Chisholm, Fleming and Associates
consulting engineers

Municipal Class Environmental Study – Schedule 'B'

Kennedy Road from Bonnieglen Farm Boulevard to Old School Road

Town of Caledon

April 2019

TOWN OF CALEDON

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Executive Summary

The Town of Caledon (Town) is responsible for the planning and management of growth within its community and determining the need for improvements to the existing transportation systems. Chisholm Fleming & Associates (CFA) has been retained by the Town to undertake the environmental assessment study for road improvement works on the 650m section of Kennedy Road north of Bonnieglen Farm Boulevard and south of Old School Road. The study area is outlined in **Figure 0-1** below.

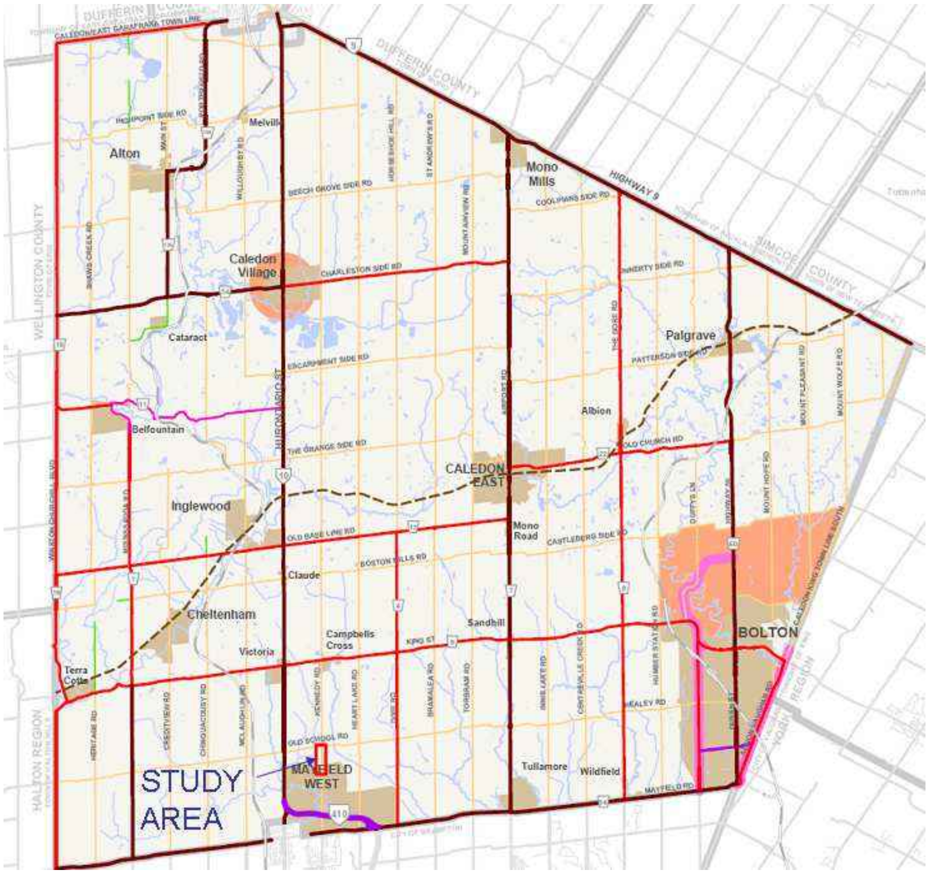


Figure 0-1 – Key Plan

The Class Environmental Assessment for the Kennedy Road improvements was done in accordance with the guidelines set out in the "Municipal Class Environmental Assessment (Municipal Engineers Association October 2000, as amended in 2007, 2011, and 2015)". The project falls within the category of a Schedule "B" Class Environmental Assessment and requires the completion of only Phase 1 and Phase 2 of the Municipal Class EA procedure.

Existing Conditions

The existing Kennedy Road is a two-lane rural cross section with open ditches on both sides of the road. The adjacent land use generally consists of farmland with wooded areas and Dixon's Methodist Church and Cemetery Area on the east side and Tony Pontes Public School (formerly Southfield Village No 2 Elementary School) on the west. The road is currently signed as a bike route that is maintained from May 1 to October 31 with a 60km/h speed limit (40km/h in front of Tony Pontes School). In addition, a 5 tonne/axle weight limit is enforced on this section of

Kennedy Road from March 15 to May 15 in order to prevent pavement damage during the spring thaw period.

