BURNSIDE

Appleby Creek Flood Mitigation Schedule B Class EA Addendum Report

Prepared For:

City of Burlington

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Prepared For:

City of Burlington

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2	July 8, 2024	Filed Addendum Report

Contributors

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In Association with

City of Burlington

Conservation Halton

Urbantech Consulting

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Executive Summary

R.J. Burnside & Associates Limited (Burnside) was retained by Branthaven Development Corporation to complete an Addendum to the Appleby Creek Flood Mitigation Municipal Class Environmental Assessment (ACFMEA) completed by Aquafor Beech Limited for the City of Burlington in February 2019.

The ACFMEA study evaluated alternative solutions along Appleby Creek, from New Street to the GO Transit Rail corridor (near Appleby Go Train Station) to identify specific opportunities to reduce the flooding risk and protect the natural heritage features and functions within the study corridor.

Since the completion of the ACFMEA, the socio-cultural and economic environments of the study area have changed as a result of plans for land use intensification and proposed development within the vicinity of the Fairview Street crossing. As a result, the preferred solution identified in the ACFMEA for the Fairview Street crossing structure does not adequately address the flooding risks within the flood limits of adjacent development lands, specifically development lands known as Oval Court lands.

The Municipal Engineers Association Municipal Class Environmental Assessment (MCEA) guidance document (February 2024) provides for a process when it may not be feasible to implement a project in the manner outlined in a MCEA project report due to unforeseen circumstances or changes in the environment. If a change is proposed after the project is authorized to proceed, pursuant to the MCEA, an Addendum to the report shall be prepared.

The Addendum will review and evaluate alternative solutions for the hydraulic structure crossing at Fairview Street to reduce flooding impacts to the Oval Court lands under Regional Storm conditions. The review is documented in the Addendum Report.

This report provides the technical background and analysis to support the change of the preferred hydraulic crossing structure at Fairview Street as an Addendum to the ACFMEA study.

The following changes have been incorporated in the technical updates to the ACFMEA Addendum:

- Response to the Ontario Land Tribunal (OLT) Settlement Agreement (November 2023).
- City of Burlington amendment to the Official Plan (to permit increased development density, intensification, and land use forms on the Oval Court Development site subject to the refinement of existing flooding and erosion hazards).
- Update to the flood hazard mapping for the ‘East Burlington Creeks’ and the need to convey Regional Storm to maximize table lands allowing for the increase development density and intensification (EBC, 2023).

- The change of funding source for the construction of the culvert / bridge from capital budget to the development charge process.

In support of the revised preferred alternative, three hydraulic structure options were reviewed for the Fairview Street crossing. The structure options include Twin Equal Span Precast Rigid Frame Culverts; Two Unequal Span Precast Rigid Frame Culverts; and a Clear Span Precast Box Concrete Girder Bridge. The precise selection of the type of preferred structure will be completed during the detailed design phase of the project in collaboration with the City of Burlington, Conservation Halton and Branthaven Developments.

The selection of the preferred structure will address the following considerations:

- Provides a reduction in water levels upstream of Fairview Street, increasing table lands to support development consistent with the Mobility Hub objectives.
- Addresses the Official Plan Amendment and Obligations under the Ontario Land Tribunal Minutes of Settlement between Branthaven Corp., the City of Burlington and Regional Municipality of Halton and Conservation Halton.
- Enhances the watercourse corridor between the railway line and Fairview Street.
- Structure selection that is consistent with established criteria, including passage of the Regional Storm.
- Road work minimization, with the lowest increase in road elevation above the current road profile.
- Entrance and intersection disturbance minimization, with the least amount of grading to connect adjacent properties to the right-of-way (ROW).
- Foundation option review and optimization based on the geometric requirements and geotechnical considerations.
- Construction duration minimization.
- Waterway control and flood risk exposure reduction based on construction time.

The Addendum Report describes the proposed changes, the circumstances necessitating the change and includes a review of measures to mitigate any negative environmental impacts. This Addendum Report is appended to the original ACFMEA project report.

In accordance with the requirements of the MCEA, the Addendum Report is available for public review and comment for a period of 30 calendar days following the publication of a Notice of Addendum. The Notice of Addendum is issued to potentially affected members of the public, review agencies and Indigenous communities that may have an interest in the project, as well as those who were notified in the preparation of the original ACFMEA report, where possible. The Notice of Addendum includes the public's right to request a Section 16 Order on the grounds that the order may prevent, mitigate or remedy adverse impacts on Aboriginal and treaty rights.

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1.0 Introduction

R.J. Burnside & Associates Limited (Burnside) was retained by Branthaven Development Corporation to complete an Addendum to the Appleby Creek Flood Mitigation Municipal Class Environmental Assessment (ACFMEA) completed by Aquafor Beech Limited for the City of Burlington in February 2019.

The ACFMEA study evaluated alternative solutions along Appleby Creek, from New Street to the GO Transit Rail corridor (near Appleby Go Train Station) to identify specific opportunities to reduce flooding risk and protect the natural heritage features and functions within the study corridor.

Since the completion of the ACFMEA, the socio-cultural and economic environments of the study area have changed as a result of plans for land use intensification and proposed development within the vicinity of the Fairview Street crossing. As a result, the preferred solution identified in the ACFMEA for the Fairview Street crossing structure does not adequately address the flooding risks within the flood limits of adjacent development lands, specifically development lands known as Oval Court lands.

2.0 Municipal Class Environmental Assessment Process

The Municipal Engineers Association Municipal Class Environmental Assessment (MCEA) guidance document (February 2024) provides for a process when it may not be feasible to implement a project in the manner outlined in a MCEA project report due to unforeseen circumstances or changes in the environment. If a change is proposed after the project is authorized to proceed, pursuant to the MCEA, an Addendum to the report shall be prepared.

2.1 Addendum Process

The Addendum will review and evaluate alternative solutions for the hydraulic structure crossing at Fairview Street to reduce flooding impacts to the Oval Court lands under Regional Storm conditions. The review is documented in the Addendum Report. The Addendum Report will describe the proposed changes, the circumstances necessitating the change and include a review of measures to mitigate any negative environmental impacts. This Addendum Report is appended to the original ACFMEA project report.

In accordance with the requirements of the MCEA, the Addendum Report is available for public review and comment for a period of 30 calendar days following the publication of a Notice of Addendum. The Notice of Addendum is issued to potentially affected members of the public, review agencies and Indigenous communities that may have an interest in the project, as well as those who were notified in the preparation of the original ACFMEA report, where possible. The Notice of Addendum will include the

public's right to request a Section 16 Order on the grounds that the order may prevent, mitigate or remedy adverse impacts on Aboriginal and treaty rights.

2.2 Class Environmental Assessment Section 16(6) Order

The Minister of the Environment (or delegate) has the authority and discretion to make an Order under Section 16 of the *Environmental Assessment Act*. Section 16 Order requests were previously known as Part II Order requests. A Section 16 Order may require that the proponent of a project going through an MCEA process:

1. Submit an application for approval of the project before they proceed. This may require a proponent to complete a comprehensive Environmental Assessment (Section 16(1) Order).

2. Meet further conditions in Section 16 Order (Section 16(3) Order). This could include, but is not limited to conditions for:

- Further study.
- Monitoring.
- Consultation.

A Section 16(6) Order can be requested if:

- You have outstanding concerns that a project going through an MCEA process may have a potential adverse impact on constitutionally protected Aboriginal and Treaty rights.
- You believe that an Order may prevent, mitigate, or remedy this impact.

A request may be made to the Minister for an order requiring a higher level of study (i.e., requiring a comprehensive MCEA approval before being able to proceed), or that conditions be imposed (e.g., require further studies), only on the grounds that the requested order may prevent, mitigate, or remedy adverse impacts on constitutionally protected Aboriginal and Treaty rights. Requests on other grounds will not be considered.

Requests should include the following:

- Requester contact information and full name.
- Project name.
- Proponent name.
- The type of order that is being requested (comprehensive EA or conditions be imposed).
- Specific reasons on how an order may prevent, mitigate or remedy potential adverse impacts on Aboriginal and Treaty rights.
- Information about efforts to date to discuss and resolve concerns with the proponent.
- Any other information in support of statements in the request.

The request should be sent in writing or by email to:

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

and

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

Requests must also be sent to the Project Team.

Interested persons may provide written comments to our project team within the 30-day comment period following the Notice of Addendum. All comments and concerns should be sent directly to the project team at:

Mr. Arif Shahzad, M. Eng., P. Eng. Senior Project Manager, City of Burlington 426 Brant Street, P.O. Box 5013 Burlington, ON L7R 3Z6 Tel: 905-335-7600 ext. 7486 E-mail: Arif.Shahzad@burlington	**Mr. Philip A. Rowe, C.E.T., EP** Consultant Project Manager R.J. Burnside & Associates Limited 1266 South Service Road, Suite C2-1 Stoney Creek, ON L8E 5R9 Tel: 905-821-5915 E-mail: Philip.Rowe@rjburnside.com

If the Minister does not receive a request for a Section 16 Order within the 30-calendar day comment period, then the project will move forward to detailed design and approvals process 30 days following the end of the comment period, and subsequent implementation of the project.

3.0 Background ─ 2019 Appleby Creek Flood Mitigation Municipal Class Environmental Assessment

The ACFMEA study was conducted in accordance with the requirements of Phases 1 and 2 of the Municipal Class Environmental Assessment, as outlined in the Municipal Engineers Association Municipal Class Environmental Assessment Manual (October 2000, as amended 2007, 2011 & 2015).

The ACFMEA study evaluated alternative solutions along Appleby Creek, from New Street to the GO Transit Rail corridor (near Appleby Go Train Station), to identify specific opportunities to reduce flooding risk and protect the natural heritage features and functions within the study corridor. The ACFMEA recommended preferred solutions for three flood vulnerable areas including the subject study area in the vicinity of the Fairview Street crossing. The Fairview Street crossing was identified within Reach 3 in the ACFMEA report

Within Reach 3, the ACFMEA assessed three options to reduce the extent of the flood hazard:

Option 1 ─ Do Nothing.

Option 2 ─ Replace the existing bridge (Fairview Street) with a 17 m span to convey the 100-year storm.

Option 3 ─ Replace the existing bridge with a span large enough to pass the Regional Storm.

Option 2, a 17 m clear span bridge that could pass the 100-year storm event, was selected as the preferred alternative in the 2019 ACFMEA study. This option included channel works at the upstream and downstream sections of the bridge. The channel works were identified through a separate study known as the Appleby Creek Erosion Control Environmental Assessment completed by Aquafor Beech Ltd. in August 2020. The channel works at a high level would include removal of failed gabion baskets, installation of armour stone retaining walls, riffle-pool features, in creek vegetation buffers and retrofit of the existing storm outfalls into the restored bank works.

While the ACFMEA File Report acknowledged that Option 2 still results in flooding of private property and the overtopping of Fairview Street under Regional Storm conditions, this option was selected primarily due to the concerns of the capital cost at the time of evaluation.

In addition, through consultation with Oval Court Landowners during the EA process the following was documented in the ACFMEA File Report:

> *'There may be an opportunity, through the re-development of lands east of Appleby Creek, between Fairview Street and the railway line, as part of the Mobility Hub development, to widen the watercourse corridor to assist in containing the extent of the floodplain east of* Appleby Creek to provide for additional tableland for re-development. Such options should be explored further with the adjacent landowners and approval agencies as part of future redevelopment.'

4.0 Existing Bridge Structure

The existing structure at the Fairview Street crossing has been identified as a 2.74 m rise x twin 3.35 m wide x 29 m long closed bottom box culvert.

There is an existing 900 mm sanitary sewer and a 500 mm diameter watermain that runs underneath the existing structure. There is also a 300 mm diameter watermain upstream of the structure.

There are two storm sewers, 900 mm and 1000 mm, which connect into the downstream end of the existing structure.

The hydraulic assessment completed as part of the ACFMEA revealed that the existing Fairview Street crossing has a maximum hydraulic conveyance capacity of the 5-year storm. It was found that Fairview Street becomes inundated during the Regional Storm event.

5.0 Changes Since the Completion of the Schedule B Municipal Class Environmental Assessment

An overview of the changes that have occurred since the February 2019 ACFMEA and the circumstances necessitating a change to the preferred solution of the ACFMEA are provided below and described further in this section, including:

- Response to the Ontario Land Tribunal (OLT) Minutes of Settlement between Branthaven, the City, Conservation Halton and Regional Municipality of Halton (November 2023).
- City of Burlington amendment to the Official Plan (to permit increased development density, intensification, and land use forms on the Oval Court Development site subject to the refinement of existing flooding and erosion hazards).
- Update to the flood hazard mapping for the 'East Burlington Creeks' and the need to convey Regional Storm to maximize table lands allowing for the increase development density and intensification (EBC, 2023).
- The change of funding source for the construction of the culvert / bridge from capital budget to development charge process.

5.1 Obligations Under the Ontario Land Tribunal Settlement (OLT)

As part of the OLT settlement (dated November 2023) between the City of Burlington and Branthaven Development the following two main Clauses as it related to conducting this Addendum has been agreed upon and must be adhered to:

Clause 19:

> *"The Fairview Street road crossing upgrades will be comprised of a culvert or bridge structure capable of conveying the Regional Storm event without overtopping Fairview Street, determined through a detailed design process, to the satisfaction of the City of Burlington and Conservation Halton, to the extent that the road crossing upgrades are the subject of a Conservation Halton permit. While the City agrees that the crossing design will be optimized at the detailed design stage, that design should incorporate a single span design and only if determined by the City that a single span design is not feasible will a dual conduit design be considered. Branthaven agrees to explore design options to mitigate and reduce the raising of the Fairview Street road profile as a result of the single span structure design. For certainty, while City staff appreciates that Branthaven wants to optimize the road crossing design to minimize road reconstruction costs and impacts, if a single span culvert or bridge is feasible to implement but requires additional road reconstruction to occur, the Parties agree that that is what should occur."*

Clause 24:

> *"The Parties agree that Branthaven shall prepare an update to the Environmental Assessment dated [February 11, 2019] (the "Flood Control EA"). This update shall be appended to the Flood Control EA as an addendum to evaluate the upgraded culvert or bridge structure in combination with the widening of the creek channel to increase the conveyance capacity to convey Regional Storm Flows without overtopping Fairview Street, and shall include the following items:*
>
> - An introduction / background.
> - A review for changes to existing conditions.
> - An identification of alternative options.
> - An evaluation of alternatives and recommendations supported by hydraulic modelling.
>
> *The parties further agree that Branthaven and the City will work cooperatively to host a public meeting to inform members of the public of the Creek Works, forthwith before completion of the aforementioned update."*

5.2 City of Burlington Amendment to Official Plan

As stated in the City of Burlington's Community Planning Report to Council, dated September 27, 2023, and as it relates to the Oval Court development lands, two key point shall be noted:

> *"Staff are of the opinion that the proposed development is consistent with the PPS, subject to the existing limits of flooding and erosion hazards of the lands being refined as a result of upgrades to the Fairview Street creek crossing and alterations to Appleby creek and associated hazard lands to provide safe access and updated regulatory limits as confirmed through the use of holding provision per the amending zoning bylaw, and the completion of Record of Site Condition."*
>
> *"The proposed development as revised by the Offer to Settle conforms to the Growth Plan, subject to the existing limits of flooding and erosion hazards of the lands being refined as a result of upgrades to the Fairview Street creek crossing and alterations to Appleby creek and associated hazard lands to provide safe access and updated regulatory limits as confirmed through the use of holding provision per the amending zoning bylaw."*

As identified in the OLT Minutes of Settlement dated November 24, 2023, the Amendment to the Official Plan is outlined under **Basis for The Amendment – Cause 3a**. An excerpt of the final ruling indicates the following:

Clause 3a

> *"The application proposes intensification that is consistent with the Provincial Policy Statement (PPS), subject to the existing limits of flooding and erosion hazards being refined as a result of future upgrades to the Fairview Street creek crossing and alterations to Appleby creek and associated hazard lands to ensure development is outside of hazardous lands and to provide safe access, all of which is to be confirmed through the use of a holding provision per the amending Zoning by-law."*

Due to the increased development density and land use form that includes residential, commercial and mixed-use buildings, it became necessary to optimize the use of table lands by examining options that could reduce the amount of land that would fall within the flood hazard limits. These changes in intensification also include the associated changes to infrastructure requirements (water, sanitary, and storm) and stormwater management strategies, resulting in potential additional socio-economic and natural environment impacts and mitigation measures associated with flood hazards.

To address the flood hazards in support of the proposed development on the Oval Court lands, a combination of conveyance improvements including upstream and downstream channel modifications will be required in conjunction with replacing the crossing at Fairview Street.

5.3 East Burlington Creek Flood Hazard Mapping Summary

In September 2023 Conservation Halton, through WSP Canada, completed an update to the flood hazard mapping for the 'East Burlington Creeks' (East Burlington Creeks (EBC) Flood Hazard Mapping Study – Hydrology Report, Conservation Halton, September 18, 2023.). The scope of work included the development of new hydrologic and hydraulic models (both 1-dimensional (1D) and 2-dimensional (2D) for each of the East Burlington Creeks watersheds, ultimately leading to the preparation of floodline delineation and flood hazard mapping.

Within the study area, the findings illustrated that the channel does not have the capacity to contain the Regional Storm flows south of the CNR. Regional flows also spill west and east onto Fairview Street. These spills follow multiple flow paths south along several streets.

Source: EBC Study 2023 - Figure 5.5

Based upon the results of the updated flood hazard modelling and mapping in the EBC report, an evaluation of structures (buildings) at risk was completed for the 1D modelling results, representing the 100-year and Regional Storm flood hazard limits, and the 2D modelling results which represents the Spill Inundation Limits. Based upon land use category, the regulatory floodplain limits (riverine flooding) and the building footprint mapping provided by Conservation Halton, the findings of the study identified a variety of flood vulnerable roadways and buildings. This analysis resulted in the identification of 86 flood vulnerable buildings in Appleby Creek, with the majority of the identified structures designated as low density residential.

The riverine flood vulnerability of each watershed system was analyzed to generate a priority list of the top twenty (20) flood vulnerable areas to be considered for mitigation. Of those twenty (20) areas, one (1) was the Appleby Creek. Table 1 provides a summary of the buildings at risk per watershed is provided in the table below:

Table 1: Summary of Estimated Buildings at Risk per Watershed

WATERSHED[1]	ESTIMATED NUMBER OF BUILDINGS WITHIN THE FLOOD HAZARD		
	100-YEAR 1D FLOOD HAZARD	REGIONAL 1D FLOODPLAIN	SPILL INUNDATION LIMITS
Tuck Creek	109	190	181
Shoreacres Creek	15	55	174
Appleby Creek	27	43	131
Sheldon Creek	73	181	267
Total	**224**	**469**	**753**

Source: EBC Study 2023 – Table 6.2

The EBC study noted that the modelling and mapping produced as part of the EBC study can be considered appropriate for use in the administration of Ontario Regulation 162/06 (Replaced by Ontario Regulation 41/24 on April 1, 2024) and land use decision making.

5.4 Future Development Lands

The Regional Storm flood plain is the greatest constraint to development lands under existing conditions. Under existing conditions, three of the properties on Oval Court lands are within the Regional Storm flood plain and all lands do not have flood free access which limits redevelopment potential. The 2019 ACFMEA documented the following under each Fairview Road Bridge Improvement:

Option 2 – 17 m Span – 100-yr Conveyance

A hydraulic assessment of the proposed bridge was undertaken, and it was determined that the minimum width of the bridge to pass the 100-year flood and maintain the existing road surface elevation would need to be 17m). Under the proposed conditions for Option 2, it was expected that there will be four (4) buildings within the regional floodplain and Fairview Road is expected to be overtopped under the Regional Storm flood conditions.

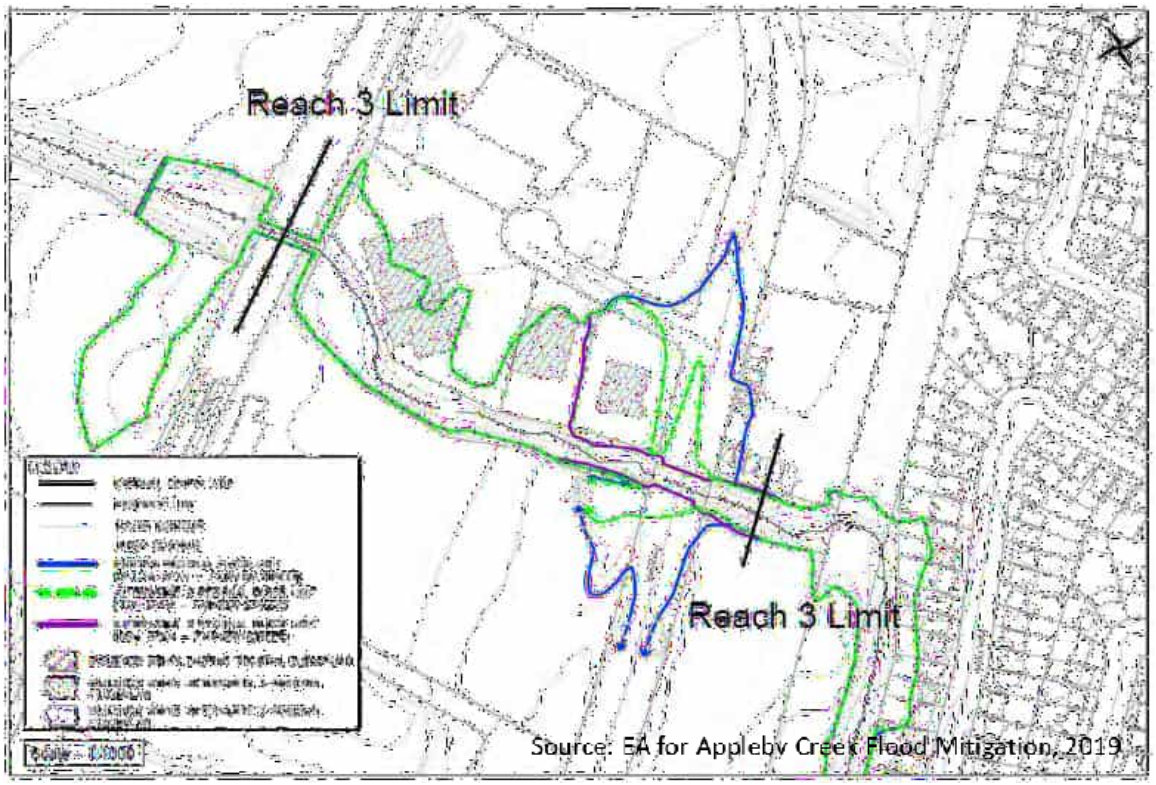
Option 3 – 60 m Span – Regional Conveyance

Similar to Option 2, this alternative investigated replacing the existing Fairview Road bridge with a larger span, however the intention of this alternative was to widen the bridge enough to pass the Regional Storm. This widening would improve hydraulic conveyance with limited risk of road inundation. A hydraulic assessment of the bridge was undertaken using a larger bridge span of 60 m to pass the Regional Storm. This alternative provided a significant increase in the hydraulic conveyance capacity through the crossing, removing at least six (6) buildings from the floodplain and increasing the available table lands within the Oval Court property. Figure 1 illustrates the future development lands at Oval Court.

Figure 1: Future Oval Court Development Limits

To illustrate the reduction of the flood line on table lands as you increase the convenance size of the Fairview structure, the 2019 ACFMEA report provided Figure 2 which illustrated the flood limit comparisons between the existing bridge span, the 17-m span option and the larger 60-m span option.

Figure 2: Flood Limit Comparison between Existing vs. 17 m Span vs. 60 m Span



6.0 Revised Alternative Solution

The 17-m-wide crossing at Fairview Street identified as the preferred solution of the 2019 ACFMEA does not provide conveyance of the Regional Storm beneath the crossing and precludes the best and most efficient use of land for the approved level of intensification in the study area, specifically for the Oval Court lands. As stated in the ACFMEA, a larger crossing and a widening of the valley will improve existing limits of flooding and erosion hazards within the study area.

The potential impact of the alternative crossing structures was re-evaluated against the established criteria and updated to address the changes to the project environment since the 2019 ACFMEA. An average ranking was applied under each of the natural, socio-cultural, and financial environments.

Based on the review of the options established in the 2019 ACFMEA as well as the need to improve the crossing structure to pass the Regional Storm and optimize adjacent development lands, the preferred solution for the Fairview Street crossing structure is revised to a larger span structure, represented by Alternative 3 of the 2019 ACFMEA.

Criteria for Evaluating Alternatives	Larger Span Rigid Frame Structures	Clear Span Bridge (17m)
Summary Natural Environment		
Impact to water quality, quantity, aquatic habitat, impact to terrestrial habitat, species at risk, impact to climate change		
Summary Socio-Cultural Environment		
conformity to local planning provisions, property impacts, access to adjacent properties, impact to cultural resources, construction duration		
Summary Financial Factors		
Capital Costs (cost of each option is within 5%), Operating and Maintenance Costs		
Summary Technical Factors		
Bridge Profile / Impact to Road Elevation, hydraulic performance, foundation requirements		
Problem / Opportunity Statement		
Addresses Problem / Opportunity Statement	Yes	Yes
Overall Summary	**Most Preferred**	**Least Preferred**

The preferred solution for the crossing structure is to include the upstream and downstream channel improvements as recommended in the 2019 ACFMEA and proposed as a part of the Appleby Creek Erosion Control EA.

6.1 Natural Environment

Each of the alternatives are anticipated to have an equivalent impact on the Natural Environment. Fish habitat as defined under the federal *Fisheries Act* is present in association with Appleby Creek and has the potential to be impacted by each of the structure alternatives. Each alternative will increase fish passage through an open base. Each of the alternatives will result in a loss of vegetation and potential impact on terrestrial habitat for urban tolerant species. The extent of impact will be dependent on the grading required for the preferred design of the crossing structure. Potential impacts to natural heritage features are anticipated to be low and short-term provided all proposed mitigation measures are implemented. The restoration measures proposed as a part of the flood mitigation and erosion control measures along Appleby Creek that will be undertaken as a part of the replacement of the existing structure on Fairview Street will improve the existing ecological conditions of the valleylands and watercourse.

6.2 Socio-cultural Environment

The 2019 ACFMEA and preliminary design work relating to the existing Fairview Street crossing structure identified that the structure is located in an urban environment with entrances (Metrolinx) and intersecting roads in close proximity. Fairview Street is a dead-end street terminating at the Sherwood Forest Park and Sports Facility. As a result, the City of Burlington has identified that the extent of roadwork is to be minimized as much as possible to ensure that road profiles and intersections are not significantly impacted. Access to the park and the residences / businesses beyond the Appleby Creek must be maintained at all times.

The larger span crossing structure supports the obligations under the Ontario Land Tribunal and City Official Plan amendments to permit increase development density by minimizing existing flood and erosion hazard. The existing bridge does not merit designation for cultural heritage, as such, none of the alternatives are anticipated to impact built heritage resources.

None of the alternative crossing structures will require property acquisition as construction is to be completed within the existing ROW; however, grading may be required for driveway access to connect adjacent properties to the road. The extent of grading and duration of construction will be dependent on the future design option for the wider span crossing structure.

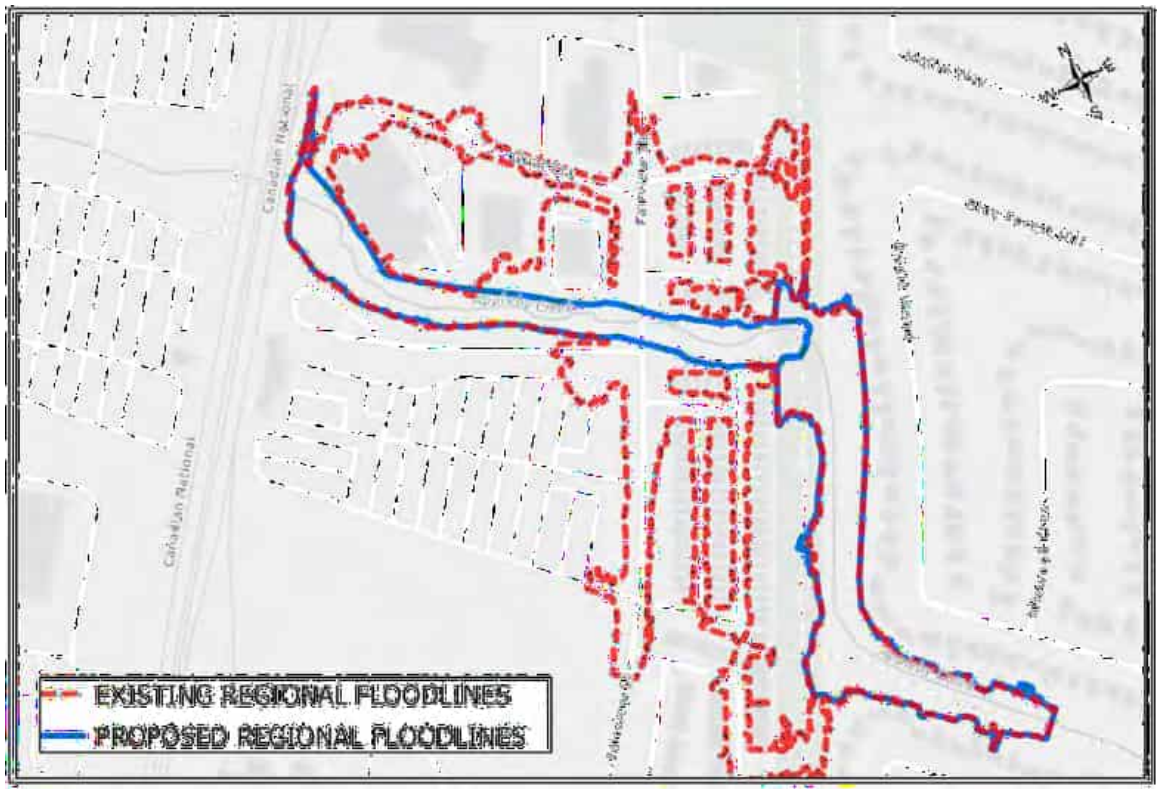
6.3 Financial Environment

The larger span crossing structure of Option 3 is anticipated to have a higher capital cost that the 17m wide structure of Option 2, however, additional costs may be off set by development charges.

6.4 Technical Environment

The HEC RAS 2D modelling has shown that the larger span structure can pass the Regional Storm event on the assumption that the proposed grading of the creek channel cross-section is completed upstream and downstream of the crossing as part of the preferred crossing structure alternative.

Figure 3: Flood Limit with Larger Span Crossing



Being in an urban environment, there is considerable infrastructure that will need to be managed during construction and / or relocated prior to construction for each alternative considered. This includes but may not be limited to: watermains, storm sewers, sanitary sewers (not to be moved), gas, cable, communications, telephone, and hydro.

Several geotechnical reports prepared for the Oval Court lands were considered in conjunction with the most recent geotechnical report. To determine the most appropriate foundation mechanism for the crossing structure, the following were taken into consideration:

- The timing of in-water works (June 15 to March 31).
- Expected construction duration.
- Proposed structure geometry.
- Foundation elevations.
- Overall costs to assess operational practicalities.

The geotechnical report confirmed that sound bedrock was available close to the surface suitable for conventional spread footings. It was recommended that the foundations be placed below frost level which established the underside of footings.

7.0 Alternative Options for the Fairview Street Crossing Structure

In addition to revising the preferred solution to a structure that allows for the Regional Storm event, three alternative design options to replace the crossing structure at Fairview Street were developed. All three crossing structure options were sized to convey the Regional Storm without overtopping Fairview Street, while containing the flood within a modified creek cross-section. Each option also includes upstream and downstream channel improvements as recommended in the ACFMEA. The details of structures and their analysis can be found in the Structural Design Brief Technical Memorandum under Appendix A. The conceptual design drawings for all three options can also be found under Appendix A.

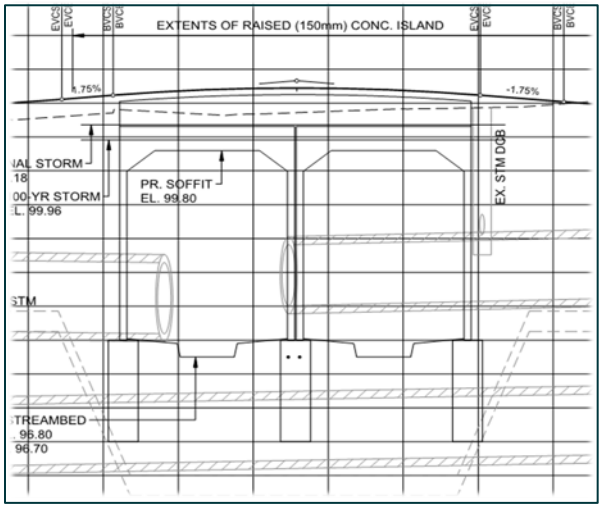
7.1 Twin Equal Span Precast Rigid Frame Culverts

This option includes the installation of two equal precast concrete rigid frame spans of 10 m separated by a central pier created by the legs of the frames. Based on the proposed soffit and expected foundation elevations, the structures will be twin 10.363 x 2.440 m precast rigid frames which is a standard precast size for this type of component. The rigid frames will be founded on cast-in-place concrete foundations estimated at elevation of 96.0 into sound bedrock.

The soffits of both frames will be set at the same elevation and the resulting increase in road elevation above the current road profile is expected to be approximately 350 mm. This is based on the deck thickness of that span of precast element which is 350 mm and the need for a load distribution slab with built in sidewalks and boulevards.

The open-bottom rigid frame structures will sit on cast-in-place concrete foundations set into sound rock. Where necessary, bridging over the existing sanitary sewer system may be required. Figure 4 illustrates the two equal span type of culvert.

Figure 4: Twin Equal Span Precast Rigid Frame Culverts



Description:

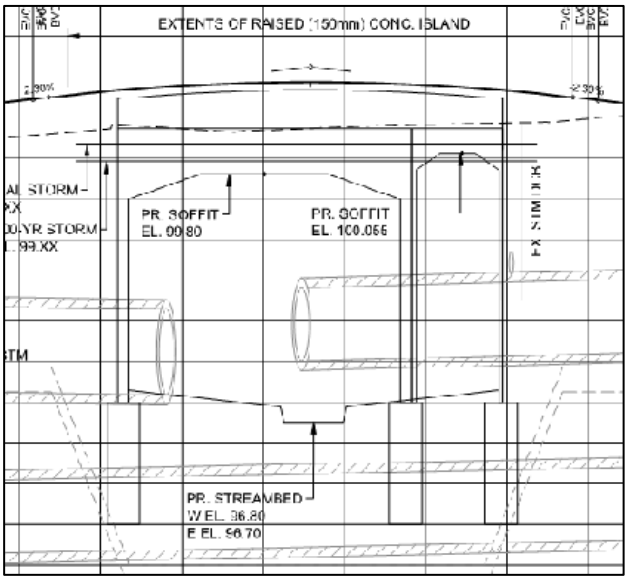
Two equal precast concrete rigid frame spans of 10 m, separated by a central pier created by the legs of the frames.

7.2 Two Unequal Span Precast Rigid Frame Culverts

This option includes two unequal precast concrete ridged frames with spans of 16 m and 4 m separated by a pier created by the legs of the culverts. Based on the proposed soffit and expected foundation elevations, the system will consist of a 16.159 x 1.830 precast culvert adjacent to a 4.257 x 1.830 precast culvert. For the best hydraulic performance, the soffits of the two structures will be set at different heights, with the top of the concrete decks matching to simplify the placement of the distribution slab.

The deck thickness of the 16 m span culvert is approximately 559 mm which is some 200 mm thicker that the 10 m span option and will result in an increase in road elevation above the current road profile in the range of 550 mm. The open-bottom rigid frame structures will sit on cast-in-place concrete foundations set into sound rock. Where necessary, bridging over the existing sanitary sewer system may be required. Figure 5 illustrates the two unequal span type of culvert.

Figure 5: Two Unequal Span Precast Rigid Frame Culverts



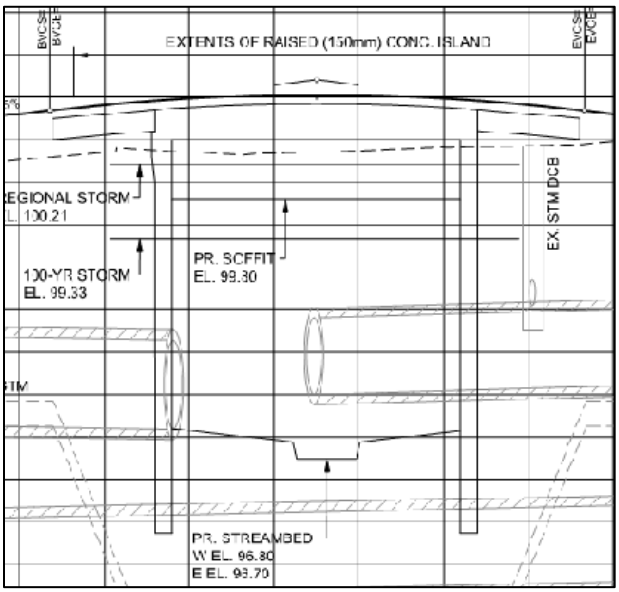
Description:

Two unequal precast concrete ridged frames with spans of 16 m and 4 m separated by a pier created by the legs of the culverts.

7.3 Clear Span Precast Box Girder Bridge (17m)

This option includes the use of a 17 m clear span box girder bridge structure. In this option there is no central pier, and the bridge will be a clear span. The soffit of the structure will be set at the same elevation as the other options. Due to the thicker depth of the 17 m span box girders, approximately 700 mm for B700 precast box girder, the increase in road elevation above the current road profile is expected to be in the range of 700 mm. The open-bottom structure will sit on cast-in-place concrete foundations set into sound rock. Where necessary, bridging over the existing sanitary sewer system may be required. Figure 6 illustrates the clear span type of bridge.

Figure 6: Clear Span Precast Box Girder Bridge



Description:

One 17-m clear span box girder bridge structure with no central pier.

8.0 Analysis of Crossing Structure Options

Several Technical Memorandums were prepared to update the analysis provided in the ACFMEA for the design of the hydraulic crossing structures, including the following:

- Technical Memorandum – Culvert Structural Design Brief, dated March 2024 (R.J. Burnside & Associates).
- Technical Memorandum – Fairview Culvert Hydraulic Assessment and Flood Analysis, dated March 2024 (R.J. Burnside & Associates).
- Technical Memorandum – Natural Heritage Review and Recommendations, dated April 2024 (R.J. Burnside & Associates).

8.1 Hydraulic Analysis

A Hydraulic Report including HECRAS 2D modeling has been prepared for the site. The Hydraulic Assessment Technical Memorandum is provided under Appendix B and provides an outline of the hydraulic analysis and modelling work completed for the study area since the 2019 ACFMEA. Modelling of the high-water levels during the Regional Storm and 100-year flood events have been identified for the structure design options.

The determination of the design rainfall event for a structure is dependent on several factors including the structure span and the type and function of the road. At Fairview Street, the road is classified as a multi-use arterial or minor arterial roadway. However, given the nature of the road, providing access to, and terminating at Sherwood Forest Park, the road functions primarily as a local or collector road.

Typically, the design event for this type of structure would be the 50-year or 100-year event based on MTO Drainage Design Standards, WC -1 Design Flows (Bridges and Culverts). Given that the total span will be in excess of 6.0 m, the 100-year event would be considered reasonable. However, the desirable performance criteria for this structure is that the structure be capable of passing the Regional Storm Event without overtopping the road.

The 2D HEC RAS hydraulic model utilized in the assessment of the Fairview Street crossing was originally prepared by Conservation Halton. The model was obtained by Branthaven for the design of 720 and 740 Oval Court and 5153 Fairview Street. Proposed channel modifications to Appleby Creek and alternative structures for the Fairview Street crossing were investigated within the Conservation Halton model by Urbantech on behalf of Branthaven. Coordination between Urbantech and Conservation Halton occurred during the investigation period. The 2D HEC RAS model that has been ultimately used as a basis for the modelling completed by Burnside was provided by Conservation Halton to Burnside on February 22, 2024.

The 2D HEC RAS model setup, including simulation settings, boundary conditions, terrain data and Manning's 'n' layers were generally maintained from the Conservation Halton model. The following refinements to the model have been made in the preparation of modelling the proposed design alternatives:

- The proposed Fairview Street structure options were modelled as bridges in the HEC RAS 2D model.
- Flows from the EBC study were referenced to update boundary conditions along with flows from storm sewers that connect into Appleby Creek.
- Terrain data has been updated to include the channel improvements, proposed road profile and site grading proposed by Urbantech.

The Hydraulic Technical Memorandum in Appendix B details the reports that were reviewed and utilized in preparation of the hydraulic report. The technical approach taken for the hydraulic modelling is also outlined along with the data generated from the 2D HEC-RAS model.

8.1.1 Proposed Structure Options

Burnside completed a hydraulic analysis of the three different structure options to replace the existing crossing of Appleby Creek under Fairview Street in Burlington. The following options were reviewed, as described in Section 7.0:

- Twin equal span culverts (10 m span culverts).
- Two unequal span culverts.
- Precast Box Beam Girder Bridge (17 m clearspan bridge).

Each option analyzed includes the upstream and downstream channel improvements as recommended in the Appleby Creek Erosion Control Environmental Assessment.

Table 2 outlines the proposed structures that were analyzed in the 2D HEC RAS model.

Table 2: Proposed Structure Options

Name	Rise (m)	Span (m)	Length (m)	Soffit Elevation (m)	Number of Barrels
2 Unequal Span Culverts	2.8	16.16 4.89	36.2	99.8	2
2 Equal Span Culverts	2.8	10	36.2	99.8	2
17 m Clearspan Bridge	2.8	17	36.2	99.8	1

8.1.2 Headwater & Tailwater Elevation of Proposed Structures

The bridge structures were modelled under the weir/pressure flow routine for high flow events. Table 3 presents the headwater and tailwater elevation observed at each structure under the Regional and 100-year storm events.

Table 3: Model Results

Structure	Regional Storm Event (m^3/s)		100-year Storm Event (m^3/s)	
	Headwater Elevation (m)	Tailwater Elevation (m)	Headwater Elevation (m)	Tailwater Elevation (m)
2 Unequal Span Culverts	100.42	99.83	100.15	99.48
Twin Equal Span Culverts (10m)	100.23	99.81	99.99	99.48

Structure	Regional Storm Event (m^3/s)		100-year Storm Event (m^3/s)	
	Headwater Elevation (m)	**Tailwater Elevation (m)**	**Headwater Elevation (m)**	**Tailwater Elevation (m)**
17 m Clearspan Bridge	100.22	99.75	99.98	99.46

The twin equal span culverts and the 17 m clear span bridge have very similar results under the Regional Storm event, only differing by 0.01 m. The hydraulic model produced will inherently have a very minor degree of error; as such, results that are within a +/- 10 cm tolerance under the same storm event are producing very similar results.

Figures 1 to 3 in Appendix A of the Hydraulic Assessment Technical Memo provide a visual representation of the floodplain extents under each of the scenarios modelled.

Depth and velocity throughout the floodplain were also analyzed for each of the scenarios. Figures 4 to 9 in Appendix A of the Hydraulic Technical Memo display the depth layers and the velocity layers under the Regional and 100-year storms.

The three structures produced similar headwater elevations under the Regional and 100-year storm events. Although the headwater elevations are above the soffit under all scenarios, the water surface is shown to be contained within the creek corridor.

8.1.3 Riparian Storage

Riparian areas serve many ecological functions, some of which act to protect water quality or maintain an ecological balance in a water body. Healthy riparian areas perform several basic functions which help maintain good water quality.

As a result of the proposed channel works, a loss of riparian storage will occur. To lower the water surface elevation, this loss of riparian storage is inevitable, however necessary to reduce the flood hazard risk through the area.

An analysis was completed by Conservation Halton which showed the impact of flood loss due to the proposed channel works had no appreciable impact on flood risk for the downstream area and the regulation limits were generally maintained.

A riparian management zone usually extends from the water's edge to the upland area. The rehabilitation planned with the culvert construction in the zone of transition zones between the water body and the vegetation will enable recovery of healthy riparian areas.

8.2 Structural Analysis

As noted above the Culvert Structural Design Brief has been prepared to assess the crossing structure options for the addendum study. Each structure option is designed to carry the entire road platform including traffic lanes, medians, boulevards, and sidewalks. Each of the structure options will require a similar level of utility relocations and coordination.

The existing crossing does not include any approach guide rail or barrier protection. Design guidance is provided by the MTO Roadside Design Manual, dated May 2020. The manual considers design speed, road function, grades, curvature, and traffic volumes to assess the risks.

The first step in assessing the need for roadside safety is to consider the hazards and establish the clear zone based on traffic speed, volume, and how flat the adjacent roadside slopes are. It was determined that the defined hazard for the structure was the end of the structure and the vertical drop to the creek below. The clear zone is an area in which it is anticipated an errant vehicle could leave the road and recover sufficiently to return to the road. It was determined that the edge of the structure was located outside the clear zone and a Roadside Safety Barrier is not required.

However, as there is a vertical drop of over 1 m, the structure and associated retaining walls would require a Guard as defined in the Ontario Building Code, where the retaining walls would be designated structures under the *Building Code Act*.

The Twin Equal Span and Two Unequal Span culvert options required three footings, while the Clear Span Bridge options require only two footings. The road profile and intersections are least impacted by the Twin Equal Span culvert option, which has the lowest increase in road elevation above the current road profile, anticipated to be ~350 mm.

The Geotechnical Investigation, Proposed Replacement of Creek Crossing Bridge Fairview Street to West of Oval Court Burlington by DS Consultants Ltd., March 28, 2024, can be found under Appendix C.

8.3 Natural Heritage

The natural features within the vicinity of the Fairview Street crossing were reviewed to document existing conditions and assess the environmental implications of the proposed crossing structure options. A background information review and a site visit were completed to determine if the environmental site conditions have remained consistent with those observed during the 2019 ACFMEA.

The scope of review included a review of previously completed supporting natural heritage investigations of the study area (Appleby Creek Erosion Control MCEA, Aquafor

Beech,2020, Scoped Environmental Evaluation Report / Environmental Impact Assessment for 720, 735 & 740 Oval Court and 5135 & 5155 Fairview Street, Burlington Ontario, Beacon Environmental Limited, 2024) as well as a site visit to review existing vegetation communities, potential for significant wildlife habitat, and previously assessed watercourse reaches. The Natural Heritage Review and Recommendations Technical Memorandum is provided in Appendix D.

Appleby Creek is classified under the MNRF Aquatic Resources Area (ARA) as having a warmwater thermal regime. Based on the MNRF's ARA mapping, eight species of fish have been recorded within Appleby Creek. Three additional fish species have been recorded by Conservation Halton.

Burnside observed the four reaches upstream of Fairview Street assessed by Beacon (2024) as well as the conditions 100 m downstream of Fairview Street to the pedestrian bridge associated with the Centennial Trail.

This reach of Appleby Creek has been historically straightened and confined to a narrow valley corridor. The valley walls of the reach upstream of Fairview Street are very steep and heavily vegetated while the valley walls of Appleby Creek downstream (south) of Fairview Street are more gradual but remain heavily vegetated. Channel hardening is present along both the right and left banks of Appleby Creek throughout the study area.

The reaches of Appleby Creek upstream and downstream of Fairview Street provide high-quality fish habitat. Undercut banks are present throughout the entirety of the assessed reach, often with exposed roots of riparian trees and shrubs present. Undercutting is also present beneath the gabion baskets throughout the assessed reaches. Seasonal barriers to fish passage observed by Burnside at the time of site investigation consist of large woody debris and boulders.

Vegetation communities within the study area are degraded and impacted by human activity. Dumping was widespread throughout all communities with household waste frequently being observed within the valleylands and Appleby Creek. Invasive species also dominate the understory layers, with Common Buckthorn growing densely throughout many of the communities present. Common Privet, non-native Honeysuckles, and Multiflora Rose were also frequently encountered.

A difference in the canopy cover within the study area was noted by Burnside in comparison to the findings of the Beacon (2024) and Aquafor Beech (2019 and 2020) reports. As Ash trees have succumbed to Emerald Ash Borer, many of the previously standing snags and dying trees have since fallen, creating an abundance of deadfall logs within the valleylands north of Fairview Road.

Candidate maternal roosting habitat for SAR bats was identified within the 2019 ACFMEA and within the Beacon Scoped EIS, 2024. During the 2024 EIS, Beacon

documented a limited number of calls by Little Brown Myotis (Myotis lucifugus; END). Since calls of Little Brown Myotis were documented, Beacon will be submitting an Information Gathering Form (IGF) to the MECP for further consultation. Beacon will be responsible for the acquisition of any *Endangered Species Act* authorizations for any impacts related to SAR bats within the proposed project limits of the improvements associated with the development of the Oval Court lands Significant Wildlife Habitat for bats was not observed within the proposed project limits of the crossing structure.

Significant Woodlands, Significant Wetlands, Significant Valleylands, Areas of Natural Scientific Interest (ANSIs), and other Significant Wildlife Habitat features are absent from the project limits of the crossing structure.

Overall, the valleylands of Appleby Creek within the study area have low ecological functioning and are representative of a degraded urban natural heritage system. Terrestrial lands are discontinuous due to the presence of roadways. Riparian vegetation associated with the Creek is also constrained due to the presence of existing development. The valleylands currently serve as habitat for urban-tolerant wildlife species which may include nesting migratory birds. Appleby Creek does provide high quality fish habitat.

Site conditions have remained largely consistent with the 2019 ACFMEA.

8.4 Financial Analysis

A high-level cost estimate has been completed for each of the three crossing structure options and summarized in table the below.

Item	Twin Equal Culverts	Two Unequal Culverts	Clear Span Bridge (17 m)
ROW reconstruction servicing and road construction	$6,548,823	$6,856,503	$6,609,823

The cost for each alternative is relatively comparable, with the difference in cost calculated to be within 5%.

The cost estimate prepared is intended to be used for comparison of each of the crossing structure options only. It generally includes the major infrastructure items of demolition, foundations, road reconstruction and utility relocation. It is not intended to be a construction cost estimate and should not be used for budgetary purposes. A construction cost estimate will be prepared during detailed design. For the purposes of this Addendum a detailed cost breakdown can be found under Appendix F. Please note, these cost estimates are not bid or actual construction cost.

9.0 Consultation

A Project Contact List was developed as a mailing list to distribute project Notices. The Project Contact List consisted of agencies, municipalities and utilities, local interest groups, local residents, and Indigenous communities that may have an interest in the project, as well as those included in the notification of the Appleby Creek Flood Mitigation MCEA (2019), where available. The Project Contact List was used to maintain contact information for interested stakeholders, and to summarize comments received about the project and related responses. A copy of the Project Contact List and comments received during the Addendum process is provided in Appendix E.

9.1 Public Open House

An in-person public open house was conducted on June 17, 2024 to allow opportunity for the public to provide input into the Addendum study.

The details of the date, time, location, and purpose of the public open house were advertised in the Hamilton Spectator on June 5, 2024. In addition, the notice of the public open house was emailed / mailed to those on the Project Contact List. The notice of the public open house was also posted to the project page of the City's website and the News section of Burlington.ca, which was emailed to the latest news subscribers. The project information displayed at the public open house was posted to the project page on the City's website following the open house.

A copy of the notice along with the Public Open House Materials are provided in Appendix E.

9.2 Indigenous Communities Engagement

MECP has developed guidance on the steps to rights-based consultation with Indigenous communities. Indigenous communities with a potential interest in the project were identified through correspondence with the MECP and previous project experience. Indigenous communities that were contacted during the Appleby Creek Flood Mitigation MCEA (2019) were also included on the notice circulation.

A summary of comments received from Indigenous communities throughout the project is provided in the Project Contact List in Appendix E.

10.0 Potential Impacts of the Revised Alternative Solution

Project activities associated with the revised preferred solution for the Fairview Street crossing are anticipated to include excavation, grading, and some vegetation removal within the grading limits of construction as well as dewatering and in-water works within Appleby Creek. The limits of grading and construction will be determined upon selection of the future design option for the wider span crossing structure.

10.1 Surface and Groundwater

The recommended foundation elevations are below frost depth, founded on bedrock located below the existing creek bed and below the local ground water table, and subject to seasonal fluctuations. This will involve work to manage both surface water (creek) and groundwater sources with allowances made for rainfall events. Dewatering will be required to excavate the footings and allow their construction in the dry. It is expected that a PTTW may be required.

10.2 Access

Construction activities have the potential to impede access to adjacent properties. Fairview Street is a dead-end street terminating at the Sherwood Forest Park and Sports Facility. Access to the park and the residences / businesses beyond the Appleby Creek must be maintained at all times.

10.3 Utilities

Infrastructure will need to be managed during construction and / or relocated as part of or prior to construction. This includes but may not be limited to: watermains, storm sewers, sanitary sewers (not to be moved), gas, cable, communications, telephone, and hydro.

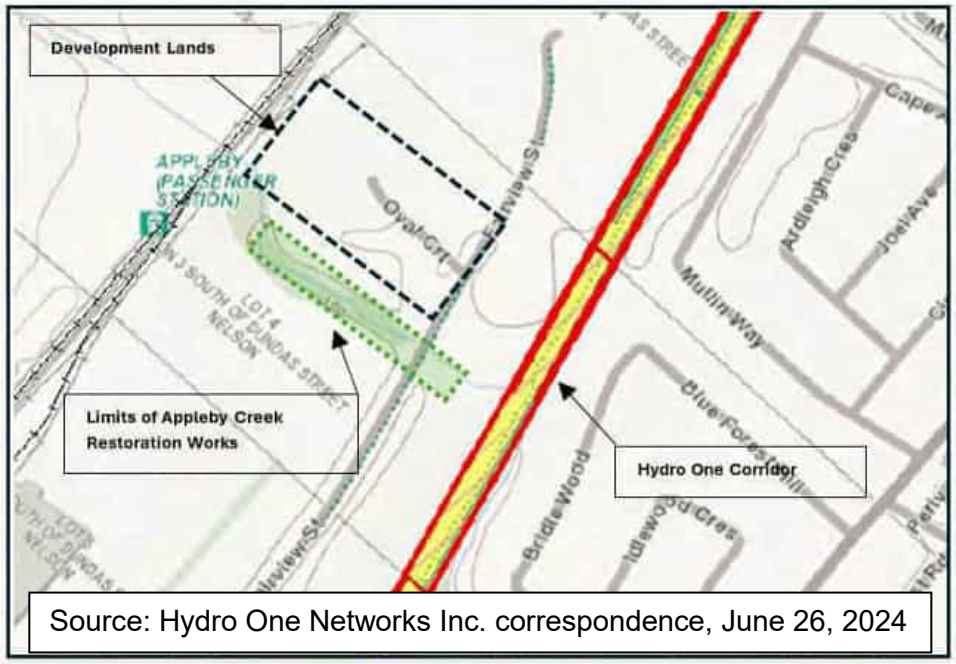
10.3.1 Hydro One

Hydro One Networks Inc. (Hydro One) has indicated that there is a transmission corridor in the vicinity of the bridge replacement project. Hydro One noted that may have provisions for future lines or secondary land uses (e.g., pipelines, watermains, parking). Impacts to the hydro corridor should be avoided.

However, it is anticipated that the bridge/culvert replacement and resulting restoration works will fall well outside of the existing Hydro One corridor; and will not result in any impacts to this hydro corridor and access for all works shall be gained through the Development lands.

Figure 4 illustrates the location of the hydro corridor.

Figure 4: Location of Hydro One Corridor and Restoration Works



10.4 Natural Heritage

Potential impacts to natural heritage features are anticipated to be low and short-term provided all proposed mitigation measures are implemented.

Fish habitat as defined under the federal *Fisheries Act* is present in association with Appleby Creek and has the potential to be impacted by the proposed crossing replacement.

In-water works are required to construct the proposed infrastructure and are required to be completed in the dry which could result in “serious harm to fish and fish habitat”.

Temporary impacts to fish and fish habitat through sediment mobilization may result from culvert replacement activities during construction.

Although the footprint of the proposed crossing structure is greater than the footprint of the existing structure, the proposed crossing structure will lead to an improvement in fish habitat when considered in the context of the associated erosion and flood control measures of the proposed Appleby Creek system improvements being coordinated with the development of the Oval Court lands. The associated system improvements include alleviating impacts associated with erosion of the watercourse banks and sedimentation of the watercourse, removing barriers to improve flow and fish passage, and riparian plantings to provide additional shading to regulate stream temperatures.

11.0 Mitigation Measures

The following mitigation measures and design approach are expected to be implemented to mitigate negative impacts of the revised preferred solution on the environment of the study area and complementary to the recommended mitigation measures as detailed in the ACFMEA.

Mitigation measures are intended to inform the future Detailed Design of the wider span crossing structure and included in the mitigation and monitoring measures developed during the Detailed Design and reporting process. These mitigation measures will be enforced during construction within the Special Provisions section of the Tender Documents, as applicable.

All Design and Construction Reports and Plans are expected to be based on a best management approach that centers on the prevention of impacts, protection of the existing environment, and opportunities for rehabilitation and enhancement of the impacted areas.

11.1 Surface and Groundwater

The construction of the preferred option, including its foundations and proposed creek grading and channelization is to be completed during the in-water works window (June 15 of any year to March 31 in the following year).

Pumps, well heads, and dewatering zones will be designed based on the soil conditions, water levels, and hydraulic conductivity data provided for each culvert in the geotechnical report.

Cofferdams will be constructed of non-erodible materials and will be sized to accommodate base flows with capacity to contain anticipated rainfall events (up to the bankfull flow). Similarly, pumps, channels, and or culverts used to by-pass flows will be sized to accommodate the base flows with provision for fluctuations to manage anticipated rainfall events. The cofferdams and dewatering are expected to remain in place throughout the entire in-water works windows to maximize the work that can be completed.

Dewatering discharge from the in-water work area will not be directed directly back to the watercourse but will be directed to rock basins or other systems designed to preclude erosion of the downstream watercourse.

All dewatering of groundwater sources and any unwatering of foundation excavations will be pumped to silt basins, siltation bags, or similar sediment controls before being released by surface flow through vegetative buffers back to the creek.

Additional testing may be required to provide estimates as to the anticipated dewatering requirements to determine if a Permit to Take Water (PTTW) will be required.

11.2 Access

Construction of the preferred solution will be staged to ensure two-way traffic is provided at all times with traffic managed to facilitate construction staging. Temporary roadway protection may be required adjacent to the active lanes and access to the Metrolinx facility must also remain uninterrupted. Modifications to the Metrolinx facility may be required to always permit bus movement.

11.3 Utilities

During construction, excavation requirements will be minimized to the extent possible to limit the impact on existing infrastructure. Potentially impact utilities are required to be contacted during detailed design to identify potential conflicts or impact to existing infrastructure. Should bridge replacement and associated restoration work result in the need for a hydro corridor expansion or transmission line replacement and/or relocation, Hydro One will be required to complete an Environmental Assessment (EA) will be required as described under the Class Environmental Assessment for Minor Transmission Facilities (Hydro One, 2016).

11.4 Natural Heritage

During construction, excavation requirements will be minimized to the extent possible to reduce the environmental impact.

All proposed works must be completed in conformity with the federal *Fisheries Act*. A request for review should be completed at the detailed design phase of the project. Construction activities that have the potential to impact fish or fish habitat must be built and operated in compliance with the federal *Fisheries Act*. If the “death of a fish by means other than fishing”, or the “harmful alteration, disruption or destruction of fish habitat” is likely to occur as a result of the project, the proponent responsible for the activities is required to obtain an Authorization from the Minister of DFO as per Paragraph 34.4(2) and 35(2)(b) of the *Fisheries Act*.

It is understood that the in-water works (works that interfere directly with the watercourse) can be completed within the period of June 15 of any year to the following March 31. It is further understood that any work in the direct watercourse must be done in the dry.

Protection of the natural environment will be provided during construction through the implementation of erosion and sediment controls (ESC) and post-construction

revegetation plans to support the crossing and associated localized channel improvements are being developed.

Temporary modifications to the existing storm sewer system will be required to ensure that the site is protected during rainfall or storm conditions.

Vegetation / tree clearing will be undertaken between August and March 31 so as not to impact breeding birds and not contravene the *Migratory Birds Convention Act*. The extent of vegetation clearing will be limited and will be delineated and monitored.

Trees for preservation will be protected using tree hording fencing in accordance with the City of Burlington's Tree Protection and Preservation Specifications.

Erosion and sediment controls (ESC) will be established before any work is commenced and shall remain in place until the project is complete, and revegetation is established. Where necessary, and to allow the work to be completed in stages, interim ESC will be installed, relocated and removed as needed to ensure the watercourse is protected at all times. ESC will be monitored, and action plans developed for remediation or its replacement as necessary.

Prior to any work in the watercourse, fish rescue by a qualified person acting under the guidance of a License to Collect Fish will be completed.

It is expected that creek base flows will by-pass the work area using one or more methods including:

- Cofferdam and pumping of base flows.
- Cofferdam and by-pass culvert within the proposed footprint.
- Cofferdam and by-pass culvert around the site.
- Cofferdams and channelization through the site.

Or some combination of the above as warranted.

Any residual un-watering of the channel and or foundation areas will be captured, pumped, and filtered before returning to the stream using filter bags and sediment controls.

The installation of the proposed structure and the creation of the final in-stream channel section, profile, and features will be done concurrently during the in-water works window.

12.0 Conclusion

This report provides the technical background and analysis to support the change of the preferred hydraulic crossing structure at Fairview Street to a wider span structure able to convey the Regional Storm, as an Addendum to the ACFMEA study.

The following changes have been incorporated in the technical updates for the ACFMEA Addendum:

- Response to the Ontario Land Tribunal Settlement Agreement (November 2023).
- City of Burlington amendment to the Official Plan (to permit increased development density, intensification, and land use forms on the Oval Court Development site subject to the refinement of existing flooding and erosion hazards).
- Update to the flood hazard mapping for the 'East Burlington Creeks' and the need to convey Regional Storm to maximize table lands allowing for the increase development density and intensification (EBC, 2023).
- The change of funding source for the construction of the culvert/bridge from capital budget to development charge process.

In support of the revised preferred alternative, three hydraulic structure options were reviewed. The structure options include Twin Equal Span Precast Rigid Frame Culverts, Two Unequal Span Precast Rigid Frame Culverts and a Clear Span Precast Box Concrete Girder Bridge. The options are described in this report and illustrated in Appendix A of this report; in Attachment A of the Structural Technical Memorandum.

The selection of the preferred structure option will be completed during detailed design in future stages of the project with consideration of the following:

- Provides a reduction in water levels upstream of Fairview Street, increasing table lands to support development consistent with the Mobility Hub objectives.
- Addresses the Official Plan Amendment and Obligations under the Ontario Land Tribunal Minutes of Settlement between Branthaven Corp, the City of Burlington and Regional Municipality of Halton and Conservation Halton.
- Enhances the watercourse corridor between the railway line and Fairview Street.
- Structure selection that is consistent with established criteria, including passage of the Regional Storm.
- Road work minimization, with the lowest increase in road elevation above the current road profile.
- Entrance and intersection disturbance minimization; with the least amount of grading to connect adjacent properties to the ROW.
- Foundation option review and optimization based on the geometric requirements and geotechnical considerations.
- Construction duration minimization.
- Waterway control and flood risk exposure reduction based on construction time.

13.0 Implementation

13.1 Construction Staging

The work to construct the structure must be staged to ensure that access is provided to residential and business areas beyond the structure, including access to Sherwood Forest Park. The intent is to ensure that one lane of traffic is provided in each direction throughout construction. This will preclude the need to install temporary traffic signals.

A preliminary traffic staging plan is provided in the structural technical memo in Appendix A. It is anticipated that for specific times, such as unloading precast materials by crane, there may be a need for additional, temporary traffic disruption to be managed by traffic control personnel.

It is anticipated that the first phase of the construction will be the south (downstream) end of the structure. This is based on the need to drop the proposed structure precast elements onto the foundations and slide these under the existing hydro lines. This will ensure that the structure can be situated properly, with any necessary adjustments made at the north end, where there is more room to work.

Is it anticipated that construction of the structure will be completed in conjunction with the required stream grading and channelization works proposed and that channelization works associated with each end will be ongoing at the same time as the structure. The management of the creek surface and base flows will involve the isolation of the work area using cofferdams and the by-pass of base creek flows using pumping, temporary culverts, temporary channels, or some combination of these as the circumstances require.

14.0 References

Appleby Creek Flood Mitigation Municipal Class Environmental Assessment Project File Report, City of Burlington, Aquafor Beech, dated February 2019.

East Burlington Creeks (EBC) Flood Hazard Mapping Study – Hydrology Report, City of Burlington, Conservation Halton, dated September 18, 2023.

Appleby Creek Erosion Control Environmental Assessment Project File Report, City of Burlington, dated August 20, 2020.

Environmental Evaluation Report / Environmental Impact Assessment for 720, 735 & 740 Oval Court and 5135 & 5155 Fairview Street, Beacon Environmental, dated January 2024.

Ontario Land Tribunal, Minutes of Settlement, between City of Burlington and Region of Halton and Branthaven Development Corporation, Application to amend the Zoning By-law, dated November 10, 2023.

Report to City of Burlington Council by Community Planning Department, Planning Analysis for 720, 735 and 740 Oval Court & 5135 and 5155 Fairview Street – Official Plan and Zoning By-law, Amendment Applications, Appendix B to L-60-23, dated September 27, 2023.

Geotechnical Investigation, Proposed Replacement of Creek Crossing Bridge Fairview Street to West of Oval Court Burlington, Ontario, DS Consultants Ltd., dated March 28, 2024.

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Appendix A

Technical Memorandum
Structural Design Brief

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Structural Design Brief

Date: April 26, 2024 **Project No.:** 300057084.5000

Project Name: Fairview Structural Design Memo

Client Name: Branthaven Development - Oval Court

Submitted To: ACFMEA Addendum Project File

Submitted By: Stephen Riley, P.Eng.

Reviewed By: Philip Rowe, C.E.T.

1.0 Introduction

R.J. Burnside & Associates Limited (Burnside) has been retained by Branthaven Development (Branthaven) to provide engineering services for the design, coordination, permitting, and approvals for the replacement of the existing Fairview Street crossing of Appleby Creek in the City of Burlington (City).

An Environmental Assessment (EA) conducted by the City for the entire Appleby Creek watershed determined that the existing structure at Fairview Street could pass a five-year flood event and that larger storm events would overtop the roadway. The EA concluded that when the structure's effective service life comes to an end, the structure should be replaced with a structure that would convey the 100-year flood event. While the impact of the Regional Flood event was considered, it was determined that an option to replace the structure that could convey the Regional Flood was not preferred. Under this scenario, the Regional Storm Event would overtop the roadway.

During the EA process, adjacent landowners (720 & 740 Oval Court and 5153 Fairview Street), collectively representing the Oval Court Lands, had written, in response to the EA commenting process, to request that language to the effect that there would be an opportunity to optimize the proposed crossing should the structure replacement be advanced to accommodate the proposed Oval Court Lands Development be included in the EA. The final EA document included a commitment to this opportunity.

Through further discussions and negotiations with the City, an addendum to the Class EA is ongoing to assess options beyond those considered in the original Environmental Assessment, including a refinement of the hydraulic modelling.

The existing structure consists of a twin-barrel concrete closed bottom box structure consisting of two 3.3 m span x 2.7 m rise cells approximately 29 m long.

The goal of refining the proposed structure is to ensure that any new structure can be sized to convey the Regional Flood without overtopping Fairview Street while containing the flood within a modified creek cross-section.

A hydraulic assessment of structure options is being considered separately and has been provided as part of the Appleby Creek Flood Mitigation Addendum.

2.0 Design Considerations

2.1 Overall Constraints

The EA study and preliminary design work relating to the structure identified that the structure is located in an urban environment with entrances to a Metrolinx parking lot and intersecting roads in proximity. The City has identified that they would prefer for the extent of roadwork to be minimized as much as possible to ensure that the road profile and intersections are not significantly impacted.

Being in an urban environment, there is considerable infrastructure that will need to be managed during construction and / or relocated as part of, or prior to construction. This includes, but may not be limited to, watermains, storm sewers, sanitary sewers (not to be moved), gas, cable, communications, telephone, and hydro.

Fairview Street is a dead-end street terminating at the Sherwood Forest Park and Sports Facility. Access to the park and the residences / businesses beyond Appleby Creek must be maintained at all times. As such, the work will be staged to ensure two-way traffic is provided at all times, with traffic managed to facilitate construction staging.

Temporary roadway protection may be required adjacent to the active lanes and access to the Metrolinx facility must also remain uninterrupted. Modifications to the Metrolinx facility may be required to permit bus movement throughout construction. Discussions with Metrolinx have been initiated.

2.2 Design Code and References

The structure and its foundations will be proportioned and designed according to:

- Canadian Highway Bridge Design Code (CHBDC) CSA S6 -19;

- MTO Structural Manual;
- MTO Roadside Design Manual;
- MTO Highway Drainage Design Standards;
- Geotechnical Investigation and Report by DS Consultants; and
- 4Sight Subsurface Utility Engineering reports.

