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Attention: Andrew Miller, P.Eng., PMP, Project Engineer, Design & Construction, Infrastructure, Development & Enterprise Services, City of Guelph

SUBJECT: ENVIRONMENTAL SOIL CHARACTERIZATION – DOWNTOWN CAPITAL IMPLEMENTATION PLAN, CITY OF GUELPH, ONTARIO

EnVision Consultants Ltd. (EnVision) was retained by City of Guelph (the 'Client') to conduct environmental soil characterization to support of the Downtown Revitalization Plan Capital Implementation Plan project, consisting of approximately 6.9 km of roadways at various locations in the City of Guelph (the 'Project Area'). The location and orientation of the Project Area is depicted on **Figure 1**, attached.

It is our understanding that this investigation was requested to characterize soils proposed for excavation during future construction activities associated with the realignment of the various roads within the Project Area; however, project details such as excess soil volumes and the locations and dimensions of future excavations are not known at this time. As such, these works were completed for due-diligence purposes to gain a preliminary understanding of soil quality within the Project Area.

FIELD METHODOLOGY

Between April 5 and April 23, 2022, thirty-one (31) boreholes (BH22-1 through BH22-31) were advanced within the Project Area to depths ranging between 2.1 and 5.2 metres below ground surface (mbgs) utilizing a track-mounted CME 75 drill rig. EnVision returned to the Project Area on August 16 and 17, 2023 to advance five (5) additional boreholes (BH23-1 through BH23-5) to depths ranging from 2.3 to 4.3 mbgs.

From depths between surface and 5.2 mbgs, split spoon samples were collected for geotechnical and environmental purposes, and between depths ranging from 2.3 mbgs and the maximum depth of investigation, rock coring was conducted for geotechnical investigation purposes in boreholes (BH21-



12, BH21-21, BH21-30, BH23-1, BH23-4, and BH23-5), the findings of which are reported under a separate cover. To support the geotechnical investigation and determine the depth to groundwater within the Project Area, 12 groundwater monitoring wells were installed at select borehole locations (BH22-2, BH22-4, BH22-9, BH22-14, BH22-15, BH22-17, BH22-19, BH21-21, BH22-24, BH23-1, BH23-3, and BH23-4).

The advanced borehole and monitoring well locations are presented in **Figure 1**, attached.

Soil samples were field screened for Combustible Gas Detection (CGD) and Photoionization Detection (PID) levels using an RKI Eagle 2 Multi-Gas Detector. In addition to visual and olfactory observations, the results of field screening were used to determine worst-case samples in order to select soils to submit to the laboratory for analysis of volatile parameters.

The boreholes were advanced through an approximately 75 to 200 mm layer of asphalt, underlain by approximately 100 to 610 mm of granular sub-base material, with the exception of BH22-4 and BH22-16, which were advanced through a layer of granular fill extending from surface to 0.8 mbgs. Below the surface materials, the general stratigraphy at the sampled locations consisted of fill materials comprised of varying compositions of sand, gravel, silt, and clay extending to depths ranging from 0.6 to 3.8 mbgs, with the exception of BH22-9. Native silty sand, sandy silt, silty sand till, clayey silt, or sandy gravel layers were observed between 0.6 to 4.4 mbgs. Weathered bedrock was observed at BH22-12, BH22-21, BH22-30, BH23-1, BH23-4, and BH23-5 between 2.3 to 3.9 mbgs. Groundwater depths ranged from 2.9 to 3.7 in BH22-4, BH22-17, and BH22-21 measured in April 2022 and 1.7 to 3.3 mbgs in BH23-1, BH23-4, and BH23-5 measured in August 2023. Remaining monitoring wells were dry at the time of the assessments. Groundwater quality was not investigated as part of this assessment. Finalized field logs are presented in **Appendix A**.

Soil samples were collected and handled in general accordance with the Ministry of Environment, Conservation and Parks (MECP) Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario. In accordance with MECP sampling protocols, new disposable gloves were used during each sampling event to transfer the samples into laboratory supplied 250 mL and 120 mL clear glass jars and 40 mL methanol-preserved vials at the time of sampling. The glass sample jars/vials were kept in a cooler with ice during field storage and transportation, and the samples were kept out of direct sunlight during field storage.