Needs and Justification

Previously completed Official Plans, Growth Plans, Long Range Plans and Transportation Master Plans anticipate population and traffic demand growth in the Region of Peel. The Town of Caledon Transportation Master Plan has designated Kennedy Road to be a Rural Main Street with two to four lanes of through traffic. A traffic study was undertaken for the section of Kennedy Road in the EA study to analyze the existing transportation and projected traffic growth by 2021 and 2031, and it concluded with the following:

- Kennedy Road in the study area will continue to operate satisfactory as a two-lane road;
- No changes in traffic control are required at the roundabout or the signalized intersection at Old School Road'
- Pedestrian facility is required on the west side of Kennedy Road which will tie into the existing sidewalk in front of Tony Pontes Public School; and
- On road cyclist facility be provided on Kenney Road

Based on the above, the following Problem or Opportunity statement was developed for this EA study:

> "The section of Kennedy Road between Bonnieglen Farm Boulevard and Old School Road be improved to support the projected population, employment and development growth, and to enhance road safety for pedestrians, cyclists, and drivers."

Public Consultation

A Notice of Study Commencement for the Kennedy Road Class Environmental Study between Old School Road and Bonnieglen Farm Boulevard was advertised in the Caledon Citizen and Caledon Enterprise on May 17th and May 24th, 2018. It was also mailed to various governments agencies, utility companies, property owners, and the other identified stakeholders on June 7th, 2018.

A Public Information Centre (PIC) was held on Thursday, December 6th, 2018 at Inglewood Community Centre 15825 McLaughlin Road, Caledon. The information presented at the PIC included the need and justification for the project, the alternative solutions being considered, the evaluation criteria, the process for assessing alternatives, and the identification of a preferred alternative. Comments received from members of the public and various review and approval agencies are summarized in the study report.

Alternatives and Recommended Preferred Alternative

Three (3) alternative solutions were identified as having the potential to address the problem or opportunity statement for this EA study:

1. **Do Nothing**: This alternative identifies what would happen if no action is taken to address the current deficiencies within the corridor in both the short- and long-term basis. This alternative provides a base line in which other alternatives may be measured;
2. **Rural Cross Section**: This alternative addresses the pavement deterioration, improves the current shoulders and drainage; however, this alternative does not address the community need for pedestrian and cyclist safety; and
3. **Urban Cross Section**: This alternative addresses the pavement deterioration and urbanizes Kennedy Road. It will also address the need for operation roadside safety improvements and the community needs for safe pedestrian and cyclist movements.

Through careful evaluation of the environmental, socio-economic, cultural, and cost impacts of each alternative, Alternative 3: Urban Cross Section was selected as the preferred. The section of Kennedy Road within the study area will have two lanes of through traffic with paved shoulders for on-road cyclists completed with curb and gutter. The existing sidewalk in front of Tony Pontes School will remain and tie into the new platform that will continue north up to Old School Road for pedestrians. It will have a 20m ROW that is expected to operate well within its capacity based on the 2031 forecasted traffic growth. With the new curb and gutter (urbanization), the widening will not encroach on the private property of Dixon Union's Cemetery. The evaluation table summarizing the assessment is included in this Project File.

Principal Environmental Impacts and Mitigation Measures

The field investigations and alternatives evaluation completed for this EA study concluded with the following main impacts, their mitigation measures and requirements associated with the preferred alternative:

- Cultural Heritage – Due to the presence of Dixon Union's Cemetery, Stage 1 Archaeological Assessment recommends a Stage 2 Archaeological Assessment for work done on private property outside of Kennedy Road ROW and a Stage 3 Archaeological Assessment for work done within 10m of the existing cemetery. Both assessments may define further study to be required prior to implementation of any design.
- Permits and Approvals – The section of Kennedy Road within this EA study is under TRCA regulated area and a permit may be required for the construction of the preferred alternative and should be obtained during detail design. Permit from the Ministry of Natural Resources and Forestry (MNRF) is not anticipated as no endangered or protected species have been identified in the area. Permit from the Ministry of Environment, Conservation, and Parks (MECP) will be required

Project Cost

A preliminary construction cost estimate for the recommended preferred alternative is $1.5 million in 2019 dollars. This amount excludes engineering costs and utility relocation costs.