2.3 Environmental

Protection of the natural environment will be provided during construction through the implementation of erosion and sediment control (ESC) measures, and post-construction revegetation plans to support the crossing and associated localized channel improvements that are being developed.

During construction, excavation requirements will be minimized to the extent possible to reduce the environmental impact and limit the impact on existing infrastructure. Temporary modifications to the existing storm sewer system will be required to ensure that the site is protected during rainfall or storm conditions.

The extent of vegetation clearing will be limited and will be delineated and monitored. ESC measures will be established before any work is commenced and shall remain in place until the project is complete and revegetation is established. Where necessary, and to allow the work to be completed in stages, interim ESC measures will be installed, relocated, and removed as needed to ensure the watercourse is protected at all times. ESC measures will be monitored and action plans will be developed for remediation or replacement as necessary.

It is understood that the in-water works (works that interfere directly with the watercourse) can be completed within the period of June 15 of any year to the following March 31. It is further understood that any work in the direct watercourse must be done in the dry.

Prior to any work in the watercourse, fish rescue by a qualified person acting under the guidance of a License to Collect Fish will be completed.

It is expected that creek base flows will by-pass the work area using one or more methods including:

- Cofferdam and pumping of base flows;
- Cofferdam and by-pass culvert within the proposed footprint;
- Cofferdam and by-pass culvert around the site;
- Cofferdams and channelization through the site; or
- Some combination of the above as warranted.

Any residual un-watering of the channel and or foundation areas will be captured, pumped, and filtered before returning to the stream using filter bags and sediment controls.

The installation of the proposed structure and the creation of the final in-stream channel section, profile, and features will be done concurrently during the in-water works window.

2.3.1 Geomorphology

A separate Geomorphology Technical Memo has been prepared to establish the extent of the low flow and channel modifications and to develop channel restoration sections and profiles. That memo is provided under separate cover.

2.3.2 Hydraulics

A Hydraulic Report including HECRAS 2D modelling has been prepared for the site and is available separately. The high-water levels during the Regional and 100-year flood events have been identified on the various proposed structure plans based on the modelling.

The determination of the design rainfall event for a structure is dependent on several factors including the structure span and the type and function of the road. At Fairview Street, the road is classified as a multi-use arterial or minor arterial roadway. However, given the nature of the road, providing access to, and terminating at Sherwood Forest Park, the road functions primarily as a local or collector road.

Typically, the design event for this type of structure would be the 50-year or 100-year event based on MTO Drainage Design Standards, WC -1 Design Flows (Bridges and Culverts). Given that the total span will exceed 6.0 m, the 100-year event would be considered reasonable.

Regardless of the typical design storm return period, the desirable performance criterion for this structure is that the structure be capable of passing the Regional Storm Event without overtopping the road.

The HEC RAS 2D modelling has shown that each of the considered structures can pass the Regional Flood Event on the assumption that grading of the creek channel cross-section is completed upstream and downstream of the crossing.

3.0 Geotechnical Considerations

3.1 Overview

A detailed Geotechnical Investigation has been completed by DS Consultants. Previous geotechnical reports were prepared for the Oval Court lands, and those reports were considered in conjunction with the most recent report to determine the most appropriate foundation mechanism for each structure. The Geotechnical Investigation Report by DS Consultants, dated March 28, 2024, can be found in the Appendix of Appleby Creek Erosion Control EA Addendum.

The key issues as far as the structure is concerned include, but may not be limited to:

- Bearing capacity;
- Settlement; and
- Dewatering requirements.

All foundation options were initially considered, including deep pile foundations, drilled caisson foundations, and conventional spread footing foundations. However, the geotechnical report confirmed that sound bedrock was available close to the surface suitable for conventional spread footings. Options for pile foundations and caisson foundations could be abandoned as they were no longer viable or practical.

The geotechnical report provided concentric bearing capacities at Serviceability Limit States (SLS) and at Ultimate Limit States (ULS). The capacity at SLS was based on a maximum limiting settlement of 25 mm which is common.

The capacities provided and associated settlement limitations are suitable for spread footings, which can be constructed using a heavy hydraulic excavator to remove shale bedrock. It was recommended that the foundations be placed below frost level which established the underside of footings of approximately 96.0 m.

Along with the bearing capacity, the report offers comments relating to the construction implications as it relates to groundwater conditions and expected issues related to working within the soil / rock, including the potential for cobbles and boulders, and both short and long-term settlement.

The geotechnical report presented estimated bearing capacities based on assumed foundation widths and anticipated bearing elevations. These values were used to estimate the footing sizes, depths, and plan areas depicted on the 30% submission drawings. The finalization of foundations is an iterative process between the structural and geotechnical engineers, to arrive at the most effective solution and this continues.

Table 1: Spread Footing Foundation Bearing Capacities

Fairview Street ID	Footing Location	Proposed Elevation (m)	Assumed Width (m)	Factored Axial Resistance (ULS)	Factored Axial Resistance: 25 mm (SLS)
Fairview Street	East & West	96.0	1.5	3500 kPa	2800 kPa

The recommended foundation elevations, which are below frost depth and founded on bedrock, are located below the existing creek bed, below the local groundwater table, and are subject to seasonal fluctuations.

Dewatering will be required to excavate the footings and allow their construction in the dry. Additional testing may be required to provide estimates as to the anticipated dewatering requirements to determine if a Permit to Take Water (PTTW) will be required.

The possibility of using a sheet pile enclosure to limit the degree of dewatering was considered; however, given the nature and location of the underlying rock, these were considered of little value.

The geotechnical report was considered in conjunction with factors such as in-water works windows (June 15 to March 31), expected construction duration, proposed structure geometry, foundation elevations, and overall costs to assess operational practicalities.

The review has determined that spread footing foundations are the most practical option for the structure given the proximity to the surface of competent rock. It was recommended that the footings be placed below the frost level, which established the underside of the footings at an elevation of 96.0 m.

4.0 Structure Considerations

The original EA considered two primary options for the ultimate replacement of the existing structure. These were a 17 m open span structure designed to convey the 100-year storm event and a 60 m span structure designed to convey the Regional Storm event. The 17 m open span option was selected as the preferred solution during the EA, but acknowledged that the Regional Flood event would result in overtopping of the roadway.

During the EA process, adjacent landowners at the northeast corner of the crossing, the subject lands, taken collectively as the Oval Court Lands had provided comments and engaged with the City in discussions and negotiations aimed at ensuring the inclusion of an opportunity to refine and optimize the crossing design as part of an overall development proposal. The refinements would include channel grading, low-flow channels, retaining walls, and revegetation, some of which were outlined in the City’s Erosion Control EA for Appleby Creek.

Through further discussion and negotiation, an Addenda to the original EA is being conducted to assess additional crossing options. A preliminary hydraulic review conducted in conjunction with proposed channel grading has indicated that there is a reasonable expectation that the following options can be shown to pass the regional flood event without overtopping the roadway.

- Twin Equal Span Precast Rigid Frame Culverts;
- Two Unequal Span Precast Rigid Frame Culverts; and
- Precast Box Beam Girder Bridge (17 m span as per the original EA).

Figures illustrating the configuration of the various culvert / bridge options can be found under Attachment A.

4.1.1 Twin Equal Span Precast Rigid Frame Culverts

This option includes the installation of two equal precast concrete rigid frame spans of 10 m, separated by a central pier created by the legs of the frames. Based on the proposed soffit and expected foundation elevations, the structures will be twin 10.363 m x 2.440 m precast rigid frames, which is a standard precast size for this type of component. The rigid frames will be founded on cast-in-place concrete foundations, estimated to be founded at an elevation of 96.0 m into sound bedrock.

The soffits of both frames will be set at the same elevation and the resulting increase in road elevation above the current road profile is expected to be approximately 350 mm. This is based on the deck thickness of the span of the precast element, which is 350 mm, and the need for a load distribution slab with built-in sidewalks and boulevards.

Where necessary, bridging over the existing sanitary sewer and / or watermains may be required.

4.1.2 Two Unequal Span Rigid Frame Culverts

This option includes the installation of two unequal precast concrete rigid frame spans of 16 m and 4 m respectively, separated by a pier created by the legs of the frames. Based on the proposed soffit and expected foundation elevations, the system will consist of a 16.159 m x 2.440 m precast rigid frame adjacent to a 4.257 m x 2.440 m precast rigid frame. These are standard precast sizes of this type of component. The rigid frames will be founded on cast-in-place concrete foundations, estimated to be founded at an elevation of 96.0 m into sound bedrock.

For the best hydraulic performance, the soffits of the two structures will be set at different heights to maximize the opening. In this configuration, the tops of the two rigid frames would match, rather than the soffits, which will also simplify the placement of the distribution slab with built-in sidewalks and boulevards. The central foundation unit will be stepped to accommodate the difference in structure depth.

The deck thickness of a 16 m span rigid frame is approximately 560 mm, which is 210 mm thicker than the 10 m span considered above, and will result in an increase in road elevation above the current road profile in the range of 550 mm.

Where necessary, bridging over the existing sanitary sewer and / or watermains may be required.

4.1.3 Precast Box Girder Bridge

A 17 m span bridge, similar to that considered in the original EA, was reconsidered in the context of an improved hydraulic model, and more specific information is available relating to geotechnical conditions.

This option includes the installation of a 17 m clear-span box girder bridge structure. For this option, there is no central pier and the bridge will be a clear span. The soffit of the structure will be set at the same elevation as the other options. The girders will be supported by cast-in-place concrete abutments, which will in turn be founded on concrete footings, founded at an elevation of 96.00 m in sound bedrock.

Due to the thicker depth of the 17 m span box girders, which is 700 mm based on an industry-standard B-700 precast box girder, the increase in road elevation above the current road profile is expected to be in the range of 700 mm.

Where necessary, bridging over the existing sanitary sewer system may be required.

5.0 Option Evaluation

The options being considered for the site include:

- Twin Equal Span Precast Rigid Frame Culverts;
- Two Unequal Span Precast Rigid Frame Culverts; and
- Precast Box Beams.

The evaluation of the options will consider:

- Utility Relocations;
- Traffic Control Requirements;
- Foundation Requirements;
- Waterway Control Requirements;
- Hydraulic Performance;
- Roadway Improvements;
- Construction Duration; and
- Construction Cost.

The work related to items for Utility Relocations and Traffic Control will be effectively the same for each of the options under consideration.

The degree to which each of the options is affected by related parameters is outlined in Table 2. Green represents the best option for the reasons outlined in the table. Yellow represents an intermediate or second-best option as outlined in the table. Orange represents the worst or least favourable option as outlined in the table.

Table 2: Evaluation of Options to Consider

Evaluation Parameter	Twin Culverts	Unequal Leg Culverts	Clear Span Bridge
Foundation Requirements	All options require strip type concrete footings. Culvert options require three footings.	All options require strip type concrete footings. Culvert options require three footings.	All options require strip type concrete footings. Clear Span Bridge requires only two footings.
Utilities Relocation	All options will require similar utilities relocations.	All options will require similar utilities relocations.	All options will require similar utilities relocations.
Waterway Control	Waterway Control required for all options, least duration for culvert options.	Waterway Control required for all options, least duration for culvert options.	Waterway Control required for all options, the longest duration for clear span bridge, due to abutment construction duration.
Hydraulic Performance	Best Hydraulic Performance, See Hydraulic Memo.	Worst Hydraulic Performance, see Hydraulic Memo.	Best Hydraulic Performance, see Hydraulic Memo.
Traffic Control Requirements	All options require staging.	All options require staging.	All options require staging.
Roadway Improvements	Least amount of roadway improvements (360 mm fill and 1550 m^2).	Middle amount of roadway improvements (560 mm fill and 1725 m^2).	Largest amount of Roadway improvements (700 mm fill and 1875 m^2).
Construction Duration	Shortest duration.	Shortest duration.	Longest duration. Based on the need to build abutments between footings and precast.
Construction Cost	Lowest cost, but all within 5% at this stage.	Highest cost, but all within 5% at this stage.	Middle cost, but all within 5% at this stage.
Overall Rank	**1**	**2**	**3**

Overall, from this review, the two equal leg culverts are the preferred option.

The twin culvert option results in the shortest construction duration, the lowest construction cost, the least amount of road fill and road reconstruction, and provides the hydraulic performance required.

6.0 Overall Structure Geometry, Dewatering, and Staging

6.1 Overview

Each structure has been designed to carry the entire road platform including traffic lanes, medians, boulevards, and sidewalks. Utilities will be relocated as part of the work and each of the structure options will require a similar level of utility relocations and coordination.

6.2 Roadside Safety – Structures and Road

Consideration has been given to roadside safety. The existing crossing does not include any approach guide rail or barrier protection. Design guidance is provided by the MTO Roadside Design Manual, dated May 2020. The Manual assesses the severity index of various categories of risk and interest and makes an assessment as to the need for and extent of potential safety systems.

The manual considers design speed, road function, grades, curvature, and traffic volumes to assess the risks.

Roadside safety considers the risks to a variety of hazards within a “desirable clear zone” or area in which it is anticipated that an errant vehicle could leave the road and recover sufficiently to return to the road. The clear zone is defined in the Roadside Design manual as follows:

> *“The unobstructed, traversable area provided beyond the edge of the through travelled way available for use by errant vehicles. The clear zone includes shoulders, bike lanes, and auxiliary lanes, except those auxiliary lanes that function like through lanes. The clear zone also includes recoverable slopes, and non-recoverable slopes with a clear run-out area. The selected clear zone width for a project is dependent upon traffic volumes and design speed, and roadside geometry”.*

Where a hazard is within the desirable clear zone, the options include relocating the hazard beyond the clear zone or shielding or protecting the hazard with a protection system. There are many systems to be considered.

The first step in assessing the need for roadside safety is to establish the clear zone based on traffic speed, volume, and how flat the adjacent roadside slopes are. At the structure, it was determined that the defined hazard was the end of the structure and the vertical drop to the creek below. It was determined that the edge of the structure, was located outside the clear zone and an argument could be made that a Roadside Safety Barrier is not required. However, as there is a vertical drop of over 1 m, the structure and associated retaining walls would require a Guard as defined in the Ontario Building Code, where the retaining walls would be designated structures under the Act. At the ends of the culvert and on the retaining wall approaches to the culverts, traffic barriers and railings have been provided.

6.3 Construction Sequencing and Dewatering

The construction of any of the options, including their foundations and creek grading and channelization is to be completed during the in-water works window (June 15 of any year to March 31 of the following year). This work involves activities directly in the streambed and must be completed in the dry. This will involve work to manage both surface water (creek) and groundwater sources with allowances made for rainfall events.

The management of the creek surface and base flows will involve the isolation of the work area using cofferdams, and the by-pass of base creek flows using pumping, temporary culverts, temporary channels, or some combination of these as the circumstances require.

Cofferdams will be constructed of non-erodible materials and will be sized to accommodate base flows with the capacity to contain anticipated rainfall events. Similarly, pumps, channels, and / or culverts used to by-pass flows will be sized to accommodate the base flows with provision for fluctuations to manage anticipated rainfall events.

By-passed flows will not be directed directly back to the watercourse but will be directed to rock basins or other systems designed to preclude erosion of the downstream watercourse.

Groundwater sources will have to be dewatered to allow the foundations to be constructed in dry conditions. Pumps, well heads, and dewatering zones will be designed based on the soil conditions, water levels, and hydraulic conductivity data provided for each culvert in the geotechnical report.

It is expected that a PTTW may be required to complete these operations. All dewatering of groundwater sources and any unwatering of foundation excavations will not be released back into the watercourse. All dewatering and unwatering will be pumped to silt basins, siltation bags, or similar sediment controls before being released by surface flow through vegetative buffers back to the creek.

The cofferdams and dewatering are expected to remain in place throughout the entire in-water works windows to maximize the work that can be completed. Works to backfill the structures and to construct the associated wingwalls and / or retaining walls can be completed outside of the in-water works window.

The work to construct the structure must be staged to ensure that access is provided to residential and business areas beyond the structure, including access to Sherwood Forest Park, and the intent is to ensure that one lane of traffic is provided in each direction throughout construction. This will preclude the need to install temporary traffic signals. It is anticipated that for specific times, such as unloading precast materials by crane, there may be a need for additional, temporary traffic disruption to be managed by traffic control personnel.

It is anticipated that the first phase of the construction will be the south (downstream) end of the structure. This is premised on the need to drop the proposed structure precast elements onto

the foundations and slide these under the existing hydro lines. This will ensure that the structure can be situated properly, with any necessary adjustments made at the north end, where there is more room to work.

Is it anticipated that construction of the structure will be completed in conjunction with the required stream grading and channelization works proposed, and that channelization works associated with each end will be ongoing at the same time as the structure.

6.4 Construction Staging

A preliminary traffic staging plan will generally take the following steps:

Stage 1

- Install Erosion and Sediment Controls.
- Remove the central median, north boulevard, and sidewalk. Provide temporary pavement to allow traffic to be relocated.
- Install temporary concrete barriers along the north edge of the existing structure.
- Establish a driving platform on the north side of the road providing two-lane access, including Temporary Concrete Barriers (TCB) as required.
- Install temporary roadside protection system (if necessary).
- Cofferdam and reroute water through one of the existing culvert barrels.
- Excavate and remove one barrel of existing culvert.
- Access the downstream creek corridor and begin creek grading operations.
- At the same time, relocate any impacted utilities including temporary provisions for stormwater drainage.
- Reroute the watercourse and excavate and remove the remaining portion of the structure.
- Excavate for, form, and place footings.
- Complete channel works and exit the watercourse.
- Install precast culverts (drop and slide under hydro wires).
- Install precast wingwalls / retaining walls or construct cast-in-place walls.
- Backfill structure and wingwalls.
- Construct distribution slab complete with sidewalks and concrete boulevard.
- Construct approach sidewalks, curbs, and boulevards.
- Waterproof and pave base course.

Stage 2

- Shift traffic to the south side of the structure.
- Realign or replace roadway protection (if necessary).
- Reroute water through one of the upstream existing culvert barrels.
- Excavate and remove one barrel of existing culvert.
- Access the upstream creek corridor and begin creek grading operations.

- At the same time, relocate any impacted utilities including temporary provisions for stormwater drainage.
- Reroute the watercourse and excavate and remove the remaining portion of the structure.
- Excavate for, form, and place footings.
- Complete channel works and exit the watercourse.
- Install precast culverts.
- Install precast wingwalls / retaining walls or construct cast-in-place walls.
- Backfill structure and wingwalls.
- Remove cofferdams and allow the creek back into the full channel.
- Construct distribution slab complete with sidewalks and concrete boulevard.
- Construct approach sidewalks, curbs, and boulevards.
- Waterproof and pave base course.
- Top course paving and line painting.

Figure 1: Stage 1 Construction

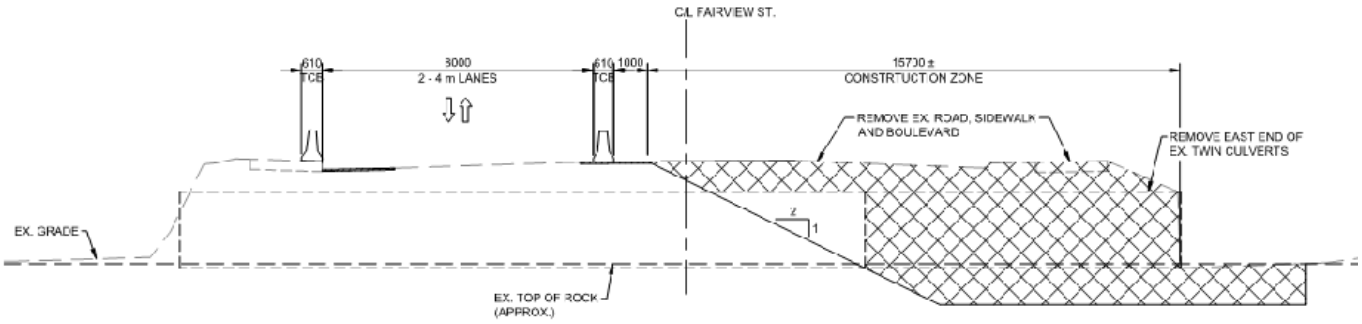


Figure 2: Stage 2 Construction

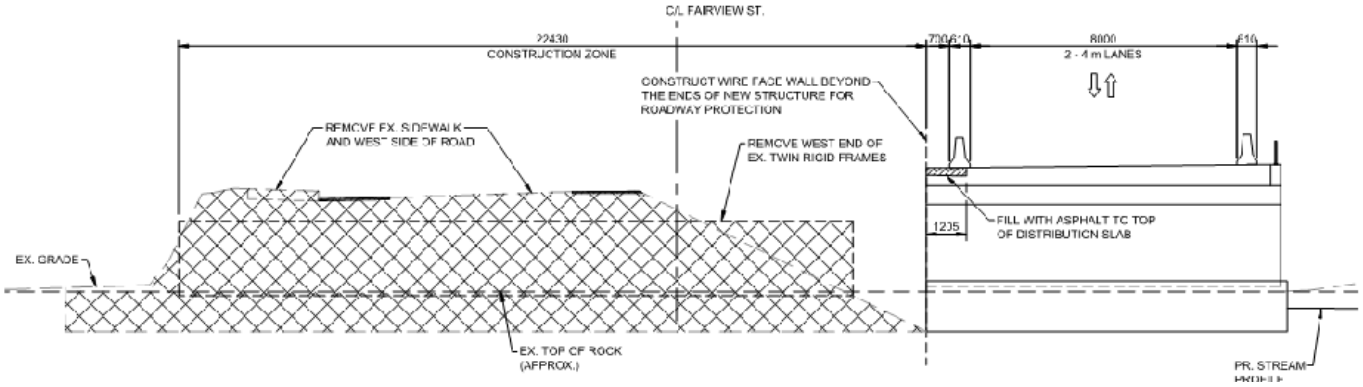
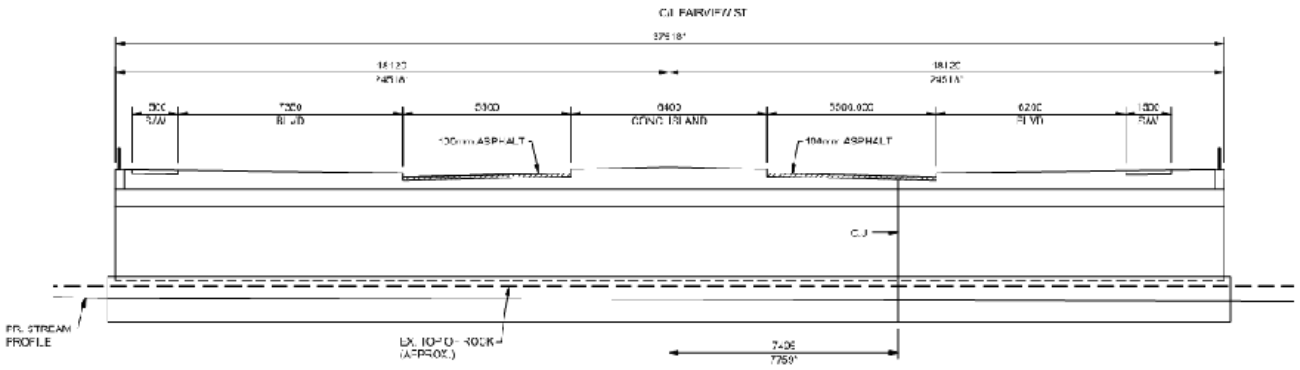


Figure 3: Completion



The complete staging plans can be found under Attachment B.

7.0 Conclusions and Recommendations

The structure design criteria and options established in the original Environmental Assessment as modified by new information and site optimization, provided through an addendum to the EA, have determined that the preferred solution from a structural perspective is the Two Equal Span Culvert option. This design brief illustrates the following.

- Structure selection is consistent with established criteria.
- Road work is minimized.
- Disturbance to entrances is minimized.
- Foundation options have been reviewed and optimized based on the geometric requirements and geotechnical considerations.
- Construction staging has been established to ensure traffic is always maintained at the structure.
- Construction duration can be minimized.
- Waterway control and flood risk exposure is reduced based on construction time.

We trust that the information presented in this illustrates the structure design and constructability issues within the context of the project criteria and constraints.

R.J. Burnside & Associates Limited

Stephen Riley, P.Eng.
Project Manager
SPR:smm

Enclosure(s) Attachment A Culvert / Bridge Options
Attachment B Construction Staging Plans

In the preparation of the various instruments of service contained herein, R.J. Burnside & Associates Limited was required to use and rely upon various sources of information (including but not limited to: reports, data, drawings, observations) produced by parties other than R.J. Burnside & Associates Limited. For its part R.J. Burnside & Associates Limited has proceeded based on the belief that the third party/parties in question produced this documentation using accepted industry standards and best practices and that all information was therefore accurate, correct and free of errors at the time of consultation. As such, the comments, recommendations and materials presented in this instrument of service reflect our best judgment in light of the information available at the time of preparation. R.J. Burnside & Associates Limited, its employees, affiliates and subcontractors accept no liability for inaccuracies or errors in the instruments of service provided to the client, arising from deficiencies in the aforementioned third party materials and documents.

R.J. Burnside & Associates Limited makes no warranties, either express or implied, of merchantability and fitness of the documents and other instruments of service for any purpose other than that specified by the contract.

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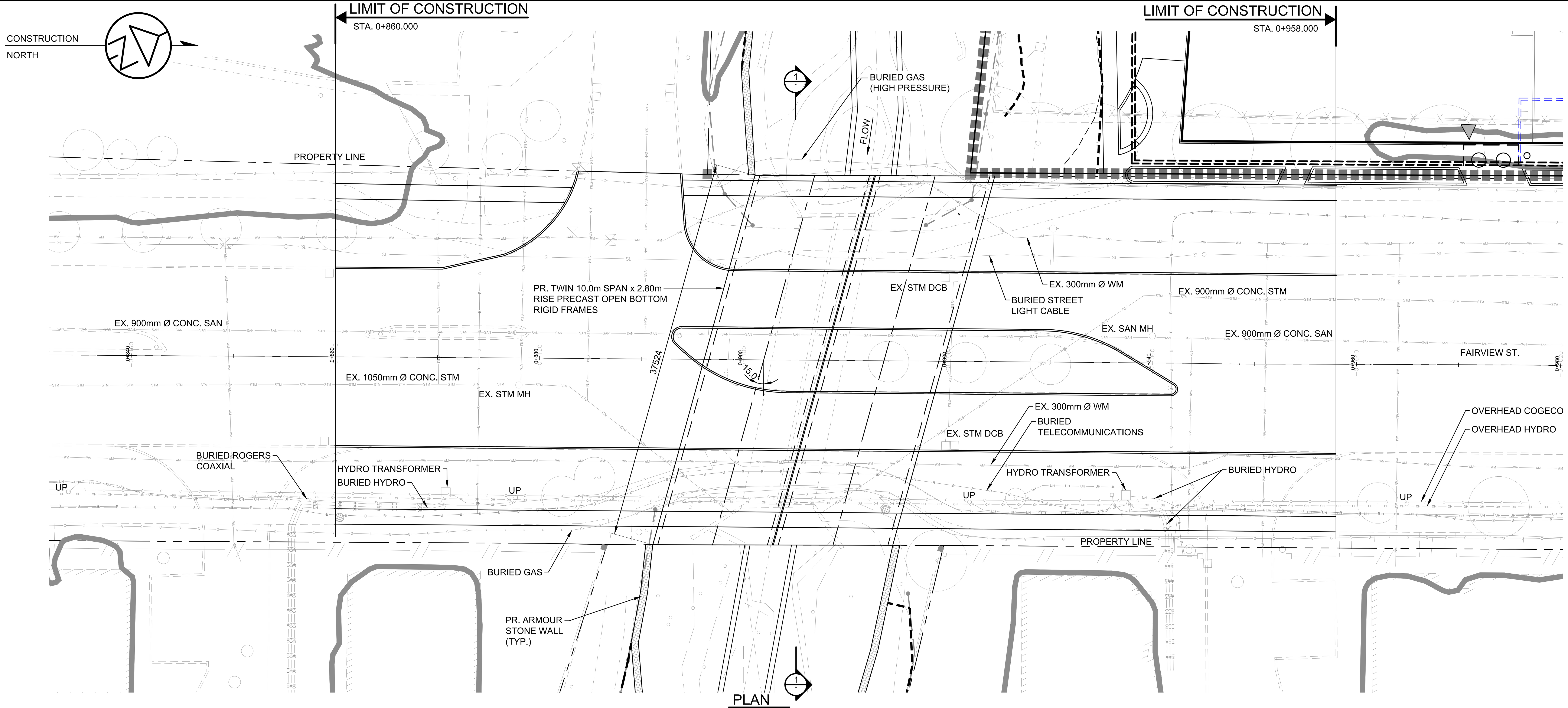
[THE DIFFERENCE IS OUR PEOPLE]

Attachment 1

Culvert / Bridge Options



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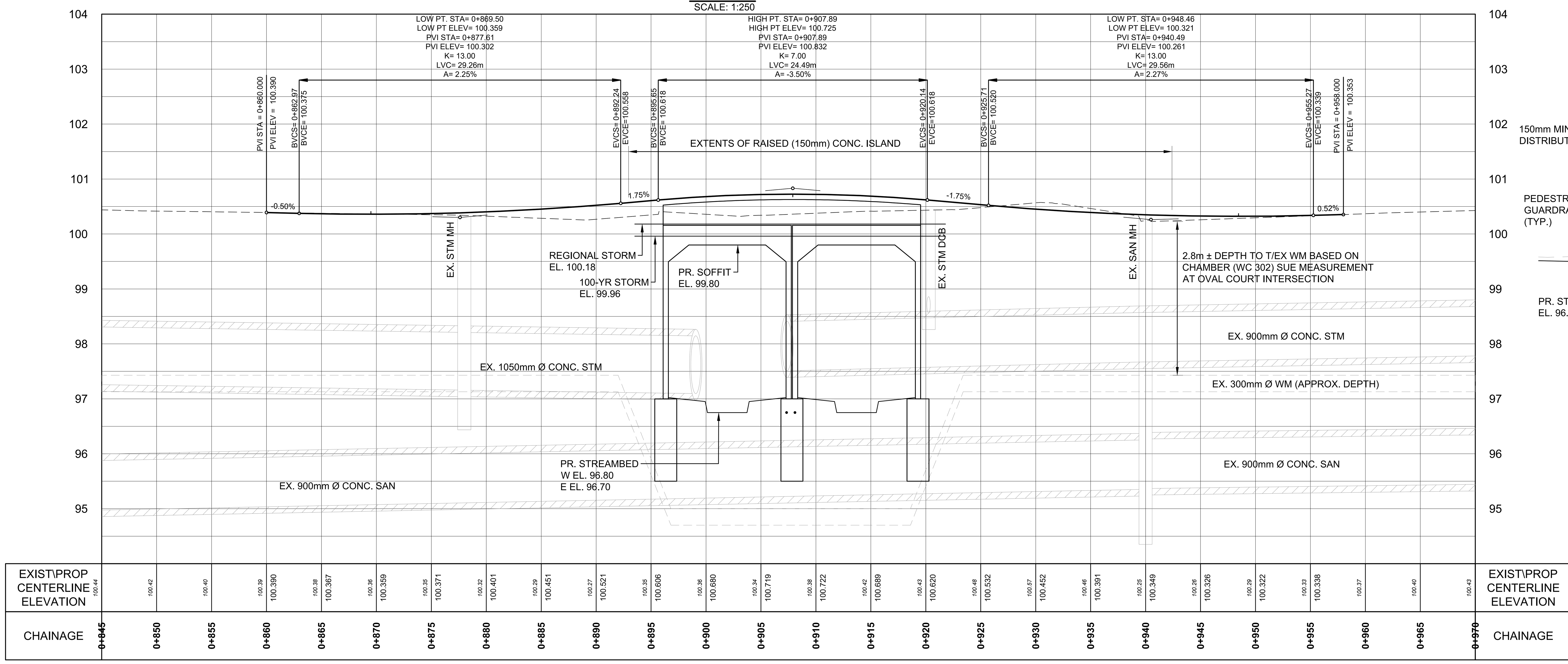

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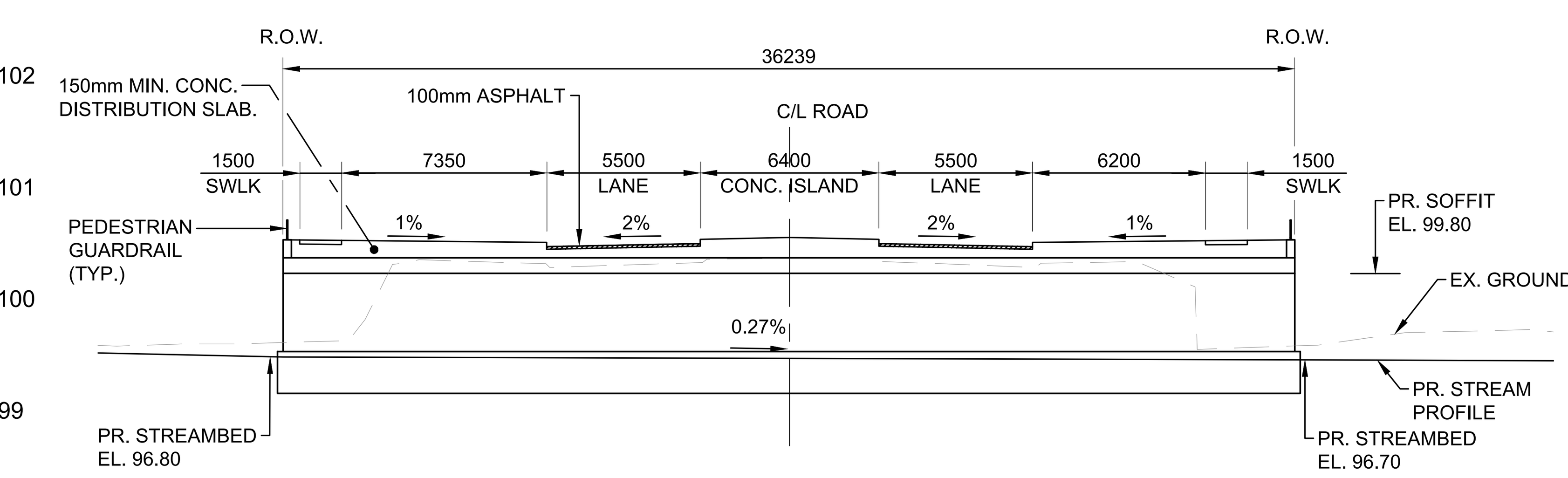

1 SECTION
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Notes
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2. The contractor shall verify all dimensions, levels, and datums on site and report any discrepancies or omissions to this office prior to construction.
3. This drawing is to be read and understood in conjunction with all other plans and documents applicable to this project.

NOT FOR CONSTRUCTION

No.	Issue / Revision	Date	Auth.
0	ISSUED FOR PRELIMINARY REVIEW	24/01/26	S.R.
1	ISSUED FOR PRELIMINARY REVIEW	24/02/22	S.R.
2	ISSUED FOR EA ADDENDA	24/03/28	S.R.

CITY OF Burlington

BRANTHAVEN DEVELOPMENT

BURNSIDE

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Client
CITY OF BURLINGTON
BRANTHAVEN DEVELOPMENT

Drawing Title
OVAL COURT LANDS BRIDGE

OPTION 1 - TWO RIGID FRAME STRUCTURES

Drawn	Checked	Designed	Checked	Date	Drawing No.
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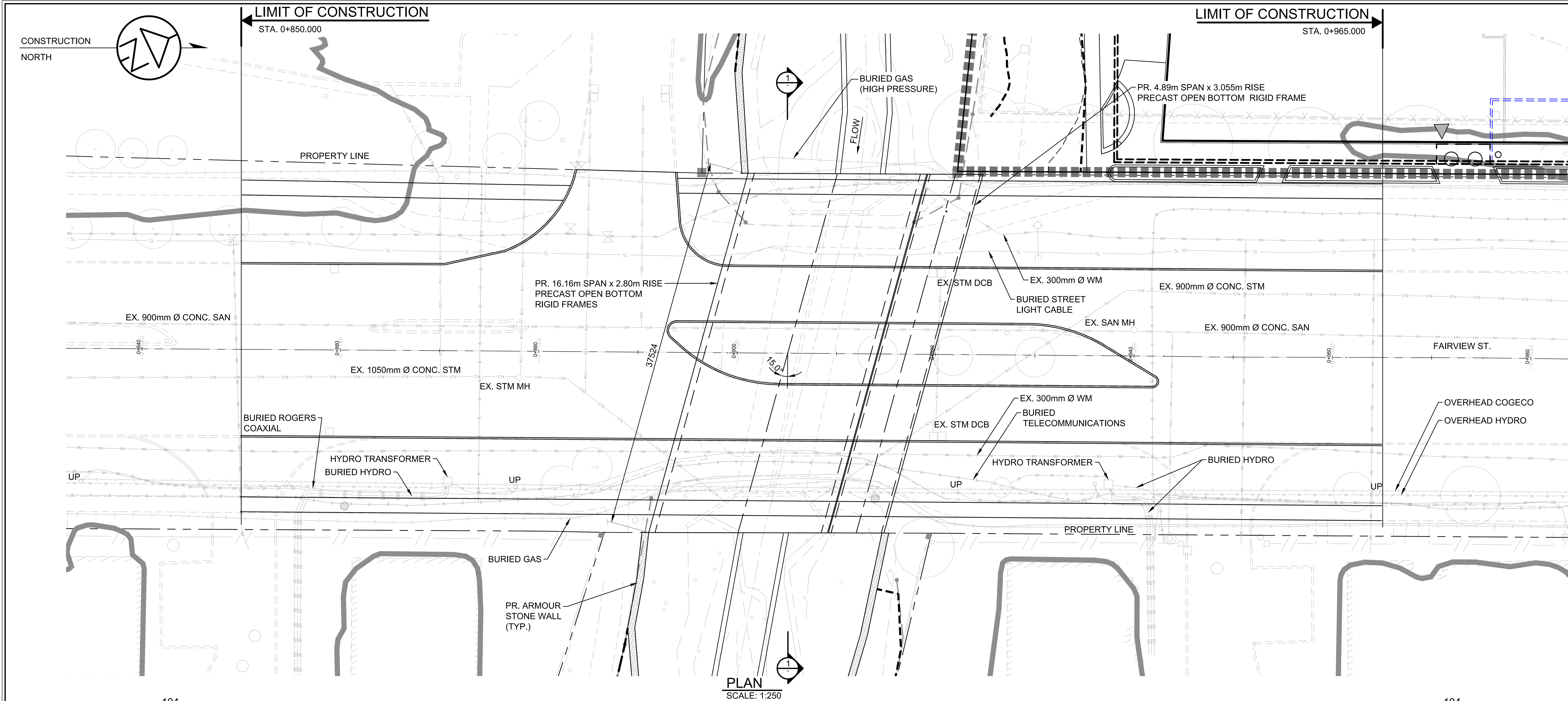

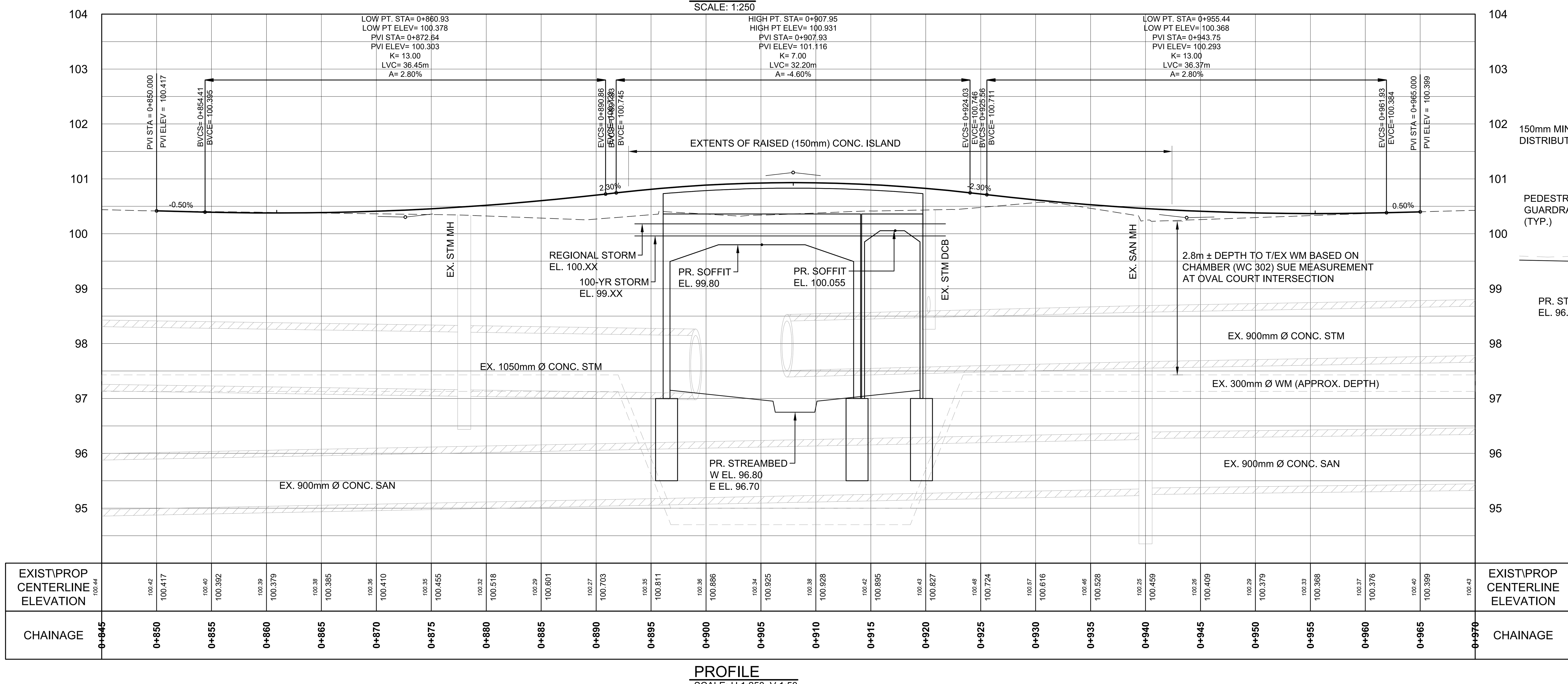

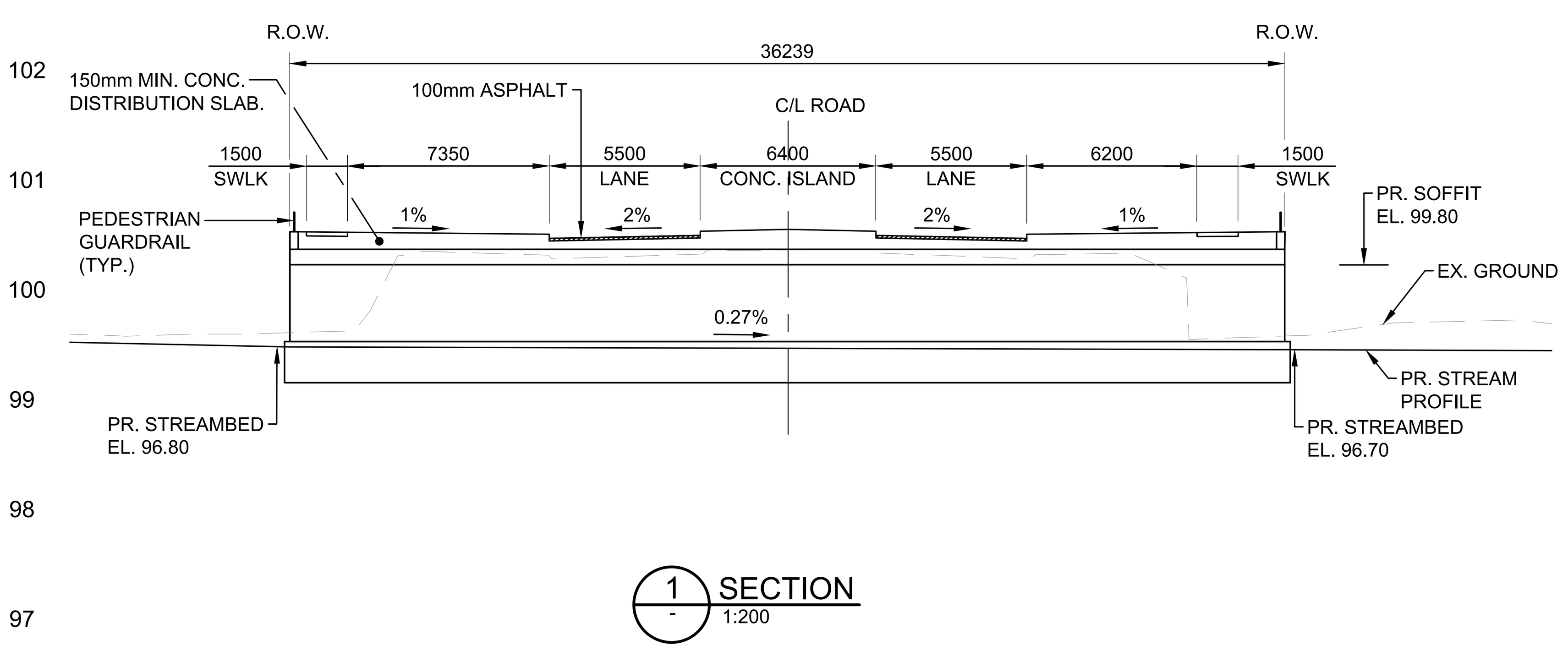

Notes

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No.	Issue / Revision	Date	Auth.
0	ISSUED FOR PRELIMINARY REVIEW	24/01/26	S.R.
1	ISSUED FOR PRELIMINARY REVIEW	24/02/22	S.R.
2	ISSUED FOR EA ADDENDA	24/03/28	S.R.

CITY OF Burlington

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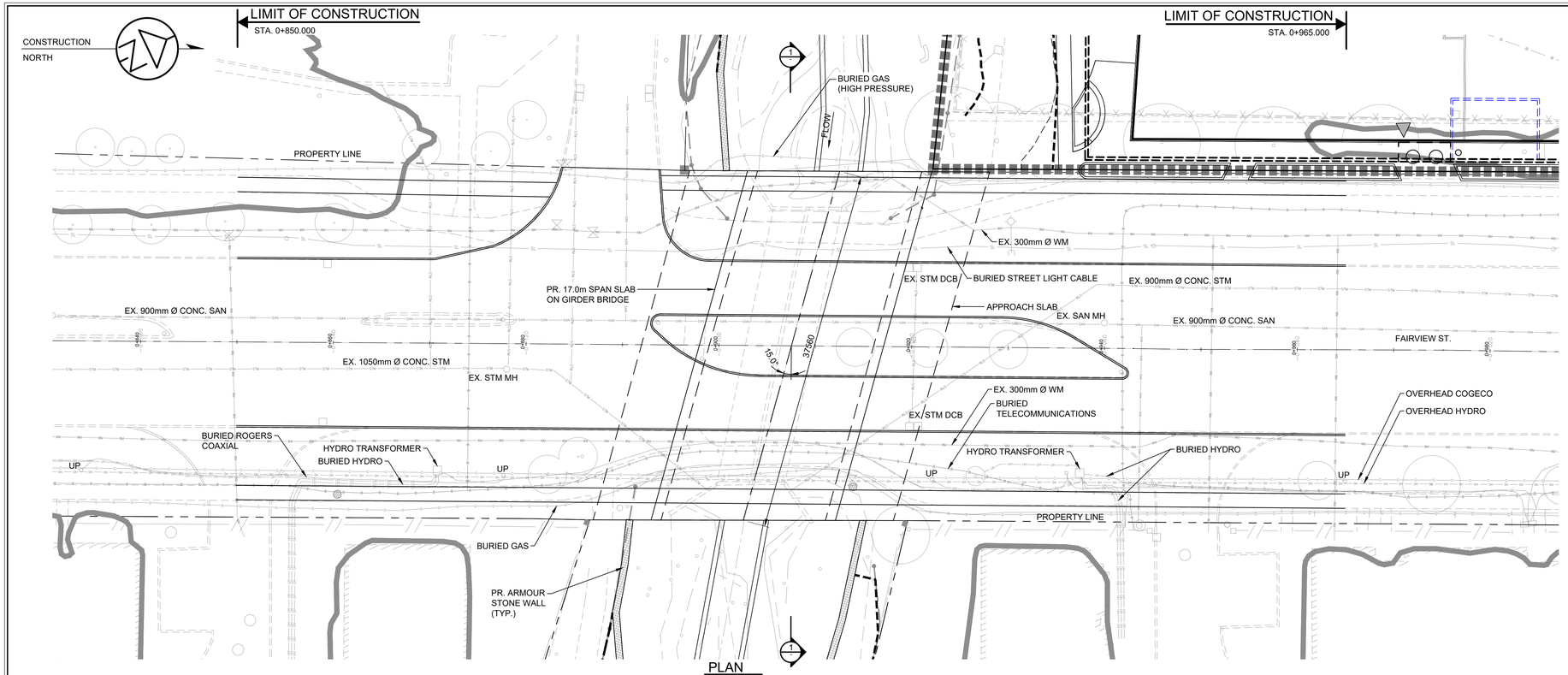
Client
CITY OF BURLINGTON
BRANTHAVEN DEVELOPMENT

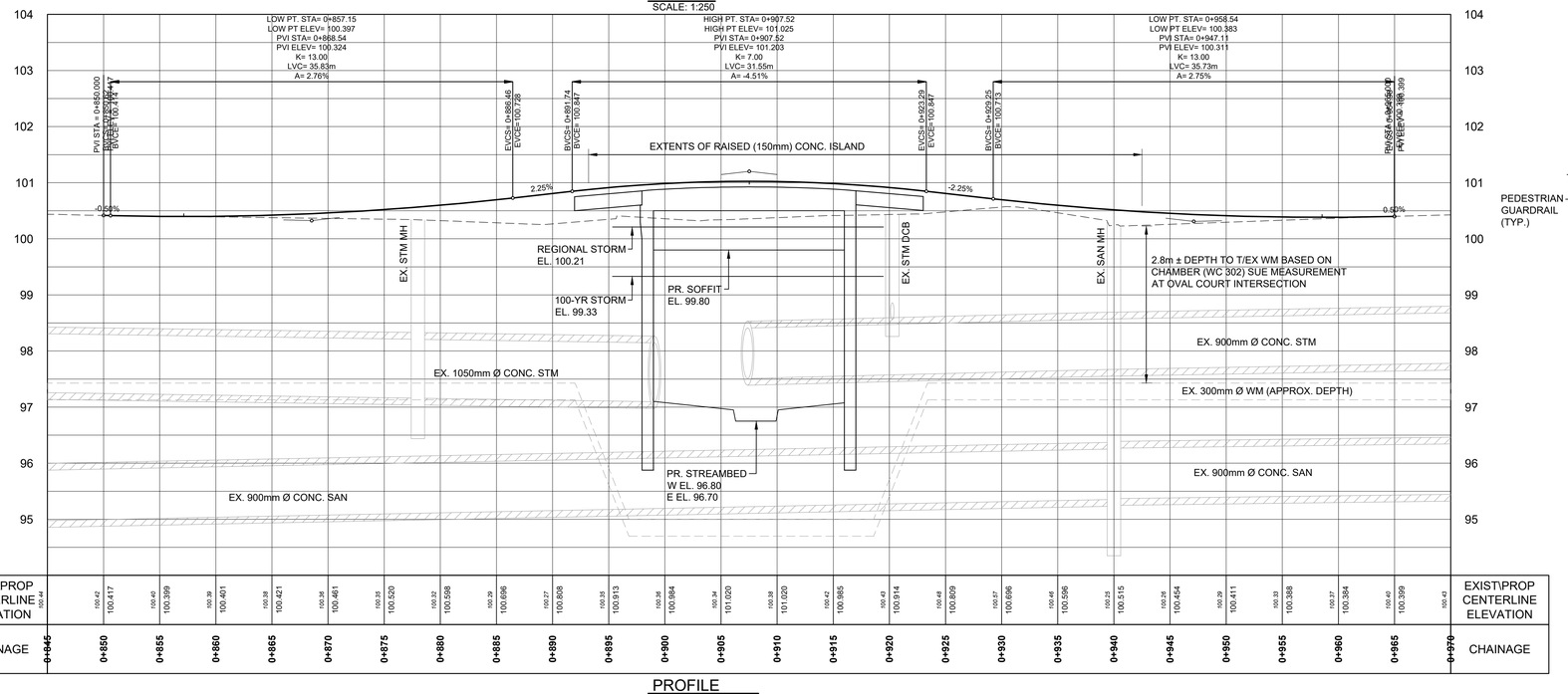
Drawing Title
OVAL COURT LANDS BRIDGE

OPTION 2 - TWO RIGID FRAME STRUCTURES - UNEQUAL SPANS

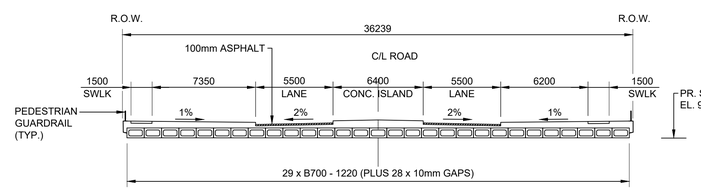
Drawn	Checked	Designed	Checked	Date	Drawing No.
AA	MB	AA	SR	23/12/14	2
Project No. 300057084.5		Contract No. 300057084.5		Revision No. 2	
Scale H 1:250 V 1:50					



PLAN
SCALE: 1:250



PROFILE
SCALE: H 1:250, V 1:50



1 - SECTION
1:200

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No.	Issue / Revision	Date	Auth.
0	ISSUED FOR PRELIMINARY REVIEW	24/01/26	S.R.
1	ISSUED FOR PRELIMINARY REVIEW	24/02/22	S.R.
2	ISSUED FOR EA ADDENDA	24/03/28	S.R.

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Drawing Title
OVAL COURT LANDS BRIDGE
OPTION 3 - CLEAR SPAN BRIDGE

Drawn	Checked	Designed	Checked	Date	Drawing No.
AA	MB	AA	SR	23/12/14	3
Project No.		Contract No.		Revision No.	
300057084.5		300057084.5		2	
Scale: H 1:250 V 1:50		0 5.0 10.0 15.0m			

104
103
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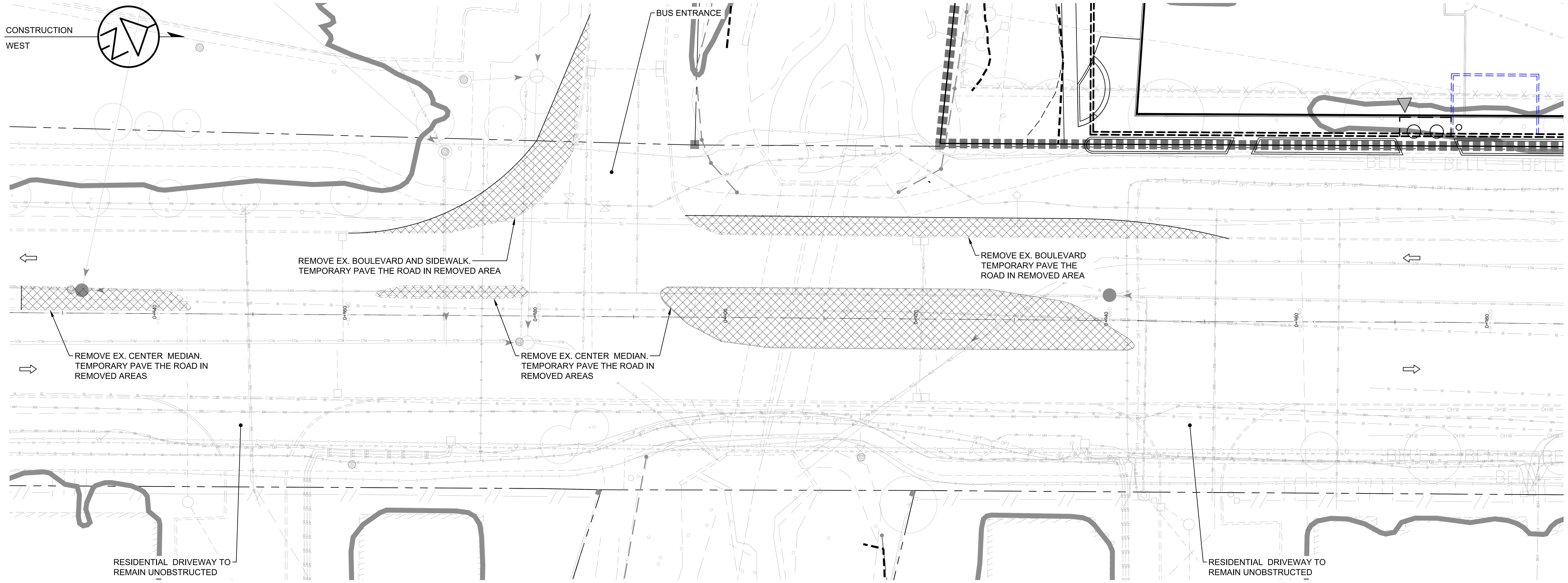
Attachment 2

Construction Staging Plans



PLAN - STAGE 1
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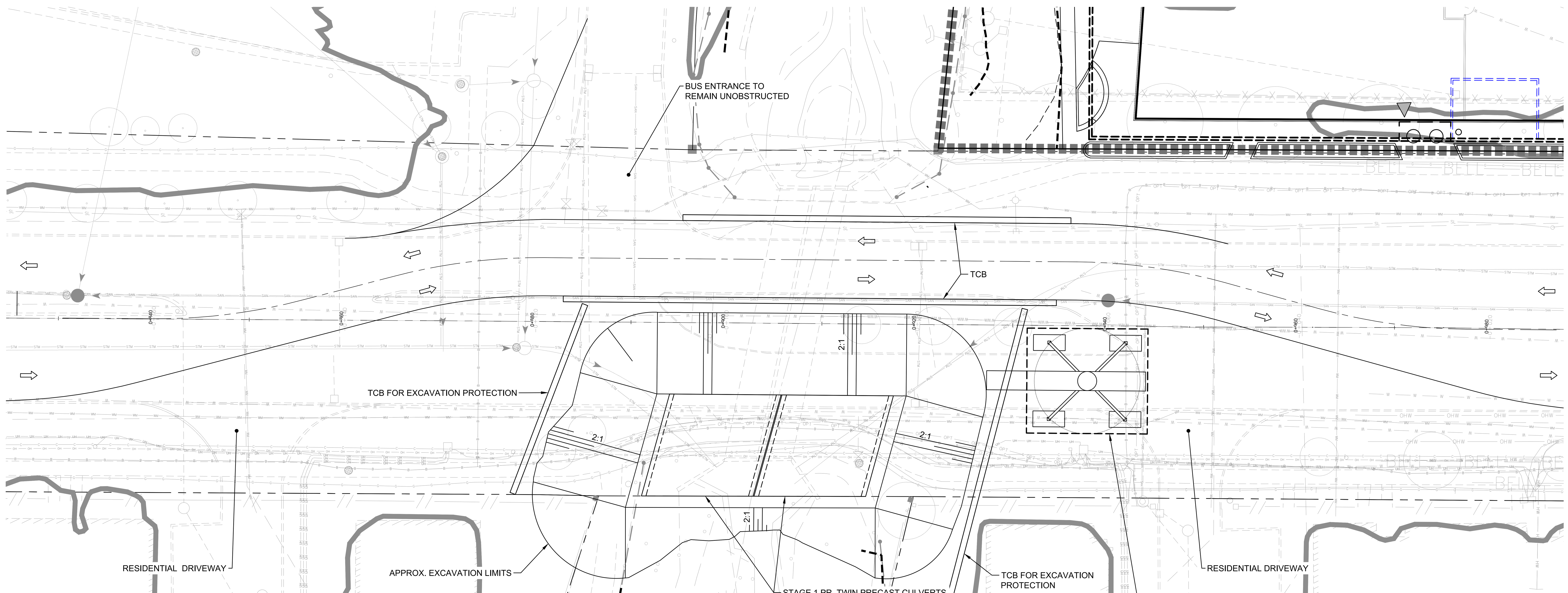

PLAN - STAGE 2 - 3
SCALE: 1:250

TRAFFIC CONTROL NOTES:

1. TRAFFIC CONTROL PLAN SHOWN IS FOR REFERENCE ONLY. CONTRACTOR SHALL DESIGN TRAFFIC CONTROL AND SIGNAGE TO SUIT THEIR OPERATIONS IN ACCORDANCE WITH THE ONTARIO TRAFFIC MANUAL (OTM).

4. ALL SIGNS, TEMPORARY PAVEMENT MARKINGS AND DELINEATIONS SHALL BE REMOVED IN THEIR ENTIRETY UPON COMPLETE OF TRAFFIC CONTROL OPERATIONS.

5. ACCESS TO ALL DRIVEWAYS AND FIELD ENTRANCES ARE TO BE MAINTAINED AT ALL TIMES DURING THE WORKS. WHERE MULTIPLE DRIVEWAYS ARE PRESENT FOR ONE RESIDENTIAL ADDRESS, ACCESS TO ONE ENTRANCE MAY BE RESTRICTED UPON WRITTEN ACCEPTANCE BY THE PROPERTY OWNER.

6. TRAFFIC CONTROL PERSON(S) SHALL TURN SIGNS TO ALL STOP WHEN EMERGENCY VEHICLES ARE PRESENT.

Notes

2. The contractor shall verify all dimensions, levels, and datums on site and report any discrepancies or omissions to this office prior to construction.

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Drawing Title
OVAL COURT LANDS BRIDGE

STAGING - PLAN I

Drawn	Checked	Designed	Checked	Date	Drawing No.
ASC	MB	AA	SR	23/12/14	FIG.1
Project No. 300057084.5		Contract No. 300057084.5		Revision No. 0	
Scale H 1:250 V 1:50					

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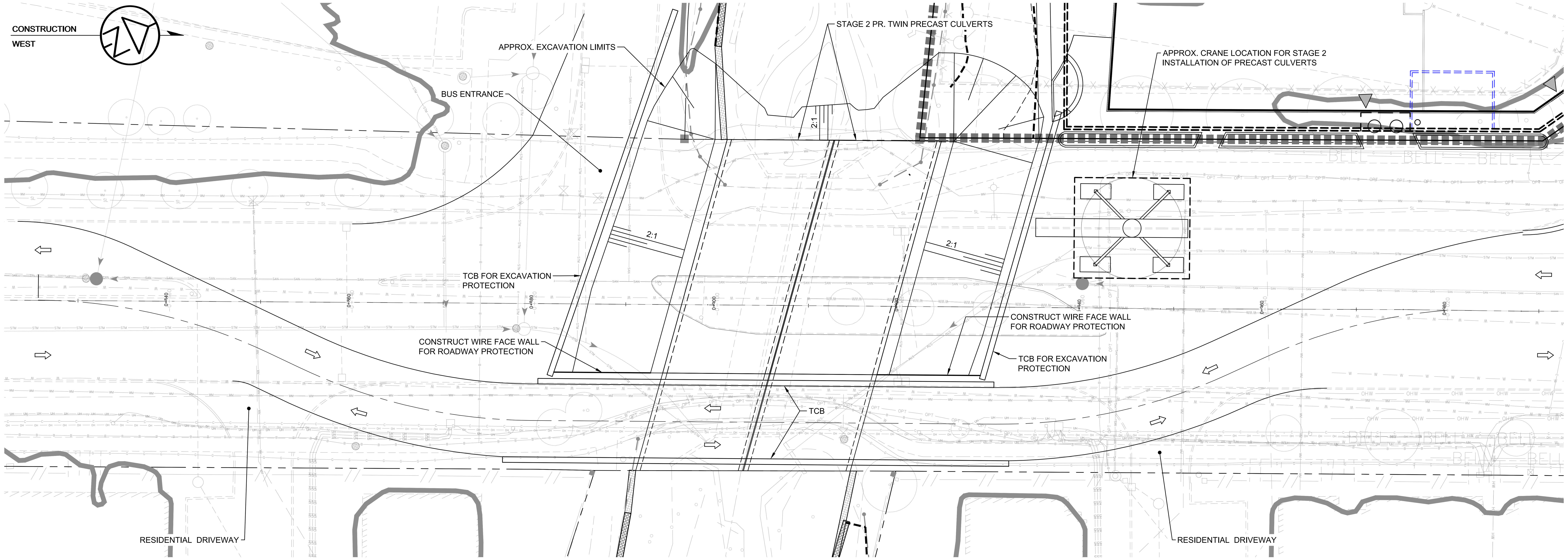

PLAN - STAGE 4 - 5
SCALE: 1:250

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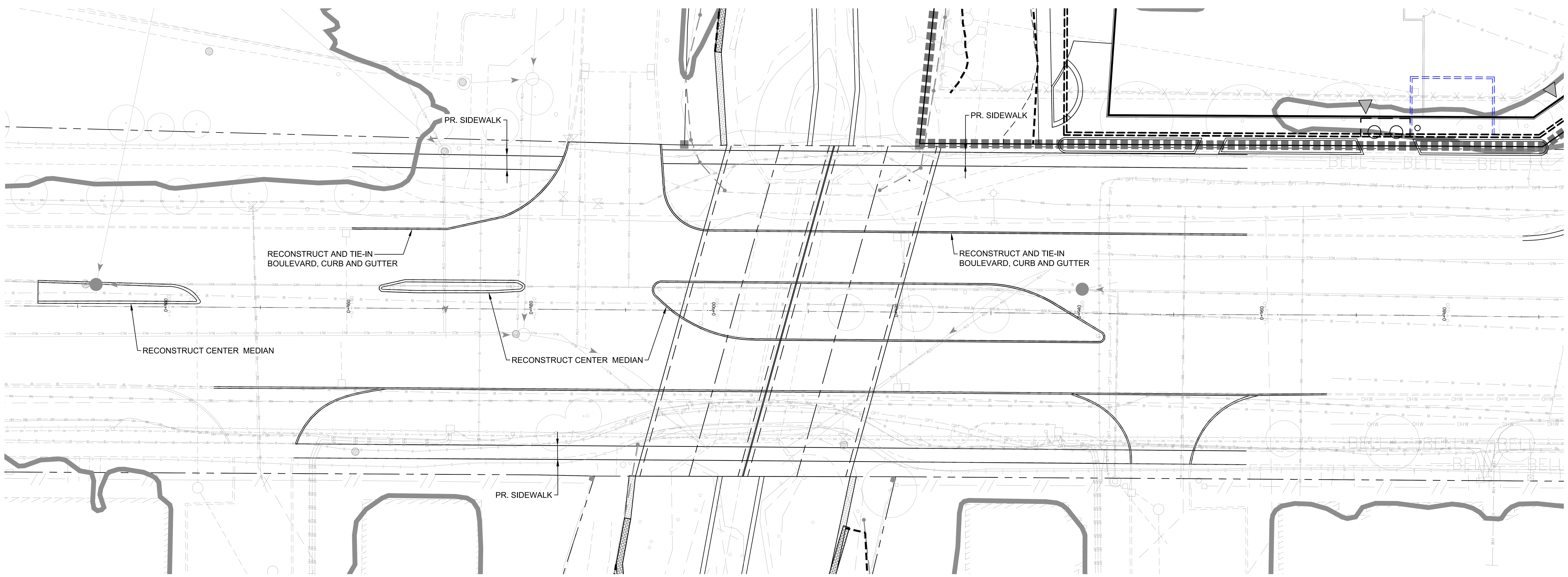
5. ACCESS TO ALL DRIVEWAYS AND FIELD ENTRANCES ARE TO BE MAINTAINED AT ALL TIMES DURING THE WORKS. WHERE MULTIPLE DRIVEWAYS ARE PRESENT FOR ONE RESIDENTIAL ADDRESS, ACCESS TO ONE ENTRANCE MAY BE RESTRICTED UPON WRITTEN ACCEPTANCE BY THE PROPERTY OWNER.
6. TRAFFIC CONTROL PERSON(S) SHALL TURN SIGNS TO ALL STOP WHEN EMERGENCY VEHICLES ARE PRESENT.