EnVision collected environmental soil samples from the boreholes for submission of laboratory analysis of contaminants of potential environmental concern (COPC), as outlined in **Table 1**, attached.

SOIL QUALITY STANDARDS

The results of the bulk laboratory analyses were compared to the following standards outlined in the MECP publication *Rules for Soil Management and Excess Soil Quality Standards (December 8, 2020)*:

Table 1 Full Depth Background Site Condition Standards (SCS) for All Property Uses other than agricultural;



Table 2.1 Full Depth Excess Soil Quality Standards (ESQS) in a Potable Ground Water Condition for Residential, Parkland, and/or Institutional Use (RPI); and,

Table 3.1 Full Depth ESQS in a Non-Potable Ground Water Condition for Industrial/Commercial/Community (ICC).

These standards were utilized to give a general understanding of the quality of soils within the Project Area to assist with assessing options for potential reuse and/or disposal.

LABORATORY ANALYSIS

The chemical analyses were conducted by Bureau Veritas (BV) located in Mississauga, Ontario. BV is accredited in accordance with the International Standard ISO/IEC 17025 and with Standards developed by the Standards Council of Canada, meeting the requirements of Section 47 of O. Reg. 153/04.

The Certificates of Analysis are included as **Appendix B**.

SUMMARY OF ANALYTICAL RESULTS

The soil analytical results are presented in **Table 2** through **Table 4** and are summarized on **Figure 2A** through **Figure 2E**. The soil analytical results indicated the samples met the MECP Table 1 SCS, Table 2.1 RPI ESQS, and/or Table 3.1 ICC ESQS for the parameters analyzed, with the exception of the following parameter exceedances of the indicated standards:

Table 1 Summary of Chemical Exceedances in Soil

SAMPLE ID	DEPTH (MBGS)	PARAMETER	UNITS	Table 1 SCS	Table 2.1 RPI ESQS	Table 3.1 ICC ESQS	ANALYTICAL RESULT
BH22-1 SS2	0.8 -1.4	PHC F4	µg/g	120	2800	3300	291
BH22-5 SS2	0.8 -1.4	PHC F4	µg/g	120	2800	3300	179
BH22-6 SS3	1.5 - 2.1	PHC F4	µg/g	120	2800	3300	249
BH22-7 SS2	0.8 - 1.4	PHC F4	µg/g	120	2800	3300	298
BH22-11 SS2	0.8 - 1.4	Mercury	µg/g	0.27	0.27	0.27	<u>0.483</u>



SAMPLE ID	DEPTH (MBGS)	PARAMETER	UNITS	Table 1 SCS	Table 2.1 RPI ESQS	Table 3.1 ICC ESQS	ANALYTICAL RESULT
BH22-12 SS2	0.8 - 1.4	Cr (VI)	µg/g	0.66	8	8	2.92
		PHC F4	µg/g	120	2800	3300	201
BH22-17 SS2	0.8 - 1.4	PHC F4	µg/g	120	2800	3300	168
BH22-18 SS2	0.8 - 1.4	PHC F4	µg/g	120	2800	3300	175
BH22-21 SS2	0.8 - 1.4	Cr (VI)	µg/g	0.66	8	8	0.87
BH22-22 SS2	0.8 - 1.4	Xylene	µg/g	0.05	0.091	3	<u>0.43</u>
BH22-23 SS1	0.0 0.6	Zinc	µg/g	290	340	340	319
BH22-24 SS3	1.5 - 2.1	PHC F4	µg/g	120	2800	3300	166
BH22-29 SS1	0.0 0.6	PHC F4	µg/g	120	2800	3300	135
BH22-31 SS2	0.8 - 1.4	PHC F4	µg/g	120	2800	3300	143
BH23-1 SS2	0.8 - 1.4	Lead	µg/g	120	120	120	<u>800</u>
		Molybdenum	µg/g	2	6.9	40	<u>2.1</u>
		PHC F4	µg/g	120	2800	3300	280
S23-1 (DUP OF BH23-2 SS2)	0.8 - 1.4	PHC F2	µg/g	10	10	26	<u>22</u>
		PHC F3	µg/g	240	240	1700	<u>1200</u>
		PHC F4	µg/g	120	2800	2800	1800
		Benzo(a)pyrene	µg/g	0.3	0.31	0.7	<u>0.4</u>



