%	90%	110%						
Total Dissolved Solids	6039135		162	172	6.0%	< 10	94%	80%	120%						
Alkalinity (as CaCO3)	6039135		92	94	2.2%	< 5	94%	80%	120%						
Bicarbonate (as CaCO3)	6039135		92	94	2.2%	< 5	NA								
Carbonate (as CaCO3)	6039135		<5	<5	NA	< 5	NA								
Hydroxide (as CaCO3)	6039135		<5	<5	NA	< 5	NA								
Fluoride	6037312		<0.05	<0.05	NA	< 0.05	98%	70%	130%	97%	80%	120%	94%	70%	130%
Chloride	6037312		217	219	0.9%	< 0.10	95%	70%	130%	100%	80%	120%	NA	70%	130%
Nitrate as N	6037312		1.73	1.75	1.1%	< 0.05	101%	70%	130%	100%	80%	120%	99%	70%	130%
Nitrite as N	6037312		<0.05	<0.05	NA	< 0.05	95%	70%	130%	99%	80%	120%	98%	70%	130%
Bromide	6037312		<0.05	<0.05	NA	< 0.05	99%	70%	130%	99%	80%	120%	97%	70%	130%
Sulphate	6037312		46.5	47.0	1.1%	< 0.10	96%	70%	130%	98%	80%	120%	96%	70%	130%
Ortho Phosphate as P	6037312		<0.10	<0.10	NA	< 0.10	99%	70%	130%	96%	80%	120%	99%	70%	130%
Ammonia as N	6040869	6040869	4.82	4.81	0.2%	< 0.02	108%	70%	130%	99%	80%	120%	118%	70%	130%
Total Phosphorus	6039135		0.53	0.52	1.9%	< 0.02	102%	70%	130%	96%	80%	120%	94%	70%	130%
True Colour	6039135		<2.50	<2.50	NA	< 2.5	105%	90%	110%	NA			NA		
Turbidity	6039135		<0.5	0.9	NA	< 0.5	111%	80%	120%						
Total Calcium	6039135		25.6	26.9	5.0%	< 0.20	91%	70%	130%	88%	80%	120%	89%	70%	130%
Total Magnesium	6039135		9.09	9.21	1.3%	< 0.10	107%	70%	130%	101%	80%	120%	107%	70%	130%
Total Potassium	6039135		1.59	1.73	NA	< 0.50	106%	70%	130%	100%	80%	120%	102%	70%	130%
Total Sodium	6039135		14.5	15.0	3.4%	< 0.10	110%	70%	130%	101%	80%	120%	108%	70%	130%
Total Aluminum	6039135		0.035	0.036	NA	< 0.010	92%	70%	130%	92%	80%	120%	100%	70%	130%
Total Antimony	6039135		<0.003	<0.003	NA	< 0.003	104%	70%	130%	103%	80%	120%	104%	70%	130%
Total Arsenic	6039135		<0.003	<0.003	NA	< 0.003	98%	70%	130%	101%	80%	120%	103%	70%	130%
Total Barium	6039135		0.021	0.021	0.0%	< 0.002	100%	70%	130%	100%	80%	120%	102%	70%	130%
Total Beryllium	6039135		<0.001	<0.001	NA	< 0.001	96%	70%	130%	92%	80%	120%	96%	70%	130%
Total Boron	6039135		0.044	0.045	NA	< 0.010	96%	70%	130%	101%	80%	120%	103%	70%	130%
Total Cadmium	6039135		<0.0001	<0.0001	NA	< 0.0001	101%	70%	130%	101%	80%	120%	103%	70%	130%
Total Chromium	6039135		<0.003	<0.003	NA	< 0.003	98%	70%	130%	97%	80%	120%	99%	70%	130%
Total Cobalt	6039135		<0.0005	<0.0005	NA	< 0.0005	103%	70%	130%	100%	80%	120%	101%	70%	130%
Total Copper	6039135		0.007	0.010	NA	< 0.002	99%	70%	130%	100%	80%	120%	98%	70%	130%
Total Iron	6039135		<0.050	<0.050	NA	< 0.050	100%	70%	130%	101%	80%	120%	101%	70%	130%
Total Lead	6039135		0.0007	0.0007	NA	< 0.0005	100%	70%	130%	96%	80%	120%	99%	70%	130%
Total Manganese	6039135		<0.002	<0.002	NA	< 0.002	97%	70%	130%	99%	80%	120%	99%	70%	130%
Total Mercury	6039135		<0.0001	<0.0001	NA	< 0.0001	102%	70%	130%	97%	80%	120%	96%	70%	130%
Total Molybdenum	6039135		<0.002	<0.002	NA	< 0.002	100%	70%	130%	99%	80%	120%	105%	70%	130%
Total Nickel	6039135		<0.003	<0.003	NA	< 0.003	99%	70%	130%	96%	80%	120%	101%	70%	130%
Total Selenium	6039135		<0.002	<0.002	NA	< 0.002	102%	70%	130%	104%	80%	120%	104%	70%	130%

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Quality Assurance

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

AGAT WORK ORDER: 24T179849

PROJECT: 8296 BVD Puslinch

ATTENTION TO: Ali Rasoul

SAMPLING SITE:7504 McLean Rd., Puslinch

SAMPLED BY:E. Fulson

Water Analysis (Continued)

