Blair Creek Drive Extension

Schedule “B” Class Environmental Assessment Project File Report

Project Location:
Kitchener, Ontario

Prepared for:
City of Kitchener
200 King Street West, Kitchener

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MTE File No.: 53018-100

Engineers, Scientists, Surveyors.

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1.0 INTRODUCTION AND BACKGROUND

1.1 Introduction

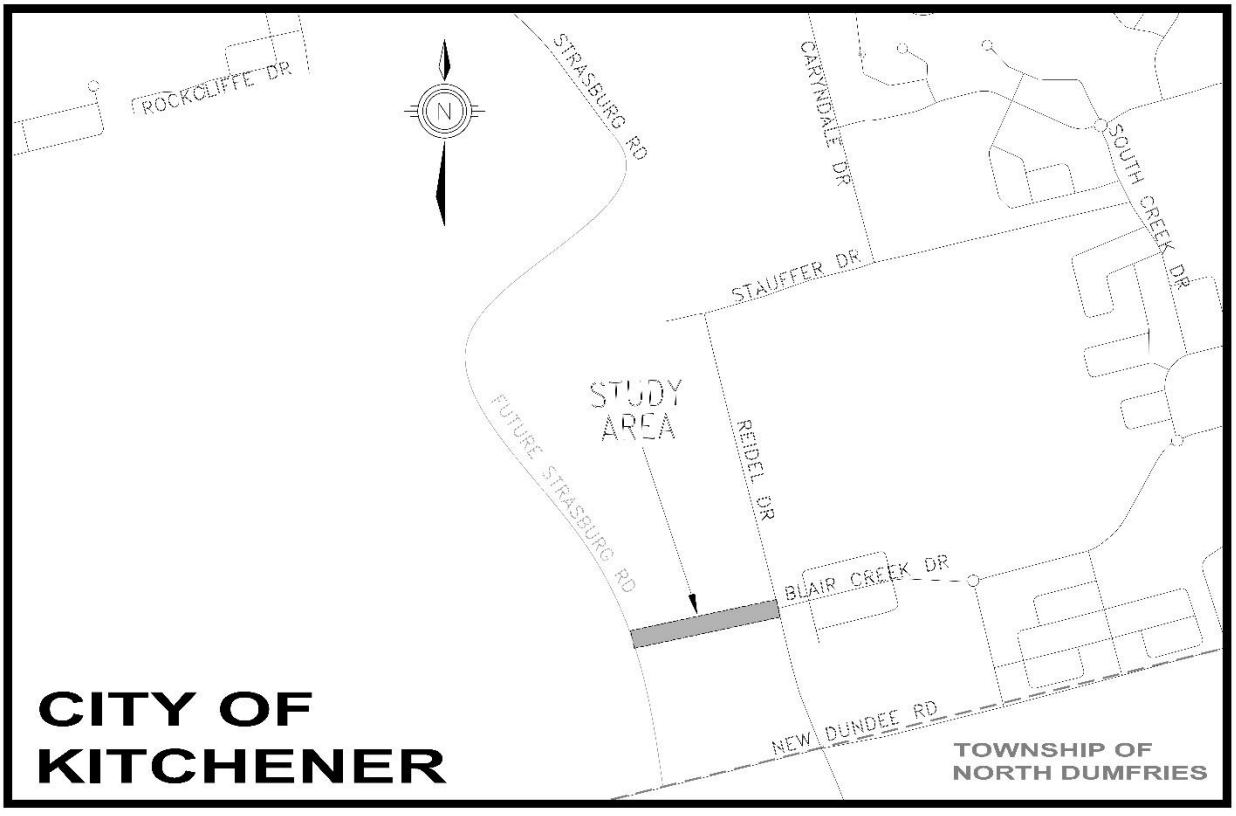
The City of Kitchener has completed a Municipal Class Environmental Assessment (Class EA) Study to evaluate an alignment for the extension of Blair Creek Drive from the future Strasburg Road to the intersection of Reidel Drive and Blair Creek Drive. The study was carried out as a Schedule B project in accordance with the Municipal Class EA document (October 2000, as amended in 2007, 2011, 2015, and 2023).

This Project File Report documents the planning and design process followed to identify the problem and opportunities, identify alternative solutions, conduct consultation, and establish the preferred solution for the alignment of the Blair Creek Drive extension and its associated underground servicing, including storm sewer and watermain.

1.2 Study Area

The Blair Creek Drive Class EA study area is situated between the future Strasburg Road at the west end, and the intersection of the future western limit of Blair Creek Drive and Reidel Drive at the east end, comprising approximately 700m. Blair Creek Drive east of Reidel Drive is not yet constructed, however its alignment through the Stauffer Woods subdivision has been established. The study area is located entirely on a single agricultural property, 271 Reidel Drive in Kitchener, Ontario.

Figure 1.0: Study Area



1.3 Class Environmental Assessment

The Class EA has been planned as a Schedule "B" undertaking in accordance with the *Municipal Class Environmental Assessment Document* published by the Municipal Engineer's Association (October 2000, as amended in 2007, 2011, 2015, and 2023) approved under the Ontario Environmental Assessment Act. For Schedule "B" projects, the proponent shall apprise specific agencies and potentially affected members of the public of the problem/opportunity and alternative solutions with one optional and two mandatory points of contact/consultation, including a Notice of Project Commencement, Public Information Centre and Notice of Project Completion.

This project conforms to the Class EA planning process **(Refer to Figure 2.0)** and is described under **Part B – Municipal Road Projects, New Roads**. The study process consists of two of the five Phases of Planning and Design Process. Phases 1 and 2 will be covered in this document with the Preliminary Design being completed separately.

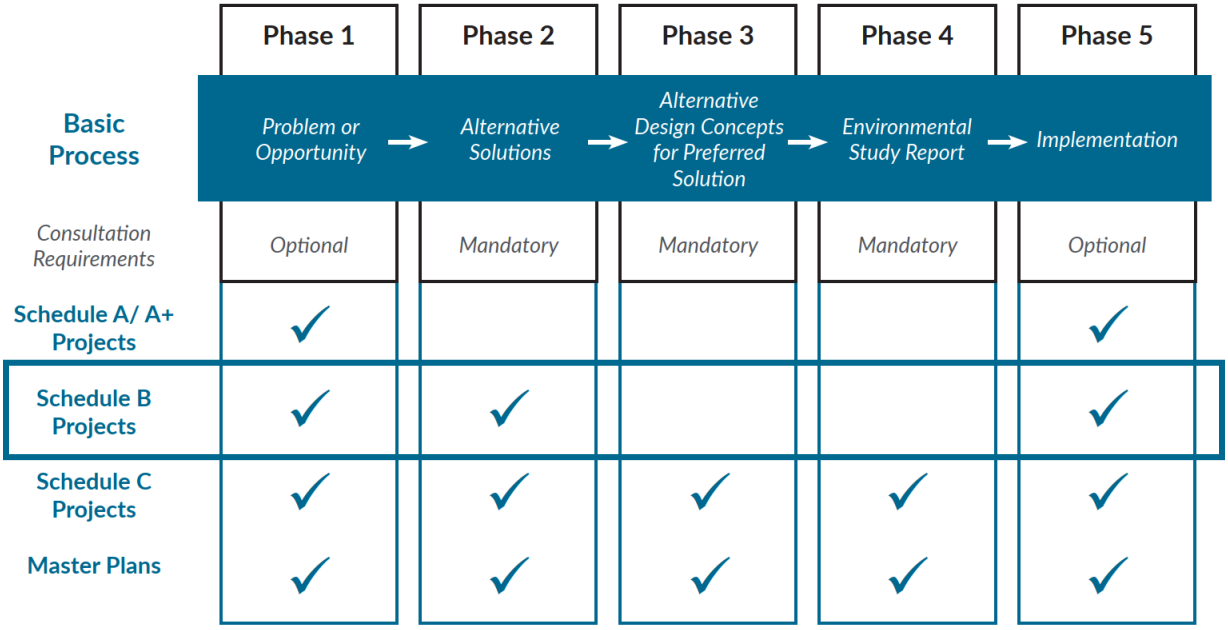


Figure 2.0: Class EA Planning Process (Municipal Engineers Association, 2023)

The purpose of this Project File Report is to summarize all information collected and alternatives developed and evaluated (including the "do nothing" alternative). The primary objective is to identify the "Preferred Solution" for the alignment of the Blair Creek Drive Extension based on an evaluation of environmental impacts (natural, social/cultural, heritage/archaeological), operations, constructability and economic considerations, as well as public, agency and other stakeholder feedback.

Once the Project File Report is completed, it will be made available for a 30-day public review period. A Notice of Study Completion will be circulated to announce the start of the public review period. The MECP will then require an additional 30 days to resolve any questions from the public.

1.4 Study Organization

The study was directed by the City of Kitchener and carried out by MTE. The members of the Project Team are listed below:

Project Team Members

Name	Company
Mr. Niall Melanson, C.E.T.	City of Kitchener – Project Manager
Mr. Vince Pugliese, P.Eng., MBA, PMP	MTE Consultants Inc. – Project Manager
Ms. Lyndsay Dokas, P.Eng.	MTE Consultants Inc. – Project Engineer

Formal Project Team meetings were held throughout the duration of the study to assess pertinent data, to develop alternative concepts and evaluation criteria, to solicit public/agency input, and to prepare for the Public Information Centre.

Several sub-consultants were contracted by MTE Consultants to conduct various studies within the Blair Creek Drive extension study area to provide information on existing conditions and input on the proposed alternatives:

Sub-Consultants

Name of Company	Expertise	Work Provided
Archaeological Research Associates (ARA)	Heritage Consultant	Heritage Impact Assessment
Paradigm Transportation Solutions (PTSL)	Transportation Consultants	Transportation Study
Natural Resource Solutions (NRSI)	Natural Environment Consultants	Natural Environment Report

MTE's Geotechnical and Environmental Divisions provided Geotechnical Investigation and Soil Characterization services.

1.5 Agency Consultation

Full communication and participation by the review agencies (both directly and indirectly involved) in the Study was encouraged from the outset of the project. Each of the review agencies listed below received notification by email prior to the Public Information Centre as well as the Notice of Commencement. These were sent to confirm that a Schedule "B" Class EA was being conducted and requested their comment and input to the Study (refer to **Appendix A** for list of contacts and communications log).

- Ministry of the Environment, Conservation and Parks
- Ministry of Citizenship and Multiculturalism
- Ministry of Natural Resources and Forestry
- Grand River Conservation Authority
- Utilities (Enova Power, Gas/Water/Kitchener Utilities, Bell, Rogers)

- Emergency Services (Police and Fire)
- Grand River Transit
- Student Transportation Services of Waterloo Region and Waterloo Region and Catholic District School Board

Appendix A contains municipal and agency correspondence. Section 5 discusses the input and responses provided by the interested parties and agencies.

1.6 Aboriginal Communities Consultation

The following communities were contacted by email to be notified of the study and invited to comment:

- Mississaugas of the Credit First Nation
- Six Nations of the Grand River
    a. Elected Council, and
    b. Haudenosaunee Confederacy Chiefs Council (HCCC)

1.7 Background and Planning Context

The City of Kitchener's Transportation Master Plan (2013) and Official Plan (2014) includes the extension of Strasburg Road southerly to New Dundee Road, and the extension of Biehn Drive, Robert Ferrie Drive and Blair Creek Drive westerly to Strasburg Road. The planned area road network supports local, Regional and Provincial objectives in growth and transportation for the surrounding communities in the Doon South and Brigadoon areas of Kitchener.

The study area is located within the Dundee North Growth Area as outlined in the Kitchener Growth Management Plan (2019) and is situated on current greenfield lands that are designated by the Official Plan as Urban. Initiatives related to this planned Growth Area that are currently ongoing include the development of the Dundee North Secondary Plan, which will outline detailed land use, and the design and construction of the Strasburg Road Extension.

Coordination meetings between the Blair Creek Drive Project Team and the Strasburg Road and Dundee North Secondary Plan Project Teams took place throughout the EA process to ensure the proper context was being considered.

The City of Kitchener Complete Streets document was referenced to assist with the development of alternative cross-section options for the Blair Creek Drive Extension.

2.0 EXISTING CONDITIONS

Below is a description of the existing conditions within the study area, which provides the context within which solutions for the project were considered. Further detail of the existing conditions is contained in the various studies which were undertaken as part of this Environmental Assessment (see **Appendix C**).

2.1 Transportation

2.1.1 Existing Transportation Network

Blair Creek Drive is an east-west major community collector roadway as outlined in the City Official Plan, with an urban two-lane cross section and a posted speed limit of 40 km/h (30 km/h where School Zones exist). Sidewalks and bike lanes are provided on both sides of the roadway. As of July 2023, Blair Creek Drive terminates at Thomas Slee Drive and will be extended westerly to Reidel Drive in the near future.

Reidel Drive is a north-south local street with a rural two-lane cross section and posted speed limit of 50 km/h. No active transportation facilities are provided.

Strasburg Road is a north-south city arterial street with a four-lane urban cross section and a posted speed limit of 60 km/h. A multi-use trail is provided on both sides of the roadway. Strasburg Road currently terminates at Rockcliffe Drive and will be extended to New Dundee Road in the future.

2.1.2 Traffic and Transportation Assessment

A Transportation Study was conducted by Paradigm Transportation Solutions Limited (Paradigm) to review future traffic operations within the Blair Creek Drive Extension Corridor and provide recommendations on road cross-section, and intersection geometry and traffic control including at the future intersections of Blair Creek Drive and Reidel Drive and at Strasburg Road.

Seven-year total traffic forecasts for the intersections were determined, the methodology of which is described in the Traffic Study report by Paradigm in **Appendix C**. Based on the projected traffic volumes, the intersections were assessed to determine whether traffic signals, roundabouts, left-turn lanes, all-way stops or two-way stops were warranted.

The study concluded that the intersections within the Blair Creek Drive Extension corridor, including at Strasburg Road and at Reidel Drive, are forecast to operate with acceptable levels of service under two-way stop control conditions. A southbound left-turn lane with 25 metres of storage is warranted at the intersection with Strasburg Road

The Paradigm study was completed in December 2023 under the assumption that Strasburg Road would be designed as a two-lane road. Since that time, the City has revised the design for Strasburg Road to a four-lane road. A separate Intersection Control Study was completed by CIMA+ for the intersection as part of the Strasburg Road Design project, where the southbound left turn lane storage length is noted as 84m. The discrepancy in storage lengths should be reconciled during detailed design of Blair Creek Drive. Future development of the surrounding area may warrant a future traffic study to analyze intersection controls. The CIMA+ ICS report is appended to this Project File Report for reference (**Appendix C**).

A roundabout screening analysis completed as part of the Paradigm study showed that the traffic volumes do not warrant a roundabout at either Strasburg Road or Reidel Drive.

2.2 Land Use and Physical Environment

The Blair Creek Drive extension study area is located in southwest Kitchener. The approximately 700m stretch of land between Reidel Drive to the east and the future Strasburg Road to the west is entirely situated on land owned by Activa (271 Reidel Drive) and slated for future development. Figure 3.0 is a Google Earth image depicting the property and surrounding

area in its existing state (as of 2018). 271 Reidel Drive is characterized by rolling topography and currently consists of active agricultural fields and hedgerows, a farmstead, a woodlot, and a wetland, encompassing approximately 80.9 hectares. The property is bordered by the future Strasburg Road to the west, Stauffer Drive to the north, Reidel Drive to the east, and New Dundee Road/the Kitchener City limit to the south. The property also forms part of the Dundee North Secondary Plan area. The proposed Blair Creek Drive extension has been incorporated into the draft plans for the development and will serve as a major collector road, providing access to the development and the surrounding transportation network.

Figure 3.0: Existing Conditions of Site and Surrounding Area

The Stauffer Woods development is currently under construction to the east of the subject property.

2.3 Natural Environment

2.3.1 Natural Heritage and Tree Inventory

A Natural Environment Report (NER) was completed by Natural Resource Solutions Inc. (NRSI) to characterize any natural features and identify significant and sensitive features that have the potential to be impacted by the Blair Creek Drive extension. The study area for the purposes of

the NER was the area within 120m of the slated Blair Creek Drive extension west of Reidel Drive.

A desktop review of existing natural heritage information was completed to scope the project determine the study approach. Field surveys were undertaken in the spring and summer of 2023 to map and classify vegetation communities, inventory trees within the subject property, and confirm habitat for Species at Risk (SAR) and Significant Wildlife Habitat (SWH) for birds and bats.

The review confirmed that there are no significant and sensitive natural features within the Blair Creek Drive Extension study area. The proposed construction is primarily contained within an agricultural field, and all natural heritage features are located 120m or greater in distance away.

Nine trees were inventoried as part of the field work. Four of the trees were identified as candidate SAR bat roost trees. Prior to commencing the field investigations, a wooded area just east of Reidel Drive had been removed, as well as the majority of the trees associated with the farmstead. Some trees along the western boundary (future Strasburg Road corridor) had been tagged by others, prior to NRSI arriving on-site.

Further details are contained in the NER in **Appendix C** including maps of the Study Area and Designated Significant Natural Features and Existing Conditions, and the tree inventory data including species and overall health.

2.3.2 Source Water Protection, Drainage and Stormwater

Source Water Protection

The Grand River Conservation Authority's online mapping tool was consulted to investigate source water protection conditions in the study area and potential for drinking water threats. The study area is located within a Significant Groundwater Recharge Area (SGRA) with a medium level of Intrinsic Vulnerability. No other sensitivities were identified related to groundwater, and none related to surface water.

Drainage and Stormwater

The study area falls within the Grand River Watershed and the Blair Creek Subwatershed and falls under the jurisdiction of the Grand River Conservation Authority. The study area is adjacent to the Roseville Swamp Cedar Creek Wetland Complex Regionally Significant Woodland and Provincially Significant Wetland within the Blair Creek Natural Area. Blair Creek flows through the northeast portion of the property at 271 Reidel Drive but no watercourse is mapped within the study area. Surface runoff is limited as the site is located in an area of highly permeable soils conducive to high rates of infiltration and storage during storm events.

2.3.3 Groundwater, Geotechnical, Environmental/Soils Conditions

A geotechnical investigation was conducted by MTE in May 2023 to determine soil and groundwater conditions through the study area and provide geotechnical engineering recommendations for servicing, excavations and dewatering, low impact development (LID) feasibility, pavement structure design and construction and pavement drainage requirements.

The subsurface soils along the proposed roadway location generally are comprised of topsoil, overlying native granular deposits consisting of sand, silty sand to sandy silt and/or gravelly sand layers, with areas of fill material overlying the native soils. Based on the results of the investigation, construction of the new road and associated services is feasible for the proposed location.

A hydrogeological report was prepared by Stantec in 2022 for the site on behalf of the property owner. MTE reviewed the report and determined that no additional hydrogeological work was necessary to include in the scope of the EA. During the geotechnical investigation, saturated conditions were not encountered within the anticipated construction depths, therefore no monitoring wells were installed.

In conjunction with the geotechnical field work, a preliminary environmental soil quality assessment was undertaken. Representative soil samples were collected from the boreholes for chemical analyses. No visual or olfactory evidence of environmental impact (staining, odour, presence of deleterious debris) was observed during the field activities. However, sample results indicate the presence of concentrations of Benzene, Toluene and Xylenes, which is suspected may have been caused by impacted groundwater flowing near this location at some point in time. The soil is suitable for reuse on site.

MTE's Geotechnical Report (June 2023) and Soil Characterization Report (July 2023) are attached in **Appendix C**.

2.4 Cultural Heritage Environment

2.4.1 Built Cultural Heritage and Cultural Heritage Landscapes

A Heritage Impact Assessment (HIA) for the study area was conducted by Archaeological Research Associates Limited (ARA) based on a site-specific Terms of Reference provided by the City of Kitchener's heritage planners. Two cultural heritage resources were identified within or adjacent to the project location. The primary residence at 271 Reidel Drive is listed as a non-designated property of cultural heritage value or interest on the City of Kitchener Municipal Heritage Register (Built Heritage Resource BHR-1). The study area is located adjacent to the Reidel Drive Cultural Heritage Landscape (CHL-1) which was identified in the Cultural Heritage Landscape Study, approved by Council in 2015.

A site visit was conducted on July 7, 2023, including the exterior and interior of the residential structure. BHR-1 underwent a O. Reg. 9/06 heritage evaluation and met two criteria, indicating that it may be worthy of designation under the Ontario Heritage Act. On the evening of November 12, 2023, the house at 271 Reidel Drive caught fire. It was observed that many of the proposed heritage attributes of the residence were destroyed. The one storey stone construction section with gable peak and some window openings remains.

The complete HIA can be found in **Appendix C**.

2.4.2 Archaeology

Stage 1 and Stage 2 Archaeological Assessments of 271 Reidel Drive have been completed by Stantec on behalf of the developer. The Stage 1 archaeological assessment determined that the study area retained potential for the identification and documentation of archaeological resources and Stage 2 archaeological assessment was recommended. The Stage 2 survey resulted in the recording of 13 new archaeological locations and 36 pre-contact Indigenous isolated findspots. During the Stage 2 archaeological assessment, Stantec archaeologists were joined by representatives from Mississauga of the Credit First Nation, Six Nations of the Grand River, and the Haudenosaunee Development Institute. Additional Stage 2 Archaeological Assessment, and Stage 3 Archaeological Assessment is recommended for some locations within the study area. The reports were submitted to and accepted by the Minister of Citizenship

and Multiculturalism (MCM) and entered into the Ontario Public Register of Archaeological Reports.

The Blair Creek Drive Extension study area is covered by these existing archaeological assessments and no additional archaeological work was undertaken as part of this project's scope.

2.5 Municipal Infrastructure

There is no existing Municipal Infrastructure within the study area. Sanitary sewer, storm sewer and watermain will be designed and incorporated into the new road and tie into surrounding infrastructure to service development north of the Blair Creek Drive Extension as per the Dundee North Secondary Plan.

At the eastern limit, Reidel Drive will be a 2-lane road with a 16.2m right-of-way and 1.8m wide sidewalks on either side. Blair Creek Drive continuing east of Reidel Drive will be a 2-lane collector road with on-road bike lanes and a 24.8m right-of-way width. There is a 525mm sanitary sewer proposed under Blair Creek Drive east of Reidel Drive.

At the western limit, the future Strasburg Road will be a 4-lane road secondary arterial road with multi-use trails on either side and a 30m right-of-way width. There is a 300mm diameter watermain proposed under Strasburg Road.

The Blair Creek Drive extension should provide continuous connection of active transportation facilities. Utilities and lighting will be planned and installed to support the development.

3.0 PROBLEMS AND OPPORTUNITIES

3.1 Problem and Opportunity Statement

Based on a review of the background information and planning context, the problem/opportunity statement for the project was developed. The Municipal Class EA addresses the following Problem/Opportunity Statement:

"A new City of Kitchener major community collector street is required to provide east-west access and connectivity within the planned new community of Dundee North in southwest Kitchener. The need for this road has been established and is supported by the City of Kitchener Official Plan and Transportation Master Plan. An extension of Blair Creek Drive between Reidel Drive and the future Strasburg Road will allow for multi-modal movement of people and goods between the internal road system and the surrounding area road network. The new road will support Kitchener's vision for Complete Streets by providing a balanced and safe environment for drivers, pedestrians, cyclists and transit users alike. The Blair Creek Drive extension will include on-street parking, cycling facilities, sidewalks and trees to create a functional and aesthetically pleasing streetscape for homes, schools and other properties located along the street."

The purpose of this project is to determine an alignment for the extension of Blair Creek Drive and its intersection with Strasburg Road, along with storm sewer and watermain, to serve planned community growth and associated travel demand.

3.2 Evaluation Criteria

Prior to developing the Alternative Solutions, evaluation criteria were established to assist in generating and evaluating the options.

Criteria	Description
Natural Environment	What are the effects on vegetation, water quality, habitat, wetlands, woodlands, and/or species at risk.
Social/Cultural Environment	What is the effect on road users' experience (accessibility/equity, safety, traffic operations, etc.) Are there impacts to the local community (noise, parking, construction, etc.)
Heritage/Archaeological Environment	What are the impacts to potential heritage resources (existing buildings/structures or landscapes) What are the impacts on archaeological resources
Property Impacts	Are there impacts to existing/future land uses
Technical/City Standards	Feasibility of construction and operation What are the space requirements for surface and underground infrastructure Does the alternative adhere to existing planning documents
Costs	Capital cost of implementation of each alternative Maintenance cost
Climate Change	Greenhouse gas (GHG) emissions Stormwater runoff

4.0 ALTERNATIVE SOLUTIONS

4.1 Development of Alternatives

A range of options were developed to address the problem statement. Each alternative runs in a straight east-west alignment from the point of intersection of the existing/planned Blair Creek Drive east of Reidel Drive. Four (4) alternatives were considered for the Blair Creek Drive Extension as follows:

- **Alternative 1** 24.8m Right-of-Way
- **Alternative 2** 26.0m Right-of-Way with Cycle Tracks
- **Alternative 3** 26.0m Right-of-Way with Bike Lanes
- **Alternative 4** Do nothing

When developing the alternatives, the project team considered whether an additional alternative with a curved alignment should be included. Since there were no natural environmental features to avoid and additional cost required to design and construct a less direct roadway, this alternative was screened out and not brought forward to the evaluation stage.

The above alternatives were presented to the interested parties at the Public Information Centre (PIC). The cross-sections are shown in **Figures 4.0 – 6.0**, and the full plan/profile views are included in **Appendix D**. The plan views incorporate sample mid-block intersections with minor collector roads. The number and location of these intersections are not part of the scope of this project and will be confirmed later through development planning. The purpose of showing the intersections with the alternatives is to provide a visual example of how this section of Blair Creek Drive could look in the future and demonstrate opportunities for traffic calming.

4.2 Detailed Description of Alternatives

4.2.1 *Alternative 1 – 24.8m ROW*

The first alternative is a two-lane road with a 24.8m right-of-way. This cross-section matches the existing cross-section of Blair Creek Drive east of Reidel Drive. The overall width of the asphalt is 14.8m from the front of curb. The driving lanes are 3.5m wide, with 1.5m bike lanes and 2.4m parking lanes along both sides of the road. The boulevards are 3.2m wide and the sidewalks are 1.5m wide.

4.2.2 *Alternative 2 – 26.0m ROW with Cycle Tracks*

The second alternative is a two-lane road with a 26.0m right-of-way. This cross-section matches the preferred cross-section for a major collector street as outlined in the City of Kitchener's Complete Streets Guidelines. The overall width of the asphalt is 9m from the front of curb. The driving lanes are 3.3m wide with a 2.4m wide parking lane on one side only. The boulevards are 4m wide and the cycle tracks are set back from the road within the boulevard. The cycle tracks are 1.6m wide and the sidewalks are 1.8m wide on both sides. There is a 0.2m buffer to separate the cyclists and pedestrians.

4.2.3 *Alternative 3 – 26.0m ROW with Bike Lanes*

The third alternative is a two-lane road with a 26.0m right-of-way. This cross-section matches the alternative cross-section for a major collector street as outlined in the City of Kitchener's Complete Streets Guidelines. The overall width of the asphalt is 14.6m from the front of curb. The driving lanes are 3.3m wide with a 2.4m parking lane on one side only. There are 2.4m wide bike lanes on each side of the road, with a 0.4m safety buffer between the bike lanes and the driving or parking lane. The boulevards are 3.1m wide and the sidewalks are 1.8m wide.

4.2.4 *Do Nothing*

The "Do Nothing" alternative must always be evaluated as part of the Environmental Class Assessment process and evaluates the advantages and disadvantages assuming the project is stopped completely and does not progress any further.

Figure 4.0: Alternative 1 – 24.8m ROW

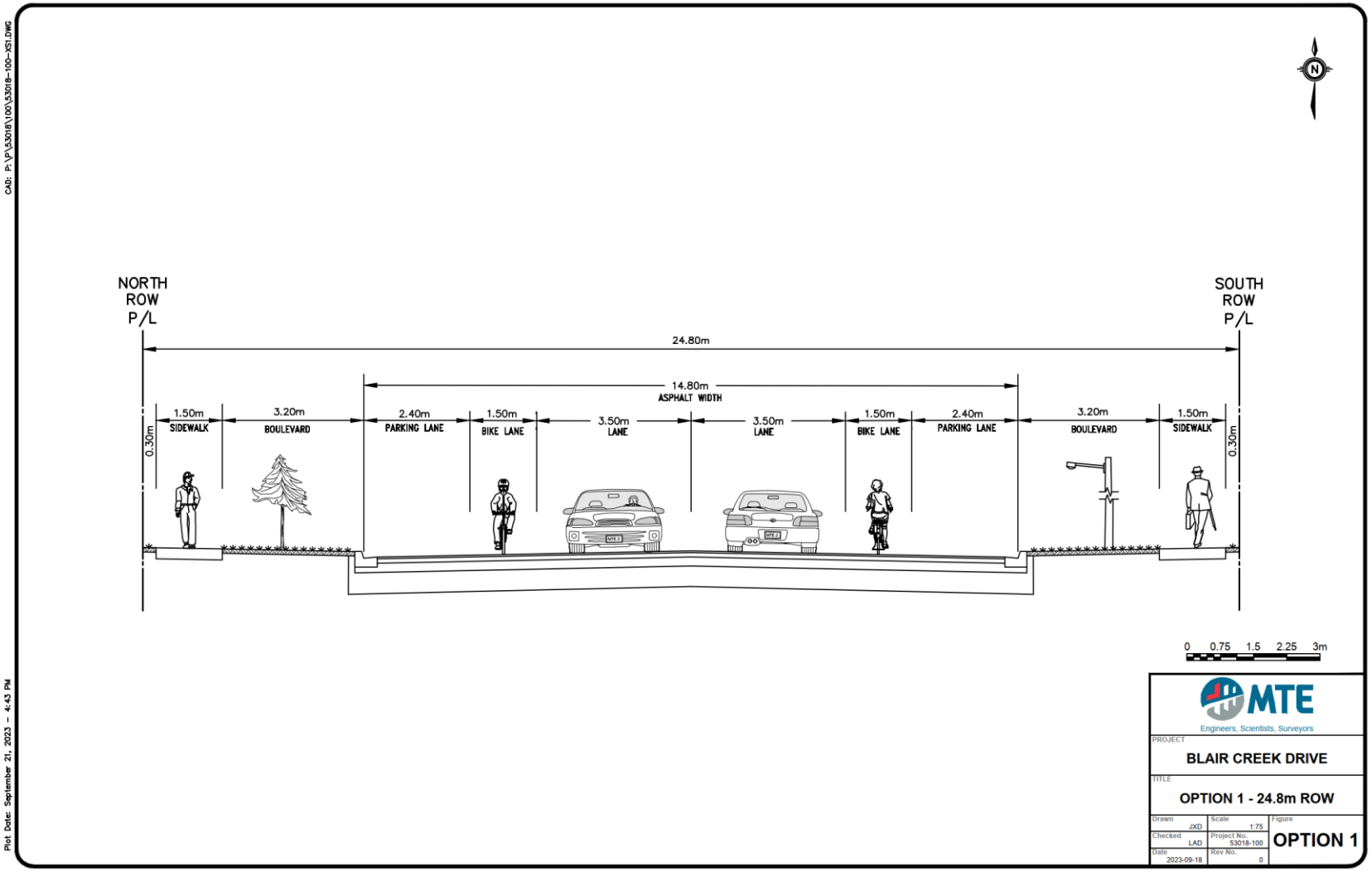


Figure 5.0: Alternative 2 – 26.0m ROW with Cycle Track

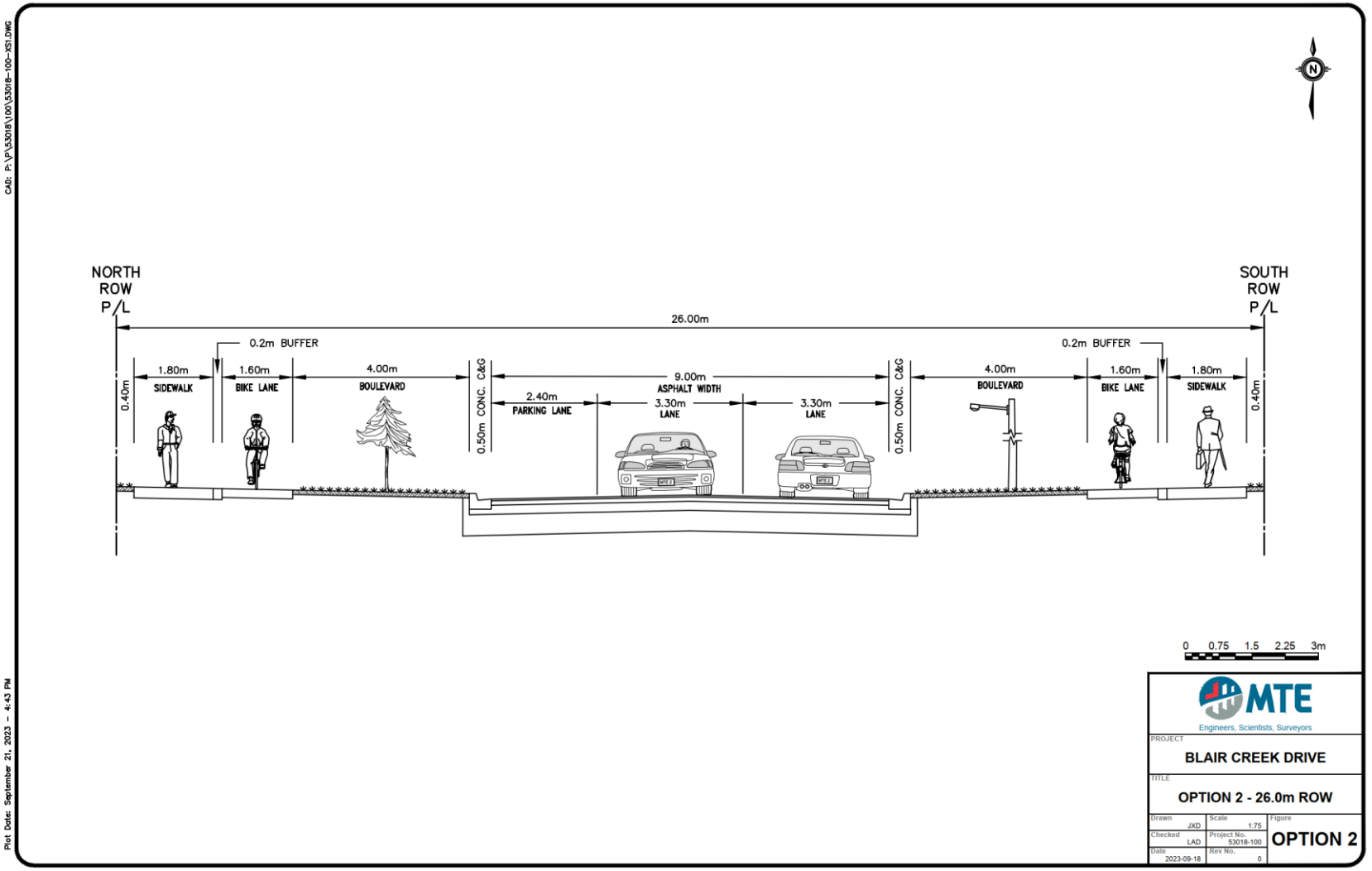
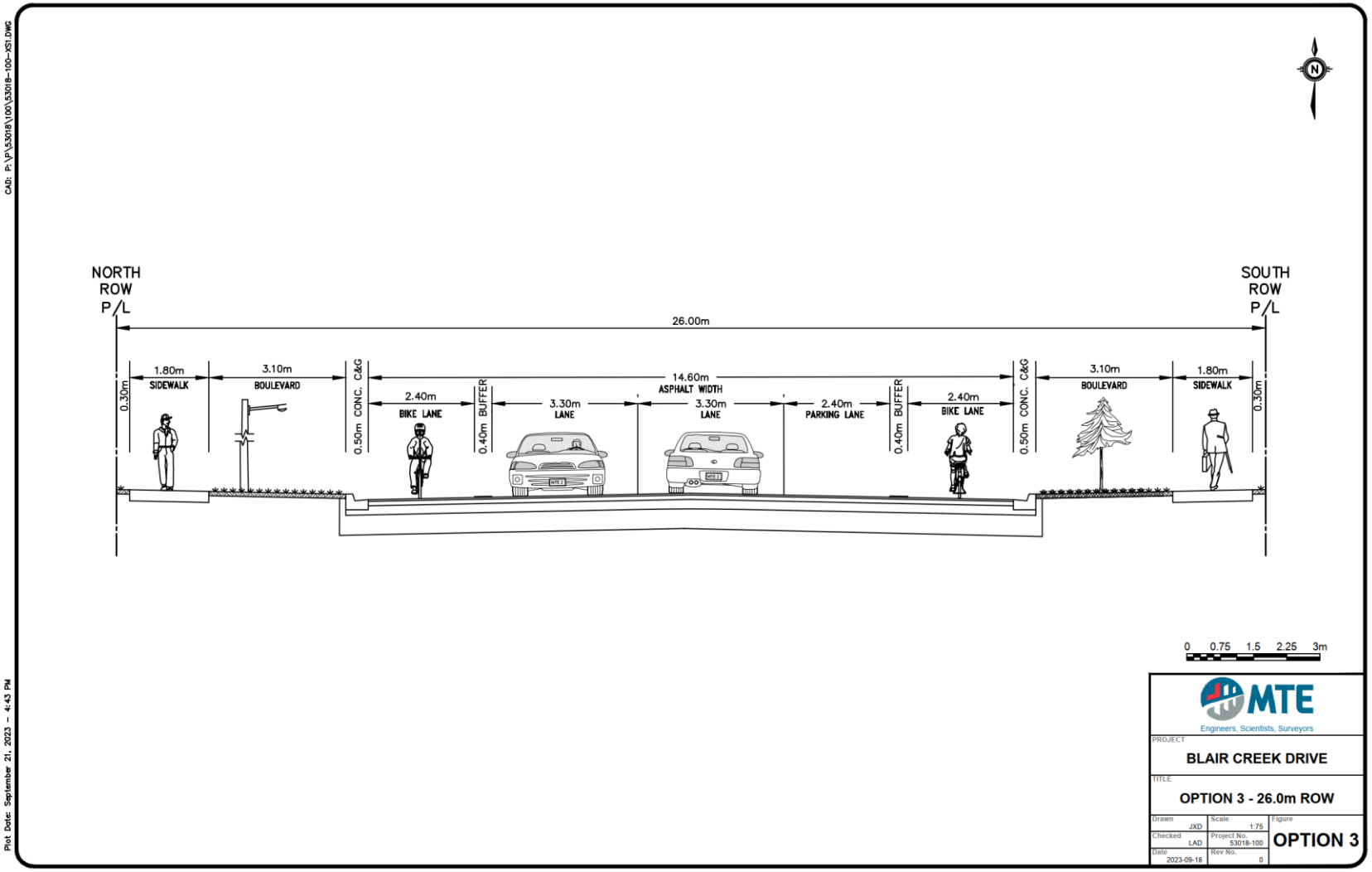


Figure 6.0: Alternative 3 – 26.0m ROW with Bike Lane



5.0 EVALUATION OF ALTERNATIVES

5.1 Evaluation Matrix

The initial evaluation of the alternatives was completed prior to the Public Information Centre so that the alternatives as well as the preferred solution could be presented to the public.

An evaluation matrix was developed to evaluate and score each option according to the following criteria:

- Natural Environment
- Social/Cultural Environment
- Heritage/Archaeological Environment
- Disruption to Existing or Future Land Uses (Property Impacts)
- Technical/City Standards
- Costs
- Climate Change

Each alternative was rated based on its ability to meet each criterion using a poor to good scaling as shown in **Figure 7.0.**

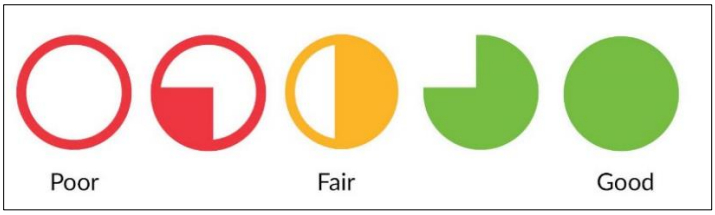


Figure 7.0: Alternatives Scoring

A detailed evaluation matrix was completed with input from various City departments (**Table 1.0).** A summary of the evaluation, the main advantages and disadvantages of each alternative (shown below in **Tables 2.0 and 3.0**), as well as the preferred alternative were presented at the Public Information Centre.

Table 1.0: Evaluation Summary of Design Alternatives (Presented at PIC)

Evaluation Criteria	Alternative 1: 24.8m ROW	Alternative 2: 26m ROW + Cycle Track	Alternative 3: 26m ROW + Bike Lane	Do Nothing
Natural Environment				
Social/Cultural Environment				
Heritage/Archaeological Environment				
Property Impacts				
Technical/City Standards				
Costs				
Climate Change				
Preferred	✗	✓	✗	✗

Table 2.0: Advantages and Disadvantages of Design Alternatives (Presented at PIC)

Alternative	Alternative 1: 24.8m ROW	Alternative 2: 26m ROW + Cycle Track (Preferred)	Alternative 3: 26m ROW + Bike Lane	Do Nothing
Advantages	• Cross-section matches the section of Blair Creek Drive east of Reidel Drive • Most parking • Narrower right-of-way is less costly to build and maintain	• Aligns with City of Kitchener Complete Streets for a Major Community Collector Road • Separated cycle tracks are the safest and cater to all ages and abilities of cyclists • Widest boulevards allow for tree planting, landscaping/streetscaping and stormwater management • Wider sidewalks and narrower driving lanes	• Physical buffer between bike lanes and driving lanes provide higher level of comfort for cyclists, although with minimum separation • Wider sidewalks and narrower driving lanes	• No direct environmental, cultural heritage or archaeological impacts
Disadvantages	• Painted on-road bike lanes with no physical separation from traffic lanes • Narrower 1.5m sidewalks • Wider driving lanes encourages higher vehicle speeds	• Widest right-of-way is most costly to build and maintain	• Aligns with City of Kitchener Complete Streets, but is the alternate cross-section for a Major Community Collector Road • Widest right-of-way is most costly to build and maintain	• Does not support the developable land uses as identified in the City of Kitchener Official Plan and Transportation Master Plan

Table 3.0: Design Alternatives Detailed Evaluation Matrix

Criteria	Description	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	General Description of Alternative	24.8m ROW	26m ROW (cycle track and sidewalk)	26m ROW (separated bike lane and sidewalk)	Do Nothing
Natural Environment	How do the alternatives compare with respect to effects on vegetation, water quality, wildlife and aquatic habitat, wetlands, terrestrial resources, woodlands, species at risk?	Some minor impacts to individual trees near project limits.	Some minor impacts to individual trees near project limits.	Some minor impacts to individual trees near project limits.	No additional impacts.
Sub Score		◕	◕	◕	●

Criteria	Description	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	General Description of Alternative	24.8m ROW	26m ROW (cycle track and sidewalk)	26m ROW (separated bike lane and sidewalk)	Do Nothing
Social/Cultural Environment	How do the alternatives compare with respect to the User Experience and does the route: • Allow for neighborhood pathway connections to area neighborhoods, promoting an active lifestyle? • Meet safety design principles?	Sidewalks and wide boulevards provide a safe and enjoyable pedestrian experience. Painted bike lanes do not provide physical separation from motor vehicles and will be used by more confident cyclists only. Wider driving lanes encourage higher speeds.	Sidewalks and wide boulevards provide a safe and enjoyable pedestrian experience. Fully separated cycle tracks provide an attractive cycling option for all ages and abilities. Setback crossrides and crosswalks provide additional safety for pedestrians and cyclists at intersections. Narrower 3.3m driving lanes encourage slower speeds and are still useable (min. width required) by emergency and transit vehicles. Loss of consistency of road cross-section from east of Reidel Drive.	Sidewalks and wide boulevards provide a safe and enjoyable pedestrian experience. Separated bikes lanes probide higher level of comfort for cyclists, though with minimum separation distance. Narrower 3.3m driving lanes encourage slower speeds and are still useable (min. width required) by emergency and transit vehicles. Loss of consistency of road cross-section from east of Reidel Drive.	Does not provide access or connection to the area neighbourhoods or surrounding development.
	Accessibility and Equity Improvements	Minimum width of 1.5m sidewalks are not preferred according to Complete Streets. Tactile plates placed at each sidewalk crossing	Standard width of 1.8m sidewalks are preferred according to Complete Streets for use by strollers, wheelchairs, etc. Tactile plates placed at each sidewalk crossing	Standard width of 1.8m sidewalks are preferred according to Complete Streets for use by strollers, wheelchairs, etc. Tactile plates placed at each sidewalk crossing	None/not applicable
	What impacts will the alternative have on the local community (e.g. noise, traffic / parking)?	Provides options for all modes of transportation. Provides the most on-street parking up front. If a school is built along the street, on-street parking will generally be prohibited along the school frontage and this would be reduced.	Provides options for all modes of transportation. On-street parking provided with narrowed travel portion may result in reduced speeds along street for safety	Provides options for all modes of transportation. On-street parking provided with narrowed travel portion may result in reduced speeds along street for safety	Does not provide access to surrounding development. No impact on noise, traffic, parking.
	What are the anticipated impacts during construction?	Reidel Drive is expected to be closed off to through traffic	Reidel Drive is expected to be closed off to through traffic	Reidel Drive is expected to be closed off to through traffic	None/not applicable
Sub Score		◑	●	◕	○

Criteria	Description	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	General Description of Alternative	24.8m ROW	26m ROW (cycle track and sidewalk)	26m ROW (separated bike lane and sidewalk)	Do Nothing
Heritage/Archaeological Environment	Potential impacts on cultural heritage resources, including built heritage resources, cultural heritage landscapes, and archaeological resources.	No direct impacts	No direct impacts	No direct impacts	No impacts
Sub Score		◕	◕	◕	●
Disruption to Existing or Future Land Uses (Property Impacts)	How does the alternative minimize disruption to existing land uses?	A straight alignment minimizes impact when compared to a winding alignment.	A straight alignment minimizes impact when compared to a winding alignment.	A straight alignment minimizes impact when compared to a winding alignment.	No disruption to existing land use.
	Does the alternative have an impact on existing property?	Property impacts confined to single parcel.	Property impacts confined to single parcel.	Property impacts confined to single parcel.	No disruption to existing land use.
	Does the alternative have an impact to future/proposed land uses (development)	Alternative will create access to future developments	Alternative will create access to future developments	Alternative will create access to future developments	Does not support future land use/access to surrounding development
Sub Score		◕	◑	◑	●
Technical/City Standards	How do the alternatives compare with respect to technical feasibility of construction and operation?	Typical of what can be found around the City currently. Bike lanes cleared along with the roadway in winter.	Wider sidewalk to clear for winter maintenance. Clearing sidewalk and cycle track side-by-side similar to a MUT.	Wider sidewalk to clear for winter maintenance. Bike lanes cleared along with the roadway in winter.	Not applicable.
	Are there concerns regarding the proposed underground servicing facilities?	No concerns found in geotechnical investigation.	No concerns found in geotechnical investigation.	No concerns found in geotechnical investigation.	Not applicable.

Criteria	Description	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	General Description of Alternative	24.8m ROW	26m ROW (cycle track and sidewalk)	26m ROW (separated bike lane and sidewalk)	Do Nothing
	Are there concerns regarding the SWM ponds?	SWM design to be provided through future subdivision development.	SWM design to be provided through future subdivision development. Wider hard surface results in more stormwater runoff when compared to Option 1.	SWM design to be provided through future subdivision development. Wider hard surface results in more stormwater runoff when compared to Option 1.	Not applicable.
	Are there concerns regarding lack of space and property acquisition to fit the road within the area available?	No concerns. No conflicts found in Geotech investigation	No concerns. No conflicts found in Geotech investigation	No concerns. No conflicts found in Geotech investigation	Not applicable.
	How do the alternatives deviate from City Standards?	Does not follow City of Kitchener Complete Streets Guidelines	Follows City of Kitchener Complete Streets Guidelines and is the Preferred Option for Major Community Collectors	Follows City of Kitchener Complete Streets Guidelines and is the Alternate Option for Major Community Collectors	Not applicable.
Sub Score		◔	◕	◑	○
Costs	How do the alternatives compare with respect to anticipated capital costs?	Lower capital cost anticipated due to smaller right-of-way	Higher capital cost anticipated due to larger right-of-way	Higher capital cost anticipated due to larger right-of-way	Lowest up front cost.
	How do the alternatives compare with respect to anticipated maintenance costs?	Lower maintenance fees anticipated due to smaller right-of-way	Larger right-of-way would increase maintenance fees	Larger right-of-way would increase maintenance fees	Lowest up front cost.
Sub Score		◕	◑	◑	●

Criteria	Description	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	General Description of Alternative	24.8m ROW	26m ROW (cycle track and sidewalk)	26m ROW (separated bike lane and sidewalk)	Do Nothing
Climate Change	How do the alternatives compare with respect to lower GHG emissions?		More comfortable bike lane encourages choosing biking over some car trips resulting in lower emissions.		No direct impact, but possibility of more congestion/emissions from idling vehicles on surrounding roadways if this connection is not built.
	How do the alternatives compare with respect to storm water run-off?	Least stormwater run-off created.	Wider hard surfaces create more stormwater run-off, however that is balanced by wider boulevards that create more potential for infiltration. Additional infiltration by permeable pavers/parking laybys is an option.	Wider hard surfaces create more stormwater run-off, however that is balanced by wider boulevards that create more potential for infiltration. Additional infiltration by permeable pavers/parking laybys is an option.	No impact.
Sub Score					
TOTAL SCORE					
RANK		**3**	**1**	**2**	**4**

Legend Score

	Nearly infeasible. Very high risk of adverse impact.
	Undesirable. High risk of adverse impact.
	Several mitigation measures required. Risk of adverse impact.
	Feasible. Some mitigation measures required. Low risk of adverse impact.
	Feasible and desirable solution. Lowest risk of adverse impact. Best solution.

5.2 Preferred Alternative

Based on the results of the evaluation, Alternative 2, with a 26.0m right-of-way and cycle tracks is preferred because it has the least negative impacts, fully addresses the problems, and takes advantage of the opportunities.

- A straight road alignment has no significant negative impacts to the surrounding environment, and
- establishes the east-west collector road as intended through past planning processes, enhancing the overall transportation network and supporting future community growth and development.

Given the lack of significant natural features, a wider right-of-way was chosen to provide the ideal cross-section as per the City of Kitchener's Complete Streets guidelines. The Preferred Alternative cross-section provides a continuation of a safe, "all ages and abilities" cycling network with the cycle tracks grade-separated from the driving and parking lanes. Wide, 1.8m sidewalks are AODA compliant, and large boulevards provide ample opportunity for future tree planting, streetscaping, low-impact development features and winter snow storage, which all contribute to a high-quality pedestrian environment. Alternative 2 allows for a variety of transportation choices which will support the new Dundee North community and the surrounding existing neighbourhoods. Storm and watermain will follow a direct alignment in accordance with standard City of Kitchener cross-sections.

6.0 POTENTIAL IMPACTS AND MITIGATION

6.1 Impacts

6.1.1 Excess Soils

Excess soil regulations must be followed through design and construction. On-site reuse of soil within the project area should be prioritized through efficient design and cut and fill planning, particularly in the areas where the concentrations of Benzene, Toluene and/or Xylenes were present. Off-site disposal of this material could result in a significant increase in construction cost since it must go to either a landfill or a Class 1 site. If dewatering is required during construction, it is noted that the groundwater may be impaired with Benzene, Toluene and/or Xylenes.

6.1.2 Natural Heritage and Cultural Heritage Environment

Natural Heritage

The proposed undertaking may result in the removal of a small number of trees near the intersection with Reidel Drive, including two candidate SAR bat roost trees. This is considered to represent a proportionally small and negligible impact in the local landscape and can be mitigated through the following measures:

- All vegetation and tree removal is to be completed outside of the peak breeding bird period
- The candidate bat maternity roost trees are to be removed outside the active bat roosting period

- Standard erosion and sediment control (ESC), and dust control measures should be implemented to limit dust settling on any adjacent vegetation/trees being retained.

Cultural Heritage

Identified impacts to the Built Heritage Resource: 271 Reidel Drive include a change in land use for a portion of the subject property from agricultural to transportation. The creation of a new road has the potential to impact the grade and drainage patterns which may adversely affect unknown archaeological resources.

Identified impacts to the Cultural Heritage Resource: Reidel Drive Cultural Heritage Landscape include loss of vegetation that abuts the roadside and defines the edge of Reidel Drive, and the potential to detract from the character or visual context of Reidel Road CHL as the new urban road cross-section is in contrast with the 'narrow two-lane alignment without shoulders' found along Reidel Drive.

While not all the impacts can be mitigated by their nature, there are some measures that can be implemented:

- Avoid use of the lands directly surrounding the farmstead and its heritage attributes at 271 Reidel Drive as construction and staging areas
- Remove only the required/minimal amount of roadside vegetation definining the road edge on Reidel Drive
- Consider commemoration of the Reidel Drive CHL and/or the 271 Reidel Drive BHR through the inclusion of signage, plaques, or public art with a design sympathetic to the character of the area
- The recommendations of the archaeological assessments completed by Stantec are to be followed.

6.1.3 Construction Impacts: Noise, Vibration, Air Quality, Access/Staging

Noise and Vibration

A noise study was not completed as part of the scope of this project as the surrounding area is primarily agricultural and slated for future development. The existing dwellings/businesses are located well outside of the Blair Creek Drive extension corridor and therefore are not considered to be highly sensitive to noise or vibration impact. It is anticipated that Noise Impact Assessments for the overall property will be completed as part of the Dundee North Secondary planning process. The potential for construction noise and vibration issues will be further reviewed during detailed design.

Air Quality

An air quality assessment was not undertaken as part of the scope of this project as the surrounding area is primarily agricultural and slated for future development. During construction of the roadway, emissions sources including from construction equipment, and airborne dust, will be temporarily present. Industry best practice will be employed during construction to mitigate these impacts. Some examples of this are:

- Ensuring all motorized equipment is in good condition, properly and regularly maintained, and compliant with applicable federal and provincial regulations.

- Ensuring all equipment is well maintained and operated in accordance with the manufacturer's specification.
- Locating stationary equipment as far away from sensitive receptors as practical.
- Adhering to the City's idling policy and minimizing idling time.
- Implementing a Dust Management Plan for the full duration of construction activities – with the use of non-chloride dust suppressants.

Access/Staging

Staging will need to be determined and including how and when motorists using Reidel Drive will be impacted. Reidel Drive is currently an access to the residence at 500 Stauffer Drive. Local access only or a detour using Stauffer Drive can be implemented if necessary and marked and signed accordingly.

6.1.4 Climate Change/Sustainability

The City of Kitchener is committed to the TransformWR strategy to mitigate climate change in Waterloo Region which has set a goal of an 80% greenhouse gas emission reduction by 2050. One of the 5 main focus areas is transportation.

The Blair Creek Drive extension will comprise a key part of the overall strategy for the Dundee North Secondary plan to create a sustainable, mixed-use community with multi-modal transportation options. The inclusion of all ages and abilities cycle tracks, wide sidewalks, tree canopy and attractive streetscaping will ideally reduce single occupant vehicle use.

Building finer-grain, efficient road networks creates more route options, limits extra travel distances and reduces associated vehicle emissions from vehicles.

Emissions from construction equipment can be mitigated using industry best practice.

6.1.5 Integration with Secondary Plan and Surrounding Development

Detailed design of the Blair Creek Drive Extension will most likely proceed in coordination with the phasing of the development on the Activa land. The development plans are subject to the land use outcomes of the Dundee North Secondary Plan currently underway by the City of Kitchener as well as other development requirements and approvals. While the alignment is generally proposed as an east-west corridor, the number of mid-block intersections and their locations are not yet known. Other land use features such as institutional (i.e. a school) will require special provisions for parking and student transportation to be incorporated into the road design. Streetscape design will be completed as per the development plan.

6.1.6 Drainage and Stormwater Management

A new road with hard surfaces will create stormwater runoff that must be managed according to City of Kitchener and MECP design criteria. It is assumed that the overall drainage and stormwater management plan for the 271 Reidel Drive property will be designed as part of the Activa site development. The preliminary design **(Appendix D)** for the Blair Creek Drive extension includes a storm sewer that will collect the runoff from the roadway and outlet to a future stormwater management facility, with the exact location of the outlet and SWM pond still to be determined. Should the Blair Creek Drive extension be constructed prior to the development, an interim storm design will be necessary to capture and treat runoff from the roadway. This could be accomplished by running a deeper storm sewer along Blair Creek Drive and connecting into the storm sewer heading north along Reidel Drive, which has an outlet point

directed east towards the Stauffer Woods development. Low-impact development features should be explored during detailed design to reduce the overall quantity of storm runoff and take advantage of the naturally permeable soils and low groundwater table in the area.

6.1.7 Sanitary Sewer

Preliminary design of sanitary sewer along the Blair Creek Drive extension was not initially considered part of the scope of the project. The City then requested that MTE address this issue, and review how the City could maximize the catchment area that would feed into a Blair Creek Drive trunk sanitary sewer. After a background review of existing and ongoing studies/investigations MTE learned that the sanitary trunk sewer for the greater surrounding area will likely not follow the alignment of Blair Creek Drive due to the depths required. MTE and the City agreed that the sanitary sewer should remain outside of the scope of this EA given that land use has not yet been determined.

The preliminary design drawings do not include a sanitary sewer, however the need for a local sewer can be explored with size and depth to be confirmed during the detailed design and development planning process.

6.1.8 Water and Utilities

The City and developer will engage with Kitchener Utilities, Enova Power, and other utility companies during the detailed design of the Blair Creek Drive extension to determine the needs and coordinate design and installation, as per the Dundee North Secondary Plan and approved site development plan. While Enova is not currently planning to extend the power line along the Blair Creek Drive extension, this may change in the future.

7.0 CONSULTATION

7.1 Notice of Project Commencement

From the outset of this study, public involvement was recognized as being important to the overall success of the assignment. A formal Notice of Study Commencement was published in The Kitchener Record on April 28, 2023, to advise the Public of the Class EA process and provide notification that the EA study for the Blair Creek Drive extension was to proceed. In addition to the newspaper advertisement, the Notice of Commencement was mailed to residences within the project area and non-resident property owners/developers. Stakeholders and agencies were emailed a copy on the same date. A project page was established on the Region of Waterloo's Engage (EngageWR) website where copies of all notices and other project information were posted online.

Copies of all notices are included in **Appendix B**.

7.2 Public Information Centre

A Notice of Public Information Centre (PIC) was sent to all residents, property owners/developers, stakeholders, agencies and other interested parties identified in response to the Notice of Study Commencement, by mail or email on September 1, 2023. On the same day, the Notice of PIC was posted online on the EngageWR project page and published in the

Kitchener Record. The letter invited the public to attend the PIC to view and comments on the alternatives and the preferred solution for the Blair Creek Drive Extension.

7.2.1 PIC

The PIC was hosted on September 20, 2023, in person at the Doon Pioneer Park Community Centre. The public was able to view the display boards, speak with the Project Team, and provide feedback through comment sheets or the Engage website. The display boards featured the purpose of the project, the problem/opportunity statement, an overview of the study area and the studies being completed, the design alternatives, design criteria, evaluation matrix and the preferred alternative. The PIC boards were posted online on the EngageWR project page the next day. The PIC display boards are included in **Appendix B**. Comment sheets were available but no written feedback was received after the PIC. One email from a member of the public was received after the PIC which expressed support for the preferred alternative, along with other comments unrelated to the scope of this project. The email was addressed by the Project Team.

7.3 Agency Correspondence

Appendix A includes a log of all communications conducted with various agencies for this project, as well as copies of communications (emails, letters, etc.). Some key contact with agencies is as follows:

7.3.1 Ministry of the Environment, Conservation and Parks (MECP)

The MECP was provided the Notice of Commencement and the notification of PIC via email by MTE Consultants Inc. The MECP responded with a letter of acknowledgement.

7.3.2 Grand River Conservation Authority (GRCA)

The Grand River Conservation Authority was provided the Notice of Commencement and the notification of PIC via email by MTE Consultants Inc.

7.3.3 Indigenous Consultation

As per the MECP's acknowledgement letter, Mississaugas of the Credit First Nation, Six Nations of the Grand River Elected Council, and Haudenosaunee Confederacy Chiefs Council were provided the Notice of Commencement, the notification of PIC, and the PIC documents via email by MTE Consultants Inc. Six Nations of the Grand River Elected Council responded to the Notice of Commencement and the notification of PIC. They requested clarification of the project area which MTE provided. No other comments have been received as of the time of writing of this report. It was noted that archaeological work is not being completed as part of this study, as this area has been covered by recent Stage 1 and Stage 2 investigations by Stantec.

7.3.4 City of Kitchener Council

Ayo Owodunni, Ward 5 City Councillor, received the Notice of Commencement. The Blair Creek Drive Extension Schedule "B" Municipal Class Environmental Assessment project file report was submitted to the Standing Committee on March 25, 2024.

7.4 Notice of Study Completion

Upon Council approval, a Notification of Study Completion will be advertised and filed with the Ministry of Environment, Conservation and Parks. The Notice of Study Completion will also be emailed to the interested parties. This Project File Report will be available for public viewing for a period of 30 days.

8.0 PERMITS/APPROVALS AND NEXT STEPS

8.1 Approvals

During the detailed design phase of the project, there will be several submissions that will need to be made regarding various elements of the project:

Feature	Approval Details	Timing
Storm Sewers	Storm sewer design, including OGS units and any Low Impact Development features will require CLI-ECA submission to the City.	90% Detailed Design
Sanitary Sewers	Sanitary sewer design will require CLI-ECA submission to the City.	90% Detailed Design
Watermain	Watermain design will require a Form 1 submission to the City.	100% Detailed Design

8.2 Next Steps

A 30-day public and agency review period will follow the submission of this report. At the conclusion of this period, the detailed design phase of the project may continue.

The drawings and documents must incorporate all the environmental and mitigation measures identified in this report to avoid and mitigate adverse impacts. These mitigation measures will be expanded upon where necessary during detailed design. The City should maintain ongoing coordination with interested parties, the public, utilities and emergency services throughout the design and construction phases.

8.3 Construction Staging

As the project transitions from the Class EA phase to the detailed design phase, there will be much more focus on the construction staging and timing of construction. Currently, it is anticipated that the detailed design phase will take place in 2025, with an expected construction start of 2026. This may be subject to the completion of the Strasburg Road construction which at the time of writing this report is expected to begin in 2025. In addition, development plans are underway for the subject property and it is likely that the Blair Creek Drive extension will be designed and built along with the development. During the detailed design phase, the Project Team and the City will need to coordinate with the Strasburg Road Project Team and the Developer to determine the ideal timing of the work.

8.3.1 Project Cost Estimate

As part of the preliminary design, a construction cost estimate was completed. A significant portion of the overall construction cost will be earthworks which can be further refined through adjustment of the road profile to minimize cut/excess soil. The project cost estimate is as follows:

Site Preparation, Removals and Traffic Control	$ 1,145,000
Road Works	$ 1,525,000
Storm Sewer	$ 850,000
Watermain	$ 750,000
Allowances (street lighting, line painting, contaminated material)	$ 200,000
Sub-Total	**$ 4,470,000**
Miscellaneous (15%)	$ 670,500
Contingency (20%)	$ 894,000
Engineering (20%)	$ 894,000
Total Estimated Construction Cost	**$ 6,928,500**

8.4 Preliminary Design

In addition to this Project File Report, MTE Consultants prepared a preliminary (30%) design of the preferred alternative **(Appendix D)**. The plans include a preliminary plan and profile of Blair Creek Drive between Reidel Drive and Strasburg Road, along with preliminary sizing and alignment of underground watermain and storm sewer.

Prior to completing the preliminary design, City staff will have an opportunity to review and provide comments. Coordination with all relevant departments and developers will be crucial to preparing servicing plans that meet the needs of all interested parties. The decisions that are made during the preliminary design will be the foundation of the detailed designs for the extension of Blair Creek Drive. The detailed road and servicing design will be determined subject to the Secondary Plan land use objectives and the approval of future development plans on the property.

9.0 SUMMARY AND RECOMMENDATIONS

As part of the Class EA process, the Do Nothing Alternative, along with three (3) Design Alternatives for the extension of Blair Creek Drive were evaluated. Following a Schedule "B" Class EA process, a Preferred Alternative was selected for the alignment of the roadway.

Alternative 2, a straight, 26.0m ROW with separated cycle tracks was selected to go forward with preliminary design.

The alternative selected meets the future transportation and servicing needs of the City, developers and interested parties.

9.1 Recommendations

- During detailed design, the Project Team should further evaluate the opportunity to include low impact development (LID) features, specifically boulevard bioretention.
- Based on existing groundwater levels, and local soil conditions, LID measures should be generally feasible, however due to layers of silty sand to sandy silt being present, insitu infiltration testing should be performed in areas of proposed LID measure to accurately measure the infiltration of the soils in those areas.
- Once locations of mid-block intersections are known, the Project Team should incorporate protected intersections for pedestrian and cyclist crossings, along with traffic calming measures such as tighter corner radii/curb bump outs.
- The proposed 300mm diameter watermain should be checked against development plans to ensure sizing is still appropriate.
- It is assumed that the construction of Blair Creek Drive will proceed in tandem with the development. Storm runoff from the roadway will be included in the development's stormwater management plan and outlet to one of the stormwater management ponds located on the site. Should the road go to construction ahead of the development, an interim stormwater management solution will need to be designed for road drainage.
- Groundwater should be tested for impacts if dewatering will be required during construction.
- Photometric analysis should be included in detailed lighting design. Analysis should include the active transportation infrastructure.
- Enova Power and other local utilities should be circulated for input on the detailed design.
- The City should consider including underground infrastructure to support future improvements to the pedestrian crossings during detailed design. This would include underground conduit for future signalization of the intersections at Strasburg Road and/or Reidel Drive if warranted.
- Reidel Drive will be closed to through traffic north of Blair Creek Drive and become a municipally owned private driveway to maintain access to 500 Stauffer Drive.

All of which is respectfully submitted,

MTE Consultants Inc.

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VPP:zeg

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Appendix A

Correspondence

BLAIR CREEK DRIVE COMMUNICATIONS LOG

MTE Project No.: 53018-100

Date	Sent By	Stakeholder Type	Sent To	Medium of Communication	Synopsis of Correspondence	Action Taken	Response By	Date of Response	Response Details
28-Apr-23	MTE		All Property Owners/Agency Contacts	mail and email	Notice of Study Commencement mailed and emailed to all residents/property owners/agency contacts				
28-Apr-23	City		Public	Newspaper	Notice of Study Commencement published in the Kitchener Record				
28-Apr-23	Resident	Public	Niall		wondering why Strasburg Rd can't be connected directly to Reidel Dr will the extension cross Blair Creek	phone response	Niall	1-May-23	advised that Strasburg Rd alignment is not a part of this study will not cross Blair Creek
28-Apr-23	Resident (Community Liaison Doon Pioneer Park Community Association, Former Ward 4 City Councillor 2010-2018)	Public	Niall		1) Raised concern about Biehn Dr EA listed in Background due to being deferred until late 2023 or early 2024 - wanted it removed from background. **(2) Curious of the work to be done as a 'Schedule B EA'** (3) Inquring about if Upper Blair, Bauman and Bechtel Watershed are included in study. **(4) Wondering if study will be 4 seasons since endangered species have been found north of proposed area.** (5) Inquiring about tree removal impact on study as there has already been a significant amount of trees removed in the area. **(6) Inquiring if developers will be held accountable for tree removals before study starts.** (7) Wants to be kept informed of TOR and study.	email response	Niall	1-May-23	1) Made emphasis on 'planned area road network' as it is still in progress and will remain on site. **(2) Geotechnical, Hydrogeotechnical, Topographic and Vegetation info in order to determine the preferred alignment of future road.** (3) Our scope does not include these. **(4) Study will likely be finalized in winter 2024** (5) No tree removal anticipated. **(6) Recent tree removals on east side of Reidel Dr relate to Activa Development and are not part of this study. but any tree removals will be reviewed by the City.** (7) Engage page will be kept up to date as the study proceeds.
29-Apr-23	Resident	Public	Niall		wondering if Strasburg Rd will be extended before Blair Creek is extended. Rasied concern for current traffic issue in area, wondering if Reidel Dr will be closed off at Blair Creek Dr.	email response	Niall	1-May-23	advised that the plan is for Strasburg Rd to be extended from its current terminus point to New Dundee Road prior to Blair Creek Dr. Addressed traffic concern with stating the eventual plan of closing Caryndale Drive south of Robert Ferrie Drive.
29-Apr-23	John123456	Public	Niall	Engage Page	Wondering if cycling lanes will be implented on these extended roads to facilitate cycling traffic	response on site	Niall	1-May-23	EA will include review of implementing cycling lanes
2-May-23	Diana Coulas Hydro One	Agency	Niall	Diana.Coulas@HydroOne.com	Please reach out to Enova Power Corportation - K-W Utility as Hydro One does not service this territory	email response	Lyndsay	2-May-23	Remove Hydro One from study contact list
3-May-23	Kevin Brousseau Stantec	Property Owner/Rep	Niall, Zen	Kevin.Brousseau@stantec.com	Thank you for the notice of study commencement and please continue to include me in the mailing list	no response			
4-May-23	Joan Del Villar Cuicas	MECP	Zenova	Joan.DelVillarCuicas@ontario.ca	Inquiring about Blair Creek Dr to east of Reidel drive as it is not shown on google maps	email response	Vince	16-May-23	The construction of the area east of Reidel Dr will be completed by others. Our study assumes that the City has that detailed design.
9-May-23	Joseph Harvey	MCM	Niall	Joseph.Harvey@ontario.ca	Provided initial advice in response to NOSC. Noted that responsibility has been transferred from MTCS to MCM but individual roles and contacts have not changed. Please copy both Karla and Joseph on project documentation.	no response			

Date	Sent By	Stakeholder Type	Sent To	Medium of Communication	Synopsis of Correspondence	Action Taken	Response By	Date of Response	Response Details
10-May-23	LisaP777888	Public	Niall	Engage Page	Wondering about transit facilities on this road and active transportation. Also wondering if this road connects residents to places in the neighbourhood.	response on site	Niall	10-May-23	Future transit needs will be assessed by Region. Active Transportation will be considered within the right of way width being studied. Existing sections of Blair Creek Drive have 1.5m wide bike lanes on both sides of the road.
31-Aug-23	MTE		All Property Owners/Agency Contacts	mail	Notice of PIC mailed to all mail contacts				
1-Sep-23	MTE (Lyndsay)		All Property Owners/Agency Contacts	email	Notice of PIC emailed to all email contacts				
1-Sep-23	City		Public	Newspaper	Notice of PIC published in the Kitchener Record				
25-Sep-23		Property Owner/Rep	Niall, Vince		In favour of Blair Creek Extension alignment Wants both Stauffer and Reidel to remain open for future. Robert Ferrie Extension is critical to access Strasburg as an alternate to Blair Creek. Does not support Biehn Drive extension and is part of the working group opposing the Biehn Drive Extension going through wetland as part of the Master Transporation Plan.	email response	Niall	26-Sep-23	Can only provide comment on Blair Creek Drive scope. Will forward comments to Transportation.
13-Oct-23	Joan Del Villar Cuicas	MECP	Niall, Vince	Joan.DelVillarCuicas@ontario.ca	MECP Letter of Acknowledgement including Aboriginal communities list and Client Guide to Preliminary Screening (in response to Notice of Commencement)				
5-Dec-23	Lyndsay Dokas	Aboriginal Communities	Mississaugas of the C	communications@mncfn.ca	Notice of Commencement, Notice of PIC, link to Engage				
			Six Nations of the Grand River Elected Council (SNGREC) Peter Graham Dawn LaForme	LRCS@sixnations.ca; dlaforme@sixnations.ca					
			Haudenosaunee Con	info@hdi.land					

AGENCY CONTACTS

Agency	Contact Name and Title	Mailing Address	Email	Phone	Ext.	Notes
Municipalities						
City of Kitchener	Ayo Owodunni, Ward 5 Councillor	C/O Office of the Mayor & Council, Kitchener City Hall, 200 King St. W., Kitchener ON, N2H 4G7	Ayo.Owodunni@kitchener.ca			
City of Kitchener	Carrie Musselman (Dundee North Secondary Plan) Senior Environmental Planner | Planning | City of Kitchener		Carrie.Musselman@kitchener.ca	519-741-2200 TTY: 1-866-969-9994	7068	
City of Kitchener	Christine Goulet (Strasburg Road Detailed Design)		Christine.Goulet@kitchener.ca			
City of Kitchener	Steven Ryder		Steven.Ryder@kitchener.ca			
City of Kitchener	Carlos Reyes		Carlos.Reyes@kitchener.ca			
City of Kitchener	Prasoon Adhikari (SSU)		Prasoon.Adhikari@kitchener.ca			
City of Kitchener	Jessica Vieira (Heritage)		Jessica.Vieira@kitchener.ca			
Region of Waterloo	Kevin Dolishny		KDolishny@regionofwaterloo.ca			
Township of North Dumfries	Kay Grant Township Planner	Township of North Dumfries 2958 Greenfield Road P.O. Box 1060 Ayr Ontario, N0B 1E0	planning@northdumfries.ca			
Provincial Agencies						
Ministry of the Environment, Conservation and Parks (MECP)	Joan Del Villar Cuicas Regional Environmental Planner Project Review Unit | Environmental Assessment Branch	Follow instructions provided by Ministry	Joan.DelVillarCuicas@ontario.ca	365-889-1180		
	Nick Colella A/Manager, Environmental Assessment Services Environmental Assessment Branch		Nick.Colella@ontario.ca			
Ministry of Citizenship and Multiculturalism (MCM)	Karla Barboza Team Lead(A), Heritage Heritage Planning Unit Programs and Services Branch	401 Bay Street, Suite 1700 Toronto ON M7A 0A7	Karla.Barboza@ontario.ca	416-314-7120		Note: Formerly the responsibility of MTCS but individual contacts/roles have not changed. Copy both Karla and Joseph on correspondence.
	Joseph Harvey Heritage Planner Citizenship, Inclusion and Heritage Division | Heritage Branch | Heritage Planning Unit		Joseph.Harvey@ontario.ca	613-242-3743		
Ministry of Natural Resources and Forestry (MNRF)	David Marriott Rural Planner Ontario Ministry of Agriculture, Food and Rural Affairs	1 Stone Road West, Guelph, ON, N1G 4Y2	David.Marriott@ontario.ca	519-766-5990		
	Land Use Policy and Stewardship		omafra.eanotices@ontario.ca			
Ministry of Transportation (MTO)	Michael Nadeau Manager Engineering Office West Region	659 Exeter Road, 4th Floor London ON N6E 1L3	Michael.Nadeau@ontario.ca	519-873-4373		
Local Authorities						
Grand River Conservation Authority (GRCA)	Chris Foster-Pengelley Assistant Supervisor of Resource Planning (South Kitchener)	400 Clyde Road, PO Box 729 Cambridge, ON N1R 5W6	CFosterPengelley@grandriver.ca	516-621-2763	2319	
Utilities						
~~Hydro One~~	~~Amanda Crow~~		~~Amanda.Crow@hydroone.com~~			
Enova Power	Shevan Mustafa Manager of Distribution Engineering	Enova Power Corp 301 Victoria St. South, Kitchener, ON N2G 4L2	Shevan.Mustafa@enovapower.com	519-745-4771	6399	
Gas (Kitchener Utilities)	Sylvie Eastman		Sylvie.Eastman@kitchener.ca			
Bell	Robin Collier Specialist, Network Provisioning		Robin.Collier@bell.ca	T: 519-568-5825 C: 226-821-1349		
Rogers	Cheryl Jacob		Cheryl.Jacob@rci.rogers.com			
Water (KU)	Angela Mick		Angela.Mick@kitchener.ca			

Emergency Services						
Waterloo Regional Police Service (WRPS)		P.O. Box 3070, 200 Maple Grove Road, Cambridge ON, N3H 5M1	publicinfo@wrps.on.ca	1-519-570-9777	8188	
Kitchener Fire Department	Tom Ruggle		Tom.Ruggle@kitchener.ca			
Transportation						
Grand River Transit (GRT)	Cheryl McGill Co-Ordinator, On-Street Passenger Amenities - Grand River Transit (GRT)	250 Strasburg Rd Kitchener, ON N2G 1H3	CMcGill@regionofwaterloo.ca			
Student Transportation Services of Waterloo Region (STSWR)	Keith Prudham	102-550 Bingemans centre Drive Kitchener, ON N2B 3X9	Keith_Prudham@stswr.ca			
Local School Boards						
Waterloo Region District School Board (WRDSB)			info@wrdsb.ca			
Waterloo Catholic District School Board (WCDSB)	Jennifer Passy Manager of Planning		Jennifer.Passy@wcdsb.ca	519-578-3677	2253	
Subconsultants						
ARA	Kayla Jonas-Galvin		Kayla.JonasGalvin@araheritage.com			
	Amy Barnes		Amy.Barnes@araheritage.com			
NRSI	Gina MacVeigh		GMacVeigh@nrsi.on.ca			
Paradigm	Jim Mallett		JMallett@ptsl.com			

ABORIGINAL COMMUNITIES

Community	Contact Name and Title	Mailing Address	Email	Phone	Ext.
Mississaugas of the Credit First Nation			communications@mncfn.ca		
Six Nations of the Grand River Elected Council (SNGREC)	Peter Graham	1695 Chiefswood Rd, PO Box 5000 Oshweken, ON N0A 1M0	LRCS@sixnations.ca	519-445-2201	
	Dawn LaForme		dlaforme@sixnations.ca		
Haudenosaunee Confederacy Chiefs Council (HCCC)			info@hdi.land		

Lyndsay Dokas

From:	Barry Cronkite <Barry.Cronkite@kitchener.ca>
Sent:	Thursday, September 21, 2023 3:43 PM
To:	Niall Melanson; Christine Goulet; Darren Kropf; Steven Ryder; Vince Pugliese; Lyndsay Dokas
Subject:	RE: Closing Reidel Drive

Thanks Niall. I think that we can still close Reidel Drive at Blair Creek and turn it into a municipally owned private driveway essentially. Emergency gates on Stauffer/Caryndale and Stauffer/Riedel would also be required. The reality is that we can't keep Stauffer/Riedel open to through traffic in the condition that they're in.

Thanks
Barry

From: Niall Melanson <Niall.Melanson@kitchener.ca>
Sent: Thursday, September 21, 2023 10:03 AM
To: Barry Cronkite <Barry.Cronkite@kitchener.ca>; Christine Goulet <Christine.Goulet@kitchener.ca>; Darren Kropf <Darren.Kropf@kitchener.ca>; Steven Ryder <Steven.Ryder@kitchener.ca>; 'Vince Pugliese' <vpugliese@mte85.com>; Lyndsay Dokas <ldokas@mte85.com>
Subject: RE: Closing Reidel Drive

Good morning Transportation

MTE and the City hosted the Blair Creek Drive PIC last night. Representatives from 500 Stauffer Drive were extremely adamant that they did not want a future driveway connection to Strasburg Road and requested that the access to the property remain down Reidel Drive. I told them that the scope of the PIC was to discuss the Blair Creek Drive Extension and there were no finalized plans for Reidel Drive but that I would take their comments back to the Transportation Division.

I will leave this with Transportation and please let me know if you have any questions.

Thank you.

Niall Melanson, C.E.T.
Project Manager, Development Engineering, City of Kitchener
niall.melanson@kitchener.ca, 519-741-2200 x 7133
200 King St. W., Kitchener, ON N2G 4GX

From: Niall Melanson
Sent: Thursday, September 7, 2023 1:42 PM
To: Barry Cronkite <Barry.Cronkite@kitchener.ca>; Christine Goulet <Christine.Goulet@kitchener.ca>; Darren Kropf <Darren.Kropf@kitchener.ca>; Steven Ryder <Steven.Ryder@kitchener.ca>; Vince Pugliese <vpugliese@mte85.com>; Lyndsay Dokas <ldokas@mte85.com>
Subject: Closing Reidel Drive

Hello Everyone.

Further to our Teams meeting today the following topics were agreed upon:

1) A driveway from the Strasburg Road extension to 500 Stauffer Drive will not be required.
2) Stauffer Drive will be closed at Reidel Drive. MTE/Paradigm will need to revise the traffic study which is part of the Blair Creek Drive EA.
3) Reidel Drive will remain open between New Dundee Road and future Blair Creek Drive.
4) Reidel Drive between future Blair Creek Drive and Stauffer Drive will become the access point for 500 Stauffer Drive. The access will be choked off similar to a driveway entrance and a 'No Exit' sign will be posted. The City will retain ownership of the right-of-way.
5) Transportation Division will review if it is feasible for Reidel Drive between future Blair Creek Drive and Stauffer Drive to have a bylaw passed closing it as a right-of-way and therefore eliminating the maintenance requirements.

Please advise if there are any revisions required to the above.

Barry – As discussed please forward to Leslie MacDonald in Legal for comment.

Thank you.

Niall Melanson, C.E.T.
Project Manager, Development Engineering, City of Kitchener
niall.melanson@kitchener.ca, 519-741-2200 x 7133
200 King St. W., Kitchener, ON N2G 4GX

Lyndsay Dokas

From: Niall Melanson <Niall.Melanson@kitchener.ca>
Sent: Tuesday, September 26, 2023 4:44 PM
To: [redacted] Vince Pugliese
Subject: RE: Blair Creek Drive Extension

Hello [redacted]

I will forward your email along to Transportation and keep a record of it.

Thanks again.

Niall Melanson, C.E.T.
Project Manager, Development Engineering, City of Kitchener
niall.melanson@kitchener.ca, 519-741-2200 x 7133
200 King St. W., Kitchener, ON N2G 4GX

From:
Sent: Tuesday, September 26, 2023 3:38 PM
To: vpugliese@mte85.com; Niall Melanson <Niall.Melanson@kitchener.ca>
Cc:
Subject: Re: Blair Creek Drive Extension

Hi Niall. Are you able to pass on my comments about Stauffer and Reidel to the Transportation Division or can you provide me with a name of someone to contact?

With thanks,
[redacted]

On Tuesday, September 26, 2023 at 01:42:23 p.m. EDT, Niall Melanson <niall.melanson@kitchener.ca> wrote:

Good afternoon [redacted]

Thank you for your email. I can only provide comments based on the scope of my assignment which is Blair Creek Drive. Future road closures would be reviewed by the Transportation Division.

Enjoy your day.

Niall Melanson, C.E.T.

Project Manager, Development Engineering, City of Kitchener

niall.melanson@kitchener.ca, 519-741-2200 x 7133

200 King St. W., Kitchener, ON N2G 4GX

From: [redacted]
Sent: Monday, September 25, 2023 2:18 PM
To: Niall Melanson <Niall.Melanson@kitchener.ca>; vpugliese@mte85.com
Cc:
Subject: Blair Creek Drive Extension

Good Afternoon...

Further to attending last Wednesday night, I did want to confirm my comments in writing.

In terms of the Blair Creek Extension, I am in favour of it and the alignment looks reasonable.

I would however like to urge that both Stauffer and Reidel remain open for future. Using these roads out of Doon South and Brigadoon is a huge timesaver to get to the 401 Westbound at Cedar Creek Road aka Highway 97. Across New Dundee Road from Reidel, the road name changes to Cameron which leads to Roseville Road. On Roseville Road, you have the option to go west to Industrial Road to access Cedar Creek Road and the 401 westbound exit OR go east to go into Cambridge or access North Dumphries Road to Cedar Creek Road. Using the Blair Creek or Robert Ferrie Extensions which lead to Strasburg Road to then New Dundee Road will make for a convoluted road system and force back tracking which would be unnecessary. I do recognize that some roadwork to Reidel and Stauffer would be necessary but not to the extent to adding shoulders, rather new pavement and fixing up of potholes etc.

The Robert Ferrie Extension is also critical to add to the infrastructure so that people from Doon South can also access Strasburg Road as an alternate to Blair Creek. With a subdivision this large, two exits are definitely needed.

Lastly, Niall, I am sure you are aware of the proposed Biehn Drive Extension going through a wetland as part of the Master Transportation Plan. I do not support the Biehn Drive Extension for the various reasons Delegations have pointed out to City Council earlier this year but do support this group's proposed solution of Alternate 4. With that said, the Robert Ferrie Extension becomes critical to the Brigadoon residents living west of McLeod Court off of Biehn Drive to access Strasburg Road via Caryndale Drive to Robert Ferrie. As part of the Working Group opposing the Biehn Drive Extension, we continue to wait on the final EA work City Council requested prior to they making any decision.

Sincerely,

[redacted]

Ministry of the Environment, Conservation and Parks

Environmental Assessment Branch

1st Floor
135 St. Clair Avenue W
Toronto ON M4V 1P5
Tel.: 416 314-8001
Fax.: 416 314-8452

Ministère de l'Environnement, de la Protection de la nature et des Parcs

Direction des évaluations environnementales

Rez-de-chaussée
135, avenue St. Clair Ouest
Toronto ON M4V 1P5
Tél. : 416 314-8001
Téléc. : 416 314-8452

October 13, 2023

Niall Melanson
City of Kitchener
Email: niall.melanson@kitchener.ca

Vince Pugliese
MTE Consultants Inc
Email: vpugliese@mte85.com

BY EMAIL ONLY

Re: **Blair Creek Drive Extension**
City of Kitchener
Municipal Class Environmental Assessment, Schedule B
Acknowledgement of Notice of Commencement

Dear Project Team,

This letter is in response to the Notice of Commencement for the above noted project. The Ministry of the Environment, Conservation and Parks (MECP) acknowledges that the City of Kitchener (proponent) has indicated that the study is following the approved environmental planning process for a Schedule B project under the Municipal Class Environmental Assessment (Class EA).

The **updated (August 2022)** attached "Areas of Interest" document provides guidance regarding the ministry's interests with respect to the Class EA process. Please address all areas of interest in the EA documentation at an appropriate level for the EA study. Proponents who address all the applicable areas of interest can minimize potential delays to the project schedule. **Further information is provided at the end of the Areas of Interest document relating to recent changes to the Environmental Assessment Act through Bill 197, Covid-19 Economic Recovery Act 2020.**

The Crown has a legal duty to consult Aboriginal communities when it has knowledge, real or constructive, of the existence or potential existence of an Aboriginal or treaty right and contemplates conduct that may adversely impact that right. Before authorizing this project, the Crown must ensure that its duty to consult has been fulfilled, where such a duty is triggered. Although the duty to consult with Aboriginal peoples is a duty of the Crown, the Crown may delegate procedural aspects of this duty to project proponents while retaining oversight of the consultation process.

The proposed project may have the potential to affect Aboriginal or treaty rights protected under Section 35 of Canada's *Constitution Act* 1982. Where the Crown's duty to consult is triggered in relation to the proposed project**, the MECP is delegating the procedural aspects of rights-based consultation to the proponent through this letter.** The Crown intends to rely on the delegated consultation process in discharging its duty to consult and maintains the right to participate in the consultation process as it sees fit.

Based on information provided to date and the Crown`s preliminary assessment the proponent is required to consult with the following communities who have been identified as potentially affected by the proposed project:

- **Mississaugas of the Credit First Nation**
- **Six Nations of the Grand River**
  - **Elected Council, and**
  - **Haudenosaunee Confederacy Chiefs Council (HCCC)**

Steps that the proponent may need to take in relation to Aboriginal consultation for the proposed project are outlined in the "Code of Practice for Consultation in Ontario's Environmental Assessment Process". Additional information related to Ontario's Environmental Assessment Act is available online at: www.ontario.ca/environmentalassessments.

Please also refer to the attached document "A Proponent's Introduction to the Delegation of Procedural Aspects of consultation with Aboriginal Communities" for further information, including the MECP's expectations for EA report documentation related to consultation with communities.

The proponent must contact the Director of Environmental Assessment Branch (EABDirector@ontario.ca) under the following circumstances after initial discussions with the communities identified by the MECP:

- Aboriginal or treaty rights impacts are identified to you by the communities;
- You have reason to believe that your proposed project may adversely affect an Aboriginal or treaty right;
- Consultation with Indigenous communities or other stakeholders has reached an impasse; or
- A Section 16 Order request is expected based on impacts to Aboriginal or treaty rights

The MECP will then assess the extent of any Crown duty to consult for the circumstances and will consider whether additional steps should be taken, including what role you will be asked to play should additional steps and activities be required.

A draft copy of the report should be sent directly to me prior to the filing of the final report, allowing a minimum of 30 days for the ministry's technical reviewers to provide comments.

Please also ensure a copy of the final notice is sent to the ministry's West Central Region EA notification email account (eanotification.wcregion@ontario.ca) after the draft report is reviewed and finalized.

Should you or any members of your project team have any questions regarding the material above, please contact me at Joan.delvillarcuicas@ontario.ca or 365-889-1180.

Sincerely,

Joan Del Villar C
Regional Environmental Planner – West Central Region
Project Review Unit, Environmental Assessment Branch

Cc: Aaron Todd, Guelph District Manager, MECP
Zenova Gentles, Administrative Assistant, MTE Consultants Inc.

Enclosed: Areas of Interest

Attached: Client's Guide to Preliminary Screening for Species at Risk

A Proponent's Introduction to the Delegation of Procedural Aspects of Consultation with Aboriginal Communities

AREAS OF INTEREST (v. August 2022)

It is suggested that you check off each section after you have considered / addressed it.

☐ **Planning and Policy**

- Applicable plans and policies should be identified in the report, and the proponent should describe how the proposed project adheres to the relevant policies in these plans.
    - Projects located in MECP Central, Eastern or West Central Region may be subject to **A Place to Grow: Growth Plan for the Greater Golden Horseshoe (2020)**.
    - Projects located in MECP Central or Eastern Region may be subject to the **Oak Ridges Moraine Conservation Plan (2017)** or the **Lake Simcoe Protection Plan (2014)**.
    - Projects located in MECP Central, Southwest or West Central Region may be subject to the **Niagara Escarpment Plan (2017)**.
    - Projects located in MECP Central, Eastern, Southwest or West Central Region may be subject to the **Greenbelt Plan (2017)**.
    - Projects located in MECP Northern Region may be subject to the **Growth Plan for Northern Ontario (2011).**

- The **Provincial Policy Statement (2020)** contains policies that protect Ontario's natural heritage and water resources. Applicable policies should be referenced in the report, and the proponent should describe how the proposed project is consistent with these policies.

- In addition to the provincial planning and policy level, the report should also discuss the planning context at the municipal and federal levels, as appropriate.

☐ **Source Water Protection**

The *Clean Water Act*, 2006 (CWA) aims to protect existing and future sources of drinking water. To achieve this, several types of vulnerable areas have been delineated around surface water intakes and wellheads for every municipal residential drinking water system that is located in a source protection area. These vulnerable areas are known as a Wellhead Protection Areas (WHPAs) and surface water Intake Protection Zones (IPZs). Other vulnerable areas that have been delineated under the CWA include Highly Vulnerable Aquifers (HVAs), Significant Groundwater Recharge Areas (SGRAs), Event-based modelling areas (EBAs), and Issues Contributing Areas (ICAs). Source protection plans have been developed that include policies to address existing and future risks to sources of municipal drinking water within these vulnerable areas.

Projects that are subject to the Environmental Assessment Act that fall under a Class EA, or one of the Regulations, have the potential to impact sources of drinking water if they occur in designated vulnerable areas or in the vicinity of other at-risk drinking water systems (i.e.

systems that are not municipal residential systems). MEA Class EA projects may include activities that, if located in a vulnerable area, could be a threat to sources of drinking water (i.e. have the potential to adversely affect the quality or quantity of drinking water sources) and the activity could therefore be subject to policies in a source protection plan. Where an activity poses a risk to drinking water, policies in the local source protection plan may impact how or where that activity is undertaken. Policies may prohibit certain activities, or they may require risk management measures for these activities. Municipal Official Plans, planning decisions, Class EA projects (where the project includes an activity that is a threat to drinking water) and prescribed instruments must conform with policies that address significant risks to drinking water and must have regard for policies that address moderate or low risks.

- In October 2015, the MEA Parent Class EA document was amended to include reference to the Clean Water Act (Section A.2.10.6) and indicates that proponents undertaking a Municipal Class EA project must identify early in their process whether a project is or could potentially be occurring with a vulnerable area. **Given this requirement, please include a section in the report on source water protection.**

    - The proponent should identify the source protection area and should clearly document how the proximity of the project to sources of drinking water (municipal or other) and any delineated vulnerable areas was considered and assessed. Specifically, the report should discuss whether or not the project is located in a vulnerable area and provide applicable details about the area.

    - If located in a vulnerable area, proponents should document whether any project activities are prescribed drinking water threats and thus pose a risk to drinking water (this should be consulted on with the appropriate Source Protection Authority). Where an activity poses a risk to drinking water, the proponent must document and discuss in the report how the project adheres to or has regard to applicable policies in the local source protection plan. This section should then be used to inform and be reflected in other sections of the report, such as the identification of net positive/negative effects of alternatives, mitigation measures, evaluation of alternatives etc.

- While most source protection plans focused on including policies for significant drinking water threats in the WHPAs and IPZs it should be noted that even though source protection plan policies may not apply in HVAs, these are areas where aquifers are sensitive and at risk to impacts and within these areas, activities may impact the quality of sources of drinking water for systems other than municipal residential systems.

- In order to determine if this project is occurring within a vulnerable area, proponents can use Source Protection Information Atlas, which is an online mapping tool available to the public. Note that various layers (including WHPAs, WHPA-Q1 and WHPA-Q2, IPZs, HVAs, SGRAs, EBAs, ICAs) can be turned on through the “Map Legend” bar on the left. The

mapping tool will also provide a link to the appropriate source protection plan in order to identify what policies may be applicable in the vulnerable area.

- For further information on the maps or source protection plan policies which may relate to their project, proponents must contact the appropriate source protection authority. **Please consult with the local source protection authority to discuss potential impacts on drinking water. Please document the results of that consultation within the report and include all communication documents/correspondence.**

More Information

For more information on the *Clean Water Act*, source protection areas and plans, including specific information on the vulnerable areas and drinking water threats, please refer to Conservation Ontario's website where you will also find links to the local source protection plan/assessment report.

A list of the prescribed drinking water threats can be found in section 1.1 of Ontario Regulation 287/07 made under the *Clean Water Act*. In addition to prescribed drinking water threats, some source protection plans may include policies to address additional "local" threat activities, as approved by the MECP.

☐ **Climate Change**

The document "Considering Climate Change in the Environmental Assessment Process" (Guide) is now a part of the Environmental Assessment program's Guides and Codes of Practice. The Guide sets out the MECP's expectation for considering climate change in the preparation, execution and documentation of environmental assessment studies and processes. The guide provides examples, approaches, resources, and references to assist proponents with consideration of climate change in EA. Proponents should review this Guide in detail.

- **The MECP expects proponents of Class EA projects to:**

1. Consider during the assessment of alternative solutions and alternative designs, the following:
    a. the project's expected production of greenhouse gas emissions and impacts on carbon sinks (climate change mitigation); and
    b. resilience or vulnerability of the undertaking to changing climatic conditions (climate change adaptation).
2. Include a discrete section in the report detailing how climate change was considered in the EA.

How climate change is considered can be qualitative or quantitative in nature and should be scaled to the project's level of environmental effect. In all instances, both a project's impacts on climate change (mitigation) and impacts of climate change on a project (adaptation) should be considered.

- The MECP has also prepared another guide to support provincial land use planning direction related to the completion of energy and emission plans. The "Community Emissions Reduction Planning: A Guide for Municipalities" document is designed to educate stakeholders on the municipal opportunities to reduce energy and greenhouse gas emissions, and to provide guidance on methods and techniques to incorporate consideration of energy and greenhouse gas emissions into municipal activities of all types. We encourage you to review the Guide for information.

Air Quality, Dust and Noise

- If there are sensitive receptors in the surrounding area of this project, a quantitative air quality/odour impact assessment will be useful to evaluate alternatives, determine impacts and identify appropriate mitigation measures. The scope of the assessment can be determined based on the potential effects of the proposed alternatives, and typically includes source and receptor characterization and a quantification of local air quality impacts on the sensitive receptors and the environment in the study area. The assessment will compare to all applicable standards or guidelines for all contaminants of concern. **Please contact this office for further consultation on the level of Air Quality Impact Assessment required for this project if not already advised.**

- If a quantitative Air Quality Impact Assessment is not required for the project, the MECP expects that the report contain a qualitative assessment which includes:

    - A discussion of local air quality including existing activities/sources that significantly impact local air quality and how the project may impact existing conditions;
    - A discussion of the nearby sensitive receptors and the project's potential air quality impacts on present and future sensitive receptors;
    - A discussion of local air quality impacts that could arise from this project during both construction and operation; and
    - A discussion of potential mitigation measures.

- As a common practice, "air quality" should be used an evaluation criterion for all road projects.

- Dust and noise control measures should be addressed and included in the construction plans to ensure that nearby residential and other sensitive land uses within the study area are not adversely affected during construction activities.

- The MECP recommends that non-chloride dust-suppressants be applied. For a comprehensive list of fugitive dust prevention and control measures that could be applied, refer to *Cheminfo Services Inc. Best Practices for the Reduction of Air Emissions from*

Construction and Demolition Activities report prepared for Environment Canada. March 2005.

- The report should consider the potential impacts of increased noise levels during the operation of the completed project. The proponent should explore all potential measures to mitigate significant noise impacts during the assessment of alternatives.

Ecosystem Protection and Restoration

- Any impacts to ecosystem form and function must be avoided where possible. The report should describe any proposed mitigation measures and how project planning will protect and enhance the local ecosystem.

- Natural heritage and hydrologic features should be identified and described in detail to assess potential impacts and to develop appropriate mitigation measures. The following sensitive environmental features may be located within or adjacent to the study area:
  - Key Natural Heritage Features: Habitat of endangered species and threatened species, fish habitat, wetlands, areas of natural and scientific interest (ANSIs), significant valleylands, significant woodlands; significant wildlife habitat (including habitat of special concern species); sand barrens, savannahs, and tallgrass prairies; and alvars.
  - Key Hydrologic Features: Permanent streams, intermittent streams, inland lakes and their littoral zones, seepage areas and springs, and wetlands.
  - Other natural heritage features and areas such as: vegetation communities, rare species of flora or fauna, Environmentally Sensitive Areas, Environmentally Sensitive Policy Areas, federal and provincial parks and conservation reserves, Greenland systems etc.

We recommend consulting with the Ministry of Natural Resources and Forestry (MNRF), Fisheries and Oceans Canada (DFO) and your local conservation authority to determine if special measures or additional studies will be necessary to preserve and protect these sensitive features. In addition, for projects located in Central Region you may consider the provisions of the Rouge Park Management Plan if applicable.

Species at Risk

- The Ministry of the Environment, Conservation and Parks has now assumed responsibility of Ontario's Species at Risk program. Information, standards, guidelines, reference materials and technical resources to assist you are found at https://www.ontario.ca/page/species-risk.

- The Client's Guide to Preliminary Screening for Species at Risk (Draft May 2019) has been attached to the covering email for your reference and use. Please review this document for next steps.

- For any questions related to subsequent permit requirements, please contact SAROntario@ontario.ca.

Surface Water

- The report must include enough information to demonstrate that there will be no negative impacts on the natural features or ecological functions of any watercourses within the study area. Measures should be included in the planning and design process to ensure that any impacts to watercourses from construction or operational activities (e.g. spills, erosion, pollution) are mitigated as part of the proposed undertaking.

- Additional stormwater runoff from new pavement can impact receiving watercourses and flood conditions. Quality and quantity control measures to treat stormwater runoff should be considered for all new impervious areas and, where possible, existing surfaces. The ministry's Stormwater Management Planning and Design Manual (2003) should be referenced in the report and utilized when designing stormwater control methods. **A Stormwater Management Plan should be prepared as part of the Class EA process** that includes:

    - Strategies to address potential water quantity and erosion impacts related to stormwater draining into streams or other sensitive environmental features, and to ensure that adequate (enhanced) water quality is maintained
    - Watershed information, drainage conditions, and other relevant background information
    - Future drainage conditions, stormwater management options, information on erosion and sediment control during construction, and other details of the proposed works
    - Information on maintenance and monitoring commitments.

- Ontario Regulation 60/08 under the *Ontario Water Resources Act* (OWRA) applies to the Lake Simcoe Basin, which encompasses Lake Simcoe and the lands from which surface water drains into Lake Simcoe. If the proposed sewage treatment plant is listed in Table 1 of the regulation, the report should describe how the proposed project and its mitigation measures are consistent with the requirements of this regulation and the OWRA.

- Any potential approval requirements for surface water taking or discharge should be identified in the report. A Permit to Take Water (PTTW) under the OWRA will be required for any water takings that exceed 50,000 L/day, except for certain water taking activities that have been prescribed by the Water Taking EASR Regulation – *O. Reg. 63/16*. These prescribed water-taking activities require registration in the EASR instead of a PTTW. Please

review the Water Taking User Guide for EASR for more information. Additionally, an Environmental Compliance Approval under the OWRA is required for municipal stormwater management works.

Groundwater

- The status of, and potential impacts to any well water supplies should be addressed. If the project involves groundwater takings or changes to drainage patterns, the quantity and quality of groundwater may be affected due to drawdown effects or the redirection of existing contamination flows. In addition, project activities may infringe on existing wells such that they must be reconstructed or sealed and abandoned. Appropriate information to define existing groundwater conditions should be included in the report.

- If the potential construction or decommissioning of water wells is identified as an issue, the report should refer to Ontario Regulation 903, Wells, under the OWRA.

- Potential impacts to groundwater-dependent natural features should be addressed. Any changes to groundwater flow or quality from groundwater taking may interfere with the ecological processes of streams, wetlands or other surficial features. In addition, discharging contaminated or high volumes of groundwater to these features may have direct impacts on their function. Any potential effects should be identified, and appropriate mitigation measures should be recommended. The level of detail required will be dependent on the significance of the potential impacts.

- Any potential approval requirements for groundwater taking or discharge should be identified in the report. A Permit to Take Water (PTTW) under the OWRA will be required for any water takings that exceed 50,000 L/day, with the exception of certain water taking activities that have been prescribed by the Water Taking EASR Regulation – *O. Reg. 63/16*. These prescribed water-taking activities require registration in the EASR instead of a PTTW. Please review the Water Taking User Guide for EASR for more information.

- Consultation with the railroad authorities is necessary wherever there is a plan to use construction dewatering in the vicinity of railroad lines or where the zone of influence of the construction dewatering potentially intercepts railroad lines.

Excess Materials Management

- In December 2019, MECP released a new regulation under the Environmental Protection Act, titled "On-Site and Excess Soil Management" (O. Reg. 406/19) to support improved management of excess construction soil. This regulation is a key step to support proper management of excess soils, ensuring valuable resources don't go to waste and to provide

clear rules on managing and reusing excess soil. New risk-based standards referenced by this regulation help to facilitate local beneficial reuse which in turn will reduce greenhouse gas emissions from soil transportation, while ensuring strong protection of human health and the environment. The new regulation is being phased in over time, with the first phase in effect on January 1, 2021. For more information, please visit https://www.ontario.ca/page/handling-excess-soil.

- The report should reference that activities involving the management of excess soil should be completed in accordance with O. Reg. 406/19 and the MECP's current guidance document titled "Management of Excess Soil – A Guide for Best Management Practices" (2014).

- All waste generated during construction must be disposed of in accordance with ministry requirements

Contaminated Sites

- Any current or historical waste disposal sites should be identified in the report. The status of these sites should be determined to confirm whether approval pursuant to Section 46 of the EPA may be required for land uses on former disposal sites. We recommend referring to the MECP's D-4 guideline for land use considerations near landfills and dumps.
    - Resources available may include regional/local municipal official plans and data; provincial data on large landfill sites and small landfill sites; Environmental Compliance Approval information for waste disposal sites on Access Environment.

- Other known contaminated sites (local, provincial, federal) in the study area should also be identified in the report (Note – information on federal contaminated sites is found on the Government of Canada's website).

- The location of any underground storage tanks should be investigated in the report. Measures should be identified to ensure the integrity of these tanks and to ensure an appropriate response in the event of a spill. The ministry's Spills Action Centre must be contacted in such an event.

- Since the removal or movement of soils may be required, appropriate tests to determine contaminant levels from previous land uses or dumping should be undertaken. If the soils are contaminated, you must determine how and where they are to be disposed of, consistent with *Part XV.1 of the Environmental Protection Act* (EPA) and Ontario Regulation 153/04, Records of Site Condition, which details the new requirements related to site assessment and clean up. Please contact the appropriate MECP District Office for further consultation if contaminated sites are present.

- **Servicing, Utilities and Facilities**

- The report should identify any above or underground utilities in the study area such as transmission lines, telephone/internet, oil/gas etc. The owners should be consulted to discuss impacts to this infrastructure, including potential spills.

- The report should identify any servicing infrastructure in the study area such as wastewater, water, stormwater that may potentially be impacted by the project.

- Any facility that releases emissions to the atmosphere, discharges contaminants to ground or surface water, provides potable water supplies, or stores, transports or disposes of waste must have an Environmental Compliance Approval (ECA) before it can operate lawfully. Please consult with MECP's Environmental Permissions Branch to determine whether a new or amended ECA will be required for any proposed infrastructure.

- We recommend referring to the ministry's environmental land use planning guides to ensure that any potential land use conflicts are considered when planning for any infrastructure or facilities related to wastewater, pipelines, landfills or industrial uses.

- **Mitigation and Monitoring**

- Contractors must be made aware of all environmental considerations so that all environmental standards and commitments for both construction and operation are met. Mitigation measures should be clearly referenced in the report and regularly monitored during the construction stage of the project. In addition, we encourage proponents to conduct post-construction monitoring to ensure all mitigation measures have been effective and are functioning properly.

- Design and construction reports and plans should be based on a best management approach that centres on the prevention of impacts, protection of the existing environment, and opportunities for rehabilitation and enhancement of any impacted areas.

- The proponent's construction and post-construction monitoring plans must be documented in the report, as outlined in Section A.2.5 and A.4.1 of the MEA Class EA parent document.

- **Consultation**

- The report must demonstrate how the consultation provisions of the Class EA have been fulfilled, including documentation of all stakeholder consultation efforts undertaken during the planning process. This includes a discussion in the report that identifies concerns that were raised and **describes how they have been addressed by the proponent** throughout

the planning process. The report should also include copies of comments submitted on the project by interested stakeholders, and the proponent's responses to these comments (as directed by the Class EA to include full documentation).

- Please include the full stakeholder distribution/consultation list in the documentation.

Class EA Process

- If this project is a Master Plan: there are several different approaches that can be used to conduct a Master Plan, examples of which are outlined in Appendix 4 of the Class EA. **The Master Plan should clearly indicate the selected approach for conducting the plan**, by identifying whether the levels of assessment, consultation and documentation are sufficient to fulfill the requirements for Schedule B or C projects. Please note that any Schedule B or C projects identified in the plan would be subject to Part II Order Requests under the Environmental Assessment Act, although the plan itself would not be. **Please include a description of the approach being undertaken (use Appendix 4 as a reference).**

- If this project is a Master Plan: Any identified projects should also include information on the MCEA schedule associated with the project.

- The report should provide clear and complete documentation of the planning process in order to allow for transparency in decision-making.

- The Class EA requires the consideration of the effects of each alternative on all aspects of the environment (including planning, natural, social, cultural, economic, technical). The report should include a level of detail (e.g. hydrogeological investigations, terrestrial and aquatic assessments, cultural heritage assessments) such that all potential impacts can be identified, and appropriate mitigation measures can be developed. Any supporting studies conducted during the Class EA process should be referenced and included as part of the report.

- Please include in the report a list of all subsequent permits or approvals that may be required for the implementation of the preferred alternative, including but not limited to, MECP's PTTW, EASR Registrations and ECAs, conservation authority permits, species at risk permits, MTO permits and approvals under the *Impact Assessment Act*, 2019.

- Ministry guidelines and other information related to the issues above are available at http://www.ontario.ca/environment-and-energy/environment-and-energy. We encourage you to review all the available guides and to reference any relevant information in the report.

Amendments to the EAA through the Covid-19 Economic Recovery Act, 2020
Once the EA Report is finalized, the proponent must issue a Notice of Completion providing a minimum 30-day period during which documentation may be reviewed and comment and input can be submitted to the proponent. The Notice of Completion must be sent to the appropriate MECP Regional Office email address.

The public can request a higher level of assessment on a project if they are concerned about potential adverse impacts to constitutionally protected Aboriginal and treaty rights. In addition, the Minister may issue an order on his or her own initiative within a specified time period. The Director (of the Environmental Assessment Branch) will issue a Notice of Proposed Order to the proponent if the Minister is considering an order for the project within 30 days after the conclusion of the comment period on the Notice of Completion. At this time, the Director may request additional information from the proponent. Once the requested information has been received, the Minister will have 30 days within which to make a decision or impose conditions on your project.

Therefore, the proponent cannot proceed with the project until at least 30 days after the end of the comment period provided for in the Notice of Completion. Further, the proponent may not proceed after this time if:

- a Section 16 Order request has been submitted to the ministry regarding potential adverse impacts to constitutionally protected Aboriginal and treaty rights, or
- the Director has issued a Notice of Proposed order regarding the project.

Please ensure that the Notice of Completion advises that outstanding concerns are to be directed to the proponent for a response, and that in the event there are outstanding concerns regarding potential adverse impacts to constitutionally protected Aboriginal and treaty rights, Section 16 Order requests on those matters should be addressed in writing to:

Minister David Piccini
Ministry of Environment, Conservation and Parks
777 Bay Street, 5th Floor
Toronto ON M7A 2J3
minister.mecp@ontario.ca

and

Director, Environmental Assessment Branch
Ministry of Environment, Conservation and Parks
135 St. Clair Ave. W, 1st Floor
Toronto ON, M4V 1P5
EABDirector@ontario.ca

Appendix B

Copies of Notices, Letters, Bulletins, etc.

Notice of Study Commencement
Blair Creek Drive Extension
Municipal Class Environmental Assessment

The Study

The City of Kitchener has initiated a Class Environmental Assessment Study for the extension of Blair Creek Drive from the future Strasburg Road to the intersection of Reidel Drive and Blair Creek Drive, approximately 700 metres (see **Figure 1.0** for study area). The Blair Creek Drive extension will include new storm sewer as well as watermain. This study will identify and evaluate alternative solutions and determine a preferred alignment for the road.

The Process

This project is being carried out in accordance with the requirements of the Environmental Assessment Act by following the 2023 Municipal Class Environmental Assessment document and it is being planned under Schedule 'B' of the Municipal Class Environmental Assessment (Class EA).

The City of Kitchener has requested MTE Consultants to undertake the study, which involves an evaluation of alternatives, selection of preferred alternative, and evaluation of environmental and cultural heritage impacts, and their mitigation measures. At the end of the study, a Project File Report (PFR) documenting the process will be submitted to the Ministry of the Environment, Conservation, and Parks (MECP) and will be available for public review for a period of 30 calendar days. Before any decisions are made on the recommendation, or acceptance of the preferred solution, all interested parties will have an opportunity to attend a Public Information Centre (PIC) meeting. Notification of the PIC will be provided at the appropriate time by means of a similar advertisement. To learn more, please visit the Engage Kitchener website and look for the project under the "In Progress" heading: **https://www.engagewr.ca/hub-page/kitchener**

Comments Invited

Public, Indigenous, and agency consultation is a key component of the Class EA process, and we value your input during the planning process. To help facilitate this input, a PIC is scheduled to take place in Fall 2023. If you wish to be placed on the study mailing list to receive notices and information, or, if you wish to provide comments at any time during the Class EA process, you can do so by contacting:

Vince Pugliese, P.Eng., PMP, MBA
MTE Consultants Inc.
Phone: (519) 743-6500 ext. 1225
Cell: (519) 651-7903
Email: vpugliese@mte85.com

Niall Melanson, C.E.T.
City of Kitchener
Phone: (519) 741-2200 ext. 7133
Email: niall.melanson@kitchener.ca

Please note that all correspondence will be kept on file for use during the decision-making process throughout the project and will become part of the public record. Under the Municipal Freedom of Information and Protection of Privacy Act and the Environmental Assessment Act, any personal information such as name, address, and telephone number included in a submission may become part of the public record unless otherwise requested in the submission.