PLAN - STAGE 6
SCALE: 1:250

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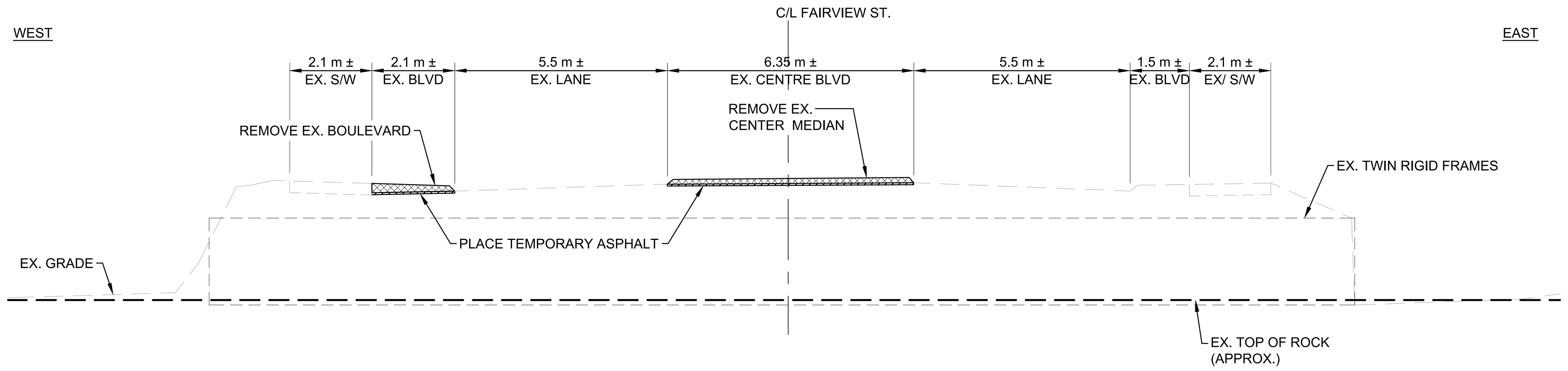
Drawing Title
OVAL COURT LANDS BRIDGE

STAGING - PLAN II

Drawn	Checked	Designed	Checked	Date	Drawing No.
ASC	MB	AA	SR	23/12/14	FIG. 2
Project No. 300057084.5		Contract No. 300057084.5		Revision No. 0	
Scale H 1:250 V 1:50		0 5.0 10.0 15.0m			

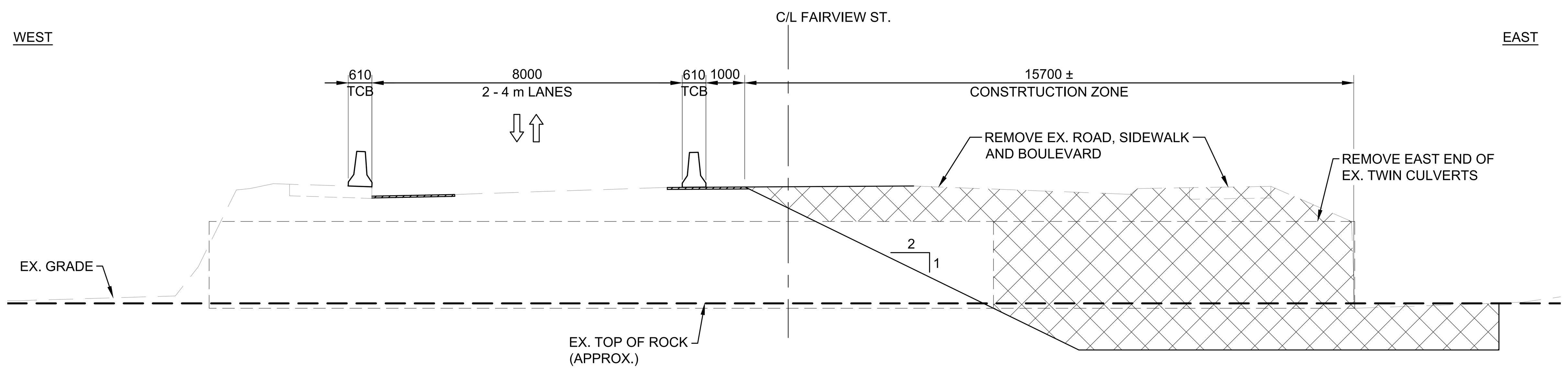
File: \\COLLINGWOOD\Shared Work Areas\057084.50 - Oval Court Lands Bridge\03_Produ



STAGE 1 NOTES:

SECTION - STAGE 1
SCALE: 1:100

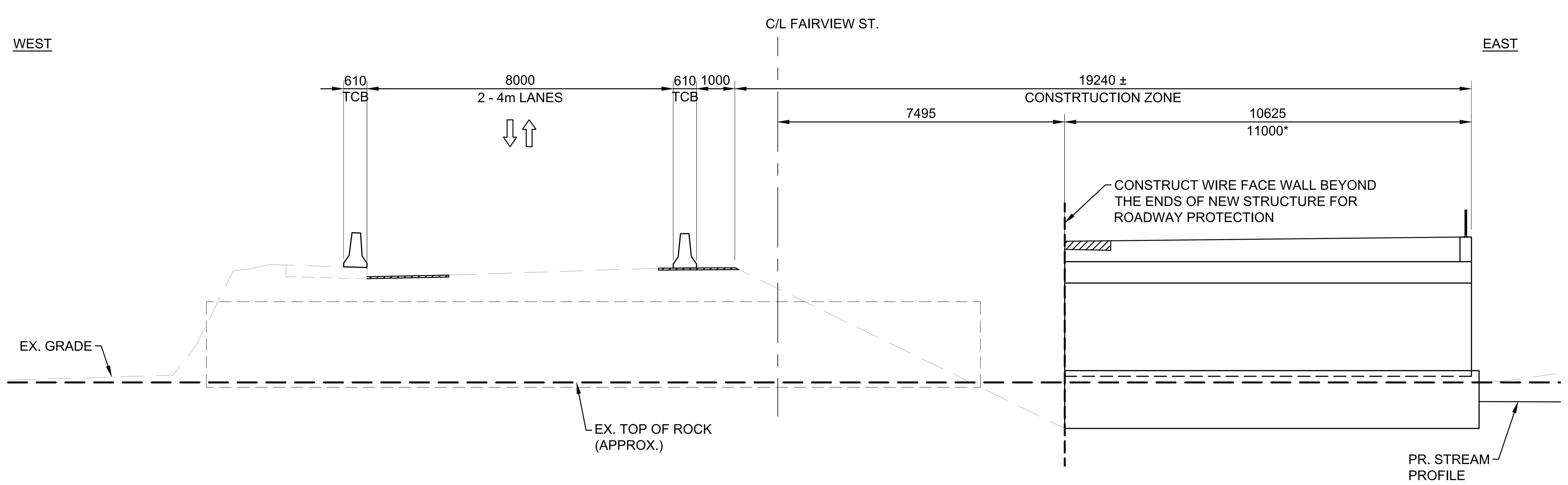
- REMOVE EX. CENTER MEDIANS AS PER CONTRACT AND AS DIRECTED BY CONTRACT ADMINISTRATOR.
- REMOVE WEST BOULEVARD AS PER CONTRACT AND AS DIRECTED BY CONTRACT ADMINISTRATOR.
- REMOVE NW CORNER OF SIDEWALK AT BUS ENTRANCE ROAD AS PER CONTRACT AND AS DIRECTED BY CONTRACT ADMINISTRATOR.
- REMOVE SOUTH WEST CORNER OF SIDEWALK AT BUS ENTRANCE ROAD AS PER CONTRACT AND AS DIRECTED BY CONTRACT ADMINISTRATOR.
- TEMPORARY PAVE ROAD IN REMOVED AREAS.



STAGE 2

SECTION - STAGE 2
SCALE: 1:100

- PLACE TEMPORARY TRAFFIC CONTROL DEVICES FOR STAGE 2.
- TEMPORARY LINE PAINTING AS REQUIRED FOR STAGE 2 TRAFFIC DIVERSION.
- DIVERT TRAFFIC TO WEST SIDE OF STRUCTURE.
- REMOVE EX. BOULEVARD AND SIDEWALK ON THE EAST SIDE AS PER CONTRACT AND AS DIRECTED BY CONTRACT ADMINISTRATOR.
- REMOVE EAST PORTION OF EX. TWIN RIGID FRAMES AND WINGWALLS.

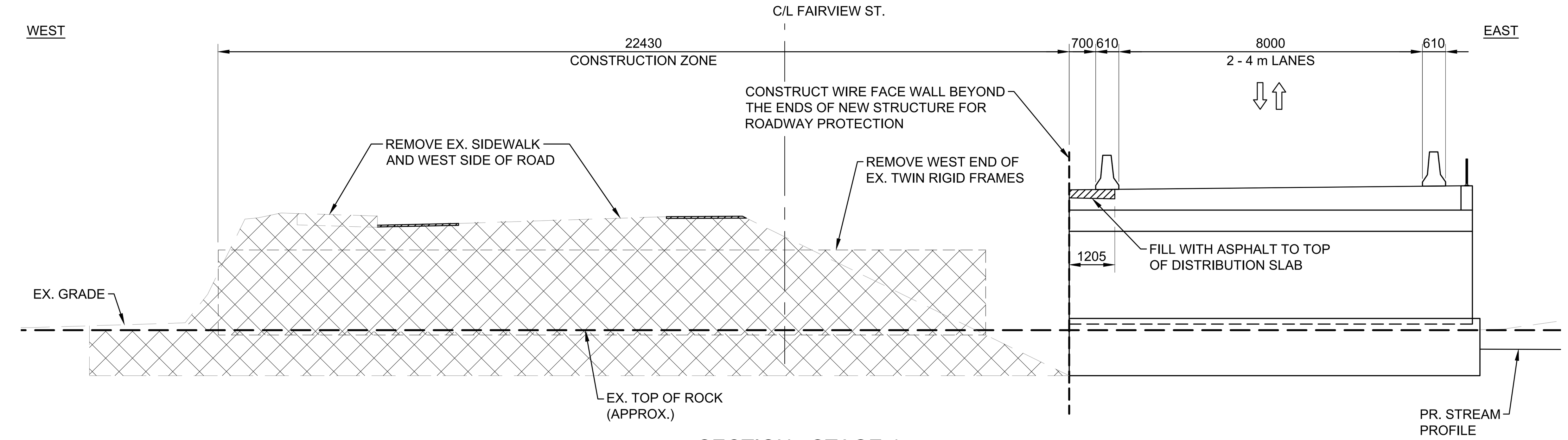


STAGE 3

SECTION - STAGE 3
SCALE: 1:100

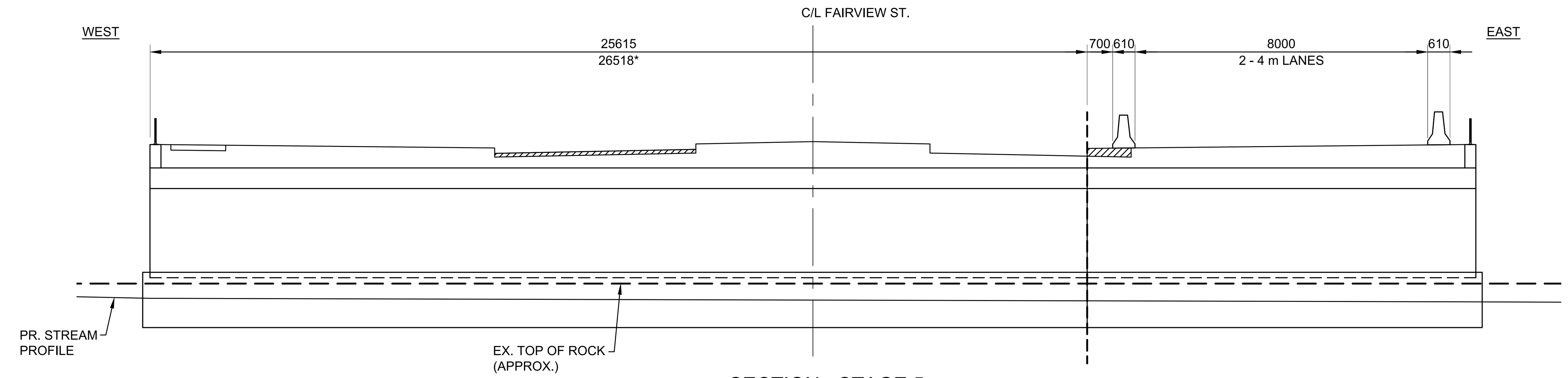
- CONSTRUCT 11 m ± OF PR. TWIN PRECAST OPEN BOTTOM RIGID CULVERTS, CONC. DISTRIBUTION SLAB, HEADWALL

* DIMENSIONS MEASURED ALONG C/L OF CULVERT



SECTION - STAGE 4
SCALE: 1:100

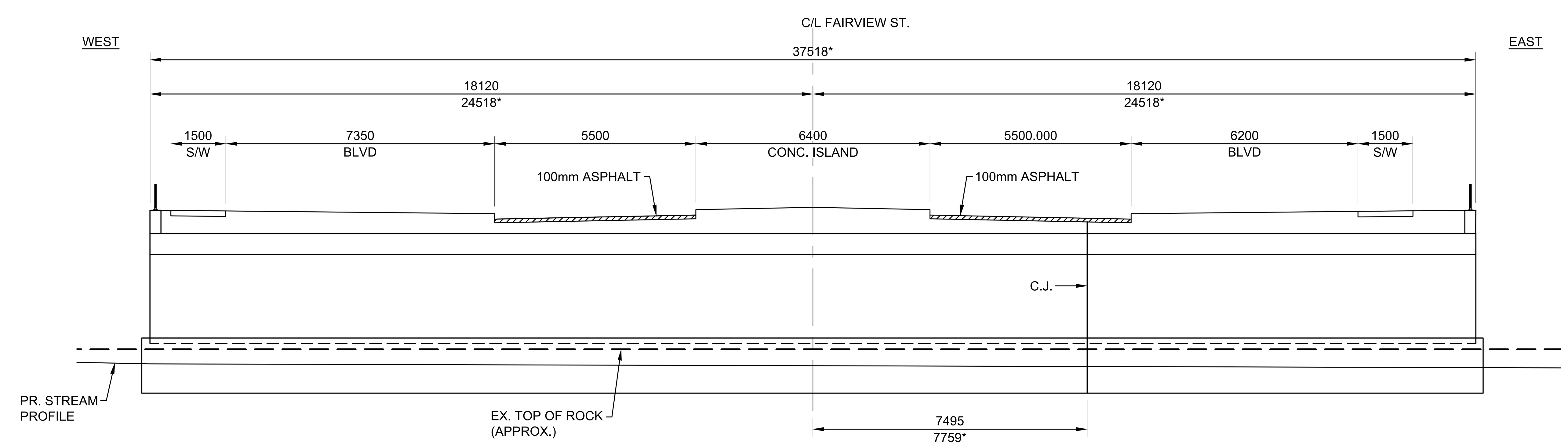
- TEMPORARY LINE PAINTING AS REQUIRED FOR STAGE 4 TRAFFIC DIVERSION.
- DIVERT TRAFFIC TO EAST SIDE OF ROADWAY USING TEMPORARY CONTROL DEVICES.
- REMOVE EX. SIDEWALK AND ROAD ON THE WEST SIDE.
- REMOVE EX. STRUCTURE ON THE WEST SIDE WITHIN STAGE 4 CONSTRUCTION ZONE.



SECTION - STAGE 5
SCALE: 1:100

- CONSTRUCT REMAINING 26.5 m ± OF PR. TWIN PRECAST OPEN BOTTOM RIGID FRAMES. CONC. DISTRIBUTION SLAB, HEADWALL AND PEDESTRIAN GUIDERAIL.
- PAVE WEST SIDE OF ROADWAY.

* DIMENSIONS MEASURED ALONG C/L OF CULVERT



SECTION - STAGE 6
SCALE: 1:100

- GRIND OUT AND PAVE EAST SIDE OF ROADWAY.
- REMOVE ALL TEMPORARY TRAFFIC BARRIERS AND TEMPORARY TRAFFIC CONTROL DEVICES.

* DIMENSIONS MEASURED ALONG C/L OF CULVERT

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No.	Issue / Revision	Date	Auth.

CITY OF Burlington

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Client
CITY OF BURLINGTON
BRANTHAVEN DEVELOPMENT

Drawing Title
OVAL COURT LANDS BRIDGE
STAGING CROSS SECTIONS

Drawn	Checked	Designed	Checked	Date	Drawing No.
ASC	MB	AA	SR	23/12/14	FIG. 3
Project No. 300057084.5		Contract No. 300057084.5		Revision No. 0	
Scale AS NOTED					

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Appendix B

Technical Memorandum
Hydraulic Assessment

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Technical Memorandum

Hydraulic Assessment

Date: April 26, 2024 **Project No.:** 300057084.5000

Project Name: Oval Court Bridge Design

Client Name: Branthaven Development

Submitted To: Addendum Project File

Submitted By: Rachel Walton, P.Eng., MASc.

Reviewed By: Stephen Riley, P.Eng.

1.0 Introduction

R.J. Burnside & Associates Limited has been retained by Branthaven Development (Branthaven) to provide engineering services for the design, coordination, permitting, and approvals for the replacement of the existing Fairview Street crossing of Appleby Creek in the City of Burlington (City).

The purpose of this technical memorandum is to explain the hydraulic assessment performed to analyze various replacement options for the Fairview Street crossing.

2.0 Background Information

The hydraulic model utilized in the assessment of the Fairview Street crossing was originally prepared by Conservation Halton (CH). The model was obtained by Branthaven for the design of the Subject Lands at 720 and 740 Oval Court and 5153 Fairview Street. Proposed channel modifications to Appleby Creek and alternative structures for the Fairview Street crossing were investigated within the CH model by Urbantech on behalf of Branthaven through the *Planning Act* process. Coordination between Urbantech and CH occurred during that period. The model that has been ultimately used as a basis for the modelling completed by Burnside and summarized in this memo was provided by CH to Burnside on February 22, 2024.

The following reports were reviewed and referenced in preparation of this hydraulic report. The modelling summarized in this report is a cumulation of many reports, studies, and modelling completed by both CH and Urbantech. To provide background of the project history, a summary / timeline of the reports is provided in Table 1 below. The following sections provide more detail on each of the reports.

Table 1: Background Reports

Material	Date	Author	Comments
Urbantech Letter to City of Burlington	January 21, 2019	Urbantech	• Letter written to EA Team (Aquafor Beech and City) as a request to work together to further reduce the Regional Floodplain risks to the adjacent developments through widening of the watercourse corridor, in conjunction with the floodplain works mentioned in the EA.
Municipal Class Environmental Assessment for Appleby Creek Flood Mitigation between Fairview Street and New Street	February 11, 2019	Aquafor Beech	• Prepared for the City of Burlington. • Included the above noted Urbantech letter in the appendix. • A 17 m bridge at the Fairview Street crossing was recommended as the preferred alternative at this location, channel modifications were not specifically mentioned. • Implementation of the preferred alternative was recommended at the end of the existing culvert service life. Implementation timing unknown based on EA.
Urbantech Letter to City of Burlington	March 18, 2019	Urbantech	• Letter written to EA Team (Aquafor Beech and City). • Following February 19, 2019, PIC for the Flood Mitigation EA. • Purpose to request further collaboration between EA and landowners.
Preliminary Hydraulic Analysis/Corridor Reconfiguration Removal of Regional Storm Floodplain from 720 and 740 Oval Court and 5153 Fairview Street	April 1, 2019	Urbantech	• Outlined options for proposed corridor management strategy to reduce flooding and erosion impacts and removal the Regional Storm floodplain from the Subject Lands. • Modeling based on a 1D HEC RAS model from CH. Same model was used in the Flood EA.
Urbantech Letter to City of Burlington	June 7, 2019	Urbantech	• Recommended a three-box culvert structure to replace the Fairview Street crossing, based on the 1D HEC RAS model.
Urbantech Letter to City of Burlington	October 18, 2019	Urbantech	• Further updates to June 7, 2019 letter.
Appleby Creek Erosion Control Environmental Assessment Project File Report	August 20, 2020	Aquafor Beech	• Investigated existing conditions and developed alternatives to mitigate erosion hazards along Appleby Creek. • Fairview Street crossing is captured within site 7A and 7B.

Material	Date	Author	Comments
Appleby Creek HEC-RAS Model in Oval Court Study Area	June 26, 2023	Urbantech	• Captured modelling collaboration that occurred between Urbantech and CH staff on June 14, 2023, as part of mediation discussions regarding proposed Oval Court development. During the mediation discussion, CH presented Urbantech with a 2D HEC RAS model of the area. The working model was provided to Urbantech following the meeting. • Urbantech refined CH's model and modifications summarized in the report, including concepts presented in the Erosion EA. • The model incorporated East Burlington Creek (EBC) flows. • A 16.16 m span culvert with a 4.87 m wide relief culvert was found to provide additional hydraulic capacity and convey the Regional Storm event under Fairview Street. • Culverts were modelled as a pier burned into the proposed terrain in the 2D model environment. • Significant reduction in flood hazard was found due to channel improvements and structure replacement.
Fairview Street Crossing Follow-up to July 17, 2023 Mediation	July 21, 2023	Urbantech	• An additional option for the Fairview Street crossing was modelled: 2 x 5.5 m closed bottom culverts with a central culvert of 11.0 m wide and an open bottom
July 17 Mediation Meeting Limits of Development, Oval Court	August 10, 2023	Urbantech	• Outlined updates to the HEC RAS 2D model due to changes to the site plan.
Hydrology Report East Burlington Creeks Flood Hazard Mapping Update	September 18, 2023	WSP	• Hydrology report to support the development of flood delineation and flood hazard mapping for EBC including Tuck, Shoreacres, Appleby, and Sheldon Creeks. • Hydrology from this report has been used in the CH 2D HEC RAS model.
720, 735, 740 Oval Court, 5135 & 5155 Fairview Street, City of Burlington Conservation Halton Comments	February 2, 2024	Conservation Halton	• Detailed comments regarding the Urbantech report "Appleby Creek HEC RAS Model in Oval Court Study Area" dated June 26, 2023, and HEC RAS model received August 21, 2023. • Comments were discussed with CH, Urbantech, and Burnside on February 15, 2024. Following the meeting, CH provided Burnside with a model that had addressed some of the minor comments.

2.1 Municipal Class Environmental Assessment Schedule B – Appleby Creek Flood Mitigation

On February 11, 2019, the Municipal Class Environmental Assessment (EA) for Appleby Creek Flood Mitigation between Fairview Street and New Street was completed by Aquafor Beech Ltd for the City. The purpose of the study was to identify flood mitigation opportunities within the Appleby Creek watershed. This study included the Fairview Street crossing in proximity to the Subject Lands. The Fairview Street crossing was identified within Reach 3 in the EA Report.

The generic regulation 1D HEC RAS model for Appleby Creek was received from CH and updated by Aquafor Beech as part of the EA process. Aquafor Beech updated the model and then used the existing condition model to evaluate flood mitigation measures within Appleby Creek.

The assessment revealed that the Fairview Street crossing has a maximum hydraulic conveyance capacity of the 5-year storm. It was found that Fairview Street becomes inundated during the Regional Storm event.

Proposed options were assessed, and it was determined that the preferred alternative would be a 17 m clearspan bridge that could pass the 100-year storm event. Channel works would be required at the upstream and downstream sections of the bridge.

2.2 Appleby Creek Erosion Control Environmental Assessment Project File Report – Final

On August 20, 2020, the Appleby Creek Erosion Control EA was completed by Aquafor Beech Ltd for the City. The purpose of this study was to investigate the existing conditions and develop alternatives to mitigate the erosion hazards at the identified locations along Appleby Creek. The Fairview Street crossing was identified within site 7B (upstream of the crossing) and 7A (downstream of the crossing).

At site 7A it was identified that there are failing gabion baskets at some locations, which can no longer provide the required protection to the adjacent private properties. Bank erosion was also observed at the meander bends where there is no gabion protection. At site 7B bank erosion was also observed and gabion baskets were found to be failing / in poor condition. Both sites were identified as having a high level of risk.

The EA recommended that comprehensive reach-based works be undertaken for both sites 7A and 7B. 150 m of bank and bed protection along 7A and 300 m of bank and bed protection along 7B was recommended. These works at a high level would include removal of failed gabion baskets, installation of armourstone retaining walls, riffle-pool features, in creek vegetation buffers, and retrofit of the existing storm outfalls into the restored bank works.

2.3 Urbantech Modelling and Design Following EAs

As outlined in Table 1, Urbantech on behalf of Branthaven had significant involvement during and after the Flood Mitigation EA and Erosion Control EA. A 2D HEC RAS model was developed by CH and further refined by Urbantech. The various memos and submissions to outline these changes have been summarized in Table 1.

The remainder of the report describes the 2D HEC RAS model developed by CH, refined by Urbantech, and further refined by CH. Burnside is using the 2D HEC RAS model as a base to perform the hydraulics for the detailed structure design at the Fairview Street crossing. As the purpose of this memorandum is to describe proposed structure options, the existing conditions have not been re-modelled by Burnside.

3.0 Existing Structure at Fairview Street

The existing structure at the Fairview Street crossing has been identified as a 2.74 m rise x twin 3.35 m wide x 29 m long closed bottom box culvert.

There is an existing 900 mm sanitary sewer and a 500 mm diameter watermain that runs underneath the existing structure. There is also a 300 mm diameter watermain upstream of the structure.

There are two storm sewers, 900 mm and 1000 mm, that connect into the downstream end of the existing structure.

4.0 Hydrology

WSP prepared the Hydrology Report EBC Flood Hazard Mapping Update, September 18, 2023, for CH, which included Appleby Creek. Peak flows calculated within the EBC study have been used as input for the hydraulic model described in this report.

A Visual Otthymo Version 6 (VO6) model was developed. The 100-year 3-hour Chicago Storm, the 48-hour Regional Storm event (AMC II) and the 12-hour Regional Storm event (AMC II) were simulated. The 12-hour Regional Storm under AMC II conditions was found to govern.

The report identified Appleby Creek as having a total contributing drainage area of approximately 12.23 km^2. The Fairview Street crossing is on the Main Branch of Appleby Creek between the CNR Oakville and D/S of Fairview Street locations identified within the EBC study. The following flows in Table 2 were calculated.

Table 2: Appleby Creek Peak Flows from East Burlington Creek (EBC) Hydrology Report

Location	Drainage Area (ha)	100 Peak Flow (m^3/s)	12 Hour Regional (AMC II) (m^3/s)
CNR Oakville	920	71.7	98.8
D/S of Fairview Street	988	75.6	104.5
	Average	**73.65**	**101.6**

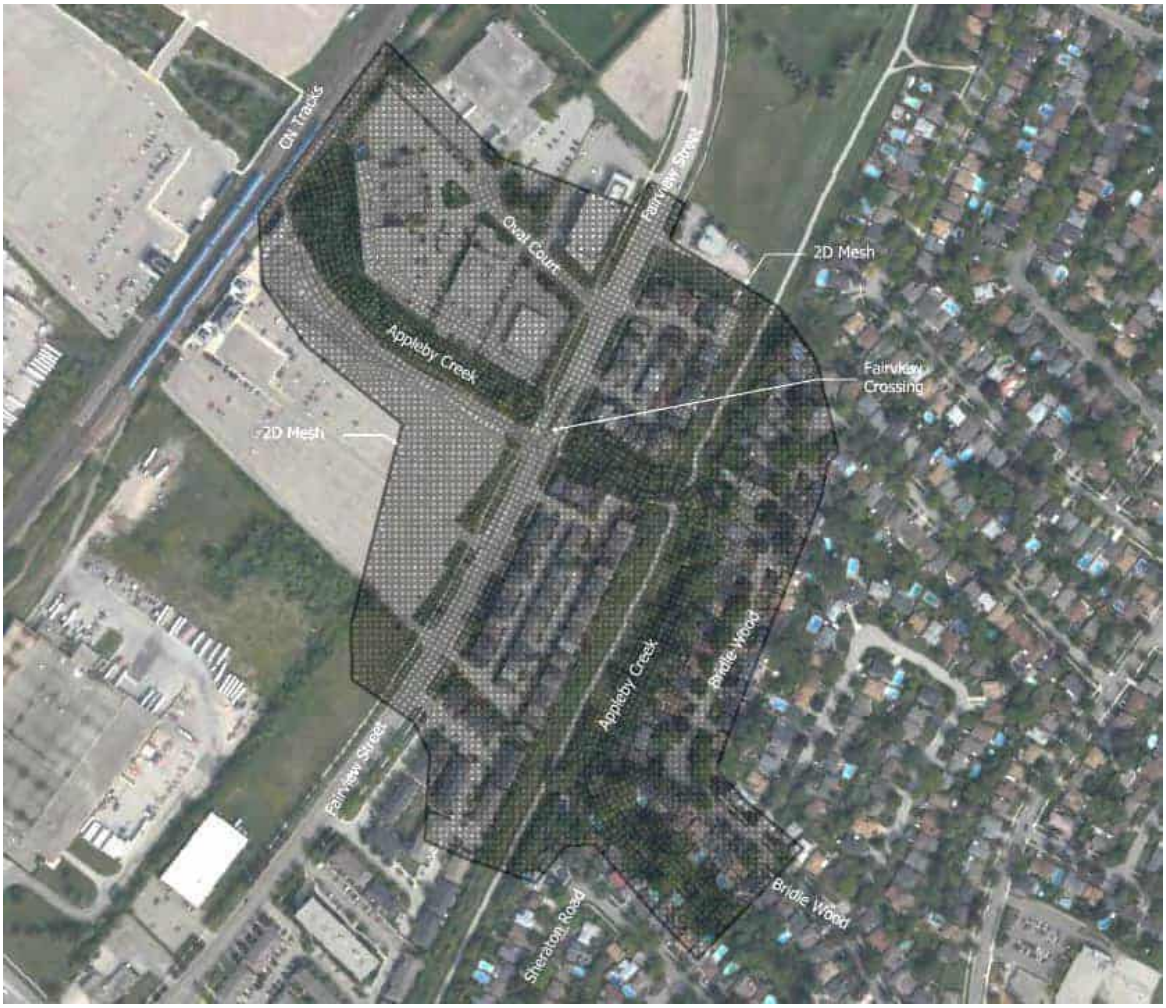
As the Fairview Street crossing is between the two locations identified in the EBC study, an average of the two flows was taken forward for modelling purposes. This assumption was made by CH. For further information on the hydrologic model developed for EBC, the Hydrology Report East Burlington Creeks (EBC) Flood Hazard Mapping Update, dated September 18, 2023, prepared by WSP should be referenced.

5.0 Hydraulics

The 2D HEC RAS model setup including simulation settings, boundary conditions, terrain data, and Manning's 'n' layers were generally maintained from the CH model. Burnside updated the Fairview Street structure as well as modified the road profile terrain data. Model input has been summarized in the following sections to provide background on the model as set up by CH/Urbantech and refined by Burnside.

The model contains one 2D flow area covering Appleby Creek that begins immediately downstream of the CN crossing and terminates south of Sheraton Road and Bridlewood. The limits of the 2D flow area are shown schematically in Figure 1 below.

Figure 1: 2D Flow Area and 2D Mesh



The 2D model geometry is generally summarized as follows:

- Nominal mesh cell size of 5 m x 5 m.
- Breaklines were drawn through the channel centerline to orient cells along the channel.
- Breaklines were drawn along areas of high ground (channel banks, road centerlines etc.) to orient cell faces to capture the high ground.
- The terrain was modified to include future development grading, channel improvements and changes to the road profile on Fairview Street to accommodate the new structure.
- All structure options were modelled using 2D area connections and coded in as bridge structures. This was done to simulate the open bottom of each structure and to reduce errors in the model that would arise from modelling culverts lower than the model terrain.
- The cell size through the structure at Fairview Street was increased in size from the original CH model to an average cell size of 5 m x 5 m. This was done to improve model stability through the 2D connection. Larger cell sizes through 2D connections provide more volume, which can reduce the risk of water oscillating between cells creating stability issues across structures.

5.1 Simulation Settings

Table 3 outlines the simulation settings in the 2D HEC RAS model.

Table 3: HEC RAS 2D Simulation Settings

	Appleby Creek @ Fairview Street Crossing
Nominal Grid Size	5 m x 5 m
Number of Cells	7663
Computational Time Step	1 second
Simulation Time	14:45 hour
Hydrograph Time Step	1 hour
Equation Set	SWE-ELM
Theta (0.6-1.0)	1
Water Surface Tolerance	0.003
Maximum Iterations (2D)	20
Initial Conditions Time	0

5.2 Terrain Data

The following modifications were made by Burnside to the terrain data supplied by CH within the model.

- The road profile along Fairview Street was raised to reflect the road geometry for the proposed structure. The profile was modified for a length of 50 m on either side of the structure. As the required profile is dependent on the structure, the lowest road profile was input to simplify terrain modifications for modelling. This will be updated once the preferred structure is selected. This is a conservative assumption because if flow does not overtop the road under the lowest road profile, it will not overtop the road under the options where the road profile is higher.

- A secondary low flow channel was added under the structure for the two equal span culvert option. The low flow channel geometry was maintained.

The terrain data supplied within the model included modifications upstream and downstream of the Fairview Street crossing that reflect the recommendations in the Erosion Control EA. Proposed grading throughout the Oval Court development was also reflected in the terrain data designed by Urbantech. This includes a berm at the northwestern limits of the Oval Court development required to contain the Regional Storm within Appleby Creek. As the site grading progresses, it should be confirmed that the terrain data is up to date.

5.3 Boundary Conditions

As stated in Section 4.0, the flows for the Fairview Street crossing were referenced from the EBC study. The flows were used to generate input boundary conditions into the model. Quasi-Steady State hydrographs were simulated, which is an appropriate assumption for sizing structures (bridges / culverts) in the 2D environment.

Flows from storm sewers that connect to Appleby Creek were also considered and input as quasi-steady state hydrographs.

The following boundary conditions summarized in Table 4 were input into the model.

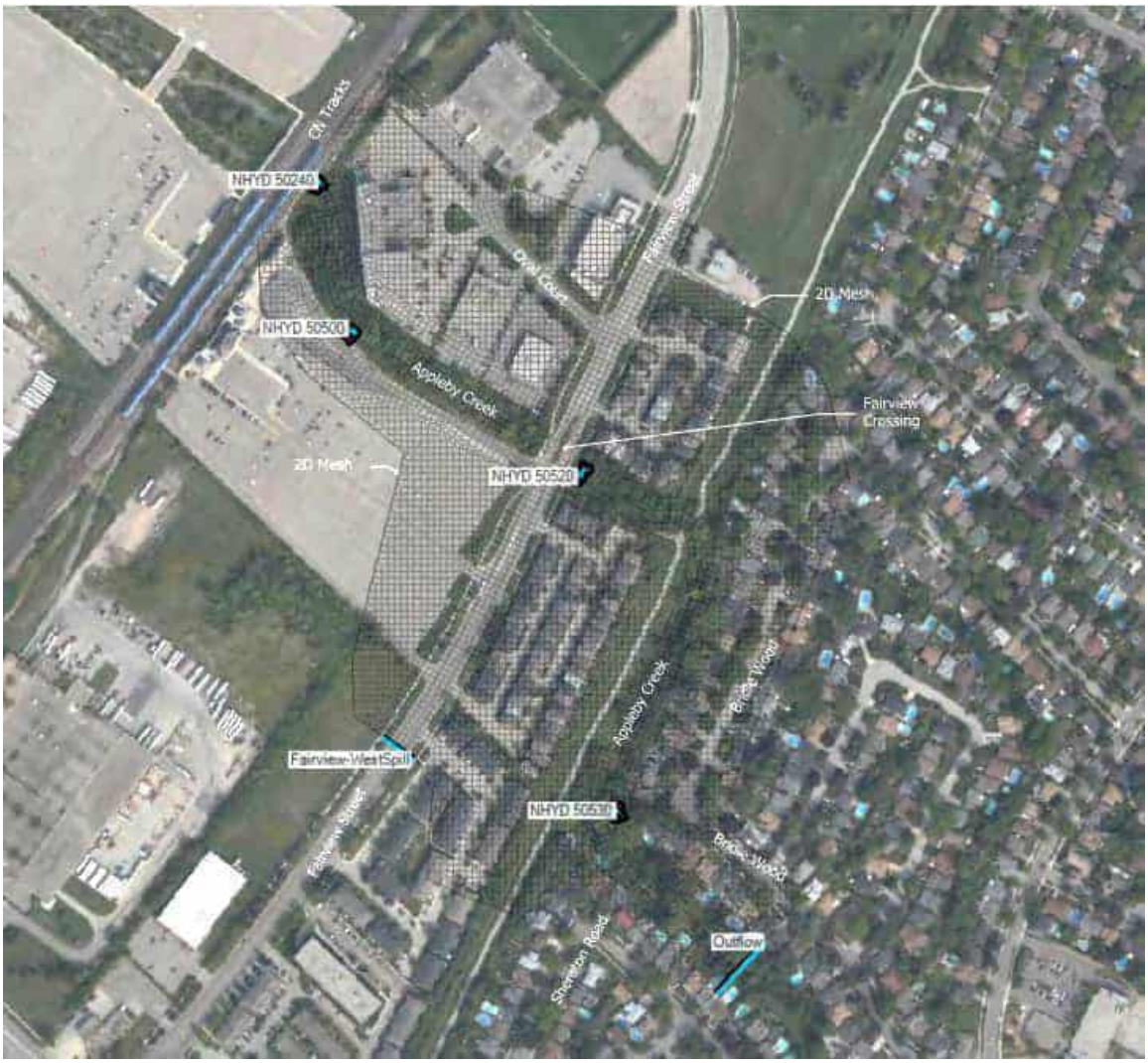
Table 4: Model Boundary Conditions

Name	Representation	Type	Regional Storm Value	100 Year Storm Value
Fairview Street BCLine: NHYD 50520	Storm Sewer Inflow	Flow Hydrograph	Quasi-Steady State: 5.32 m^3/s EG Slope: 0.005 m/m	Quasi-Steady State: 5.32 m^3/s EG Slope: 0.005 m/m
Fairview Street BCLine: NHYD 50540	Appleby Creek Flow	Flow Hydrograph	Quasi-Steady State: 101.6 m^3/s EG Slope: 0.005 m/m	Quasi-Steady State: 73.65 m^3/s EG Slope: 0.005 m/m
Fairview Street BCLine: NHYD 50500	Storm Sewer Inflow	Flow Hydrograph	Quasi-Steady State: 3.17 m^3/s EG Slope: 0.005 m/m	Quasi-Steady State: 3.17 m^3/s EG Slope: 0.005 m/m
Fairview Street BCLine: NHYD 50530	Storm Sewer Inflow	Flow Hydrograph	Quasi-Steady State: 3.62 m^3/s EG Slope: 0.005 m/m	Quasi-Steady State: 3.62 m^3/s EG Slope: 0.005 m/m
Fairview Street BCLine: Outflow	Model Outflow	Normal Depth	Friction Slope: 0.00625 m/m	Friction Slope: 0.00625 m/m
Fairview Street BCLine: Fairview-WestSpill	Fairview Street Spill Location	Normal Depth	Friction Slope: 0.005 m/m	Friction Slope: 0.005 m/m

To remain conservative, the storm sewer inflow values were maintained from the Regional Storm to the 100-year storm. Further information regarding the calculation of the storm sewer inflow values would be required to change from the Regional Event to the 100-year event.

The location of the boundary condition lines are shown in Figure 2.

Figure 2: Model Boundary Condition Line Locations



5.4 Land Cover Layer

A land classification layer was defined in HEC RAS. Figure 3 illustrates the polygons used to define each Manning's 'n' value. Table 5 outlines the Manning's 'n' value defined for each land type. Note that these values and the polygons have been maintained from the CH model.

Table 5: Manning's 'n' Values

Land Use	ID	Manning's 'n'
Forest	1	0.080
Field	2	0.055
Urban Residential	3	0.035
Building	4	1.000
Grass	5	0.045
Impervious	6	0.020
Low Flow	7	0.035
Overbank	8	0.013

Figure 3: Manning's 'n' Layer

5.5 Proposed Structures

Table 6 outlines the proposed structures that were analyzed in the 2D HEC RAS model.

Table 6: Proposed Structure Options

Name	Rise (m)	Span (m)	Length (m)	Soffit Elevation (m)	Number of Barrels
Two Unequal Span Culverts	2.8	16.16 4.89	36.2	99.8	2
Two Equal Span Culverts	2.8	10	36.2	99.8	2
17 m Clearspan Bridge	2.8	17	36.2	99.8	1

The bridge structures were modelled under the weir / pressure flow routine for high flow events.

6.0 Model Results

Table 7 outlines the headwater and tailwater elevation observed at each structure under the Regional and 100-year storm events.

Table 7: Model Results

Structure	Regional Storm Event (m^3/s)		100-year Storm Event (m^3/s)	
	Headwater Elevation (m)	Tailwater Elevation (m)	Headwater Elevation (m)	Tailwater Elevation (m)
Two Unequal Span Culverts	100.42	99.83	100.15	99.48
Two 10 m Equal Span Culverts	100.23	99.81	99.99	99.48
17 m Clearspan Bridge	100.22	99.75	99.98	99.46

The two equal span culverts and the 17 m clearspan bridge have very similar results under the Regional Storm event, only differing by 0.01 m. The hydraulic model produced will inherently have some degree of error, and as such, results that are within a +/- 10 cm tolerance under the same storm event are producing very similar results.

Figures 1 to 3 under **Appendix A** provide a visual representation of the floodplain extents under each of the scenarios modelled.

Depth and velocity throughout the floodplain were also analyzed for each of the scenarios. Figures 4 to 9 in **Appendix A** display the depth layers and the velocity layers under the Regional and 100-year storms.

6.1 Riparian Storage

As a result of the proposed channel works, a loss of riparian storage will occur. This loss of riparian storage is inevitable to lower the water surface elevation, however, it is necessary to reduce the flood hazard risk through the area.

An analysis was completed by CH which showed that impact of flood loss due to the proposed channel works had no appreciable impact on flood risk for the downstream area and the regulation limits were generally maintained.

7.0 Conclusion

Burnside has undertaken a hydraulic analysis of various structures to replace the existing crossing of Appleby Creek under Fairview Street in Burlington. The following options were reviewed:

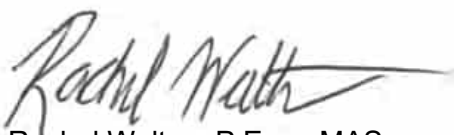
- Two unequal span culverts;
- Two 10 m span culverts; and
- 17 m Clearspan Bridge.

Each option analyzed includes a number of the upstream and downstream channel improvements that were contemplated in the Erosion Control EA.

The remaining structures produced similar headwater elevations under the Regional and 100-year storm events. Although the headwater elevations are above the soffit under all scenarios, the water surface is shown to be contained within the creek corridor.

Based on an overall assessment of the Fairview Street Crossing including cost and a structural assessment, the two 10 m span culverts have been selected as the preferred alternative. The model will be updated during the detailed design to include the corresponding proposed road profile and updated grading for the development lands.

R.J. Burnside & Associates Limited



Rachel Walton, P.Eng., MASc.
Project Engineer
RW:smm

Enclosure(s) Appendix A Figures

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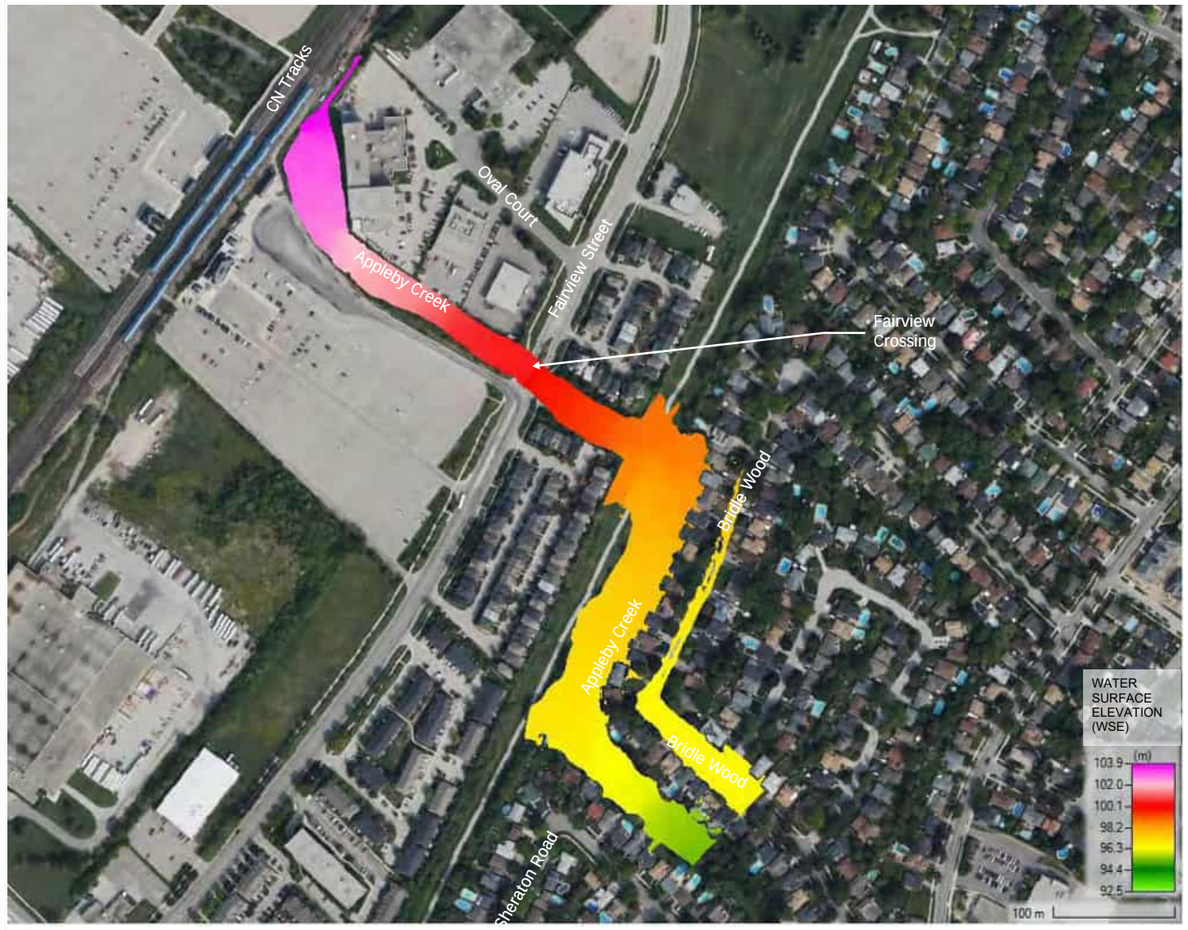
Appendix A

Figures



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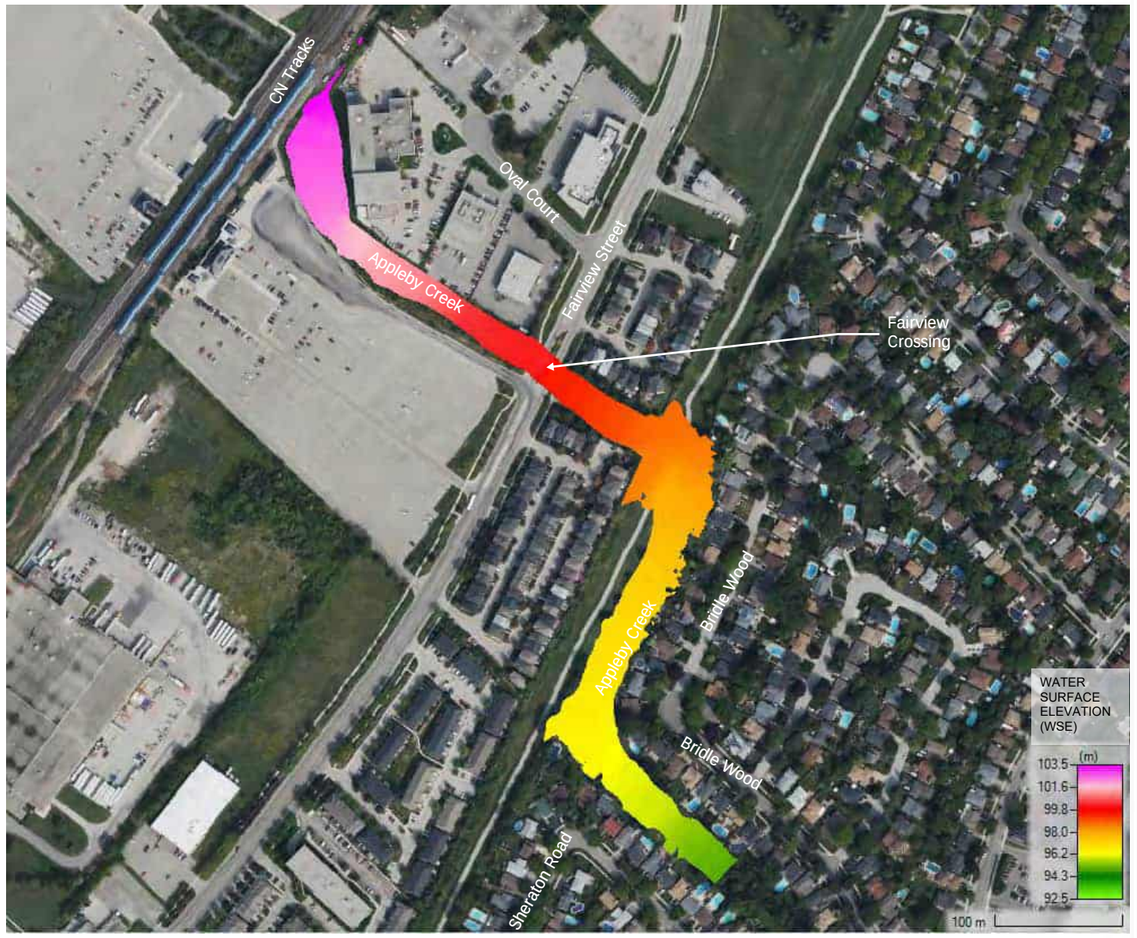

100-Year WSE

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HYDRAULIC ANALYSIS
2 CULVERTS UNEQUAL SPAN
REGIONAL & 100-YEAR STORM EVENTS

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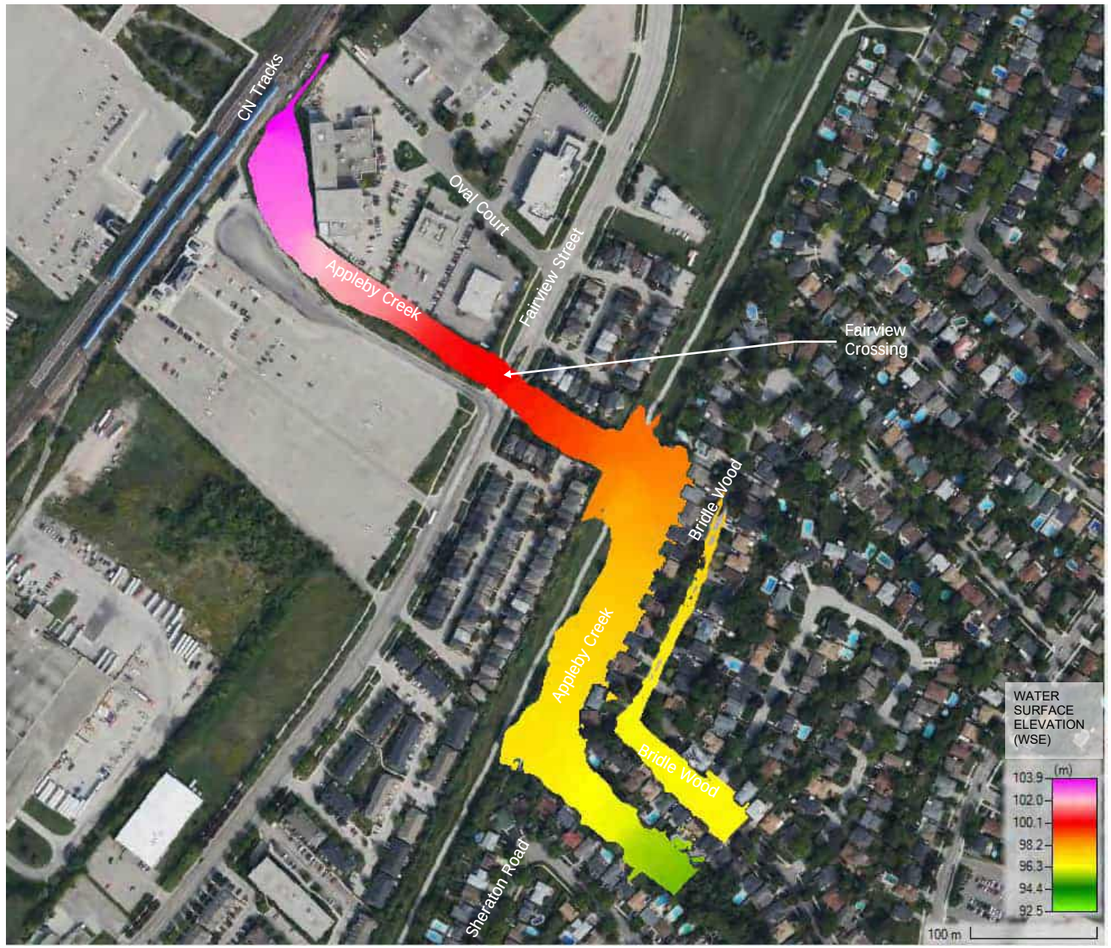

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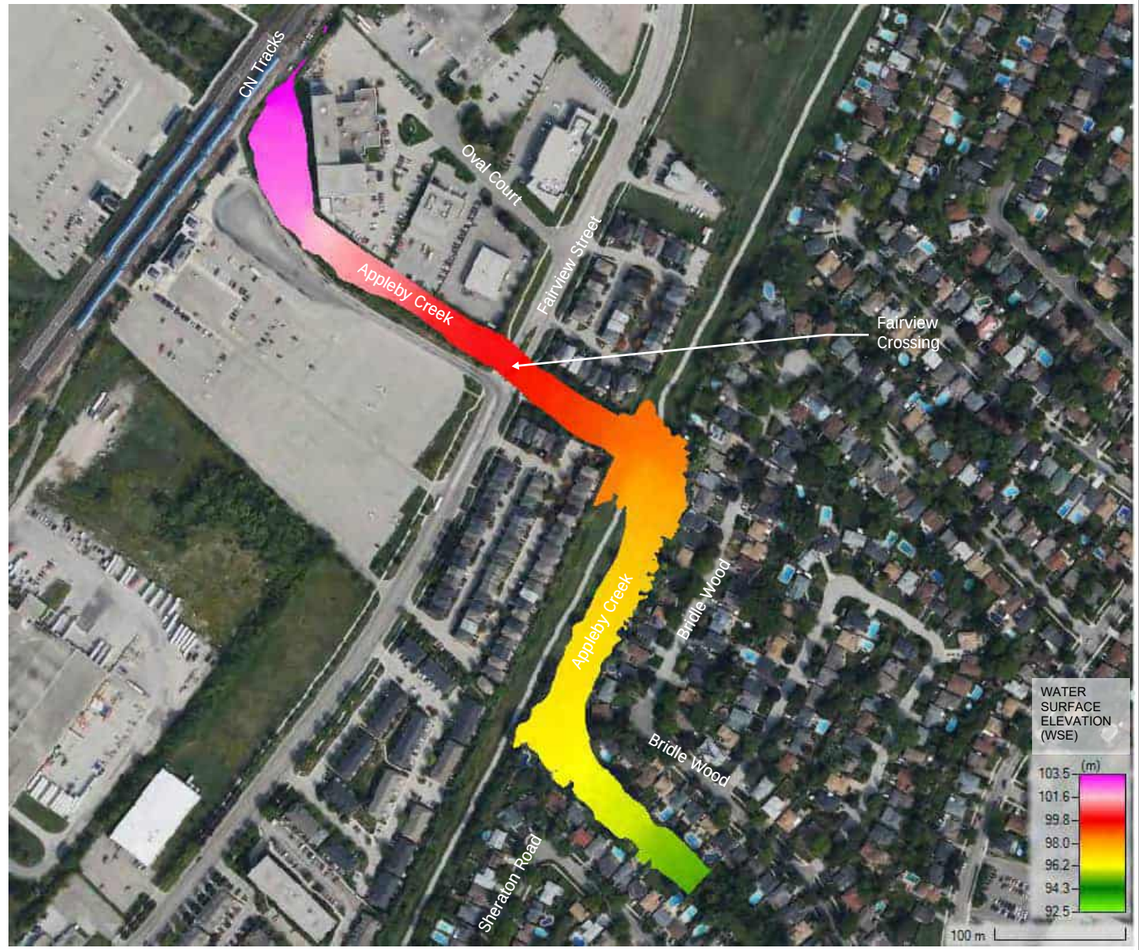

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Figure Title
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2 CULVERTS 10 m SPAN
REGIONAL & 100-YEAR STORM EVENTS

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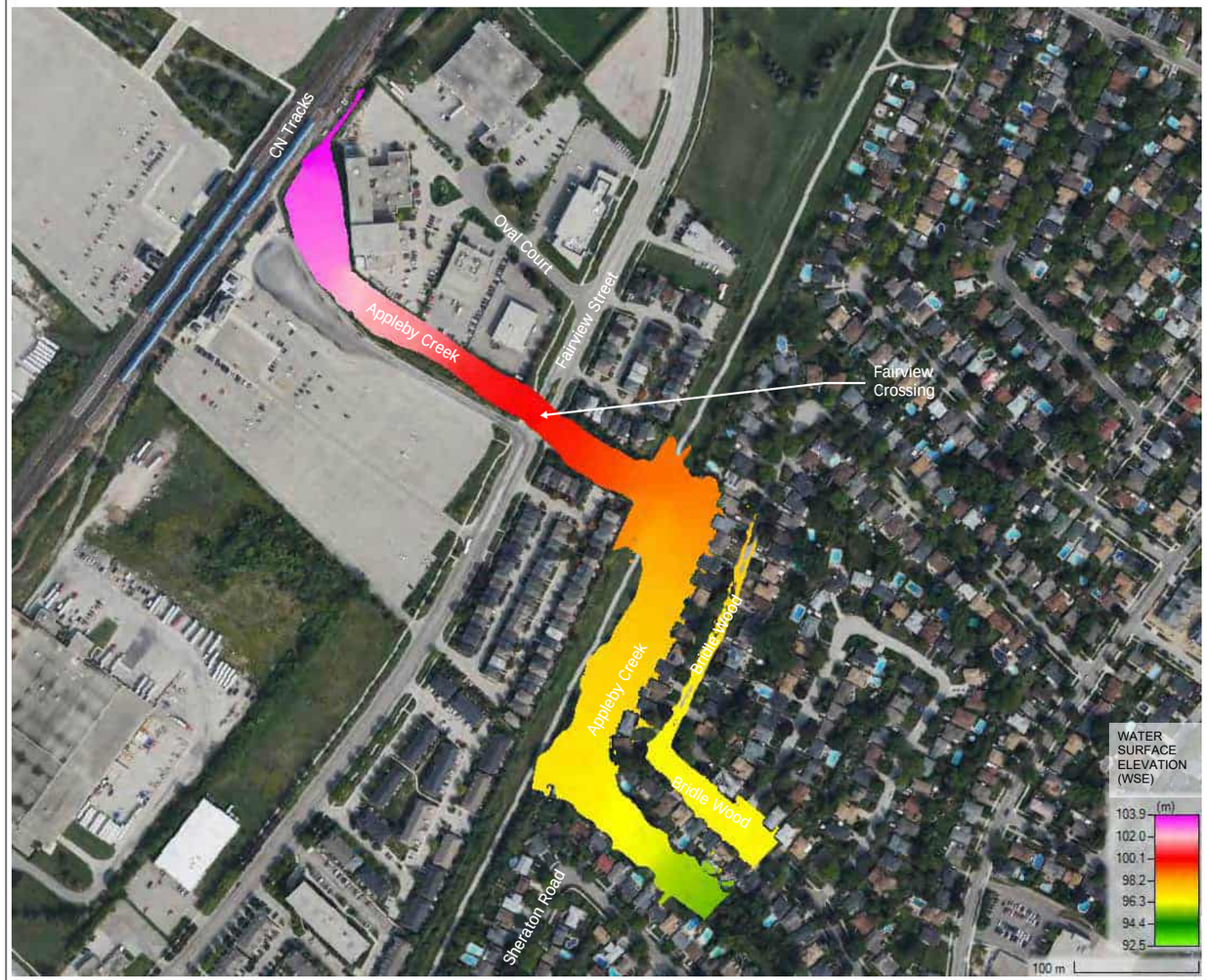

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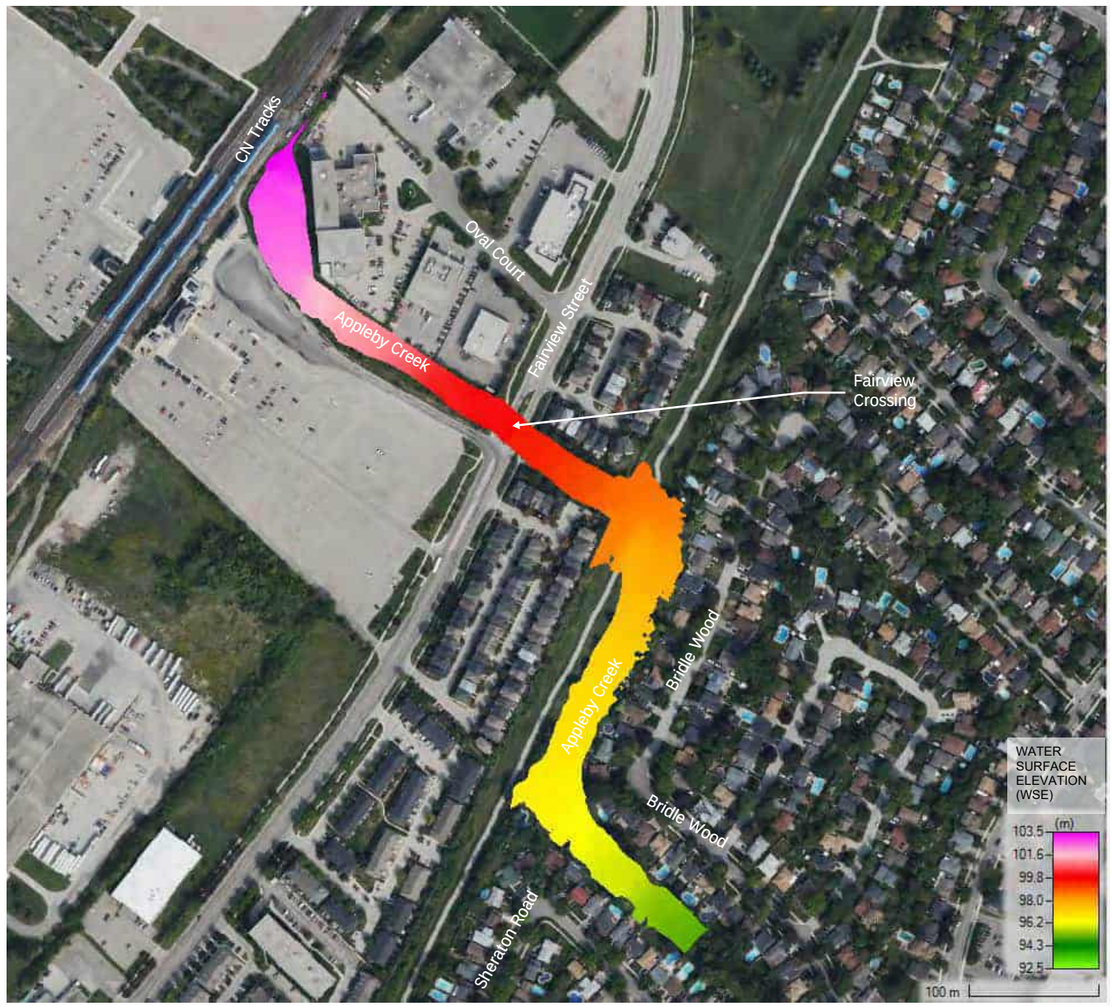

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17 M CLEARSPAN BRIDGE
REGIONAL & 100-YEAR STORM EVENTS

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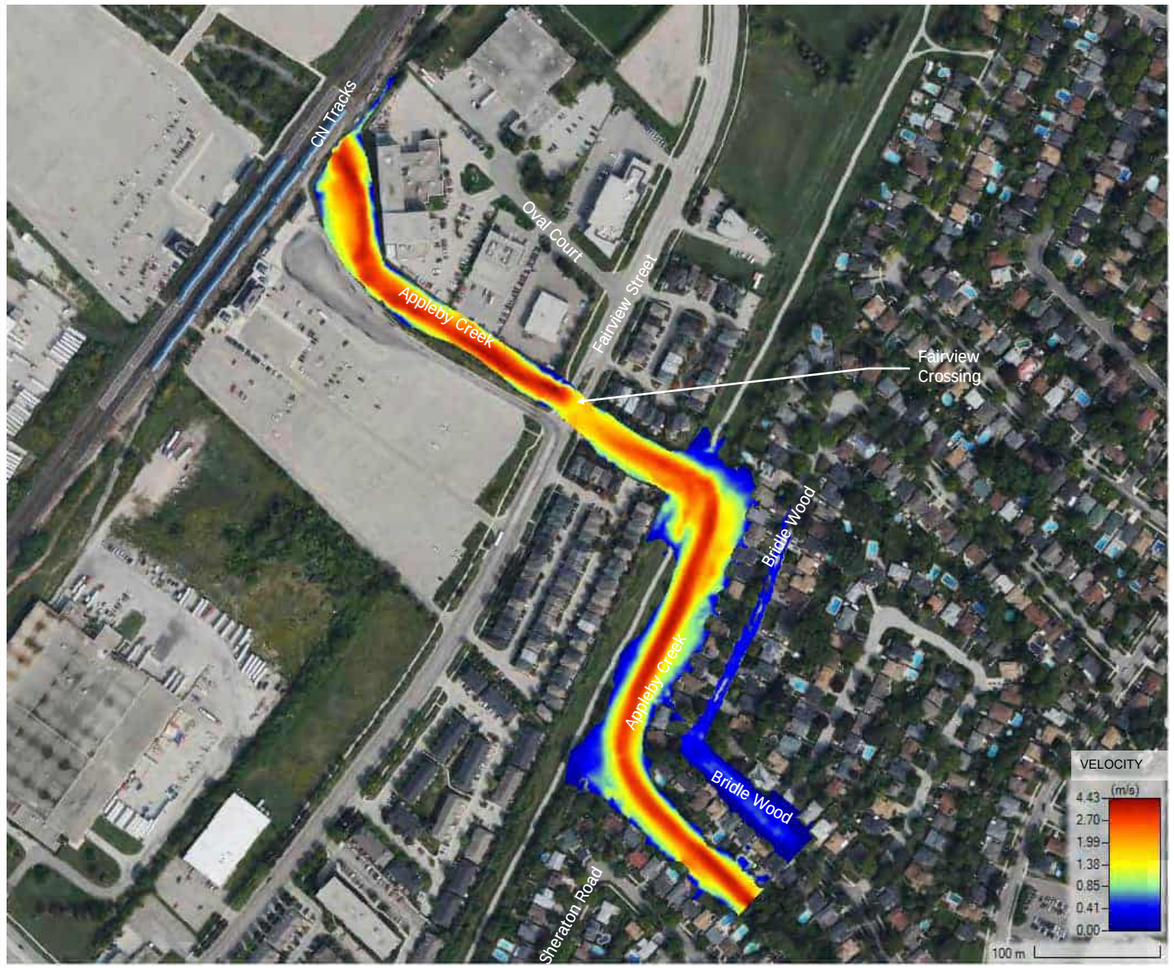

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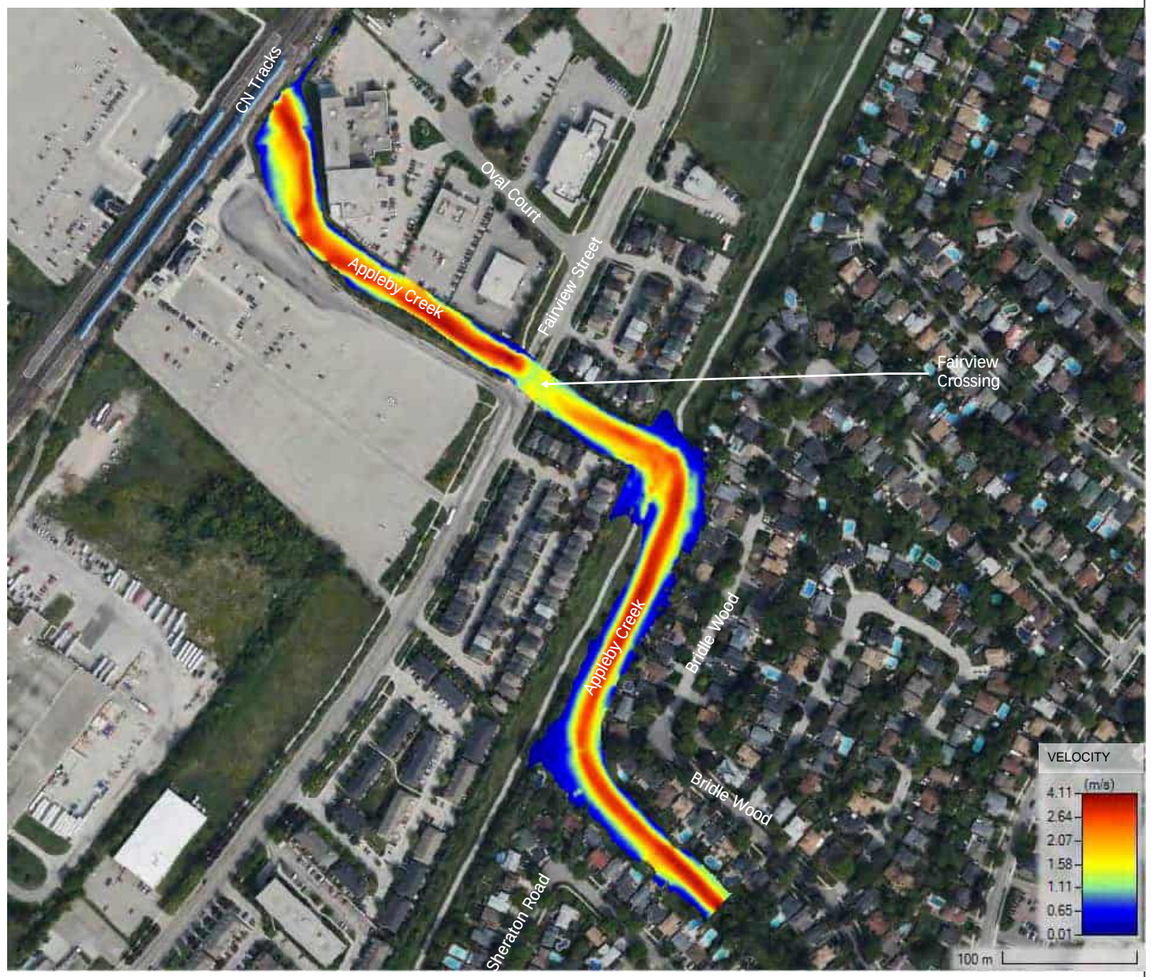