RPT Date: Aug 08, 2024			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Total Silver	6039135		0.0013	0.0014	7.4%	< 0.0001	106%	70%	130%	100%	80%	120%	101%	70%	130%
Total Strontium	6039135		0.177	0.183	3.3%	< 0.005	98%	70%	130%	101%	80%	120%	104%	70%	130%
Total Thallium	6039135		<0.0003	<0.0003	NA	< 0.0003	97%	70%	130%	93%	80%	120%	95%	70%	130%
Total Tin	6039135		<0.002	<0.002	NA	< 0.002	110%	70%	130%	101%	80%	120%	103%	70%	130%
Total Titanium	6039135		<0.010	<0.010	NA	< 0.010	102%	70%	130%	105%	80%	120%	104%	70%	130%
Total Tungsten	6039135		<0.010	<0.010	NA	< 0.010	102%	70%	130%	99%	80%	120%	102%	70%	130%
Total Uranium	6039135		<0.0005	<0.0005	NA	< 0.0005	97%	70%	130%	99%	80%	120%	104%	70%	130%
Total Vanadium	6039135		<0.002	<0.002	NA	< 0.002	105%	70%	130%	105%	80%	120%	108%	70%	130%
Total Zinc	6039135		<0.020	<0.020	NA	< 0.020	100%	70%	130%	97%	80%	120%	95%	70%	130%
Total Zirconium	6039135		<0.004	<0.004	NA	< 0.004	100%	70%	130%	97%	80%	120%	100%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate NA: results are under 5X the RDL and will not be calculated.

Matrix spike NA: Spike level < native concentration. Matrix spike acceptance limits do not apply and are not calculated.

TOC															
Total Organic Carbon	6041185		0.9	0.8	NA	< 0.5	102%	80%	120%	99%	80%	120%	97%	80%	120%

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Certified By:

AGAT Laboratories

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Method Summary

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

AGAT WORK ORDER: 24T179849

PROJECT: 8296 BVD Puslinch

ATTENTION TO: Ali Rasoul

SAMPLING SITE:7504 McLean Rd., Puslinch

SAMPLED BY:E. Fulson

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Total Organic Carbon	INOR-121-6026	SM 5310 B	TOC ANALYZER
Electrical Conductivity	INOR-93-6000	modified from SM 2510 B	PC TITRATE
pH	INOR-93-6000	modified from SM 4500-H+ B	PC TITRATE
Saturation pH (Calculated)		SM 2320 B	CALCULATION
Langelier Index (Calculated)		SM 2330B	CALCULATION
Hardness (as CaCO3) (Calculated)	MET-93-6105	modified from EPA SW-846 6010C & 200.7 & SM 2340 B	CALCULATION
Total Dissolved Solids	INOR-93-6028	modified from EPA 1684,ON MOECC E3139,SM 2540C,D	BALANCE
Alkalinity (as CaCO3)	INOR-93-6000	Modified from SM 2320 B	PC TITRATE
Bicarbonate (as CaCO3)	INOR-93-6000	modified from SM 2320 B	PC TITRATE
Carbonate (as CaCO3)	INOR-93-6000	modified from SM 2320 B	PC TITRATE
Hydroxide (as CaCO3)	INOR-93-6000	modified from SM 2320 B	PC TITRATE
Fluoride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Chloride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Bromide	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Ortho Phosphate as P	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6059	modified from SM 4500-NH3 H	LACHAT FIA
Total Phosphorus	INOR-93-6057	modified from LACHAT 10-115-01-3A	LACHAT FIA
True Colour	INOR-93-6074	modified from SM 2120 B	LACHAT FIA
Turbidity	INOR-93-6000	modified from SM 2130 B	PC TITRATE
Total Calcium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP/MS
Total Magnesium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP/MS
Total Potassium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP/MS
Total Sodium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP/MS
Total Aluminum	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Antimony	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Arsenic	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Barium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Beryllium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Boron	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cadmium	MET -93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Chromium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cobalt	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Copper	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS

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Method Summary

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

AGAT WORK ORDER: 24T179849

PROJECT: 8296 BVD Puslinch

ATTENTION TO: Ali Rasoul

SAMPLING SITE:7504 McLean Rd., Puslinch

SAMPLED BY:E. Fulson

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Total Iron	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Lead	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Manganese	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Mercury	MET-93-6100	modified from EPA 245.2 and SM 3112 B	CVAAS
Total Molybdenum	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Nickel	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Selenium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Silver	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Strontium	INOR-93-6003	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Thallium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Tin	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Titanium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Tungsten	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Uranium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Vanadium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Zinc	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Zirconium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS

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Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only
Work Order #: 24T179849
Cooler Quantity: 1 med
Arrival Temperatures: 15.3 | 15.9 | 15.8
Custody Seal Intact: ☐Yes ☐No ☐N/A
Notes: Loose ice

Report Information:
Company: A & A Environmental Consultants Inc.
Contact: Dr. Ali Rasoul
Address: [redacted]
Phone:
Reports to be sent to:
1. Email: arasoul@aaenvironmental.ca, vsowden@"
2. Email: sscott@"; tdemers@" ; ckennedy@"

Regulatory Requirements: ☐ No Regulatory Requirement
(Please check all applicable boxes)