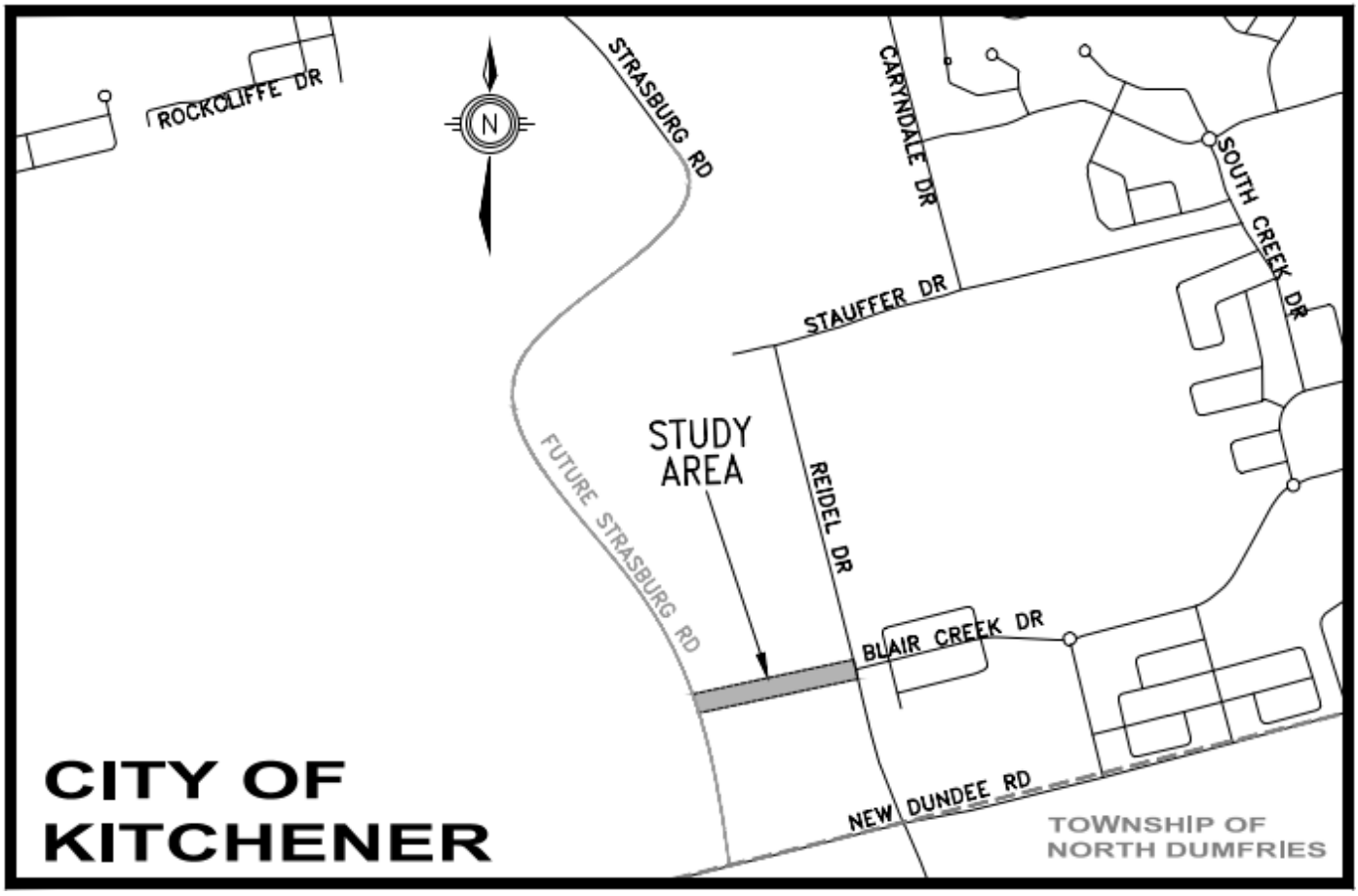


Figure 1. Blair Creek Drive Extension (Study Area)

This figure illustrates the limits of the study area bounded by the future extension of Strasburg Road and Reidel Drive.

This notice was issued on April 28, 2023.

Notice of Public Information Centre

Blair Creek Drive Extension - Municipal Class Environmental Assessment

To support future development in southwest Kitchener, this study includes the extension of Blair Creek Drive from the intersection of Reidel Drive and Blair Creek Drive to the future Strasburg Road, approximately 700 metres (See **Figure 1.0** for study area). On behalf of the City of Kitchener, MTE Consultants is undertaking a study to determine a preferred road alignment and preliminary design of the new Blair Creek Drive.

This project is being carried out in accordance with the requirements of the Environmental Assessment Act by following the Municipal Class EA document (as amended in 2007, 2011, 2015 and 2023) and it is being planned under Schedule 'B' of the Municipal Class EA.

At this stage of the project, several technical studies have been completed or are underway including Ecological, Heritage, Traffic and Geotechnical. MTE has identified a preferred alignment and cross-section for the extension of Blair Creek Drive in the study area shown below.

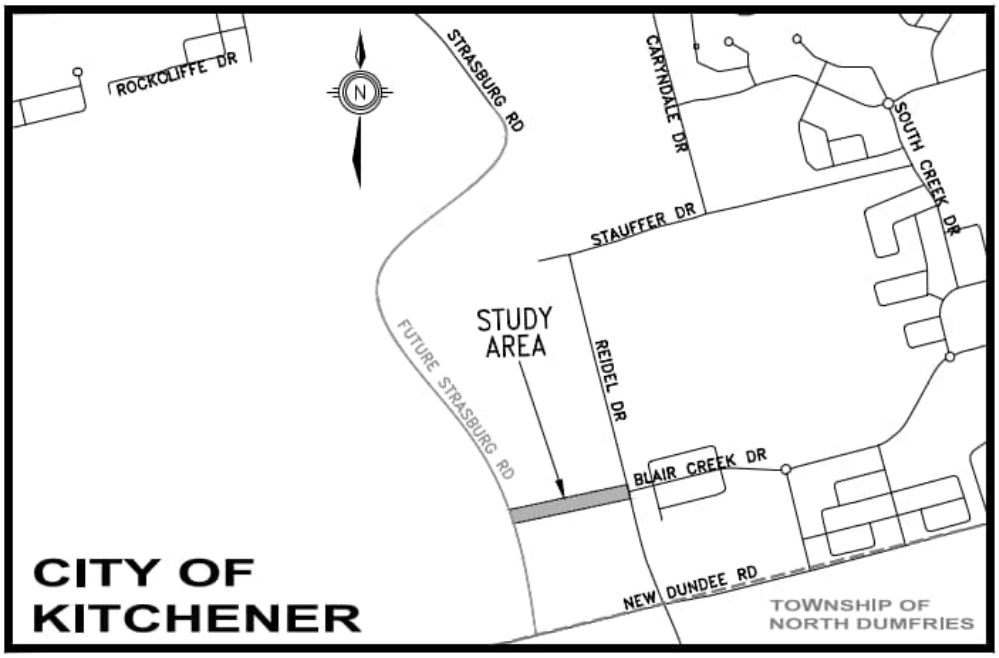


Figure 1: Blair Creek Drive Extension Area

Presentation, discussion, and input on the identified alternatives will be conducted at the Public Information Centre (PIC). MTE Consultants and the City of Kitchener invite all interested parties to attend a PIC meeting on

Wednesday, September 20, 2023 at 6:30pm
Doon Pioneer Park Community Centre, Room 2
150 Pioneer Drive
Kitchener, ON N2P 2C2

Notification of this PIC will also be provided via newspaper advertisement in The Record and online at EngageKitchener.

Please note that comments will be maintained for reference throughout the project and will become part of the public record. Under the Municipal Freedom of Information and Protection of Privacy Act and the Environmental Assessment Act, any personal information such as name, address, and telephone number included in a submission will become part of the public record unless the comments specifically request that such personal details not be included in the public record.

Project information including the PIC presentation materials will be made available after September 20 on the City's Website: Blair Creek Drive Extension Environmental Assessment | EngageWR

This Notice was issued on September 1, 2023.

Blair Creek Drive Extension Class EA

Public Information Centre

ENTRANCE

Blair Creek Drive Extension Class EA

Public Information Centre

KITCHENER

MTE

Blair Creek Drive Extension Class EA

Public Information Centre

KITCHENER

MTE

Welcome!

Welcome to the **Public Information Centre for Blair Creek Drive Extension** between Reidel Drive and the future Strasburg Road.

The Project is being planned under Schedule B of the Municipal Class Environmental Assessment (EA) Act.

We ask that you:

- Review the **Display Boards**
- Ask any **questions** you have of the Project Team
- Fill out a **Comment Sheet** with your feedback about the project and the Preferred Alternative

KITCHENER

MTE

What is the purpose of this Public Information Centre?

- Present the **Problem** to be solved
- Present the **Alternative Solutions**
- Present the evaluation criteria and **Preferred Alternative**
- Obtain **feedback** on the Preferred Alternative and address any questions or concerns you may have regarding this project

KITCHENER

MTE

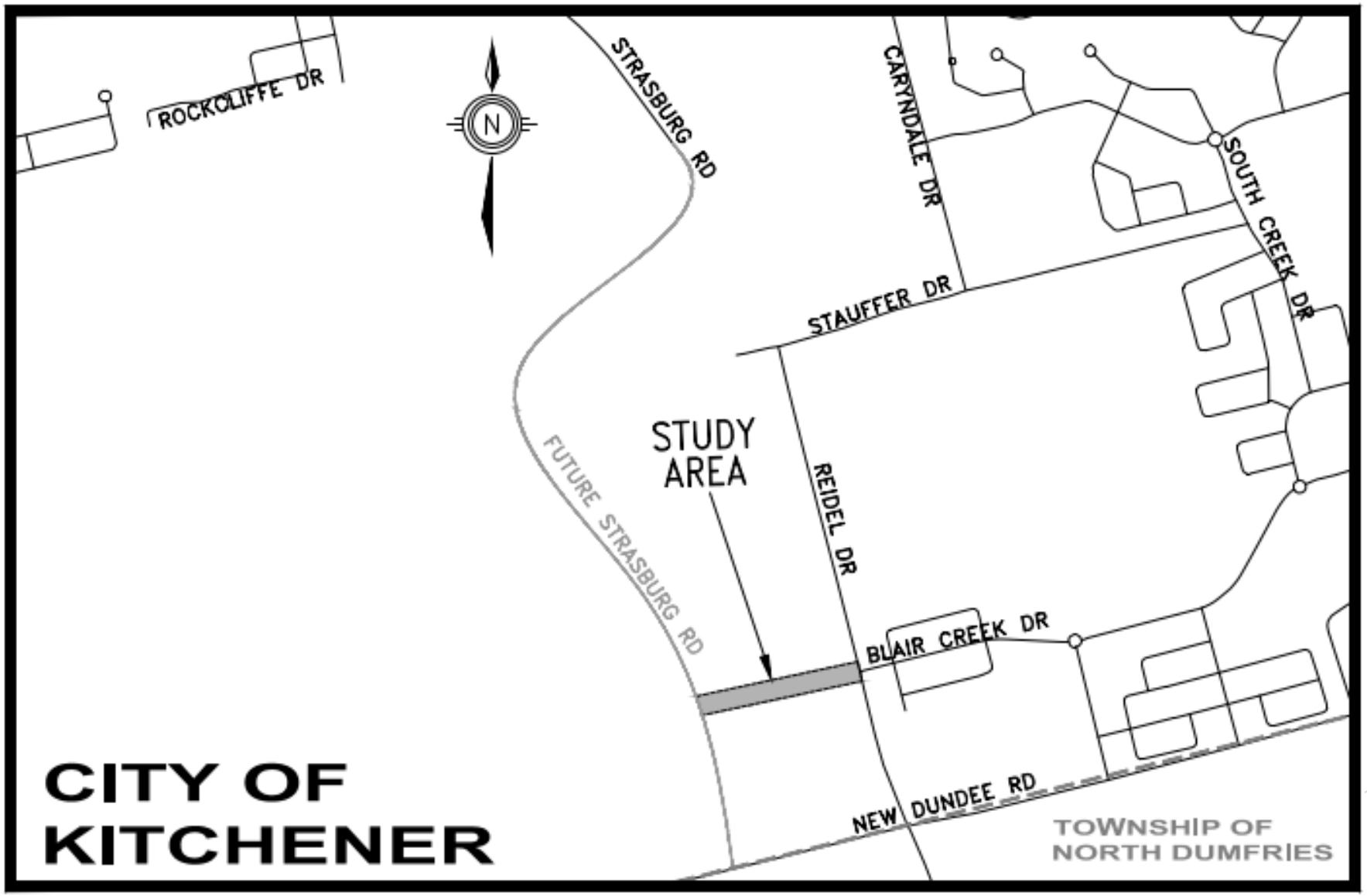
What Problem(s) are being solved?

Each Class EA must have a Problem of Opportunity Statement.

A new City of Kitchener major community collector street is required to provide east-west access and connectivity within the planned new community of Dundee North in southwest Kitchener. The need for this road has been established and is supported by the City of Kitchener Official Plan and Transportation Master Plan. An extension of Blair Creek Drive between Reidel Drive and the future Strasburg Road will allow for multi-modal movement of people and goods between the internal road system and the surrounding area road network. The new road will support Kitchener's vision for Complete Streets by providing a balanced and safe environment for drivers, pedestrians, cyclists and transit users alike. The Blair Creek Drive extension will include on-street parking, cycling facilities, sidewalks and trees to create a functional and aesthetically pleasing streetscape for homes, schools and other properties located along the street.

The purpose of this project is to determine an alignment for the extension of Blair Creek Drive and its intersection with Strasburg Road, along with storm sewer and watermain, to serve planned community growth and associated travel demand.

Blair Creek Drive Extension Study Area



What Studies are being completed?

- Traffic Study
- Natural Environment Report
- Stage 1-3 Archaeological Assessment (by others)
- Built Heritage and Cultural Landscape Assessment
- Geotechnical Investigation

Design Alternatives

Alternative	Description
Do Nothing	• No improvements – do not continue any further with project. • Does not support the developable land uses as identified in the City of Kitchener Official Plan Transportation Master Plan and will not be considered further.
Alternative 1: 24.8m Right-of-Way	• On-road bike lane, 3.2m boulevards and 1.5m sidewalks
Alternative 2: 26m Right-of-Way	• Off-road cycle track, 4m boulevards and 1.8m sidewalks
Alternative 3: 26m Right-of-Way	• On-road, separated bike lane, 3.1m boulevards and 1.8m sidewalks

Evaluation Criteria

Criteria	Description
Natural Environment	• Effects on vegetation, water quality, habitat, wetlands, woodlands, species at risk
Social/Cultural Environment	• Effect on road users' experience (accessibility/equity, safety, traffic operations, etc.) • Impacts to local community (noise, parking, construction, etc.)
Heritage/Archaeological Environment	• Impacts to potential heritage resources (existing buildings/structures or landscapes) • Impacts on archaeological resources
Property Impacts	• Impacts to existing/future land uses
Technical/City Standards	• Feasibility of construction and operation • Space requirements for surface and underground infrastructure • Adherence to existing planning documents
Costs	• Capital and maintenance costs
Climate Change	• Greenhouse gas (GHG) emissions • Stormwater runoff

Evaluation Matrix

Evaluation Criteria	Alternative 1: 24.8m ROW	Alternative 2: 26m ROW + Cycle Track	Alternative 3: 26m ROW + Bike Lane	Do Nothing
Natural Environment				
Social/Cultural Environment				
Heritage/Archaeological Environment				
Property Impacts				
Technical/City Standards				
Costs				
Climate Change				
Preferred	✗	✓	✗	✗

What is the Preferred Alternative and Why

- A curved alignment was eliminated from discussion early on, based on the fact that no natural environment features needed to be avoided.
- Three options of cross-sections for a straight alignment were evaluated
- **Alternative 2** is the preferred alternative:
  - Aligns with City of Kitchener Complete Streets for a Major Community Collector Road
  - Separated cycle tracks are the safest and cater to all ages and abilities of cyclists
  - Widest boulevards allow for tree planting, landscaping/streetscaping and stormwater management

Alternative 1: 24.8m ROW

Pros:

- Cross-section matches the section of Blair Creek Drive east of Reidel Drive
- Most parking
- Narrower right-of-way is less costly to build and maintain

Cons:

- Painted on-road bike lanes with no physical separation from traffic lanes
- Narrower 1.5m sidewalks
- Wider driving lanes encourages higher vehicle speeds

Alternative 2: 26m ROW + Cycle Track

Pros:

- Aligns with City of Kitchener Complete Streets for a Major Community Collector Road
- Separated cycle tracks are the safest and cater to all ages and abilities of cyclists
- Widest boulevards allow for tree planting, landscaping/streetscaping and stormwater management
- Wider sidewalks and narrower driving lanes

Cons:

- Widest right-of-way is most costly to build and maintain

Alternative 3: 26m ROW + Bike Lane

Pros:

- Physical buffer between bike lanes and driving lanes provide higher level of comfort for cyclists, although with minimum separation
- Wider sidewalks and narrower driving lanes

Cons:

- Aligns with City of Kitchener Complete Streets, but is the alternate cross-section for a Major Community Collector Road
- Widest right-of-way is most costly to build and maintain

We Want to Hear From You!

Please provide comments by filling out the comment form or by contacting a member of the Project Team below:

Niall Melanson, C.E.T.
City Project Manager
200 King Street West
Kitchener, Ontario N2G 4G7
Tel: 519-741-2200 ext. 7133
Email: Niall.Melanson@Kitchener.ca

Vince Pugliese, P.Eng.
Consultant Project Manager
520 Bingemans Centre Drive
Kitchener, Ontario N2B 3X9
Tel: 519-743-6500 ext. 1347
Email: VPugliese@mte85.com

To receive updates on the project, request that your name/email be added to the mailing list. These information boards will be posted on the Project Website.

Your input on this study is valuable and appreciated. All information is collected in accordance with the Freedom of Information and Protection of Privacy Act.

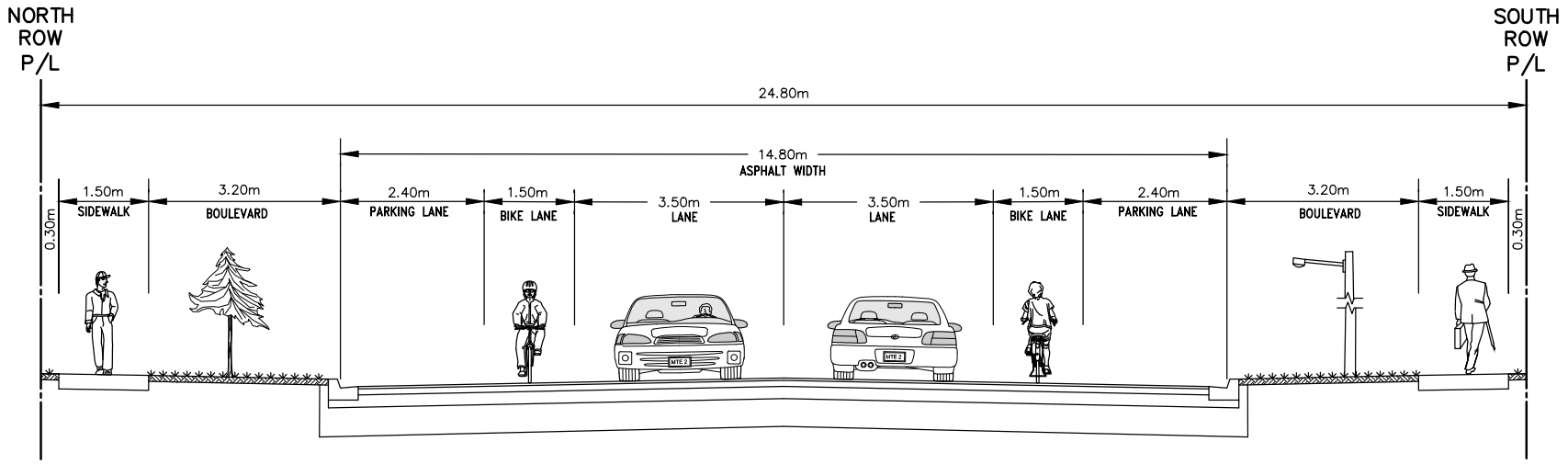
KITCHENER

MTE

Project Website:
https://www.engagewr.ca/hub-page/kitchener

CAD: P:\P\53018\100\53018-100-XS1.DWG

Plot Date: September 18, 2023 - 11:29 AM



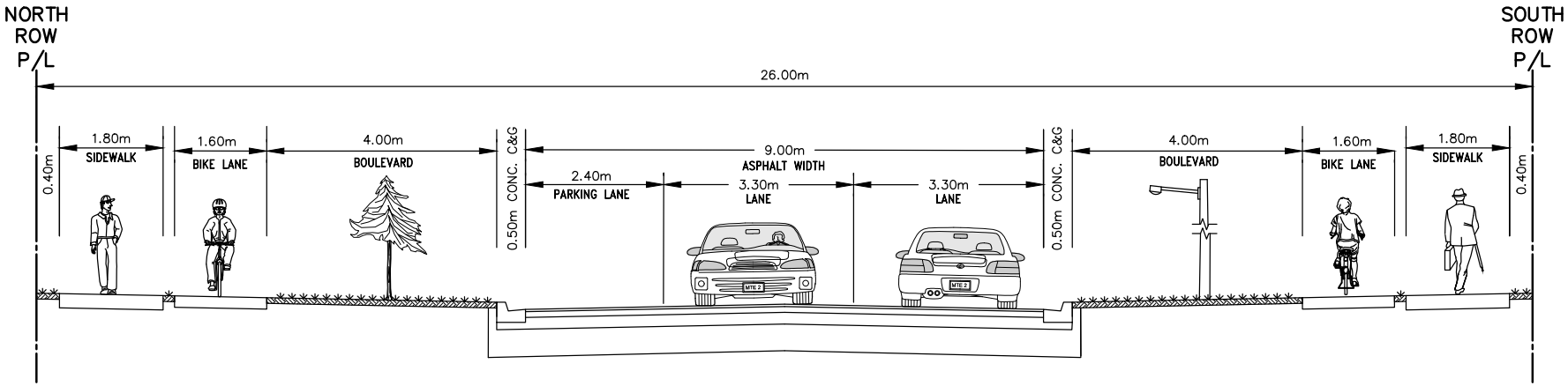
0 0.75 1.5 2.25 3m

MTE
Engineers, Scientists, Surveyors

PROJECT
BLAIR CREEK DRIVE

TITLE
OPTION 1 - 24.8m ROW

Drawn	Scale	Figure
JXD	1:75	**OPTION 1**
Checked	Project No.	
LAD	53018-100	
Date	Rev No.	
2023-09-18	0	



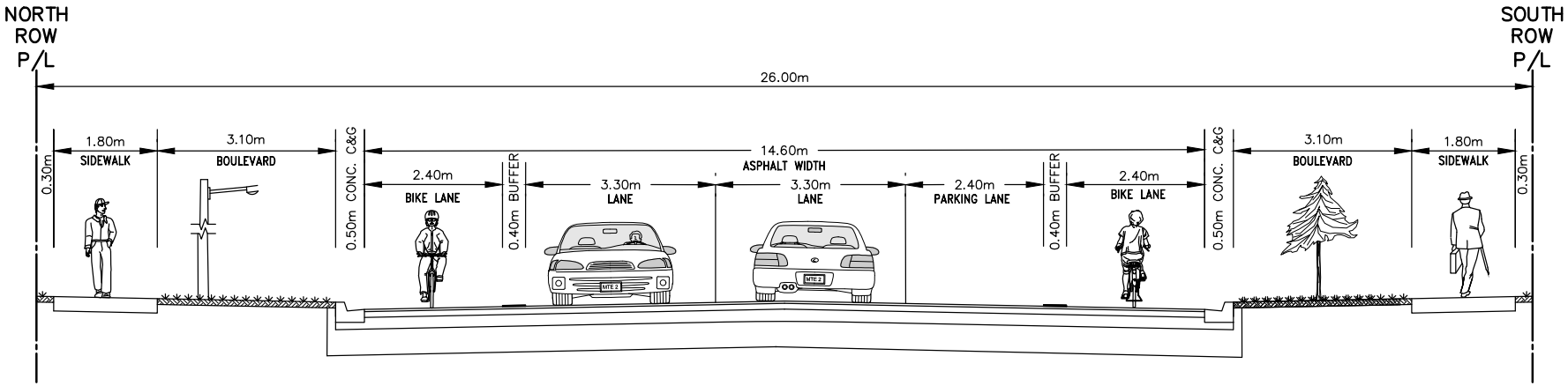
0 0.75 1.5 2.25 3m

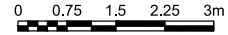
MTE
Engineers, Scientists, Surveyors

PROJECT
BLAIR CREEK DRIVE

TITLE
OPTION 2 - 26.0m ROW

Drawn: JXD	Scale: 1:75	Figure: **OPTION 2**
Checked: LAD	Project No.: 53018-100	
Date: 2023-09-18	Rev No.: 0	



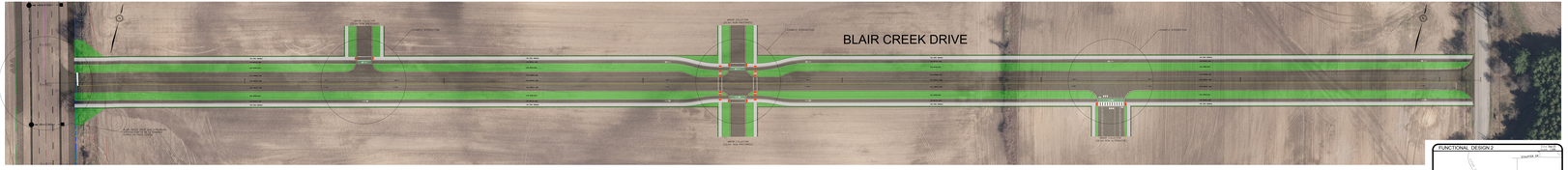


MTE
Engineers, Scientists, Surveyors

PROJECT
BLAIR CREEK DRIVE

TITLE
OPTION 3 - 26.0m ROW

Drawn: JXD	Scale: 1:75	Figure: **OPTION 3**
Checked: LAD	Project No.: 53018-100	
Date: 2023-09-18	Rev No.: 0	



BLAIR CREEK DRIVE
26.0m ROW (OPTION 2)

MTE

Appendix C

Copies of Reports prepared by Consultant and Others

NRSI, September 2023

Natural Environment Report and Tree Inventory

MTE

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

September 12, 2023 Project #3129

Lyndsay Dokas
MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, Ontario N2B 3X9

RE: Blair Creek Drive Extension Class B Environmental Assessment
Natural Environment Report

1.0 Introduction

Natural Resource Solutions Inc. (NRSI) was retained by MTE Consultants Inc. to complete a Natural Environment Report (NER) to support the preliminary design associated with the planned extension of Blair Creek Drive between the future Strasburg Road and the intersection of Reidel Drive and Blair Creek Drive in the City of Kitchener. For the purposes of this report, the "study area" is the area within 120m of the slated Blair Creek Drive extension west of Reidel Drive, and is shown on Map 1.

The study area is characterized by active agricultural fields and hedgerows (Map 1). The study area does not contain any Natural Heritage features as defined by the City of Kitchener's Official Plan (OP) (City of Kitchener 2014). The study area is adjacent to the Regionally Significant Woodland and Provincially Significant Wetland (PSW) (the Roseville Swamp Cedar Creek Wetland Complex) within the Blair Creek Natural Area (City of Kitchener 2014). Both Blair Creek and the Roseville Swamp Cedar Creek Wetland Complex are regulated by the Grand River Conservation Authority (GRCA) (Grand River Conservation Authority 2023).

2.0 Project Scoping

In order to determine the study approach for the NER, existing natural heritage information was gathered and reviewed to identify key natural heritage features and species that are reported from the study area. Agencies were contacted and provided background information for the study area. Correspondence from the GRCA and the Ministry of Natural Resources and Forestry (MNRF) are appended to this report in Appendix I. The MECP was contacted to determine scoping for specific Species at Risk (SAR) surveys. Background information on the natural environmental features within the study area was gathered from the Natural Heritage Information Centre (NHIC) and Land Information Ontario databases (MNRF 2022), and relevant taxa-specific databases, as listed below.

Initial wildlife species lists were compiled to provide information on species reported from the vicinity of the study area using various atlases, including the Ontario Breeding Bird Atlas (BSC et al. 2006), Ontario Mammal Atlas (Dobbyn 1994), the Ontario Reptile and Amphibian Atlas (Ontario Nature 2019), the Ontario Butterfly Atlas (MacNaughton et al. 2022), and the Ontario Odonata Atlas (OOAD 2023). Information was compiled from the 10x10km atlas square that overlaps the subject property (square 17MH47). These initial species lists were used to guide the scope and type of wildlife field surveys required as outlined in the following sections.

Based on these initial species lists, SAR and Species of Conservation Concern (SCC) were identified from the study area. SAR are those listed on the Species at Risk in Ontario List

(MECP 2022) and/or the federal Species at Risk list (Government of Canada 2023). These include species identified by the Committee on the Status of Species at Risk in Ontario (COSSARO) as provincially Endangered, Threatened, or Special Concern. Species listed as Endangered or Threatened are protected by the Endangered Species Act (ESA), 2007 provincially, and aquatic species listed as Endangered or Threatened under the federal *Species at Risk Act* (SARA 2007) which includes protection to their habitat. These are referred to in this report as 'regulated SAR'.

Species considered Special Concern are included in the definition of SCC, which includes the following:

- Species designated provincially as Special Concern;
- Species that have been assigned a conservation status (S-Rank) of S1 to S3 or SH by the Natural Heritage Information Centre; and
- Species that are designated federally as Endangered or Threatened by the Committee for the Status of Endangered Wildlife in Canada (COSEWIC) but not provincially by the COSSARO. These species may be protected by the federal SARA if they are listed as Endangered or Threatened on Schedule 1 of SARA, but are not protected provincially by the ESA.

A preliminary screening exercise was conducted on these species to identify which species may have suitable habitat within the study area (Appendix II). This involved cross-referencing the preferred habitat for reported SAR (OMNR 2000) against habitats known to occur within the study area. This was refined once background information was received from the MNRF and GRCA. This was completed to ensure that the potential presence of all SAR and SCC within the study area was adequately assessed in this NER. The screening was further updated once field surveys were completed on the subject property.

An assessment of the presence of Significant Wildlife Habitat (SWH) was also completed for the study area based on discrete provincial significance criteria (MNRF 2015) and NRSI knowledge of the site conditions (Appendix III). SWH is afforded protection under the Provincial Policy Statement (OMMAH 2020) and municipal natural heritage protection policies. Although the road design is not specifically subject to SWH constraints, they were considered to provide additional information to inform responsible design planning.

3.0 Field Methodology

Based on aerial imagery and a background review, a limited scope of field surveys were undertaken within the study area to characterize any natural features and identify significant and sensitive features and species that have the potential to be impacted by the Blair Creek Drive extension.

3.1 Terrestrial Field Surveys

3.1.1 Vegetation Surveys

Vegetation communities within the study area were mapped and classified following the Ecological Land Classification (ELC) system for southern Ontario (Lee et al. 1998) during both the April 21, 2023 and June 13, 2023 site visits. Details on the vegetation communities were

recorded, including species composition, uncommon species or features, and evidence of human impact.

A two-season vegetation inventory (spring and summer) was conducted in tandem with ELC efforts to record all species of vascular flora within the study area. As the study area is agricultural fields and hedgerows, limited vegetation was expected.

3.1.2 Tree Inventory

A comprehensive inventory of trees ≥10cm Diameter at Breast Height (DBH) within the subject property was completed by NRSI Certified Arborists/Registered Professional Foresters on June 16, 2023. All trees with the potential to be impacted by the proposed road development were identified and assessed as per the City of Kitchener's Tree Management Policy (2002). Inventoried trees were assigned a unique identifier for mapping purposes, and the location of said trees were subsequently surveyed using a mapping grade GPS unit. The following information was recorded for each tree:

- Species;
- Tag number (on-site trees) / alphabetic identifier (boundary or off-site trees);
- DBH measurement (cm);
- Crown radius;
- Number of Stems;
- General health (excellent, good, fair, poor, very poor, dead);
- Potential for structural failure (improbable, possible, probable, imminent);
- Tree location (on-site, boundary, off-site); and
- General comments (i.e., disease, aesthetic quality, development constraints, sensitivity to development).

The potential for structural failure and the overall health of each tree was assessed based on the criteria outlined in Appendix IV. In carrying out these assessments, NRSI has exercised a reasonable standard of care, skill and diligence as would be customarily and normally provided in carrying out these assessments. The assessments have been made using accepted arboricultural techniques including a visual examination of each tree for structural defects, scars, external indications of decay such as fungal fruiting bodies, evidence of insect attack, the condition of any visible root structures, the degree and direction of lean (if any), the general condition of the tree(s) and the surrounding site, and the current or planned proximity of property and people. None of the trees examined on the property were dissected, cored, probed, or climbed and detailed root crown examinations involving excavation were not undertaken. Based on correspondence with the City, an analysis of tree impacts was not completed as part of this undertaking as the City will be preparing the Tree Management Plan report at the 30% design stage. The conditions for this assessment, including restrictions, professional responsibility, and third-party liability can be found in Appendix V.

3.1.3 Bird Survey

Due to the limited features present on site, only one bird survey was completed on June 13, 2023 following the Ontario Breeding Bird Atlas protocol (OBBA 2021). The survey was primarily conducted to confirm habitat for Species at Risk (SAR) and Significant Wildlife Habitat (SWH) species. The entire subject property was walked during the early morning bird survey, and all

visual and auditory observations of birds were recorded as well as the highest level of breeding evidence.

3.1.4 Significant Wildlife Habitat/Species at Risk Habitat Assessment

Assessments of potential SAR habitat and SWH were also completed to refine initial desktop-level screening completed as part of the background review. The SAR assessment for the study area included a leaf-off bat habitat assessment on April 21, 2023. The results of the SAR habitat and SWH assessments are provided in Appendix II and Appendix III, respectively.

The bat habitat assessment was completed based on the guidelines outlined in the Survey Protocol for Species at Risk Bats within Treed Habitats for Little Brown Myotis, Northern Myotis & Tri-Colored Bats (MNRF 2017), Survey Protocol for Maternity Roost Surveys (Forests/Woodlands) (MECP 2022a) and the Bat Survey Standards Note (MECP 2022b).

3.1.5 Additional Wildlife

All observations of mammals, amphibians, and reptiles were documented on all field visits. This included actual direct observations of individuals, as well as signs of wildlife presence (i.e., tracks, scats, dens, nests etc.).

4.0 Existing Conditions

4.1 Designated Natural Areas

No Designated Natural Areas are present within the study area. Map 1 shows a sliver of the Roseville Swamp Cedar Creek Wetland Complex and associated wooded area at the northeast extent however aerial imagery does not show any natural features (i.e. features are greater than 120m away).

4.2 Terrestrial Features

4.2.1 Vegetation Communities and Vascular Flora

There were no vegetation communities identified by NRSI biologists within the study area. The only areas of vegetation present on the subject property are two hedgerows and agricultural fields planted with Soy beans (*Glycine max)*.

The wooded area shown on Map 1, just east of Reidel Drive, had been removed prior to commencing the field investigations. The majority of the trees associated with the dwelling in the subject property had also previously been removed.

4.2.2 Tree Inventory

In total, nine trees were inventoried, including three species. Of the trees inventoried and assessed, seven (77.8%) are native and two (22.2%) are non-native. Some trees along the western boundary of the study area had been tagged prior NRSI staff arriving on-site. Appendix VI provides a list of tree species inventoried and outlines whether they are native or non-native and their overall health. Tree locations are shown on Map 2.

4.2.3 Vascular Flora

A total of 23 species were identified within the subject property during the field investigations, including 12 invasive species (approximately 52%). None of the species observed are considered significant. A complete list of the species observed can be found in Appendix VII.

4.2.4 Birds

In total, 103 bird species are reported from within 10km of the study area based on the Ontario Breeding Bird Atlas (OBBA) (BSC et al., 2006). A total of 13 common species were documented within the subject property during site investigations, and none of the species observed are considered significant. There is no suitable habitat present on-site to support significant species. A complete list of the species observed can be found in Appendix VII.

4.2.5 Herpetofauna

The Ontario Reptile and Amphibian Atlas (ORAA 2019), GRCA, and NHIC identified a total of 25 herpetofauna species to have been reported within the general vicinity (up to 10km) of the study area. Of these 25 species, five are considered to be significant (two SCC and three SAR). All 5 of these species were screened out as there was no suitable habitat identified on the subject property during field surveys. No herpetofauna species-specific surveys were conducted within the subject property due to the lack of suitable habitat. A complete list of the species observed can be found in Appendix VII.

4.2.6 Mammals

According to the Mammal Atlas of Ontario (1994) and the NHIC (2023), 46 species of mammals are reported within the vicinity of the subject property. No mammal species were documented within the subject property during field surveys. A complete list of the species observed can be found in Appendix VII.

Bat Habitat Assessment

A total of four candidate bat roost trees were documented within the hedgerows during the habitat assessment (Map 2).

4.2.7 Butterflies

According to the Ontario Butterfly Atlas, 75 butterfly species are reported from the study area (MacNaughton et al., 2023). One of these, the Monarch Butterfly is considered to be a significant species.

NRSI biologists did not observe any butterfly species during the field investigations. The Monarch host plant, Common Milkweed (*Asclepias syriaca*) was identified as being present within the subject property, but there was no suitable habitat present as the Common Milkweed was scattered individual plants. A complete list of the species observed can be found in Appendix VII.

4.2.8 Damselflies and Dragonflies

According to the Ontario Odonata Atlas (2023), seven odonate species are reported from the study area. NRSI biologists did not document any within the subject property and none of the dragonfly or damselfly species identified through background information sources were SAR or SCC. A complete list of the species observed can be found in Appendix VII.

4.3 Potential Significant Habitats

4.3.1 Provincially Significant Species and their Habitats

Based on the results of background information review, several provincially significant species were identified as having occurrence records in the general vicinity (i.e., within up to 10km) of the subject property. This information was based on publicly-available records provided by the NHIC (MNRF 2023) as well as through review of wildlife atlases for birds, amphibians and

reptiles, mammals, butterflies, and odonates (dragonflies and damselflies) and correspondence with the GRCA (BSC et al., 2006, Ontario Nature 2019, Dobbyn 1994, Macnaughton et al. 2023, OOAD 2023, GRCA 2023).

Based on the results of the background information review and NRSI biologist knowledge of the habitats present within the study area, three species that are regulated under the *Endangered Species Act* (ESA) may occur within the study area:

- Little Brown Myotis (*Myotis lucifungus*);
- Northern Myotis (*Myotis septentrionalis*); and,
- Tri-colored Bat (*Perimyotis subflavus*).

The bat SAR are not expected to be negatively impacted by the future infrastructure, as only two of the four candidate trees containing potentially suitable roosting features were identified within the Blair Creek Drive extension area, which are expected to require removal to accommodate the road works (Map 3). Additional potential roost trees may also exist within the hedgerow that would have been assessed as part of the Strasburg Road EA. Removal of two candidate SAR bat roost trees is considered to represent a proportionally small and negligible impact in the local landscape, and removal of these trees outside of the bat active period of April 1 to September 30 (i.e., removal between October 1 and March 31) will avoid impacts to SAR bats (MECP 2022).

No other SAR or SCC were documented within the subject property, or have habitat within the study area. The complete SAR and SCC habitat assessment is provided in Appendix II.

4.3.2 Potential Significant Wildlife Habitat

During the site investigations, NRSI biologists evaluated the potential for SWH types to be present within the property. No evidence of seasonal concentrations areas, rare vegetation communities, specialized wildlife habitat, habitat for species of conservation concern or animal movement corridors was documented from the Blair Creek Drive extension subject property or as being present within the study area.

The complete SWH assessment is provided in Appendix III.

5.0 Natural Heritage Policy Implications and Development Constraints

The only significant natural features and ecological function that occurs within the study area is the Potential for SAR habitat.

Development or site alteration within SAR habitat is prohibited unless permitted or authorized by the MECP in accordance with the ESA. Similarly, federally listed SAR are protected under the SARA.

Based on the preliminary assessment of natural features, only two candidate maternity roost trees for SAR bats are present within the Blair Creek Drive extension, which is considered a proportionally small amount of habitat in the local landscape. Otherwise, no SAR habitat has been documented within the existing area slated for the Blair Creek Drive extension, but may be present within the broader study area. These potential adjacent SAR habitats will not be impacted by the undertaking, and no permitting or authorization under the ESA will be required.

Similarly, no SWH has been identified within the area slated for the Blair Creek Drive extension. Candidate SWH may be present in the properties surrounding the study area, specifically the Roseville Swamp Cedar Creek Wetland Complex and Blair Creek; however these features are well removed from the proposed road construction activities and impacts to these features are considered unlikely.

6.0 Preliminary Impact Assessment

6.1 Terrestrial Features

No direct impacts are expected to significant or sensitive features as there were none identified within the subject property.

The proposed undertaking may result in the removal of a small number of trees, as well as two candidate bat roost trees.

The following measures are general recommendations to avoid or minimize potential direct impacts to the limited natural features outside of the subject property (i.e., hedgerow that runs north-south at edge of subject property).

- All vegetation and tree removal is to be be completed outside of the peak breeding bird period (approximately April 1 - August 31) in accordance with the Migratory Bird Convention Act (MBCA) to avoid impacts to breeding birds;
- The identified candidate bat maternity roost trees are to be removed outside the active bat roosting period (May 1 - September 30) to avoid potential impacts to roosting SAR bats;
- Standard Erosion and Sediment Control (ESC) measures should be implemented to maintain equipment and site works within the limit of construction;
- Dust control measures should be implemented as appropriate to limit dust settling on any adjacent vegetation/trees being retained.

7.0 Summary

NRSI was retained by MTE Consultants Inc. to complete a NER associated with the proposed extension of Blair Creek Drive. Based on review of background natural heritage information for the study area, in conjunction with the terrestrial field surveys, it has been determined that there are limited constraints to development. As proposed construction is primarily contained within an agricultural field, it is not anticipated that there will be negative impacts, as all natural heritage features are located 120m or greater in distance away.

8.0 References

Bird Studies Canada (BSC), Environment Canada's Canadian Wildlife Service, Ontario Nature, Ontario Field Ornithologists and Ontario Ministry of Natural Resources. 2008. Ontario Breeding Bird Atlas Database. http://www.birdsontario.org/atlas/aboutdata.jsp?lang=en

City of Kitchener. 2002. Tree Management Policy I-1160. February 28, 2002.

City of Kitchener. 2010. Tree Conservation Bylaw. April 2010.

City of Kitchener. 2014. City of Kitchener Official Plan. https://www.kitchener.ca/en/development-and-construction/official-plan.aspx

City of Kitchener. 2014. City of Kitchener Natural Heritage System Technical Background Report. https://www.kitchener.ca/en/resourcesGeneral/Documents/DSD_PLAN_Natural_Heritage_Systems_Background_Report.pdf

Dobbyn, J.S. 1994. Atlas of the Mammals of Ontario. Don Mills, Federation of Ontario Naturalists.

Dunster, J.A. 2009. Tree Risk Assessment in Urban Areas and the Urban/Rural Interface: Course Manual. Silverton, Oregon: Pacific Northwest Chapter, International Society of Arboriculture.

Dunster, J.A., E.T. Smiley, N. Matheny, and S. Lily. 2013. Tree Risk Assessment Manual. Champaign, Illinois: International Society of Arboriculture.

Government of Canada. 1994. *Migratory Birds Convention Act*. Last updated December 12, 2017. https://laws-lois.justice.gc.ca/eng/acts/M-7.01/page-1.html

Government of Canada. 2018. General nesting periods of migratory birds. Updated: October 30, 2018. Available: https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods.html

Government of Canada. 2023. Species at Risk Public Registry: Species Search. COSEWIC Last Assessment Date: 2023-06-13. Available: https://species-registry.canada.ca/index-en.html#/species?sortBy=commonNameSort&sortDirection=asc&pageSize=10

Grand River Conservation Authority. 2023. GRCA Web Map. https://maps.grandriver.ca/web-gis/public/?theme=General&bbox=540740,4799278,550498,4805616

Lee, H.T., W.D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig and S. McMurray. 1998. Ecological Land Classification for Southern Ontario: First Approximation and its Application. Ontario Ministry of Natural Resources, Southcentral Science Section, Science Development and Transfer Branch. SCSS Field Guide FG-02.

Macnaughton, A., R. Layberry, C. Jones and B. Edwards. 2023. Ontario Butterfly Atlas Online. http://www.ontarioinsects.org/atlas_online.htm. Updated January 2023.

Ontario Ministry of the Environment, Conservation, and Parks (MECP). 2023. O. Reg. 230/08: Species at Risk in Ontario List. Available: https://www.ontario.ca/laws/regulation/080230

Ontario Ministry of the Environment, Conservation, and Parks (MECP). 2022. Species at Risk Bats Survey Note 2022. 3pp.

Ontario Ministry of Municipal Affairs and Housing (OMMAH). 2020. Provincial Policy Statement. Approved by the Lieutenant Governor in Council, Order in Council No. 229/2020.

Ontario Ministry of Natural Resources (OMNR). 2000. Significant Wildlife Habitat Technical Guide. October 2000.

Ontario Ministry of Natural Resources (OMNR). 2010. Natural Heritage Reference Manual for Policies of the Provincial Policy Statement, Second Edition. March 18, 2010.

Ontario Ministry of Natural Resources (OMNR). 2011. Bats and Bat Habitats: Guidelines for Wind Power Projects. First edition. July, 2011.

Ontario Ministry of Natural Resources and Forestry (MNRF). 2015. Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E. January 2015.

Ontario Ministry of Natural Resources and Forestry (MNRF). 2017. Survey Protocol for Species at Risk Bats Within Treed Habitats: Little Brown Myotis, Northern Myotis & Tri-colored Bat. April 2017. Ontario Ministry of Natural Resources and Forestry, Guelph District.

Ontario Ministry of Natural Resources and Forestry (MNRF). 2023. Natural Heritage Information Centre (NHIC): Make a Natural Heritage Area Map Application. Published: 2014-07-17. Accessed May 2023. Available: https://www.ontario.ca/page/make-natural-heritage-area-map

Ontario Nature. 2019. Reptiles and Amphibians of Ontario Range Maps. http://www.ontarioinsects.org/herpatlas/herp_online.html.

Ontario Odonata Atlas Database (OOAD). 2023. Natural Heritage Information Centre, Ontario Ministry of Natural Resources and Forestry. Species list from atlas squares 17PJ76 queried on April 20, 2023 by C.D. Jones.

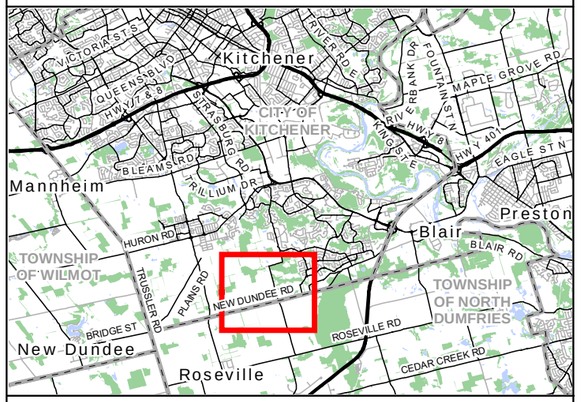
Watt, R.W. and M.C. Caceres. 1999. Managing for Snags in the Boreal Forests of Northeastern Ontario. OMNR. Northeast Science and Technology. Technical Note- 016. 20p.

Maps

Map 1

Blair Creek Drive Extension EA

Study Area and Designated Significant Natural Features



542500 543000 543500 544000 544500 545000 545500

4802500 4802000 4801500 4801000 4800500

CARYNDALE DR
STAUFFER DR
ELMBANK TRL
SOUTH CREEK DR
MEADOWRIDGE ST
MOORLANDS CRES
FENSIDE ST
SEDGEWOOD ST
TALLGRASS CRES
THOMAS SLEE DR
Roseville Swamp
Cedar Creek
Wetland Complex
Blair Creek
BLAIR CREEK DR
PINE WARBLER ST
STAUFFER WOODS TRAIL
SHADED CREEK DR
DODGE DR
JACOB DETWEILER DR
WINTERGREEN CRES
BLAIR VALLEY DR
REIDEL DR
NEW DUNDEE RD
CAMERON RD
Roseville Swamp

Legend

- Study Area (120m)
- Road Way
- Parcel Boundary
- Utility Line
- Primary Road
- Secondary Road
- Permanent Watercourse
- Intermittent Watercourse
- Water Body
- Provincially Significant Wetland (PSW)
- Unevaluated Wetland
- Wooded Area
- ANSI, Life Science

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Project: 3129 Date: June 13, 2023	NAD83 - UTM Zone 17 Size: 11x17" **1:10,000**

0 200 400 600 Metres

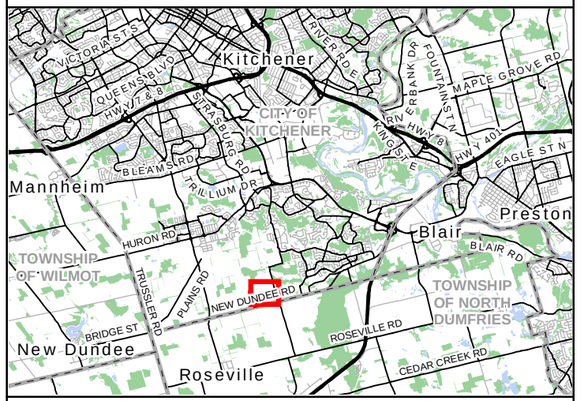
N

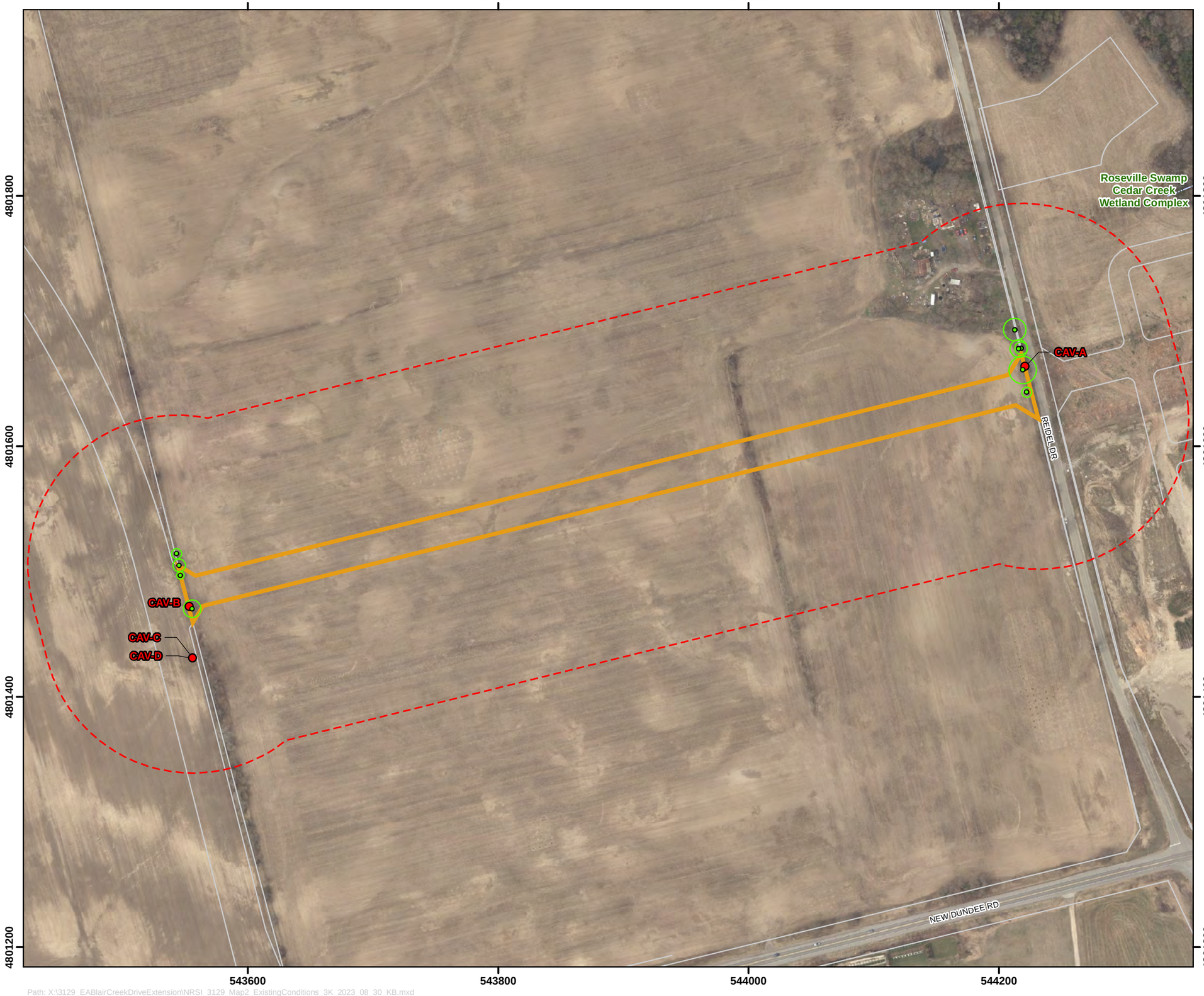
Path: X:\3129_EABlairCreekDriveExtension\NRSI_3129_Map1_StudyArea_SigNatFeatures_10K_2023_06_12_KEF.mxd

Map 2

Blair Creek Drive Extension EA

Existing Conditions





Legend

- Study Area (120m)
- Road Way
- Parcel Boundary
- Inventoried Tree (Crown to Scale)
- Bat Habitat (CAV)
- Intermittent Watercourse

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Project: 3129 Date: August 30, 2023	NAD83 - UTM Zone 17 Size: 11x17" **1:3,000**

0 40 80 120 160 200 Metres

N

Path: X:\3129_EABlairCreekDriveExtension\NRSI_3129_Map2_ExistingConditions_3K_2023_08_30_KB.mxd

Appendix I
Agency Correspondence

Subject: RE: Background Information Request - Blair Creek Drive Extension, Kitchener ON
From: Chris Foster-Pengelly <cfosterpengelly@grandriver.ca>
Date: 2023-06-23, 11:30 a.m.
To: Gina MacVeigh <gmacveigh@nrsi.on.ca>
CC: "ekrauss@nrsi.on.ca" <ekrauss@nrsi.on.ca>

Hi Gina,

Please find below the background that the GRCA has in the Blair Creek Drive Extension Study Area:

1. No watercourse is mapped within the 120 m study area.
2. Species of concern with records nearby include:
    - Snapping Turtle (*Chelydra serpentina*)
    - Midland Painted Turtle (*Chrysemys picta marginata*)
    - Butternut (*Juglans cinerea*)
    - Jefferson Salamander (*Ambystoma jeffersonianum*)
    - Unisexual Ambystoma (Jefferson Salamander dependent population) -Ambystoma hybrid pop. 1.
3. A unit of the Roseville Swamp Cedar Creek Provincially Significant Wetland appears to be mapped just within the eastern end of the 120 m study area.
4. No ANSIs within 120 m of study area.
5. No mapped wildlife habitat values within 120 m of the study area.

Thank you,
Chris

Chris Foster-Pengelly, M.Sc.
Office: 519-621-2763 ext. 2319
Toll-free: 1-866-900-4722
www.grandriver.ca | Connect with us on social media

From: Permits <permits@grandriver.ca>
Sent: Wednesday, June 14, 2023 3:29 PM
To: Chris Foster-Pengelly <cfosterpengelly@grandriver.ca>
Subject: FW: Background Information Request - Blair Creek Drive Extension, Kitchener ON

From: Grand River Conservation Authority <grca@grandriver.ca>
Sent: Wednesday, June 14, 2023 2:27 PM
To: Permits <permits@grandriver.ca>
Subject: FW: Background Information Request - Blair Creek Drive Extension, Kitchener ON

From: Gina MacVeigh <gmacveigh@nrsi.on.ca>
Sent: Wednesday, June 14, 2023 11:15 AM
To: Grand River Conservation Authority <grca@grandriver.ca>
Cc: Eve Krauss <ekrauss@nrsi.on.ca>
Subject: Background Information Request - Blair Creek Drive Extension, Kitchener ON

Good afternoon,

I am submitting a request for background information regarding the extension of Blair Creek Drive in Kitchener, ON. NRSI will be carrying out scoped field surveys in support of a Class EA (exempt/A) associated with the extension. Please see attached for a formal background information request letter, including a map of the study area.

At this time, we are requesting any further information on Species at Risk or other natural heritage features that may not have been previously identified within the preliminary background information collection. If any additional information is required at this time, please let me know.

Thank you in advance,

Gina
--

Gina MacVeigh F.W.T. (she/her)
Senior Aquatic Biologist
Natural Resource Solutions Inc.
415 Phillip Street, Unit C
Waterloo, ON N2L 3X2
(p) 519-725-2227 Ext. 405 (f) 519-725-2575
(m) 226-448-9734
(w) www.nrsi.on.ca (e) gmacveigh@nrsi.on.ca
@nrsinews Natural Resource Solutions Inc.
Over 20 years of environmental consulting excellence

Subject: RE: Background Information Request - Blair Creek Drive Extension, Kitchener ON
From: "Denyes, David (MNRF)" <David.Denyes@ontario.ca>
Date: 2023-06-14, 3:22 p.m.
To: Gina MacVeigh <gmacveigh@nrsi.on.ca>
CC: "ekrauss@nrsi.on.ca" <ekrauss@nrsi.on.ca>

Hello Gina,

Thank you for your request for information on natural heritage features.

I've reviewed our records and note that we don't have any additional information to provide for the identified study area.

Absence or lack of information for a given geographic area does not necessarily mean the absence of natural heritage features. Many areas in Ontario have never been surveyed and new plant and animal species records are still being discovered for many localities. In addition, new species may be listed and new natural heritage features may be defined over time. For these reasons, the Ministry cannot provide a definitive statement on the presence, absence or condition of natural heritage features in all parts of Ontario.

Regards,

David

David Denyes
Management Biologist
Ministry of Natural Resources and Forestry
Vineland Field Office
4890 Victoria Avenue North
Vineland Station ON, L0R 2E0
Tel: (289) 241-6872
david.denyes@ontario.ca

From: Gina MacVeigh <gmacveigh@nrsi.on.ca>
Sent: Wednesday, June 14, 2023 11:23 AM
To: Scientific Collection Permits Guelph (MNRF) <scp.guelph@ontario.ca>
Cc: Eve Krauss <ekrauss@nrsi.on.ca>
Subject: Background Information Request - Blair Creek Drive Extension, Kitchener ON

Good afternoon,

I am submitting a request for background information regarding the extension of Blair Creek Drive in Kitchener, ON. NRSI will be carrying out scoped field surveys in support of a Class EA associated with the extension. Please see attached for a formal background information request letter, including a map of the study area.

At this time, we are requesting any further information on Species at Risk or other natural heritage features that may not have been previously identified within the preliminary background information

collection. If any additional information is required at this time, please let me know.

Thank you in advance,

Gina
--

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Appendix II

Species at Risk and Species of Conservation Concern Habitat Screening

Species at Risk (SAR) and Species of Special Concern (SCC) Screening Table

Common Name	Scientific Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	NRSI Observed	Habitat Source	Habitat Preference	Suitable Habitats within Study Area	Carried Forward to EIS?	Rationale
Vascular Plants												
Butternut	*Juglans cinerea*	S2?	END	E	E	Schedule 1		Michigan Flora Online (A. A. Reznicek, E. G. Voss, & B. S. Walters. 2011)	Stream banks and swamps, as well as upland beech-maple, oak-hickory, and mixed hardwood stands.	No	No	Suitable habitat is not present within the study area. Vegetation inventory completed within the subject property and none were identified.
Scarlet Beebalm	*Monarda didyma*	S3						Lester, Randall K. and John Vandevender (2015)	Often found along stream banks, thickets, road edges, and at the borders of woodland openings.	No	No	Suitable habitat is not present within the study area. Vegetation inventory completed within the subject property and none were identified.
Reptiles and Amphibians												
Snapping Turtle	*Chelydra serpentina*	S4	SC	SC	SC	Schedule 1		Species at Risk in Ontario (MECP 2022)	Slow-flowing rivers and streams, lakes, and permanent or semi-permanent wetlands with soft substrates and vegetation. Key habitat requirements: open areas with structures for basking, open sand or gravel areas for nesting, shallow areas with soft substrates to bury in, soft banks or substrates for hibernation.	No	No	Though open areas of sand are present within the subject property, these areas are active agricultural land and are not considered suitable habitat. No watercourses or features present within 120m of the subject property.
Midland Painted Turtle	*Chrysemys picta marginata*	S4		SC	SC	Schedule 1		COSEWIC (2018)	Slow moving, relatively shallow and well-vegetated wetlands and water bodies with abundant basking sites and organic substrate.	No	No	Though open areas of substrate are present within the subject property, these areas are active agricultural land and are not considered suitable habitat. No watercourses or features present within 120m of the subject property.
Blanding's Turtle (Great Lakes / St. Lawrence population)	*Emydoidea blandingii*	S3	THR	E	E	Schedule 1		Recovery Strategy for the Blanding's Turtle (MECP 2019)	Eutrophic, shallow wetlands such as marshes, ponds, swamps, bogs, fens, or coastal wetlands, with soft, muddy substrates, abundant aquatic vegetation, and basking structures (logs, stumps, hummocks). Large overland movements occur between aquatic habitats and to open sandy or gravelly areas for nesting. Forest habitat is important for upland movements. Overwintering typically occurs in permanent wetlands.	No	No	Though open areas of sand are present within the subject property, these areas are active agricultural land and are not considered suitable habitat. No watercourses or features present within 120m of the subject property.
Milksnake	*Lampropeltis triangulum*	S4	NAR	SC	SC	Schedule 1		Significant Wildlife Habitat Technical Guide: Appendix G (OMNR 2000)	Farmlands, meadows, hardwood or aspen stands; pine forest with brushy or woody cover; river bottoms or bog woods; hides under logs, stones, or boards or in outbuildings; often uses communal nest sites.	No	No	Though there is agricultural land within the study area, there is no hibernaculum or areas of suitable cover present. No features suitable for a hibernaculm were identified within the field investigations.
Northern Ribbonsnake	*Thamnophis sauritus septentrionalis*	S4	SC	SC	SC	Schedule 1		Significant Wildlife Habitat Technical Guide: Appendix G (OMNR 2000)	Sunny grassy areas with low dense vegetation near bodies of shallow permanent quiet water; wet meadows grassy marshes or sphagnum bogs; borders of ponds, lakes or streams; hibernates in groups.	No		Suitable habitat is not present within the study area.
Jefferson Salamander	*Ambystoma jeffersonianum*	S2	END	E	E	Schedule 1		Recovery Strategy for the Jefferson Salamander (Linton, J, J. McCarter & H. Fotherby)	Large deciduous or mixed forest containing, or in close proximity to, suitable breeding ponds which include fishless vernal pools or wetlands with suitable hydroperiod for larval development (was present until Aug/Sept). Habitats must contain shelter features including leaf litter, woody debris, rocks, logs, or stumps. Hibernation sites are underground in mammal burrows, root systems, or crevices or fissures in rocks.	No	No	Suitable habitat is not present within the study area. Although this species has been identified within the Blair Creek corridor/PSW, no features are present within the study area to support this species or to act as a travel corridor.

Common Name	Scientific Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	NRSI Observed	Habitat Source	Habitat Preference	Suitable Habitats within Study Area	Carried Forward to EIS?	Rationale
Unisexual Ambystoma (Jefferson Salamander-dependent population)	*Ambystoma laterale - (2) jeffersonianum*	S2	END	E	E	Schedule 1		Species at Risk in Ontario (MECP 2022)	Unisexual Ambystoma salamanders live in leaf litter, under logs and in underground cavities in deciduous and mixed forests, typically within close proximity to breeding habitats. Adults breeds in vernal pools (temporary woodland ponds) or fish-free permanent wetlands. They lay their eggs in clumps attached to underwater vegetation in shallow water. The eggs hatch into aquatic larvae after about one month, and the larvae transform into juveniles by the end of summer. The juveniles leave the pond and head into the surrounding forest. Unisexual Ambystoma salamanders spend the winter underground where they can get below the frost line and avoid freezing temperatures, such as in mammal burrows, rock crevices or other underground cavities. Although these salamanders spend much of the year underground or under cover, they can often be observed in early spring when they travel to breeding sites.	No	No	Suitable habitat is not present within the study area. Although this species has been identified within the Blair Creek corridor/PSW, no features are present within the study area to support this species or to act as a travel corridor.
Western Chorus Frog (Great Lakes / St. Lawrence - Canadian Shield population)	*Pseudacris triseriata pop. 2*	S4	NAR	T	T	Schedule 1		Significant Wildlife Habitat Technical Guide: Appendix G (OMNR 2000)	Roadside ditches or temporary ponds in fields; swamps or wet meadows; woodland or open country with cover and moisture; small ponds and temporary pools ponds and temporary pools.	No	No	Suitable habitat is not present within the study area. No vernal pools or swamp areas present within the study area.
Mammals												
Eastern Small-footed Myotis	*Myotis leibii*	S2S3	END					Species at Risk in Ontario (MECP 2022)	Roosts in caves, mine shafts, crevices or buildings that are in or near woodland. Hibernates in cold dry caves or mines. Maternity colonies in caves or buildings. Hunts in forests.	No	No	Suitable habitat is not present within the study area.
Little Brown Myotis	*Myotis lucifugus*	S3	END	E	E	Schedule 1		Recovery Strategy for the Little Brown Myotis, Northern Myotis and Tri-colored Bat in Ontario (Humphrey, C. & H. Fortherby. 2019)	Uses caves, quarries, tunnels, hollow trees or buildings for roosting. Winters in humid caves. Maternity sites in dark warm areas such as attics and barns. Feeds primarily in wetlands and forest edges.	Yes	Yes	Isolated candidate roost trees were identified within the subject property and have been further discussed in the NER.
Northern Myotis	*Myotis septentrionalis*	S3	END	E	E	Schedule 1		Recovery Strategy for the Little Brown Myotis, Northern Myotis and Tri-colored Bat in Ontario (Humphrey, C. & H. Fortherby. 2019)	Roosts in houses and man-made structures but prefers hollow trees or under loose bark. Hibernates in mines or caves. Hunts within forest, below the canopy.	Yes	Yes	Isolated candidate roost trees were identified within the subject property and have been further discussed in the NER.
Tri-colored Bat	*Perimyotis subflavus*	S3?	END	E	E	Schedule 1		Recovery Strategy for the Little Brown Myotis, Northern Myotis and Tri-colored Bat in Ontario (Humphrey, C. & H. Fortherby. 2019)	Roosts and maternity colonies in older forests and occassionally in barns or other sturctures. Forage over water and along streams in the forest. Hibernate in caves.	Yes	Yes	Isolated candidate roost trees were identified within the subject property and have been further discussed in the NER.
Woodland Vole	*Microtus pinetorum*	S3?	SC	SC	SC	Schedule 1		Species at Risk in Ontario (MECP 2022)	Mature deciduous forest in the Carolinian region where there is a deep litter layer that allows it to burrow.	No	No	Suitable habitat is not present within the study area.
American Badger (Southwestern Ontario population)	*Taxidea taxus jacksoni*	S1	END	E	E	Schedule 1		Significant Wildlife Habitat Technical Guide: Appendix G (OMNR 2000)	Open grasslands and oak savannahs; dens in new hole or enlarged existing hole; sometimes makes food caches	No	No	Suitable habitat is not present within the study area.
Butterflies												
Black Dash	*Euphyes conspicua*	S3						North American Butterfly Association (n.d.)	Sedgy marshes, fens, and wet meadows.	No	No	Suitable habitat is not present within the study area.
Hackberry Emperor	*Asterocampa celtis*	S3						Butterflies and Moths of North America (n.d.)	Wooded streams, forest glades and river edges, wooded roadsides and towns.	No	No	Suitable habitat is not present within the study area.
Tawny Emperor	*Asterocampa clyton*	S3						Butterflies and Moths of North America (n.d.)	Densely wooded riparian areas, dry woods, open woods, cities, fencerows and parks.	No	No	Suitable habitat is not present within the study area.

Common Name	Scientific Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	NRSI Observed	Habitat Source	Habitat Preference	Suitable Habitats within Study Area	Carried Forward to EIS?	Rationale
Monarch	*Danaus plexippus*	S2N,S4B	SC	E	SC	Schedule 1		Species at Risk in Ontario (MECP 2022)	Adults found in a diversity of habitats with a variety of wildflowers. Caterpillars are confined to meadows and open areas where milkweeds grow (larval food plants).	No	No	Suitable habitat is not present within the study area. Although a few scattered individual Common Milkweed plants were observed within the subject property, no Monarchs were observed, and the scattered Common Milkweed plants would not provide suitable habitat.
Odonates												

Reference List

A. A. Reznicek, E. G. Voss, & B. S. Walters. Michigan Flora Online. University of Michigan. Published: February 2011. Available: https://michiganflora.net/browse.aspx.

Butterflies and Moths of North America, (n.d.). Hackberry Emporer. https://www.butterfliesandmoths.org/species/Asterocampa-celtis

Butterflies and Moths of North America. (n.d.) Tawny Emporer. https://www.butterfliesandmoths.org/species/Asterocampa-clyton#:~:text=Tawny%20Emperors%20almost%20never%20visit,New%20Mexico%2C%20and%20southeastern%20Arizona.

COSEWIC. 2018. COSEWIC assessment and status report on the Midland Painted Turtle Chrysemys picta marginata and the Eastern Painted Turtle Chrysemys picta picta in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xvi + 107 pp. (http://www.registrelepsararegistry.gc.ca/default.

Government of Canada. 2022. Species at Risk Public Registry: Species Search. COSEWIC Last Assessment Date: 2022-05-11. Available: https://species-registry.canada.ca/index-en.html#/species?sortBy=commonNameSort&sortDirection=asc&pageSize=10

Humphrey, C. and H. Fotherby. 2019. Recovery Strategy for the Little Brown Myotis (Myotis lucifugus), Northern Myotis (Myotis septentrionalis) and Tri-colored Bat (Perimyotis subflavus) in Ontario. Ontario Recovery Strategy Series. Prepared by the Ministry of the Environment, Conservation and Parks, Peterborough

Lester, Randall K. and John Vandevender. 2015. Plant Guide for scarlet beebalm (Monarda didyma). USDANatural Resources Conservation Service, Appalachian Plant Materials Center, Alderson, WV 24910.

Linton, J, J. McCarter and H. Fotherby 2018. Recovery Strategy for the Jefferson Salamander (Ambystoma jeffersonianum) and Unisexual Ambystoma (Jefferson Salamander dependent population) (Ambystoma laterale - (2) jeffersonianum) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Mi

Ministry of Northern Development, Mines, Natural Resources and Forestry (NDMNRF). 2022. Natural Heritage Information Centre (NHIC): Species List for Ontario. Published: 2014-07-17. All Species List Updated: 2022-04-11. Available: https://www.ontario.ca/page/get-natural-heritage-information

Ministry of the Environment, Conservation and Parks. 2019. Recovery Strategy for the Blanding's Turtle (Emydoidea blandingii) in Ontario. Ontario Recovery Strategy Series. Prepared by the Ministry of the Environment, Conservation and Parks, Peterborough, Ontario. iv + 6 pp. + Appendix. Adoption of the Recovery

Ministry of the Environment, Conservation, and Parks (MECP). 2022. Species at Risk in Ontario. Published: 2018-07-12. Updated: 2022-04-01. Available: https://www.ontario.ca/page/species-risk-ontario

North American Butterfly Association. (n.d.), New Jersey Butterflies. https://www.naba.org/chapters/nabanj/butterflies/black_dash.html#:~:text=Habitat%3A%20Sedgy%20marshes%2C%20fens%2C,late%20June%20to%20late%20July.

Ontario Ministry of Natural Resources (OMNR). 2000. Significant Wildlife Habitat Technical Guide. Appendix G: Wildlife Habitat Matrices and Habitat Descriptions for Rare Vascular Plants. October 2000.

Appendix III
Significant Wildlife Habitat Screening

Significant Wildlife Habitat Type	Presence Within Study Area	Presence Within Subject Property	Assessment Details
Seasonal Concentration Areas			
Waterfowl Stopover and Staging Areas (Terrestrial)	Not Present	Not Present	Spring sheet water is not present within the study area.
Waterfowl Stopover and Staging Areas (Aquatic)	Not Present	Not Present	Suitable wetland or pond habitat are not present within the study area.
Shorebird Migratory Stopover Area	Not Present	Not Present	Shoreline habitat is absent from the study area.
Raptor Wintering Area	Not Present	Not Present	There are no woodlands present within the study area.
Bat Hibernacula	Not Present	Not Present	No bat hibernacula was identified within the study area.
Bat Maternity Colonies	Not Present	Not Present	There are no forested areas present within the study are.
Turtle Wintering Area	Not Present	Not Present	There are no areas of open water present within the study area.
Reptile Hibernaculum	Not Present	Not Present	Suitable structures providing access below the frost line are not present within the study area.
Colonially - Nesting Bird Breeding Habitat (Bank and Cliff)	Not Present	Not Present	No eroding soil banks or stock piled soils are present within the study area.
Colonially - Nesting Bird Breeding Habitat (Tree/Shrubs)	Not Present	Not Present	No suitable swamp habitat is present within the study area.
Colonially - Nesting Bird Breeding Habitat (Ground)	Not Present	Not Present	Island and peninsula habitats are not present within the study area.
Migratory Butterfly Stopover Areas	Not Present	Not Present	The study area is not located within 5km of Lake Ontario, nor is there any forested habitat present.
Landbird Migratory Stopover Areas	Not Present	Not Present	The study area is not located within 5km of Lake Ontario or Lake Erie, nor is there any woodlot habitat present.
Deer Yarding Areas	Not Present	Not Present	Suitable deer wintering habitat is not present within the study area due to the absence of a forested area.
Deer Winter Congregation Areas	Not Present	Not Present	Not present within study area.
Rare Vegetation Communities			
Cliff and Talus Slopes	Not Present	Not Present	Rare vegetation community is not present within the study area.
Sand Barrens	Not Present	Not Present	Rare vegetation community is not present within the study area.
Alvar	Not Present	Not Present	Rare vegetation community is not present within the study area.
Old Growth Forest	Not Present	Not Present	Rare vegetation community is not present within the study area.
Savannah	Not Present	Not Present	Rare vegetation community is not present within the study area.
Tallgrass Prairie	Not Present	Not Present	Rare vegetation community is not present within the study area.
Other Rare Vegetation Communities	Not Present	Not Present	Rare vegetation community is not present within the study area.
Specialized Wildlife Habitat			
Waterfowl Nesting Area	Not Present	Not Present	There is no suitable waterfowl nesting habitat present as the study area is greater than 120m from the nearest wetland.
Bald Eagle and Osprey Nesting, Foraging and Perching Habitat	Not Present	Not Present	Suitable nesting habitat is absent from the study area.
Woodland Raptor Nesting Habitat	Not Present	Not Present	There is no forest stand or interior habitat present within the study area.
Turtle Nesting Areas	Not Present	Not Present	The agricultural fields offer exposed mineral soil, however none of the listed ELC Ecosites exist within 100m of the study area.
Seeps and Springs	Not Present	Not Present	There are no headwater features present within the study area.
Amphibian Breeding Habitat (Woodland)	Not Present	Not Present	Wetland, pond and woodland pool habitats are absent from the study area.
Amphibian Breeding Habitat (Wetland)	Not Present	Not Present	There is no wetland habitat present within the study area.
Woodland Area-Sensitive Bird Breeding Habitat	Not Present	Not Present	Interior and mature forest habitat is absent from the study area.
Habitat for Species of Conservation Concern			
Marsh Bird Breeding Habitat	Not Present	Not Present	There is no wetland habitat present within the study area.
Open Country Bird Breeding Habitat	Not Present	Not Present	Grassland areas are absent from the study area.
Shrub/Early Successional Bird Breeding Habitat	Not Present	Not Present	Agricultural fields do not qualify as candidate habitat nor is there any shrub/ thicket habitat present within the study area.
Terrestrial Crayfish	Not Present	Not Present	Wetland and marsh habitat are absent from the study area.
Special Concern and Rare Wildlife Species	Not Present	Not Present	There are no ELC Ecosites present within the study area that would provide habitat for special concern plants or animal species.
Animal Movement Corridors			
Amphibian Movement Corridors	Not Present	Not Present	There is no suitable breeding habitat present within the study area and agricultural fields do not qualify as a corridor.
Deer Movement Corridors	Not Present	Not Present	There is no suitable wintering habitat present within the subject property and agricultural fields do not qualify as a corridor.
Exceptions			
EcoDistrict 6E-14 Mast Producing Areas	Not Present	Not Present	The study area is not located within the Bruce Peninsula.
EcoDistrict 6E-17 Lek	Not Present	Not Present	The study area is not located within Ecoregion 6E.

Appendix IV
Tree Health & Risk Assessment Criteria

Tree Health Assessment Criteria

Assessment Criteria	Definition[1]
Excellent	Represents a tree in near perfect form, health, and vigour. This tree would exhibit no deadwood, no decline, and no visible defects.
Good	Represents a tree ranging from a generally healthy tree to a near perfect tree in terms of health, vigour and structure. This tree exhibits a complete, balanced crown structure with little to no deadwood and minimal defects as well as a properly formed root flare.
Fair	Represents a tree with minor health, balance or structural issues with minimal to moderate deadwood. Branching structure shows signs of included bark or minor rot within the branch connections or trunk wood. The root flare shows minimal signs of mechanical injury, decay, poor callusing, or girdling roots. Trees in the category require minor remedial actions to improve the vigour and structure of the tree.
Poor	Represents a tree that exhibits a poor vigour, reduced crown size (<30% of crown typical of species caused by overcrowding or decline), extreme crown unbalance, or extensive rot in the branching and trunk wood. Fungus could be seen from these rotting areas, suggesting further decay. These trees have extensive crown die back with a large amount of deadwood, and possibly dead sections. These weakened areas can lead to a potential failure of tree sections. Rooting zones show signs of extensive root decay or damage (fruiting bodies or mechanical damage) or girdling roots. Trees in this category require more extensive actions to prevent failure. A tree identified as poor would be a candidate for removal in the near future.
Very Poor	Represents a tree that exhibits major health and structural defects. Quite often the defects or diseases affecting this tree will be fatal. Large quantities of fungus, large dead sections with possible cavities and bark falling off all are signs that a tree is in an advanced state of decline and would be identified as very poor. These trees may have a probable or imminent potential for structural failure and may be identified for removal.
Dead	Represents a tree that exhibits no sign of new growth, including buds, foliage, or shoot growth. These trees may have a probable or imminent potential for structural failure and may be identified for removal.

[1]Dunster 2009

Tree Risk Assessment Criteria

Assessment Criteria*	Definition[2]
Improbable	The tree or branch is not likely to fail during normal weather conditions and may not fail in many severe weather conditions within the specified time frame.
Possible	Failure could occur, but it is unlikely during normal weather conditions within the specified time frame.
Probable	Failure may be expected under normal weather conditions within the specified time frame.
Imminent	Failure has started or is most likely to occur in the near future, even if there is no significant wind or increased load. This is a rare occurrence for a risk assessor to encounter, and it may require immediate action to protect people from harm.
*A specified time frame of 2 years will be used when assessing potential for structural failure.	

[2]Dunster et al. 2013

Appendix V
Conditions of Tree Inventory Assessment

Conditions of Tree Assessment

Limitations

This tree inventory and assessment is based on the circumstances and observations by Natural Resource Solutions Inc. (NRSI) as they existed at the time of the site inspection(s) of the Client's Property as described in this report (the "Property") and the trees situated thereon, and upon information provided by the Client to NRSI. The opinions in this assessment are given based on observations made and using generally accepted professional judgment, however, because trees are living organisms and subject to change, damage and disease, the results, observations, recommendations, and analysis as set out in this assessment are valid only at the date any such observations and analysis took place. No guarantee, warranty, representation or opinion is offered or made by NRSI as to the length of the validity of the results, observations, recommendations and analysis contained within this assessment. As a result, the Client shall not rely upon this assessment, save and except for representing the circumstances and observations at the date of site inspection(s), and the analysis and recommendations made in relation to the proposed undertaking. It is recommended that the inventoried trees discussed in this assessment should be re-assessed periodically, where required.

Further Services

Neither NRSI, nor any assessor employed or retained by NRSI (the "Assessor") for the purpose of preparing or assisting in the preparation of this assessment shall be required to provide any further consultation or services to the Client including, without limitation, acting as an expert witness or witness in any court in any jurisdiction unless the Client has first made specific arrangements with respect to such further services, including providing payment of the Assessor's regular hourly billing fees.

NRSI accepts no responsibility for the implementation of all or any part of this report, unless specifically requested to examine the implementation of such activities recommended herein. Any request for the inspection or supervision of all or part of the implementation shall be made in writing and the details agreed to in writing by both parties.

Assumptions

The Client is hereby notified that where any of the information set out and referenced in this assessment are based on assumptions, facts or information provided to NRSI, NRSI will in no way be responsible for the veracity or accuracy of any such information. Further, the Client acknowledges and agrees that NRSI has, for the purposes of preparing their assessment, assumed that the Property is in full compliance with all applicable federal, provincial, municipal and local statutes, regulations, by-laws, guidelines and other related laws. NRSI explicitly denies any legal liability for any and all issues with respect to non-compliance with any of the above-referenced statutes, regulations, by-laws, guidelines and laws as it may pertain to or affect the Property.

Restriction of Assessment

The assessment carried out was restricted to the areas as described in this report. NRSI is not legally liable for any other trees except those expressly discussed herein. The conclusions of this assessment do not apply to any areas, trees, or any other property not covered or referenced in this assessment.

Professional Responsibility

In carrying out this assessment, NRSI and any Assessor appointed for and on behalf of NRSI to perform and carry out the assessment has exercised a reasonable standard of care, skill and diligence. The assessment has been made using accepted arboricultural techniques. These include a visual examination of each tree for structural defects, scars, external indications of decay such as fungal fruiting bodies, evidence of insect attack, discolored foliage (during the leaf-on period), the condition of any visible root structures, the degree and direction of lean (if any), the general condition of the tree(s) and the surrounding site, and the current or planned proximity of property and people. Except where specifically noted in the assessment, none of the trees examined on the property were dissected, cored, probed, or climbed, and detailed root crown examinations involving excavation were not undertaken.

No guarantees are offered, or implied, that trees recommended for retention, or all parts of them, will remain standing. It is professionally impossible to predict with absolute certainty the behaviour of any single tree or group of trees, or all their component parts, in all given circumstances. Inevitably, a standing tree will always pose some risk. Most trees have the potential to fall, lean, or otherwise pose a danger to property and persons in the event of extreme weather conditions, and this risk can only be eliminated if the tree is removed.

Without limiting the foregoing, no liability is assumed by NRSI or its directors, officers, employers, contractors, agents or Assessors for:

a) Any legal description provided with respect to the Property;

b) Issues of title and/or ownership with respect to the Property;

c) The accuracy of the Property line locations or boundaries with respect to the Property; and

d) The accuracy of any other information provided to NRSI by the Client or third parties;

e) Any consequential loss, injury or damages suffered by the Client or any third parties, including but not limited to replacement costs, loss of use, earnings and business interruption; and,

f) The unauthorized distribution of the assessment.

Third Party Liability

This assessment was prepared by NRSI for the Client. The data collected reflect NRSI's best assessment of the inventoried trees situated on the Property with the information available at the time of observation. Data analysis and the assessment of potential impacts to inventoried trees is specific to the proposed undertaking as described in this report. NRSI accepts no responsibility for any damages or loss suffered by any third party or by the Client as a result of decisions made or actions based upon the use of this assessment for purposes unrelated to the proposed undertaking.

General

Any plans and/or illustrations in this assessment are included only to help the Client visualize the issues in this assessment and shall not be relied upon for any other purpose.

This report shall be considered as a whole, no sections are severable, and the assessment shall be considered incomplete if any pages are missing.

Appendix VI
Tree Inventory Data & Summary Tables

PROJECT NAME Tree Protection Plan
Tree Inventory Data

Tree Number	Common Name	Scientific Name	Native/ Non-native	Stem Count	DBH (cm)	Crown Radius (m)	Potential for Structural Failure Rating	Overall Condition	Location	Proposed Action	Rationale for Removal	Compensation Required	Comments
006	Black Walnut	*Juglans nigra*	Native	3	60.0+34.0+20.0	9.0	Improbable	Fair					Evidence of branch failure; grape vine throughout trunk and canopy; some poor branch attachment; few dead branches.
005	Black Walnut	*Juglans nigra*	Native	1	15.0	5.0	Improbable	Fair					Grape vine all throughout canopy; twisted trunk; slightly suppressed.
004	Black Walnut	*Juglans nigra*	Native	1	28.5	7.0	Improbable	Fair					Numerous dead branches; aggressive grape vine up trunk and throughout canopy; poor branch attachment.
1901	Black Walnut	*Juglans nigra*	Native	3	15.0+11.9+13.7	4.0	Possible	Fair					Middle size stem broken off recently but still has growth; poor branch attachment; few dead branches.
1902	Manitoba Maple	*Acer negundo*	Native	1	+38.5+36.4+13.3+	11.0	Possible	Fair					Poor branch attachment; evidence of branch failure; few dead branches; stems all shooting different directions.
297	American Basswood	*Tilia americana*	Native	7	45+40+47+25+36	7.0	Possible	Fair					Aggressive grape vine throughout canopy; evidence of branch failure; numerous wildlife holes; few dead branches.
298	Manitoba Maple	*Acer negundo*	Native	1	19.0	3.0	Possible	Poor					Completely covered by grape vine; evidence of branch failures.
299	American Basswood	*Tilia americana*	Native	2	60+45	5.0	Probable	Very Poor					Main stem completely hallow; smaller stems with growth; on other side of fence so possibly has smaller stems; scaffold branching; wildlife tree.
300	American Basswood	*Tilia americana*	Native	2	19.0+23.8	4.0	Improbable	Fair					Covered in grape vine; epicormic growth; growing from stone pile.

Summary of Inventoried Trees

Common Name	Scientific Name	Good	Fair	Poor	Very Poor	Dead	Total
Native Species							
Black Walnut	*Juglans nigra*		4				4
American Basswood	*Tilia americana*		2		1		3
Manitoba Maple	*Acer negundo*		1	1			2
Overall Total			7	1	1		9

Overall Conditions of Trees Inventoried

Potential for Structural Failure Rating	Overall Condition						Total
	Excellent	Good	Fair	Poor	Very Poor	Dead	
Improbable	0	0	4	0	0	0	**4**
Possible	0	0	3	1	0	0	**4**
Probable	0	0	0	0	1	0	**1**
Imminent	0	0	0	0	0	0	**0**
Total	**0**	**0**	**7**	**1**	**1**	**0**	**9**

Appendix VII
Species Lists

Plant Species Reported from the Study Area - Blair Creek Drive Ext. EA (Project #3129)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Waterloo Region	GRCA	NHIC Data*	NRSI Observed	Hedgerow 1 (East) (06-13-2023)	Hedgerow 2 (West) (06-13-2023)	Ag. Field (06-13-2023)	Bat Habitat Assessment (04-21-2023)
		MNRF 2023	MECP 2023	Government of Canada 2023	Government of Canada 2023	Government of Canada 2023	Richardson & Martin 1999	Email from Chris Foster-Pengelly	MNRF 2023					
Dicotyledons	**Dicots**													
Aceraceae	**Maple Family**													
Acer negundo	Manitoba Maple	S5								X	X	X		X
Anacardiaceae	**Sumac or Cashew Family**													
Rhus glabra	Smooth Sumac	S5								X	X			
Asclepiadaceae	**Milkweed Family**													
Asclepias syriaca	Common Milkweed	S5								X		X		
Asteraceae	**Composite or Aster Family**													
Arctium minus	Common Burdock	SE5								X		X		
Brassicaceae	**Mustard Family**													
Alliaria petiolata	Garlic Mustard	SE5								X	X	X		
Caprifoliaceae	**Honeysuckle Family**													
Lonicera tatarica	Tatarian Honeysuckle	SE5								X		X		
Caryophyllaceae	**Pink Family**													
Silene vulgaris	Bladder Campion	SE5								X	X			
Cucurbitaceae	**Gourd Family**													
Echinocystis lobata	Wild Mock-cucumber	S5								X		X		
Fabaceae	**Pea Family**													
Glycine max	Soy Bean	SE2								X			X	
Juglandaceae	**Walnut Family**													
Juglans cinerea	Butternut	S2?	END	E	E	Schedule 1		X	X					
Juglans nigra	Black Walnut	S4?					R+*			X				
Lamiaceae	**Mint Family**													
Leonurus cardiaca	Common Motherwort	SE5								X	X	X		
Monarda didyma	Scarlet Beebalm	S3					R+		X					
Moraceae	**Mulberry Family**													
Morus alba	White Mulberry	SE5								X		X		
Oleaceae	**Olive Family**													
Fraxinus americana	White Ash	S4								X				X
Rhamnaceae	**Buckthorn Family**													
Rhamnus cathartica	Common Buckthorn	SE5								X	X	X		
Rosaceae	**Rose Family**													
Potentilla recta	Sulphur Cinquefoil	SE5								X	X			
Prunus avium	Sweet Cherry	SE4								X				X
Prunus serotina	Black Cherry	S5								X				X
Rubus idaeus	Common Red Raspberry	S5								X	X	X		
Salicaceae	**Willow Family**													
Populus deltoides	Eastern Cottonwood	S5					R+			X		X		
Tiliaceae	**Linden Family**													
Tilia americana	American Basswood	S5								X		X		X
Vitaceae	**Grape Family**													
Parthenocissus vitacea	Thicket Creeper	S5								X	X	X		
Vitis riparia	Riverbank Grape	S5								X	X	X		
Monocotyledons	**Monocots**													
Poaceae	**Grass Family**													
Bromus inermis	Smooth Brome	SE5								X	X	X		
TOTAL								**1**	**2**	**23**	**11**	**15**	**1**	**5**

*NHIC Atlas Squares: 17NJ4301 & 17NJ4401

Bird Species Reported from the Study Area - Blair Creek Extension EA (Project #3129)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Region of Waterloo Status	OBBA*	NHIC Data**	NRSI Observed: Highest Level of Breeding Evidence	Entire Site	Incidentals
		MNRF 2023	MECP 2023	Government of Canada 2023	Government of Canada 2023	Government of Canada 2023	Martin 1996	BSC et al. 2006	MNRF 2023	NRSI Results from 2023		
Anatidae	**Ducks, Geese & Swans**											
Aix sponsa	Wood Duck	S5B,S3N					√*	CO				
Anas platyrhynchos	Mallard	S5						CO				
Anas rubripes	American Black Duck	S4					√	CO				
Branta canadensis	Canada Goose	S5						CO				
Mergus merganser	Common Merganser	S5					√	PR				
Odontophoridae	**New World Quails**											
Colinus virginianus	Northern Bobwhite	S1?	END	E	E	Schedule 1	√	PO				
Phasianidae	**Partridges, Grouse & Turkeys**											
Meleagris gallopavo	Wild Turkey	S5						CO				
Columbidae	**Pigeons & Doves**											
Columba livia	Rock Pigeon	SNA						CO				
Zenaida macroura	Mourning Dove	S5						CO				
Cuculiformes	**Cuckoos & Anis**											
Coccyzus erythropthalmus	Black-billed Cuckoo	S4S5B					√	PO				
Caprimulgidae	**Goatsuckers**											
Chordeiles minor	Common Nighthawk	S4B	SC	SC	T	Schedule 1	√*	PO				
Apodidae	**Swifts**											
Chaetura pelagica	Chimney Swift	S3B	THR	T	T	Schedule 1		PO				
Trochilidae	**Hummingbirds**											
Archilochus colubris	Ruby-throated Hummingbird	S5B					√	PR				
Rallidae	**Rails, Gallinules & Coots**											
Porzana carolina	Sora	S5B					√	PO				
Rallus limicola	Virginia Rail	S4S5B					√	PR				
Charadriidae	**Plovers & Lapwings**											
Charadrius vociferus	Killdeer	S4B						CO		**PO**	PO	
Scolopacidae	**Sandpipers & Allies**											
Actitis macularia	Spotted Sandpiper	S5B						CO				
Gallinago delicata	Wilson's Snipe	S5B					√	PO				
Scolopax minor	American Woodcock	S4B						PO				
Ardeidae	**Herons & Bitterns**											
Ardea herodias	Great Blue Heron	S4					√	CO				
Butorides virescens	Green Heron	S4B					√	PO				
Cathartidae	**Vultures**											
Cathartes aura	Turkey Vulture	S5B,S3N					√	CO		**OB**	OB	
Accipitridae	**Hawks, Kites, Eagles & Allies**											
Accipiter cooperii	Cooper's Hawk	S4	NAR	NAR	NS	No schedule	√	CO				
Accipiter striatus	Sharp-shinned Hawk	S5	NAR	NAR	NS	No schedule	√	PR				
Buteo jamaicensis	Red-tailed Hawk	S5	NAR	NAR	NS	No schedule		CO				
Circus hudsonius	Northern Harrier	S5B,S4N	NAR	NAR	NS	No schedule	√	PR				
Strigidae	**Typical Owls**											
Bubo virginianus	Great Horned Owl	S4						CO				
Megascops asio	Eastern Screech-Owl	S4	NAR	NAR	NS	No schedule		PR				
Alcedinidae	**Kingfishers**											
Megaceryle alcyon	Belted Kingfisher	S5B,S4N					√	CO				
Picidae	**Woodpeckers**											
Colaptes auratus	Northern Flicker	S5						CO				
Dryobates pubescens	Downy Woodpecker	S5						CO				
Dryobates villosus	Hairy Woodpecker	S5						CO				
Dryocopus pileatus	Pileated Woodpecker	S5					√	PR				

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Region of Waterloo Status	OBBA*	NHIC Data**	NRSI Observed: Highest Level of Breeding Evidence	Entire Site	Incidentals
Melanerpes carolinus	Red-bellied Woodpecker	S5					√	CO				
Melanerpes erythrocephalus	Red-headed Woodpecker	S3	END	E	E	Schedule 1	√	PR				
Sphyrapicus varius	Yellow-bellied Sapsucker	S5B,S3N					√	PR				
Falconidae	**Caracaras & Falcons**											
Falco sparverius	American Kestrel	S4						PR				
Tyrannidae	**Tyrant Flycatchers**											
Contopus virens	Eastern Wood-Pewee	S4B	SC	SC	SC	Schedule 1		PR				
Empidonax alnorum	Alder Flycatcher	S5B					√	PO				
Empidonax minimus	Least Flycatcher	S5B					√	CO				
Empidonax traillii	Willow Flycatcher	S4B						CO				
Myiarchus crinitus	Great Crested Flycatcher	S5B						CO				
Sayornis phoebe	Eastern Phoebe	S5B						CO				
Tyrannus tyrannus	Eastern Kingbird	S4B						CO				
Vireonidae	**Vireos**											
Vireo gilvus	Warbling Vireo	S5B						PR				
Vireo olivaceus	Red-eyed Vireo	S5B						CO				
Corvidae	**Crows & Jays**											
Corvus brachyrhynchos	American Crow	S5						CO				
Cyanocitta cristata	Blue Jay	S5						CO		**OB**		OB
Alaudidae	**Larks**											
Eremophila alpestris	Horned Lark	S4						PR		**PO**		PO
Hirundinidae	**Swallows**											
Hirundo rustica	Barn Swallow	S4B	SC	SC	T	Schedule 1		CO				
Petrochelidon pyrrhonota	Cliff Swallow	S4S5B					√*	CO				
Riparia riparia	Bank Swallow	S4B	THR	T	T	Schedule 1		CO				
Stelgidopteryx serripennis	Northern Rough-winged Swallow	S4B						CO				
Tachycineta bicolor	Tree Swallow	S4S5B						CO				
Paridae	**Chickadees & Titmice**											
Baeolophus bicolor	Tufted Titmouse	S3					√	PR				
Poecile atricapillus	Black-capped Chickadee	S5						CO				
Sittidae	**Nuthatches**											
Sitta canadensis	Red-breasted Nuthatch	S5					√	CO				
Sitta carolinensis	White-breasted Nuthatch	S5						CO				
Certhiidae	**Creepers**											
Certhia americana	Brown Creeper	S5					√	CO				
Troglodytidae	**Wrens**											
Thryothorus ludovicianus	Carolina Wren	S4					√	PR				
Troglodytes aedon	House Wren	S5B						CO				
Polioptilidae	**Gnatcatchers**											
Polioptila caerulea	Blue-gray Gnatcatcher	S4B					√	PO				
Regulidae	**Kinglets**											
Corthylio calendula	Ruby-crowned Kinglet	S5B,S3N					√			**OB**		OB
Regulus satrapa	Golden-crowned Kinglet	S5					√	CO				
Turdidae	**Thrushes**											
Catharus fuscescens	Veery	S5B					√	PO				
Hylocichla mustelina	Wood Thrush	S4B	SC	T	T	Schedule 1		PR				
Sialia sialis	Eastern Bluebird	S5B,S4N	NAR	NAR	NS	No schedule	√	CO				
Turdus migratorius	American Robin	S5						CO		**PR**	PR	
Mimidae	**Mockingbirds, Thrashers & Allies**											
Dumetella carolinensis	Gray Catbird	S5B,S3N						CO				
Toxostoma rufum	Brown Thrasher	S4B					√	CO		**OB**		OB
Sturnidae	**Starlings**											
Sturnus vulgaris	European Starling	SNA						CO				
Bombycillidae	**Waxwings**											
Bombycilla cedrorum	Cedar Waxwing	S5						CO				

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Region of Waterloo Status	OBBA*	NHIC Data**	NRSI Observed: Highest Level of Breeding Evidence	Entire Site	Incidentals
Passeridae	**Old World Sparrows**											
Passer domesticus	House Sparrow	SNA						CO				
Fringillidae	**Finches & Allies**											
Haemorhous mexicanus	House Finch	SNA						CO				
Spinus pinus	Pine Siskin	S5					√	PR				
Spinus tristis	American Goldfinch	S5						CO		**PO**	PO	
Emberizidae	**New World Sparrows & Allies**											
Ammodramus savannarum	Grasshopper Sparrow	S4B	SC	SC	SC	Schedule 1	√	PR				
Melospiza georgiana	Swamp Sparrow	S5B,S4N						PR				
Melospiza melodia	Song Sparrow	S5						CO		**PO**	PO	PO
Passerculus sandwichensis	Savannah Sparrow	S5B,S3N						CO				
Pipilo erythrophthalmus	Eastern Towhee	S4B,S3N						PO				
Pooecetes gramineus	Vesper Sparrow	S4B					√	PR		**PO**		PO
Spizella passerina	Chipping Sparrow	S5B,S3N						CO				
Spizella pusilla	Field Sparrow	S4B,S3N						CO				
Zonotrichia albicollis	White-throated Sparrow	S5					√	PR				
Icteridae	**Troupials & Allies**											
Agelaius phoeniceus	Red-winged Blackbird	S5						CO		**PO**	PO	
Icterus galbula	Baltimore Oriole	S4B						CO				
Molothrus ater	Brown-headed Cowbird	S5						CO		**OB**		OB
Quiscalus quiscula	Common Grackle	S5						CO				
Sturnella magna	Eastern Meadowlark	S4B,S3N	THR	T	T	Schedule 1		CO				
Parulidae	**Wood Warblers**											
Geothlypis philadelphia	Mourning Warbler	S5B					√	PO				
Geothlypis trichas	Common Yellowthroat	S5B,S3N						PR				
Parkesia noveboracensis	Northern Waterthrush	S5B					√	PR				
Seiurus aurocapilla	Ovenbird	S5B					√	CO				
Setophaga coronata	Yellow-rumped Warbler	S5B,S4N					√	PR				
Setophaga pensylvanica	Chestnut-sided Warbler	S5B					√	CO				
Setophaga petechia	Yellow Warbler	S5B						CO				
Setophaga pinus	Pine Warbler	S5B,S3N					√	PR				
Setophaga ruticilla	American Redstart	S5B					√	PR				
Vermivora cyanoptera	Blue-winged Warbler	S4B					√	PO				
Cardinalidae	**Cardinals, Grosbeaks & Allies**											
Cardinalis cardinalis	Northern Cardinal	S5						CO		**PR**		PR
Passerina cyanea	Indigo Bunting	S5B						CO				
Pheucticus ludovicianus	Rose-breasted Grosbeak	S5B						CO				
Piranga olivacea	Scarlet Tanager	S5B					√	PR				
Total								**103**	**0**	**13**	**6**	**8**

*OBBA Atlas Square: 17NJ40

**NHIC Atlas Squares: 17N4301 & 17NJ4401

Reptile and Amphibian Species Reported from the Study Area - Blair Creek Drive Extension (Project #3129)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Region of Waterloo Status	GRCA	ORAA*	NHIC Data**
		MNRF 2023	MECP 2023	Government of Canada 2023	Government of Canada 2023	Government of Canada 2023	RMOW 1985	Email from Chris Foster-Pengelly	Ontario Nature 2019	MNRF 2023
Turtles										
Chelydra serpentina	Snapping Turtle	S4	SC	SC	SC	Schedule 1	C	X	X	X
Chrysemys picta marginata	Midland Painted Turtle	S4		SC	SC	Schedule 1	C	X	X	X
Emydoidea blandingii	Blanding's Turtle (Great Lakes / St. Lawre	S3	THR	E	E	Schedule 1	√		X	
Trachemys scripta	Pond Slider	SNA							X	
Snakes										
Lampropeltis triangulum	Milksnake	S4	NAR	SC	SC	Schedule 1	√		X	
Opheodrys vernalis	Smooth Greensnake	S4					√		X	
Nerodia sipedon sipedon	Northern Watersnake	S5	NAR	NAR	NS	No schedule	√		X	
Storeria dekayi	Dekay's Brownsnake	S5	NAR	NAR	NS	No schedule	C*		X	
Storeria occipitomaculata	Red-bellied Snake	S5					C*		X	
Thamnophis sauritus septentrionalis	Northern Ribbonsnake	S4	SC	SC	SC	Schedule 1	√		X	
Thamnophis sirtalis sirtalis	Eastern Gartersnake	S5					C		X	
Salamanders										
Ambystoma jeffersonianum	Jefferson Salamander	S2	END	E	E	Schedule 1	√	X	X	
Ambystoma laterale - (2) jeffersonianum	Unisexual Ambystoma (Jefferson Salamar	S2	END	E	E	Schedule 1	√	X		X
Ambystoma maculatum	Spotted Salamander	S4					√		X	
Notophthalmus viridescens viridescens	Red-spotted Newt	S5					√		X	
Plethodon cinereus	Eastern Red-backed Salamander	S5					C		X	
Frogs and Toads										
Anaxyrus americanus	American Toad	S5					C		X	
Dryophytes versicolor	Gray Treefrog	S5					C		X	
Pseudacris triseriata pop. 2	Western Chorus Frog (Great Lakes / St. L	S4	NAR	T	T	Schedule 1			X	
Pseudacris crucifer	Spring Peeper	S5					C		X	
Lithobates catesbeianus	American Bullfrog	S4					√		X	
Lithobates clamitans	Green Frog	S5					C		X	
Lithobates palustris	Pickerel Frog	S4	NAR	NAR	NS	No schedule	√		X	
Lithobates pipiens	Northern Leopard Frog	S5	NAR	NAR	NS	No schedule	C		X	
Lithobates sylvaticus	Wood Frog	S5					C		X	
Total								**4**	**24**	**3**

*ORAA Atlas Square: 17NJ40

**NHIC Atlas Squares: 17NJ4301 & 17NJ4401

Mammal Species Reported from the Study Area - Blair Creek Drive Extension (Project #3129)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Region of Waterloo Status	Ontario Mammal Atlas	NHIC Data**	NRSI Observed
		MNRF 2023	MECP 2023	Government of Canada 2023	Government of Canada 2023	Government of Canada 2023	RMOW 1985	Dobbyn 1994	MNRF 2023	
Didelphimorphia	**Opossums**									
Didelphis virginiana	Virginia Opossum	S4					R	X		
Eulipotyphla	**Shrews, Moles, Hedgehogs, and Allies**									
Blarina brevicauda	Northern Short-tailed Shrew	S5						X		
Condylura cristata	Star-nosed Mole	S5						X		
Parascalops breweri	Hairy-tailed Mole	S4					R	X		
Sorex cinereus	Masked Shrew	S5					G	X		
Sorex fumeus	Smoky Shrew	S5					R	X		
Sorex palustris	Water Shrew	S5					R	X		
Chiroptera	**Bats**									
Eptesicus fuscus	Big Brown Bat	S4						X		
Lasionycteris noctivagans	Silver-haired Bat	S4						X		
Lasiurus borealis	Eastern Red Bat	S4						X		
Lasiurus cinereus	Hoary Bat	S4						X		
Myotis leibii	Eastern Small-footed Myotis	S2S3	END					X		
Myotis lucifugus	Little Brown Myotis	S3	END	E	E	Schedule 1		X		
Myotis septentrionalis	Northern Myotis	S3	END	E	E	Schedule 1		X		
Perimyotis subflavus	Tri-colored Bat	S3?	END	E	E	Schedule 1		X		
Lagomorpha	**Rabbits and Hares**									
Lepus americanus	Snowshoe Hare	S5					S	X		
Lepus europaeus	European Hare	SNA						X		
Sylvilagus floridanus	Eastern Cottontail	S5						X		
Rodentia	**Rodents**									
Castor canadensis	Beaver	S5					S	X		
Erethizon dorsatum	Porcupine	S5					S	X		
Glaucomys sabrinus	Northern Flying Squirrel	S5					R	X		
Marmota monax	Woodchuck	S5						X		
Microtus pennsylvanicus	Meadow Vole	S5						X		
Microtus pinetorum	Woodland Vole	S3?	SC	SC	SC	Schedule 1		X		
Mus musculus	House Mouse	SNA						X		
Napaeozapus insignis	Woodland Jumping Mouse	S5						X		
Ondatra zibethicus	Muskrat	S5						X		
Peromyscus leucopus	White-footed Mouse	S5						X		
Peromyscus maniculatus	Deer Mouse	S5						X		
Rattus norvegicus	Norway Rat	SNA						X		
Sciurus carolinensis	Eastern Gray Squirrel	S5						X		
Synaptomys cooperi	Southern Bog Lemming	S4					R	X		
Tamias striatus	Eastern Chipmunk	S5						X		
Tamiasciurus hudsonicus	Red Squirrel	S5						X		
Zapus hudsonius	Meadow Jumping Mouse	S5						X		
Canidae	**Canines**									
Canis latrans	Coyote	S5					S	X		
Vulpes vulpes	Red Fox	S5						X		
Felidae	**Felines**									
Lynx rufus	Bobcat	S4					R	X		
Mephitidae	**Skunks and Stink Badgers**									
Mephitis mephitis	Striped Skunk	S5						X		
Mustelidae	**Weasels and Allies**									
Mustela frenata	Long-tailed Weasel	S4					S	X		
Mustela richardsonii	American Ermine	S5						X		

Butterfly Species Reported from the Study Area - Blair Creek Drive Extension (Project #3129)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Region of Waterloo Status	Ontario Butterfly Atlas*	NHIC Data**
		MNRF 2023	MECP 2023	Government of Canada 2023	Government of Canada 2023	Government of Canada 2023	Linton 2012	Macnaughton et al. 2022	MNRF 2023
Hesperiidae	**Skippers**								
Anatrytone logan	Delaware Skipper	S4					C	X	
Ancyloxypha numitor	Least Skipper	S5					UC	X	
Carterocephalus palaemon	Arctic Skipper	S5					R	X	
Epargyreus clarus	Silver-spotted Skipper	S4					UC	X	
Erynnis baptisiae	Wild Indigo Duskywing	S4					UK	X	
Erynnis icelus	Dreamy Duskywing	S5					R	X	
Erynnis juvenalis	Juvenal's Duskywing	S5					R	X	
Euphyes bimacula	Two-spotted Skipper	S4					R	X	
Euphyes conspicua	Black Dash	S3					UC	X	
Euphyes dion	Dion Skipper	S4					R	X	
Euphyes vestris	Dun Skipper	S5					VC	X	
Pholisora catullus	Common Sootywing	S4					R	X	
Poanes hobomok	Hobomok Skipper	S5					C	X	
Poanes massasoit	Mulberry Wing	S4					R	X	
Polites mystic	Long Dash Skipper	S5					UC	X	
Polites origenes	Crossline Skipper	S4					R	X	
Polites peckius	Peck's Skipper	S5					VC	X	
Polites themistocles	Tawny-edged Skipper	S5					C	X	
Pompeius verna	Little Glassywing	S4					UC	X	
Thymelicus lineola	European Skipper	SNA					VC	X	
Wallengrenia egeremet	Northern Broken Dash	S5					C	X	
Papilionidae	**Swallowtails**								
Papilio cresphontes	Giant Swallowtail	S4					UC	X	
Papilio glaucus	Eastern Tiger Swallowtail	S5					VC	X	
Papilio polyxenes	Black Swallowtail	S5					VC	X	
Papilio troilus	Spicebush Swallowtail	S4						X	
Pieridae	**Whites and Sulphurs**								
Colias eurytheme	Orange Sulphur	S5					VC	X	
Colias philodice	Clouded Sulphur	S5						X	
Pieris oleracea	Mustard White	S4					PE	X	
Pieris rapae	Cabbage White	SNA					VC	X	
Pontia protodice	Checkered White	SNA					R	X	
Pyrisitia lisa	Little Yellow	SNA						X	
Lycaenidae	**Harvesters, Coppers, Hairstreaks, Blues**								
Callophrys niphon	Eastern Pine Elfin	S5					R	X	
Celastrina lucia	Northern Spring Azure	S5						X	
Celastrina neglecta	Summer Azure	S5					VC	X	
Celastrina sp.	Azure species	SNA						X	
Cupido comyntas	Eastern Tailed Blue	S5					UC	X	
Feniseca tarquinius	Harvester	S4					R	X	
Glaucopsyche lygdamus	Silvery Blue	S5						X	
Lycaena hyllus	Bronze Copper	S5					VC	X	
Satyrium acadica	Acadian Hairstreak	S4					UC	X	
Satyrium calanus	Banded Hairstreak	S4					UC	X	

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Region of Waterloo Status	Ontario Butterfly Atlas*	NHIC Data**
Satyrium caryaevorus	Hickory Hairstreak	S4					R	X	
Satyrium liparops	Striped Hairstreak	S5					UC	X	
Satyrium titus	Coral Hairstreak	S5					UC	X	
Nymphalidae	**Brush-footed Butterflies**								
Aglais milberti	Milbert's Tortoiseshell	S5					UC	X	
Asterocampa celtis	Hackberry Emperor	S3						X	
Asterocampa clyton	Tawny Emperor	S3					UC	X	
Boloria bellona	Meadow Fritillary	S5					VC	X	
Boloria selene	Silver-bordered Fritillary	S5					R	X	
Cercyonis pegala	Common Wood-Nymph	S5					VC	X	
Chlosyne nycteis	Silvery Checkerspot	S5					R	X	
Coenonympha california	Common Ringlet	S5					C	X	
Danaus plexippus	Monarch	S2N,S4B	SC	E	SC	Schedule 1	VC	X	
Euphydryas phaeton	Baltimore Checkerspot	S4					R	X	
Junonia coenia	Common Buckeye	SNA					UC	X	
Lethe anthedon	Northern Pearly-Eye	S5					C	X	
Lethe appalachia	Appalachian Brown	S4					UC	X	
Lethe eurydice	Eyed Brown	S5					VC	X	
Libytheana carinenta	American Snout	SNA					R	X	
Limenitis archippus	Viceroy	S5					VC	X	
Limenitis arthemis arthemis	White Admiral	S5					C	X	
Limenitis arthemis astyanax	Red-spotted Purple	S5					C	X	
Megisto cymela	Little Wood-Satyr	S5					VC	X	
Nymphalis antiopa	Mourning Cloak	S5					VC	X	
Nymphalis l-album	Compton Tortoiseshell	S5					UC	X	
Phyciodes cocyta	Northern Crescent	S5					UC	X	
Phyciodes tharos	Pearl Crescent	S4					C	X	
Polygonia comma	Eastern Comma	S5					VC	X	
Polygonia interrogationis	Question Mark	S5					VC	X	
Polygonia progne	Gray Comma	S5					UC	X	
Speyeria atlantis	Atlantis Fritillary	S5					R	X	
Speyeria cybele	Great Spangled Fritillary	S5					VC	X	
Vanessa atalanta	Red Admiral	S5B					VC	X	
Vanessa cardui	Painted Lady	S5B					C	X	
Vanessa virginiensis	American Lady	S5					C	X	
								75	**0**

*TEA Atlas Square: 17NJ40
**NHIC Atlas Squares: 17TNJ4301 & 17TNJ4401

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Region of Waterloo Status	Ontario Mammal Atlas	NHIC Data**	NRSI Observed
Neovison vison	American Mink	S4					S	X		
Taxidea taxus jacksoni	American Badger (Southwestern Ontario	S1	END	E	E	Schedule 1		X		
Procyonidae	**Raccoons and Allies**									
Procyon lotor	Northern Raccoon	S5						X		
Ursidae	**Bears**									
Ursus americanus	American Black Bear	S5	NAR	NAR	NS	No schedule		X		
Artiodactyla	**Deer and Bison**									
Odocoileus virginianus	White-tailed Deer	S5						X		X
Total								**46**	**0**	**1**

*Mammal Atlas Square Numbers: NU40
**NHIC Atlas Squares: 17TNJ4301 & 17TNJ4401

Odonate Species Reported from the Study Area - EA Blair Creek Drive Extension (Project #3129)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Odonate Atlas*	NHIC Data**
		MNRF 2023a	MECP 2023	Government of Canada 2023	Government of Canada 2023	Government of Canada 2023	OOAD 2023	MNRF 2023b
Coenagrionidae	**Narrow-winged Damselflies**							
Amphiagrion saucium	Eastern Red Damsel	S4					X	
Argia apicalis	Blue-fronted Dancer	S4					X	
Enallagma civile	Familiar Bluet	S5					X	
Enallagma exsulans	Stream Bluet	S5					X	
Ischnura verticalis	Eastern Forktail	S5					X	
Corduliidae	**Emeralds**							
Epitheca cynosura	Common Baskettail	S5					X	
Libellulidae	**Skimmers**							
Plathemis lydia	Common Whitetail	S5					X	
Total							**7**	**0**

*Odonate Atlas Square Numbers: 17NJ40

**NHIC Atlas Squares: 17TNJ4301 & 17TNJ4401

ARA, September 2023

Heritage Impact Assessment (Draft)

MTE

ARCHAEOLOGY | HERITAGE | OUTREACH | EDUCATION

Heritage Impact Assessment
Class Environmental Assessment & Preliminary Design for Blair Creek Drive Road, Storm Sewer, & Watermain Extension (Future Strasburg Road to Intersection of Reidel Drive and Blair Creek Drive)
City of Kitchener
Regional Municipality of Waterloo
Former Waterloo County, Ontario

Prepared for
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HR-453-2023
ARA File # 2023-0033

16/11/2023

EXECUTIVE SUMMARY

The study area is an approximately 200-acre parcel of land and is characterized by rolling topography, lands which appear under agricultural use, a small creek, forested area, slopes, and grade changes which surround a primary residence with multiple outbuildings. The residence on in the study area fronts onto Reidel Drive. Two cultural heritage resources have been identified within or adjacent to the project location. The project location is proposed to be located within the study area (271 Reidel Drive) which is listed as a non-designated property of cultural heritage value or interest on the City of Kitchener Municipal Heritage Register (BHR-1). The study area is located adjacent to the Reidel Drive Cultural Heritage Landscape (CHL), which was identified in the *Cultural Heritage Landscape Study*, approved by Council in 2015 (CHL-1).