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2 CULVERTS UNEQUAL SPAN
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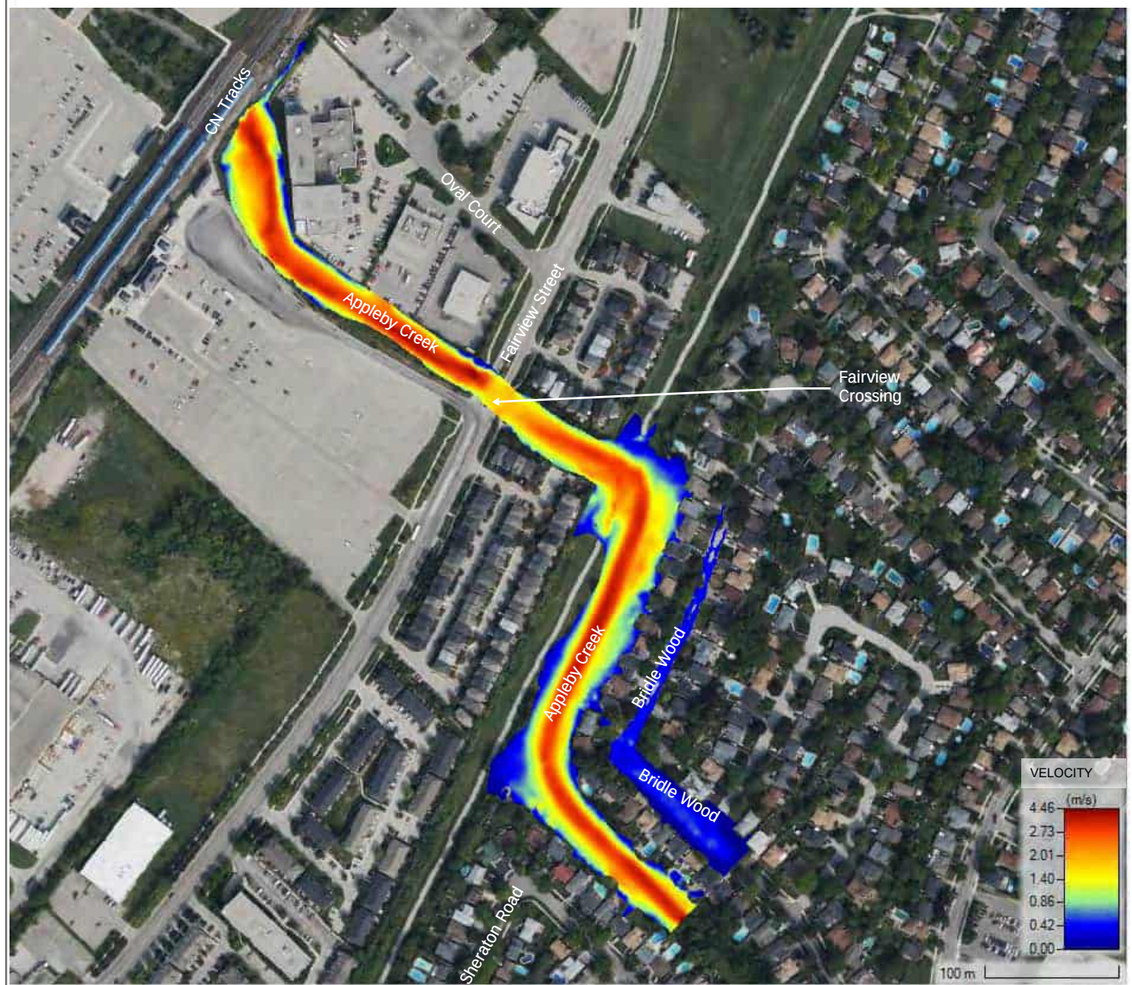

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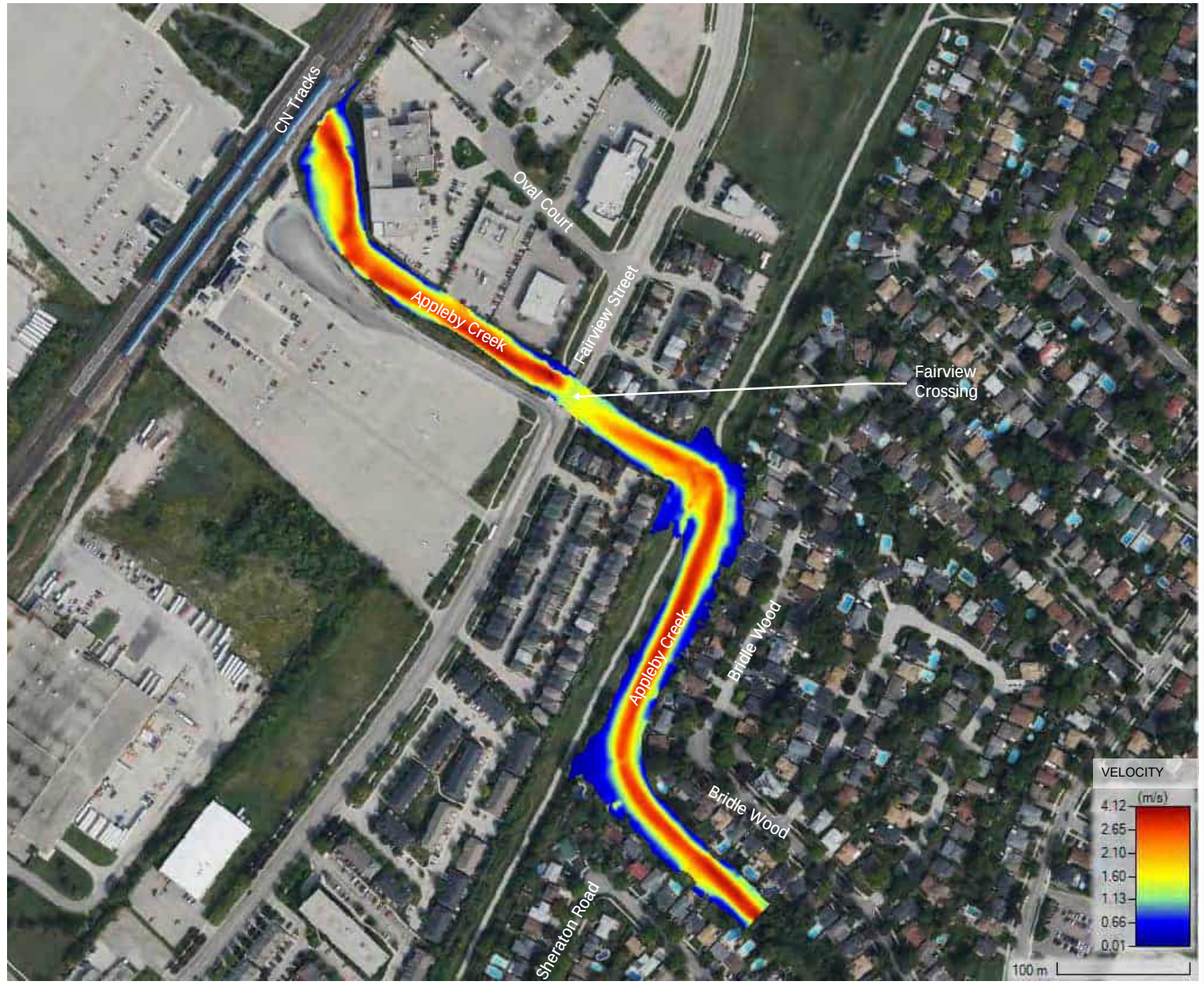

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2 CULVERTS 10 m SPAN
REGIONAL & 100-YEAR STORM EVENTS

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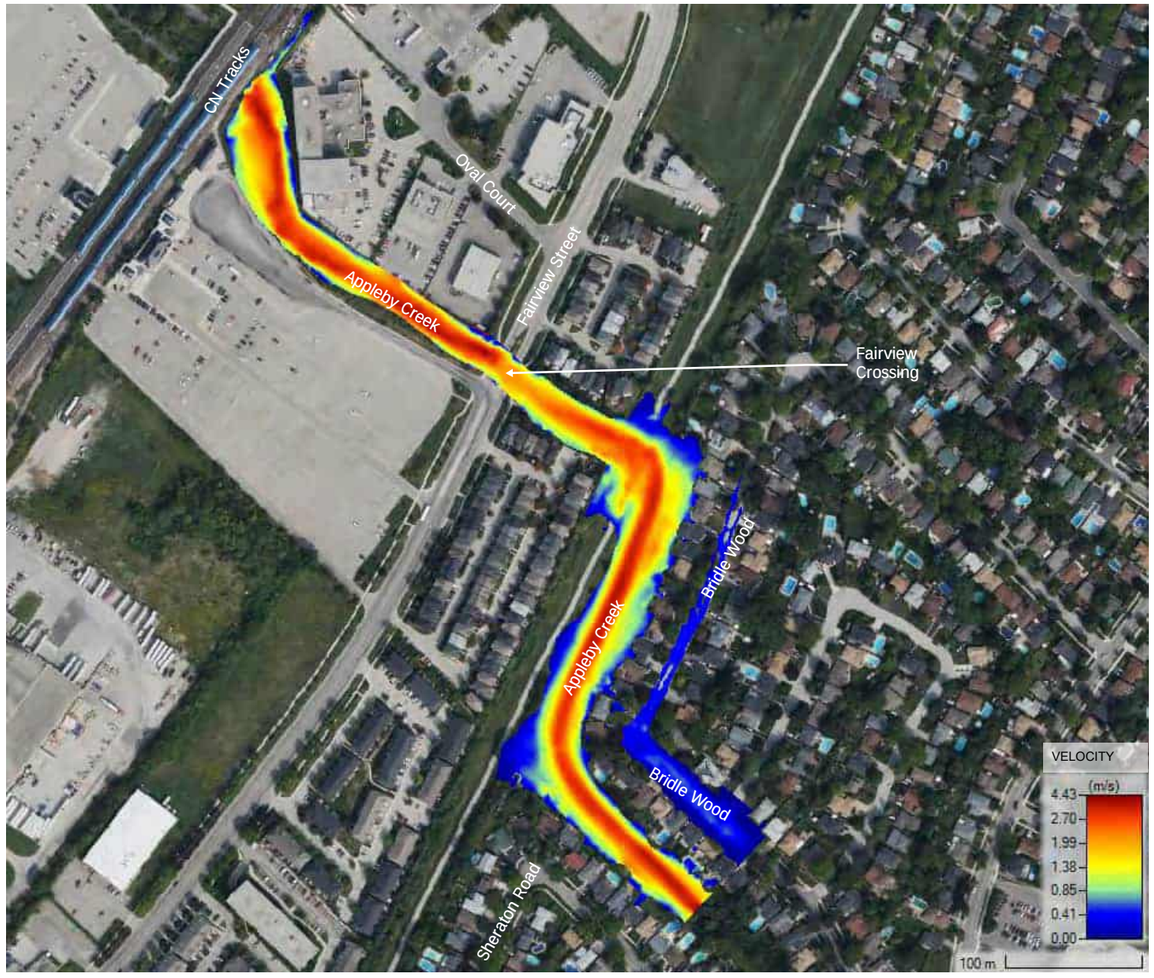

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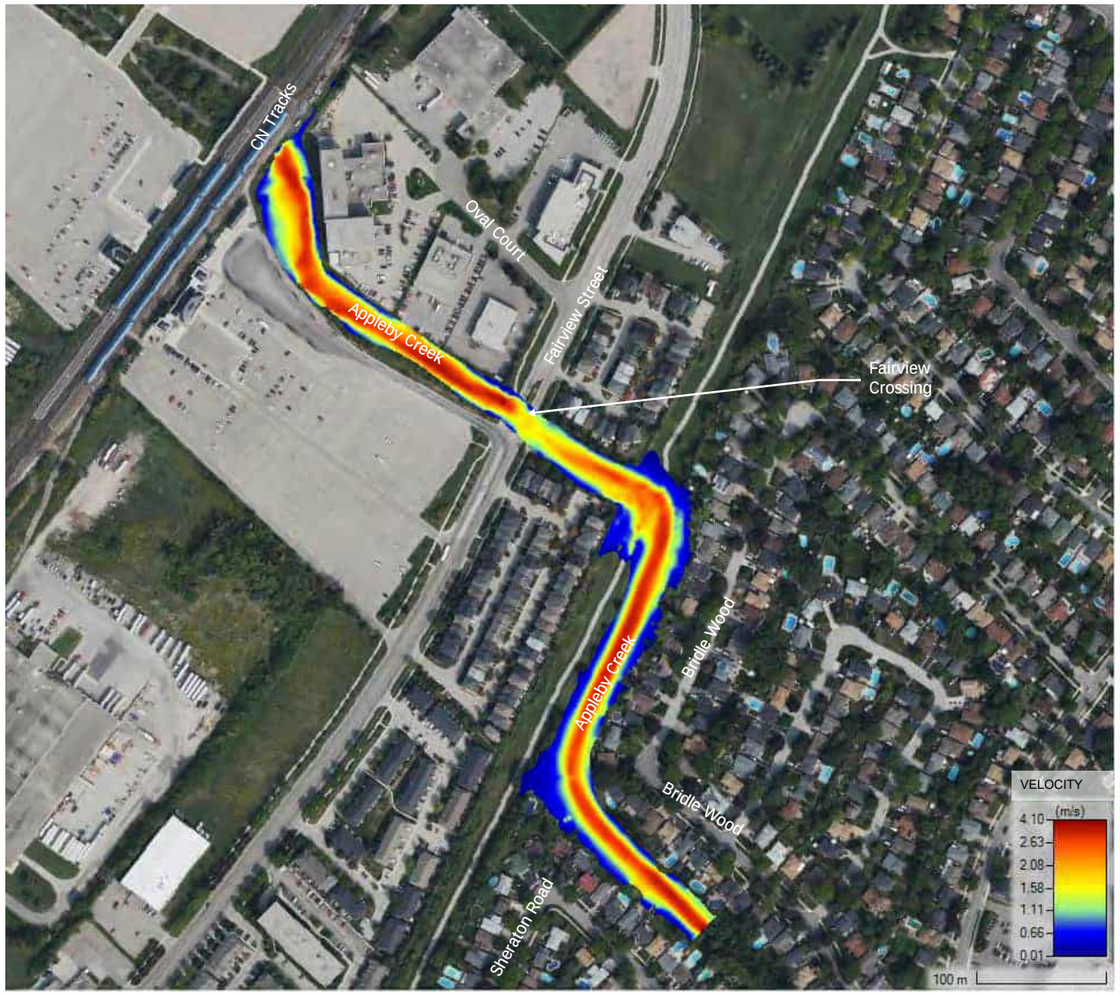

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17 M CLEARSPAN BRIDGE
REGIONAL & 100-YEAR STORM EVENTS

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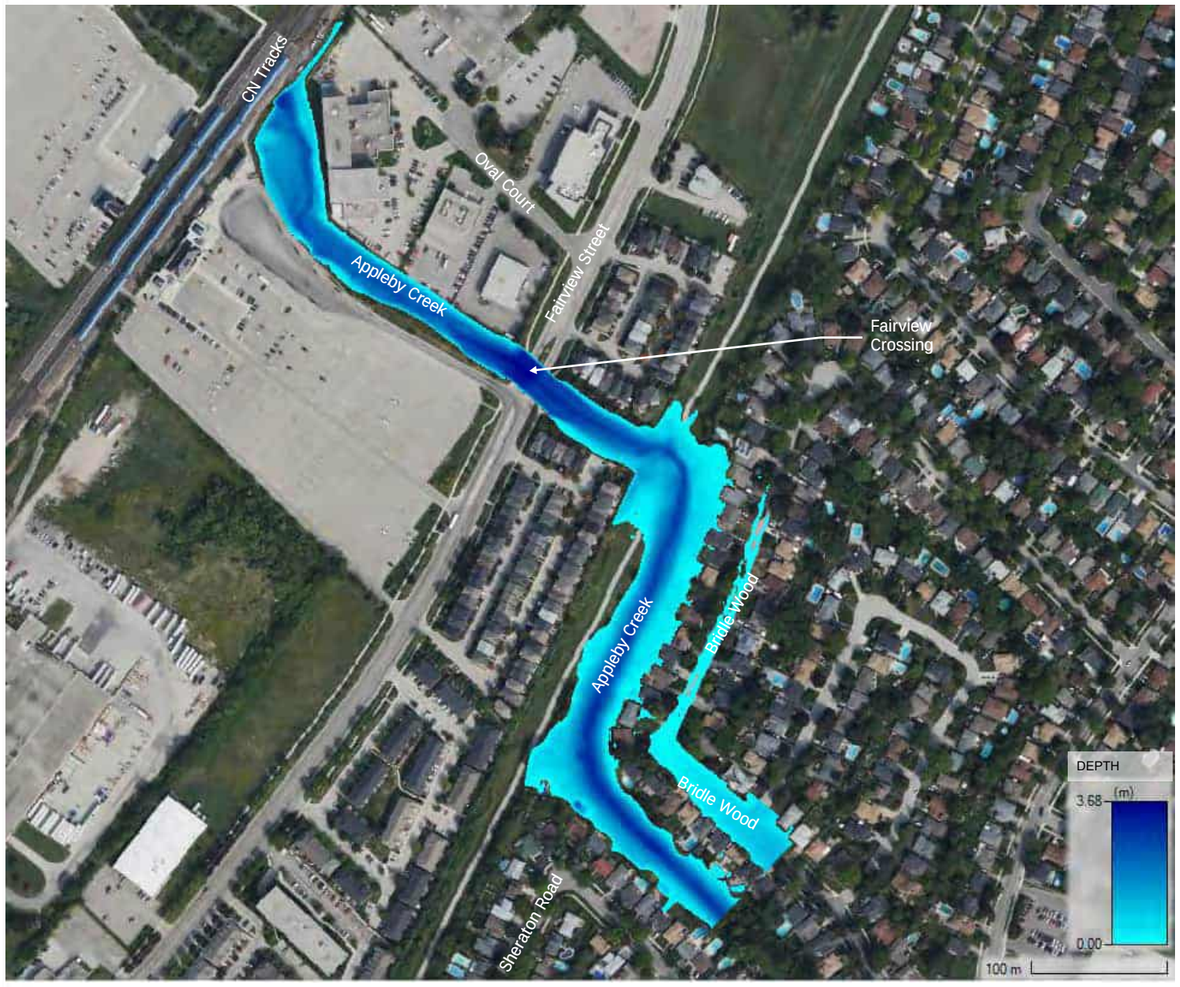

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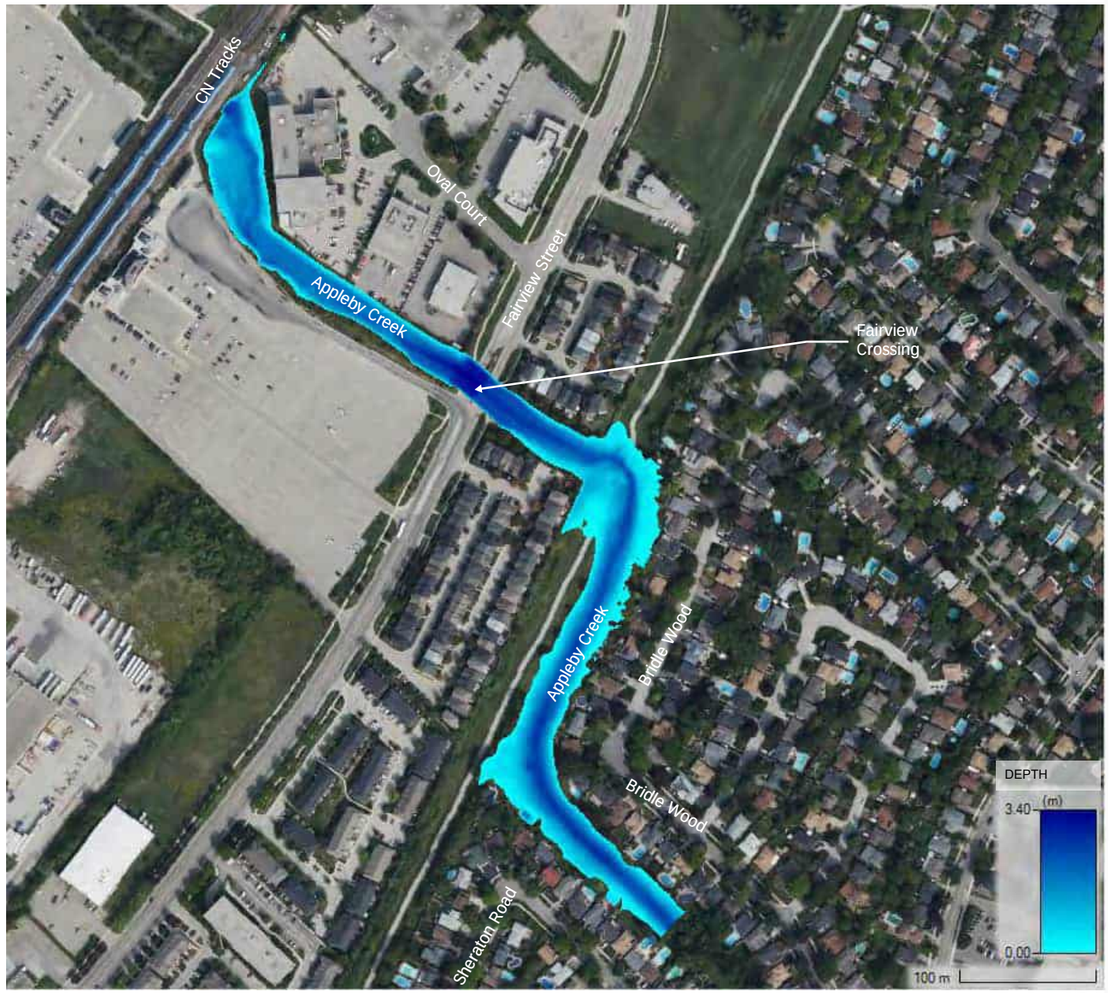

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2 CULVERTS UNEQUAL SPAN
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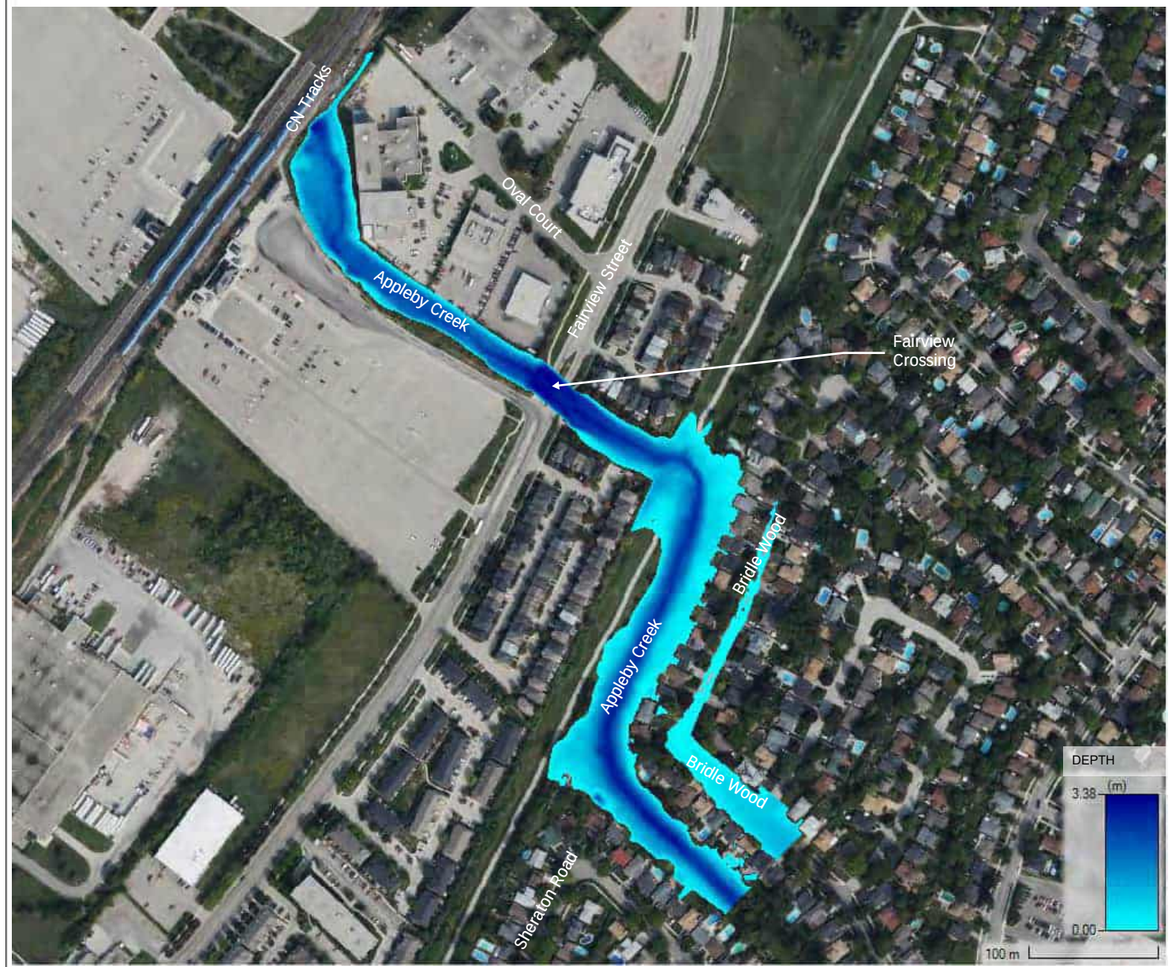

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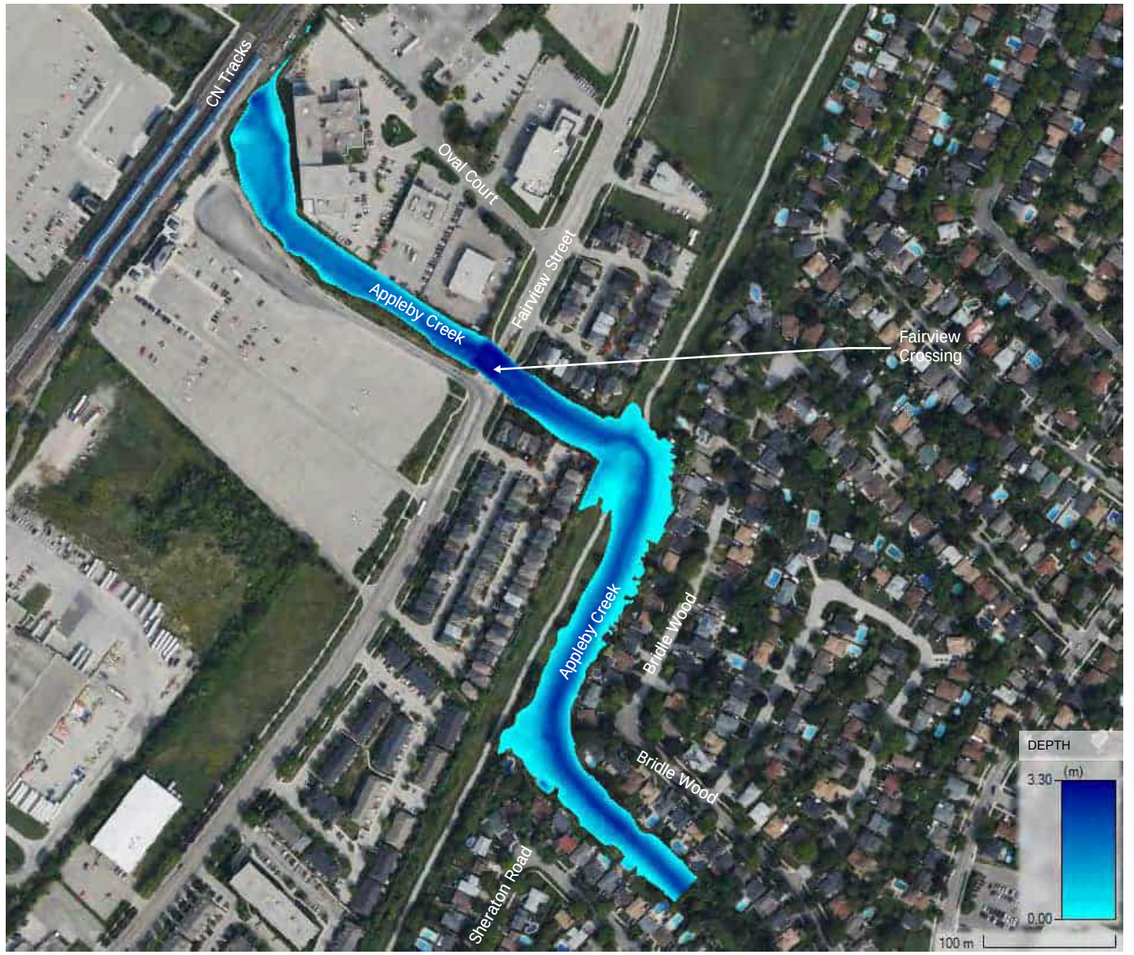

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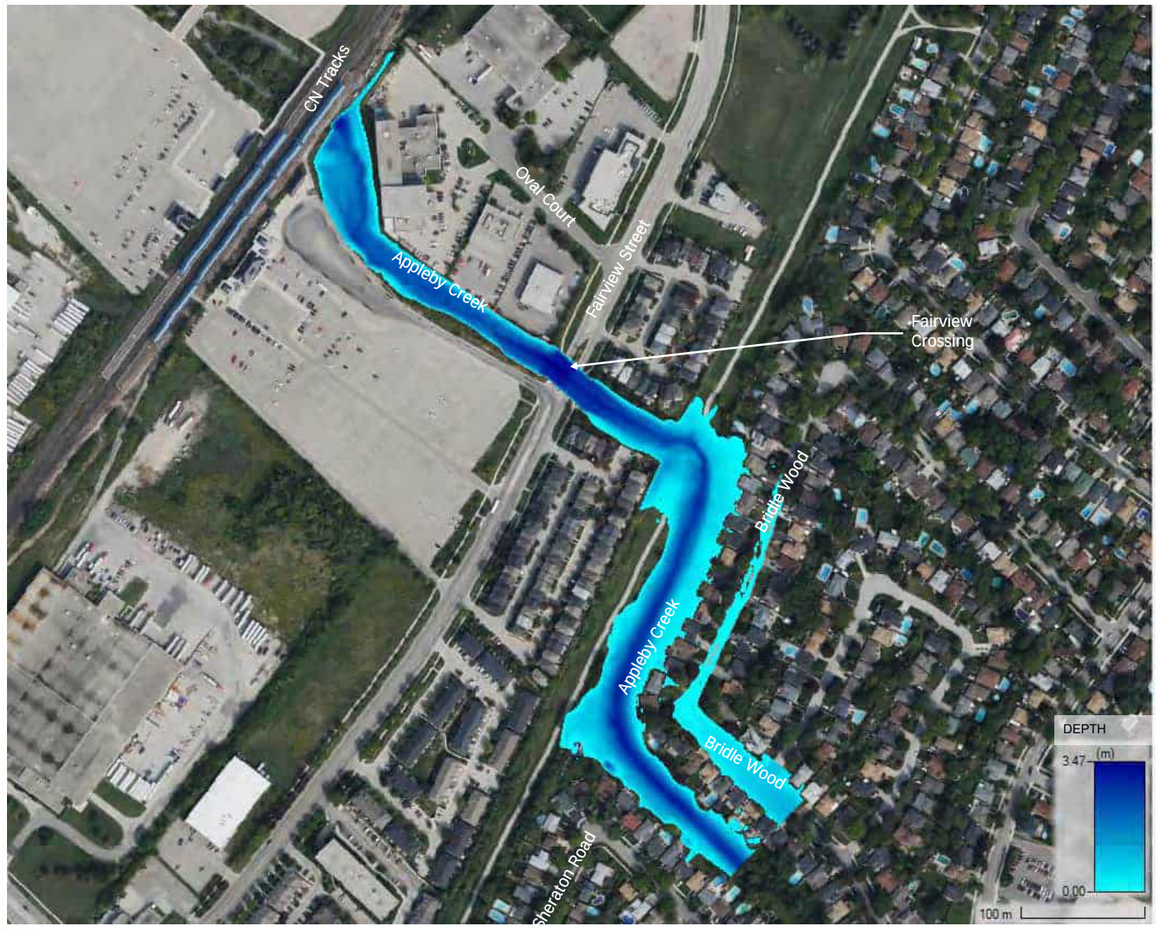

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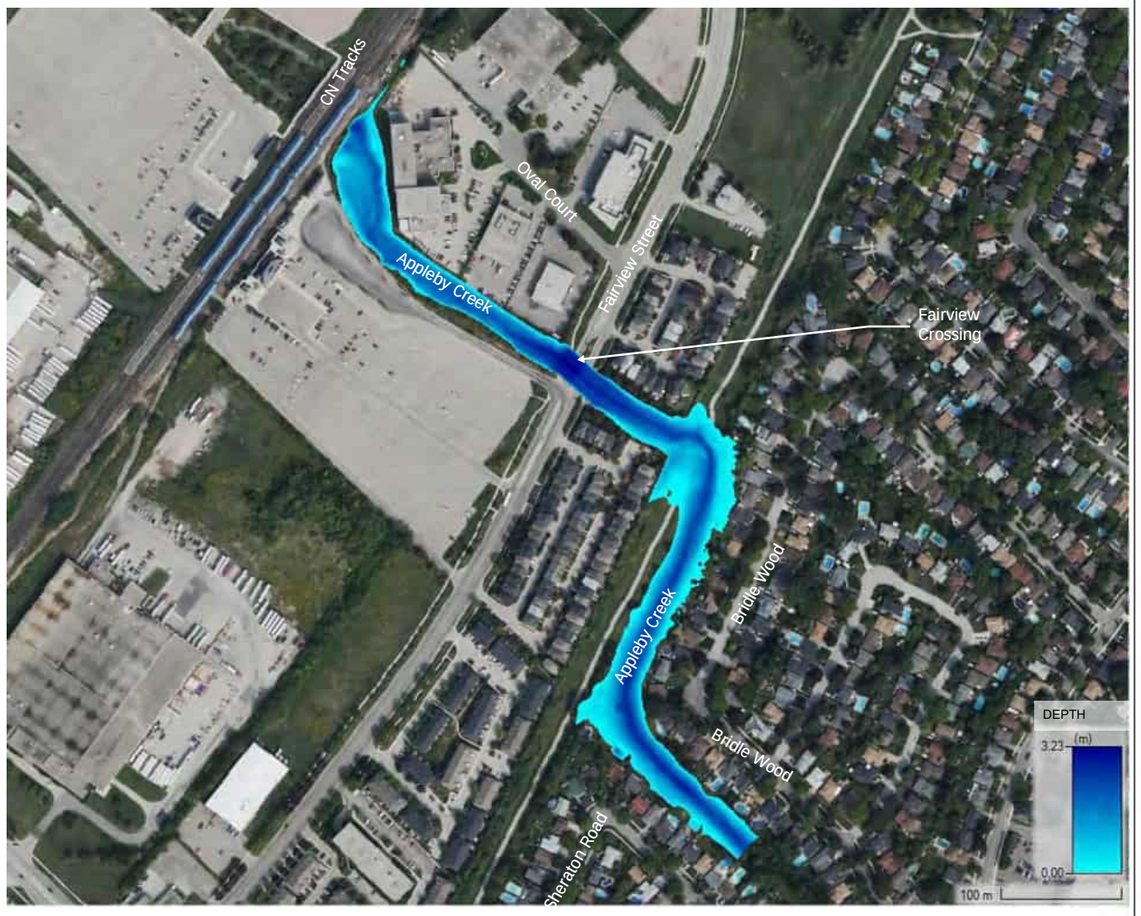

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[THE DIFFERENCE IS OUR PEOPLE]

Appendix C

Geotechnical Investigation

Report on

Geotechnical Investigation
Proposed Replacement of Creek Crossing Bridge
Fairview Street to West of Oval Court
Burlington, Ontario

Prepared For:

Branthaven Development

Project No. 20-117-102
Date: March 28, 2024

DS CONSULTANTS LTD.
6221 Highway 7, Unit 16
Vaughan, Ontario, L4H 0K8
Telephone: (905) 264-9393
www.dsconsultants.ca

Table of Contents

1. INTRODUCTION

DS Consultants Ltd. (DS) was retained by Branthaven Development (the client) to carry out a geotechnical investigation for the proposed replacement of the creek crossing bridge at Fairview Street, about 90 m southwest of the intersection of Oval Court and Fairview Street, in Burlington, Ontario.

Two boreholes (BH24-1 and BH24-2, see **Drawing 1** for locations) were drilled by DS at the bridge site for the geotechnical investigation.

The logs of the boreholes BH19-9A/B (see **Drawing 1** for locations) previously drilled by DS in 2020 near the bridge site are attached in **Appendix A**.

The purpose of this geotechnical investigation was to determine the subsurface conditions at the borehole locations and from the findings in the boreholes make geotechnical engineering recommendations for the proposed bridge replacement.

This report is provided on the basis of the terms of reference presented above and, on the assumption, that the design will be in accordance with applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design. It may then be necessary to carry out additional borings and reporting before the recommendations can cater to the changed design.

This report has been prepared for Branthaven Development and its designer. Use of this report by third party without DS consent is prohibited.

2. FIELD AND LABORATORY WORK

Two (2) boreholes (BH24-1 and BH24-2, see **Drawing 1** for borehole locations) were drilled at the subject site to depths ranging from 7.7 to 9.2 m below ground surface. Both boreholes were drilled into shale bedrock.

The boreholes were drilled using solid stem continuous flight augers equipment by a drilling sub-contractor under the direction and supervision of DS personnel. Samples were retrieved at regular intervals with a 50 mm O.D. split-barrel sampler driven with a hammer weighing 624 N and dropping 760 mm in accordance with the Standard Penetration Test (SPT) method. The samples were logged in the field and returned to the DS laboratory for detailed examination by the project engineer and for laboratory testing.

In addition to visual examination in the laboratory, all soil samples from the boreholes were tested for water contents. Grain size analyses and Atterberg Limits testing of selected 2 soil samples were conducted, and results are presented on the respective borehole logs and on **Drawings 5** and **6**.

Water level observations were made during and upon completion of drilling. Monitoring well of 50 mm diameter was installed in BH24-2 for the long-term groundwater measurements.

The ground surface elevations at the borehole locations were surveyed by DS using a differential GPS system. It should be noted that the elevations at the as-drilled borehole/well locations were not provided by a professional surveyor and should be considered approximate. Contractors performing any work referenced to the borehole elevations should confirm the borehole elevations for their work.

3. SITE AND SUBSURFACE CONDITIONS

On August 14, 2023, a senior geotechnical engineer from DS visited the site for slope stability study of the creek bank slopes. Site Google Images and Photographs (Photos 1 to 3) taken during the site visit near Fairview Street Bridge are attached in **Appendix B**.

The borehole location plan is shown on **Drawing 1**. General notes on sample description are provided on **Drawing 1A**. The subsurface conditions at the boreholes are presented in the individual borehole logs presented on **Drawings 2** to **3**. Generalized sub-surface profile for boreholes BH24-1 and BH24-2 is provided on **Drawing 4**. The test results of grain size analyses and Atterberg Limits are presented on **Drawings 5** to **6.**

3.1 Soil Conditions

Topsoil and Fill:

In Boreholes BH24-1 and BH24-2, a layer of 100 mm thick topsoil was found below surface. Below the topsoil, fill materials were found extending to a depth of 0.8 m. The fill in BH24-1 consisted of loose sandy silt, with a measured SPT N value of 8 blows per 300 mm penetration. The fill in BH24-2 consisted of firm silty clay, with a measured SPT N value of 4 blows per 300 mm penetration.

Silty Clay till Deposit:

Below the fill, native silty clay till was found, extending to depths of 2.3 to 2.4 m. The silty clay till deposit was firm to stiff in consistency, with measured SPT N values ranging from 5 to 13 blows per 300 mm penetration.

Grain size analyses of 2 silty clay till samples (BH24-1/SS2 and BH24-2/SS3) were conducted and the results are presented on **Drawing 5** and on the borehole logs. The fractions of soil particles of silty clay till are presented as follows:

Clay:	17 to 21%
Silt:	48 to 54%
Sand:	19%
Gravel:	10 to 12%

Atterberg Limits tests of the selected two (2) silty clay samples (BH24-1/SS2 and BH24-2/SS3) were also conducted. The results are shown on the borehole logs and on **Drawing 6** and are summarized as follows:

Liquid limit (WL): 28 to 32%
Plastic limit (WP): 15 to 16%
Plasticity index (PI): 13 to 16

Silty Clay Till/Shale Complex:

Below the silty clay till deposit, a layer of hard silty clay till/shale complex was encountered at depth of 2.3 to 2.8 m in BH24-1 and at depth of 2.4 to 3.0 m in BH24-2, with measured SPT N values ranging from 42 to more than 50 blows per 300 mm penetration. The silty clay till/shale complex deposit consisted of silty clay till mixed with highly weathered shale.

3.2 Bedrock Conditions

Shale bedrock of Queenston Formation was encountered in Boreholes BH24-1 and BH24-2 at depths of 2.8 to 3.0 m below the existing ground surface, corresponding to elevations varying from Elev. 96.9 to 97.5 m, as listed on **Table 1** below.

Table 1: Approximate Depth and Elevation of Bedrock Surface at Boreholes

Borehole No.	Depth of Bedrock Surface below Existing Ground (m)	Approximate Elevation of Shale Bedrock Surface (m)	Notes
BH24-1	2.8	97.5	Bedrock was augered from 2.8 to 7.7 m.
BH24-2	3.0	96.9	Bedrock was augered from 3.0 to 9.2 m.

The bedrock depths shown on the borehole logs are approximate. Commonly the till overlying the shale contains slabs of limestone which would give a false indication of the bedrock level. Similarly the depth of weathering cannot be determined accurately due to the presence of limestone layers.

The logs of previous boreholes BH19-9A/B (see **Drawing 1** for locations) drilled by DS in 2020 near the bridge site are attached in **Appendix A**. The shale bedrock in Borehole BH19-9B was cored at depth of 3.7 to 15.7 m (Elev. 97.2 to 85.2 m), as presented in **Appendix A**.

As shown in the photographs (**Photos 2 and 3**) in **Appendix B**, shale bedrock was observed at the creek bed near the bridge and at the lower portion of the creek bank slope near the southwest part of the bridge site.

The shale bedrock generally contains hard layers of sandstone, limestone and siltstone. Typically the hard layers comprise about 15 to 30 percent of the unit. However, higher concentrations of hard layers can be present. The hard layers are usually less than 100 to 150 mm thick but some layers are much

thicker. The thicker layers have been observed to be as much as 750 to 900 mm at other sites. The layers are actually lenses and they can vary significantly in thickness over short distance.

Appendix C presents more details and general comments about the shale bedrock.

3.3 Groundwater Conditions

During the drilling operations, no groundwater was observed in Boreholes BH24-1 and BH24-2.

The groundwater table measured in the monitoring well in BH24-2 was at a depth of 3.9 m, corresponding to Elev. 96.0 m.

The logs of previous boreholes BH19-9A/B (see **Drawing 1** for locations) drilled by DS in 2020 near the bridge site are attached in **Appendix A**. Groundwater levels observed in the monitoring wells in BH19-9A/B were at depth of 3.4 to 3.6 m, corresponding to Elev. 97.5 to 97.3 m.

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations in response to major weather events.

4. DISCUSSION AND PRELIMINARY GEOTECHNICAL RECOMMENDATIONS

In this report, the soil and groundwater conditions are interpreted as relevant to the design and planning of the proposed bridge replacement. Comments relating to construction are intended for the guidance of the design engineer to establish constructability.

The construction methods described in this report must not be considered as being specifications or direct recommendations to the contractors, or as being the only suitable methods. Prospective contractors should evaluate all of the factual information, obtain additional subsurface information as they might deem necessary and should select their construction methods, sequencing and equipment based on their own experience in similar ground conditions. The readers of this report are also reminded that the conditions are known only at the borehole locations and conditions may vary significantly in-between.

4.1 Foundations

Shale bedrock of Queenston Formation was encountered in Boreholes BH24-1 and BH24-2 at depths of 2.8 to 3.0 m below the existing ground surface, corresponding to elevations varying from Elev. 96.9 to 97.5 m. As shown in the photographs (Photos 2 and 3) in **Appendix B**, shale bedrock was also observed at the creek bed near the bridge and at the lower portion of the creek bank slope near the southwest part of the bridge site.

Based on the bedrock information indicated above, the proposed new bridge structure can be supported by footings founded on shale bedrock.

Footings founded on shale bedrock, at minimum 0.3 m below the bedrock surface can be designed for bearing capacity values of 2.5 MPa at SLS and 3.8 MPa at ULS.

The bearing capacity values given above are considered sufficient for the proposed bridge. Higher bearing capacity values for footings on sound bedrock are available, if required.

Foundations designed to the specified bearing capacity at the serviceability limit states (SLS) are expected to settle less than 25 mm total and 19 mm differential.

All footings exposed to seasonal freezing conditions must have at least 1.2 m of soil cover or its thermal equivalent for frost protection.

Where it is necessary to place footings on shale bedrock at different levels, the upper footing must be founded below an imaginary 1 horizontal to 1 vertical (1H:1V) line drawn up from the base of the lower footing. The lower footing must be installed first to help minimize the risk of undermining the upper footing.

It should be noted that the recommended bearing capacities have been calculated by DS from the borehole information for the preliminary design stage only. The investigation and comments are necessarily on-going as new information of the underground conditions becomes available. For example, more specific information is available with respect to conditions between boreholes when foundation construction is underway. The interpretation between boreholes and the recommendations of this report must therefore be checked through field inspections provided by DS to validate the information for use during the construction stage.

4.2 Approach Embankments

It is recommended that all existing fill material, organic soils, loose/disturbed soils and other unsuitable materials be removed from the area of the proposed approach embankments prior to commencing earthwork construction. After stripping, the exposed subgrade should be inspected and approved by a qualified geotechnical engineer.

The materials used for the construction of the embankment fills below slab should consist of approved, acceptable earth fill, i.e. select subgrade materials (SSM) or Granular 'B' – OPSS 1010. The embankment fill should be placed on the approved and properly rolled subgrade in lifts not exceeding 300 mm when loosely placed and each lift should be uniformly compacted to at least 98% of the material's Standard Proctor Maximum Dry Density (SPMDD).

4.3 Earth Pressure and Retaining Structures

Backfill behind abutments and retaining walls should consist of non-frost susceptible, free draining granular materials.

Granular backfill to be placed behind the abutment walls and wingwalls should conform to the minimum requirements illustrated in OPSD 3101.150. The granular backfill should conform to OPSS 1010 for either Granular 'A' or 'B' Type I and Type II. To maintain free draining characteristics in these granular fill materials, the maximum percentage passing the No. 200 sieve (75 μm) should be limited to 5%.

The backfill should be placed in accordance with OPSS 501. A perforated subdrain should be installed behind the base of the walls as shown in OPSD 3501.00 to maintain the granular fill in a drained condition. The subdrain should be directed to a positive outlet to the municipal sewer or highway drainage system.

Computation of earth pressures acting against rigid retaining walls and any wingwalls should be in accordance with the Canadian Highway Bridge Design Code, (CHBDC). For design purposes, the following properties can be assumed for backfill.

Compacted Granular 'A' and Granular 'B' Type II

Angle of Internal Friction ϕ=35° (unfactored)

Unit weight = 22 kN/m^3

Coefficient of Lateral Earth Pressure:

Level Backfill	Backfill Sloping at 3H:1V	Backfill Sloping at 2H:1V
K_a=0.27	K_a=0.34	K_a=0.40
K_b=0.35	K_b=0.44	K_b=0.50
K_o=0.43	K_o=0.56	K_o=0.62
K*=0.45	K*=0.60	K*=0.66

Compacted Granular 'B' Type I

Angle of Internal Friction ϕ=32° (unfactored)

Unit Weight = 21 kN/m^3

Coefficient of Lateral Earth Pressure:

Level Backfill	Backfill Sloping at 3H:1V	Backfill Sloping at 2H:1V
K_a=0.31	K_a=0.42	K_a=0.54
K_b=0.41	K_b=0.52	K_b=0.64
K_o=0.47	K_o=0.66	K_o=0.76
K*=0.57	K*=0.74	K*=0.86

Notes:

K_a is the coefficient of active earth pressure

K_b is the backfill earth pressure coefficient for an unrestrained structure

including compaction efforts

K_o is the coefficient of earth pressure at rest

K* is the earth pressure coefficient for a soil loading a fully restrained structure and includes compaction effect

These values are based on the assumption that the backfill behind the retaining structure is free-draining granular material and adequate drainage is provided.

The earth pressure coefficient adopted will depend on whether the retaining structure is restrained or some movement can occur such that the active state of earth pressure can develop. In the case of a rigid frame structure, yielding is unlikely and therefore at rest pressures should be used. The effect of compaction should also be taken into account in the selection of the appropriate earth pressure coefficients.

As an alternative to conventional retaining walls, consideration could be given to Retained Soil System in which case the designer will have to include the geometric, performance and appearance requirements. The Retained Soil System must be designed and constructed by a specialized contractor.

4.4 SEISMIC SITE CLASSIFICATION

4.4.1 Site Coefficient

The subsurface profile at this site has been classified as Type I according to the CHBDC. Therefore, according to Table 4.4 of the CHBDC, a Site Coefficient "S" (ground motion amplification factor) of 1.0 should be used in seismic design, if required.

4.4.2 Seismic Analysis Coefficient

The potential for seismic (earthquake) loading may also have to be considered for the design of the retaining wall in accordance with Section 4.6 of the CHBDC. According to Table A3.1.1 and Table 4.1 of the CHBDC, this site is located in Seismic Performance Zone 2 for the proposed bridge.

4.5 Erosion and Scour Protection

Erosion and scour protection should be provided for the abutments and foundations of the bridge. Proper erosion and scour protection should also be provided along the sides of the creek near the bridge structures.

The erosion and scour protection should be designed by a specialist river engineer/scientist who is familiar with the findings of this investigation.

4.6 Excavations and Groundwater Control

Excavations can be carried out with heavy hydraulic backhoe. Dewatering will be required prior to any excavations below the groundwater table.

Contractor should be prepared to deal with creek water. Water level anticipated in the creek can fluctuate seasonally and may be higher during wet periods of the year.

All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the existing fill, firm to stiff clayey silt to silty clay deposits and any sandy soils can be classified as Type 3 soil above groundwater table and as Type 4 soil below the water table. The very stiff to hard clayey silt to silty clay deposits can be classified as Type 2 soil above groundwater and as Type 3 soil below groundwater.

It should be noted that the soil may contain boulders. Possible large obstructions such as buried concrete pieces and existing foundations are also anticipated in the fill material. Provisions must be made in the excavation contract for the removal of possible boulders in the till or obstructions in the fill material.

5. GENERAL COMMENTS AND LIMITATIONS OF REPORT

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

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

The conclusions and recommendations given in this report are based on information determined at the test hole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of test holes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. DS accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

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

DS CONSULTANTS LTD

Alka Sangar, M.Eng., P.Eng.

Fanyu Zhu, Ph.D., P.Eng.

Drawings

J:\2020 Projects\20-117-102 Geo - Bridge on Fairview Street, Oval Court, Burlington, Ontario\Geotechnical\QGIS\1-QGIS\Figure 1 Borehole Location Plan.qgs Mar-26

Legend

- Borehole
- Monitoring Well
- Monitoring Well (DS - 2020)

DS CONSULTANTS LTD.
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Client: BRANTHAVEN DEVELOPMENT

Project: GEOTECHNICAL INVESTIGATION
Fairview Street at Oval Court, Burlington, ON

Title: **BOREHOLE LOCATION PLAN**

N

Size:	Approved By:	Drawn By:	Date:
8.5 x 11	F.Z	K.T	March 2024
Rev: 0	Scale: As Shown	Project No.: 20-117-102	Drawing No.: 1

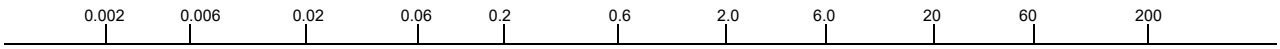
Image/Map Source: *Google Satellite Image*

Drawing 1A: Notes on Soil Sample Descriptions

1. All sample descriptions included in this report generally follow the Unified Soil Classification. Laboratory grain size analyses provided by DS also follow the same system. Different classification systems may be used by others, such as the system by the International Society for Soil Mechanics and Foundation Engineering (ISSMFE). Please note that, with the exception of those samples where a grain size analysis and/or Atterberg Limits testing have been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		



EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional preliminary geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

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LOG OF BOREHOLE BH24-1

PROJECT: Geotechnical Investigation
CLIENT: Branthaven Developments
PROJECT LOCATION: Fairview St. at Oval Court, Burlington, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4803585.27 E 600619.69

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Mar-13-2024

REF. NO.: 20-117-102
ENCL NO.: 2

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
100.3 / 0.0	**TOPSOIL:** 100mm					
100.2 / 0.1	**FILL:** sandy silt, trace gravel, reddish brown, moist, loose	1	SS	8	100	
99.5 / 0.8	**SILTY CLAY TILL:** some sand, some gravel, trace shale fragments, reddish brown, moist, stiff	2	SS	13	99	10 19 54 17
		3	SS	9		
98.0 / 2.3	**SILTY CLAY TILL/SHALE COMPLEX:** trace sand, reddish brown, moist, hard	4	SS	42	98	
97.5 / 2.8	**SHALE BEDROCK:** Queenston Formation, reddish brown, weathered	5	SS	50/ 50mm	97	
		6	SS	50/ 25mm	96	
		7	SS	50/ 50mm	95	
92.6 / 7.7	**END OF BOREHOLE:** Notes: 1) Borehole was dry upon completion.	8	SS	50/ 50mm	94 93	

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

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

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 20-117-102GEO.GPJ DS.GDT 24-3-26

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LOG OF BOREHOLE BH24-2

PROJECT: Geotechnical Investigation
CLIENT: Branthaven Developments
PROJECT LOCATION: Fairview St. at Oval Court, Burlington, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4803533.86 E 600638.28

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Mar-13-2024

REF. NO.: 20-117-102
ENCL NO.: 3

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS "N" 0.3 m	ELEVATION
99.9					
99.8 / 0.1	**TOPSOIL:** 100mm **FILL:** silty clay, trace gravel, reddish brown, moist, firm	1	SS	4	
99.1 / 0.8	**SILTY CLAY TILL:** some sand, some gravel, trace shale fragments, reddish brown, moist, firm	2	SS	5	99
		3	SS	6	98
97.5 / 2.4	**SILTY CLAY TILL/SHALE COMPLEX:** trace sand, reddish brown, moist, hard	4	SS	50/ 75mm	
96.9 / 3.0	**SHALE BEDROCK:** Queenston Formation, reddish brown, weathered	5	SS	50/ 75mm	97
		6	SS	50/ 130mm	95
		7	SS	50/ 50mm	94
		8	SS	50/ 75mm	93
90.7 / 9.2	**END OF BOREHOLE:**	9	SS	50/ 50mm	92 / 91

Notes:
1) Borehole was dry upon completion.
2) 50mm dia. monitoring well installed upon completion.
3) Water Level Readings:

Date: Water level(mbgl):
Mar. 25, 2024 3.9

W. L. 96.0 m
Mar 25, 2024

DYNAMIC CONE PENETRATION RESISTANCE PLOT
SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)

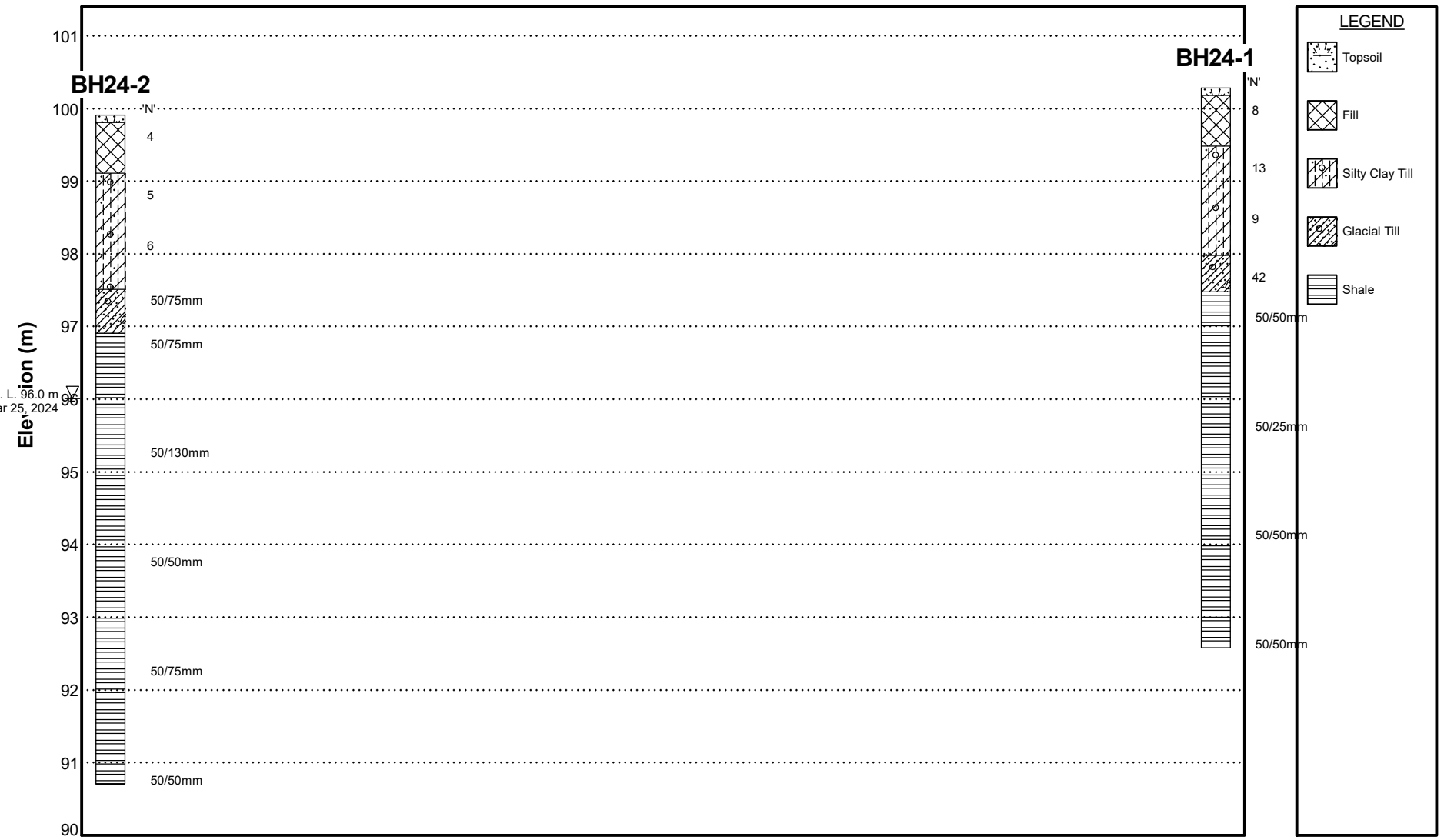
REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL
12	19	48	21

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε_f=3% Strain at Failure

DS SOIL LOG-2021-FINAL 20-117-102GEO.GPJ DS.GDT 24-3-26



Distance Along Baseline (Not to Scale)

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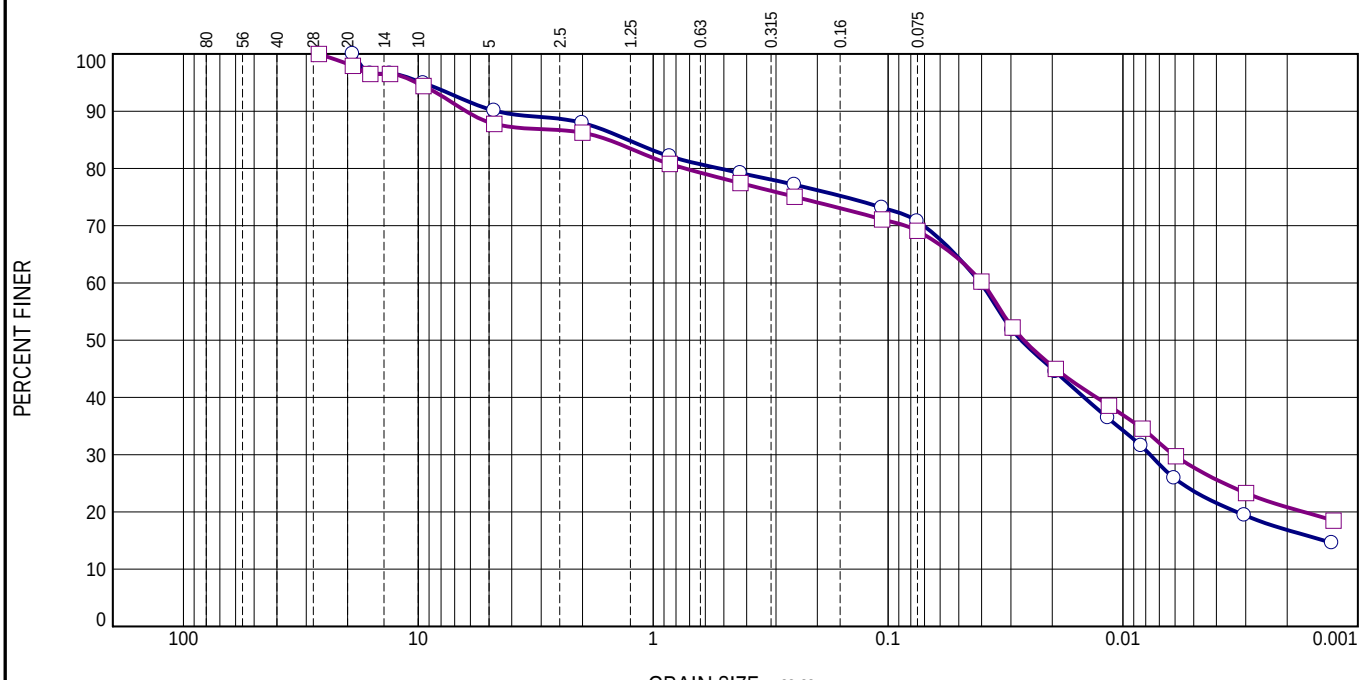
Generalized Sub-surface Profile

DRAWING NO.	4
JOB NO.	20-117-102
DATE	March 26, 2024

DS FENCE (M) 20-117-102GEO.GPJ DS.GDT 3/26/24

Particle Size Distribution Report

ASTM D422



	% +75mm	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	9.9	2.2	8.7	8.4	53.9	16.9
□	0.0	2.1	10.1	1.6	8.8	8.3	48.3	20.8

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	28	15	1.2820	0.0405	0.0271	0.0077	0.0014			
□	32	16	1.5517	0.0396	0.0264	0.0061				

Material Description	USCS	AASHTO
○ Silty clay till, some sand, trace gravel	CL	A-6(7)
□ Silty clay till, some sand, some gravel	CL	A-6(9)

Project No. 20-117-102 Client: Branthaven Developments.

Project: Geotechnical Investigation, Fairview Street at Oval Court, Burlington.

○Location: BH24-1 SS2 Sample Number: VM-5177

□Location: BH24-2 SS3 Sample Number: VM-5177

Remarks:

○Sampled on March 13, 2024

F.M.=1.09

□Sampled on March 13, 2024

F.M.=1.23

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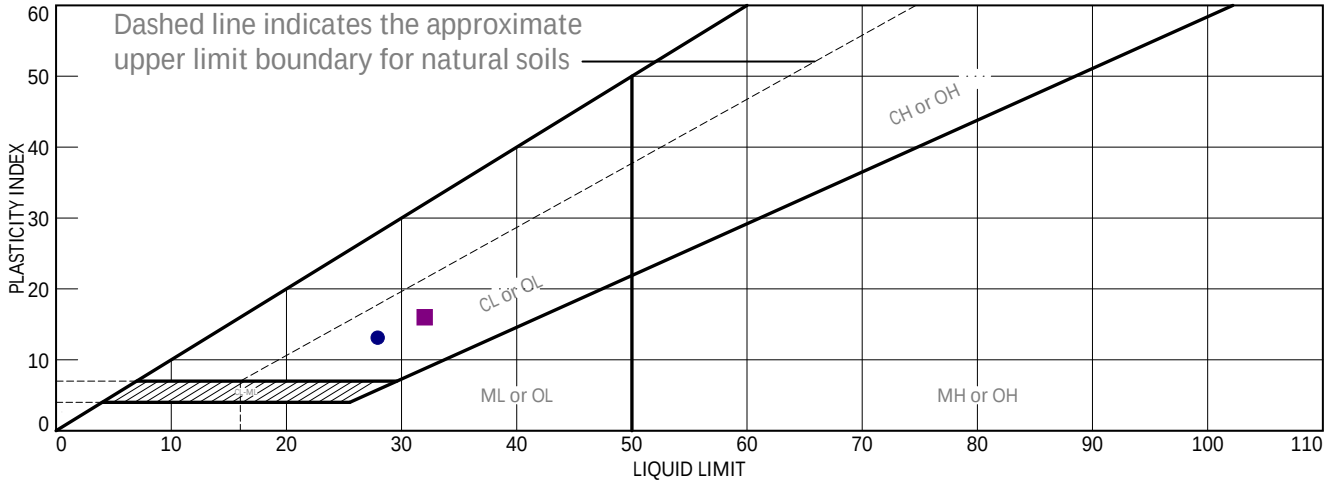
Geotechnical ❖ Environmental ❖ Materials ❖ Hydrogeology

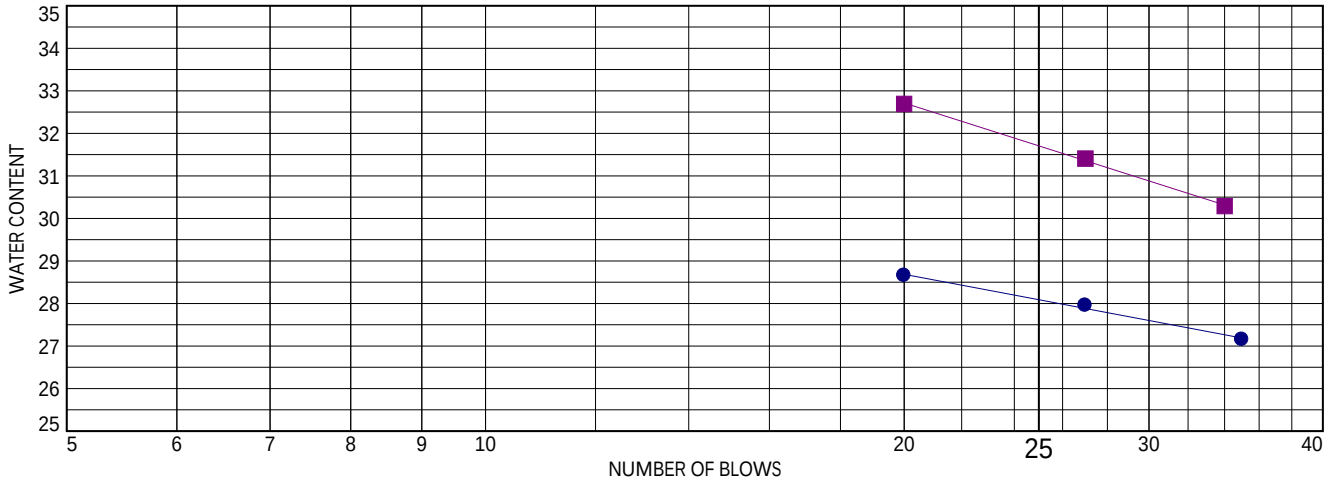
CCIL

Figure: 5

Tested By: Helen/Nisha Checked By: S.Kirupa

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty clay till, some sand, trace gravel	28	15	13	79.2	70.8	CL
■	Silty clay till, some sand, some gravel	32	16	16	77.4	69.1	CL

Project No. 20-117-102 Client: Branthaven Developments.