SAMPLE ID	DEPTH (MBGS)	PARAMETER	UNITS	Table 1 SCS	Table 2.1 RPI ESQS	Table 3.1 ICC ESQS	ANALYTICAL RESULT
BH23-3 SS2	0.8 – 1.4	Benzo(b)fluoranthene	µg/g	0.47	3.2	7	0.54
		Fluoranthene	µg/g	0.56	0.69	70	0.63
		Indeno(1,2,3-cd)pyrene	µg/g	0.23	0.38	0.76	0.33
BH23-4 SS2	0.8 – 1.4	PHC F4	µg/g	120	2800	2800	240

Notes:

0.5 Exceeds Table 1 SCS

0.5 Exceeds Table 2.1 RPI ESQS

0.5 Exceeds Table 3.1 ICC ESQS

* Registered detection limit (RDL) exceeded the SCS/ESQS, and as such was treated as an exceedance.

The above table excludes reference to Electrical Conductivity (EC) and Sodium Adsorption Ratio (SAR). With the exception of BH22-3 located on Northumberland Street on the southeastern portion of the Project Area, concentrations of EC and/or SAR exceeding the Table 1 SCS, and Table 2.1 RPI and/or Table 3.1 ICC ESQS were identified in the samples analyzed across the Project Area. These impacts are anticipated to be resulting from the seasonal application of de-icing compounds to roadways and adjacent walkways for pedestrian and vehicular safety.

Further, pH values outside the acceptable range (5.0 – 9.0) were identified within soil samples analyzed from BH22-1, BH22-3, BH22-7, BH22-12, BH22-16, and BH22-27 at depths ranging from 0.8 – 1.5 mbgs, as discussed in further detail below.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the chemical analysis, EnVision provides the following conclusions and recommendations:

Sampled soils within the Project Area were found to meet the Table 3.1 ICC ESQS for the parameters analyzed, with the exception of concentrations of mercury identified in BH22-11 on Cardigan Street on the northern portion of the Project Area and concentrations of lead identified in BH23-1 on Wellington Street on the southern portion of the Project Area. The vertical and lateral extent of these impacts is not known. Due to the level of contamination identified, soils represented by this testing will likely require disposal as waste at a licensed



landfill or dump, or alternately may be treated and/or processed prior to reuse. The balance of soils may be considered suitable for reuse at sites accepting Table 3.1 ICC ESQS.

Sampled soils within the Project Area were also found to meet the Table 2.1 RPI ESQS for the parameters analyzed, with the exception of the soils described above, as well as soils from BH22-2 located on Woolwich Street on the eastern portion of the Project Area which exceeded for xylenes and soils from BH23-2 and BH23-3 on Wellington Street East on the southeastern portion of the Project Area, which exceeded for PHCs and PAHs, respectively. The vertical and lateral extent of these impacts are not known. The balance of soils may be suitable for placement at sites accepting Table 2.1 ESQS soils, or greater.

Various exceedances of the Table 1 SCS were identified across the Project Area. In addition to the soils identified above, impacted soils were identified in BH22-5, BH22-6, BH22-7, BH22-18, BH22-23, and BH22-24 located on Norfolk Street, Woolwich Street, Norwich Street East, and Suffolk Street West on the northwestern portion of the Project Area, BH22-12, BH22-17, BH22-21, and BH22-31 located on Eramosa Road, Macdonell Street, Woolwich Street, and Douglas Street on the northeastern/eastern portion of the Project Area, BH22-1 and BH22-29 located on Dublin Street North and Cork Street East on the southwestern portion of the Project Area, and BH23-4 located on Wyndham Street North on the southeastern portion of the Project Area. The vertical and lateral extents of these impacts are not known. The balance of sampled locations met the applicable Table 1 SCS for the parameters analyzed and may be considered suitable for reuse at sites accepting Table 1 soils or greater.