Study Completion

A notice of Study Completion will be issued on May 31, 2019.

1 Introduction and Background

1.1 Introduction and Study Area

The Town of Caledon (Town) is responsible for the planning and management of growth within its community and determining the need for improvements to the existing transportation systems. In that regard, the Town has identified the need to urbanize Kennedy Road between Bonnieglen Farm Boulevard and Old School Road.

The Town has initiated a Class Environmental Assessment (EA) through their consultant Chisholm, Fleming and Associates (CFA) for improvements to Kennedy Road in accordance with the planning and design process for Schedule B projects as outlined in the Municipal Class Environmental Assessment October 2000 as amended in 2007, 2011, and 2015.

Currently Kennedy Road is configured as a two-lane rural cross section with open ditches. Lands adjacent to the study area are predominately farmlands, with the newly constructed Tony Pontes School on the west side just north of Bonnieglen Farm Boulevard and Dixon Union's Cemetery on the east. The study area location is illustrated in **Figure 1-1**.

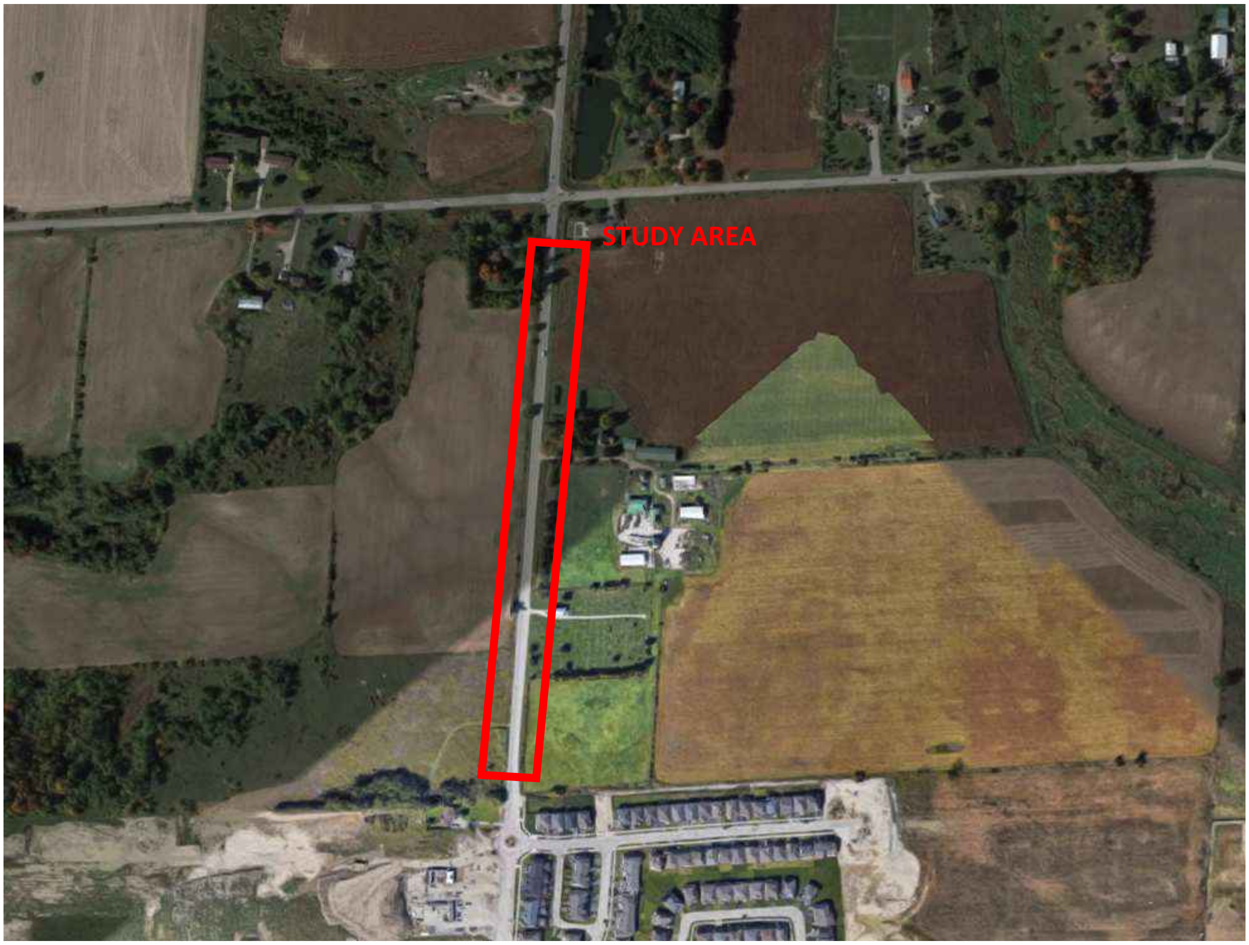


Figure 1-1 – Study Area

Traffic control on Kennedy Road is achieved with traffic control signals at the intersection of Old School Road and with a roundabout intersection at Bonnieglen Farm Boulevard. A 60 km/h speed limit exists on Kennedy Road within the study area, and a 40 km/h community safety zone established recently by the Town in the area adjacent to Tony Pontes Public School. The road is currently signed as a bike route that is maintained from May 1 to October 31. Also, in order to prevent further damage during the spring thaw period a 5 tonne/axle weight limit is maintained on this section of Kennedy Road from March 15 to May 15.