As part of the site-specific Terms of Reference, BHR-1 underwent a O. Reg 9/06 heritage evaluation. BHR-1 has met two criteria under Ontario Regulation 9/06 and may be worthy of designation under the *Ontario Heritage Act*. On the evening of November 12, 2023, the house at 271 Reidel Drive caught fire. ARA staff conducted as site visit from public lands on November 13, 2023. As observed during this site visit many of the proposed heritage attributes of the residence have been completely destroyed. The one storey stone construction section with gable peak and some window openings remain.

The proposed project includes an approximately 700-meter portion of land which runs linear in an east-west direction through the property known as 271 Reidel Drive. The project location is proposed to be used as a road extension, continuing from the future Strasburg Road alignment which intersects at of Reidel Drive and Blair Creek Drive. The Blair Creek Drive Road Extension will also include new storm sewer as well as a 300mm diameter watermain. The proposed project will also include the creation of the paved roadway, parking, sidewalks, bike lanes and boulevards.

Three proposed project design options were considered. All three design options involve the development and alteration of the same portion of land on 271 Reidel Drive and appear to be the same proposed location and size of opening onto Reidel Drive. From a heritage perspective all three options will result in the same potential impacts. Therefore, no design option is considered to have less impact and therefore there is no preferred alternative from a heritage perspective.

Given that potential impacts have been identified, mitigation measures must be recommended. The MCM *InfoSheet #5: Heritage Impact Assessments and Conservation Plans* (2006d:3) lists specific methods to minimize any potential negative impacts. The following mitigation strategy applies to all three design options.

As a result of this HIA, the following mitigation strategies are recommended:

- Any construction and staging areas should avoid the use of lands directly surrounding the heritage attributes associate with BHR-1 and if required construction fencing should be erected to ensure that construction areas and machinery is kept well away from the building;
- That only the required/a minimal amount of roadside vegetation which defines the road edge on Reidel Drive be removed for the construction of the road. Further that the diverse roadside vegetation which defines the road edge on Reidel Drive which is not being removed be protected during staging and construction activities with construction fencing. If possible, replacement of any vegetation removed and the integration of additional vegetation along the new roadway should be considered. A Landscape Plan may be considered to limit negative impacts associated with vegetation removal.

- That an archaeological assessment is suggested to address the potential impacts of ground disturbance and change in grade and drainage patterns to unknown archaeological resources.
- As the roadway will create public access to 271 Reidel Drive, this will provide a potential opportunity to interpret and commemorate Reidel Drive CHL (CHL-1) and/or 271 Reidel Drive (BHR-1) through the inclusion of signage, plaques, and public art;
- That if the inclusion of signage, plaques, built features associated with the road design is pursued, consideration be given to a design which does sympathetic to the character of the area;
- Public consultation may result in additional information on BHR-1 and CHL-1. If additional information is provided it should be reviewed by a qualified heritage consultant to: 1) determine the cultural heritage value or interest evaluation needs revision, 2) review information against potential project impacts, and 3) and if the information warrant additional strategies for future conservation of any identified cultural heritage resources;
- Should the proposed project or the proposed study area expand beyond the scope examined in this report, a qualified heritage consultant should be retained to determine the potential impacts and suggest mitigation measures;
- That adequate archaeological assessment that meets or exceed provincial standards be undertaken as part of this proposed project. No soil disturbing activities should take place until all archaeological concerns are mitigated, and all reports are accepted by the MCM.

There are no mitigation measures for two of the identified impacts:

- Impact 1 – The proposed project reflects a change in land use for a portion of the subject property from agricultural to transportation within the project location.
- Impact 4 – The proposed project has the potential to detract from the character or visual context of Reidel Road CHL through the creation of a new opening, and a two-lane paved roadway with a bike lane, parking, boulevard, and pedestrian path. This type of road design is in contrast with the ‘narrow two-lane alignment without shoulders’ found along Reidel Drive.

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ABBREVIATIONS

ARA – Archaeological Research Associates Ltd.
BHR – Built Heritage Resource
CHAR – Cultural Heritage Assessment Report
CHL – Cultural Heritage Landscape
CHVI – Cultural Heritage Value or Interest
CN – Canadian National Railway
GRCA – Grand River Conservation Authority
GTR – Grand Trunk Railway
CHIA – Cultural Heritage Impact Assessment
EA – Environmental Assessment
HIA – Heritage Impact Assessment
MCM – Ministry of Citizenship and Multiculturalism
OHA – Ontario Heritage Act
OHT – Ontario Heritage Trust
OP – Official Plan
O. Reg. – Ontario Regulation
PPS – Provincial Policy Statement
ROP– Regional Official Plan

PERSONNEL

Principal: P.J. Racher, MA, CAHP
Heritage Operations Manager: K. Jonas Galvin, MA, RPP, MCIP, CAHP
Project Manager: A. Barnes, MA, CAHP
Field Surveyors: A. Barnes, S. Zia Dipl Architectural. Conservation, B.Arch
Photographers: A. Barnes, S. Zia
Research: R. Hendricks, MA
Cartographer: L. Bailey (GIS)
Technical Writers: S. Zia, V. Mance, BA

CITY OF KITCHENER MINIMUM REPORT REQUIREMENTS CHART

City of Kitchener Minimum Requirements (Project Specific ToR)	Relevant ARA Section
Present Owner Contact Information	1.0 Project Context
Detailed Site History	4.0 Historical Context
Written Description of Existing Conditions	5.0 Consultation 6.0 Field Survey 7.0 Property Description
Photographic Documentation	Appendix A: Property Location Images
Heritage Assessment and Statement of CHVI (if applicable)	8.0 Heritage Assessment
Proposed Project Options	9.0 Proposed Project
Impacts Assessment	10.0 Analysis of Potential Impacts
Conservation and Mitigation Recommendations	11. Preferred Design and Mitigation Measures
Summary Statement	12.0 Summary Statement Recommendation
Qualifications of authors/personnel	Appendix C: Key Team Member's Qualifications

1.0 PROJECT CONTEXT

Under a contract awarded in April 2023, by MTE Consultants Inc. (MTE) Archaeological Research Associates Ltd. (ARA) carried out a Heritage Impact Assessment (HIA), in support of the Class Environmental Assessment and Preliminary Design as detailed in the *Professional Services – Class EA & Preliminary Design for Blair Creek Drive Road, Storm Sewer, & Watermain Extension (Future Strasburg Road to Intersection of Reidel Drive and Blair Creek Drive), RFQ No.: Q23-010,* for the City of Kitchener.

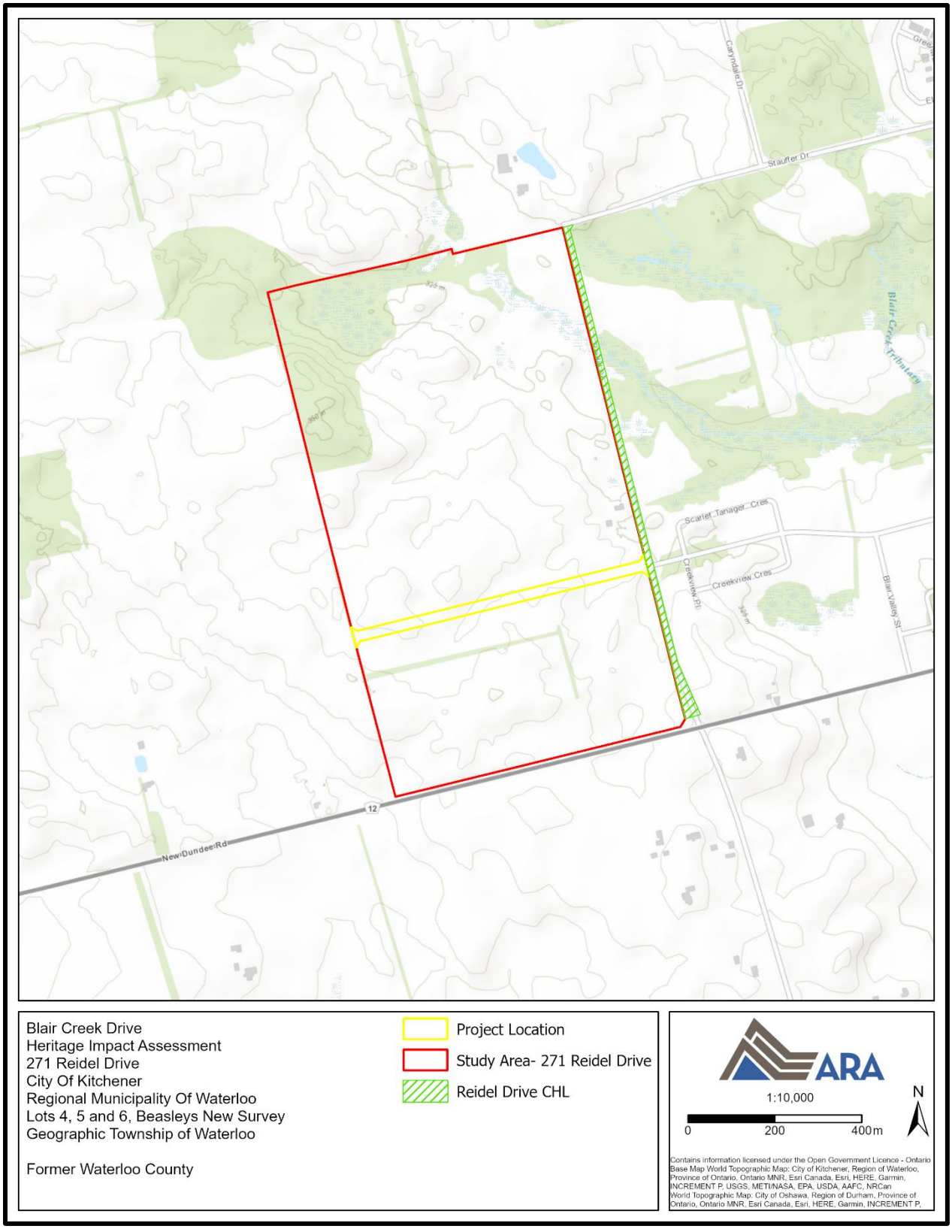
The preliminary design for the *Blair Creek Drive Road, Storm, & Watermain Extension* includes an approximately 700-meter portion of land (henceforth project location) which runs linear in an east-west direction through the property known as 271 Reidel Drive (henceforth study area) (see Map 1). The project location is proposed to be used as a road extension, continuing from the future Strasburg Road alignment which intersects at Reidel Drive and Blair Creek Drive. The Blair Creek Drive Road Extension will also include new storm sewer as well as a 300mm diameter watermain.

The study area is an approximately 200-acre parcel of land and is characterized by rolling topography, lands which appear under agricultural use, a small creek, forested area, slopes, and grade changes which surround a primary residence with multiple outbuildings. The residence on in the study area fronts onto Reidel Drive.

Two cultural heritage resources have been identified within or adjacent to the project location. The project location is proposed to be located within the study area (271 Reidel Drive) which is listed as a non-designated property of cultural heritage value or interest on the City of Kitchener Municipal Heritage Register. The study area is located adjacent to the Reidel Drive Cultural Heritage Landscape (CHL), which was identified in the *Cultural Heritage Landscape Study*, approved by Council in 2015.

The purpose of this assessment is to identify and evaluate the cultural heritage resources within the study area that may be impacted by the proposed project. This assessment was conducted in accordance with the aims of the *Provincial Policy Statement* (2020), the *Ontario Heritage Act*, R.S.O. 1990, c. O.18, *Ontario Heritage Tool Kit series* (MCM 2006a), the *Region of Waterloo Official Plan* (2015), the *City of Kitchener Official Plan* (2014) and the project specific Terms of Reference (TOR) provided by City of Kitchener (2023).

The study area (271 Reidel Drive) is currently owned by Grambian Investments, Inc.



Map 1: Study Area in the City of Kitchener
(Produced by ARA under licence using ArcGIS® software by Esri, © Esri)

Map 2: Aerial of Study Area in the City of Kitchener
(Produced by ARA under licence using ArcGIS® software by Esri, © Esri)

2.0 LEGISLATION AND POLICY REVIEW

The framework for this assessment report is provided by federal guidelines, provincial planning legislation, and policies as well as regional and local municipal Official Plans and guidelines.

2.1 Federal Guidelines

At the national level, *The Standards and Guidelines for Conservation of Historic Places in Canada* (Parks Canada 2010) provides guidance for the preservation, rehabilitation, and restoration of historic places, including cultural heritage landscapes (CHLs) and built heritage resources (BHRs). Such guidance includes the planning and implementation of heritage conservation activities.

With respect to CHLs, the *Standards and Guidelines for the Conservation of Historic Places* define them as "any geographical area that has been modified, influenced or given special cultural meaning by people, and that has been formally recognized for its heritage value" (Parks Canada 2010:113). It identifies the three categories of cultural landscapes which are also contained within the UNESCO (2010) Operational Guidelines for the Implementation of the World Heritage Convention: designed; organically evolved (vernacular); and associative. The *Standards and Guidelines* further outlines specific guidelines for cultural heritage landscapes, including 11 subsections on: "evidence of land use; evidence of traditional practices; land patterns; spatial organization; visual relationships; circulation; ecological features; vegetation; landforms; water features; and built features" (Parks Canada 2010:50).

2.2 Provincial Policies and Guidelines

2.2.1 Planning Act

In Ontario, the *Planning Act* is the primary document used by provincial and municipal governments in land use planning decisions. The purpose of the *Planning Ac*t is outlined in Section 1.1 of the Act, which states:

> ***1.1*** *The purposes of this Act are,*
> *(a) to promote sustainable economic development in a healthy natural environment within the policy and by the means provided under this Act;*
> *(b) to provide for a land use planning system led by provincial policy;*
> *(c) to integrate matters of provincial interest in provincial and municipal planning decisions;*
> *(d) to provide for planning processes that are fair by making them open, accessible, timely and efficient;*
> *(e) to encourage co-operation and co-ordination among various interests;*
> *(f) to recognize the decision-making authority and accountability of municipal councils in planning.*1994, c. 23, s. 4.

Part I Provincial Administration, Section 2 states:

> *The Minister, the council of a municipality, a local board, a planning board and the Municipal Board, in carrying out their responsibilities under the Act, shall have regard to, among other matters, matters of provincial interest such as,*
> > *(d) the conservation of features of significant architectural, cultural, historical, archaeological, or scientific interest.* 1990: Part I (2. d).

Part I Provincial Administration, Section 3, 5 Policy statements and provincial plans states:

> *A decision of the council of a municipality, a local board, a planning board, a minister of the Crown and a ministry, board, commission or agency of the government, including the Tribunal, in respect of the exercise of any authority that affects a planning matter,*
>
> *(a) shall be consistent with the policy statements issued under subsection (1) that are in effect on the date of the decision; and*
>
> *(b) shall conform with the provincial plans that are in effect on that date, or shall not conflict with them, as the case may be.* 2006, c. 23, s. 5; 2017, c. 23, Sched. 5, s. 80.

The current *Provincial Policy Statement* (*PPS*), issued under section 3 of the *Planning Ac*t, came into effect May 1, 2020.

2.2.2 The Provincial Policy Statement (2020)

The *Provincial Policy Statement* (*PPS* 2020) contains a combined statement of the Province's land use planning policies. It provides the provincial government's policies on a range of land use planning issues including cultural heritage outlined in Section 1.7 c) as including:

> *Ontario's long-term prosperity, environmental health, and social well-being depend on conserving biodiversity, protecting the health of the Great Lakes, and protecting natural heritage, water, agricultural, mineral and cultural heritage and archaeological resources for their economic, environmental and social benefits* (Section 1.7 e) MMAH 2020:24).

The *PPS* 2020 promotes the conservation of cultural heritage resources through detailed polices in Section 2.6, such as 2.6.1 Significant built heritage resources and significant cultural heritage landscapes shall be conserved" and

> *2.6.3 Planning authorities shall not permit development and site alteration on adjacent lands to protected heritage property except where the proposed development and site alteration has been evaluated and it has been demonstrated that the heritage attributes of the protected heritage property will be conserved* (MMAH 2020:31).

2.2.3 Ontario Heritage Act

The *OHA*, R.S.O. 1990, c.018 is the guiding piece of provincial legislation for the conservation of significant cultural heritage resources in Ontario. The *OHA* gives provincial and municipal governments the authority and power to conserve Ontario's heritage. The *OHA* has policies which address individual properties (Part IV) and heritage districts (Part IV), which require municipalities to keep a register of such properties and allows the municipalities to list non-designated properties which may have cultural heritage value or interest (Section 27).

In order to objectively identify cultural heritage resources, O. Reg. 9/06 (as amended by O. Reg, 569/22) made under the *OHA* sets out nine criteria for determining cultural heritage value or interest (CHVI) (MCM 2006b:20–27). The criteria set out in the regulation were developed to identify and evaluate properties for designation under the *OHA*. Best practices in evaluating

properties that are not yet protected employ O. Reg. 9/06 (as amended by O. Reg, 569/22) to determine if they have CHVI. These nine criteria are:

1. *The property has design value or physical value because it is a rare, unique, representative or early example of a style, type, expression, material or construction method,*
2. *The property has design value or physical value because it displays a high degree of craftsmanship or artistic merit, or*
3. *The property has design value or physical value because it demonstrates a high degree of technical or scientific achievement.*
4. *The property has historical value or associative value because it has direct associations with a theme, event, belief, person, activity, organization or institution that is significant to a community,*
5. *The property has historical value or associative value because it yields, or has the potential to yield, information that contributes to an understanding of a community or culture, or*
6. *The property has historical value or associative value because it, demonstrates or reflects the work or ideas of an architect, artist, builder, designer or theorist who is significant to a community.*
7. *The property has contextual value because it is important in defining, maintaining or supporting the character of an area,*
8. *The property has contextual value because it is physically, functionally, visually or historically linked to its surroundings, or*
9. *The property has contextual value because it is a landmark.* (O. Reg. 569/22, s. 1 (2)).

The *OHA* provides three key tools for the conservation of built heritage resources (BHRs) and cultural heritage landscapes (CHLs). It allows for protection as:

1. A single property (i.e., farmstead, park, garden, estate, cemetery), a municipality can designate BHRs and CHLs as individual properties under Part IV of the *OHA*.
2. Multiple properties or a specific grouping of properties may be considered a CHL, as such, a municipality can designate the area as a Heritage Conservation District (HCD) under Part V of the *OHA*.
3. Lastly, a municipality has the authority to add an individual or grouping of non-*OHA* designated property(ies) (often called “listed” properties) of heritage value or interest on their Municipal Heritage Register.

An *OHA* designation provides the strongest heritage protection available for conserving cultural heritage resources.

2.2.4 Eight Guiding Principles in the Conservation of Built Heritage Properties

The MCM’s *Eight Guiding Principles in the Conservation of Built Heritage Properties* (2007) provides statements on heritage conservation best practices. These statements form the ministry’s position and are based on international charters and best practices. As with the Standards and Guidelines for the Conservation of Historic Places in Canada, these principles are meant to guide changes to cultural heritage resources to ensure that cultural heritage value or interest is conserved. The statements are:

1. *Respect for documentary evidence*

2. *Respect for original location*
3. *Respect for historic material*
4. *Respect for original fabric*
5. *Respect for the building's history*
6. *Reversibility*
7. *Legibility*
8. *Maintenance* (MCM 2007).

2.2.5 Ontario Heritage Tool Kit

MCM's Heritage Toolkit *Heritage Resources in the Land Use Planning Process*, *Information Sheet #2 Cultural Heritage Landscapes* (2006c:1–2) defines CHLs, similar to *Standards and Guidelines for Conservation of Historic Places in Canada,* with these definitions:

- *Designed Cultural Landscapes – These are areas that are clearly defined and created intentionally by human design. They may include garden and parkland landscapes constructed for aesthetic reasons and may be associated with religious or monumental buildings.*
- *Evolved Cultural Landscapes – This type of landscape is often the result of a social, economic, administrative and/or religious motivation that has continued to develop into its present form due to associations with, or in response to, its natural environment. There are two sub-categories of this CHL type:*
    - *Relic Landscape – One in which an evolutionary process came to an end but its significant distinguishing features are still visible.*
    - *Continuing Landscape – One that retains associations with traditional practices but which retains an active social role in the current community while continuing to evolve and exhibit material evidence of this ongoing evolution.*
- *Associative Cultural Landscapes – These landscapes have religious, artistic, or cultural associations with nature rather than with material cultural evidence, which may be insignificant or absent* (MCM 2006c:1–2).

2.3 Municipal Policies

2.3.1 Region of Waterloo Official Plan

The Region of Waterloo *Regional Official Plan 2051* (ROP) Chapter 3 focuses on "Liveability in Waterloo." Section 3.G contains policies related specifically to cultural heritage in Waterloo Region. Policy 3.G.1 indicates that: "The Region and Area Municipalities will ensure that cultural heritage resources are conserved using the provisions of the Heritage Act, the Planning Act, the Environmental Assessment Act…" (2015:48).

Building on Policy 3.G.1, Policy 3.G.3 states:

> *Area Municipalities will identify cultural heritage resources by establishing and maintaining a register of properties that are of cultural heritage value or interest. Area Municipalities will include on their register properties designated under Part IV, V or VI of the Heritage Act, and will consider including, but not be limited to, the following additional cultural heritage resources of cultural heritage value or interest:*
> *(a) properties that have heritage conservation easements or covenants registered against title;*

> *(b) cultural heritage resources of Regional interest; and*
> *(c) cultural heritage resources identified by the Grand River Conservation Authority and the Federal or Provincial governments (Region of Waterloo 2015:48-49).*

In Policy 3.G.4 the Region indicates it will also coordinate and maintain a "region-wide inventory of cultural heritage resources" which will include the resources noted above as well as resources identified by "postsecondary institutions or local historical societies" (Region of Waterloo 2015:49). Policies 3.G.5- 3.G.7 address cultural heritage landscape conservation (2015:49–51).

CHLs are to be conserved through the preparation and updating of a *Regional Implementation Guideline for Cultural Heritage Landscape Conservation* which will provide an identification and implementation framework and will allow for the highlighting of CHLs of Regional interest (Policy 3.G.5 Region of Waterloo 2015:49). Policy 3.G.6 further states: "Area Municipalities will designate Cultural Heritage Landscapes in their official plans and establish associated policies to conserve these areas. The purpose of this designation is to conserve groupings of cultural heritage resources…" (Region of Waterloo 2015:50).

2.3.2 City of Kitchener Official Plan

The *City of Kitchener OP* outlines goals of the *OP* which includes providing:

> *…a framework for the creation and maintenance of a safe and healthy urban environment within which opportunities are provided for people to satisfy their social, economic, cultural and physical needs and for maintaining and conserving the integrity of the natural and cultural heritage* (City of Kitchener 2014:2-4).

Section 12 of *City of Kitchener OP* contains policies addressing cultural heritage resources. Within this section there are objectives for the conservation of cultural heritage resources including:

> *12.C.1.1. To conserve the city's cultural heritage resources through their identification, protection, use and/or management in such a way that their heritage values, attributes and integrity are retained.*
> *12.C.1.2. To ensure that all development or redevelopment and site alteration is sensitive to and respects cultural heritage resources and that cultural heritage resources are conserved*. (2014:12-1).

Policy 12.C.1.3. states that cultural heritage resources are to be included in a list maintained by the City:

> *a) properties listed as non-designated properties of cultural heritage value or interest on the Municipal Heritage Register;*
> *b) properties designated under Part IV and V of the Ontario Heritage Act;*
> *c) cultural heritage landscapes; and*
> *d) heritage corridors* (2014:12-2).

The City also acknowledges that all cultural heritage resources have not been identified and as such, Policy 12.C.1.4. provides for properties that are not "listed or designated to be considered as having cultural heritage value or interest" (2014:12-2).

The protection of CHLs is outlined in policies 12.C.1.8.–12.C.1.12. which provide for inventorying and listing of CHLs on the Municipal Heritage Register, their mapping and their conservation through legislation and along the Grand River (2014:12-2–12-3). Beyond these policies the OP contains cultural heritage policies within Section 12 that address Heritage Conservation Districts; archaeology; conservation measures for cultural heritage resources; Heritage Impact Assessments and Heritage Conservation Plans; Heritage Permit application process; the demolition/damage of cultural heritage resources; public infrastructure; incentives; the role and resources of Kitchener including leading by example with the care and management of City-owned cultural heritage resources; and the design and integration of cultural heritage resources in the City.

2.3.3 City of Kitchener Cultural Heritage Landscape Study (2014)

The *City of Kitchener Cultural Heritage Landscape Study* (2014) is a planning tool which provides a legislative framework and planning tools to guide and manage change within identified CHLs. One of the purposes of the CHL Study was to consider "large scale areas that express both the historical process of development and the physical outcomes of that process" (2014: 5).

The Study resulted in the identification of 55 CHLs with the City of Kitchener. The CHLs are categorized within one of the following nine categories:

- Residential Neighbourhoods
- Parks, Natural Areas and other Public/Private Open Spaces
- Transportation Corridors and Streetscapes
- Institutional Landscapes
- Commercial Industrial and Retail Landscapes.
- Agricultural Landscapes
- Large Lot Residential/Estate Landscapes
- Cemeteries
- Grand River Valley Landscapes

Rural roads are described in the study as:

> *…roads serviced and in some cases continue to service the farm and agricultural community in the southern part of the original Township of Waterloo. Many of these are part of the random network of roads that connected the small rural hamlets that had agriculture service industries such as grist mills, flax mills and sawmills. Many of these roads have rural cross-sections with narrow shoulders, ditches, utility lines and few fences. Most traverse the natural topography of the glacial landforms without the interruption of major grading* (City of Kitchener 2014:12).

Under the category of "Transportation Corridors and Streetscapes" Reidel Drive has been identified as a rural road CHL (L-RD-10).

2.3.4 Summary of Policies

Provincial legislation and policies, and the municipal policies, call for the identification and conservation of cultural heritage resources and they provide policies related to potential development impacts to cultural heritage resources. Federal guidelines provide direction on many activities including the appropriate actions in terms of cultural heritage resource conservation,

restoration and maintenance. This HIA will address these cultural heritage policies and guidelines as they relate to study area.

3.0 KEY CONCEPTS

The following concepts require clear definition in advance of the methodological overview and proper understanding is fundamental for any discussion pertaining to cultural heritage resources:

- **Built Heritage Resource** (BHR) can be defined in the *PPS* as: "a building, structure, monument, installation or any manufactured or constructed part or remnant that contributes to a property's cultural heritage value or interest as identified by a community, including Indigenous community. Built heritage resources are located on property that has been designated under Parts IV or V of the *Ontario Heritage Act*, or that may be included on local, provincial and/or federal and/or international registers" (MMAH 2020:41).
- **Conserved** means "the identification, protection, management and use of built heritage resources, cultural heritage landscapes and archaeological resources in a manner that ensures their cultural heritage value or interest is retained. This may be achieved by the implementation of recommendations set out in a conservation plan, archaeological assessment, and/or heritage impact assessment that has been approved, accepted or adopted by relevant planning authority and/or decision-makers. Mitigative measures and/or alternative development approaches can be included in these plans and assessments" (MMAH 2020:41).
- **Cultural Heritage Landscape** (CHL) is defined in the *PPS* as: "a defined geographical area that may have been modified by human activity and is identified as having cultural heritage value or interest by a community, including an Aboriginal community. The area may involve features such as structures, spaces, archaeological sites or natural elements that are valued together for their interrelationship, meaning or association. Examples may include, but are not limited to, heritage conservation districts designated under the *Ontario Heritage Act*; villages, parks, gardens, battlefields, mainstreets and neighbourhoods, cemeteries, trailways, viewsheds, natural areas and industrial complexes of heritage significance; and areas recognized by federal or international designation authorities (e.g., a National Historic Site or District designation, or a UNESCO World Heritage Site)" (MMAH 2020:42).
- **Cultural Heritage Value or Interest** (CHVI), also referred to as Heritage Value, is identified if a property meets one of the criteria outlined in O. Reg. 9/06 namely historic or associate value, design or physical value and/or contextual value. Provincial significance is defined under *Ontario Heritage Act (OHA) O. Reg*. 10/06.
- **Heritage Attributes** are defined as: "the principal features or elements that contribute to a protected heritage property's cultural heritage value or interest, and may include the property's built, constructed, or manufactured elements, as well as natural landforms, vegetation, water features, and its visual setting (e.g., significant views or vistas to or from a protected heritage property)." (MMAH 2020:44-45).
- **Protected heritage property** is defined as "property designated under Parts IV, V or VI of the Ontario Heritage Act; property subject to a heritage conservation easement under Parts II or IV of the Ontario Heritage Act; property identified by the Province and prescribed public bodies as provincial heritage property under the Standards and Guidelines for Conservation of Provincial Heritage Properties; property protected under federal legislation, and UNESCO World Heritage Sites" (MMAH 2020:49).
- **Significant** in reference to cultural heritage is defined as: "resources that have been determined to have cultural heritage value or interest. Processes and criteria for

determining cultural heritage value or interest are established by the Province under the authority of the Ontario Heritage Act" (MMAH 2020:51).

Key heritage definitions from the *Region of Waterloo Official Plan* are as follows:

- **Built heritage resources** are defined as "one or more significant buildings, structures, monuments, installations or remains associated with architectural, cultural, social, political, economic or military history and identified as being important to the community. These resources may be identified through designation or heritage conservation easement under the *Ontario Heritage Act*, or listed by local, regional, provincial or federal jurisdictions" (2015:G-4).
- **Cultural Heritage Impact Assessment** is detailed as "a study to determine if cultural heritage resources will be negatively impacted by a proposed development or site alteration. It can also demonstrate how the cultural heritage resource will be conserved in the context of redevelopment or site alteration. Mitigative or avoidance measures or alternative development approaches may also be recommended" (2015:G-5).
- **Cultural heritage landscape** is "a defined geographical area of heritage significance which has been modified by human activities and is valued by a community. It involves a grouping(s) of individual heritage features such as structures, spaces, archaeological sites and natural elements, which together form a significant type of heritage form, distinctive from that of its constituent elements or parts" (2015:G-5).
- **Cultural heritage resources** are "the physical remains and the intangible cultural traditions of past human activities. These include, but are not limited to:

    - buildings (residential, commercial, institutional, industrial and agricultural);
    - cultural heritage landscapes (designed, organic/evolved);
    - structures (water tower; bridge, fence and dam);
    - monuments (cenotaph, statue and cairn);
    - archaeological resources;
    - cemeteries;
    - scenic roads;
    - vistas/viewsheds;
    - culturally significant natural features (tree and landform);
    - movable objects (archival records and artifacts); and
    - cultural traditions (language, stories, music, dance, food, celebrations, art and crafts") (2015:G-6).

Key heritage definitions from the *City of Kitchener Official Plan* are as follows:

- **Adaptive Re-use** "the recycling of a building and/or structure usually for a new function, such as the use of a former industrial building for residential purposes." (2014:A-1).
- **Cultural Heritage Resources "**includes buildings, structures and properties designated under the Ontario Heritage Act or listed on the Municipal Heritage Register, properties on the Heritage Kitchener Inventory of Historic Buildings, built heritage resources and cultural heritage landscapes as defined in the Provincial Policy Statement." (2014:A-5).
- **Cultural Heritage Landscapes** "a defined geographical area that may have been modified by human activity and is identified as having cultural heritage value or interest by a community. The area may involve features such as structures, spaces, archaeological sites or natural elements that are valued together for their interrelationship, meaning or association. Examples may include, but are not limited to, heritage

> conservation districts designated under the Ontario Heritage Act; villages, parks, gardens, battlefields, mainstreets and neighbourhoods, cemeteries, trailways, viewsheds, natural areas and industrial complexes of heritage significance; and areas recognized by federal or international designation authorities (2014:A-5).

The *Standards and Guidelines for the Conservation of Historic Places* identifies the three categories of cultural landscapes which are also contained within the UNESCO (2010) Operational Guidelines for the Implementation of the World Heritage Convention: designed; organically evolved (vernacular); and associative. The Ministry of Heritage, Sport, Tourism and Culture Industries (MCM) *Information Sheet #2 Cultural Heritage Landscapes* (2006c:1-2) continues these definitions:

- **Designed Cultural Landscapes** – These are areas that are clearly defined and created intentionally by human design. They may include garden and parkland landscapes constructed for aesthetic reasons and may be associated with religious or monumental buildings.
- **Evolved Cultural Landscapes** – This type of landscape is often the result of a social, economic, administrative and/or religious motivation that has continued to develop into its present form due to associations with, or in response to, its natural environment. There are two sub-categories of this CHL type:
  - Relic Landscape – One in which an evolutionary process came to an end but its significant distinguishing features are still visible.
  - Continuing Landscape – One that retains associations with traditional practices but which retains an active social role in the current community while continuing to evolve and exhibit material evidence of this ongoing evolution.
- **Associative Cultural Landscapes –** These landscapes have religious, artistic, or cultural associations with nature rather than with material cultural evidence, which may be insignificant or absent.

4.0 HISTORICAL CONTEXT

After a century of archaeological work in southern Ontario, scholarly understanding of the historical usage of the area has become very well-developed. With occupation beginning in the Palaeo period approximately 11,000 years ago, the greater vicinity of the study area comprises a complex chronology of Indigenous and Euro-Canadian histories. Section 4.1.1 summarizes the region's settlement history, whereas Section 4.1.2 documents past and present land uses.

4.1 Settlement History

4.1.1 Pre-Contact

The Pre-Contact history of the region is lengthy and rich, and a variety of Indigenous groups inhabited the landscape. Archaeologists generally divide this vibrant history into three main periods: Palaeo, Archaic and Woodland. Each of these periods comprise a range of discrete sub-periods characterized by identifiable trends in material culture and settlement patterns, which are used to interpret past lifeways. The principal characteristics of these sub-periods are summarized in Table 1.

Table 1: Pre-Contact Settlement History
(Wright 1972; Ellis and Ferris 1990; Warrick 2000; Munson and Jamieson 2013)

Sub-Period	Timeframe	Characteristics
Early Palaeo	9000–8400 BC	Gainey, Barnes and Crowfield traditions; Small bands; Mobile hunters and gatherers; Utilization of seasonal resources and large territories; Fluted points
Late Palaeo	8400–7500 BC	Holcombe, Hi-Lo and Lanceolate biface traditions; Continuing mobility; Campsite/Way-Station sites; Smaller territories are utilized; Non-fluted points
Early Archaic	7500–6000 BC	Side-Notched, Corner-Notched (Nettling, Thebes) and Bifurcate traditions; Growing diversity of stone tool types; Heavy woodworking tools appear (e.g., ground stone axes and chisels)
Middle Archaic	6000–2500 BC	Stemmed (Kirk, Stanly/Neville), Brewerton Side- and Corner-Notched traditions; Reliance on local resources; Populations increasing; More ritual activities; Fully ground and polished tools; Net-sinkers common; Earliest copper tools
Late Archaic	2500–900 BC	Narrow Point (Lamoka), Broad Point (Genesee) and Small Point (Crawford Knoll) traditions; Less mobility; Use of fish-weirs; True cemeteries appear; Stone pipes emerge; Long-distance trade (marine shells and galena)
Early Woodland	900–400 BC	Meadowood tradition; Crude cord-roughened ceramics emerge; Meadowood cache blades and Side-Notched points; Bands of up to 35 people
Middle Woodland	400 BC–AD 600	Saugeen tradition; Stamped ceramics appear; Saugeen projectile points; Cobble spall scrapers; Seasonal settlements and resource utilization; Post holes, hearths, middens, cemeteries and rectangular structures identified
Middle/Late Woodland Transition	AD 600–900	Princess Point tradition; Cord roughening, impressed lines and punctate designs on pottery; Adoption of maize horticulture at the western end of Lake Ontario; Oval houses and 'incipient' longhouses; First palisades; Villages with 75 people
Late Woodland (Early)	AD 900–1300	Glen Meyer tradition; Settled village-life based on agriculture; Small villages (0.4 ha) with 75–200 people and 4–5 longhouses; Semi-permanent settlements

Sub-Period	Timeframe	Characteristics
Late Woodland (Middle)	AD 1300–1400	Uren and Middleport traditions; Classic longhouses emerge; Larger villages (1.2 ha) with up to 600 people; More permanent settlements (30 years)
Late Woodland (Late)	AD 1400–1600	Pre-Contact Neutral tradition; Larger villages (1.7 ha); Examples up to 5 ha with 2,500 people; Extensive croplands; Also hamlets, cabins, camps and cemeteries; Potential tribal units; Fur trade begins ca. 1580; European trade goods appear

Although Iroquoian-speaking populations tended to leave a much more obvious mark on the archaeological record and are therefore emphasized in the Late Woodland entries above, it must be understood that Algonquian-speaking populations also represented a significant presence in southern Ontario. Due to the sustainability of their lifeways, archaeological evidence directly associated with the Anishinaabeg remains elusive, particularly when compared to sites associated with the more sedentary agriculturalists. Many artifact scatters in southern Ontario were likely camps, chipping stations or processing areas associated with the more mobile Anishinaabeg, utilized during their travels along the local drainage basins while making use of seasonal resources. This part of southern Ontario represents the ancestral territory of various Indigenous groups, each with their own land use and settlement pattern tendencies.

4.1.2 Post-Contact

The arrival of European explorers and traders at the beginning of the 17th century triggered widespread shifts in Indigenous lifeways and set the stage for the ensuing Euro-Canadian settlement process. Documentation for this period is abundant, ranging from the first sketches of Upper Canada and the written accounts of early explorers to detailed township maps and lengthy histories. The Post-Contact period can be effectively discussed in terms of major historical events, and the principal characteristics associated with these events are summarized in Table 2.

Table 2: Post-Contact Settlement History
(Smith 1846; Sutherland 1864; Coyne 1895; Lajeunesse 1960; Cumming 1972; Janusas 1988; Ellis and Ferris 1990; Surtees 1994; Hayes 1997; Bloomfield 2006; AO 2022)

Historical Event	Timeframe	Characteristics
Early Exploration	Early 17th century	Brûlé explores southern Ontario in 1610/11; Champlain travels through in 1613 and 1615/1616, making contact with a number of Indigenous groups (including the Algonquin, Huron-Wendat and other First Nations); European trade goods become increasingly common and begin to put pressure on traditional industries
Increased Contact and Conflict	Mid- to late 17th century	Conflicts between various First Nations during the Beaver Wars result in numerous population shifts; European explorers continue to document the area, and many Indigenous groups trade directly with the French and English; 'The Great Peace of Montreal' treaty established between roughly 39 different First Nations and New France in 1701
Fur Trade Development	Early to mid-18th century	Growth and spread of the fur trade; Peace between the French and English with the Treaty of Utrecht in 1713; Ethnogenesis of the Métis; Hostilities between French and British lead to the Seven Years' War in 1754; French surrender in 1760
British Control	Mid- to late 18th century	*Royal Proclamation* of 1763 recognizes the title of the First Nations to the land; Numerous treaties subsequently arranged by the Crown; First land cession under the new protocols is the Seneca surrender of the west side of the Niagara River in 1764; The Niagara Purchase (Treaty 381) in 1781 included this area

Historical Event	Timeframe	Characteristics
Loyalist Influx	Late 18th century	United Empire Loyalist influx after the American Revolutionary War (1775–1783); British develop interior communication routes and acquire additional lands; Between the Lakes Purchase completed with the Mississaugas in 1784 and confirmed in 1792 (Treaty 3); Haldimand Proclamation of 1784 grants land to Six Nations (the Haldimand Tract), clarified by the Simcoe Patent (Treaty 4) in 1793; *Constitutional Act* of 1791 creates Upper and Lower Canada
County Development	Late 18th to early 19th century	Became part of York County's 'West Riding' in 1792; Brant surrenders Blocks 1–6 of the Haldimand Tract to the Crown in 1798; Became part of the Gore District and Halton County in 1816; Wellington District and Waterloo County created in 1840; Waterloo County independent after the abolition of the district system in 1849
Township Formation	Early 19th century	Waterloo initially comprised Block 2 of the Haldimand Tract; Purchased by United Empire Loyalist R. Beasley and his partners in 1798; Deeds could not be issued until full payment was made to Six Nations; Nearly 5,750 ha sold to Pennsylvania Mennonites and non-Mennonites in 1800; German Company formed to facilitate a bulk sale of land to Pennsylvania Mennonites, represented by D. Erb and S. Bricker; Remaining 24,281 ha purchased in 1805 with clear title; Lots drawn by shareholders in Pennsylvania; Steady and rapid stream of settlers ensued, disrupted only by the Napoleonic Wars and the War of 1812
Township Development	Mid-19th to early 20th century	Population reached 4,424 by 1841 (mostly Pennsylvania Dutch and German); 33,518 ha taken up by 1846, with 12,151 ha under cultivation; 20 saw mills and 8 grist mills in operation at that time; Traversed by the Grand Trunk Railway (1856), Galt & Guelph Railway (1855/57), Preston & Berlin Railway (1857/1873) and Waterloo Junction Railway (1889/91); Principal settlements at Berlin, Hespeler, Preston and Waterloo, Other communities at Blair, Bloomingdale, Breslau, Bridgeport, Doon, Freeport, Freiburg, German Mills, New Aberdeen, Oregon (Upper Doon), Shantz, Strasburg and Williamsburg

4.1.3 Past and Present Land Use

4.1.3.1 Overview

During Pre-Contact and Early Contact times, the vicinity of the study area would have comprised a mixture of coniferous trees, deciduous trees and open areas. Indigenous communities would have managed the landscape to some degree, particularly during the Late Woodland period when clearings were made for agriculture. During the early 19th century, Pennsylvania Mennonites and later Euro-Canadian settlers arrived in the area and continued to clear the forests for agricultural and settlement purposes. The study area is located in a rural area as part of Beasley's New Survey; the closest settlements were Oregon in the Township of Waterloo and Roseville in the Township of North Dumfries.

4.1.3.2 Beasley's New Survey

After the American Revolution, the Haudenosaunee who allied with the British were granted a tract six miles wide on either bank on either side of the Grand River by Governor Haldimand in 1784 (Bricker 1935). Surveyor Augustus Jones completed a proper survey of the tract in the spring of 1791, and by 1798 Haudenosaunee Chief Joseph Brant, under a power of attorney, sold several blocks of their lands to settlers. Richard Beasley, James Wilson, and John Baptiste Rousseau purchased one of these blocks, known as Block No. 2, which consisted of approximately 94,012 acres. It was secured by a mortgage between the purchasers and Haudenosaunee trustees on May 10, 1798 (Bricker 1935). Block No. 2 was later surveyed into

various other tracts, such as Beasley's Old Survey, Beasley's Broken Front, Horning's Tract, Beihn's Tract, and Beasley's New Survey, among others.

Beasley's New Survey consisted of 13 lots in the southwest corner of the Township of Waterloo and was the last of the Block 2 tracts to be opened for sale. Very few transactions were recorded prior to 1825, although Lot 5 records a sale in 1822 to the Executors of Samuel Street (Bricker 1935:119).

4.1.3.3 Oregon

Oregon was a small village located on Mill Creek in the Township of Waterloo. Settled as early as 1808, the predominate industries consisted of milling and manufacturing. John Tilt owned a construction material factory which produced items such as bricks, drain tiles, and pails, milled lumber for a profit of roughly $4,000 a year, and Graham Watson owned a woollen cloth factory that produced an equivalent profit (Sutherland 1864). The village did not have a post office.

4.1.3.4 Roseville

Roseville was a post village in the Township of North Dumfries that was initially settled during the 1820s by Scottish and Pennsylvania German settlers (Mills 2018). The early settler families lived along the Roseville, Cedar Creek and New Dundee roads in log cabins and homes. In 1824, Pennsylvania native Jacob Rosenberger subdivided 160 acres into town lots (NDMHC 2002). By the 1860s, the village had a population of 150 and contained Henry Bricker's steam-powered sawmill, a general store, a school, two hotels, a post office, among other trades (Sutherland 1864). The population remained steady through 1884, when the village of 150 people had a United Brethren Church, a sawmill owned by James Barton, a blacksmith and carriage shop, one hotel, and a general store (Evans 1884).

4.2 Study Area History

4.2.1 Mapping and Imagery Analysis

In order to gain a general understanding of the study area's past land uses, two historical settlement maps and one topographic map were examined during the research component of the study. Specifically, the following resources were consulted:

- *Tremaines' Map of the County of Waterloo, Canada West* (1861) (OHCMP 2019);
- The *Illustrated Historical Atlas of the County of Waterloo, Ont.* (1881) (MU 2001); and
- A topographic map from 1916 (OCUL 2023).
- An aerial image from 1954 (UW 2016)

The limits of the study area are shown on georeferenced versions of the consulted historical resources in Map 3–Map 6. The study area traversed only Lot 5, Beasley's New Survey.

Tremaines' Map of the County of Waterloo, Canada West (1861) indicates that the study area was located at the northwest intersection of two historic roads: what is now known as New Dundee Road and Reidel Drive (Map 3). There are no watercourses or other topographic features marked within the study area, nor does there appear to be any locally significant landmarks indicated, such as cemeteries, churches, and/or schoolhouses. The study area (which encompasses all of Lot 5, Beasley New Survey) was listed as being owned by James Goodfellow, and there is a structure located in the same relative location as the extant house. However, the

type of structure and material used in the construction has not been noted. The 1861 Canada Census indicates that the Goodfellow family was living in a one-storey log house in 1861, and it is possible that the structure on the map could be that habitation.

The *Illustrated Historical Atlas of the County of Waterloo, Ont.* (1881) continues to show the location of the study area at the northwest corner of two historically surveyed roadways (Map 4). Unlike the 1861 map, there is no structure of any kind marked within the study area, although this does not necessarily mean there was not one present. There is also no owner listed. The closest landmark drawn on the map was the schoolhouse for School Section No. 22, which was located on Lot 3 of Beasley's New Survey.

The topographic map from 1916 depicts a wood or frame house (black) located on the west side of Reidel Drive in the same location where the house was drawn on the 1861 historical map, and where the extent house is currently situated (Map 5). A creek (likely Blair Creek, but unlabeled on the topographic map) traversed the northeast corner of the study area, north of the structure, and a bridge spanning this creek has been indicated on Reidel Drive, near its intersection with Stauffer Road to the north. There are a number of other structures, both wood and stone or brick, located in the general vicinity of the study area, but overall, the surrounding area has remained very rural in character.

An aerial image from 1954 shows a predominately agricultural landscape, both within the boundaries of the study area and the properties adjacent to the study area (see Map 6). The northwest corner of the subject property is covered by a woodlot, and here is what appears to be one structure within the subject property that faced onto Reidel Drive. The type of structure cannot be determined due to the resolution of the photo. New Dundee Road, Reidel Drive, and Blair Creek Drive remain in the same configuration as depicted on the 1916 topographic map.

4.3 Site Specific History - 271 Reidel Drive

The Crown Patent for 94,012 acres of Block No. 2 on the Grand River was granted on February 5, 1798, to Richard Beasley, James Wilson, and John Baptiste Rousseau (see Table 3). In 1800, 64,590 of these acres was partitioned to Richard Beasley, who then subdivided the acreage into various surveys and plans, one of which was called Beasley's New Survey. A concise date for the establishment of the plan was not located, but one of the earliest transactions dates from 1814 (Bricker 1935).

On December 4, 1822, Richard Beasley sold 200 acres of Lot 5 in Beasley's New Survey to the executors of Samuel Street. On June 2, 1854, an executor, whose name is illegible, sold all of Lot 5 to James Goodfellow. James Goodfellow was born on June 4, 1822, in Scotland and married Euphemia Kerr (b. 1826) around 1847 before immigrating to Ontario (Family Search 2023a). The couple had at least nine children: Elizabeth, Ellen, Janet, Andrew, John, Annie, Margaret, Thomas, and Euphemia, called Effie. James Goodfellow died on February 13, 1911, in Culross Township, Bruce County, Ontario and is buried in Culross-Teeswater Cemetery (Family Search 2023a).

The 1861 Canada West Census listed James Goodfellow as a Scottish-born 39-year-old Presbyterian farmer who lived with his wife Euphemia (age 35) and children Elizabeth (13), Helen/Ellen (10), Andrew (8), Janet (6), John (4), Mary (1), and his 82-year-old mother Betty in a one storey log house (LAC 1861). The Goodfellows owned 200 acres, 120 of which were under cultivation. The property was valued at around $6,000 and the family grew wheat, barley, peas,

oats, corn, potatoes, turnips, carrots, and hay. The farm also produced wool and flannel. The Goodfellows raised cows for both meat and milk, horses, sheep, and pigs (LAC 1861).

The 1871 Canada Census listed James Goodfellow as a 48-year-old Presbyterian that continued to work as a farmer. He lived with his 43-year-old wife Euphemia and their children Elizabeth (22), Helen/Ellen (19), Andrew (17), Janet (15), John (13), Margaret (11), Annie (9), Thomas (6), and Euphemia (2). Unfortunately, information regarding their house was not available in this census (LAC 1871).

On January 11, 1879, James Goodfellow sold Lot 5 in Beasley's New Survey to John Wismer. John Wismer was born on August 11, 1835, in Waterloo County, Ontario to Johann Wismer and Susannah Cressman Wismer who were originally from Pennsylvania. (Family Search 2023d). John married Nancy Snyder (1836 – 1927) on September 23, 1856, in Waterloo, Ontario. The couple had at least eight children: Benjamin, John, David, Henry, Leah, Nancy, Isaiah, and Emeline. John Wismer died on July 29, 1930, and was buried in Blair Cemetery in Waterloo County (Family Search 2023d).

The 1881 Canada Census listed John Wismer as a 45-year-old Ontario-born Mennonite of German descent who worked as a farmer. He lived with his wife Nancy (44) and their children John (21), David (19), Henry (18), Leah (16), Nancy (13), Isaiah (10), and Emeline (4) (LAC 1881). In 1891 John (55) and Nancy (54) Wismer lived in a one-and-a-half storey stone house with their children David (29), Leah (26), and Isaiah (20), David's wife Ester (Shantz) Wismer (23) and their child Ellton (infant), and an 18-year-old German domestic named Elisabeth Mettz. The family was Mennonite and John and Isaiah worked as farmers (LAC 1891).

In June 1895 John Wismer sold Lot 5 to his youngest son Isaiah Wismer. Isaiah Wismer was born on August 28, 1870, in Stratford, Ontario. In January 1897, Wismer married Ida Munson Wambold (1876 – 1954) in Waterloo, Ontario. The couple had two children: Herbert Leroy and Clarence Isaiah. Isaiah Wismer died on October 23, 1933, in Strasburg, Ontario and was buried in Pioneer Park Mennonite Cemetery (Family Search 2023c).

The 1901 Canada Census listed Isaiah Wismer, aged 30, working as a farmer and living with his wife Ida (25) and their son Herbert (3), as well as two domestics: 26-year-old Catherine Theodore and Henry Theodore, whose age is not given. The Wismers were Mennonites, and the Theodores were Methodist (LAC 1901). In 1911 the Wismers were still Mennonite farmers in Waterloo Township and had added a son, Clarence, aged 4, to their family. They also shared their residence with 18-year-old Catholic lodger Herbert Latner, who worked as a labourer (LAC 1911).

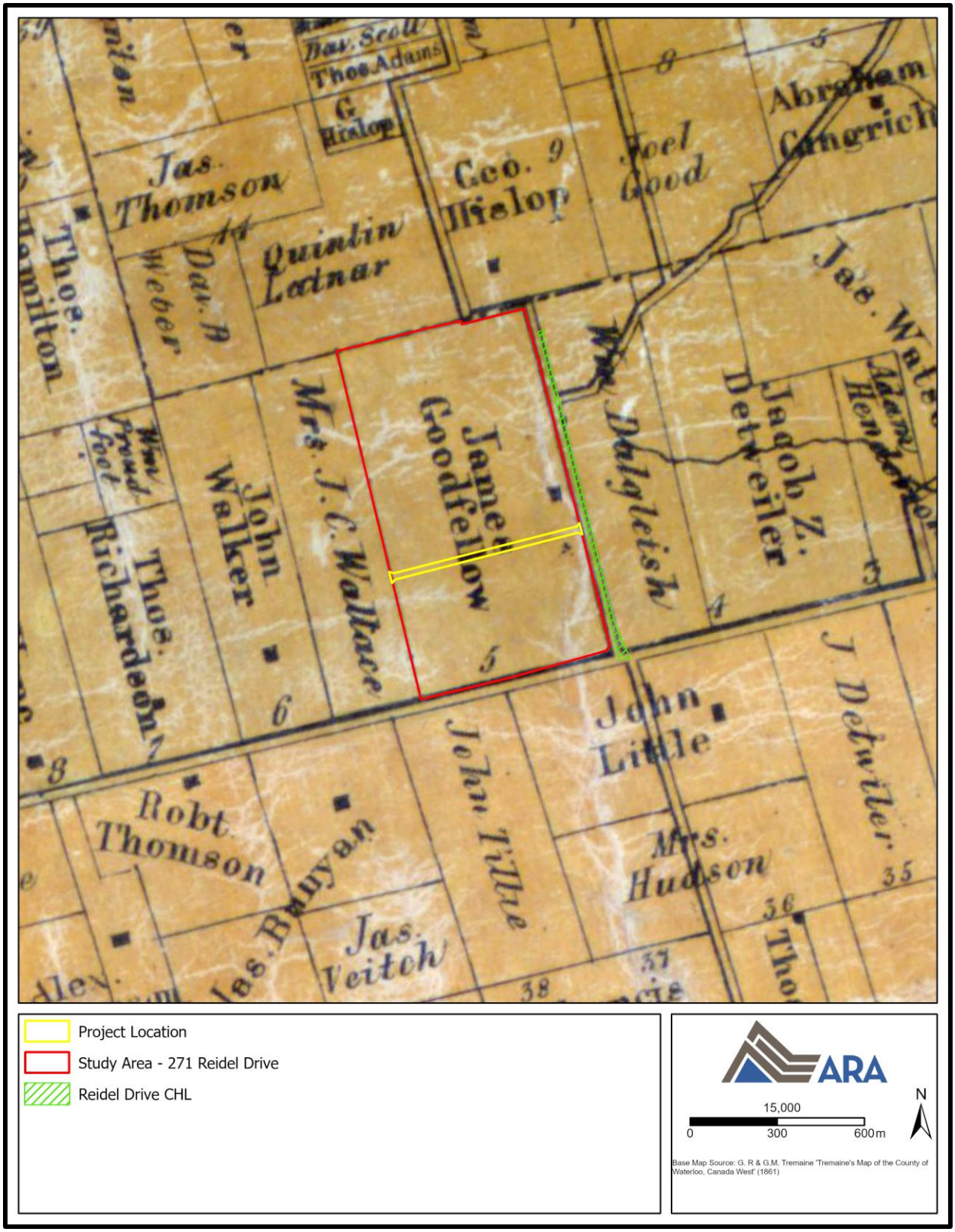
On March 5, 1921, Isaiah Wismer sold all 200 acres to Ervin C. Weber. Ervin Cressman Weber was born on September 21, 1885, in New Dundee, Ontario to George S. Weber (1861 – 1943) and Phillis Cressman (1863 – 1920). Phillis Cressman was a distant cousin of John Wismer through his mother, Susannah Cressman. Ervin married Louida Martin (1888 – 1960) on December 8, 1915, in Kitchener, Ontario and the couple had at least seven children: Rhea, Elva Mary, Willis, Arnott, Royal, Grace Ruth, and Maurice. The 1921 Canada Census listed Ervin Weber, a 37-year-old Ontario born Mennonite farmer, living with his wife Louida, age 35, and their children Elva (3), Willis (1), and Arnott (infant) in a 6-room house plastered with lime mortar (LAC 1921). Ervin Weber died on October 27, 1981, in Cambridge and was buried in Kitchener's First Mennonite Cemetery (Family Search 2023b).

On July 15, 1969, Ervin C. Weber granted Lot 5 to Maylake Investments, with an agreement for sale registered between the same parties ten years later in September 1979. On May 15, 1984,

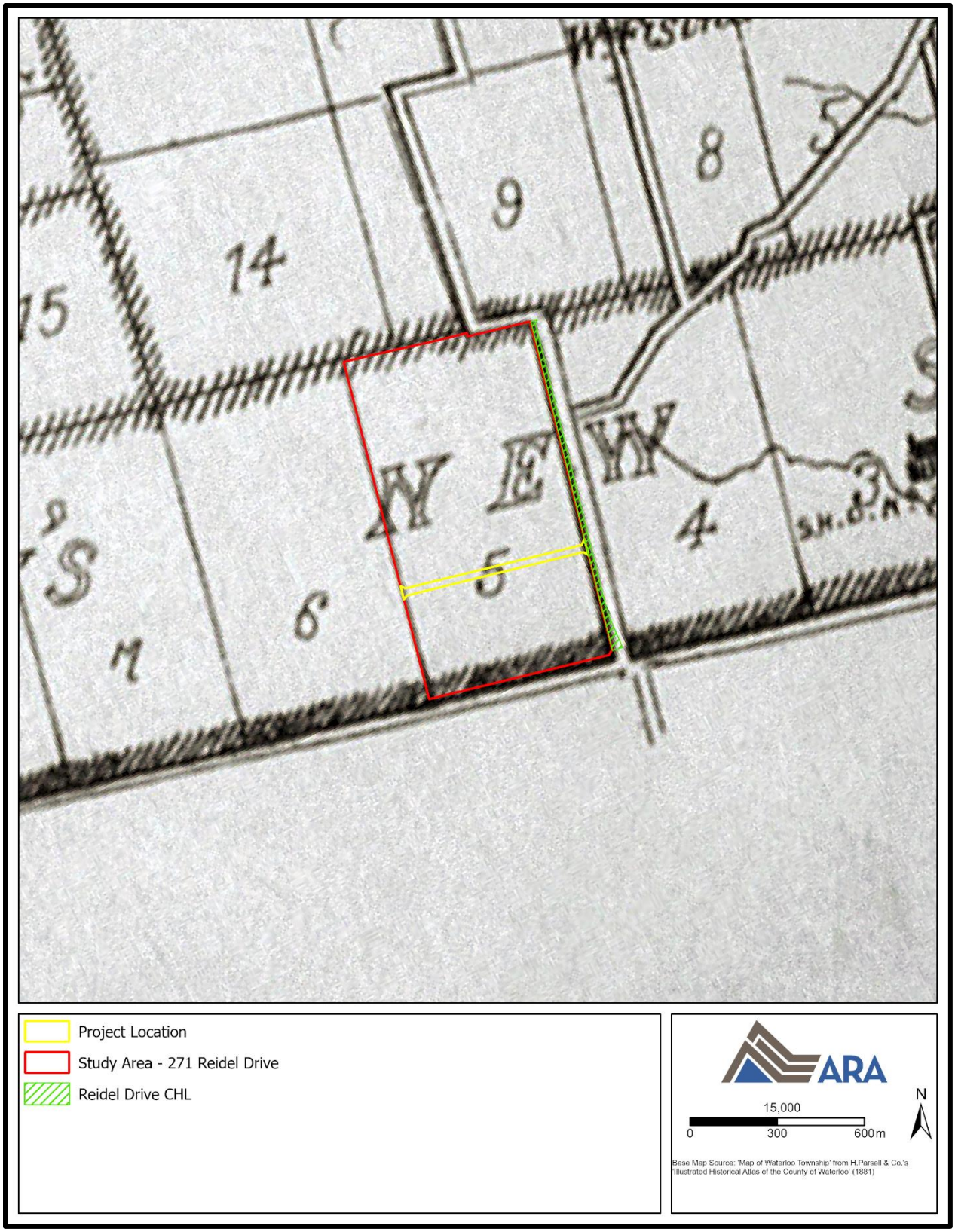
Ervin Weber Investments sold the 200 acres to Grambian Construction and Investments, Ltd. In 1986 Grambian Construction transferred Lot 5 to Rosenheim Investments Ltd. Rosenheim Investments, Ltd, transferred the lot back to Grambian Investments on February 2, 2007. On December 8, 2021, Grambian Investments filed for absolute title for the property at 271 Reidel Drive.

Table 3: Summary of Property Ownership for 217 Reidel Drive (LRO #58)

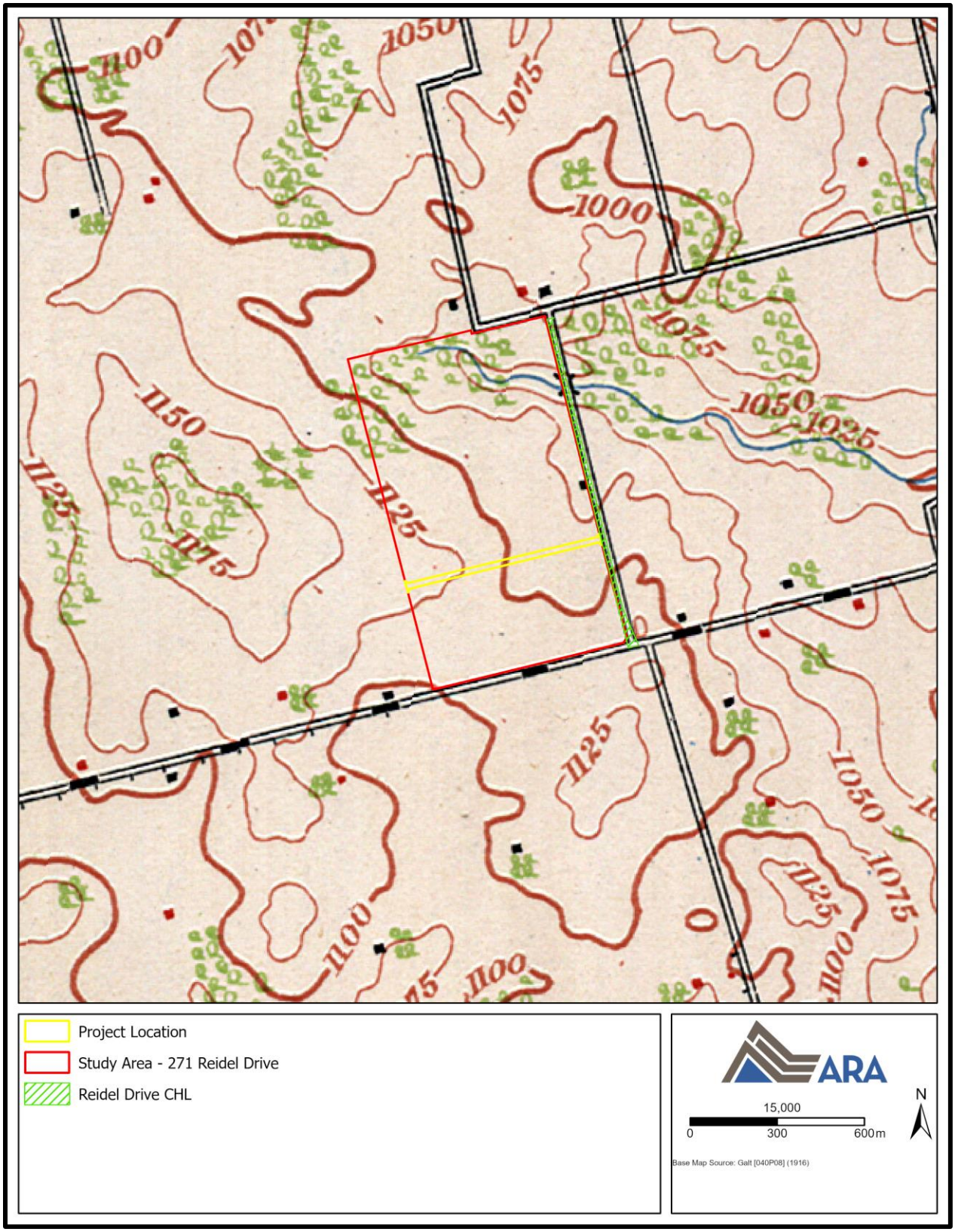
Instrument #	Instrument	Date	Grantor	Grantee	Comments
--	Patent	5 Feb 1798	The Crown	Richard Beasley, James Wilson, and John B. Rosseau	94,012 acres, Block 2 on Grand River
31	Partition	17 Nov 1800	James Wilson & John Baptiste Rosseau	Richard Beasley	64,590 acres Part Block 2
100	B&S	30 Jan 1804	John Baptiste Rosseau	Richard Beasley	26,860 acres Part Block 2
101	Quit Claim	22 Dec 1803 (reg. 1804)	Chief Joseph Brant	Richard Beasley	13,430 acres Part of Block 2
866	B&S	4 Dec 1822	Richard Beasley	Exrs of Samuel Street	200 acres, Lot 5
424	B&S	2 Jun 1854	James H. [Illeg.], Executor	James Goodfellow	200 acres, Lot 5
7393	B&S	11 Jan 1879	James Goodfellow	John Wismer	200 acres, Lot 5
13361	B&S	19 Jun 1895	John Wismer & wife	Isaiah Wismer	200 acres, Lot 5
23919	Grant	5 Mar 1921	Isaac (Isaiah) Wismer	Ervin C. Weber	200 acres, Lot 5
408261	Grant	15 Jul 1969	Ervin C. Weber	Maylake Investments	200 acres, Lot 5
666185	Agreement	15 Sep 1979	Ervin Weber Investments Inc.	Maylake Investments Ltd	
780916	Transfer	15 May 1984	Ervin Weber Investments, Inc.	Grambian Construction & Investments, Inc.	200 acres, Lot 5
866302	Transfer	5 Sep 1986	Grambian Construction & Investments, Inc	Rosenheim Investments, Ltd.	200 acres, Lot 5
WR167476	Transfer	2 Feb 2007	Rosenheim Investments, Ltd	Grambian Investments Inc.	
WR1397416	Title Application	8 Dec 2021	Grambian Investments, Inc.		271 Reidel Drive



Map 3: *Tremaines' Map of the County of Waterloo, Canada West* (1861)
(Produced under licence using ArcGIS® software by Esri, © Esri; OHCMP 2019)



Map 4: *Illustrated Historical Atlas of the County of Waterloo, Ont.* (1881)
(Produced under licence using ArcGIS® software by Esri, © Esri; MU 2001)



Map 5: Topographic Maps from 1916
(Produced under licence using ArcGIS® software by Esri, © Esri, OCUL 2023)

Map 6: Aerial Image (1954)
(Produced under licence using ArcGIS® software by Esri, © Esri UW 2016)

5.0 CONSULTATION

Built Heritage Resources (BHRs) and CHLs are broadly referred to as cultural heritage resources. A variety of types of recognition exist to commemorate and/or protect cultural heritage resources in Ontario.

The Minister of Environment and Climate Change, on the advice of the Historic Sites and Monuments Board of Canada (HSMBC), makes recommendations to declare a site, event or person of national significance. The National Historic Sites program commemorates important sites that had a nationally significant effect on, or illustrates a nationally important aspect of, the history of Canada. A National Historic Event is a recognized event that evokes a moment, episode, movement or experience in the history of Canada. National Historic People are people who are recognized as those who through their words or actions, have made a unique and enduring contribution to the history of Canada. There exists Parks Canada's online *Directory of Federal Heritage Designations* which captures these national commemorations. This directory also lists Heritage Railway Stations, Federal Heritage Buildings and Heritage Lighthouses. The *Federal Canadian Heritage Database* was searched, and no plaques or properties were noted within or adjacent to the study area (Parks Canada 2022). It is important to note that these federal commemoration programs do not offer protection from alteration or destruction.

The Ontario Heritage Trust (OHT) operates the Provincial Plaque Program that has over 1,250 provincial plaques recognizing key people, places and events that shaped the province. Additionally, properties owned by the province may be recognized as a "provincial heritage property" (MCM 2010). The OHT plaque database was searched and none of the properties within or adjacent to the study area are commemorated with an OHT plaque (OHT 2021b).

The study area is within the Grand River watershed. The Grand River is commemorated with plaques by the Grand River Conservation Authority and is a recognized Canadian Heritage River. There are five plaques at various points along the Grand River at associated tributaries which include: Grand River: Cambridge (Galt); Conestogo River: St. Jacobs; Nith River: New Hamburg; Speed River: Guelph; Eramosa River: Halton Hills (GRCA 2021). No plaques relating to the Grand River are located within the study area.

MCM's list of Heritage Conservation Districts was consulted. No designated districts were identified in or adjacent to the study area (MCM 2019). The list of properties designated by the MCM under Section 34.5 of the *OHA* was consulted. No properties in or adjacent to the study area are listed. The list of properties designation under Part IV of the *OHA* was consulted. No properties in or adjacent to the study area are recognized under Part IV of the *OHA*. The City of Kitchener maintains a list of *Non-designated Properties of Heritage Value or Interest*, as per Section 27 of the *OHA*, which appears to be last updated October 24, 2017. 271 Reidel Drive is included on the Register and was added on January 12, 2009.

At project commencement, ARA contacted the City of Kitchener Heritage Planner to inquire about: 1) protected properties within or adjacent to the study area, 2) properties with other types of recognition in or adjacent to the study area, and 3) previous studies or information relevant to the current study area and to gain an understanding of the cultural heritage related requirements for this report. ARA contacted City of Kitchener staff via email and phone in April 2023. The City of Kitchener indicated that CHL, L-RD-10, Reidel Drive, which has been identified in the City of Kitchener 2014 *Cultural Heritage Landscape Study* is located adjacent to the study area. City of Kitchener staff also confirmed that 271 Reidel Drive is included on the heritage register for listed

properties (non-designated). A site-specific Terms of Reference for the requirements of this report were provided to ARA via email on September 7, 2023.

6.0 FIELD SURVEY

The field survey component of an assessment involves the collection of primary data through systematic photographic documentation of all potential cultural heritage resources within the study area, as identified through historical research and consultation. Generally, potential cultural heritage resources are identified by applying a 40-year rolling timeline. This timeline is considered an industry best practice (i.e., MTO 2008). A date of 40 years does not automatically attribute CHVI to a resource; rather, that it should be flagged as a potential resource and evaluated for CHVI.

Additional cultural heritage resources may also be identified during the survey itself. Photographs capturing all properties with potential BHRs and CHLs are taken, as are general views of the surrounding landscape. The field survey also assists in confirming the location of each potential cultural heritage resource and helps to determine the relationship between resources. Given that such surveys are limited to areas of public access (i.e., roadways, intersections, non-private lands, etc.), there is always the possibility that obscured cultural heritage resources may be missed or that heritage attributes may be refined upon closer inspection.

A field survey was conducted on July 7, 2023, to photograph and document the study area. Permission to enter 271 Reidel Drive was granted by the property owner and the exterior and interior was documented. Additional photographic documentation was conducted from publicly accessible, non-private lands.A secondary field study was conducted on November 13th, 2023. A photo from the public realm was taken to document the site after the fire.

7.0 PROPERTY DESCRIPTION (JULY 7 2023)

The property at 271 Reidel Street is located on the west side of Reidel Drive. The site visit was conducted on the entire property including landscape features such as mature trees and agricultural fields, the exterior and interior of the residential structure. At the time of the site visit, the subject property was not occupied. It appears that the heat in the house was off, as was the water and electricity. Due to access issues resulting from the cultivated agricultural fields, photographs could not be taken from all corners of the property.

7.1 Contextual Surrounding

The lots surrounding the subject property, consists majorly of agricultural and forested land. A tertiary road, Reidel Drive, is on east side of the subject property (see Image 1 and Image 2). Reidel Drive connects to New Dundee Road to the south and Stauffer Drive to the north (see Image 1). The contextual surrounding is characterized by rolling topography, forested lands, rural roadway, slopes, and grade changes (see Image 2 - Image 7.)

7.2 Site Layout

The subject property is composed of a house, barn, silos, ruins located towards the south of the house and agricultural fields on the north, west and south. The dwelling is situated with a setback

from Reidel Drive and is accessed via a gravel driveway. The driveway branches off to the barn further west of the house and continues towards the agricultural fields. The house is situated on a rise of land that slopes slightly to the southwest where the barn and silos are located. Towards the east of the silos are ruins that could have been coops. Among the ruins is also a well that does not appear to be in use any longer.

7.3 Main Residence (July 7, 2023)

7.3.1 Exterior

The subject property consists of a three-bay, two-storey main residence, with a one-and-a-half storey rear extension followed by a one storey stone rear wing. The house and wings create an overall T shape plan (see Image 9). The main portion has a gable roof with a central gable peak. The roof is clad in metal and has wide overhanging eaves with rhythmically placed wood brackets, decorative wood molding with dentils (see Image 11). The main residence is clad in Insulbrick veneer which shows evidence of significant wear and rests on a stone foundation with parging. The exception is the south elevation which is clad in board and batten. The façade has rectangular window opening (assumed based on side elevation windows) with a decorative wood trim surrounds and denticulated hoodmould (see Image 10). The main entrance was boarded up at the time of the site visit but also features the triangular pediment with dentils in keeping with the façade windows. The window in the gable peak was also boarded up, however the exposed top portion of the window suggest it is a has a round window opening with lancet style window and also features the detailed trim with dentils in keeping with rest of the façade openings (see Image 11). All opening's surrounding appear to be exposed wood (i.e., no paint visible). The south and north elevation, some of which are not boarded, show rectangular window openings with the same window treatment as the facade, however they appear to have retained some of the white paint (Image 12 and Image 17).

The middle section varies in materials depending on the elevation. The south elevation carries through the board and batten cladding on the upper storey and the stonework associated with the rear wing on the first storey (see Image 17). There is a large dormer with a shed style roof and all openings are boarded up. This section has an open porch with shed style metal roof which is supported wood posts. The north elevation carried through the Insulbrick veneer on the upper storey and has a later addition clad in vinyl on the first storey (see Image 12 - Image 13). This elevation shows signs of advanced deterioration as the there are several openings in the roofline and several areas where there is material is missing and/or boarded up and the structure is pulling away from main structure.

The rear wing has a gable roof with return eaves and is constructed in field stone with heavy mortar (see Image 14-Image 17). The north and south elevation both contain one rectangular window openings which are boarded up, however they appear to have stone sills. The rear of the stone wing has remnants of what appears to have been a covered porch area with wooden deck. There is a single door opening which is boarded up.

7.3.2 Interior

The interior of 271 Reidel Drive is in significant disrepair. However, the original layout of the house appears to remain intact. The access to the house is from the south elevation through a covered porch. The access to the rest of the house is from the main floor, which consists of two separate accesses to two separate portions of the second floor and an access to the basement.

The entrance door on the main floor opens up into a foyer that leads to the family room on the east side (Image 27). Immediately at the entrance of the family room, towards the south, is the door to access the basement and stairs leading up to one of the portions on the second floor (Image 28). A door on the north side of the family room leads into the rear portion of the house, which was not accessed during this site visit as it was boarded up. Towards the south of the family room is a large open kitchen with cabinets on its east wall, an old metal chimney on its south and a door and window on its west wall (Image 29, Image 30). The kitchen has two doorways located towards the south side. One of them leads into another room towards the west while the one on the east leads to a semi-circular stairwell leading to the second portion of the second floor (Image 31). On the east side of the stairwell is a full washroom and another room (Image 32). Throughout the main floor wood floorboards with wide trim, high windows set deep into the walls, and wooden cornice details on walls were observed. Each of these rooms features windows with wooden moldings and sill details (Image 33). Many of the original wood trim details on the main floor also appear to be original.

The first portion of the second floor, accessed through the family room, appears to be a later addition. Although the condition of the portion is similar to the rest of the house with windows boarded up and floors and walls in disrepair. The access from the stairs leads into an open space with an open kitchen located towards the south (Image 34). On the east side of the open space are two rooms and a full bathroom, and on the west side are large rectangular windows. The ceilings of the rooms are vaulted.

The second portion of the second floor, accessed through the semi-circular stairwell, opens up into a semi-circular space (Image 35). This portion contains rooms on its west, south and north side. The rooms have vaulted ceilings and skylights were observed in the room on the north side (Image 36). Similar wooden floorboards, like the main floor, were observed in this portion with high wooden trim and boarded up high windows.

The basement is unfinished and was wet when the site visit was conducted. It has access from the house via a separate staircase (Image 37). It is divided into two portions with a door connecting them. The basement has rubble stone walls that are coated in concrete plaster. The floor and the ceiling appeared to be poured concrete. The basement also houses the mechanical systems of the dwelling (Image 38).

7.4 Outbuildings

The subject property contains a large rectangular barn with gable roof clad in metal. It is made of vertical plank board. There barn is accessed by large casement style doors on the east elevation. There are several rectangular openings on all elevations which are boarded up (see Image 18 and Image 19).

The subject property contains two open concrete silo shells (see Image 20 to Image 21). There are also several remnants of stone walls and remnant foundations. A small wooden outbuilding with a wooden shed style roof is located within the stone ruins. There is a row of rectangular windowpanes on the east elevation which have all been smashed. Several wooden structures are located throughout the ruins which appear to have been used as sheds and/or are leftover porches (see Image 20 to Image 22). Overall the location and orientation of the outbuildings and ruins is fragmented within the area surrounding the main house and there are no defined pathways linking the outbuildings and ruins to the main house

7.5 Architecture and Design

7.5.1 Historic Ontario Farms

The historic Ontario farm typology follow similar patterns and typically includes the following features: main farmhouse, main barn, secondary barns/outbuildings, silo/s, entrance driveways which are framed (often with vegetation of pillars), a front yard, mature trees, rear or side fields, drive lanes, woodlot(s), and wind rows along property edges (ERA 2020). Specifically, Ontario farms can be described as:

> *Ontario's farms are the creations of immigrants of varied backgrounds who often showed distain, if not outright hostility, for their neighbours. The landscape mirrors this outlook: no residential farm villages, a system of public roads that bypass farm buildings, and private lanes leading to them. Building sites varied with local conditions but tended to be set well back on the lots. Here was privacy, freedom from the "disagreeable necessity" of gazing at one's neighbour, and security from passers-by helping themselves to the orchard or kitchen garden* (McIlwraith 1997:241).

When compared against the typical characteristics of Historic Ontario farms, 271 Reidel Drive, does not appear to demonstrate enough significant features and therefore can not be considered a representative Historic Ontario farm landscape (see Table 4).

Table 4: Characteristics of Ontario Farms
(adapted from McIlwraith 1997; Shearer 2012; Williams 2014)

Characteristics	271 Reidel Road Characteristics
Centralized 'farmstead' composed of clustered grouping of houses, barns, and ancillary buildings, connected by walkways and laneways	No - Custer is not intact and connections are not extant
Farmstead landscape may include remnants of nearby kitchen gardens and orchards	No
Farmstead framed by trees and perennial plantings to provide shelter from sun and wind	No
Farmstead placed on raised setting where possible	No
Entrance driveway leading to farmstead, often lined with mature trees	No
If present, farmstead placed near natural water source	Yes
Farmstead set back from roadway with farmhouse placed nearest to road	No
Large primary barn	No
Outbuildings, possible adapted retrofit of early log shanties	Yes
Drive lanes providing access to barn/outbuildings	No
Paddock, placed in proximity to barn and outbuildings	No
Silo	Yes
Rear fields, connected to farmstead through drive lanes	Yes
Rear woodlot	Yes
Wind rows along property edge, placed with consideration to prevailing wind direction	Yes

The design of the "Ontario Farmhouse" is an important element of the Ontario Farm. The simple prototype is flexible and highly adaptable allowing for individual variations and decorative finishing elements to be applied as desired. These finishes often sought to emphasize a particular architectural style or included selected characteristics or features of various styles. In Ontario, farmhouses typically embodied Gothic Revival or Italianate architecture features. Gothic Revival

architecture style is expressed by the inclusion of steep gables, general symmetry from part to part, projecting or recessed bays, porches with split post and shallow roof which span frontage, dichromatic brickwork. The details and architectural features of the primary residence on the subject property are best aligned with the Gothic Revival architecture style.

7.5.2 Gothic Revival

The Gothic Revival architecture style is rooted in medieval architecture and originated in England in the late 18th century. According to McAlester, the style is traced back to 1749, when Sir Horace Walpole "began remodeling his country house in the Medieval style, complete with battlements and multiple pointed-arch windows" (1984:200). Over the following century the number of buildings which followed Gothic Revival principles increased so dramatically, likely the result of promotion by English architect A.W.N. Pugin that they become commonplace throughout England (McAlester 1984). In North America, the publication of design plans and patterns by Andrew Downing "in 1842 (*Cottage Residences*) and in 1850 (*The Architecture of Country Houses*)" popularized the style (McAlester 1984:200). With a great number of early settlers to Ontario being of English descent, it is not surprising that Gothic Revival architecture "first appeared [in Canada] in the 1820's and continued throughout the rest of the nineteenth century and well into the twentieth century, especially for religious buildings" (Ricketts et al. 2011: 55). As one of the most enduring of the revival style, the variation of the style's application from residences to churches is evident throughout Ontario.

According to Ricketts et al. "the style proved to be surprisingly adaptable, fluid, open to new interpretations with every new generation of architects" without losing the quintessential features that distinguish the style (2011:73). As a result, several subcategories of the style emerge in Canada including Romantic Gothic Revival Style (circa 1820), Ecclesiological Gothic Revival Style (circa 1840), High Victoria Gothic Revival Style (circa 1850s), and French Gothic Revival Style (end of 19th century) (Ricketts et al. 2011). Not all Gothic Revival architecture is done of such a grand scale as the style's application to smaller more modest residence is also widespread. In Ontario specifically, the Gothic Cottage, also known as the Ontario Cottage, became one of "the most pervasive Ontario residential style prior to 1950" (Kyles 2016).

There are three types of "Ontario Cottages" as outlined by McKendry: 1) hipped roof, 2) gable roof with one-and-a half storeys, and 3) gable roof with one-and-a-half storeys and a front central gable or peak interrupting the eaves (2016). McKendry also notes that the central gable in the "Ontario cottage" steepened over time and took on the proportions of the Gothic Revival style (2016). The prevalence of these styles in Ontario's countryside is related to the pattern's promotion in publications, specifically, the design found in the Canadian Farmer 1864 for, "A Cheap Farm House" (Vol. 1, No. 22). The article provides a set of design guidelines for the construction of a house to accommodate large families. The article notes these buildings "… can be built with brick walls…the appearance of the house shown in the above engraving might be considerably improved by the addition of a verandah" (see Figure 1) (Brown 1864:340).

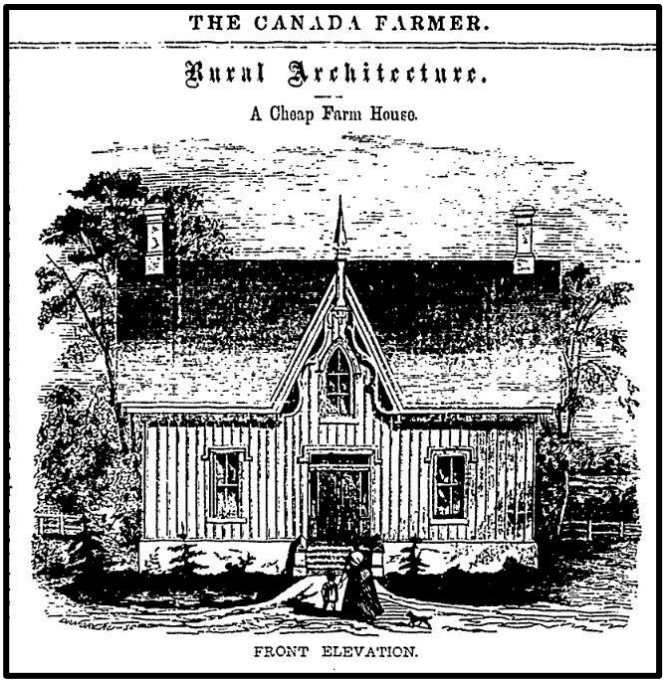


Figure 1: "A Cheap Farm House" The Canada Farmer (Brown 1864:340)

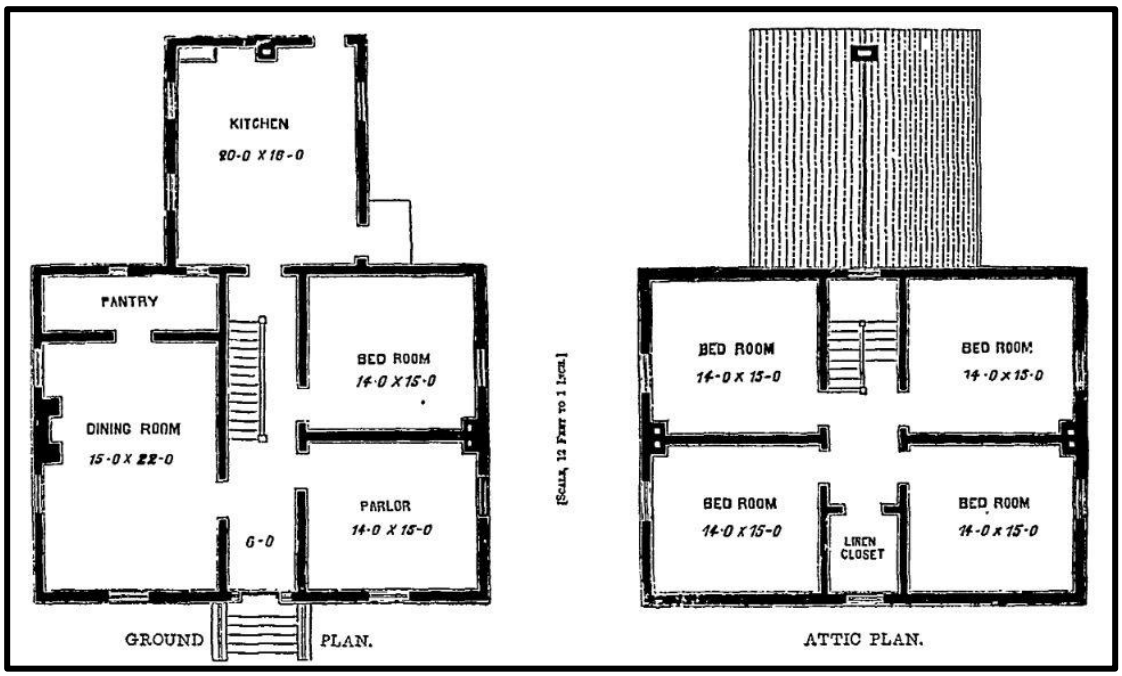


Figure 2: "A Cheap Farm House" - Floor Plans in The Canada Farmer (Brown 1864:341)

When examined against the typical characteristics of the Gothic Revival style as outlined in *Well-Preserved* (Fram 2003), *Ontario Architecture: A Guide to Styles and Building Terms 1784 to the Present* (Blumenson 1990), *Ontario Architecture (*Kyles 2016), and *A Field Guide to American Houses* (McAlester 1984) the subject building exhibits many of the characteristics of Gothic

Revival design and can therefore be considered a representative example of an Gothic Revival style (see Table 5)

Table 5: Characteristics of Gothic Cottage / Ontario Cottage Architecture (Adapted from Kyles 2016)

Characteristics	271 Reidel Drive
One-and-a-half storeys	Yes
Rectangle, L-shaped or T-shaped plan	Yes
Symmetrical or balanced façade	Yes
Ornate doorways (often with sidelights and transom).	Unknown – not visible
Hip roof or gable roof with central gable	Yes
Window in central gable (half moon or lancet window is common, however regional variation is often expressed)	Yes – Condition of window unknown
Roof can have a dormer, a belvedere or two chimneys often symmetrically placed.	No
Decorative woodwork (expressed in finials, trim, verge boards, verandahs or entrances)	Yes- brackets and dentils on some windows visible
Dichromatic brickwork (often express in voussoirs, quoins, or brick banding)	No
Partial or full porch (often with split post and shallow roof)	No

8.0 HERITAGE ASSESSMENT

8.1 Reidel Drive CHL

The following information is found in its entirety in the Reidel Drive CHL Data sheet (Appendix B). No additional evaluation was completed for Reidel Drive as part of this HIA.

8.1.1 Description

Reidel Drive, from Stauffer Drive southerly to Blair Creek, is a paved road with a posted speed limit of 50km/h. It follows a straight alignment between Lots 4 and 5 of Beasleys New Survey. The road follows an undulating topography that gently slopes down at the Blair Creek crossing. The road is bounded by agricultural lands and a single wood pole hydro line runs parallel to the road on the east side for the length of this section of Reidel Drive. Sections of the road, particularly at the north end and around the Blair Creek crossing, are enclosed by dense vegetation that closely bounds the road alignment given that there are no shoulders, while other sections of the road open up to clear views of adjacent cultivated fields.

Roads in the Township of Waterloo were not formally laid out during a township survey as in other parts of Upper Canada. Instead, an irregular network of roads developed given that they were typically built after settlers had begun to clear their lots, and the need for roads linking villages, settlements, farms, markets, and mills followed. The road is bounded by Lots 4 and 5 of Beasleys New Survey. The 1831 Assessment Rolls indicate that this part of the township was not developed, and thus Reidel Drive was not yet in place. The earliest historic map available to show this road is the 1861 Tremaine, which indicates that James Goodfellow owned/farmed land to the west, while William Dalgleish owned/farmed land to the east. The surrounding agricultural landscape remains

> *intact. At present, Reidel Drive continues to form part of the local road network. Reidel Drive is considered to be of local historical and contextual value given that the road was built as part of initial settlement activities in the southern part of the Township of Waterloo, forming part of Beasleys New Survey; relates to the development of the Township of Waterloo for agricultural purposes in the nineteenth century; is bounded by cultivated fields and a rural landscape; and, continues to form part of the local road network. The following attributes are evocative of the road's historic and scenic character: the narrow two-lane alignment without shoulders; the scenic views to surrounding agricultural fields; the spatial and visual relationship between the road thoroughfare and Blair Creek, and associated vegetation; the diverse roadside vegetation that abuts the roadside providing a defined edge to the road; and, the undulating topography and original historic alignment" (2014:L-RD-40).*

There are three main categories of value provided in the CHL Datasheet, Historic Integrity, Cultural Value and Community value, each with several subcategories. The following cultural heritage value has been assigned to the Reidel Drive CHL:

> *Historical Integrity: Land Use – Continuity of Use:*
> - *Reidel Drive, from Stauffer Drive southerly to Blair Creek, follows a straight alignment between Lots 4 and 5 of Beasleys New Survey. The earliest historic map available to show this road is the 1861 Tremaine, which indicates that James Goodfellow owned/farmed land to the west, while William Dalgleish owned/farmed land to the east. The surrounding agricultural landscape remains intact*
>
> *Cultural Value: Historical Value- Historic Understanding of Area:*
> - *Reidel Drive is considered to be of local historical and contextual value given that the road: was built as part of initial settlement activities in the southern part of the Township of Waterloo, forming part of Beasleys New Survey; relates the development of the Township of Waterloo for agricultural purposes in the nineteenth century; and is bounded by cultivated fields and a rural landscape.*

Character Defining Features include*:*

- *the narrow two-lane alignment without shoulders;*
- *the scenic views to surrounding agricultural fields;*
- *the spatial and visual relationship between the road thoroughfare and Blair Creek, and associated vegetation;*
- *the diverse vegetation that abuts the roadside providing a defined edge to the road; and,*
- *the undulating topography and original historic alignment*

8.2 271 Reidel Drive

8.2.1 Heritage Register

In 2005 and 2007, the City of Kitchener completed a Cultural Heritage Resource Evaluation Form which was used to generate a Statement of Significance for 271 Reidel Drive in 2008. As a result,

the property was added to the City of Kitchener Heritage Register on January 1, 2009. The Statement of Significance included the following information:

> ***Year Built**: c. 1860*
> ***Architectural Style:** Ontario Gothic Revival*
> ***Original Owner:** James Goodfellow*
> ***Original Use**: Residence*
> ***Condition:** Good*
>
> ***Description of Historic Place***
> *271 Reidel Drive is a one-and-one-half storey 19th century residence built in the Ontario Gothic Revival architectural style. The residence is situated on a 204.18-acre parcel of land located on the west side of Reidel Drive between Stauffer Drive and New Dundee Road in the Dundee planning community of the City of Kitchener within the Region of Waterloo. The principal resource that contributes to the heritage value is the residence.*
>
> ***Heritage Value***
> *271 Reidel Drive is recognized for its design, physical, and historical values. The design and physical value relates to the architecture and construction of the residence. The residence is a rare example of the Ontario Gothic Revival architectural style with decorative features and frame construction. The residence is in fair condition with many intact original elements. The residence features a fieldstone foundation; tin roof; front door with sidelights, transom, and denticulated hoodmould; 6/6 pane double hung windows with denticulated hoodmould; rounded-arch gothic window set in a gable dormer; wide modillioned frieze complete with several scrolled brackets; and, west woodshed annex constructed of fieldstone.*
>
> *The historic value relates to the association of the residence with mixed use farming. The residence contributes to the understanding of farming in the area since farming was not prevalent until the mid 20th century.*
>
> ***Heritage Attributes***
> *The heritage value of 271 Reidel Drive resides in the following heritage attributes:*
> - *All elements related to the construction and Ontario Gothic Revival architectural style, including:*
>   - *Fieldstone foundation;*
>   - *Roof and rooflines including tin roof*
>   - *Front door with 2 pane sidelights, 3 pane transom, and denticulated hoodmould;*
>   - *Window openings with 6/6 pane double hung windows with denticulated hoodmoulds;*
>   - *Rounded-arch gothic window with decorative tracery set in a gable dormer;*
>   - *Wood fascia, soffits and frieze complete with several scrolled brackets; and,*
>   - *West woodshed annex constructed of fieldstone.* (City of Kitchener 2008)

8.3 Evaluation of 271 Reidel Drive According to Ontario Regulation 9/06

Using the information provided by the consultation, field survey and additional historical and contextual research, an evaluation of 271 Reidel Drive according to O. Reg. 9/06, can be found below in Table 6.

Table 6: Evaluation of 271 Reidel Drive Using O. Reg. 9/06

Description	Criteria Met Yes/No	Value
The property has design value or physical value because it is a rare, unique, representative, or early example of a style, type, expression, material or construction method.	Yes	271 Reidel Drive is readable as a farmstead; however, when compared to the typical characteristics of historic Ontario Farmstead it is not a representative example. 271 Reidel Drive has design value as a representative example of a Gothic Cottage architecture style. The three-bay, one-and-a-half storey building has a gable roof with central peak with a lancet window opening in the gable peak which are representative characteristics of the Gothic Cottage style. The building has a symmetrical façade and decorative detailing including wooden dentils and wooden brackets which are also representative of this style.
The property has design value or physical value because it displays a high degree of craftsmanship or artistic value.	No	271 Reidel Drive does not display a high degree of craftsmanship of artistic value. The materials and techniques used for its construction were common for their time.
The property has design value or physical value because it displays a high degree of technical or scientific achievement.	No	The building at 271 Reidel Drive does not display a high degree of technical or scientific achievement.
The property has historical value or associative value because it has direct associations with a theme, event, belief, person, activity, organization, or institution that is significant to a community.	Yes	271 Reidell Drive has historical value for its association with the Goodfellow family and the Wiser family who were both farmers in the area and help understand the rural agricultural practices of early settlers in the 19th and 20th century in the surrounding community. In 1861, James Goodfellow, a Scottish immigrant, owned the 200 acres subject property, 120 of which were under cultivation. The property was valued at around $6,000, a significant value for the time period, and the family grew wheat, barley, peas, oats, corn, potatoes, turnips, carrots, and hay. The farm also produced wool and flannel. The Goodfellows raised cows for both meat and milk, horses, sheep, and pigs. As early settlers, the Goodfellows' significant agricultural pursuits would have been important to the surrounding community for the mixed nature of farming practices they pursued. In 1879 James Goodfellow sold the approximately 200 acres property to John Wismer. John Wismer a Mennonite of German descent also worked as a farmer and continuing to pursue agricultural pursuits in the community. The Wismer family was a well-known early settler family in the area. The subject property remained in the Wismer family until 1921. The subject property appears to have been used for agricultural purposes for over 150 years.

Description	Criteria Met Yes/No	Value
The property has historical value or associative value because it yields or has the potential to yield information that contributes to the understanding of a community or culture.	No	271 Reidel Drive does not have the potential to yield information that contributes to the understanding of its community. There is no evidence that this property would offer new knowledge or a greater understanding of particular aspects of the community's history.
The property has historical value or associative value because it demonstrates or reflects the work or ideas of an architect, builder, artist, designer or theorist who is significant to a community.	No	271 Reidel Drive does not reflect the ideas of an architect, builder, designer, or theorist. Research did not reveal a builder or architect associated with the property. Research suggests that the design of the residence did not generate key ideas in the field of architecture.
The property has contextual value because it is important in defining, maintaining, or supporting the character of an area.	No	271 Reidel Drive is in keeping with the general rural nature of the surrounding area, however the uninhabited main house and ruins diminishes legibility of the subject property as a farmstead. The surrounding area has seen several large-scale developments which have been completed and/or are in progress. The rural character is anticipated to be diminished with the proposed subdivision on the east side of Reidel.
The property has contextual value because it is physically, functionally, visually, or historically linked to its surroundings.	No	271 Reidel Drive is not physically or functionally linked to its surroundings. There is no demonstrated material connection between the property and its surroundings. 271 Reidel Drive is not functionally linked to its surroundings as the property's function is not dependant on its surroundings. 271 Reidel Drive is not visually or historically linked to its surroundings. Although the lands surrounding the main building are comprised of several natural and agricultural features these are not a significant visual or historic link that would warrant consideration under this criterion.
The property has contextual value because it is a landmark.	No	271 Reidel Drive is not considered a significant landmark. .

8.3.1 Summary of Evaluation

The O. Reg 9/06 evaluation confirms 271 Riedel Drive has CHVI and has met two criteria and may be worthy for designation under the *OHA*. However, the visible structural deterioration and architectural integrity may weaken the viability, feasibility, and practicality of the retention of some or all of the heritage attributes.

8.4 Statement of Cultural Heritage Value or Interest

A statement of CHVI and the identification of heritage attributes has been informed by the evaluation. The identified heritage attributes form the basis for the impact evaluation and suggested mitigation measures outlined in additional sections of the report.

8.4.1 Introduction and Description of Property

The subject property at 271 Reidel Drive is situated on a large rectangular shaped lot that contains a two-storey, Insulbrick clad house with a one-storey stone wing built circa 1860 in a Gothic Ontario farmhouse style.

8.4.2 Statement of Cultural Heritage Value/Statement of Significance

271 Reidel Drive has design value as a representative example of a Gothic Cottage architecture style. The three-bay, one-and-a-half storey building has a gable roof with central peak with a lancet window opening in the gable peak which are representative characteristics of the Gothic Cottage style. The building has a symmetrical façade and decorative detailing including wooden dentils and wooden brackets which are also representative of this style.

271 Reidell Drive has historical value for its association with the Goodfellow family and the Wiser family who were both farmers in the area and help understand the rural agricultural practices of early settlers in the 19th and 20th century in the surrounding community. In 1861, James Goodfellow, a Scottish immigrant, owned the 200 acres subject property, 120 of which were under cultivation. The property was valued at around $6,000, a significant value for the time period, and the family grew wheat, barley, peas, oats, corn, potatoes, turnips, carrots, and hay. The farm also produced wool and flannel. The Goodfellows raised cows for both meat and milk, horses, sheep, and pigs. As early settlers, the Goodfellows' significant agricultural pursuits would have been important to the surrounding community for the mixed nature of farming practices they pursued. In 1879 James Goodfellow sold the 200 acres property to John Wismer. John Wismer a Mennonite of German descent also worked as a farmer and continuing to pursue agricultural pursuits in the community. The Wismer family was a well-known early settler family in the area. The subject property remained in the Wismer family until 1921. The subject property appears to have been used for agricultural purposes for over 150 years.

Heritage Attributes

271 Reidel Drive has design value as a representative example of a Gothic Cottage architecture style. The property contains the following heritage attributes which reflect his value:

- Ontario Gothic Cottage architectural style, including:
  - Two storey, three-bay main building;
  - Gable roof with central gable peak;
  - Rectangular window openings with denticulated hoodmoulds;
  - Rounded-arch gothic window with denticulated hoodmould set in a gable dormer; and
  - Moulded wood fascia, soffits and frieze complete with several scrolled brackets.

271 Reidell Drive has historical value for its association with the Goodfellow family and the Wiser family who were both farmers in the area and help understand the rural agricultural practices of early settlers in the 19th and 20th century in the surrounding community.

- Location along Riedel Drive
- Ontario Gothic Cottage architectural style, including:
  - Two storey, three-bay main building;
  - Gable roof with central gable peak;
  - Rectangular window openings with denticulated hoodmoulds;
  - Rounded-arch gothic window with denticulated hoodmould set in a gable dormer; and

  - Moulded wood fascia, soffits and frieze complete with several scrolled brackets
- One storey rear stone wing with gable roof.

Table 7: Summary of CHL/BHR Value Statements and Heritage Attributes

Type and Number	Address/ Name	Value Statement(s)	Heritage Attributes
CHL – 1 (L-RD-10)	Reidel Drive	***Historical Integrity: Land Use – Continuity of Use:*** *Reidel Drive, from Stauffer Drive southerly to Blair Creek, follows a straight alignment between Lots 4 and 5 of Beasleys New Survey. The earliest historic map available to show this road is the 1861 Tremaine, which indicates that James Goodfellow owned/farmed land to the west, while William Dalgleish owned/farmed land to the east. The surrounding agricultural landscape remains intact.* ***Cultural Value: Historical Value- Historic Understanding of Area:*** *Reidel Drive is considered to be of local historical and contextual value given that the road: was built as part of initial settlement activities in the southern part of the Township of Waterloo, forming part of Beasleys New Survey; relates the development of the Township of Waterloo for agricultural purposes in the nineteenth century; and is bounded by cultivated fields and a rural landscape.*	• *the narrow two-lane alignment without shoulders;* • *the scenic views to surrounding agricultural fields;* • *the spatial and visual relationship between the road thoroughfare and Blair Creek, and associated vegetation;* • *the diverse vegetation that abuts the roadside providing a defined edge to the road; and,* • *the undulating topography and original historic alignment*

BHR - 1	271 Reidel Drive	271 Reidel Drive has design value as a representative example of a Gothic Cottage architecture style. The three-bay, one-and-a-half storey building has a gable roof with central peak with a lancet window opening in the gable peak which are representative characteristics of the Gothic Cottage style. The building has a symmetrical façade and decorative detailing including wooden dentils and wooden brackets which are also representative of this style.
		
		271 Reidell Drive has historical value for its association with the Goodfellow family and the Wiser family who were both farmers in the area and help understand the rural agricultural practices of early settlers in the 19th and 20th century in the surrounding community. In 1861, James Goodfellow, a Scottish immigrant, owned the 200 acres subject property, 120 of which were under cultivation. The property was valued at around $6,000, a significant value for the time period, and the family grew wheat, barley, peas, oats, corn, potatoes, turnips, carrots, and hay. The farm also produced wool and flannel. The Goodfellows raised cows for both meat and milk, horses, sheep, and pigs. As early settlers, the Goodfellows' significant agricultural pursuits would have been important to the surrounding community for the mixed nature of farming practices they pursued. In 1879 James Goodfellow sold the 200 acres property to John Wismer. John Wismer a Mennonite of German descent also worked as a farmer and continuing to pursue agricultural pursuits in the community. The Wismer family was a well-known early settler family in the area. The subject
			• Ontario Gothic Cottage architectural style, including:
			  ○ Two storey, three-bay main building;
			  ○ Gable roof with central gable peak;
			  ○ Rectangular window openings with denticulated hoodmoulds;
			  ○ Rounded-arch gothic window with denticulated hoodmould set in a gable dormer; and
			  ○ Moulded wood fascia, soffits and frieze complete with several scrolled brackets.

Type and Number	Address/ Name	Value Statement(s)	Heritage Attributes
		property remained in the Wismer family until 1921. The subject property appears remains in the same large parcel form since 1861.	

*** The value statement and heritage attributes which have been taken directly from CHL Data sheets are noted in Italics**

8.5 271 Reidel Drive Current Conditions (November 13, 2023)

On the evening of November 12, 2023, the main house at 271 Reidel Drive caught fire. ARA staff conducted as site visit from public lands on November 13, 2023. As observed during this site visit many of the proposed heritage attributes of the residence have been destroyed. The one storey stone construction section with gable peak and some window openings remain (Figure 3).

Figure 3: Photo of 271 Reidel Drive Current Conditions (Photo taken on November 13, 2023; Facing Northwest)

9.0 PROPOSED PROJECT

According to the Class Environmental Assessment and Preliminary Design as detailed in the *Professional Services – Class EA & Preliminary Design for Blair Creek Drive Road, Storm Sewer, & Watermain Extension (Future Strasburg Road to Intersection of Reidel Drive and Blair Creek Drive), RFQ No.: Q23-010,* for the City of Kitchener, the preliminary design for the *Blair Creek Drive Road, Storm, & Watermain Extension* includes an approximately 700-meter portion of land which runs linear in an east-west direction through the property known as 271 Reidel Drive. The project location is proposed to be used as a road extension, continuing from the future Strasburg Road alignment which intersects at of Reidel Drive and Blair Creek Drive. The Blair Creek Drive

Road Extension will also include new storm sewer as well as a 300mm diameter watermain. The proposed project will also include the creation of the paved roadway, parking, sidewalks, bike lanes and boulevards.

9.1 Alternative Design Options

All design options show the same proposed location for the roadway. The proposed roadway runs in an east-west direction, through the southern portion of 271 Reidel Drive. The proposed roadway shows a centrally placed intersection which serves to allow for a future north-south road development. One road opening is proposed on the east side of the project location to provide a future access to the south, and one road opening on the west side of the project location to provide a future access to the north. The variation in design options appears to be in the proposed location for parking, boulevards, bike lands and sidewalks. A general description of the three design options are included below along with renderings.

9.1.1 Design Option 1

A cross section of this design option shows two 3.5 m asphalt vehicle lanes centrally place, with a 1.5 m bike lane location on the north and south with no barriers. To the north and south of the bike lanes are a 2.4 m parking lane. A curb separates the parking lane with a 3.2 m boulevard with streetlight and/or trees/landscape on the north and south and a 1.5 m pedestrian sidewalk is located on the outer edge of the design on the north and south side (see Figure 4)

9.1.2 Design Option 2

A cross section of this design option shows two 3.3 m asphalt vehicle lanes centrally place, with 2.4 m parking lane along the north side only. A curb separates the parking and vehicle lands and give way to a 4m boulevard on the north and south side. A 1.6 m bike lane is proposed on the north and south side adjacent to the Boulevard. The pedestrian sidewalk is proposed at 1.8 m and is location on the outer edge of the north and south side of the road (see Figure 5).

9.1.3 Design Options 3

A cross section of this design option shows two 3.3 m asphalt vehicle lanes centrally place, with 2.4 m parking lane along the south side, followed by a 2.4 m bike lane on the north and south side. A curb separates the bike land and give way to a 3.1m boulevard on the north and south side. pedestrian sidewalk is proposed at 1.8 m and is location on the outer edge of the north and south side of the road (see Figure 6)

9.2 Do Nothing Option

Any proposed changes to a cultural heritage resource should also consider a do-nothing option. In this case, the do-nothing option would result in no road being constructed.