The above excludes reference to elevated concentrations of salt related parameters (i.e., EC and/or SAR) which were identified at sampled locations across the Project Area, with the exception of BH22-3 located on Northumberland Street on the southeastern portion of the Site. Subject to specific landfill/reuse site requirements, EC/SAR impacted soils are considered acceptable for final placement at one of the following locations:

- where it is reasonable to expect that the soil will be affected by the same chemicals as a result of continued application of de-icing salts for the safety of vehicular or pedestrian traffic;
- at an industrial or commercial property use to which non-potable standards would be applicable; or
- at least 1.5 mbgs.

The following exceptions to the above apply, and salt impacted soils should not be placed:

within 30 metres of a waterbody;

within 100 metres of a potable water well or area with an intended property use that may require a potable water well; or,

a location that will be used for growing crops or pasturing livestock, unless the excess soil is placed 1.5 mbgs (or greater).



Further, the above excludes reference to elevated concentrations of pH which were identified in soil samples collected from BH22-1, BH22-3, BH22-7, BH22-12, BH22-16, and BH22-27. If excess soil proposed for reuse has a pH value outside the acceptable range (from 5.0 to 9.0 for surface soil and from 5.0 to 11.0 for subsurface soil), the excess soil must meet the Table 1 SCS. Or, alternately, before the excess soil is deposited at a reuse site, the owner or operator of the reuse site must ensure that a QP completes an assessment of the potential impacts of the placement of this excess soil and confirms that it will not cause an adverse effect.

The Project Leader must inform the reuse site owner/operator that the excess soil is from a location that may be expected to contain salt and/or elevated pH levels related impacts, and provided relevant sampling results including this memo, and identify and communicate any potential risks to surface water and groundwater to the reuse site owner.

Acceptance of any excavated soil will be at the discretion of the receiving site. It is the responsibility of the receiving site and/or soil movement contractor of this material to ensure that the soil received is represented by this testing, and as such, additional testing may be required to satisfy the receiving sites' QP and/or O. Reg. 406/19.



CLOSURE

The purpose of this testing was to evaluate the concentrations of select parameters in representative soil samples and does not constitute a Phase Two Environmental Site Assessment as defined in O. Reg. 153/04 or a Soil Characterization Report (SCR) as defined by O. Reg 406/19. At the request of the Client, the works undertaken by EnVision were completed solely to determine the chemical composition of the soils at the sampled locations and did not include investigations and reporting in accordance with Ontario Regulation 406/19 (O. Reg 406/19). Additional reporting and/or testing of this material may be required to support disposal and/or potential reuse, at the discretion of the receiving site and/or in accordance with O. Reg. 406/19.

This environmental soil characterization memo was prepared for the account of The City of Guelph. EnVision has completed this assessment in accordance with generally accepted professional practises and procedures applicable at the time of preparation. These services are not subject to any express or implied warranties, and none should be inferred. The material in this memo reflects EnVision's judgement in light of the information available at the time of preparation. Any use, which a Third Party not noted above makes of this report, or nay reliance on decisions to be made based on it, are the responsibility of such Third Parties. EnVision Consultants Limited accepts no responsibility for damages, if any, suffered by a Third Party as a result of decisions made or actions based on this report.

Yours sincerely,

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INCLUSIONS (AVAILABLE UPON REQUEST*)

Tables

Table 1	Summary of Soil Samples Submitted for Chemical Analysis
Table 2	Metals & ORPs in Soil
Table 3	PHCs & BTEX in Soil
Table 4	PAHs in Soil

Figures

Figure 1	Borehole Location Plan
Figure 2A-2E	Summary of Chemical Analysis in Soil

Appendices

Appendix A	Finalized Field Logs
Appendix B	Certificate of Analysis

*PLEASE CONTACT ENGINEERING@GUELPH.CA



TABLES



FIGURES



APPENDIX

A *Finalized Field Logs*



APPENDIX

B *Certificates of Analysis*