Besides the Tony Pontes Public School (formerly Southfield Village No 2 Elementary School), the environment and adjacent land use generally consists of farmland with wooded areas and Dixon's Methodist Church and Cemetery Area on the east side of Kennedy Road.

The Town is currently undertaking an Environmental Assessment for improvements to Old School Road which includes assessment of the intersection with Kennedy Road.

1.2 Municipal Class EA Planning

The planning of major municipal infrastructure projects or activities is subject to the Environmental Assessment Act, R.S.O. 1990, and requires the proponent to complete an Environmental Assessment. The Municipal Class EA process was developed by the Municipal Engineers Association (MEA) in consultation with the Ministry of the Environment (MOE), as an alternative method to Individual Environmental Assessments for recurring municipal projects that were similar in nature, usually limited in scale and with a predictable range of environmental impacts, which were responsive to mitigating measures. The Municipal Class EA process solicits input and approval from regulatory agencies, the municipality, and the public at the local level. This process leads to an evaluation of the alternatives in view of the significance of environmental impacts and the choice of effective mitigation measures.

A flow chart, **Figure 1-2** prepared by MEA illustrates the Class EA procedure. There are three categories of assessment with the Municipal Class EA procedure dependent on the complexity and potential environmental impact (Schedule A and A+ - negotiable impacts, Schedule B- modest impacts, Schedule C- significant impacts).