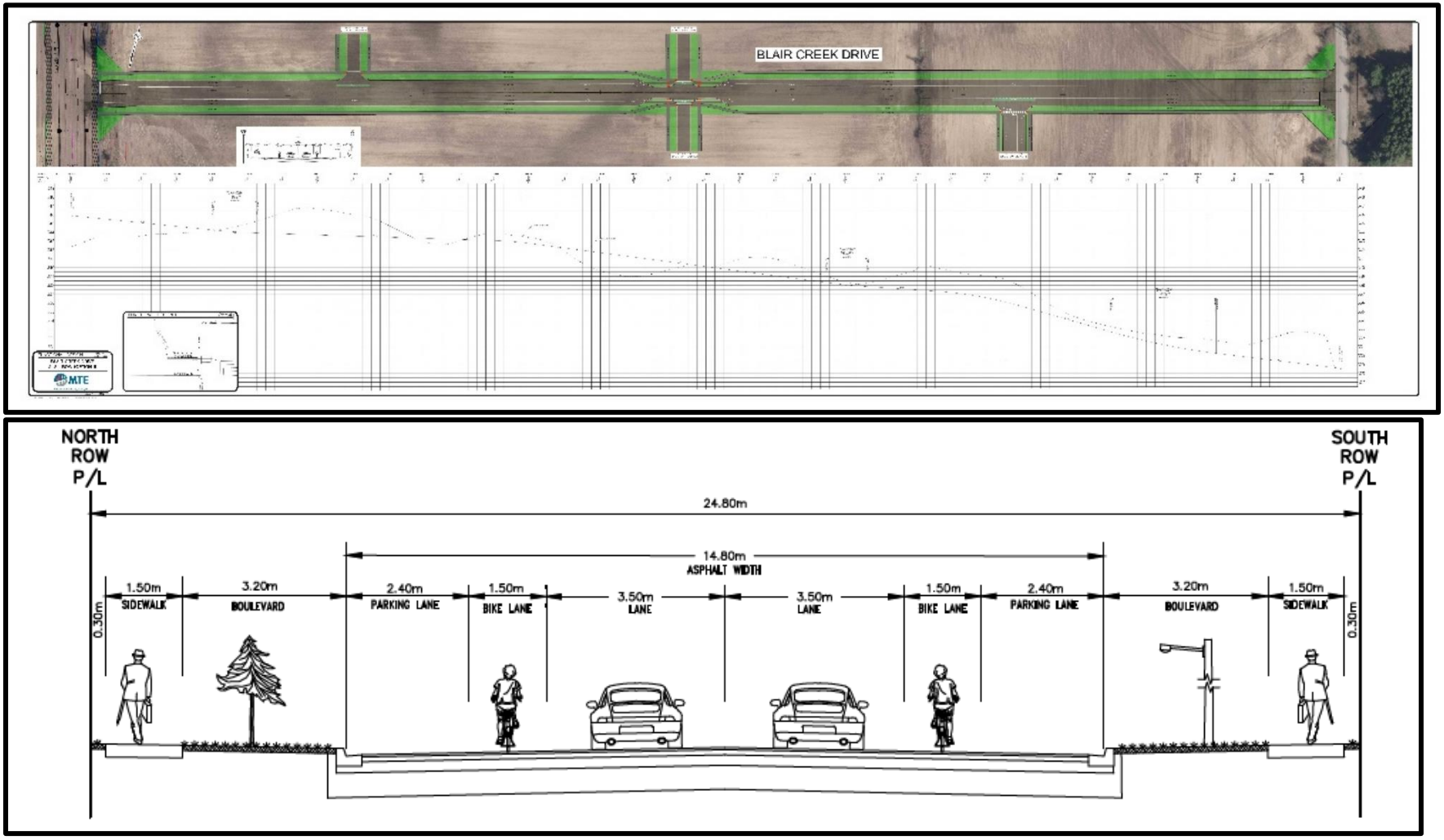


Figure 4: Proposed Project - Design Option 1
(Provided by City of Kitchener)

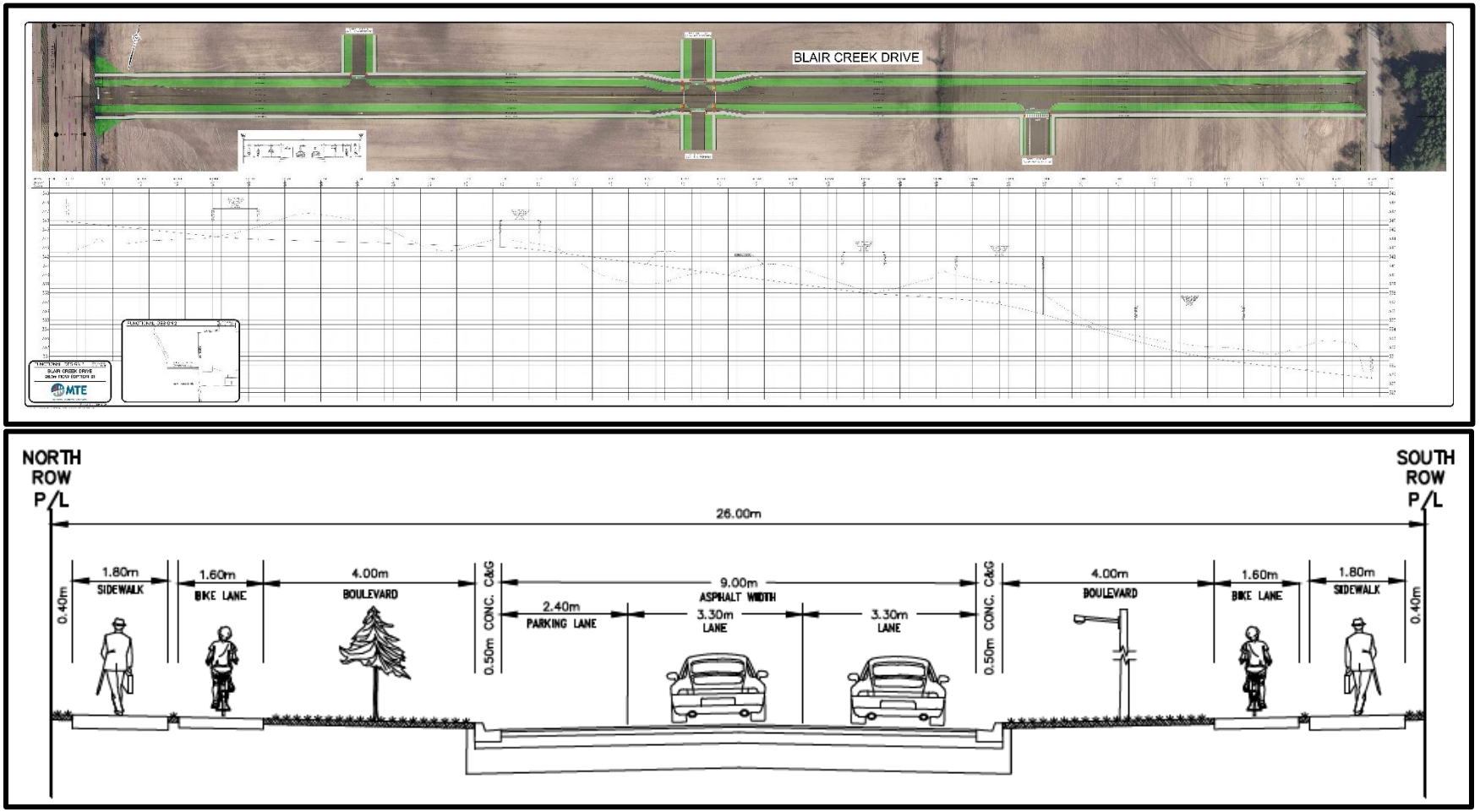


Figure 5: Proposed Project– Design Option 2
(Provided by City of Kitchener)

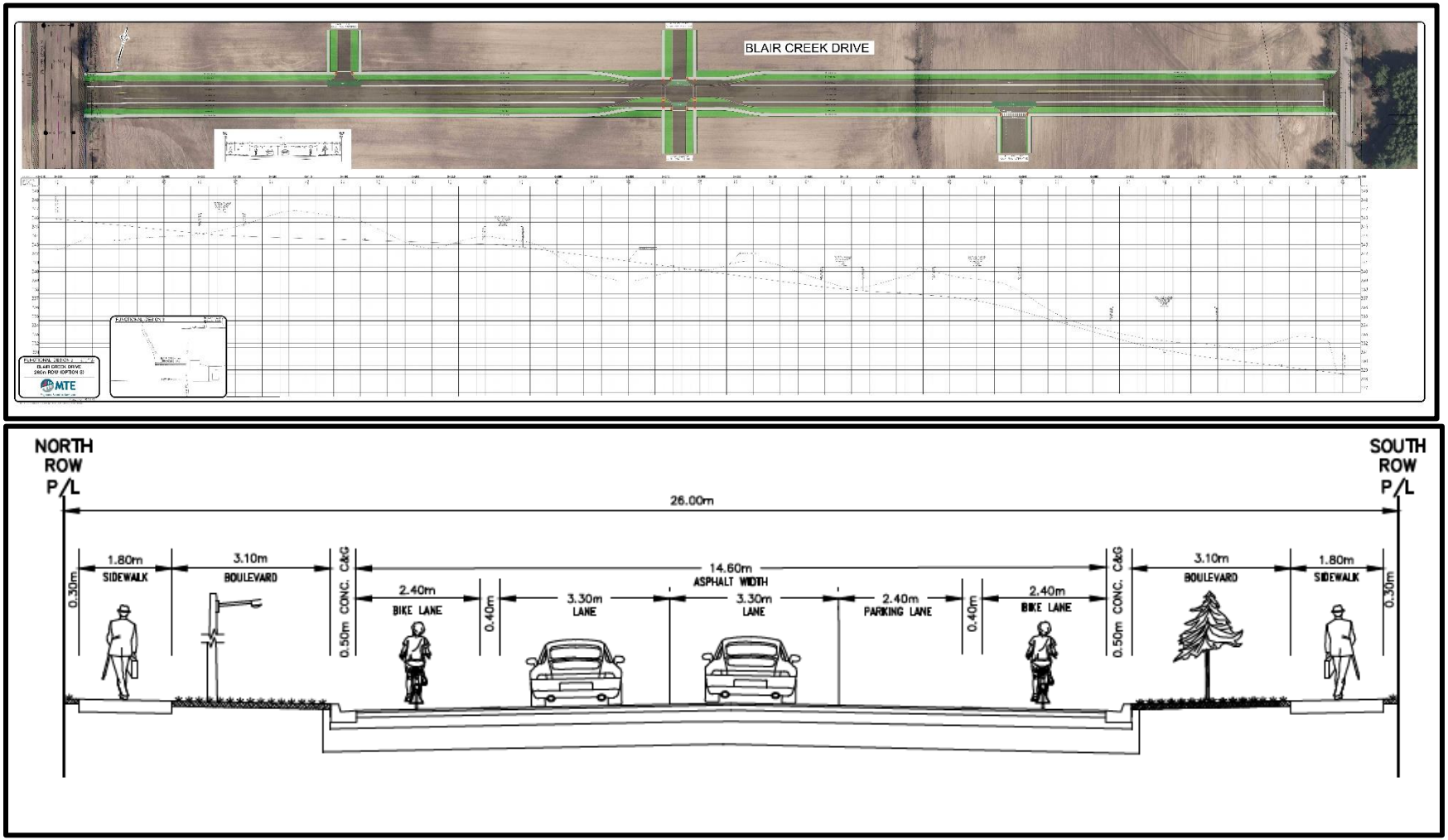


Figure 6: Proposed Project – Design Option 3
(Provided by City of Kitchener)

10.0 ANALYSIS OF POTENTIAL IMPACTS

The MCM *InfoSheet #5: Heritage Impact Assessments and Conservation Plans* (2006b:3) provides a list of potential negative impacts to consider when evaluating any proposed project. Impacts can be classified as either direct or indirect.

Direct impacts (those that physically affect the heritage resources themselves) include, but are not limited to: initial project staging, excavation/levelling operations, construction of access roads and renovations or repairs over the life of the project. These direct impacts may impact some or all significant heritage attributes or may alter soils and drainage patterns and adversely impact unknown archaeological resources.

Indirect impacts include but are not limited to: alterations that are not compatible with the historic fabric and appearance of the area; alterations that detract from the cultural heritage values, attributes, character or visual context of a heritage resource. This could include the construction of new buildings; the creation of shadows that alter the appearance of an identified heritage attribute; the isolation of a heritage attribute from its surrounding environment; the obstruction of significant views and vistas; and other less-tangible impacts.

An assessment of impacts on CHL-1 and BHR-1 can be evaluated using the negative impacts presented in *InfoSheet #5: Heritage Impact Assessments and Conservation Plans* (MCM 2006c). The impacts are examined below in Table 8 and Table 9

10.1 BHR-1: 271 Reidel Drive

Table 8: Impacts on 271 Reidel Drive Proposed Project
(Adapted from MCM 2006b)

Impact	Applicable? (Yes/No)	Comments
Destruction of any, or part of any, significant heritage attributes.	No	There is no proposed destruction of any, or part of any, heritage attributes as part of any of the design options of the proposed project.
Alterations to a property that detract from the cultural heritage values, attributes, character or visual context of a heritage resource; such as the construction of new buildings that are incompatible in scale, massing, materials, height, building orientation or location relative to the heritage resource.	No	All the design options for the proposed project will result in the development of a roadway through the existing agricultural fields located on the southern portion of the property. Due to the size of the agricultural fields, and the distance between the proposed project location and the heritage attributes (i.e., the main residence) , there is a sufficient buffer that this alteration to the property lot will not significantly detract from the heritage resource.
Shadows created that alter the appearance of a heritage attribute or change the viability of a natural feature or plantings, such as a garden.	No	No shadows will be created as part of any of the design options of the proposed project. The proposed project is to be located at ground level.
Isolation of a heritage attribute from its surrounding environment, context or significant relationship.	No	The heritage attributes of 217 Reidel Drive are confined to the main residence and therefore they will not be isolated from their context as a result of any of the design options.
Direct or indirect obstruction of significant views or vistas within, from, or of built and natural features.	No	No significant views or vistas were identified as heritage attributes associated with 271 Reidel Drive.

Impact	Applicable? (Yes/No)	Comments
A change in land use such as rezoning a battlefield from open space to residential use, allowing new development or site alteration to fill in the formerly open spaces.	Yes	The proposed project reflects a change in land use for a portion of the subject property from agricultural to transportation within the project location.
Land disturbances such as a change in grade that alters soils, and drainage patterns that adversely affect an archaeological resource.	Yes	The proposed development involves the creation of a new road. This has the potential to impact the grade, and drainage patterns which may adversely affect unknown archaeological resources.

10.2 CHL -1: Reidel Drive CHL

Table 9: Impacts on Reidel Drive CHL Proposed Development
(Adapted from MCM 2006b)

Impact	Applicable? (Yes/No)	Comments
Destruction of any, or part of any, significant heritage attributes.	Yes	All of the design options of the proposed project include the creation of a road opening along Reidel Drive which will result in the loss of vegetation that abuts the roadside and defines the edge of Reidel Drive.
Alterations to a property that detract from the cultural heritage values, attributes, character or visual context of a heritage resource; such as the construction of new buildings that are incompatible in scale, massing, materials, height, building orientation or location relative to the heritage resource.	Yes	The proposed project will result in the development of a road through the existing agricultural fields located on the southern portion of 271 Reidel Drive. All of the design options of the proposed project has the potential to detract from the character or visual context of Reidel Road CHL through the creation of a new opening, and a two-lane paved roadway with a bike lane, parking, boulevard, and pedestrian path. This type of road design is in contrast with the 'narrow two-lane alignment without shoulders found along Reidel Drive.
Shadows created that alter the appearance of a heritage attribute or change the viability of a natural feature or plantings, such as a garden.	No	No shadows will be created as part of the proposed project. The proposed project is to be located at ground level.
Isolation of a heritage attribute from its surrounding environment, context or significant relationship.	No	All of the design options of the proposed project will result in the development of a road through the existing agricultural fields located on the southern portion of 271 Reidel Drive. When considering the length of Reidel Drive and the size of the agricultural fields in relation to the size of the project location, the proposed road will not significantly isolate the 'scenic views to the surrounding agricultural fields' which is a character defining feature
Direct or indirect obstruction of significant views or vistas within, from, or of built and natural features.	No	All of the design options of the proposed project will result in the development of a road through the existing agricultural fields located on the southern portion of 271 Reidel Drive. When considering the length of Reidel Drive and the size of the agricultural fields in relation to the size of the project location which is at ground level, the proposed road will not significantly obstruct the 'scenic views to the surrounding agricultural fields' which is a character defining feature.

Impact	Applicable? (Yes/No)	Comments
A change in land use such as rezoning a battlefield from open space to residential use, allowing new development or site alteration to fill in the formerly open spaces.	No	There are no proposed changes to the land use of the Reidel Drive.
Land disturbances such as a change in grade that alters soils, and drainage patterns that adversely affect an archaeological resource.	No	There are no proposed changes to Reidel Drive CHL as part of the proposed project.

10.2.1 Summary of Impacts

As Table 8 and Table 9 summarizes, the proposed project has the potential to adversely impact the heritage attributes of BHR-1 and CHL-1 as defined by MCM *InfoSheet #5: Heritage Impact Assessments and Conservation Plans* (MCL 2006b:3). The impacts which have been identified by ARA in the impact assessment include:

BHR-1: 271 Reidel Drive

- Impact 1 – The proposed project reflects a change in land use for a portion of the subject property from agricultural to transportation within the project location.
- Impact 2 – The proposed project involves the creation of a new road. This will result in ground disturbance and also has the potential to impact the grade, and drainage patterns all of which may adversely affect unknown archaeological resources.

CHL-1: Reidel Drive

- Impact 3 – The proposed project includes the creation of a road opening along Reidel Drive which will result in the loss of vegetation that abuts the roadside and defines the edge of Reidel Drive for that section.
- Impact 4 – The proposed project has the potential to detract from the character or visual context of Reidel Road CHL through the creation of a new opening, and a two-lane paved roadway with a bike lane, parking, boulevard, and pedestrian path. This type of road design is in contrast with the 'narrow two-lane alignment without shoulders' found along Reidel Drive.

11.0 PREFERRED DESIGN AND MITIGATION MEASURES

As a result of consultation and field survey the following BHRs and CHLs were identified within and adjacent to the project location: Riedel Drive (CHL-1) and 271 Reidel Drive (BHR-1).

11.1 Preferred Design Option

From a heritage perspective, when any impacts are identified a do-nothing option is considered the best conservation practice. However, there are other short- and long-term planning and policy related factors which make this option less feasible.

All three design options involve the development and alteration of the same portion of land on 271 Reidel Drive and appear to be the same proposed location and size of opening onto Reidel Drive. From a heritage perspective all three options will result in the same potential impacts.

Therefore, no design option is considered to have less impact and therefore there is no preferred alternative from a heritage perspective.

11.2 Mitigation Measures

Given that potential impacts have been identified, mitigation measures must be recommended. The MCM *InfoSheet #5: Heritage Impact Assessments and Conservation Plans* (2006d:3) lists specific methods to minimize any potential negative impacts. The following mitigation strategy applies to all three design options. As a result of this HIA, the following mitigation strategies are recommended:

- Any construction and staging areas should avoid the use of lands directly surrounding the heritage attributes associate with BHR-1 and if required construction fencing should be erected to ensure that construction areas and machinery is kept well away from the building;
- That only the required/a minimal amount of roadside vegetation which defines the road edge on Reidel Drive be removed for the construction of the road. Further that the diverse roadside vegetation which defines the road edge on Reidel Drive which is not being removed be protected during staging and construction activities with construction fencing. If possible, replacement of any vegetation removed and the integration of additional vegetation along the new roadway should be considered. A Landscape Plan may be considered to limit negative impacts associated with vegetation removal.
- That an archaeological assessment is suggested to address the potential impacts of ground disturbance and change in grade and drainage patterns to unknown archaeological resources.
- As the roadway will create public access to 271 Reidel Drive, this will provide a potential opportunity to interpret and commemorate Reidel Drive CHL (CHL-1) and/or 271 Reidel Drive (BHR-1) through the inclusion of signage, plaques, and public art;
- That if the inclusion of signage, plaques, built features associated with the road design is pursued, consideration be given to a design which does sympathetic to the character of the area;
- Public consultation may result in additional information on BHR-1 and CHL-1. If additional information is provided it should be reviewed by a qualified heritage consultant to: 1) determine the cultural heritage value or interest evaluation needs revision, 2) review information against potential project impacts, and 3) and if the information warrant additional strategies for future conservation of any identified cultural heritage resources;
- Should the proposed project or the proposed study area expand beyond the scope examined in this report, a qualified heritage consultant should be retained to determine the potential impacts and suggest mitigation measures;
- That adequate archaeological assessment that meets or exceed provincial standards be undertaken as part of this proposed project. No soil disturbing activities should take place until all archaeological concerns are mitigated, and all reports are accepted by the MCM.

There are no mitigation measures for two of the identified impacts:

- Impact 1 – The proposed project reflects a change in land use for a portion of the subject property from agricultural to transportation within the project location.
- Impact 4 – The proposed project has the potential to detract from the character or visual context of Reidel Road CHL through the creation of a new opening, and a two-lane paved roadway with a bike lane, parking, boulevard, and pedestrian path. This type of road design is in contrast with the ‘narrow two-lane alignment without shoulders’ found along Reidel Drive.

12.0 SUMMARY STATEMENT AND RECOMMENDATIONS

The study area is an approximately 200-acre parcel of land and is characterized by rolling topography, lands which appear under agricultural use, a small creek, forested area, slopes, and grade changes which surround a primary residence with multiple outbuildings. The residence on in the study area fronts onto Reidel Drive. Two cultural heritage resources have been identified within or adjacent to the project location. The project location is proposed to be located within the study area (271 Reidel Drive) which is listed as a non-designated property of cultural heritage value or interest on the City of Kitchener Municipal Heritage Register (BHR-1). The study area is located adjacent to the Reidel Drive Cultural Heritage Landscape (CHL), which was identified in the *Cultural Heritage Landscape Study*, approved by Council in 2015 (CHL-1).

As part of the site-specific Terms of Reference, BHR-1 underwent a O. Reg 9/06 heritage evaluation. BHR-1 has met two criteria under Ontario Regulation 9/06 and may be worthy of designation under the *Ontario Heritage Act*. On the evening of November 12, 2023, the house at 271 Reidel Drive caught fire. ARA staff conducted as site visit from public lands on November 13, 2023. As observed during this site visit many of the proposed heritage attributes of the residence have been completely destroyed. The one storey stone construction section with gable peak and some window openings remain.

The proposed project includes an approximately 700-meter portion of land which runs linear in an east-west direction through the property known as 271 Reidel Drive. The project location is proposed to be used as a road extension, continuing from the future Strasburg Road alignment which intersects at of Reidel Drive and Blair Creek Drive. The Blair Creek Drive Road Extension will also include new storm sewer as well as a 300mm diameter watermain. The proposed project will also include the creation of the paved roadway, parking, sidewalks, bike lanes and boulevards.

Three proposed project design options were considered. All three design options involve the development and alteration of the same portion of land on 271 Reidel Drive and appear to be the same proposed location and size of opening onto Reidel Drive. From a heritage perspective all three options will result in the same potential impacts. Therefore, no design option is considered to have less impact and therefore there is no preferred alternative from a heritage perspective.

Given that potential impacts have been identified, mitigation measures must be recommended. The MCM *InfoSheet #5: Heritage Impact Assessments and Conservation Plans* (2006d:3) lists specific methods to minimize any potential negative impacts. The following mitigation strategy applies to all three design options.

As a result of this HIA, the following mitigation strategies are recommended:

- Any construction and staging areas should avoid the use of lands directly surrounding the heritage attributes associate with BHR-1 and if required construction fencing should be erected to ensure that construction areas and machinery is kept well away from the building;
- That only the required/a minimal amount of roadside vegetation which defines the road edge on Reidel Drive be removed for the construction of the road. Further that the diverse roadside vegetation which defines the road edge on Reidel Drive which is not being removed be protected during staging and construction activities with construction fencing. If possible, replacement of any vegetation removed and the integration of additional vegetation along the

new roadway should be considered. A Landscape Plan may be considered to limit negative impacts associated with vegetation removal.

- That an archaeological assessment is suggested to address the potential impacts of ground disturbance and change in grade and drainage patterns to unknown archaeological resources.
- As the roadway will create public access to 271 Reidel Drive, this will provide a potential opportunity to interpret and commemorate Reidel Drive CHL (CHL-1) and/or 271 Reidel Drive (BHR-1) through the inclusion of signage, plaques, and public art;
- That if the inclusion of signage, plaques, built features associated with the road design is pursued, consideration be given to a design which does sympathetic to the character of the area;
- Public consultation may result in additional information on BHR-1 and CHL-1. If additional information is provided it should be reviewed by a qualified heritage consultant to: 1) determine the cultural heritage value or interest evaluation needs revision, 2) review information against potential project impacts, and 3) and if the information warrant additional strategies for future conservation of any identified cultural heritage resources;
- Should the proposed project or the proposed study area expand beyond the scope examined in this report, a qualified heritage consultant should be retained to determine the potential impacts and suggest mitigation measures;
- That adequate archaeological assessment that meets or exceed provincial standards be undertaken as part of this proposed project. No soil disturbing activities should take place until all archaeological concerns are mitigated, and all reports are accepted by the MCM.

There are no mitigation measures for two of the identified impacts:

- Impact 1 – The proposed project reflects a change in land use for a portion of the subject property from agricultural to transportation within the project location.
- Impact 4 – The proposed project has the potential to detract from the character or visual context of Reidel Road CHL through the creation of a new opening, and a two-lane paved roadway with a bike lane, parking, boulevard, and pedestrian path. This type of road design is in contrast with the ‘narrow two-lane alignment without shoulders’ found along Reidel Drive.

13.0 BIBLIOGRAPHY AND SOURCES

Archives of Ontario (AO)
2022 *Access our Collections*. Accessed online at: http://www.archives.gov.on.ca/en/access/our_collection.aspx.

Bloomfield, E.
2006 *Waterloo Township Through Two Centuries*. Kitchener: Waterloo Historical Society.

Blumenson, J.
1990 *Ontario Architecture: A Guide to Styles and Building Terms 1784 to the present*. Toronto: Fitzhenry and Whiteside

Bricker, I.C.
1935 *The History of Waterloo Township Up To 1825*. In Waterloo Historical Society 22:81-131.

Brown, G.
1864 *Rural Architecture: A Cheap Farm House*. The Canada Farmer. Volume 1. No. 22. Accessed online at https://www.canadiana.ca/view/oocihm.8_04206_21/5?r=0&s=1

City of Kitchener
2008 *Statement of Significance 271 Reidel Drive*.
2014 *City of Kitchener Official Plan: A Complete & Healthy Kitchener.* Accessed online at: https://www.kitchener.ca/en/resourcesGeneral/Documents/DSD_PLAN_City_of_Kitchener_Official_Plan_2014.pdf
2014 *Cultural Heritage Landscape Study*. Accessed online at: https://www.kitchener.ca/en/resourcesGeneral/Documents/DSD_PLAN_CHL_Study_Report.pdf

Coyne, J. H.
1895 *The Country of the Neutrals (As Far as Comprised in the County of Elgin): From Champlain to Talbot*. St. Thomas: Times Print.

Cumming, R. (ed.)
1972 *Historical Atlas of the County of Wellington, Ontario*. Reprint of 1906 Edition. Toronto: Historical Atlas Publishing Co.

Ellis, C.J. and N. Ferris (eds.)
1990 *The Archaeology of Southern Ontario to A.D. 1650*. Occasional Publication of the London Chapter, OAS Number 5. London: Ontario Archaeological Society Inc.

ERA
2020 *The Historic Ontario Farmstead Typology.* Accessed online at: https://www.eraarch.ca/2020/historic-farmsteads-drive-a-new-rural-cultural-economy/.

Evans, W.
1884 *Waterloo County Gazetteer and Directory*. W.W. Williams: Toronto.

Family Search
2023a *Goodfellow, James*. Accessed online at: https://www.familysearch.org/tree/person/details/KVV9-HJR.

2023b *Weber, Ervin C.* Accessed online at: https://www.familysearch.org/tree/person/details/KJW9-RBY.
2023c *Wismer, Isaiah*. Accessed online at: https://www.familysearch.org/tree/person/details/LC67-P35.
2023d *Wismer, John*. Accessed online at: https://www.familysearch.org/tree/person/details/LC67-2YL

Fram, M.
2003 *Well Preserved: The Ontario Heritage Foundation's Manual of Principles and Practice for Architectural Conservation*. Erin: Boston Mills Press

Government of Ontario
1990 *Ontario Heritage Act, R.S.O. 1990, c. O.18*. Accessed online at: www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90o18_e.htm.
1990 *Planning Act R.S.O. 1990, c. P.13.* Accessed online at: www.ontario.ca/laws/statute/90p13.
2006 *Ontario Regulation 9/06 made under the Ontario Heritage Act*. Accessed online at: www.ontario.ca/laws/regulation/060009.
2010 *Environmental Assessment Act, R.S.O. 1990, c. 16. Sched 7, s.1*. Accessed online at: www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90e18_e.htm.
2022 *Eight guiding Principles in the Conservation of Built Heritage Properties.* Accessed online at:https://www.ontario.ca/page/eight-guiding-principles-conservation-built-heritage-properties
2023 *Ontario Regulation 569/22 made under the Ontario Heritage Act*. Accessed online at: www.e-laws.gov.on.ca/html/regs/english/elaws_regs_060009_e.htm.

Grand River Conservation Authority (GRCA)
2021 *Heritage River Plaques*. Accessed online at: https://www.grandriver.ca/en/our-watershed/Heritage-River-Plaques.aspx.

Hayes, G.
1997 *Waterloo County: An Illustrated History.* Kitchener: Waterloo Historical Society.

Janusas, S.
1988 *Archaeological Perspective of a Historic Overview of the Regional Municipality of Waterloo*. Regional Municipality of Waterloo Planning and Development Department, Waterloo.

Kyles, S.
2016 *Gothic Revival*. In Ontario Architecture. Accessed online at: www.ontarioarchitecture.com/gothicrevival.html

Lajeunesse, E.J.
1960 *The Windsor Border Region: Canada's Southernmost Frontier*. Toronto: The Champlain Society.

Land Registry Office (LRO) #58
2023 *Lot 5, Beasley's New Survey*. Accessed online at www.onland.ca.

Library and Archives Canada (LAC)
1861 *James Goodfellow* in the Canada Census, Subdistrict of South Waterloo, District of Waterloo. Microfilm C-1078-1079, Page Number 83, Lines 1 – 9.
1871 *James Goodfellow* in the Canada Census, Subdistrict of Waterloo South, District of Waterloo South. Microfilm C-9943, Page Number 2 -3, Lines 12 – 2.
1881 *John Wismer* in the Canada Census, Subdistrict of Waterloo South, District of Waterloo South. Microfilm C-13264, Page Number 4, Family Number 12, Lines 4 – 12.
1891 *John Wismer* in the Canada Census, Subdistrict of Waterloo South, District of Waterloo South. Microfilm T-6375, Page Number 6 – 7, Family Number 26, Lines 18 – 25.
1901 *Isaiah Wismer* in the Canada Census, Subdistrict of Waterloo South, District of Waterloo South. Microfilm T-6503, Page Number 1, Family Number 5, Lines 27 – 31.
1911 *Isaiah Wismer* in the Canada Census, Subdistrict of Waterloo South, District of Waterloo South. Microfilm T-20408, Page Number 3, Family Number 22, Lines 2 – 6.
1921 *Ervin Weber* in the Canada Census, Subdistrict of South Waterloo, District of Waterloo South. RG31, Page Number 2, Family Number 20, Lines 38 – 42.

McAlester, Virginia & Lee
1984 *A Field Guide to American Houses*. New York: Alfred A Knopf Inc.

McGill University
2001 *The Canadian County Atlas Digital Project*. Accessed online at: http://digital.library.mcgill.ca/countyatlas/default.htm.

McKendry, J.
2016 *A discussion of Kingston and Area's Historic Small Houses known as "The Ontatio Cottage" Type* in Journal of the Society for the Study of Architecture in Canada [1998-] 41/2.

McIlwraith, T.E.
1997 *Looking for Old Ontario.* Toronto: University of Toronto Press.

Ministry of Citizenship and Multiculturalism (MCM)
1992 *Guideline for Preparing the Cultural Heritage Resource Component of Environmental Assessments.*
2006a Ontario Heritage Toolkit Series. Toronto: Ministry of Culture.
2006b Heritage Property Evaluation: A Guide to Listing, Researching and Evaluating Cultural Heritage Property in Ontario Communities. Ontario Heritage Tool Kit Series. Toronto: Ministry of Culture.
2006c InfoSheet #2: Cultural Heritage Landscapes. Ontario Heritage Toolkit Series. Toronto: Ministry of Culture.
2006d InfoSheet #5: Heritage Impact Assessments and Conservation Plans. Ontario Heritage Tool Kit Series. Toronto: Ministry of Culture.
2010 *Standards & Guidelines for Conservation of Provincial Heritage Properties.*
2019 *List of Heritage Conservation Districts*. Accessed online at: www.mtc.gov.on.ca/en/heritage/heritage_conserving_list.shtml.

Ministry of Municipal Affairs and Housing (MMAH)
2020 *Provincial Policy Statement*. Toronto: Ministry of Municipal Affairs and Housing.

Munson, M.K. and S.M. Jamieson (eds.)
2013 *Before Ontario: The Archaeology of a Province*. Kingston: McGill-Queen's University Press.

North Dumfries Municipal Heritage Committee (NDMHC)
2002 An Historic Walking Tour of Roseville, Ontario. Accessed online at: https://www.northdumfries.ca/en/doing-business/resources/Documents/Roseville-Walking-Tour19.pdf.

Ontario Council of University Libraries (OCUL)
2023 *Historical Topographic Map Digitization Project*. Access online at: https://ocul.on.ca/topomaps/.

Ontario Heritage Trust (OHT)
2021 *Architecture Styles*. Accessed online at: Architectural style - Ontario Heritage Trust
2021b *Ontario Heritage Plaque Guide*. Accessed online at: www.heritagetrust.on.ca/en/index.php /online-plaque-guide.

Ontario Historical County Maps Project (OHCMP)
2019 *Ontario Historical County Maps Project*. Accessed online at: http://maps.library.utoronto.ca/hgis/countymaps/maps.html.

Parks Canada
2010 *Standards and Guidelines for the Conservation of Historic Places in Canada 2nd Edition*. Accessed online at: www.historicplaces.ca/media/18072/81468-parks-s+g-eng-web2.pdf.
2022 *Directory of Federal Heritage Designations*. Accessed online at: https://www.pc.gc.ca/apps/dfhd/search-recherche_eng.aspx.

Region of Waterloo
2013 *Regional Implementation Guideline for Cultural Heritage Conservation.* Accessed online: https://www.regionofwaterloo.ca/en/exploring-the-region/resources/Documents/Final_Implementation_Guideline_for_CHL_Conservation-access.pdf
2015 *Official Plan*. Accessed online at: www.regionofwaterloo.ca/en/regionalGovernment/PreviousROP.asp.

Ricketts, S., L. Maitland, and J. Hucker
2011 *A Guide to Canadian Architectural Styles- Second Edition*. Peterborough: Broadview Press Exchange.

Shearer, W.
2012 *The Evolution of the Agricultural Cultural Landscape* in *Heritage Matters*, Vol. 10, Issue 3.

Smith, W.H.
1846 *Smith's Canadian Gazetteer: Comprising Statistical and General Information Respecting all Parts of the Upper Province, or Canada West*. Toronto: H. & W. Rowsell.

Surtees, R.J.
1994 *Land Cessions, 1763–1830*. In Aboriginal Ontario: Historical Perspectives on the First Nations, edited by E.S. Rogers and D.B. Smith, pp. 92–121. Toronto: Dundurn Press.

Sutherland, J.
1864 *County of Waterloo Gazetteer and General Business Directory*. Mitchell Co: Toronto.

University of Waterloo (UW)
2016 *Digital Historical Air Photos of KW and Surrounding Area*. Accessed online at: http://www.lib.uwaterloo.ca/locations/umd/project/.

Warrick, G.
2000 *The Precontact Iroquoian Occupation of Southern Ontario.* Journal of World Prehistory 14(4):415–456.

Williams, R.
2014 *Landscape Architecture in Canada.* Montreal & Kingston: McGill-Queen's University Press

Wright, J.V.
1972 *Ontario Prehistory: An Eleven-Thousand-Year Archaeological Outline*. Archaeological Survey of Canada, National Museum of Man. Ottawa: National Museums of Canada.

Appendix A: Property Location Images

Map 7: Photo Locations in Study Area
(Produced under licence using ArcGIS® software by Esri, © Esri UW 2016)

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INTERIOR OF 271 REIDEL DRIVE

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Image 36: 271 Reidel Drive Interior – View of Room with Skylight
(Photo taken on July 7, 2023)

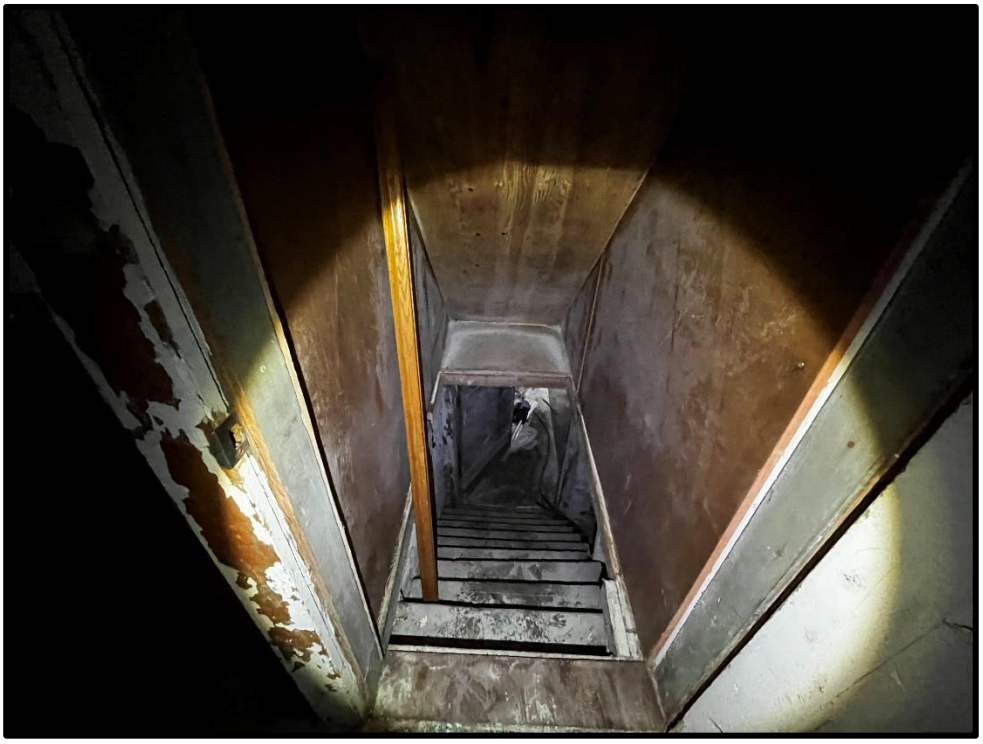


Image 37: 271 Reidel Drive Interior – View of Access to Basement
(Photo taken on July 7, 2023)

Image 38: 271 Reidel Drive Interior – View of Basement
(Photo taken on July 7, 2023)

Appendix B: Reidel Drive CHL Datasheet

L-RD-10 Reidel Drive

LOCATION:

A north/south alignment starting at Stauffer Drive and ending at the New Dundee Road.

Within the Described boundary, there are:

Designated HCDs:	0
Designated Properties:	0
Listed Properties:	0

HISTORIC THEMES:

Pioneer Settlement, Transportation, Agriculture, Mennonite Settlement

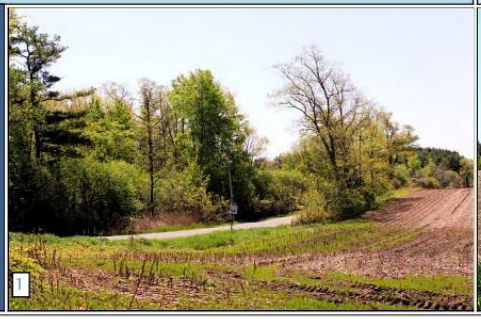
LANDSCAPE TYPE: Transportation Corridor

ARCHAEOLOGICAL POTENTIAL: YES

DESCRIPTION:

Reidel Drive, from Stauffer Drive southerly to Blair Creek, is a paved road with a posted speed limit of 50km/h. It follows a straight alignment between Lots 4 and 5 of Beasleys New Survey. The road follows an undulating topography that gently slopes down at the Blair Creek crossing. The road is bounded by agricultural lands and a single wood pole hydro line runs parallel to the road on the east side for the length of this section of Reidel Drive. Sections of the road, particularly at the north end and around the Blair Creek crossing, are enclosed by dense vegetation that closely bounds the road alignment given that there are no shoulders, while other sections of the road open up to clear views of adjacent cultivated fields.

Roads in the Township of Waterloo were not formally laid out during a township survey as in other parts of Upper Canada. Instead, an irregular network of roads developed given that they were typically built after settlers had begun to clear their lots, and the need for roads linking villages settlements, farms, markets and mills followed. The road is bounded by Lots 4 and 5 of Beasley's New Survey. The 1831 Assessment Rolls indicate that this part of the township was not yet developed, and thus Reidel Drive was not yet in place (Bloomfield 1997:36). The earliest historic map available to show this road is the 1861 Tremaine, which indicates that James Goodfellow owned/farmed land to the west, while William Dalgleish owned/farmed land to the east. The surrounding agricultural landscape remains intact. At present, Reidel Drive continues to form part of the local road network. Reidel Drive is considered to be of local historical and contextual value given that the road: was built as part of initial settlement activities in the southern part of the Township of Waterloo, forming part of Beasley's New Survey; relates to the development of the Township of Waterloo for agricultural purposes in the nineteenth century; is bounded by cultivated fields and a rural landscape; and, continues to form part of the local road network. The following attributes are evocative of the road's historic and scenic charcter: the narrow two-lane alignment without shoulders; the scenic views to surrounding agricultural fields; the spatial and visual relationship between the road thoroughfare and Blair Creek, and associated vegetation; the diverse roadside vegetation that abuts the roadside providing a defined edge to the road; and, the undulating topography and original historic alignment.



HISTORICAL INTEGRITY	CULTURAL VALUE	COMMUNITY VALUE
☑ LAND USE - CONTINUITY OF USE	☐ DESIGN VALUE - RARENESS OR UNIQUENESS	☐ COMMUNITY IDENTITY - TELLS STORY OF AREA
☐ OWNERSHIP - CONTINUITY OF OWNERSHIP	☐ DESIGN VALUE - AESTHETIC/SCENIC REASONS	☐ PUBLIC STEWARDSHIP SUPPORTED BY VOLUNTEERISM
☐ BUILT ELEMENTS - ORIGINAL GROUPINGS AND ASSOCIATED SITES	☐ DESIGN VALUE - HIGH DEGREE TECHNICAL / SCIENTIFIC INTEREST	☐ COMMUNITY IMAGE IDENTIFIED WITH KITCHENER'S PROVINCIAL/NATIONAL REPUTATION
☐ VEGETATION - ORIGINAL PATTERNS	☑ HISTORIC VALUE - HISTORIC UNDERSTANDING OF AREA	☐ TOURISM - PROMOTED AS TOURIST DESTINATION
☐ CULTURAL RELATIONSHIPS - SUPPORTING DESIGNED ELEMENTS	☐ HISTORIC VALUE - DIRECT ASSOCIATION WITH A THEME, EVENT OR PERSON	☐ LANDMARK - RECOGNIZED BY COMMUNITY
☐ NATURAL FEATURES - PROMINENT NATURAL FEATURES	☐ HISTORIC VALUE-WORK OF LANDSCAPE ARCHITECT, ARCHITECT OR OTHER DESIGNER	☐ COMMEMORATION - SITE USED FOR CELEBRATIONS
☐ NATURAL RELATIONSHIPS - FEATURES THAT DETERMINE USE	☐ CONTEXTUAL VALUE - LANDMARK VALUE	☐ PUBLIC SPACE - USED FOR FREQUENT PUBLIC EVENTS
☐ VIEW THAT REFLECTS LANDSCAPE CHARACTER FROM HISTORIC PHOTOS	☐ CONTEXTUAL VALUE - IMPORTANT IN DEFINING CHARACTER OF AREA	☐ CULTURAL TRADITIONS - USED TO EXPRESS CULTURAL TRADITIONS
☐ RUIN - HUMAN MADE REMNANTS	☐ CONTEXTUAL VALUE - HISTORICALLY, PHYSICALLY, FUNCTIONALLY OR VISUALLY LINKED TO SURROUNDINGS	☐ QUALITY OF LIFE - VALUED FOR ITS DAY-TO-DAY IMPACT ON COMMUNITY LIFE
☐ DESIGNED LANDSCAPES THAT HAVE RESTORATION POTENTIAL		☐ LOCAL HISTORY - CONTRIBUTING TO LOCAL LORE
		☐ VISUALLY SIGNIFICANT PHOTOGRAPHED OFTEN
		☐ GENUS LOCI - SENSE OF PLACE
		☐ PLANNING - IDENTIFIED THROUGH OTHER PLANNING INITIATIVES
Reidel Drive, from Stauffer Drive southerly to Blair Creek, follows a straight alignment between Lots 4 and 5 of Beasleys New Survey. The earliest historic map available to show this road is the 1861 Tremaine, which indicates that James Goodfellow owned/farmed land to the west, while William Dalgleish owned/farmed land to the east. The surrounding agricultural landscape remains intact.	Reidel Drive is considered to be of local historical and contextual value given that the road: was built as part of initial settlement activities in the southern part of the Township of Waterloo, forming part of Beasleys New Survey; relates to the development of the Township of Waterloo for agricultural purposes in the nineteenth century; and is bounded by cultivated fields and a rural landscape.	At present, Reidel Drive continues to form part of the local road network and is a reminder of the mid-nineteenth century development of lots and new farmsteads.


4

5


6

CHARACTER DEFINING FEATURES:

Features of this road include: the narrow two-lane alignment without shoulders; the scenic views to surrounding agricultural fields; the spatial and visual relationship between the road thoroughfare and Blair Creek, and associated vegetation; the diverse roadside vegetation that abuts the roadside providing a defined edge to the road; and, the undulating topography and original historic alignment.

LIST OF FIGURES:

1. Reidel Drive at Stauffer Drive intersection.
2. Kame landscape off of Reidel Drive.
3. Rural cross section.
4. Agricultural landscape.
5. Undulating kame topography along Reidel Drive.
6. Undulating kame topography along Reidel Drive.

Appendix C: Key Team Member's Qualifications

Kayla Jonas Galvin, MA, RPP, MCIP, CAHP- Heritage Operations Manager

Kayla Jonas Galvin, Archaeological Research Associates Ltd.'s Heritage Operations Manager, has extensive experience evaluating cultural heritage resources and landscapes for private and public-sector clients to fulfil the requirements of provincial and municipal legislation such as the *Environmental Assessment Act*, the *Standards & Guidelines for the Conservation of Provincial Heritage Properties* and municipal Official Plans. She served as Team Lead on the Ministry of Tourism, Culture and Sport Historic Places Initiative, which drafted over 850 Statements of Significance and for *Heritage Districts Work!*, a study of 64 heritage conservation districts in Ontario. Kayla was an editor *of Arch, Truss and Beam: The Grand River Watershed Heritage Bridge Inventory* and has worked on Municipal Heritage Registers in several municipalities. Kayla has drafted over 150 designation reports and by-laws for the City of Kingston, the City of Burlington, the Town of Newmarket, Municipality of Chatham-Kent, City of Brampton and the Township of Whitchurch-Stouffville. Kayla is the Heritage Team Lead for ARA's roster assignments for Infrastructure Ontario and oversees evaluation of properties according to *Standards & Guidelines for the Conservation of Provincial Heritage Properties*. Kayla is a Registered Professional Planner (RPP), Member of the Canadian Institute of Planners (MCIP), a professional member of the Canadian Association of Heritage Professionals (CAHP) and sits on the board of the Ontario Association of Heritage Professionals.

Amy Barnes, M.A., CAHP- Heritage Project Manager

Amy Barnes, a Project Manager with ARA's Heritage team, has over ten years of experience evaluating cultural heritage resources and landscapes and community engagement. Amy has extensive experience working with provincial and municipal legislation and guidelines, including the Ontario Heritage Act, Official Plans, the Standards and Guidelines for the Conservation of Historic Places, and the Ontario Heritage Toolkit. Ms. Barnes has completed over 100 heritage related project and 200+ cultural assessments and has been qualified as an expert witness at the Ontario Superior Court of Justice. Amy has worked in the public and private sector where her duties included project management, public consultation, facilitator, researcher, database and records management, and report author. Amy supported the completion of peer reviews of 9/06 evaluations for multiple high-profile properties in the City of Toronto. Amy Barnes holds an M.A. in Heritage Conservation from the School of Canadian Studies at Carleton University in Ottawa, Ontario. Amy has successfully completed the International Association of Public Participation (IAP2) Foundations in Public Participation, the IAP2 Planning and Techniques for Effective Public Participation, and Indigenous Awareness Training through Indigenous Awareness Canada. Amy is a professional member of CAHP and the former Vice-Chair of the Cambridge Municipal Heritage Advisory Committee

Sumra Zia, G.D.A.C., B.Arch- Cultural Heritage Technician

Sumra Zia, joined the Heritage team at ARA as a Cultural Heritage Technician, and works on heritage impact, assessment, and evaluations. Before joining the heritage team at ARA, Sumra completed a Graduate Diploma in Architectural Conservation from Carleton University in Ottawa. The diploma added to her bachelor's degree in Architecture and Planning from NED University in Pakistan. She has work experience in architecture design, interior design, urban planning, adaptive reuse projects together with working on historic buildings as a conservation specialist. Sumra is well versed with the Ontario Heritage Act, the Ontario Building Code, Ontario Heritage Toolkit and the Standards and Guidelines for the Conservation of Historic Places. Sumra has worked with local communities on tangible and intangible issues connected to architectural practices and as a part of her Architectural Conservation degree has completed various case studies on heritage properties in Canada, which range from the Royal Botanical Gardens in Burlington to the Elgin Hotel in Ottawa. She is passionate about studying the effects of global climate change on cultural heritage properties and landscapes and how working with climate change could be beneficial for best conservation practices.

MTE, January 2024

Geotechnical Investigation Report

Blair Creek Drive Extension

Geotechnical Investigation Report

Project Location:
Blair Creek Drive, Kitchener, Ontario

Prepared for:
City of Kitchener
200 King Street West
Kitchener, ON N2G 4G7

Prepared by:
MTE Consultants Inc.
365 Home Street
Stratford, ON N5A 2A5

January 18, 2024

MTE File No.: 53018-100-Rev01

Engineers, Scientists, Surveyors.

Contents

Tables

Appendices

1.0 Introduction

MTE Consultants Inc. (MTE) was retained by the City of Kitchener to conduct a geotechnical investigation for the extension of Blair Creek Drive in Kitchener, Ontario. The proposed extension extends eastward from Reidel Drive, as shown on **Figure 1 in Appendix A**.

It is anticipated that the proposed project will involve the construction of new sanitary and storm sewers, watermain, new pavement structure, and curbs and sidewalks. Sewer depths are anticipated to be approximately 4.0 to 5.0 meters below ground surface (mbgs) along the roadway.

The purpose of this geotechnical investigation is to determine the soil and groundwater conditions along the roadway and provide geotechnical engineering recommendations for site servicing, excavations and dewatering, low impact development (LID) feasibility, pavement structure design and construction, and pavement drainage requirements.

2.0 Investigative Program

2.1 Field Program

The fieldwork for this investigation was carried out on May 5, 2023, and involved the drilling of seven (7) boreholes (Boreholes BH101-23 to BH107-23) to depths ranging from approximately 4.9 to 6.7 m. The locations of the boreholes are shown on the Site Plan, **Figure 1 in Appendix A**.

Public utility companies were contacted prior to the start of drilling activities in order to isolate underground utilities near the boring locations.

The boreholes were advanced with a Track Mounted D50T drill rig equipped with continuous flight hollow stem augers and was supplied and operated by London Soil Test Ltd.

Representative soil samples were recovered throughout the depths explored. Standard Penetration Tests (SPT) were carried out during sampling operations in the boreholes using conventional split spoon equipment. The SPT N-values recorded are plotted on the borehole logs in Appendix B.

Selected soil samples collected from the boreholes (within the proposed construction depths) were subdivided for visual and olfactory screening, combustible soil vapour (CSV) headspace measurements, and/or laboratory chemical analysis. Samples for chemical analysis were collected directly into pre-cleaned, laboratory supplied, test group specific containers. For the analysis of PHC F1 and VOCs/BTEX, soil samples were collected by means of plastic syringe core samplers into Teflon lined screw cap, gas tight glass vials prepared by the subcontracted laboratory with methanol preservative. The results of the laboratory testing are provided in the concurrent Soil Characterization Report.

Upon completion of drilling, the boreholes were backfilled with soil cuttings and bentonite in accordance with Ontario Regulation 468/10 (formerly O. Reg. 903) under the provinces Water Resources Act.

The fieldwork was monitored throughout by a member of our geotechnical and environmental engineering staff, who directed the drilling procedures; recorded the SPT values; documented the soil stratigraphy; monitored the groundwater conditions; and transported the recovered soil samples to our office for further classification.

The borehole coordinates and ground surface elevations were surveyed by MTE with a Trimble Global Navigation Satellite System (GNSS) rover. The borehole locations are referenced to Canadian Spatial Reference System (CSRS 1997) coordinates with the zone reference (17T) excluded. The geodetic ground surface elevations are based on GNSS and local base station telemetry and have a vertical root mean squared error of less than 20mm.

The borehole locations and elevations are provided in the following table:

Table 1 - Borehole Coordinate Summary

Borehole	Northing (m)	Easting (m)	Elevation (masl)
BH101-23	4801601	544136	333.8
BH102-23	4801581	544040	339.4
BH103-23	4801567	543961	338.9
BH104-23	4801535	543869	343.0
BH105-23	4801517	543768	342.1
BH106-23	4801493	543674	345.8
BH107-23	4801469	543580	342.3

Notes: masl – meters above sea level

2.2 Laboratory Program

All of the soil samples collected were submitted for moisture content testing with the results shown on the borehole logs in **Appendix B**. Additionally, two (2) soil samples were submitted for particle size distribution analyses and the results are provided in **Appendix C**. The remaining soil samples will be stored for a period of 3 months and will be discarded of at that time without prior request from the client to extend storage time.

3.0 Soil Conditions

Reference is provided to the appended borehole logs for soil stratigraphy details, SPT N-values, moisture content profiles, and groundwater observations and measurements. Soil conditions encountered at the site typically include topsoil and/or fill, overlying native sand deposits.

3.1 Topsoil

Topsoil was encountered at ground surface in all seven boreholes and was 130 to 560 mm thick (average thickness of 240 mm). The topsoil typically comprised dark brown sandy silt with roots and other organic content. A 300 mm thick layer of buried topsoil was encountered in Borehole BH106-23 at a depth of 2.0 mbgs (elevation 343.8 masl).

The topsoil was determined through visual observation and no nutrient testing for applicable plant growth was performed as part of the scope of work for this project. The topsoil was noted as very moist at the time of the fieldwork.

3.2 Fill

A layer of sand fill with various amounts of organics was encountered underlying the surficial topsoil in Borehole BH106-23. The sand fill was about 1.9 m in thickness when fully penetrated and extended to a depth of about 2.0 mbgs in Borehole BH106-23.

SPT N-values in the fill range from 1 to 3 blows per 300 mm penetration of the split spoon sampler indicating very loose conditions.

Insitu moisture contents in the fill range from about 8 to 15% indicating very moist conditions.

3.3 Silty Sand and Sandy Silt

Layers of native silty sand to sandy silt were encountered underlying the surficial topsoil in Boreholes BH105-23, and BH107-23 and at various depths in Boreholes BH101-23, BH103-23 and BH106-23. Where fully penetrated the layers of silty sand to sandy silt ranged from 0.8 to 3.1 m in thickness and were generally brown in colour.

SPT N-values measured in the silty sand to sandy silt layers range from 4 to above 49 blows per 300 mm penetration of the split spoon sampler indicating loose to dense conditions.

Insitu moisture contents in the silty sand to sandy silt range from about 3 to 20% indicating moist to very moist conditions. It is noted, saturated seams were encountered within the silty sand deposits in Boreholes BH103-23, BH106-23, and BH107-23.

3.4 Sand and Gravelly Sand

Layers of native sand and gravelly sand was encountered beneath the surficial topsoil in Boreholes BH101-23 to BH104-23 and the buried topsoil in Borehole BH106-23. Layers of sand and gravelly sand were encountered at various depths in all seven boreholes and extended to the termination depths in all boreholes. The sand and gravelly sand was brown in colour, and cobbles were encountered during drilling and should be expected during construction.

The results of particle size distribution analyses conducted on samples of the sand and gravelly sand are provided in **Appendix C** and summarized in the following table;

Table 2 - Results of Sand and Gravelly Sand Particle Size Distribution Analyses

Borehole Number	Sample Depth (mbgs)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
BH101-23	1.5 - 2.1	13	80	5	2
BH104-23	3.0 - 3.7	27	64	7	2

SPT N-values measured in the sand and gravelly sand layers range from 11 to above 50 blows per 300 mm penetration of the split spoon sampler indicating compact to very dense conditions.

Insitu moisture contents in the sand and gravelly sand ranged from about 1 to 9% indicating damp to very moist conditions.

4.0 Groundwater Conditions

Groundwater observations and measurements were carried out in the open boreholes at the time of drilling and are summarized on the borehole logs. Saturated conditions were not encountered in the seven boreholes during drilling and the seven boreholes were dry prior to backfilling. However, isolated wet to saturated seams were encountered, generally within the silty sand to sandy silt layers and the fill material encountered in BH106-23.

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations and local variations. It should also be noted that perched groundwater conditions may occur due to relatively impermeable nature of silt soils.

5.0 Discussion and Recommendations

This project will involve the construction of the proposed extension of Blair Creek Drive including pavement structure, sidewalks, curbs and gutter, and associated underground utilities.

The subsurface stratigraphy along the proposed roadway location generally comprises of topsoil, overlying native granular deposits consisting of sand, silty sand to sandy silt and/or gravelly sand layers, with areas of fill material overlying the native granulars (Borehole BH106-23). Saturated conditions were not encountered within the depths of exploration.

Based on the results of this geotechnical investigation, construction of the new pavement structure and associated services is feasible for the proposed location. The following subsections of this report contain geotechnical recommendations pertaining to site servicing, excavations and dewatering, LID feasibility, pavement structure design, pavement construction, and pavement drainage requirements.

5.1 Site Servicing

5.1.1 Excavations and Dewatering

It is understood that the project will involve the construction of pavement structure and installation of services along the roadway. Construction depths are anticipated to be approximately 3.0 to 5.0 metres below ground surface.

Temporary excavations to conventional depths for installation of underground pipes at this site must comply with the Ontario Occupational Health and Safety Act and Regulations for Construction Projects. The predominate soils encountered at the site are classified as Type 3 soils (O. Reg. 213/91, s. 226 (4)). Temporary side slopes through this material must be cut at an inclination of 1.0 horizontal to 1.0 vertical or flatter from the base of the excavation, exclusive of groundwater effects.

Where wet to saturated conditions are encountered, excavation side slopes should be expected to slough to flatter inclinations, potentially 3.0 horizontal to 1.0 vertical or flatter.

Trench side slopes must be continuously inspected especially after periods of heavy rainfall or snow melt to identify areas of instability. Surface water should be directed away from entering the trench.

Where spatial limitations (from utility poles, existing underground services, above ground structures, etc.) do not permit overburden cut slopes at the inclinations above, a steeper cut slope can be employed if trench boxes are used to protect workers. Some movement or slumping of the soils adjacent to the trench box should be expected if this option is used.

Minor groundwater should be expected from saturated seams and wet conditions within the fill and upper native soil deposits. It is envisioned that conventional sump pump techniques will be adequate to control the inflow.

It will be necessary to flatten or support the excavation side slopes where groundwater seepage is occurring to ensure stability. Every excavation that a worker may be required to enter shall be kept reasonably free of water (O. Reg. 213/91, s. 230).

It should be noted that an Environmental Activity and Sector Registry (EASR) or Permit to Take Water (PTTW), issued by the Ministry of Environment, Conservation and Parks, will be required if the dewatering system/sumps result in a water taking of more than 50,000L/day or 400,000 L/day, respectively. The design of the dewatering system should be left to the contractor's discretion to control groundwater at least 0.5m below the invert level in order to provide stable excavation base. The contractor shall notify the prime consultant in the event that they feel that an EASR/PTTW will be needed.

5.1.2 Pipe Bedding

It is anticipated that the invert elevation of the proposed storm sewer will be approximately 3.0 to 5.0 metres below ground surface. No bearing problems are anticipated for pipes set on properly dewatered native inorganic subsoil. The bedding material may need to be thickened if excavations encounter soft or spongy soil at the base of the service trench.

Pipe bedding for services should be conventional Class 'B' pipe bedding comprising a minimum 150 mm thick layer of OPSS 1010 Granular 'A' aggregate below the pipe invert. Granular 'A' type aggregate should be provided around the pipe to at least 300 mm above the pipe and the bedding aggregate should be compacted to a minimum 100% Standard Proctor Maximum Dry Density (SPMDD), as per the Region of Waterloo and Area Municipalities Design Guidelines and Supplemental Specifications for Municipal Services Document (DGSSMS), dated January 2019.

A well-graded clear stone such as Coarse Aggregate for HL4 Asphaltic Concrete (OPSS 1003) could be used in the sewer trenches as bedding below the spring line of the pipe to facilitate sump pump dewatering, if necessary. The clear stone should be compacted with a plate tamper and fully wrapped with a non-woven geotextile to prevent the migration of fine particles from the saturated soils.

5.1.3 Trench Backfilling

The trenches above the specified pipe bedding should be backfilled with inorganic on-site soils placed in maximum 300 mm thick lifts and compacted to at least 98% SPMDD, as per the DGSSMS. Wet or saturated soils are not considered suitable for reuse as trench backfill. Any additional material required at the site should comprise imported inorganic soils such as OPSS 1010 Select Subgrade Material specifications.

To minimize potential problems, backfilling operations should follow closely after excavation so that only a minimal length of trench is exposed. Care should be taken to protect side slopes of excavations by diverting surface run-off away from the excavations. If construction extends into the winter, then additional steps should be taken to minimize frost and ensure that frozen material is not used as backfill.

5.2 Curbs, Gutter, and Sidewalks

The concrete for curbs, gutters and sidewalks should be proportioned, mixed, placed and cured in accordance with the requirements of OPSS 353, and OPSS 1350 and shall meet the following specific requirements (OPSS 353.05.01), as per the City of Kitchener specification CKSS 353:

- Minimum compressive strength = 32 MPa at 28 days
- Maximum water to cement (w/c) ratio = 0.45
- Coarse aggregate = 20.0 mm nominal max. size
- Maximum slump = 45 mm (for curb) / 70 ± 20 mm (for sidewalk)

- Air entrainment = 6.5 ± 1.5%

A minimum of 150 mm of OPSS 1010 Granular ‘A’ material compacted to at least 100% SPMDD is required as a base for sidewalks. During cold weather any freshly placed concrete must be covered with insulating blankets to protect against freezing as per OPSS 904. Three cylinders from each day’s pour should be taken for compressive strength testing. Air entrainment, temperature and slump tests should be conducted on the same batch of concrete from the test cylinders made.

5.3 Pavement Construction

Installation of the services and construction of the new roadway is proposed along the subject area. The full construction of the pavement structure would consist of removing the existing topsoil, excavating to suitable subgrade elevation, and placement of imported OPSS 1010 Granular ‘B’ subbase soils, OPSS 1010 Granular ‘A’ base soils and hot mix asphalt.

The existing fill materials encountered in Borehole BH106-23 are considered suitable to be left below the road structure following a proof roll and inspection by qualified geotechnical personnel. Areas with excessive organic content and/or topsoil, if encountered, must be subexcavated. Depending on finished grades at the site the pavement subgrade soils will comprise of compacted trench backfill, existing fill materials, or native soils.

The City of Kitchener specified pavement design for a collector roadway without a transit route was deemed sufficient for the reconstruction and is provided in the following table;

Table 3 - Pavement Design

Pavement Component	Thickness
HL3 Surface Hot Mix Asphalt	40 mm
HL4 Binder Hot Mix Asphalt	80 mm
OPSS 1010 Granular ‘A’ Base	210 mm
OPSS 1010 Granular ‘B’ Subbase	450 mm

Samples of aggregates should be checked for conformance to OPSS 1010 prior to utilization on-site and during construction. The Granular 'B' subbase and Granular 'A' base courses must be compacted to 100% SPMDD, as verified by insitu density testing.

The hot mix asphalt paving materials should conform to the requirements of OPSS 1150. The asphalt should be placed and compacted in accordance with OPSS 310. The City of Kitchener specified Performance Graded Asphalt Cement (PG-AC) designation for the hot mix asphalt is 58-28.

The surface asphalt should each be placed in one lift. The binder asphalt should be placed in two lifts. It is recommended to place the surface asphalt as soon as possible following placement of the binder asphalt to ensure the full pavement strength is provided for regular traffic.

A joint transition treatment will be required where old and new pavement meet. Provided the existing pavement is 100 mm thick or greater, the recommended transition treatment comprises milling of the old surface layer approximately 0.3 m wide and 50 mm deep. Where the existing pavement is less than 100 mm thick, the transition treatment should comprise saw cutting the existing asphalt to provide a clean face to tie the new asphalt into.

It is recommended to clean all of the construction joints with stiff bristle brooms and compressed air to remove all dirt, dust, and other foreign matter. A tack coat should be applied to all construction joints prior to the placement of hot mix asphalt to ensure an adequate bond is achieved between the pavement layers.

The necessity for continuous repair work and paving supervision as well as quality assurance testing during road reconstruction projects cannot be over emphasized. An annual maintenance program is also recommended to maintain the pavements at a suitable level.

The pavement design is based on the assumption that construction will be carried out during the drier time of the year and that the subgrade soil is stable as determined by proof-rolling inspected by qualified geotechnical personnel. The subgrade and subbase materials can be significantly damaged and loose internal strength if construction is conducted in unfavorable weather. If the subgrade is wet and unstable, additional granular subbase will be required.

All materials and construction services required for the work should be in accordance with the relevant sections of the Ontario Provincial Standard Specifications.

5.3.1 Pavement Drainage

Adequate subsurface drainage is considered critical to the performance and lifespan of pavement. The pavement subgrade should be sloped at a minimum of 3% to promote drainage, and the pavement granular courses and asphalt should be sloped at a minimum of 2% to promote rainwater drainage. Surface water should not be allowed to pond along the outside pavement edges.

Short subdrains should be placed at subgrade level at each catchbasin and installation shall be in accordance with OPSS 405 and OPSD 216.021. The subdrain shall be 150 mm diameter perforated pipe conforming to OPSS 1801 or 1840, and prewrapped with geotextile conforming to OPSS 1860.

5.4 Low Impact Developments (LIDs)

Based on the information provided, the use of Low Impact Developments (LIDs) are being considered. Based on the results of the investigation, the soil conditions in the upper 3.0 metres generally consist of topsoil overlying silty sand to sandy silt layers and/or sand and gravelly sand layers. Grain size analysis testing was carried out on a sample of the native sand and the gravelly sand, based on the results the sands and gravelly sands have an estimated hydraulic permeability ranging from $1x10^{-1}$ to 1×10^{-4} m/s.

LID measuress constructed within the sand and or gravelly sand should perform adequately. However, due to layers of silty sand to sandy silt being present insitu infiltration testing should be performed in the areas of proposed LID measures to accurately measure the infiltration of the soils in those areas.

5.5 Construction Inspection and Testing

MTE recommends that geotechnical inspection and testing procedures be conducted throughout the various phases of the project.

Engineer site visits should be conducted to confirm suitable subgrade conditions and soil compaction testing should be carried out on trench backfill. Imported granular materials should be tested for conformance to specifications prior to importation to the site. Field compaction testing of the pavement structure components (granulars and hot mix asphalt) should be conducted. Samples of the hot mix asphalt should be collected during pavement and laboratory testing for compliance completed. It is recommended to collect hot mix asphalt samples at a minimum frequency of 1 sample for each 500 tonnes placed on-site.

During placement of concrete at the site, testing should be performed on-site to confirm the slump and air content of the concrete are within specifications. Concrete test cylinders should be cast for compressive strength testing from the same samples tested for slump and air content. Concrete should be tested at a frequency of once every 100m^3 or daily, whichever is greater.

MTE offers soil compaction, concrete, and asphalt testing, as well as soil inspection services through our Kitchener, Stratford, and London offices.

6.0 Limitations of Report

Services performed by MTE Consultants Inc. (MTE) were conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the Geotechnical Engineering & Consulting profession practicing under similar conditions in the same geographic area were the services are provided. No other warranty or representation expressed or implied as to the accuracy of the information, conclusions or recommendations is included or intended in this report.

This report was completed for the sole use of the Client. This report is not intended to be exhaustive in scope or to imply a risk-free site. As such, this report may not deal with all issues potentially applicable to the site and may omit aspects which are or may be of interest to the reader.

In addition, it should be recognized that a soil sample result represents one distinct portion of a site at the time it is collected, and that the findings of this report are based on conditions as they existed during the time period of the investigation. The material in the report reflects our best judgment using the information available at the time the report was written. The soil and groundwater conditions between and beyond the test holes may differ from those encountered in the test holes. Should subsurface conditions arise that are different from those in the test holes MTE should be notified to determine whether or not changes should be made as a result of these conditions.

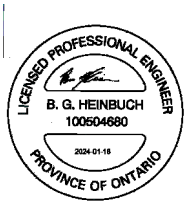
It should be recognized that the passage of time may affect the views, conclusions and recommendations (if any) provided in this report because groundwater conditions of a property can change, along with regulatory requirements. All design details were not known at the time of submission of this report and it is recommended MTE should be retained to review the final design documents prior to construction to confirm they are consistent with our report recommendations. Should additional or new information become available, MTE recommends that it be brought to our attention in order that we may determine whether it affects the contents of this report.

Any use which another party makes of this report, or any reliance on, or decisions to be made based upon it, are the responsibility of such parties. MTE accepts no responsibility for liabilities incurred by or damages, if any, suffered by another party as a result of decisions made or actions taken, based upon this report. Others with interest in the site should undertake their own investigations and studies to determine how or if the condition affects them or their plans. The contractors bidding on this project or undertaking the construction should make their own interpretation of the factual information and draw their own conclusions as to how subsurface conditions may affect their work.

The benchmark and elevations provided in this report are primarily established to identify differences between the test hole locations and should not be used for other purposes such as, planning, development, grading, and excavation.

All of which is respectfully submitted,

MTE Consultants Inc.



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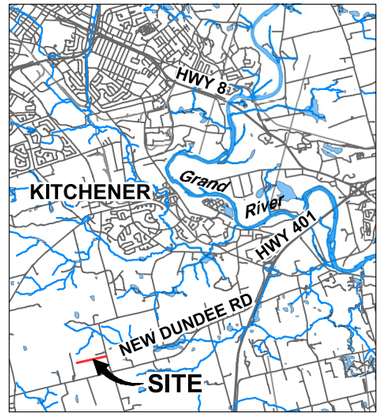
Appendix A

Figures

Figure 1 - Site Plan



KEY PLAN (nts)

N

LEGEND

BOREHOLE

(339.4m) ELEVATION (m AMSL)

REFERENCES

2021 AERIAL IMAGE, ROAD AND WATER NETWORK, CITY OF KITCHENER OPEN DATA SET; AND
MTE, BLAIR CREEK DRIVE,
FILE No. 53018-100-F1, FIGURE No. 1,
APRIL 18 - 2023.

NOTES

THIS FIGURE IS SCHEMATIC ONLY AND TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

0 25 50 75 100m

Scale (11x17): 1:2500

MTE
Engineers, Scientists, Surveyors

PROJECT
GEOTECHNICAL INVESTIGATION
BLAIR CREEK DRIVE EXTENSION
KITCHENER, ONTARIO

TITLE
SITE PLAN

Drawn: DCH	Scale: AS SHOWN	**FIGURE 1**
Checked:	Project No.: 53018-100	
Date: June 13/23	Rev No.: 0	

Client: City of Kitchener
Time:10:49:33
Plot Date: 13 June 2023
CAD: P:\P\53018\100\2_PROD\53018-100-R01 GEOTECHNICAL INVESTIGATION\53018-100-R01001.DWG
25mm
Original Format in Tabloid (279mm x 432mm; 11" x 17")
0

Appendix B

Borehole Logs

Abbreviations and Symbols

MTE Boreholes BH101-23 to BH107-23

The following are abbreviations and symbols commonly used on borehole logs, figures and reports.

Sample Types

AS	Auger Sample
CS	Chunk Sample
BS	Bulk Sample
GS	Grab Sample
WS	Wash Sample
SS	Split Spoon
RC	Rock Core
SC	Soil Core
TW	Thinwall, Open
TP	Thinwall, Piston

Soil Tests

PP	Pocket Penetrometer
FV	Field Vane
SPT	Standard Penetration Test
CPT	Cone Penetration Test
WC	Water Content
WL	Water Level

Penetration Resistance

Standard Penetration Test, N (ASTM D1586)	The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) open spilt spoon sampler for a distance of 300 mm (12 in.).
Dynamic Cone Penetration Resistance	The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive an uncased 50 mm (2 in.) diameter, 60o cone attached to “A” size drill rods for a distance of 300 mm (12 in.).

Soil Description

Cohesive Soils	Undrained Shear Strength (Cu)	
Consistency	kPa	psf
Very Soft	0 to 12	0 to 250
Soft	12 to 25	250 to 500
Firm	25 to 50	500 to 1,000
Stiff	50 to 100	1,000 to 2,000
Very Stiff	100 to 200	2,000 to 4,000
Hard	Above 200	Above 4,000

Cohesionless Soils	
Relative Density	SPT N Value
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	Above 50

WH	Sampler advanced by static weight of hammer
WR	Sampler advanced by static weight of drilling rods
PH	Sampler advanced by hydraulic force
PM	Sampler advanced by manual force

DTPL	Drier than Plastic Limit
APL	About Plastic Limit
WTPL	Wetter than Plastic Limit
mbgs	Metres below Ground Surface

ID No.: BH101-23

Project Name: Blair Creek Drive Extension

MTE File No.: 53018-100

Client: City of Kitchener

Site Location: Blair Creek Drive, Kitchener, ON

Date Completed: 5/5/2023

Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track Mounted

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Depth (ft / m)	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Standard Penetration (Dynamic Cone)	Shear Strength (PP) kPa / Shear Strength (FV) kPa	Water Content %
0 / 0	Ground Surface	333.8					
	TOPSOIL dark brown sandy silt, very moist (200mm)	0.0	1	SS	11		5
2 /	**SAND AND GRAVEL** compact brown sand and gravel, trace silt, moist		2	SS	17		4
4 /		332.3					
	SAND compact light brown sand, some gravel, trace silt and clay, moist to very moist	1.5	3	SS	15		4
6 / 2			4	SS	29		8
8 /		330.8					
10 /	**SILTY SAND** dense brown silty sand, some gravel, moist	3.0	5	SS	49		3
12 / 4							
14 /		329.2					
	SAND compact brown sand, trace silt, moist	4.6	6	SS	26		5
16 /		328.6					
18 /	Drilling Terminated	5.2					
20 / 6							
22 /							

Groundwater Observations and Standpipe Details: ← Cuttings; ← Dry Cave

Borehole dry upon drilling completion

Field Technician: C. McCulla

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

ID No.: BH102-23

Project Name: Blair Creek Drive Extension

MTE File No.: 53018-100

Client: City of Kitchener

Site Location: Blair Creek Drive, Kitchener, ON

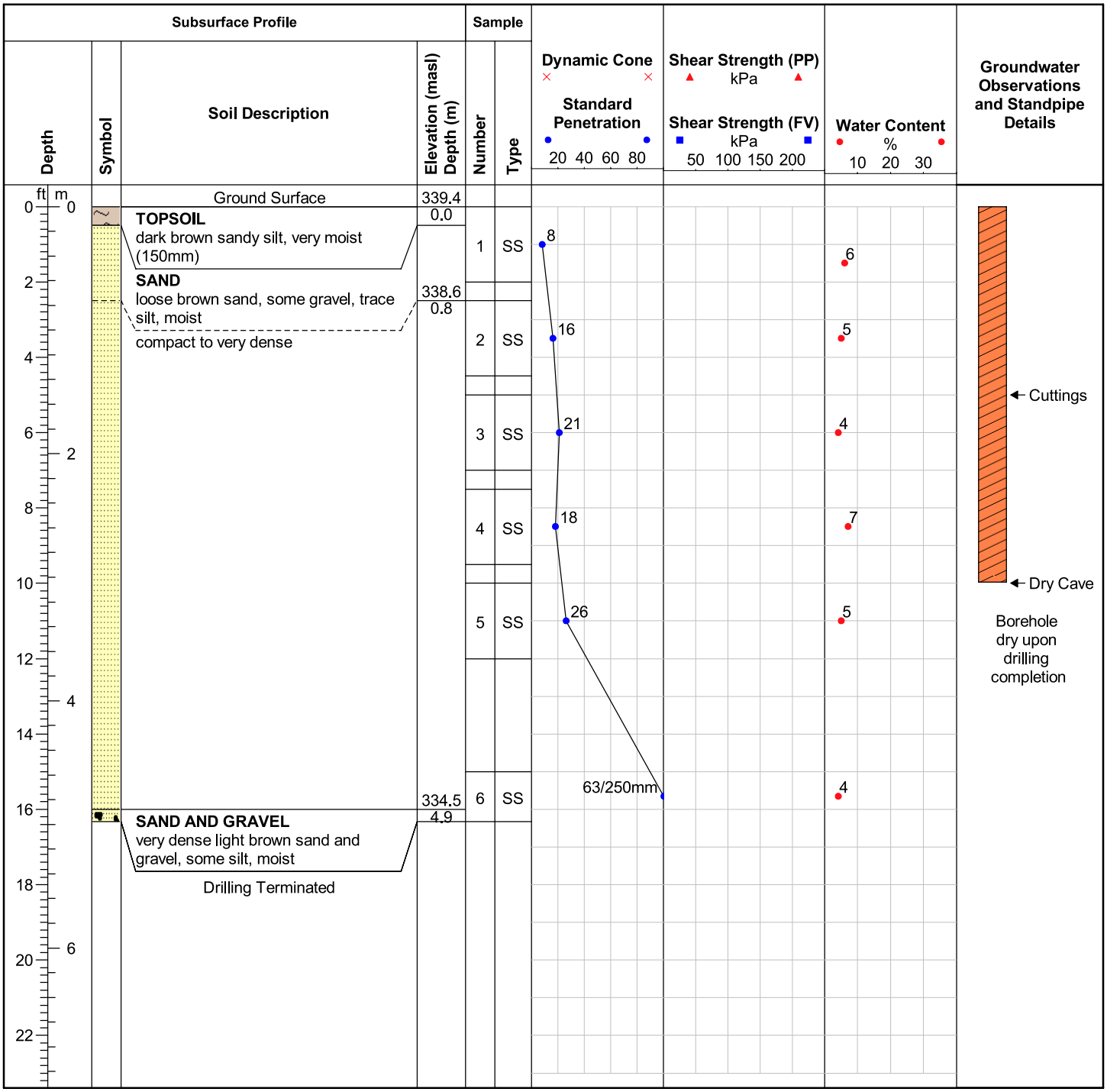
Date Completed: 5/5/2023

Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track Mounted

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: C. McCulla

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

Sheet: 1 of 1

ID No.: BH103-23

Project Name: Blair Creek Drive Extension

MTE File No.: 53018-100

Client: City of Kitchener

Site Location: Blair Creek Drive, Kitchener, ON

Date Completed: 5/5/2023

Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track Mounted

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone – Standard Penetration	Shear Strength (PP) kPa / Shear Strength (FV) kPa	Water Content %	Groundwater Observations and Standpipe Details
0 / 0		Ground Surface	338.9						
		TOPSOIL dark brown sandy silt, very moist (560mm)	0.0 / 338.3	1	SS	5		16	
2 /		**SAND** loose brown sand, some silt, trace gravel, very moist to moist	0.6						
		compact		2	SS	11		6	
4 /									
				3	SS	11		4	
6 / 2			336.6						
		SILTY SAND loose light brown silty sand, very moist with occasional saturated seams	2.3	4	SS	9		20	
8 /									
		compact	3.0 / 335.5	5	SS	19		6	
10 /									
		GRAVELLY SAND compact to very dense light brown gravelly sand, trace silt, moist	3.4						
12 / 4									
				6	SS	78		3	
14 /									
		occasional cobbles	334.0 / 4.9						
16 /		Drilling Terminated							
18 /									
20 / 6									
22 /									

Dynamic Cone – Standard Penetration: 20 40 60 80

Shear Strength (PP) kPa / Shear Strength (FV) kPa: 50 100 150 200

Water Content %: 10 20 30

Groundwater Observations and Standpipe Details: ← Cuttings; ← Dry Cave

Water encountered at 2.3mbgs during drilling

Field Technician: C. McCulla

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

ID No.: BH104-23

Project Name: Blair Creek Drive Extension

MTE File No.: 53018-100

Client: City of Kitchener

Site Location: Blair Creek Drive, Kitchener, ON

Date Completed: 5/5/2023

Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track Mounted

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone / Standard Penetration	Shear Strength (PP) kPa / Shear Strength (FV) kPa	Water Content %	Groundwater Observations and Standpipe Details
0 / 0		Ground Surface	343.0						
		TOPSOIL dark brown sandy silt, very moist (130mm)	0.0	1	SS	5		5	
2		**SAND** loose light brown sand, trace silt and gravel, moist to very moist		2	SS	9		6	
4			341.5						
		compact	1.5	3	SS	28		9	
6 / 2									
8			340.4	4	SS	59		3	
		GRAVELLY SAND very dense to dense light brown gravelly sand, trace silt and clay, moist	2.6						
10				5	SS	38		3	
12 / 4									
14			338.4						
		SAND dense light brown sand, trace silt, moist	4.6	6	SS	36		4	
16									
18									
20 / 6			336.9						
		SAND AND GRAVEL very dense light brown sand and gravel, trace silt, moist	6.1	7	SS	60		2	
22			336.3						
		Drilling Terminated	6.7						

Cuttings

Bentonite

Dry Cave

Borehole dry upon drilling completion

Field Technician: C. McCulla

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

ID No.: BH105-23

Project Name: Blair Creek Drive Extension

MTE File No.: 53018-100

Client: City of Kitchener

Site Location: Blair Creek Drive, Kitchener, ON

Date Completed: 5/5/2023

Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track Mounted

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Depth (ft / m)	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Standard Penetration (Dynamic Cone)	Shear Strength (PP) kPa / Shear Strength (FV) kPa	Water Content %
0 / 0	Ground Surface	342.1					
	TOPSOIL dark brown sandy silt, very moist (180mm)	0.0	1	SS	4		14
2	**SANDY SILT** loose brown sandy silt, trace clay, very moist	341.3 / 0.8	2	SS	14		12
4	**SILTY SAND** compact light brown silty sand, trace gravel and clay, very moist	340.6 / 1.5	3	SS	14		8
6 / 2	**SAND** compact light brown sand, trace silt and gravel, very moist to moist		4	SS	12		4
8							
10	occasional cobbles	338.7 / 3.4	5	SS	22		3
12 / 4							
14							
16			6	SS	15		3
18							
20 / 6	**SAND AND GRAVEL** compact grey sand and gravel, some silt, damp to moist	336.0 / 6.1	7	SS	24		1
22	Drilling Terminated	335.4 / 6.7					

Groundwater Observations and Standpipe Details: Cuttings; Bentonite; Dry Cave

Borehole dry upon drilling completion

Field Technician: C. McCulla

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

ID No.: BH106-23

Project Name: Blair Creek Drive Extension

MTE File No.: 53018-100

Client: City of Kitchener

Site Location: Blair Creek Drive, Kitchener, ON

Date Completed: 5/5/2023

Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track Mounted

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Depth (ft / m)	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) kPa / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)	Groundwater Observations and Standpipe Details
0 / 0	Ground Surface	345.8						
	FILL (TOPSOIL) dark brown sandy silt, very moist (150mm)	0.0	1	SS	3		8	
2	**FILL** very loose brown sand, some silt, trace gravel, organics, and wood fragments, very moist		2	SS	1		12	
4								
6 / 2			3	SS	2		15	← Cuttings
	300mm topsoil layer	343.8 / 2.0 / 343.5						
8	**SAND** compact light brown sand, some silt, very moist	2.3	4	SS	15		9	
10		342.8						
	SILTY SAND compact light brown silty sand, trace gravel, very moist with occasional saturated seams	3.0	5	SS	10		9	
12 / 4								
14								
16	150mm saturated seam	340.9 / 4.9	6	SS	21		8	← Bentonite
18								
20 / 6		339.7						
	SAND compact grey sand, trace silt, damp to moist	6.1	7	SS	26		2	← Dry Cave
22		339.1						
	Drilling Terminated	6.7						

Water encountered at 3.0 and 4.9mbgs during drilling

Field Technician: C. McCulla

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

ID No.: BH107-23

Project Name: Blair Creek Drive Extension

MTE File No.: 53018-100

Client: City of Kitchener

Site Location: Blair Creek Drive, Kitchener, ON

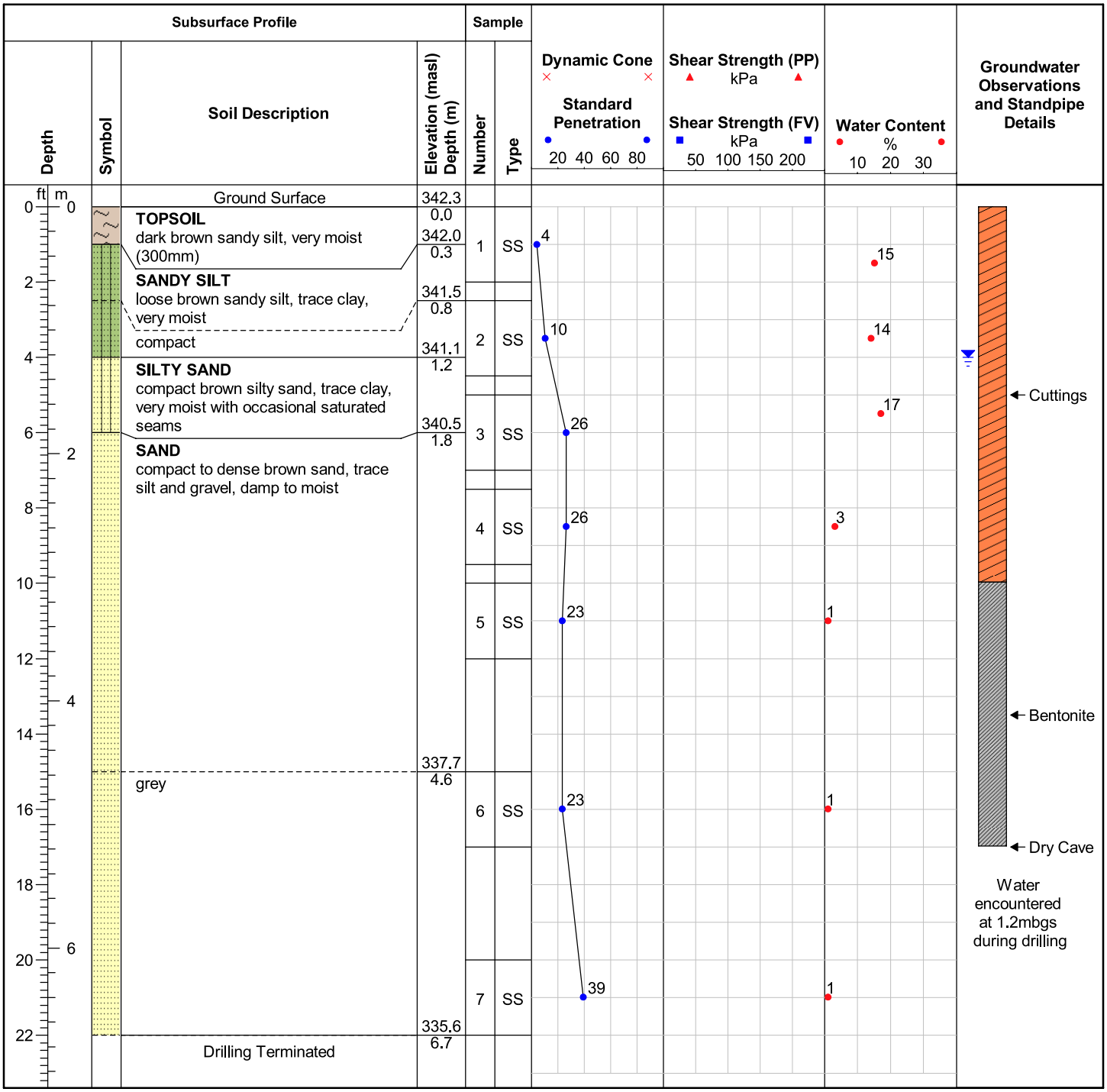
Date Completed: 5/5/2023

Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track Mounted

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: C. McCulla

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

Sheet: 1 of 1

Appendix C

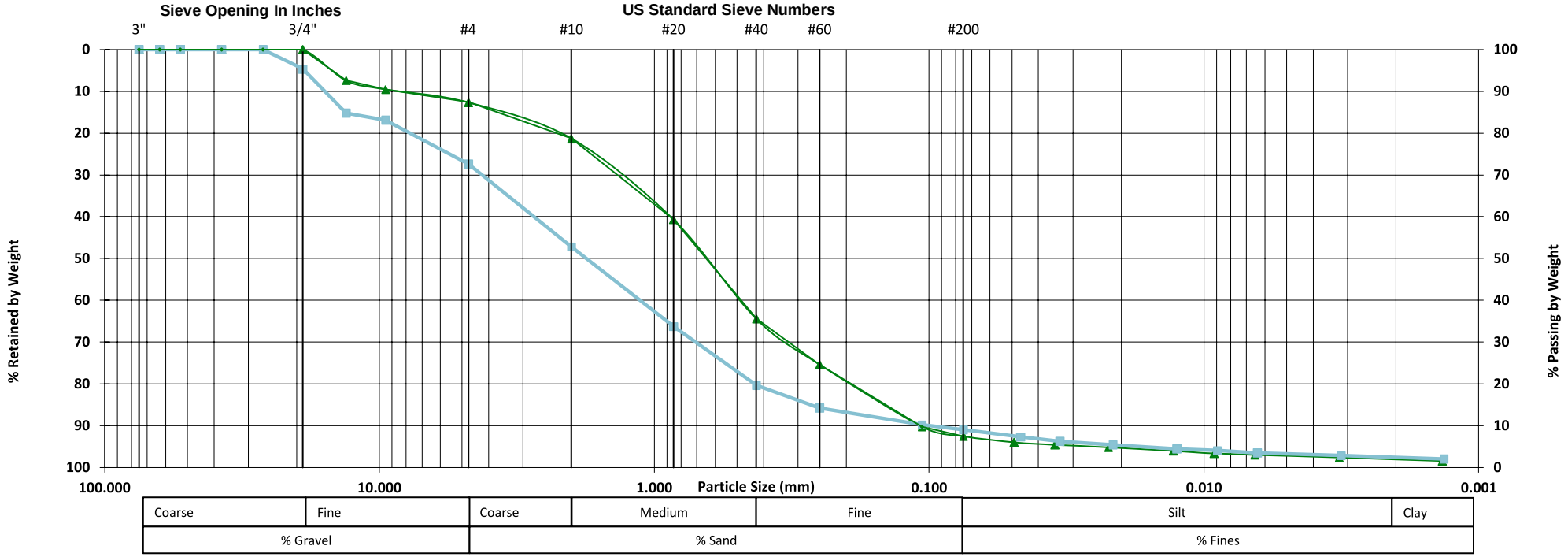
Laboratory Test Results

Table 101

Particle Size Distribution Analysis Test Results

Project Name:	**Blair Creek Drive Extension**	**Date Sampled:**	**May 5, 2023**	**MTE File No.:**	**53018-100**
Client:	**City of Kitchener**	**Date Tested:**	**May 26-30, 2023**	**Table No:**	**101**
Project Location:	**Blair Creek Drive, Kitchener, ON**				

Unified Soil Classification



Symbol	Borehole ID	Sample #	Sample Depth	Description
▲	BH101-23	SS-3	1.5-2.1 mbgs	SAND, some Gravel, trace Silt and Clay
■	BH104-23	SS-5	3.0-3.7 mbgs	Gravelly SAND, trace Silt and Caly

CERTIFIED BY CCIL
Canadian Council of Independent Laboratories
For specific tests as listed on www.ccil.com

NOTES:

MTE, July 2023

Soil Characterization Report (Draft)

Blair Creek Drive Future Extension

Draft

Preliminary Soil Characterization Report

Project Location:

Blair Creek Drive from Reidel Drive and Strasburg Drive
Kitchener, ON

Prepared for:

City of Kitchener
200 King Street West
Kitchener, ON N2B 3X9

Prepared by:

MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, ON N2B 3X9

July 12, 2023

MTE File No.: 53018-100

Engineers, Scientists, Surveyors.

Contents

Figures

Tables

Appendices

1.0 Introduction

MTE Consultants Inc. (MTE) was retained by the City of Kitchener (City) to conduct a preliminary environmental soil quality assessment and to prepare this draft Soil Characterization Report (SCR) for the extension of Blair Creek Drive in Kitchener, Ontario. The proposed new stretch of Blair Creek Drive will extend between Reidel Drive and the future Strasburg Road extension, a length of approximately 700 m (the "Project Area"), as shown on **Figure 1**.

The Project Area currently consists of a portion of a vacant agricultural field. The surrounding properties consist of agricultural fields, wood lots and rural residential properties, including a farmstead with several outbuildings which is located approximately 60 m to the northeast. The existing Reidel Road corridor is located to the east and a golf driving range is located approximately 400 m to the south on New Dundee Road.

The project will involve the installation of services along the new roadway and construction of pavement structure with one lane in each direction including concrete curbs and gutters on each side along the road. Construction depths are anticipated to be approximately 4.0 meters below ground surface (mbgs) along the new roadway.

This assessment was completed in conjunction with MTE's geotechnical investigation for the project as part of the preliminary design stage. Under Ontario Regulation (O. Reg.) 406/19 there are exemptions for low-risk Project Areas that are/have been used for agricultural purposes (refer to Section 8 of O. Reg. 406/19) and, as such, this project is currently exempt from the regulated planning requirements.

As new road construction will not likely occur for a few years, the City opted to complete a preliminary environmental soil quality assessment in conjunction with the geotechnical investigation. Therefore, the work described herein was completed in the spirit of O. Reg. 406/19 for preliminary due diligence purposes. Per the City's directive, an Assessment of Past Uses (APU) and a formal Sampling and Analysis Plan (SAP) have not been completed and are outside of the current scope of work.

The purpose of the assessment was to determine the general environmental quality of soil within the Project Area in advance of the project, which at a minimum is expected to generate excess topsoil requiring appropriate management during the future construction activities.

For the readers' benefit, the current Ministry of Environment, Conservation and Parks (MECP) was previously named the Ontario Ministry of the Environment (MOE) and the Ontario Ministry of the Environment and Climate Change (MOECC). For ease of discussion in this report, "MECP" is used to represent this provincial ministry and is inclusive of MOE and MOECC.

2.0 Scope of the Investigation

The following scope of work was completed for the SCR:

- Prepare a Site-Specific Health and Safety Plan (HASP) including safety provisions for project team members and personal protective equipment requirements.
- Advancement of seven boreholes in conjunction with the geotechnical investigation, for the collection of representative soil samples.
- Record the soil stratigraphy and headspace readings from all collected soil sample intervals, including observing any staining or visual evidence of contamination.

- Submission of selected topsoil and sub-soil samples to an accredited laboratory for chemical analysis including Petroleum Hydrocarbon Fractions (PHC) F1-F4, Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX), Volatile Organic Compounds (VOCs), Metals, Polycyclic Aromatic Hydrocarbons (PAHs), Electrical Conductivity (EC), Sodium Adsorption Ration (SAR), and pH.
- The collection of quality assurance/quality control (QA/QC) field duplicates samples.
- Surveying the ground surface at all investigative locations with respect to a fixed point.
- Data assessment and reporting.

3.0 Investigation Methods

(i) Drilling

The fieldwork for this investigation was carried out on May 5, 2023 and involved the drilling of seven Boreholes (BH101-23 to BH107-23) to 5 or 6 mbgs. The locations of the boreholes are shown on the Location Plan, **Figure 1**. The borehole logs are provided in **Appendix A**.

Public utility companies were contacted prior to the start of drilling activities to identify underground utilities near the drilling locations.

The boreholes were advanced with a Morooka MST 800 drill rig equipped with continuous flight solid stem augers and was supplied and operated by London Soil Test Ltd.

Soil cores were recovered from each borehole location using split spoon samplers and were logged by MTE for geological characteristics as well as visual and olfactory evidence of environmental impacts such as staining, odours or the presence of non-soil materials. Sampling equipment (e.g., split spoons) was cleaned between locations to minimize the potential for cross contamination between boreholes.

(ii) Soil Sampling

Selected soil samples collected from the split spoons (within the anticipated future construction depths) were subdivided for visual and olfactory screening, combustible soil vapour (CSV) headspace measurements, and potential laboratory chemical analysis. All soil samples were placed into new laboratory supplied containers, which were clearly labeled with a unique sample identifier, project number, MTE contact name and the requested analytical parameters. Soil samples for PHC F1 and VOC/BTEX analyses were collected following USEPA SW-846 Method 5035 (field methanol preservation). Soil samples collected for other analyses were collected in 250 ml unpreserved clear glass jars supplied by the laboratory.

New nitrile gloves were worn during the handling of all samples, sampling equipment and sample jars and changed between each sample. The soil samples were placed in a cooler with ice for transportation under Chain-of-Custody to the analytical laboratory, ALS Environmental (ALS) of Waterloo, Ontario.

(iii) Field Screening Measures

A portion of each soil sample was placed into a new zip-top plastic bag for field headspace screening. The organic vapour concentrations in the headspace of each soil sample were measured using a pre-cleaned and calibrated RKI Eagle 2 sample drawing monitor. The equipment calibration and maintenance were performed according to manufacturers' recommendations prior to arriving at the Project Area and in the field to ensure proper operation.

The procedure for collection of field headspace measurements included waiting approximately 15 minutes for the soil/vapour in the zip-top plastic bag to equilibrate and allow for headspace development and inserting the sampling probe into a small opening in the bag. The field headspace readings were measured to be 0 parts per million (ppm) or 5 ppm for organic vapour, indicative of non-detectable or low background concentrations of volatiles in the recovered soil samples from within the planned construction depth.

(iv) Groundwater

Groundwater observations and measurements were carried out in the open boreholes at the time of drilling and are summarized on the borehole logs. Saturated conditions were not encountered in the boreholes during drilling and each borehole was dry prior to backfilling. However, isolated wet to saturated seams were encountered, generally within the native silty sand encountered in BH103-23 and BH106-23.

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations and local variations.

(v) Sediment

The Project Area consist of a portion of an agricultural field. No ponds or waterbodies are present within the Project Area. There is no sediment present within the Project Area and, therefore, sediment samples were not collected for analysis.

(vi) Analytical Testing

Environmental analyses were conducted on selected samples, representing soil considered likely to be excavated or removed as part of the future road construction project. All samples were submitted to ALS Environmental (ALS), a CALA-accredited laboratory, for analysis of the minimum parameter groups required under O.Reg. 406/19 and/or the contaminants of potential concern anticipated for the Project Area (e.g., OC Pesticides in topsoil). The samples were selected for general spatial assessment purposes, and as warranted based on field observations and headspace results, as follows:

Table 1 - Environmental Laboratory Testing Summary

Sample ID	Approx. Depth (mbgs)	Matrix	Analysis
BH101-23 “T” and it’s duplicate	0.0-0.6	Topsoil	PHCs, BTEX, Metals, OCPs, pH
BH101-23 SS2	0.8-1.4	Sand & Gravel	PHCs, BTEX, Metals, pH
BH102-23 “T”	0.0-0.6	Topsoil	PHCs, BTEX, Metals
BH102-23 SS3	1.5-2.1	Sand	PHCs, BTEX, Metals
BH103-23 “T”	0.0-0.6	Topsoil	PHCs, BTEX, Metals, OCPs, pH
BH103-23 SS4	2.3-2.9	Silty Sand*	PHCs, BTEX, Metals, pH, TCLP
BH104-23 “T”	0.0-0.2	Topsoil	PHCs, BTEX, Metals
BH104-23 SS2	0.8-1.4	Sand	PHCs, BTEX, Metals
BH105-23 “T”	0.0-0.6	Topsoil	PHCs, BTEX, Metals, OCPs, pH
BH105-23 SS3	1.5-2.1	Sand	PHCs, BTEX, Metals, pH
BH106-23 “T”	0.0-0.6	Topsoil	PHCs, BTEX, Metals
BH106-23 SS2	0.8-1.4	Fill (sand)	PHCs, BTEX, Metals
BH107-23 “T”	0.0-0.3	Topsoil	PHCs, BTEX, Metals, OCPs, pH
BH107-23 SS4	2.3-2.9	Sand	PHCs, BTEX, Metals, pH

Notes: * – wet to saturated seams; PHC – petroleum hydrocarbon fractions; BTEX – benzene, toluene, ethylbenzene and xylenes; OCPs – Organochlorinated Pesticides; TCLP – Toxicity Characterization Leachate Procedure.

(vii) Residual Management

Excess soil cuttings generated during the drilling activities were placed/dispersed within the Project Area. All of the boreholes advanced during drilling activities were backfilled with bentonite.

(viii) Elevation Surveying

The borehole coordinates and ground surface elevations were surveyed by MTE with a Trimble Global Navigation Satellite System (GNSS) rover. The borehole locations are referenced to Canadian Spatial Reference System (CSRS 1997) coordinates with the zone reference (17T) excluded. The geodetic ground surface elevations are based on GNSS and local base station telemetry and have a vertical root mean squared error of less than 20 mm.

(ix) Quality Assurance/Quality Control Measures

A QA/QC program was implemented for excess soil sample activities to demonstrate that the data collected was representative of the conditions within the Project Area and met the sampling program objectives.

The QA/QC program included field QA/QC procedures and laboratory QA/QC procedures.

Field QA procedures included:

- Adherence to MTE's standard operating procedures (SOPs), which meet industry standards and MECP guidance for field sample data collection;
- The use of new laboratory-supplied sample containers;
- The use of new and dedicated sampling equipment;
- The use of new nitrile gloves during and between the handling of all samples and field equipment; and
- Implementing equipment cleaning procedures.

Laboratory analyses were completed by an analytical laboratory accredited in accordance with the International Standard ISO/IEC 17025 General Requirement for the Competence of Testing and Calibration Laboratories, dated May 5, 2005 (as amended), and accredited in accordance with the applicable standards for proficiency testing developed by the Standards Council of Canada or the Canadian Association for Laboratory Accreditation.

Laboratory QA/QC procedures were implemented internally by the laboratory and validated through a review of the sample Chain-of-Custody forms and Laboratory Certificates of Analysis.

QC samples (field duplicates) were also submitted for analysis. The analytical data precision was assessed by calculating the Relative Percent Difference (RPD) between the investigation sample results (C1) and the field duplicate sample results (C2). The RPD acceptance criteria was set at 50% for soil samples.

(x) Deviations from Sampling and Analysis Plan

There were no deviations from the proposed sampling and laboratory program during the fieldwork activities on May 5, 2023.

4.0 Review and Evaluation

(i) Project Area Geology and Hydrogeology

The soil stratigraphy encountered at the Project Area generally consisted of surficial topsoil overlying fill or native sand to sand and gravel deposits.

Borehole logs describing and illustrating the soil stratigraphy at each investigation location are included in **Appendix A**.

MTE notes the following pertinent information:

- Fill was encountered below the surficial topsoil at BH106-23 and extended to a depth of 2.1 mbgs. The fill was comprised of brown sand to silty clay, sandy silt with trace amounts of wood fragments. No evidence of environmental impacts (e.g., no odour, staining, or deleterious debris) was observed at the investigated locations.

(ii) Regulatory Standards

MTE compared the analytical results to the following MECP tables:

On-Site Reuse Considerations

- 2011 Table 2: Full Depth Background Site Conditional Standards (SCS) for Agricultural, Residential / Parkland / Institutional and Industrial / Commercial / Community Property Use (Table 2 Ag., Table 2 RPI SCS, and Table 2 ICC SCS, respectively).

Off-site Reuse Considerations

- 2011 Table 1: Full Depth Background Site Conditional Standards (SCS) for Residential / Parkland / Institutional / Industrial / Commercial / Community Property Use (Table 1 SCS); and
- 2020 Table 2.1: Full Depth Background Excess Soil Quality Standards in a Potable Groundwater Condition for Agricultural, Residential / Parkland / Institutional and Industrial / Commercial / Community Property Use (Table 2.1 Ag. ESQS, Table 2.1 RPI ESQS, and Table 2.1 ICC ESQS, respectively).

***Note 1**: For additional ease of discussion, the following definitions are provided:*

- *2011 Site Condition Standards ("SCS") - As identified in 'Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act (as amended April 15, 2011). Prior to 2021, commonly used to determine soil quality.*
- *2020 Excess Soil Quality Standards ("ESQS") - As identified in Appendix 1 of the Rules for Soil Management adopted by reference in O. Reg. 406/19 made under the Environmental Protection Act (December 8, 2020). Current applicable Standards to determine excess soil quality.*

***Note 2**: Table 1 SCS are identical to Table 1 ESQS.*

The soil sample submitted for TCLP analyses was compared to the applicable O.Reg. 347/90 Schedule 4 criteria.

(iii) Soil Quality

MTE selected 15 soil samples (including one field duplicate soil sample) for laboratory analysis from all seven boreholes within the Project Area at depths ranging from 0.2 and 2.9 mbgs (representing soil within the anticipated future construction excavation depths).

The soil quality analytical data is provided in the attached **Tables 101 to 104** (for comparison to the Table 2 SCS) **and Tables 201 to 204** (for comparison to the Table 1 SCS and Table 2.1 ESQS). Copies of the ALS Laboratory Certificates of Analysis are included in **Appendix B** and a summary of the locations and depths sampled and analyzed are shown on the attached Plan and Profile, **Figure 2**.

Based on the analytical results the following is provided:

- All samples analyzed, inclusive of topsoil and the underlying subsoil meet the Table 2 Ag. SCS and, therefore, the Table 2 RPI and ICC SCS for the analyzed parameters.
- Concentrations of Benzene, Toluene and Xylenes above the Table 2.1 Ag., RPI and ICC ESQS were identified in the subsoil at Borehole BH103-23 between approximately 2.3 and 2.9 m. The borehole log for this drilling location indicates saturated seams of silty sand at this depth above a layer of compact sand from 3 to 3.4 m bgs, indicating that the benzene, toluene and xylene reported in the soil above 3 m bgs may have been caused by impacted groundwater flowing near this location at some point in time.
- A concentration of Benzene above the Table 2.1 Ag., RPI and ICC ESQS was identified in the topsoil at Borehole BH105-23. A concentration of total Xylenes above the Table 1 SCS/ESQS was also reported in this sample, but below the Table 2.1 Ag. ESQS.
- A concentration of Benzene above the Table 2.1 Ag., RPI and ICC ESQS was identified in the subsoil at Borehole BH105-23 between approximately 1.5 and 2.1 m. A concentration of total Xylenes above the Table 1 SCS/ESQS was also reported in this sample, but below the Table 2.1 Ag. ESQS. The borehole log for this drilling location indicates very moist sand at this depth indicating that the benzene and xylene reported in the soil may have been the result of impacted groundwater that flowed near this location at some point in time.

The environmental results are further summarized in the following table:

Table 2 - Environmental Testing Results Summary

Sample Location	Exceedances	Table 1 SCS/ESQS	Table 2.1 Ag. ESQS	Table 2.1 RPI ESQS	Table 2.1 ICC ESQS	Table 2 Ag. SCS
BH103-23 1.5-2.1 m	Benzene, Toluene, Xylenes	**Fail**	**Fail**	**Fail**	**Fail***	Pass
BH105-23 0.0-0.6 m	Benzene	**Fail**	**Fail**	**Fail**	**Fail***	Pass
	Xylenes	**Fail**	Pass	Pass	Pass	Pass
BH105-23 1.5-2.1 m	Benzene	**Fail**	**Fail**	**Fail**	**Fail***	Pass
	Xylenes	**Fail**	Pass	Pass	Pass	Pass

NOTES:

1) *See discussion and recommendations in Subsection (v) below.
2) *The ESQS are between 10 and 100 times lower/more stringent than their respective Table 2 Ag. SCS.
3) Following receipt of the results, the analytical laboratory was instructed to re-analyze the above noted samples. Elevated concentrations of the target analytes were subsequently confirmed.

All other analytical results indicate that the analyzed soil meets the Table 1 SCS/ESQS for the analyzed parameters.

(i) Leachate Testing

TCLP Analysis

Should impacted soil at BH103-23 or BH105-23 become excess to the project, Toxicity Characteristic Leachate Procedure (TCLP) analyses indicates that soil at BH-103-23 meets the O.Reg. 347/90 Schedule 4 criteria and, therefore, is considered to be non-hazardous for waste disposal purposes.

mSPLP Analysis

Based on the above-noted parameters of concern (Benzene, Toluene and Xylenes), the QP_{ESA} has determined that Modified Synthetic Precipitation Leaching Procedure (mSPLP) testing is not required under O. Reg. 406/19.

(ii) QA/QC

As previously noted, MTE collected a field duplicate soil sample (BH1101-23 “T” [topsoil]) that was analyzed for pH, Metals and PHC/BTEX parameters.

All the calculable Relative Percent Difference (RPDs) for the topsoil sample collected from borehole BH101-23 (0.0-0.6 m) and its field duplicate sample BH1101-23 were below the 50% criteria, with RPD variation ranging between 0.8% and 11.6%.

(iv) Summary of Findings

Based on the findings of this soil quality assessment including field observations and analytical data, the following summary is provided.

- Seven boreholes were advanced along the Project Area in conjunction with a geotechnical investigation. Representative soil samples were collected throughout for chemical analyses.
- The soil stratigraphy encountered at the Project Area generally consisted of surficial topsoil overlying fill (fill observed at one location) or native sand to sand and gravel deposits.
- Isolated wet to saturated seams were encountered, generally within the native silty sand encountered in BH103-23 and BH106-23. Soil from the saturated seam at BH103-23 at a depth of 2.3 to 2.9 m bgs reported concentrations of benzene, toluene and xylene above the Table 2.1 Ag., RPI and ICC ESQS. This impact may have been caused by impacted groundwater flowing near this location at some point in time. Soil from the saturated seam at BH106-23 starting at a depth of 3.0 m bgs was not analyzed during this soil sampling program. However, soil described as “very moist” was analyzed from BH105 from 1.5 to 2.1 m bgs was analyzed for BTEX and reported Table 2.1 Ag., RPI and ICC ESQS exceedances for benzene.