Project: Geotechnical Investigation, Fairview Street at Oval Court, Burlington.

●Location: BH24-1 SS2 Sample Number: VM-5177

■Location: BH24-2 SS3 Sample Number: VM-5177

Remarks:

●Sampled on March 13, 2024

■Sampled on March 13, 2024

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Figure: 6

Tested By: Nisha Checked By: S.Kirupa

Appendix A

Logs of Previous Boreholes BH19-9A/B
(See Drawing 1 for borehole location plan)

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LOG OF BOREHOLE BH19-9A

PROJECT: Geotechnical Investigation
CLIENT: Branthaven Development Group
PROJECT LOCATION: Oval Court, Burlington, ON
DATUM: Geodetic
BOREHOLE LOCATION: (5135 Fair View St.) N 4803599.38 E 600598.43

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jun/22/2020

REF. NO.: 20-117-100
ENCL NO.: 10

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
100.9								20 40 60 80 100	10 20 30			
0.0	**Straight augered to 4.3m below grade without soil sampling**					Bentonite	100	○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE	w_P w w_L			
						Filter Pack	99					
						Slotted Pipe	98					
						W. L. 97.3 m Jun 29, 2020						
96.6												
96.4	**SHALE BEDROCK:** Queenston		1	SS	50/				○			
4.5	Formation, weathered, reddish brown				25mm							
	END OF BOREHOLE:											

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water level Reading:

Date:	Water Level (mbgl):
Jun 29, 2020	3.6

DS SOIL LOG 20-117-100 ENVIRO. HYDRO. GEOTECH_BRANTHAVEN DEVELOPMENT GROUP.GPJ DS.GDT 8/13/20

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH19-9B

PROJECT: Geotechnical Investigation
CLIENT: Branthaven Development Group
PROJECT LOCATION: Oval Court, Burlington, ON
DATUM: Geodetic
BOREHOLE LOCATION: (5135 Fair View St.) N 4803599.1 E 600599.05

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jun/22/2020

REF. NO.: 20-117-100
ENCL NO.: 11

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
100.9 0.0	**ASPHALT:** 125mm	1	SS	12	100
100.5 0.4	**GRANULAR:** sand and gravel, 250mm				
100.1 0.8	**FILL:** clayey silt, trace gravel, brown, moist, stiff	2	SS	23	
	CLAYEY SILT TILL/ SHALE COMPLEX: sandy, trace gravel, trace shale fragments, reddish	3	SS	50/ 125mm	99
98.6 2.3	brown, moist, hard	4	SS	50/ 100mm	
	SHALE BEDROCK: Queenston Formation, weathered, reddish brown	5	SS	50/ 100mm	98
	Rock coring started at 3.7m	R1	CORE		W. L. 97.5 m Jul 07, 2020
		R2	CORE		96
		R3	CORE		Bentonite 94
		R4	CORE		93
		R5	CORE		92
		R6	CORE		91
		R7	CORE		90
		R8	CORE		89
85.2 15.7	**END OF BOREHOLE:**				88 Filter Pack Slotted Pipe 86

Notes:
1) 50mm dia. monitoring well installed in the corehole upon completion.
2) Water Level Readings:

Date	Water Level (mbgs)
Jun 29, 2020	3.5
Jul 07, 2020	3.4

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30
POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)
METHANE AND GRAIN SIZE DISTRIBUTION (%) — GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

DS SOIL LOG 20-117-100 ENVIRO, HYDRO, GEOTECH, BRANTHAVEN DEVELOPMENT GROUP.GPJ DS.GDT 8/13/20

DS CONSULTANTS LTD.

LOG OF ROCK CORE BH19-9B

PROJECT: Geotechnical Investigation
CLIENT: Branthaven Development Group
LOCATION: Oval Court, Burlington, ON
DATUM: Geodetic
BH LOCATION: (5135 Fair View St.) N 4803599.1 E 600599.05

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jun/22/2020

REF. NO.: 20-117-100
ENCL NO.: 11A

(m) ELEV / DEPTH	ROCK DESCRIPTION	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES **	WEATHERING INDEX	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm^3) E (GPa)
97.2	Rock Surface															
3.7 / 93.5	**QUEENSTON FORMATION:** laminated to thinly bedded, reddish brown to grey, very weak to medium strong, SHALE and LIMY SHALE (82 to 97%), interbedded with thinly laminated to medium bedded with slightly weathered to fresh, light grey, strong to very strong SILTSTONE and LIMESTONE (3 to 18%).		1	HQ	100	87	16	95								
5.1 / 94.3	Siltstone and limestone (hard) layers at the following depths:		2	HQ	100	100	4	100								
6.6 / 92.8	Depth(m) Thickness(mm) 3.9 50 4.1 150 4.6 25 5.5 25 6.3 40 7.2 150 8.2 90		3	HQ	100	100	10	100								
8.1 / 91.3	9.4 115 9.5 13 10.0 13 10.2 50 11.2 100 11.5 178 12.9 25		4	HQ	95	90	14	88								
9.6 / 89.8	13.0 25 13.4 25 13.8 50 15.0 50		5	HQ	100	95	4	88								
11.1 / 88.3			6	HQ	100	100	18	100								
12.6 / 86.8			7	HQ	100	100	8	100								
14.1 / 85.2			8	HQ	90	90	3	90								
15.7	**END OF COREHOLE:**															

DS ROCK CORE-2018** 20-117-100 ENVIRO, HYDRO, GEOTECH_BRANTHAVEN DEVELOPMENT GROUP.GPJ DS.GDT 8/12/20

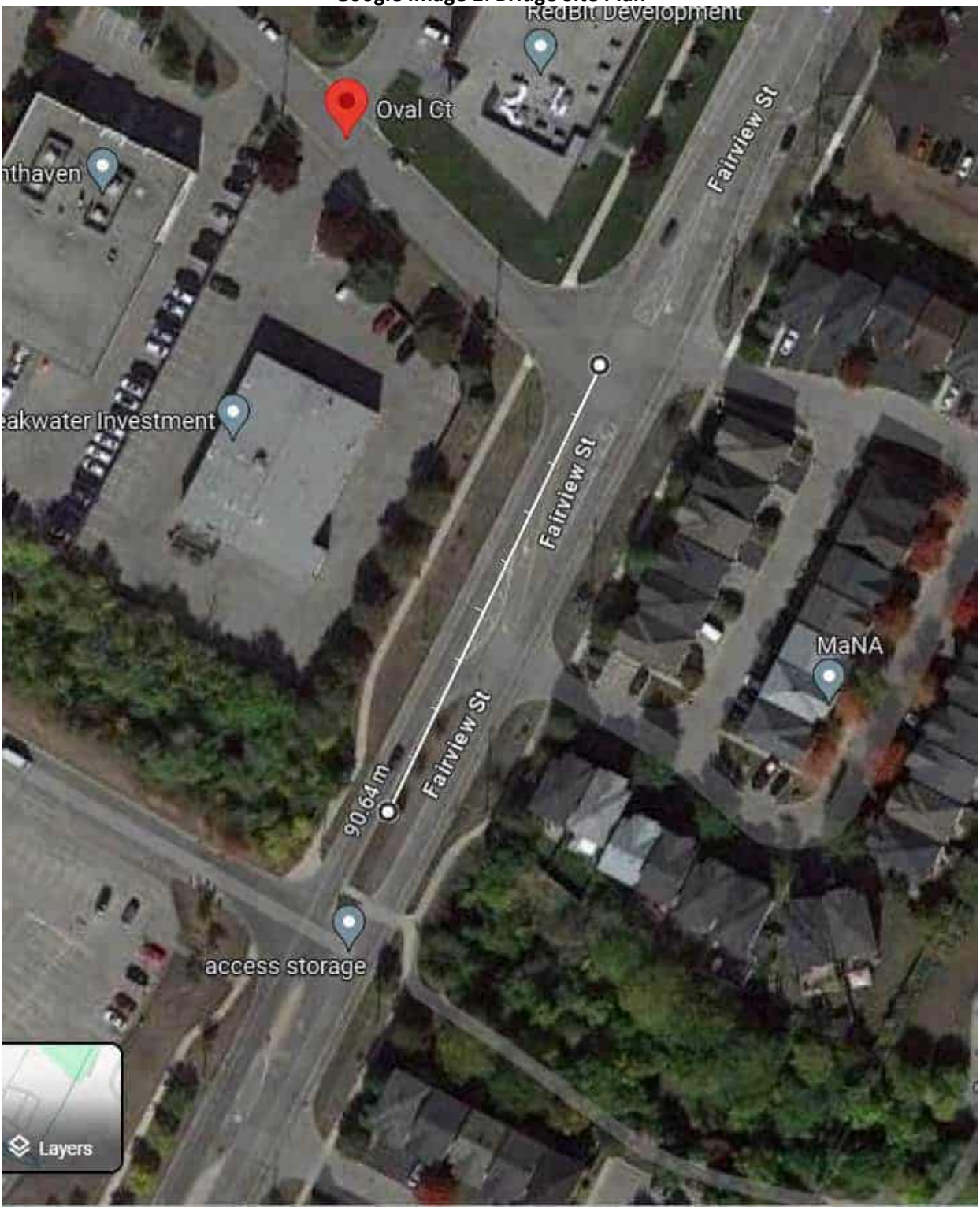
Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered
θ = angle to the core axis
** Only vertical/subvertical fracture indicated

E = Modulus of Elasticity
*: UCS [Mpa] ≈ 24 $I_{S(50)}$

Appendix B

Site Google Images and Photographs (Photos 1 to 3) by DS on Aug.14, 2023

Google Image 1: Bridge Site Plan



Google Image 2: Fairview Street at the subject bridge site (looking northeast)

Photo 1: Creek and Fairview Street bridge (looking northwest - Upstream)

Photo 2: Creek and Fairview Street Bridge (looking southeast - Downstream)

Photo 3: Creek conditions near Fairview Street – Bedrock at creek bed and lower portion of creek bank slope (looking northwest - upstream)

Appendix C

General Comments on Shale Bedrock

General Comments on Bedrock in Metro Toronto Area

The bedrock that makes spread footings or caissons a popular choice for high-rise foundation support is a shale or shale limestone composition. The highest member, the Queenston Formation, is generally found west of Toronto, while the Georgian Bay Formation underlies most of Metro Toronto, with the Collingwood Formation east of Toronto. The Queenston is, relatively speaking, the weaker of the three formations that are likely to support caissons or footings.

The Georgian Bay as well as the Queenston and Collingwood Formation are of Middle Ordovician Age. It is defined as the rock unit that overlies the bluish grey shales of the Collingwood Formation and is in turn overlain by the red shale of the Queenston Formation. The Georgian Bay Formation consists of bluish and grey shale with interbeds of sandstone, limestone and dolostone. Towards the west where the Georgian Bay formation underlies the Queenston Formation, the limestone content increases significantly and limestone and/or sandstone may comprise as much as 70 to 90 percent of the bedrock. The hard layers are usually less than about 100 to 150 mm thick but some layers are much thicker. The thicker layers have been observed to be as much as 750 to 900 mm at some sites. The layers are actually lenses and they can vary significantly in thickness over short distances.

The upper portion of the bedrock is commonly weathered for a depth of 600 to 1000 mm and within this weathered zone hard limestone layers or lenses are common. These hard limestone layers can result in contractual problems for augers, and can provide misleading bedrock elevations. Where the weathering is more extensive a shale till layer may be found above the bedrock. In the sound bedrock, the limestone, sandstone, dolostone is hard to very hard.

Stress relief features such as folds and faults are common in the bedrock. In these features, the rock is heavily fractured and sheared, and contains layers of shale rubble and clay. Weathering is much deeper than the surrounding rock in these features and often there is a lateral migration of the stress relief features resulting in sound unweathered bedrock overlying fractured and weather bedrock. The stress relief features are usually in the order of 4 to 6 m wide, but the depth can vary from 4 to 5 m to in excess of 10 m. These features occur randomly.

The bedrock contains significant high locked in horizontal stresses. These stresses can impose significant loads on tunnel walls but the slower rate of construction for basements allows for a relaxation of these stresses and they are not normally a problem for basement construction.

Groundwater seepage below the top 1000 mm is generally small, however, at several locations in Toronto and Mississauga large quantities have been encountered.

Bedding joints in the bedrock are very close-to-close, smooth planar in the shale and rough planar in the limestone. Significant vertical jointing is common.

Where the bedrock was cored, a detailed description of the rock core is appended to the borehole log.

Design features related to the bedrock are discussed in other sections of this report, and these general comments must be considered with these comments.

Methane gas exists in the bedrock, normally below the top 1000 mm and more concentrated with depth. Appropriate care and monitoring is essential in all confined bedrock excavations, particularly caissons and tunnels.

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Appendix D

Technical Memorandum
Natural Heritage Review and Recommendation

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Technical Memorandum

Natural Heritage Review and Recommendations

Date:	April 24, 2024	**Project No.:**	300057084.0000
Project Name:	Oval Court Environmental Assessment Addendum		
Client Name:	Branthaven Development Corp.		
Submitted To:	Branthaven Development Corp.		
Submitted By:	Sarah Yoshida, B.Sc. (Env.), Eco. Rest. Cert.		
Reviewed By:	Kevin Butt, B.Sc. (Env.) Rest Cert, TRAQ, ISA Certified Arborist & Terrestrial Ecologist Chris Pfohl, CET, EP, CAN-CISEC, Sr. Aquatic Ecologist		

1.0 Introduction

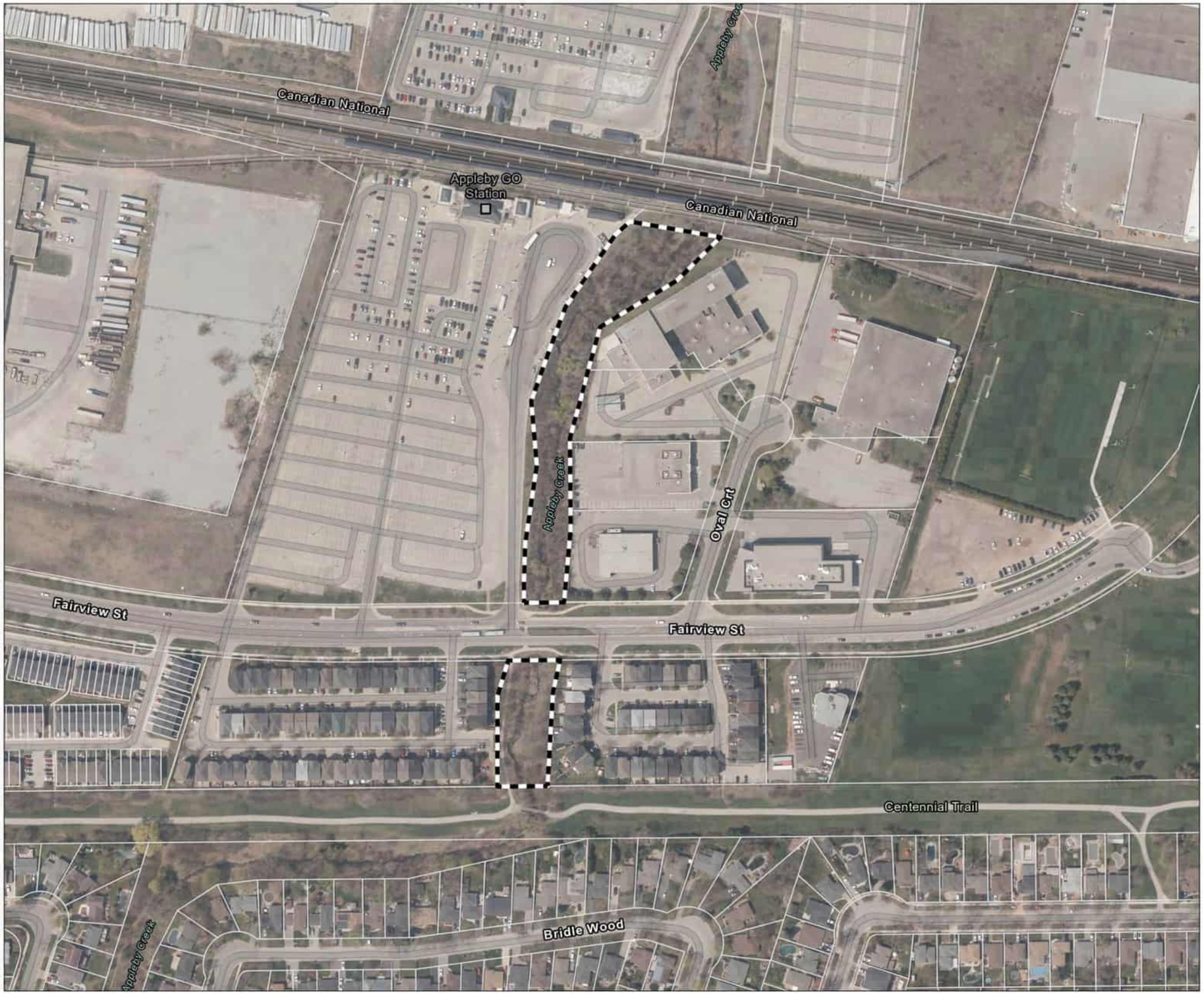
R.J. Burnside & Associates Limited (Burnside) has been retained by Branthaven Development Corp. (Branthaven) to complete the addendum to the Appleby Creek Flood Mitigation Municipal Class Environmental Assessment (ACFMEA) Study. The original Study was completed in February 2019 by Aquafor Beech Ltd. on behalf of the City of Burlington.

The 17-metre-wide crossing at Fairview Street and Appleby Creek identified as the preferred solution of the ACFMEA does not provide adequate flood protection from a regional storm and inhibits the best and most efficient use of land for the approved level of intensification. Alternative crossing structures are being considered to address the regional storm through the addendum process.

1.1 Purpose

The purpose of Burnside's investigation was to review the natural features within the vicinity of the Fairview Street crossing to document existing conditions compared to previously completed ecological investigation completed as a part of a previous Appleby Creek Flood Mitigation

Municipal Class Environmental Assessment (ACFMEA) (Aquafor Beech, 2019) and assess the ecological implications of the proposed crossing structure alternatives.



Study Area

Sources:

1. Ministry of Natural Resources and Forestry,© King's Printer for Ontario.
2. Natural Resources Canada,© His Majesty the King in Right of Canada.

Disclaimer:

R.J. Burnside & Associates Limited and the above mentioned sources and agencies are not responsible for the accuracy of the spatial, temporal, or other aspects of the data represented on this map. It is recommended that users confirm the accuracy of the information represented.

This map is the product of a Geographic Information System (GIS). As such, the data represented on this map may be subject to updates and future reproductions may not be identical.

Datum: North American 1983	
Coord. System: NAD 1983 UTM Zone 17N	
Projection: Transverse Mercator	
Central Meridian: 81°00.00"W	
False Easting: 500,000m	False Northing: 0m
Page Orientation: -63.43°	Scale Factor: 0.99960

Grid North

0 25 50 75 100
Metres

BURNSIDE

Client

BRANTHAVEN DEVELOPMENT CORPORATION

Figure Title

APPLEBY CREEK FLOOD MITIGATION MCEA

STUDY AREA

Drawn	Checked	Date	Figure No.
HN	SY	2024/04/24	1
Scale		Project No.	
H 1:2,500		300057084	

File Path: \\oscar\shared work areas\057084.50 - Oval Court Lands Bridge\14_GIS\057084 Oval Court Lands EA\057084 Oval Court Lands EA.aprx Print Date: 2024/04/24 Time: 08:51 AM

1.2 Site Description

The Study Area consists of the existing crossing at Fairview Street, Appleby Creek, and its associated valleylands. The Study Area spans approximately 260 m northwest (upstream) of the crossing to the existing GO rail corridor and 100 m southeast (downstream) of the crossing ending at the Centennial Trail pedestrian bridge.

The ACFMEA characterized the site as follows:

Section 2.1 Study Area

- *Subsection 2.1.3 Reach 3 – Fairway Road to Railway*: identifies that Fairview Road is four lanes wide at the bridge and has a grassy boulevard, with a sidewalk on both sides of the road. The road has a traditional curb and gutter system.

Section 3.2 Fluvial Assessment of Existing Conditions:

- *Subsection 3.2.4 Reach 3 – Fairway Road to Railway* identifies that this section is similar to the other two reaches but has been straightened and confined to a narrow corridor, with a steeper and deeper valley than the other two reaches.
- The bed material is described as "*exposed and fractured shale bedrock, and there is limited riprap or masonry material expect at locations where localized bank treatments have been placed (e.g., Fairview Road bridge inlet). The native bed material seems to have allowed for a more natural morphology to form throughout Reach 3, with an obvious riffle-pool pattern, and more meandering of the low flow channel within the valley. The low flow channel is also significantly narrower than Reaches 1 and 2, and generally has deeper flow"*.
- The terrestrial component of the riparian corridor is described as dense with trees and shrubs due to no formal maintenance.
- Multiple locations of erosion of the riparian area were recorded, resulting in exposed shale bedrock and failing gabion baskets.

2.0 Background Information Review

Burnside's Ecology staff reviewed the following sources of background information to determine ecological constraints which may impact the proposed works:

- Aerial Imagery (2021)
- Ministry of Natural Resources and Forestry (MNRF) Land Information Ontario (LIO) database
- MNRF Natural Heritage Information Centre (NHIC) database for significant species and designated natural features within 120 m of the subject lands
- Conservation Halton (CH) regulated features, mapping and information
- MNRF Aquatic Resources Area (ARA) mapping (2017)
- MNRF Ontario Hydrologic Network (OHN) mapping (2020)
- CH regulated features, mapping and information

- The Ontario Reptile and Amphibian Atlas (ORAA)
- The Ontario Breeding Bird Atlas (OBBA)
- Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), AgMaps mapping (2021)
- Department of Fisheries and Oceans (DFO) Species at Risk (SAR) mapping (2022)
- Appleby Creek Erosion Control Environmental Assessment (Aquafor Beech, 2020)
- Scoped Environmental Evaluation Report / Environmental Impact Assessment for 720, 735 & 740 Oval Court and 5135 & 5155 Fairview Street, Burlington Ontario (Beacon Environmental Limited, 2024)

2.1 Appleby Creek Erosion Control EA

Aquafor Beech was retained by the City of Burlington to undertake an erosion control Municipal Class Environmental Assessment (MCEA) for Appleby Creek from Lake Ontario to South Service Road. The purpose of this MCEA was to assess the existing conditions within Appleby Creek and determine alternatives to address erosion concerns along the Creek. The natural heritage assessment associated with the MCEA also included the following:

- Geomorphic assessments within seven identified reaches
- The identification of ecological (Environmental Land Classification) communities and botanical inventories
- Candidate bat maternity roost snags
- Identification of candidate significant wildlife habitat
- Identification of species at risk habitat
- Identification and assessment of linkage and corridor features

The Study Area was divided into 12 erosion sites and four maintenance sites. Erosion sites 7a and 7b are present within the Study Area of ACFMEA addendum.

2.2 Scoped EEA / EIA for 720, 735 & 740 Oval Court and 5135 & 5155 Fairview Street

Beacon Environmental Limited (Beacon) was retained by Branthaven to complete a scoped EEA / EIA for development of the lands located at 720, 735 & 740 Oval Court and 5135 & 5155 Fairview Street Burlington. The scope of ecological inventories completed by Beacon include the following:

- Ecological Land Classification (ELC)
- Three-season Botanical Inventory
- Tree Inventory
- Calling Amphibians
- Breeding Bird Surveys
- Reptile Surveys
- Bat Acoustic Monitoring
- Aquatic Habitat Assessment

- Watercourse Thermal Assessment
- Fish Community Sampling

Inventories were completed during the 2019 field season. Beacon determined that Significant Woodlands, Significant Wetlands, Significant Valleylands, Areas of Natural Scientific Interest (ANSIs), Significant Wildlife Habitat features, and habitat of endangered or threatened species are all absent from the Study Area.

Beacon did confirm that Appleby Creek provides high-quality fish habitat.

2.3 Fisheries

Appleby Creek is classified under the MNRF ARA as having a warmwater thermal regime. Based on the MNRF's ARA mapping, eight species of fish have been recorded within the Appleby Creek which is provided in Table 2.1.

Table 2.1: Aquatic Resources Area Fisheries Data for Appleby Creek

Common Name	Scientific Name	Thermal Regime
Blacknose Dace	*Rhinichthys atratulus*	Cool
Brook Stickleback	*Culea inconstans*	Cool
Creek Chub	*Semotilus atromaculatus*	Cool
Fathead Minnow	*Pimephales promelas*	Warm
Green Sunfish	*Lepomis cyanellus*	Warm
Longnose Dace	*Rhinichthys cataractae*	Cool
Pumpkinseed	*Lepomis gibbosus*	Warm
White Sucker	*Catostomus commersoni*	Cool

The ACFMEA (Table 3.9) identifies 14 species / families captured by Conservation Halton in earlier studies that were not identified within the MNRF ARA mapping include Brassy Minnow (*Hybognathus hankinsoni*), Largemouth Bass (*Micropterus nigricans*), and Threespine Stickleback (*Gasterosteus aculeatus*).

The Beacon study also noted that Conservation Halton has captured Chinook Salmon at a sampling station located along the shoreline of Lake Ontario.

2.4 Proposed Rehabilitation and Restoration Activities

2.4.1 ACFMEA

Rehabilitation and restoration activities are also proposed as a part of the ACFMEA. Section 5.6 identifies tree, shrub and plant compensation and protection; replanting areas; recommended plant species for restoration; and monitoring plan components. Further direction is provided in Table 5.2 that provides metrics for each of the performance measures for success targets,

potential outcomes and adaptive management actions for different scenarios of success and deficiencies.

2.4.2 Other Studies

The Appleby Creek Erosion Control EA recommends comprehensive reach-based works, specifically measures to channelizing the creek to address erosion risks at erosion sites 7a and 7b (immediately adjacent to the Fairview Street crossing). Proposed works will include:

- Removal of existing gabion baskets
- Installation of armourstone retaining wall
- Installation of round stone riffle-pool features and in-creek vegetation buffer
- Retrofit of existing storm outfall into the restorative bank works
- Tree and shrub plantings above the armourstone wall

The EEA / EIA report prepared by Beacon (2024) identifies "*minor widening and re-shaping of the eastern corridor slope, essentially creating a new "top of slope" along the corridor*" is proposed rather than utilizing armourstone. Beacon also references the replacement of the existing Fairview Street crossing. Table 10 of the report specifies that "*localized grading and implementation of retaining walls is proposed to optimize the corridor bottom width*" along the south side of Fairview Street in order to prevent erosion and to integrate the proposed crossing structure to the existing watercourse. Localized grading and armourstone retaining wall installation is also recommended on the north side of Fairview Street along the east side of Appleby Creek to address future erosion concerns while maximizing the corridor bottom width. The area of the armourstone retaining walls will be minimized to the greatest extent possible while meeting the needs to widen the floodplain. In addition, the existing stormwater outfall located on the south side of the watercourse that currently discharge to Appleby Creek "*will be integrated into the replacement* [crossing] *structure*".

The Beacon report specifies that "*localized watercourse realignment, grading, and implementation of retaining walls upstream and downstream of the new crossing*; [the removal of] *the existing stormwater outfall on the east side of the creek and replace with one consolidated stormwater outfall at Fairview Street...and restore with native vegetation*". The works proposed by Beacon "*will address the recommendations from the Appleby Creek Flood Mitigation EA (Aquafor Beech, 2019) and will remove flooding from the Subject lands*". The EEA / EIA identifies the proposed widening of the Appleby Creek valleylands will "*result in the temporary removal of existing vegetation cover that will be replaced with higher quality native species*" and will impact a smaller area than that proposed within the Appleby Creek Erosion Control EA. Works are only to be undertaken along the eastern portion of the watercourse.

Works are to be undertaken 150 m upstream and 80 m downstream of the Fairview Street Crossing. The proposed erosion rehabilitation measures described above will require extensive vegetation removal, regrading as well as in-water works both upstream and downstream of the Fairview Street crossing. Beacon will be undertaking the detailed design associated with the proposed corridor grading and works. Currently, an approach similar to that used immediately

upstream of the Subject Lands in association with the Metrolinx-owned lands is proposed (Photo 1).

Photo 1: Creek realignment and erosion rehabilitation measures implemented upstream of the Subject Lands

A comprehensive restoration plan associated with the replacement of the existing Fairview Street structure will be required. The restoration plan should be consistent and complement Beacon's proposed restoration plan.

3.0 Methodology

Field surveys were conducted on March 21, 2024. During the field investigations, information was collected to determine if on-site conditions have remained consistent with the findings of the ACFMEA.

The natural heritage characterizations within the Appleby Creek Erosion Control EA and Oval Court EEA / EIA were also consulted.

The scope of field investigations for these previous studies was restricted to a review of existing vegetation communities, significant wildlife habitat, and review of previously assessed watercourse reaches.

4.0 Existing Conditions

4.1 Environmental Land Classification

The condition of the valleylands associated with Appleby Creek within the Study Area have remained consistent with those noted within the ACFMEA.

The naturalized vegetation adjacent to the crossing was identified as Mineral Cultural Woodland (CUW1) with a Mineral Cultural Thicket (CUT1) and Mineral Cultural Meadow (CUM1) inclusions. All vegetation communities within the Study Area are degraded and impacted by human activity. Dumping was widespread throughout all communities with household waste frequently being observed within the valleylands and Appleby Creek. Informal trails are present within the CUW1 communities. Invasive species also dominate the understory layers, with Common Buckthorn growing densely throughout many of the communities present. Common Privet, non-native Honeysuckles, and Multiflora Rose were also frequently encountered.

There has been significant dieback of Ash trees due to Emerald Ash Borer so the comment that characterized the area as having dense tree cover (in addition to shrubs). Many of the trees that were anticipated to be standing during the site investigation have since fallen, creating an abundance of deadfall logs within the valleylands north of Fairview Road.

A summary of the ELC communities present can be found in Table 4.1 below.

Table 4.1: ELC Summary

ELC (1998) Code	Name	Description
CUW1a	Mineral Cultural Woodland	This community is present along the south side of Appleby Creek and represents the valleyland of the Creek (Photo 1). The slope of this community ranges from moderately steep to steep. Portions of the valley walls are steep and are subject to active erosion, with exposed areas of shale noted during Burnside's site visit. Fallen woody debris is abundant within this community. Canopy cover within this community appears to have decreased based on the photos provided within the Beacon (2024) EEA /EIA report that were also reflective of the ACFMEA. A number Green Ash (*Fraxinus pennsylvanica*) trees and Crack Willow (*Salix fragilis*) have fallen down, creating further gaps within the canopy, with canopy species providing approximately 30 – 35% cover. Canopy species observed include dead Green Ash, Crack Willow, Black Walnut (*Juglans nigra*) and Basswood (*Tilia americana*). The subcanopy is not well developed and consists of many of the same species found within the canopy in addition to Manitoba Maple (*Acer negundo*). The understory is dense and is dominated by European Buckthorn (*Rhamnus cathartica*) with lesser associates of Hawthorn (*Crataegus spp*.), Common Privet (*Ligustrum vulgare*), Ash regeneration, and Manitoba Maple regeneration. Red Osier Dogwood (*Cornus sericea*) is the most prevalent understory species within the areas immediately adjacent to Appleby Creek.
CUW1b	Mineral Cultural Woodland	This community is present in association with the valleylands of Appleby Creek south of Fairview Street (Photo 2). The valley slope is not as steep as those found north of Fairview Street. Conditions have largely remained consistent with the ACFMEA report. Few canopy trees are present, subcanopy trees provide the majority of cover within this community. The subcanopy provides approximately 35% cover and is dominated by Black Walnut and Manitoba Maple. The understory is moderately dense, providing 60-70% cover. Pussy Willow (*Salix discolor*), Multiflora Rose (*Rosa multiflora*), and Red Osier Dogwood are prevalent closest to Appleby Creek. Manitoba Maple, Green Ash regeneration, European Buckthorn, Red Raspberry (*Rubus ideaus*), and Black Raspberry (*Rubus occidentalis*) are also common. Fallen woody debris is not as prevalent within this community as CUW1a.

CUT1	Cultural Thicket	This community is present along the south side of Appleby Creek and represents the valleyland of the Creek (Photo 3). The slope of this community ranges from moderately steep to very steep, with portions being subject to active erosion and areas of exposed areas of shale noted during Burnside's site visit. The canopy is open and consists of standing Ash snags and Crack Willow. The sub-canopy is poorly developed and consists of young Crack Willow, Manitoba Maple, and Black Walnut. The understory is dense (>80% cover) and is dominated by Common Buckthorn with lesser associates of Hawthorn. Other species present include Ash regeneration, Multiflora Rose, and Red Osier Dogwood. Fallen woody debris is abundant within this community.
CUM1	Cultural Meadow (inclusion)	This community is present in association with Appleby Creek immediately downstream of the railway culvert crossing (Photo 4). Cool season grasses dominate the area. Staghorn Sumac (*Rhus typhina*) regeneration was also present.
MAS2-1	Cattail Mineral Shallow Marsh (inclusion)	This community is present in association with Appleby Creek immediately downstream of the railway culvert crossing (Photo 5). This community was not included in the ACFMEA but was identified by Beacon. Cattail (*Typha spp.*) comprise the entirety of this community with lesser associates of Reed Canary Grass (*Phalaris arundinacea*), This feature is identified as an inclusion due to its small size.

Photo 2: Representative photo of the CUW1a community

Photo 3: Representative of the CUW1b community

Photo 4: Representative photo of the CUT1 community

Photo 5: Representative photo of the CUM1 community

Photo 6: The MAS2-1 community is visible in the background

These communities have not significantly changed from the ACFMEA's characterization.

4.2 Incidental Wildlife Observations

Incidental wildlife sightings were limited to the Study Area and were documented during field investigations to provide a general characterization of the habitat functions of the Study Area. Incidental observations were those recorded during targeted surveys for other aquatic or terrestrial investigations. Examples include tracks, carcasses, live sightings, etc.

A summary of incidental wildlife observations can be found in Table 4.2 below.

Table 4.2: Incidental wildlife observations

Common Name	Scientific Name	Location / ELC community	Comments
American Crow	*Corvus brachyrhynchos*	CUW1a	Flyover
American Goldfinch	*Spinus tristis*	CUW1b	
Black-capped Chickadee	*Poecile atricapillus*	CUW1b	
Herring Gull	*Larus argentatus*	CUW1b	Flyover
House Finch	*Haemorhous mexicanus*	CUW1b	
House Sparrow	*Passer domesticus*	CUW1b	
Mourning Dove	*Zenaida macroura*	CUT1	Flyover
Northern Cardinal	*Cardinalis cardinalis*	CUT1, CUW1a, CUW1b	

Common Name	Scientific Name	Location / ELC community	Comments
Eastern Coyote	*Canis latrans*	CUT1, CUW1a	Tracks, fecal matter
Grey Squirrel	*Sciurus carolinensis*	CUT1, CUW1a, CUW1b	

4.3 Aquatic Habitat Assessment

Existing conditions were observed from the valleylands on March 21, 2024. Water conditions were clear with excellent visibility. Weather conditions were cloudy with a high of 2ºC.

Conditions were compared to those reported by Beacon during the course of the 2019 field surveys. Burnside revisited the four reaches upstream of Fairview Street assessed by Beacon (2024) as well as the conditions 100 meters downstream of Fairview Street to the pedestrian bridge associated with the Centennial Trail. The watercourse and aquatic habitat were reviewed to determine if conditions have remained consistent with those observed during previous site investigations.

This reach of Appleby Creek has been historically straightened and confined to a narrow valley corridor as identified in the ACFMEA. The valley walls of the reach upstream of Fairview Street are very steep and heavily vegetated while the valley walls of Appleby Creek downstream (south) of Fairview Street are more gradual but remain heavily vegetated. Channel hardening is present along both the right and left banks of Appleby Creek throughout the Study Area. A summary of the observed conditions can be found in Table 4.3 below.

Photo 7: Existing culvert inlet

Photo 8: Appleby Creek facing upstream of Fairview Street crossing

Photo 9: Existing culvert outlet at Fairview Street

Photo 10: Appleby Creek facing downstream of the Fairview Street crossing

Photo 11: Appleby Creek facing upstream from the existing pedestrian bridge at the downstream extent of the Study Area

Photo 12: Appleby Creek facing downstream from the existing pedestrian bridge at the downstream extent of the Study Area

Table 4.3: Summary of Aquatic Conditions

Reach	Location (Beacon, 2024)	Summary of Conditions (Beacon, 2024)	Current site conditions (March 2024) consistent with Beacon (2024) Report	Erosion Concerns
Reach 1	Immediately downstream of upstream rail corridor culvert (15 m long)	Run Substrate: bedrock (dominant) overlain by fine silts, gravel, and sand 30% overhead cover Undercut banks Channel hardening (gabion baskets) present along the east bank.	Consistent with the reported conditions	
Reach 2	Approximately 80 m downstream of upstream rail corridor culvert (5 m long)	Deep pool Substrate: Bedrock (dominant), shale No in-stream vegetation Undercut banks present 60% overhead cover Flats are present between reach 2 and 3	Consistent with the reported conditions	Failing gabion baskets along the west bank near reach 2. The gabion cages are failing at the base level, causing angular stone to fall into the watercourse (Photo 12). Gabion baskets along the west bank adjacent to the Appleby GO parking lot stormwater outfall are degraded between reaches 2 and 3. The gabion cages

Reach	Location (Beacon, 2024)	Summary of Conditions (Beacon, 2024)	Current site conditions (March 2024) consistent with Beacon (2024) Report	Erosion Concerns
				are failing at the base level, causing angular stone to fall into the watercourse (Photos 13 – 14). Undercutting was observed underneath the gabion baskets described above.
Reach 3	Approximately 100 m upstream of Fairview Street crossing (10 m long)	Riffle Substrate: cobble (dominant), shale, cobble, gravel No in-stream vegetation Undercut banks present Large woody debris present > 80% overhead cover	Consistent with the reported conditions	Significant erosion was noted between reach 3 and reach 4. Considerable erosion was noted at the stormwater outfall adjacent to the parking area of Branthaven Homes. The underlying geotextile fabric beneath the round river stone of the outfall structure is visible, with the placed round river stone falling into Appleby Creek. Bank erosion is steep, with bank heights >1m above the stream (Photos 16 – 17).

Reach	Location (Beacon, 2024)	Summary of Conditions (Beacon, 2024)	Current site conditions (March 2024) consistent with Beacon (2024) Report	Erosion Concerns
				Gabion baskets emptying along right bank (Photo 15).
Reach 4	Approximately 40 m upstream of Fairview Street crossing.	Run Substrate: bedrock (dominant), shale, boulder, gravel No in-stream vegetation Undercut banks Beyond the reach: barrier to fish passage approximately 2 m upstream of the Fairview Street Crossing.	Consistent with the reported conditions	Undercut banks were observed on both the east and west banks. Erosion visible near the culvert headwall along the left bank.
Downstream of the Fairview Street	100 meters downstream of Fairview Street crossing.	Scour pool, run Substrate (pool): bedrock (dominant), cobble, gravel Substrate (run): cobble (dominant), shale, gravel, boulder Beyond the Beacon (2024) study area confirmed by Burnside:	Consistent with the reported conditions	Bank erosion is steep along bend of the run approximately 20 m downstream of the Fairview Street crossing, with bank heights 0.5-1 m high above the stream . Shale bedrock visible is also in the area of extensive erosion. Bank erosion present along west bank

Reach	Location (Beacon, 2024)	Summary of Conditions (Beacon, 2024)	Current site conditions (March 2024) consistent with Beacon (2024) Report	Erosion Concerns
		Deeper pools are present along the bend downstream of the run Substrate (pool): bedrock with fine silts, shale No in-stream vegetation Cover: 50% Root wads (shrubs), grasses, and trees present Large and small woody debris present Undercut banks Channel hardening: gabion baskets		approximately 70 m downstream of the Fairview Street crossing (Photo 19).

Photo 13: Failing gabion baskets along the west bank near reach 2

Photo 14: Gabion baskets along the west bank adjacent to the Appleby GO parking lot stormwater outfall

Photo 15: Gabion baskets along the west bank adjacent to the Appleby GO parking lot stormwater outfall

Photo 16: Gabion baskets along the east bank of reach 3

Photo 17: Erosion at the stormwater outfall adjacent to the parking area of Branthaven Homes

Photo 18: Bank erosion immediately upstream of stormwater outfall adjacent to the parking area of Branthaven Homes

Photo 19: Bank erosion located 20 m downstream of the Fairview Street crossing

Photo 20: Bank erosion located approximately 70 m downstream of the Fairview Street crossing

4.3.1 Fish Habitat

The reaches of Appleby Creek upstream and downstream of Fairview Street provide high-quality fish habitat. Undercut banks are present throughout the entirety of the assessed reach, often with exposed roots of riparian trees and shrubs present. Undercutting is also present beneath the gabion baskets throughout the assessed reaches. Seasonal barriers to fish

passage observed by Burnside at the time of site investigation consist of large woody debris and boulders.

5.0 Natural Heritage Features

5.1 Provincially Significant Wetlands (PSW)

No PSWs are present within the Study Area. One wetland community was identified by Beacon (2024) at the upstream extent of the Study Area. This wetland community only spans 0.01 ha and does not meet the 2 ha threshold to be considered as a significant wetland.

5.2 Significant Woodlands

Significant woodlands are absent from the Subject Lands. Per Beacon's Supplemental Tree Density Analysis of Appleby Creek Valleylands 720, 735, & 740 Oval Court and 5135 & 5155 Fairview Street, Burlington Ontario (2023) report, neither of the woodlands north or south of the Fairview Road Crossing were found to meet the definition of "woodland" as defined within the City of Burlington and Halton Region Official Plans.

5.3 Significant Valleylands

Significant Valleylands were not identified as being present within the City of Burlington Official Plan, Halton Region Official Plan or ACFMEA.

5.4 Areas of Natural Scientific Interest (ANSI)

No ANSIs are present within the Study Area.

5.5 Significant Habitat of Species at Risk

Beacon (2024) identified nine candidate maternity roost trees, one of which occurs in the immediate vicinity of the crossing. A limited number of calls from Little Brown Myotis (*Myotis lucifugus*; END) were also detected within the CUW1a and CUT1 communities. Beacon ecologists established that the low number of calls (five calls across four nights) encountered are not consistent with maternal roosting habitat.

5.6 Significant Wildlife Habitat (SWH)

The ACFMEA identifies that the following candidate and confirmed SWH was identified for the following species within the study area:

- Bat Maternity Roost Colonies (candidate)
- Migratory Butterfly Stopover Areas (candidate)
- Landbird Migratory Stopover Areas (candidate)
- Special Concern and Rare Wildlife Species: Eastern wood-pewee and Snapping turtle (candidate), Black-crowned Night-heron (candidate/confirmed)

Beacon's study identifies that SWH features are absent from the Study Area. Burnside's review of site conditions and review of SWH criteria support that these SWH are not present within the Study Area.

Burnside acknowledges that the valleylands associated with Appleby Creek within the Study Area are degraded within a highly urbanized context and do not provide high quality habitat.

5.7 Summary of Natural Heritage Constraints

Overall, the valleylands of Appleby Creek within the Study Area have low ecological functioning. Terrestrial lands are discontinuous due to the presence of roadways. Riparian vegetation associated with the Creek is also constrained due to the presence of existing development. The valleylands currently serve as habitat for urban-tolerant wildlife species which may include nesting migratory birds. As such, the valleylands do not contain natural heritage features and areas identified in policies 2.1.4 or 2.1.5 of the Provincial Policy Statement (PPS).

Appleby Creek does provide high quality fish habitat as confirmed by Burnside based on the site visit. Per Sections 2.1.6 and 2.1.8 of the PPS,

> *2.1.6 Development and site alternation shall not be permitted in fish habitat except in accordance with provincial and federal requirements"*
>
> *2.1.8 Development and site alteration shall not be permitted on adjacent lands to the natural heritage features and areas identified in policies s 2.1.4, 2.1.5, and 2.1.6 unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions.*

Fish habitat is defined within the federal *Fisheries Act* as

> *"water frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas".*

All proposed works must be completed in conformity with the federal *Fisheries Act.* A request for review should be completed at the detailed design phase of the project.

6.0 Preferred Alternative

Three options were assessed by Burnside to determine the preferred alternative to replace the existing crossing at Fairview Street and Appleby Creek. The alternatives are as follows:

- Option 1: Twinequal span rigid frame structures
- Option 2: Two unequal span rigid frame structures
- Option 3: clear span precast box Girder bridge (17 m)

Based on Burnside's assessment, the preferred alternative is Option 1, specifically the construction of twin 10-meter span culverts.

7.0 Constraints and Opportunities

The proposed crossing replacement has the potential to impact natural heritage features summarized in sections 4.0 and 5.0 above.

Potential impacts to natural heritage features are anticipated to be low and short-term provided all proposed mitigation measures are implemented. The restoration measures proposed as a part of the flood mitigation along Appleby Creek that will be undertaken as a part of the replacement of the existing structure on Fairview Street will improve the existing ecological conditions of the valleylands and watercourse.

The potential negative impacts and associated recommended mitigation measures identified in the ACFMEA are still applicable with the change in the proposed structure. Impacts to SWH that were referenced are not applicable due to these elements not being present; however, the mitigation measures provided are suitable for implementation for other benefits to natural heritage features and functions. It should also be noted that Significant Woodlands have also been determined to be absent. Additional information is provided specific to fish and fish habitat to enhance the information documented in the ACFMEA.

The general mitigation measures specified within the ACFMEA are suitable for implementation. In addition to the mitigation measures listed within the ACFMEA, Burnside recommends the following:

- The *Clean Equipment Protocol for Industry* (Halloran et al. 2013) should be implemented to prevent the further spread of invasive species.
- Works should be scheduled to avoid wet and rainy periods.
- An Environmental Inspector will ensure that all operation plans and construction timing associated with noise reduction are being followed.
- Dust levels should be regularly monitored for the duration of construction by an environmental monitor.

7.1 Fish and Fish Habitat

Fish habitat as defined under the federal *Fisheries Act* are present in association with Appleby Creek and have the potential to be impacted by the proposed crossing replacement.

Per Section 2.16 of the Provincial Policy Statement (2020),

> *"Development and site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements"*

Furthermore, construction activities that have the potential to impact fish or fish habitat must be built and operated in compliance with the federal *Fisheries Act*. If the *"death of a fish by means other than fishing"*, or the *"harmful alteration, disruption or destruction of fish habitat"* is likely to occur as a result of the project, the proponent responsible for the activities is required to obtain an Authorization from the Minister of DFO as per Paragraph 34.4(2) and 35(2)(b) of the Fisheries Act.

The footprint of the proposed culvert will span an additional 81.56 m^2 within the creek open space. This area was not identified to contain spawning habitat. There is potential to increase fish passage through an open-bottomed culvert.

As mentioned in Section 1.0 above, the existing crossing currently does not provide adequate flood protection from a regional storm event. Regional storm flow is currently anticipated to exceed the channel capacity of Appleby Creek at Fairview Street. The ACFMEA recommended bridge widening at Fairview Street. The Appleby Creek Erosion Control EA also recommended channel widening between Fairview Street and the Metrolinx rail corridor to provide flood relief, further justifying the need to widen the Fairview Street Crossing.

The replacement of the existing Fairview Street structure should be considered in the context of the erosion and flood control measures within the Appleby Creek system. Although the proposed crossing will increase the footprint of the structure, these improvements overall will lead to an improvement in fish habitat. Improvements include alleviating impacts associated with erosion of the watercourse banks and sedimentation of the watercourse, removing barriers to improve flow and fish passage, and riparian plantings to provide additional shading to regulate stream temperatures.

7.2 Habitat of Endangered and Threatened Species

Beacon will be submitting an Information Gathering Form (IGF) to the MECP for further consultation. Beacon will be responsible for the acquisition of any Endangered Species Act authorizations related to SAR bats within the proposed project limits.

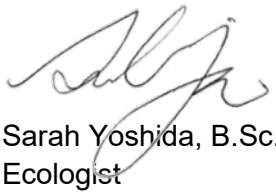
8.0 Conclusions

Overall, the conditions of the valleylands associated with Appleby within the Study Area are representative of a degraded urban natural heritage system. Significant Woodlands, Significant Valleylands, PSWs, and SWH are absent from the proposed project study area. Habitat for SAR bats was identified within the Study Area in both the EIS and ACFMEA. Surveys completed by Beacon (2024) also documented a limited number of calls by Little Brown Myotis. Beacon will be submitting an IGF to the MECP on behalf of Branthaven Homes, consultation with the MECP is ongoing.

The corridor associated with Appleby Creek does serve as a linkage function to connect natural heritage features upstream and downstream of the Study Area. Field conditions have remained largely consistent with the 2019 ACFMEA, the only notable differences being a more open canopy due to fallen Ash trees and capacity of the specific reach of Appleby Creek.

The preferred alternative to replace the existing crossing structure at Fairview Street at Appleby Creek will consist of twin 10-meter span culverts. The proposed culvert replacements will have a greater footprint than the existing culvert. The replacement of the existing Fairview Street structure should be considered in the context of the proposed flood control measures within the Appleby Creek System which will lead to an overall improvement in fish habitat and valleyland conditions.

R.J. Burnside & Associates Limited



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Enclosure(s) Attachment 1 - 057084 Oval Court Lands_SAR Screening Table
Attachment 2 - 057084 Oval Court Lands_SWH Ecoregion 7E Criteria Screening Table
Attachment 3 - 057084 Oval Court Lands_Background Info
Figure 2 - Environmental Land Classification Mapping
Figure 3 - Aquatic Habitat

COMMON NAME	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description	Habitat Present in Study Area?	Species Observed?
Anthropods									
Monarch Butterfly	Danaus plexippus	S2N, S4B	SC	END	SC	1	Throughout their life cycle, Monarchs use three different types of habitat. Only the caterpillars (larvae) feed on milkweed plants and are confined to meadows and open areas where milkweed grows. Adult butterflies can be found in many diverse habitats where they feed on		
Birds									
Barn Swallow	Hirundo rustica	S4B	THR	THR	THR	1	Prefers farmland, lake/river shorelines, wooded clearings, urban populated areas, rocky cliffs, and wetlands. Nests inside or on exterior of buildings; under bridges and in road culverts; on rock faces, and in caves, etc.8	Suitable habitat may be present in association with the culvert.	within the culvert or during Beacon's 2019 field surveys.
Bank Swallow	Riparia riparia	S4B	SC	THR	THR	1	Prefers open habitats including, farmland, lake/river shorelines, grasslands, and wetlands. Nests in exposed earthen banks along shorelines and in artificial sites such as gravel pits.7	No potential. Suitable habitat absent.	N/A
Bobolink	Dolichonyx oryzivorus	S4B	SC	THR	THR	1	Generally prefers open grasslands and hay fields for nesting, typically featuring relatively tall vegetation. Sometimes uses large fields of winter wheat and rye in southwestern Ontario. Sensitive to vegetation structure and composition. Positively associated with high grass-to-forb ratios; moderate litter depth; tolerate wetter portions of fields compared to Eastern Meadowlark (EAME) and more likely to nest closer to field centres rather than field margins. Lower tolerance to presence of patches of bare ground. Appear to prefer larger fields than EAME.9	No potential. Suitable habitat absent.	N/A
Chimney Swift	Chaetura pelagica	S4B,S4N	THR	THR	THR	1	Historically nested in large hollow trees, other tree cavities and cracks in cliffs. Currently, most are found in developed areas in large, uncapped chimneys. Proximity to lakes is also a preferred habitat feature as they will forage for flying insects close to water.7	No potential. Suitable habitat absent.	N/A
Eastern Meadowlark	Sturnella magna	S4B	THR	THR	THR	1	Generally prefers grassy pastures, meadows and hay fields. Prefers moderately tall grass with abundant litter cover, a high proportion of grass cover, moderate forb density, low proportions of shrub and woody vegetation cover, and low percent of bare ground. Prefers to nest in drier sites and frequently nests around field margins.9	No potential. Suitable habitat absent.	N/A
Eastern Wood-pewee	Contopus virens	S4B	SC	SC	SC	1	Prefers open space near the nest in the form of forest edges, clearings, roadways, and water. Does not require large areas of woods but occurs less frequently in woodlots surrounded by development than in those without.7	Low potential suitable habitat present. None observed during Beacon's 2019 field surveys.	Confirmed absent by Beacon. Site conditions continue to be degraded and have not changed significnat since Beacon's 2019 field surveys. This site is unlikely to support this species.
Red-headed Woodpecker	Melanerpes erythrocephalus	S4B	SC	END	THR	1	Breeds in open woodland and woodland edges, especially oak savannah and riparian forest. These habitats can occur in parks, golf courses, cemeteries and private woodlands. Existence of large, dead, weathered trees or live trees with large dead branches are an important characteristic of habitat.7	Low potential suitable habitat present. None observed during Beacon's 2019 field surveys.	by Beacon. Site conditions continue to be degraded and
Wood Thrush	Hylocichla mustelina	S4B	SC	THR	THR	1	Inhabits and breeds in woodlands ranging from small (3 ha) and isolated to large and contiguous. The presence of tall trees and a thick understorey are usually prerequisites for site occupancy.7	Low potential suitable habitat present. None observed during Beacon's 2019 field surveys.	Confirmed absent by Beacon. Site conditions continue to be degraded and have not changed
Mammals									
Eastern Small-footed Myotis	Myotis leibii	S2S3	END	END	No status	No schedule	Overwintering habitat: Caves and abandoned mines. According to the Recovery Strategy for the Eastern Small-footed Myotis in Ontario, summer / roosting habitats used by the species in Ontario are poorly understood, but elsewhere in its range it primarily roosts in open, sunny rocky habitats, and, occasionally, in buildings. Summer roosts for this species are believed to be located in close proximity to their hibernacula (i.e., less than 100 m). The species' preference for rocky habitats in summer may limit an individual's home range to those rocky areas which also contain hibernacula (i.e., karst areas and Canadian Shield areas containing abandoned mines with adits).16	No potential. Suitable Roosting habitat absent.	Confirmed absent by Beacon (2024).

Little Brown Myotis	Myotis lucifugus	S4	END	END	END	1	Overwintering habitat: Caves and mines that remain above 0 degrees Celsius. Maternal Roosts: Often associated with buildings (attics, barns etc.). Occasionally found in trees (25-44 cm dbh).15	Low potential. Suitable roost trees present per Aquafor Beech (2020) and Beacon (2024) reports. Per the Beacon (2024) report, very few calls were recorded during acoustic monitoring surveys, indicating that maternaity roost habitats are present.	Confrmed present but significnat habitat is absent.
Northern Myotis	Myotis septentrionalis	S3	END	END	END	1	Overwintering habitat: Caves and mines that remain above 0 Maternal Roosts: Often associated with cavities of large diameter trees (25-44 cm dbh). Occasionally found in structures (attics, barns etc.)15	Low potential. Suitable roost trees present per Aquafor Beech (2020) and Beacon (2024) reports. Per the Beacon (2024) report, no calls of Northern Myotis were recorded.	Confirmed absent by Beacon (2024).
Tri-colored Bat	Perimyotis subflavus	S3?	END	END	END	1	Overwintering habitat: Deepest parts of caves and mines where temperature is the least variable. Maternal Roosts: Less is known about roosts of Tri-colored Bats. Most roost sites found within forested habitats. May roost in clumps of dead foliage and lichens. In more anthropogenically modified landscapes, maternity roosts may be barns or similar human-made structures.15	Low potential. Suitable roost trees present per Aquafor Beech (2020) and Beacon (2024) reports. Per the Beacon (2024) report, no calls of Northern Myotis were recorded.	Confirmed absent by Beacon (2024).
Reptiles									
Eastern Hog-nosed Snake	Heterodon platirhinos	S3	THR	THR	0	0	0	No potential. Suitable habitat absent.	N/A
Northern Map Turtle	Graptemys geographica	S3	SC	SC	SC	1	Highly aquatic. Inhabit slow moving water in larger lakes, rivers, reservoirs, oxbow sloughs, and open marshes, including some of the bays and inlets of the Great Lakes themselves with soft mud to sand, gravel, or marl bottom substrates. Less common in smaller lakes and streams; juveniles may reside in small ponds. Require high-quality water that supports the female's mollusc prey.19	No potential. Suitable habitat absent. Suitable substrates are absent, watercourse substrates larely consist of cobble and gravel underlain by limestone bedrock. This reahc of Appleby Creek is not considered to be a large river.	N/A
Snapping Turtle	Chelydra serpentina	S3	SC	SC	SC	1	Generally inhabit shallow waters where they can hide under the soft mud and leaf litter. Nesting sites usually occur on gravely or sandy areas along streams. Snapping Turtles often take advantage of man-made structures for nest sites, including roads (especially gravel shoulders), dams and aggregate pits.10	No potential. Suitable habitat absent. The reach of Appleby Creek lacks soft substrates that can be used by Snapping Turtles. Suitable basking habitat is limited along the Study Area as canopy cover is typically in excess of 70% cover. Suitable nesting habitat is absent from the Study Area.	N/A
Vegetation									
American Columbo	Frasera caroliniensis	S2	END	END	0	0	Occurs in deciduous woodlands and forests with dry to mesic clay, clay-loams, and silty clays.24	No potential. Suitable habitat is absent.	N/A
American Hart's-tongue Fern	Asplenium scolopendrium	S3	SC	SC	SC	1	Restricted to moist shaded calcareous rocky woods along the Niagara Escarpment.24	No potential. Suitable habitat is absent.	N/A
American Ginseng	Panax quinquefolius	S2	END	END	END	1	Grows in rich, moist, undisturbed and relatively mature deciduous woods in areas of neutral soil (such as over limestone or marble bedrock).20	No potential. Suitable habitat is absent.	N/A
Broad Beech Fern	Phegopteris hexagonoptera	S3	SC	SC	0	0	Occurs in moist deciduous forests, often occurin at the base of slopes, margins of seeps, and along watercourses. 25	Very low potential. Woodlands are heavily degraded.	Confirmed absent. Not observed by Aquafor Beech (2020), Beacon (2024), or Burnside.
Butternut	Juglans cinerea	S2?	END	END	END	1	Butternut grows best in rich, moist and well-drained soils or limestone gravel sites. They are less commonly found in dry, rocky and sterile soils. They generally grow alone or in small groups in deciduous forests that are commonly comprised of Basswood, Black Cherry, Beed, Black Walnut, Elm, Hemlock, Hickory, Oak, Red Maple, Sugar Maple, Poplar, White Ash and Yellow Birch.6 In Ontario, they can be found throughout the southern Ontario, south of the Canadian Shield.10	Moderate potential.	Confirmed absent. Not observed by Aquafor Beech (2020), Beacon (2024), or Burnside.

Dense Blazing-star	Liatris spicata	S2	THR	THR	THR	1	Generally found in moist prairies, grassland savannahs, wet areas between sand dunes, and abandoned fields.10	No potential. Suitable habitat is absent.	N/A
Downy Yellow False Foxglove	Aureolaria virginica	S1	END	END	0	0	Well drained soils in dry, open to semi-open, upland oak forests, woodlands and savanna. Known to grow on sand dunes, sand plains, clay ridges, slopes, stony loams on moraines, and shallow soils over	No potential. Suitable habitat is absent.	N/A
Eastern Flowering Dogwood	Cornus florida	S2?	END	END	END	1	Generally grows in deciduous and mixed forests, in the drier areas of its habitat, although it is occasionally found in slightly moist environments; Also grows around forest edges and hedgerows.20	No potential. Suitable habitat is absent.	N/A
Fern-leaved Yellow False Foxglove	Aureolaria pedicularia	S3?	THR	THR	0	0	Occurs on dry sandy soils of open woodlands and savannahs, particularly Black Oak savannahs. Common associates include Hickory and Pine. 25	No potential. Suitable habitat is absent.	N/A
Hoary Mountain-mint	Pycnanthemum incanum	S1	END	END	0	0	Occurs on dry sandy soils of open woodlands and savannahs, particularly Black Oak savannahs. Common associates include Hickory and Pine. 25	No potential. Suitable habitat is absent.	N/A
Red Mulberry	Morus rubra	S2	END	END	END	1	Generally grows in moist forest habitats. In Ontario, these include slopes and ravines of the Niagara Escarpment, and sand spits and bottom lands; Can grow in open areas such as hydro corridors.20	No potential. Suitable habitat is absent.	N/A
Smooth Yellow False Foxglove	Aureolaria flava	S2?	THR	THR	THR	1	Dry, open to semi-open upland oak forests and oak woodlands with well-drained soils, hemi-parasitic with White Oak. 25	No potential. Suitable habitat is absent.	N/A

[1]**S-Ranks (provincial)**

Provincial (or Subnational) ranks are used by the Natural Heritage Information Centre (NHIC) to set protection priorities for rare species and natural communities. These ranks are not legal designations. Provincial ranks are assigned in a manner similar to that described for global ranks, but consider only those factors within the political boundaries of Ontario.
(Provinical Status from MNR Biodiversity Explorer September 2012)

S1 Critically Imperiled - Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.
S2 Imperiled - Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.
S3 Vulnerable - Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

[2]**SARO *Endangered Species Act, 2007***
(provincial status from MNR December 2014)
The provincial review process is implemented by the MNR's Committee on the Status of Species at Risk in Ontario (COSSARO).

EXT Extinct - A species that no longer exists anywhere.
EXP Extirpated - A species that no longer exists in the wild in Ontario but still occurs elsewhere.
END Endangered - A species facing imminent extinction or extirpation in Ontario which is a candidate for regulation under Ontario's Endangered Species Act (ESA) (END-R designations are no longer relevant as species are covered under new ESA April 2009)
THR Threatened - A species that is at risk of becoming endangered in Ontario if limiting factors are not reversed.
SC Special Concern (formerly Vulnerable) - A species with characteristics that make it sensitive to human activities or natural events.
NAR Not at Risk - A species that has been evaluated and found to be not at risk.
DD Data Deficient (formerly Indeterminate) - A species for which there is insufficient information for a provincial status recommendation.

[3]**SARA (Federal *Species at Risk Act*) Status and Schedule (includes COSEWIC Status)**
The Act establishes Schedule 1, as the official list of wildlife species at risk. It classifies those species as being either Extirpated, Endangered, Threatened, or a Special Concern. Once listed, the measures to protect and recover a listed wildlife species are implemented.
EXT Extinct - A wildlife species that no longer exists.
EXP Extirpated - A wildlife species that no longer exists in the wild in Canada, but exists elsewhere in the wild.
END Endangered - A wildlife species that is facing imminent extirpation or extinction.
THR Threatened - A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
SC Special Concern - A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

[4]**SARA Schedule**
Schedule 1: is the official list of species that are classified as extirpated, endangered, threatened, and of special concern.
Schedule 2: species listed in Schedule 2 are species that had been designated as endangered or threatened, and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.
Schedule 3: species listed in Schedule 3 are species that had been designated as special concern, and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.

The Act establishes Schedule 1 as the official list of wildlife species at risk. However, please note that while Schedule 1 lists species that are extirpated, endangered, threatened and of special concern, the prohibitions do not apply to species of special concern.

Species that were designated at risk by COSEWIC prior to October 1999 (Schedule 2 & 3) must be reassessed using revised criteria before they can be considered for addition to Schedule 1 of SARA. After they have been assessed, the Governor in Council may on the recommendation of the Minister, decide on whether or not they should be added to the List of Wildlife Species at Risk.

[5]**Habitat Present on Site**
Determination of suitability of the site to be support each species based on 'Key Habitats Used By Species'.
Yes - Specific habitat present and species and / or evidence observed;
Likely – The whole study area or portions of it contain conditions that could support the species;
Unlikely – Few similarities between study area conditions and preferred habitat exist;
No - Specific habitat not present and species and / or evidence not observed

[6]**Species Observed**
Reported sighting of species during fall field investigations by RJB biologists

Additional Sources:

Sources:

[7] Cadman, M.D., et al. (eds). 2007. *Atlas of the Breeding Birds of Ontario, 2001-2005*. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature, Toronto, xxii + 706 pp

[8] Species at Risk Public Registry http://www.sararegistry.gc.ca

[9] McCracken, J.D. et al. 2013. Recovery Strategy for the Bobolink (Dolichonyx oryzivorus) and Eastern Meadowlark (Sturnella magna) in Ontario .Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario, viii + 88 pp.

[10] MNR SARO List Species Descriptions (http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/MNR_SAR_CSSR_SARO_LST_EN.html)

[11] COSEWIC Species Assessment Report

[12] Naughton, Donna. 2012. *The Natural History of Canadian Mammals*. Canadian Museum of Nature and University of Toronto Press, Toronto, + 784 pp

[13]Farrar, John Laird, 2017, *Trees in Canada*, Natural Resources Canada | Canada Forest Services, and, Fitchenry &Whiteside Limited, pp.238 - 239

[14]Ontario Nature Reptile and Amphibian Atlas (https://ontarionature.org/programs/citizen-science/reptile-amphibian-atlas/species/)

[15]Environment Canada. 2015.Recovery Strategy for Little Brown Myotis (Myotis lucifugus), Northern Myotis (Myotis septentrionalis) and Tri-colored Bat (Perimyotis subflavus) in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. Ix + 110 pp.

16Humphrey, C. 2017. Recovery Strategy for the Eastern Small-footed Myotis (Myotis leibii) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario. vii + 76 pp.

[17]Department of Fisheries and Oceans (DFO) Aquatic Species at Risk found online at: http://www.dfo-mpo.gc.ca/species-especes/sara-lep/identify-eng.html.

[18]Paulson, D. 2011. Dragonflies and Damselflies of the East. Princeton University Press, Princeton, NJ.

[19]Harding, J.H., 1997. Amphibians and Reptiles of the Great Lakes Region. The University of Michigan Press. Ann Arbor, Michigan

[20]MNRF. 2018. City of Niagara Falls Species at Risk Table. Guelph District.