☐ Regulation 153/04
Table (Indicate One) ☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One) ☑ Coarse ☐ Fine

☐ Sewer Use
☐ Sanitary ☐ Storm
Region (Indicate One)
☐ MISA

☐ Regulation 558
☐ CCME
☑ Prov. Water Quality Objectives (PWQO)
☐ Other
(Indicate One)

Is this submission for a **Record of Site Condition?** ☐ Yes ☑ No

Report Guideline on *Certificate of Analysis* ☑ Yes ☐ No

Turnaround Time (TAT) Required:
Regular TAT ☑ 5 to 7 Business Days
Rush TAT (Rush Surcharges Apply)
☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day
OR Date Required (Rush Surcharges May Apply):
Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*
For 'Same Day' analysis, please contact your AGAT CPM

Project Information:
Project: 8296 BVD Puslinch
Site Location: 7504 McLean Rd., Puslinch
Sampled By: E. Fulsom
AGAT Quote #: 16288129079 PO: 8296
Please note: if quotation number is not provided, client will be billed full price for analysis.

Invoice Information:
Bill To Same: Yes ☑ No ☐
Company:
Contact:
Address:
Email:

Sample Matrix Legend
B Biota
GW Ground Water
O Oil
P Paint
S Soil
SD Sediment
SW Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI (Y/N)	O. Reg 153: Metals and Inorganics (☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (Incl. Hydrides))	ORPs: ☐ B-HWS ☐ Cl⁻ ☐ CN⁻ ☐ Cr⁶⁺ ☑ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☑ M&I ☑ VOCs ☑ ABNs ☑ B(a)P ☑ PCBs	Sewer Use	WQA - 93179	Metals Water 93-196	CCME F1-F4/VOCs Soil 91-248	CCME F1-F4/VOCs Water 91-249	CCME F1-F4/ BTEX Water 91-315	Sieve & texture (75 Micron)
MW3	7/30/24		7	GW		N																☑					

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
[redacted] E. Fulsom	7/30/24	3:45pm	[redacted]	July 30	3:54pm
	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time

Page 1 of 1

Document ID: DIV-78-1511.015

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Date Issued: March 16, 2018

APPENDIX D – MECP Well Records

Water Well Records - Report #8296

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
PUSLINCH TOWNSHIP	17 569850 4812531 W	2017-06 7610						7291402 (Z254573) A	
PUSLINCH TOWNSHIP CON 08 025	17 569956 4812447 W	2012-04 1737						7199708 (Z145690) A	
									2
PUSLINCH TOWNSHIP CON 08 028	17 570809 4812624 W	1988-06 4207	6	FR 0160	51/165/30/1:0	CO		6709384 (20187)	GREY LMSN 0110 LMSN 0165
PUSLINCH TOWNSHIP CON 08 028	17 570797 4812633 W	1986-07 4207	6 6	FR 0130	60/133/7/1:0	CO		6708700 (NA)	BRWN CLAY GRVL STNS 0060 GREY CLAY GRVL STNS 0086 GREY LMSN 0133
									CO 2
PUSLINCH TOWNSHIP CON 08 025	17 569944 4812433 W	1969-11 4208	6	FR 0083	54/60/20/1:0	DO		6703496 ()	BRWN CLAY STNS 0010 GREY CLAY STNS 0079 GREY LMSN 0085
PUSLINCH TOWNSHIP CON 08 027	17 570658 4812485 W	1988-11 2336	6 6	FR 0125 FR 0185	58/80/20/1:	DO		6709478 (37335)	BRWN CLAY STNS 0020 BRWN SAND GRVL 0040 BRWN CLAY GRVL 0070 BRWN ROCK 0120 BRWN ROCK 0135 GREY ROCK 0145 GREY ROCK 0150 BRWN ROCK 0160 GREY ROCK 0186
PUSLINCH TOWNSHIP CON 08 025	17 570123 4812596 W	2013-07 2663	6.25 6.11	UT 0160 UT 0201	47/50/30/1:	DO		7214833 (Z172142) A148670	BRWN CLAY 0045 GRVL SAND 0066 BRWN LMSN 0110 GREY LMSN 0201
PUSLINCH TOWNSHIP CON 08 025	17 570160 4812622 W	2013-08 2663	6.25 6.11	UT 0200	44/46/30/1:	DO		7214832 (Z172165) A148676	BRWN CLAY GRVL 0010 BRWN CLAY BLDR 0025 BRWN GRVL SAND 0065 BRWN LMSN 0135 BRWN LMSN 0200
PUSLINCH TOWNSHIP 08 026	17 570450 4812869 W	2004-12 7154	6.21	FR 0103 FR 0136	26/109/10/2:0	DO		6715246 (Z16971) A006831	BRWN GRVL SAND 0054 GREY CLAY STNS 0079 BRWN LMSN 0119 GREY LMSN 0141