  We refer to MTE’s geotechnical investigation report (Ref. 53018-100, dated June 28, 2023) provided under separate cover for discussion related to excavations and dewatering. Should groundwater require management during construction the reader is advised that groundwater may be impaired with Benzene, Toluene and/or Xylenes.
- No visual or olfactory evidence of environmental impact (staining, odour, presence of deleterious debris) was observed during the field activities.

- Select soil samples were submitted to an accredited laboratory for chemical analysis for the Contaminants of Potential Concern anticipated for the Project Area including PHCs, BTEX, Metals and Hydrides, pH and/or OCPs.
- The chemical analysis results generally indicate (refer to Section 4.0 (iii) for details):

  Topsoil

  - Topsoil at BH105-23 does not meet the Table 2.1 Ag., RPI and ICC ESQS for Benzene; however, this sample meets the Table 2 Ag. SCS.
  - All other results indicate that the analyzed soil meets the Table 1 SCS/ESQS for the analyzed parameters.

  Subsoil

  - Native silty sand at BH103-23 between 2.3 and 2.9 m does not meet the Table 2.1 Ag., RPI and ICC ESQS for Benzene, Toluene and Xylenes; however, this sample meets the Table 2 Ag. SCS.
  - Native sand at BH105-23 between 1.5 and 2.1 m does not meet the Table 2.1 Ag., RPI and ICC ESQS for Benzene; however, this sample meets the Table 2 Ag. SCS.
  - All other results indicate that the analyzed soil meets the Table 1 SCS/ESQS for the analyzed parameters.

(v) Discussion and Recommendations – Excess Soil Management Reuse Options

The following is a summary of the available reuse options for excess soil that may be generated at the Project Area, based on existing information collected during the geotechnical investigation which was completed to support design. As noted in the following sections, where applicable, additional soil sampling and analysis for delineation purposes is recommended to better define the extent of soil impacts in an attempt to reduce volume of soil requiring special attention, management, and/or disposal at the time of construction. All excess soil exported from the Project Area for off-site reuse must be free of staining; PHC or solvent-like odours, and/or deleterious debris.

(i) On-Site Reuse of Soil within Project Area

All soil obtained and analyzed from the investigated locations is considered to be environmentally suitable for continued agricultural use and reuse within the Project Area for new roadway construction purposes (e.g., all analyzed soil meets the Table 2 Ag., RPI and ICC SCS), if geotechnically suitable.

(ii) Zone 1 Excess Soil: Landfill or Class 1 Site – Soil Concentrations Above Table 2.1 ICC ESQS, but below Table 2 SCS

Concentrations of Benzene, Toluene and/or Xylenes were reported above the Table 2.1 ICC ESQS in the topsoil or native sand at BH103-23 and BH105-23. (Zone 1 Excess Soil as shown on **Figure 2**)

MTE recommends on-site reuse of this soil within the Project Area where possible. From the preliminary design drawings, the exceedances at BH103-23 and BH105-23 appear to be in locations where there will either be minimal disturbance (BH103) or “filling” (BH105) is required to achieve the proposed grades for the new roadway. The design consultant is advised that this soil is suitable to be reused within the Project Area and creative design solutions and approach to soil management during construction should be considered such that topsoil in proximity to

BH105-23, or native silty sand/sand at BH103-23 and BH105-23 can remain within the Project Area.

Additional soil sampling and analysis would be required to better define the spatial extent of the reported soil impacts at these locations to reduce the volume of soil requiring special attention, management, and/or disposal at the time of construction.

If topsoil in proximity to BH105-23, or native sand at BH103-23 and BH105-23 becomes excess, the results of the TCLP testing indicates that the soil id non-hazardous for waste disposal purposes.

(iii) Zone 2 Excess Soil: Beneficial Off-Site Reuse – Meeting Table 1 SCS/ESQS (and Table 2.1 Ag., RPI and ICC ESQS)

All remaining soil at the investigated locations (e.g., BH101-23, BH102-23, BH104-23, BH106-26 and BH107-23; excluding soil described in (ii) above) meets the Table 1 SCS/ESQS as well as the Table 2.1 Ag., RPI and ICC ESQS and, therefore, is considered to be environmentally suitable for reuse at an appropriate (Table 1 or Table 2.1) Reuse Site that can accept salt impacted soil for reuse in accordance with O.Reg. 406/19 and the Soil Rules.

Reuse Site options may include, but may not be limited to:

- Other development projects, in accordance with the Soil Rules; and
- Aggregate pits in accordance with their licenses or rehabilitation plans.

The deposit of excess soil on a Reuse Site is also subject to the following conditions:

1. The Reuse Site must have a beneficial purpose for the material being imported and the quantity of soil must be suitable and placed for that purpose. Consultation with a geotechnical engineer may be required.
2. The analytical results documented herein (and any future testing/results) should be forwarded to the owner/manager of the Reuse Site(s) prior to proceeding with the shipment of soil.
3. In accordance with O. Reg. 406/19, the Reuse Site must provide written consent to accept the soil. MTE recommends the use of amended OPSS 180 Forms (forms PH-CC-181, PH-CC-182, or both and PH-CC-183).
4. The moisture content of the material is suitable for transportation.
5. The excess soil must be finally placed no later than two years after it is deposited at the Reuse Site.

Other considerations for reuse off-Site, should include:

- Ensuring appropriate drainage patterns are maintained during and following placement at the Reuse Site.
- Ensuring the protection of natural heritage features (wetlands and woodlands) during the and following placement at the Reuse Site, including the use of erosion controls.

Alternatively, these soils could also be transferred to Class 1 Reuse Site.

MTE notes the subsurface conditions and environmental quality of the soil may vary between and beyond the sampled locations. If soils are encountered during movement/placement that appear to have been environmentally impacted or observed to contain debris, these soils should not be sent off site for reuse. The contractor should separate these materials and have them inspected/tested by a qualified person (QP_{ESA}) to determine appropriate actions.

(iv) Recommended On-Site Reuse Approach

MTE recommends on-site reuse of soil within the Project Area in the following preferential order:

1) Soil exceeding Table 2.1 Ag., RPI and ICC ESQS, but meeting Table 2 Ag. SCS (Zone 1 Excess Soil); and

2) Soil Meeting Table 1 SCS/ESQS for RPIICC Property Use (Zone 2 Excess Soil).

(vi) Groundwater Considerations

Groundwater quality assessment is outside the scope of this excess soil assessment report. Therefore, we refer to MTE's geotechnical investigation report (Ref. 53018-100, dated June 28, 2023) provided under separate cover for discussion related to excavations and dewatering. Should groundwater require management during construction the reader is advised that groundwater may be impaired with Benzene, Toluene and/or Xylenes.

5.0 Limitations

Services performed by **MTE Consultants Inc.** (MTE) were conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the Environmental Engineering & Consulting profession. No other warranty or representation expressed or implied as to the accuracy of the information, conclusions or recommendations is included or intended in this report.

This report was completed for the sole use of MTE and the client. It was carried out in accordance with the approved Scope of Work referred to in Section 4 and the requirements of O. Reg.153/04 (as amended). As such, this report may not deal with all issues potentially applicable to the site and may omit issues, which are or may be of interest to the reader. MTE makes no representation that the present report has dealt with any and all of the important features, including any or all important environmental features, except as provided in the Scope of Work. All findings and conclusions presented in this report are based on site conditions as they existed during the time period of the investigation. This report is not intended to be exhaustive in scope or to imply a risk-free facility or conditions.

Any use which a third party makes of this report, or any reliance on, or decisions to be made based upon it, are the responsibility of such third parties. MTE accepts no responsibility for liabilities incurred by or damages, if any, suffered by any third party as a result of decisions made or actions taken, based upon this report. Others with interest in the site should undertake their own investigations and studies to determine how or if the condition affects them or their plans.

It should be recognized that the passage of time may affect the views, conclusions and recommendations (if any) provided in this report because environmental conditions of a property can change. Should additional or new information become available, MTE recommends that it be brought to our attention in order that we may re-assess the contents of this report.

All of which is respectfully submitted,

MTE Consultants Inc.

DRAFT

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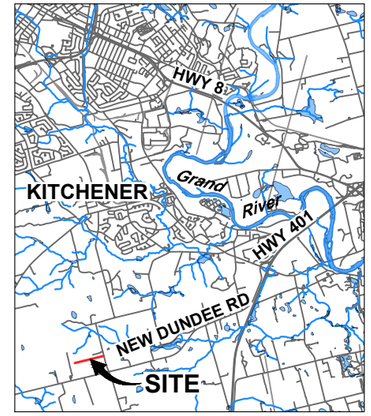
6.0 References

1. Ontario Ministry of the Environment, Conservation and Parks, 2020. *Rules for Soil Management and Excess Soil Quality Standards.*
2. Ontario Ministry of the Environment, Conservation and Parks, 2021. *Ontario Regulation 406/19, On-Site and Excess Soil Management.*
3. Ontario Ministry of the Environment Protocol, March 9, 2004, amended February 19, 2021. *Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act*.

Figures



KEY PLAN (nts)

N

LEGEND

BOREHOLE

(339.4m) ELEVATION (m AMSL)

REFERENCES

2021 AERIAL IMAGE, ROAD AND WATER NETWORK, CITY OF KITCHENER OPEN DATA SET; AND
MTE, BLAIR CREEK DRIVE,
FILE No. 53018-100-F1, FIGURE No. 1,
APRIL 18 - 2023.

NOTES

THIS FIGURE IS SCHEMATIC ONLY AND TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

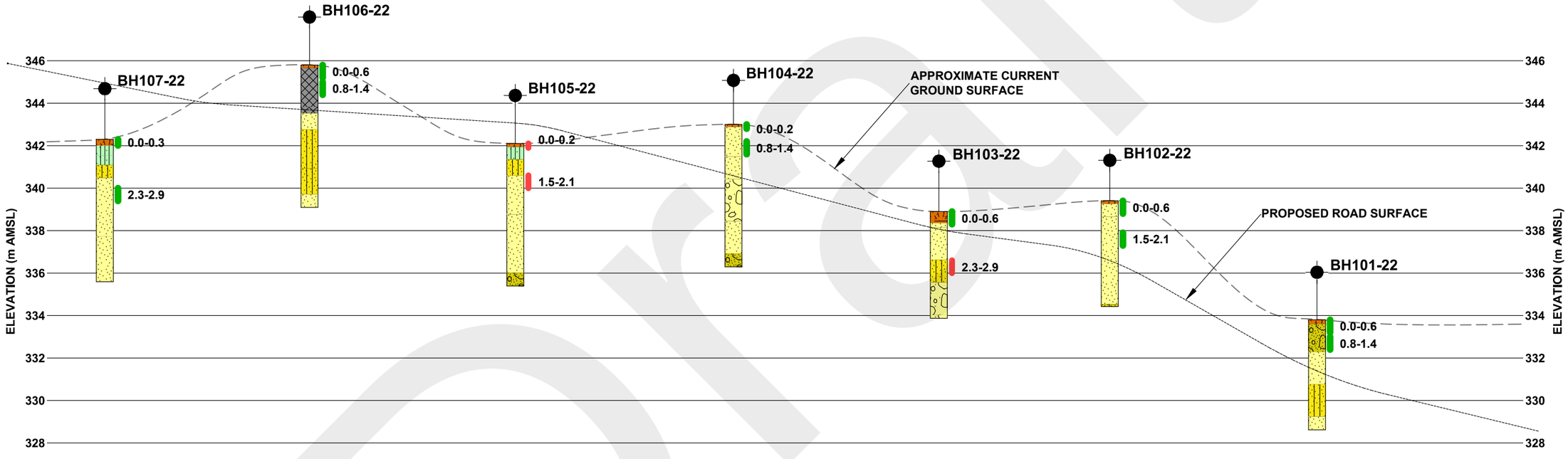
0 25 50 75 100m
Scale (11x17): 1:2500

MTE
Engineers, Scientists, Surveyors

PROJECT
SOIL CHARACTERIZATION REPORT
BLAIR CREEK DRIVE EXTENSION
KITCHENER, ONTARIO

TITLE
LOCATION PLAN

Drawn: DCH	Scale: AS SHOWN	**FIGURE 1**
Checked:	Project No.: 53018-100	
Date: July 4/23	Rev No.: 0	



LEGEND

BOREHOLE

(339.4m) ELEVATION (m AMSL)

SIMPLIFIED STRATIGRAPHY

- TOPSOIL
- FILL
- SAND
- SANDY SILT
- SILTY SAND
- SAND & GRAVEL
- GRAVELLY SAND

ZONE 1
EXCESS SOIL: LOCATION AND DEPTH OF SOIL WITH CONCENTRATIONS OF BENZENE, TOLUENE AND/OR XYLENES ABOVE THE TABLE 2.1 (Ag., RPI and ICC) ESQS. REFER TO SECTION 4(v) IN THE TEXT OF THIS REPORT

ZONE 2
EXCESS SOIL: LOCATION AND DEPTH OF SOIL ANALYZED WITH ALL CONCENTRATIONS BELOW THE TABLE 1 SCS/ESQS AND THE Table 2.1 (Ag., RPI and ICC) ESQS.
REFER TO SECTION 4(v) IN THE TEXT OF THIS REPORT

REFERENCES

2021 AERIAL IMAGE, ROAD AND WATER NETWORK, CITY OF KITCHENER OPEN DATA SET;
MTE, BLAIR CREEK DRIVE, FILE No. 53018-100-F1, FIGURE No. 1, APRIL 18 - 2023; AND
MTE, BLAIR CREEK DRIVE, FILE No. 53018-100-FD3, FUNCTIONAL DESIGN 3, JUNE 28 - 2023.

NOTES

THIS FIGURE IS SCHEMATIC ONLY AND TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

WIDTH OF BOREHOLES FOR ILLUSTRATION PURPOSES ONLY AND DO NOT CORRESPOND TO ACTUAL SPATIAL EXTENT.

THE GEOLOGIC SEQUENCE PRESENTED HEREIN IS BASED ON PROFESSIONAL INTERPRETATION FROM THE OVERBURDEN SEDIMENTS RECORDED DURING DRILLING, ACTUAL GEOLOGICAL CONDITIONS MAY VARY BETWEEN AND BEYOND LOCATIONS.

ALL LOCATIONS ARE APPROXIMATE.

0 20 40 60 80 100m
Horizontal Scale 1:2000

0 2 4 6 8 10m
Vertical Scale 1:200

MTE
Engineers, Scientists, Surveyors

PROJECT
SOIL CHARACTERIZATION REPORT
BLAIR CREEK DRIVE EXTENSION
KITCHENER, ONTARIO

TITLE
PLAN AND PROFILE

Drawn: DCH	Scale: AS SHOWN
Checked:	Project No.: 53018-100
Date: July 11/23	Rev No.: 0

FIGURE 2

Tables

Table 101: Metals and Inorganics Analysis in Soil

Parameters	Unit	RDL	2011 Table 2 SCS (Agr., Coarse)	2011 Table 2 SCS (R/P/I, Coarse)	2011 Table 2 SCS (I/C/C, Coarse)	Sample Location	BH101-23	BH101-23	BH101-23	BH102-23	BH102-23	BH103-23	BH103-23	BH104-23	BH104-23	BH105-23
						Sample Name	BH101-23 2.5-4.5'	BH101-23 T	BH1101-23 T	BH102-23 5-7'	BH102-23 T	BH103-23 7.5-9.5	BH103-23 T	BH104- 2.5-4.5'	BH104-23 T	BH105-23 5-7'
						Lab Job #	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081
						Laboratory ID	WT2312081-002	WT2312081-007	WT2312081-054	WT2312081-010	WT2312081-014	WT2312081-018	WT2312081-021	WT2312081-023	WT2312081-029	WT2312081-032
						Sampling Date	05-05-23 08:55	05-05-23 09:35	05-05-23 16:00	05-05-23 09:55	05-05-23 10:30	05-05-23 11:05	05-05-23 11:30	05-05-23 11:50	05-05-23 12:20	05-05-23 12:40
						Sample Depth (m bgs)	0.8-1.4	0.0-0.6	0.0-0.6	1.5-2.1	0.0-0.6	2.3-2.9	0.0-0.6	0.8-1.4	0.0-0.1	1.5-2.1
						Maximum Concentration			Field Duplicate							
Metals and Inorganics																
Antimony	µg/g	0.1	7.5	7.5	40	0.25	<0.10	0.25	0.23	<0.10	0.17	0.11	0.13	<0.10	0.14	<0.10
Arsenic	µg/g	0.1	11	18	18	4.61	4.52	4.27	4.01	4.08	3.68	4.61	2.23	2.44	2.85	1.68
Barium	µg/g	0.5	390	390	670	57.5	20.2	51.4	50.3	19	38	36.4	33.1	13.4	38	19.2
Beryllium	µg/g	0.1	4	4	8	0.51	0.22	0.41	0.39	0.22	0.29	0.46	0.25	0.18	0.31	0.16
Boron	µg/g	5	120	120	120	12.5	12.5	7	6.2	10.7	8.2	8.5	<5.0	7.5	<5.0	<5.0
Cadmium	µg/g	0.02	1	1.2	1.9	0.352	0.208	0.352	0.332	0.212	0.312	0.153	0.229	0.107	0.279	0.118
Chromium	µg/g	0.5	160	160	160	23.8	8.87	23.8	21.4	8.21	13.8	15.8	18.2	6.04	15.2	5.67
Cobalt	µg/g	0.1	22	22	80	6.67	3.81	5.28	5.05	4.12	4.58	6.67	3.13	2.59	3.92	2.19
Copper	µg/g	0.5	140	140	230	35	22.3	35	33	20	29.6	25	16.1	14.8	15.4	9.36
Lead	µg/g	0.5	45	120	120	24.6	18.2	24.6	22.9	20.6	19.2	19.6	17.5	9.69	20.9	7.58
Molybdenum	µg/g	0.1	6.9	6.9	40	0.75	0.41	0.57	0.57	0.75	0.42	0.32	0.31	0.3	0.29	0.17
Nickel	µg/g	0.5	100	100	270	13.7	7.62	12	10.9	9.29	9.03	13.5	7.8	5.48	8.3	4.2
Selenium	µg/g	0.2	2.4	2.4	5.5	0.28	<0.20	0.28	0.25	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver	µg/g	0.1	20	20	40	0.36	<0.10	0.36	0.33	<0.10	0.26	<0.10	0.17	<0.10	0.14	<0.10
Thallium	µg/g	0.05	1	1	3.3	0.105	0.088	0.095	0.09	0.086	0.072	0.091	0.062	<0.050	0.071	<0.050
Uranium	µg/g	0.05	23	23	33	0.837	0.568	0.83	0.837	0.748	0.732	0.598	0.508	0.457	0.546	0.376
Vanadium	µg/g	0.2	86	86	86	35	15.1	31	27.6	16.8	19	30.7	22.1	11.2	25.9	12.9
Zinc	µg/g	2	340	340	340	151	113	151	143	126	128	80.8	92.6	50.5	91.4	49.3
pH	pH units	-	NR	NR	NR	8.1	8.05	7.23	7.21	-	-	7.73	7.01	-	-	7.93

Notes:
2011 Site Condition Standards (SCS) - As identified in 'Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act' (as amended April 15, 2011)

Bold - Exceeds 2011 Table 2 SCS Agr.
Bold - Exceeds 2011 Table 2 SCS R/P/I
Bold - Exceeds 2011 Table 2 SCS I/C/C

"-" - parameter not analyzed
RDL - Reported detection limit
NR - Not Relevant
NV- No Value
NA - Not Applicable
"<" - Less than the Reporting Detection Limit

Table 101: Metals and Inorganics Analysis in Soil

Parameters	Unit	RDL	2011 Table 2 SCS (Agr., Coarse)	2011 Table 2 SCS (R/P/I, Coarse)	2011 Table 2 SCS (I/C/C, Coarse)	BH105-23 BH105-23 T WT2312081 WT2312081-037 05-05-23 13:50 0.0-0.6	BH106-23 BH106-23 2.5-4.5' WT2312081 WT2312081-039 05-05-23 00:00 0.8-1.4	BH106-23 BH106-23 T WT2312081 WT2312081-045 05-05-23 14:40 0.0-0.2	BH107-23 BH107-23 7.5-9.5' WT2312081 WT2312081-049 05-05-23 15:20 2.3-2.9	BH107-23 BH107-23 T WT2312081 WT2312081-053 05-05-23 15:50 0.0-0.3
Metals and Inorganics										
Antimony	µg/g	0.1	7.5	7.5	40	0.18	<0.10	0.16	<0.10	0.15
Arsenic	µg/g	0.1	11	18	18	4.04	2.35	2.77	2.15	2.15
Barium	µg/g	0.5	390	390	670	57.5	22.9	35.1	31.8	32.2
Beryllium	µg/g	0.1	4	4	8	0.51	0.26	0.32	0.15	0.28
Boron	µg/g	5	120	120	120	6	<5.0	<5.0	5	<5.0
Cadmium	µg/g	0.02	1	1.2	1.9	0.293	0.152	0.332	0.165	0.18
Chromium	µg/g	0.5	160	160	160	20.8	9.64	18.8	5.94	14.6
Cobalt	µg/g	0.1	22	22	80	6.55	3.16	4.06	2.54	3.47
Copper	µg/g	0.5	140	140	230	23.7	11.2	17.1	10.5	14.1
Lead	µg/g	0.5	45	120	120	18.6	15.2	17.1	11.7	13.5
Molybdenum	µg/g	0.1	6.9	6.9	40	0.42	0.22	0.32	0.26	0.43
Nickel	µg/g	0.5	100	100	270	13.7	6.74	9.32	4.68	7.15
Selenium	µg/g	0.2	2.4	2.4	5.5	0.22	<0.20	<0.20	<0.20	<0.20
Silver	µg/g	0.1	20	20	40	0.17	<0.10	0.18	<0.10	0.13
Thallium	µg/g	0.05	1	1	3.3	0.105	0.058	0.072	0.05	0.068
Uranium	µg/g	0.05	23	23	33	0.668	0.39	0.524	0.448	0.565
Vanadium	µg/g	0.2	86	86	86	35	18.7	25.2	15.2	20.5
Zinc	µg/g	2	340	340	340	97	70.9	84.6	73.6	69.7
pH	pH units	-	NR	NR	NR	7.16	-	-	8.1	4.1

Notes:
2011 Site Condition Standards (SCS) - As identified in 'Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act' (as amended April 15, 2011)

Bold	- Exceeds 2011 Table 2 SCS
Bold	- Exceeds 2011 Table 2 SCS
Bold	- Exceeds 2011 Table 2 SCS

"-" - parameter not analyzed
RDL - Reported detection limit
NR - Not Relevant
NV- No Value
NA - Not Applicable
"<" - Less than the Reporting Detection Limit

Table 102: Petroleum Hydrocarbons (PHCs) Analysis in Soil

Parameters	Unit	RDL	2011 Table 2 SCS (Agr., Coarse)	2011 Table 2 SCS (R/P/I, Coarse)	2011 Table 2 SCS (I/C/C, Coarse)	Sample Location		BH101-23	BH101-23	BH101-23	BH102-23	BH102-23	BH103-23	BH103-23	BH104-23	BH104-23	BH105-23
						Sample Name		BH101-23 2.5-4.5'	BH101-23 T	BH1101-23 T	BH102-23 5-7'	BH102-23 T	BH103-23 7.5-9.5	BH103-23 T	BH104- 2.5-4.5'	BH104-23 T	BH105-23 5-7'
						Lab Job #		WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081
						Laboratory ID		WT2312081-002	WT2312081-007	WT2312081-054	WT2312081-010	WT2312081-014	WT2312081-018	WT2312081-021	WT2312081-023	WT2312081-029	WT2312081-032
						Sampling Date		05-05-23 08:55	05-05-23 09:35	05-05-23 16:00	05-05-23 09:55	05-05-23 10:30	05-05-23 11:05	05-05-23 11:30	05-05-23 11:50	05-05-23 12:20	05-05-23 12:40
						Sample Depth (m bgs)		0.8-1.4	0.0-0.6	0.0-0.6	1.5-2.1	0.0-0.6	2.3-2.9	0.0-0.6	0.8-1.4	0.0-0.1	1.5-2.1
						Maximum Concentration				Field Duplicate							
Petroleum Hydrocarbons (PHCs)																	
F1 (C6 to C10)	µg/g	5	55	55	55	<	5	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
F1 (C6 to C10) minus BTEX	µg/g	5	55	55	55	<	5	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
F2 (C10 to C16)	µg/g	10	98	98	230	<	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
F3 (C16 to C34)	µg/g	50	300	300	1700	<	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
F4 (C34 to C50)	µg/g	50	2800	2800	3300	<	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Reached Baseline at C50	unitless		NR	NR	NR		NA	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Notes:

2011 Site Condition Standards (SCS) - As identified in 'Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act' (as amended April 15, 2011)

Bold	- Exceeds 2011 Table 2 SCS Agr.
Bold	- Exceeds 2011 Table 2 SCS R/P/I
Bold	- Exceeds 2011 Table 2 SCS I/C/C

"-" - parameter not analyzed
RDL - Reported detection limit
NR - Not Relevant
NV- No Value
NA - Not Applicable
"<" - Less than the Reporting Detection Limit

Table 102: Petroleum Hydrocarbons (PHCs) Analysis in Soil

Parameters	Unit	RDL	2011 Table 2 SCS (Agr., Coarse)	2011 Table 2 SCS (R/P/I, Coarse)	2011 Table 2 SCS (I/C/C, Coarse)	BH105-23	BH106-23	BH106-23	BH107-23	BH107-23
						BH105-23 T	BH106-23 2.5-4.5'	BH106-23 T	BH107-23 7.5-9.5'	BH107-23 T
						WT2312081	WT2312081	WT2312081	WT2312081	WT2312081
						WT2312081-037	WT2312081-039	WT2312081-045	WT2312081-049	WT2312081-053
						05-05-23 13:50	05-05-23 00:00	05-05-23 14:40	05-05-23 15:20	05-05-23 15:50
						0.0-0.6	0.8-1.4	0.0-0.2	2.3-2.9	0.0-0.3
Petroleum Hydrocarbons (PHCs)										
F1 (C6 to C10)	µg/g	5	55	55	55	<5.0	<5.0	<5.0	<5.0	<5.0
F1 (C6 to C10) minus BTEX	µg/g	5	55	55	55	<5.0	<5.0	<5.0	<5.0	<5.0
F2 (C10 to C16)	µg/g	10	98	98	230	<10	<10	<10	<10	<10
F3 (C16 to C34)	µg/g	50	300	300	1700	<50	<50	<50	<50	<50
F4 (C34 to C50)	µg/g	50	2800	2800	3300	<50	<50	<50	<50	<50
Reached Baseline at C50	unitless		NR	NR	NR	YES	YES	YES	YES	YES

Notes:
2011 Site Condition Standards (SCS) - As identified in 'Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act' (as amended April 15, 2011)

Bold	- Exceeds 2011 Table 2 SCS
Bold	- Exceeds 2011 Table 2 SCS
Bold	- Exceeds 2011 Table 2 SCS

"-" - parameter not analyzed
RDL - Reported detection limit
NR - Not Relevant
NV- No Value
NA - Not Applicable
"<" - Less than the Reporting Detection Limit

Table 103: Benzene, Toluene, Ethyl Benzene, and Xylenes (BTEX) Analysis in Soil

Parameters	Unit	RDL	2011 Table 2 SCS (Agr., Coarse)	2011 Table 2 SCS (R/P/I, Coarse)	2011 Table 2 SCS (I/C/C, Coarse)	Sample Location	BH101-23	BH101-23	BH101-23	BH102-23	BH102-23	BH103-23	BH103-23	BH104-23	BH104-23	BH105-23
						Sample Name	BH101-23 2.5-4.5'	BH101-23 T	BH1101-23 T	BH102-23 5-7'	BH102-23 T	BH103-23 7.5-9.5	BH103-23 T	BH104- 2.5-4.5'	BH104-23 T	BH105-23 5-7'
						Lab Job #	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081
						Laboratory ID	WT2312081-002	WT2312081-007	WT2312081-054	WT2312081-010	WT2312081-014	WT2312081-018	WT2312081-021	WT2312081-023	WT2312081-029	WT2312081-032
						Sampling Date	05-05-23 08:55	05-05-23 09:35	05-05-23 16:00	05-05-23 09:55	05-05-23 10:30	05-05-23 11:05	05-05-23 11:30	05-05-23 11:50	05-05-23 12:20	05-05-23 12:40
						Sample Depth (m bgs)	0.8-1.4	0.0-0.6	0.0-0.6	1.5-2.1	0.0-0.6	2.3-2.9	0.0-0.6	0.8-1.4	0.0-0.1	1.5-2.1
						Maximum Concentration			Field Duplicate							
Benzene, Toluene, Ethyl Benzene, and Xylenes (BTEX)																
Benzene	µg/g	0.005	0.21	0.21	0.32	0.0694	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0324	<0.0050	0.005	<0.0050	0.0378
Ethylbenzene	µg/g	0.015	1.1	1.1	1.1	0.032	<0.015	<0.015	<0.015	<0.015	<0.015	0.032	<0.015	<0.015	<0.015	0.024
Toluene	µg/g	0.05	2.3	2.3	6.4	0.207	<0.050	<0.050	<0.050	<0.050	<0.050	0.207	<0.050	<0.050	<0.050	0.158
o-Xylene	µg/g	0.03	NR	NR	NR	0.032	<0.030	<0.030	<0.030	<0.030	<0.030	0.032	<0.030	<0.030	<0.030	<0.030
m+p-Xylene	µg/g	0.03	NR	NR	NR	0.147	<0.030	<0.030	<0.030	<0.030	<0.030	0.147	<0.030	<0.030	<0.030	0.09
Xylene Mixture	µg/g	0.05	3.1	3.1	26	0.179	<0.050	<0.050	<0.050	<0.050	<0.050	0.179	<0.050	<0.050	<0.050	0.09

Notes:

2011 Site Condition Standards (SCS) - As identified in 'Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act' (as amended April 15, 2011)

Bold	- Exceeds 2011 Table 2 SCS Agr.
Bold	- Exceeds 2011 Table 2 SCS R/P/I
Bold	- Exceeds 2011 Table 2 SCS I/C/C

"-" - parameter not analyzed
RDL - Reported detection limit
NR - Not Relevant
NV- No Value
NA - Not Applicable
"<" - Less than the Reporting Detection Limit

Table 103: Benzene, Toluene, Ethyl Benzene, and Xylenes (BTEX) Analysis in Soil

Parameters	Unit	RDL	2011 Table 2 SCS (Agr., Coarse)	2011 Table 2 SCS (R/P/I, Coarse)	2011 Table 2 SCS (I/C/C, Coarse)	BH105-23 BH105-23 T WT2312081 WT2312081-037 05-05-23 13:50 0.0-0.6	BH106-23 BH106-23 2.5-4.5' WT2312081 WT2312081-039 05-05-23 00:00 0.8-1.4	BH106-23 BH106-23 T WT2312081 WT2312081-045 05-05-23 14:40 0.0-0.2	BH107-23 BH107-23 7.5-9.5' WT2312081 WT2312081-049 05-05-23 15:20 2.3-2.9	BH107-23 BH107-23 T WT2312081 WT2312081-053 05-05-23 15:50 0.0-0.3
Volatile Organic Compounds (VOCs)										
Benzene	µg/g	0.005	0.21	0.21	0.32	0.0694	<0.0050	<0.0050	<0.0050	<0.0050
Ethylbenzene	µg/g	0.015	1.1	1.1	1.1	0.02	<0.015	<0.015	<0.015	<0.015
Toluene	µg/g	0.05	2.3	2.3	6.4	0.196	<0.050	<0.050	<0.050	<0.050
o-Xylene	µg/g	0.03	NR	NR	NR	<0.030	<0.030	<0.030	<0.030	<0.030
m+p-Xylene	µg/g	0.03	NR	NR	NR	0.062	<0.030	<0.030	<0.030	<0.030
Xylene Mixture	µg/g	0.05	3.1	3.1	26	0.062	<0.050	<0.050	<0.050	<0.050

Notes:
2011 Site Condition Standards (SCS) - As identified in 'Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act' (as amended April 15, 2011)

Bold	- Exceeds 2011 Table 2 SCS
Bold	- Exceeds 2011 Table 2 SCS
Bold	- Exceeds 2011 Table 2 SCS

"-" - parameter not analyzed
RDL - Reported detection limit
NR - Not Relevant
NV- No Value
NA - Not Applicable
"<" - Less than the Reporting Detection Limit

Table 104: Organochlorine (OC) Pesticides Analysis in Soil

Parameters	Unit	RDL	2011 Table 2 SCS (Agr., Coarse)	2011 Table 2 SCS (R/P/I, Coarse)	2011 Table 2 SCS (I/C/C, Coarse)	Sample Location		BH101-23	BH103-23	BH105-23	BH107-23
						Sample Name		BH101-23 T	BH103-23 T	BH105-23 T	BH107-23 T
						Lab Job #		WT2312081	WT2312081	WT2312081	WT2312081
						Laboratory ID		WT2312081-007	WT2312081-021	WT2312081-037	WT2312081-053
						Sampling Date		05-05-23 09:35	05-05-23 11:30	05-05-23 13:50	05-05-23 15:50
						Sample Depth (m bgs)		0.0-0.6	0.0-0.6	0.0-0.6	0.0-0.3
						Maximum Concentration					
Organochlorine Pesticides (OCs)											
alpha-Chlordane	µg/g	0.02	NR	NR	NR	<	0.02	<0.020	<0.020	<0.020	<0.020
gamma-Chlordane	µg/g	0.02	NR	NR	NR	<	0.02	<0.020	<0.020	<0.020	<0.020
Chlordane (Total)	µg/g	0.03	0.05	0.05	0.05	<	0.03	<0.030	<0.030	<0.030	<0.030
o,p-DDD	µg/g	0.02	NR	NR	NR	<	0.02	<0.020	<0.020	<0.020	<0.020
p,p-DDD	µg/g	0.02	NR	NR	NR	<	0.02	<0.020	<0.020	<0.020	<0.020
o,p-DDD + p,p-DDD	µg/g	0.03	3.3	3.3	4.6	<	0.03	<0.030	<0.030	<0.030	<0.030
o,p-DDE	µg/g	0.02	NR	NR	NR	<	0.02	<0.020	<0.020	<0.020	<0.020
p,p-DDE	µg/g	0.02	NR	NR	NR	<	0.02	<0.020	<0.020	<0.020	<0.020
o,p-DDE + p,p-DDE	µg/g	0.03	0.26	0.26	0.52	<	0.03	<0.030	<0.030	<0.030	<0.030
o,p-DDT	µg/g	0.02	NR	NR	NR	<	0.02	<0.020	<0.020	<0.020	<0.020
p,p-DDT	µg/g	0.02	NR	NR	NR	<	0.04	<0.040	<0.040	<0.040	<0.040
o,p-DDT + p,p-DDT	µg/g	0.03	0.078	1.4	1.4	<	0.045	<0.045	<0.045	<0.045	<0.045
Dieldrin	µg/g	0.02	0.05	0.05	0.088	<	0.02	<0.020	<0.020	<0.020	<0.020
Endosulfan I	µg/g	0.02	NR	NR	NR	<	0.02	<0.020	<0.020	<0.020	<0.020
Endosulfan II	µg/g	0.02	NR	NR	NR	<	0.02	<0.020	<0.020	<0.020	<0.020
Total Endosulfan	µg/g	0.03	0.04	0.04	0.3	<	0.03	<0.030	<0.030	<0.030	<0.030
Endrin	µg/g	0.02	0.04	0.04	0.04	<	0.02	<0.020	<0.020	<0.020	<0.020
Heptachlor	µg/g	0.02	0.15	0.15	0.19	<	0.02	<0.020	<0.020	<0.020	<0.020
Heptachlor epoxide	µg/g	0.02	0.05	0.05	0.05	<	0.02	<0.020	<0.020	<0.020	<0.020
Hexachlorobenzene	µg/g	0.01	0.52	0.52	0.66	<	0.01	<0.010	<0.010	<0.010	<0.010
Hexachlorobutadiene	µg/g	0.01	0.012	0.012	0.031	<	0.01	<0.010	<0.010	<0.010	<0.010
gamma-Hexachlorocyclohexane (Lindane)	µg/g	0.01	0.056	0.056	0.056	<	0.01	<0.010	<0.010	<0.010	<0.010
Hexachloroethane	µg/g	0.01	0.089	0.089	0.21	<	0.01	<0.010	<0.010	<0.010	<0.010
Methoxychlor	µg/g	0.02	0.13	0.13	1.6	<	0.04	<0.040	<0.040	<0.040	<0.040

Notes:
2011 Site Condition Standards (SCS) - As identified in 'Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act' (as amended April 15, 2011)

Bold	- Exceeds 2011 Table 2 SCS Agr.
Bold	- Exceeds 2011 Table 2 SCS R/P/I
Bold	- Exceeds 2011 Table 2 SCS I/C/C

"-" - parameter not analyzed
RDL - Reported detection limit
NR - Not Relevant
NV- No Value
NA - Not Applicable
"<" - Less than the Reporting Detection Limit

Table 201: Metals and Inorganics Analysis in Soil

Parameters	Unit	RDL	Table 1 ESQS (R/P/I or I/C/C)	Table 2.1 ESQS (Agr.)	Table 2.1 ESQS (R/P/I)	Table 2.1 ESQS (I/C/C)		Maximum Concentration	Sample Location	BH101-23	BH101-23	BH101-23	BH102-23	BH102-23	BH103-23	BH103-23	BH104-23
									Sample Name	BH101-23 2.5-4.5'	BH101-23 T	BH1101-23 T	BH102-23 5-7'	BH102-23 T	BH103-23 7.5-9.5	BH103-23 T	BH104- 2.5-4.5'
									Lab Job #	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081
									Laboratory ID	WT2312081-002	WT2312081-007	WT2312081-054	WT2312081-010	WT2312081-014	WT2312081-018	WT2312081-021	WT2312081-023
									Sampling Date	05-05-23 08:55	05-05-23 09:35	05-05-23 16:00	05-05-23 09:55	05-05-23 10:30	05-05-23 11:05	05-05-23 11:30	05-05-23 11:50
									Sample Depth (m bgs)	0.8-1.4	0.0-0.6	0.0-0.6	1.5-2.1	0.0-0.6	2.3-2.9	0.0-0.6	0.8-1.4
Metals and Inorganics																	
Antimony	µg/g	0.1	1.3	7.5	7.5	40		0.25		<0.10	0.25	0.23	<0.10	0.17	0.11	0.13	<0.10
Arsenic	µg/g	0.1	18	11	18	18		4.61		4.52	4.27	4.01	4.08	3.68	4.61	2.23	2.44
Barium	µg/g	0.5	220	390	390	670		57.5		20.2	51.4	50.3	19	38	36.4	33.1	13.4
Beryllium	µg/g	0.1	2.5	4	4	8		0.51		0.22	0.41	0.39	0.22	0.29	0.46	0.25	0.18
Boron	µg/g	5	36	120	120	120		12.5		12.5	7	6.2	10.7	8.2	8.5	<5.0	7.5
Cadmium	µg/g	0.02	1.2	1	1.2	1.9		0.352		0.208	0.352	0.332	0.212	0.312	0.153	0.229	0.107
Chromium	µg/g	0.5	70	160	160	160		23.8		8.87	23.8	21.4	8.21	13.8	15.8	18.2	6.04
Cobalt	µg/g	0.1	21	22	22	80		6.67		3.81	5.28	5.05	4.12	4.58	6.67	3.13	2.59
Copper	µg/g	0.5	92	140	140	230		35		22.3	35	33	20	29.6	25	16.1	14.8
Lead	µg/g	0.5	120	45	120	120		24.6		18.2	24.6	22.9	20.6	19.2	19.6	17.5	9.69
Molybdenum	µg/g	0.1	2	6.9	6.9	40		0.75		0.41	0.57	0.57	0.75	0.42	0.32	0.31	0.3
Nickel	µg/g	0.5	82	100	100	270		13.7		7.62	12	10.9	9.29	9.03	13.5	7.8	5.48
Selenium	µg/g	0.2	1.5	2.4	2.4	5.5		0.28		<0.20	0.28	0.25	<0.20	<0.20	<0.20	<0.20	<0.20
Silver	µg/g	0.1	0.5	20	20	40		0.36		<0.10	0.36	0.33	<0.10	0.26	<0.10	0.17	<0.10
Thallium	µg/g	0.05	1	1	1	3.3		0.105		0.088	0.095	0.09	0.086	0.072	0.091	0.062	<0.050
Uranium	µg/g	0.05	2.5	23	23	33		0.837		0.568	0.83	0.837	0.748	0.732	0.598	0.508	0.457
Vanadium	µg/g	0.2	86	86	86	86		35		15.1	31	27.6	16.8	19	30.7	22.1	11.2
Zinc	µg/g	2	290	340	340	340		151		113	151	143	126	128	80.8	92.6	50.5
pH	pH units	-	NR	NV	NV	NV		8.1		8.05	7.23	7.21	-	-	7.73	7.01	-

Notes:
2020 Excess Soil Quality Standards (ESQS) - As identified in Appendix 1 of the Rules for Soil Management adopted by reference in O.Reg. 406/19 made under the Environmental Protection Act (December 8, 2020)

Bold - Exceeds Table 1 ESQS (R/P/I or I/C/C)
Bold - Exceeds Table 2.1 ESQS (Agr.)
Bold - Exceeds Table 2.1 ESQS (R/P/I)
Bold - Exceeds Table 2.1 ESQS (I/C/C)

"-" - parameter not analyzed
RDL - Reported detection limit
NR - Not Relevant
NV- No Value
NA - Not Applicable
"<" - Less than the Reporting Detection Limit

Table 201: Metals and Inorganics Analysis in Soil

Parameters	Unit	RDL	Table 1 ESQS (R/P/I or I/C/C)	Table 2.1 ESQS (Agr.)	Table 2.1 ESQS (R/P/I)	Table 2.1 ESQS (I/C/C)	BH104-23 BH104-23 T WT2312081 WT2312081-029 05-05-23 12:20 0.0-0.1	BH105-23 BH105-23 5-7' WT2312081 WT2312081-032 05-05-23 12:40 1.5-2.1	BH105-23 BH105-23 T WT2312081 WT2312081-037 05-05-23 13:50 0.0-0.6	BH106-23 BH106-23 2.5-4.5' WT2312081 WT2312081-039 05-05-23 00:00 0.8-1.4	BH106-23 BH106-23 T WT2312081 WT2312081-045 05-05-23 14:40 0.0-0.2	BH107-23 BH107-23 7.5-9.5' WT2312081 WT2312081-049 05-05-23 15:20 2.3-2.9	BH107-23 BH107-23 T WT2312081 WT2312081-053 05-05-23 15:50 0.0-0.3
Metals and Inorganics													
Antimony	µg/g	0.1	1.3	7.5	7.5	40	0.14	<0.10	0.18	<0.10	0.16	<0.10	0.15
Arsenic	µg/g	0.1	18	11	18	18	2.85	1.68	4.04	2.35	2.77	2.15	2.15
Barium	µg/g	0.5	220	390	390	670	38	19.2	57.5	22.9	35.1	31.8	32.2
Beryllium	µg/g	0.1	2.5	4	4	8	0.31	0.16	0.51	0.26	0.32	0.15	0.28
Boron	µg/g	5	36	120	120	120	<5.0	<5.0	6	<5.0	<5.0	5	<5.0
Cadmium	µg/g	0.02	1.2	1	1.2	1.9	0.279	0.118	0.293	0.152	0.332	0.165	0.18
Chromium	µg/g	0.5	70	160	160	160	15.2	5.67	20.8	9.64	18.8	5.94	14.6
Cobalt	µg/g	0.1	21	22	22	80	3.92	2.19	6.55	3.16	4.06	2.54	3.47
Copper	µg/g	0.5	92	140	140	230	15.4	9.36	23.7	11.2	17.1	10.5	14.1
Lead	µg/g	0.5	120	45	120	120	20.9	7.58	18.6	15.2	17.1	11.7	13.5
Molybdenum	µg/g	0.1	2	6.9	6.9	40	0.29	0.17	0.42	0.22	0.32	0.26	0.43
Nickel	µg/g	0.5	82	100	100	270	8.3	4.2	13.7	6.74	9.32	4.68	7.15
Selenium	µg/g	0.2	1.5	2.4	2.4	5.5	<0.20	<0.20	0.22	<0.20	<0.20	<0.20	<0.20
Silver	µg/g	0.1	0.5	20	20	40	0.14	<0.10	0.17	<0.10	0.18	<0.10	0.13
Thallium	µg/g	0.05	1	1	1	3.3	0.071	<0.050	0.105	0.058	0.072	0.05	0.068
Uranium	µg/g	0.05	2.5	23	23	33	0.546	0.376	0.668	0.39	0.524	0.448	0.565
Vanadium	µg/g	0.2	86	86	86	86	25.9	12.9	35	18.7	25.2	15.2	20.5
Zinc	µg/g	2	290	340	340	340	91.4	49.3	97	70.9	84.6	73.6	69.7
pH	pH units	-	NR	NV	NV	NV	-	7.93	7.16	-	-	8.1	4.1

Notes:
2020 Excess Soil Quality Standards (ESQS) - As identified in Appendix 1 of the Rules for Soil Management adopted by reference in O.Reg. 406/19 made under the Environmental Protection Act (December 8, 2020)

Bold	- Exceeds Table 1 ESQS (R/P/I or I/C/C)
Bold	- Exceeds Table 2.1 ESQS (Agr.)
Bold	- Exceeds Table 2.1 ESQS (R/P/I)
Bold	- Exceeds Table 2.1 ESQS (I/C/C)

"-" - parameter not analyzed
RDL - Reported detection limit
NR - Not Relevant
NV- No Value
NA - Not Applicable
"<" - Less than the Reporting Detection Limit

Table 202: Petroleum Hydrocarbons (PHCs) Analysis in Soil

Parameters	Unit	RDL	Table 1 ESQS (R/P/I or I/C/C)	Table 2.1 ESQS (Agr.)	Table 2.1 ESQS (R/P/I)	Table 2.1 ESQS (I/C/C)	Sample Location		BH101-23	BH101-23	BH101-23	BH102-23	BH102-23	BH103-23	BH103-23	BH104-23
							Sample Name		BH101-23 2.5-4.5'	BH101-23 T	BH1101-23 T	BH102-23 5-7'	BH102-23 T	BH103-23 7.5-9.5	BH103-23 T	BH104- 2.5-4.5'
							Lab Job #		WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081
							Laboratory ID		WT2312081-002	WT2312081-007	WT2312081-054	WT2312081-010	WT2312081-014	WT2312081-018	WT2312081-021	WT2312081-023
							Sampling Date		05-05-23 08:55	05-05-23 09:35	05-05-23 16:00	05-05-23 09:55	05-05-23 10:30	05-05-23 11:05	05-05-23 11:30	05-05-23 11:50
							Sample Depth (m bgs)		0.8-1.4	0.0-0.6	0.0-0.6	1.5-2.1	0.0-0.6	2.3-2.9	0.0-0.6	0.8-1.4
							Maximum Concentration				Field Duplicate					
Petroleum Hydrocarbons (PHCs)																
F1 (C6 to C10)	µg/g	5	25	NV	NV	NV	<	5	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
F1 (C6 to C10) minus BTEX	µg/g	5	25	17	25	25	<	5	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
F2 (C10 to C16)	µg/g	10	10	10	10	26	<	10	<10	<10	<10	<10	<10	<10	<10	<10
F3 (C16 to C34)	µg/g	50	240	240	240	240	<	50	<50	<50	<50	<50	<50	<50	<50	<50
F4 (C34 to C50)	µg/g	50	120	2800	2800	3300	<	50	<50	<50	<50	<50	<50	<50	<50	<50
Reached Baseline at C50	unitless		NR	NV	NV	NV		NA	YES	YES	YES	YES	YES	YES	YES	YES

Notes:

2020 Excess Soil Quality Standards (ESQS) - As identified in Appendix 1 of the Rules for Soil Management adopted by reference in O.Reg. 406/19 made under the Environmental Protection Act (December 8, 2020)

Bold - Exceeds Table 1 ESQS (R/P/I or I/C/C)
Bold - Exceeds Table 2.1 ESQS (Agr.)
Bold - Exceeds Table 2.1 ESQS (R/P/I)
Bold - Exceeds Table 2.1 ESQS (I/C/C)

"-" - parameter not analyzed
RDL - Reported detection limit
NR - Not Relevant
NV- No Value
NA - Not Applicable
"<" - Less than the Reporting Detection Limit

Table 202: Petroleum Hydrocarbons (PHCs) Analysis in Soil

Parameters	Unit	RDL	Table 1 ESQS (R/P/I or I/C/C)	Table 2.1 ESQS (Agr.)	Table 2.1 ESQS (R/P/I)	Table 2.1 ESQS (I/C/C)	BH104-23 BH104-23 T WT2312081 WT2312081-029 05-05-23 12:20 0.0-0.1	BH105-23 BH105-23 5-7' WT2312081 WT2312081-032 05-05-23 12:40 1.5-2.1	BH105-23 BH105-23 T WT2312081 WT2312081-037 05-05-23 13:50 0.0-0.6	BH106-23 BH106-23 2.5-4.5' WT2312081 WT2312081-039 05-05-23 00:00 0.8-1.4	BH106-23 BH106-23 T WT2312081 WT2312081-045 05-05-23 14:40 0.0-0.2	BH107-23 BH107-23 7.5-9.5' WT2312081 WT2312081-049 05-05-23 15:20 2.3-2.9	BH107-23 BH107-23 T WT2312081 WT2312081-053 05-05-23 15:50 0.0-0.3
Petroleum Hydrocarbons (PHCs)													
F1 (C6 to C10)	µg/g	5	25	NV	NV	NV	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
F1 (C6 to C10) minus BTEX	µg/g	5	25	17	25	25	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
F2 (C10 to C16)	µg/g	10	10	10	10	26	<10	<10	<10	<10	<10	<10	<10
F3 (C16 to C34)	µg/g	50	240	240	240	240	<50	<50	<50	<50	<50	<50	<50
F4 (C34 to C50)	µg/g	50	120	2800	2800	3300	<50	<50	<50	<50	<50	<50	<50
Reached Baseline at C50	unitless		NR	NV	NV	NV	YES	YES	YES	YES	YES	YES	YES

Notes:
2020 Excess Soil Quality Standards (ESQS) - As identified in Appendix 1 of the Rules for Soil Management adopted by reference in O.Reg. 406/19 made under the Environmental Protection Act (December 8, 2020)

Bold	- Exceeds Table 1 ESQS (R/P/I or I/C/C)
Bold	- Exceeds Table 2.1 ESQS (Agr.)
Bold	- Exceeds Table 2.1 ESQS (R/P/I)
Bold	- Exceeds Table 2.1 ESQS (I/C/C)

"-" - parameter not analyzed
RDL - Reported detection limit
NR - Not Relevant
NV- No Value
NA - Not Applicable
"<" - Less than the Reporting Detection Limit

Table 203: Benzene, Toluene, Ethyl Benzene, and Xylenes (BTEX) Analysis in Soil

Parameters	Unit	RDL	Table 1 ESQS (R/P/I or I/C/C)	Table 2.1 ESQS (Agr.)	Table 2.1 ESQS (R/P/I)	Table 2.1 ESQS (I/C/C)	Sample Location	BH101-23	BH101-23	BH101-23	BH102-23	BH102-23	BH103-23	BH103-23	BH104-23
							Sample Name	BH101-23 2.5-4.5'	BH101-23 T	BH1101-23 T	BH102-23 5-7'	BH102-23 T	BH103-23 7.5-9.5	BH103-23 T	BH104- 2.5-4.5'
							Lab Job #	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081	WT2312081
							Laboratory ID	WT2312081-002	WT2312081-007	WT2312081-054	WT2312081-010	WT2312081-014	WT2312081-018	WT2312081-021	WT2312081-023
							Sampling Date	05-05-23 08:55	05-05-23 09:35	05-05-23 16:00	05-05-23 09:55	05-05-23 10:30	05-05-23 11:05	05-05-23 11:30	05-05-23 11:50
							Sample Depth (m bgs)	0.8-1.4	0.0-0.6	0.0-0.6	1.5-2.1	0.0-0.6	2.3-2.9	0.0-0.6	0.8-1.4
							Maximum Concentration			Field Duplicate					
Benzene, Toluene, Ethyl Benzene, and Xylenes (BTEX)															
Benzene	µg/g	0.005	0.02	0.02	0.02	0.02	**0.0694**	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	**0.0324**	<0.0050	0.005
Ethylbenzene	µg/g	0.015	0.05	0.05	0.05	0.05	0.032	<0.015	<0.015	<0.015	<0.015	<0.015	0.032	<0.015	<0.015
Toluene	µg/g	0.05	0.2	0.2	0.2	0.2	**0.207**	<0.050	<0.050	<0.050	<0.050	<0.050	**0.207**	<0.050	<0.050
o-Xylene	µg/g	0.03	NR	NV	NV	NV	0.032	<0.030	<0.030	<0.030	<0.030	<0.030	0.032	<0.030	<0.030
m+p-Xylene	µg/g	0.03	NR	NV	NV	NV	0.147	<0.030	<0.030	<0.030	<0.030	<0.030	0.147	<0.030	<0.030
Xylene Mixture	µg/g	0.05	0.05	0.091	0.091	0.091	**0.179**	<0.050	<0.050	<0.050	<0.050	<0.050	**0.179**	<0.050	<0.050

Notes:
2020 Excess Soil Quality Standards (ESQS) - As identified in Appendix 1 of the Rules for Soil Management adopted by reference in O.Reg. 406/19 made under the Environmental Protection Act (December 8, 2020)

Bold	- Exceeds Table 1 ESQS (R/P/I or I/C/C)
Bold	- Exceeds Table 2.1 ESQS (Agr.)
Bold	- Exceeds Table 2.1 ESQS (R/P/I)
Bold	- Exceeds Table 2.1 ESQS (I/C/C)

"-" - parameter not analyzed
RDL - Reported detection limit
NR - Not Relevant
NV- No Value
NA - Not Applicable
"<" - Less than the Reporting Detection Limit

Table 203: Benzene, Toluene, Ethyl Benzene, and Xylenes (BTEX) Analysis in Soil

Parameters	Unit	RDL	Table 1 ESQS (R/P/I or I/C/C)	Table 2.1 ESQS (Agr.)	Table 2.1 ESQS (R/P/I)	Table 2.1 ESQS (I/C/C)	BH104-23 BH104-23 T WT2312081 WT2312081-029 05-05-23 12:20 0.0-0.1	BH105-23 BH105-23 5-7' WT2312081 WT2312081-032 05-05-23 12:40 1.5-2.1	BH105-23 BH105-23 T WT2312081 WT2312081-037 05-05-23 13:50 0.0-0.6	BH106-23 BH106-23 2.5-4.5' WT2312081 WT2312081-039 05-05-23 00:00 0.8-1.4	BH106-23 BH106-23 T WT2312081 WT2312081-045 05-05-23 14:40 0.0-0.2	BH107-23 BH107-23 7.5-9.5' WT2312081 WT2312081-049 05-05-23 15:20 2.3-2.9	BH107-23 BH107-23 T WT2312081 WT2312081-053 05-05-23 15:50 0.0-0.3
Volatile Organic Compounds (VOCs)													
Benzene	µg/g	0.005	0.02	0.02	0.02	0.02	<0.0050	**0.0378**	**0.0694**	<0.0050	<0.0050	<0.0050	<0.0050
Ethylbenzene	µg/g	0.015	0.05	0.05	0.05	0.05	<0.015	0.024	0.02	<0.015	<0.015	<0.015	<0.015
Toluene	µg/g	0.05	0.2	0.2	0.2	0.2	<0.050	0.158	0.196	<0.050	<0.050	<0.050	<0.050
o-Xylene	µg/g	0.03	NR	NV	NV	NV	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
m+p-Xylene	µg/g	0.03	NR	NV	NV	NV	<0.030	0.09	0.062	<0.030	<0.030	<0.030	<0.030
Xylene Mixture	µg/g	0.05	0.05	0.091	0.091	0.091	<0.050	**0.09**	**0.062**	<0.050	<0.050	<0.050	<0.050

Notes:
2020 Excess Soil Quality Standards (ESQS) - As identified in Appendix 1 of the Rules for Soil Management adopted by reference in O.Reg. 406/19 made under the Environmental Protection Act (December 8, 2020)

Bold	- Exceeds Table 1 ESQS (R/P/I or I/C/C)
Bold	- Exceeds Table 2.1 ESQS (Agr.)
Bold	- Exceeds Table 2.1 ESQS (R/P/I)
Bold	- Exceeds Table 2.1 ESQS (I/C/C)

"-" - parameter not analyzed
RDL - Reported detection limit
NR - Not Relevant
NV- No Value
NA - Not Applicable
"<" - Less than the Reporting Detection Limit

Table 204: Organochlorine (OC) Pesticides Analysis in Soil

Parameters	Unit	RDL	Table 1 ESQS (R/P/I or I/C/C)	Table 2.1 ESQS (Agr.)	Table 2.1 ESQS (R/P/I)	Table 2.1 ESQS (I/C/C)		Maximum Concentration	Sample Location	BH101-23	BH103-23	BH105-23	BH107-23
									Sample Name	BH101-23 T	BH103-23 T	BH105-23 T	BH107-23 T
									Lab Job #	WT2312081	WT2312081	WT2312081	WT2312081
									Laboratory ID	WT2312081-007	WT2312081-021	WT2312081-037	WT2312081-053
									Sampling Date	05-05-23 09:35	05-05-23 11:30	05-05-23 13:50	05-05-23 15:50
									Sample Depth (m bgs)	0.0-0.6	0.0-0.6	0.0-0.6	0.0-0.3
Organochlorine Pesticides (OCs)													
alpha-Chlordane	µg/g	0.02	NR	NV	NV	NV	<	0.02		<0.020	<0.020	<0.020	<0.020
gamma-Chlordane	µg/g	0.02	NR	NV	NV	NV	<	0.02		<0.020	<0.020	<0.020	<0.020
Chlordane (Total)	µg/g	0.03	0.05	0.05	0.05	0.05	<	0.03		<0.030	<0.030	<0.030	<0.030
o,p-DDD	µg/g	0.02	NR	NV	NV	NV	<	0.02		<0.020	<0.020	<0.020	<0.020
p,p-DDD	µg/g	0.02	NR	NV	NV	NV	<	0.02		<0.020	<0.020	<0.020	<0.020
o,p-DDD + p,p-DDD	µg/g	0.03	0.05	NV	NV	NV	<	0.03		<0.030	<0.030	<0.030	<0.030
o,p-DDE	µg/g	0.02	NR	NV	NV	NV	<	0.02		<0.020	<0.020	<0.020	<0.020
p,p-DDE	µg/g	0.02	NR	NV	NV	NV	<	0.02		<0.020	<0.020	<0.020	<0.020
o,p-DDE + p,p-DDE	µg/g	0.03	0.05	NV	NV	NV	<	0.03		<0.030	<0.030	<0.030	<0.030
o,p-DDT	µg/g	0.02	NR	NV	NV	NV	<	0.02		<0.020	<0.020	<0.020	<0.020
p,p-DDT	µg/g	0.02	NR	NV	NV	NV	<	0.04		<0.040	<0.040	<0.040	<0.040
o,p-DDT + p,p-DDT	µg/g	0.03	1.4	NV	NV	NV	<	0.045		<0.045	<0.045	<0.045	<0.045
Dieldrin	µg/g	0.02	0.05	0.05	0.05	0.088	<	0.02		<0.020	<0.020	<0.020	<0.020
Endosulfan I	µg/g	0.02	NR	NV	NV	NV	<	0.02		<0.020	<0.020	<0.020	<0.020
Endosulfan II	µg/g	0.02	NR	NV	NV	NV	<	0.02		<0.020	<0.020	<0.020	<0.020
Total Endosulfan	µg/g	0.03	0.04	0.04	0.04	0.04	<	0.03		<0.030	<0.030	<0.030	<0.030
Endrin	µg/g	0.02	0.04	0.04	0.04	0.04	<	0.02		<0.020	<0.020	<0.020	<0.020
Heptachlor	µg/g	0.02	0.05	0.072	0.072	0.072	<	0.02		<0.020	<0.020	<0.020	<0.020
Heptachlor epoxide	µg/g	0.02	0.05	0.05	0.05	0.05	<	0.02		<0.020	<0.020	<0.020	<0.020
Hexachlorobenzene	µg/g	0.01	0.01	0.034	0.034	0.034	<	0.01		<0.010	<0.010	<0.010	<0.010
Hexachlorobutadiene	µg/g	0.01	0.01	0.01	0.01	0.01	<	0.01		<0.010	<0.010	<0.010	<0.010
gamma-Hexachlorocyclohexane (Lindane)	µg/g	0.01	0.01	0.01	0.01	0.01	<	0.01		<0.010	<0.010	<0.010	<0.010
Hexachloroethane	µg/g	0.01	0.01	0.01	0.01	0.01	<	0.01		<0.010	<0.010	<0.010	<0.010
Methoxychlor	µg/g	0.02	0.05	0.13	0.13	0.19	<	0.04		<0.040	<0.040	<0.040	<0.040

Notes:
2020 Excess Soil Quality Standards (ESQS) - As identified in Appendix 1 of the Rules for Soil Management adopted by reference in O.Reg. 406/19 made under the Environmental Protection Act (December 8, 2020)

Bold	- Exceeds Table 1 ESQS (R/P/I or I/C/C)
Bold	- Exceeds Table 2.1 ESQS (Agr.)
Bold	- Exceeds Table 2.1 ESQS (R/P/I)
Bold	- Exceeds Table 2.1 ESQS (I/C/C)

"-" - parameter not analyzed
RDL - Reported detection limit
NR - Not Relevant
NV- No Value
NA - Not Applicable
"<" - Less than the Reporting Detection Limit

Appendix A

Borehole Logs

ID No.: BH101-23

Project Name: Blair Creek Drive Extension

MTE File No.: 53018-100

Client: City of Kitchener

Site Location: Blair Creek Drive, Kitchener, ON

Date Completed: 5/5/2023

Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track Mounted

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone – Standard Penetration	Shear Strength (PP) kPa / Shear Strength (FV) kPa	Water Content %	Groundwater Observations and Standpipe Details
0 / 0		Ground Surface	333.8						
		TOPSOIL dark brown sandy silt, very moist (200mm)	0.0	1	SS	11		5	
2 /		**SAND AND GRAVEL** compact brown sand and gravel, trace silt, moist		2	SS	17		4	
4 /			332.3						
		SAND compact light brown sand, some gravel, trace silt and clay, moist to very moist	1.5	3	SS	15		4	
6 / 2				4	SS	29		8	
8 /			330.8						
10 /		**SILTY SAND** dense brown silty sand, some gravel, moist	3.0	5	SS	49		3	
12 /									
14 / 4			329.2						
		SAND compact brown sand, trace silt, moist	4.6	6	SS	26		5	
16 /			328.6						
18 /		Drilling Terminated	5.2						
20 / 6									
22 /									

Dynamic Cone – Standard Penetration: 20 40 60 80

Shear Strength (PP) kPa / Shear Strength (FV) kPa: 50 100 150 200

Water Content %: 10 20 30

Groundwater Observations and Standpipe Details: ← Cuttings; ← Dry Cave

Borehole dry upon drilling completion

Field Technician: C. McCulla

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

ID No.: BH102-23

Project Name: Blair Creek Drive Extension

MTE File No.: 53018-100

Client: City of Kitchener

Site Location: Blair Creek Drive, Kitchener, ON

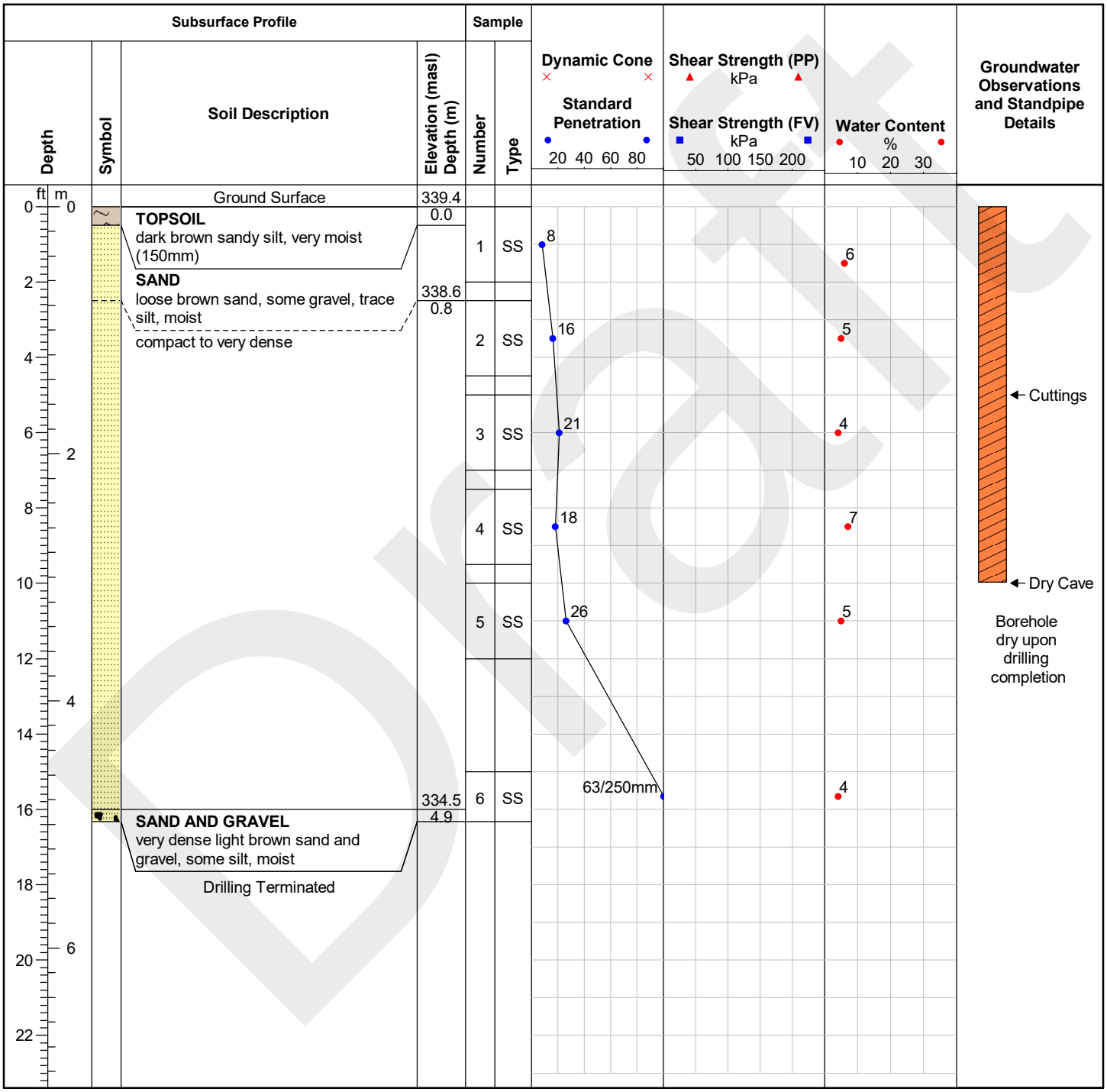
Date Completed: 5/5/2023

Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track Mounted

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: C. McCulla

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

Sheet: 1 of 1

ID No.: BH103-23

Project Name: Blair Creek Drive Extension

MTE File No.: 53018-100

Client: City of Kitchener

Site Location: Blair Creek Drive, Kitchener, ON

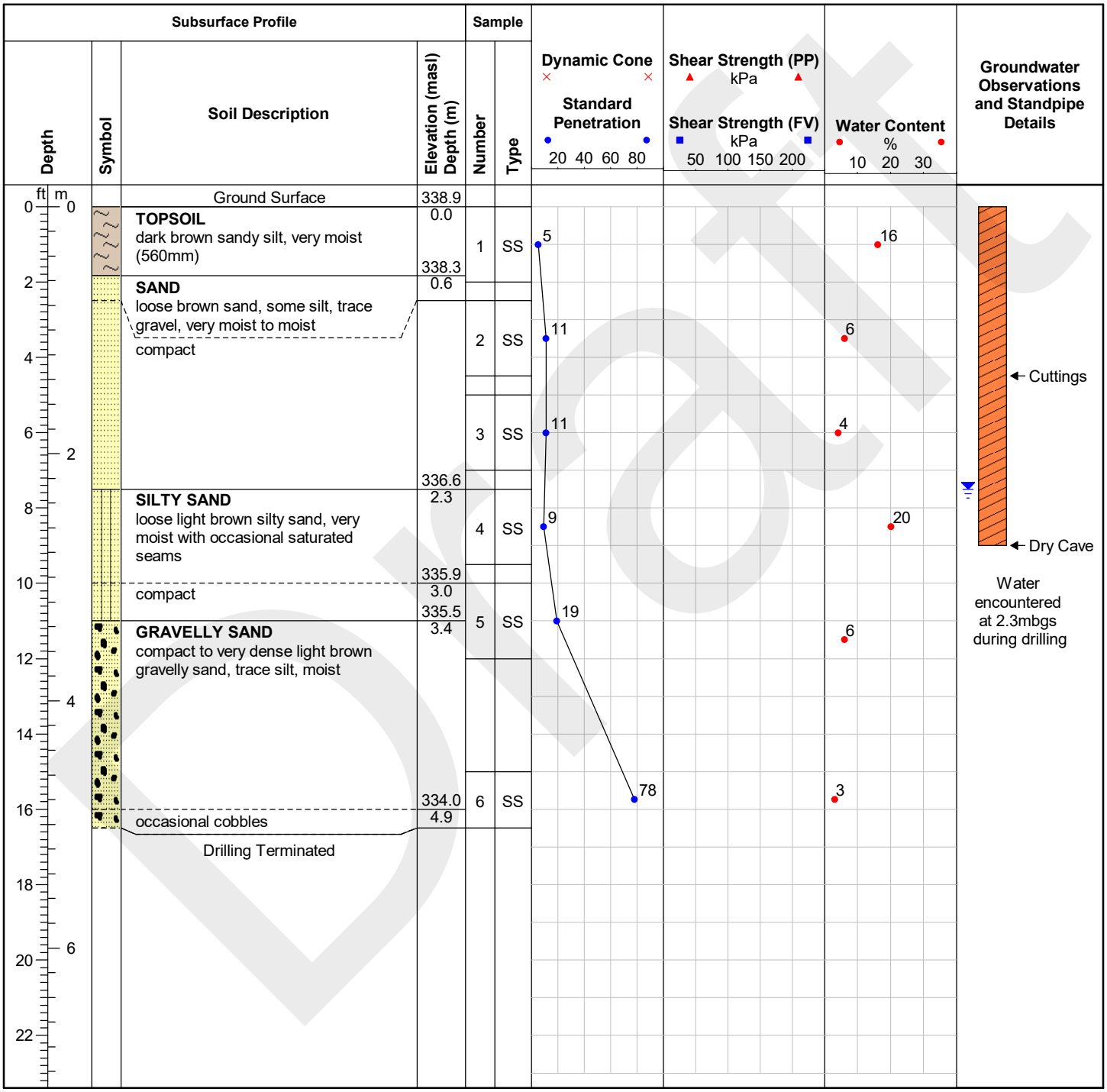
Date Completed: 5/5/2023

Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track Mounted

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: C. McCulla

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

Sheet: 1 of 1

ID No.: BH104-23

Project Name: Blair Creek Drive Extension

MTE File No.: 53018-100

Client: City of Kitchener

Site Location: Blair Creek Drive, Kitchener, ON

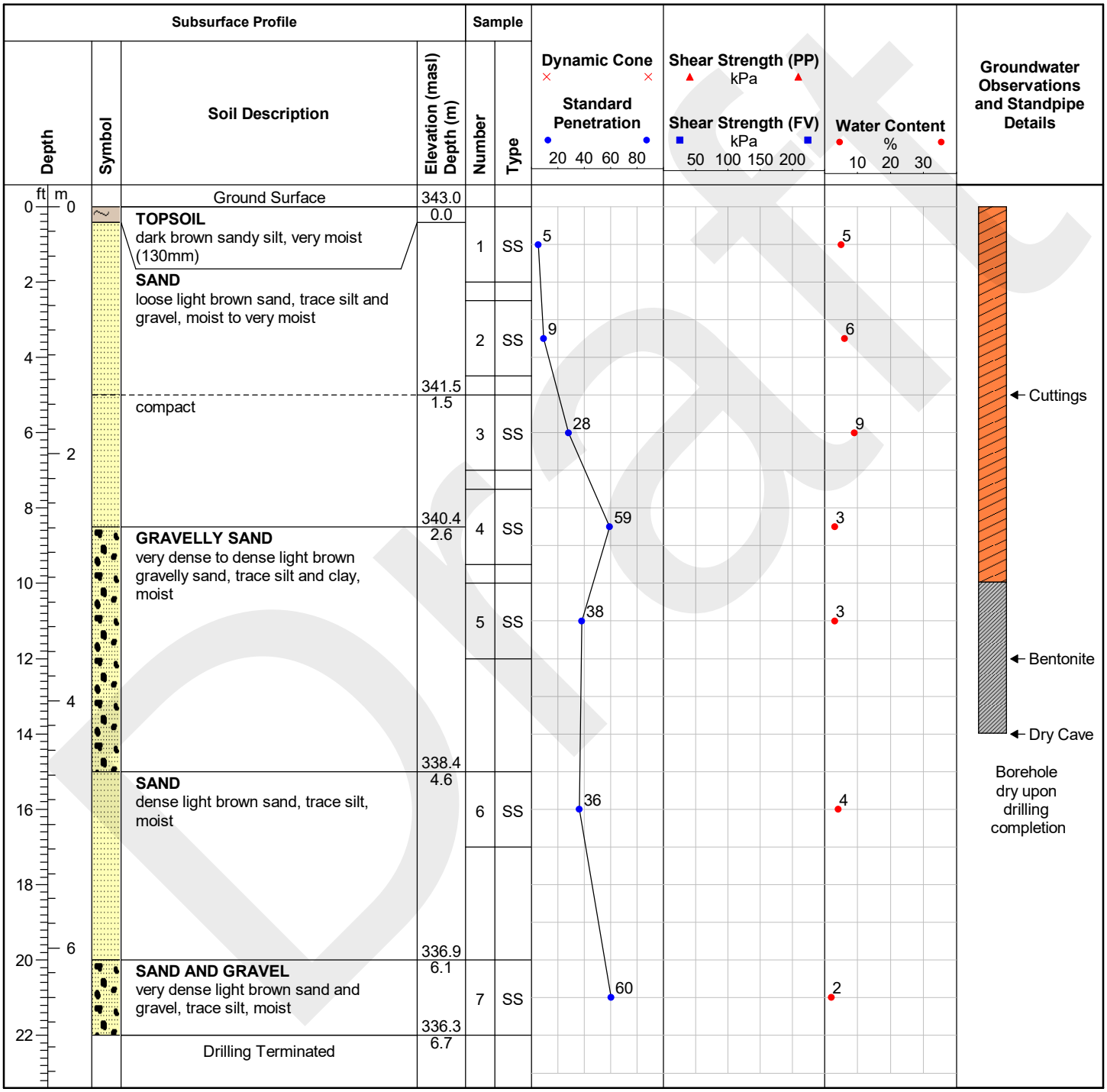
Date Completed: 5/5/2023

Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track Mounted

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: C. McCulla

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

Sheet: 1 of 1

ID No.: BH105-23

Project Name: Blair Creek Drive Extension

MTE File No.: 53018-100

Client: City of Kitchener

Site Location: Blair Creek Drive, Kitchener, ON

Date Completed: 5/5/2023

Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track Mounted

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Depth (ft)	Depth (m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone / Standard Penetration	Shear Strength (PP) kPa / Shear Strength (FV) kPa	Water Content %	Groundwater Observations and Standpipe Details
			Ground Surface	342.1						
0	0		**TOPSOIL** dark brown sandy silt, very moist (180mm)	0.0	1	SS	4		14	
2			**SANDY SILT** loose brown sandy silt, trace clay, very moist	341.3 / 0.8	2	SS	14		12	
4			**SILTY SAND** compact light brown silty sand, trace gravel and clay, very moist	340.6 / 1.5	3	SS	14		8	Cuttings
6	2		**SAND** compact light brown sand, trace silt and gravel, very moist to moist		4	SS	12		4	
8										
10			occasional cobbles	338.7 / 3.4	5	SS	22		3	
12	4									Bentonite
14										Dry Cave
16					6	SS	15		3	Borehole dry upon drilling completion
18										
20	6		**SAND AND GRAVEL** compact grey sand and gravel, some silt, damp to moist	336.0 / 6.1	7	SS	24		1	
22			Drilling Terminated	335.4 / 6.7						

Field Technician: C. McCulla

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

Sheet: 1 of 1

ID No.: BH106-23

Project Name: Blair Creek Drive Extension

MTE File No.: 53018-100

Client: City of Kitchener

Site Location: Blair Creek Drive, Kitchener, ON

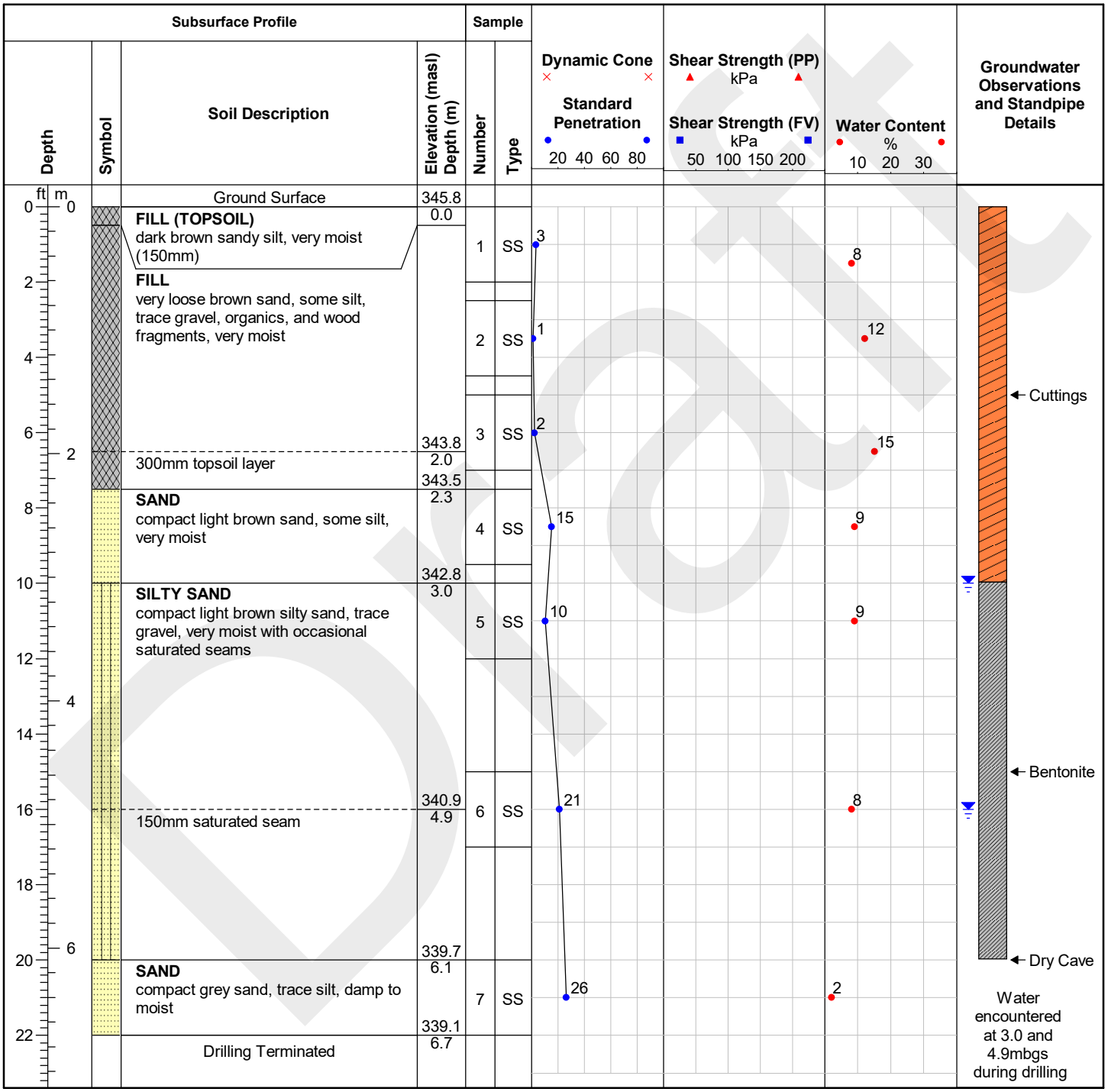
Date Completed: 5/5/2023

Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track Mounted

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: C. McCulla

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

Sheet: 1 of 1

ID No.: BH107-23

Project Name: Blair Creek Drive Extension

MTE File No.: 53018-100

Client: City of Kitchener

Site Location: Blair Creek Drive, Kitchener, ON

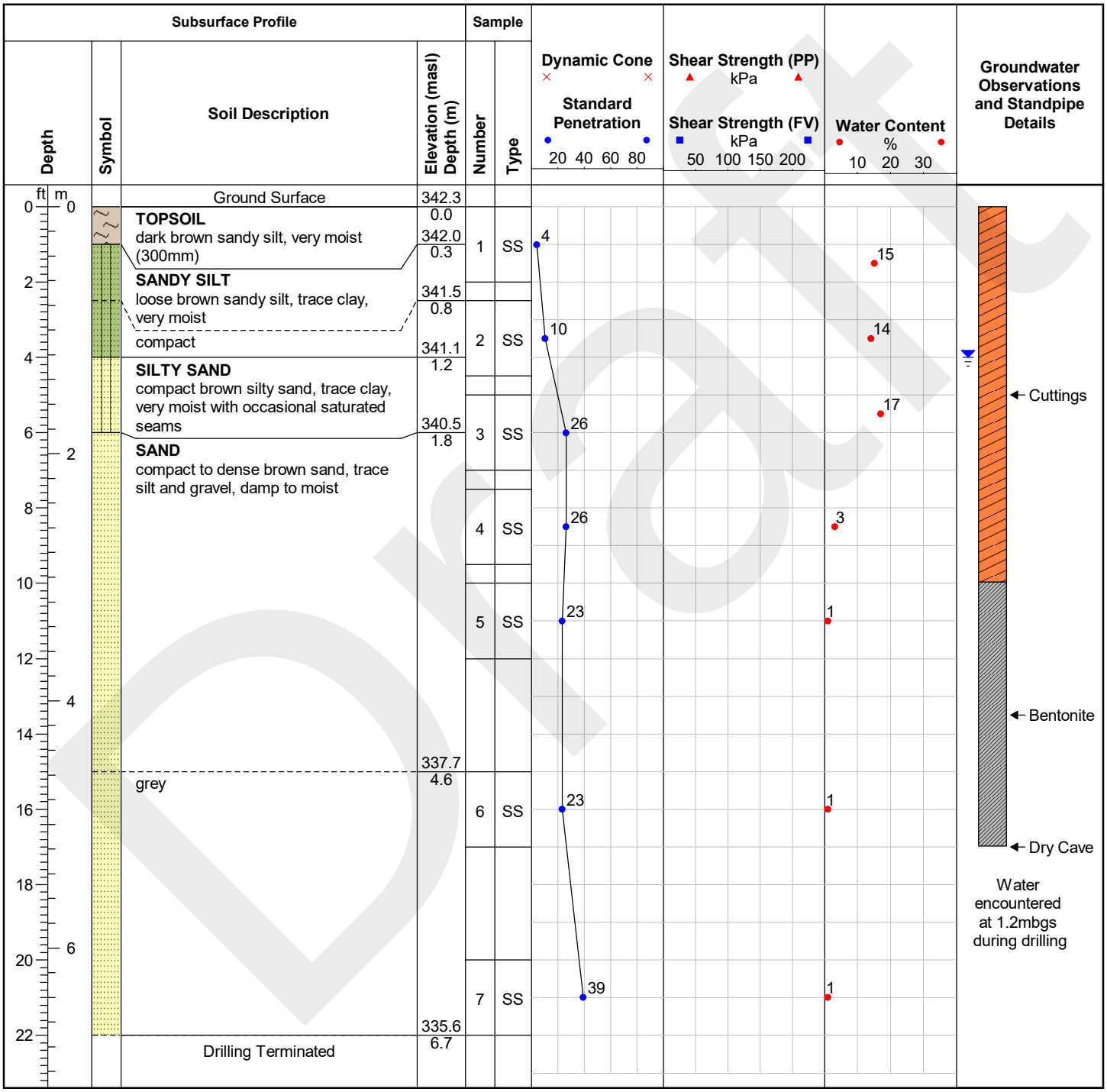
Date Completed: 5/5/2023

Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track Mounted

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: C. McCulla

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

Appendix B

Laboratory Certificates of Analysis

ALS Canada Ltd.

right solutions.
right partner.

CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

Work Order	: **WT2312081**	Page	: 1 of 37
Client	: **MTE Consultants Inc.**	Laboratory	: Waterloo - Environmental
Contact	: Jen Lambke	Account Manager	: Emily Hansen
Address	: 520 Bingemans Centre Drive Kitchener ON Canada N2B 3X9	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 519 743 6500	Telephone	: +1 519 886 6910
Project	: 53018-100 Blair Creek	Date Samples Received	: 05-May-2023 19:30
PO	: ----	Date Analysis Commenced	: 09-May-2023
C-O-C number	: ----	Issue Date	: 17-May-2023 17:01
Sampler	: client		
Site	: ----		
Quote number	: Q79143 - CoK Roads Recon Program		
No. of samples received	: 62		
No. of samples analysed	: 15		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Guideline Comparison

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Centralized Prep, Waterloo, Ontario
Amaninder Dhillon	Team Lead - Semi-Volatile Instrumentation	Organics, Waterloo, Ontario
Andrea Armstrong	Department Manager - Air Quality and Volatiles	VOC, Waterloo, Ontario
Greg Pokocky	Manager - Inorganics	Inorganics, Waterloo, Ontario
Greg Pokocky	Manager - Inorganics	Metals, Waterloo, Ontario
Jocelyn Kennedy	Department Manager - Semi-Volatile Organics	Organics, Waterloo, Ontario

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.
Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guidelines are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Key : LOR: Limit of Reporting (detection limit).

Unit	*Description*
%	percent
µg/g	micrograms per gram
mg/kg	milligrams per kilogram
pH units	pH units

>: greater than.
<: less than.
Red shading is applied where the result or the LOR is greater than the Guideline Upper Limit (or lower than the Guideline Lower Limit, if applicable).
For drinking water samples, Red shading is applied where the result for E.coli, fecal or total coliforms is greater than or equal to the Guideline Upper Limit .

Qualifiers

Qualifier	*Description*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*
SHMI	*Surrogate recovery was outside ALS DQO (High) due to Matrix Interference*

Analytical Results

Sub-Matrix: **Solid**
(Matrix: **Soil/Solid**)

Analyte	Method/Lab	LOR	Unit	Client sample ID: BH101-23 2.5-4.5'	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
				Sampling date/time: 05-May-2023 08:55						
				WT2312081-002						
Physical Tests										
Moisture	E144/WT	0.25	%	3.81	--	--	--	--	--	--
pH (1:2 soil:CaCl2-aq)	E108A/WT	0.10	pH units	8.05	--	--	--	--	--	--
Metals										
Antimony	E440C/WT	0.10	mg/kg	<0.10	1.3 mg/kg	7.5 mg/kg	40 mg/kg	7.5 mg/kg	--	--
Arsenic	E440C/WT	0.10	mg/kg	4.52	18 mg/kg	11 mg/kg	18 mg/kg	18 mg/kg	--	--
Barium	E440C/WT	0.50	mg/kg	20.2	220 mg/kg	390 mg/kg	670 mg/kg	390 mg/kg	--	--
Beryllium	E440C/WT	0.10	mg/kg	0.22	2.5 mg/kg	4 mg/kg	8 mg/kg	4 mg/kg	--	--
Boron	E440C/WT	5.0	mg/kg	12.5	36 mg/kg	120 mg/kg	120 mg/kg	120 mg/kg	--	--
Cadmium	E440C/WT	0.020	mg/kg	0.208	1.2 mg/kg	1 mg/kg	1.9 mg/kg	1.2 mg/kg	--	--
Chromium	E440C/WT	0.50	mg/kg	8.87	70 mg/kg	160 mg/kg	160 mg/kg	160 mg/kg	--	--
Cobalt	E440C/WT	0.10	mg/kg	3.81	21 mg/kg	22 mg/kg	80 mg/kg	22 mg/kg	--	--
Copper	E440C/WT	0.50	mg/kg	22.3	92 mg/kg	140 mg/kg	230 mg/kg	140 mg/kg	--	--
Lead	E440C/WT	0.50	mg/kg	18.2	120 mg/kg	45 mg/kg	120 mg/kg	120 mg/kg	--	--
Molybdenum	E440C/WT	0.10	mg/kg	0.41	2 mg/kg	6.9 mg/kg	40 mg/kg	6.9 mg/kg	--	--
Nickel	E440C/WT	0.50	mg/kg	7.62	82 mg/kg	100 mg/kg	270 mg/kg	100 mg/kg	--	--
Selenium	E440C/WT	0.20	mg/kg	<0.20	1.5 mg/kg	2.4 mg/kg	5.5 mg/kg	2.4 mg/kg	--	--
Silver	E440C/WT	0.10	mg/kg	<0.10	0.5 mg/kg	20 mg/kg	40 mg/kg	20 mg/kg	--	--
Thallium	E440C/WT	0.050	mg/kg	0.088	1 mg/kg	1 mg/kg	3.3 mg/kg	1 mg/kg	--	--
Uranium	E440C/WT	0.050	mg/kg	0.568	2.5 mg/kg	23 mg/kg	33 mg/kg	23 mg/kg	--	--
Vanadium	E440C/WT	0.20	mg/kg	15.1	86 mg/kg	86 mg/kg	86 mg/kg	86 mg/kg	--	--
Zinc	E440C/WT	2.0	mg/kg	113	290 mg/kg	340 mg/kg	340 mg/kg	340 mg/kg	--	--
Volatile Organic Compounds										
Benzene	E611A/WT	0.0050	µg/g	<0.0050	0.02 µg/g	0.02 µg/g	0.02 µg/g	0.02 µg/g	--	--
Ethylbenzene	E611A/WT	0.015	µg/g	<0.015	0.05 µg/g	0.05 µg/g	0.05 µg/g	0.05 µg/g	--	--
Toluene	E611A/WT	0.050	µg/g	<0.050	0.2 µg/g	0.2 µg/g	0.2 µg/g	0.2 µg/g	--	--
Xylene, m+p-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylene, o-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylenes, total	E611A/WT	0.050	µg/g	<0.050	0.05 µg/g	0.091 µg/g	0.091 µg/g	0.091 µg/g	--	--
BTEX, total	E611A/WT	0.10	µg/g	<0.10	--	--	--	--	--	--
Hydrocarbons										
F1 (C6-C10)	E581.F1/WT	5.0	µg/g	<5.0	25 µg/g	17 µg/g	25 µg/g	25 µg/g	--	--
F2 (C10-C16)	E601.SG-L/WT	10	µg/g	<10	10 µg/g	10 µg/g	26 µg/g	10 µg/g	--	--

Analyte	Method/Lab	LOR	Unit	WT2312081-002 (Continued)	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Hydrocarbons - Continued										
F3 (C16-C34)	E601.SG-L/WT	50	µg/g	<50	**240 µg/g**	**240 µg/g**	**240 µg/g**	**240 µg/g**	--	--
F4 (C34-C50)	E601.SG-L/WT	50	µg/g	<50	**120 µg/g**	**2800 µg/g**	**3300 µg/g**	**2800 µg/g**	--	--
F1-BTEX	EC580/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
Hydrocarbons, total (C6-C50)	EC581/WT	80	µg/g	<80	--	--	--	--	--	--
Chromatogram to baseline at nC50	E601.SG-L/WT		µg/g	YES	--	--	--	--	--	--
Bromobenzotrifluoride, 2- (F2-F4 surrogate)	E601.SG-L/WT	1.0	%	78.7	--	--	--	--	--	--
Dichlorotoluene, 3,4-	E581.F1/WT	1.0	%	83.2	--	--	--	--	--	--
Bromofluorobenzene, 4-	E611A/WT	0.10	%	88.8	--	--	--	--	--	--
Difluorobenzene, 1,4-	E611A/WT	0.10	%	95.9	--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

No Breaches Found

Key:

ON406/20	Ontario Regulation 406/19 - Excess Soils - 17-December-20
T1-RPIICC	406 T1 - Soil - Res/Park/Inst/Ind/Com/Commu Property Use
T2.1-S-AG	406 T2.1 - Volume Independent Soil - Agricultural or Other Property Use
T2.1-S-ICC	406 T2.1 - Volume Independent Soil - Ind/Com/Commu Property Use
T2.1-S-RPI	406 T2.1 - Volume Independent Soil - Res/Park/Inst Property Use

Analytical Results

Sub-Matrix: **Solid**
(Matrix: **Soil/Solid**)

Analyte	Method/Lab	LOR	Unit	Client sample ID: BH101-23 T Sampling date/time: 05-May-2023 09:35 WT2312081-007	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Physical Tests										
Moisture	E144/WT	0.25	%	13.2	--	--	--	--	--	--
pH (1:2 soil:CaCl2-aq)	E108A/WT	0.10	pH units	7.23	--	--	--	--	--	--
Metals										
Antimony	E440C/WT	0.10	mg/kg	0.25	**1.3 mg/kg**	**7.5 mg/kg**	**40 mg/kg**	**7.5 mg/kg**	--	--
Arsenic	E440C/WT	0.10	mg/kg	4.27	**18 mg/kg**	**11 mg/kg**	**18 mg/kg**	**18 mg/kg**	--	--
Barium	E440C/WT	0.50	mg/kg	51.4	**220 mg/kg**	**390 mg/kg**	**670 mg/kg**	**390 mg/kg**	--	--
Beryllium	E440C/WT	0.10	mg/kg	0.41	**2.5 mg/kg**	**4 mg/kg**	**8 mg/kg**	**4 mg/kg**	--	--
Boron	E440C/WT	5.0	mg/kg	7.0	**36 mg/kg**	**120 mg/kg**	**120 mg/kg**	**120 mg/kg**	--	--
Cadmium	E440C/WT	0.020	mg/kg	0.352	**1.2 mg/kg**	**1 mg/kg**	**1.9 mg/kg**	**1.2 mg/kg**	--	--
Chromium	E440C/WT	0.50	mg/kg	23.8	**70 mg/kg**	**160 mg/kg**	**160 mg/kg**	**160 mg/kg**	--	--
Cobalt	E440C/WT	0.10	mg/kg	5.28	**21 mg/kg**	**22 mg/kg**	**80 mg/kg**	**22 mg/kg**	--	--
Copper	E440C/WT	0.50	mg/kg	35.0	**92 mg/kg**	**140 mg/kg**	**230 mg/kg**	**140 mg/kg**	--	--
Lead	E440C/WT	0.50	mg/kg	24.6	**120 mg/kg**	**45 mg/kg**	**120 mg/kg**	**120 mg/kg**	--	--
Molybdenum	E440C/WT	0.10	mg/kg	0.57	**2 mg/kg**	**6.9 mg/kg**	**40 mg/kg**	**6.9 mg/kg**	--	--
Nickel	E440C/WT	0.50	mg/kg	12.0	**82 mg/kg**	**100 mg/kg**	**270 mg/kg**	**100 mg/kg**	--	--
Selenium	E440C/WT	0.20	mg/kg	0.28	**1.5 mg/kg**	**2.4 mg/kg**	**5.5 mg/kg**	**2.4 mg/kg**	--	--
Silver	E440C/WT	0.10	mg/kg	0.36	**0.5 mg/kg**	**20 mg/kg**	**40 mg/kg**	**20 mg/kg**	--	--
Thallium	E440C/WT	0.050	mg/kg	0.095	**1 mg/kg**	**1 mg/kg**	**3.3 mg/kg**	**1 mg/kg**	--	--
Uranium	E440C/WT	0.050	mg/kg	0.830	**2.5 mg/kg**	**23 mg/kg**	**33 mg/kg**	**23 mg/kg**	--	--
Vanadium	E440C/WT	0.20	mg/kg	31.0	**86 mg/kg**	**86 mg/kg**	**86 mg/kg**	**86 mg/kg**	--	--
Zinc	E440C/WT	2.0	mg/kg	151	**290 mg/kg**	**340 mg/kg**	**340 mg/kg**	**340 mg/kg**	--	--
Volatile Organic Compounds										
Benzene	E611A/WT	0.0050	µg/g	<0.0050	**0.02 µg/g**	**0.02 µg/g**	**0.02 µg/g**	**0.02 µg/g**	--	--
Ethylbenzene	E611A/WT	0.015	µg/g	<0.015	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	--	--
Toluene	E611A/WT	0.050	µg/g	<0.050	**0.2 µg/g**	**0.2 µg/g**	**0.2 µg/g**	**0.2 µg/g**	--	--
Xylene, m+p-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylene, o-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylenes, total	E611A/WT	0.050	µg/g	<0.050	**0.05 µg/g**	**0.091 µg/g**	**0.091 µg/g**	**0.091 µg/g**	--	--
BTEX, total	E611A/WT	0.10	µg/g	<0.10	--	--	--	--	--	--
Hydrocarbons										
F1 (C6-C10)	E581.F1/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
F2 (C10-C16)	E601.SG-L/WT	10	µg/g	<10	**10 µg/g**	**10 µg/g**	**26 µg/g**	**10 µg/g**	--	--

Analyte	Method/Lab	LOR	Unit	WT2312081-007 (Continued)	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Hydrocarbons - Continued										
F3 (C16-C34)	E601.SG-L/WT	50	µg/g	<50	**240 µg/g**	**240 µg/g**	**240 µg/g**	**240 µg/g**	--	--
F4 (C34-C50)	E601.SG-L/WT	50	µg/g	<50	**120 µg/g**	**2800 µg/g**	**3300 µg/g**	**2800 µg/g**	--	--
F1-BTEX	EC580/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
Hydrocarbons, total (C6-C50)	EC581/WT	80	µg/g	<80	--	--	--	--	--	--
Chromatogram to baseline at nC50	E601.SG-L/WT		µg/g	YES	--	--	--	--	--	--
Bromobenzotrifluoride, 2- (F2-F4 surrogate)	E601.SG-L/WT	1.0	%	74.3	--	--	--	--	--	--
Dichlorotoluene, 3,4-	E581.F1/WT	1.0	%	83.0	--	--	--	--	--	--
Bromofluorobenzene, 4-	E611A/WT	0.10	%	89.6	--	--	--	--	--	--
Difluorobenzene, 1,4-	E611A/WT	0.10	%	102	--	--	--	--	--	--
Organochlorine Pesticides										
Aldrin	E660F/WT	0.020	µg/g	<0.020	**0.05 µg/g**	**0.05 µg/g**	**0.088 µg/g**	**0.05 µg/g**	--	--
Chlordane, cis- (alpha)	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
Chlordane, total	E660F/WT	0.030	µg/g	<0.030	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	--	--
Chlordane, trans- (gamma)	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDD, 2,4'-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDD, 4,4'-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDD, total	E660F/WT	0.030	µg/g	<0.030	**0.05 µg/g**	**3.3 µg/g**	**4.6 µg/g**	**3.3 µg/g**	--	--
DDE, 2,4'-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDE, 4,4'-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDE, total	E660F/WT	0.030	µg/g	<0.030	**0.05 µg/g**	**0.26 µg/g**	**0.52 µg/g**	**0.26 µg/g**	--	--
DDT, 2,4'-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDT, 4,4'-	E660F/WT	0.020	µg/g	<0.040 DLM	--	--	--	--	--	--
DDT, total	E660F/WT	0.030	µg/g	<0.045	**1.4 µg/g**	**0.078 µg/g**	**1.4 µg/g**	**1.4 µg/g**	--	--
Dieldrin	E660F/WT	0.020	µg/g	<0.020	**0.05 µg/g**	**0.05 µg/g**	**0.088 µg/g**	**0.05 µg/g**	--	--
Endosulfan, alpha-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
Endosulfan, beta-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
Endosulfan, total	E660F/WT	0.030	µg/g	<0.030	**0.04 µg/g**	**0.04 µg/g**	**0.04 µg/g**	**0.04 µg/g**	--	--
Endrin	E660F/WT	0.020	µg/g	<0.020	**0.04 µg/g**	**0.04 µg/g**	**0.04 µg/g**	**0.04 µg/g**	--	--
Heptachlor epoxide	E660F/WT	0.020	µg/g	<0.020	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	--	--
Heptachlor	E660F/WT	0.020	µg/g	<0.020	**0.05 µg/g**	**0.072 µg/g**	**0.072 µg/g**	**0.072 µg/g**	--	--
Hexachlorobenzene	E660F/WT	0.010	µg/g	<0.010	**0.01 µg/g**	**0.034 µg/g**	**0.034 µg/g**	**0.034 µg/g**	--	--
Hexachlorobutadiene	E660F/WT	0.010	µg/g	<0.010	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	--	--
Hexachlorocyclohexane, gamma-	E660F/WT	0.010	µg/g	<0.010	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	--	--
Hexachloroethane	E660F/WT	0.010	µg/g	<0.010	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	--	--

Analyte	Method/Lab	LOR	Unit	WT2312081-007 (Continued)	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Organochlorine Pesticides - Continued										
Methoxychlor	E660F/WT	0.020	µg/g	<0.040 DLM	**0.05 µg/g**	**0.24 µg/g**	**0.19 µg/g**	**0.13 µg/g**	--	--
Decachlorobiphenyl	E660F/WT	0.1	%	79.4	--	--	--	--	--	--
Tetrachloro-m-xylene	E660F/WT	0.1	%	106	--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

No Breaches Found

Key:

ON406/20	Ontario Regulation 406/19 - Excess Soils - 17-December-20
T1-RPIICC	406 T1 - Soil - Res/Park/Inst/Ind/Com/Commu Property Use
T2.1-S-AG	406 T2.1 - Volume Independent Soil - Agricultural or Other Property Use
T2.1-S-ICC	406 T2.1 - Volume Independent Soil - Ind/Com/Commu Property Use
T2.1-S-RPI	406 T2.1 - Volume Independent Soil - Res/Park/Inst Property Use

Analytical Results

Sub-Matrix: **Solid**
(Matrix: **Soil/Solid**)

Analyte	Method/Lab	LOR	Unit	Client sample ID: BH102-23 5-7'	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
				Sampling date/time: 05-May-2023 09:55						
				WT2312081-010						
Physical Tests										
Moisture	E144/WT	0.25	%	3.43	--	--	--	--	--	--
Metals										
Antimony	E440C/WT	0.10	mg/kg	<0.10	**1.3 mg/kg**	**7.5 mg/kg**	**40 mg/kg**	**7.5 mg/kg**	--	--
Arsenic	E440C/WT	0.10	mg/kg	4.08	**18 mg/kg**	**11 mg/kg**	**18 mg/kg**	**18 mg/kg**	--	--
Barium	E440C/WT	0.50	mg/kg	19.0	**220 mg/kg**	**390 mg/kg**	**670 mg/kg**	**390 mg/kg**	--	--
Beryllium	E440C/WT	0.10	mg/kg	0.22	**2.5 mg/kg**	**4 mg/kg**	**8 mg/kg**	**4 mg/kg**	--	--
Boron	E440C/WT	5.0	mg/kg	10.7	**36 mg/kg**	**120 mg/kg**	**120 mg/kg**	**120 mg/kg**	--	--
Cadmium	E440C/WT	0.020	mg/kg	0.212	**1.2 mg/kg**	**1 mg/kg**	**1.9 mg/kg**	**1.2 mg/kg**	--	--
Chromium	E440C/WT	0.50	mg/kg	8.21	**70 mg/kg**	**160 mg/kg**	**160 mg/kg**	**160 mg/kg**	--	--
Cobalt	E440C/WT	0.10	mg/kg	4.12	**21 mg/kg**	**22 mg/kg**	**80 mg/kg**	**22 mg/kg**	--	--
Copper	E440C/WT	0.50	mg/kg	20.0	**92 mg/kg**	**140 mg/kg**	**230 mg/kg**	**140 mg/kg**	--	--
Lead	E440C/WT	0.50	mg/kg	20.6	**120 mg/kg**	**45 mg/kg**	**120 mg/kg**	**120 mg/kg**	--	--
Molybdenum	E440C/WT	0.10	mg/kg	0.75	**2 mg/kg**	**6.9 mg/kg**	**40 mg/kg**	**6.9 mg/kg**	--	--
Nickel	E440C/WT	0.50	mg/kg	9.29	**82 mg/kg**	**100 mg/kg**	**270 mg/kg**	**100 mg/kg**	--	--
Selenium	E440C/WT	0.20	mg/kg	<0.20	**1.5 mg/kg**	**2.4 mg/kg**	**5.5 mg/kg**	**2.4 mg/kg**	--	--
Silver	E440C/WT	0.10	mg/kg	<0.10	**0.5 mg/kg**	**20 mg/kg**	**40 mg/kg**	**20 mg/kg**	--	--
Thallium	E440C/WT	0.050	mg/kg	0.086	**1 mg/kg**	**1 mg/kg**	**3.3 mg/kg**	**1 mg/kg**	--	--
Uranium	E440C/WT	0.050	mg/kg	0.748	**2.5 mg/kg**	**23 mg/kg**	**33 mg/kg**	**23 mg/kg**	--	--
Vanadium	E440C/WT	0.20	mg/kg	16.8	**86 mg/kg**	**86 mg/kg**	**86 mg/kg**	**86 mg/kg**	--	--
Zinc	E440C/WT	2.0	mg/kg	126	**290 mg/kg**	**340 mg/kg**	**340 mg/kg**	**340 mg/kg**	--	--
Volatile Organic Compounds										
Benzene	E611A/WT	0.0050	µg/g	<0.0050	**0.02 µg/g**	**0.02 µg/g**	**0.02 µg/g**	**0.02 µg/g**	--	--
Ethylbenzene	E611A/WT	0.015	µg/g	<0.015	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	--	--
Toluene	E611A/WT	0.050	µg/g	<0.050	**0.2 µg/g**	**0.2 µg/g**	**0.2 µg/g**	**0.2 µg/g**	--	--
Xylene, m+p-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylene, o-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylenes, total	E611A/WT	0.050	µg/g	<0.050	**0.05 µg/g**	**0.091 µg/g**	**0.091 µg/g**	**0.091 µg/g**	--	--
BTEX, total	E611A/WT	0.10	µg/g	<0.10	--	--	--	--	--	--
Hydrocarbons										
F1 (C6-C10)	E581.F1/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
F2 (C10-C16)	E601.SG-L/WT	10	µg/g	<10	**10 µg/g**	**10 µg/g**	**26 µg/g**	**10 µg/g**	--	--
F3 (C16-C34)	E601.SG-L/WT	50	µg/g	<50	**240 µg/g**	**240 µg/g**	**240 µg/g**	**240 µg/g**	--	--

Analyte	Method/Lab	LOR	Unit	WT2312081-010 (Continued)	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Hydrocarbons - Continued										
F4 (C34-C50)	E601.SG-L/WT	50	µg/g	<50	**120 µg/g**	**2800 µg/g**	**3300 µg/g**	**2800 µg/g**	--	--
F1-BTEX	EC580/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
Hydrocarbons, total (C6-C50)	EC581/WT	80	µg/g	<80	--	--	--	--	--	--
Chromatogram to baseline at nC50	E601.SG-L/WT		µg/g	YES	--	--	--	--	--	--
Bromobenzotrifluoride, 2- (F2-F4 surrogate)	E601.SG-L/WT	1.0	%	90.5	--	--	--	--	--	--
Dichlorotoluene, 3,4-	E581.F1/WT	1.0	%	100	--	--	--	--	--	--
Bromofluorobenzene, 4-	E611A/WT	0.10	%	92.9	--	--	--	--	--	--
Difluorobenzene, 1,4-	E611A/WT	0.10	%	102	--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

No Breaches Found

Key:

ON406/20	Ontario Regulation 406/19 - Excess Soils - 17-December-20
T1-RPIICC	406 T1 - Soil - Res/Park/Inst/Ind/Com/Commu Property Use
T2.1-S-AG	406 T2.1 - Volume Independent Soil - Agricultural or Other Property Use
T2.1-S-ICC	406 T2.1 - Volume Independent Soil - Ind/Com/Commu Property Use
T2.1-S-RPI	406 T2.1 - Volume Independent Soil - Res/Park/Inst Property Use

Analytical Results

Sub-Matrix: **Solid**
(Matrix: **Soil/Solid**)

Analyte	Method/Lab	LOR	Unit	Client sample ID: BH102-23 T Sampling date/time: 05-May-2023 10:30 WT2312081-014	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Physical Tests										
Moisture	E144/WT	0.25	%	7.69	--	--	--	--	--	--
Metals										
Antimony	E440C/WT	0.10	mg/kg	0.17	**1.3 mg/kg**	**7.5 mg/kg**	**40 mg/kg**	**7.5 mg/kg**	--	--
Arsenic	E440C/WT	0.10	mg/kg	3.68	**18 mg/kg**	**11 mg/kg**	**18 mg/kg**	**18 mg/kg**	--	--
Barium	E440C/WT	0.50	mg/kg	38.0	**220 mg/kg**	**390 mg/kg**	**670 mg/kg**	**390 mg/kg**	--	--
Beryllium	E440C/WT	0.10	mg/kg	0.29	**2.5 mg/kg**	**4 mg/kg**	**8 mg/kg**	**4 mg/kg**	--	--
Boron	E440C/WT	5.0	mg/kg	8.2	**36 mg/kg**	**120 mg/kg**	**120 mg/kg**	**120 mg/kg**	--	--
Cadmium	E440C/WT	0.020	mg/kg	0.312	**1.2 mg/kg**	**1 mg/kg**	**1.9 mg/kg**	**1.2 mg/kg**	--	--
Chromium	E440C/WT	0.50	mg/kg	13.8	**70 mg/kg**	**160 mg/kg**	**160 mg/kg**	**160 mg/kg**	--	--
Cobalt	E440C/WT	0.10	mg/kg	4.58	**21 mg/kg**	**22 mg/kg**	**80 mg/kg**	**22 mg/kg**	--	--
Copper	E440C/WT	0.50	mg/kg	29.6	**92 mg/kg**	**140 mg/kg**	**230 mg/kg**	**140 mg/kg**	--	--
Lead	E440C/WT	0.50	mg/kg	19.2	**120 mg/kg**	**45 mg/kg**	**120 mg/kg**	**120 mg/kg**	--	--
Molybdenum	E440C/WT	0.10	mg/kg	0.42	**2 mg/kg**	**6.9 mg/kg**	**40 mg/kg**	**6.9 mg/kg**	--	--
Nickel	E440C/WT	0.50	mg/kg	9.03	**82 mg/kg**	**100 mg/kg**	**270 mg/kg**	**100 mg/kg**	--	--
Selenium	E440C/WT	0.20	mg/kg	<0.20	**1.5 mg/kg**	**2.4 mg/kg**	**5.5 mg/kg**	**2.4 mg/kg**	--	--
Silver	E440C/WT	0.10	mg/kg	0.26	**0.5 mg/kg**	**20 mg/kg**	**40 mg/kg**	**20 mg/kg**	--	--
Thallium	E440C/WT	0.050	mg/kg	0.072	**1 mg/kg**	**1 mg/kg**	**3.3 mg/kg**	**1 mg/kg**	--	--
Uranium	E440C/WT	0.050	mg/kg	0.732	**2.5 mg/kg**	**23 mg/kg**	**33 mg/kg**	**23 mg/kg**	--	--
Vanadium	E440C/WT	0.20	mg/kg	19.0	**86 mg/kg**	**86 mg/kg**	**86 mg/kg**	**86 mg/kg**	--	--
Zinc	E440C/WT	2.0	mg/kg	128	**290 mg/kg**	**340 mg/kg**	**340 mg/kg**	**340 mg/kg**	--	--
Volatile Organic Compounds										
Benzene	E611A/WT	0.0050	µg/g	<0.0050	**0.02 µg/g**	**0.02 µg/g**	**0.02 µg/g**	**0.02 µg/g**	--	--
Ethylbenzene	E611A/WT	0.015	µg/g	<0.015	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	--	--
Toluene	E611A/WT	0.050	µg/g	<0.050	**0.2 µg/g**	**0.2 µg/g**	**0.2 µg/g**	**0.2 µg/g**	--	--
Xylene, m+p-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylene, o-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylenes, total	E611A/WT	0.050	µg/g	<0.050	**0.05 µg/g**	**0.091 µg/g**	**0.091 µg/g**	**0.091 µg/g**	--	--
BTEX, total	E611A/WT	0.10	µg/g	<0.10	--	--	--	--	--	--
Hydrocarbons										
F1 (C6-C10)	E581.F1/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
F2 (C10-C16)	E601.SG-L/WT	10	µg/g	<10	**10 µg/g**	**10 µg/g**	**26 µg/g**	**10 µg/g**	--	--
F3 (C16-C34)	E601.SG-L/WT	50	µg/g	<50	**240 µg/g**	**240 µg/g**	**240 µg/g**	**240 µg/g**	--	--