[21]Michigan Flora found online at https://michiganflora.net/search.aspx

[22]Natural Heritage Information Centre (https://www.ontario.ca/page/get-natural-heritage-information)

Project Name: Oval Court Lands - Municipal EA Addendum

Significant Wildlife Habitat Screening in the Study Area– Ecoregion 7E Criteria (2015)

Project Number: 300057084.0000

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Table 1.1: Seasonal Concentration Areas of Animals						
Waterfowl Stopover & Staging Areas (Terrestrial) **<u>Rationale</u>**: Habitat important to migrating waterfowl.	CUM1 CUT1 - Plus evidence of annual spring flooding from melt water or run-off within these ecosites. Fields with seasonal flooding and waste grains in the Long Point, Rondeau, Lake St. Clair, Grand Bend and Point Pelee areas may be important to Tundra Swans.	Fields with sheet water during Spring (mid-March to May). • Fields flooding during spring melt and run-off provide important invertebrate foraging habitat for migrating waterfowl. • Agricultural fields with waste grains are commonly used by waterfowl, these are not considered SWH unless they have spring sheet water available.	No potential • CUM1 ecosites are present but are not sufficiently large to support large aggregations of waterfowl.	American Black Duck Northern Pintail Gadwall Blue-winged Teal Green-winged Teal American Wigeon Northern Shoveler Tundra Swan	Studies carried out and verified presence of an annual concentration of any listed species, evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects. • Any mixed species aggregations of 100 or more individuals required. • The flooded field ecosite habitat plus a 100-300 m radius area, dependent on local site conditions and adjacent land use is the SWH. • Annual use of habitat is documented from information sources or field studies (annual use can be based on studies or determined by past surveys with species numbers and dates). • **SWHMiST Index #7** provides development effects and mitigation measures.	N/A
Waterfowl Stopover & Staging Areas (Aquatic) **<u>Rationale:</u>**	MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7	• Ponds, marshes, lakes, bays, coastal inlets, and watercourses used during migration. Sewage treatment ponds and SWM ponds do not qualify as a SWH, however a reservoir managed as a large wetland or pond/lake does qualify. • These habitats have an abundant food supply (mostly aquatic invertebrates and	No potential • MAS ecosites are present but are not sufficiently large to support large aggregations of waterfowl.	Canada Goose Cackling Goose Snow Goose American Black Duck Northern Pintail Northern Shoveler American Wigeon Gadwall Green-winged Teal Blue-winged Teal Hooded Merganser Common Merganser Lesser Scaup Greater Scaup Long-tailed Duck Surf Scoter	**Studies carried out & verified presence of:** • Aggregations of 100 or more of listed species for 7 days, results in >700 waterfowl use days. • Areas with annual staging of ruddy ducks, canvasbacks, and redheads are SWH. • The combined area of the Ecological Land Classification (ELC) ecosites and a 100 m radius area is the SWH. • Wetland area and shorelines associated with sites identified within the SWHTG Appendix K are SWH.	N/A

Significant Wildlife Habitat Screening in the Study Area– Ecoregion 7E Criteria (2015)

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Important for local and migrant waterfowl populations during the spring or fall migration or both periods combined. Sites identified are usually only one of a few in the eco-district.		vegetation in shallow water).		White-winged Scoter Black Scoter Ring-necked duck Common Goldeneye Bufflehead Redhead Ruddy Duck Red-breasted Merganser Brant Canvasback Ruddy Duck	• Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”. • Annual Use of Habitat is Documented from Information Sources or Field Studies (Annual can be based on completed studies or determined from past surveys with species numbers and dates recorded). • **SWHMiST Index #7** provides development effects and mitigation measures.	
Shorebird Migratory Stopover Area **<u>Rationale</u>**: High quality shorebird stopover habitat is extremely rare and typically has a long history of use.	BBO1 BBO2 BBS1 BBS2 BBT1 BBT2 SDO1 SDS2 SDT1 MAM1 MAM2 MAM3 MAM4 MAM5	• Shorelines of lakes, rivers and wetlands, including beach areas, bars and seasonally flooded, muddy and un-vegetated shoreline habitats. • Great Lakes coastal shorelines, including groynes and other forms of armour rock lakeshores, are extremely important for migratory shorebirds in May to mid-June and early July to October. • Sewage treatment ponds and storm water ponds do not qualify as a SWH.	No potential • Suitable vegetation communities are absent.	Greater Yellowlegs Lesser Yellowlegs Marbled Godwit Hudsonian Godwit Black-bellied Plover American Golden-Plover Semipalmated Plover Solitary Sandpiper Spotted Sandpiper Semipalmated Sandpiper Pectoral Sandpiper White-rumped Sandpiper Baird’s Sandpiper Least Sandpiper Purple Sandpiper Stilt Sandpiper Short-billed Dowitcher Red-necked Phalarope Whimbrel RuddyTurnstone Sanderling Dunlin	**Studies confirming:** • Presence of 3 or more of listed species and >1000 shorebird use days during spring or fall migration period (shorebird use days are the accumulated number of shorebirds counted per day over the course of the fall or spring migration period). • Whimbrel stop briefly (<24 hrs.) during spring migration, any site with >100 Whimbrel used for 3 years or more is significant. • The area of significant shorebird habitat includes the mapped ELC shoreline ecosites plus a 100 m radius area. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”. • **SWHMiST Index #8** provides development effects and mitigation measures.	N/A
Raptor Wintering Area **<u>Rationale</u>**: Sites used by multiple species, a high number of individuals and used	<u>Hawks/Owls:</u> Combination of ELC Community Series; need to have present one Community Series from each land class; <u>Forest:</u>	• The habitat provides a combination of fields and woodlands that provide roosting, foraging and resting habitats for wintering raptors.	No potential • Suitable vegetation communities are absent.	Rough-legged Hawk Red-tailed Hawk Northern Harrier American Kestrel Snowy Owl **<u>Special Concern:</u>** Short-eared Owl	**Studies confirm the use of these habitats by:** • One or more Short-eared Owls or; One or more Bald Eagles or; At least 10 individuals and two of the listed hawk/owl species.	N/A

Significant Wildlife Habitat Screening in the Study Area– Ecoregion 7E Criteria (2015)

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
annually are most significant.	FOD, FOM, FOC. <u>Upland</u>: CUM; CUT; CUS; CUW. <u>Bald Eagle:</u> Forest community Series: FOD, FOM, FOC, SWD, SWM or SWC on shoreline areas adjacent to large rivers or adjacent to lakes with open water (hunting area).	• Raptor wintering sites (hawk/owl) need to be **>** 20 ha, with a combination of forest and upland. • Least disturbed sites, idle/fallow or lightly grazed field/meadow (>15ha) with adjacent woodlands. • Field area of the habitat is to be wind swept with limited snow depth or accumulation. • Eagle sites have open water, large trees and snags available for roosting.		Bald Eagle	• To be significant a site must be used regularly (3 in 5 years) for a minimum of 20 days by the above number of birds. • The habitat area for an Eagle winter site is the shoreline forest ecosites directly adjacent to the prime hunting area. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects.” • **SWHMiST Index #10 and #11** provides development effects and mitigation measures.	
Bat Hibernacula **<u>Rationale</u>**; Bat hibernacula are rare habitats in all Ontario landscapes.	**Bat Hibernacula may be found in these ecosites:** CCR1 CCR2 CCA1 CCA2 (Note: buildings are not considered to be SWH)	• Hibernacula may be found in caves, mine shafts, underground foundations and Karsts. • Active mine sites should not be considered as SWH. • The locations of bat hibernacula are relatively poorly known.	No potential • Suitable vegetation communities are absent.	Big Brown Bat Tri-coloured Bat	• All sites with confirmed hibernating bats are SWH. • The habitat area includes a 200 m radius around the entrance of the hibernaculum for most development types and 1000 m for wind farms. • Studies are to be conducted during the peak swarming period (August to September). Surveys should be conducted following methods outlined in the “Bats and Bat Habitats: Guidelines for Wind Power Projects”. • **SWHMiST Index #1** provides development effects and mitigation measures.	N/A
Bat Maternity Colonies **<u>Rationale:</u>**	Maternity colonies considered SWH are found in forested ecosites.	• Maternity colonies can be found in tree cavities, vegetation and often in	No potential • Suitable vegetation communities are absent.	Big Brown Bat Silver-haired Bat	• Maternity Colonies with confirmed use by: – >10 Big Brown Bats	N/A

Significant Wildlife Habitat Screening in the Study Area– Ecoregion 7E Criteria (2015)

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Known locations of forested bat maternity colonies are extremely rare in all Ontario landscapes.	**All ELC ecosites in ELC Community Series:** FOD FOM SWD SWM	buildings are not considered to be SWH). • Maternity roosts are not found in caves and mines in Ontario. • Maternity colonies located in Mature deciduous or mixed forest stands with >10/ha large diameter (>25 cm dbh) wildlife trees. • Female Bats prefer wildlife tree (snags) in early stages of decay, class 1-3 or class 1 or 2. • Silver-haired Bats prefer older mixed or deciduous forest and form maternity colonies in tree cavities and small hollows. Older forest areas with at least 21 snags/ha are preferred.			– >5 Adult Female Silver- haired Bats • The area of the habitat includes the entire woodland, or a forest stand ELC ecosite or an ecoelement containing the maternity colonies. • Evaluation methods for maternity colonies should be conducted following methods outlined in the “Bats and Bat Habitats: Guidelines for Wind Power Projects”. • **SWHMiST Index #12** provides development effects and mitigation measures.	
Turtle Wintering Areas **<u>Rationale:</u>** Generally, sites are the only known sites in the area. Sites with the highest number of individuals are most significant.	Snapping and Midland Painted Turtles. **ELC Community Classes:** SW, MA, OA and SA **ELC Community Series:** FEO and BOO	• For most turtles, wintering areas are in the same general area as their core habitat. Water has to be deep enough not to freeze and have soft mud substrates. • Over-wintering sites are permanent water bodies, large wetlands, and bogs or fens with adequate Dissolved Oxygen. • Man-made ponds such as sewage lagoons or storm water ponds	No potential • Suitable habitat to support overwintering turtles	Midland Painted Turtle **<u>Special Concern:</u>** Northern Map Turtle Snapping Turtle	• Presence of 5 over-wintering Midland Painted Turtles is significant. • One or more Northern Map Turtle or Snapping Turtle over-wintering within a wetland is significant. • The mapped ELC ecosite area with the over wintering turtles is the SWH. If the hibernation site is within a stream or river, the deep-water pool where the turtles are over wintering is the SWH. • Over wintering areas may be identified by searching for congregations (Basking Areas) of turtles on warm, sunny days during the fall (September–October) or spring (March–May).	N/A

Significant Wildlife Habitat Screening in the Study Area– Ecoregion 7E Criteria (2015)

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
	For Northern Map Turtle: Open Water areas such as deeper rivers or streams and lakes with current can also be used as over-wintering habitat.	should not be considered SWH.			• Congregation of turtles is more common where wintering areas are limited and therefore significant. • **SWHMiST Index #28** provides development effects and mitigation measures for turtle wintering habitat.	
Reptile Hibernaculum **<u>Rationale</u>**: Generally, sites are the only known sites in the area. Sites with the highest number of individuals are most significant.	For all snakes, habitat may be found in any ecosite other than very wet ones. Talus, Rock Barren, Crevice, Cave, and Alvar sites may be directly related to these habitats. Observations or congregations of snakes on sunny warm days in the spring or fall is a good indicator.	• For snakes, hibernation takes place in sites located below frost lines in burrows, rock crevices and other natural or naturalized locations. The existence of features that go below frost line; such as rock piles or slopes, old stone fences, and abandoned crumbling foundations assist in identifying candidate SWH. • Areas of broken and fissured rock are particularly valuable since they provide access to subterranean sites below the frost line. • Wetlands can also be important over-wintering habitat in conifer or shrub swamps and swales, poor fens, or depressions in bedrock terrain with sparse trees or shrubs with sphagnum moss or sedge hummock groundcover.	No potential • No hibernacula features observed within the Study Area • None observed by Beacon (2024) or Aquafor Beech (2020)	**<u>Snakes</u>**: Eastern Gartersnake Northern Watersnake Northern Red-bellied Snake Northern Brownsnake Smooth Green Snake Northern Ring-necked Snake **<u>Special Concern</u>**: Milksnake Eastern Ribbonsnake	**Studies confirming:** • Presence of snake hibernacula used by a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. • Congregations of a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. near potential hibernacula (e.g., foundation or rocky slope) on sunny warm days in Spring (April/May) and Fall (September/October). • **Note**: If there are Special Concern Species present, then site is SWH. • **Note:** Sites for hibernation possess specific habitat parameters (e.g., temperature, humidity, etc.) and consequently are used annually, often by many of the same individuals of a local population (i.e., strong hibernation site fidelity). Other critical life processes (e.g., mating) often take place in close proximity to hibernacula. The feature in which the hibernacula is located plus a 30 m radius area is the SWH. • **SWHMiST Index #13** provides development effects and mitigation measures for snake hibernacula.	N/A

Significant Wildlife Habitat Screening in the Study Area– Ecoregion 7E Criteria (2015)

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Colonially - Nesting Bird Breeding Habitat (Bank & Cliff) **<u>Rationale</u>:** Historical use and number of nests in a colony make this habitat significant. An identified colony can be very important to local populations. All swallow population are declining in Ontario.	Eroding banks, sandy hills, borrow pits, steep slopes, and sand piles. Cliff faces, bridge abutments, silos, barns. **Habitat found in the following ecosites:** CUM1 CUT1 CUS1 BLO1 BLS1 BLT1 CLO1 CLS1 CLT1	• Any site or areas with exposed soil banks, undisturbed or naturally eroding that is not a licensed/permitted aggregate area. • Does not include man-made structures (bridges or buildings) or recently (2 years) disturbed soil areas, such as berms, embankments, soil or aggregate stockpiles. • Does not include a licensed/permitted Mineral Aggregate Operation.	No potential • Bare banks observed along Appleby Creek, no nests observed. • Indicator species not observed by Beacon during 2019 field investigations.	Cliff Swallow Northern Rough-winged Swallow (this species is not colonial but can be found in Cliff Swallow colonies)	**Studies confirming:** • Presence of 1 or more nesting sites with 8 or more cliff swallow pairs and/or rough-winged swallow pairs during the breeding season. • A colony identified as SWH will include a 50 m radius habitat area from the peripheral nests. • Field surveys to observe and count swallow nests are to be completed during the breeding season. Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”. • **SWHMiST Index #4** provides development effects and mitigation measures.	N/A
Colonially - Nesting Bird Breeding Habitat (Tree/Shrubs) **<u>Rationale:</u>** Large colonies are important to local bird population, typically sites are only known colony in area and are used annually.	SWM2 SWM3 SWM5 SWM6 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7 FET1	• Nests in live or dead standing trees in wetlands, lakes, islands, and peninsulas. Shrubs and occasionally emergent vegetation may also be used. • Most nests in trees are 11 to 15 m from ground, near the top of the tree.	No potential • Suitable vegetation communities are absent.	Great Blue Heron Black-crowned Nigh-Heron Great Egret Green Heron	**Studies confirming:** • Presence of 2 or more active nests of Great Blue Heron or other listed species. • The habitat extends from the edge of the colony and a minimum 300 m radius or extent of the Forest ecosite containing the colony or any island <15.0 ha with a colony is the SWH. • Confirmation of active heronries are to be achieved through site visits conducted during the nesting season (April to August) or by evidence such as the presence of fresh guano, dead young and/or eggshells. • **SWHMiST Index #5** provides development effects and mitigation measures.	N/A
Colonially - Nesting Bird Breeding Habitat (Ground)	Any rocky island or peninsula (natural or artificial) within a lake or large river (two-lined on a 1;50,000 NTS map).	• Nesting colonies of gulls and terns are on islands or peninsulas associated with open	No potential • Suitable vegetation communities are absent.	Herring Gull Great Black-backed Gull Little Gull Ring-billed Gull Common Tern	**Studies confirming:** • Presence of > 25 active nests for Herring Gulls or Ring-billed Gulls, >5	N/A

Significant Wildlife Habitat Screening in the Study Area– Ecoregion 7E Criteria (2015)

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
<u>Rationale:</u> Colonies are important to local bird population, typically sites are only known colony in area and are used annually.	Close proximity to watercourses in open fields or pastures with scattered trees or shrubs (Brewer's Blackbird). MAM1 – 6 MAS1 – 3 CUM CUT CUS	water or in marshy areas. • Brewers Blackbird colonies are found loosely on the ground in low bushes in close proximity to streams and irrigation ditches within farmlands.		Caspian Tern Brewer's Blackbird	active nests for Common Tern or >2 active nests for Caspian Tern. • Presence of 5 or more pairs for Brewer's Blackbird. • Any active nesting colony of one or more Little Gull, and Great Black-backed Gull is significant. • The edge of the colony and a minimum 150 m radius area of habitat, or the extent of the ELC ecosites containing the colony or any island <3.0 ha with a colony is the SWH. • Studies would be done during May/June when actively nesting. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects". • **SWHMiST Index #6** provides development effects and mitigation measures.	
Migratory Butterfly Stopover Areas **<u>Rationale:</u>** Butterfly stopover areas are extremely rare habitats and are biologically important for butterfly species that migrate south for the winter.	Combination of ELC Community Series; need to have present one Community Series from each land class. <u>Field</u>: CUM CUT CUS <u>Forest</u>: FOC FOD FOM CUP Anecdotally, a candidate site for butterfly stopover will have a history of butterflies being observed.	• A butterfly stopover area will be a minimum of 10 ha in size with a combination of field and forest habitat present and will be located within 5 km of Lake Erie or Ontario. • The habitat is typically a combination of field and forest and provides the butterflies with a location to rest prior to their long migration south. • The habitat should not be disturbed, fields/meadows with an abundance of preferred nectar plants and woodland edge providing shelter are	No potential • CUT1 community not sufficiently large	Painted Lady Red Admiral <u>Special Concern</u> Monarch	S**tudies confirm:** • The presence of Monarch Use Days (MUD) during fall migration (August/October). MUD is based on the number of days a site is used by Monarchs, multiplied by the number of individuals using the site. Numbers of butterflies can range from 100-500/day, significant variation can occur between years and multiple years of sampling should occur. • Observational studies are to be completed and need to be done frequently during the migration period to estimate MUD. • MUD of >5000 or >3000 with the presence of Painted Ladies or Red Admiral's is to be considered significant. • **SWHMiST Index #16** provides development effects and mitigation measures.	N/A

Significant Wildlife Habitat Screening in the Study Area– Ecoregion 7E Criteria (2015)

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
		requirements for this habitat. • Staging areas usually provide protection from the elements and are often spits of land or areas with the shortest distance to cross the Great Lakes.				
Landbird Migratory Stopover Areas **<u>Rationale:</u>** Sites with a high diversity of species as well as high numbers are most significant.	**All ecosites associated with these ELC Community Series:** FOC FOM FOD SWC SWM SWD	• Woodlots >5 ha in size and within 5 km of Lake Erie and Ontario. • If woodlands are rare in an area of shoreline, woodland fragments 2-5 ha can be considered for this habitat. • If multiple woodlands are located along the shoreline those Woodlands <2 km from Lake Ontario are more significant. • Sites have a variety of habitats; forest, grassland and wetland complexes. • The largest sites are more significant. • Woodlots and forest fragments are important habitats to migrating birds, these features located along the shore and located within 5 km of Lake Erie and Ontario are Candidate SWH.	No potential • Suitable vegetation communities are absent.	All migratory songbirds. Canadian Wildlife Service Ontario website: http://www.ec.gc.ca/nature/default.asp?lang=En&n=421B7A9D-1 All migrant raptors species: *Ontario Ministry of Natural Resources: Fish and Wildlife Conservation Act, 1997.* Schedule 7: Specially Protected Birds (Raptors)	**Studies confirm:** • Use of the habitat by >200 birds/day and with >35 spp with at least 10 bird spp. recorded on at least 5 different survey dates. This abundance and diversity of migrant bird species is considered above average and significant. • Studies should be completed during spring (April/May) and fall (August/October) migration using standardized assessment techniques. Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”. • **SWHMiST Index #9** provides development effects and mitigation measures.	N/A
Deer Winter Congregation Areas **<u>Rationale:</u>**	**All Forested ecosites with these ELC Community Series:** FOC	• Woodlots >100 ha in size or if large woodlots are rare in planning area woodlots >50 ha.	No potential • Not identified by the MNRF as being present	White-tailed Deer	**Studies confirm:** • Deer management is an MNRF responsibility, deer winter congregation	Confirmed absent

Significant Wildlife Habitat Screening in the Study Area– Ecoregion 7E Criteria (2015)

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Deer movement during winter in the southern areas of Ecoregion 7E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands to reduce or avoid the impacts of winter conditions.	FOM FOD SWC SWM SWD Conifer plantations much smaller than 50 ha may also be used.	• Deer movement during winter in the southern areas of Ecoregion 7E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands. • Large woodlots > 100 ha and up to 1500 ha are known to be used annually by densities of deer that range from 0.1-1.5 deer/ha. • Woodlots with high densities of deer due to artificial feeding are not significant.			areas considered significant will be mapped by MNRF. • Use of the woodlot by white- tailed deer will be determined by MNRF, all woodlots exceeding the area criteria are significant, unless determined not to be significant by MNRF. • Studies should be completed during winter (January/February) when >20 cm of snow is on the ground using aerial survey techniques, ground or road surveys. or a pellet count deer density survey. • **SWHMiST Index #2** provides development effects and mitigation measures.	
Table 1.2.1: Rare Vegetation Communities						
Cliffs and Talus Slopes **Rationale:** Cliffs and Talus Slopes are extremely rare habitats in Ontario.	**Any ELC ecosite within Community Series:** TAO CLO TAS CLS TAT CLT	• Most cliff and talus slopes occur along the Niagara Escarpment. • A Cliff is vertical to near vertical bedrock >3 m in height. • A Talus Slope is rock rubble at the base of a cliff made up of coarse rocky debris.	No potential • Suitable vegetation communities are absent.		• Confirm any ELC Vegetation Type for Cliffs or Talus Slopes. • **SWHMiST Index #21** provides development effects and mitigation measures.	N/A
Sand Barren **Rationale;** Sand barrens are rare in Ontario and support rare species. Most Sand Barrens have been lost due to cottage	**ELC ecosites:** SBO1 SBS1 SBT1 Vegetation cover varies from patchy and barren to continuous meadow (SBO1), thicket-like	A sand barren area >0.5 ha in size. • Sand Barrens typically are exposed sand, generally sparsely vegetated and caused by lack of moisture, periodic fires and erosion. Usually	No potential • Suitable vegetation communities are absent.		• Confirm any ELC Vegetation Type for Sand Barrens • Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic sp.). • **SWHMiST Index #20** provides development effects and mitigation measures.	N/A

Significant Wildlife Habitat Screening in the Study Area– Ecoregion 7E Criteria (2015)

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
development and forestry.	(SBS1), or more closed and treed (SBT1). Tree cover always <u>≤</u> 60%.	located within other types of natural habitat such as forest or savannah. Vegetation can vary from patchy and barren to tree covered, but less than 60%.				
Alvar **<u>Rationale;</u>** Alvars are extremely rare habitats in Ecoregion 7E.	ALO1 ALS1 ALT1 FOC1 FOC2 CUM2 CUS2 CUT2-1 CUW2 **Five Alvar Indicator Species:** *Carex crawei* *Panicum philadelphicum* *Eleocharis compressa* *Scutellaria parvula* *Trichostema brachiatum* These indicator species are very specific to Alvars within Ecoregion 7E.	• An alvar is typically a level, mostly unfractured calcareous bedrock feature with a mosaic of rock pavements and bedrock overlain by a thin veneer of soil. The hydrology of alvars is complex, with alternating periods of inundation and drought. Vegetation cover varies from sparse lichen-moss associations to grasslands and shrublands and comprising a number of characteristic or indicator plants. Undisturbed alvars can be phyto- and zoogeographically diverse, supporting many uncommon or are relict plant and animals species. Vegetation cover varies from patchy to barren with a less than 60% tree cover. • An Alvar site > 0.5 ha in size. • Alvar is particularly rare in Ecoregion 7E where	No potential • Suitable vegetation communities are absent.		**Field studies that identify:** • Four of the five Alvar Indicator Species at a Candidate Alvar site is Significant. • Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic sp.). • The alvar must be in excellent condition and fit in with surrounding landscape with few conflicting land uses. • **SWHMiST Index #17** provides development effects and mitigation measures.	N/A

Significant Wildlife Habitat Screening in the Study Area– Ecoregion 7E Criteria (2015)

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
		the only known sites are found in the western islands of Lake Erie.				
Old Growth Forest **<u>Rationale;</u>** Due to historic logging practices and land clearance for agriculture, old growth forest is rare in the Ecoregion 7E.	**Forest Community Series:** FOD FOC FOM SWD SWC SWM	• Old Growth forests are characterized by heavy mortality or turnover of over-storey trees resulting in a mosaic of gaps that encourage development of a multi-layered canopy and an abundance of snags and downed woody debris.	No potential • Suitable vegetation communities are absent.		**Field Studies will determine:** • If dominant trees species of the are >140 years old, then the area containing these trees is SWH. • The forested area containing the old growth characteristics will have experienced no recognizable forestry activities (cut stumps will not be present). • The area of forest ecosites combined or an eco-element within an ecosite that contains the old growth characteristics is the SWH. • Determine ELC vegetation types for the forest forest area containing the old growth characteristics. • **SWHMiST Index #23** provides development effects and mitigation measures.	N/A
Savannah **<u>Rationale:</u>** Savannahs are extremely rare habitats in Ontario.	TPS1 TPS2 TPW1 TPW2 CUS2	• No minimum size to site. Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH. • A Savannah is a tallgrass prairie habitat that has tree cover between 25–60%. • In Ecoregion 7E, known Tallgrass Prairie and savannah remnants are scattered between Lake Huron and Lake Erie, near Lake St. Clair, north of and along the Lake Erie shoreline, in	No potential • Suitable vegetation communities are absent.		**Field studies confirm:** • one or more of the Savannah indicator species listed in Appendix N should be present. **Note**: Savannah plant spp. list from Ecoregion 7E should be used. • Area of the ELC ecosite is the SWH. • Site must not be dominated by exotic or introduced species (<50% vegetative cover is exotic sp.). • **SWHMiST Index #18** provides development effects and mitigation measures.	N/A

Significant Wildlife Habitat Screening in the Study Area– Ecoregion 7E Criteria (2015)

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
		Brantford and in Toronto area (north of Lake Ontario).				
Tallgrass Prairie **<u>Rationale:</u>** Tallgrass Prairies are extremely rare habitats in Ontario.	TPO1 TPO2	• No minimum size to site. Site must be restored or a natural site. Remnant sites such as railway Right of Ways (ROW) are not considered to be SWH. • A Tallgrass Prairie has ground cover dominated by prairie grasses. An open Tallgrass Prairie habitat has < 25% tree cover. • In Ecoregion 7E, known Tallgrass Prairie and savannah remnants are scattered between Lake Huron and Lake Erie, near Lake St. Clair, north of and along the Lake Erie shoreline, in Brantford and in Toronto area (north of Lake Ontario).	No potential • Suitable vegetation communities are absent.		**Field studies confirm:** • One or more of the Prairie indicator species listed in Appendix N should be present. **Note:** Prairie plant spp. list from Ecoregion 7E should be used. • Area of the ELC ecosite is the SWH. • Site must not be dominated by exotic or introduced species (<50% vegetative cover is exotic sp.). • **SWHMiST Index #19** provides development effects and mitigation measures.	N/A
Other Rare Vegetation Communities **<u>Rationale:</u>** Plant communities that often contain rare species which depend on the habitat for survival.	• Provincially Rare S1, S2 and S3 vegetation communities are listed in Appendix M of the SWHTG. • Any ELC ecosite Code that has a possible ELC Vegetation Type that is Provincially Rare is Candidate SWH.	• ELC ecosite codes that have the potential to be a rare ELC Vegetation Type as outlined in Appendix M. • The MNRF/Natural Heritage Information Centre (NHIC) will have up to date listing for rare vegetation communities. • Rare Vegetation Communities may include beaches, fens, forest, marsh, barrens, dunes and swamps.	No potential • Suitable vegetation communities are absent.		**Field studies should confirm:** • If an ELC Vegetation Type is a rare vegetation community based on listing within Appendix M of SWHTG. • Area of the ELC Vegetation Type polygon is the SWH. • **SWHMiST Index #37** provides development effects and mitigation measures.	N/A

Significant Wildlife Habitat Screening in the Study Area– Ecoregion 7E Criteria (2015)

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Table 1.2.2: Specialized Habitat for Wildlife considered Significant Wildlife Habitat						
Waterfowl Nesting Area **<u>Rationale;</u>** Important to local waterfowl populations, sites with greatest number of species and highest number of individuals are significant.	**All upland habitats located adjacent to these wetland ELC ecosites are Candidate SWH:** MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SWT1 SWT2 SWD1 SWD2 SWD3 SWD4 Note: includes adjacency to Provincially Significant Wetlands (PSW).	• A waterfowl nesting area extends 120 m from a wetland (> 0.5 ha) or a wetland (>0.5ha) and any small wetlands (0.5ha) within 120 m or a cluster of 3 or more small (<0.5 ha) wetlands within 120 m of each individual wetland where waterfowl nesting is known to occur. • Upland areas should be at least 120 m wide so that predators such as racoons, skunks, and foxes have difficulty finding nests. • Wood Ducks and Hooded Mergansers utilize large diameter trees (>40 cm dbh) in woodlands for cavity nest sites.	No potential • Suitable vegetation communities are absent.	American Black Duck Northern Pintail Northern Shoveler Gadwall Blue-winged Teal Green-winged Teal Wood Duck Hooded Merganser Mallard	**Studies confirmed:** • Presence of 3 or more nesting pairs for listed species excluding Mallards, or; • Presence of 10 or more nesting pairs for listed species including Mallards. • Any active nesting site of an American Black Duck is considered significant. • Nesting studies should be completed during the spring breeding season (April - June). Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”. • A field study confirming waterfowl nesting habitat will determine the boundary of the waterfowl nesting habitat for the SWH, this may be greater or less than 120 m from the wetland and will provide enough habitat for waterfowl to successfully nest. • **SWHMiST Index #25** provides development effects and mitigation measures.	N/A
Bald Eagle & Osprey Nesting, Foraging & Perching Habitat **<u>Rationale;</u>** Nest sites are fairly uncommon in Eco-region 7E and are used annually by these species. Many suitable nesting locations may be lost due to increasing shoreline	**ELC Forest Community Series:** FOD FOM FOC SWD SWM and SWC (directly adjacent to riparian areas – rivers, lakes, ponds and wetlands.	• Nests are associated with lakes, ponds, rivers or wetlands along forested shorelines, islands, or on structures over water. • Osprey nests are usually at the top a tree whereas Bald Eagle nests are typically in super canopy trees in a notch within the tree’s canopy. • Nests located on man-made objects are not to	No potential • Suitable vegetation communities are absent.	Osprey **Special Concern** Bald Eagle	**Studies confirm the use of these nests by**: • One or more active Osprey or Bald Eagle nests in an area. • Some species have more than one nest in a given area and priority is given to the primary nest with alternate nests included within the area of the SWH. • For an Osprey, the active nest and a 300 m radius around the nest or the contiguous woodland stand is the SWH, maintaining undisturbed shorelines with large trees within this area is important.	N/A

Significant Wildlife Habitat Screening in the Study Area– Ecoregion 7E Criteria (2015)

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
development pressures and scarcity of habitat.		be included as SWH (e.g., telephone poles and constructed nesting platforms).			• For a Bald Eagle the active nest and a 400-800 m radius around the nest is the SWH. Area of the habitat from 400-800 m is dependent on-site lines from the nest to the development and inclusion of perching and foraging habitat. • To be significant a site must be used annually. When found inactive, the site must be known to be inactive for >3 years or suspected of not being used for >5 years before being considered not significant. • Observational studies to determine nest site use, perching sites and foraging areas need to be done from mid-March to mid-August. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects". • **SWHMiST Index #26** provides development effects and mitigation measures.	
Woodland Raptor Nesting Habitat **<u>Rationale:</u>** Nests sites for these species are rarely identified; these area sensitive habitats and are often used annually by these species.	May be found in all forested ELC ecosites. **May also be found in:** SWC SWM SWD and CUP3	• All natural or conifer plantation woodland/forest stands >30 ha with >4ha of interior habitat. Interior habitat determined with a 200 m buffer. • Stick nests found in a variety of intermediate-aged to mature conifer, deciduous or mixed forests within tops or crotches of trees. Species such as Coopers hawk nest along forest edges sometimes on peninsulas or small off-shore islands.	No potential • Suitable vegetation communities are absent.	Northern Goshawk Cooper's Hawk Sharp-shinned Hawk Red-shouldered Hawk Barred Owl Broad-winged Hawk	**Studies confirm:** • Presence of 1 or more active nests from species list is considered significant. • Red-shouldered Hawk and Northern Goshawk – A 400 m radius around the nest or 28 ha area of habitat is the SWH (the 28 ha habitat area would be applied where optimal habitat is irregularly shaped around the nest). • Barred Owl – A 200 m radius around the nest is the SWH. • Broad-winged Hawk and Coopers Hawk– A 100 m radius around the nest is the SWH. • Sharp-Shinned Hawk – A 50 m radius around the nest is the SWH. • Conduct field investigations from early March to end of May. The use of call	N/A

Significant Wildlife Habitat Screening in the Study Area– Ecoregion 7E Criteria (2015)

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
		• In disturbed sites, nests may be used again, or a new nest will be in close proximity to old nest.			broadcasts can help in locating territorial (courting/nesting) raptors and facilitate the discovery of nests by narrowing down the search area. • **SWHMiST Index #27** provides development effects and mitigation measures.	
Turtle Nesting Areas **<u>Rationale;</u>** These habitats are rare and when identified will often be the only breeding site for local populations of turtles.	**Exposed mineral soil (sand or gravel) areas adjacent (<100 m) or within the following ELC ecosites:** MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 BOO1 FEO1	• Best nesting habitat for turtles are close to water and away from roads and sites less prone to loss of eggs by predation from skunks, raccoons or other animals. • For an area to function as a turtle-nesting area, it must provide sand and gravel that turtles are able to dig in and are located in open, sunny areas. Nesting areas on the sides of municipal or provincial road embankments and shoulders are not SWH. • Sand and gravel beaches adjacent to undisturbed shallow weedy areas of marshes, lakes, and rivers are most frequently used.	No potential • Suitable vegetation communities are absent.	Midland Painted Turtle <u>Special Concern Species:</u> Northern Map Turtle Snapping Turtle	**Studies confirm:** • Presence of 5 or more nesting Midland Painted Turtles. • One or more Northern Map Turtle or Snapping Turtle nesting is a SWH. • The area or collection of sites within an area of exposed mineral soils where the turtles nest, plus a radius of 30-100 m around the nesting area dependent on slope, riparian vegetation and adjacent land use is the SWH. • Travel routes from wetland to nesting area are to be considered within the SWH as part of the 30-100 m area of habitat. • Field investigations should be conducted in prime nesting season typically late spring to early summer. Observational studies observing the turtles nesting is a recommended method. • **SWHMiST Index #28** provides development effects and mitigation measures for turtle nesting habitat.	N/A
Seeps and Springs **<u>Rationale</u>:** Seeps/Springs are typical of headwater areas and are often at the source of coldwater streams.	Seeps/Springs are areas where ground water comes to the surface. Often, they are found within headwater areas within forested habitats. Any forested ecosite within the headwater areas of a	• Any forested area (with <25% meadow/field/ pasture) within the headwaters of a stream or river system. • Seeps and springs are important feeding and drinking areas especially in the winter	No potential • Site is not located within a headwater area	Wild Turkey Ruffed Grouse Spruce Grouse White-tailed Deer Salamander spp.	**Field Studies confirm:** • Presence of a site with 2 or more seeps/springs should be considered SWH. • The area of a ELC forest ecosite or an ecoelement within ecosite containing the seeps/springs is the SWH. The protection of the recharge area	Confirmed absent

Significant Wildlife Habitat Screening in the Study Area– Ecoregion 7E Criteria (2015)

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
	stream could have seeps/springs.	will typically support a variety of plant and animal species.			considering the slope, vegetation, height of trees and groundwater condition need to be considered in delineation the habitat. • **SWHMiST Index #30** provides development effects and mitigation measures.	
Amphibian Breeding Habitat (Woodland) **<u>Rationale:</u>** These habitats are extremely important to amphibian biodiversity within a landscape and often represent the only breeding habitat for local amphibian populations.	All ecosites associated with these ELC Community Series: FOC FOM FOD SWC SWM SWD Breeding pools within the woodland or the shortest distance from forest habitat are more significant because they are more likely to be used due to reduced risk to migrating amphibians.	• Presence of a wetland, pond or woodland pool (including vernal pools) >500 m^2 (about 25 m diameter) within or adjacent (within 120 m) to a woodland (no minimum size). Some small wetlands may not be mapped and may be important breeding pools for amphibians. • Woodlands with permanent ponds or those containing water in most years until mid-July are more likely to be used as breeding habitat.	No potential • Suitable vegetation communities are absent.	Eastern Newt Blue-spotted Salamander Spotted Salamander Gray Treefrog Spring Peeper Western Chorus Frog Wood Frog	**Studies confirm:** • Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog species with at least 20 individuals (adults or eggs masses) or 2 or more of the listed frog species with Call Level Codes of 3. • A combination of observational study and call count surveys will be required during the spring (March-June) when amphibians are concentrated around suitable breeding habitat within or near the woodland/wetlands. • The habitat is the wetland area plus a 230 m radius of woodland area. If a wetland area is adjacent to a woodland, a travel corridor connecting the wetland to the woodland is to be included in the habitat. • **SWHMiST Index #14** provides development effects and mitigation measures.	N/A
Amphibian Breeding Habitat (Wetlands) **<u>Rationale;</u>** Wetlands supporting breeding for these amphibian species are extremely important and fairly rare within	**ELC Community Classes:** SW MA FE BO OA and SA.	• Wetlands >500 m2 (about 25 m diameter), supporting high species diversity are significant; some small or ephemeral habitats may not be identified on MNRF mapping and could be important amphibian breeding habitats.	Unlikely • Suitable vegetation communities are absent.	Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue-spotted Salamander Gray Treefrog Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog	**Studies confirm:** • Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog/toad species with at least 20 individuals (adults or eggs masses) or 2 or more of the listed frog/toad species with Call Level Codes of 3 or; Wetland with confirmed breeding Bullfrogs are significant.	Confirmed absent by Beacon (2024)

Significant Wildlife Habitat Screening in the Study Area– Ecoregion 7E Criteria (2015)

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Central Ontario landscapes.	Typically, these wetland ecosites will be isolated (>120m) from woodland ecosites, however larger wetlands containing predominantly aquatic species (e.g., Bull Frog) may be adjacent to woodlands.	• Presence of shrubs and logs increase significance of pond for some amphibian species because of available structure for calling, foraging, escape and concealment from predators. • Bullfrogs require permanent water bodies with abundant emergent vegetation.		Bullfrog	• The ELC ecosite wetland area and the shoreline are the SWH. • A combination of observational study and call count surveys will be required during the spring (March-June) when amphibians are concentrated around suitable breeding habitat within or near the wetlands. • If a SWH is determined for Amphibian Breeding Habitat (Wetlands) then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule. • **SWHMiST Index #15** provides development effects and mitigation measures.	
Woodland Area-Sensitive Bird Breeding Habitat **<u>Rationale</u>:** Large, natural blocks of mature woodland habitat within the settled areas of Southern Ontario are important habitats for area sensitive interior forest song birds.	**All ecosites associated with these ELC Community Series:** FOC FOM FOD SWC SWM SWD	• Habitats where interior forest breeding birds are breeding, typically large mature (>60 yrs. old) forest stands or woodlots >30 ha. • Interior forest habitat is at least 200 m from forest edge habitat.	No potential • Suitable vegetation communities are absent.	Yellow-bellied Sapsucker Red-breasted Nuthatch Veery Blue-headed Vireo Northern Parula Black-throated Green Warbler Blackburnian Warbler Black-throated Blue Warbler Ovenbird Scarlet Tanager Winter Wren Pileated Woodpecker **Special Concern:** Cerulean Warbler Canada Warbler	**Studies confirm:** • Presence of nesting or breeding pairs of 3 or more of the listed wildlife species. • **Note**: any site with breeding Cerulean Warblers or Canada Warblers is to be considered SWH. • Conduct field investigations in spring and early summer when birds are singing and defending their territories. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”. • **SWHMiST Index #34** provides development effects and mitigation measures.	N/A
Table 1.3: Habitat for Species of Conservation Concern considered Significant Wildlife Habitat						
Marsh Breeding Bird Habitat **<u>Rationale;</u>** Wetlands for these bird species are	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6	• Nesting occurs in wetlands. • All wetland habitat is to be considered as long as there is shallow water with emergent	Unlikely • MAS inclusion present but limited in extent	American Bittern Virginia Rail Sora Common Moorhen American Coot Pied-billed Grebe	**Studies confirm:** • Presence of 5 or more nesting pairs of Sedge Wren or Marsh Wren or breeding by any combination of 4 or more of the listed species.	Confirmed absent by Beacon (2024)

Significant Wildlife Habitat Screening in the Study Area– Ecoregion 7E Criteria (2015)

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
typically productive and fairly rare in Southern Ontario landscapes.	SAS1 SAM1 SAF1 FEO1 BOO1 **For Green Heron:** All SW, MA and CUM1 sites	aquatic vegetation present. • For Green Heron, habitat is at the edge of water such as sluggish streams, ponds and marshes sheltered by shrubs and trees. Less frequently, it may be found in upland shrubs or forest a considerable distance from water.		Marsh Wren Sedge Wren Common Loon Green Heron Trumpeter Swan **Special Concern:** Black Tern Yellow Rail	• **Note**: any wetland with breeding of 1 or more Black Terns, Trumpeter Swan, Green Heron or Yellow Rail is SWH. • Area of the ELC ecosite is the SWH. • Breeding surveys should be done in May/June when these species are actively nesting in wetland habitats. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”. • **SWHMiST Index #35** provides development effects and mitigation measures.	
O**p**en **Country Bird Breedin**g Ha**b**itat **<u>Rationale;</u>** This wildlife habitat is declining throughout Ontario and North America. Species such as the Upland Sandpiper have declined significantly the past 40 years based on CWS (2004) trend records.	CUM1 CUM2	• Large grassland areas (includes natural and cultural fields and meadows) >30 ha. • Grasslands not Class 1 or 2 agricultural lands, and not being actively used for farming (i.e., no row cropping or intensive hay or livestock pasturing in the last 5 years). • Grassland sites considered significant should have a history of longevity, either abandoned fields, mature hayfields and pasturelands that are at least 5 years or older. • The Indicator bird species are area sensitive requiring larger grassland areas than the common grassland species.	No potential • CUM1 community not sufficiently large	Upland Sandpiper Grasshopper Sparrow Vesper Sparrow Northern Harrier Savannah Sparrow **Special Concern** Short-eared Owl	**Field Studies confirm:** • Presence of nesting or breeding of 2 or more of the listed species. • A field with 1 or more breeding Short-eared Owls is to be considered SWH. • The area of SWH is the contiguous ELC ecosite field areas. • Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”. • **SWHMiST Index #32** provides development effects and mitigation measures.	N/A
Shrub/Early Successional Bird Breeding Ha**b**itat	CUT1 CUT2 CUS1	• Large field areas succeeding to shrub	No potential • CUT community not sufficiently large	**Indicator Spp:** Brown Thrasher Clay-coloured Sparrow	**Field Studies confirm:**	N/A

Significant Wildlife Habitat Screening in the Study Area– Ecoregion 7E Criteria (2015)

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Rationale; This wildlife habitat is declining throughout Ontario and North America. The Brown Thrasher has declined significantly over the past 40 years based on CWS (2004) trend records.	CUS2 CUW1 CUW2 Patches of shrub ecosites can be complexed into a larger habitat for some bird species.	and thicket habitats >10 ha in size. • Shrub land or early successional fields, not class 1 or 2 agricultural lands, not being actively used for farming (i.e., no row-cropping, haying or live-stock pasturing in the last 5 years). • Shrub thicket habitats (>10 ha) are most likely to support and sustain a diversity of these species. • Shrub and thicket habitat sites considered significant should have a history of longevity, either abandoned fields or pasturelands.		**Common Spp.** Field Sparrow Black-billed Cuckoo Eastern Towhee Willow Flycatcher **Special Concern:** Yellow-breasted Chat Golden-winged Warbler	• Presence of nesting or breeding of 1 of the indicator species and at least 2 of the common species. • A habitat with breeding Yellow-breasted Chat or Golden-winged Warbler is to be considered as SWH. • The area of the SWH is the contiguous ELC ecosite field/thicket area. • Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”. • **SWHMiST cxlix Index #33** provides development effects and mitigation measures.	
Terrestrial Crayfish **Rationale:** Terrestrial Crayfish are only found within SW Ontario in Canada and their habitats are very rare.	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 MAS1 MAS2 MAS3 SWD SWT SWM CUM1 with inclusions of above meadow marsh or swamp ecosites can be used by terrestrial crayfish.	• Wet meadow and edges of shallow marshes (no minimum size) should be surveyed for Terrestrial Crayfish. • Constructs burrows in marshes, mudflats, meadows, the ground can’t be too moist. Can often be found far from water. • Both species are a semi-terrestrial burrower which spends most of its life within burrows consisting of a network of tunnels. Usually the soil is not too moist so that the tunnel is well formed.	Unlikely • MAS1 community is present but limited in extent, likely subject to frequent flooding	Chimney or Digger Crayfish (*Fallicambarus fodiens*) Devil Crayfish or Meadow Crayfish (*Cambarus Diogenes*)	**Studies Confirm:** • Presence of 1 or more individuals of species listed or their chimneys (burrows) in suitable meadow marsh, swamp or moist terrestrial sites. • Area of ELC ecosite or an ecoelement area of meadow marsh or swamp within the larger ecosite area is the SWH. • Surveys should be done April to August in temporary or permanent water. **Note** the presence of burrows or chimneys are often the only indicator of presence, observance or collection of individuals is very difficult. • **SWHMiST Index #36** provides development effects and mitigation measures.	Not observed by Burnside, beacon (2024), and Aquafor Beech (2020)

Significant Wildlife Habitat Screening in the Study Area– Ecoregion 7E Criteria (2015)

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Special Concern and Rare Wildlife Species **<u>Rationale:</u>** These species are quite rare or have experienced significant population declines in Ontario.	All plant and animal Element Occurrences (EO) within a 1 or 10 km grid. Older element occurrences were recorded prior to GPS being available, therefore location information may lack accuracy.	When an element occurrence is identified within a 1 or 10 km grid for a Special Concern or provincially Rare species; linking candidate habitat on the site needs to be completed to ELC ecosites.	Low potential	All Special Concern and Provincially Rare (S1-S3, SH) plant and animal species. Lists of these species are tracked by the NHIC.	**Studies Confirm:** • Assessment/inventory of the site for the identified Special Concern or rare species needs to be completed during the time of year when the species is present or easily identifiable. • The area of the habitat to the finest ELC scale that protects the habitat form and function is the SWH, this must be delineated through detailed field studies. The habitat needs be easily mapped and cover an important life stage component for a species e.g., specific nesting habitat or foraging habitat. • **SWHMiST Index #37** provides development effects and mitigation measures.	Not observed by Burnside, beacon (2024), and Aquafor Beech (2020)
Table 1.4.1: Animal Movement Corridors						
Amphibian Movement Corridors **<u>Rationale;</u>** Movement corridors for amphibians moving from their terrestrial habitat to breeding habitat can be extremely important for local populations.	Corridors may be found in all ecosites associated with water. Corridors will be determined based on identifying the significant breeding habitat for these species in Table 1.1.	• Movement corridors between breeding habitat and summer habitat. • Movement corridors must be determined when Amphibian breeding habitat is confirmed as SWH from Table 1.2.2 (Amphibian Breeding Habitat–Wetland) of this Schedule.	No potential • Amphibian breeding (wetland) confirmed absent	Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue-spotted Salamander Gray Treefrog Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog Bullfrog	• Field Studies must be conducted at the time of year when species are expected to be migrating or entering breeding sites. • Corridors should consist of native vegetation, with several layers of vegetation. • Corridors unbroken by roads, waterways or bodies, and undeveloped areas are most significant. • Corridors should have at least 15 m of vegetation on both sides of waterway or be up to 200 m wide of woodland habitat and with gaps <20 m. • Shorter corridors are more significant than longer corridors, however amphibians must be able to get to and from their summer and breeding habitat. • **SWHMiST Index #40** provides development effects and mitigation measures.	N/A

Significant Wildlife Habitat Screening in the Study Area– Ecoregion 7E Criteria (2015)

Habitat	CANDIDATE - Significant Wildlife Habitat			CONFIRMED - Significant Wildlife Habitat		
	Ecological Land Classification Ecosite Codes	**Habitat Criteria**	**Presence of Candidate Habitat in the Study Area (within 120 m of the Project)**	**Wildlife Species**	**Defining Criteria**	**Presence of Confirmed Significant Wildlife Habitat in the Study Area (within 120 m of the Project)**
Table 1.5.1: Significant Wildlife Habitat Exceptions for Ecodistricts within EcoRegion 7E						
7E-2 - Bat Migratory Stopover Area **Rationale:** Stopover areas for long distance migrant bats are important during fall migration.	No specific ELC types	• Long distance migratory bags typically migrate during late summer and early fall from summer breeding habitats throughout Ontario to southern wintering areas. Their annual fall migration may concentrate these species of bats at stopover areas. • This is the only known bat migratory stopover habitats based on current information.	No potential • Study Area is not located at Long Point	Hoary Bat Eastern Red Bat Silver-haird Bat	• Long Point ($42^0$35'N, 80^0 30'E, to $42^0$33'N, $80^0$03'E) has been identified as a significant stop-over habitat for fall migrating Silver-haired Bats, due to significant increases in abundance, activity and feeding that was documented during fall migration. • The confirmantion criteria and habitat areas for this SWH are still being determined. • **SWH MIST Index #38** provides development effects and mitigation measures.	N/A

Species list in taxonomic order for square 17PJ00

Species #	Common Name	# of Records	Earliest Yr_____	Latest Yr
3	Midland Painted Turtle	12	1973	2018
4	Northern Map Turtle	2	1989	2008
5	Red-eared Slider	1	2000	2000
6	Snapping Turtle	26	1973	2019
10	Dekay's Brownsnake	22	1973	2018
12	Eastern Gartersnake	25	1973	2018
13	Eastern Hog-nosed Snake	2	1973	1973
15	Eastern Milksnake	17	1973	2017
19	Northern Ring-necked Snake	1	1973	1973
20	Northern Watersnake	5	1972	2016
22	Red-bellied Snake	4	1986	2013
25	American Bullfrog	5	1993	2016
28	Gray Treefrog	68	1973	2016
29	Green Frog	53	1973	2018
31	Northern Leopard Frog	25	1943	2005
32	Pickerel Frog	1	1993	1993
33	Spring Peeper	107	1973	2012
35	Wood Frog	27	1992	2016
36	American Toad	73	1969	2018
44	Eastern Red-backed Salamander	29	1973	2019
46	Jefferson Salamander	1	1989	1989
48	Mudpuppy	1	1984	1984
51	Red-spotted Newt	5	1973	2018
53	Spotted Salamander	5	1926	1989

Study Area

Ecological Land Classification

Ecological Land Classification (Inclusion)

ELC Descriptions

CUM1: Mineral Cultural Meadow
CUT1: Mineral Cultural Thicket Ecosite
CUW1b: Mineral Cultural Woodland
CUWa: Cultural Woodland
MAS2-1: Cattail Mineral Shallow Marsh Type

Sources:

1. Ministry of Natural Resources and Forestry,© King's Printer for Ontario.
2. Natural Resources Canada,© His Majesty the King in Right of Canada.

Disclaimer:

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This map is the product of a Geographic Information System (GIS). As such, the data represented on this map may be subject to updates and future reproductions may not be identical.

Datum: North American 1983	
Coord. System: NAD 1983 UTM Zone 17N	
Projection: Transverse Mercator	
Central Meridian: 81°0'0.00"W	
False Easting: 500,000m	False Northing: 0m
Page Orientation: -63.43°	Scale Factor: 0.99960

Grid North

0 25 50 75 100
Metres

BURNSIDE

Client

BRANTHAVEN DEVELOPMENT CORPORATION

Figure Title

APPLEBY CREEK FLOOD MITIGATION MCEA

ECOLOGICAL LAND CLASSIFICATION

Drawn	Checked	Date	Figure No.
HN	SY	2024/04/24	2
Scale		Project No.	
H 1:1,750		300057084	

File Path: \\oscar\shared work areas\057084.50 - Oval Court Lands Bridge\14_GIS\057084 Oval Court Lands EA\057084 Oval Court Lands EA.aprx Print Date: 2024/04/24 Time: 08:51 AM

Watercourse - Thermal Regime: Warm (Beacon 2020)

Aquatic Habitat Assessment Reaches (Defined and Assessed by Beacon, 2024)

Study Area

Sources:

1. Ministry of Natural Resources and Forestry,© King's Printer for Ontario.
2. Natural Resources Canada,© His Majesty the King in Right of Canada.

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This map is the product of a Geographic Information System (GIS). As such, the data represented on this map may be subject to updates and future reproductions may not be identical.

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Coord. System: NAD 1983 UTM Zone 17N	
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Page Orientation: -63.43°	Scale Factor: 0.99960

Grid North

0 25 50 75 100

Metres

BURNSIDE

Client

BRANTHAVEN DEVELOPMENT CORPORATION

Figure Title

APPLEBY CREEK FLOOD MITIGATION MCEA

AQUATICS

Drawn	Checked	Date	Figure No.
HN	SY	2024/04/24	3
Scale		Project No.	
H 1:1,750		300057084	

File Path: \\oscar\shared work areas\057084.50 - Oval Court Lands Bridge\14_GIS\057084 Oval Court Lands EA\057084 Oval Court Lands EA.aprx Print Date: 2024/04/24 Time: 08:53 AM

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix E

Consultation

Agency/ Organization	Title	First Name	Last Name	Position	Address 1	Address 2	City	Prov.	Postal Code	Email	Telephone	Comments Received	Response Given
Federal													
Environment Canada	Mr.	Rob	Dobos	Manager, Environmental Assessment Section	867 Lakeshore Road	P.O. Box 5050	Burlington	ON	L7R 4A6	rob.dobos@ec.gc.ca	905-336-8901		
Environment Canada	Ms.	Sheila	Allen	Senior EA Officer	867 Lakeshore Road	P.O. Box 5050	Burlington	ON	L7R 4A6	sheila.allen@ec.gc.ca	905-336-8901		
Transport Canada		Linda	Beaulieu		100 Front Street		Sarnia	ON	N7T 2M4	linda.beaulieu@tc.gc.ca	416-952-0470	240607_Email. Resonse to Notice of Addendum and POH: Please note Transport Canada does not require receipt of all Individual or Class EA related notifications. We request that project proponents self-assess if their project meets criteria.	240607_Email_Notice of Addendum & POH sent
Fisheries and Oceans Canada	Ms.	Cindy	Latendresse	Administrative Assistant	3027 Harvester Road	District Office Unit 304	Burlington	ON	L7R 4K3	cindy.latendresse@foc.gc.ca	905-639-0188		240607_Email_Notice of Addendum & POH sent
Provincial													
Ministry of Environment	Ms.	Dorothy	Moszynski	Project Evaluator	5575 Yonge Street	8th Floor	North York	ON	M2M 4J1	dorothy.moszynski@ontario.ca	416-325-6345		240607_Email_Notice of Addendum & POH sent
Ministry of Environment	Mr.	Daniel	Delaquis	Supervisor, Project Coordinator	5575 Yonge Street	8th Floor	North York	ON	M2M 4J1	dan.delaquis@ontario.ca			240607_Email_Notice of Addendum & POH sent
Ministry of Natural Resources	Mr.	Steven	Strong	Aurora District Planner	50 Bloomington Road West		Aurora	ON	L4G 3G8	steven.strong@ontario.ca	905-713-7360		240607_Email_Notice of Addendum & POH sent
Ministry of Transportation		Rina	Kulathinal	Head, Transportation Highway Engineering	1201 Wilson Avenue	2nd Floor Building D	Downsview	ON	M3M 1J8	rina.kulathinal@ontario.ca			240607_Email_Notice of Addendum & POH sent
Ministry of Transportation	Mr.	John	Van Voorst		1201 Wilson Avenue	5th Floow Atrium Tower	Downsview	ON	M3M 1J8	john.vanvoorst@ontario.ca			240607_Email_Notice of Addendum & POH sent
Ministry of Tourism and Culture	Ms.	Paula	Kupla	A/Heritage Planner, Central West, Culture Services Unit, Programs & Services Branch	400 University 4th Floor		Toronto	ON	M7A 2R9	paula.kulpa@ontario.ca	416-212-1802		240607_Email_Notice of Addendum & POH sent
Ministry of the Environment, Conservation and Parks										eanotification.cregion@ontario.ca		240607_Email. MECP confirmed receipt of Notice of Addendum and POH and has filed the notice for records.	240607_Email_Notice of Addendum & POH sent
Ministry of the Environment, Conservation and Parks - Environmental Assessment and Permissions Branch										MEA.NOTICES.EAAB@ontario.ca			240607_Email_Notice of Addendum & POH sent
Ministry of Citizenship and Multiculturalism (MCM).	Ms.	Karla	Barboza	Team Lead-Heritage (A)	401 Bay Street	Suite 1700	Toronto	ON	M7A 0A7	karla.barboza@ontario.ca	416-314-7120		240607_Email_Notice of Addendum & POH sent
Ministry of Citizenship and Multiculturalism (MCM).		Dan	Minkin	Heritage Planner						Dan.Minkin@ontario.ca;			240607_Email_Notice of Addendum & POH sent
Metrolinx		Jason	Ryan		20 Bay Street	Suite 600	Toronto	ON	M5J 2W3	Jason.Ryan@gotransit.com	416-869-3600 ext. 5478		240607_Email_Notice of Addendum & POH sent

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Grey Highlight = Removed from contact list

Agency/ Organization	Title	First Name	Last Name	Position	Address 1	Address 2	City	Prov.	Postal Code	Email	Telephone	Comments Received	Response Given
Hydro One Networks Inc.	Ms.	Susan	SUN Hongxia							Susan.SUN@HydroOne.com secondarylanduse@hydroone.com		240626_Email. Hydro One responded to Notice of Addendum and POH: Confirmed Hydro One has existing high voltage transmission facilities in the study area. Hydro One does not have sufficient information to comment on potential resulting impacts the project may have on Hydro One's infrastructure. Requested to be informed as much as possible as more information becomes available. Response does not constitute as approval for plans Hydro One must continued to be consulted on the project. The transmission corridor may have provisions for future line or already contain secondary land uses, request consider in planning. Should Appleby Creek Flood Mitigation result in a Hydro One station expansion or transmission line replacement and/or relocation, an Environmental Assessment (EA) will be required as described under the Class Environmental Assessment for Minor Transmission Facilities (Hydro One, 2016). The EA process would require min 6 months for a Class EA Screening Process (or up to 18 months if Full Class EA were required). Associated costs will be allocated and recovered from proponents in accordance with Transmission System Code. If triggered, Hydro One will rely on studies completed as part of the EA that is currently being undertaken. Please formally confirm that Hydro One infrastructure and associated rights-of-way will be completely avoided, or if not possible, allocate appropriate lead-time in your project schedule to collaboratively work through potential conflicts with Hydro One. Note developments should not reduce line clearances or limit access to Hydro One infrastructure at any time. Any construction activities must maintain the electrical clearance from transmission line conductors as specified in the Ontario Health and Safety Act for the respective line voltage. Be advised any changes to lot grading or drainage within, or in proximity to Hydro One transmission corridor lands must be controlled and directed away from the transmission corridor. Note the proponent will be held responsible for all costs associated with modifications or relocations of Hydro One infrastructure that result from the project and any added costs that may be incurred due to increased efforts to maintain said infrastructure. Please ensure all future communications about this and future project(s) are sent to us electronically to secondarylanduse@hydroone.com	
Municipal													
Municipality of Halton				Regional Clerk	111 Bronte Road		Oakville	ON	L6M 3L1	regionalclerk@halton.ca	905-825-6000		240607_Email_Notice of Addendum & POH sent
Municipality of Halton		Richard	Clark	Senior Planner			Oakville	ON	L6M 3L1	richard.clark@halton.ca	905-825-6000 x7214		240607_Email_Notice of Addendum & POH sent
Municipality of Halton		Ron	Reinholt	Regional Forester			Oakville	ON	L6M 3L1	ron.reinholt@halton.ca	905-825-6000		240607_Email_Notice of Addendum & POH sent
Regional Municipality of Halton		Natalie	Spina	Public Works, Infrastructure Planning Policy Planner, Groundwater & Hydrology						Natalie.Spina@halton.ca	905-825-6000 x 3241		240607_Email_Notice of Addendum & POH sent
Regional Municipality of Halton		Heather	Ireland	Public Works, Infrastructure Planning Policy, Senior Planner - Natural Environment						Heather.Ireland@halton.ca	905-825-6000 x 7214		240607_Email_Notice of Addendum & POH sent
Regional Municipality of Halton		Shelley	Partridge	Public Works, Development Services, Senior Planner						Shelley.Partridge@halton.ca	905-825-6000 x 7180		240607_Email_Notice of Addendum & POH sent
Regional Municipality of Halton		Nicole	Pettenuzzo	Public Works, Development Services, Senior Planner						Nicole.Pettenuzzo@halton.ca	905-825-6000 x 7923		240607_Email_Notice of Addendum & POH sent
Utilities													
Bell Canada		Richard	de Bokx		5115 Creekbank Road, 3rd Floor, West Tower Mississauga ON L4W 5R1					richard.de_bokx@bell.ca	905-219-4558		240607_Email_Notice of Addendum & POH sent
Bell Canada, Municipal Operations Centre	Mr.	John	Lachapelle	Planner & Manager, ROW Control Centre	100 Borough Drive	Floor 5 Blue	Scarborough	ON	M1P 4WZ	rowcentre@bell.ca			240607_Email_Notice of Addendum & POH sent
Rogers Communications				Planning Coordinator	3573 Wolfedale Road		Mississauga	ON	L5C 3T6		905-897-3914; 888-764-3771		240607_Mail_Notice of Addendum & POH sent via hard copy mail
Enbridge Pipelines Inc.										notifications@enbridge.com;			240607_Email_Notice of Addendum & POH sent
Enbridge Pipelines Inc.										mark-ups@enbridge.com			240607_Email_Notice of Addendum & POH sent
MHBC Planning, Urban Design & Landscape Architecture										TCEnergy@mhbcplan.com			240607_Email_Notice of Addendum & POH sent
Trans-Northern Pipelines Inc.					45 Vogell Road	Suite 310	Richmond Hill	ON	L4B 3P6	crossingrequesteast@tnpi.ca			240607_Email_Notice of Addendum & POH sent
Trans-Northern Pipelines Inc.					45 Vogell Road	Suite 310	Richmond Hill	ON	L4B 3P6	markupanddrawingrequests@tnpi.ca			240607_Email_Notice of Addendum & POH sent
Zayo										Utility.Circulations@zayo.com	416-649-7527	240607_Email. Notcie of Addendum and POH response: confirmed receipt, a response will be provided within 15 business days.	240607_Email_Notice of Addendum & POH sent
Other													
Conservation Halton		Heather	Dearlove	Environmental Planner	2596 Britannia Road West		Burlington	ON	L7P 0G3	hdearlove@hrca.on.ca	905-336-1158 x2231		240607_Email_Notice of Addendum & POH sent
Conservation Halton			Planner	2596 Britannia Road West			Burlington	ON	L7P 0G3	admin@hrca.on.ca envserv@hrc.on.ca	905-336-1158		240607_Email_Notice of Addendum & POH sent
Conservation Halton		Emma	DeFields	2596 Britannia Road West			Burlington	ON	L7P 0G3	edefields@hrca.on.ca	905-336-1158		240607_Email_Notice of Addendum & POH sent
Conservation Halton		Colleen	Bain	2596 Britannia Road West			Burlington	ON	L7P 0G3	cbain@hrca.on.ca	905-336-1158	240607_Email. Response to Notice of Addendum and POH: contact is not longer with conservation Halton. Please direct general inquiries to enserv@hrca.on.ca	240607_Email_Notice of Addendum & POH sent
CN Rail				General Contact						proximity@cn.ca	905-669-3264	240607_Email. Response to Notice of Addendum and POH: Thanked for email. Due to higher than usual volumes, there may be delays in CN;s response time.	240607_Email_Notice of Addendum & POH sent
Halton Region Paramedic Services		Greg	Sage	Chief/ Director of Paramedic Services	1179 Bronte Rd		Oakville	ON	L6M 4G3	accesshalton@halton.ca	905-825-6000		240607_Email_Notice of Addendum & POH sent
Burlington Fire Services		Karen	Roche	Chief	426 Brant Street	P.O. Box 5013	Burlington	ON	L7R 3Z6	https://www.burlington.ca//Modules/email/emailattachment.aspx?CV2=PlUsqwqaKrTHHSeCrzzdsm4MweQuAleQuAl&ref=https://www.burlington.ca/en/fire-and-emergency-services/fire-department.aspx&lang=en			240607_Email_Notice of Addendum & POH sent
Halton Regional Police Service		Steven	Tanner	Chief	3800 Constable Henshaw Blvd.		Burlington	ON	L7M 4M8	stephen.tanner@haltonpolice.ca			240607_Email_Notice of Addendum & POH sent

Blue Highlight = Email only
Grey Highlight = Removed from contact list

Agency/ Organization	Title	First Name	Last Name	Position	Address 1	Address 2	City	Prov.	Postal Code	Email	Telephone	Comments Received	Response Given
Halton District School Board				Planning Department / General Contact	Box 5005 2050 Guelph Line		Burlington	ON	L7R 3Z2	plan@hdsb.ca ~~contact@hdsb.ca~~		240607_Email. Response to Notice of Addendum and POH request to keep plan@hdsb.ca on contact list but remove contact@hdsb.ca	240607_Email_Notice of Addendum & POH sent
Halton Catholic District School Board		Ryan	Merrick	Superintendent Facility Management Services						facilities@hcdsb.org			240607_Email_Notice of Addendum & POH sent
Conseil Scolaire Viamonde		Miguel	Ladouceur	Executive Director, Capital Maintenance and Planning	116 Cornelius Parkway		Toronto	ON	M6L 2K5	ladouceurm@csviamonde.ca planification@csviamonde.ca			240607_Email_Notice of Addendum & POH sent
Burlington Hydro										https://www.burlington.ca//Modules/email/emailattachment.aspx?CV2=qsjv4jPlUsPlUsNQmfomaMTttA6geQuAleQuAl&ref=https://www.burlington.ca/Modules/contact/search.aspx?s=qu31Zi5lA5HPyBC2mbBnNbjz0AeQuAleQuAl&lang=en			240607_Email_Notice of Addendum & POH sent
Burlington Resident Association				General Contact						BurlingtonResidentAssociation@gmail.com	612-979-5159		240607_Email_Notice of Addendum & POH sent
Burlington Lakeshore Residents Association				General Contact						lakeshoreresidents@outlook.com			240607_Email_Notice of Addendum & POH sent

Blue Highlight = Email only
Grey Highlight = Removed from contact list

Agency/Organization	Title	First Name	Last Name	Position	Address 1	Address 2	City	Prov.	Postal Code	Email	Telephone	Comments Received	Response Given
Ontario Secritariat for Aboriginal Affairs		Gill	Surinder Singh	Policy Advisor - Policy	720 Bay Street	4th Floor	Toronto	ON	M5G 2K1	surinder.singh.gill@osaa.gov.on.ca	416-314-6781		240607_Email_Notice of Addendum & POH sent
Lands and ART Lands and Trust Services, Indian and Northern Affairs Canada	Ms.	Cheyenne	Loon	Senior Enironmental O	25 St. Claire Ave. Eas	8th Floor	Toronto	ON	M4T 1M2	cheyenne.loon@aandc-aadnc.gc.ca	416-973-6625		240607_Email_Notice of Addendum & POH sent
Hamilton Executive Directors' Aboriginal Coalition (HEDAC) De dwa da dehs nye>s Aboriginal Health Centre		Cathy (Marilyn	Staats (Wright)	Co-chair	712 Main Street East		Hamilton	ON	L8M 1K6	dedwada@cogeco.net	905-548-9593 (905-544-4320 X228)		240607_Email_Notice of Addendum & POH sent
Six Nations Lands and Resources	Ms.	Jo-Ann E.C.	Greene	Director	2498 Chiefswood Roa	P.O. Box	Oshweken	ON	N0A 1M0		519-753-0665		240607_Mail_Notice of Addendum & POH sent via hard copy mail
The Chiefs of Ontario	Ms.	Margaret	Carpenter	Environmental Coordin	111 Peter Street	Suite 804	Tronoto	ON	M5V 2H1	margaret1@coo.org	416-597-1266		240607_Email_Notice of Addendum & POH sent
The Métis Nation of Ontario	Ms.	Jane	Brennan	Administrator	500 Old St. Patric St.	Unit D	Ottawa	ON	K1N 9G4	janeb@metisnation.org	613-798-1488		240607_Email_Notice of Addendum & POH sent
The Métis Nation of Ontario	Ms.	Melanie	Paradis	Director	75 Sherborne Street	Suite 311	Toronto	ON	M5A 2P9	melaniep@metisnation.org	416-977-9881 X114		240607_Email_Notice of Addendum & POH sent
Ontario Federation of Indian Friendship	Ms.	Sylvia	Maracle		219 Front Street		Toronto	ON	M5A 1E8	maracle@ofifc.org	416-956-7575 X306		240607_Email_Notice of Addendum & POH sent
Ministry of Aboriginal Affairs	Ms.	Lorena	Weesit	Correspondence Coord	160 Bloor Street East	4th Floor	Toronto	ON	M7A 2E6				240607_Mail_Notice of Addendum & POH sent via hard copy mail
Ministry of Aboriginal Affairs	Mr.	David	Pickles	Team Lead for Eas	160 Bloor Street East	9th Floor	Toronto	ON	M7A 2E6	david.pickles@ontario.ca	416-326-4757		
Assessment and Historical Research Indian and Northern Affairs Canada	Mr.	Sean	Darcy	Manager	10 Wellington St.		Gatineau	QC	K1A 0H4		819-997-8155		240607_Mail_Notice of Addendum & POH sent via hard copy mail
Department of Indian and Northern Affairs										CAU-UCA@aadnc-aandc.gc.ca			240607_Email_Notice of Addendum & POH sent
Six Nations of the Grand River		Peter	Graham	Consultation Supervisor						LRCS@sixnations.ca; cc dlaforme@sixnations.ca; lonnybomberry@sixnations.ca;	519-753-0665 x 5425		240607_Email_Notice of Addendum & POH sent
Six Nations of the Grand River		Lonny	Bomberry	Lands and Resources Director,						cc lonnybomberry@sixnations.ca			240607_Email_Notice of Addendum & POH sent
Six Nations of the Grand River	Ms.	Dawn	LaForme		2498 Chiefwood Road	P.O. Box 5000	Ohsweken	ON	N0A 1M0	cc dlaforme@sixnations.ca	519-445-2201		240607_Email_Notice of Addendum & POH sent
Métis Nation of Ontario		Jesse	Fieldwebster	Manager of Lands, Resources and Consultations	255 Cranston Crescer	P.O. Box 4	Midland	ON	L4R 4K6	consultations@metisnation.org	(705)-529-6000		240607_Email_Notice of Addendum & POH sent
Mississaugas of the Credit First Nation	Chief	Claire	Sault	Chief	2789 Mississauga Road, RR #6		Hagersville	ON	N0A 1H0	claires@mncfn.ca	905-768-1133		240607_Email_Notice of Addendum & POH sent
Mississaugas of the Credit First Nation										MCFN.Consultation@mncfn.ca; DOCA.Admin@mncfn.ca		240607_Email. MCFN Department of Consultation and Accommodation has begun phasing out the previous administration email. Emails and items received at DOCA.Admin@mncfn.ca are continuing to be monitored as they are received and redirected.	240607_Email_Notice of Addendum & POH sent
Mississaugas of the Credit First Nation		Abby	LaForme	Consultation Manager	4065 Hwy 6		Hagersville	ON	N0A 1H0	abby.laforme@mncfn.ca	(905) 768 – 4260		240607_Email_Notice of Addendum & POH sent
Mississaugas of the Credit First Nation		Mark	LaForme	Director	4065 Hwy 6		Hagersville	ON	N0A 1H0	mark.laforme@mncfn.ca;			240607_Email_Notice of Addendum & POH sent

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Grey Highlight = Removed from contact list

Agency/Organization	City	Prov.	Comments Received	Response Given
Resident 1	Burlington	ON		240607_Email_Notice of Addendum & POH sent
Resident 2	Burlington	ON		240607_Email_Notice of Addendum & POH sent
Resident 3	Burlington	ON		240607_Email_Notice of Addendum & POH sent
Resident 4	Burlington	ON		240607_Email_Notice of Addendum & POH sent
Resident 5	Burlington	ON		240607_Email_Notice of Addendum & POH sent
Resident 6	Burlington	ON		240607_Email_Notice of Addendum & POH sent
Resident 7	Burlington	ON		240607_Email_Notice of Addendum & POH sent
Resident 8	Burlington	ON		240607_Email_Notice of Addendum & POH sent
Resident 9	Burlington	ON		240607_Email_Notice of Addendum & POH sent
Resident 10	Burlington	ON		240607_Email_Notice of Addendum & POH sent
Resident 11	Burlington	ON		240607_Email_Notice of Addendum & POH sent
Resident 12	Burlington	ON		240607_Email_Notice of Addendum & POH sent
Resident 13	Burlington	ON		240607_Email_Notice of Addendum & POH sent
Resident 14	Burlington	ON		240607_Email_Notice of Addendum & POH sent
Resident 15	Burlington	ON		240607_Email_Notice of Addendum & POH sent

Blue Highlight = Email only
Grey Highlight = Removed from contact list

Crystal Ferguson

From: Crystal Ferguson
Sent: Friday, June 07, 2024 8:54 AM
To: 'linda.beaulieu@tc.gc.ca'; 'cindy.latendresse@foc.gc.ca'; 'dorothy.moszynski@ontario.ca'; 'dan.delaquis@ontario.ca'; 'steven.strong@ontario.ca'; 'rina.kulathinal@ontario.ca'; 'john.vanvoorst@ontario.ca'; 'paula.kulpa@ontario.ca'; 'eanotification.cregion@ontario.ca'; 'MEA.NOTICES.EAAB@ontario.ca'; 'karla.barboza@ontario.ca'; 'Dan.Minkin@ontatio.ca'; 'Jason.Ryan@gotransit.com'; 'regionalclerk@halton.ca'; 'richard.clark@halton.ca'; 'ron.reinholt@halton.ca'; 'Natalie.Spina@halton.ca'; 'Heather.Ireland@halton.ca'; 'Shelley.Partridge@halton.ca'; 'Nicole.Pettenuzzo@halton.ca'; 'richard.de_bokx@bell.ca'; 'rowcentre@bell.ca'; 'notifications@enbridge.com'; 'mark-ups@enbridge.com'; 'TCEnergy@mhbcplan.com'; 'crossingrequesteast@tnpi.ca'; 'markupanddrawingrequests@tnpi.ca'; 'Utility.Circulations@zayo.com'; 'hdearlove@hrca.on.ca'; 'admin@hrca.on.ca'; 'envserv@hrc.on.ca'; 'edefields@hrca.on.ca'; 'cbain@hrca.on.ca'; 'proximity@cn.ca'; 'accesshalton@halton.ca'; 'stephen.tanner@haltonpolice.ca'; 'plan@hdsb.ca'; 'contact@hdsb.ca'; 'facilities@hcdsb.org'; 'ladouceurm@csviamonde.ca'; 'planification@csviamonde.ca'; 'BurlingtonResidentAssociation@gmail.com'; 'lakeshoreresidents@outlook.com'
Cc: Philip Rowe; 057084 Oval Court Lands - Municipal EA Addendum
Subject: Notice of Addendum and Public Open House, Appleby Creek Flood Mitigation Municipal Class Environmental Assessment
Attachments: Notice of Addendum Appleby Creek PIC.pdf

Hello,

On behalf of the City of Burlington, please see the attached Notice of Addendum and Public Open House for the Appleby Creek Flood Mitigation Municipal Class Environmental Assessment (MCEA) study. Since the original study was completed in 2019, changes in land use and proposed developments near the Fairview Street crossing have necessitated a review.