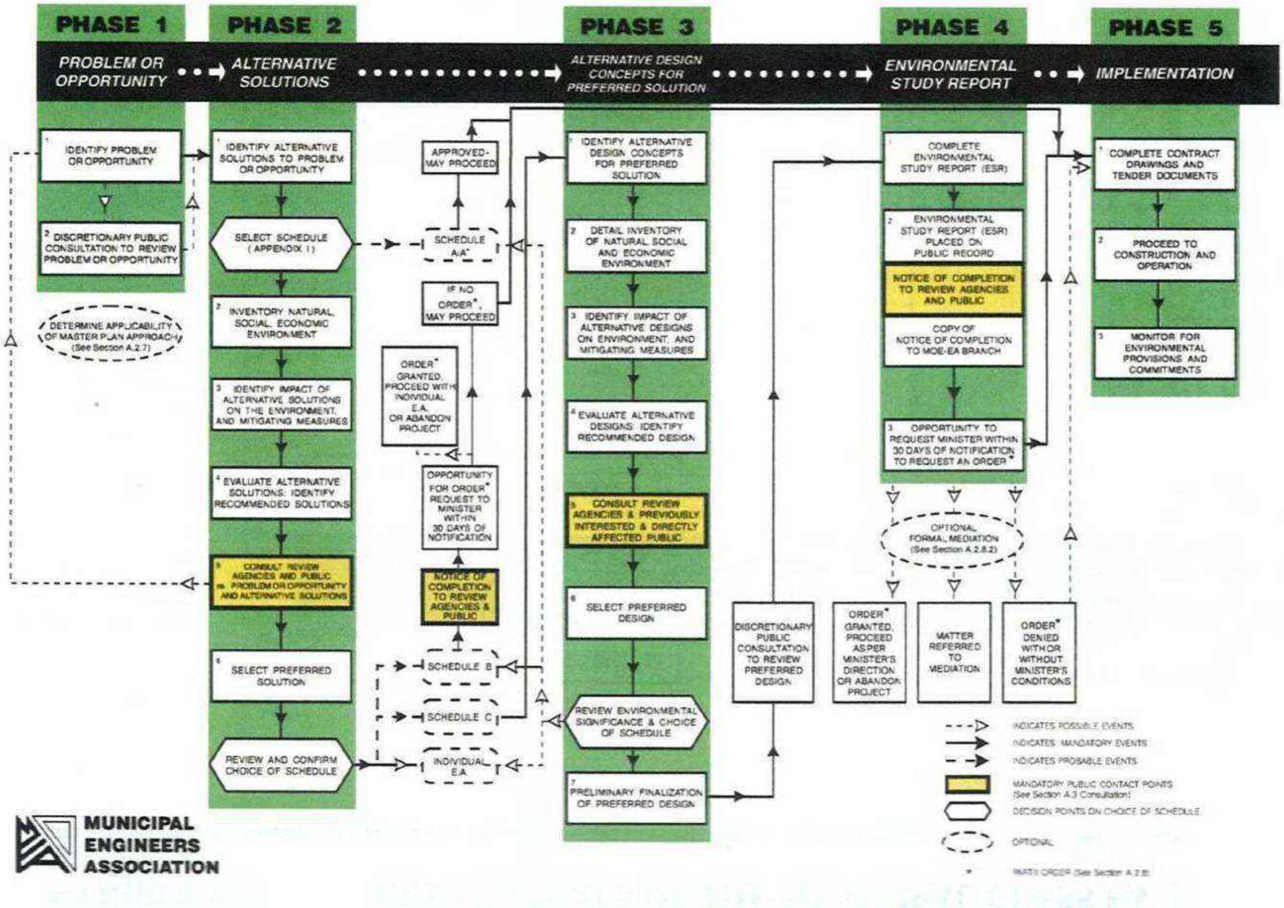


Figure 1-2 – MEA EA Process

The Municipal Class EA also provides an opportunity for any member of the public or agency to provide comment on the work proposed as well to review the completed Project File within 30 days of its filing. During the 30-day period review, the public may request a Part II Order (or "bump-up") if they believe their issues or concerns related to the proposed undertaking has not been satisfied.

The proposed urbanization of Kennedy Road between Bonnieglen Farm Boulevard and Old School Road falls under Schedule B. Schedule B projects generally include improvements and minor extensions to the existing infrastructure. This project has the potential for some adverse, yet mitigatable environmental impacts and requires the completion of only Phases 1 and 2 of the Municipal Class EA procedure (**Figure 1-2**). Public consultation is required at two stages under a Schedule B project. At the completion of Phase 2 if there are no outstanding concerns, then the Town may proceed to implementation.

1.3 Schedule B Project File

In accordance with the Municipal Class EA process for a Schedule B project; this Project File Report defines the following;

- Problem/opportunity statement;
- Alternative solutions to the proposed project;
- The existing, natural, social and economic environment;

- Potential impacts of the alternative solutions on the existing environment and appropriate mitigation measures;
- An evaluation of the alternatives;
- The consultation process undertaken throughout the project; and
- Selection of the preferred alternative

1.4 Project Organization

The project has been directed by a project co-ordination team made up of staff from the Town of Caledon and Chisholm, Fleming and Associates and their sub consultants. The following is a list of those who have been involved in the overall planning and coordination of this project.

Town of Caledon	
Mike Ip, C.E.T.	Project Manager

Chisholm, Fleming and Associates	
Paul LaPalme, P.Eng	Project Director
Leonard Rach, P.Eng	Project Manager
Andrew Ostler, P.Eng	Project Engineer
Winnie Wong, P.Eng	Engineer

The following sub-consultant companies were engaged by Chisholm, Fleming and Associates to provide specialized services where required:

ASI Heritage	Archaeological and Cultural Heritage Investigation
LGL Limited	Terrestrial Screening
Paradigm Transportation Solutions	Traffic Investigation
Sola Engineering	Geotechnical Investigation
Planview	SUE Investigation
Pearson and Pearson	Topographical and Legal Survey
SS Wilson	Noise Investigation

1.5 Notice of Study Commencement and Initial Responses

In accordance with the Municipal Class Environmental Assessment process, a Notice of Study Commencement for the Kennedy Road Class EA study was advertised in local newspapers. This Notice of Study Commencement was advertised in the Caledon Citizen and Caledon Enterprise on May 17th and May 24th, 2018. A copy of the Notice of Study Commencement is found in **Appendix A**.