Analyte	Method/Lab	LOR	Unit	WT2312081-014 (Continued)	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Hydrocarbons - Continued										
F4 (C34-C50)	E601.SG-L/WT	50	µg/g	<50	**120 µg/g**	**2800 µg/g**	**3300 µg/g**	**2800 µg/g**	--	--
F1-BTEX	EC580/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
Hydrocarbons, total (C6-C50)	EC581/WT	80	µg/g	<80	--	--	--	--	--	--
Chromatogram to baseline at nC50	E601.SG-L/WT		µg/g	YES	--	--	--	--	--	--
Bromobenzotrifluoride, 2- (F2-F4 surrogate)	E601.SG-L/WT	1.0	%	89.3	--	--	--	--	--	--
Dichlorotoluene, 3,4-	E581.F1/WT	1.0	%	103	--	--	--	--	--	--
Bromofluorobenzene, 4-	E611A/WT	0.10	%	91.9	--	--	--	--	--	--
Difluorobenzene, 1,4-	E611A/WT	0.10	%	97.8	--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

No Breaches Found

Key:

ON406/20	Ontario Regulation 406/19 - Excess Soils - 17-December-20
T1-RPIICC	406 T1 - Soil - Res/Park/Inst/Ind/Com/Commu Property Use
T2.1-S-AG	406 T2.1 - Volume Independent Soil - Agricultural or Other Property Use
T2.1-S-ICC	406 T2.1 - Volume Independent Soil - Ind/Com/Commu Property Use
T2.1-S-RPI	406 T2.1 - Volume Independent Soil - Res/Park/Inst Property Use

Analytical Results

Sub-Matrix: **Solid**
(Matrix: **Soil/Solid**)

Analyte	Method/Lab	LOR	Unit	Client sample ID: BH103-23 7.5-9.5 Sampling date/time: 05-May-2023 11:05 WT2312081-018	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Physical Tests										
Moisture	E144/WT	0.25	%	12.1	--	--	--	--	--	--
pH (1:2 soil:CaCl2-aq)	E108A/WT	0.10	pH units	7.73	--	--	--	--	--	--
Metals										
Antimony	E440C/WT	0.10	mg/kg	0.11	1.3 mg/kg	7.5 mg/kg	40 mg/kg	7.5 mg/kg	--	--
Arsenic	E440C/WT	0.10	mg/kg	4.61	18 mg/kg	11 mg/kg	18 mg/kg	18 mg/kg	--	--
Barium	E440C/WT	0.50	mg/kg	36.4	220 mg/kg	390 mg/kg	670 mg/kg	390 mg/kg	--	--
Beryllium	E440C/WT	0.10	mg/kg	0.46	2.5 mg/kg	4 mg/kg	8 mg/kg	4 mg/kg	--	--
Boron	E440C/WT	5.0	mg/kg	8.5	36 mg/kg	120 mg/kg	120 mg/kg	120 mg/kg	--	--
Cadmium	E440C/WT	0.020	mg/kg	0.153	1.2 mg/kg	1 mg/kg	1.9 mg/kg	1.2 mg/kg	--	--
Chromium	E440C/WT	0.50	mg/kg	15.8	70 mg/kg	160 mg/kg	160 mg/kg	160 mg/kg	--	--
Cobalt	E440C/WT	0.10	mg/kg	6.67	21 mg/kg	22 mg/kg	80 mg/kg	22 mg/kg	--	--
Copper	E440C/WT	0.50	mg/kg	25.0	92 mg/kg	140 mg/kg	230 mg/kg	140 mg/kg	--	--
Lead	E440C/WT	0.50	mg/kg	19.6	120 mg/kg	45 mg/kg	120 mg/kg	120 mg/kg	--	--
Molybdenum	E440C/WT	0.10	mg/kg	0.32	2 mg/kg	6.9 mg/kg	40 mg/kg	6.9 mg/kg	--	--
Nickel	E440C/WT	0.50	mg/kg	13.5	82 mg/kg	100 mg/kg	270 mg/kg	100 mg/kg	--	--
Selenium	E440C/WT	0.20	mg/kg	<0.20	1.5 mg/kg	2.4 mg/kg	5.5 mg/kg	2.4 mg/kg	--	--
Silver	E440C/WT	0.10	mg/kg	<0.10	0.5 mg/kg	20 mg/kg	40 mg/kg	20 mg/kg	--	--
Thallium	E440C/WT	0.050	mg/kg	0.091	1 mg/kg	1 mg/kg	3.3 mg/kg	1 mg/kg	--	--
Uranium	E440C/WT	0.050	mg/kg	0.598	2.5 mg/kg	23 mg/kg	33 mg/kg	23 mg/kg	--	--
Vanadium	E440C/WT	0.20	mg/kg	30.7	86 mg/kg	86 mg/kg	86 mg/kg	86 mg/kg	--	--
Zinc	E440C/WT	2.0	mg/kg	80.8	290 mg/kg	340 mg/kg	340 mg/kg	340 mg/kg	--	--
Volatile Organic Compounds										
Benzene	E611A/WT	0.0050	µg/g	0.0324	0.02 µg/g	0.02 µg/g	0.02 µg/g	0.02 µg/g	--	--
Ethylbenzene	E611A/WT	0.015	µg/g	0.032	0.05 µg/g	0.05 µg/g	0.05 µg/g	0.05 µg/g	--	--
Toluene	E611A/WT	0.050	µg/g	0.207	0.2 µg/g	0.2 µg/g	0.2 µg/g	0.2 µg/g	--	--
Xylene, m+p-	E611A/WT	0.030	µg/g	0.147	--	--	--	--	--	--
Xylene, o-	E611A/WT	0.030	µg/g	0.032	--	--	--	--	--	--
Xylenes, total	E611A/WT	0.050	µg/g	0.179	0.05 µg/g	0.091 µg/g	0.091 µg/g	0.091 µg/g	--	--
BTEX, total	E611A/WT	0.10	µg/g	0.45	--	--	--	--	--	--
Hydrocarbons										
F1 (C6-C10)	E581.F1/WT	5.0	µg/g	<5.0	25 µg/g	17 µg/g	25 µg/g	25 µg/g	--	--
F2 (C10-C16)	E601.SG-L/WT	10	µg/g	<10	10 µg/g	10 µg/g	26 µg/g	10 µg/g	--	--

Analyte	Method/Lab	LOR	Unit	WT2312081-018 (Continued)	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Hydrocarbons - Continued										
F3 (C16-C34)	E601.SG-L/WT	50	µg/g	<50	**240 µg/g**	**240 µg/g**	**240 µg/g**	**240 µg/g**	--	--
F4 (C34-C50)	E601.SG-L/WT	50	µg/g	<50	**120 µg/g**	**2800 µg/g**	**3300 µg/g**	**2800 µg/g**	--	--
F1-BTEX	EC580/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
Hydrocarbons, total (C6-C50)	EC581/WT	80	µg/g	<80	--	--	--	--	--	--
Chromatogram to baseline at nC50	E601.SG-L/WT		µg/g	YES	--	--	--	--	--	--
Bromobenzotrifluoride, 2- (F2-F4 surrogate)	E601.SG-L/WT	1.0	%	96.2	--	--	--	--	--	--
Dichlorotoluene, 3,4-	E581.F1/WT	1.0	%	99.1	--	--	--	--	--	--
Bromofluorobenzene, 4-	E611A/WT	0.10	%	97.0	--	--	--	--	--	--
Difluorobenzene, 1,4-	E611A/WT	0.10	%	106	--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Summary of Guideline Breaches by Sample

SampleID/Client ID	Matrix	Analyte	Analyte Summary	Guideline	Category	Result	Limit
BH103-23 7.5-9.5	Soil/Solid	Benzene		ON406/20	T1-RPIICC	0.0324 µg/g	0.02 µg/g
	Soil/Solid	Toluene		ON406/20	T1-RPIICC	0.207 µg/g	0.2 µg/g
	Soil/Solid	Xylenes, total		ON406/20	T1-RPIICC	0.179 µg/g	0.05 µg/g
	Soil/Solid	Benzene		ON406/20	T2.1-S-AG	0.0324 µg/g	0.02 µg/g
	Soil/Solid	Toluene		ON406/20	T2.1-S-AG	0.207 µg/g	0.2 µg/g
	Soil/Solid	Xylenes, total		ON406/20	T2.1-S-AG	0.179 µg/g	0.091 µg/g
	Soil/Solid	Benzene		ON406/20	T2.1-S-ICC	0.0324 µg/g	0.02 µg/g
	Soil/Solid	Toluene		ON406/20	T2.1-S-ICC	0.207 µg/g	0.2 µg/g
	Soil/Solid	Xylenes, total		ON406/20	T2.1-S-ICC	0.179 µg/g	0.091 µg/g
	Soil/Solid	Benzene		ON406/20	T2.1-S-RPI	0.0324 µg/g	0.02 µg/g
	Soil/Solid	Toluene		ON406/20	T2.1-S-RPI	0.207 µg/g	0.2 µg/g
	Soil/Solid	Xylenes, total		ON406/20	T2.1-S-RPI	0.179 µg/g	0.091 µg/g

Key:

ON406/20	Ontario Regulation 406/19 - Excess Soils - 17-December-20
T1-RPIICC	406 T1 - Soil - Res/Park/Inst/Ind/Com/Commu Property Use
T2.1-S-AG	406 T2.1 - Volume Independent Soil - Agricultural or Other Property Use
T2.1-S-ICC	406 T2.1 - Volume Independent Soil - Ind/Com/Commu Property Use
T2.1-S-RPI	406 T2.1 - Volume Independent Soil - Res/Park/Inst Property Use

Analytical Results

Sub-Matrix: **Solid**
(Matrix: **Soil/Solid**)

Analyte	Method/Lab	LOR	Unit	Client sample ID: BH103-23 T Sampling date/time: 05-May-2023 11:30 WT2312081-021	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Physical Tests										
Moisture	E144/WT	0.25	%	10.6	--	--	--	--	--	--
pH (1:2 soil:CaCl2-aq)	E108A/WT	0.10	pH units	7.01	--	--	--	--	--	--
Metals										
Antimony	E440C/WT	0.10	mg/kg	0.13	**1.3 mg/kg**	**7.5 mg/kg**	**40 mg/kg**	**7.5 mg/kg**	--	--
Arsenic	E440C/WT	0.10	mg/kg	2.23	**18 mg/kg**	**11 mg/kg**	**18 mg/kg**	**18 mg/kg**	--	--
Barium	E440C/WT	0.50	mg/kg	33.1	**220 mg/kg**	**390 mg/kg**	**670 mg/kg**	**390 mg/kg**	--	--
Beryllium	E440C/WT	0.10	mg/kg	0.25	**2.5 mg/kg**	**4 mg/kg**	**8 mg/kg**	**4 mg/kg**	--	--
Boron	E440C/WT	5.0	mg/kg	<5.0	**36 mg/kg**	**120 mg/kg**	**120 mg/kg**	**120 mg/kg**	--	--
Cadmium	E440C/WT	0.020	mg/kg	0.229	**1.2 mg/kg**	**1 mg/kg**	**1.9 mg/kg**	**1.2 mg/kg**	--	--
Chromium	E440C/WT	0.50	mg/kg	18.2	**70 mg/kg**	**160 mg/kg**	**160 mg/kg**	**160 mg/kg**	--	--
Cobalt	E440C/WT	0.10	mg/kg	3.13	**21 mg/kg**	**22 mg/kg**	**80 mg/kg**	**22 mg/kg**	--	--
Copper	E440C/WT	0.50	mg/kg	16.1	**92 mg/kg**	**140 mg/kg**	**230 mg/kg**	**140 mg/kg**	--	--
Lead	E440C/WT	0.50	mg/kg	17.5	**120 mg/kg**	**45 mg/kg**	**120 mg/kg**	**120 mg/kg**	--	--
Molybdenum	E440C/WT	0.10	mg/kg	0.31	**2 mg/kg**	**6.9 mg/kg**	**40 mg/kg**	**6.9 mg/kg**	--	--
Nickel	E440C/WT	0.50	mg/kg	7.80	**82 mg/kg**	**100 mg/kg**	**270 mg/kg**	**100 mg/kg**	--	--
Selenium	E440C/WT	0.20	mg/kg	<0.20	**1.5 mg/kg**	**2.4 mg/kg**	**5.5 mg/kg**	**2.4 mg/kg**	--	--
Silver	E440C/WT	0.10	mg/kg	0.17	**0.5 mg/kg**	**20 mg/kg**	**40 mg/kg**	**20 mg/kg**	--	--
Thallium	E440C/WT	0.050	mg/kg	0.062	**1 mg/kg**	**1 mg/kg**	**3.3 mg/kg**	**1 mg/kg**	--	--
Uranium	E440C/WT	0.050	mg/kg	0.508	**2.5 mg/kg**	**23 mg/kg**	**33 mg/kg**	**23 mg/kg**	--	--
Vanadium	E440C/WT	0.20	mg/kg	22.1	**86 mg/kg**	**86 mg/kg**	**86 mg/kg**	**86 mg/kg**	--	--
Zinc	E440C/WT	2.0	mg/kg	92.6	**290 mg/kg**	**340 mg/kg**	**340 mg/kg**	**340 mg/kg**	--	--
Volatile Organic Compounds										
Benzene	E611A/WT	0.0050	µg/g	<0.0050	**0.02 µg/g**	**0.02 µg/g**	**0.02 µg/g**	**0.02 µg/g**	--	--
Ethylbenzene	E611A/WT	0.015	µg/g	<0.015	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	--	--
Toluene	E611A/WT	0.050	µg/g	<0.050	**0.2 µg/g**	**0.2 µg/g**	**0.2 µg/g**	**0.2 µg/g**	--	--
Xylene, m+p-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylene, o-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylenes, total	E611A/WT	0.050	µg/g	<0.050	**0.05 µg/g**	**0.091 µg/g**	**0.091 µg/g**	**0.091 µg/g**	--	--
BTEX, total	E611A/WT	0.10	µg/g	<0.10	--	--	--	--	--	--
Hydrocarbons										
F1 (C6-C10)	E581.F1/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
F2 (C10-C16)	E601.SG-L/WT	10	µg/g	<10	**10 µg/g**	**10 µg/g**	**26 µg/g**	**10 µg/g**	--	--

Analyte	Method/Lab	LOR	Unit	WT2312081-021 (Continued)	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Hydrocarbons - Continued										
F3 (C16-C34)	E601.SG-L/WT	50	µg/g	<50	**240 µg/g**	**240 µg/g**	**240 µg/g**	**240 µg/g**	--	--
F4 (C34-C50)	E601.SG-L/WT	50	µg/g	<50	**120 µg/g**	**2800 µg/g**	**3300 µg/g**	**2800 µg/g**	--	--
F1-BTEX	EC580/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
Hydrocarbons, total (C6-C50)	EC581/WT	80	µg/g	<80	--	--	--	--	--	--
Chromatogram to baseline at nC50	E601.SG-L/WT		µg/g	YES	--	--	--	--	--	--
Bromobenzotrifluoride, 2- (F2-F4 surrogate)	E601.SG-L/WT	1.0	%	81.5	--	--	--	--	--	--
Dichlorotoluene, 3,4-	E581.F1/WT	1.0	%	99.6	--	--	--	--	--	--
Bromofluorobenzene, 4-	E611A/WT	0.10	%	102	--	--	--	--	--	--
Difluorobenzene, 1,4-	E611A/WT	0.10	%	112	--	--	--	--	--	--
Organochlorine Pesticides										
Aldrin	E660F/WT	0.020	µg/g	<0.020	**0.05 µg/g**	**0.05 µg/g**	**0.088 µg/g**	**0.05 µg/g**	--	--
Chlordane, cis- (alpha)	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
Chlordane, total	E660F/WT	0.030	µg/g	<0.030	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	--	--
Chlordane, trans- (gamma)	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDD, 2,4'-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDD, 4,4'-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDD, total	E660F/WT	0.030	µg/g	<0.030	**0.05 µg/g**	**3.3 µg/g**	**4.6 µg/g**	**3.3 µg/g**	--	--
DDE, 2,4'-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDE, 4,4'-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDE, total	E660F/WT	0.030	µg/g	<0.030	**0.05 µg/g**	**0.26 µg/g**	**0.52 µg/g**	**0.26 µg/g**	--	--
DDT, 2,4'-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDT, 4,4'-	E660F/WT	0.020	µg/g	<0.040 DLM	--	--	--	--	--	--
DDT, total	E660F/WT	0.030	µg/g	<0.045	**1.4 µg/g**	**0.078 µg/g**	**1.4 µg/g**	**1.4 µg/g**	--	--
Dieldrin	E660F/WT	0.020	µg/g	<0.020	**0.05 µg/g**	**0.05 µg/g**	**0.088 µg/g**	**0.05 µg/g**	--	--
Endosulfan, alpha-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
Endosulfan, beta-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
Endosulfan, total	E660F/WT	0.030	µg/g	<0.030	**0.04 µg/g**	**0.04 µg/g**	**0.04 µg/g**	**0.04 µg/g**	--	--
Endrin	E660F/WT	0.020	µg/g	<0.020	**0.04 µg/g**	**0.04 µg/g**	**0.04 µg/g**	**0.04 µg/g**	--	--
Heptachlor epoxide	E660F/WT	0.020	µg/g	<0.020	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	--	--
Heptachlor	E660F/WT	0.020	µg/g	<0.020	**0.05 µg/g**	**0.072 µg/g**	**0.072 µg/g**	**0.072 µg/g**	--	--
Hexachlorobenzene	E660F/WT	0.010	µg/g	<0.010	**0.01 µg/g**	**0.034 µg/g**	**0.034 µg/g**	**0.034 µg/g**	--	--
Hexachlorobutadiene	E660F/WT	0.010	µg/g	<0.010	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	--	--
Hexachlorocyclohexane, gamma-	E660F/WT	0.010	µg/g	<0.010	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	--	--
Hexachloroethane	E660F/WT	0.010	µg/g	<0.010	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	--	--

Analyte	Method/Lab	LOR	Unit	WT2312081-021 (Continued)	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Organochlorine Pesticides - Continued										
Methoxychlor	E660F/WT	0.020	µg/g	<0.040 DLM	**0.05 µg/g**	**0.24 µg/g**	**0.19 µg/g**	**0.13 µg/g**	--	--
Decachlorobiphenyl	E660F/WT	0.1	%	151 SHMI	--	--	--	--	--	--
Tetrachloro-m-xylene	E660F/WT	0.1	%	90.3	--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

No Breaches Found

Key:

ON406/20	Ontario Regulation 406/19 - Excess Soils - 17-December-20
T1-RPIICC	406 T1 - Soil - Res/Park/Inst/Ind/Com/Commu Property Use
T2.1-S-AG	406 T2.1 - Volume Independent Soil - Agricultural or Other Property Use
T2.1-S-ICC	406 T2.1 - Volume Independent Soil - Ind/Com/Commu Property Use
T2.1-S-RPI	406 T2.1 - Volume Independent Soil - Res/Park/Inst Property Use

Analytical Results

Sub-Matrix: **Solid**
(Matrix: **Soil/Solid**)

Analyte	Method/Lab	LOR	Unit	Client sample ID: BH104- 2.5-4.5'	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
				Sampling date/time: 05-May-2023 11:50						
				WT2312081-023						
Physical Tests										
Moisture	E144/WT	0.25	%	5.06	--	--	--	--	--	--
Metals										
Antimony	E440C/WT	0.10	mg/kg	<0.10	**1.3 mg/kg**	**7.5 mg/kg**	**40 mg/kg**	**7.5 mg/kg**	--	--
Arsenic	E440C/WT	0.10	mg/kg	2.44	**18 mg/kg**	**11 mg/kg**	**18 mg/kg**	**18 mg/kg**	--	--
Barium	E440C/WT	0.50	mg/kg	13.4	**220 mg/kg**	**390 mg/kg**	**670 mg/kg**	**390 mg/kg**	--	--
Beryllium	E440C/WT	0.10	mg/kg	0.18	**2.5 mg/kg**	**4 mg/kg**	**8 mg/kg**	**4 mg/kg**	--	--
Boron	E440C/WT	5.0	mg/kg	7.5	**36 mg/kg**	**120 mg/kg**	**120 mg/kg**	**120 mg/kg**	--	--
Cadmium	E440C/WT	0.020	mg/kg	0.107	**1.2 mg/kg**	**1 mg/kg**	**1.9 mg/kg**	**1.2 mg/kg**	--	--
Chromium	E440C/WT	0.50	mg/kg	6.04	**70 mg/kg**	**160 mg/kg**	**160 mg/kg**	**160 mg/kg**	--	--
Cobalt	E440C/WT	0.10	mg/kg	2.59	**21 mg/kg**	**22 mg/kg**	**80 mg/kg**	**22 mg/kg**	--	--
Copper	E440C/WT	0.50	mg/kg	14.8	**92 mg/kg**	**140 mg/kg**	**230 mg/kg**	**140 mg/kg**	--	--
Lead	E440C/WT	0.50	mg/kg	9.69	**120 mg/kg**	**45 mg/kg**	**120 mg/kg**	**120 mg/kg**	--	--
Molybdenum	E440C/WT	0.10	mg/kg	0.30	**2 mg/kg**	**6.9 mg/kg**	**40 mg/kg**	**6.9 mg/kg**	--	--
Nickel	E440C/WT	0.50	mg/kg	5.48	**82 mg/kg**	**100 mg/kg**	**270 mg/kg**	**100 mg/kg**	--	--
Selenium	E440C/WT	0.20	mg/kg	<0.20	**1.5 mg/kg**	**2.4 mg/kg**	**5.5 mg/kg**	**2.4 mg/kg**	--	--
Silver	E440C/WT	0.10	mg/kg	<0.10	**0.5 mg/kg**	**20 mg/kg**	**40 mg/kg**	**20 mg/kg**	--	--
Thallium	E440C/WT	0.050	mg/kg	<0.050	**1 mg/kg**	**1 mg/kg**	**3.3 mg/kg**	**1 mg/kg**	--	--
Uranium	E440C/WT	0.050	mg/kg	0.457	**2.5 mg/kg**	**23 mg/kg**	**33 mg/kg**	**23 mg/kg**	--	--
Vanadium	E440C/WT	0.20	mg/kg	11.2	**86 mg/kg**	**86 mg/kg**	**86 mg/kg**	**86 mg/kg**	--	--
Zinc	E440C/WT	2.0	mg/kg	50.5	**290 mg/kg**	**340 mg/kg**	**340 mg/kg**	**340 mg/kg**	--	--
Volatile Organic Compounds										
Benzene	E611A/WT	0.0050	µg/g	0.0050	**0.02 µg/g**	**0.02 µg/g**	**0.02 µg/g**	**0.02 µg/g**	--	--
Ethylbenzene	E611A/WT	0.015	µg/g	<0.015	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	--	--
Toluene	E611A/WT	0.050	µg/g	<0.050	**0.2 µg/g**	**0.2 µg/g**	**0.2 µg/g**	**0.2 µg/g**	--	--
Xylene, m+p-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylene, o-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylenes, total	E611A/WT	0.050	µg/g	<0.050	**0.05 µg/g**	**0.091 µg/g**	**0.091 µg/g**	**0.091 µg/g**	--	--
BTEX, total	E611A/WT	0.10	µg/g	<0.10	--	--	--	--	--	--
Hydrocarbons										
F1 (C6-C10)	E581.F1/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
F2 (C10-C16)	E601.SG-L/WT	10	µg/g	<10	**10 µg/g**	**10 µg/g**	**26 µg/g**	**10 µg/g**	--	--
F3 (C16-C34)	E601.SG-L/WT	50	µg/g	<50	**240 µg/g**	**240 µg/g**	**240 µg/g**	**240 µg/g**	--	--

Analyte	Method/Lab	LOR	Unit	WT2312081-023 (Continued)	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Hydrocarbons - Continued										
F4 (C34-C50)	E601.SG-L/WT	50	µg/g	<50	**120 µg/g**	**2800 µg/g**	**3300 µg/g**	**2800 µg/g**	--	--
F1-BTEX	EC580/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
Hydrocarbons, total (C6-C50)	EC581/WT	80	µg/g	<80	--	--	--	--	--	--
Chromatogram to baseline at nC50	E601.SG-L/WT		µg/g	YES	--	--	--	--	--	--
Bromobenzotrifluoride, 2- (F2-F4 surrogate)	E601.SG-L/WT	1.0	%	94.3	--	--	--	--	--	--
Dichlorotoluene, 3,4-	E581.F1/WT	1.0	%	122	--	--	--	--	--	--
Bromofluorobenzene, 4-	E611A/WT	0.10	%	116	--	--	--	--	--	--
Difluorobenzene, 1,4-	E611A/WT	0.10	%	126	--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

No Breaches Found

Key:

ON406/20	Ontario Regulation 406/19 - Excess Soils - 17-December-20
T1-RPIICC	406 T1 - Soil - Res/Park/Inst/Ind/Com/Commu Property Use
T2.1-S-AG	406 T2.1 - Volume Independent Soil - Agricultural or Other Property Use
T2.1-S-ICC	406 T2.1 - Volume Independent Soil - Ind/Com/Commu Property Use
T2.1-S-RPI	406 T2.1 - Volume Independent Soil - Res/Park/Inst Property Use

Analytical Results

Sub-Matrix: **Solid**
(Matrix: **Soil/Solid**)

Analyte	Method/Lab	LOR	Unit	Client sample ID: BH104-23 T Sampling date/time: 05-May-2023 12:20 WT2312081-029	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Physical Tests										
Moisture	E144/WT	0.25	%	12.2	--	--	--	--	--	--
Metals										
Antimony	E440C/WT	0.10	mg/kg	0.14	**1.3 mg/kg**	**7.5 mg/kg**	**40 mg/kg**	**7.5 mg/kg**	--	--
Arsenic	E440C/WT	0.10	mg/kg	2.85	**18 mg/kg**	**11 mg/kg**	**18 mg/kg**	**18 mg/kg**	--	--
Barium	E440C/WT	0.50	mg/kg	38.0	**220 mg/kg**	**390 mg/kg**	**670 mg/kg**	**390 mg/kg**	--	--
Beryllium	E440C/WT	0.10	mg/kg	0.31	**2.5 mg/kg**	**4 mg/kg**	**8 mg/kg**	**4 mg/kg**	--	--
Boron	E440C/WT	5.0	mg/kg	<5.0	**36 mg/kg**	**120 mg/kg**	**120 mg/kg**	**120 mg/kg**	--	--
Cadmium	E440C/WT	0.020	mg/kg	0.279	**1.2 mg/kg**	**1 mg/kg**	**1.9 mg/kg**	**1.2 mg/kg**	--	--
Chromium	E440C/WT	0.50	mg/kg	15.2	**70 mg/kg**	**160 mg/kg**	**160 mg/kg**	**160 mg/kg**	--	--
Cobalt	E440C/WT	0.10	mg/kg	3.92	**21 mg/kg**	**22 mg/kg**	**80 mg/kg**	**22 mg/kg**	--	--
Copper	E440C/WT	0.50	mg/kg	15.4	**92 mg/kg**	**140 mg/kg**	**230 mg/kg**	**140 mg/kg**	--	--
Lead	E440C/WT	0.50	mg/kg	20.9	**120 mg/kg**	**45 mg/kg**	**120 mg/kg**	**120 mg/kg**	--	--
Molybdenum	E440C/WT	0.10	mg/kg	0.29	**2 mg/kg**	**6.9 mg/kg**	**40 mg/kg**	**6.9 mg/kg**	--	--
Nickel	E440C/WT	0.50	mg/kg	8.30	**82 mg/kg**	**100 mg/kg**	**270 mg/kg**	**100 mg/kg**	--	--
Selenium	E440C/WT	0.20	mg/kg	<0.20	**1.5 mg/kg**	**2.4 mg/kg**	**5.5 mg/kg**	**2.4 mg/kg**	--	--
Silver	E440C/WT	0.10	mg/kg	0.14	**0.5 mg/kg**	**20 mg/kg**	**40 mg/kg**	**20 mg/kg**	--	--
Thallium	E440C/WT	0.050	mg/kg	0.071	**1 mg/kg**	**1 mg/kg**	**3.3 mg/kg**	**1 mg/kg**	--	--
Uranium	E440C/WT	0.050	mg/kg	0.546	**2.5 mg/kg**	**23 mg/kg**	**33 mg/kg**	**23 mg/kg**	--	--
Vanadium	E440C/WT	0.20	mg/kg	25.9	**86 mg/kg**	**86 mg/kg**	**86 mg/kg**	**86 mg/kg**	--	--
Zinc	E440C/WT	2.0	mg/kg	91.4	**290 mg/kg**	**340 mg/kg**	**340 mg/kg**	**340 mg/kg**	--	--
Volatile Organic Compounds										
Benzene	E611A/WT	0.0050	µg/g	<0.0050	**0.02 µg/g**	**0.02 µg/g**	**0.02 µg/g**	**0.02 µg/g**	--	--
Ethylbenzene	E611A/WT	0.015	µg/g	<0.015	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	--	--
Toluene	E611A/WT	0.050	µg/g	<0.050	**0.2 µg/g**	**0.2 µg/g**	**0.2 µg/g**	**0.2 µg/g**	--	--
Xylene, m+p-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylene, o-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylenes, total	E611A/WT	0.050	µg/g	<0.050	**0.05 µg/g**	**0.091 µg/g**	**0.091 µg/g**	**0.091 µg/g**	--	--
BTEX, total	E611A/WT	0.10	µg/g	<0.10	--	--	--	--	--	--
Hydrocarbons										
F1 (C6-C10)	E581.F1/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
F2 (C10-C16)	E601.SG-L/WT	10	µg/g	<10	**10 µg/g**	**10 µg/g**	**26 µg/g**	**10 µg/g**	--	--
F3 (C16-C34)	E601.SG-L/WT	50	µg/g	<50	**240 µg/g**	**240 µg/g**	**240 µg/g**	**240 µg/g**	--	--

Analyte	Method/Lab	LOR	Unit	WT2312081-029 (Continued)	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Hydrocarbons - Continued										
F4 (C34-C50)	E601.SG-L/WT	50	µg/g	<50	**120 µg/g**	**2800 µg/g**	**3300 µg/g**	**2800 µg/g**	--	--
F1-BTEX	EC580/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
Hydrocarbons, total (C6-C50)	EC581/WT	80	µg/g	<80	--	--	--	--	--	--
Chromatogram to baseline at nC50	E601.SG-L/WT		µg/g	YES	--	--	--	--	--	--
Bromobenzotrifluoride, 2- (F2-F4 surrogate)	E601.SG-L/WT	1.0	%	77.5	--	--	--	--	--	--
Dichlorotoluene, 3,4-	E581.F1/WT	1.0	%	100	--	--	--	--	--	--
Bromofluorobenzene, 4-	E611A/WT	0.10	%	90.1	--	--	--	--	--	--
Difluorobenzene, 1,4-	E611A/WT	0.10	%	99.6	--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

No Breaches Found

Key:

ON406/20	Ontario Regulation 406/19 - Excess Soils - 17-December-20
T1-RPIICC	406 T1 - Soil - Res/Park/Inst/Ind/Com/Commu Property Use
T2.1-S-AG	406 T2.1 - Volume Independent Soil - Agricultural or Other Property Use
T2.1-S-ICC	406 T2.1 - Volume Independent Soil - Ind/Com/Commu Property Use
T2.1-S-RPI	406 T2.1 - Volume Independent Soil - Res/Park/Inst Property Use

Analytical Results

Sub-Matrix: **Solid**
(Matrix: **Soil/Solid**)

Analyte	Method/Lab	LOR	Unit	Client sample ID: BH105-23 5-7'	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
				Sampling date/time: 05-May-2023 12:40						
				WT2312081-032						
Physical Tests										
Moisture	E144/WT	0.25	%	10.2	--	--	--	--	--	--
pH (1:2 soil:CaCl2-aq)	E108A/WT	0.10	pH units	7.93	--	--	--	--	--	--
Metals										
Antimony	E440C/WT	0.10	mg/kg	<0.10	**1.3 mg/kg**	**7.5 mg/kg**	**40 mg/kg**	**7.5 mg/kg**	--	--
Arsenic	E440C/WT	0.10	mg/kg	1.68	**18 mg/kg**	**11 mg/kg**	**18 mg/kg**	**18 mg/kg**	--	--
Barium	E440C/WT	0.50	mg/kg	19.2	**220 mg/kg**	**390 mg/kg**	**670 mg/kg**	**390 mg/kg**	--	--
Beryllium	E440C/WT	0.10	mg/kg	0.16	**2.5 mg/kg**	**4 mg/kg**	**8 mg/kg**	**4 mg/kg**	--	--
Boron	E440C/WT	5.0	mg/kg	<5.0	**36 mg/kg**	**120 mg/kg**	**120 mg/kg**	**120 mg/kg**	--	--
Cadmium	E440C/WT	0.020	mg/kg	0.118	**1.2 mg/kg**	**1 mg/kg**	**1.9 mg/kg**	**1.2 mg/kg**	--	--
Chromium	E440C/WT	0.50	mg/kg	5.67	**70 mg/kg**	**160 mg/kg**	**160 mg/kg**	**160 mg/kg**	--	--
Cobalt	E440C/WT	0.10	mg/kg	2.19	**21 mg/kg**	**22 mg/kg**	**80 mg/kg**	**22 mg/kg**	--	--
Copper	E440C/WT	0.50	mg/kg	9.36	**92 mg/kg**	**140 mg/kg**	**230 mg/kg**	**140 mg/kg**	--	--
Lead	E440C/WT	0.50	mg/kg	7.58	**120 mg/kg**	**45 mg/kg**	**120 mg/kg**	**120 mg/kg**	--	--
Molybdenum	E440C/WT	0.10	mg/kg	0.17	**2 mg/kg**	**6.9 mg/kg**	**40 mg/kg**	**6.9 mg/kg**	--	--
Nickel	E440C/WT	0.50	mg/kg	4.20	**82 mg/kg**	**100 mg/kg**	**270 mg/kg**	**100 mg/kg**	--	--
Selenium	E440C/WT	0.20	mg/kg	<0.20	**1.5 mg/kg**	**2.4 mg/kg**	**5.5 mg/kg**	**2.4 mg/kg**	--	--
Silver	E440C/WT	0.10	mg/kg	<0.10	**0.5 mg/kg**	**20 mg/kg**	**40 mg/kg**	**20 mg/kg**	--	--
Thallium	E440C/WT	0.050	mg/kg	<0.050	**1 mg/kg**	**1 mg/kg**	**3.3 mg/kg**	**1 mg/kg**	--	--
Uranium	E440C/WT	0.050	mg/kg	0.376	**2.5 mg/kg**	**23 mg/kg**	**33 mg/kg**	**23 mg/kg**	--	--
Vanadium	E440C/WT	0.20	mg/kg	12.9	**86 mg/kg**	**86 mg/kg**	**86 mg/kg**	**86 mg/kg**	--	--
Zinc	E440C/WT	2.0	mg/kg	49.3	**290 mg/kg**	**340 mg/kg**	**340 mg/kg**	**340 mg/kg**	--	--
Volatile Organic Compounds										
Benzene	E611A/WT	0.0050	µg/g	0.0378	**0.02 µg/g**	**0.02 µg/g**	**0.02 µg/g**	**0.02 µg/g**	--	--
Ethylbenzene	E611A/WT	0.015	µg/g	0.024	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	--	--
Toluene	E611A/WT	0.050	µg/g	0.158	**0.2 µg/g**	**0.2 µg/g**	**0.2 µg/g**	**0.2 µg/g**	--	--
Xylene, m+p-	E611A/WT	0.030	µg/g	0.090	--	--	--	--	--	--
Xylene, o-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylenes, total	E611A/WT	0.050	µg/g	0.090	**0.05 µg/g**	**0.091 µg/g**	**0.091 µg/g**	**0.091 µg/g**	--	--
BTEX, total	E611A/WT	0.10	µg/g	0.31	--	--	--	--	--	--
Hydrocarbons										
F1 (C6-C10)	E581.F1/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
F2 (C10-C16)	E601.SG-L/WT	10	µg/g	<10	**10 µg/g**	**10 µg/g**	**26 µg/g**	**10 µg/g**	--	--

Analyte	Method/Lab	LOR	Unit	WT2312081-032 (Continued)	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Hydrocarbons - Continued										
F3 (C16-C34)	E601.SG-L/WT	50	µg/g	<50	**240 µg/g**	**240 µg/g**	**240 µg/g**	**240 µg/g**	--	--
F4 (C34-C50)	E601.SG-L/WT	50	µg/g	<50	**120 µg/g**	**2800 µg/g**	**3300 µg/g**	**2800 µg/g**	--	--
F1-BTEX	EC580/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
Hydrocarbons, total (C6-C50)	EC581/WT	80	µg/g	<80	--	--	--	--	--	--
Chromatogram to baseline at nC50	E601.SG-L/WT		µg/g	YES	--	--	--	--	--	--
Bromobenzotrifluoride, 2- (F2-F4 surrogate)	E601.SG-L/WT	1.0	%	95.4	--	--	--	--	--	--
Dichlorotoluene, 3,4-	E581.F1/WT	1.0	%	94.6	--	--	--	--	--	--
Bromofluorobenzene, 4-	E611A/WT	0.10	%	95.3	--	--	--	--	--	--
Difluorobenzene, 1,4-	E611A/WT	0.10	%	107	--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Summary of Guideline Breaches by Sample

SampleID/Client ID	Matrix	Analyte	Analyte Summary	Guideline	Category	Result	Limit
BH105-23 5-7'	Soil/Solid	Benzene		ON406/20	T1-RPIICC	0.0378 µg/g	0.02 µg/g
	Soil/Solid	Xylenes, total		ON406/20	T1-RPIICC	0.090 µg/g	0.05 µg/g
	Soil/Solid	Benzene		ON406/20	T2.1-S-AG	0.0378 µg/g	0.02 µg/g
	Soil/Solid	Benzene		ON406/20	T2.1-S-ICC	0.0378 µg/g	0.02 µg/g
	Soil/Solid	Benzene		ON406/20	T2.1-S-RPI	0.0378 µg/g	0.02 µg/g

Key:

ON406/20 Ontario Regulation 406/19 - Excess Soils - 17-December-20

T1-RPIICC 406 T1 - Soil - Res/Park/Inst/Ind/Com/Commu Property Use

T2.1-S-AG 406 T2.1 - Volume Independent Soil - Agricultural or Other Property Use

T2.1-S-ICC 406 T2.1 - Volume Independent Soil - Ind/Com/Commu Property Use

T2.1-S-RPI 406 T2.1 - Volume Independent Soil - Res/Park/Inst Property Use

Analytical Results

Sub-Matrix: **Solid**
(Matrix: **Soil/Solid**)

Analyte	Method/Lab	LOR	Unit	Client sample ID: BH105-23 T Sampling date/time: 05-May-2023 13:50 WT2312081-037	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Physical Tests										
Moisture	E144/WT	0.25	%	16.7	--	--	--	--	--	--
pH (1:2 soil:CaCl2-aq)	E108A/WT	0.10	pH units	7.16	--	--	--	--	--	--
Metals										
Antimony	E440C/WT	0.10	mg/kg	0.18	1.3 mg/kg	7.5 mg/kg	40 mg/kg	7.5 mg/kg	--	--
Arsenic	E440C/WT	0.10	mg/kg	4.04	18 mg/kg	11 mg/kg	18 mg/kg	18 mg/kg	--	--
Barium	E440C/WT	0.50	mg/kg	57.5	220 mg/kg	390 mg/kg	670 mg/kg	390 mg/kg	--	--
Beryllium	E440C/WT	0.10	mg/kg	0.51	2.5 mg/kg	4 mg/kg	8 mg/kg	4 mg/kg	--	--
Boron	E440C/WT	5.0	mg/kg	6.0	36 mg/kg	120 mg/kg	120 mg/kg	120 mg/kg	--	--
Cadmium	E440C/WT	0.020	mg/kg	0.293	1.2 mg/kg	1 mg/kg	1.9 mg/kg	1.2 mg/kg	--	--
Chromium	E440C/WT	0.50	mg/kg	20.8	70 mg/kg	160 mg/kg	160 mg/kg	160 mg/kg	--	--
Cobalt	E440C/WT	0.10	mg/kg	6.55	21 mg/kg	22 mg/kg	80 mg/kg	22 mg/kg	--	--
Copper	E440C/WT	0.50	mg/kg	23.7	92 mg/kg	140 mg/kg	230 mg/kg	140 mg/kg	--	--
Lead	E440C/WT	0.50	mg/kg	18.6	120 mg/kg	45 mg/kg	120 mg/kg	120 mg/kg	--	--
Molybdenum	E440C/WT	0.10	mg/kg	0.42	2 mg/kg	6.9 mg/kg	40 mg/kg	6.9 mg/kg	--	--
Nickel	E440C/WT	0.50	mg/kg	13.7	82 mg/kg	100 mg/kg	270 mg/kg	100 mg/kg	--	--
Selenium	E440C/WT	0.20	mg/kg	0.22	1.5 mg/kg	2.4 mg/kg	5.5 mg/kg	2.4 mg/kg	--	--
Silver	E440C/WT	0.10	mg/kg	0.17	0.5 mg/kg	20 mg/kg	40 mg/kg	20 mg/kg	--	--
Thallium	E440C/WT	0.050	mg/kg	0.105	1 mg/kg	1 mg/kg	3.3 mg/kg	1 mg/kg	--	--
Uranium	E440C/WT	0.050	mg/kg	0.668	2.5 mg/kg	23 mg/kg	33 mg/kg	23 mg/kg	--	--
Vanadium	E440C/WT	0.20	mg/kg	35.0	86 mg/kg	86 mg/kg	86 mg/kg	86 mg/kg	--	--
Zinc	E440C/WT	2.0	mg/kg	97.0	290 mg/kg	340 mg/kg	340 mg/kg	340 mg/kg	--	--
Volatile Organic Compounds										
Benzene	E611A/WT	0.0050	µg/g	0.0694	0.02 µg/g	0.02 µg/g	0.02 µg/g	0.02 µg/g	--	--
Ethylbenzene	E611A/WT	0.015	µg/g	0.020	0.05 µg/g	0.05 µg/g	0.05 µg/g	0.05 µg/g	--	--
Toluene	E611A/WT	0.050	µg/g	0.196	0.2 µg/g	0.2 µg/g	0.2 µg/g	0.2 µg/g	--	--
Xylene, m+p-	E611A/WT	0.030	µg/g	0.062	--	--	--	--	--	--
Xylene, o-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylenes, total	E611A/WT	0.050	µg/g	0.062	0.05 µg/g	0.091 µg/g	0.091 µg/g	0.091 µg/g	--	--
BTEX, total	E611A/WT	0.10	µg/g	0.35	--	--	--	--	--	--
Hydrocarbons										
F1 (C6-C10)	E581.F1/WT	5.0	µg/g	<5.0	25 µg/g	17 µg/g	25 µg/g	25 µg/g	--	--
F2 (C10-C16)	E601.SG-L/WT	10	µg/g	<10	10 µg/g	10 µg/g	26 µg/g	10 µg/g	--	--

Analyte	Method/Lab	LOR	Unit	WT2312081-037 (Continued)	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Hydrocarbons - Continued										
F3 (C16-C34)	E601.SG-L/WT	50	µg/g	<50	**240 µg/g**	**240 µg/g**	**240 µg/g**	**240 µg/g**	--	--
F4 (C34-C50)	E601.SG-L/WT	50	µg/g	<50	**120 µg/g**	**2800 µg/g**	**3300 µg/g**	**2800 µg/g**	--	--
F1-BTEX	EC580/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
Hydrocarbons, total (C6-C50)	EC581/WT	80	µg/g	<80	--	--	--	--	--	--
Chromatogram to baseline at nC50	E601.SG-L/WT		µg/g	YES	--	--	--	--	--	--
Bromobenzotrifluoride, 2- (F2-F4 surrogate)	E601.SG-L/WT	1.0	%	78.5	--	--	--	--	--	--
Dichlorotoluene, 3,4-	E581.F1/WT	1.0	%	95.0	--	--	--	--	--	--
Bromofluorobenzene, 4-	E611A/WT	0.10	%	90.9	--	--	--	--	--	--
Difluorobenzene, 1,4-	E611A/WT	0.10	%	96.8	--	--	--	--	--	--
Organochlorine Pesticides										
Aldrin	E660F/WT	0.020	µg/g	<0.020	**0.05 µg/g**	**0.05 µg/g**	**0.088 µg/g**	**0.05 µg/g**	--	--
Chlordane, cis- (alpha)	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
Chlordane, total	E660F/WT	0.030	µg/g	<0.030	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	--	--
Chlordane, trans- (gamma)	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDD, 2,4'-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDD, 4,4'-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDD, total	E660F/WT	0.030	µg/g	<0.030	**0.05 µg/g**	**3.3 µg/g**	**4.6 µg/g**	**3.3 µg/g**	--	--
DDE, 2,4'-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDE, 4,4'-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDE, total	E660F/WT	0.030	µg/g	<0.030	**0.05 µg/g**	**0.26 µg/g**	**0.52 µg/g**	**0.26 µg/g**	--	--
DDT, 2,4'-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDT, 4,4'-	E660F/WT	0.020	µg/g	<0.040 DLM	--	--	--	--	--	--
DDT, total	E660F/WT	0.030	µg/g	<0.045	**1.4 µg/g**	**0.078 µg/g**	**1.4 µg/g**	**1.4 µg/g**	--	--
Dieldrin	E660F/WT	0.020	µg/g	<0.020	**0.05 µg/g**	**0.05 µg/g**	**0.088 µg/g**	**0.05 µg/g**	--	--
Endosulfan, alpha-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
Endosulfan, beta-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
Endosulfan, total	E660F/WT	0.030	µg/g	<0.030	**0.04 µg/g**	**0.04 µg/g**	**0.04 µg/g**	**0.04 µg/g**	--	--
Endrin	E660F/WT	0.020	µg/g	<0.020	**0.04 µg/g**	**0.04 µg/g**	**0.04 µg/g**	**0.04 µg/g**	--	--
Heptachlor epoxide	E660F/WT	0.020	µg/g	<0.020	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	--	--
Heptachlor	E660F/WT	0.020	µg/g	<0.020	**0.05 µg/g**	**0.072 µg/g**	**0.072 µg/g**	**0.072 µg/g**	--	--
Hexachlorobenzene	E660F/WT	0.010	µg/g	<0.010	**0.01 µg/g**	**0.034 µg/g**	**0.034 µg/g**	**0.034 µg/g**	--	--
Hexachlorobutadiene	E660F/WT	0.010	µg/g	<0.010	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	--	--
Hexachlorocyclohexane, gamma-	E660F/WT	0.010	µg/g	<0.010	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	--	--
Hexachloroethane	E660F/WT	0.010	µg/g	<0.010	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	--	--

Analyte	Method/Lab	LOR	Unit	WT2312081-037 (Continued)		ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Organochlorine Pesticides - Continued											
Methoxychlor	E660F/WT	0.020	µg/g	<0.040	DLM	**0.05 µg/g**	**0.24 µg/g**	**0.19 µg/g**	**0.13 µg/g**	--	--
Decachlorobiphenyl	E660F/WT	0.1	%	174	SHMI	--	--	--	--	--	--
Tetrachloro-m-xylene	E660F/WT	0.1	%	93.2		--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Summary of Guideline Breaches by Sample

SampleID/Client ID	Matrix	Analyte	Analyte Summary	Guideline	Category	Result	Limit
BH105-23 T	Soil/Solid	Benzene		ON406/20	T1-RPIICC	0.0694 µg/g	0.02 µg/g
	Soil/Solid	Xylenes, total		ON406/20	T1-RPIICC	0.062 µg/g	0.05 µg/g
	Soil/Solid	Benzene		ON406/20	T2.1-S-AG	0.0694 µg/g	0.02 µg/g
	Soil/Solid	Benzene		ON406/20	T2.1-S-ICC	0.0694 µg/g	0.02 µg/g
	Soil/Solid	Benzene		ON406/20	T2.1-S-RPI	0.0694 µg/g	0.02 µg/g

Key:

ON406/20	Ontario Regulation 406/19 - Excess Soils - 17-December-20
T1-RPIICC	406 T1 - Soil - Res/Park/Inst/Ind/Com/Commu Property Use
T2.1-S-AG	406 T2.1 - Volume Independent Soil - Agricultural or Other Property Use
T2.1-S-ICC	406 T2.1 - Volume Independent Soil - Ind/Com/Commu Property Use
T2.1-S-RPI	406 T2.1 - Volume Independent Soil - Res/Park/Inst Property Use

Analytical Results

Sub-Matrix: **Solid**
(Matrix: **Soil/Solid**)

Analyte	Method/Lab	LOR	Unit	Client sample ID: BH106-23 2.5-4.5'	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
				Sampling date/time: 05-May-2023 00:00						
				WT2312081-039						
Physical Tests										
Moisture	E144/WT	0.25	%	8.82	--	--	--	--	--	--
Metals										
Antimony	E440C/WT	0.10	mg/kg	<0.10	**1.3 mg/kg**	**7.5 mg/kg**	**40 mg/kg**	**7.5 mg/kg**	--	--
Arsenic	E440C/WT	0.10	mg/kg	2.35	**18 mg/kg**	**11 mg/kg**	**18 mg/kg**	**18 mg/kg**	--	--
Barium	E440C/WT	0.50	mg/kg	22.9	**220 mg/kg**	**390 mg/kg**	**670 mg/kg**	**390 mg/kg**	--	--
Beryllium	E440C/WT	0.10	mg/kg	0.26	**2.5 mg/kg**	**4 mg/kg**	**8 mg/kg**	**4 mg/kg**	--	--
Boron	E440C/WT	5.0	mg/kg	<5.0	**36 mg/kg**	**120 mg/kg**	**120 mg/kg**	**120 mg/kg**	--	--
Cadmium	E440C/WT	0.020	mg/kg	0.152	**1.2 mg/kg**	**1 mg/kg**	**1.9 mg/kg**	**1.2 mg/kg**	--	--
Chromium	E440C/WT	0.50	mg/kg	9.64	**70 mg/kg**	**160 mg/kg**	**160 mg/kg**	**160 mg/kg**	--	--
Cobalt	E440C/WT	0.10	mg/kg	3.16	**21 mg/kg**	**22 mg/kg**	**80 mg/kg**	**22 mg/kg**	--	--
Copper	E440C/WT	0.50	mg/kg	11.2	**92 mg/kg**	**140 mg/kg**	**230 mg/kg**	**140 mg/kg**	--	--
Lead	E440C/WT	0.50	mg/kg	15.2	**120 mg/kg**	**45 mg/kg**	**120 mg/kg**	**120 mg/kg**	--	--
Molybdenum	E440C/WT	0.10	mg/kg	0.22	**2 mg/kg**	**6.9 mg/kg**	**40 mg/kg**	**6.9 mg/kg**	--	--
Nickel	E440C/WT	0.50	mg/kg	6.74	**82 mg/kg**	**100 mg/kg**	**270 mg/kg**	**100 mg/kg**	--	--
Selenium	E440C/WT	0.20	mg/kg	<0.20	**1.5 mg/kg**	**2.4 mg/kg**	**5.5 mg/kg**	**2.4 mg/kg**	--	--
Silver	E440C/WT	0.10	mg/kg	<0.10	**0.5 mg/kg**	**20 mg/kg**	**40 mg/kg**	**20 mg/kg**	--	--
Thallium	E440C/WT	0.050	mg/kg	0.058	**1 mg/kg**	**1 mg/kg**	**3.3 mg/kg**	**1 mg/kg**	--	--
Uranium	E440C/WT	0.050	mg/kg	0.390	**2.5 mg/kg**	**23 mg/kg**	**33 mg/kg**	**23 mg/kg**	--	--
Vanadium	E440C/WT	0.20	mg/kg	18.7	**86 mg/kg**	**86 mg/kg**	**86 mg/kg**	**86 mg/kg**	--	--
Zinc	E440C/WT	2.0	mg/kg	70.9	**290 mg/kg**	**340 mg/kg**	**340 mg/kg**	**340 mg/kg**	--	--
Volatile Organic Compounds										
Benzene	E611A/WT	0.0050	µg/g	<0.0050	**0.02 µg/g**	**0.02 µg/g**	**0.02 µg/g**	**0.02 µg/g**	--	--
Ethylbenzene	E611A/WT	0.015	µg/g	<0.015	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	--	--
Toluene	E611A/WT	0.050	µg/g	<0.050	**0.2 µg/g**	**0.2 µg/g**	**0.2 µg/g**	**0.2 µg/g**	--	--
Xylene, m+p-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylene, o-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylenes, total	E611A/WT	0.050	µg/g	<0.050	**0.05 µg/g**	**0.091 µg/g**	**0.091 µg/g**	**0.091 µg/g**	--	--
BTEX, total	E611A/WT	0.10	µg/g	<0.10	--	--	--	--	--	--
Hydrocarbons										
F1 (C6-C10)	E581.F1/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
F2 (C10-C16)	E601.SG-L/WT	10	µg/g	<10	**10 µg/g**	**10 µg/g**	**26 µg/g**	**10 µg/g**	--	--
F3 (C16-C34)	E601.SG-L/WT	50	µg/g	<50	**240 µg/g**	**240 µg/g**	**240 µg/g**	**240 µg/g**	--	--

Analyte	Method/Lab	LOR	Unit	WT2312081-039 (Continued)	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Hydrocarbons - Continued										
F4 (C34-C50)	E601.SG-L/WT	50	µg/g	<50	**120 µg/g**	**2800 µg/g**	**3300 µg/g**	**2800 µg/g**	--	--
F1-BTEX	EC580/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
Hydrocarbons, total (C6-C50)	EC581/WT	80	µg/g	<80	--	--	--	--	--	--
Chromatogram to baseline at nC50	E601.SG-L/WT		µg/g	YES	--	--	--	--	--	--
Bromobenzotrifluoride, 2- (F2-F4 surrogate)	E601.SG-L/WT	1.0	%	73.6	--	--	--	--	--	--
Dichlorotoluene, 3,4-	E581.F1/WT	1.0	%	92.3	--	--	--	--	--	--
Bromofluorobenzene, 4-	E611A/WT	0.10	%	87.4	--	--	--	--	--	--
Difluorobenzene, 1,4-	E611A/WT	0.10	%	96.4	--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

No Breaches Found

Key:

ON406/20	Ontario Regulation 406/19 - Excess Soils - 17-December-20
T1-RPIICC	406 T1 - Soil - Res/Park/Inst/Ind/Com/Commu Property Use
T2.1-S-AG	406 T2.1 - Volume Independent Soil - Agricultural or Other Property Use
T2.1-S-ICC	406 T2.1 - Volume Independent Soil - Ind/Com/Commu Property Use
T2.1-S-RPI	406 T2.1 - Volume Independent Soil - Res/Park/Inst Property Use

Analytical Results

Sub-Matrix: **Solid**
(Matrix: **Soil/Solid**)

Analyte	Method/Lab	LOR	Unit	Client sample ID: BH106-23 T Sampling date/time: 05-May-2023 14:40 WT2312081-045	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Physical Tests										
Moisture	E144/WT	0.25	%	13.0	--	--	--	--	--	--
Metals										
Antimony	E440C/WT	0.10	mg/kg	0.16	**1.3 mg/kg**	**7.5 mg/kg**	**40 mg/kg**	**7.5 mg/kg**	--	--
Arsenic	E440C/WT	0.10	mg/kg	2.77	**18 mg/kg**	**11 mg/kg**	**18 mg/kg**	**18 mg/kg**	--	--
Barium	E440C/WT	0.50	mg/kg	35.1	**220 mg/kg**	**390 mg/kg**	**670 mg/kg**	**390 mg/kg**	--	--
Beryllium	E440C/WT	0.10	mg/kg	0.32	**2.5 mg/kg**	**4 mg/kg**	**8 mg/kg**	**4 mg/kg**	--	--
Boron	E440C/WT	5.0	mg/kg	<5.0	**36 mg/kg**	**120 mg/kg**	**120 mg/kg**	**120 mg/kg**	--	--
Cadmium	E440C/WT	0.020	mg/kg	0.332	**1.2 mg/kg**	**1 mg/kg**	**1.9 mg/kg**	**1.2 mg/kg**	--	--
Chromium	E440C/WT	0.50	mg/kg	18.8	**70 mg/kg**	**160 mg/kg**	**160 mg/kg**	**160 mg/kg**	--	--
Cobalt	E440C/WT	0.10	mg/kg	4.06	**21 mg/kg**	**22 mg/kg**	**80 mg/kg**	**22 mg/kg**	--	--
Copper	E440C/WT	0.50	mg/kg	17.1	**92 mg/kg**	**140 mg/kg**	**230 mg/kg**	**140 mg/kg**	--	--
Lead	E440C/WT	0.50	mg/kg	17.1	**120 mg/kg**	**45 mg/kg**	**120 mg/kg**	**120 mg/kg**	--	--
Molybdenum	E440C/WT	0.10	mg/kg	0.32	**2 mg/kg**	**6.9 mg/kg**	**40 mg/kg**	**6.9 mg/kg**	--	--
Nickel	E440C/WT	0.50	mg/kg	9.32	**82 mg/kg**	**100 mg/kg**	**270 mg/kg**	**100 mg/kg**	--	--
Selenium	E440C/WT	0.20	mg/kg	<0.20	**1.5 mg/kg**	**2.4 mg/kg**	**5.5 mg/kg**	**2.4 mg/kg**	--	--
Silver	E440C/WT	0.10	mg/kg	0.18	**0.5 mg/kg**	**20 mg/kg**	**40 mg/kg**	**20 mg/kg**	--	--
Thallium	E440C/WT	0.050	mg/kg	0.072	**1 mg/kg**	**1 mg/kg**	**3.3 mg/kg**	**1 mg/kg**	--	--
Uranium	E440C/WT	0.050	mg/kg	0.524	**2.5 mg/kg**	**23 mg/kg**	**33 mg/kg**	**23 mg/kg**	--	--
Vanadium	E440C/WT	0.20	mg/kg	25.2	**86 mg/kg**	**86 mg/kg**	**86 mg/kg**	**86 mg/kg**	--	--
Zinc	E440C/WT	2.0	mg/kg	84.6	**290 mg/kg**	**340 mg/kg**	**340 mg/kg**	**340 mg/kg**	--	--
Volatile Organic Compounds										
Benzene	E611A/WT	0.0050	µg/g	<0.0050	**0.02 µg/g**	**0.02 µg/g**	**0.02 µg/g**	**0.02 µg/g**	--	--
Ethylbenzene	E611A/WT	0.015	µg/g	<0.015	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	--	--
Toluene	E611A/WT	0.050	µg/g	<0.050	**0.2 µg/g**	**0.2 µg/g**	**0.2 µg/g**	**0.2 µg/g**	--	--
Xylene, m+p-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylene, o-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylenes, total	E611A/WT	0.050	µg/g	<0.050	**0.05 µg/g**	**0.091 µg/g**	**0.091 µg/g**	**0.091 µg/g**	--	--
BTEX, total	E611A/WT	0.10	µg/g	<0.10	--	--	--	--	--	--
Hydrocarbons										
F1 (C6-C10)	E581.F1/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
F2 (C10-C16)	E601.SG-L/WT	10	µg/g	<10	**10 µg/g**	**10 µg/g**	**26 µg/g**	**10 µg/g**	--	--
F3 (C16-C34)	E601.SG-L/WT	50	µg/g	<50	**240 µg/g**	**240 µg/g**	**240 µg/g**	**240 µg/g**	--	--

Analyte	Method/Lab	LOR	Unit	WT2312081-045 (Continued)	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Hydrocarbons - Continued										
F4 (C34-C50)	E601.SG-L/WT	50	µg/g	<50	**120 µg/g**	**2800 µg/g**	**3300 µg/g**	**2800 µg/g**	--	--
F1-BTEX	EC580/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
Hydrocarbons, total (C6-C50)	EC581/WT	80	µg/g	<80	--	--	--	--	--	--
Chromatogram to baseline at nC50	E601.SG-L/WT		µg/g	YES	--	--	--	--	--	--
Bromobenzotrifluoride, 2- (F2-F4 surrogate)	E601.SG-L/WT	1.0	%	79.0	--	--	--	--	--	--
Dichlorotoluene, 3,4-	E581.F1/WT	1.0	%	97.4	--	--	--	--	--	--
Bromofluorobenzene, 4-	E611A/WT	0.10	%	95.6	--	--	--	--	--	--
Difluorobenzene, 1,4-	E611A/WT	0.10	%	109	--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

No Breaches Found

Key:

ON406/20	Ontario Regulation 406/19 - Excess Soils - 17-December-20
T1-RPIICC	406 T1 - Soil - Res/Park/Inst/Ind/Com/Commu Property Use
T2.1-S-AG	406 T2.1 - Volume Independent Soil - Agricultural or Other Property Use
T2.1-S-ICC	406 T2.1 - Volume Independent Soil - Ind/Com/Commu Property Use
T2.1-S-RPI	406 T2.1 - Volume Independent Soil - Res/Park/Inst Property Use

Analytical Results

Sub-Matrix: **Solid**
(Matrix: **Soil/Solid**)

Analyte	Method/Lab	LOR	Unit	Client sample ID: BH107-23 7.5-9.5'	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
				Sampling date/time: 05-May-2023 15:20						
				WT2312081-049						
Physical Tests										
Moisture	E144/WT	0.25	%	1.94	--	--	--	--	--	--
pH (1:2 soil:CaCl2-aq)	E108A/WT	0.10	pH units	8.10	--	--	--	--	--	--
Metals										
Antimony	E440C/WT	0.10	mg/kg	<0.10	1.3 mg/kg	7.5 mg/kg	40 mg/kg	7.5 mg/kg	--	--
Arsenic	E440C/WT	0.10	mg/kg	2.15	18 mg/kg	11 mg/kg	18 mg/kg	18 mg/kg	--	--
Barium	E440C/WT	0.50	mg/kg	31.8	220 mg/kg	390 mg/kg	670 mg/kg	390 mg/kg	--	--
Beryllium	E440C/WT	0.10	mg/kg	0.15	2.5 mg/kg	4 mg/kg	8 mg/kg	4 mg/kg	--	--
Boron	E440C/WT	5.0	mg/kg	5.0	36 mg/kg	120 mg/kg	120 mg/kg	120 mg/kg	--	--
Cadmium	E440C/WT	0.020	mg/kg	0.165	1.2 mg/kg	1 mg/kg	1.9 mg/kg	1.2 mg/kg	--	--
Chromium	E440C/WT	0.50	mg/kg	5.94	70 mg/kg	160 mg/kg	160 mg/kg	160 mg/kg	--	--
Cobalt	E440C/WT	0.10	mg/kg	2.54	21 mg/kg	22 mg/kg	80 mg/kg	22 mg/kg	--	--
Copper	E440C/WT	0.50	mg/kg	10.5	92 mg/kg	140 mg/kg	230 mg/kg	140 mg/kg	--	--
Lead	E440C/WT	0.50	mg/kg	11.7	120 mg/kg	45 mg/kg	120 mg/kg	120 mg/kg	--	--
Molybdenum	E440C/WT	0.10	mg/kg	0.26	2 mg/kg	6.9 mg/kg	40 mg/kg	6.9 mg/kg	--	--
Nickel	E440C/WT	0.50	mg/kg	4.68	82 mg/kg	100 mg/kg	270 mg/kg	100 mg/kg	--	--
Selenium	E440C/WT	0.20	mg/kg	<0.20	1.5 mg/kg	2.4 mg/kg	5.5 mg/kg	2.4 mg/kg	--	--
Silver	E440C/WT	0.10	mg/kg	<0.10	0.5 mg/kg	20 mg/kg	40 mg/kg	20 mg/kg	--	--
Thallium	E440C/WT	0.050	mg/kg	0.050	1 mg/kg	1 mg/kg	3.3 mg/kg	1 mg/kg	--	--
Uranium	E440C/WT	0.050	mg/kg	0.448	2.5 mg/kg	23 mg/kg	33 mg/kg	23 mg/kg	--	--
Vanadium	E440C/WT	0.20	mg/kg	15.2	86 mg/kg	86 mg/kg	86 mg/kg	86 mg/kg	--	--
Zinc	E440C/WT	2.0	mg/kg	73.6	290 mg/kg	340 mg/kg	340 mg/kg	340 mg/kg	--	--
Volatile Organic Compounds										
Benzene	E611A/WT	0.0050	µg/g	<0.0050	0.02 µg/g	0.02 µg/g	0.02 µg/g	0.02 µg/g	--	--
Ethylbenzene	E611A/WT	0.015	µg/g	<0.015	0.05 µg/g	0.05 µg/g	0.05 µg/g	0.05 µg/g	--	--
Toluene	E611A/WT	0.050	µg/g	<0.050	0.2 µg/g	0.2 µg/g	0.2 µg/g	0.2 µg/g	--	--
Xylene, m+p-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylene, o-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylenes, total	E611A/WT	0.050	µg/g	<0.050	0.05 µg/g	0.091 µg/g	0.091 µg/g	0.091 µg/g	--	--
BTEX, total	E611A/WT	0.10	µg/g	<0.10	--	--	--	--	--	--
Hydrocarbons										
F1 (C6-C10)	E581.F1/WT	5.0	µg/g	<5.0	25 µg/g	17 µg/g	25 µg/g	25 µg/g	--	--
F2 (C10-C16)	E601.SG-L/WT	10	µg/g	<10	10 µg/g	10 µg/g	26 µg/g	10 µg/g	--	--

Analyte	Method/Lab	LOR	Unit	WT2312081-049 (Continued)	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Hydrocarbons - Continued										
F3 (C16-C34)	E601.SG-L/WT	50	µg/g	<50	**240 µg/g**	**240 µg/g**	**240 µg/g**	**240 µg/g**	--	--
F4 (C34-C50)	E601.SG-L/WT	50	µg/g	<50	**120 µg/g**	**2800 µg/g**	**3300 µg/g**	**2800 µg/g**	--	--
F1-BTEX	EC580/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
Hydrocarbons, total (C6-C50)	EC581/WT	80	µg/g	<80	--	--	--	--	--	--
Chromatogram to baseline at nC50	E601.SG-L/WT		µg/g	YES	--	--	--	--	--	--
Bromobenzotrifluoride, 2- (F2-F4 surrogate)	E601.SG-L/WT	1.0	%	95.4	--	--	--	--	--	--
Dichlorotoluene, 3,4-	E581.F1/WT	1.0	%	91.8	--	--	--	--	--	--
Bromofluorobenzene, 4-	E611A/WT	0.10	%	90.3	--	--	--	--	--	--
Difluorobenzene, 1,4-	E611A/WT	0.10	%	101	--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

No Breaches Found

Key:

ON406/20	Ontario Regulation 406/19 - Excess Soils - 17-December-20
T1-RPIICC	406 T1 - Soil - Res/Park/Inst/Ind/Com/Commu Property Use
T2.1-S-AG	406 T2.1 - Volume Independent Soil - Agricultural or Other Property Use
T2.1-S-ICC	406 T2.1 - Volume Independent Soil - Ind/Com/Commu Property Use
T2.1-S-RPI	406 T2.1 - Volume Independent Soil - Res/Park/Inst Property Use

Analytical Results

Sub-Matrix: **Solid**
(Matrix: **Soil/Solid**)

Analyte	Method/Lab	LOR	Unit	Client sample ID: BH107-23 T Sampling date/time: 05-May-2023 15:50 WT2312081-053	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Physical Tests										
Moisture	E144/WT	0.25	%	17.0	--	--	--	--	--	--
pH (1:2 soil:CaCl2-aq)	E108A/WT	0.10	pH units	4.10	--	--	--	--	--	--
Metals										
Antimony	E440C/WT	0.10	mg/kg	0.15	**1.3 mg/kg**	**7.5 mg/kg**	**40 mg/kg**	**7.5 mg/kg**	--	--
Arsenic	E440C/WT	0.10	mg/kg	2.15	**18 mg/kg**	**11 mg/kg**	**18 mg/kg**	**18 mg/kg**	--	--
Barium	E440C/WT	0.50	mg/kg	32.2	**220 mg/kg**	**390 mg/kg**	**670 mg/kg**	**390 mg/kg**	--	--
Beryllium	E440C/WT	0.10	mg/kg	0.28	**2.5 mg/kg**	**4 mg/kg**	**8 mg/kg**	**4 mg/kg**	--	--
Boron	E440C/WT	5.0	mg/kg	<5.0	**36 mg/kg**	**120 mg/kg**	**120 mg/kg**	**120 mg/kg**	--	--
Cadmium	E440C/WT	0.020	mg/kg	0.180	**1.2 mg/kg**	**1 mg/kg**	**1.9 mg/kg**	**1.2 mg/kg**	--	--
Chromium	E440C/WT	0.50	mg/kg	14.6	**70 mg/kg**	**160 mg/kg**	**160 mg/kg**	**160 mg/kg**	--	--
Cobalt	E440C/WT	0.10	mg/kg	3.47	**21 mg/kg**	**22 mg/kg**	**80 mg/kg**	**22 mg/kg**	--	--
Copper	E440C/WT	0.50	mg/kg	14.1	**92 mg/kg**	**140 mg/kg**	**230 mg/kg**	**140 mg/kg**	--	--
Lead	E440C/WT	0.50	mg/kg	13.5	**120 mg/kg**	**45 mg/kg**	**120 mg/kg**	**120 mg/kg**	--	--
Molybdenum	E440C/WT	0.10	mg/kg	0.43	**2 mg/kg**	**6.9 mg/kg**	**40 mg/kg**	**6.9 mg/kg**	--	--
Nickel	E440C/WT	0.50	mg/kg	7.15	**82 mg/kg**	**100 mg/kg**	**270 mg/kg**	**100 mg/kg**	--	--
Selenium	E440C/WT	0.20	mg/kg	<0.20	**1.5 mg/kg**	**2.4 mg/kg**	**5.5 mg/kg**	**2.4 mg/kg**	--	--
Silver	E440C/WT	0.10	mg/kg	0.13	**0.5 mg/kg**	**20 mg/kg**	**40 mg/kg**	**20 mg/kg**	--	--
Thallium	E440C/WT	0.050	mg/kg	0.068	**1 mg/kg**	**1 mg/kg**	**3.3 mg/kg**	**1 mg/kg**	--	--
Uranium	E440C/WT	0.050	mg/kg	0.565	**2.5 mg/kg**	**23 mg/kg**	**33 mg/kg**	**23 mg/kg**	--	--
Vanadium	E440C/WT	0.20	mg/kg	20.5	**86 mg/kg**	**86 mg/kg**	**86 mg/kg**	**86 mg/kg**	--	--
Zinc	E440C/WT	2.0	mg/kg	69.7	**290 mg/kg**	**340 mg/kg**	**340 mg/kg**	**340 mg/kg**	--	--
Volatile Organic Compounds										
Benzene	E611A/WT	0.0050	µg/g	<0.0050	**0.02 µg/g**	**0.02 µg/g**	**0.02 µg/g**	**0.02 µg/g**	--	--
Ethylbenzene	E611A/WT	0.015	µg/g	<0.015	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	--	--
Toluene	E611A/WT	0.050	µg/g	<0.050	**0.2 µg/g**	**0.2 µg/g**	**0.2 µg/g**	**0.2 µg/g**	--	--
Xylene, m+p-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylene, o-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylenes, total	E611A/WT	0.050	µg/g	<0.050	**0.05 µg/g**	**0.091 µg/g**	**0.091 µg/g**	**0.091 µg/g**	--	--
BTEX, total	E611A/WT	0.10	µg/g	<0.10	--	--	--	--	--	--
Hydrocarbons										
F1 (C6-C10)	E581.F1/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
F2 (C10-C16)	E601.SG-L/WT	10	µg/g	<10	**10 µg/g**	**10 µg/g**	**26 µg/g**	**10 µg/g**	--	--

Analyte	Method/Lab	LOR	Unit	WT2312081-053 (Continued)	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Hydrocarbons - Continued										
F3 (C16-C34)	E601.SG-L/WT	50	µg/g	<50	**240 µg/g**	**240 µg/g**	**240 µg/g**	**240 µg/g**	--	--
F4 (C34-C50)	E601.SG-L/WT	50	µg/g	<50	**120 µg/g**	**2800 µg/g**	**3300 µg/g**	**2800 µg/g**	--	--
F1-BTEX	EC580/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
Hydrocarbons, total (C6-C50)	EC581/WT	80	µg/g	<80	--	--	--	--	--	--
Chromatogram to baseline at nC50	E601.SG-L/WT		µg/g	YES	--	--	--	--	--	--
Bromobenzotrifluoride, 2- (F2-F4 surrogate)	E601.SG-L/WT	1.0	%	84.1	--	--	--	--	--	--
Dichlorotoluene, 3,4-	E581.F1/WT	1.0	%	94.9	--	--	--	--	--	--
Bromofluorobenzene, 4-	E611A/WT	0.10	%	97.3	--	--	--	--	--	--
Difluorobenzene, 1,4-	E611A/WT	0.10	%	110	--	--	--	--	--	--
Organochlorine Pesticides										
Aldrin	E660F/WT	0.020	µg/g	<0.020	**0.05 µg/g**	**0.05 µg/g**	**0.088 µg/g**	**0.05 µg/g**	--	--
Chlordane, cis- (alpha)	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
Chlordane, total	E660F/WT	0.030	µg/g	<0.030	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	--	--
Chlordane, trans- (gamma)	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDD, 2,4'-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDD, 4,4'-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDD, total	E660F/WT	0.030	µg/g	<0.030	**0.05 µg/g**	**3.3 µg/g**	**4.6 µg/g**	**3.3 µg/g**	--	--
DDE, 2,4'-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDE, 4,4'-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDE, total	E660F/WT	0.030	µg/g	<0.030	**0.05 µg/g**	**0.26 µg/g**	**0.52 µg/g**	**0.26 µg/g**	--	--
DDT, 2,4'-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
DDT, 4,4'-	E660F/WT	0.020	µg/g	<0.040 DLM	--	--	--	--	--	--
DDT, total	E660F/WT	0.030	µg/g	<0.045	**1.4 µg/g**	**0.078 µg/g**	**1.4 µg/g**	**1.4 µg/g**	--	--
Dieldrin	E660F/WT	0.020	µg/g	<0.020	**0.05 µg/g**	**0.05 µg/g**	**0.088 µg/g**	**0.05 µg/g**	--	--
Endosulfan, alpha-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
Endosulfan, beta-	E660F/WT	0.020	µg/g	<0.020	--	--	--	--	--	--
Endosulfan, total	E660F/WT	0.030	µg/g	<0.030	**0.04 µg/g**	**0.04 µg/g**	**0.04 µg/g**	**0.04 µg/g**	--	--
Endrin	E660F/WT	0.020	µg/g	<0.020	**0.04 µg/g**	**0.04 µg/g**	**0.04 µg/g**	**0.04 µg/g**	--	--
Heptachlor epoxide	E660F/WT	0.020	µg/g	<0.020	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	--	--
Heptachlor	E660F/WT	0.020	µg/g	<0.020	**0.05 µg/g**	**0.072 µg/g**	**0.072 µg/g**	**0.072 µg/g**	--	--
Hexachlorobenzene	E660F/WT	0.010	µg/g	<0.010	**0.01 µg/g**	**0.034 µg/g**	**0.034 µg/g**	**0.034 µg/g**	--	--
Hexachlorobutadiene	E660F/WT	0.010	µg/g	<0.010	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	--	--
Hexachlorocyclohexane, gamma-	E660F/WT	0.010	µg/g	<0.010	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	--	--
Hexachloroethane	E660F/WT	0.010	µg/g	<0.010	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	**0.01 µg/g**	--	--

Analyte	Method/Lab	LOR	Unit	WT2312081-053 (Continued)	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Organochlorine Pesticides - Continued										
Methoxychlor	E660F/WT	0.020	µg/g	<0.040 DLM	**0.05 µg/g**	**0.24 µg/g**	**0.19 µg/g**	**0.13 µg/g**	--	--
Decachlorobiphenyl	E660F/WT	0.1	%	135	--	--	--	--	--	--
Tetrachloro-m-xylene	E660F/WT	0.1	%	105	--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

No Breaches Found

Key:

ON406/20	Ontario Regulation 406/19 - Excess Soils - 17-December-20
T1-RPIICC	406 T1 - Soil - Res/Park/Inst/Ind/Com/Commu Property Use
T2.1-S-AG	406 T2.1 - Volume Independent Soil - Agricultural or Other Property Use
T2.1-S-ICC	406 T2.1 - Volume Independent Soil - Ind/Com/Commu Property Use
T2.1-S-RPI	406 T2.1 - Volume Independent Soil - Res/Park/Inst Property Use

Analytical Results

Sub-Matrix: **Solid**
(Matrix: **Soil/Solid**)

Analyte	Method/Lab	LOR	Unit	Client sample ID: BH1101-23 T Sampling date/time: 05-May-2023 16:00 WT2312081-054	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Physical Tests										
Moisture	E144/WT	0.25	%	13.7	--	--	--	--	--	--
pH (1:2 soil:CaCl2-aq)	E108A/WT	0.10	pH units	7.21	--	--	--	--	--	--
Metals										
Antimony	E440C/WT	0.10	mg/kg	0.23	**1.3 mg/kg**	**7.5 mg/kg**	**40 mg/kg**	**7.5 mg/kg**	--	--
Arsenic	E440C/WT	0.10	mg/kg	4.01	**18 mg/kg**	**11 mg/kg**	**18 mg/kg**	**18 mg/kg**	--	--
Barium	E440C/WT	0.50	mg/kg	50.3	**220 mg/kg**	**390 mg/kg**	**670 mg/kg**	**390 mg/kg**	--	--
Beryllium	E440C/WT	0.10	mg/kg	0.39	**2.5 mg/kg**	**4 mg/kg**	**8 mg/kg**	**4 mg/kg**	--	--
Boron	E440C/WT	5.0	mg/kg	6.2	**36 mg/kg**	**120 mg/kg**	**120 mg/kg**	**120 mg/kg**	--	--
Cadmium	E440C/WT	0.020	mg/kg	0.332	**1.2 mg/kg**	**1 mg/kg**	**1.9 mg/kg**	**1.2 mg/kg**	--	--
Chromium	E440C/WT	0.50	mg/kg	21.4	**70 mg/kg**	**160 mg/kg**	**160 mg/kg**	**160 mg/kg**	--	--
Cobalt	E440C/WT	0.10	mg/kg	5.05	**21 mg/kg**	**22 mg/kg**	**80 mg/kg**	**22 mg/kg**	--	--
Copper	E440C/WT	0.50	mg/kg	33.0	**92 mg/kg**	**140 mg/kg**	**230 mg/kg**	**140 mg/kg**	--	--
Lead	E440C/WT	0.50	mg/kg	22.9	**120 mg/kg**	**45 mg/kg**	**120 mg/kg**	**120 mg/kg**	--	--
Molybdenum	E440C/WT	0.10	mg/kg	0.57	**2 mg/kg**	**6.9 mg/kg**	**40 mg/kg**	**6.9 mg/kg**	--	--
Nickel	E440C/WT	0.50	mg/kg	10.9	**82 mg/kg**	**100 mg/kg**	**270 mg/kg**	**100 mg/kg**	--	--
Selenium	E440C/WT	0.20	mg/kg	0.25	**1.5 mg/kg**	**2.4 mg/kg**	**5.5 mg/kg**	**2.4 mg/kg**	--	--
Silver	E440C/WT	0.10	mg/kg	0.33	**0.5 mg/kg**	**20 mg/kg**	**40 mg/kg**	**20 mg/kg**	--	--
Thallium	E440C/WT	0.050	mg/kg	0.090	**1 mg/kg**	**1 mg/kg**	**3.3 mg/kg**	**1 mg/kg**	--	--
Uranium	E440C/WT	0.050	mg/kg	0.837	**2.5 mg/kg**	**23 mg/kg**	**33 mg/kg**	**23 mg/kg**	--	--
Vanadium	E440C/WT	0.20	mg/kg	27.6	**86 mg/kg**	**86 mg/kg**	**86 mg/kg**	**86 mg/kg**	--	--
Zinc	E440C/WT	2.0	mg/kg	143	**290 mg/kg**	**340 mg/kg**	**340 mg/kg**	**340 mg/kg**	--	--
Volatile Organic Compounds										
Benzene	E611A/WT	0.0050	µg/g	<0.0050	**0.02 µg/g**	**0.02 µg/g**	**0.02 µg/g**	**0.02 µg/g**	--	--
Ethylbenzene	E611A/WT	0.015	µg/g	<0.015	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	**0.05 µg/g**	--	--
Toluene	E611A/WT	0.050	µg/g	<0.050	**0.2 µg/g**	**0.2 µg/g**	**0.2 µg/g**	**0.2 µg/g**	--	--
Xylene, m+p-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylene, o-	E611A/WT	0.030	µg/g	<0.030	--	--	--	--	--	--
Xylenes, total	E611A/WT	0.050	µg/g	<0.050	**0.05 µg/g**	**0.091 µg/g**	**0.091 µg/g**	**0.091 µg/g**	--	--
BTEX, total	E611A/WT	0.10	µg/g	<0.10	--	--	--	--	--	--
Hydrocarbons										
F1 (C6-C10)	E581.F1/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
F2 (C10-C16)	E601.SG-L/WT	10	µg/g	<10	**10 µg/g**	**10 µg/g**	**26 µg/g**	**10 µg/g**	--	--

Analyte	Method/Lab	LOR	Unit	WT2312081-054 (Continued)	ON406/20 T1-RPIICC	ON406/20 T2.1-S-AG	ON406/20 T2.1-S-ICC	ON406/20 T2.1-S-RPI		
Hydrocarbons - Continued										
F3 (C16-C34)	E601.SG-L/WT	50	µg/g	<50	**240 µg/g**	**240 µg/g**	**240 µg/g**	**240 µg/g**	--	--
F4 (C34-C50)	E601.SG-L/WT	50	µg/g	<50	**120 µg/g**	**2800 µg/g**	**3300 µg/g**	**2800 µg/g**	--	--
F1-BTEX	EC580/WT	5.0	µg/g	<5.0	**25 µg/g**	**17 µg/g**	**25 µg/g**	**25 µg/g**	--	--
Hydrocarbons, total (C6-C50)	EC581/WT	80	µg/g	<80	--	--	--	--	--	--
Chromatogram to baseline at nC50	E601.SG-L/WT		µg/g	YES	--	--	--	--	--	--
Bromobenzotrifluoride, 2- (F2-F4 surrogate)	E601.SG-L/WT	1.0	%	94.4	--	--	--	--	--	--
Dichlorotoluene, 3,4-	E581.F1/WT	1.0	%	91.3	--	--	--	--	--	--
Bromofluorobenzene, 4-	E611A/WT	0.10	%	89.2	--	--	--	--	--	--
Difluorobenzene, 1,4-	E611A/WT	0.10	%	100	--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

No Breaches Found

Key:

ON406/20	Ontario Regulation 406/19 - Excess Soils - 17-December-20
T1-RPIICC	406 T1 - Soil - Res/Park/Inst/Ind/Com/Commu Property Use
T2.1-S-AG	406 T2.1 - Volume Independent Soil - Agricultural or Other Property Use
T2.1-S-ICC	406 T2.1 - Volume Independent Soil - Ind/Com/Commu Property Use
T2.1-S-RPI	406 T2.1 - Volume Independent Soil - Res/Park/Inst Property Use

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QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2312081**	Page	: 1 of 17
Client	: **MTE Consultants Inc.**	Laboratory	: Waterloo - Environmental
Contact	: Jen Lambke	Account Manager	: Emily Hansen
Address	: 520 Bingemans Centre Drive Kitchener ON Canada N2B 3X9	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 519 743 6500	Telephone	: +1 519 886 6910
Project	: 53018-100 Blair Creek	Date Samples Received	: 05-May-2023 19:30
PO	: ----	Issue Date	: 17-May-2023 17:08
C-O-C number	: ----		
Sampler	: client		
Site	: ----		
Quote number	: Q79143 - CoK Roads Recon Program		
No. of samples received	: 62		
No. of samples analysed	: 15		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- Matrix Spike outliers occur - please see following pages for full details.
- Test sample Surrogate recovery outliers exist for all regular sample matrices - please see following pages for full details.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Soil/Solid**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Matrix Spike (MS) Recoveries								
Hydrocarbons	Anonymous	Anonymous	F3 (C16-C34)	----	E601.SG-L	149 % E	60.0-140%	Recovery greater than upper data quality objective
Hydrocarbons	Anonymous	Anonymous	F4 (C34-C50)	----	E601.SG-L	156 % E	60.0-140%	Recovery greater than upper data quality objective
Organochlorine Pesticides	WT2312081-007	BH101-23 T	DDT, 2,4'-	789-02-6	E660F	46.3 % K	50.0-150%	Recovery less than lower data quality objective
Organochlorine Pesticides	WT2312081-007	BH101-23 T	DDT, 4,4'-	50-29-3	E660F	39.4 % K	50.0-150%	Recovery less than lower data quality objective
Organochlorine Pesticides	WT2312081-007	BH101-23 T	Methoxychlor	72-43-5	E660F	36.8 % K	50.0-150%	Recovery less than lower data quality objective

Result Qualifiers

Qualifier	*Description*
E	*Matrix Spike recovery outside ALS DQO due to heterogeneous analyte background in sample.*
K	*Matrix Spike recovery outside ALS DQO due to sample matrix effects.*

Regular Sample Surrogates

Sub-Matrix: **Solid**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Result	Limits	Comment
Samples Submitted							
Organochlorine Pesticides Surrogates	WT2312081-021	BH103-23 T	Decachlorobiphenyl	2051-24-3	151 %	50.0-150 %	Recovery greater than upper data quality objective
Organochlorine Pesticides Surrogates	WT2312081-037	BH105-23 T	Decachlorobiphenyl	2051-24-3	174 %	50.0-150 %	Recovery greater than upper data quality objective

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial BH102-23 5-7'	E581.F1	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial BH101-23 2.5-4.5'	E581.F1	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial BH101-23 T	E581.F1	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial BH102-23 T	E581.F1	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial BH103-23 T	E581.F1	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial BH103-23 7.5-9.5	E581.F1	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial BH104- 2.5-4.5'	E581.F1	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial										
BH104-23 T	E581.F1	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial										
BH105-23 5-7'	E581.F1	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial										
BH105-23 T	E581.F1	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial										
BH106-23 T	E581.F1	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial										
BH107-23 7.5-9.5'	E581.F1	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial										
BH106-23 2.5-4.5'	E581.F1	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	5 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial										
BH107-23 T	E581.F1	05-May-2023	09-May-2023	----	----		12-May-2023	40 days	7 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial										
BH1101-23 T	E581.F1	05-May-2023	09-May-2023	----	----		12-May-2023	40 days	7 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH103-23 7.5-9.5	E601.SG-L	05-May-2023	15-May-2023	14 days	10 days	✓	16-May-2023	40 days	1 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP] BH104-23 T	E601.SG-L	05-May-2023	15-May-2023	14 days	10 days	✓	16-May-2023	40 days	1 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP] BH105-23 5-7'	E601.SG-L	05-May-2023	15-May-2023	14 days	10 days	✓	16-May-2023	40 days	1 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP] BH107-23 7.5-9.5'	E601.SG-L	05-May-2023	15-May-2023	14 days	10 days	✓	16-May-2023	40 days	1 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP] BH1101-23 T	E601.SG-L	05-May-2023	15-May-2023	14 days	10 days	✓	16-May-2023	40 days	1 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP] BH105-23 T	E601.SG-L	05-May-2023	10-May-2023	14 days	4 days	✓	16-May-2023	40 days	6 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP] BH106-23 T	E601.SG-L	05-May-2023	10-May-2023	14 days	4 days	✓	16-May-2023	40 days	6 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP] BH107-23 T	E601.SG-L	05-May-2023	10-May-2023	14 days	4 days	✓	16-May-2023	40 days	6 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP] BH101-23 2.5-4.5'	E601.SG-L	05-May-2023	10-May-2023	14 days	5 days	✓	16-May-2023	40 days	6 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP] BH101-23 T	E601.SG-L	05-May-2023	10-May-2023	14 days	5 days	✓	16-May-2023	40 days	6 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH103-23 T	E601.SG-L	05-May-2023	10-May-2023	14 days	5 days	✓	16-May-2023	40 days	6 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH106-23 2.5-4.5'	E601.SG-L	05-May-2023	10-May-2023	14 days	5 days	✓	16-May-2023	40 days	6 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH102-23 5-7'	E601.SG-L	05-May-2023	10-May-2023	14 days	5 days	✓	16-May-2023	40 days	7 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH102-23 T	E601.SG-L	05-May-2023	10-May-2023	14 days	5 days	✓	16-May-2023	40 days	7 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH104- 2.5-4.5'	E601.SG-L	05-May-2023	10-May-2023	14 days	5 days	✓	16-May-2023	40 days	7 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH102-23 5-7'	E440C	05-May-2023	12-May-2023	----	----		12-May-2023	180 days	7 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH101-23 2.5-4.5'	E440C	05-May-2023	12-May-2023	----	----		12-May-2023	180 days	7 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH101-23 T	E440C	05-May-2023	12-May-2023	----	----		12-May-2023	180 days	7 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH102-23 T	E440C	05-May-2023	12-May-2023	----	----		12-May-2023	180 days	7 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Soil/Solid by CRC ICPMS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP] BH103-23 T	E440C	05-May-2023	12-May-2023	----	----		12-May-2023	180 days	7 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP] BH103-23 7.5-9.5	E440C	05-May-2023	12-May-2023	----	----		12-May-2023	180 days	7 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP] BH104- 2.5-4.5'	E440C	05-May-2023	12-May-2023	----	----		12-May-2023	180 days	7 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP] BH104-23 T	E440C	05-May-2023	12-May-2023	----	----		12-May-2023	180 days	7 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP] BH105-23 5-7'	E440C	05-May-2023	12-May-2023	----	----		12-May-2023	180 days	7 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP] BH105-23 T	E440C	05-May-2023	12-May-2023	----	----		12-May-2023	180 days	7 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP] BH106-23 2.5-4.5'	E440C	05-May-2023	12-May-2023	----	----		12-May-2023	180 days	7 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP] BH106-23 T	E440C	05-May-2023	12-May-2023	----	----		12-May-2023	180 days	7 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP] BH107-23 7.5-9.5'	E440C	05-May-2023	12-May-2023	----	----		12-May-2023	180 days	7 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Soil/Solid by CRC ICPMS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH107-23 T	E440C	05-May-2023	12-May-2023	----	----		12-May-2023	180 days	7 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH1101-23 T	E440C	05-May-2023	12-May-2023	----	----		12-May-2023	180 days	7 days	✓
Organochlorine Pesticides : OCPs by GC-MS-MS or GC-MS										
Glass soil jar/Teflon lined cap [ON MECP]										
BH103-23 T	E660F	05-May-2023	15-May-2023	60 days	10 days	✓	17-May-2023	40 days	2 days	✓
Organochlorine Pesticides : OCPs by GC-MS-MS or GC-MS										
Glass soil jar/Teflon lined cap [ON MECP]										
BH105-23 T	E660F	05-May-2023	15-May-2023	60 days	10 days	✓	17-May-2023	40 days	2 days	✓
Organochlorine Pesticides : OCPs by GC-MS-MS or GC-MS										
Glass soil jar/Teflon lined cap [ON MECP]										
BH107-23 T	E660F	05-May-2023	15-May-2023	60 days	10 days	✓	17-May-2023	40 days	2 days	✓
Organochlorine Pesticides : OCPs by GC-MS-MS or GC-MS										
Glass soil jar/Teflon lined cap [ON MECP]										
BH101-23 T	E660F	05-May-2023	15-May-2023	60 days	11 days	✓	17-May-2023	40 days	2 days	✓
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap [ON MECP]										
BH102-23 5-7'	E144	05-May-2023	----	----	----		09-May-2023	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap [ON MECP]										
BH101-23 2.5-4.5'	E144	05-May-2023	----	----	----		09-May-2023	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap [ON MECP]										
BH101-23 T	E144	05-May-2023	----	----	----		09-May-2023	----	----	

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap [ON MECP]										
BH102-23 T	E144	05-May-2023	----	----	----		09-May-2023	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap [ON MECP]										
BH103-23 T	E144	05-May-2023	----	----	----		09-May-2023	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap [ON MECP]										
BH103-23 7.5-9.5	E144	05-May-2023	----	----	----		09-May-2023	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap [ON MECP]										
BH104- 2.5-4.5'	E144	05-May-2023	----	----	----		09-May-2023	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap [ON MECP]										
BH104-23 T	E144	05-May-2023	----	----	----		09-May-2023	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap [ON MECP]										
BH105-23 5-7'	E144	05-May-2023	----	----	----		09-May-2023	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap [ON MECP]										
BH105-23 T	E144	05-May-2023	----	----	----		09-May-2023	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap [ON MECP]										
BH106-23 2.5-4.5'	E144	05-May-2023	----	----	----		09-May-2023	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap [ON MECP]										
BH106-23 T	E144	05-May-2023	----	----	----		09-May-2023	----	----	

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap [ON MECP]										
BH107-23 7.5-9.5'	E144	05-May-2023	----	----	----		09-May-2023	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap [ON MECP]										
BH107-23 T	E144	05-May-2023	----	----	----		09-May-2023	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap [ON MECP]										
BH1101-23 T	E144	05-May-2023	----	----	----		09-May-2023	----	----	
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap [ON MECP]										
BH101-23 2.5-4.5'	E108A	05-May-2023	10-May-2023	----	----		12-May-2023	30 days	7 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap [ON MECP]										
BH101-23 T	E108A	05-May-2023	10-May-2023	----	----		12-May-2023	30 days	7 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap [ON MECP]										
BH103-23 T	E108A	05-May-2023	10-May-2023	----	----		12-May-2023	30 days	7 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap [ON MECP]										
BH103-23 7.5-9.5	E108A	05-May-2023	10-May-2023	----	----		12-May-2023	30 days	7 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap [ON MECP]										
BH105-23 5-7'	E108A	05-May-2023	10-May-2023	----	----		12-May-2023	30 days	7 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap [ON MECP]										
BH105-23 T	E108A	05-May-2023	10-May-2023	----	----		12-May-2023	30 days	7 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap [ON MECP]										
BH107-23 7.5-9.5'	E108A	05-May-2023	10-May-2023	----	----		12-May-2023	30 days	7 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap [ON MECP]										
BH107-23 T	E108A	05-May-2023	10-May-2023	----	----		12-May-2023	30 days	7 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap [ON MECP]										
BH1101-23 T	E108A	05-May-2023	10-May-2023	----	----		12-May-2023	30 days	7 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial										
BH102-23 5-7'	E611A	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial										
BH101-23 2.5-4.5'	E611A	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial										
BH101-23 T	E611A	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial										
BH102-23 T	E611A	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial										
BH103-23 T	E611A	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial										
BH103-23 7.5-9.5	E611A	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial BH104- 2.5-4.5'	E611A	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial BH104-23 T	E611A	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial BH105-23 5-7'	E611A	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial BH105-23 T	E611A	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial BH106-23 T	E611A	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial BH107-23 7.5-9.5'	E611A	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	4 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial BH106-23 2.5-4.5'	E611A	05-May-2023	09-May-2023	----	----		09-May-2023	40 days	5 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial BH107-23 T	E611A	05-May-2023	09-May-2023	----	----		12-May-2023	40 days	7 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial BH1101-23 T	E611A	05-May-2023	09-May-2023	----	----		12-May-2023	40 days	7 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
BTEX by Headspace GC-MS	E611A	929327	2	40	5.0	5.0	✓
CCME PHC - F1 by Headspace GC-FID	E581.F1	929326	2	40	5.0	5.0	✓
CCME PHCs - F2-F4 by GC-FID (Low Level)	E601.SG-L	931187	3	56	5.3	5.0	✓
Metals in Soil/Solid by CRC ICPMS (<355 µm)	E440C	927723	1	20	5.0	5.0	✓
Moisture Content by Gravimetry	E144	927667	1	15	6.6	5.0	✓
OCPs by GC-MS-MS or GC-MS	E660F	929356	1	7	14.2	5.0	✓
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A	929954	2	40	5.0	5.0	✓
Laboratory Control Samples (LCS)							
BTEX by Headspace GC-MS	E611A	929327	2	40	5.0	5.0	✓
CCME PHC - F1 by Headspace GC-FID	E581.F1	929326	2	40	5.0	5.0	✓
CCME PHCs - F2-F4 by GC-FID (Low Level)	E601.SG-L	931187	3	56	5.3	5.0	✓
Metals in Soil/Solid by CRC ICPMS (<355 µm)	E440C	927723	2	20	10.0	10.0	✓
Moisture Content by Gravimetry	E144	927667	1	15	6.6	5.0	✓
OCPs by GC-MS-MS or GC-MS	E660F	929356	1	7	14.2	5.0	✓
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A	929954	2	40	5.0	5.0	✓
Method Blanks (MB)							
BTEX by Headspace GC-MS	E611A	929327	2	40	5.0	5.0	✓
CCME PHC - F1 by Headspace GC-FID	E581.F1	929326	2	40	5.0	5.0	✓
CCME PHCs - F2-F4 by GC-FID (Low Level)	E601.SG-L	931187	3	56	5.3	5.0	✓
Metals in Soil/Solid by CRC ICPMS (<355 µm)	E440C	927723	1	20	5.0	5.0	✓
Moisture Content by Gravimetry	E144	927667	1	15	6.6	5.0	✓
OCPs by GC-MS-MS or GC-MS	E660F	929356	1	7	14.2	5.0	✓
Matrix Spikes (MS)							
BTEX by Headspace GC-MS	E611A	929327	2	40	5.0	5.0	✓
CCME PHC - F1 by Headspace GC-FID	E581.F1	929326	2	40	5.0	5.0	✓
CCME PHCs - F2-F4 by GC-FID (Low Level)	E601.SG-L	931187	3	56	5.3	5.0	✓
OCPs by GC-MS-MS or GC-MS	E660F	929356	1	7	14.2	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A Waterloo - Environmental	Soil/Solid	MOEE E3137A	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C) and is carried out in accordance with procedures described in the Analytical Protocol (prescriptive method). A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil by centrifuging, settling, or decanting and then analyzed using a pH meter and electrode.
Moisture Content by Gravimetry	E144 Waterloo - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	Moisture is measured gravimetrically by drying the sample at 105°C. Moisture content is calculated as the weight loss (due to water) divided by the wet weight of the sample, expressed as a percentage.
Metals in Soil/Solid by CRC ICPMS (<355 µm)	E440C Waterloo - Environmental	Soil/Solid	EPA 6020B (mod)	This method is intended to liberate metals that may be environmentally available. Samples are dried, then sieved through a 355 µm sieve, and digested with HNO3 and HCl. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Silicate minerals are not solubilized. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. This method does not adequately recover elemental sulfur, and is unsuitable for assessment of elemental sulfur standards or guidelines. Analysis is by Collision/Reaction Cell ICPMS.
CCME PHC - F1 by Headspace GC-FID	E581.F1 Waterloo - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	CCME Fraction 1 (F1) is analyzed by static headspace GC-FID. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
CCME PHCs - F2-F4 by GC-FID (Low Level)	E601.SG-L Waterloo - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	Sample extracts are subjected to in-situ silica gel treatment prior to analysis by GC-FID for CCME hydrocarbon fractions (F2-F4).
BTEX by Headspace GC-MS	E611A Waterloo - Environmental	Soil/Solid	EPA 8260D (mod)	Volatile Organic Compounds (VOCs) are analyzed by static headspace GC-MS. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
OCPs by GC-MS-MS or GC-MS	E660F Waterloo - Environmental	Soil/Solid	EPA 8270E (mod)	OCPs are analyzed by GC-MS-MS or GC-MS

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
F1-BTEX	EC580 Waterloo - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	F1-BTEX is calculated as follows: F1-BTEX = F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).
Sum F1 to F4 (C6-C50)	EC581 Waterloo - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	Hydrocarbons, total (C6-C50) is the sum of CCME Fractions F1(C6-C10), F2(C10-C16), F3(C16-C34), and F4(C34-C50). F4G-sg is not used within this calculation due to overlap with other fractions.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil : 0.01CaCl2 - As Received for pH	EP108A Waterloo - Environmental	Soil/Solid	MOEE E3137A	A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil by centrifuging, settling or decanting and then analyzed using a pH meter and electrode.
Digestion for Metals and Mercury (355 µm Sieve)	EP440C Waterloo - Environmental	Soil/Solid	EPA 200.2 (mod)	Samples are sieved through a 355 µm sieve, and digested with HNO3 and HCl. This method is intended to liberate metals that may be environmentally available.
VOCs Methanol Extraction for Headspace Analysis	EP581 Waterloo - Environmental	Soil/Solid	EPA 5035A (mod)	VOCs in samples are extracted with methanol. Extracts are then prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
PHCs and PAHs Hexane-Acetone Tumbler Extraction	EP601 Waterloo - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1 (mod)	Samples are subsampled and Petroleum Hydrocarbons (PHC) and PAHs are extracted with 1:1 hexane:acetone using a rotary extractor.
Pesticides, PCB, PAH, and Neutral Extractable Chlorinated Hydrocarbons Extraction	EP660 Waterloo - Environmental	Soil/Solid	EPA 3570 (mod)	A homogenized subsample is extracted with organic solvents using a mechanical shaker.