A Public Open House is planned to provide information about the project and gather comments from the public.

A study area map is provided on the attached notice. Information about this study can be found at: burlington.ca/applebyflood

Public Open House

Date: Monday, June 17, 2024

Time: Drop-in 6:00p.m. – 8:00 p.m.

Location: Appleby Ice Centre – Community Room No. 1

1201 Appleby Line, Burlington, ON L7L 5H9

If you have any questions or comments, please contact one of the Project Team members below:

Arif Shahzad, M.Eng., P.Eng.

Senior Project Manager

City of Burlington

426 Brant Street, P.O. Box 5013

Burlington ON L7R 3Z6

Phone: 905-335-7600 ext. 7486

Email: Arif.Shahzad@burlington.ca

Philip A. Rowe, C.E.T., EP.

Consultant Project Manager

R.J. Burnside & Associates Limited

1266 South Service Road, Suite C2

Stoney Creek ON L8E 5R9

Phone: 905-821-5915

Email: Philip.Rowe@rjburnside.com

On behalf of the study team,

From: Crystal Ferguson
Sent: Friday, June 07, 2024 2:28 AM
To: 057084 Oval Court Lands - Municipal EA Addendum <057084OvalCourtLands-MunicipalEAAddendum@rjburnside.com>
Cc: Philip Rowe <Philip.Rowe@rjburnside.com>
[redacted]
Subject: Notice of Addendum and Public Open House, Appleby Creek Flood Mitigation Municipal Class Environmental Assessment

Hello,

On behalf of the City of Burlington, please see the attached Notice of Addendum and Public Open House for the Appleby Creek Flood Mitigation Municipal Class Environmental Assessment (MCEA) study. Since the original study was completed in 2019, changes in land use and proposed developments near the Fairview Street crossing have necessitated a review. Based on your expressed interest in the previous study this Notice is being circulated to keep you informed of updates to the project.

A Public Open House is planned to provide information about the project and gather comments from the public.

A study area map is provided on the attached notice. Information about this study can be found at: burlington.ca/applebyflood

Public Open House

Date: Monday, June 17, 2024

Time: Drop-in 6:00p.m. – 8:00 p.m.

Location: Appleby Ice Centre – Community Room No. 1

1201 Appleby Line, Burlington, ON L7L 5H9

If you have any questions or comments, please contact one of the Project Team members below:

Arif Shahzad, M.Eng., P.Eng.

Senior Project Manager

City of Burlington

426 Brant Street, P.O. Box 5013

Burlington ON L7R 3Z6

Phone: 905-335-7600 ext. 7486

Email: Arif.Shahzad@burlington.ca

Philip A. Rowe, C.E.T., EP.

Consultant Project Manager

R.J. Burnside & Associates Limited

1266 South Service Road, Suite C2

Stoney Creek ON L8E 5R9

Phone: 905-821-5915

Email: Philip.Rowe@rjburnside.com

On behalf of the study team,

Crystal Ferguson

From:	Crystal Ferguson
Sent:	Friday, June 07, 2024 2:27 AM
To:	margaret1@coo.org
Cc:	Philip Rowe; 057084 Oval Court Lands - Municipal EA Addendum
Subject:	Notice of Addendum and Public Open House, Appleby Creek Flood Mitigation Municipal Class Environmental Assessment
Attachments:	Notice of Addendum Appleby Creek PIC.pdf

Hello Margaret Carpenter, Chiefs of Ontario,

On behalf of the City of Burlington, please see the attached Notice of Addendum and Public Open House for the Appleby Creek Flood Mitigation Municipal Class Environmental Assessment (MCEA) study. Since the original study was completed in 2019, changes in land use and proposed developments near the Fairview Street crossing have necessitated a review.

A Public Open House is planned to provide information about the project and gather comments from the public. A study area map is provided on the attached notice. Information about this study can be found at: burlington.ca/applebyflood

Public Open House

Date: Monday, June 17, 2024
Time: Drop-in 6:00p.m. – 8:00 p.m.
Location: Appleby Ice Centre – Community Room No. 1
1201 Appleby Line, Burlington, ON L7L 5H9

If you have any questions or comments, please contact one of the Project Team members below:

Arif Shahzad, M.Eng., P.Eng.
Senior Project Manager
City of Burlington
426 Brant Street, P.O. Box 5013
Burlington ON L7R 3Z6
Phone: 905-335-7600 ext. 7486
Email: Arif.Shahzad@burlington.ca

Philip A. Rowe, C.E.T., EP.
Consultant Project Manager
R.J. Burnside & Associates Limited
1266 South Service Road, Suite C2
Stoney Creek ON L8E 5R9
Phone: 905-821-5915
Email: Philip.Rowe@rjburnside.com

On behalf of the study team,

Crystal Ferguson

From: Crystal Ferguson
Sent: Friday, June 07, 2024 8:06 AM
To: CAU-UCA@aadnc-aandc.gc.ca
Cc: Philip Rowe; 057084 Oval Court Lands - Municipal EA Addendum
Subject: Notice of Addendum and Public Open House, Appleby Creek Flood Mitigation Municipal Class Environmental Assessment
Attachments: Notice of Addendum Appleby Creek PIC.pdf

Hello Department of Indian and Northern Affairs,

On behalf of the City of Burlington, please see the attached Notice of Addendum and Public Open House for the Appleby Creek Flood Mitigation Municipal Class Environmental Assessment (MCEA) study. Since the original study was completed in 2019, changes in land use and proposed developments near the Fairview Street crossing have necessitated a review.

A Public Open House is planned to provide information about the project and gather comments from the public. A study area map is provided on the attached notice. Information about this study can be found at: burlington.ca/applebyflood

Public Open House
Date: Monday, June 17, 2024
Time: Drop-in 6:00p.m. – 8:00 p.m.
Location: Appleby Ice Centre – Community Room No. 1
1201 Appleby Line, Burlington, ON L7L 5H9

If you have any questions or comments, please contact one of the Project Team members below:

Arif Shahzad, M.Eng., P.Eng.
Senior Project Manager
City of Burlington
426 Brant Street, P.O. Box 5013
Burlington ON L7R 3Z6
Phone: 905-335-7600 ext. 7486
Email: Arif.Shahzad@burlington.ca

Philip A. Rowe, C.E.T., EP.
Consultant Project Manager
R.J. Burnside & Associates Limited
1266 South Service Road, Suite C2
Stoney Creek ON L8E 5R9
Phone: 905-821-5915
Email: Philip.Rowe@rjburnside.com

On behalf of the study team,

Crystal Ferguson

From: Crystal Ferguson
Sent: Friday, June 07, 2024 8:16 AM
To: 'cheyenne.loon@aandc-aadnc.gc.ca'
Cc: Philip Rowe; 057084 Oval Court Lands - Municipal EA Addendum
Subject: Notice of Addendum and Public Open House, Appleby Creek Flood Mitigation Municipal Class Environmental Assessment
Attachments: Notice of Addendum Appleby Creek PIC.pdf

Hello Cheyenne Loon, Lands and ART Lands and Trust Services, Indian and Northern Affairs Canada,

On behalf of the City of Burlington, please see the attached Notice of Addendum and Public Open House for the Appleby Creek Flood Mitigation Municipal Class Environmental Assessment (MCEA) study. Since the original study was completed in 2019, changes in land use and proposed developments near the Fairview Street crossing have necessitated a review.

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Public Open House

Date: Monday, June 17, 2024

Time: Drop-in 6:00p.m. – 8:00 p.m.

Location: Appleby Ice Centre – Community Room No. 1

1201 Appleby Line, Burlington, ON L7L 5H9

If you have any questions or comments, please contact one of the Project Team members below:

Arif Shahzad, M.Eng., P.Eng.
Senior Project Manager

Philip A. Rowe, C.E.T., EP.
Consultant Project Manager

City of Burlington

426 Brant Street, P.O. Box 5013

Burlington ON L7R 3Z6

Phone: 905-335-7600 ext. 7486

Email: Arif.Shahzad@burlington.ca

R.J. Burnside & Associates Limited

1266 South Service Road, Suite C2

Stoney Creek ON L8E 5R9

Phone: 905-821-5915

Email: Philip.Rowe@rjburnside.com

On behalf of the study team,

Crystal Ferguson

From: Crystal Ferguson
Sent: Friday, June 07, 2024 8:16 AM
To: claires@mncfn.ca; MCFN.Consultation@mncfn.ca; DOCA.Admin@mncfn.ca; abby.laforme@mncfn.ca; mark.laforme@mncfn.ca
Cc: Philip Rowe; 057084 Oval Court Lands - Municipal EA Addendum
Subject: Notice of Addendum and Public Open House, Appleby Creek Flood Mitigation Municipal Class Environmental Assessment
Attachments: Notice of Addendum Appleby Creek PIC.pdf

Hello Chief Claire Sault,

Mark LaForme, Director,

Abby LaForme, Consultation Manager, Mississaugas of the Credit First Nation,

On behalf of the City of Burlington, please see the attached Notice of Addendum and Public Open House for the Appleby Creek Flood Mitigation Municipal Class Environmental Assessment (MCEA) study. Since the original study was completed in 2019, changes in land use and proposed developments near the Fairview Street crossing have necessitated a review.

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1201 Appleby Line, Burlington, ON L7L 5H9

If you have any questions or comments, please contact one of the Project Team members below:

Arif Shahzad, M.Eng., P.Eng.

Senior Project Manager

City of Burlington

426 Brant Street, P.O. Box 5013

Burlington ON L7R 3Z6

Phone: 905-335-7600 ext. 7486

Email: Arif.Shahzad@burlington.ca

Philip A. Rowe, C.E.T., EP.

Consultant Project Manager

R.J. Burnside & Associates Limited

1266 South Service Road, Suite C2

Stoney Creek ON L8E 5R9

Phone: 905-821-5915

Email: Philip.Rowe@rjburnside.com

On behalf of the study team,

Crystal Ferguson

From: Crystal Ferguson
Sent: Friday, June 07, 2024 2:27 AM
To: consultations@metisnation.org; janeb@metisnation.org; melaniep@metisnation.org
Cc: Philip Rowe; 057084 Oval Court Lands - Municipal EA Addendum
Subject: Notice of Addendum and Public Open House, Appleby Creek Flood Mitigation Municipal Class Environmental Assessment
Attachments: Notice of Addendum Appleby Creek PIC.pdf

Hello Consultations, Melanie Paradis, Director,
Jane Brennan, Administrator, Métis Nation of Ontario,

On behalf of the City of Burlington, please see the attached Notice of Addendum and Public Open House for the Appleby Creek Flood Mitigation Municipal Class Environmental Assessment (MCEA) study. Since the original study was completed in 2019, changes in land use and proposed developments near the Fairview Street crossing have necessitated a review.

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Public Open House
Date: Monday, June 17, 2024
Time: Drop-in 6:00p.m. – 8:00 p.m.
Location: Appleby Ice Centre – Community Room No. 1
1201 Appleby Line, Burlington, ON L7L 5H9

If you have any questions or comments, please contact one of the Project Team members below:

Arif Shahzad, M.Eng., P.Eng.
Senior Project Manager
City of Burlington
426 Brant Street, P.O. Box 5013
Burlington ON L7R 3Z6
Phone: 905-335-7600 ext. 7486
Email: Arif.Shahzad@burlington.ca

Philip A. Rowe, C.E.T., EP.
Consultant Project Manager
R.J. Burnside & Associates Limited
1266 South Service Road, Suite C2
Stoney Creek ON L8E 5R9
Phone: 905-821-5915
Email: Philip.Rowe@rjburnside.com

On behalf of the study team,

Crystal Ferguson

From: Crystal Ferguson
Sent: Friday, June 07, 2024 2:28 AM
To: maracle@ofifc.org
Cc: Philip Rowe; 057084 Oval Court Lands - Municipal EA Addendum
Subject: Notice of Addendum and Public Open House, Appleby Creek Flood Mitigation Municipal Class Environmental Assessment
Attachments: Notice of Addendum Appleby Creek PIC.pdf

Hello Sylvia Maracle, Ontario Federation of Indian Friendship,

On behalf of the City of Burlington, please see the attached Notice of Addendum and Public Open House for the Appleby Creek Flood Mitigation Municipal Class Environmental Assessment (MCEA) study. Since the original study was completed in 2019, changes in land use and proposed developments near the Fairview Street crossing have necessitated a review.

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Location: Appleby Ice Centre – Community Room No. 1
1201 Appleby Line, Burlington, ON L7L 5H9

If you have any questions or comments, please contact one of the Project Team members below:

Arif Shahzad, M.Eng., P.Eng.
Senior Project Manager
City of Burlington
426 Brant Street, P.O. Box 5013
Burlington ON L7R 3Z6
Phone: 905-335-7600 ext. 7486
Email: Arif.Shahzad@burlington.ca

Philip A. Rowe, C.E.T., EP.
Consultant Project Manager
R.J. Burnside & Associates Limited
1266 South Service Road, Suite C2
Stoney Creek ON L8E 5R9
Phone: 905-821-5915
Email: Philip.Rowe@rjburnside.com

On behalf of the study team,

Crystal Ferguson

From: Crystal Ferguson
Sent: Friday, June 07, 2024 2:28 AM
To: surinder.singh.gill@osaa.gov.on.ca
Cc: Philip Rowe; 057084 Oval Court Lands - Municipal EA Addendum
Subject: Notice of Addendum and Public Open House, Appleby Creek Flood Mitigation Municipal Class Environmental Assessment
Attachments: Notice of Addendum Appleby Creek PIC.pdf

Hello Gill Surinder Singh, Ontario Secretariat for Aboriginal Affairs,

On behalf of the City of Burlington, please see the attached Notice of Addendum and Public Open House for the Appleby Creek Flood Mitigation Municipal Class Environmental Assessment (MCEA) study. Since the original study was completed in 2019, changes in land use and proposed developments near the Fairview Street crossing have necessitated a review. Based on your expressed interest in the previous study this Notice is being circulated to keep you informed of updates to the project.

A Public Open House is planned to provide information about the project and gather comments from the public. A study area map is provided on the attached notice. Information about this study can be found at: burlington.ca/applebyflood

Public Open House
Date: Monday, June 17, 2024
Time: Drop-in 6:00p.m. – 8:00 p.m.
Location: Appleby Ice Centre – Community Room No. 1
1201 Appleby Line, Burlington, ON L7L 5H9

If you have any questions or comments, please contact one of the Project Team members below:

Arif Shahzad, M.Eng., P.Eng.
Senior Project Manager
City of Burlington
426 Brant Street, P.O. Box 5013
Burlington ON L7R 3Z6
Phone: 905-335-7600 ext. 7486
Email: Arif.Shahzad@burlington.ca

Philip A. Rowe, C.E.T., EP.
Consultant Project Manager
R.J. Burnside & Associates Limited
1266 South Service Road, Suite C2
Stoney Creek ON L8E 5R9
Phone: 905-821-5915
Email: Philip.Rowe@rjburnside.com

On behalf of the study team,

Crystal Ferguson

From: Crystal Ferguson
Sent: Friday, June 07, 2024 8:16 AM
To: 'LRCS@sixnations.ca'; 'dlaforme@sixnations.ca'; 'lonnybomberry@sixnations.ca'; 'dlaforme@sixnations.ca'
Cc: Philip Rowe; 057084 Oval Court Lands - Municipal EA Addendum
Subject: Notice of Addendum and Public Open House, Appleby Creek Flood Mitigation Municipal Class Environmental Assessment
Attachments: Notice of Addendum Appleby Creek PIC.pdf

Hello Peter Graham, Consultation Supervisor,

Lonny Bomberry, Lands and Resources Director,

Dawn Laforme, Six Nations of the Grand River,

On behalf of the City of Burlington, please see the attached Notice of Addendum and Public Open House for the Appleby Creek Flood Mitigation Municipal Class Environmental Assessment (MCEA) study. Since the original study was completed in 2019, changes in land use and proposed developments near the Fairview Street crossing have necessitated a review.

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Location: Appleby Ice Centre – Community Room No. 1

1201 Appleby Line, Burlington, ON L7L 5H9

If you have any questions or comments, please contact one of the Project Team members below:

Arif Shahzad, M.Eng., P.Eng.

Senior Project Manager

City of Burlington

426 Brant Street, P.O. Box 5013

Burlington ON L7R 3Z6

Phone: 905-335-7600 ext. 7486

Email: Arif.Shahzad@burlington.ca

Philip A. Rowe, C.E.T., EP.

Consultant Project Manager

R.J. Burnside & Associates Limited

1266 South Service Road, Suite C2

Stoney Creek ON L8E 5R9

Phone: 905-821-5915

Email: Philip.Rowe@rjburnside.com

On behalf of the study team,

Crystal Ferguson

From: Colleen Bain <cbain@hrca.on.ca>
Sent: Friday, June 07, 2024 8:55 AM
To: Crystal Ferguson
Subject: Automatic reply: [EXTERNAL]Notice of Addendum and Public Open House, Appleby Creek Flood Mitigation Municipal Class Environmental Assessment

Hello,

Thank you for your message. As of June 30th, 2023, I am no longer with Conservation Halton. Please direct your email to the appropriate contact as outlined below:

- Niagara Escarpment Commission Files – Charles Priddle (cpriddle@hrca.on.ca)
- Planning Act Applications (OPA, ZBA, Site Plan, Consent, Minor Variance) – chplanning@hrca.on.ca
- General Inquiries – enserv@hrca.on.ca

Please note that your email will not be forwarded automatically.

Sincerely,

-Colleen Bain

Crystal Ferguson

From: SUN Hongxia <Susan.SUN@HydroOne.com> on behalf of SECONDARY LAND USE Department <Department.SecondaryLandUse@hydroone.com>
Sent: Wednesday, June 26, 2024 9:49 AM
To: Shahzad, Arif
Cc: SECONDARY LAND USE Department
Subject: Hydro One Response: 20240626-NoticeOfPIC1-Appleby Creek Flood Mitigation
Attachments: 20240626-NoticeOfPIC1-Appleby Creek Flood Mitigation.pdf; 19826.pdf

Please see the attached for Hydro One's Response.

Hydro One Networks Inc

SecondaryLandUse@HydroOne.com

Crystal Ferguson

From: Laureen Choi [Staff] <choil@hdsb.ca>
Sent: Friday, June 07, 2024 11:32 AM
To: Crystal Ferguson
Subject: Re: [hdsbplanningdepartment] Notice of Addendum and Public Open House, Appleby Creek Flood Mitigation Municipal Class Environmental Assessment

Hi Crystal. Thank you for the notification.

You have two HDSB email addresses in your mailing list.

plan@hdsb.ca
contact@hdsb.ca

Can you keep "plan@hdsb.ca" on your list but remove "contact@hdsb.ca"?

The plan email goes directly to all contacts within the Planning Department which is good.

The contact email will get lost in the general inbox of our front line staff at our Board office.

Laureen Choi
Specialist - Planning
Halton District School Board
J.W. Singleton Education Centre
2050 Guelph Line
Burlington, Ontario L7P 5A8
www.hdsb.ca
905-335-3665 x2201
905-749-2184

On Fri, Jun 7, 2024 at 8:54 AM 'Crystal Ferguson' via HDSB Planning Department External <HDSBPlanningDepartment@hdsb.ca> wrote:

> Hello,
>
> On behalf of the City of Burlington, please see the attached Notice of Addendum and Public Open House for the Appleby Creek Flood Mitigation Municipal Class Environmental Assessment (MCEA) study. Since the original study was completed in 2019, changes in land use and proposed developments near the Fairview Street crossing have necessitated a review.
>
> A Public Open House is planned to provide information about the project and gather comments from the public.
>
> A study area map is provided on the attached notice. Information about this study can be found at: burlington.ca/applebyflood

Public Open House

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Time: Drop-in 6:00p.m. – 8:00 p.m.

Location: Appleby Ice Centre – Community Room No. 1

1201 Appleby Line, Burlington, ON L7L 5H9

If you have any questions or comments, please contact one of the Project Team members below:

Arif Shahzad, M.Eng., P.Eng.

Senior Project Manager

City of Burlington

426 Brant Street, P.O. Box 5013

Burlington ON L7R 3Z6

Phone: 905-335-7600 ext. 7486

Email: Arif.Shahzad@burlington.ca

Philip A. Rowe, C.E.T., EP.

Consultant Project Manager

R.J. Burnside & Associates Limited

1266 South Service Road, Suite C2

Stoney Creek ON L8E 5R9

Phone: 905-821-5915

Email: Philip.Rowe@rjburnside.com

On behalf of the study team,

Crystal Ferguson
Environmental Coordinator

R.J. Burnside & Associates
128 Wellington Street West, Suite 301, Barrie, Ontario L4N 8J6
Office: +1 800-265-9662 Direct: +1 705-797-4352
www.rjburnside.com

Crystal Ferguson

From: DOCA Admin <DOCA.Admin@mncfn.ca>
Sent: Friday, June 07, 2024 8:16 AM
To: Crystal Ferguson
Subject: !Message Redirected

****The Mississauga's of the Credit First Nation's Department of Consultation and Accommodation has begun phasing out the previous administration email. Emails and items received at DOCA.Admin@mncfn.ca are continuing to be monitored as they are received and redirected.*
*Your message has been redirected to DOCA's newly implemented Email address, DOCA@mncfn.ca. Please ensure that DOCA Contact information in your companies address books and other databases is updated at your earliest convenience, Miigwech****

Department of Consultation and Accommodation *(DOCA)*
Mississaugas of the Credit First Nation *(MCFN)*
Tel: (905) 768-4260
Email: DOCA@mncfn.ca
Website: http://mncfn.ca/doca
Location: 4065 Hwy. 6 Hagersville, ON N0A 1H0, CA
Mail: 2789 Mississauga Road Hagersville, ON N0A 1H0, CA
Google Maps: https://www.google.ca/maps/place/MNCFN-DOCA/@42.9718566,-80.0429177,15z/data=!4m5!3m4!1s0x0:0xd52b4642633e9aa2!8m2!3d42.9718566!4d-80.0429177

Crystal Ferguson

From: EA Notices to CRegion (MECP) <eanotification.cregion@ontario.ca>
Sent: Friday, June 07, 2024 3:02 PM
To: Crystal Ferguson
Subject: RE: Notice of Addendum and Public Open House, Appleby Creek Flood Mitigation Municipal Class Environmental Assessment

Hi Crystal,

Thanks so much for sending along the Notice of Addendum and the details of the Public Open House for the Appleby Creek Flood Mitigation Municipal Class Environmental Assessment (MCEA) study.

We've filed this for our record.

Kind regards,

Krish Selvakumar, MFC (he/him)
Environmental Resource Planner/Assessment Coordinator
Environmental Assessment Services Section
Environmental Assessment Branch
Ministry of the Environment, Conservation and Parks
T: (437) 240-5922 | krishna.selvakumar@ontario.ca

Ontario

From: Crystal Ferguson <Crystal.Ferguson@rjburnside.com>
Sent: Friday, June 7, 2024 8:54 AM
To: linda.beaulieu@tc.gc.ca; cindy.latendresse@foc.gc.ca; Moszynski, Dorothy (MECP) <Dorothy.Moszynski@ontario.ca>; Delaquis, Dan (MNRF) <Dan.Delaquis@ontario.ca>; Strong, Steven (MNRF) <steven.strong@ontario.ca>; Kulathinal, Rina (MTO) <Rina.Kulathinal@ontario.ca>; Van Voorst, John (MTO) <John.VanVoorst@ontario.ca>; Kulpa, Paula (MCM) <Paula.Kulpa@ontario.ca>; EA Notices to CRegion (MECP) <eanotification.cregion@ontario.ca>; MEA Notices to Director EAAB (MECP) <MEANOTICESEAAB@ontario.ca>; Barboza, Karla (She/Her) (MCM) <Karla.Barboza@ontario.ca>; Dan.Minkin@ontatio.ca; Jason.Ryan@gotransit.com; regionalclerk@halton.ca; richard.clark@halton.ca; ron.reinholt@halton.ca; Natalie.Spina@halton.ca; Heather.Ireland@halton.ca; Shelley.Partridge@halton.ca; Nicole.Pettenuzzo@halton.ca; richard.de_bokx@bell.ca; rowcentre@bell.ca; notifications@enbridge.com; mark-ups@enbridge.com; TCEnergy@mhbcplan.com; crossingrequesteast@tnpi.ca; markupanddrawingrequests@tnpi.ca; Utility.Circulations@zayo.com; hdearlove@hrca.on.ca; admin@hrca.on.ca; envserv@hrc.on.ca; edefields@hrca.on.ca; cbain@hrca.on.ca; proximity@cn.ca; accesshalton@halton.ca; stephen.tanner@haltonpolice.ca; plan@hdsb.ca; contact@hdsb.ca; facilities@hcdsb.org; Ladouceur, Miguel <ladouceurm@CSViamonde.ca>; planification@csviamonde.ca; BurlingtonResidentAssociation@gmail.com; lakeshoreresidents@outlook.com
Cc: Philip Rowe <Philip.Rowe@rjburnside.com>; 057084 Oval Court Lands - Municipal EA Addendum <057084OvalCourtLands-MunicipalEAAddendum@rjburnside.com>
Subject: Notice of Addendum and Public Open House, Appleby Creek Flood Mitigation Municipal Class Environmental Assessment

Hello,

On behalf of the City of Burlington, please see the attached Notice of Addendum and Public Open House for the Appleby Creek Flood Mitigation Municipal Class Environmental Assessment (MCEA) study. Since the original study was completed in 2019, changes in land use and proposed developments near the Fairview Street crossing have necessitated a review.

A Public Open House is planned to provide information about the project and gather comments from the public.

A study area map is provided on the attached notice. Information about this study can be found at: burlington.ca/applebyflood

Public Open House

Date: Monday, June 17, 2024

Time: Drop-in 6:00p.m. – 8:00 p.m.

Location: Appleby Ice Centre – Community Room No. 1

1201 Appleby Line, Burlington, ON L7L 5H9

If you have any questions or comments, please contact one of the Project Team members below:

Arif Shahzad, M.Eng., P.Eng.

Senior Project Manager

City of Burlington

426 Brant Street, P.O. Box 5013

Burlington ON L7R 3Z6

Phone: 905-335-7600 ext. 7486

Email: Arif.Shahzad@burlington.ca

Philip A. Rowe, C.E.T., EP.

Consultant Project Manager

R.J. Burnside & Associates Limited

1266 South Service Road, Suite C2

Stoney Creek ON L8E 5R9

Phone: 905-821-5915

Email: Philip.Rowe@rjburnside.com

On behalf of the study team,

Crystal Ferguson
Environmental Coordinator

R.J. Burnside & Associates
128 Wellington Street West, Suite 301, Barrie, Ontario L4N 8J6
Office: +1 800-265-9662 Direct: +1 705-797-4352
www.rjburnside.com

Crystal Ferguson

From: ONT Environment / Environnement ONT <EnviroOnt@tc.gc.ca>
Sent: Friday, June 07, 2024 9:09 AM
To: Crystal Ferguson
Subject: RE: Notice of Addendum and Public Open House, Appleby Creek Flood Mitigation Municipal Class Environmental Assessment
Attachments: Notice of Addendum Appleby Creek PIC.pdf

UNCLASSIFIED / NON CLASSIFIÉ

Hello Crystal,

Thank you for your correspondence. For any general inquiries in future please use this email that this reply is from – **EnviroOnt@tc.gc.ca** (…. and remove Linda.Beaulieu@tc.gc.ca from your list, thx).

Please note Transport Canada does not require receipt of all Individual or Class EA related notifications. We request that project proponents self-assess whether their project:

1. Will interact with a federal property and/or waterway by reviewing the Directory of Federal Real Property, available at at www.tbs-sct.gc.ca/dfrp-rbif/; **and**
2. Will require approval and/or authorization under any Acts administered by Transport Canada* available at http://www.tc.gc.ca/eng/acts-regulations/menu.htm.

Proposed projects that will occur on federal property (including reserve lands or lands owned by federal departments other than Transport Canada) will be subject to an Impact Assessment per Section 82 of the *Impact Assessment Act, 2019* prior to exercising a federal power (including full or partial funding), and/or performing a function or duty (e.g. regulatory approval or issuance of a lease) in relation to that project.

If the criteria above do not apply, Transport Canada's Environmental Assessment program should not be included in any further correspondence, and future notifications will not receive a response. If there is a role under the program, correspondence should be forwarded to: EnviroOnt@tc.gc.ca with a **brief description of Transport Canada's expected role**.

*Below is a summary of the most common Acts that apply to projects in an Environmental Assessment context:

- ***Canadian Navigable Waters Act (CNWA)*** – the Act applies primarily to works constructed or placed in, on, over, under, through, or across navigable waters set out under the Act. The Navigation Protection Program administers the CNWA through the review and authorization of works affecting navigable waters. Information about the Program, CNWA and approval process is available at: http://www.tc.gc.ca/eng/programs-621.html. Inquiries can be directed to NPPONT-PPNONT@tc.gc.ca or by calling (519) 383-1863.

- ***Railway Safety Act (RSA)*** – the Act provides the regulatory framework for railway safety, security, and some of the environmental impacts of railway operations in Canada. The Rail Safety Program develops and enforces regulations, rules, standards and procedures governing safe railway operations. Additional information about the Program is available at: https://www.tc.gc.ca/eng/railsafety/menu.htm. Inquiries can be directed to RailSafety@tc.gc.ca or by calling (613) 998-2985.

- ***Transportation of Dangerous Goods Act (TDGA)*** – the transportation of dangerous goods by air, marine, rail and road is regulated under the TDGA. Transport Canada, based on risks, develops safety standards and regulations, provides oversight and gives expert advice on dangerous goods to promote public safety. Additional information about the transportation of dangerous goods is available at: https://www.tc.gc.ca/eng/tdg/safety-menu.htm. Inquiries can be directed to TDG-TMDOntario@tc.gc.ca or by calling (416) 973-1868.

- ***Aeronautics Act*** – this Act and the associated Canadian Aviation Regulations (CARs) govern civil aviation in Canada. Transport Canada should be notified of projects involving aerodromes and associated structures, or activities that could affect aviation safety. Elevated structures, such as wind turbines and communication towers, are examples of projects that must be assessed for lighting and marking requirements in accordance with the CARs. Transport Canada also has an interest in projects that have the potential to cause interference between wildlife and aviation activities. One example would be waste facilities, which may attract birds into commercial and recreational flight paths. Additional guidance can be found in the *Land Use In The Vicinity of Aerodromes* publication, available at: https://www.tc.gc.ca/eng/civilaviation/publications/tp1247-menu-1418.htm. Information about Transport Canada's Civil Aviation program can be found at: https://tc.canada.ca/en/aviation. Inquires can be directed to aviation.ont@tc.gc.ca or by calling 1 (800) 305-2059 / (416) 952-0230.

Please advise if additional information is needed.

Thank you,

Environmental Assessment Program, Ontario Region
Transport Canada / Government of Canada / 4900 Yonge St., Toronto, ON M2N 6A5
EnviroOnt@tc.gc.ca

Programme d'évaluation environnementale, Région de l'Ontario
Transports Canada / Gouvernement du Canada / 4900, rue Yonge, Toronto, ON, M2N 6A5
EnviroOnt@tc.gc.ca

From: Crystal Ferguson <Crystal.Ferguson@rjburnside.com>
Sent: Friday, June 07, 2024 8:54 AM
To: Beaulieu, Linda (she,her | elle,la) (TC/TC) <linda.beaulieu@tc.gc.ca>; cindy.latendresse@foc.gc.ca; dorothy.moszynski@ontario.ca; dan.delaquis@ontario.ca; steven.strong@ontario.ca; rina.kulathinal@ontario.ca; john.vanvoorst@ontario.ca; paula.kulpa@ontario.ca; eanotification.cregion@ontario.ca; MEA.NOTICES.EAAB@ontario.ca; karla.barboza@ontario.ca; Dan.Minkin@ontatio.ca; Jason.Ryan@gotransit.com; regionalclerk@halton.ca; richard.clark@halton.ca; ron.reinholt@halton.ca; Natalie.Spina@halton.ca;

Heather.Ireland@halton.ca; Shelley.Partridge@halton.ca; Nicole.Pettenuzzo@halton.ca; richard.de_bokx@bell.ca; rowcentre@bell.ca; notifications@enbridge.com; mark-ups@enbridge.com; TCEnergy@mhbcplan.com; crossingrequesteast@tnpi.ca; markupanddrawingrequests@tnpi.ca; Utility.Circulations@zayo.com; hdearlove@hrca.on.ca; admin@hrca.on.ca; envserv@hrc.on.ca; edefields@hrca.on.ca; cbain@hrca.on.ca; proximity@cn.ca; accesshalton@halton.ca; stephen.tanner@haltonpolice.ca; plan@hdsb.ca; contact@hdsb.ca; facilities@hcdsb.org; ladouceurm@csviamonde.ca; planification@csviamonde.ca; BurlingtonResidentAssociation@gmail.com; lakeshoreresidents@outlook.com
Cc: Philip Rowe <Philip.Rowe@rjburnside.com>; 057084 Oval Court Lands - Municipal EA Addendum <057084OvalCourtLands-MunicipalEAAddendum@rjburnside.com>
Subject: [External/Externe]: Notice of Addendum and Public Open House, Appleby Creek Flood Mitigation Municipal Class Environmental Assessment

Hello,

On behalf of the City of Burlington, please see the attached Notice of Addendum and Public Open House for the Appleby Creek Flood Mitigation Municipal Class Environmental Assessment (MCEA) study. Since the original study was completed in 2019, changes in land use and proposed developments near the Fairview Street crossing have necessitated a review.

A Public Open House is planned to provide information about the project and gather comments from the public.

A study area map is provided on the attached notice. Information about this study can be found at: burlington.ca/applebyflood

Public Open House

Date: Monday, June 17, 2024

Time: Drop-in 6:00p.m. – 8:00 p.m.

Location: Appleby Ice Centre – Community Room No. 1

1201 Appleby Line, Burlington, ON L7L 5H9

If you have any questions or comments, please contact one of the Project Team members below:

Arif Shahzad, M.Eng., P.Eng.

Senior Project Manager

City of Burlington

426 Brant Street, P.O. Box 5013

Burlington ON L7R 3Z6

Phone: 905-335-7600 ext. 7486

Email: Arif.Shahzad@burlington.ca

Philip A. Rowe, C.E.T., EP.

Consultant Project Manager

R.J. Burnside & Associates Limited

1266 South Service Road, Suite C2

Stoney Creek ON L8E 5R9

Phone: 905-821-5915

Email: Philip.Rowe@rjburnside.com

On behalf of the study team,

Crystal Ferguson
Environmental Coordinator

R.J. Burnside & Associates
128 Wellington Street West, Suite 301, Barrie, Ontario L4N 8J6
Office: +1 800-265-9662 Direct: +1 705-797-4352
www.rjburnside.com

Crystal Ferguson

From: Utility Circulations <utility.circulations+canned.response@zayo.com>
Sent: Friday, June 07, 2024 8:54 AM
To: Crystal Ferguson
Subject: Re: Notice of Addendum and Public Open House, Appleby Creek Flood Mitigation Municipal Class Environmental Assessment

Thank you for your submission, it has been placed in the queue and will be replied to within 15 business days. When possible please try to avoid submitting AutoCAD files.

Crystal Ferguson

From: SUN Hongxia <Susan.SUN@HydroOne.com> on behalf of SECONDARY LAND USE Department <Department.SecondaryLandUse@hydroone.com>
Sent: Wednesday, June 26, 2024 9:49 AM
To: Shahzad, Arif
Cc: SECONDARY LAND USE Department
Subject: Hydro One Response: 20240626-NoticeOfPIC1-Appleby Creek Flood Mitigation
Attachments: 20240626-NoticeOfPIC1-Appleby Creek Flood Mitigation.pdf; 19826.pdf

Please see the attached for Hydro One's Response.

Hydro One Networks Inc

SecondaryLandUse@HydroOne.com

Hydro One Networks Inc.

483 Bay Street
8th Floor South Tower
Toronto, Ontario M5G 2P5

HydroOne.com

June 26, 2024

Re: Appleby Creek Flood Mitigation

Attention:
Arif Shahzad, M.Eng., P.Eng.
Stormwater Engineer - Capital
City of Burlington

Thank you for sending us notification regarding Appleby Creek Flood Mitigation. In our preliminary assessment, we have confirmed that Hydro One has existing high voltage Transmission facilities within your study area. At this time we do not have sufficient information to comment on the potential resulting impacts that your project may have on our infrastructure. As such, we must stay informed as more information becomes available so that we can advise if any of the alternative solutions present actual conflicts with our assets, and if so; what resulting measures and costs could be incurred by the proponent. Note that this response does not constitute approval for your plans and is being sent to you as a courtesy to inform you that we must continue to be consulted on your project.

In addition to the existing infrastructure mentioned above, the applicable transmission corridor may have provisions for future lines or already contain secondary land uses (e.g., pipelines, watermains, parking). Please take this into consideration in your planning.

Also, we would like to bring to your attention that should Appleby Creek Flood Mitigation result in a Hydro One station expansion or transmission line replacement and/or relocation, an Environmental Assessment (EA) will be required as described under the Class Environmental Assessment for Minor Transmission Facilities (Hydro One, 2016). This EA process would require a minimum of 6 months for a Class EA Screening Process (or up to 18 months if a Full Class EA were to be required) to be completed. Associated costs will be allocated and recovered from proponents in accordance with the Transmission System Code. If triggered, Hydro One will rely on studies completed as part of the EA you are current undertaking.

Consulting with Hydro One on such matters during your project's EA process is critical to avoiding conflicts where possible or, where not possible, to streamlining processes (e.g., ensuring study coverage of expansion/relocation areas within the current EA). Once in receipt of more specific project information regarding the potential for conflicts (e.g., siting, routing), Hydro One will be in a better position to communicate objections or not objections to alternatives proposed.

If possible at this stage, please formally confirm that Hydro One infrastructure and associated rights-of-way will be completely avoided, or if not possible, allocate appropriate lead-time in your project schedule to collaboratively work through potential conflicts with Hydro One, which ultimately could result in timelines identified above.

In planning, note that developments should not reduce line clearances or limit access to our infrastructure at any time. Any construction activities must maintain the electrical clearance from the transmission line conductors as specified in the Ontario Health and Safety Act for the respective line voltage.

Be advised that any changes to lot grading or drainage within, or in proximity to Hydro One transmission corridor lands must be controlled and directed away from the transmission corridor.

Please note that the proponent will be held responsible for all costs associated with modifications or relocations of Hydro One infrastructure that result from your project, as well as any added costs that may be incurred due to increased efforts to maintain said infrastructure.

We reiterate that this message does not constitute any form of approval for your project. Hydro One must be consulted during all stages of your project. Please ensure that all future communications about this and future project(s) are sent to us electronically to secondarylanduse@hydroone.com

Sent on behalf of,

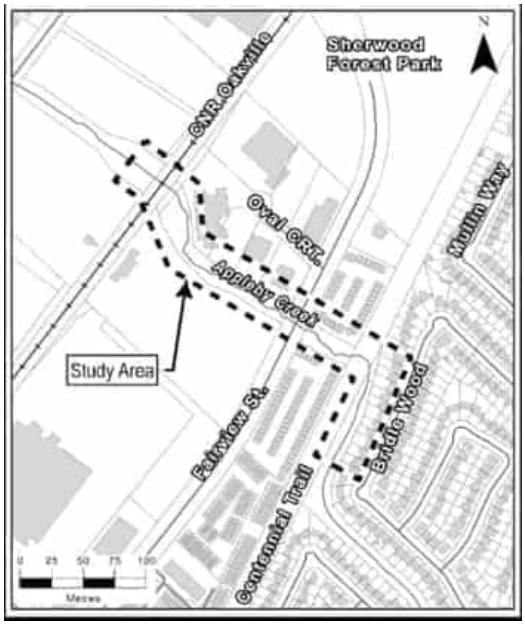
Secondary Land Use
Asset Optimization
Strategy & Integrated Planning
Hydro One Networks Inc.

Notice of Addendum and Public Open House
City of Burlington

Municipal Class Environmental Assessment for Appleby Creek Flood Mitigation

The Study

The City of Burlington has partnered with Branthaven Homes, represented by R.J. Burnside & Associates Limited, to update the Municipal Class Environmental Assessment (MCEA) for the Appleby Creek Flood Mitigation project between Fairview Street and New Street. Since the original study was completed in 2019, changes in land use and proposed developments near the Fairview Street crossing have necessitated a review.



The Process

The Addendum to the 2019 Project File Report is being completed in accordance with the requirements of the MCEA process (Municipal Engineers Association, February 2024) which is an approved process under the *Ontario Environmental Assessment Act*. The Addendum contains the background and technical analysis of the revised hydraulic crossing of Fairview Street. The City is seeking comments on the proposed changes as outlined in the Addendum.

Public Open House

A Public Open House is planned to provide information about the project and gather comments from the public. Representatives of the project team will be available to discuss the Addendum and answer questions. The Addendum will be finalized after this Public Open House and will include responses to received comments. An electronic copy of the Addendum will be available for viewing on the City website at burlington.ca/applebyflood for public review and comment for a period of 30 days starting July 8 and ending Aug. 6, 2024 in accordance with the requirements of the MCEA process.

Public Open House Drop-in

Date and Time: **June 17, 2024. 6 to 8 p.m.**
Location: **Appleby Ice Centre – Community Room No. 1**
1201 Appleby Line, Burlington, ON L7L 5H9

To provide comments on the project or if you require alternative accommodations to view the Addendum, please contact either of the following Project Team members below before 4:30 p.m. Aug. 6, 2024:

Arif Shahzad, M.Eng., P.Eng.
Senior Project Manager
City of Burlington
426 Brant Street, P.O. Box 5013
Burlington ON L7R 3Z6
Phone: 905-335-7600 ext. 7486
Email: Arif.Shahzad@burlington.ca

Philip A. Rowe, C.E.T., EP.
Consultant Project Manager
R.J. Burnside & Associates Limited
1266 South Service Road, Suite C2
Stoney Creek ON L8E 5R9
Phone: 905-821-5915
Email: Philip.Rowe@rjburnside.com

Section 16 Order Request

In addition to general project comments as outlined above, a request to the Minister of the Environment, Conservation and Parks for an order imposing additional conditions or requiring a comprehensive environmental assessment may be made on the grounds that the requested order may prevent, mitigate, or remedy adverse impacts on constitutionally protected Aboriginal and treaty rights. Requests shall be made within the 30-day comment period and should include the full name and contact information of the requester for the ministry. Requests should specify what kind of order is being requested (additional conditions or a comprehensive environmental assessment), explain how an order may prevent, mitigate, or remedy potential adverse impacts, and can include supporting information. The request should be sent by 4:30 p.m. Aug. 6, 2024 to:

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

Director, Environmental Assessment Branch
Ministry of the Environment, Conservation and Parks
135 St. Clair Avenue West, 1st Floor
Toronto, ON M4V 1P5
Email: EABDirector@ontario.ca

Requests should also be sent to the City of Burlington. Please visit the Ministry's website for more information on requests for orders under section 16 of the Environmental Assessment Act at:
ontario.ca/page/class-environmental-assessments-section-16-order.

All personal information included in your request, such as name, address, telephone number and property location, is collected under the authority of Section 30 of the Environmental Assessment Act and is collected and maintained for the purpose of creating a record that is available to the general public. As this information is collected for the purpose of a public record, the protection of personal information provided in the Freedom of Information and Protection of Privacy Act (FIPPA) does not apply (s.37). Personal information you submit will become part of a public record that is available to the general public unless you request that your personal information remain confidential. Project and Notice information will be made accessible upon request in accordance with the Accessibility Standard for Information and Communication under the Accessibility for Ontarians with Disabilities Act, 2005.

This notice first advertised June 5, 2024.

GROCERIES

Federal NDP eye price cap on staples

THE CANADIAN PRESS

OTTAWA The federal New Democrats want a price cap on grocery store staples if the Liberal government can't convince grocers to bring down the prices themselves.

In Europe, some countries have implemented similar measures, and while it's something Industry Minister François-Philippe Champagne said he has looked into, he doesn't think it's a good idea.

"You have commodities which are traded on a global scale. So think about sugar, think about wheat, how can you have a price in one particular region," he said Tuesday.

"But I think the better way to do that is keep putting pressure on the grocers, on the large manufacturers around the world, and bringing more competition."

For months, the Liberals have been trying to get big grocers in Canada to sign a code of conduct that they say will bring down food prices for everyone.

And Champagne has even said he's trying to court a foreign grocer to usher in competition. "I think it would help shake up the market and bring better prices," he said.

Some food costs have recently eased due to a slight decline in inflation, but the NDP says prices have not dropped nearly as much as they have risen in the past three years. Leader Jagmeet Singh said he's tired of Canadians getting ripped off by corporations, which he says continue to price gouge.

Last month, some shoppers boycotted Loblaw following a month-long campaign from frustrated consumers who are feeling the pinch and blame the grocery giant.

GRASSY NARROWS FIRST NATION

Ontario, Ottawa sued over mercury contamination

THE CANADIAN PRESS

TORONTO A northern Ontario First Nation that has been plagued by mercury poisoning for decades said Tuesday it is suing the governments of Ontario and Canada over mercury contamination in a river system that flows through its territory.

Grassy Narrows First Nation alleges the governments breached their obligations by failing to ensure the community could safely practise its right to fish. The lawsuit alleges the governments first allowed the English-Wabigoon river system to be contaminated, then failed to remediate it, all while authorizing industrial activities that worsened the harm.

Mercury is harmful to humans who eat contaminated fish, and the people of Grassy Narrows fish to eat, earn a living and maintain their way of life, according to the statement of claim.

Speaking on the steps of a downtown Toronto courthouse Tuesday, Grassy Narrows Chief Rudy Turtle said he believes the issue would have been handled very differently if it had affected a different region and population.

"We're not looked at as important because there's very few of us," he said of the community, of which roughly 1,000 members live on reserve.

The lawsuit is seeking, among other things, an order that the governments remediate and protect the river and Grassy Narrows territory, and prohibit the authorization of industrial land use in or near the territory that would infringe on treaty rights.

None of the allegations have been tested in court.

In a joint statement, federal Indigenous Services Minister Patty Hajdu and Environment Minister Steven Guilbeault said it is "extremely important" to the federal government that it do its part in responding to this crisis and Ottawa will "be there to work with Grassy Narrows and Wabaseemong Independent Nations every step of the way."

They said the government will fully fund a centre to care for those with mercury poisoning and have announced $146 million for its construction and operation. "We are finalizing the last details so that the construction can start shortly," they said.

Members of the Grassy Narrows First Nation are refused entry to Queen's Park to serve a statement of claim to Premier Doug Ford on Tuesday.

ARLYN MCADOREY THE CANADIAN PRESS

ENVIRONMENT

New rules on benzene pollution aimed at Sarnia firm

THE CANADIAN PRESS

TORONTO Ontario has created new rules specifically for one Sarnia plastics plant to try to ensure it stops emitting high levels of benzene that have affected a neighbouring First Nation for years.

The province has issued four orders to Ineos Styrolution since 2019, recently temporarily shut down the facility and added new conditions to its licence that it must meet before it restarts operations, but the government says benzene levels remain elevated.

The Ministry of the Environment, Conservation and Parks says it is very concerned about elevated levels of benzene recorded around the Aamjiwnaang First Nation, which is across the road from Ineos.

Benzene can cause neurological symptoms such as dizziness and headaches following short-term exposures, and can cause cancers such as leukemia after long-term exposures.

The ministry now says one-hour average concentrations in the air shouldn't exceed 90 micrograms per cubic metre, but this spring there have been several readings over that level at Aamjiwnaang monitors, including one instance of more than double that level.

Ineos has not yet responded to the province's latest move, but did issue a statement over the weekend warning that it would need more time to comply with new rules the federal government recently implemented that were aimed at the company.

Appleby Creek Flood Mitigation Municipal Class Environmental Assessment Addendum

Public Open House

June 17, 2024, 6:00 – 8:00p.m.

Appleby Ice Centre – Community Room No. 1

1201 Appleby Line, Burlington, ON L7L 5H9

Welcome

Public Open House
Appleby Creek Flood Mitigation
Municipal Class Environmental EA
Study Addendum

- **Sign In**
- Please Sign in and review the information on the boards
- Please discuss your questions with the Study Team

- **Fill out a Comment Sheet**
- Please fill out a comment sheet and return to the Study
- Team in person, by email or mail by **June 28, 2024.**

Study Purpose

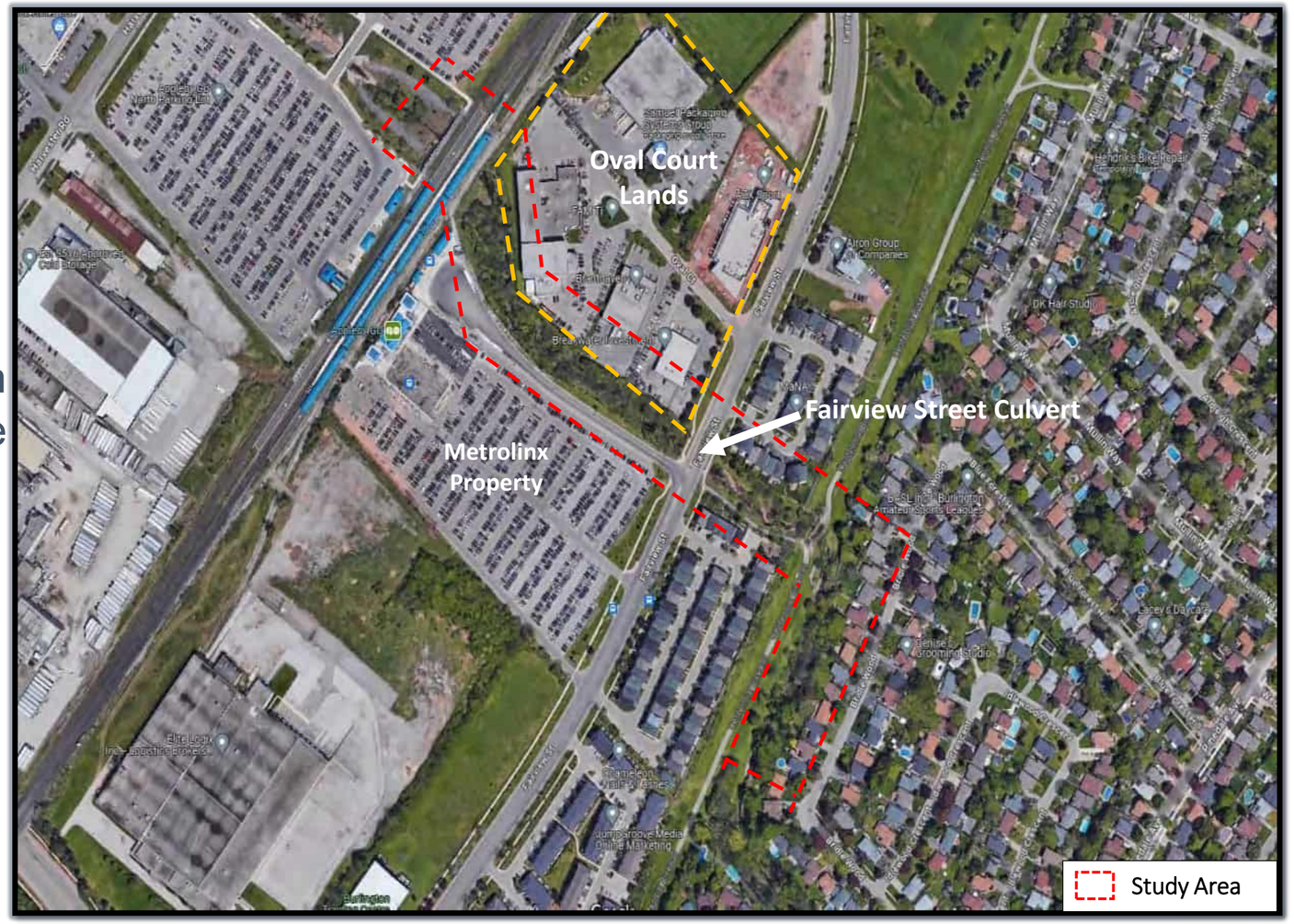
In February 2019, Aquafor Beech completed the **Appleby Creek Flood Mitigation Study** under the Municipal Class Environmental Assessment (MCEA) process.

Since the 2019 study, the socio-cultural and economic environments of the study area between Fairview Street and New Street have changed due to:

- Plans for land use intensification
- Proposed development within the vicinity of the Fairview Street crossing.

The preferred solution identified for the Fairview Street crossing structure does not adequately address the flooding risks within the flood limits of adjacent development lands, specifically development lands known as Oval Court Lands.

An addendum to the 2019 Appleby Creek Flood Mitigation Study is being conducted to review and evaluate alternative solutions for the hydraulic structure crossing at Fairview Street to reduce flooding impacts to Oval Court lands under Regional Storm Conditions.



Purpose of this Public Open House is to:

- Provide an overview of the MCEA Addendum process
- Provide information on the changes to the environment of the Study Area
- Identify the revised preferred solution
- Identify next steps and implementation

Addendum Process and Timeline

The Addendum Study is carried out according to the guidelines set out in the Municipal Engineers Association (MEA) Class Environmental Assessment document (February 2024) when it may not be feasible to implement a project in the manner outlined in the MCEA project report due to unforeseen circumstances or changes in the environment after the project is authorized to proceed.

➢ **February 2019** **Appleby Creek Flood Mitigation Study Municipal Class EA**

➢ **February 2024** **MCEA Addendum**

Review alternatives relative to current environment

- ➢Review recommended crossing solutions for Fairview Street
- ➢ Review existing and future needs and opportunities
  - • Review natural, social / cultural conditions
  - • Planned development
  - • Policy framework

Confirm recommended solution and complete Addendum Report

- ➢Identify and Evaluate Alternative Solutions/Strategies
- ➢Review Impacts and Mitigation Measures
- ➢Recommend Preferred Solution
- ➢Complete Appleby Creek Flood Mitigation Study Addendum Report

Future Phases (not within the scope of the Addendum)

- ➢Detailed designs, permits
- ➢Implementation

Public Open House

Present the recommended solution

Notice of Addendum

30-day public review of Addendum

Appleby Creek Flood Mitigation Study 2019

Background & Purpose

- Evaluated alternative solutions along Appleby Creek from New Street to GO Transit Corridor to identify specific opportunities to reduce flooding risks
- Recommended preferred solutions for three flood vulnerable areas including the subject study area in the vicinity of the Fairview Street crossing
- Existing Fairview Street crossing has max hydraulic conveyance capacity of the 5-year storm and becomes inundated during the Regional Storm event
- The existing structure at the Fairview Street crossing is a 2.74 m rise x twin 3.35 m wide x 29 m long closed bottom box culvert

Fairview Street Crossing Alternative Options

- **3 options** were considered for Fairview Street Crossing to reduce extent of flood hazard
- **Option 1**
  Do Nothing
- **Option 2**
  Replace the existing Fairview St. Bridge with a 17metre span structure to convey the 100- year storm
- **Option 3**
  Replace the existing Fairview St. Bridge with a 60m span structure to convey the Regional Storm

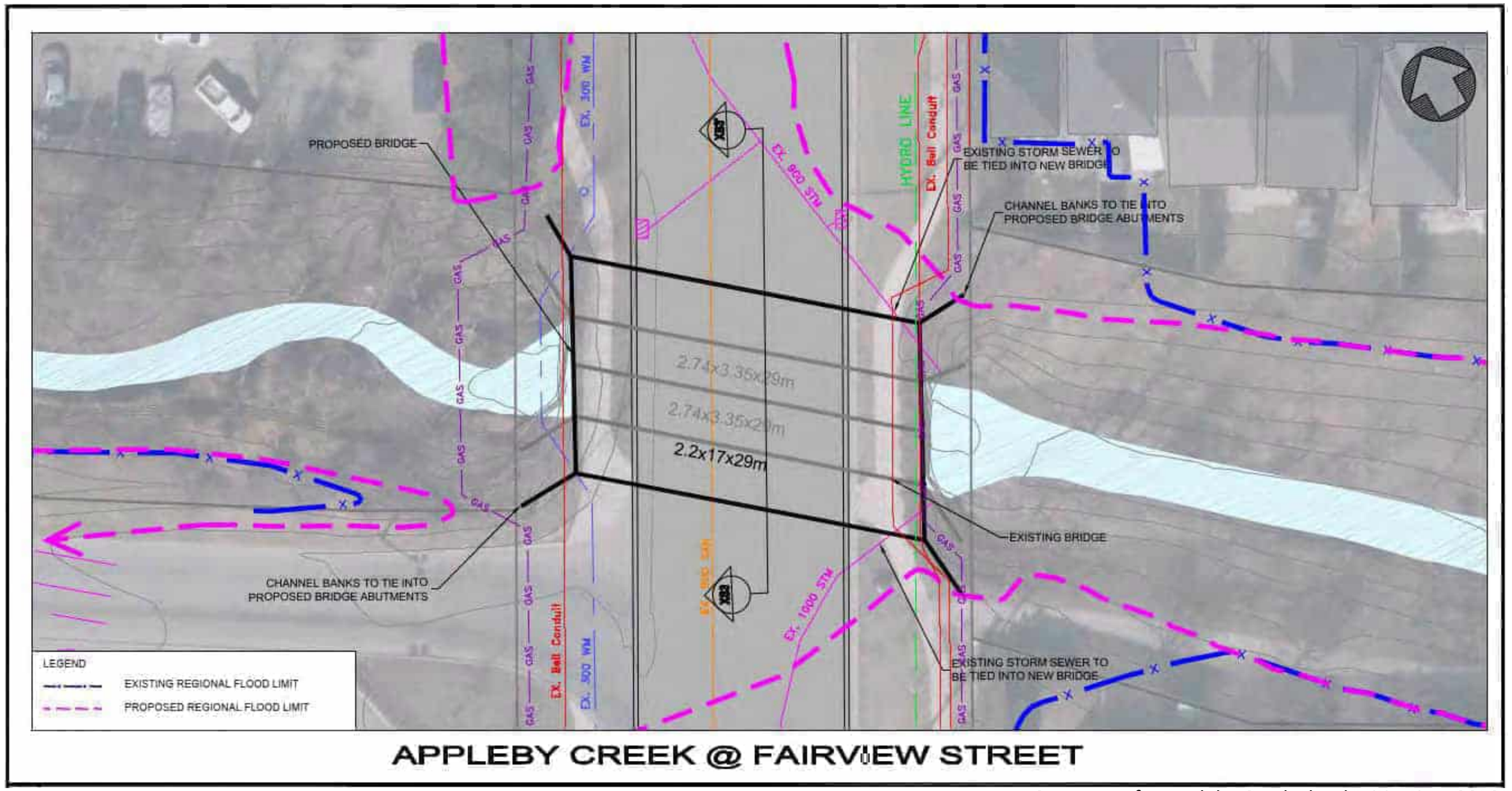
Preferred Solution

- **Option 2**
  a 17 m Clear span bridge that could pass the 100-year storm event, was selected as the preferred alternative
- Included channel works at the upstream and downstream sections of the bridge
- Selected primarily due to the concerns of the capital cost at the time of evaluation
- **Still results in flooding of private property and the overtopping of Fairview Street under Regional Storm conditions**

While the 2019 Appleby Creek MCEA Study acknowledged that the preferred option still resulted in flooding of private property and the overtopping of Fairview Street under Regional Storm conditions, Option 2 was selected based on concerns of capital cost, the current condition of existing bridge and the uncertainty of the pace of development growth at the time of evaluation.

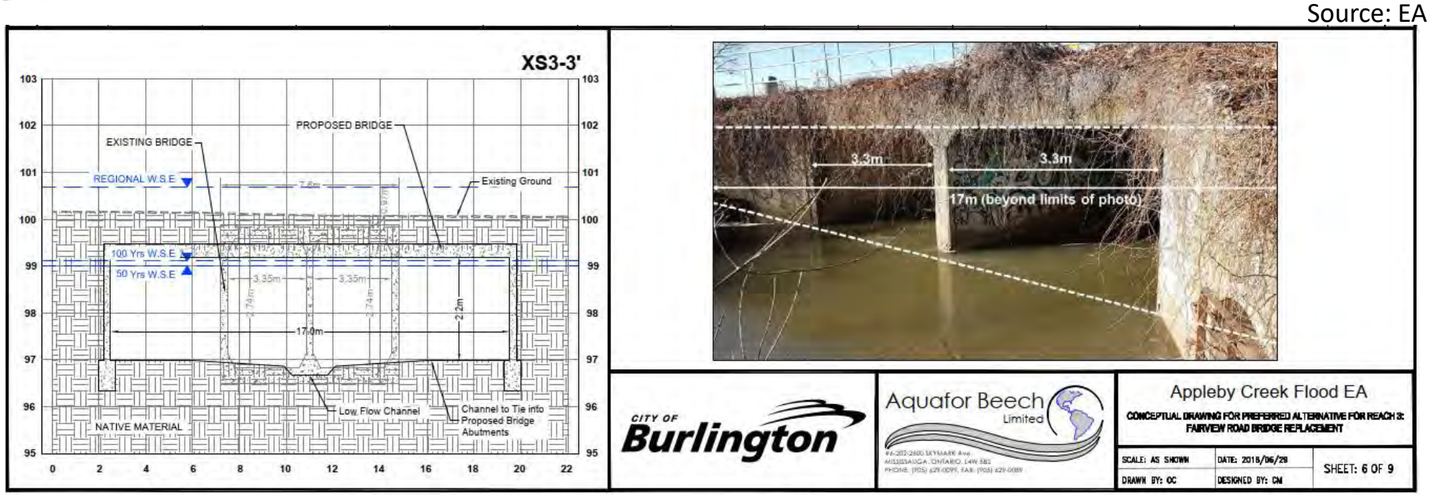
Appleby Creek Flood Mitigation Study 2019

2019 Preferred Solution Fairview Street Crossing

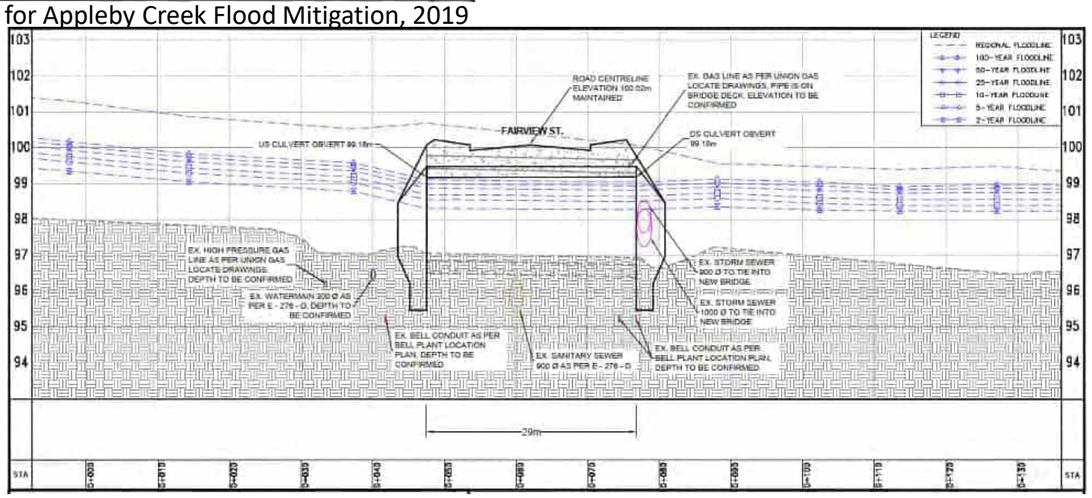


Source: EA for Appleby Creek Flood Mitigation, 2019

The hydraulic assessment completed as part of the 2019 study determined the Fairview Street crossing structure would need to be 17m wide to pass the 100-year storm while maintaining the existing road surface elevation



Source: EA for Appleby Creek Flood Mitigation, 2019



Source: EA for Appleby Creek Flood Mitigation, 2019

What Has Changed?

Changes since the February 2019 Appleby Creek Flood Mitigation Study:

January 2019

- Development plans for the Oval Court lands identify the need to increase table lands to support the planned development

September 2023

- Update to the flood hazard mapping for the ‘East Burlington Creeks’
  - identified the need to convey the Regional Storm to maximize table lands allowing for the increase development density and intensification (EBC, 2023).