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
PUSLINCH TOWNSHIP 004	17 570566 4812683 W	2006-11 2663	6.25	FR 0244	44/122/18/1:	DO		6716008 (Z41595) A039541	BRWN GRVL CLAY 0030 BRWN CLAY STNS 0067 GREY LMSN 0085 BRWN LMSN 0244
									DO 6
PUSLINCH TOWNSHIP CON 08 027	17 570718 4812446 W	2019-08 7385	6.11 6.11	FR 0180 FR 0255	85/89/15/1:	DO CO		7341679 (Z311062) A268738	BRWN CLAY STNS 0010 GREY CLAY GRVL 0070 GREY CLAY SAND GRVL 0107 BRWN ROCK 0145 BRWN ROCK 0180 GREY ROCK 0255 BLUE SHLE 0260
									DO CO 1
PUSLINCH TOWNSHIP CON 08 027	17 570790 4812414 W	2002-08 2336	6 6	FR 0158 FR 0160	80/94/15/1:0	DO IN		6714198 (237507)	BRWN CLAY STNS 0055 BRWN CLAY GRVL 0085 GREY CLAY GRVL 0108 BRWN ROCK FCRD 0111 BRWN ROCK 0160
									DO IN 1
PUSLINCH TOWNSHIP CON 08 027	17 570834 4812414 W	1989-08 4552	6	FR 0120	90/100/10/1:	IN		6710048 (45396)	CLAY GRVL 0102 YLLW LMSN 0123
PUSLINCH TOWNSHIP CON 08 026	17 570240 4812553 W	1995-10 2336	6 6	FR 0220 FR 0240	43/103/40/1:0	IN		6711872 (163117)	BRWN CLAY STNS 0025 BRWN SAND GRVL 0050 GREY CLAY STNS 0065 BRWN CLAY SAND GRVL 0074 BRWN ROCK 0180 GREY ROCK 0220 BRWN ROCK 0240
PUSLINCH TOWNSHIP 08 028	17 570583 4812680 W	2007-06 2336	6	FR 0140	35/75/10/1:0	IN		7046280 (Z59179) A044206	BRWN CLAY BLDR 0015 BRWN GRVL SAND 0030 GREY CLAY SAND GRVL 0066 BRWN ROCK 0140
									IN 3
PUSLINCH TOWNSHIP CON 08 025	17 569890 4812610 W	2008-07 1129	1.97			MO		7122497 (M03703) A077778	BRWN SAND SILT TILL 0025
PUSLINCH TOWNSHIP CON 08 025	17 570082 4813059 W	2013-12 7366	1.5			MO	0003 10	7214719 (Z178896) A159684	BLCK LOAM 0001 BRWN SAND GRVL 0008 BRWN SILT 0013
PUSLINCH TOWNSHIP CON 08 025	17 570126 4813068 W	2013-12 7366	1.5			MO	0003 10	7214720 (Z178898) A159682	BLCK LOAM 0001 BRWN SAND GRVL 0008 BRWN SILT 0013

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
PUSLINCH TOWNSHIP CON 08 025	17 570071 4813023 W	2013-12 7366	1.5			MO	0003 10	7214721 (Z178894) A159685	BLCK LOAM 0001 BRWN SAND GRVL 0008 BRWN SILT 0013
PUSLINCH TOWNSHIP CON 08 025	17 570126 4813068 W	2013-12 7366	0.99			MO	0009 10	7214722 (Z178895) A159683	BLCK LOAM 0001 BRWN SAND GRVL 0008 BRWN SILT 0015 BLCK SAND 0019
PUSLINCH TOWNSHIP CON 07 025	17 569861 4812403 W	2021-06 7675	2	UT 0021	///:	MO	0030 5	7394717 (MIIOHQ93) A323497	BRWN SAND GRVL DNSE 0021 GREY SAND GRVL DNSE 0035
PUSLINCH TOWNSHIP CON 08 026	17 570282 4812616 W	2022-02 7747	2 6	UT 0042	42///:	MO	0040 10	7412599 (VNOA2FCJ) A321539	BLCK DNSE 0000 BRWN SILT TILL DNSE 0022 BRWN SAND STNS DNSE 0050
PUSLINCH TOWNSHIP CON 08 026	17 570246 4812408 W	2022-02 7747	2 6	UT 0050	50///:	MO	0045 10	7412600 (53Z2NP8H) A329963	BLCK DNSE 0000 BRWN SAND GRVL DNSE 0002 BRWN CLAY TILL DNSE 0027 BRWN SAND GRVL DNSE 0055
PUSLINCH TOWNSHIP CON 08 026	17 570380 4812541 W	2022-02 7747	2 6		///:	MO	0045 10	7412601 (TIF9KD2F) A329964	BRWN SAND FILL DNSE 0005 BRWN CLAY TILL DNSE 0025 GREY SAND STNS DNSE 0055
									MO 9
PUSLINCH TOWNSHIP CON 08 025	17 569892 4812501 W	2013-04 4011	4.71 39.3			OT		7201847 (Z159895) A	BLUE 0008 0061 0072
									OT 1
PUSLINCH TOWNSHIP CON 07 025	17 569874 4812423 W	1981-03 4208	6 5	FR 0090	15/90/8/1:0	ST DO		6707585 ()	BRWN CLAY SNDY 0008 GREY GRVL 0030 GREY CLAY SNDY 0045 GREY GRVL 0046 GREY LMSN 0095
									ST DO 1
PUSLINCH TOWNSHIP	17 570072 4812572 W	2011-01 7215				TH	0014 15	7159585 (Z127139) A111976	BRWN SAND STNS LOOS 0010 BRWN SILT SAND STNS 0029
									TH 1