QUALITY CONTROL REPORT

Work Order	: **WT2312081**	Page	: 1 of 14
Client	: MTE Consultants Inc.	Laboratory	: Waterloo - Environmental
Contact	: Jen Lambke	Account Manager	: Emily Hansen
Address	: 520 Bingemans Centre Drive Kitchener ON Canada N2B 3X9	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	:	Telephone	: +1 519 886 6910
Project	: 53018-100 Blair Creek	Date Samples Received	: 05-May-2023 19:30
PO	: ----	Date Analysis Commenced	: 09-May-2023
C-O-C number	: ----	Issue Date	: 17-May-2023 17:07
Sampler	: client 519 743 6500		
Site	: ----		
Quote number	: Q79143 - CoK Roads Recon Program		
No. of samples received	: 62		
No. of samples analysed	: 15		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Waterloo Centralized Prep, Waterloo, Ontario
Amaninder Dhillon	Team Lead - Semi-Volatile Instrumentation	Waterloo Organics, Waterloo, Ontario
Andrea Armstrong	Department Manager - Air Quality and Volatiles	Waterloo VOC, Waterloo, Ontario
Greg Pokocky	Manager - Inorganics	Waterloo Inorganics, Waterloo, Ontario
Greg Pokocky	Manager - Inorganics	Waterloo Metals, Waterloo, Ontario
Jocelyn Kennedy	Department Manager - Semi-Volatile Organics	Waterloo Organics, Waterloo, Ontario

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 927667)											
WT2312081-054	BH1101-23 T	Moisture	----	E144	0.25	%	13.7	13.7	0.135%	20%	----
Physical Tests (QC Lot: 929360)											
WT2312063-005	Anonymous	pH (1:2 soil:CaCl2-aq)	----	E108A	0.10	pH units	7.06	7.07	0.142%	5%	----
Physical Tests (QC Lot: 929954)											
EO2303639-001	Anonymous	pH (1:2 soil:CaCl2-aq)	----	E108A	0.10	pH units	7.87	7.86	0.127%	5%	----
Metals (QC Lot: 927723)											
WT2312077-028	Anonymous	Antimony	7440-36-0	E440C	0.10	mg/kg	0.12 µg/g	0.13	0.01	Diff <2x LOR	----
		Arsenic	7440-38-2	E440C	0.10	mg/kg	1.55 µg/g	1.76	12.6%	30%	----
		Barium	7440-39-3	E440C	0.50	mg/kg	8.87 µg/g	8.80	0.830%	40%	----
		Beryllium	7440-41-7	E440C	0.10	mg/kg	0.12 µg/g	0.15	0.02	Diff <2x LOR	----
		Boron	7440-42-8	E440C	5.0	mg/kg	9.6 µg/g	11.2	1.6	Diff <2x LOR	----
		Cadmium	7440-43-9	E440C	0.020	mg/kg	0.291 µg/g	0.293	0.889%	30%	----
		Chromium	7440-47-3	E440C	0.50	mg/kg	4.76 µg/g	5.74	18.5%	30%	----
		Cobalt	7440-48-4	E440C	0.10	mg/kg	0.86 µg/g	0.91	4.88%	30%	----
		Copper	7440-50-8	E440C	0.50	mg/kg	2.89 µg/g	3.09	0.20	Diff <2x LOR	----
		Lead	7439-92-1	E440C	0.50	mg/kg	17.0 µg/g	19.7	14.8%	40%	----
		Molybdenum	7439-98-7	E440C	0.10	mg/kg	1.09 µg/g	1.32	19.4%	40%	----
		Nickel	7440-02-0	E440C	0.50	mg/kg	3.12 µg/g	3.58	13.8%	30%	----
		Selenium	7782-49-2	E440C	0.20	mg/kg	<0.20 µg/g	<0.20	0	Diff <2x LOR	----
		Silver	7440-22-4	E440C	0.10	mg/kg	<0.10 µg/g	<0.10	0	Diff <2x LOR	----
		Thallium	7440-28-0	E440C	0.050	mg/kg	<0.050 µg/g	<0.050	0	Diff <2x LOR	----
		Uranium	7440-61-1	E440C	0.050	mg/kg	0.437 µg/g	0.491	11.7%	30%	----
		Vanadium	7440-62-2	E440C	0.20	mg/kg	4.81 µg/g	5.34	10.4%	30%	----
		Zinc	7440-66-6	E440C	2.0	mg/kg	104 µg/g	116	11.2%	30%	----
Volatile Organic Compounds (QC Lot: 928623)											
WT2312081-049	BH107-23 7.5-9.5'	Benzene	71-43-2	E611A	0.0050	mg/kg	<0.0050 µg/g	<0.0050	0	Diff <2x LOR	----
		Ethylbenzene	100-41-4	E611A	0.015	mg/kg	<0.015 µg/g	<0.015	0	Diff <2x LOR	----
		Toluene	108-88-3	E611A	0.050	mg/kg	<0.050 µg/g	<0.050	0	Diff <2x LOR	----
		Xylene, m+p-	179601-23-1	E611A	0.030	mg/kg	<0.030 µg/g	<0.030	0	Diff <2x LOR	----
		Xylene, o-	95-47-6	E611A	0.030	mg/kg	<0.030 µg/g	<0.030	0	Diff <2x LOR	----

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Volatile Organic Compounds (QC Lot: 929327)											
WT2312019-001	Anonymous	Benzene	71-43-2	E611A	0.0050	mg/kg	<0.0050	<0.0050	0	Diff <2x LOR	----
		Ethylbenzene	100-41-4	E611A	0.015	mg/kg	<0.015	<0.015	0	Diff <2x LOR	----
		Toluene	108-88-3	E611A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Xylene, m+p-	179601-23-1	E611A	0.030	mg/kg	<0.030	<0.030	0	Diff <2x LOR	----
		Xylene, o-	95-47-6	E611A	0.030	mg/kg	<0.030	<0.030	0	Diff <2x LOR	----
Hydrocarbons (QC Lot: 928622)											
WT2312081-049	BH107-23 7.5-9.5'	F1 (C6-C10)	----	E581.F1	5.0	mg/kg	<5.0 µg/g	<5.0	0	Diff <2x LOR	----
Hydrocarbons (QC Lot: 929326)											
WT2312019-001	Anonymous	F1 (C6-C10)	----	E581.F1	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	----
Hydrocarbons (QC Lot: 929342)											
WT2311791-001	Anonymous	F2 (C10-C16)	----	E601.SG-L	10	mg/kg	<10 µg/g	<10	0	Diff <2x LOR	----
		F3 (C16-C34)	----	E601.SG-L	50	mg/kg	64 µg/g	54	9	Diff <2x LOR	----
		F4 (C34-C50)	----	E601.SG-L	50	mg/kg	<50 µg/g	<50	0	Diff <2x LOR	----
Hydrocarbons (QC Lot: 929366)											
WT2312063-001	Anonymous	F2 (C10-C16)	----	E601.SG-L	16	mg/kg	22	29	6	Diff <2x LOR	----
		F3 (C16-C34)	----	E601.SG-L	50	mg/kg	1280	1540	18.3%	40%	----
		F4 (C34-C50)	----	E601.SG-L	50	mg/kg	958	1070	11.0%	40%	----
Hydrocarbons (QC Lot: 931187)											
WT2312019-002	Anonymous	F2 (C10-C16)	----	E601.SG-L	10	mg/kg	<10	<10	0	Diff <2x LOR	----
		F3 (C16-C34)	----	E601.SG-L	50	mg/kg	<50	<50	0	Diff <2x LOR	----
		F4 (C34-C50)	----	E601.SG-L	50	mg/kg	<50	<50	0	Diff <2x LOR	----
Organochlorine Pesticides (QC Lot: 929356)											
WT2312081-007	BH101-23 T	Aldrin	309-00-2	E660F	0.020	mg/kg	<0.020 µg/g	<0.020	0	Diff <2x LOR	----
		Chlordane, cis- (alpha)	5103-71-9	E660F	0.020	mg/kg	<0.020 µg/g	<0.020	0	Diff <2x LOR	----
		Chlordane, trans- (gamma)	5103-74-2	E660F	0.020	mg/kg	<0.020 µg/g	<0.020	0	Diff <2x LOR	----
		DDD, 2,4'-	53-19-0	E660F	0.020	mg/kg	<0.020 µg/g	<0.020	0	Diff <2x LOR	----
		DDD, 4,4'-	72-54-8	E660F	0.020	mg/kg	<0.020 µg/g	<0.020	0	Diff <2x LOR	----
		DDE, 2,4'-	3424-82-6	E660F	0.020	mg/kg	<0.020 µg/g	<0.020	0	Diff <2x LOR	----
		DDE, 4,4'-	72-55-9	E660F	0.020	mg/kg	<0.020 µg/g	<0.020	0	Diff <2x LOR	----
		DDT, 2,4'-	789-02-6	E660F	0.020	mg/kg	<0.020 µg/g	<0.020	0	Diff <2x LOR	----
		DDT, 4,4'-	50-29-3	E660F	0.040	mg/kg	<0.040 µg/g	<0.040	0	Diff <2x LOR	----
		Dieldrin	60-57-1	E660F	0.020	mg/kg	<0.020 µg/g	<0.020	0	Diff <2x LOR	----
		Endosulfan, alpha-	959-98-8	E660F	0.020	mg/kg	<0.020 µg/g	<0.020	0	Diff <2x LOR	----
		Endosulfan, beta-	33213-65-9	E660F	0.020	mg/kg	<0.020 µg/g	<0.020	0	Diff <2x LOR	----

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Organochlorine Pesticides (QC Lot: 929356) - continued											
WT2312081-007	BH101-23 T	Endrin	72-20-8	E660F	0.020	mg/kg	<0.020 µg/g	<0.020	0	Diff <2x LOR	----
		Heptachlor	76-44-8	E660F	0.020	mg/kg	<0.020 µg/g	<0.020	0	Diff <2x LOR	----
		Heptachlor epoxide	1024-57-3	E660F	0.020	mg/kg	<0.020 µg/g	<0.020	0	Diff <2x LOR	----
		Hexachlorobenzene	118-74-1	E660F	0.010	mg/kg	<0.010 µg/g	<0.010	0	Diff <2x LOR	----
		Hexachlorobutadiene	87-68-3	E660F	0.010	mg/kg	<0.010 µg/g	<0.010	0	Diff <2x LOR	----
		Hexachlorocyclohexane, gamma-	58-89-9	E660F	0.010	mg/kg	<0.010 µg/g	<0.010	0	Diff <2x LOR	----
		Hexachloroethane	67-72-1	E660F	0.010	mg/kg	<0.010 µg/g	<0.010	0	Diff <2x LOR	----
		Methoxychlor	72-43-5	E660F	0.040	mg/kg	<0.040 µg/g	<0.040	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 927667)						
Moisture	----	E144	0.25	%	<0.25	----
Metals (QCLot: 927723)						
Antimony	7440-36-0	E440C	0.1	mg/kg	<0.10	----
Arsenic	7440-38-2	E440C	0.1	mg/kg	<0.10	----
Barium	7440-39-3	E440C	0.5	mg/kg	<0.50	----
Beryllium	7440-41-7	E440C	0.1	mg/kg	<0.10	----
Boron	7440-42-8	E440C	5	mg/kg	<5.0	----
Cadmium	7440-43-9	E440C	0.02	mg/kg	<0.020	----
Chromium	7440-47-3	E440C	0.5	mg/kg	<0.50	----
Cobalt	7440-48-4	E440C	0.1	mg/kg	<0.10	----
Copper	7440-50-8	E440C	0.5	mg/kg	<0.50	----
Lead	7439-92-1	E440C	0.5	mg/kg	<0.50	----
Molybdenum	7439-98-7	E440C	0.1	mg/kg	<0.10	----
Nickel	7440-02-0	E440C	0.5	mg/kg	<0.50	----
Selenium	7782-49-2	E440C	0.2	mg/kg	<0.20	----
Silver	7440-22-4	E440C	0.1	mg/kg	<0.10	----
Thallium	7440-28-0	E440C	0.05	mg/kg	<0.050	----
Uranium	7440-61-1	E440C	0.05	mg/kg	<0.050	----
Vanadium	7440-62-2	E440C	0.2	mg/kg	<0.20	----
Zinc	7440-66-6	E440C	2	mg/kg	<2.0	----
Volatile Organic Compounds (QCLot: 928623)						
Benzene	71-43-2	E611A	0.005	mg/kg	<0.0050	----
Ethylbenzene	100-41-4	E611A	0.015	mg/kg	<0.015	----
Toluene	108-88-3	E611A	0.05	mg/kg	<0.050	----
Xylene, m+p-	179601-23-1	E611A	0.03	mg/kg	<0.030	----
Xylene, o-	95-47-6	E611A	0.03	mg/kg	<0.030	----
Volatile Organic Compounds (QCLot: 929327)						
Benzene	71-43-2	E611A	0.005	mg/kg	<0.0050	----
Ethylbenzene	100-41-4	E611A	0.015	mg/kg	<0.015	----
Toluene	108-88-3	E611A	0.05	mg/kg	<0.050	----
Xylene, m+p-	179601-23-1	E611A	0.03	mg/kg	<0.030	----
Xylene, o-	95-47-6	E611A	0.03	mg/kg	<0.030	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Hydrocarbons (QCLot: 928622)						
F1 (C6-C10)	----	E581.F1	5	mg/kg	<5.0	----
Hydrocarbons (QCLot: 929326)						
F1 (C6-C10)	----	E581.F1	5	mg/kg	<5.0	----
Hydrocarbons (QCLot: 929342)						
F2 (C10-C16)	----	E601.SG-L	10	mg/kg	<10	----
F3 (C16-C34)	----	E601.SG-L	50	mg/kg	<50	----
F4 (C34-C50)	----	E601.SG-L	50	mg/kg	<50	----
Hydrocarbons (QCLot: 929366)						
F2 (C10-C16)	----	E601.SG-L	10	mg/kg	<10	----
F3 (C16-C34)	----	E601.SG-L	50	mg/kg	<50	----
F4 (C34-C50)	----	E601.SG-L	50	mg/kg	<50	----
Hydrocarbons (QCLot: 931187)						
F2 (C10-C16)	----	E601.SG-L	10	mg/kg	<10	----
F3 (C16-C34)	----	E601.SG-L	50	mg/kg	<50	----
F4 (C34-C50)	----	E601.SG-L	50	mg/kg	<50	----
Organochlorine Pesticides (QCLot: 929356)						
Aldrin	309-00-2	E660F	0.02	mg/kg	<0.020	----
Chlordane, cis- (alpha)	5103-71-9	E660F	0.02	mg/kg	<0.020	----
Chlordane, trans- (gamma)	5103-74-2	E660F	0.02	mg/kg	<0.020	----
DDD, 2,4'-	53-19-0	E660F	0.02	mg/kg	<0.020	----
DDD, 4,4'-	72-54-8	E660F	0.02	mg/kg	<0.020	----
DDE, 2,4'-	3424-82-6	E660F	0.02	mg/kg	<0.020	----
DDE, 4,4'-	72-55-9	E660F	0.02	mg/kg	<0.020	----
DDT, 2,4'-	789-02-6	E660F	0.02	mg/kg	<0.020	----
DDT, 4,4'-	50-29-3	E660F	0.02	mg/kg	<0.020	----
Dieldrin	60-57-1	E660F	0.02	mg/kg	<0.020	----
Endosulfan, alpha-	959-98-8	E660F	0.02	mg/kg	<0.020	----
Endosulfan, beta-	33213-65-9	E660F	0.02	mg/kg	<0.020	----
Endrin	72-20-8	E660F	0.02	mg/kg	<0.020	----
Heptachlor	76-44-8	E660F	0.02	mg/kg	<0.020	----
Heptachlor epoxide	1024-57-3	E660F	0.02	mg/kg	<0.020	----
Hexachlorobenzene	118-74-1	E660F	0.01	mg/kg	<0.010	----
Hexachlorobutadiene	87-68-3	E660F	0.01	mg/kg	<0.010	----
Hexachlorocyclohexane, gamma-	58-89-9	E660F	0.01	mg/kg	<0.010	----
Hexachloroethane	67-72-1	E660F	0.01	mg/kg	<0.010	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Organochlorine Pesticides (QCLot: 929356) - continued						
Methoxychlor	72-43-5	E660F	0.02	mg/kg	<0.020	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 927667)									
Moisture	----	E144	0.25	%	50 %	100	90.0	110	----
Physical Tests (QCLot: 929360)									
pH (1:2 soil:CaCl2-aq)	----	E108A	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 929954)									
pH (1:2 soil:CaCl2-aq)	----	E108A	----	pH units	7 pH units	100	98.0	102	----
Metals (QCLot: 927723)									
Antimony	7440-36-0	E440C	0.1	mg/kg	100 mg/kg	104	80.0	120	----
Arsenic	7440-38-2	E440C	0.1	mg/kg	100 mg/kg	104	80.0	120	----
Barium	7440-39-3	E440C	0.5	mg/kg	25 mg/kg	107	80.0	120	----
Beryllium	7440-41-7	E440C	0.1	mg/kg	10 mg/kg	100	80.0	120	----
Boron	7440-42-8	E440C	5	mg/kg	100 mg/kg	103	80.0	120	----
Cadmium	7440-43-9	E440C	0.02	mg/kg	10 mg/kg	102	80.0	120	----
Chromium	7440-47-3	E440C	0.5	mg/kg	25 mg/kg	98.7	80.0	120	----
Cobalt	7440-48-4	E440C	0.1	mg/kg	25 mg/kg	99.3	80.0	120	----
Copper	7440-50-8	E440C	0.5	mg/kg	25 mg/kg	96.0	80.0	120	----
Lead	7439-92-1	E440C	0.5	mg/kg	50 mg/kg	99.9	80.0	120	----
Molybdenum	7439-98-7	E440C	0.1	mg/kg	25 mg/kg	107	80.0	120	----
Nickel	7440-02-0	E440C	0.5	mg/kg	50 mg/kg	98.5	80.0	120	----
Selenium	7782-49-2	E440C	0.2	mg/kg	100 mg/kg	99.5	80.0	120	----
Silver	7440-22-4	E440C	0.1	mg/kg	10 mg/kg	97.4	80.0	120	----
Thallium	7440-28-0	E440C	0.05	mg/kg	100 mg/kg	96.1	80.0	120	----
Uranium	7440-61-1	E440C	0.05	mg/kg	0.5 mg/kg	101	80.0	120	----
Vanadium	7440-62-2	E440C	0.2	mg/kg	50 mg/kg	102	80.0	120	----
Zinc	7440-66-6	E440C	2	mg/kg	50 mg/kg	97.3	80.0	120	----
Volatile Organic Compounds (QCLot: 928623)									
Benzene	71-43-2	E611A	0.005	mg/kg	3.475 mg/kg	104	70.0	130	----
Ethylbenzene	100-41-4	E611A	0.015	mg/kg	3.475 mg/kg	102	70.0	130	----
Toluene	108-88-3	E611A	0.05	mg/kg	3.475 mg/kg	99.3	70.0	130	----
Xylene, m+p-	179601-23-1	E611A	0.03	mg/kg	6.95 mg/kg	102	70.0	130	----
Xylene, o-	95-47-6	E611A	0.03	mg/kg	3.475 mg/kg	103	70.0	130	----
Volatile Organic Compounds (QCLot: 929327)									

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Volatile Organic Compounds (QCLot: 929327) - continued									
Benzene	71-43-2	E611A	0.005	mg/kg	3.475 mg/kg	103	70.0	130	----
Ethylbenzene	100-41-4	E611A	0.015	mg/kg	3.475 mg/kg	101	70.0	130	----
Toluene	108-88-3	E611A	0.05	mg/kg	3.475 mg/kg	101	70.0	130	----
Xylene, m+p-	179601-23-1	E611A	0.03	mg/kg	6.95 mg/kg	106	70.0	130	----
Xylene, o-	95-47-6	E611A	0.03	mg/kg	3.475 mg/kg	104	70.0	130	----
Hydrocarbons (QCLot: 928622)									
F1 (C6-C10)	----	E581.F1	5	mg/kg	69.1875 mg/kg	91.1	80.0	120	----
Hydrocarbons (QCLot: 929326)									
F1 (C6-C10)	----	E581.F1	5	mg/kg	69.1875 mg/kg	86.4	80.0	120	----
Hydrocarbons (QCLot: 929342)									
F2 (C10-C16)	----	E601.SG-L	10	mg/kg	821.775 mg/kg	111	70.0	130	----
F3 (C16-C34)	----	E601.SG-L	50	mg/kg	1151.486 mg/kg	110	70.0	130	----
F4 (C34-C50)	----	E601.SG-L	50	mg/kg	719.6893 mg/kg	111	70.0	130	----
Hydrocarbons (QCLot: 929366)									
F2 (C10-C16)	----	E601.SG-L	10	mg/kg	821.775 mg/kg	86.5	70.0	130	----
F3 (C16-C34)	----	E601.SG-L	50	mg/kg	1151.486 mg/kg	89.2	70.0	130	----
F4 (C34-C50)	----	E601.SG-L	50	mg/kg	719.6893 mg/kg	94.4	70.0	130	----
Hydrocarbons (QCLot: 931187)									
F2 (C10-C16)	----	E601.SG-L	10	mg/kg	821.775 mg/kg	106	70.0	130	----
F3 (C16-C34)	----	E601.SG-L	50	mg/kg	1151.486 mg/kg	103	70.0	130	----
F4 (C34-C50)	----	E601.SG-L	50	mg/kg	719.6893 mg/kg	121	70.0	130	----
Organochlorine Pesticides (QCLot: 929356)									
Aldrin	309-00-2	E660F	0.02	mg/kg	0.005 mg/kg	86.6	50.0	150	----
Chlordane, cis- (alpha)	5103-71-9	E660F	0.02	mg/kg	0.005 mg/kg	64.0	50.0	150	----
Chlordane, trans- (gamma)	5103-74-2	E660F	0.02	mg/kg	0.005 mg/kg	69.3	50.0	150	----
DDD, 2,4'-	53-19-0	E660F	0.02	mg/kg	0.005 mg/kg	90.0	50.0	150	----
DDD, 4,4'-	72-54-8	E660F	0.02	mg/kg	0.005 mg/kg	99.9	50.0	150	----
DDE, 2,4'-	3424-82-6	E660F	0.02	mg/kg	0.005 mg/kg	82.0	50.0	150	----
DDE, 4,4'-	72-55-9	E660F	0.02	mg/kg	0.005 mg/kg	96.4	50.0	150	----
DDT, 2,4'-	789-02-6	E660F	0.02	mg/kg	0.005 mg/kg	65.6	50.0	150	----
DDT, 4,4'-	50-29-3	E660F	0.02	mg/kg	0.005 mg/kg	62.2	50.0	150	----
Dieldrin	60-57-1	E660F	0.02	mg/kg	0.005 mg/kg	87.7	50.0	150	----
Endosulfan, alpha-	959-98-8	E660F	0.02	mg/kg	0.005 mg/kg	80.9	50.0	150	----
Endosulfan, beta-	33213-65-9	E660F	0.02	mg/kg	0.005 mg/kg	54.7	50.0	150	----

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Organochlorine Pesticides (QCLot: 929356) - continued									
Endrin	72-20-8	E660F	0.02	mg/kg	0.005 mg/kg	79.1	50.0	150	----
Heptachlor	76-44-8	E660F	0.02	mg/kg	0.005 mg/kg	86.7	50.0	150	----
Heptachlor epoxide	1024-57-3	E660F	0.02	mg/kg	0.005 mg/kg	83.1	50.0	150	----
Hexachlorobenzene	118-74-1	E660F	0.01	mg/kg	0.005 mg/kg	96.5	50.0	150	----
Hexachlorobutadiene	87-68-3	E660F	0.01	mg/kg	0.005 mg/kg	111	50.0	150	----
Hexachlorocyclohexane, gamma-	58-89-9	E660F	0.01	mg/kg	0.005 mg/kg	91.5	50.0	150	----
Hexachloroethane	67-72-1	E660F	0.01	mg/kg	0.005 mg/kg	100	50.0	150	----
Methoxychlor	72-43-5	E660F	0.02	mg/kg	0.005 mg/kg	63.1	50.0	150	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Soil/Solid**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Volatile Organic Compounds (QCLot: 928623)										
WT2312081-049	BH107-23 7.5-9.5'	Benzene	71-43-2	E611A	3.16 mg/kg	3.125 mg/kg	110	60.0	140	----
		Ethylbenzene	100-41-4	E611A	3.01 mg/kg	3.125 mg/kg	105	60.0	140	----
		Toluene	108-88-3	E611A	2.90 mg/kg	3.125 mg/kg	101	60.0	140	----
		Xylene, m+p-	179601-23-1	E611A	5.95 mg/kg	6.25 mg/kg	104	60.0	140	----
		Xylene, o-	95-47-6	E611A	3.01 mg/kg	3.125 mg/kg	105	60.0	140	----
Volatile Organic Compounds (QCLot: 929327)										
WT2312019-001	Anonymous	Benzene	71-43-2	E611A	2.37 mg/kg	3.125 mg/kg	97.4	60.0	140	----
		Ethylbenzene	100-41-4	E611A	2.30 mg/kg	3.125 mg/kg	94.4	60.0	140	----
		Toluene	108-88-3	E611A	2.26 mg/kg	3.125 mg/kg	92.9	60.0	140	----
		Xylene, m+p-	179601-23-1	E611A	4.79 mg/kg	6.25 mg/kg	98.4	60.0	140	----
		Xylene, o-	95-47-6	E611A	2.36 mg/kg	3.125 mg/kg	96.8	60.0	140	----
Hydrocarbons (QCLot: 928622)										
WT2312081-049	BH107-23 7.5-9.5'	F1 (C6-C10)	----	E581.F1	58.1 mg/kg	62.5 mg/kg	101	60.0	140	----
Hydrocarbons (QCLot: 929326)										
WT2312019-001	Anonymous	F1 (C6-C10)	----	E581.F1	49.6 mg/kg	62.5 mg/kg	102	60.0	140	----
Hydrocarbons (QCLot: 929342)										
WT2311791-001	Anonymous	F2 (C10-C16)	----	E601.SG-L	741 mg/kg	821.775 mg/kg	108	60.0	140	----
		F3 (C16-C34)	----	E601.SG-L	1440 mg/kg	1151.486 mg/kg	149	60.0	140	E
		F4 (C34-C50)	----	E601.SG-L	939 mg/kg	719.6893 mg/kg	156	60.0	140	E
Hydrocarbons (QCLot: 929366)										
WT2312063-001	Anonymous	F2 (C10-C16)	----	E601.SG-L	659 mg/kg	821.775 mg/kg	100	60.0	140	----
		F3 (C16-C34)	----	E601.SG-L	950 mg/kg	1151.486 mg/kg	103	60.0	140	----
		F4 (C34-C50)	----	E601.SG-L	365 mg/kg	719.6893 mg/kg	63.4	60.0	140	----
Hydrocarbons (QCLot: 931187)										
WT2312019-002	Anonymous	F2 (C10-C16)	----	E601.SG-L	668 mg/kg	821.775 mg/kg	101	60.0	140	----
		F3 (C16-C34)	----	E601.SG-L	916 mg/kg	1151.486 mg/kg	98.7	60.0	140	----
		F4 (C34-C50)	----	E601.SG-L	653 mg/kg	719.6893 mg/kg	113	60.0	140	----
Organochlorine Pesticides (QCLot: 929356)										
WT2312081-007	BH101-23 T	Aldrin	309-00-2	E660F	0.008 mg/kg	0.005 mg/kg	85.3	50.0	150	----

Sub-Matrix: **Soil/Solid**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Organochlorine Pesticides (QCLot: 929356) - continued										
WT2312081-007	BH101-23 T	Chlordane, cis- (alpha)	5103-71-9	E660F	0.010 mg/kg	0.005 mg/kg	98.9	50.0	150	----
		Chlordane, trans- (gamma)	5103-74-2	E660F	0.007 mg/kg	0.005 mg/kg	76.5	50.0	150	----
		DDD, 2,4'-	53-19-0	E660F	0.010 mg/kg	0.005 mg/kg	104	50.0	150	----
		DDD, 4,4'-	72-54-8	E660F	0.010 mg/kg	0.005 mg/kg	107	50.0	150	----
		DDE, 2,4'-	3424-82-6	E660F	0.008 mg/kg	0.005 mg/kg	86.6	50.0	150	----
		DDE, 4,4'-	72-55-9	E660F	0.009 mg/kg	0.005 mg/kg	94.4	50.0	150	----
		DDT, 2,4'-	789-02-6	E660F	0.004 mg/kg	0.005 mg/kg	46.3	50.0	150	K
		DDT, 4,4'-	50-29-3	E660F	0.004 mg/kg	0.005 mg/kg	39.4	50.0	150	K
		Dieldrin	60-57-1	E660F	0.009 mg/kg	0.005 mg/kg	91.6	50.0	150	----
		Endosulfan, alpha-	959-98-8	E660F	0.006 mg/kg	0.005 mg/kg	59.2	50.0	150	----
		Endosulfan, beta-	33213-65-9	E660F	0.009 mg/kg	0.005 mg/kg	95.3	50.0	150	----
		Endrin	72-20-8	E660F	0.012 mg/kg	0.005 mg/kg	126	50.0	150	----
		Heptachlor	76-44-8	E660F	0.008 mg/kg	0.005 mg/kg	78.1	50.0	150	----
		Heptachlor epoxide	1024-57-3	E660F	0.010 mg/kg	0.005 mg/kg	102	50.0	150	----
		Hexachlorobenzene	118-74-1	E660F	0.008 mg/kg	0.005 mg/kg	87.2	50.0	150	----
		Hexachlorobutadiene	87-68-3	E660F	0.009 mg/kg	0.005 mg/kg	94.8	50.0	150	----
		Hexachlorocyclohexane, gamma-	58-89-9	E660F	0.008 mg/kg	0.005 mg/kg	83.6	50.0	150	----
		Hexachloroethane	67-72-1	E660F	0.007 mg/kg	0.005 mg/kg	73.4	50.0	150	----
		Methoxychlor	72-43-5	E660F	0.004 mg/kg	0.005 mg/kg	36.8	50.0	150	K

Qualifiers

Qualifier	Description
E	*Matrix Spike recovery outside ALS DQO due to heterogeneous analyte background in sample.*
K	*Matrix Spike recovery outside ALS DQO due to sample matrix effects.*

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Metals (QCLot: 927723)									
	RM	Antimony	7440-36-0	E440C	3.99 mg/kg	91.1	70.0	130	----
	RM	Arsenic	7440-38-2	E440C	3.73 mg/kg	99.8	70.0	130	----
	RM	Barium	7440-39-3	E440C	105 mg/kg	100	70.0	130	----
	RM	Beryllium	7440-41-7	E440C	0.349 mg/kg	92.8	70.0	130	----
	RM	Boron	7440-42-8	E440C	8.5 mg/kg	106	70.0	130	----
	RM	Cadmium	7440-43-9	E440C	0.91 mg/kg	110	70.0	130	----
	RM	Chromium	7440-47-3	E440C	101 mg/kg	100	70.0	130	----
	RM	Cobalt	7440-48-4	E440C	6.9 mg/kg	96.7	70.0	130	----
	RM	Copper	7440-50-8	E440C	123 mg/kg	94.4	70.0	130	----
	RM	Lead	7439-92-1	E440C	267 mg/kg	92.7	70.0	130	----
	RM	Molybdenum	7439-98-7	E440C	1.03 mg/kg	97.3	70.0	130	----
	RM	Nickel	7440-02-0	E440C	26.7 mg/kg	98.1	70.0	130	----
	RM	Silver	7440-22-4	E440C	4.06 mg/kg	82.7	70.0	130	----
	RM	Thallium	7440-28-0	E440C	0.0786 mg/kg	88.1	70.0	130	----
	RM	Uranium	7440-61-1	E440C	0.52 mg/kg	89.9	70.0	130	----
	RM	Vanadium	7440-62-2	E440C	32.7 mg/kg	96.2	70.0	130	----
	RM	Zinc	7440-66-6	E440C	297 mg/kg	92.8	70.0	130	----

VS-175/176
SOL - 112/113/114/115/116/117/118

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 17 -

Page 1 of 6

Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Contact your AM to co
Company:	MTE Consultants Inc.	Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	Regular [R] ☑ Standard TAT if received by 3 pm
Contact:	Jen Lambke	Quality Control (QC) Report with Report ☑ YES ☐ NO	PRIORITY (Business Days): 4 day [P4-20%] ☐ / 3 day [P3-25%] ☐ / 2 day [P2-50%] ☐ — EMERGENCY: 1 Business d / Same Day, W / (Laboratory
Phone:	519-703-0800	☑ Compare Results to Criteria on Report - provide details below if box checked	
	Company address below will appear on the final report	Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	Date and Time Required for all E&P TATs:
Street:	520 Bingeman Centre Drive	Email 1 or Fax dgonser@mte85.com	For tests that can not be performed according to the service level sele
City/Province:	Kitchener	Email 2 jlambke@mte85.com	Analysis R
Postal Code:		Email 3	
Invoice To	Same as Report To ☑ YES ☐ NO	**Invoice Distribution**	
	Copy of Invoice with Report ☐ YES ☐ NO	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Company:		Email 1 or Fax accounting@mte85.com	
Contact:		Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	Q79143	AFE/Cost Center:	PO#
Job #:	53018-100 Blair Creek	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): WT2312081 — ALS Contact: Emily Hansen — Sampler: MSD CMc

Environmental Division Waterloo
Work Order Reference
WT2312081

Telephone : +1 519 886 6910

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	PHC BTEX	Metals & Hydrides	PAHs	SAR/EC	pH	PHC VOCs	OC Pesticides	SAMPLES O	SUSPECTED HAZARD (see Spe
	BH 101 - 23 0 - 2'	5-May-23	8:50	Soil	4								X	
	" 2.5 - 4.5'	"	8:55	"	4								X	
	" 5 - 7'	"	9:00	"	4								X	
	" 7.5 - 9.5'	"	9:05	"	4								X	
	" 10 - 12'	"	9:15	"	4								X	
	" 15 - 17'	"	9:25	"	4								X	
	" T	"	9:35	"	4								X	
	BH 102 - 23 0 - 2'	5-May-23	9:45	Soil	4								X	
	" 2.5 - 4.5'	"	9:50	"	4								X	
	" 5 - 7'	"	9:55	"	4								X	
	" 7.5 - 9.5'	"	10:00	"	4								X	
	" 10 - 12'	"	10:10	"	4								X	

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☒ NO	O.Reg. 406 Independent Volume
Are samples for human consumption/ use? ☐ YES ☒ NO	- Table 1 RPIICC, Table 2.1 Ag, Table 2.1 RPI, Table 2.1 ICC,

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ None — SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ — Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
			16.6	21.0	18.6	19.3	17.9

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Chris McCulk	Date: 5-May-23	Time: pm	Received by:	Date:	Time:	Received by: JS	Date: May 5/23	Time: 730 pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION — WHITE - LABORATORY COPY — YELLOW - CLIENT COPY

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1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 17 -

Report To	Contact and company name below will appear on the final report
Company:	MTE Consultants Inc.
Contact:	Jen Lambke
Phone:	519-703-0800
	Company address below will appear on the final report
Street:	520 Bingeman Centre Drive
City/Province:	Kitchener
Postal Code:	
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution	
Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	dgonser@mte85.com
Email 2	jlambke@mte85.com
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	accounting@mte85.com
Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	Q79143	AFE/Cost Center:	PO#
Job #:	53018-100 Blair Creek	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	

ALS Lab Work Order # (lab use only):

ALS Contact: Emily Hansen

Sampler: MARCM

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200%] (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: TS / 5 business days

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	PHC BTEX	Metals & Hydrides	PAHs	SAR/EC	pH	PHC VOCs	OC Pesticides	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	BH102-23 15-17'	5-May-23	10:20	Soil	4								X	
	" T	"	10:30	"	4								X	
	BH103-23 0-2'	"	10:45	"	4								X	
	" 2.5-4.5'	"	10:50	"	4								X	
	" 5-7'	"	11:00	"	4								X	
	" 7.5-9.5'	"	11:05	"	4								X	
	" 10-12	"	11:10	"	4								X	
	" 15-17	"	11:20	"	4								X	
	" T	"	11:30	"	4								X	
	BH104-23 0-2'	5-May-23	11:45	"	4								X	
	" 2.5-4.5'	"	11:50	"	4								X	
	" 5-7'	"	11:55	"	4								X	

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☒ NO

Are samples for human consumption/ use? ☐ YES ☒ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

O.Reg. 406 Independent Volume
- Table 1 RPIICC, Table 2.1 Ag, Table 2.1 RPI, Table 2.1 ICC, :

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ none SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
			16.6	21.0	18.6	19.3	17.9

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Chris McAlla	Date: 5-May-23	Time: pm	Received by:	Date:	Time:	Received by:	Date: May 5/23	Time: 730 pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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JUNE 6TH 2022

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1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form.**

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 17 -

Report To	Contact and company name below will appear on the final report
Company:	MTE Consultants Inc.
Contact:	Jen Lambke
Phone:	519-703-0800
	Company address below will appear on the final report
Street:	520 Bingeman Centre Drive
City/Province:	Kitchener
Postal Code:	
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution	
Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	dgonser@mte85.com
Email 2	jlambke@mte85.com
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	accounting@mte85.com
Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	Q79143	AFE/Cost Center:	PO#
Job #:	53018-100 Blair Creek	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	

ALS Lab Work Order # (lab use only):

ALS Contact: Emily Hansen Sampler: MTE

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: TS / 5 business days

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	PHC BTEX	Metals & Hydrides	PAHs	SAR/EC	pH	PHC VOCs	OC Pesticides	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	BH104-23 7.5-9.5'	5-May-23	12:00	Soil	4								X	
	" 10-12'	"	12:05	"	4								X	
	" 15-17'	"	12:10	"	4								X	
	" 20-22'	"	12:15	"	4								X	
	" T	"	12:20	"	4								X	
	BH105-23 0-2'	5-May-23	12:30	"	4								X	
	" 2.5-4.5'	"	12:35	"	4								X	
	" 5-7'	"	12:40	"	4								X	
	" 7.5-9.5'	"	12:45	"	4								X	
	" 10-12'	"	12:50	"	4								X	
	" 15-17'	"	12:55	"	4								X	
	" 20-22'	"	1:05 pm	"	4								X	

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☒ NO

Are samples for human consumption/ use? ☐ YES ☒ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

O.Reg 406 Independent Volume
- Table 1 RPIICC, Table 2.1 Ag, Table 2.1 RPI; Table 2.1 ICC, :
-

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ None SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
			16.6	21.0	18.6	19.3	17.9

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:
Chris McCulla	5-May-23	pm

INITIAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:
AB	May 5 23	7:30

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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Affix ALS barcode label here (lab use only)

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Company:	MTE Consultants Inc.
Contact:	Jen Lambke
Phone:	519-703-0800
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City/Province:	Kitchener
Postal Code:	
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
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Email 2: jlambke@mte85.com
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: accounting@mte85.com
Email 2:

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: TS / 5 business days

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:	Q79143
Job #:	53018-100 Blair Creek
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only):

ALS Contact: Emily Hansen **Sampler:** MXG CMQ

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	PHC BTEX	Metals & Hydrides	PAHs	SAR/EC	pH	PHC VOCs	OC Pesticides	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	BH105-23 T	5-May-23	1:15pm	Soil	4								X	
	BH106-23 0-2'	"	1:50pm	"	4								X	
	" 2.5-4.5'	"	2:00pm	"	4								X	
	" 5-7'	"	2:05pm	"	4								X	
	" 7.5-9.5'	"	2:10pm	"	4								X	
	" 10-12'	"	2:20pm	"	4								X	
	" 15-17'	"	2:25pm	"	4								X	
	" 20-22'	"	2:30pm	"	4								X	
	" T	"	2:40pm	"	4								X	
	BH107-23 0-2'	5-May-23	3:00pm	Soil	4								X	
	" 2.5-4.5'	"	3:10	"	4								X	
	" 5-7'	"	3:15	"	4								X	

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☒ NO
Are samples for human consumption/ use? ☐ YES ☒ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

O.Reg. 406 Independent Volume
- Table 1 RPIICC, Table 2.1 Ag, Table 2.1 RPI, Table 2.1 ICC.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ None | SIF Observations Yes ☐ No ☐
Ice Packs ☐ | Ice Cubes ☐ | Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
			16.6	21.0	19.6	19.3	17.9

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:
Chris McCulla	5-May-23	pm

INITIAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:
TS	May 5/23	7:30pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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JUNE 2018 FRONT

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Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 17 -

Page 5 of 6

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Contact:	Jen Lambke
Phone:	519-703-0800
	Company address below will appear on the final report
Street:	520 Bingeman Centre Drive
City/Province:	Kitchener
Postal Code:	
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax dgonser@mte85.com
Email 2 jlambke@mte85.com
Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax accounting@mte85.com
Email 2

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: TS / 5 business days

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:	Q79143
Job #:	53018-100 Blair Creek
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only):

ALS Contact: Emily Hansen Sampler: MDC/AC

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	PHC BTEX	Metals & Hydrides	PAHs	SAR/EC	pH	PHC VOCs	OC Pesticides	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	BH107-23 7.5-9.5'	5-May-23	3:20	Soil	4								X	
	" 10-12'	"	3:25	"	4								X	
	" 15-17'	"	3:30	"	4								X	
	" 20-22'	"	3:40	"	4								X	
	" T	5-May-23	3:50	"	4								X	
	BH1101-23 T	"	4:00	"	4								X	
	BH1106-23 15-17'	"	4:10	"	4								X	

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☒ NO
Are samples for human consumption/ use? ☐ YES ☒ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

O.Reg. 406 Independent Volume
- Table 1 RPIICC, Table 2.1 Ag, Table 2.1 RPI, Table 2.1 ICC, :
-

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ None ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
			16.6	21.0	18.6	19.3	17.9

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:
Chris McCulk	5 May 23	pm

INITIAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:
TS	May 5/23	7:30 pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JUNE 2016 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 17 -

Page 6 of 6

Report To	Contact and company name below will appear on the final report
Company:	MTE Consultants Inc.
Contact:	Jen Lambke
Phone:	519-703-0800
	Company address below will appear on the final report
Street:	520 Bingeman Centre Drive
City/Province:	Kitchener
Postal Code:	

Report Format / Distribution	
Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	dgonser@mte85.com
Email 2	jlambke@mte85.com
Email 3	

Invoice To		
	Same as Report To	☑ YES ☐ NO
	Copy of Invoice with Report	☐ YES ☐ NO
Company:		
Contact:		

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	accounting@mte85.com
Email 2	

Project Information	
ALS Account # / Quote #:	Q79143
Job #:	53018-100 Blair Creek
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only):

ALS Contact: Emily Hansen Sampler: MXB/MC

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: TS / 5 business days

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	PHC BTEX	Metals & Hydrides	PAHs	SAR/EC	pH	PHC VOCs	OC Pesticides	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	BH 101 - 23 L	5-May-23	9:40	Soil	2								X	
	BH 102 - 23 L	"	10:60	"	2								X	
	BH 103 - 23 L	"	11:40	"	2								X	
	BH 104 - 23 L	"	12:25	"	2								X	
	BH 105 - 23 L	"	1:30 pm	"	2								X	
	BH 106 - 23 L	"	2:50 pm	"	2								X	
	BH 107 - 23 L	"	3:55 pm	"	2								X	

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☒ NO

Are samples for human consumption/ use? ☐ YES ☒ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

O.Reg. 406 Independent Volume
- Table 1 RPIICC, Table 2.1 Ag, Table 2.1 RPI; Table 2.1 ICC, :
-

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ None SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
			16.6	21.0	18.6	19.3	17.9

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:
Chris McLellan	5-May-23	pm

INITIAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:
	May 5/23	730

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JUNE 2018 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

PM

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CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

Work Order	: **WT2313616**	Page	: 1 of 4
Client	: **MTE Consultants Inc.**	Laboratory	: Waterloo - Environmental
Contact	: Jen Lambke	Account Manager	: Emily Hansen
Address	: 520 Bingemans Centre Drive Kitchener ON Canada N2B 3X9	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 519 743 6500	Telephone	: +1 519 886 6910
Project	: 53018-100 Blair Creek	Date Samples Received	: 18-May-2023 14:00
PO	: ----	Date Analysis Commenced	: 19-May-2023
C-O-C number	: ----	Issue Date	: 26-May-2023 16:43
Sampler	: ----		
Site	: ----		
Quote number	: Q79143 - CoK Roads Recon Program		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Guideline Comparison

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Andrea Armstrong	Department Manager - Air Quality and Volatiles	VOC, Waterloo, Ontario
Robert Braun	Soils Team Supervisor	Inorganics, Waterloo, Ontario
Walt Kippenhuck	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Walt Kippenhuck	Supervisor - Inorganic	Metals, Waterloo, Ontario

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.
Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guidelines are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Key : LOR: Limit of Reporting (detection limit).

Unit	*Description*
µg/L	micrograms per litre
mg/L	milligrams per litre
pH units	pH units

>: greater than.
<: less than.
Red shading is applied where the result or the LOR is greater than the Guideline Upper Limit (or lower than the Guideline Lower Limit, if applicable).
For drinking water samples, Red shading is applied where the result for E.coli, fecal or total coliforms is greater than or equal to the Guideline Upper Limit .

Analytical Results

Sub-Matrix: **Soil/Solid**
(Matrix: **Soil/Solid**)

	Client sample ID	BH105-23L							
	Sampling date/time	05-May-2023 13:30							
Analyte	*Method/Lab*	*LOR*	*Unit*	WT2313616-001	**ONWCR Sch. 4**				
TCLP Anions & Nutrients									
Nitrate + Nitrite (as N), TCLP	EC240.N+N/WT	7.50	mg/L	<7.50	1000 mg/L	--	--	--	--	--
TCLP Extractables									
Cyanide, weak acid dissociable, TCLP	E337A/WT	0.10	mg/L	<0.10	--	--	--	--	--	--
Fluoride, TCLP	E240.F/WT	10	mg/L	<10	150 mg/L	--	--	--	--	--
Nitrate (as N), TCLP	E240.NO3/WT	5.0	mg/L	<5.0	--	--	--	--	--	--
Nitrite (as N), TCLP	E240.NO2/WT	5.0	mg/L	<5.0	--	--	--	--	--	--
TCLP Metals									
Arsenic, TCLP	E444/WT	1.0	mg/L	<1.0	2.5 mg/L	--	--	--	--	--
Barium, TCLP	E444/WT	2.5	mg/L	<2.5	100 mg/L	--	--	--	--	--
Boron, TCLP	E444/WT	0.50	mg/L	<0.50	500 mg/L	--	--	--	--	--
Cadmium, TCLP	E444/WT	0.050	mg/L	<0.050	0.5 mg/L	--	--	--	--	--
Chromium, TCLP	E444/WT	0.25	mg/L	<0.25	5 mg/L	--	--	--	--	--
Lead, TCLP	E444/WT	0.25	mg/L	<0.25	5 mg/L	--	--	--	--	--
Mercury, TCLP	E512/WT	0.0010	mg/L	<0.0010	0.1 mg/L	--	--	--	--	--
pH, TCLP 1st preliminary	EPP444/WT	0.010	pH units	9.79	--	--	--	--	--	--
pH, TCLP 2nd preliminary	EPP444/WT	0.010	pH units	5.14	--	--	--	--	--	--
pH, TCLP extraction fluid initial	EPP444/WT	0.010	pH units	2.93	--	--	--	--	--	--
pH, TCLP final	EPP444/WT	0.010	pH units	5.75	--	--	--	--	--	--
Selenium, TCLP	E444/WT	0.10	mg/L	<0.10	1 mg/L	--	--	--	--	--
Silver, TCLP	E444/WT	0.050	mg/L	<0.050	5 mg/L	--	--	--	--	--
Uranium, TCLP	E444/WT	0.20	mg/L	<0.20	10 mg/L	--	--	--	--	--
TCLP VOCs									
Benzene, TCLP	E615B/WT	5.0	µg/L	<5.0	500 µg/L	--	--	--	--	--
Carbon tetrachloride, TCLP	E615B/WT	25	µg/L	<25	500 µg/L	--	--	--	--	--
Chlorobenzene, TCLP	E615B/WT	25	µg/L	<25	8000 µg/L	--	--	--	--	--
Chloroform, TCLP	E615B/WT	100	µg/L	<100	10000 µg/L	--	--	--	--	--
Dichlorobenzene, 1,2-, TCLP	E615B/WT	25	µg/L	<25	20000 µg/L	--	--	--	--	--
Dichlorobenzene, 1,4-, TCLP	E615B/WT	25	µg/L	<25	500 µg/L	--	--	--	--	--
Dichloroethane, 1,2-, TCLP	E615B/WT	25	µg/L	<25	500 µg/L	--	--	--	--	--
Dichloroethylene, 1,1-, TCLP	E615B/WT	25	µg/L	<25	1400 µg/L	--	--	--	--	--

Analyte	Method/Lab	LOR	Unit	WT2313616-001 (Continued)	ONWCR Sch. 4					
TCLP VOCs - Continued										
Dichloromethane, TCLP	E615B/WT	100	µg/L	<100	5000 µg/L	--	--	--	--	--
Methyl ethyl ketone [MEK], TCLP	E615B/WT	100	µg/L	<100	200000 µg/L	--	--	--	--	--
Tetrachloroethylene, TCLP	E615B/WT	25	µg/L	<25	3000 µg/L	--	--	--	--	--
Trichloroethylene, TCLP	E615B/WT	25	µg/L	<25	5000 µg/L	--	--	--	--	--
Vinyl chloride, TCLP	E615B/WT	50	µg/L	<50	200 µg/L	--	--	--	--	--
Bromofluorobenzene, 4-, TCLP	E615B/WT	1.0	%	101	--	--	--	--	--	--
Difluorobenzene, 1,4-, TCLP	E615B/WT	1.0	%	99.7	--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

No Breaches Found

Key:

ONWCR	Ontario MECP, General Waste Control Regulation No. 347/90,558/00
Sch. 4	Schedule 4 Leachate Quality Criteria

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QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2313616**	Page	: 1 of 7
Client	: **MTE Consultants Inc.**	Laboratory	: Waterloo - Environmental
Contact	: Jen Lambke	Account Manager	: Emily Hansen
Address	: 520 Bingemans Centre Drive Kitchener ON Canada N2B 3X9	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 519 743 6500	Telephone	: +1 519 886 6910
Project	: 53018-100 Blair Creek	Date Samples Received	: 18-May-2023 14:00
PO	: ----	Issue Date	: 26-May-2023 16:41
C-O-C number	: ----		
Sampler	: ----		
Site	: ----		
Quote number	: Q79143 - CoK Roads Recon Program		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
TCLP Extractables : Fluoride by IC (TCLP)										
HDPE [ON MECP] BH105-23L	E240.F	24-May-2023	26-May-2023	----	----		26-May-2023	28 days	21 days	✓
TCLP Extractables : Nitrate by IC (TCLP)										
HDPE [ON MECP] BH105-23L	E240.NO3	24-May-2023	26-May-2023	----	----		26-May-2023	7 days	21 days	✓
TCLP Extractables : Nitrite by IC (TCLP)										
HDPE [ON MECP] BH105-23L	E240.NO2	24-May-2023	26-May-2023	----	----		26-May-2023	7 days	21 days	✓
TCLP Extractables : WAD Cyanide (TCLP)										
HDPE-Total (Lab Preserved) BH105-23L	E337A	24-May-2023	26-May-2023	33 days	21 days	✓	26-May-2023	12 days	0 days	✓
TCLP Metals : Mercury by CVAAS (TCLP)										
Glass vial - total (lab preserved) BH105-23L	E512	24-May-2023	26-May-2023	----	----		26-May-2023	28 days	21 days	✓
TCLP Metals : Metals by CRC ICPMS (TCLP)										
HDPE - total (lab preserved) BH105-23L	E444	24-May-2023	26-May-2023	----	----		26-May-2023	180 days	21 days	✓
TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)										
Lab Split - Non-Volatile Leach: 14 day HT (e.g. CN, SVOC, NOx) BH105-23L	EPP444	05-May-2023	24-May-2023	----	----		----	----	----	

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
TCLP VOCs : VOCs by Headspace GC-MS (TCLP)										
Glass vial (sodium bisulfate)										
BH105-23L	E615B	19-May-2023	22-May-2023	----	----		22-May-2023	14 days	17 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Fluoride by IC (TCLP)	E240.F	956130	1	6	16.6	5.0	✓
Mercury by CVAAS (TCLP)	E512	956403	1	10	10.0	5.0	✓
Metals by CRC ICPMS (TCLP)	E444	956067	1	11	9.0	5.0	✓
Nitrate by IC (TCLP)	E240.NO3	956131	1	6	16.6	5.0	✓
Nitrite by IC (TCLP)	E240.NO2	956132	1	6	16.6	5.0	✓
VOCs by Headspace GC-MS (TCLP)	E615B	949373	1	5	20.0	5.0	✓
WAD Cyanide (TCLP)	E337A	956044	1	6	16.6	5.0	✓
Laboratory Control Samples (LCS)							
Fluoride by IC (TCLP)	E240.F	956130	1	6	16.6	5.0	✓
Mercury by CVAAS (TCLP)	E512	956403	1	10	10.0	5.0	✓
Metals by CRC ICPMS (TCLP)	E444	956067	1	11	9.0	5.0	✓
Nitrate by IC (TCLP)	E240.NO3	956131	1	6	16.6	5.0	✓
Nitrite by IC (TCLP)	E240.NO2	956132	1	6	16.6	5.0	✓
VOCs by Headspace GC-MS (TCLP)	E615B	949373	1	5	20.0	5.0	✓
WAD Cyanide (TCLP)	E337A	956044	1	6	16.6	5.0	✓
Method Blanks (MB)							
Fluoride by IC (TCLP)	E240.F	956130	1	6	16.6	5.0	✓
Mercury by CVAAS (TCLP)	E512	956403	1	10	10.0	5.0	✓
Metals by CRC ICPMS (TCLP)	E444	956067	1	11	9.0	5.0	✓
Nitrate by IC (TCLP)	E240.NO3	956131	1	6	16.6	5.0	✓
Nitrite by IC (TCLP)	E240.NO2	956132	1	6	16.6	5.0	✓
VOCs by Headspace GC-MS (TCLP)	E615B	949373	1	5	20.0	5.0	✓
WAD Cyanide (TCLP)	E337A	956044	1	6	16.6	5.0	✓
Matrix Spikes (MS)							
Fluoride by IC (TCLP)	E240.F	956130	1	6	16.6	5.0	✓
Mercury by CVAAS (TCLP)	E512	956403	1	10	10.0	5.0	✓
Metals by CRC ICPMS (TCLP)	E444	956067	1	11	9.0	5.0	✓
Nitrate by IC (TCLP)	E240.NO3	956131	1	6	16.6	5.0	✓
Nitrite by IC (TCLP)	E240.NO2	956132	1	6	16.6	5.0	✓
VOCs by Headspace GC-MS (TCLP)	E615B	949373	1	5	20.0	5.0	✓
WAD Cyanide (TCLP)	E337A	956044	1	6	16.6	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Fluoride by IC (TCLP)	E240.F Waterloo - Environmental	Soil/Solid	EPA 1311/EPA 300.1 (mod)	Inorganic anions are analyzed by obtaining an extract produced by the Toxicity Characteristic Leachate Procedure (TCLP) as per EPA 1311, which is then analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite by IC (TCLP)	E240.NO2 Waterloo - Environmental	Soil/Solid	EPA 1311/EPA 300.1 (mod)	Inorganic anions are analyzed by obtaining an extract produced by the Toxicity Characteristic Leachate Procedure (TCLP) as per EPA 1311, which is then analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate by IC (TCLP)	E240.NO3 Waterloo - Environmental	Soil/Solid	EPA 1311/EPA 300.1 (mod)	Inorganic anions are analyzed by obtaining an extract produced by the Toxicity Characteristic Leachate Procedure (TCLP) as per EPA 1311, which is then analyzed by Ion Chromatography with conductivity and/or UV detection.
WAD Cyanide (TCLP)	E337A Waterloo - Environmental	Soil/Solid	APHA 4500-CN I (mod)	Weak Acid Dissociable (WAD) cyanide is determined after extraction by Continuous Flow Analyzer (CFA) with in-line distillation followed by colourmetric analysis.
Metals by CRC ICPMS (TCLP)	E444 Waterloo - Environmental	Soil/Solid	EPA 1311/6020B (mod)	An extract produced by the Toxicity Characteristic Leachate Procedure (TCLP) as per EPA 1311 is analyzed by Collision/Reaction Cell ICPMS.
Mercury by CVAAS (TCLP)	E512 Waterloo - Environmental	Soil/Solid	SW 846 -1311/245.1 CVAA ON TCLP LEACHATE	An extract produced by the Toxicity Characteristic Leachate Procedure (TCLP) as per EPA 1311 is analyzed by CVAAS.
VOCs by Headspace GC-MS (TCLP)	E615B Waterloo - Environmental	Soil/Solid	EPA 8260D (mod)	Volatile Organic Compounds (VOCs) are analyzed by static headspace GC-MS. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
Nitrate and Nitrite (as N), (TCLP) (Calculation)	EC240.N+N Waterloo - Environmental	Soil/Solid	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
VOCs Preparation for Headspace Analysis (TCLP)	EP582 Waterloo - Environmental	Soil/Solid	EPA 5021A (mod)	Liquid obtained after the TCLP process is prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)	EPP444 Waterloo - Environmental	Soil/Solid	EPA 1311	Preparation of a Toxicity Characteristic Leaching Procedure (TCLP) solid sample involves particle size reduction, homogenization, then determination of appropriate extraction fluid. A measured portion of fresh subsample is placed in an extraction bottle with the appropriate extraction fluid then tumbled in a rotary extractor for 18+/- 2 hours at 23 +/- 2 C. The liquid leachate is filtered to separate from solids then bottled and prepared for analytical tests.
TCLP Leachate Preparation (VOCs)	EPP582 Waterloo - Environmental	Soil/Solid	EPA 1311	An extract produced by the Toxicity Characteristic Leaching Procedure (TCLP) as per EPA 1311.

QUALITY CONTROL REPORT

Work Order	: **WT2313616**	Page	: 1 of 10
Client	: MTE Consultants Inc.	Laboratory	: Waterloo - Environmental
Contact	: Jen Lambke	Account Manager	: Emily Hansen
Address	: 520 Bingemans Centre Drive Kitchener ON Canada N2B 3X9	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	:	Telephone	: +1 519 886 6910
Project	: 53018-100 Blair Creek	Date Samples Received	: 18-May-2023 14:00
PO	: ----	Date Analysis Commenced	: 19-May-2023
C-O-C number	: ----	Issue Date	: 26-May-2023 16:44
Sampler	: ---- 519 743 6500		
Site	: ----		
Quote number	: Q79143 - CoK Roads Recon Program		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Andrea Armstrong	Department Manager - Air Quality and Volatiles	Waterloo VOC, Waterloo, Ontario
Robert Braun	Soils Team Supervisor	Waterloo Inorganics, Waterloo, Ontario
Walt Kippenhuck	Supervisor - Inorganic	Waterloo Inorganics, Waterloo, Ontario
Walt Kippenhuck	Supervisor - Inorganic	Waterloo Metals, Waterloo, Ontario

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
TCLP Extractables (QC Lot: 956044)											
WT2313535-001	Anonymous	Cyanide, weak acid dissociable, TCLP	----	E337A	0.10	mg/L	<0.10	<0.10	0	Diff <2x LOR	----
TCLP Extractables (QC Lot: 956130)											
WT2313535-001	Anonymous	Fluoride, TCLP	16984-48-8	E240.F	10	mg/L	<10	<10	0	Diff <2x LOR	----
TCLP Extractables (QC Lot: 956131)											
WT2313535-001	Anonymous	Nitrate (as N), TCLP	14797-55-8	E240.NO3	5.0	mg/L	<5.0	<5.0	0	Diff <2x LOR	----
TCLP Extractables (QC Lot: 956132)											
WT2313535-001	Anonymous	Nitrite (as N), TCLP	14797-65-0	E240.NO2	5.0	mg/L	<5.0	<5.0	0	Diff <2x LOR	----
TCLP Metals (QC Lot: 956067)											
WT2313478-001	Anonymous	Arsenic, TCLP	7440-38-2	E444	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		Barium, TCLP	7440-39-3	E444	2.5	mg/L	<2.5	<2.5	0	Diff <2x LOR	----
		Boron, TCLP	7440-42-8	E444	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
		Cadmium, TCLP	7440-43-9	E444	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		Chromium, TCLP	7440-47-3	E444	0.25	mg/L	<0.25	<0.25	0	Diff <2x LOR	----
		Lead, TCLP	7439-92-1	E444	0.25	mg/L	<0.25	<0.25	0	Diff <2x LOR	----
		Selenium, TCLP	7782-49-2	E444	0.10	mg/L	<0.10	<0.10	0	Diff <2x LOR	----
		Silver, TCLP	7440-22-4	E444	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		Uranium, TCLP	7440-61-1	E444	0.20	mg/L	<0.20	<0.20	0	Diff <2x LOR	----
TCLP Metals (QC Lot: 956403)											
WT2313478-001	Anonymous	Mercury, TCLP	7439-97-6	E512	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
TCLP VOCs (QC Lot: 949373)											
WT2313483-001	Anonymous	Benzene, TCLP	71-43-2	E615B	5.0	µg/L	<0.0050 mg/L	<5.0	0	Diff <2x LOR	----
		Carbon tetrachloride, TCLP	56-23-5	E615B	25	µg/L	<0.025 mg/L	<25	0	Diff <2x LOR	----
		Chlorobenzene, TCLP	108-90-7	E615B	25	µg/L	<0.025 mg/L	<25	0	Diff <2x LOR	----
		Chloroform, TCLP	67-66-3	E615B	100	µg/L	<0.10 mg/L	<100	0	Diff <2x LOR	----
		Dichlorobenzene, 1,2-, TCLP	95-50-1	E615B	25	µg/L	<0.025 mg/L	<25	0	Diff <2x LOR	----
		Dichlorobenzene, 1,4-, TCLP	106-46-7	E615B	25	µg/L	<0.025 mg/L	<25	0	Diff <2x LOR	----
		Dichloroethane, 1,2-, TCLP	107-06-2	E615B	25	µg/L	<0.025 mg/L	<25	0	Diff <2x LOR	----
		Dichloroethylene, 1,1-, TCLP	75-35-4	E615B	25	µg/L	<0.025 mg/L	<25	0	Diff <2x LOR	----
		Dichloromethane, TCLP	75-09-2	E615B	100	µg/L	<0.10 mg/L	<100	0	Diff <2x LOR	----
		Methyl ethyl ketone [MEK], TCLP	78-93-3	E615B	100	µg/L	<0.10 mg/L	<100	0	Diff <2x LOR	----

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
TCLP VOCs (QC Lot: 949373) - continued											
WT2313483-001	Anonymous	Tetrachloroethylene, TCLP	127-18-4	E615B	25	µg/L	<0.025 mg/L	<25	0	Diff <2x LOR	----
		Trichloroethylene, TCLP	79-01-6	E615B	25	µg/L	<0.025 mg/L	<25	0	Diff <2x LOR	----
		Vinyl chloride, TCLP	75-01-4	E615B	50	µg/L	<0.050 mg/L	<50	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
TCLP Extractables (QCLot: 956044)						
Cyanide, weak acid dissociable, TCLP	----	E337A	0.1	mg/L	<0.10	----
TCLP Extractables (QCLot: 956130)						
Fluoride, TCLP	16984-48-8	E240.F	10	mg/L	<10	----
TCLP Extractables (QCLot: 956131)						
Nitrate (as N), TCLP	14797-55-8	E240.NO3	5	mg/L	<5.0	----
TCLP Extractables (QCLot: 956132)						
Nitrite (as N), TCLP	14797-65-0	E240.NO2	5	mg/L	<5.0	----
TCLP Metals (QCLot: 956067)						
Arsenic, TCLP	7440-38-2	E444	1	mg/L	<1.0	----
Barium, TCLP	7440-39-3	E444	2.5	mg/L	<2.5	----
Boron, TCLP	7440-42-8	E444	0.5	mg/L	<0.50	----
Cadmium, TCLP	7440-43-9	E444	0.05	mg/L	<0.050	----
Chromium, TCLP	7440-47-3	E444	0.25	mg/L	<0.25	----
Lead, TCLP	7439-92-1	E444	0.25	mg/L	<0.25	----
Selenium, TCLP	7782-49-2	E444	0.1	mg/L	<0.10	----
Silver, TCLP	7440-22-4	E444	0.05	mg/L	<0.050	----
Uranium, TCLP	7440-61-1	E444	0.2	mg/L	<0.20	----
TCLP Metals (QCLot: 956403)						
Mercury, TCLP	7439-97-6	E512	0.001	mg/L	<0.0010	----
TCLP VOCs (QCLot: 949373)						
Benzene, TCLP	71-43-2	E615B	5	µg/L	<5.0	----
Carbon tetrachloride, TCLP	56-23-5	E615B	25	µg/L	<25	----
Chlorobenzene, TCLP	108-90-7	E615B	25	µg/L	<25	----
Chloroform, TCLP	67-66-3	E615B	100	µg/L	<100	----
Dichlorobenzene, 1,2-, TCLP	95-50-1	E615B	25	µg/L	<25	----
Dichlorobenzene, 1,4-, TCLP	106-46-7	E615B	25	µg/L	<25	----
Dichloroethane, 1,2-, TCLP	107-06-2	E615B	25	µg/L	<25	----
Dichloroethylene, 1,1-, TCLP	75-35-4	E615B	25	µg/L	<25	----
Dichloromethane, TCLP	75-09-2	E615B	100	µg/L	<100	----
Methyl ethyl ketone [MEK], TCLP	78-93-3	E615B	100	µg/L	<100	----
Tetrachloroethylene, TCLP	127-18-4	E615B	25	µg/L	<25	----
Trichloroethylene, TCLP	79-01-6	E615B	25	µg/L	<25	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
TCLP VOCs (QCLot: 949373) - continued						
Vinyl chloride, TCLP	75-01-4	E615B	50	µg/L	<50	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
TCLP Extractables (QCLot: 956044)									
Cyanide, weak acid dissociable, TCLP	----	E337A	0.1	mg/L	6.25 mg/L	124	70.0	130	----
TCLP Extractables (QCLot: 956130)									
Fluoride, TCLP	16984-48-8	E240.F	10	mg/L	1 mg/L	85.1	70.0	130	----
TCLP Extractables (QCLot: 956131)									
Nitrate (as N), TCLP	14797-55-8	E240.NO3	5	mg/L	2.5 mg/L	99.3	70.0	130	----
TCLP Extractables (QCLot: 956132)									
Nitrite (as N), TCLP	14797-65-0	E240.NO2	5	mg/L	0.5 mg/L	92.1	70.0	130	----
TCLP Metals (QCLot: 956067)									
Arsenic, TCLP	7440-38-2	E444	1	mg/L	0.05 mg/L	107	70.0	130	----
Barium, TCLP	7440-39-3	E444	2.5	mg/L	0.0125 mg/L	104	70.0	130	----
Boron, TCLP	7440-42-8	E444	0.5	mg/L	0.05 mg/L	102	70.0	130	----
Cadmium, TCLP	7440-43-9	E444	0.05	mg/L	0.005 mg/L	103	70.0	130	----
Chromium, TCLP	7440-47-3	E444	0.25	mg/L	0.0125 mg/L	104	70.0	130	----
Lead, TCLP	7439-92-1	E444	0.25	mg/L	0.025 mg/L	105	70.0	130	----
Selenium, TCLP	7782-49-2	E444	0.1	mg/L	0.05 mg/L	104	70.0	130	----
Silver, TCLP	7440-22-4	E444	0.05	mg/L	0.005 mg/L	101	70.0	130	----
Uranium, TCLP	7440-61-1	E444	0.2	mg/L	0.00025 mg/L	108	70.0	130	----
TCLP Metals (QCLot: 956403)									
Mercury, TCLP	7439-97-6	E512	0.001	mg/L	0.0001 mg/L	97.6	70.0	130	----
TCLP VOCs (QCLot: 949373)									
Benzene, TCLP	71-43-2	E615B	5	µg/L	250 µg/L	102	70.0	130	----
Carbon tetrachloride, TCLP	56-23-5	E615B	25	µg/L	250 µg/L	117	60.0	140	----
Chlorobenzene, TCLP	108-90-7	E615B	25	µg/L	250 µg/L	98.3	70.0	130	----
Chloroform, TCLP	67-66-3	E615B	100	µg/L	250 µg/L	105	70.0	130	----
Dichlorobenzene, 1,2-, TCLP	95-50-1	E615B	25	µg/L	250 µg/L	104	70.0	130	----
Dichlorobenzene, 1,4-, TCLP	106-46-7	E615B	25	µg/L	250 µg/L	109	70.0	130	----
Dichloroethane, 1,2-, TCLP	107-06-2	E615B	25	µg/L	250 µg/L	98.6	70.0	130	----
Dichloroethylene, 1,1-, TCLP	75-35-4	E615B	25	µg/L	250 µg/L	104	70.0	130	----
Dichloromethane, TCLP	75-09-2	E615B	100	µg/L	250 µg/L	104	70.0	130	----
Methyl ethyl ketone [MEK], TCLP	78-93-3	E615B	100	µg/L	250 µg/L	87.3	50.0	150	----
Tetrachloroethylene, TCLP	127-18-4	E615B	25	µg/L	250 µg/L	119	70.0	130	----

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
TCLP VOCs (QCLot: 949373) - continued									
Trichloroethylene, TCLP	79-01-6	E615B	25	µg/L	250 µg/L	110	70.0	130	----
Vinyl chloride, TCLP	75-01-4	E615B	50	µg/L	250 µg/L	105	60.0	130	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Soil/Solid**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
TCLP Extractables (QCLot: 956044)										
WT2313535-001	Anonymous	Cyanide, weak acid dissociable, TCLP	----	E337A	7.91 mg/L	6.25 mg/L	126	50.0	140	----
TCLP Extractables (QCLot: 956130)										
WT2313535-001	Anonymous	Fluoride, TCLP	16984-48-8	E240.F	16 mg/L	20 mg/L	81.3	50.0	150	----
TCLP Extractables (QCLot: 956131)										
WT2313535-001	Anonymous	Nitrate (as N), TCLP	14797-55-8	E240.NO3	48.4 mg/L	50 mg/L	96.7	50.0	150	----
TCLP Extractables (QCLot: 956132)										
WT2313535-001	Anonymous	Nitrite (as N), TCLP	14797-65-0	E240.NO2	8.9 mg/L	10 mg/L	89.1	50.0	150	----
TCLP Metals (QCLot: 956067)										
WT2313718-001	Anonymous	Arsenic, TCLP	7440-38-2	E444	9.1 mg/L	10 mg/L	91.0	50.0	140	----
		Barium, TCLP	7440-39-3	E444	12.5 mg/L	12.5 mg/L	100	50.0	140	----
		Boron, TCLP	7440-42-8	E444	10.4 mg/L	10 mg/L	104	50.0	140	----
		Cadmium, TCLP	7440-43-9	E444	10.3 mg/L	10 mg/L	103	50.0	140	----
		Chromium, TCLP	7440-47-3	E444	10.4 mg/L	10 mg/L	104	50.0	140	----
		Lead, TCLP	7439-92-1	E444	10.2 mg/L	10 mg/L	102	50.0	140	----
		Selenium, TCLP	7782-49-2	E444	10.4 mg/L	10 mg/L	104	50.0	140	----
		Silver, TCLP	7440-22-4	E444	0.089 mg/L	0.1 mg/L	88.9	50.0	140	----
		Uranium, TCLP	7440-61-1	E444	10.3 mg/L	10 mg/L	103	50.0	140	----
TCLP Metals (QCLot: 956403)										
WT2313478-001	Anonymous	Mercury, TCLP	7439-97-6	E512	0.0028 mg/L	0.003 mg/L	93.8	50.0	140	----
TCLP VOCs (QCLot: 949373)										
WT2313483-001	Anonymous	Benzene, TCLP	71-43-2	E615B	247 µg/L	250 µg/L	99.0	50.0	140	----
		Carbon tetrachloride, TCLP	56-23-5	E615B	282 µg/L	250 µg/L	113	50.0	140	----
		Chlorobenzene, TCLP	108-90-7	E615B	238 µg/L	250 µg/L	95.0	50.0	140	----
		Chloroform, TCLP	67-66-3	E615B	250 µg/L	250 µg/L	102	50.0	140	----
		Dichlorobenzene, 1,2-, TCLP	95-50-1	E615B	251 µg/L	250 µg/L	100	50.0	140	----
		Dichlorobenzene, 1,4-, TCLP	106-46-7	E615B	263 µg/L	250 µg/L	105	50.0	140	----
		Dichloroethane, 1,2-, TCLP	107-06-2	E615B	241 µg/L	250 µg/L	96.6	50.0	140	----
		Dichloroethylene, 1,1-, TCLP	75-35-4	E615B	249 µg/L	250 µg/L	99.7	50.0	140	----
		Dichloromethane, TCLP	75-09-2	E615B	250 µg/L	250 µg/L	101	50.0	140	----
		Methyl ethyl ketone [MEK], TCLP	78-93-3	E615B	220 µg/L	250 µg/L	88.1	50.0	140	----

Sub-Matrix: **Soil/Solid**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
TCLP VOCs (QCLot: 949373) - continued										
WT2313483-001	Anonymous	Tetrachloroethylene, TCLP	127-18-4	E615B	281 µg/L	250 µg/L	112	50.0	140	----
		Trichloroethylene, TCLP	79-01-6	E615B	266 µg/L	250 µg/L	106	50.0	140	----
		Vinyl chloride, TCLP	75-01-4	E615B	250 µg/L	250 µg/L	100	50.0	140	----

Paradigm, December 2023

Transportation Study

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2023-12-20
Project: 230070

Lyndsay Dokas, P.Eng.
Project Manager
MTE Consultants Inc.
520 Bingemans Centre Drive
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RE: BLAIR CREEK DRIVE EXTENSION, KITCHENER, ON – CLASS ENVIRONMENTAL ASSESSMENT, TRANSPORTATION STUDY

The City of Kitchener, through MTE Consultants Inc. retained Paradigm Transportation Solutions Limited (Paradigm) to conduct this Transportation Study as part of the Class Environmental Assessment and Preliminary Design for the Blair Creek Drive storm sewer, watermain and road extension.

The City of Kitchener (the City) has initiated this Municipal Class Environmental Assessment (EA) and preliminary design for the extension of Blair Creek Drive from the future Strasburg Road to the intersection of Reidel Drive and Blair Creek Drive, approximately 700 metres.

Figure 1 (attached) illustrates the location of the study area.

Background

The Doon South and Brigadoon planned area road network includes the extension of Strasburg Road southerly to New Dundee Road and the extension of Biehn Drive, Robert Ferrie Drive and Blair Creek Drive westerly to Strasburg Road. Biehn Drive, Robert Ferrie Drive and Blair Creek Drive are expected to each function as major collector roads and Strasburg Road as an arterial street.

The proposed Blair Creek Drive extension will connect westerly (where Blair Creek Drive ends at Reidel Drive) to the future Strasburg Road extension.

In September 2016, BA Group prepared an update to the *Doon South Community and Broader Study Area Traffic Impact Study*[1] which included the Blair Creek Drive Extension under seven-year future traffic conditions.

[1] BA Consulting Group Ltd., *Update to Doon South Community and Broader Study Area Traffic Impact Study*, 2016.

Study Scope

This Transportation Study has been prepared to review future traffic operations within the Blair Creek Drive Extension Corridor based on previously projected volumes and provide recommendations on road cross-section, and intersection geometry and traffic control accordingly.

The study area includes the future intersections of Blair Creek Drive at Reidel Drive and at Strasburg Road.

Existing Conditions

Blair Creek Drive is an east-west major community collector roadway as outlined in the City Official Plan[2], with an urban two-lane cross section and a posted speed limit of 30 km/h. Sidewalks and bike lanes are provided on both sides of the roadway. As of July 2023, Blair Creek Drive terminates at Thomas Slee Drive and will be extended westerly to Reidel Drive in the near future.

Reidel Drive is a north-south local street[3] with a rural two-lane cross section and posted speed limit of 50 km/h. No active transportation facilities are provided.

Strasburg Road is a north-south city arterial street[4] with a four-lane urban cross section and a posted speed limit of 60 km/h. A multi-use trail is provided on both sides of the roadway. Strasburg Road currently terminates at Rockcliffe Drive and will be extended to New Dundee Road in the future with a two-lane cross-section.

Future Conditions

The September 2016 BA Group study included seven-year total traffic forecasts for the intersection of Blair Creek Drive and Strasburg Road. The study did not include forecasts for the intersection of Blair Creek Drive and Reidel Drive. Volumes for this intersection were estimated based on the difference in traffic volumes at Reidel Drive and New Dundee Road between the seven-year forecast traffic scenarios with and without the Blair Creek Road Extension.

Figure 2 (attached) illustrates the forecast traffic volumes.

[2] City of Kitchener, *City of Kitchener Official Plan: Map 11 Integrated Transportation System*, (Kitchener, 2019).
[3] City of Kitchener, *City of Kitchener Official Plan: Map 11 Integrated Transportation System*, (Kitchener, 2019).
[4] City of Kitchener, *City of Kitchener Official Plan: Map 11 Integrated Transportation System*, (Kitchener, 2019).

Traffic Signal Control Justification

The study area intersections have been assessed using the Ontario Traffic Manual (OTM) Justification 7[5] to determine if a change in traffic control is warranted. **Appendix A** contains the warrant analysis worksheets for Justification 7.

Based on the warrant analysis, traffic control signals are not warranted at either intersection under the forecast traffic conditions.

Roundabout Screening Tool

In accordance with Region of Waterloo policies, a roundabout screening analysis was completed to estimate the cost of a roundabout in comparison to a stop-control intersection. The results indicate that the roundabout alternative has a higher collision cost than stop-control for both study area intersections. Therefore, a roundabout does not screen in for either intersection.

Appendix B contains the screening worksheets for both intersections.

Left-Turn Lane Warrants

The Ministry of Transportation Design Supplement for the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads[6] provides guidance on the assessment and/or need for auxiliary left-turn lanes.

Warrants have been calculated for southbound left-turns at Strasburg Road and Blair Creek Drive. The warrant was calculated using the nomographs for left-turn lanes on a two-lane undivided highway at an unsignalized intersection with a design speed of 70 km/h (10 km/h over the assumed future speed limit of 60 km/h). Based on this method, a southbound left-turn lane with 25 metres of storage is warranted under forecast traffic volumes.

Figure 3 (attached) shows the warrant nomograph.

All-Way Stop Control Warrant

All-way stop control warrants were assessed for the intersection of Reidel Drive and Blair Creek Drive. The warrants were assessed using the OTM all-way strop minimum volume warrants[7] to determine if all-way stop control is warranted. Eight hours of data was not available and therefore the warrant analysis was completed based on the highest volumes between the AM and PM peak hours. As the warrants were not completed using eight hours of data, the analysis is only an estimation. The warrant for collector roads and rural arterial roads

[5] Ontario Ministry of Transportation, *Ontario Traffic Manual Book 12: Traffic Signals*, (Toronto: Queen's Printer for Ontario, 2012).
[6] Ontario Ministry of Transportation, *MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads*, (Toronto: Queen's Printer for Ontario, 2020).
[7] Ontario Ministry of Transportation, *Ontario Traffic Manual Book 5: Regulatory Signs*, (Toronto: Queen's Printer for Ontario, 2021).

was used as Blair Creek Drive will function as a major collector and Reidel Drive as a local street.

Based on the warrant analysis, all-way stop control is not warranted as traffic volumes on the minor road make up less than 30% of the total approaching volumes and less than 150 vehicles per hour during the AM peak hour.

Intersection Operations

Based on the warrants and screening above, the study area intersections have been analyzed under stop-control on the Blair Creek Drive approaches using Synchro 11 software.

Intersection level of service (LOS) is a recognized method of quantifying the average delay experienced by drivers at intersections. It is based on the delay experienced by individual vehicles executing various movements. The delay is related to the number of vehicles intending to make a particular movement, compared to the estimated capacity for that movement. The capacity is based on criteria related to the opposing traffic flows and intersection geometry.

The highest possible rating is LOS A, under which the average total delay is equal to or less than 10.0 seconds per vehicle. When the average delay exceeds 80 seconds for signalized intersections, 50 seconds for unsignalized intersections or when the volume to capacity ratio is greater than 1.0, the movement is classed as LOS F and remedial measures are usually implemented if they are feasible. LOS E is usually used as a guideline for the determination of road improvement needs on through lanes, while LOS F may be acceptable for left-turn movements at peak times, depending on delays.

Following the Region of Waterloo Transportation Impact Study (TIS) Guidelines[8], critical thresholds are as follows:

- Intersections:
  - overall LOS E or F (i.e. average control delay per vehicle greater than 55 seconds) for signalized intersections; and
  - overall LOS E or F (i.e. average control delay per vehicle greater than 35 seconds) for unsignalized intersections; and
- Movements:
  - the average control delay for individual movements is greater than 55 seconds;
  - estimated 95th percentile queue length for an exclusive movement exceeds the available storage space;
  - estimated 95th percentile queue length for an individual movement will block an existing access;

[8] Region of Waterloo, *Transportation Impact Study Guidelines*, 2014.

- exclusive turning lanes are inaccessible because of the queue lengths in adjacent through lanes; and
- poor quality of service for non-auto modes.

Table 1 summarizes the results of the intersection operational analysis, including the AM and PM peak hour LOS, v/c ratios, and 95th percentile queues.

The results indicate that the study area intersections are operating with acceptable levels of service under stop-control on the Blair Creek Drive approaches.

Appendix C contains the supporting Synchro 11 reports.

TABLE 1: INTERSECTION OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction/Movement/Approach																Overall
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Reidel Drive & Blair Creek Drive	TWSC	LOS	<	B	>	**B**	<	B	>	**B**	<	A	>	**A**	<	A	>	**A**	
			Delay	<	11	>	**11**	<	13	>	**13**	<	0	>	**0**	<	0	>	**0**	
			V/C	<	0.17	>		<	0.40	>		<	0.00	>		<	0.00	>		
			Q	<	4	>		<	14	>		<	0	>		<	0	>		
	Strasburg Road & Blair Creek Drive	TWSC	LOS					B		>	**B**		A	>	**A**	A	A		**A**	
			Delay					12		>	**12**		0	>	**0**	8	0		**3**	
			V/C					0.37		>			0.00	>		0.07	0.00			
			Q					13		>			0	>		2	0			
			Stor.					-		>			-	>		25	-			
			Avail.					-		>			-	>		23	-			
PM Peak Hour	Reidel Drive & Blair Creek Drive	TWSC	LOS	<	C	>	**C**	<	B	>	**B**	<	A	>	**A**	<	A	>	**A**	
			Delay	<	16	>	**16**	<	12	>	**12**	<	0	>	**0**	<	0	>	**0**	
			V/C	<	0.55	>		<	0.25	>		<	0.00	>		<	0.00	>		
			Q	<	26	>		<	8	>		<	0	>		<	0	>		
	Strasburg Road & Blair Creek Drive	TWSC	LOS					D		>	**D**		A	>	**A**	A	A		**A**	
			Delay					26		>	**26**		0	>	**0**	9	0		**7**	
			V/C					0.52		>			0.00	>		0.27	0.00			
			Q					22		>			0	>		8	0			
			Stor.					-		>			-	>		25	-			
			Avail.					-		>			-	>		17	-			

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds
V/C - Volume to Capacity Ratio
Q - 95th Percentile Queue Length (m)
Stor. - Existing Storage (m)
Avail. - Available Storage (m)
TWSC - Two-Way Stop Control
< / > - Shared with through movement

Reidel Drive Closure

The City has confirmed closure of Stauffer Drive at Reidel Drive, with Reidel Drive north of Blair Creek Drive becoming the access point for the property at 500 Stauffer Drive. The forecast traffic in **Figure 2** show volumes to/from the north on Reidel Drive and does not reflect the closure. Intersection operations summarized in **Table 1** indicate that the intersection of Reidel Drive and Blair Creek Drive is forecast to operate with acceptable levels of service. A reduced number of trips at this intersection is likely to improve operations and does not have an impact on the recommended solution reviewed above.

Conclusions

The intersections within the Blair Creek Drive Extension corridor, including at Strasburg Road and at Reidel Drive, are forecast to operate with acceptable levels of service under two-way stop-control on the Blair Creek Drive approaches. A southbound left-turn lane with 25 metres of storage is warranted at the intersection with Strasburg Road.

Please do not hesitate to contact us if we can be of further assistance.

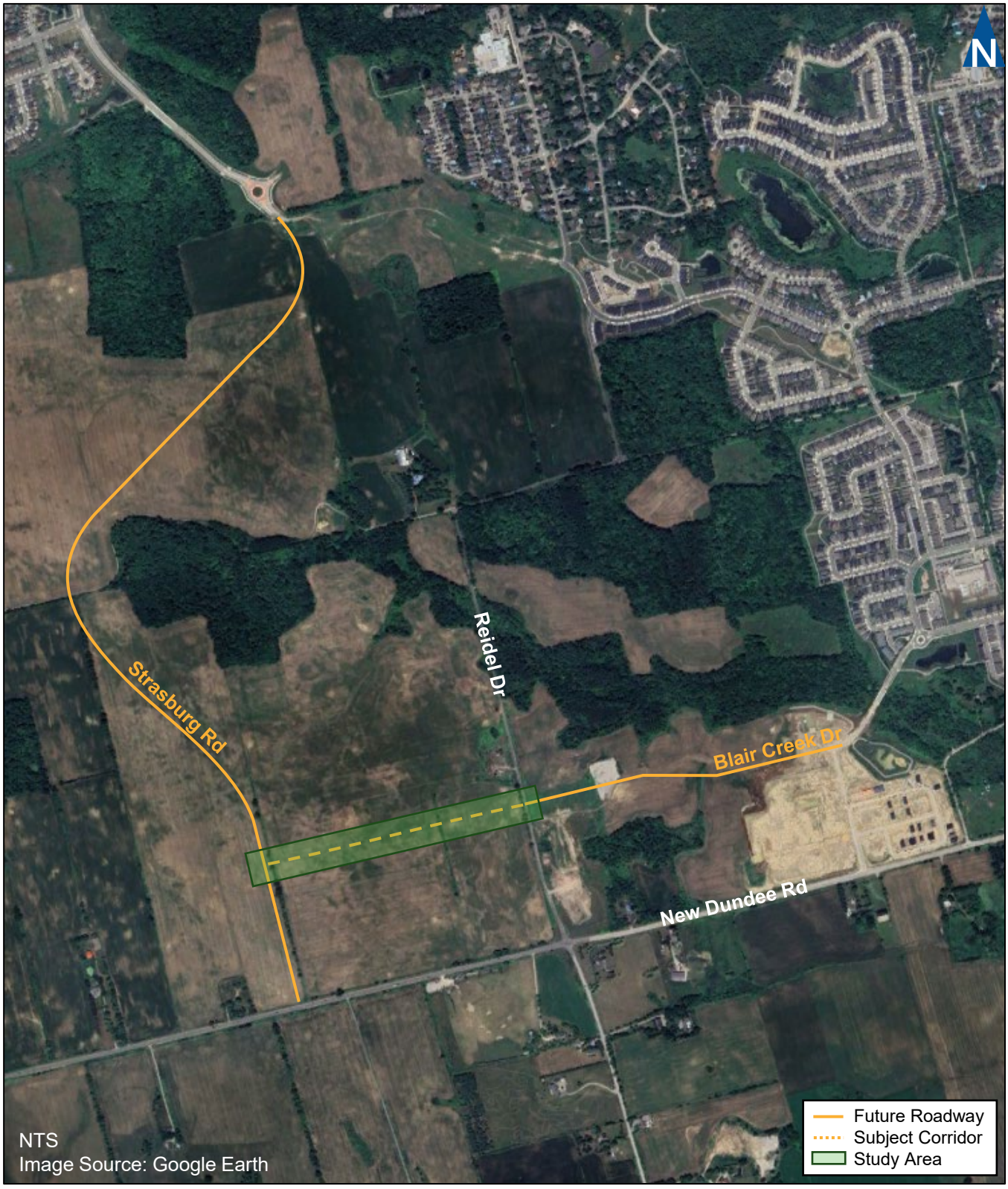
Yours very truly,

PARADIGM TRANSPORTATION SOLUTIONS LIMITED

Jim Mallett
M.A.SC., P.Eng., PTOE
President and CEO, Principal

Maddison Murch
P.Eng.
Transportation Engineer

Attachments



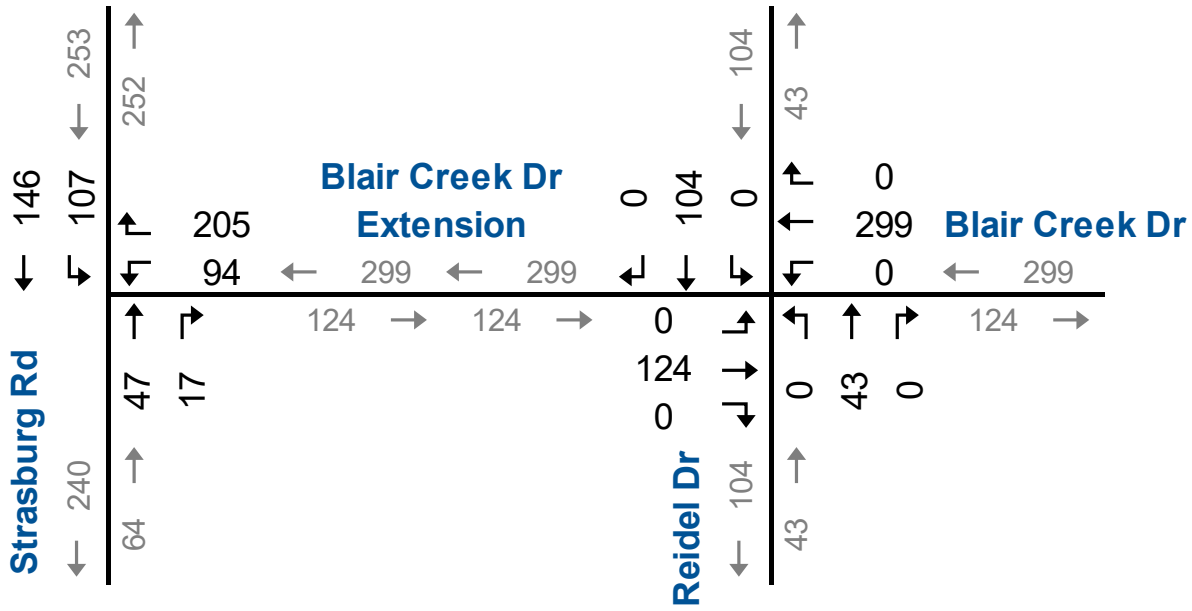
paradigm TRANSPORTATION SOLUTIONS LIMITED

Study Area

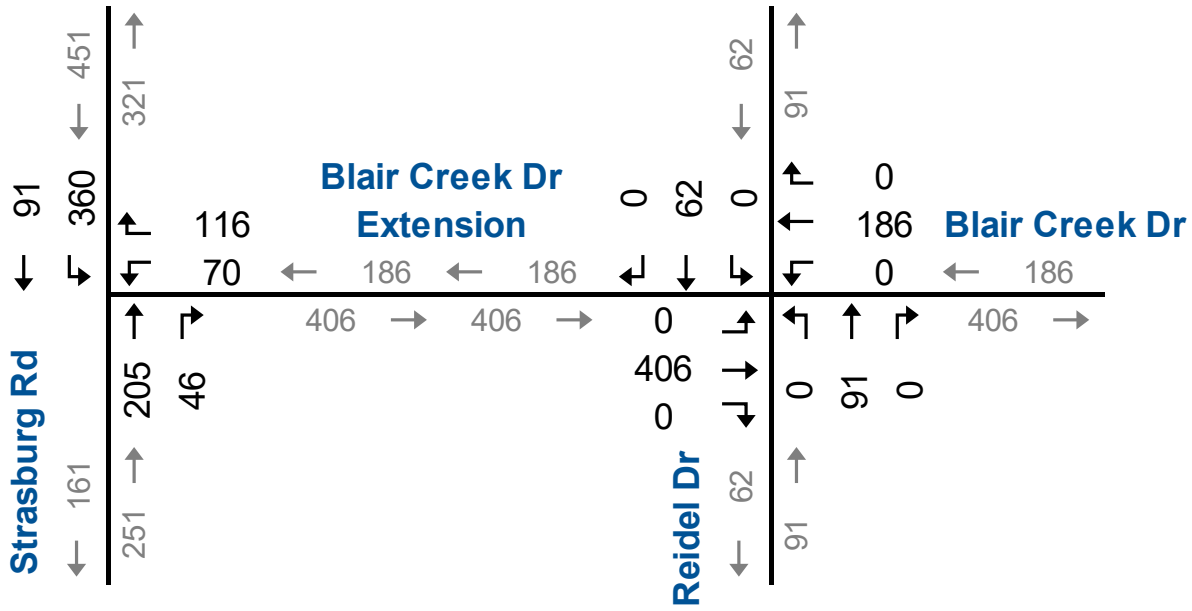
Blair Creek Drive Extension, Kitchener
230070

Figure 1

AM Peak Hour



PM Peak Hour



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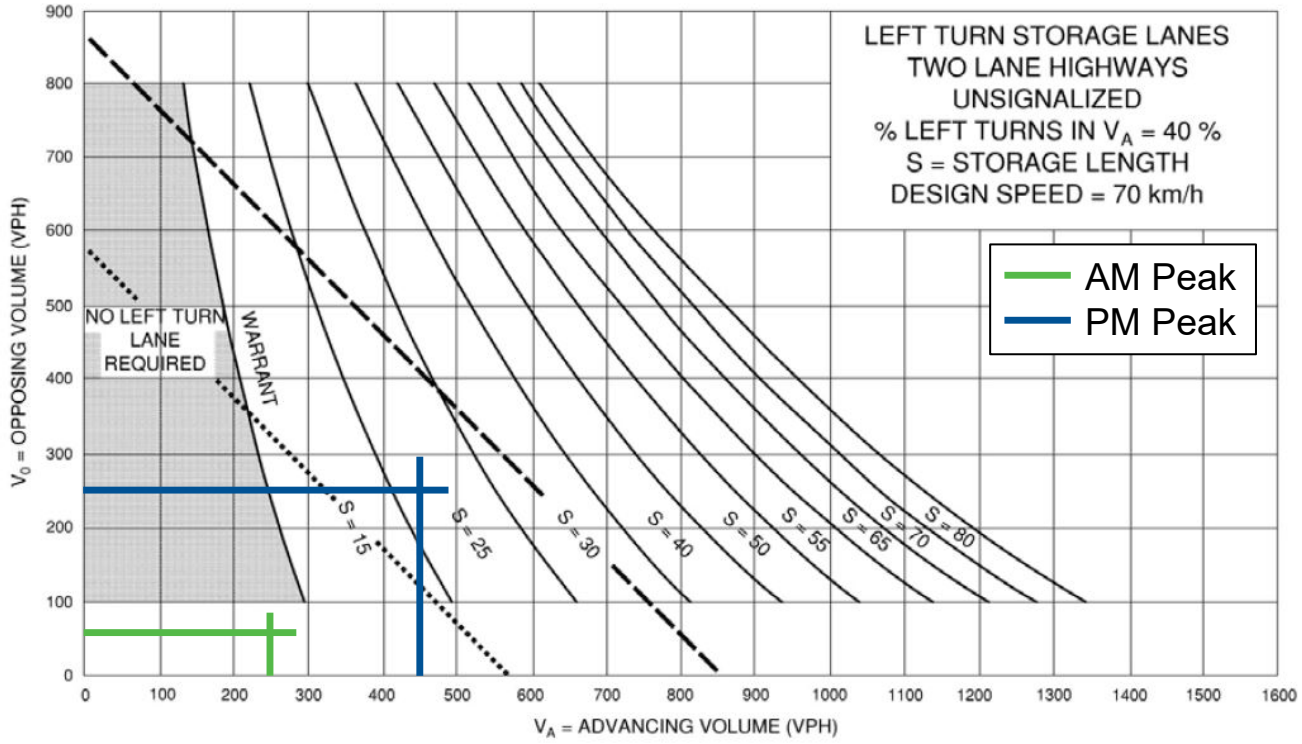
Forecast Traffic Volumes

Blair Creek Drive Extension, Kitchener
230070

Figure 2



AM Peak Hour — PM Peak Hour

Southbound Left-Turn Lane Warrant
Forecast Total Traffic
Strasburg Road & Blair Creek Drive

Blair Creek Drive Extension, Kitchener
230070

Figure 3

Appendix A

Traffic Signal Control Justification Assessments

Signal Justification Calculation for Forecast Volumes
(OTM Book 12 - Justification 7)

Horizon Year: 7-Year Forecast Traffic
Region/City/Township: RMOW/CoK

Major Street: Strasburg Road
Minor Street: Blair Creek Drive

North/South?: Y

Number of Approach Lanes: 1
Tee Intersection? Y
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

	Major Street						Minor Street						
	Strasburg Road						Blair Creek Drive						
	Northbound			Southbound			Eastbound			Westbound			Peds
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Crossing
AM Peak Hour		47	17	107	146					94		205	
PM Peak Hour		205	46	360	91					70		116	
verage Hourly Volum	0	63	16	117	59	0	0	0	0	41	0	80	0

Warrant	AHV
1A - All	376
1B - Minor	121
2A - Major	255
2B - Cross	41

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes	1		2 or more		Average Hourly Volume
1A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	All Approaches	480	720	600	900	376
					% Fulfilled	52.2%

	Approach Lanes	1		2 or more		Average Hourly Volume
1B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Minor Street Approaches	180	255	180	255	121
					% Fulfilled	47.5%

Warrant 2 - Delay To Cross Traffic

	Approach Lanes	1		2 or more		Average Hourly Volume
2A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Major Street Approaches	480	720	600	900	255
					% Fulfilled	35.4%

	Approach Lanes	1		2 or more		Average Hourly Volume
2B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Traffic Crossing Major Street	50	75	50	75	41
					% Fulfilled	54.7%

Signal Justification Calculation for Forecast Volumes
(OTM Book 12 - Justification 7)

Horizon Year: 7-Year Forecast Traffic
Region/City/Township: RMOW/CoK

Major Street: Blair Creek Drive
Minor Street: Reidel Drive
North/South?: N

Number of Approach Lanes: 1
Tee Intersection? N
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

	Major Street						Minor Street						
	Blair Creek Drive						Reidel Drive						
	Eastbound			Westbound			Northbound			Southbound			Peds
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Crossing
AM Peak Hour	0	124	0	0	299	0	0	43	0	0	104	0	
PM Peak Hour	0	406	0	0	186	0	0	91	0	0	62	0	
verage Hourly Volum	0	133	0	0	121	0	0	34	0	0	42	0	0

Warrant	AHV
1A - All	329
1B - Minor	75
2A - Major	254
2B - Cross	42

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes	1		2 or more		Average Hourly Volume
1A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	All Approaches	480	720	600	900	329
					% Fulfilled	45.7%

	Approach Lanes	1		2 or more		Average Hourly Volume
1B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Minor Street Approaches	120	170	120	170	75
					% Fulfilled	44.1%

Warrant 2 - Delay To Cross Traffic

	Approach Lanes	1		2 or more		Average Hourly Volume
2A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Major Street Approaches	480	720	600	900	254
					% Fulfilled	35.2%

	Approach Lanes	1		2 or more		Average Hourly Volume
2B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Traffic Crossing Major Street	50	75	50	75	42
					% Fulfilled	55.3%

Appendix B

Roundabout Screening Worksheet

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Region of Waterloo

Last Rev JAN 2021

Scenario: 7-Year Horizon

Major Road: Reidel Drive

Minor Road: Blair Creek Drive

Major Road Direction:	North / South
Urban or Rural:	Urban
Proposed Control:	Stop Control
Proposed Config.	4-Leg Intersection

LT Lanes Proposed (non roundabout):		RT Lanes Proposed (non roundabout):	
Major	No LT Lanes	**Major**	No RT Lanes
Minor	No LT Lanes	**Minor**	No RT Lanes

Is there going to be any fully protected left-turn phasing? NO

Number of approaches with FPLTP: N/A

Is the proposed intersection "new" or is it existing: NEW

Does control and number of approaches remain the same: NO

Will the proposed intersection have illumination: NO

NOTE: No collision history required

5-Year Total Collisions: N/A

5-Year PDO Collisions: N/A

Proposed RA Configuration? SINGLE - 4 x 1

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

Major Road (mid-block) 10-Year Horizon AADT: 1,530

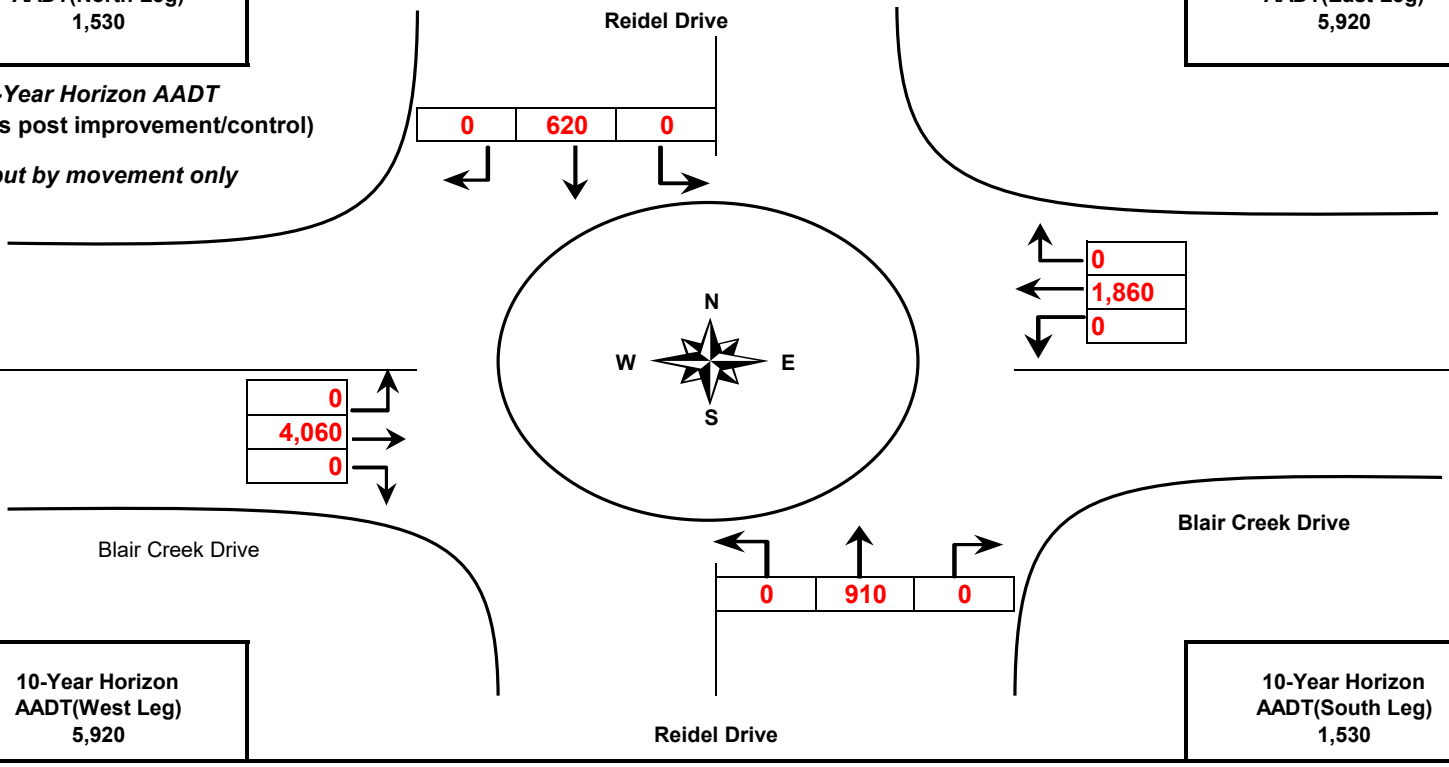
Minor Road (mid-block) 10-Year Horizon AADT: 5,920

10-Year Horizon AADT(North Leg) 1,530

10-Year Horizon AADT(East Leg) 5,920

10-Year Horizon AADT (10ys post improvement/control)

Input by movement only



10-Year Horizon AADT(West Leg) 5,920

10-Year Horizon AADT(South Leg) 1,530

Direct Capital Costs

Fatal =	$1,656,500
Injury =	$60,500
PDO_{SIG} =	$5,000
PDO_{RA} =	$4,500
Discount Rate =	0.06

20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)

Collisions by Severity	Total	PDO	Injury	Fatal
Stop Control	$110,243.15	$14,910.90	$76,332.33	$18,999.92
Roundabout	$222,853.83	$89,362.18	$133,491.65	$0.00

* Roundabout calibration Factor - 0.5

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Region of Waterloo

Last Rev JAN 2021

Scenario: **7-Year Horizon**

Major Road: **Reidel Drive**
Minor Road: **Blair Creek Drive**

Major Road Direction: North / South

Urban or Rural: Urban

Proposed Control: Stop Control

Proposed Config. 4-Leg Intersection

Roundabout Conflicts: **6120**

5-Year Total Collisions: **N/A**

5-Year PDO Collisions: **N/A**

Estimated **ANNUAL (1-YEAR ONLY)** Collisions				
Future Expected Collisions by Severity	**Total**	**PDO**	**Injury**	**Fatal**
Stop Control	**0.37**	**0.26**	**0.11**	**0.00**
Roundabout	**1.92**	**1.73**	**0.19**	**0.00**

TOTAL CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Stop Control	4-Leg Intersection	**-8.9**	**0.82**	**0.25**	**N/A**	**0.006**	**n/a**

PDO CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Stop Control	4-Leg Intersection	**-8.74**	**0.77**	**0.23**	**N/A**	**0.006**	**n/a**

Collision Modification Factors (cmf's)	Left Turn Lane	Right Turn Lane	Calibration Factor	Empirical Bays Weighting	
			0.84	Total	PDO
				N/A	**N/A**
	Illumination	Protected LT Phasing			
	0.91	**1.00**			

Comments:

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Region of Waterloo

Last Rev JAN 2021

Scenario: 7-Year Horizon

Major Road: Strasburg Road

Minor Road: Blair Creek Drive

Major Road Direction:	North / South
Urban or Rural:	Urban
Proposed Control:	Stop Control
Proposed Config.	3-Leg Intersection

LT Lanes Proposed (non roundabout):		RT Lanes Proposed (non roundabout):	
Major	1 Approach	**Major**	No RT Lanes
Minor	No LT Lanes	**Minor**	No RT Lanes

Is there going to be any fully protected left-turn phasing? NO

Number of approaches with FPLTP: N/A

Is the proposed intersection "new" or is it existing: NEW

Does control and number of approaches remain the same: NO

Will the proposed intersection have illumination: NO

NOTE: No collision history required

5-Year Total Collisions: N/A

5-Year PDO Collisions: N/A

Proposed RA Configuration? SINGLE - 3 x 1

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

Major Road (mid-block) 10-Year Horizon AADT: 7,720

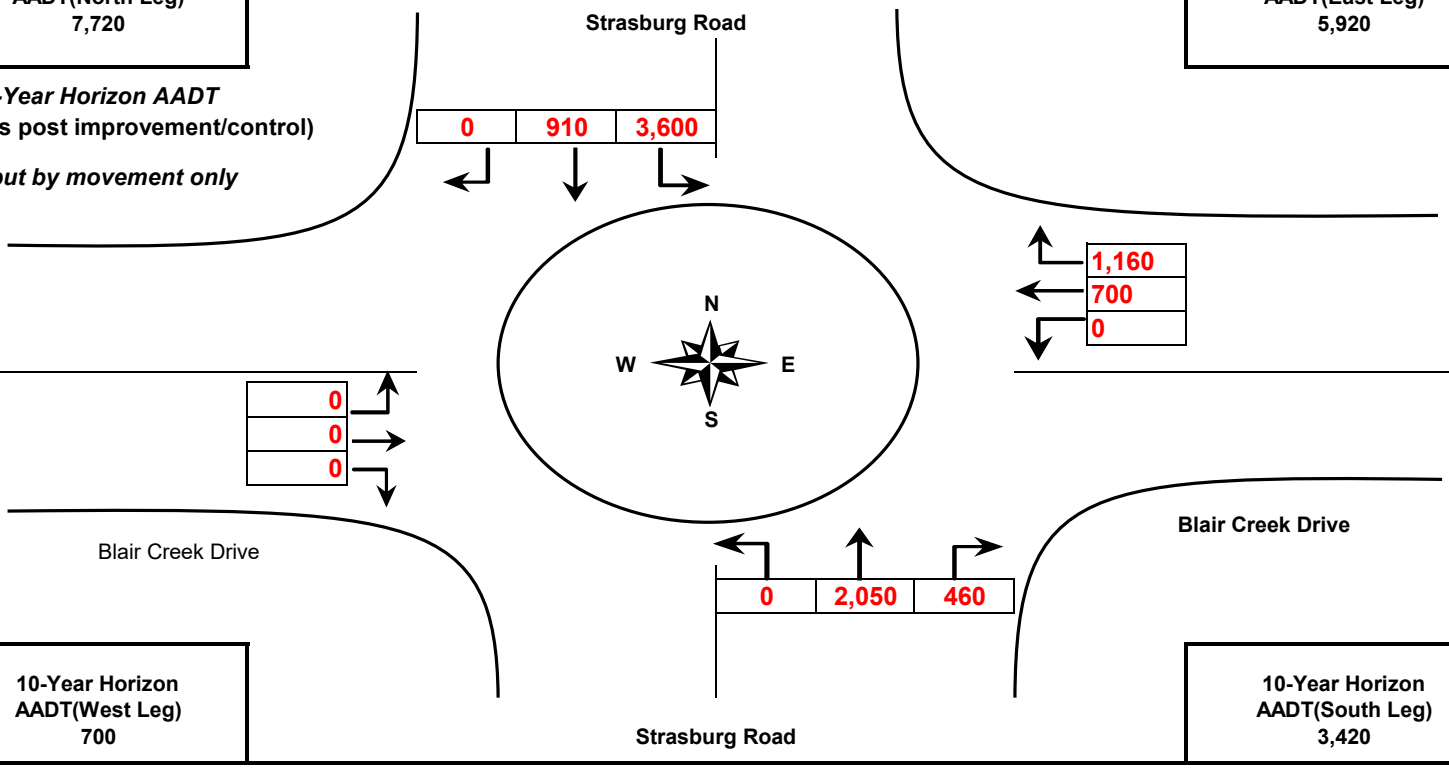
Minor Road (mid-block) 10-Year Horizon AADT: 5,920

10-Year Horizon AADT(North Leg) 7,720

10-Year Horizon AADT(East Leg) 5,920

10-Year Horizon AADT (10ys post improvement/control)

Input by movement only



10-Year Horizon AADT(West Leg) 700

10-Year Horizon AADT(South Leg) 3,420

Direct Capital Costs

Fatal = $1,656,500

Injury = $60,500

PDO_{SIG} = $5,000

PDO_{RA} = $4,500

Discount Rate = 0.06

20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)

Collisions by Severity	Total	PDO	Injury	Fatal
Stop Control	**$176,653.99**	**$25,807.32**	**$131,846.74**	**$18,999.92**
Roundabout	**$535,279.23**	**$214,641.67**	**$320,637.56**	**$0.00**

* Roundabout calibration Factor - 0.9

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Region of Waterloo

Last Rev JAN 2021

Scenario: **7-Year Horizon**

Major Road: **Strasburg Road**
Minor Road: **Blair Creek Drive**

Major Road Direction: North / South

Urban or Rural: Urban

Proposed Control: Stop Control

Proposed Config. 3-Leg Intersection

Roundabout Conflicts: **8720**

5-Year Total Collisions: **N/A**

5-Year PDO Collisions: **N/A**

Estimated **ANNUAL (1-YEAR ONLY)** Collisions				
Future Expected Collisions by Severity	**Total**	**PDO**	**Injury**	**Fatal**
Stop Control	**0.64**	**0.45**	**0.19**	**0.00**
Roundabout	**4.62**	**4.16**	**0.46**	**0.00**

TOTAL CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Stop Control	3-Leg Intersection	**-13.36**	**1.11**	**0.41**	**N/A**	**0.006**	**n/a**

PDO CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Stop Control	3-Leg Intersection	**-15.38**	**1.2**	**0.51**	**N/A**	**0.006**	**n/a**

Collision Modification Factors (cmf's)	Left Turn Lane	Right Turn Lane	Calibration Factor	Empirical Bays Weighting	
			0.61	Total	PDO
				N/A	**N/A**
	Illumination	Protected LT Phasing			
	0.91	**1.00**			

Comments:

Appendix C

Synchro Reports

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	124	0	0	299	0	0	43	0	0	104	0
Future Volume (vph)	0	124	0	0	299	0	0	43	0	0	104	0
Ideal Flow (vphpl)	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt												
Flt Protected												
Satd. Flow (prot)	0	1520	0	0	1520	0	0	1520	0	0	1520	0
Flt Permitted												
Satd. Flow (perm)	0	1520	0	0	1520	0	0	1520	0	0	1520	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		699.1			256.0			177.5			225.8	
Travel Time (s)		50.3			18.4			12.8			16.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	124	0	0	299	0	0	43	0	0	104	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	124	0	0	299	0	0	43	0	0	104	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	32.7%	ICU Level of Service A	
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	9.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	124	0	0	299	0	0	43	0	0	104	0
Future Vol, veh/h	0	124	0	0	299	0	0	43	0	0	104	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	124	0	0	299	0	0	43	0	0	104	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	297	147	104	209	147	43	104	0	0	43	0	0
Stage 1	104	104	-	43	43	-	-	-	-	-	-	-
Stage 2	193	43	-	166	104	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	655	744	951	748	744	1027	1488	-	-	1566	-	-
Stage 1	902	809	-	971	859	-	-	-	-	-	-	-
Stage 2	809	859	-	836	809	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	450	744	951	652	744	1027	1488	-	-	1566	-	-
Mov Cap-2 Maneuver	450	744	-	652	744	-	-	-	-	-	-	-
Stage 1	902	809	-	971	859	-	-	-	-	-	-	-
Stage 2	527	859	-	708	809	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.8	13.1	0	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1488	-	-	744	744	1566	-	-
HCM Lane V/C Ratio	-	-	-	0.167	0.402	-	-	-
HCM Control Delay (s)	0	-	-	10.8	13.1	0	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.6	1.9	0	-	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	94	205	47	17	107	146
Future Volume (vph)	94	205	47	17	107	146
Ideal Flow (vphpl)	1765	1765	1775	1775	1775	1900
Storage Length (m)	0.0	0.0		0.0	25.0	
Storage Lanes	1	0		0	1	
Taper Length (m)	7.5				7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.907		0.964			
Flt Protected	0.985				0.950	
Satd. Flow (prot)	1546	0	1678	0	1653	1863
Flt Permitted	0.985				0.950	
Satd. Flow (perm)	1546	0	1678	0	1653	1863
Link Speed (k/h)	50		60			60
Link Distance (m)	699.1		153.8			208.7
Travel Time (s)	50.3		9.2			12.5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	94	205	47	17	107	146
Shared Lane Traffic (%)						
Lane Group Flow (vph)	299	0	64	0	107	146
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.6		3.6			3.6
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.09	1.09	1.09	1.00
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	38.9%	ICU Level of Service A	
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	7.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	94	205	47	17	107	146
Future Vol, veh/h	94	205	47	17	107	146
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	25	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	94	205	47	17	107	146

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	416	56	0	0	64	0
Stage 1	56	-	-	-	-	-
Stage 2	360	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	593	1011	-	-	1538	-
Stage 1	967	-	-	-	-	-
Stage 2	706	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	551	1011	-	-	1538	-
Mov Cap-2 Maneuver	551	-	-	-	-	-
Stage 1	967	-	-	-	-	-
Stage 2	657	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.1	0	3.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	801	1538	-
HCM Lane V/C Ratio	-	-	0.373	0.07	-
HCM Control Delay (s)	-	-	12.1	7.5	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	1.7	0.2	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (vph)	0	406	0	0	186	0	0	91	0	0	62	0
Future Volume (vph)	0	406	0	0	186	0	0	91	0	0	62	0
Ideal Flow (vphpl)	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt												
Flt Protected												
Satd. Flow (prot)	0	1520	0	0	1520	0	0	1520	0	0	1520	0
Flt Permitted												
Satd. Flow (perm)	0	1520	0	0	1520	0	0	1520	0	0	1520	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		699.1			256.0			177.5			225.8	
Travel Time (s)		50.3			18.4			12.8			16.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	406	0	0	186	0	0	91	0	0	62	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	406	0	0	186	0	0	91	0	0	62	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	38.7%	ICU Level of Service A	
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	11.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	0	406	0	0	186	0	0	91	0	0	62	0
Future Vol, veh/h	0	406	0	0	186	0	0	91	0	0	62	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	406	0	0	186	0	0	91	0	0	62	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	246	153	62	356	153	91	62	0	0	91	0	0
Stage 1	62	62	-	91	91	-	-	-	-	-	-	-
Stage 2	184	91	-	265	62	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	708	739	1003	599	739	967	1541	-	-	1504	-	-
Stage 1	949	843	-	916	820	-	-	-	-	-	-	-
Stage 2	818	820	-	740	843	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	571	739	1003	338	739	967	1541	-	-	1504	-	-
Mov Cap-2 Maneuver	571	739	-	338	739	-	-	-	-	-	-	-
Stage 1	949	843	-	916	820	-	-	-	-	-	-	-
Stage 2	632	820	-	384	843	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.6	11.5	0	0
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1541	-	-	739	739	1504	-	-
HCM Lane V/C Ratio	-	-	-	0.549	0.252	-	-	-
HCM Control Delay (s)	0	-	-	15.6	11.5	0	-	-
HCM Lane LOS	A	-	-	C	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	3.4	1	0	-	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	70	116	205	46	360	91
Future Volume (vph)	70	116	205	46	360	91
Ideal Flow (vphpl)	1765	1765	1775	1775	1775	1900
Storage Length (m)	0.0	0.0		0.0	25.0	
Storage Lanes	1	0		0	1	
Taper Length (m)	7.5				7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.916		0.975			
Flt Protected	0.982				0.950	
Satd. Flow (prot)	1557	0	1697	0	1653	1863
Flt Permitted	0.982				0.950	
Satd. Flow (perm)	1557	0	1697	0	1653	1863
Link Speed (k/h)	50		60			60
Link Distance (m)	699.1		153.8			208.7
Travel Time (s)	50.3		9.2			12.5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	70	116	205	46	360	91
Shared Lane Traffic (%)						
Lane Group Flow (vph)	186	0	251	0	360	91
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.6		3.6			3.6
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.09	1.09	1.09	1.00
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	57.7%	ICU Level of Service	B
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	8.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	70	116	205	46	360	91
Future Vol, veh/h	70	116	205	46	360	91
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	25	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	70	116	205	46	360	91

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1039	228	0	0	251	0
Stage 1	228	-	-	-	-	-
Stage 2	811	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	255	811	-	-	1314	-
Stage 1	810	-	-	-	-	-
Stage 2	437	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	185	811	-	-	1314	-
Mov Cap-2 Maneuver	185	-	-	-	-	-
Stage 1	810	-	-	-	-	-
Stage 2	317	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	25.5	0	7
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	357	1314	-
HCM Lane V/C Ratio	-	-	0.521	0.274	-
HCM Control Delay (s)	-	-	25.5	8.8	-
HCM Lane LOS	-	-	D	A	-
HCM 95th %tile Q(veh)	-	-	2.9	1.1	-

Strasburg Blair Creek

Intersection Control Study Report
CIMA+ January 2024

MTE

The Region of Waterloo

Intersection Control Study

Strasburg Road South and Blair Creek Drive in the City of Kitchener

CIMA+ file number: B001669
16 January 2024 – Review 01

The Region of Waterloo

Intersection Control Study

Strasburg Road South and Blair Creek Drive in the City of Kitchener

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CIMA+ file number: B001669
16 January 2024 – Review 01

Executive Summary

CIMA+ has undertaken an Intersection Control Study (ICS) at Strasburg Road South and Blair Creek Drive in the City of Kitchener. This is a planned new intersection as part of the Strasburg Road South extension from its existing terminus, the roundabout at Robert Ferrie Drive, southerly to New Dundee Road (Regional Road 12).

The ICS compares minor street stop control, a signalized intersection and a roundabout. Conceptual designs for the latter two alternatives are in this report as Figures 2.1 and 2.2. A comparison of construction and 20-year study period costs is shown in Table i.