November 2023

- As part of the Ontario Land Tribunal Minutes of Settlement between City of Burlington, Conservation Halton and the Oval Court Land Owners, the following conditions were agreed upon:
  - “The Fairview Street road crossing upgrades will be comprised of a culvert or bridge structure capable of conveying the Regional Storm event without overtopping Fairview Street, determined through a detailed design process, to the satisfaction of the City of Burlington and Conservation Halton…”
  - “The Parties agree that the Owner shall prepare an update to the Environmental Assessment dated [February 11, 2019] (the “Flood Control EA”). This update shall be appended to the Flood Control EA as an addendum to evaluate the upgraded culvert or bridge structure in combination with the widening of the creek channel to increase the conveyance capacity to convey Regional Storm Flows without overtopping Fairview Street,

What Has Changed?

Changes since the February 2019 Appleby Creek Flood Mitigation Study:

November 2023

- City of Burlington amendment to the Official Plan to permit mixed-use and high density on the Oval Court Lands was based on the following:
  - Intensification consistent with the Provincial Policy Statement;
  - Conformity to the Halton Region Official Plan and Official Plan for the Burlington Planning Area; and,
  - Subject to the existing limits flooding being refined due to future upgrades to the Fairview Street creek crossing and alterations to Appleby Creek and associated hazard lands to ensure development is outside of hazardous lands and to provide safe access.

November 2023

- City of Burlington completed a review of the portion of the cost of the creek crossing and creek works that are eligible for Development Charge, included in the Development Charge By-law.

February 2024

- Addendum to the 2019 Appleby Creek Flood Mitigation MCEA initiated.

Revised Preferred Solution

To increase the capacity of the crossing structure to convey the Regional Storm Flows without overtopping Fairview Street, the alternatives considered in the 2019 Appleby Creek Flood Mitigation Study were reviewed.

A larger span structure was preferred when compared to the 17m span structure based on the following:

- Ability to convey the 100-year and Regional storm
- Limited increase in road surface elevation above the current profile
- Less grading required for access and connection to adjacent properties
- Similar cost for each option (within 5%)
- Shorter duration of construction

Criteria for Evaluating Alternatives	Larger Span Rigid Frame Structures	Clear Span Bridge (17m)
Summary Natural Environment		
Impact to water quality, quantity, aquatic habitat, impact to terrestrial habitat, species at risk, impact to climate change	◔	◔
Summary Socio-Cultural Environment		
conformity to local planning provisions, property impacts, access to adjacent properties, impact to cultural resources, construction duration	○	◔
Summary Financial Factors		
Capital Costs (cost of each option is within 5%), Operating and Maintenance Costs	○	◔
Summary Technical Factors		
Bridge Profile / Impact to Road Elevation, hydraulic performance, foundation requirements	○	◑
Problem / Opportunity Statement		
Addresses Problem / Opportunity Statement	Yes	Yes
Overall Summary	**Most Preferred**	**Least Preferred**

- Least Preferred ●
- Less Preferred ◕
- Somewhat Preferred ◑
- More Preferred ◔
- Most Preferred ○

Revised Preferred Solution

2019 Fairview Street Crossing Evaluation- Updated

Table 4-28. Evaluation Matrix of Alternatives for Reach 3

EVALUATION CRITERIA		Alternative 1 - Do Nothing		Alternative 2 - Fairview Street Bridge Improvements (17m Span - 100-yr Conveyance)		Alternative 3 - Fairview Street Bridge Improvements (60m Span - Regional Conveyance)	
		Score	Explanation	Score	Explanation	Score	Explanation
Physical, Technical and Engineering Criteria							
Potential Impact to Flood Risks	Reduction to the number of building within the flood limits	0	9 buildings within regional flood limit and 2 buildings in 100-yr flood limit	5	4 buildings within regional flood limit and 2 buildings in 100-yr flood limit	8	3 buildings within regional flood limit and 2 buildings in 100-yr flood limit
	Maximum bridge conveyance capacity (i.e., limited backwatering)	1	No increase to flood flow capacity (10-yr flood)	8	100-year floods conveyed	10	Regional floods conveyed
	Decrease in frequency of road overtopping	5	Only regional flood overtops New Street	5	Only regional flood overtops New Street	7	No analyzed flows are expected to overtop New Street
Channel Erosion	Potential impact to channel erosion within reach	5	No significant erosion issues at this time	7	Increased conveyance at bridge will decrease shear and velocity	7	Increased conveyance at bridge will decrease shear and velocity
Impact on Existing Infrastructure	Potential impact to the surrounding infrastructure (e.g., sewers, watermains, gas, roads) during and after constructions	10	Surrounding utilities are well protected from erosion or deterioration. No relocation required at this time.	5	Significant relocation of utilities	0	Significant relocation of utilities, Also, road and all driveways will have to be raised.
Lifespan of Works	Potential to increase the expected lifespan/years of works before intervention needs to be repeated	5	Infrastructure approaching half of lifespan	10	New bridge lifespan > 50 years	10	New bridge lifespan > 50 years
Physical, Technical and Engineering Criteria Subtotal		**26**		**40**		**42**	
Weighted Score for Physical and Natural Criteria (maximum of 50 pts)		**22**		**33**		**35**	
Natural, Social and Cultural Criteria							
Aquatic Habitat	Potential to impact aquatic habitat conditions, including channel features and overhanging vegetation	2	No improvements to the degraded aquatic habitat. Culvert prevents fish passage creates an impervious in channel bed	8	Potential to increase fish passage through bridge. Opportunities to remove fish barrier upstream of the bridge.	8	Potential to increase fish passage through the culvert. Opportunities to remove fish barrier upstream of the bridge.
Terrestrial Vegetation	Potential impact to the existing mature trees and canopy cover in river corridor	10	No tree removals required	7	Minimal tree removals required for culvert replacement	7	Minimal tree removals required for culvert replacement
Terrestrial Habitat	Potential impact to connectivity, diversity and quantity / quality of terrestrial habitat	5	No impact on the existing terrestrial habitat. Limited bridge span currently restricts terrestrial passage.	8	Improved terrestrial connectivity through new culvert. Limited disturbance upstream.	10	Further improved terrestrial connectivity through new culvert. Limited disturbance upstream.
Public Health and Safety	Potential impact to public health and safety includes risk to private property, parking lots, roads, footbridges and public trails	2	Continued flood risks (no risks of infrastructure failure)	6	Flood frequency reduced, & many houses removed from flood limits	9	Flood frequency further reduced, & many houses removed from flood limits
Landowner Impacts	Potential impacts associated with the construction of facilities, particularly with respect to land uses such as residential and schools. Access / egress also needs to be considered	10	No disturbance to private properties	3	High level of disruption to local residents during construction as Fairview Street will be closed, potentially for several months.	0	High level of disruption to local residents during construction as Fairview Street will be closed, potentially for several months. A section of Fairview Street will need to be reconstructed and could impact driveway access.
Aesthetic Value	Potential for alternative to be an asset to the community by integrating facility into the surrounding community aesthetics	4	Aging infrastructure is not aesthetically pleasing.	8	New bridge will be aesthetically pleasing	8	New bridge will be aesthetically pleasing
Natural, Social and Cultural Criteria Subtotal		**33**		**40**		**42**	
Weighted Score for Social and Cultural Criteria (maximum of 25 pts)		**14**		**17**		**18**	
Economic Criteria							
Capital Costs	The relative estimated costs of implementing the proposed treatment based on factors such as location, access / egress and area to dispose material	10	No capital costs	5	Second highest costs associated with minor channel work and bridge replacement	0	Most significant capital costs, with minor channel work, bridge replacement and road realignment
Operations & Maintenance Costs	The relative cost of operating and maintaining the facility based on factors such as location, access / egress and availability of sediment drying area	8	Minimal maintenance presently required.	8	Minimal maintenance required.	8	Minimal maintenance required.
Economic Criteria Subtotal		**18**		**13**		**8**	
Weighted Score for Economic Criteria (maximum of 25 pts)		**18**		**13**		**8**	
Total Weighted Score (maximum of 100 pts)		**53**		**63**		**61**	

Revise Score from 7 to 8 - The 60 meter span would further decrease velocity and potentially decrease scour down potential in major storm.

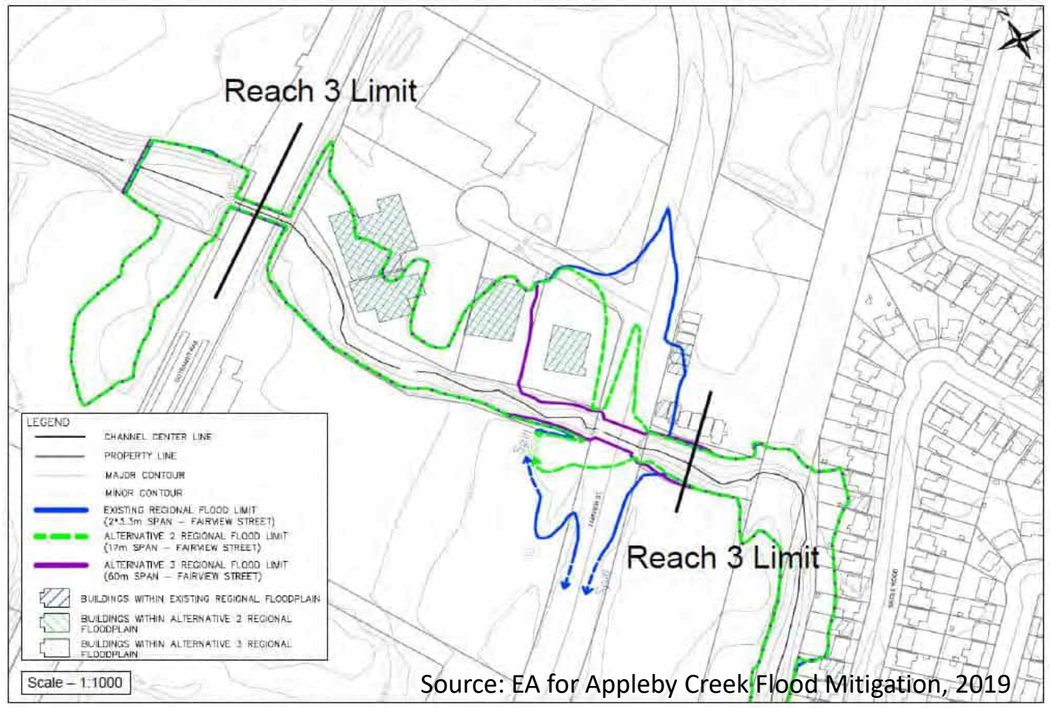
Revise Score from 0 to 3
The disruption for reconstruction of the road in either case is similar in application and duration.

Revise Score from 0 to 3
The review of current cost estimates indicate the variance between the cost of a structure to convey a region storm vs a 100 year storm is <5%
Additional cost may be off set by development charges.

Revise Total Score from 61 to 68
After applying the revised evaluation scores to the table, Alternative 3, the wider span structure becomes the preferred solution.
In addition, Alternative 3 provides a significant increase in the hydraulic conveyance capacity. It is also anticipated to reduce backwater conditions that might occur during the more frequent storm events

Revised Preferred Solution

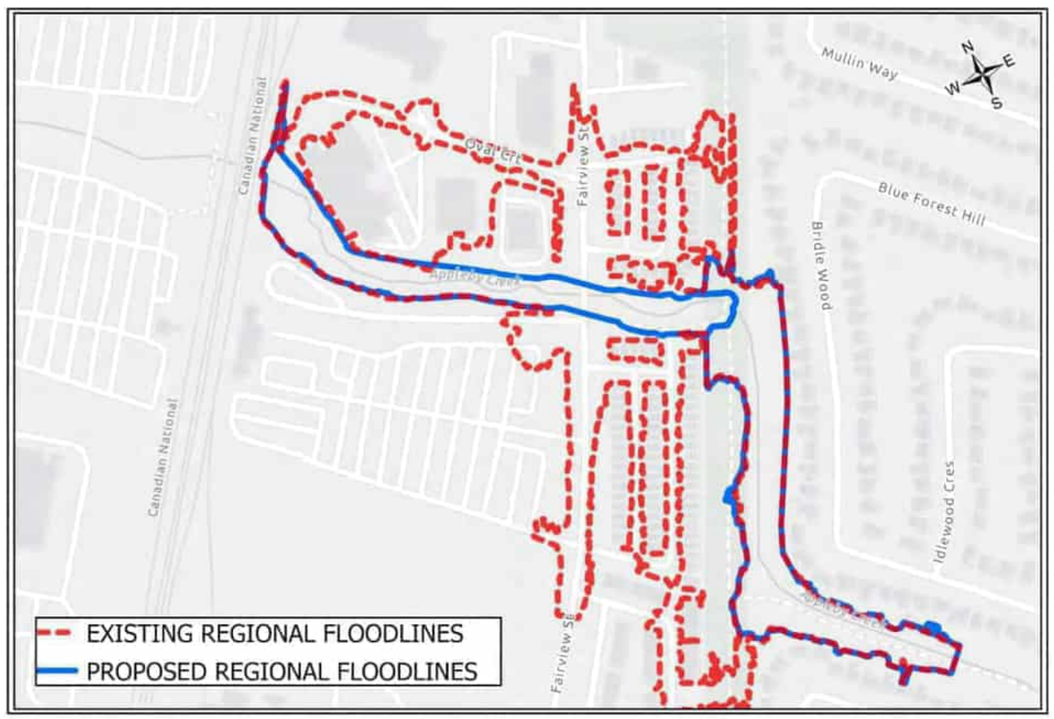
Flood Conditions - Fairview Street Crossing



Source: EA for Appleby Creek Flood Mitigation, 2019

2019 MCEA Preferred Solution (Option 2)

- Fairview Street crossing structure 17m wide to pass the 100-year storm
- maintains the existing road surface elevation
- four (4) buildings on the Oval Court Lands would be located within the Regional floodplain
- water would overtop Fairview Road under Regional storm conditions



2024 MCEA Addendum Revised Solution (Option 3)

- Fairview Street crossing with a larger span structure to pass the 100-year storm and Regional storm conditions
- Minor grade elevation increase on the road surface depending on type of structure selected. Adjacent driveway and may require restoration.
- Existing and proposed buildings on Oval Court lands would be removed from within the Regional floodplain.

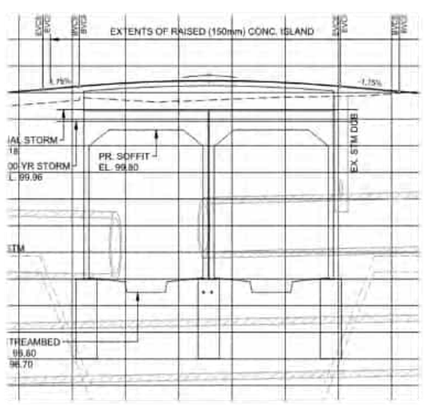
Fairview Street Crossing Structure

Proposed Design Options

To achieve a larger span crossing structure that will pass the Regional storm, three design options are proposed for consideration in detailed design.

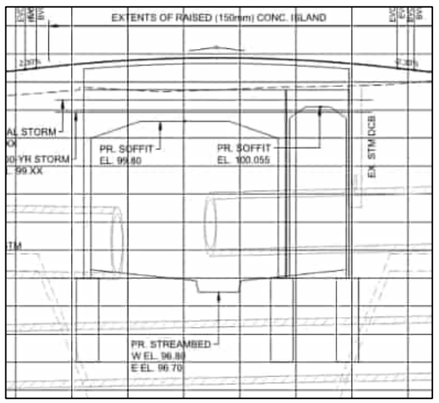
Each option includes upstream and downstream channel improvements as recommended in the 2019 MCEA.

Each option is sized to convey the Regional storm within a modified creek cross-section, without overtopping Fairview Street.



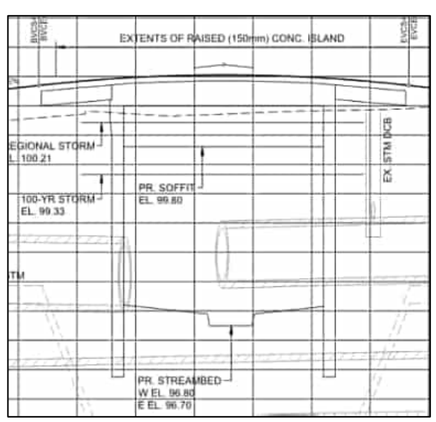
Option 1: Twin Equal Span Precast Rigid Frame Culverts

- two equal precast concrete rigid frame spans of 10 meters, separated by a central pier created by the legs of the frames



Option 2: Two Unequal Span Precast Rigid Frame Culverts

- two unequal precast concrete ridged frames with spans of 16 meters and 4 meters separated by a pier created by the legs of the culverts

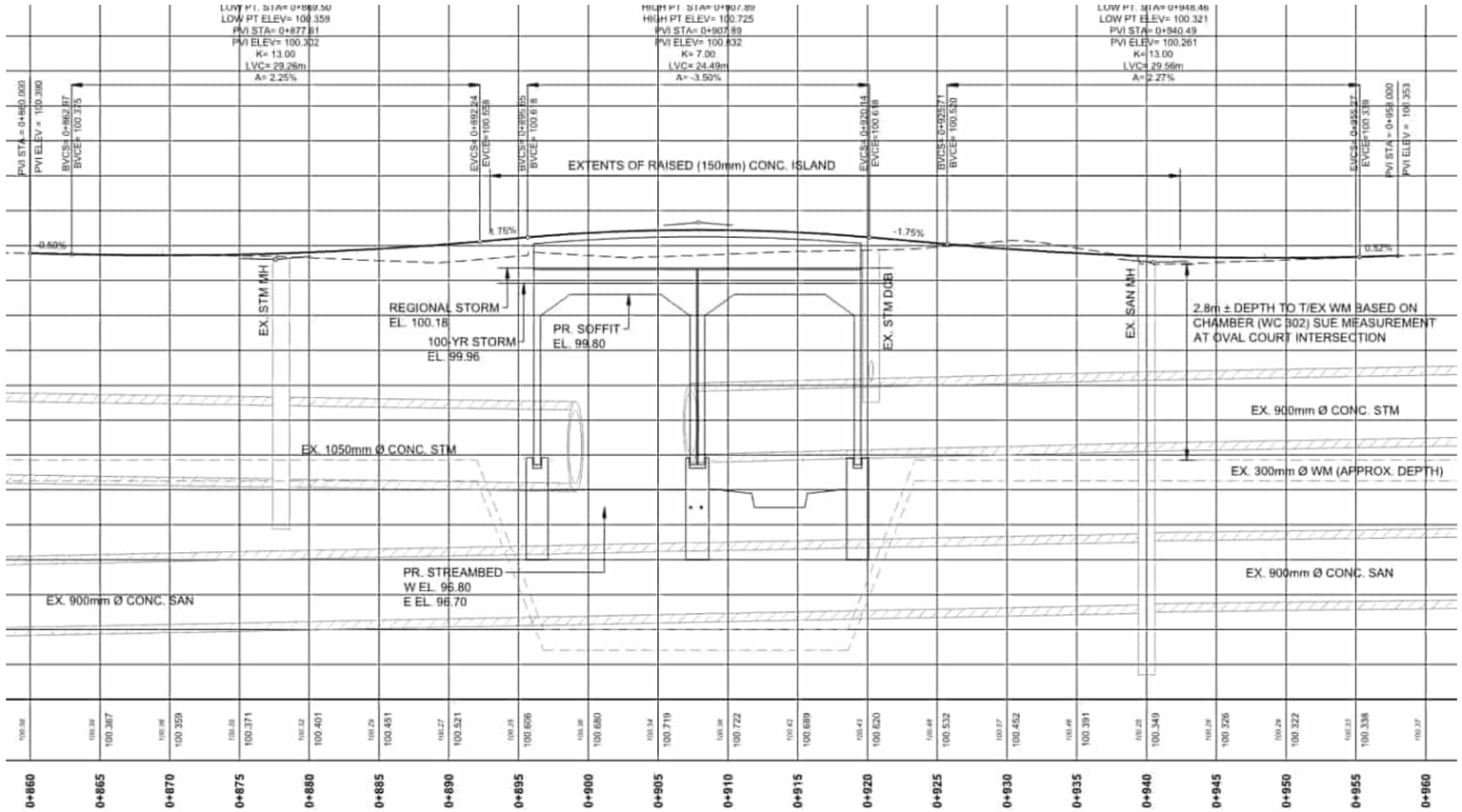


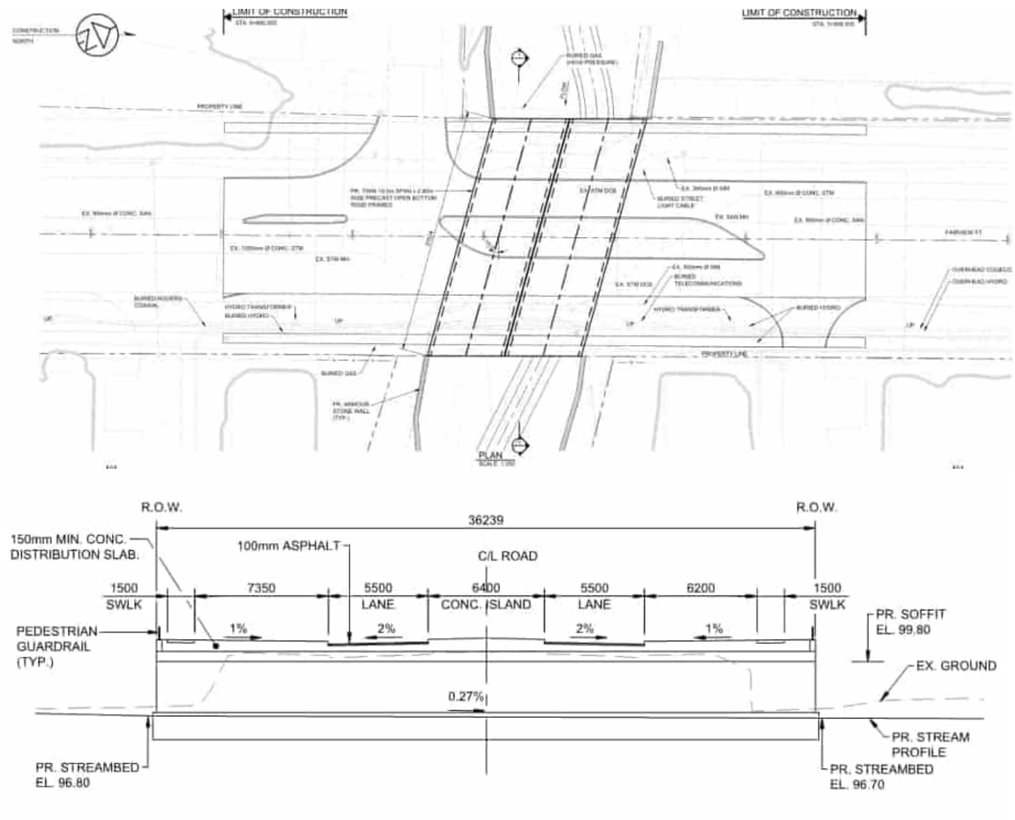
Option 3: Clear Span Precast Box Girder Bridge 17m

- one 17meter clear span box girder bridge structure with no central pier.

Alternative Design Option 1

Twin Equal Span Precast Rigid Frame Culverts

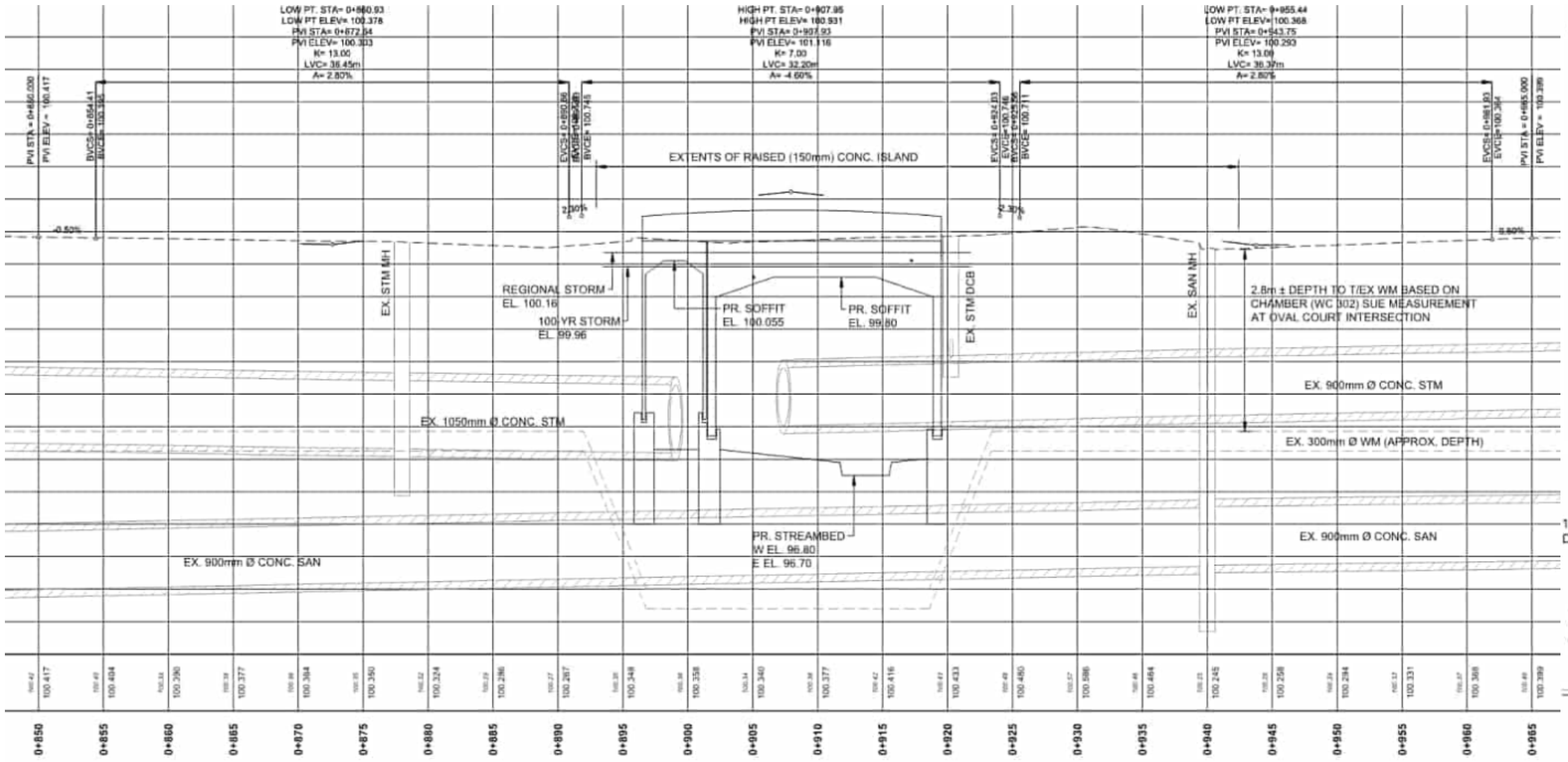


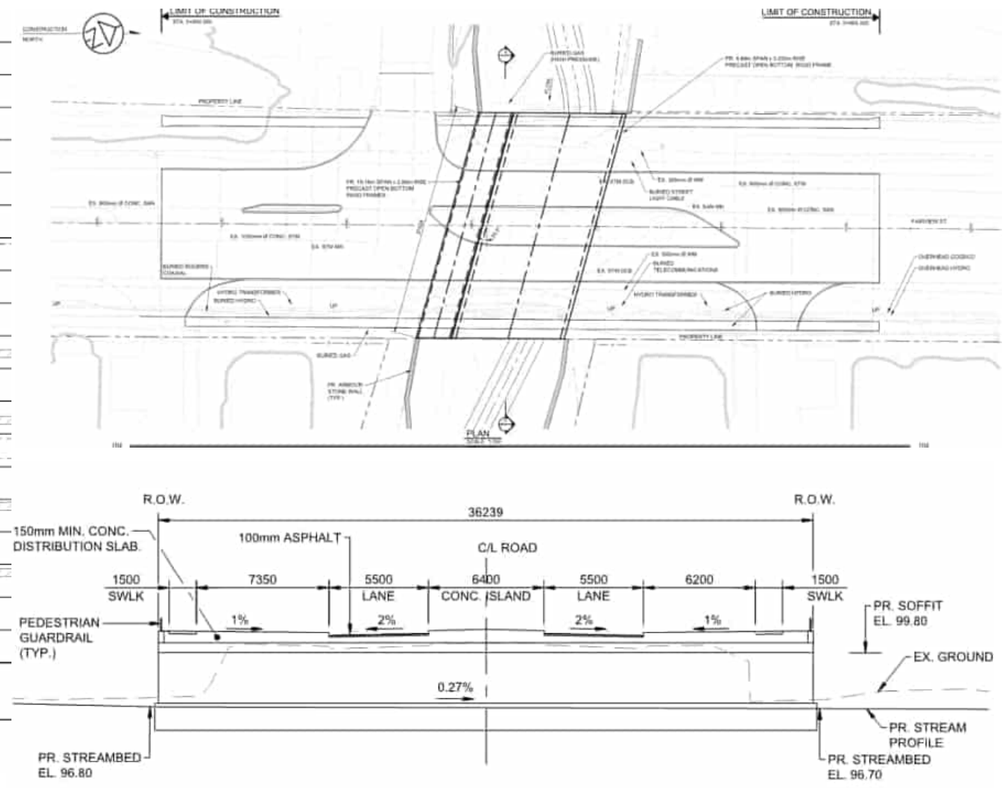


- Twin 10.363 x 2.440 meter precast rigid frames (standard precast size) separated by a central pier, with soffits of both frames set at the same elevation
- Open-bottom rigid frame structures will sit on cast-in-place concrete foundations set into sound rock
- Increase in road elevation above the current road profile is expected to be approximately 350 millimeter based on the thickness of deck of the precast frame and the need for a load distribution slab with built in sidewalks and boulevards
- Bridging over the existing sanitary sewer system may be required where necessary.

Alternative Design Option 2

Two Unequal Span Precast Rigid Frame Culverts

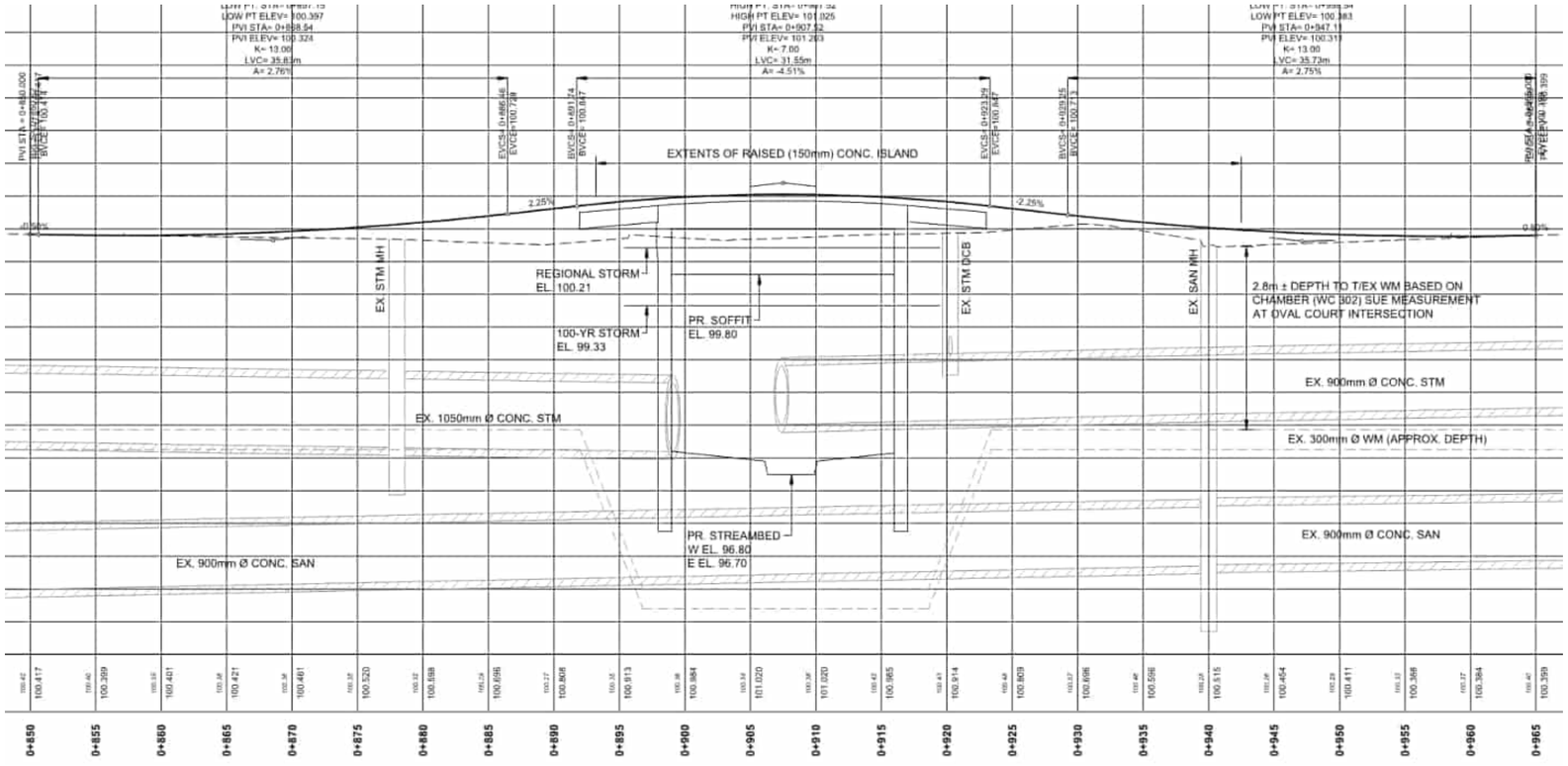


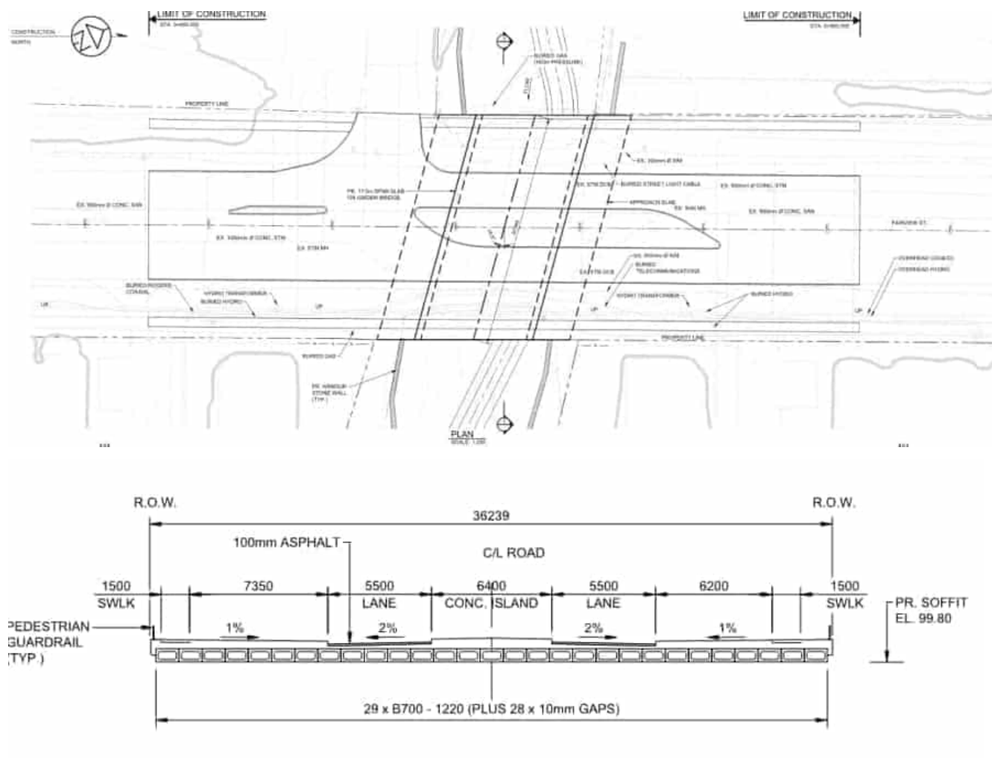


- Two unequal precast rigid frames with spans of 16 meters and 4 meters separated by a pier, with soffits of both frames set at different heights
- Open-bottom rigid frame structures will sit on cast-in-place concrete foundations set into sound rock
- Increase in road elevation above the current road profile is expected to be approximately 550 millimeter based on the thickness of deck of the precast frame.
- Bridging over the existing sanitary sewer system may be required where necessary.

Alternative Design Option 3

Clear Span Precast Box Girder Bridge 17m





- One clear span box girder bridge structure with a span of 17 meter with no central pier
- Open-bottom structure will sit on cast-in-place concrete foundations set into sound rock
- Increase in road elevation above the current road profile is expected to be approximately 700 millimeter based on the thickness of deck of the span box girders
- Bridging over the existing sanitary sewer system may be required where necessary.

Example Barrier Construction

Source: R.J. Burnside and Associates Limited

Parapet Wall with Patterned Concrete and Pedestrian Height Handrail

Source: R.J. Burnside and Associates Limited

Pedestrian Guard Only, with Bicycle Height Handrail

Source: R.J. Burnside and Associates Limited

Parapet Wall with Plain Concrete and Bicycle Height Handrail

Construction Staging

Construction

The construction of the Fairview Street crossing structure must be staged to ensure that access is provided to residential and business areas beyond the structure, including access to Sherwood Forest Park.

First phase -south (downstream) end of the structure:

Starting at the south end allows for enough work area to slide the crossing structure under the existing hydro lines and onto the foundations.

The structure is anticipated to be constructed at the same time as the stream grading and channelization works.

The work area will be isolated from the creek flows using cofferdams. Base creek flows will by-pass the work area using pumping, temporary culverts, temporary channels, or some combination of these as permitted.

Traffic

- Provide one lane in each direction throughout construction.
- Maintain access to driveways and entrances throughout construction.
- Potential for temporary traffic disruption at specific times to be managed by traffic control personnel.

Construction Staging

Stage 1

- Remove centre medians and west boulevard and portions of the sidewalk at the bus entrance road
- Provide a temporary paved road in areas of removals

Stage 2

- Place temporary traffic control devices
- Provide temporary line painting for traffic diversion
- Divert traffic to the west side of the crossing structure
- Remove existing boulevard and sidewalk on the east side
- Remove east portion of the existing crossing structure

Stage 3

- Construct a portion of the crossing structure and headwall

Stage 4

- Place temporary traffic control devices
- Provide temporary line painting for traffic diversion
- Divert traffic to the east side of the crossing structure
- Remove existing sidewalk and road on the west side
- Remove west portion of the existing crossing structure

Stage 5

- Construct remaining portion of the crossing structure, headwall and pedestrian guiderail
- Pave west side of roadway

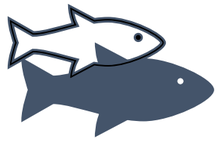
Stage 6

- Grind out and pave east side of roadway
- Remove all temporary traffic barriers and temporary control devices

Design Considerations

Natural Features

- Proposed mitigation measures should be implemented to minimize potential impacts to natural heritage features which are anticipated to be low and short-term.
- Management of surface water (Appleby Creek) and groundwater will be required to construct footings. Mitigation measures and permits from approval authorities may be required.



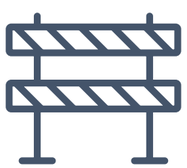
- Construction, including foundations and modifications to the creek are required to be completed during appropriate timing windows to minimize or avoid impact to habitat. Replacement of the existing structure will lead to an overall improvement in fish habitat and valleyland conditions.
- Significant Woodlands, Significant Valleylands, Provincially Significant Wetlands, Significant habitat of Endangered and Threatened species, and Significant Wildlife Habitat are all absent from the proposed project study area.

Utilities

- Infrastructure will need to be managed during construction and / or relocated prior to construction e.g. watermains, storm sewers, sanitary sewers (not to be moved), gas, cable, communications, telephone, and hydro. Excavation should be minimized to limit impact on existing infrastructure.

Road Elevation

- Road profile, intersections and driveways will be impacted to varying degrees by each of the crossing structure options



Access

- Construction activities may impact access to adjacent properties. Access to the park and the residences and businesses beyond Appleby Creek will be maintained at all times.

Next Steps

June 28, 2024

- Review feedback from the Open House

July 8 to August 6, 2024

- 30-Day Addendum review comment period
  - Appleby Creek Flood Mitigation Study Addendum posted for public review and comment until August 8, 2024

Following the Addendum Process

September 2024

- Selection of the preferred design of the Fairview Street crossing structure and complete detailed design

- Implementation

October 2024 to February 2025

- Obtain required permits and approvals
- Begin construction

Thank You

Help shape decisions made in this Study

Please fill out a comment form, or complete and submit the comment form available on the Project website at the link provided.

Open House information materials about the Addendum study will be made available online at *burlington.ca/applebyflood* for review and comment until **June 28, 2024**.

An electronic copy of the Addendum report will be available for viewing on the City webpage for public review and comment for 30 days starting **July 8 and ending August 6, 2024.**

If you would like more information or if you have any questions or concerns, please contact:

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Phone: 905-821-5915
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BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix F

Culvert / Bridge Cost Estimates

ESTIMATED SCHEDULE OF UNIT PRICES
FAIRVIEW STREET CULVERT REPLACEMENT AT APPLEBY CREEK

City of Burlington

3/25/2024

	Twin Equal Culverts	Two Unequal Culverts	Bridge
CONTRACT I - EXISTING RIGHT OF WAY RECONSTRUCTION SERVICING & ROAD CONSTRUCTION:			
1 TWIN EQUAL SPAN CULVERTS	$ 6,548,823	$ -	$ -
2 TWO UNEQUAL SPAN CULVERTS		$ 6,856,503	$ -
3 BRIDGE			$ 6,609,823
TotalConstruction Costs	**$ 6,548,823**	**$ 6,856,503**	**$ 6,609,823**
TOTAL SUBDIVISION - SERVICING AND ROADS:	**$ 6,548,823**	**$ 6,856,503**	**$ 6,609,823**
ENGINEERING FEES 20% TOTAL CONSTRUCTION COSTS:	*$ 1,309,765*	*$ 1,371,301*	*$ 1,321,965*
PROJECT CONTINGENCY 20% TOTAL CONSTRUCTION	*$ 1,309,765*	*$ 1,371,301*	*$ 1,321,965*
	$ 9,168,352	**$ 9,599,104**	**$ 9,253,752**

Fairview Street Culvert Replacement at Appleby Creek
Twin Equal Span Culverts Option

PROJECT: Fairview Street Culvert Replacement at Appleby Creek
BASED ON: Burnside GA
LOCATION: City of Burlington

March 25, 2024

Item	Description	Unit	Unit Rate	COST ESTIMATE Quantity	COST ESTIMATE Amount
1	**Demolition**				
	Sawcut, remove and dispose of Ex. Granular and Asphalt	m^2	$ 14.00	1,570	$ 21,980.00
	Remove and Dispose of Existing Curb and Gutter, including traffic island curb	m	$ 18.00	220	$ 3,964.50
	Remove Ex. 300mm Watermain	m	$ 300.00	40	$ 12,000.00
	Provide bypass for Ex. 300mm Watermain service	L.S.	$ 25,000.00	1	$ 25,000.00
	Ex. Twin 2.2m x 2.74m Box Culverts - 30m length	L.S.	$ 50,000.00	1	$ 50,000.00
	Intercept Ex.900mm Dia Conc. Storm sewers, remove 12.0m of sewer and the Ex. Headwall and pump flows to bypass existing headwall into creek	L.S.	$ 15,000.00	1	$ 15,000.00
	Intercept Ex.1050mm Dia Conc. Storm sewers, remove 5.5m of sewer and the Ex. Headwall and pump flows to bypass existing headwall into creek	L.S.	$ 15,000.00	1	$ 15,000.00
	Remove Ex. Sidewalk and central traffic island	m^2	$ 18.00	430	$ 7,740.00
	Remove Ex. Double Catchbasins	ea.	$ 2,000.00	2	$ 4,000.00
	Remove existing double catchbasin leads	m	$ 300.00	15	$ 4,500.00
				SUBTOTAL	$ 159,184.50
2	**Bridge, Foundations**				
	GENERAL WORK:				
	1.1) Construction Layout for Culvert Works	L.S.	$ 20,000.00	1	$ 20,000.00
	1.2) Grade Checks	L.S.	$ 10,000.00	1	$ 10,000.00
	1.3) As-Built Submissions	L.S.	$ 5,000.00	1	$ 5,000.00
	TEMPORARY CONSTRUCTION				$ -
	2.1) Granular B Type II for Crane Pad	t	$ 48.00	500	$ 24,000.00
	ROAD WORKS:				$ -
	3.1) Granular Backfill (Bridge and Retain Walls)	t	$ 43.00	2,000	$ 86,000.00
	3.2) Structure Connections	ea.	$ 6,000.00	4	$ 24,000.00
	3.3) Steel Beam Guide Rail	m	$ 415.00	100	$ 41,500.00
	3.4) Steel Beam Energy Attenuation Terminal				$ -
	a) Approach End Treatment	ea.	$ 9,500.00	2	$ 19,000.00
	b) Leaving End Treatment	ea.	$ 6,500.00	2	$ 13,000.00
	BRIDGE WORK:				$ -
	4.1 Waterway Control		$ 50,000.00	1	$ 50,000.00
	4.2) Unwatering/Dewatering Structure Excavations	L.S.	$ 50,000.00	1	$ 50,000.00
	4.3) Pipe Subdrain	m	$ 70.00	100	$ 7,000.00
	4.4) Excavation for Structure	L.S	$ 75,000.00	1	$ 75,000.00
	4.5) Concrete in Working Slabs (Provisional)	m^3	$ 550.00	60	$ 33,000.00
	4.6) Concrete in Footings	m^3	$ 1,100.00	280	$ 308,000.00
	4.7) Concrete in Distribution/Deck	L.S.	$ 495,000.00	1	$ 495,000.00
	4.8) Concrete in headwalls and wingwalls	L.S.	$ 125,000.00	1	$ 125,000.00
	4.9) Concrete in Parapet Walls (on Bridge)	L.S.	$ 40,000.00	1	$ 40,000.00
	4.10) Concrete in Approach Slabs	L.S.	$ 100,000.00	1	$ 100,000.00
	4.11) Parapet Wall Form Liner	m^2	$ 300.00	60	$ 18,000.00
	4.12) Parapet Wall Railing	L.S.	$ 25,000.00	1	$ 25,000.00
	4.13) Prestressed Concrete Members - Fabrication	L.S.	$ 1,440,000.00	1	$ 1,440,000.00
	4.14) Prestressed Concrete Members - Delivery	L.S.	$ 150,000.00	1	$ 150,000.00
	4.15) Prestressed Concrete Members - Erection	L.S.	$ 300,000.00	1	$ 300,000.00
	4.16) Electrical and Ducts, Handholds, and Conduits	L.S.	$ 20,000.00	1	$ 20,000.00
	4.17) Joint Fillers, Seals and Compounds	L.S.	$ 5,000.00	1	$ 5,000.00
	4.18) Bearings	ea.	$ -	16	$ -
	4.19) Glass Fibre Reinforced Polymer Reinforcing	L.S.	$ 60,000.00	1	$ 60,000.00
	4.20) Reinforcing Steel Bar	L.S.	$ 180,000.00	1	$ 120,000.00
	4.21) Reinforcing Stainless Steel Bar	L.S.		1	$ -
	SITE RESTORATION WORK:				
	5.1) Rip-Rap	t	$ 100.00	100	$ 10,000.00
	5.2) Topsoil from Stockpiles	m^3	$ 50.00	50	$ 2,500.00
	5.3) Seed and Erosion Control Blanket	m^2	$ 5.00	100	$ 500.00
	PREMIUM FOR STAGING:				
	6.1 Premium for Staging	L.S.	$ 735,300.00	1	$ 735,300.00
				SUBTOTAL	$ 4,411,800.00
3	**Retaining Walls and Foundations**				
	Cast in place 0.75m high safety wall with R-bar	m^3	$ 6,050.00	0	$ -
	Cut and export (including existing road make up)	m^3	$ 50.00	3,300	$ 165,000.00
	Granular A Backfill	m^3	$ 100.00	720	$ 72,000.00
				SUBTOTAL	$ 237,000.00
4	**Road Reconstruction**				
	HL3 (40mm)	m^2	$ 22.00	1,570	$ 34,540.00
	HL8 (80mm)	m^2	$ 22.00	1,570	$ 34,540.00
	Granular A (150mm)	m^2	$ 17.00	1,570	$ 26,690.00
	Granular B (300mm)	m^2	$ 20.00	1,649	$ 32,970.00
	Two Stage Curb and Gutter with subdrain	m	$ 150.00	117	$ 17,550.00
	Concrete Center Island with barrier curb	m	$ 600.00	104	$ 62,190.00
	Concrete cast in place transfer slab (0.3m thick)	m^3	$ 6,050.00	0	$ -
	Proposed 2.0m Sidewalk with 150mm depth Granular A leveling course	m^2	$ 110.00	185	$ 20,350.00
	Cast in place protection for Sanitary sewer with R-Bar	m^3	$ 6,050.00	96	$ 582,978.00
	Topsoil and Sod Boulevard	m^2	$ 10.00	430	$ 4,300.00
	Traffic Control (Allowance)	L.S.	$ 10,000.00	1	$ 10,000.00
	Signage and Striping (Allowance)	L.S.	$ 3,000.00	1	$ 3,000.00
	Relocate Street Lights (Allowance)	L.S.	$ 20,000.00	1	$ 20,000.00
				SUBTOTAL	$ 849,108.00
5	**Existing Utility Relocations**				
	Replace double catchbasins	ea.	$ 10,000.00	2	$ 20,000.00
	Install 300mm diameter catchbasin leads	m	$ 300.00	15	$ 4,380.00
	Connect Ex. 900mm storm sewer into new culvert	L.S.	$ 5,000.00	1	$ 5,000.00
	900mm dia. Concrete Storm Sewer	m	$ 1,100.00	5	$ 5,500.00
	Connect Ex. 1050mm storm sewer into new culvert	L.S.	$ 5,000.00	1	$ 5,000.00
	1050mm dia. Concrete Storm Sewer	m	$ 1,300.00	5	$ 6,500.00
	Relocate EX. Drain valve chamber	L.S.	$ 50,000.00	1	$ 50,000.00
	Install 300mm PVC Watermain	m	$ 430.00	45	$ 19,350.00
	Connect to Ex. 300mm PVC Watermain	ea.	$ 10,000.00	2	$ 20,000.00
	Steel Liner for 500mm watermain	m	$ 3,200.00	30	$ 96,000.00
	Steel Liner for 300mm watermain	m	$ 2,000.00	30	$ 60,000.00
	Relocate Ex.hydro conduits, telecom and fiber optic, gasmains (Allowance)	L.S.	$ 600,000.00	1	$ 600,000.00
				SUBTOTAL	$ 891,730.00

	COST ESTIMATE
TOTAL Twin Equal Span Culverts Option :	***$ 6,548,822.50***
20% Consulting Fees:	***$ 1,309,764.50***
20% Contingency:	***$ 1,309,764.50***
TOTAL Fairview Street Culvert Replacement at Appleby Creek Twin Equal Span Culverts Option (Incl. 25% Contingency):	***$ 9,168,351.50***

Fairview Street Culvert Replacement at Appleby Creek
Two Unequal Span Culverts Option

PROJECT: Fairview Street Culvert Replacement at Appleby Creek
BASED ON: Burnside GA
LOCATION: City of Burlington

March 25, 2024

Item	Description	Unit	Unit Rate	COST ESTIMATE Quantity	COST ESTIMATE Amount
1	**Demolition**				
	Sawcut, remove and dispose of Ex. Granular and Asphalt	m^2	$ 14.00	1,750	$ 24,500.00
	Remove and Dispose of Existing Curb and Gutter, including traffic island curb	m	$ 18.00	220	$ 3,964.50
	Remove Ex. 300mm Watermain	m	$ 300.00	40	$ 12,000.00
	Provide bypass for Ex. 300mm Watermain service	L.S.	$ 25,000.00	1	$ 25,000.00
	Ex. Twin 2.2m x 2.74m Box Culverts - 30m length	L.S.	$ 50,000.00	1	$ 50,000.00
	Intercept Ex.900mm Dia Conc. Storm sewers, remove 12.0m of sewer and the Ex. Headwall and pump flows to bypass existing headwall into creek	L.S.	$ 15,000.00	1	$ 15,000.00
	Intercept Ex.1050mm Dia Conc. Storm sewers, remove 5.5m of sewer and the Ex. Headwall and pump flows to bypass existing headwall into creek	L.S.	$ 15,000.00	1	$ 15,000.00
	Remove Ex. Sidewalk and central traffic island	m^2	$ 18.00	430	$ 7,740.00
	Remove Ex. Double Catchbasins	ea.	$ 2,000.00	2	$ 4,000.00
	Remove existing double catchbasin leads	m	$ 300.00	15	$ 4,500.00
				SUBTOTAL	$ 161,704.50
2	**Bridge, Foundations**				
	GENERAL WORK:				
	1.1) Construction Layout for Culvert Works	L.S.	$ 20,000.00	1	$ 20,000.00
	1.2) Grade Checks	L.S.	$ 10,000.00	1	$ 10,000.00
	1.3) As-Built Submissions	L.S.	$ 5,000.00	1	$ 5,000.00
	TEMPORARY CONSTRUCTION				$ -
	2.1) Granular B Type II for Crane Pad	t	$ 48.00	500	$ 24,000.00
	ROAD WORKS:				$ -
	3.1) Granular Backfill (Bridge and Retain Walls)	t	$ 43.00	2,000	$ 86,000.00
	3.2) Structure Connections	ea.	$ 6,000.00	4	$ 24,000.00
	3.3) Steel Beam Guide Rail	m	$ 415.00	100	$ 41,500.00
	3.4) Steel Beam Energy Attenuation Terminal				$ -
	a) Approach End Treatment	ea.	$ 9,500.00	2	$ 19,000.00
	b) Leaving End Treatment	ea.	$ 6,500.00	2	$ 13,000.00
	BRIDGE WORK:				$ -
	4.1 Waterway Control		$ 50,000.00	1	$ 50,000.00
	4.2) Unwatering/Dewatering Structure Excavations	L.S.	$ 50,000.00	1	$ 50,000.00
	4.3) Pipe Subdrain	m	$ 70.00	100	$ 7,000.00
	4.4) Excavation for Structure	L.S	$ 75,000.00	1	$ 75,000.00
	4.5) Concrete in Working Slabs (Provisional)	m^3	$ 550.00	60	$ 33,000.00
	4.6) Concrete in Footings	m^3	$ 1,100.00	280	$ 308,000.00
	4.7) Concrete in Distribution/Deck	L.S.	$ 495,000.00	1	$ 495,000.00
	4.8) Concrete in headwalls and wingwalls	L.S.	$ 125,000.00	1	$ 125,000.00
	4.9) Concrete in Parapet Walls (on Bridge)	L.S.	$ 40,000.00	1	$ 40,000.00
	4.10) Concrete in Approach Slabs	L.S.	$ 100,000.00	1	$ 100,000.00
	4.11) Parapet Wall Form Liner	m^2	$ 300.00	60	$ 18,000.00
	4.12) Parapet Wall Railing	L.S.	$ 25,000.00	1	$ 25,000.00
	4.13) Prestressed Concrete Members - Fabrication	L.S.	$ 1,712,000.00	1	$ 1,712,000.00
	4.14) Prestressed Concrete Members - Delivery	L.S.	$ 120,000.00	1	$ 120,000.00
	4.15) Prestressed Concrete Members - Erection	L.S.	$ 300,000.00	1	$ 300,000.00
	4.16) Electrical and Ducts, Handholds, and Conduits	L.S.	$ 20,000.00	1	$ 20,000.00
	4.17) Joint Fillers, Seals and Compounds	L.S.	$ 5,000.00	1	$ 5,000.00
	4.18) Bearings	ea.	$ -	16	$ -
	4.19) Glass Fibre Reinforced Polymer Reinforcing	L.S.	$ 60,000.00	1	$ 60,000.00
	4.20) Reinforcing Steel Bar	L.S.	$ 180,000.00	1	$ 120,000.00
	4.21) Reinforcing Stainless Steel Bar	L.S.		1	$ -
	SITE RESTORATION WORK:				
	5.1) Rip-Rap	t	$ 100.00	100	$ 10,000.00
	5.2) Topsoil from Stockpiles	m^3	$ 50.00	50	$ 2,500.00
	5.3) Seed and Erosion Control Blanket	m^2	$ 5.00	100	$ 500.00
	PREMIUM FOR STAGING:				
	6.1 Premium for Staging	L.S.	$ 783,700.00	1	$ 783,700.00
				SUBTOTAL	$ 4,702,200.00
3	**Retaining Walls and Foundations**				
	Cast in place 0.75m high safety wall with R-bar	m^3	$ 6,050.00	0	$ -
	Cut and export (including existing road make up)	m^3	$ 50.00	3,300	$ 165,000.00
	Granular A Backfill	m^3	$ 100.00	720	$ 72,000.00
				SUBTOTAL	$ 237,000.00
4	**Road Reconstruction**				
	HL3 (40mm)	m^2	$ 22.00	1,750	$ 38,500.00
	HL8 (80mm)	m^2	$ 22.00	1,750	$ 38,500.00
	Granular A (150mm)	m^2	$ 17.00	1,750	$ 29,750.00
	Granular B (300mm)	m^2	$ 20.00	1,838	$ 36,750.00
	Two Stage Curb and Gutter with subdrain	m	$ 150.00	117	$ 17,550.00
	Concrete Center Island with barrier curb	m	$ 600.00	104	$ 62,190.00
	Concrete cast in place transfer slab (0.3m thick)	m^3	$ 6,050.00	0	$ -
	Proposed 2.0m Sidewalk with 150mm depth Granular A leveling course	m^2	$ 110.00	185	$ 20,350.00
	Cast in place protection for Sanitary sewer with R-Bar	m^3	$ 6,050.00	96	$ 582,978.00
	Topsoil and Sod Boulevard	m^2	$ 10.00	430	$ 4,300.00
	Traffic Control (Allowance)	L.S.	$ 10,000.00	1	$ 10,000.00
	Signage and Striping (Allowance)	L.S.	$ 3,000.00	1	$ 3,000.00
	Relocate Street Lights (Allowance)	L.S.	$ 20,000.00	1	$ 20,000.00
				SUBTOTAL	$ 863,868.00
5	**Existing Utility Relocations**				
	Replace double catchbasins	ea.	$ 10,000.00	2	$ 20,000.00
	Install 300mm diameter catchbasin leads	m	$ 300.00	15	$ 4,380.00
	Connect Ex. 900mm storm sewer into new culvert	L.S.	$ 5,000.00	1	$ 5,000.00
	900mm dia. Concrete Storm Sewer	m	$ 1,100.00	5	$ 5,500.00
	Connect Ex. 1050mm storm sewer into new culvert	L.S.	$ 5,000.00	1	$ 5,000.00
	1050mm dia. Concrete Storm Sewer	m	$ 1,300.00	5	$ 6,500.00
	Relocate EX. Drain valve chamber	L.S.	$ 50,000.00	1	$ 50,000.00
	Install 300mm PVC Watermain	m	$ 430.00	45	$ 19,350.00
	Connect to Ex. 300mm PVC Watermain	ea.	$ 10,000.00	2	$ 20,000.00
	Steel Liner for 500mm watermain	m	$ 3,200.00	30	$ 96,000.00
	Steel Liner for 300mm watermain	m	$ 2,000.00	30	$ 60,000.00
	Relocate Ex.hydro conduits, telecom and fiber optic, gasmains (Allowance)	L.S.	$ 600,000.00	1	$ 600,000.00
				SUBTOTAL	$ 891,730.00

	COST ESTIMATE
TOTAL Two Unequal Span Culverts Option :	***$ 6,856,502.50***
20% Consulting Fees:	***$ 1,371,300.50***
20% Contingency:	***$ 1,371,300.50***
TOTAL Fairview Street Culvert Replacement at Appleby Creek Two Unequal Span Culverts Option (Incl. 25% Contingency):	***$ 9,599,103.50***

Fairview Street Culvert Replacement at Appleby Creek
Bridge Option

PROJECT: Fairview Street Culvert Replacement at Appleby Creek
BASED ON: Burnside GA
LOCATION: City of Burlington

March 25, 2024

Item	Description	Unit	Unit Rate	COST ESTIMATE Quantity	COST ESTIMATE Amount
1	**Demolition**				
	Sawcut, remove and dispose of Ex. Granular and Asphalt	m^2	$ 14.00	1,860	$ 26,040.00
	Remove and Dispose of Existing Curb and Gutter, including traffic island curb	m	$ 18.00	220	$ 3,964.50
	Remove Ex. 300mm Watermain	m	$ 300.00	40	$ 12,000.00
	Provide bypass for Ex. 300mm Watermain service	L.S.	$ 25,000.00	1	$ 25,000.00
	Ex. Twin 2.2m x 2.74m Box Culverts - 30m length	L.S.	$ 50,000.00	1	$ 50,000.00
	Intercept Ex.900mm Dia Conc. Storm sewers, remove 12.0m of sewer and the Ex. Headwall and pump flows to bypass existing headwall into creek	L.S.	$ 15,000.00	1	$ 15,000.00
	Intercept Ex.1050mm Dia Conc. Storm sewers, remove 5.5m of sewer and the Ex. Headwall and pump flows to bypass existing headwall into creek	L.S.	$ 15,000.00	1	$ 15,000.00
	Remove Ex. Sidewalk and central traffic island	m^2	$ 18.00	430	$ 7,740.00
	Remove Ex. Double Catchbasins	ea.	$ 2,000.00	2	$ 4,000.00
	Remove existing double catchbasin leads	m	$ 300.00	15	$ 4,500.00
				SUBTOTAL	$ 163,244.50
2	**Bridge, Foundations**				
	GENERAL WORK:				
	1.1) Construction Layout for Bridge Works	L.S.	$ 20,000.00	1	$ 20,000.00
	1.2) Grade Checks for Bridge Works	L.S.	$ 10,000.00	1	$ 10,000.00
	1.3) As-Built Submissions of Bridge Works	L.S.	$ 5,000.00	1	$ 5,000.00
	TEMPORARY CONSTRUCTION				$ -
	2.1) Granular B Type II for Crane Pad	t	$ 48.00	500	$ 24,000.00
	ROAD WORKS:				$ -
	3.1) Granular Backfill (Bridge and Retain Walls)	t	$ 43.00	2,000	$ 86,000.00
	3.2) Structure Connections	ea.	$ 6,000.00	4	$ 24,000.00
	3.3) Steel Beam Guide Rail	m	$ 415.00	100	$ 41,500.00
	3.4) Steel Beam Energy Attenuation Terminal				$ -
	a) Approach End Treatment	ea.	$ 9,500.00	2	$ 19,000.00
	b) Leaving End Treatment	ea.	$ 6,500.00	2	$ 13,000.00
	BRIDGE WORK:				$ -
	4.1) Waterway Control	L.S.	$ 50,000.00	1	$ 50,000.00
	4.2) Unwatering/Dewatering Structure Excavations	L.S.	$ 50,000.00	1	$ 50,000.00
	4.3) Pipe Subdrain	m	$ 70.00	100	$ 7,000.00
	4.4) Earth Excavation for Structure	L.S	$ 50,000.00	1	$ 50,000.00
	4.5) Concrete in Working Slabs (Provisional)	m^3	$ 550.00	42	$ 23,100.00
	4.6) Concrete in Footings	m^3	$ 1,100.00	250	$ 275,000.00
	4.7) Concrete in Substructure & Wings	L.S.	$ 350,000.00	1	$ 350,000.00
	4.8) Concrete in Deck	L.S.	$ 495,000.00	1	$ 495,000.00
	4.9) Concrete in Parapet Walls (on Bridge)	L.S.	$ 40,000.00	1	$ 40,000.00
	4.10) Concrete in Approach Slabs	L.S.	$ 100,000.00	1	$ 100,000.00
	4.11) Parapet Wall Form Liner	m^2	$ 300.00	60	$ 18,000.00
	4.12) Parapet Wall Railing	L.S.	$ 25,000.00	1	$ 25,000.00
	4.13) Prestressed Concrete Members - Fabrication	L.S.	$ 1,280,000.00	1	$ 1,280,000.00
	4.14) Prestressed Concrete Members - Delivery	L.S.	$ 115,000.00	1	$ 115,000.00
	4.15) Prestressed Concrete Members - Erection	L.S.	$ 200,000.00	1	$ 200,000.00
	4.16) Electrical and Ducts, Handholds, and Conduits	L.S.	$ 20,000.00	1	$ 20,000.00
	4.17) Joint Fillers, Seals and Compounds	L.S.	$ 5,000.00	1	$ 5,000.00
	4.18) Bearings	ea.	$ 750.00	42	$ 31,500.00
	4.19) Glass Fibre Reinforced Polymer Reinforcing	L.S.	$ 60,000.00	1	$ 60,000.00
	4.20) Reinforcing Steel Bar	L.S.	$ 250,000.00	1	$ 250,000.00
	4.21) Reinforcing Stainless Steel Bar	L.S.		1	$ -
	SITE RESTORATION WORK:				
	5.1) Rip-Rap	t	$ 100.00	100	$ 10,000.00
	5.2) Topsoil from Stockpiles	m^3	$ 50.00	50	$ 2,500.00
	5.3) Seed and Erosion Control Blanket	m^2	$ 5.00	100	$ 500.00
	PREMIUM FOR STAGING:				
	6.1 Premium for Staging	L.S.	$ 740,020.00	1	$ 740,020.00
				SUBTOTAL	$ 4,440,120.00
3	**Retaining Walls and Foundations**				
	Cast in place 0.75m high safety wall with R-bar	m^3	$ 6,050.00	0	$ -
	Cut and export (including existing road make up)	m^3	$ 50.00	3,300	$ 165,000.00
	Granular A Backfill	m^3	$ 100.00	720	$ 72,000.00
				SUBTOTAL	$ 237,000.00
4	**Road Reconstruction**				
	HL3 (40mm)	m^2	$ 22.00	1,860	$ 40,920.00
	HL8 (80mm)	m^2	$ 22.00	1,860	$ 40,920.00
	Granular A (150mm)	m^2	$ 17.00	1,860	$ 31,620.00
	Granular B (300mm)	m^2	$ 20.00	2,195	$ 43,900.00
	Two Stage Curb and Gutter with subdrain	m	$ 150.00	117	$ 17,550.00
	Concrete Center Island with barrier curb	m	$ 600.00	104	$ 62,190.00
	Concrete cast in place transfer slab (0.3m thick)	m^3	$ 6,050.00	0	$ -
	Proposed 2.0m Sidewalk with 150mm depth Granular A leveling course	m^2	$ 110.00	185	$ 20,350.00
	Cast in place protection for Sanitary sewer with R-Bar	m^3	$ 6,050.00	96	$ 582,978.00
	Topsoil and Sod Boulevard	m^2	$ 10.00	430	$ 4,300.00
	Traffic Control (Allowance)	L.S.	$ 10,000.00	1	$ 10,000.00
	Signage and Striping (Allowance)	L.S.	$ 3,000.00	1	$ 3,000.00
	Relocate Street Lights (Allowance)	L.S.	$ 20,000.00	1	$ 20,000.00
				SUBTOTAL	$ 877,728.00
5	**Existing Utility Relocations**				
	Replace double catchbasins	ea.	$ 10,000.00	2	$ 20,000.00
	Install 300mm diameter catchbasin leads	m	$ 300.00	15	$ 4,380.00
	Connect Ex. 900mm storm sewer into new culvert	L.S.	$ 5,000.00	1	$ 5,000.00
	900mm dia. Concrete Storm Sewer	m	$ 1,100.00	5	$ 5,500.00
	Connect Ex. 1050mm storm sewer into new culvert	L.S.	$ 5,000.00	1	$ 5,000.00
	1050mm dia. Concrete Storm Sewer	m	$ 1,300.00	5	$ 6,500.00
	Relocate EX. Drain valve chamber	L.S.	$ 50,000.00	1	$ 50,000.00
	Install 300mm PVC Watermain	m	$ 430.00	45	$ 19,350.00
	Connect to Ex. 300mm PVC Watermain	ea.	$ 10,000.00	2	$ 20,000.00
	Steel Liner for 500mm watermain	m	$ 3,200.00	30	$ 96,000.00
	Steel Liner for 300mm watermain	m	$ 2,000.00	30	$ 60,000.00
	Relocate Ex.hydro conduits, telecom and fiber optic, gasmains (Allowance)	L.S.	$ 600,000.00	1	$ 600,000.00
				SUBTOTAL	$ 891,730.00

	COST ESTIMATE
TOTAL Bridge Option :	***$ 6,609,822.50***
20% Consulting Fees:	***$ 1,321,964.50***
20% Contingency:	***$ 1,321,964.50***
TOTAL Fairview Street Culvert Replacement at Appleby Creek Bridge Option (Incl. 20% Contingency):	***$ 9,253,751.50***

R.J. Burnside & Associates Limited