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION

Notes:
UTM: UTM in Zone, Easting, Northing and Datum is NAD83; L: UTM estimated from Centroid of Lot; W: UTM not from Lot Centroid
DATE CNTR: Date Work Completedand Well Contractor Licence Number
CASING DIA: .Casing diameter in inches
WATER: Unit of Depth in Fee. See Table 4 for Meaning of Code

PUMP TEST: Static Water Level in Feet / Water Level After Pumping in Feet / Pump Test Rate in GPM / Pump Test Duration in Hour : Minutes
WELL USE: See Table 3 for Meaning of Code
SCREEN: Screen Depth and Length in feet
WELL: WEL (AUDIT #) Well Tag . A: Abandonment; P: Partial Data Entry Only
FORMATION: See Table 1 and 2 for Meaning of Code

Total Wells: 27

1. Core Material and Descriptive terms

Code	Description	Code	Description	Code	Description	Code	Description	Code	Description
BLDR	BOULDERS	FCRD	FRACTURED	IRFM	IRON FORMATION	PORS	POROUS	SOFT	SOFT
BSLT	BASALT	FGRD	FINE-GRAINED	LIMY	LIMY	PRDG	PREVIOUSLY DUG	SPST	SOAPSTONE
CGRD	COARSE-GRAINED	FGVL	FINE GRAVEL	LMSN	LIMESTONE	PRDR	PREV. DRILLED	STKY	STICKY
CGVL	COARSE GRAVEL	FILL	FILL	LOAM	TOPSOIL	QRTZ	QUARTZITE	STNS	STONES
CHRT	CHERT	FLDS	FELDSPAR	LOOS	LOOSE	QSND	QUICKSAND	STNY	STONEY
CLAY	CLAY	FLNT	FLINT	LTCL	LIGHT-COLOURED	QTZ	QUARTZ	THIK	THICK
CLN	CLEAN	FOSS	FOSILIFEROUS	LYRD	LAYERED	ROCK	ROCK	THIN	THIN
CLYY	CLAYEY	FSND	FINE SAND	MARL	MARL	SAND	SAND	TILL	TILL
CMTD	CEMENTED	GNIS	GNEISS	MGRD	MEDIUM-GRAINED	SHLE	SHALE	UNKN	UNKNOWN TYPE
CONG	CONGLOMERATE	GRNT	GRANITE	MGVL	MEDIUM GRAVEL	SHLY	SHALY	VERY	VERY
CRYS	CRYSTALLINE	GRSN	GREENSTONE	MRBL	MARBLE	SHRP	SHARP	WBRG	WATER-BEARING
CSND	COARSE SAND	GRVL	GRAVEL	MSND	MEDIUM SAND	SHST	SCHIST	WDFR	WOOD FRAGMENTS
DKCL	DARK-COLOURED	GRWK	GREYWACKE	MUCK	MUCK	SILT	SILT	WTHD	WEATHERED
DLMT	DOLOMITE	GVLY	GRAVELLY	OBDN	OVERBURDEN	SLTE	SLATE		
DNSE	DENSE	GYPS	GYPSUM	PCKD	PACKED	SLTY	SILTY		
DRTY	DIRTY	HARD	HARD	PEAT	PEAT	SNDS	SANDSTONE		
DRY	DRY	HPAN	HARDPAN	PGVL	PEA GRAVEL	SNDY	SANDYOAPSTONE		

2. Core Color

Code	Description
WHIT	WHITE
GREY	GREY
BLUE	BLUE
GREN	GREEN
YLLW	YELLOW
BRWN	BROWN
RED	RED
BLCK	BLACK
BLGY	BLUE-GREY

3. Well Use

Code	Description	Code	Description
DO	Domestic	OT	Other
ST	Livestock	TH	Test Hole
IR	Irrigation	DE	Dewatering
IN	Industrial	MO	Monitoring
CO	Commercial	MT	Monitoring TestHole
MN	Municipal		
PS	Public		
AC	Cooling And A/C		
NU	Not Used		

4. Water Detail

Code	Description	Code	Description
FR	Fresh	GS	Gas
SA	Salty	IR	Iron
SU	Sulphur		
MN	Mineral		
UK	Unknown		

APPENDIX E – Water Balance Calculation

	Area (m^2)	Infiltration Factors				Precipitation Data		Calculated	
		Topography	Soil	Cover	Accumulative Infiltration Factors	P (mm/y) (m^3/y)	E (mm/y) (m^3/y)	I (mm/y) (m^3/y)	R (mm/y) (m^3/y)
Pre-development									
Impervious Area	0					916	183	0	733
						0.0	0.0	0.0	0.0
Pervious Area	27,923	0.20 (Moderately Flat)	0.2 (gravelly silty sand)	0.10	0.50	916	553	181.5	181.5
						25577.5	15441.4	5068.0	5068.0

Inputs	m^3/year	Outputs	m^3/year
Total Precipitation	25577.5	Total Evapotranspiration	15441.4
		Total Infiltration	5068.0
		Total Runoff	5068.0
Total	25577.5	Total	25577.5
Difference (Inputs-Outputs)		0	