In addition, the Notice of Study Commencement was mailed to various government agencies, first nations, utility companies, property owners, residents, and other identified stakeholders on June 7, 2018. A copy of the letter and the mailing list for this mail out is also provided in **Appendix A** along with their responses. **Table 1-1** provides a summary of responses from the Notice of Study Commencement.

Table 1-1 – Comments from Initial Notice of Study

Respondent	Summary of Comments	Responses
Municipalities		
	None	
Local Agencies		
Toronto and Region Conservation Authority	Send PIC material prior to PIC and submit review of EA application and report prior to filing	Send PIC material prior to PIC and submit review of EA application and report prior to filing
Peel District School Board	August 28 - Thank you for your Notice of Study Commencement letter for the proposed road improvements on Kennedy Road, between Bonnieglen Farm Boulevard and Old School Road. As you are probably aware, Tony Pontes Public School is located on the west side of the study area. Has your team been in contact with anyone from the Board for the proposed improvements? I would like to have a better understanding of how this will affect our school site. August 29 - Provided updated site plan	August 28 - Thanks for responding to the letter that was sent. We are still undergoing the EA process and haven't done any further coordination with the board in regards to what will be recommended for any improvements. By chance would you be able to send the plans that your site is using for construction. The version that we have received are the ones from Jan 2017 for Site Plan approval. Having this information will help ensure that the recommendations will be appropriate given the future as-built configuration of the site. Further coordination during detailed design
Federal Agencies		
	None	
Provincial Agencies		
Ministry of Natural Resources and Forestry	'Received email from Steven Strong on June 8. Sent following on Oct 2 - I am not sure if you have received any other responses from MNRF. Species at risk to be considered in the area include Butternut (endangered), Bank Swallow (threatened), Barn Swallow (threatened), Bobolink (threatened) and Eastern Meadowlark (threatened). If possible, please provide conceptual design	Listed species were not found present within the study area Send PIC material and prelim design prior to PIC date.

	information relative to the project as it may be displayed at the upcoming open house (<10 megabytes).	
First Nations		
	Would like to be kept informed of any developments through the studies	Findings/Reports will be shared as requested
Local Interest Groups		
Residents		
#22 Bonnieglen	I would like more information and to be kept in the loop for the expansion of Kennedy. Also can you share the plans the city has for the land behind the houses on Bonnieglen Farm Blvd.	Advised that further information on the study will be provided at the PIC and that there are no current plans for that land.
Property Owners		
	None	

2 Existing Conditions

2.1 Land Use

The land use within the study area is mainly rural in nature with the Tony Pontes Public School in the southwest quadrant of the study area. The Mayfield West Phase 2 Secondary Plan governs the development and redevelopment of land as shown on Schedule B.2 Mayfield West Phase 2 Secondary Plan Land Use Plan **Figure 2-1**.