Table i: Total Study Period Costs

Cost	Minor Street Stop Control	Signalized Intersection	Roundabout
Construction	$1,245,000	$1,378,000	$1,712,000
Maintenance (PC)	-	$60,000	$20,000
Collision (PC)	$142,000	$370,000	$421,000
Total Study Period Cost (PC)	**$1,387,000**	**$1,808,000**	**$2,153,000**

Expressed as present costs, minor street stop control is estimated to have the lowest 20-year study period cost by a margin of $421,000 over a signalized intersection and $766,000 over a roundabout. Both margins should probably be considered significant even with the assumptions associated with the construction cost estimates and safety prediction methodology.

Forecast peak hour delays and 95th percentile queues are predicted to be the lowest overall with a roundabout, but capacity should not be a problem with any of the alternatives

Minor street stop control would be an efficient type of intersection, but it would provide no speed control on Strasburg Road nor a controlled east-west crossing for pedestrians and cyclists. A signalized intersection would provide for increased accessibility and may be a more convenient alternative for cyclists. A roundabout would allow for efficient peak and off-peak traffic operations, would complement the two roundabouts to the north on Strasburg Road, at Huron Road and Robert Ferrie Drive, and would provide an opportunity for landscaping or a gateway treatment. It would also result in some measure of speed control along this section of Strasburg Road, and virtually eliminate the possibility of a fatal crash. However, it is the alternative with the highest 20-year study period cost.

Accordingly, it is recommended that a minor street stop control be implemented at the future intersection of Strasburg Road and Blair Creek Drive. If a controlled east-west crossing for pedestrians and cyclists is desired, or if delays for drivers on Blair Creek Drive becomes an issue, then it may be converted to a signalized intersection when traffic signals are justified or when deemed appropriate by the City of Kitchener.

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1. Introduction

1.1 Purpose of this Report

The City of Kitchener has requested an Intersection Control Study (ICS) to recommend a preferred type of control at Strasburg Road South and Blair Creek Drive. This is a planned new intersection as part of the Strasburg Road South extension from its existing terminus, the roundabout at Robert Ferrie Drive, southerly to New Dundee Road (Regional Road 12).

The ICS compares minor street stop control, a signalized intersection, and a roundabout. The following quantitative criteria were used in the comparison:

- Peak hour operational performance for motorists.
- Estimated construction costs.
- 20-year study period costs (which include motor vehicle collision and intersection maintenance costs).

Several qualitative criteria are discussed but not formally evaluated: off-peak traffic operations, environmental considerations, aesthetics, public outreach, conditions for pedestrians, conditions for cyclists, speed control, access management, and driver expectancy.

This ICS follows an Environmental Study Report (ESR) completed by SNC Lavalin, May 2012, for the Strasburg Road Extension from north of Stauffer Drive to New Dundee Road, and the *Blair Creek Drive Extension Class Environmental Assessment Transportation Study* memo submitted in draft by Paradigm Transportation Solutions Limited, August 2023. Note that a signal warrant analysis was undertaken as part of the Paradigm memo, which concluded that traffic signals are not justified at the intersection.

1.2 Site Context

Strasburg Road is classified as a City Arterial Street in the 2019 Official Plan. North of the roundabout at Robert Ferrie Drive it extends to Ottawa Street (Regional Road 4). Strasburg Road south of Bleams Road has a four-lane urban section and a posted speed limit of 60 km/h, with multi-use paths on both sides.

Blair Creek Drive is classified as a Major Community Collector Street in the 2019 Official Plan. It has a two-lane urban section and a posted speed limit of 30 km/h, with sidewalks and bike lanes on both sides. As of July 2023, Blair Creek Drive terminates at Thomas Slee Drive and will be extended westerly to Reidel Drive in the near future, and then farther west to Strasburg Road.

The extensions for both streets are planned for the same cross section as existing. Strasburg Road will have a right-of-way width of 30 m. The area along the Strasburg Road South and Blair Creek Drive extensions is planned for predominantly low-density residential development. The site context and approximate alignment of the Strasburg Road extension and Blair Creek Drive is shown in Figure 1.1.

Figure 1.1: Study Area Context

The planned new intersection at Strasburg Road and Blair Creek Drive will be about 280 m west of Reidel Drive, and 380 m north of New Dundee Road (Regional Road 12).

2. Alternatives Development

Conceptual designs for a signalized intersection and a roundabout are shown as Figures 2.1 and 2.2. A conceptual design for minor street stop control has not been developed. It would have the same footprint and lane configuration as a signalized intersection, but without crossings for pedestrians and cyclists on the north and south legs.

CIMA+

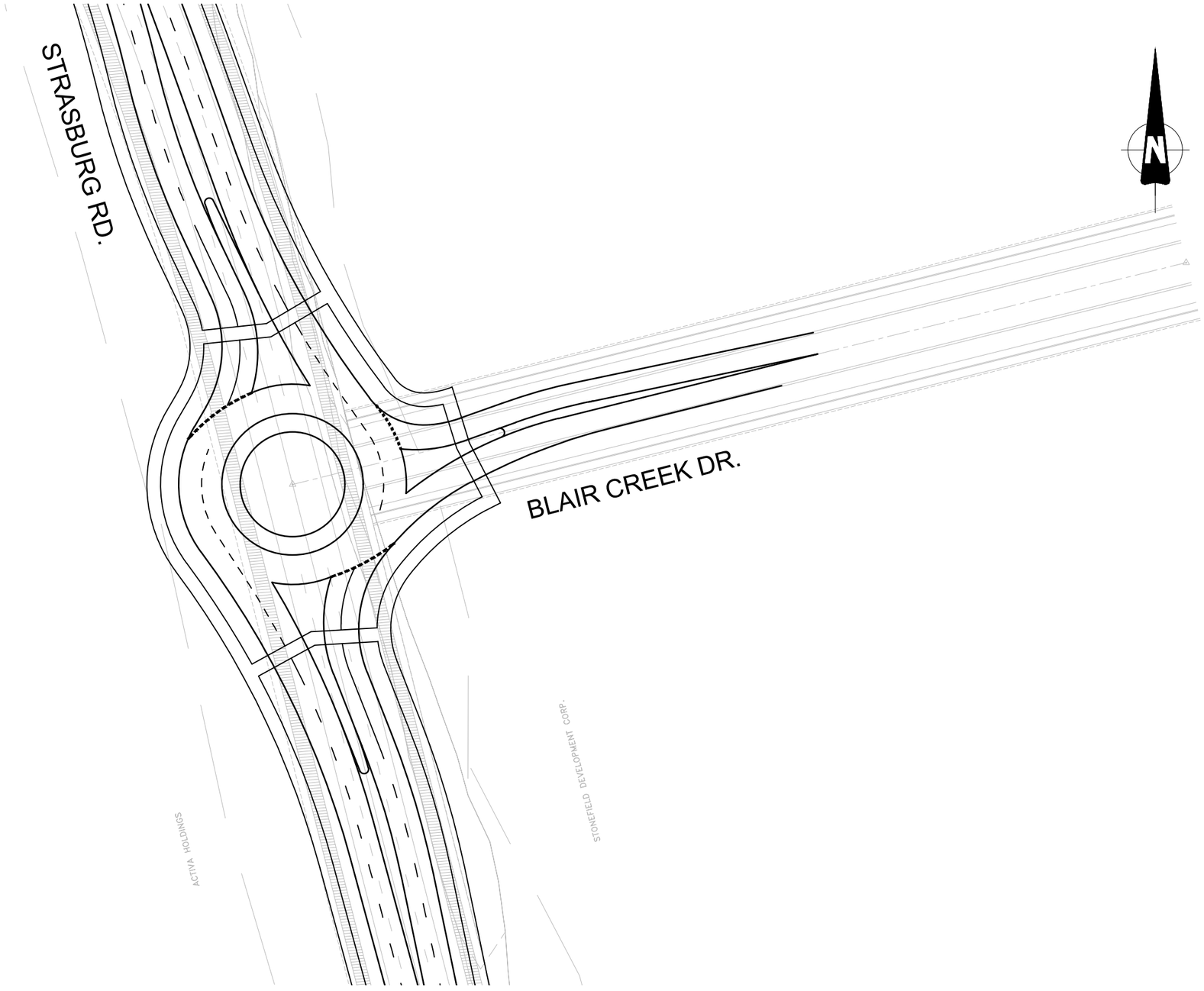
Signalized Intersection Concept

Strasburg Road and Blair Creek Drive

DRAFTER: CM	SCALE: 1:1000
DESIGNER: CM	DATE: 2024/01/16
APPROVER: PW	PROJECT No: B001691
	DRAWING No: 1

PATH: P:\Project\C11-08\B001691_Kitchener_Strasburg Blair ICS\300_DESIGN\310_Dwg\B001691 - Rbt (e01v01).dwg / LAYOUT: Layout1

TITLEBLOCK 11x17 LA ENG 3.0



CIMA+

Roundabout Concept

Strasburg Road and Blair Creek Drive

DRAFTER: CM	SCALE: 1:1000
DESIGNER: CM	DATE: 2023/12/05
APPROVER: PW	PROJECT No: B001691
	DRAWING No: 2

In accordance with an initial assessment in Synchro, and the planned road cross sections, the signalized intersection has two through lanes northbound and southbound on Strasburg Road. There is an exclusive left-turn lane southbound and a shared right-turn lane northbound. Blair Creek Drive has a shared left/through/right-turn lane westbound. The conceptual design is shown in Figure 2.1. The configuration is the same as at other intersections to the north on Strasburg Road, at Templewood Drive and Rush Meadow Street. A WB-17 design vehicle would need to over-track into the oncoming lane when making a northbound right turn to Blair Creek Drive.

In accordance with an initial assessment in ARCADY, the roundabout has two-lane entries on Strasburg Road and a single-lane entry westbound on Blair Creek Drive. The conceptual design is shown in Figure 2.2. The inscribed circle diameter (ICD) varies between 44 and 50 m. The design achieves appropriate speed control for the context and accommodates a WB-17 design vehicle for all movements, although that vehicle will need to over-track adjacent lanes in the two-lane sections. The roundabout will require some property outside of the 30 m right-of-way for Strasburg Road.

Multi-use paths are depicted on both sides of Strasburg Road for the alternatives. Specific pedestrian and cyclist crossing treatments for the north, south and east legs are expected to be determined for the preferred alternative during preliminary design. Note that under minor street stop control there would be no crossings on the north and south legs of the intersection.

3. Performance Evaluation

3.1 Operational Performance

Forecast peak hour turning movements at the subject intersection are from Figure 2 in the *Blair Creek Drive Extension Class Environmental Assessment Transportation Study* memo, and are summarized in Figure 3.1.

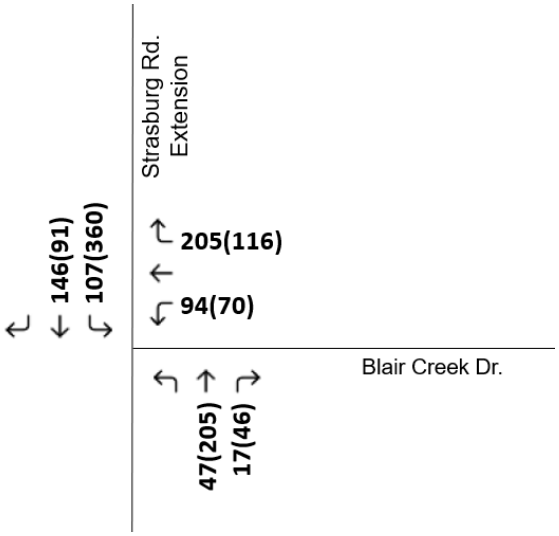


Figure 3.1: Forecast Peak Hour Turning Movements

The peak hour forecasts were input into Synchro 11 under Highway Capacity Manual (HCM) 2000 methodology for a signalized intersection, and ARCADY 9 with a y-intercept adjustment of the capacity prediction of 5% downwards for a roundabout.[1] Future heavy vehicle percentages were assumed to be 2% on all approaches. The analysis for minor street stop control was taken from the Paradigm memo.

Predicted future peak hour level of service (LOS) and 95th percentile queue results are provided in Table 3.1. Synchro and ARCADY output sheets for a signalized intersection and a roundabout are contained in Appendix A.

Table 3.1: Predicted Future Peak Hour Traffic Operations

Movement	Minor Street Stop Control		Signalized Intersection		Roundabout	
	LOS	95% Queue	LOS	95% Queue	LOS	95% Queue
Blair Creek Dr. WB TR	B (D)	12 (22) m	B (A)	36 (25) m	A (A)	2 (4) m
Strasburg Rd. NB TR	A (A)	-	A (A)	14 (28) m	A (A)	2 (2) m
Strasburg Rd. SB L	A (A)	2 (8) m	A (D)	23 (84) m	A (A)	5 (4) m
Strasburg Rd. SB T	A (A)	-	A (A)	22 (24) m		
Overall	**A (A)**		**A (C)**		**A (A)**	

Notes:

1. SB, EB, NB, and WB are southbound, eastbound, northbound, and westbound. PM peak hour results in ().
2. "LOS" uses signalized delay thresholds for a signalized intersection and unsignalized delay thresholds for minor street stop control and a roundabout.
3. "Queue" corresponds to the longest 95th percentile queue per direction. ARCADY queues are output in vehicles and converted to metres by multiplying by 7 and dividing by the number of lanes.

Minor street stop control is predicted to operate at overall peak hour LOS A with minimal queuing. There may be some delay for westbound drivers, who would be under stop control, during the PM peak hour.

A signalized intersection is predicted to operate at overall peak hour LOS A during the future AM peak hour and LOS C during the future PM peak hour. Future 95th percentile queues should be low to moderate, except for the southbound left turn where they may exceed available storage during the PM peak hour unless an extended left-turn lane is provided.

The roundabout is predicted to operate at overall future peak hour LOS A with minimal queuing.

[1] ARCADY was developed in the United Kingdom, where roundabouts are much more common than in Canada. Therefore a y-intercept adjustment of the capacity prediction in ARCADY should be applied to account for driver unfamiliarity. Based on research and observation it is appropriate to apply a 10% downwards adjustment soon after opening, and a lesser 5% adjustment after several years of operation.

3.2 Safety Performance

3.2.1 Future Safety Assessment

Future safety performance for motorists was predicted in accordance with the Intersection Control Studies Safety Assessment Methodology (HSM) spreadsheet (dated January 2021) provided by Region of Waterloo Transportation Services. The spreadsheet utilizes a Safety Performance Function (SPF) for the prediction of collisions at stop-controlled and signalized intersections based on Highway Safety Manual (HSM) methodology using average annual daily traffic (AADT), calibrated using Region crash data at similar intersections. The model is based on multiple-vehicle collisions and is assumed to apply to single-vehicle collisions as well.

For the roundabout alternative the spreadsheet draws upon an SPF based on a conflict model developed by the Region from current roundabout collision experience. It has been assumed this collision experience will continue in the future, even as driver familiarity with roundabouts increases. Injury crashes are taken to be 10% of the total crashes, with all remaining collisions being property-damage-only (PDO). The model has the following form:

$$\text{Total crash frequency} = 0.0004 \times (Total\ Daily\ Conflicts) + 1.8122$$

Note that given results when using the spreadsheet, for the roundabout configuration a “3x1” roundabout was selected (a 3-leg design with single-lane entries) rather than a “3x2” roundabout (a 3-leg design with two-lane entries).

The future traffic forecasts in the *Blair Creek Drive Extension Class Environmental Assessment Transportation Study* memo were assumed to be appropriate as the 10-year horizon forecasts required for input into the Region spreadsheet. The forecast AM and PM peak hour volumes were added and then multiplied by 5 to obtain AADT volumes.

Predicted fatal, non-fatal injury, PDO and non-reportable (NR) collision frequencies are listed in Table 3.2.

Table 3.2: Predicted Annual Collision Frequencies

Collision Severity	Minor Street Stop Control	Signalized Intersection	Roundabout
Fatal	0	0	-
Non-Fatal Injury	0.15	0.45	0.36
PDO and NR	0.33	0.67	3.27
Total	**0.48**	**1.12**	**3.63**

3.2.2 Economic Analysis

Study period costs associated with motor vehicle collisions by severity were calculated as present costs (PC) using a 6% discount rate over 20 years and the formula:

$$\text{PC} = (\text{crash frequency})(\text{crash cost})\left(\frac{1.06^{20}-1}{(0.06)(1.06^{20})}\right)$$

Direct human capital crash costs from the Highway Safety Manual (HSM) Table 4A-1 were used, adjusted using the Consumers Price Index. They are $1,656,000 per fatal, $60,500 per non-fatal injury and $5,000 per PDO collision.

The resulting 20-year study period collision costs are provided in Table 3.3.

Table 3.3: Study Period Collision Costs

Collision Cost	Minor Street Stop Control	Signalized Intersection	Roundabout
Fatal (PC)	$19,000	$19,000	-
Non-Fatal Injury (PC)	$104,000	$312,000	$252,000
PDO and NR (PC)	$19,000	$38,000	$169,000
Total (PC)	**$142,000**	**$370,000**	**$421,000**

A signalized intersection is expected to have the least number of total collisions, and minor street stop control is expected to have the lowest study period collision cost. A roundabout is expected to have the highest number of total collisions, and the highest total direct human capital crash cost. The cost margins over 20 years are $228,000 and $51,000, neither of which should be considered significant given the assumptions associated with the safety prediction methodology and the underlying traffic forecasts.

Crash costs are mostly a societal cost, and if there are any savings associated with an alternative then only a small portion of that savings may return directly to the City. Note that a roundabout will virtually eliminate the possibility of a fatal crash.

4. Alternatives Comparison

4.1 Construction Costs

The estimated construction cost of the minor street stop control alternative is $1,245,000. The estimated cost of a signalized intersection as per Figure 2.1 is $1,378,000. Compared to the minor street stop control this adds some concrete work for two additional pedestrian crossings, and $100,000 for traffic signal plant. So the cost to convert from stop to signal control should just be the difference between the two estimates, or $133,000 (plus any contractor mobilization). The estimated construction cost of a roundabout as per Figure 2.2 is $1,712,000, including $79,500 for some property acquisition outside of the 30 m right-of-way for Strasburg Road.

The cost estimates are all within the same limits of construction, and include a 20% contingency and 10% engineering. Details are provided in Appendix C.

4.2 Study Period Costs

In addition to construction and property acquisition costs, study period costs consist of the societal costs of motor vehicle collisions, plus ongoing operating and maintenance costs.

Operation/maintenance costs are estimated at $5,000 per year for a signalized intersection, for a present cost (PC) of approximately $60,000 over 20 years. This consists of following Minimum Maintenance Standards with respect to traffic signal maintenance, but assumes signal replacement occurs after 20 years. The corresponding cost for a roundabout is $2,000 per year, for a PC of approximately $20,000 over 20 years. This includes landscaping and a greater degree of signage, pavement marking and illumination maintenance.

A comparison of total construction and 20-year study period costs for the alternatives is shown in Table 4.1.

Table 4.1: Total Study Period Costs

Cost	Minor Street Stop Control	Signalized Intersection	Roundabout
Construction	$1,245,000	$1,378,000	$1,712,000
Maintenance (PC)	-	$60,000	$20,000
Collision (PC)	$142,000	$370,000	$421,000
Total Study Period Cost (PC)	**$1,387,000**	**$1,808,000**	**$2,153,000**

Expressed as present costs, minor street stop control is estimated to have the lowest 20-year study period cost by a margin of $421,000 over a signalized intersection and $766,000 over a roundabout.

Both margins should probably be considered significant even with the assumptions associated with the construction cost estimates and safety prediction methodology. For instance, if the study period collision cost for a roundabout were to be 50% lower, the margin between it and minor street stop control would still be greater than $600,000 over 20 years.

4.3 Qualitative Criteria

Several qualitative criteria are also discussed but were not formally evaluated: off-peak traffic operations, environmental considerations, aesthetics, public outreach, conditions for pedestrians, conditions for cyclists, speed control, access management, and driver expectancy. Table 4.2 summarizes comments associated with minor street stop control, a signalized intersection and a roundabout at this location.

Table 4.2: Summary of Qualitative Evaluation

Criteria	Signalized Intersection	Signalized Intersection	Roundabout
Off-Peak Traffic Operations	No delays for drivers on Strasburg Rd. but potentially higher delays for those making left turns from Blair Creek Dr.	Assuming the signals are semi-actuated and rest on green for Strasburg Rd, low delays for these drivers but potentially higher delays for those making left turns from Blair Creek Dr.	Although all traffic would need to slow to navigate the roundabout, control delay would be low overall.
Vehicle Noise, Fuel Consumption and Emissions	Low, as a function of motor vehicle delays, start/stop cycles and idling.	Moderate, as a function of motor vehicle delays, start/stop cycles and idling.	Low due to generally lower delays and more uniform motor vehicle speeds.
Public Outreach	Status quo.	Status quo.	Could be included as part of the City's and Region's ongoing roundabout outreach efforts.
Aesthetics	Status quo.	Status quo.	Roundabout provides opportunity for landscaping in central island and to act as a gateway treatment.
Conditions for Pedestrians	Pedestrians would not have a controlled east-west crossing of Strasburg Rd.	Pedestrians wanting to cross Strasburg Rd. would likely have to use pushbutton to activate Walk indication. Signalized intersections are considered accessible with standard curb ramps, tactile warning surface indicators (TWSIs) and accessible pedestrian signals (APS).	Wait times for pedestrians should be low. A roundabout with two-lane entries may result in accessibility challenges to people with low vision. Level 2 Pedestrian Crossovers (PXOs) can be supplemented with rapid flashing beacons (RFBs) if necessary. Statistically pedestrians are 50% to 90% less likely to be involved in a collision at a roundabout than a signalized intersection.

Conditions for Cyclists	Multi-use paths on Strasburg Rd, but cyclists would not have a controlled east-west crossing.	Multi-use paths on Strasburg Rd.	Multi-use paths on Strasburg Rd. Cyclists would have to yield to traffic at the crosswalks regardless of crossing treatment used. Lower motor vehicle speeds are better suited for cyclists. Statistically, cyclists are less likely to be involved in a collision at a single-lane roundabout, but not necessarily a multi-lane roundabout.
Speed Control	No control of motor vehicle speeds on Strasburg Rd.	Motor vehicle speeds controlled only during red signal indication.	Motor vehicle speeds always controlled in vicinity of intersection due to geometry of roundabout.
Access Management	No restrictions.	No restrictions.	No anticipated restrictions.
Driver Expectancy	Status quo.	Status quo.	Most drivers in the Region are familiar with roundabouts. There are two roundabouts to the north on Strasburg Rd.

Minor street stop control would be a lower-cost and efficient type of intersection, but it would provide no speed control on Strasburg Road nor a controlled east-west crossing for pedestrians and cyclists.

A signalized intersection would be a less efficient type of intersection, but it would provide for increased accessibility for pedestrians with vision loss and may be a more convenient alternative for cyclists.

A roundabout would allow for efficient peak and off-peak traffic operations, and low vehicle noise, fuel consumption and emissions. It would also complement the two roundabouts to the north on Strasburg Road, at Huron Road and Robert Ferrie Drive, result in some measure of speed control along this section of Strasburg Road, and provide an opportunity for landscaping or a gateway treatment. However, it is the alternative with the highest 20-year study period cost.

5. Conclusions and Recommendations

Expressed as present costs, minor street stop control is estimated to have the lowest 20-year study period cost by a margin of $421,000 over a signalized intersection and $766,000 over a roundabout. Both margins should probably be considered significant even with the assumptions associated with the construction cost estimates and safety prediction methodology.

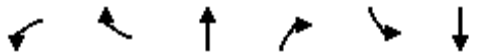
Forecast peak hour delays and 95th percentile queues are predicted to be the lowest overall with a roundabout, but capacity should not be a problem with any of the alternatives

Minor street stop control would be an efficient type of intersection, but it would provide no speed control on Strasburg Road nor a controlled east-west crossing for pedestrians and cyclists. A signalized intersection would provide for increased accessibility and may be a more convenient alternative for cyclists. A roundabout would allow for efficient peak and off-peak traffic operations, would complement the two roundabouts to the north on Strasburg Road, at Huron Road and Robert Ferrie Drive, and would provide an opportunity for landscaping or a gateway treatment. It would also result in some measure of speed control along this section of Strasburg Road, and virtually eliminate the possibility of a fatal crash. However, it is the alternative with the highest 20-year study period cost.

Accordingly, it is recommended that a minor street stop control be implemented at the future intersection of Strasburg Road and Blair Creek Drive. If a controlled east-west crossing for pedestrians and cyclists is desired, or if delays for drivers on Blair Creek Drive becomes an issue, then it may be converted to a signalized intersection when traffic signals are justified or when deemed appropriate by the City of Kitchener.

A

Appendix A
Capacity Analysis Outputs



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	94	205	47	17	107	146
Future Volume (vph)	94	205	47	17	107	146
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5		4.5	4.5
Lane Util. Factor	1.00		0.95		1.00	0.95
Frt	0.91		0.96		1.00	1.00
Flt Protected	0.98		1.00		0.95	1.00
Satd. Flow (prot)	1664		3401		1770	3539
Flt Permitted	0.98		1.00		0.71	1.00
Satd. Flow (perm)	1664		3401		1322	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	102	223	51	18	116	159
RTOR Reduction (vph)	134	0	11	0	0	0
Lane Group Flow (vph)	191	0	58	0	116	159
Turn Type	Prot		NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases					6	
Actuated Green, G (s)	18.0		18.0		18.0	18.0
Effective Green, g (s)	18.0		18.0		18.0	18.0
Actuated g/C Ratio	0.40		0.40		0.40	0.40
Clearance Time (s)	4.5		4.5		4.5	4.5
Lane Grp Cap (vph)	665		1360		528	1415
v/s Ratio Prot	c0.11		0.02			0.04
v/s Ratio Perm					c0.09	
v/c Ratio	0.29		0.04		0.22	0.11
Uniform Delay, d1	9.2		8.2		8.9	8.5
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	1.1		0.1		1.0	0.2
Delay (s)	10.2		8.3		9.8	8.6
Level of Service	B		A		A	A
Approach Delay (s)	10.2		8.3			9.1
Approach LOS	B		A			A

Intersection Summary			
HCM 2000 Control Delay	9.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.25		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	37.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection: 3: Strasburg Rd & Blair Creek Dr Extension

Movement	WB	NB	NB	SB	SB	SB
Directions Served	LR	T	TR	L	T	T
Maximum Queue (m)	43.3	15.7	9.2	29.0	25.4	13.1
Average Queue (m)	20.9	5.2	2.6	12.5	11.4	4.3
95th Queue (m)	35.6	13.7	9.1	23.3	21.9	12.1
Link Distance (m)	250.6	243.2	243.2		215.4	215.4
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (m)				70.0		
Storage Blk Time (%)						
Queuing Penalty (veh)						

Network Summary

Network wide Queuing Penalty: 0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	70	116	205	46	360	91
Future Volume (vph)	70	116	205	46	360	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5		4.5	4.5
Lane Util. Factor	1.00		0.95		1.00	0.95
Frt	0.92		0.97		1.00	1.00
Flt Protected	0.98		1.00		0.95	1.00
Satd. Flow (prot)	1674		3442		1770	3539
Flt Permitted	0.98		1.00		0.58	1.00
Satd. Flow (perm)	1674		3442		1087	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	76	126	223	50	391	99
RTOR Reduction (vph)	76	0	30	0	0	0
Lane Group Flow (vph)	126	0	243	0	391	99
Turn Type	Prot		NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases					6	
Actuated Green, G (s)	18.0		18.0		18.0	18.0
Effective Green, g (s)	18.0		18.0		18.0	18.0
Actuated g/C Ratio	0.40		0.40		0.40	0.40
Clearance Time (s)	4.5		4.5		4.5	4.5
Lane Grp Cap (vph)	669		1376		434	1415
v/s Ratio Prot	c0.08		0.07			0.03
v/s Ratio Perm					c0.36	
v/c Ratio	0.19		0.18		0.90	0.07
Uniform Delay, d1	8.8		8.7		12.7	8.3
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	0.6		0.3		24.4	0.1
Delay (s)	9.4		9.0		37.0	8.4
Level of Service	A		A		D	A
Approach Delay (s)	9.4		9.0			31.3
Approach LOS	A		A			C

Intersection Summary			
HCM 2000 Control Delay	20.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	49.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection: 3: Strasburg Rd & Blair Creek Dr Extension

Movement	WB	NB	NB	SB	SB	SB
Directions Served	LR	T	TR	L	T	T
Maximum Queue (m)	31.0	32.2	18.7	91.2	68.3	35.1
Average Queue (m)	13.8	15.9	7.3	49.4	10.1	5.1
95th Queue (m)	25.4	27.6	15.7	83.7	46.6	23.5
Link Distance (m)	250.6	243.2	243.2		215.4	215.4
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (m)				70.0		
Storage Blk Time (%)				6		
Queuing Penalty (veh)				3		

Network Summary

Network wide Queuing Penalty: 3

1 Traffic Volumes

2033 AM Peak Hour

From \ To	1st exit	2nd exit	U-Turn	Total
SB - Strasburg Rd	146	107	0	253
NB - Strasburg Rd	17	47	0	64
WB - Blair Creek Dr	205	94	0	299
Total	368	248	0	-

2033 PM Peak Hour

From \ To	1st exit	2nd exit	U-Turn	Total
SB - Strasburg Rd	91	360	0	451
NB - Strasburg Rd	46	205	0	251
WB - Blair Creek Dr	116	70	0	186
Total	253	635	0	-

2 Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only	Leg has bypass	Percentage intercept adjustment (%)
SB - Strasburg Rd	7.50	8.00	10.0	25.0	50.0	20.0	☐	☐	95.00
NB - Strasburg Rd	7.50	8.00	10.0	25.0	50.0	20.0	☐	☐	95.00
WB - Blair Creek Dr	3.65	4.25	10.0	15.0	44.0	20.0	☐	☐	95.00

3 Analysis Results

	AM Peak Hour							PM Peak Hour						
	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Network Residual Capacity	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Network Residual Capacity
Conceptual Geometry, 95% y-intercept Adjustment - 2033 Forecasts														
SB - Strasburg Rd	0.5	1.82	0.12	A	3.01	A	209 % [WB - Blair Creek Dr]	**1.0**	**2.02**	**0.22**	**A**	**2.48**	**A**	**234 % [WB - Blair Creek Dr]**
NB - Strasburg Rd	0.5	1.65	0.03	A				**0.5**	**2.05**	**0.14**	**A**			
WB - Blair Creek Dr	1.5	4.31	0.28	A				**0.8**	**4.17**	**0.19**	**A**			

Notes

1. Because ARCADY was developed in the United Kingdom, where roundabouts are more common than in Canada, a y-intercept adjustment of the capacity prediction in ARCADY should be applied to account for driver unfamiliarity. Based on research and observation it is appropriate to apply a 10% downwards adjustment soon after opening, and a lesser 5% adjustment after several years of operation.
2. Queue lengths are given in 95th percentile values in vehicles by approach. They can be converted to metres per lane by multiplying by 7 and dividing by number of lanes, accounting for the storage effects of flared entries where appropriate.
3. Residual capacity is defined as the percent growth in traffic for one of the legs to reach level of service (LOS) 'E' as per Exhibit 17-2 of the Highway Capacity Manual (2010).

B

Appendix B
Safety Performance Analysis

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Region of Waterloo

Last Rev JAN 2021

Scenario: 2033

Major Road: Strasburg Road

Minor Road: Blair Creek Drive

Major Road Direction:	North / South
Urban or Rural:	Urban
Proposed Control:	Stop Control
Proposed Config.	3-Leg Intersection

LT Lanes Proposed (non roundabout):		RT Lanes Proposed (non roundabout):	
Major	1 Approach	**Major**	No RT Lanes
Minor	No LT Lanes	**Minor**	No RT Lanes

Is there going to be any fully protected left-turn phasing? NO

Number of approaches with FPLTP: N/A

Is the proposed intersection "new" or is it existing: NEW

Does control and number of approaches remain the same: NO

Will the proposed intersection have illumination: YES

5-Year Total Collisions: 0

5-Year PDO Collisions: 0

Proposed RA Configuration? SINGLE - 4 x 1

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

Major Road (mid-block) 10-Year Horizon AADT: 6,385

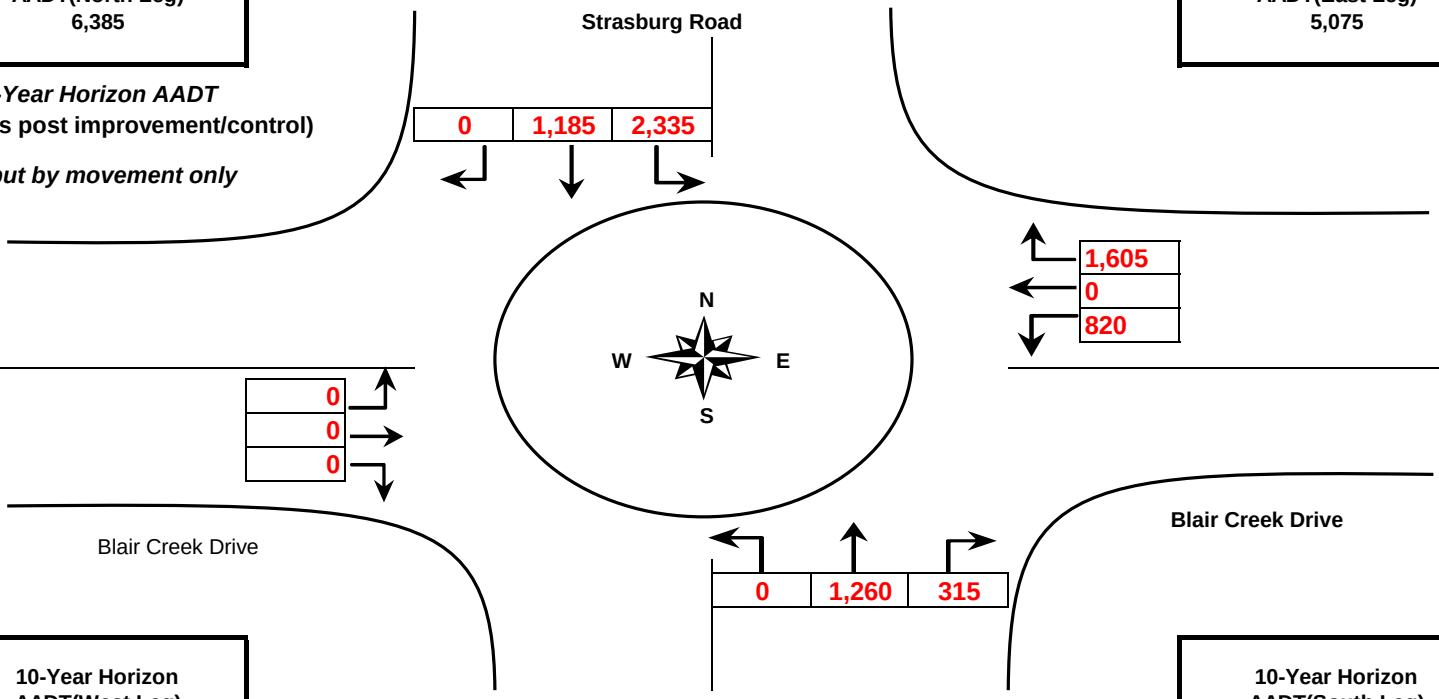
Minor Road (mid-block) 10-Year Horizon AADT: 5,075

10-Year Horizon AADT(North Leg) 6,385

10-Year Horizon AADT(East Leg) 5,075

**** 10-Year Horizon AADT***
(10ys post improvement/control)

**** Input by movement only***



10-Year Horizon AADT(West Leg) 0

10-Year Horizon AADT(South Leg) 3,580

Strasburg Road

Direct Capital Costs

Fatal = $1,656,500
Injury = $60,500
PDO_{SIG} = $5,000
PDO_{RA} = $4,500

Discount Rate = 0.06

20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)

Collisions by Severity	Total	PDO	Injury	Fatal
Stop Control	**$142,014.83**	**$18,925.37**	**$104,089.54**	**$18,999.92**
Roundabout	**$233,918.49**	**$93,799.00**	**$140,119.49**	**$0.00**

* Roundabout calibration Factor - 0.5

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Region of Waterloo

Last Rev JAN 2021

Scenario: 2033

Major Road: Strasburg Road
Minor Road: Blair Creek Drive

Major Road Direction: North / South

Urban or Rural: Urban

Proposed Control: Stop Control

Proposed Config. 3-Leg Intersection

Roundabout Conflicts: 6495

5-Year Total Collisions: 0

5-Year PDO Collisions: 0

Estimated **ANNUAL (1-YEAR ONLY)** Collisions				
Future Expected Collisions by Severity	**Total**	**PDO**	**Injury**	**Fatal**
Stop Control	**0.48**	**0.33**	**0.15**	**0.00**
Roundabout	**2.02**	**1.82**	**0.20**	**0.00**

TOTAL CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Stop Control	3-Leg Intersection	**-13.36**	**1.11**	**0.41**	**N/A**	**0.006**	**n/a**

PDO CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Stop Control	3-Leg Intersection	**-15.38**	**1.2**	**0.51**	**N/A**	**0.006**	**n/a**

Collision Modification Factors (cmf's)	Left Turn Lane	Right Turn Lane	Calibration Factor	Empirical Bays Weighting	
			0.61	Total	PDO
				N/A	**N/A**
	Illumination	Protected LT Phasing			
	0.91	**1.00**			

Comments:

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Region of Waterloo

Last Rev JAN 2021

Scenario: 2033

Major Road: Strasburg Road

Minor Road: Blair Creek Drive

Major Road Direction:	North / South
Urban or Rural:	Urban
Proposed Control:	Signalized
Proposed Config.	3-Leg Intersection

LT Lanes Proposed (non roundabout):		RT Lanes Proposed (non roundabout):	
Major	1 Approach	**Major**	No RT Lanes
Minor	No LT Lanes	**Minor**	No RT Lanes

Is there going to be any fully protected left-turn phasing?	NO
Number of approaches with FPLTP:	N/A

Is the proposed intersection "new" or is it existing:	NEW
Does control and number of approaches remain the same:	NO
Will the proposed intersection have illumination:	YES

5-Year Total Collisions: 0

5-Year PDO Collisions: 0

Proposed RA Configuration? SINGLE - 3 x 1

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

Major Road (mid-block) 10-Year Horizon AADT: 6,385

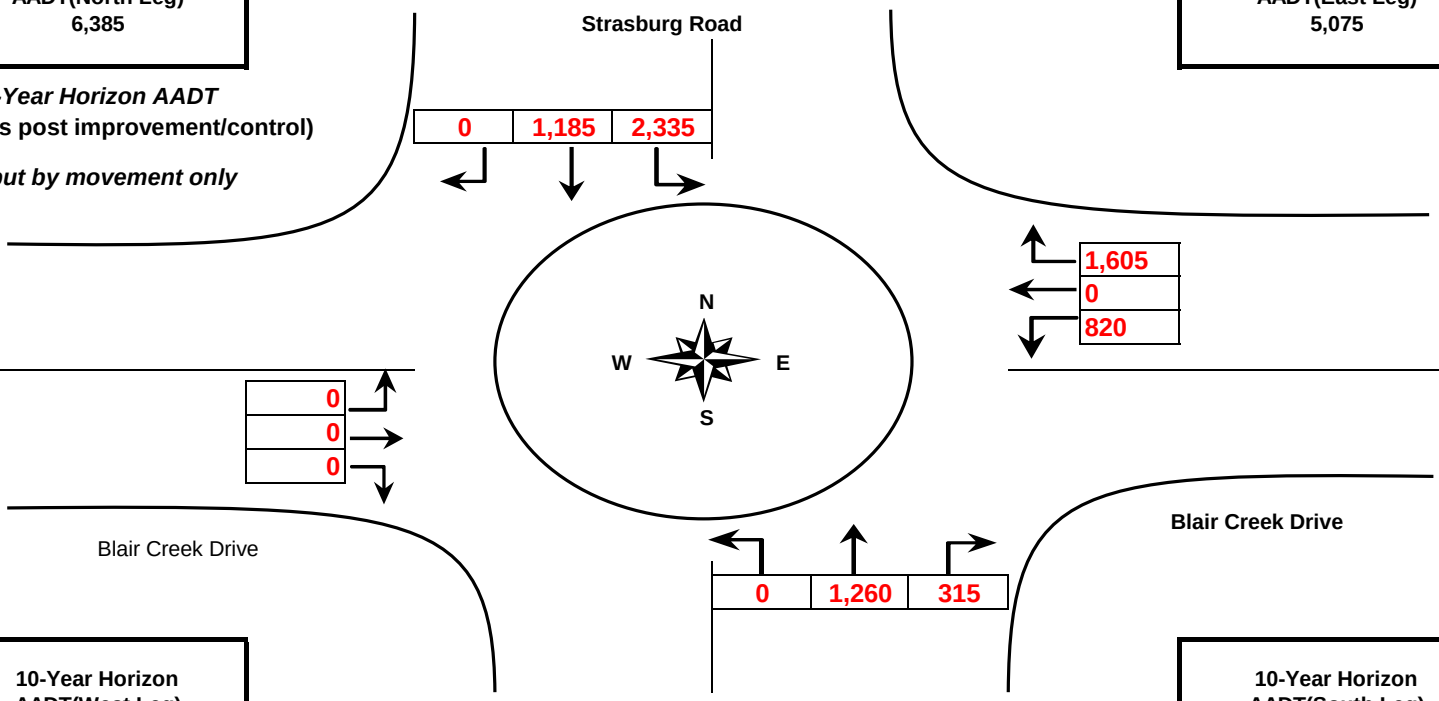
Minor Road (mid-block) 10-Year Horizon AADT: 5,075

10-Year Horizon AADT(North Leg) 6,385

10-Year Horizon AADT(East Leg) 5,075

**** 10-Year Horizon AADT***
(10ys post improvement/control)

**** Input by movement only***



10-Year Horizon AADT(West Leg) 0

10-Year Horizon AADT(South Leg) 3,580

Direct Capital Costs

Fatal = $1,656,500
Injury = $60,500
PDO$_{SIG}$ = $5,000
PDO$_{RA}$ = $4,500

Discount Rate = 0.06

20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)

Collisions by Severity	Total	PDO	Injury	Fatal
Signalized	**$369,692.77**	**$38,424.24**	**$312,268.61**	**$18,999.92**
Roundabout	**$421,053.28**	**$168,838.20**	**$252,215.08**	**$0.00**

* Roundabout calibration Factor - 0.9

INTERSECTION CONTROL STUDIES
SAFETY ASSESSMENT METHODOLOGY (HSM)

Region of Waterloo

Last Rev JAN 2021

Scenario: 2033

Major Road: Strasburg Road
Minor Road: Blair Creek Drive

Major Road Direction: North / South

Urban or Rural: Urban

Proposed Control: Signalized

Proposed Config. 3-Leg Intersection

Roundabout Conflicts: 6495

5-Year Total Collisions: 0

5-Year PDO Collisions: 0

Estimated **ANNUAL (1-YEAR ONLY)** Collisions				
Future Expected Collisions by Severity	**Total**	**PDO**	**Injury**	**Fatal**
Signalized	**1.12**	**0.67**	**0.45**	**0.00**
Roundabout	**3.63**	**3.27**	**0.36**	**0.00**

TOTAL CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Signalized	3-Leg Intersection	**-12.13**	**1.11**	**0.26**	**N/A**	**0.002**	**n/a**

PDO CRASH COEFFICIENTS USED IN CALCULATION						Fatal/Inj. Ratio	Collision Factor
Control	Intersection Config	Intercept	AADTmaj	AADTmin	Overdispersion		
Signalized	3-Leg Intersection	**-13.24**	**1.14**	**0.3**	**N/A**	**0.002**	**n/a**

Collision Modification Factors (cmf's)	Left Turn Lane	Right Turn Lane	Calibration Factor	Empirical Bays Weighting	
	0.93		**1.59**	Total	PDO
				N/A	**N/A**
	Illumination	Protected LT Phasing			
	0.91	**1.00**			

Comments:

C

Appendix C
Construction Cost Estimates

Construction Cost Estimate
Minor Street Stop Control
Strasburg Road and Blair Creek Drive

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total
1	Clearing and Grubbing	m^2	1000	$13.50	$13,500
2	Earth Borrow	m^3	500	$30.00	$15,000
3	Earth Excavation	m^3	2000	$30.00	$60,000
4	Remove Asphalt (full depth)	m^2	0	$11.50	$0
5	Remove Curb/Gutter	m	0	$14.00	$0
6	Asphalt HL-1	t	850	$130.00	$110,500
7	HDBC	t	1700	$120.00	$204,000
8	Granular A	t	1800	$17.00	$30,600
9	Granular B	t	1700	$17.00	$28,900
10	Minor Concrete Works	m^2	30	$75.00	$2,250
11	Asphalt Multi-Use Path (3.0m)	m	440	$250.00	$110,000
12	Concrete Curb & Gutter	m	900	$48.00	$43,200
13	Culvert Extension	m	0	$350.00	$0
14	Storm Sewer System	LS	1	$250,000.00	$250,000
15	Pavement Marking & Signage	LS	1	$20,000.00	$20,000
16	Illumination	LS	1	$20,000.00	$20,000
17	Utility Relocations/Protection	LS	1	$50,000.00	$50,000
Sub-Total Construction Cost					**$957,950**
Bump-Up plus Contingency (20% of Construction Cost)					$191,590.00
Estimated Engineering - Civil, Geo, etc. (10%)					$95,795.00
Total Construction Cost					**$1,245,335.00**
Property		m^2	0	$ 50	$ -
Rough Total					**$ 1,245,335**

Construction Cost Estimate
Signalized Intersection
Strasburg Road and Blair Creek Drive

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total
1	Clearing and Grubbing	m^2	1000	$13.50	$13,500
2	Earth Borrow	m^3	500	$30.00	$15,000
3	Earth Excavation	m^3	2000	$30.00	$60,000
4	Remove Asphalt (full depth)	m^2	0	$11.50	$0
5	Remove Curb/Gutter	m	0	$14.00	$0
6	Asphalt HL-1	t	850	$130.00	$110,500
7	HDBC	t	1700	$120.00	$204,000
8	Granular A	t	1800	$17.00	$30,600
9	Granular B	t	1700	$17.00	$28,900
10	Minor Concrete Works	m^2	55	$75.00	$4,125
11	Asphalt Multi-Use Path (3.0m)	m	440	$250.00	$110,000
12	Concrete Curb & Gutter	m	900	$48.00	$43,200
13	Culvert Extension	m	0	$350.00	$0
14	Storm Sewer System	LS	1	$250,000.00	$250,000
15	Pavement Marking & Signage	LS	1	$20,000.00	$20,000
16	Illumination	LS	1	$20,000.00	$20,000
17	Traffic Signal Installation	each	1	$100,000.00	$100,000
18	Utility Relocations/Protection	LS	1	$50,000.00	$50,000
	Sub-Total Construction Cost				**$1,059,825**
	Bump-Up plus Contingency (20% of Construction Cost)				$211,965.00
	Estimated Engineering - Civil, Geo, etc. (10%)				$105,982.50
	Total Construction Cost				**$1,377,772.50**
	Property	m^2	0	$ 50	$ -
	Rough Total				**$ 1,377,773**

Construction Cost Estimate
Roundabout
Strasburg Road and Blair Creek Drive

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total Price
1	Clearing and Grubbing	m^2	2000	$13.50	$27,000
2	Earth Borrow	m^3	1000	$30.00	$30,000
3	Earth Excavation	m^3	3000	$30.00	$90,000
4	Remove Asphalt (full depth)	m^2	0	$11.50	$0
5	Remove Curb/Gutter	m	0	$14.00	$0
6	Asphalt HL-3	t	1000	$130.00	$130,000
7	HDBC	t	2000	$120.00	$240,000
8	Granular A	t	2850	$17.00	$48,450
9	Granular B	t	1700	$17.00	$28,900
10	Minor Concrete Works	m^2	80	$75.00	$6,000
11	Asphalt Multi-Use Path (3.0m)	m	500	$250.00	$125,000
12	Concrete Curb & Gutter	m	1750	$48.00	$84,000
13	Concrete Splitter Island	m^2	850	$50.00	$42,500
14	Concrete Coloured Truck Apron	m^2	275	$123.00	$33,825
15	Central Island Landscaping	LS	1	$20,000.00	$20,000
16	Culvert Extension	m	0	$350.00	$0
17	Storm Sewer System	LS	1	$250,000.00	$250,000
18	Pavement Marking & Signage	LS	1	$25,000.00	$25,000
19	Illumination	LS	1	$25,000.00	$25,000
20	Utility Relocations/Protections	LS	1	$50,000.00	$50,000
Sub-Total Construction Cost					**$1,255,675**
Bump-Up plus Contingency (20% of Construction Cost)					$251,135.00
Estimated Engineering - Civil, Geo, etc. (10%)					$125,567.50
Total Construction Cost					**$1,632,377.50**
Property		m^2	1590	$ 50	$ 79,500
Rough Total					**$ 1,711,878**

Appendix D

Preliminary (30%) Design Drawings

The Corporation Of The

CITY OF KITCHENER

Berry Vrbanovic - Mayor

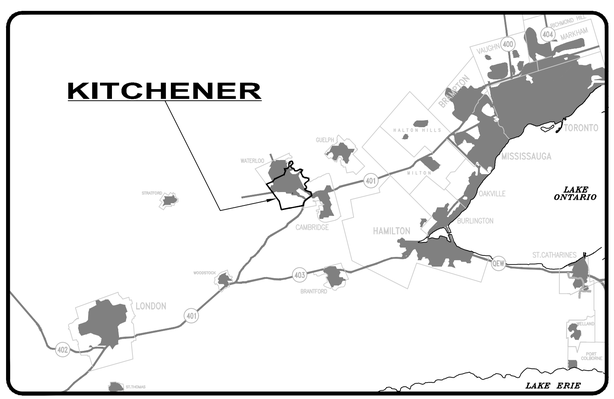
Development Services Department
ENGINEERING DIVISION

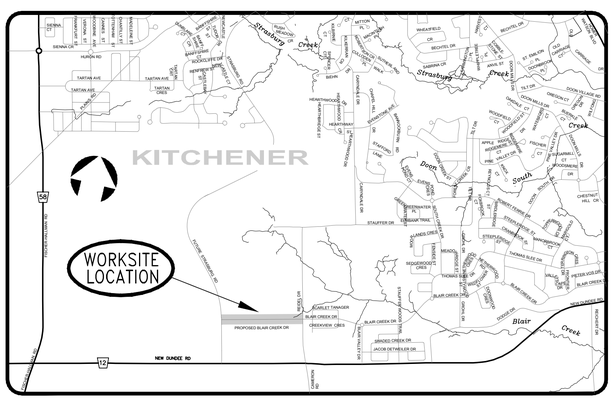
BLAIR CREEK DRIVE

CONSTRUCTION PROJECT
2024

FOR CONSTRUCTION
CONTRACT # TXX-XXX

ISSUED FOR 30% REVIEW





Key Map

City of Kitchener
Contract No. TXX-XXX

MTE
Engineers, Scientists, Surveyors

LEGEND

REMOVAL AND ADJUSTMENTS

- (A) APPURTENANCE ADJUSTMENT BY CONTRACTOR (CB,MH,WV etc.)
- (A) ADJUSTMENT C/W CAST IN PLACE RISER
- (B) ADJUSTMENT BY OTHERS
- (C) RELOCATE EXISTING CATCHBASIN
- (EX) EXCAVATE/BACKFILL EXIST. CATCHBASIN/MANHOLE
- (R) REMOVE, SALVAGE AND REINSTALL
- (E) TO BE EXPOSED BY CONTRACTOR
- FENCE REMOVAL
- MH — MAINTENANCE HOLE AND SEWER REMOVAL
- VC — VALVE CHAMBER AND WATERMAIN REMOVAL
- CONCRETE PAVEMENT WITH BITUMINOUS SURFACE TO BE REMOVED
- ASPHALT SURFACE TO BE REMOVED

UNDERGROUND SERVICES

SEWERS

- PROP 90.0m–200mm ø SAN @ 1.00% MH — PROPOSED SANITARY SEWER MAIN AND MANHOLE
- 100.5m–200mm ø SAN @ 2.12% MH — EXISTING SANITARY SEWER MAIN AND MANHOLE
- PROP 90.0m–300mm ø STM @ 0.50% MH — PROPOSED STORM SEWER MAIN AND MANHOLE
- 65.3m–300mm ø STM @ 4.27% MH — EXISTING STORM SEWER MAIN AND MANHOLE
- CBMH — PROPOSED CATCH BASIN MANHOLE
- DCBMH — PROPOSED DOUBLE CATCH BASIN MANHOLE
- CB — PROPOSED CATCH BASIN
- DCB — PROPOSED DOUBLE CATCH BASIN
- CBMH — EXISTING CATCH BASIN MANHOLE
- DCBMH — EXISTING DOUBLE CATCH BASIN MANHOLE
- CB — EXISTING CATCH BASIN
- DCB — EXISTING DOUBLE CATCH BASIN
- DI — EXISTING DITCH INLET CATCH BASIN
- ////// — INSULATION

WATER

- PROP 300mm ø WM VC — PROPOSED WATER MAIN AND VALVE CHAMBER
- 300mm ø WM VC — EXISTING WATER MAIN AND VALVE CHAMBER
- HYD WV — PROPOSED HYDRANT SET
- HYD WV — EXISTING HYDRANT SET
- WV — PROPOSED WATER VALVE
- WV — EXISTING WATER VALVE
- EXISTING CURB STOP VALVE
- CS — PROPOSED CURB STOP VALVE
- LAWN SPRINKLER HEAD
- MW — MONITORING WELL

NATURAL GAS

- 100mm ø GAS — EXISTING GAS MAIN
- GV — EXISTING GAS VALVE
- VP — EXISTING VENT PIPE

ROAD SURFACE FEATURES

- Ret. Wall — EXISTING RETAINING WALL
- EXISTING FENCE
- SWK — CONCRETE SIDEWALK
- CONCRETE BARRIER CURB (OPSD 600.110)
- CONCRETE CURB AND GUTTER (OPSD 600.043)
- RESIDENTIAL DRIVEWAY ENTRANCES / DROP CURB
- COMMERCIAL / INDUSTRIAL REINFORCED DROP CURB
- PROPOSED CONCRETE DRIVEWAY RAMP
- PROPOSED ASHPALT DRIVEWAY RAMP
- PROPOSED GRAVEL DRIVEWAY RAMP
- PROPOSED INTERLOCKING CONCRETE PAVERS
- PROPOSED STAMPED CONCRETE
- PROPOSED ASHPALT BOULEVARD
- PROPOSED 200mm THICK CONCRETE

LEGAL AND CONTROL SYMBOLS

- IRON BAR
- SIB — STANDARD IRON BAR
- RIB — ROUND IRON BAR
- IP — IRON PIPE
- CC — CUT CROSS
- HCM — HORIZONTAL CONTROL MONUMENT
- VCM — VERTICAL CONTROL MONUMENT
- TBM — TEMPORARY BENCHMARK
- BM — BENCHMARK
- STATION CHAINAGE

UTILITIES

ELECTRICAL

- HP — HYDRO POLE
- HPLS — HYDRO POLE LIGHT STANDARD
- HPLST — HYDRO POLE LIGHT STANDARD WITH TRANSFORMER
- HPT — HYDRO POLE WITH TRANSFORMER
- LS — LIGHT STANDARD
- TS — TRAFFIC SIGNAL POLE
- HW — HANDWELL
- GUY ANCHOR
- DIRECT BURIED ELECTRICAL DUCT/CABLE
- CONCRETE ENCASED ELECTRICAL DUCT

TELECOMMUNICATIONS

- BHP — BELL HYDRO POLE
- BP — BELL POLE
- BRP — BELL ROGERS POLE
- PED — PEDESTAL
- DIRECT BURIED TELECOMM DUCT/CABLE
- DIRECT BURIED TELECOMM DUCT

SIGNAGE

- RRS — RAIL ROAD SIGN
- MK — MK
- RS — ROAD SIGN
- Sign — DISPLAY BOARD SIGN

VEGETATION

- HEDGE
- TREE CONIFEROUS
- SHRUB CONIFEROUS
- TREE DECIDUOUS
- SHRUB DECIDUOUS
- STUMP

MISCELLANEOUS

- BH — BOREHOLE
- TP — TEST PIT
- WATER DATUM LINE
- PST — POST
- PM — PARKING METER
- MB — MAILBOX
- RK — BOULDER / ROCK
- BOLLARD
- PILLAR
- POLE — POLE
- TR — TRASH CAN
- TREE PLANTER GRATE
- #200 KING ST. W. KITCHENER CITY HALL — MUNICIPAL ADDRESS
- 5 Pt.77 — LOT NUMBER – PART LOT NUMBER
- R.P.198 — REGISTERED PLAN NUMBER
- PROPERTIES WITH MULTIPLE UTILITY SERVICES

TABLE OF CONTENTS

The Corporation Of The
CITY OF KITCHENER

Development Services
Engineering Division

LEGEND, SYMBOLOGY AND TABLE OF CONTENTS

MTE FILE No: 53018-100-ST1
PROPOSED CONDITIONS - BLAIR CREEK DRIVE - FROM STA 1+000 TO 1+140
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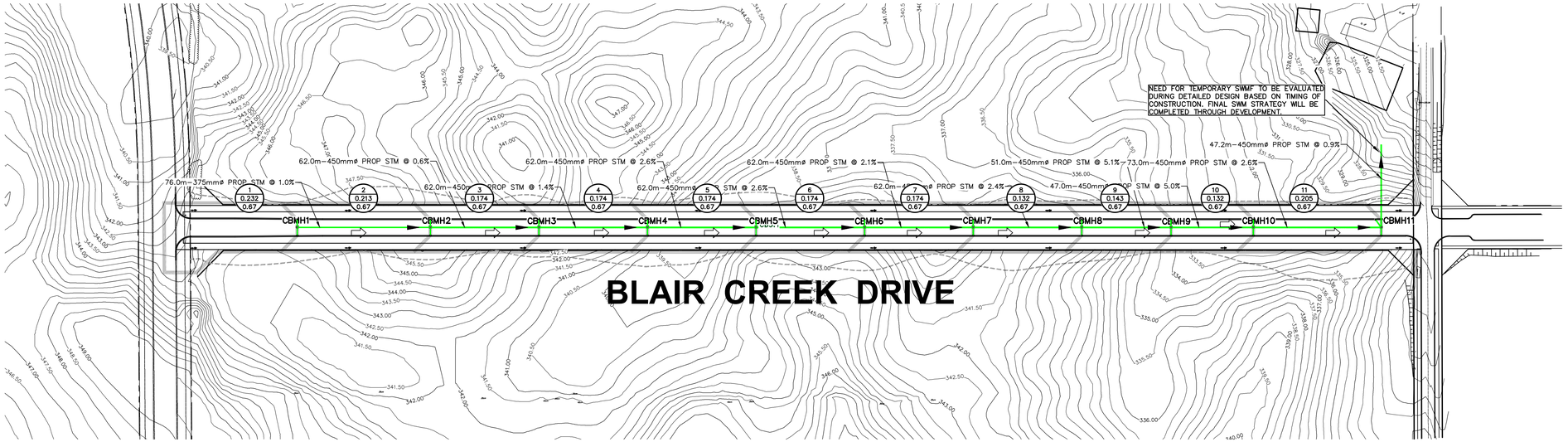

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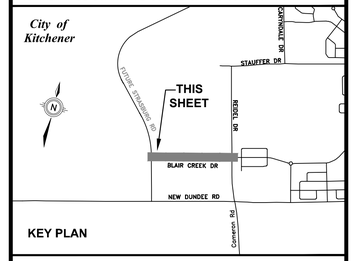
XXX

construction NORTH | true NORTH

THE POSITION OF THE POLE LINES, CONDUITS, WATERMAINS, SEWERS, AND OTHER UTILITIES AND STRUCTURES ARE N O T NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED.

BEFORE STARTING WORK

THE CONTRACTOR SHALL CONFIRM THE POSITION AND EXACT LOCATION OF ALL SUCH UTILITIES, AND SHALL ASSUME ALL LIABILITY FOR ANY DAMAGE TO THEM MADE DURING THE COURSE OF THE CONTRACT WORK.



STORM DRAINAGE LEGEND

1 / 0.174 / 0.67 — ID No., AREA (Ha), RUNOFF COEFFICIENT

STORM DRAINAGE LIMITS

MH — 55.5m–450mmø STM. @ 0.5% — PROPOSED STORM SEWER

EXISTING STORM SEWER

OVERLAND FLOW ROUTE

SURVEY

TOPO FROM CITY OF KITCHENER 2000-161413927_V-ET_20200306-2000.dwg DATED 4/20/2023

BENCHMARK

NO.	REVISION	BY	MM/DD/YY
9.			
8.			
7.			
6			
5.			
4.			
3.			
2.	ISSUED FOR 30% REVIEW	LAD	03/01/24
1.	PRELIMINARY (30%) DESIGN	LAD	01/09/24

The Corporation Of The CITY OF KITCHENER

Development Services
Engineering Division

MTE
Engineers, Scientists, Surveyors

STORM CATCHMENT PLAN
BLAIR CREEK DRIVE
FROM STA. 1+000 TO STA. 1+140

DESIGNED BY:	APPROVED BY:	DRAWN BY:
JXR	X.X	PFR
		CHECKED BY: -
		SCALE: 1:750
		DATE: (MM.DD.YY) 01.09.24
CONSULTANT DWG. No. 53018-100-ST1	SHEET No. 1 of 7	DWG. No. ST1

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53018-100-PP1.1
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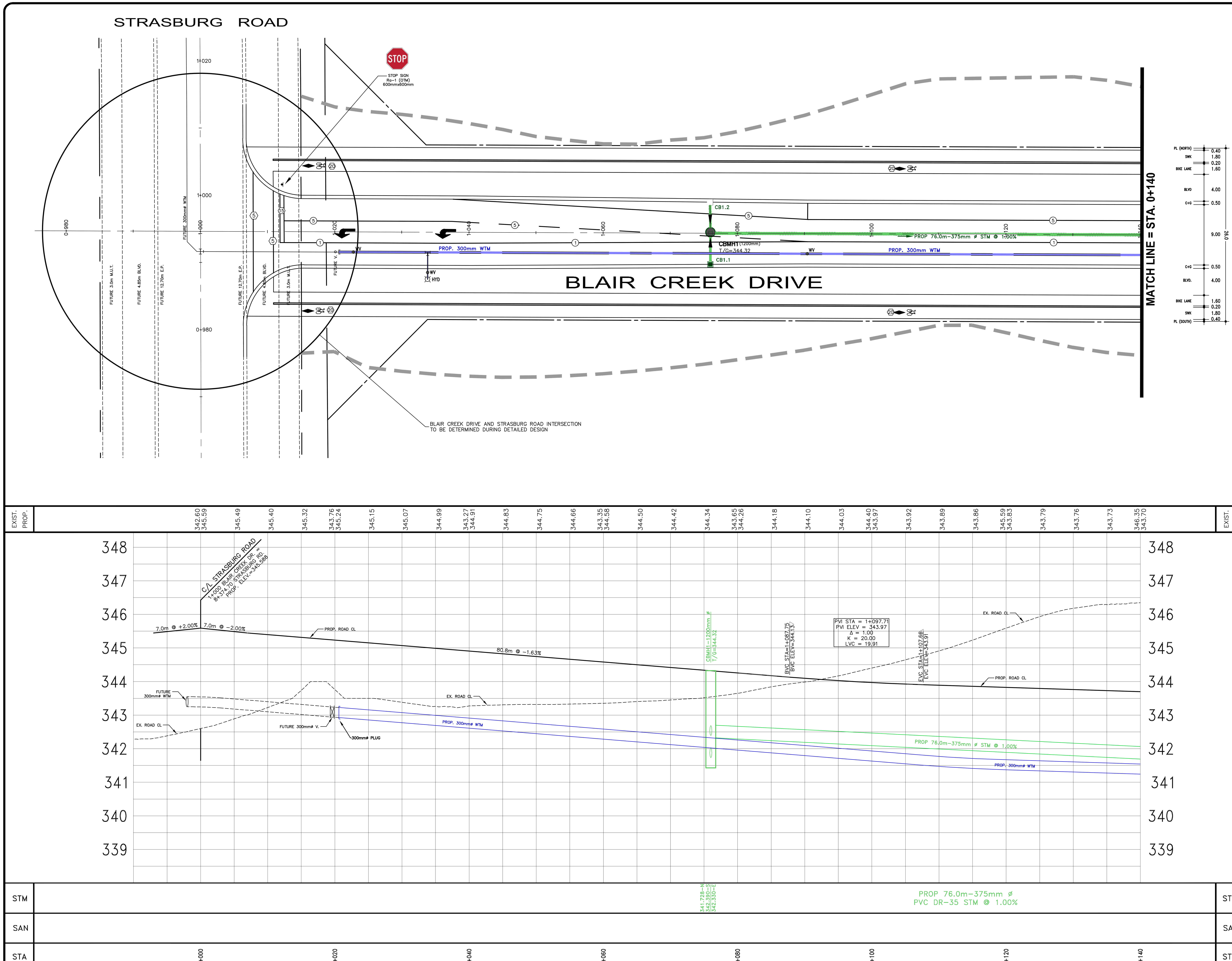

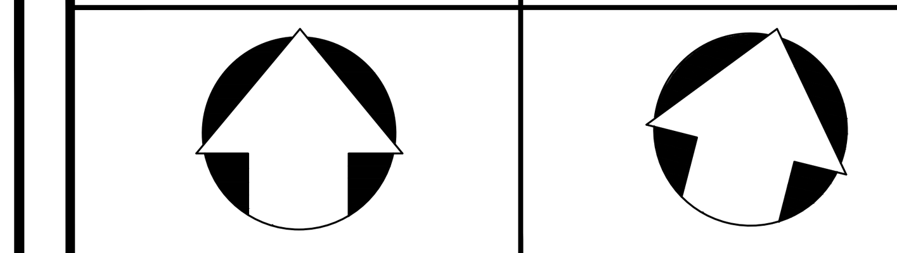

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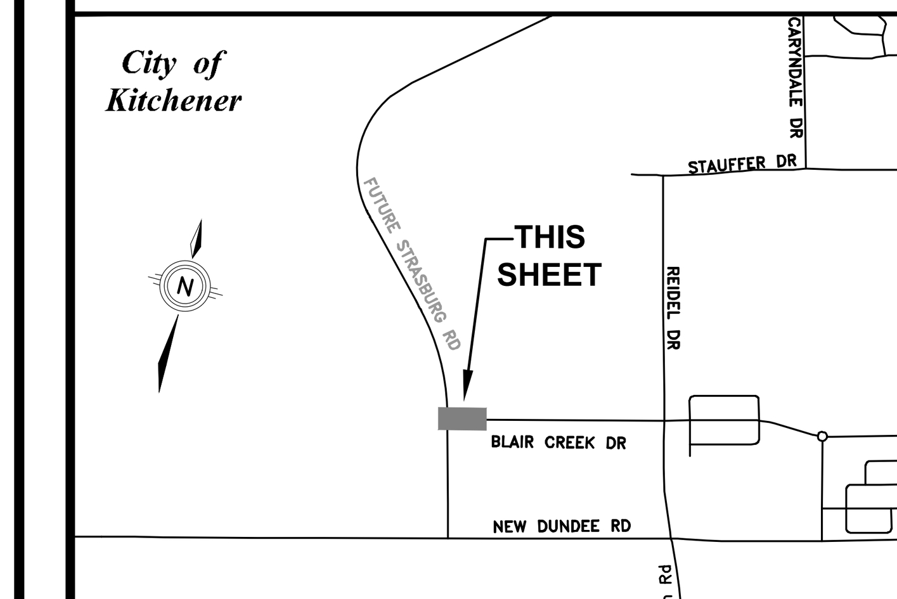

KEY PLAN

LEGEND

▬ ▬ ▬ LIMIT OF 3:1 GRADING

PAVEMENT MARKING LEGEND	
1	SOLID YELLOW, 10cm
5	SOLID WHITE, 10cm
6	333 BROKEN WHITE, 10cm
15	SOLID WHITE, 60cm
20	SOLID WHITE, SYMBOLS AND ARROWS

NOTES

1. 333, 363, 393, DENOTES PAVEMENT MARKING SPACING (IE., 3m LINE, 3m GAP, 3m LINE)
2. (1) DENOTES PAVEMENT MARKING
3. ⟨1⟩ DENOTES PAVEMENT MARKING, DURABLE

SURVEY

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DATED 4/20/2023

BENCHMARK

NO.	REVISION	BY	MM/DD/YY
9.			
8.			
7.			
6			
5.			
4.			
3.			
2.	ISSUED FOR 30% REVIEW	LAD	03/01/24
1.	PRELIMINARY (30%) DESIGN	LAD	01/09/24

KITCHENER
The Corporation Of The
CITY OF KITCHENER

Development Services
Engineering Division

MTE
Engineers, Scientists, Surveyors

PROPOSED CONDITONS
BLAIR CREEK DRIVE
FROM STA. 1+000 TO STA. 1+140

DESIGNED BY: JXR	APPROVED BY: X.X	DRAWN BY: PFR
		CHECKED BY: -
		SCALE: 1:250
		DATE: (MM.DD.YY) 01.09.24
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12.12.2023
Plotted On: ----
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XXX

MTE FILE No: 53018-100-PP1.2

PROPOSED CONDITIONS - BLAIR CREEK DRIVE - FROM STA 1+140 TO 1+300

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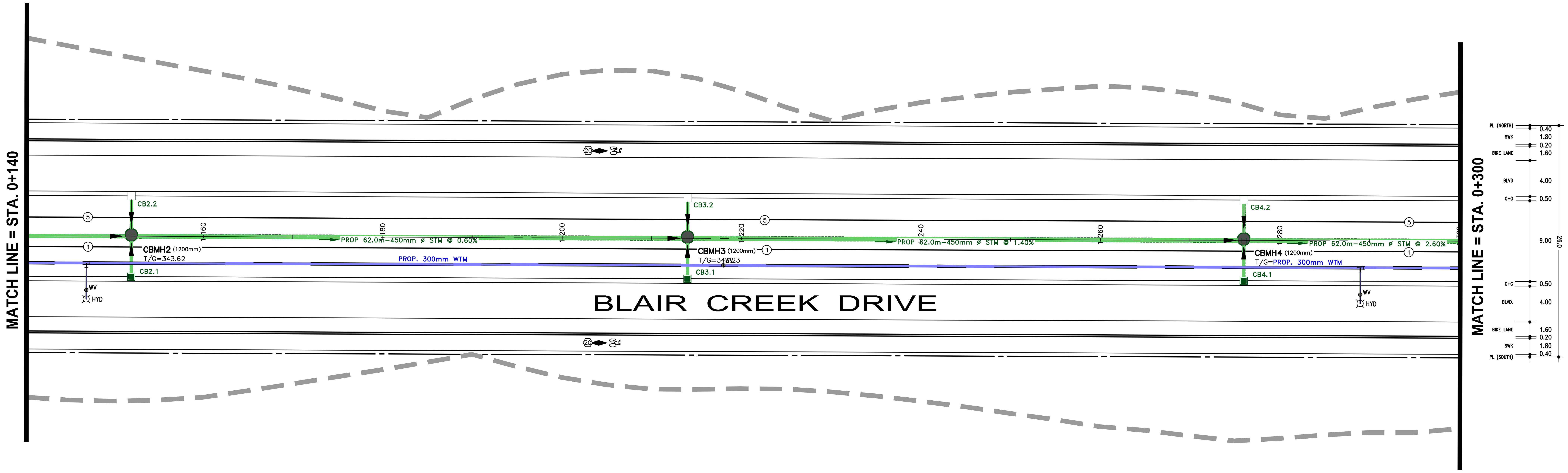

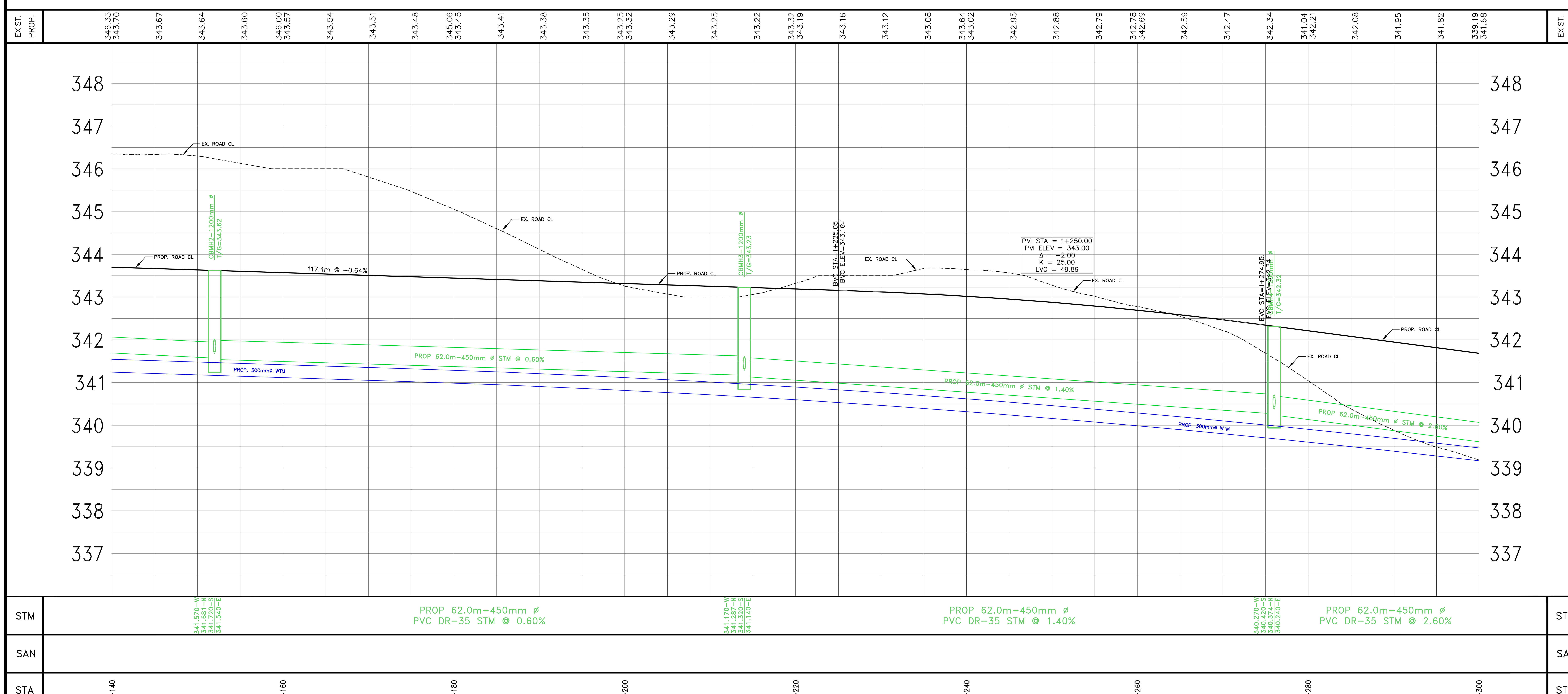

construction NORTH | true NORTH

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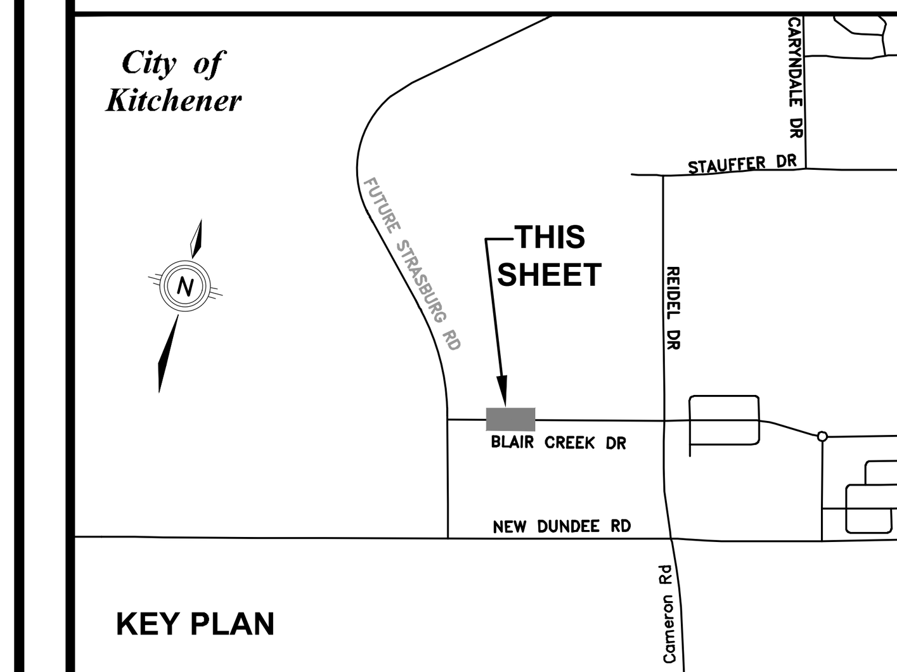

KEY PLAN

LEGEND

▬ ▬ ▬ LIMIT OF 3:1 GRADING

PAVEMENT MARKING LEGEND	
1	SOLID YELLOW, 10cm
5	SOLID WHITE, 10cm
6	333 BROKEN WHITE, 10cm
15	SOLID WHITE, 60cm
20	SOLID WHITE, SYMBOLS AND ARROWS

NOTES

1. 333, 363, 393, DENOTES PAVEMENT MARKING SPACING (IE., 3m LINE, 3m GAP, 3m LINE)
2. (1) DENOTES PAVEMENT MARKING
3. ⟨1⟩ DENOTES PAVEMENT MARKING, DURABLE

SURVEY

TOPO FROM CITY OF KITCHENER 2000-161413927_V-ET_20200306-2000.dwg
DATED 4/20/2023

BENCHMARK

NO.	REVISION	BY	MM/DD/YY
9.			
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3.			
2.	ISSUED FOR 30% REVIEW	LAD	03/01/24
1.	PRELIMINARY (30%) DESIGN	LAD	01/09/24

KITCHENER

The Corporation Of The
CITY OF KITCHENER

Development Services
Engineering Division

MTE
Engineers, Scientists, Surveyors

PROPOSED CONDITONS
BLAIR CREEK DRIVE
FROM STA. 1+140 TO STA. 1+300

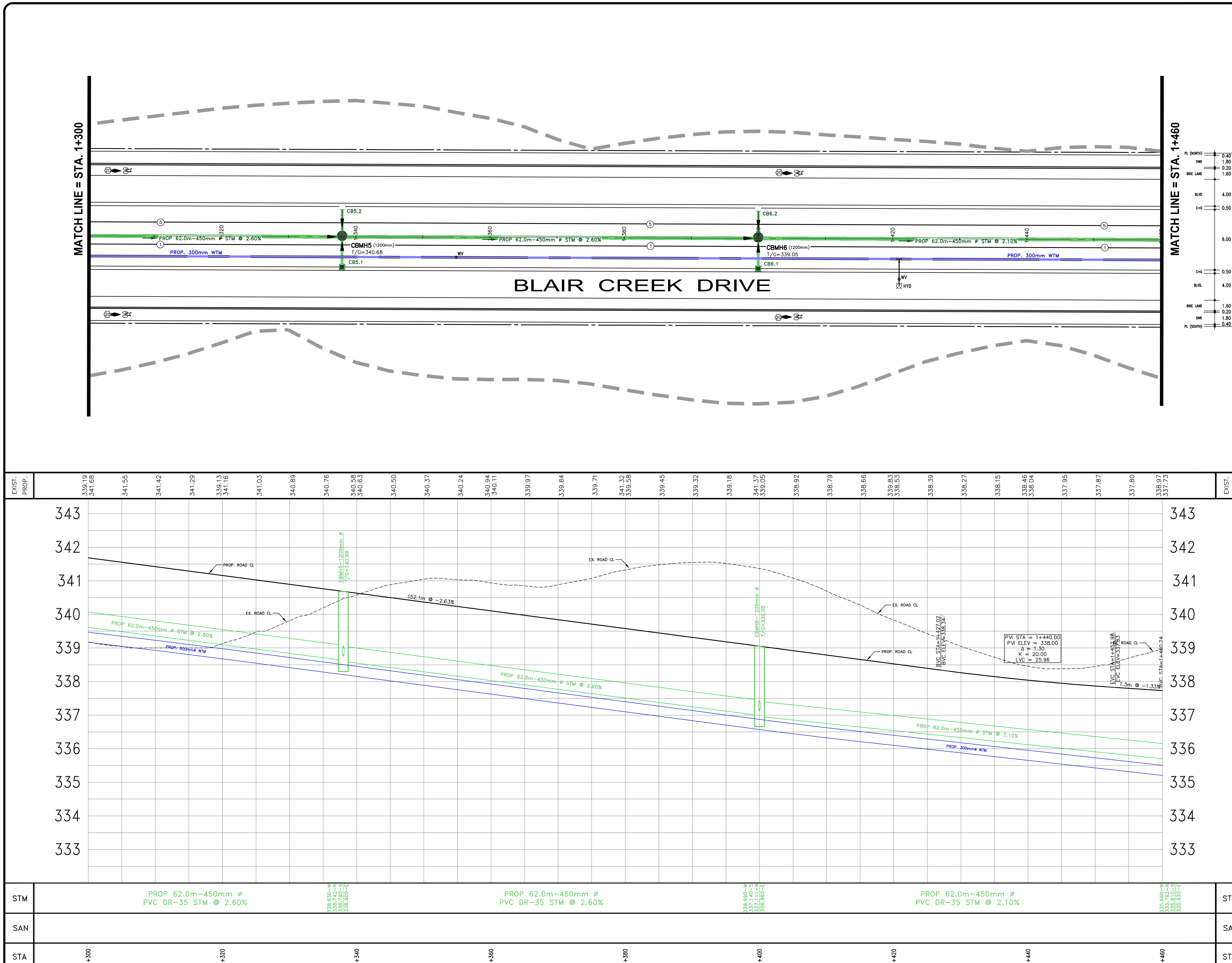
DESIGNED BY: JXR	APPROVED BY: X.X	DRAWN BY: PFR
		CHECKED BY: -
		SCALE: 1:250
		DATE: (MM.DD.YY) 01.09.24
CONSULTANT DWG. No. 53018-100-PP1	SHEET No. 3 of 7	DWG. No. PP1.2

Date: Mar. 01, 2024 - 4:03 pm Plotted by: PRaimbault Filename: P:\P\53018\100\53018-100-PP1.dwg

Plotted On: ---- 12.12.2023 53018-100-PP1.dwg

XXX

53018-100-PP1.3
MTE FILE No:
PROPOSED CONDITIONS - BLAIR CREEK DRIVE - FROM STA 1+300 TO 1+460
P:\P\53018\100\53018-100-PP1.DWG



construction NORTH

true NORTH

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City of Kitchener

THIS SHEET

KEY PLAN

LEGEND

LIMIT OF 3:1 GRADING

PAVEMENT MARKING LEGEND	
1	SOLID YELLOW, 10cm
5	SOLID WHITE, 10cm
6	333 BROKEN WHITE, 10cm
15	SOLID WHITE, 60cm
20	SOLID WHITE, SYMBOLS AND ARROWS

NOTES

1. 333, 363, 393, DENOTES PAVEMENT MARKING SPACING (IE., 3m LINE, 3m GAP, 3m LINE)
2. (1) DENOTES PAVEMENT MARKING
3. ⟨1⟩ DENOTES PAVEMENT MARKING, DURABLE

SURVEY

TOPO FROM CITY OF KITCHENER 2000-161413927_V-ET_20200306-2000.dwg
DATED 4/20/2023

BENCHMARK

NO.	REVISION	BY	MM/DD/YY
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3.			
2.	ISSUED FOR 30% REVIEW	LAD	03/01/24
1.	PRELIMINARY (30%) DESIGN	LAD	01/09/24

The Corporation Of The
CITY OF KITCHENER

Development Services
Engineering Division

MTE
Engineers, Scientists, Surveyors

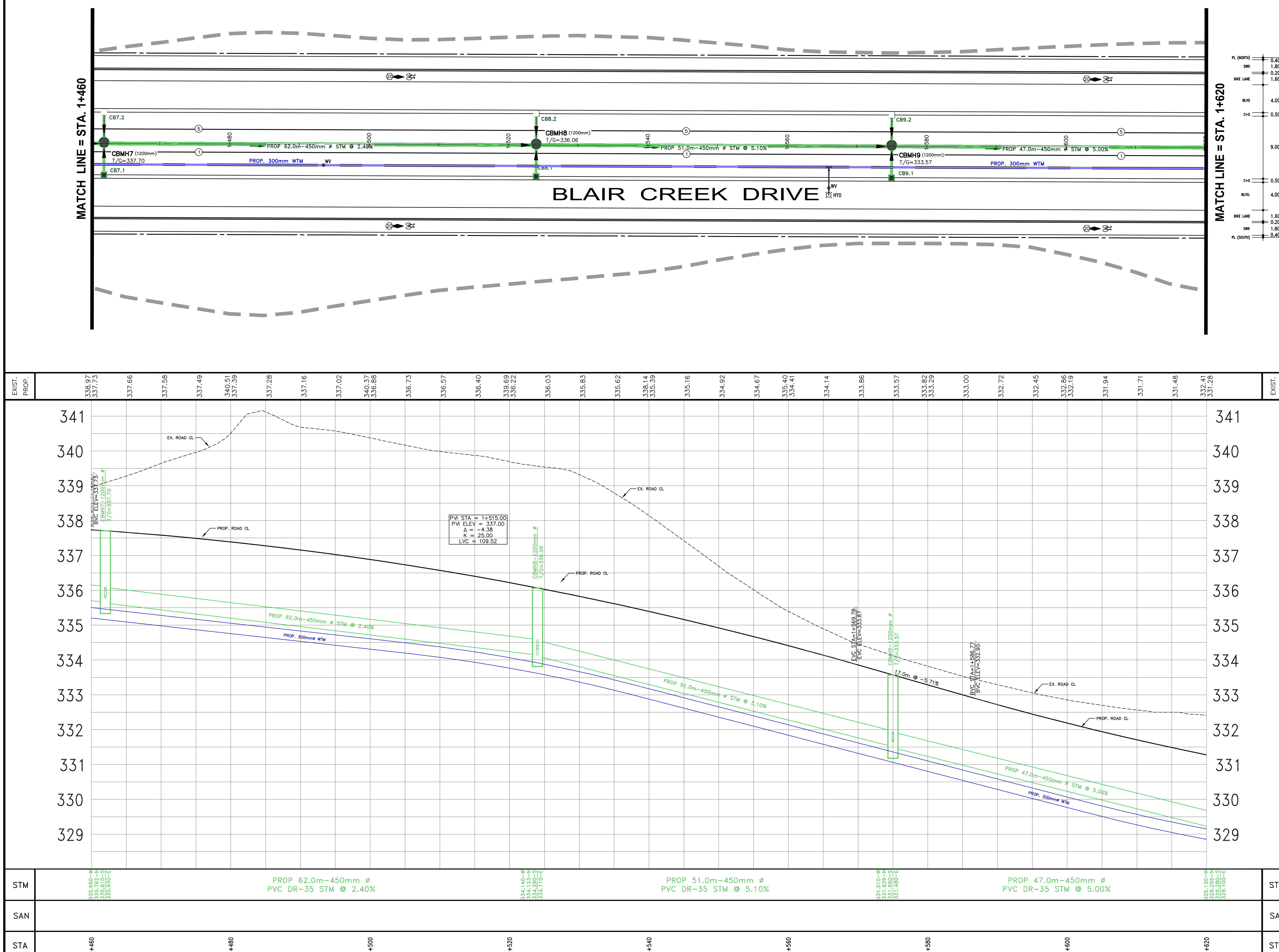
PROPOSED CONDITONS
BLAIR CREEK DRIVE
FROM STA. 1+300 TO STA. 1+460

DESIGNED BY:	APPROVED BY:	DRAWN BY:
JXR	X.X	PFR
		CHECKED BY: -
		SCALE: 1:250
		DATE: (MM.DD.YY) 01.09.24
CONSULTANT DWG. No. 53018-100-PP1	SHEET No. 4 of 7	DWG. No. PP1.3

Date: Mar. 01, 2024 - 4:03 pm Plotted by: PRaimbault Filename: P:\P\53018\100\53018-100-PP1.dwg

53018-100-PP1.dwg
12.12.2023
Plotted On: ----

MTE FILE No: 53018-100-PP1.4
PROPOSED CONDITIONS - BLAIR CREEK DRIVE - FROM STA 1+460 TO 1+620
P:\P\53018\100\53018-100-PP1.DWG



construction NORTH | true NORTH

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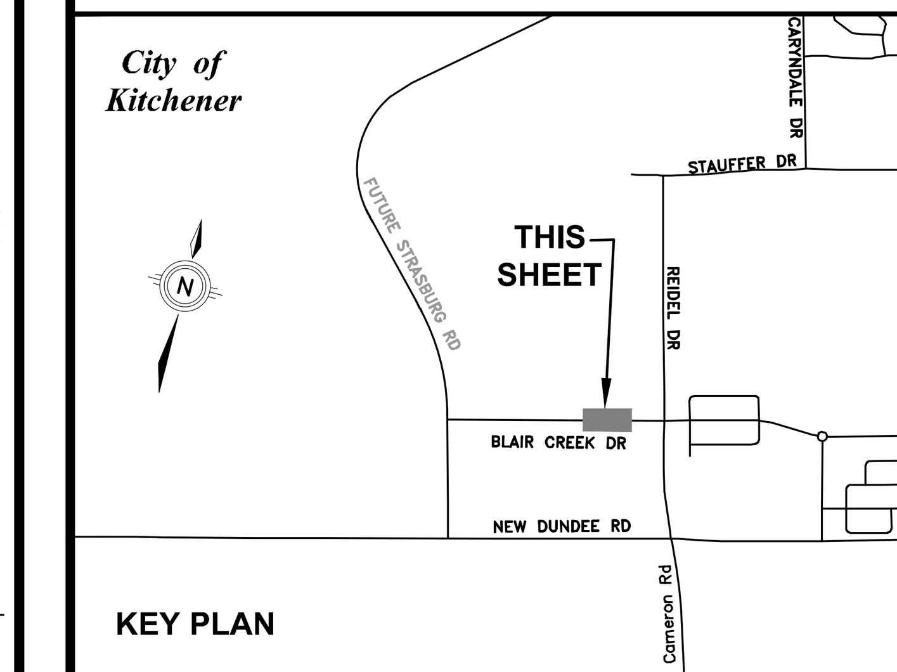

KEY PLAN

LEGEND

LIMIT OF 3:1 GRADING

PAVEMENT MARKING LEGEND	
1	SOLID YELLOW, 10cm
5	SOLID WHITE, 10cm
6	333 BROKEN WHITE, 10cm
15	SOLID WHITE, 60cm
20	SOLID WHITE, SYMBOLS AND ARROWS

NOTES

1. 333, 363, 393, DENOTES PAVEMENT MARKING SPACING (IE., 3m LINE, 3m GAP, 3m LINE)
2. (1) DENOTES PAVEMENT MARKING
3. ⟨1⟩ DENOTES PAVEMENT MARKING, DURABLE

SURVEY

TOPO FROM CITY OF KITCHENER 2000-161413927_V-ET_20200306-2000.dwg
DATED 4/20/2023

BENCHMARK

NO.	REVISION	BY	MM/DD/YY
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3.			
2.	ISSUED FOR 30% REVIEW	LAD	03/01/24
1.	PRELIMINARY (30%) DESIGN	LAD	01/09/24

The Corporation Of The
CITY OF KITCHENER

Development Services
Engineering Division

MTE
Engineers, Scientists, Surveyors

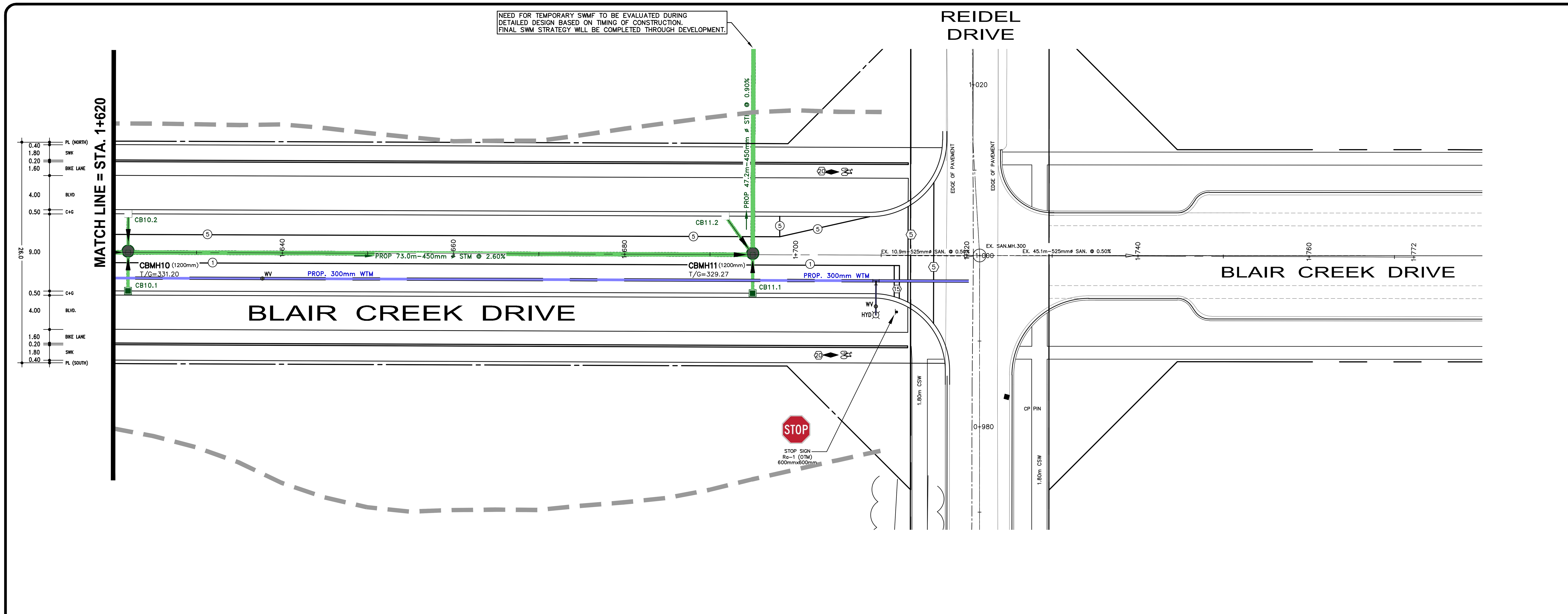
PROPOSED CONDITONS
BLAIR CREEK DRIVE
FROM STA. 1+460 TO STA. 1+620

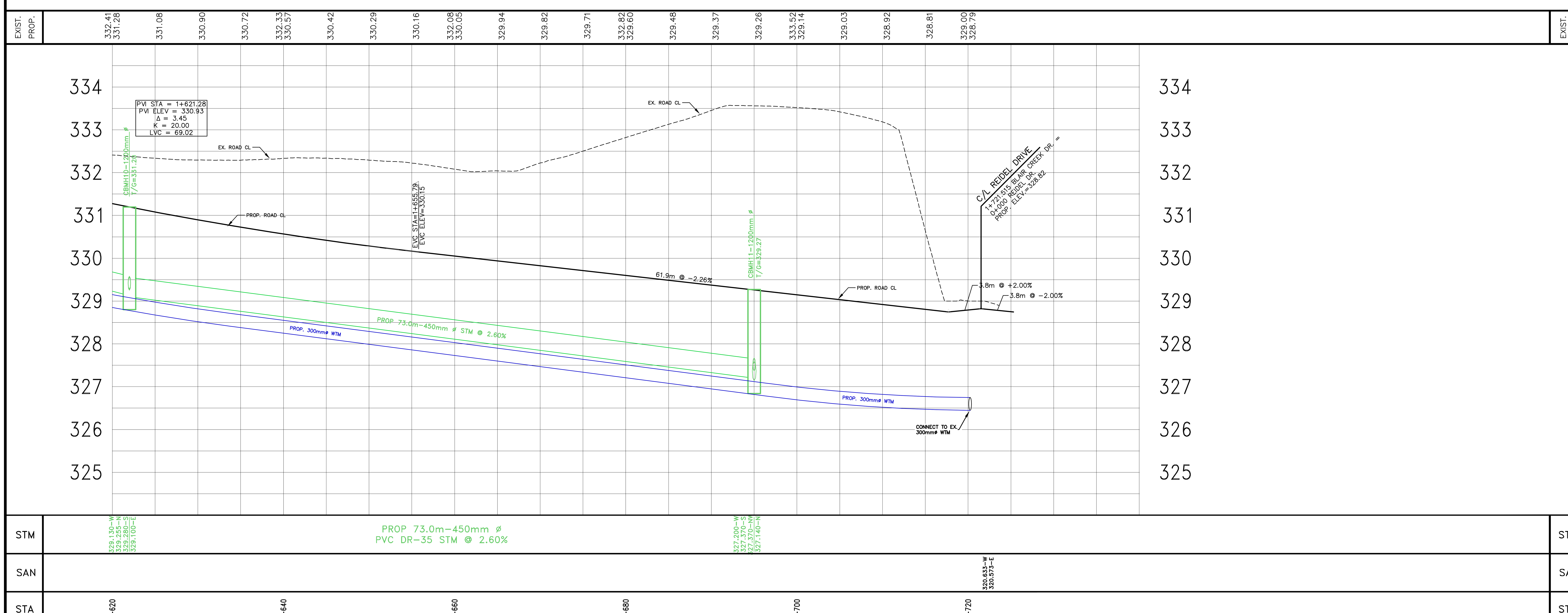
DESIGNED BY:	APPROVED BY:	DRAWN BY:
JXR	X.X	PFR
		CHECKED BY: -
		SCALE: 1:250
		DATE: (MM.DD.YY) 01.09.24
CONSULTANT DWG. No. 53018-100-PP1	SHEET No. 5 of 7	DWG. No. PP1.4

Date: Mar. 01, 2024 - 4:02 pm Plotted by: PRaimbault Filename: P:\P\53018\100\53018-100-PP1.dwg

53018-100-PP1.dwg
12.12.2023
Plotted On: ----
XXX

53018-100-PP1.5
MTE FILE No: PROPOSED CONDITIONS - BLAIR CREEK DRIVE - FROM STA 1+620 TO 1+720
P:\P\53018\100\53018-100-PP1.DWG





53018-100-PP1.dwg
12.12.2023
Plotted On: ----
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construction NORTH | true NORTH

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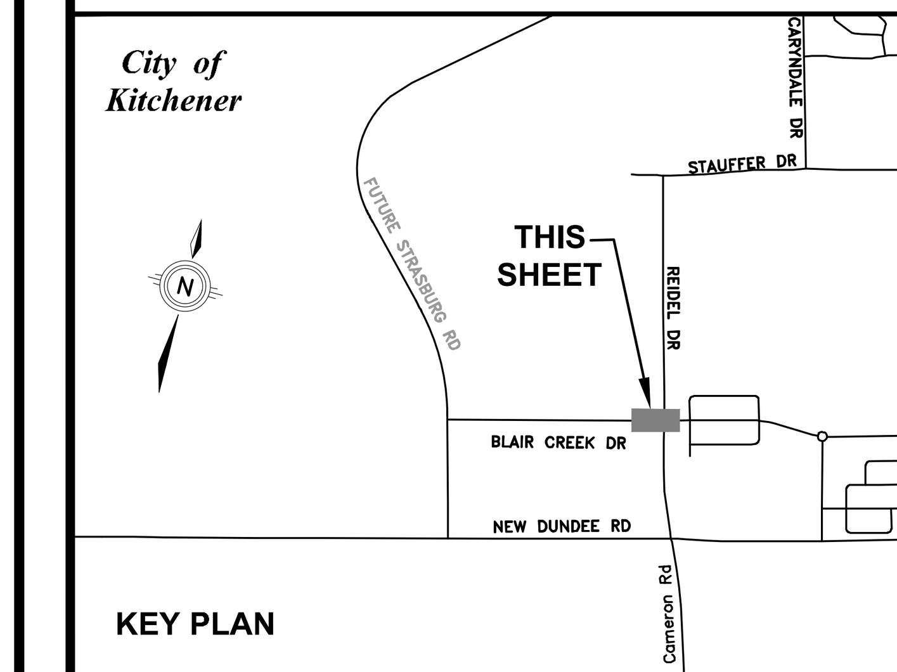

KEY PLAN

LEGEND

▬ ▬ ▬ LIMIT OF 3:1 GRADING

PAVEMENT MARKING LEGEND	
1	SOLID YELLOW, 10cm
5	SOLID WHITE, 10cm
6	333 BROKEN WHITE, 10cm
15	SOLID WHITE, 60cm
20	SOLID WHITE, SYMBOLS AND ARROWS

NOTES

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2. (1) DENOTES PAVEMENT MARKING
3. ⟨1⟩ DENOTES PAVEMENT MARKING, DURABLE

SURVEY
TOPO FROM CITY OF KITCHENER 2000-161413927_V-ET_20200306-2000.dwg
DATED 4/20/2023

BENCHMARK

NO.	REVISION	BY	MM/DD/YY
9.			
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3.			
2.	ISSUED FOR 30% REVIEW	LAD	03/01/24
1.	PRELIMINARY (30%) DESIGN	LAD	01/09/24

KITCHENER
The Corporation Of The
CITY OF KITCHENER

Development Services
Engineering Division

MTE
Engineers, Scientists, Surveyors

PROPOSED CONDITONS
BLAIR CREEK DRIVE
FROM STA. 1+620 TO STA. 1+720

Date: Mar. 01, 2024 - 4:02 pm Plotted by: PRaimbault Filename: P:\P\53018\100\53018-100-PP1.dwg

DESIGNED BY: JXR	APPROVED BY: X.X	DRAWN BY: PFR
		CHECKED BY: -
		SCALE: 1:250
		DATE: (MM.DD.YY) 01.09.24
CONSULTANT DWG. No. 53018-100-PP1	SHEET No. 6 of 7	DWG. No. PP1.5

XXX

MTE FILE No: **53018-100-XS2.1**

PROPOSED CONDITIONS - BLAIR CREEK DRIVE - FROM STA 1+620 TO 1+720

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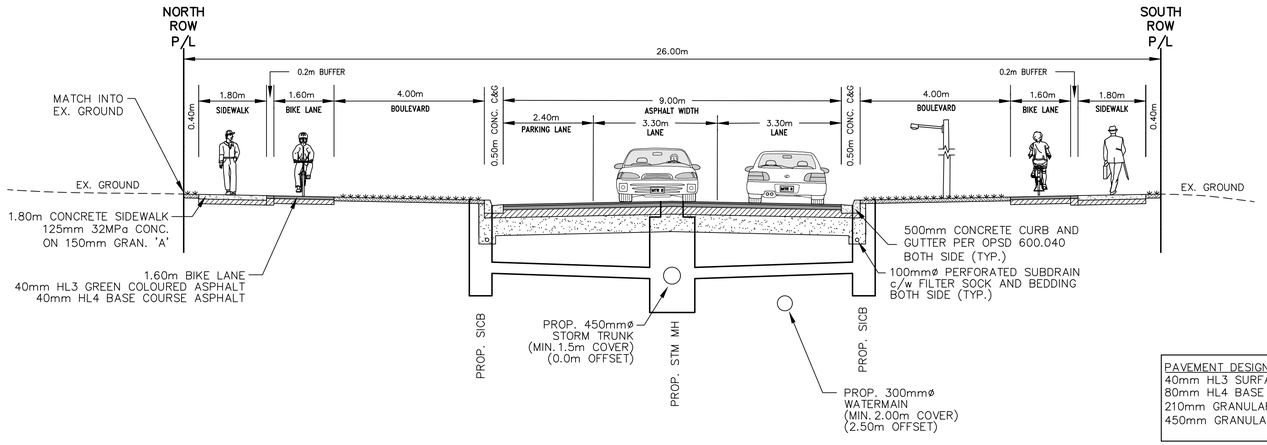
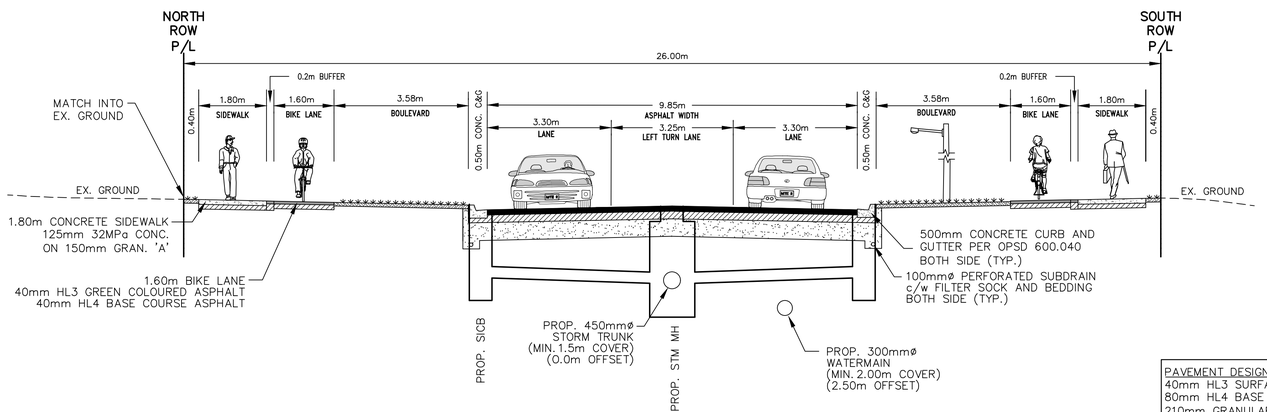


PAVEMENT DESIGN
40mm HL3 SURFACE COURSE ASPHALT
80mm HL4 BASE COURSE ASPHALT
210mm GRANULAR 'A'
450mm GRANULAR 'B'

BLAIR CREEK DRIVE
TYPICAL SECTION IN PARKING LANE

SCALE 1:100



PAVEMENT DESIGN
40mm HL3 SURFACE COURSE ASPHALT
80mm HL4 BASE COURSE ASPHALT
210mm GRANULAR 'A'
450mm GRANULAR 'B'

BLAIR CREEK DRIVE
TYPICAL SECTION IN LEFT TURN LANE

SCALE 1:100

Plotted On: City of Kitchener 12.12.2023 53018-100-XS2.dwg

XXX

construction NORTH | true NORTH

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SURVEY

TOPO FROM CITY OF KITCHENER 2000-161413927_V-ET_20200306-2000.dwg DATED 4/20/2023

BENCHMARK

NO.	REVISION	BY	MM/DD/YY
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2.	ISSUED FOR 30% REVIEW	LAD	03/01/24
1.	PRELIMINARY (30%) DESIGN	LAD	01/09/24

The Corporation Of The
CITY OF KITCHENER

Development Services
Engineering Division

MTE
Engineers, Scientists, Surveyors

TYPICAL CROSS SECTION
BLAIR CREEK DRIVE

DESIGNED BY: JXR	APPROVED BY: X.X	DRAWN BY: PFR	
		CHECKED BY: -	
		SCALE: 1:100	
		DATE: (MM.DD.YY) 01.09.24	
CONSULTANT DWG. No. 53018-100-XS2	SHEET No. 7 of 7	DWG. No. XS2.1	

Date: Mar 01, 2024 - 4:07 pm Plotted by: PRamkaut Filename: P:\P\53018\100\53018-100-XS2.dwg

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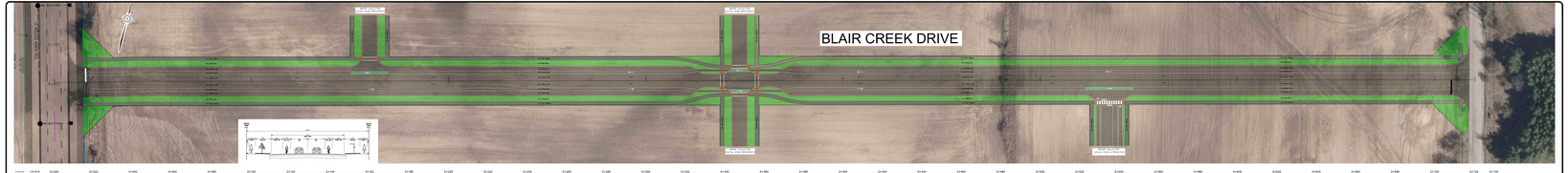

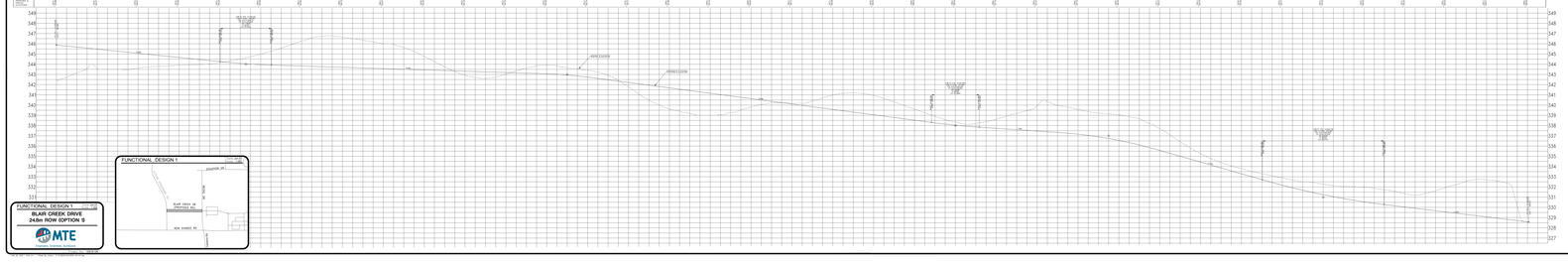

FUNCTIONAL DESIGN 1
PLAN / PROFILE

BLAIR CREEK DRIVE
242m ROH (OPTION 1)

MTE
CONSULTING INC.
SUDBURY NORTH BAY TIMMINS

FUNCTIONAL DESIGN 2
Date: Jun-23
Scale: 1:250

BLAIR CREEK DRIVE
26.0m ROW (OPTION 2)

MTE
Engineers, Scientists, Surveyors

Project No.: 53018-100


BLAIR CREEK DRIVE
MINOR COLLECTOR (20.0m ROW PREFERRED)
MINOR COLLECTOR (20.0m ROW ALTERNATIVE)
STM SEWER (SYSTEM 2)
3:1 MAX
NORTH ROW P/L
SOUTH ROW P/L
EDGE OF PAVEMENT
CP PIN
BLAIR CREEK DRIVE
CHAINAGE
PROPOSED ℄ PROFILE ELEVATIONS
−0+010
0+000
0+020
0+040
0+060
0+080
0+100
0+120
0+140
0+160
0+180
0+200
0+220
0+240
0+260
0+280
0+300
0+320
0+340
0+360
0+380
0+400
0+420
0+440
0+460
0+480
0+500
0+520
0+540
0+560
0+580
0+600
0+620
0+640
0+660
0+680
0+700
0+720
0+730
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PROPOSED ℄ ELEVATION
EXISTING ℄ ELEVATION
FUNCTIONAL DESIGN 3
Date: Jun-23
Scale: 1:250
STAUFFER DR
REIDEL DR
FUTURE STRASBURG RD
BLAIR CREEK DR (PROPOSED DR)
NEW DUNDEE RD
FUNCTIONAL DESIGN 3
Date: Jun-23
Scale: 1:250
BLAIR CREEK DRIVE
26.0m ROW (OPTION 3)
MTE
Engineers, Scientists, Surveyors
Project No.: 53018-100