	Area (m^2)	Infiltration Factors				Precipitation Data		Calculated	
		Topography	Soil	Cover	Accumulative Infiltration Factors	P (mm/y) (m^3/y)	E (mm/y) (m^3/y)	I (mm/y) (m^3/y)	R (mm/y) (m^3/y)
Post Development									
Impervious Area	20,980					916	183	0	733
						19217.7	3843.5	0.0	15374.1
Pervious Area	6,943	0.2 (Moderately Flat)	0.2 (gravelly silty sand)	0.10	0.5	916	553	181.5	181.5
						6359.8	3839.5	1260.2	1260.2

Inputs	m^3/year	Outputs	m^3/year
Total Precipitation	25577.5	Total Evapotranspiration	7683.0
		Total Infiltration	1260.2
		Total Runoff	16634.3
Total	25577.5	Total	25577.5
Difference (Inputs-Outputs)		0	

Developmental Impacts	Infiltration	Runoff
Sub-Total Post-Development (m^3/year)	1260.2	16634.3
Impacts from Pre to Post Development (m^3/year)	-3807.9	11566.3

APPENDIX F – Geotechnical Testing Report Data

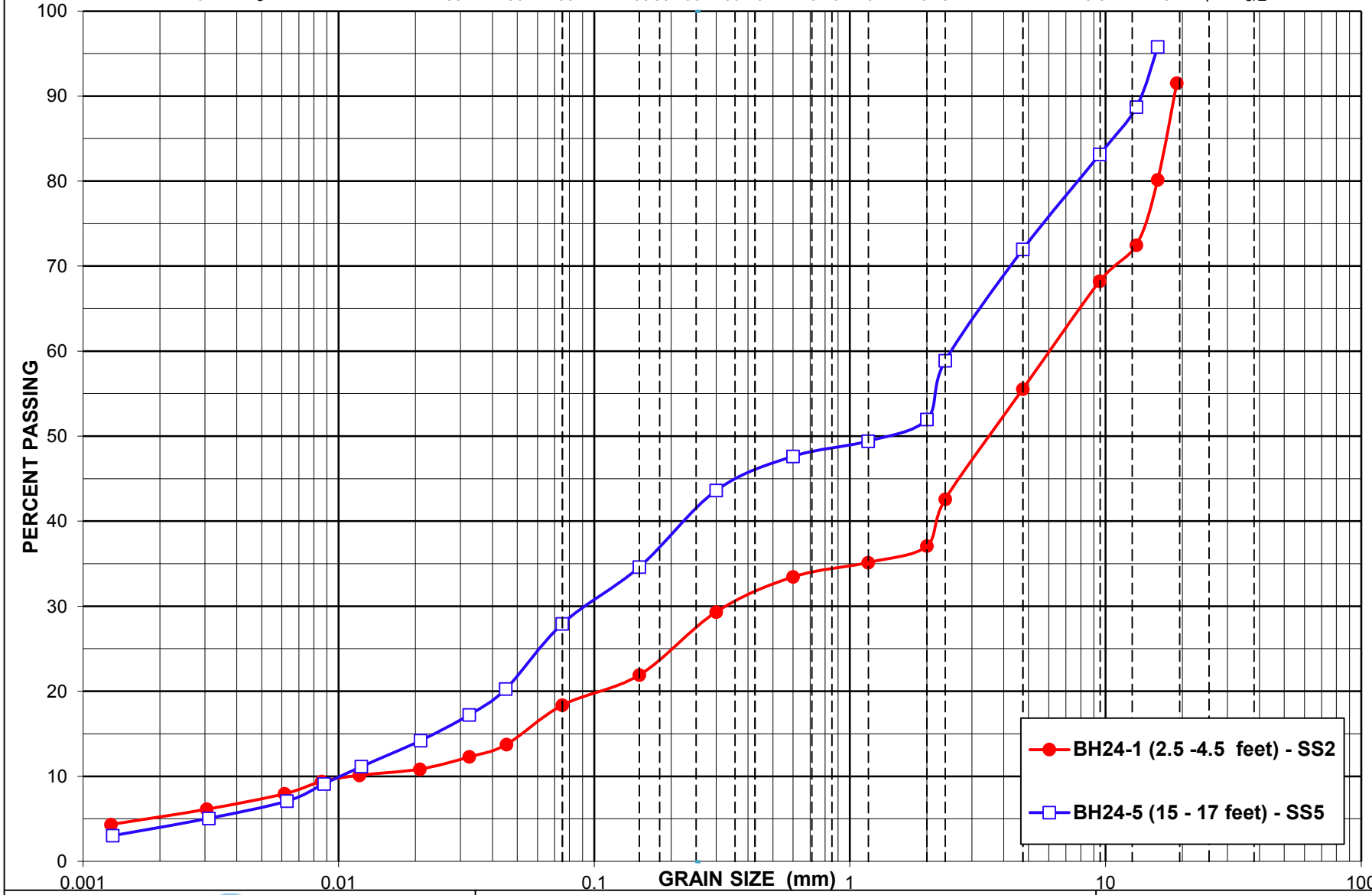
LS 702/D 422

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse

GRAIN SIZE IN MICROMETERS: 1 3 5 1 30 50 200

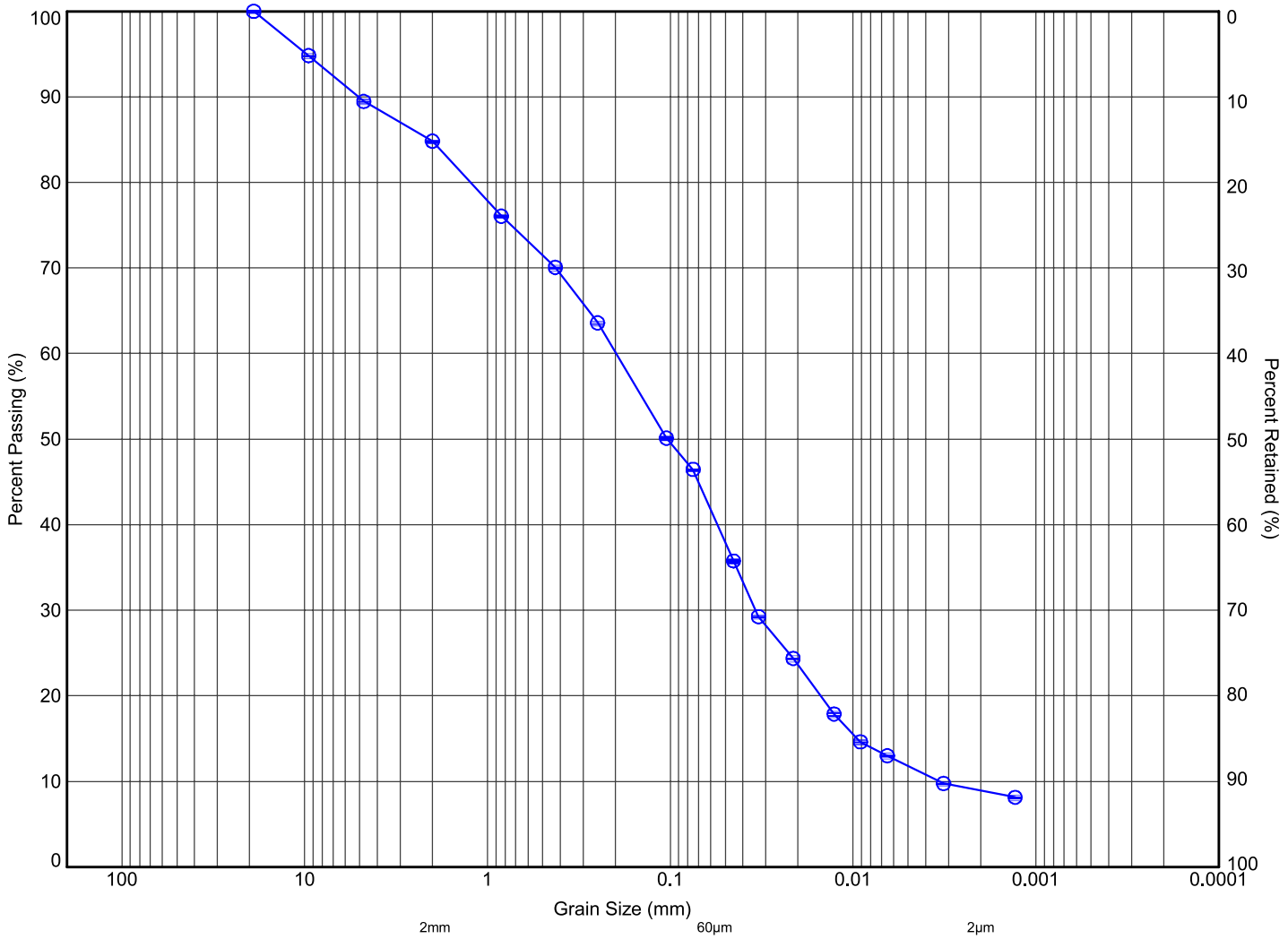
SIEVE DESIGNATION NOMBER (Imperial): 100 80 60 50 40 25 20 16 10 8 4 3/8" 1/2" 3/4" 1" 3/2"



GEOTRUST ENGINEERING LIMITED

GRAIN SIZE DISTRIBUTION

Drawing No.: 1	1
PROJECT No. :	GT23001TA
DATE :	July 1, 2024



MIT SYSTEM	COBBLES	GRAVEL			SAND			SILT	CLAY
		COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE		

MIT SYSTEM

	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
⊖	**1**	SS5	3.3	319.9	15	43	33	9	

Terraprobe
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title:

GRAIN SIZE DISTRIBUTION
SILTY SAND, SOME GRAVEL, TRACE CLAY

File No.: **1-20-0525-01**

APPENDIX G – Due Diligence Risk Assessment Executive Summary

HSGROUP

DUE DILIGENCE RISK ASSESSMENT REPORT

human health, ecological risk assessment, and toxicology

Prepared By:

Hugh Scobie, MSc., DABT, C.Chem, QP_{RA}

PROJECT TITLE:	Due Diligence Risk Assessment – 7504 McLean Road, Puslinch, Ontario
PREPARED FOR:	BVD Real Estate Inc.130 Delta Park Boulevard, Brampton, ON, L6T 5E7
DATE:	Revised December 12, 2025

EXECUTIVE SUMMARY

Hugh Scobie o/a HS Group (HS Group) in association with BVD Real Estate Inc. ('the client') has prepared this due diligence risk assessment (DDRA) for the purpose of evaluating potential risks to human receptors for the property located at 7504 McLean Road, Puslinch, Ontario (the 'Site'). The RA is being conducted as part of due diligence and while the format generally follows that of a risk assessment conducted under Ontario Regulation 153/04 (O. Reg. 153/04) (as amended) that would be used to support a Record of Site Condition (RSC) the DDRA will not be submitted to the Ontario Ministry of the Environment, nor be used to support the filing of an RSC.

The subject site is a rectangular shaped lot located in the northwest area of Puslinch, Ontario at 7504 McLean Road. The site is bound by vacant land located northeast and northwest and industrial buildings to the southwest and southeast of the site. The site is currently vacant land. The subject site area is located within the Mill Creek-Grand River watershed which contains Mill Creek and the Grand River. The site is zoned as being "Industrial" as quoted from the Township of Puslinch Comprehensive Zoning By-law No. 023-18 as amended and is located on the northwest side of McLean Road. Sub-surface intrusive investigations have been conducted at the Site by A&A Environmental Consultants Inc.. The investigations noted impacts of soil. The impacts in soil were identified Electrical Conductivity (EC), Sodium Adsorption Ratio (SAR), zinc, lead and PHC F4. No impacts were identified in groundwater with the recent groundwater sampling.

The Table 1 Site Condition Standards have been used for the identification of impacts in soil and groundwater, as the Township of Puslinch requires its use as part of a bylaw issue. In the discussions presented below, soil and ground water are considered to be impacted or contaminated if they exceed the Table 1 Site Condition Standards. As previously noted, on this basis, EC, SAR, zinc, lead and PHC F4 were found to exceed their applicable MECP Table 1 Site Condition Standards (SCS) in soil. In the case of groundwater, copper was found to exceed its applicable MECP Table 1 Site Condition Standards (SCS). As a result, the above compounds in soil and groundwater were evaluated further in the DDRA.

As discussed, the Site is used for industrial/commercial use and is currently vacant. The Site is to be used for truck parking in the future, along with the construction of an on-site building. Therefore, the primary human receptors are workers at the Site. In the case of soil, there is the potential for direct contact with soil and the inhalation of dust. There is the potential for direct contact with groundwater as it may be used as a potable source. In the case of ecological receptors, the primary receptors are terrestrial plants, soil invertebrates, birds and mammals. In the case of soil, there is the potential for root uptake, direct contact, inhalation of dust, ingestion of food items and prey. In the case of groundwater given the minimum depth to groundwater (3.77 mbgs), there is no potential exposure for ecological receptors.

For the Human Health Risk Assessment (HHRA), further screening of the exceedances in soil was completed with a comparison to the applicable MECP Table 2 (industrial/commercial, coarse soil, potable groundwater) human health component values, as the Table 1 SCS were only applicable for the identification of impacts at the Site given the requirement of the Township of Puslinch. For soil, the values for direct contact were used for comparison. In the case of soil, no exceedances were noted. In the case of lead, no human health component values are currently available. The MEPC has released updated TRVs for lead and these will be used to determine potential risks to risks at the Site due to exposure to soil. In the case of groundwater, no exceedances of the

human health component value associated with the ingestion of potable groundwater were noted. As such. No further evaluation of groundwater was required in the HHRA.

For the Ecological Risk Assessment (ERA), further screening of the exceedances in soil was completed with a comparison to the applicable MECP Table 2 (industrial/commercial, coarse soil, potable groundwater) ecological component values. In the case of soil, lead exceeded for birds and mammals, while zinc exceeded for both terrestrial plants/soil invertebrates and birds and mammals requiring further assessment in the ERA. In the case of groundwater, no exceedances were noted, as such groundwater in association with ecological receptors will not be evaluated further in the ERA.

The HHRA concluded that no unacceptable risks were present in association with soil. As a result, there are no unacceptable risks to users of the site.

The ERA concluded that in the absence of risk management measures, the calculated Screening Indices for terrestrial plants and soil invertebrates were greater than one for zinc in soil. It may be inferred from this result that growth and reproduction of sensitive plants and soil invertebrates may be inhibited in areas of the Site with concentrations of zinc exceeding their associated TRVs. In the case of mammals and birds exposed to soil at the soil, in the absence of risk management measures, the calculated Screening Indices were greater than one for lead and zinc in association with the American woodcock. It may be inferred from this result that there is the potential for unacceptable risks to birds at the Site. As a result, there is the requirement to cap the impacted soil with gravel, asphalt, building footprint or 0.5 m of soil meeting the Table 1 SCS is required to mitigate potential risks to ecological health. With this risk management measure in place no unacceptable risks are present due to soil at the Site.

With the recommended risk management measures in place, no unacceptable risks exist at the Site and the Site is suitable for continued commercial/industrial use without any remediation.

On this basis, the following property specific standards were developed based on the presence of risk management at the site for impacts in soil.

Table 4-6: Calculated Property Specific Standards for Soil

Parameter	Units	Maximum Soil Concentration	Calculated Property Specific Standard	Basis of Property Specific Standard
Lead	µg/g	130	**156**	Maximum concentration x 1.2
Zinc	µg/g	678	**814**	Maximum concentration x 1.2