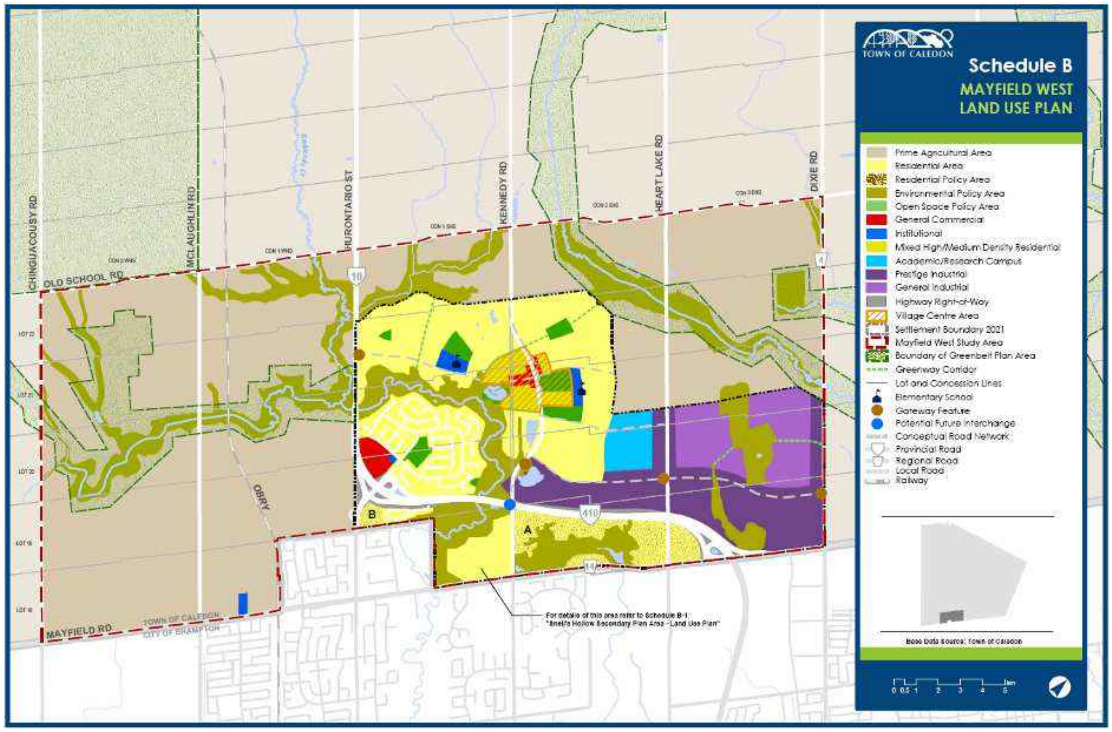


Figure 2-1 – Official Plan – Schedule B - Mayfield West Land Use Plan

The Plan Area has been planned as a complete community that is compact, pedestrian and cyclist friendly and transit oriented. Collectively, these attributes support the development of a safe, healthy and balanced community.

The following goals and objectives have been developed for the Plan Area.

Goal: The Plan Area will develop a complete community that is compact, pedestrian and cyclist friendly and transit oriented.

Objectives:

- Achieve net ecological gain, where practical, possible and advisable;
- Adopt an integrated design process;
- Foster a local identity rooted in the spirit of the Town of Caledon;
- Establish the structure for a close-knit small town that fosters self-sufficiency;
- Achieve a range and a mix of housing;
- Promote walking, cycling and transit opportunities;
- Maximize conservation and innovation
- Ensure community connectivity and integration at all scales, and;
- Support adaptive change

For this area the following targets have been established;

Population	10,348
Population related jobs	2,635
Employment Area Jobs	1,164
Land Area (Hectares)	207.5

2.2 Archaeological Assessment and Built Heritage

2.2.1 Stage 1 Archaeological Assessment

A Stage 1 archaeological assessment was conducted for this project by Archeological Services Inc (ASI). A full copy of their report is found in **Appendix B**. The Stage 1 background study determined that six previously registered archaeological sites are located within one kilometre of the study area, and that Dixon's Union Cemetery is within the study area. **Figure 2-2** illustrates the archaeological potential in the study area.

The property inspection determined that the study area exhibits archaeological potential in areas beyond the disturbed right of way and would require a Stage 2 archaeological assessment. In terms of the Dixon's Union Cemetery, their lands should be avoided by the project design. However, a Stage 3 cemetery investigation will be required on lands within a 10 metre buffer of the cemetery property, prior to any proposed impacts, to confirm the presence or absence of unmarked graves with the existing right of way.

Figure 2-2 – Archaeological Potential

2.2.2 Built Heritage and Culture Landscape Assessment

A Built Heritage and Culture Landscape assessment was undertaken by ASI to inventory any built heritage and culture landscapes within the study corridors, and to identify impacts to the cultural heritage resources and propose appropriate mitigation measures. A complete copy of their report is found in **Appendix C**.

The results of the ASI study revealed a study area with a rural land use history dating back to the early nineteenth century. A review of federal registers and municipal and provincial inventories revealed that there are three previously identified features of cultural heritage value adjacent to the study area **Figure 2-3**. Two farmscapes were identified at 12909 Kennedy Road and at 3431 Old School Road. Also, the church and cemetery located at 12895 Kennedy Road was identified as a property of "high significance". Overall, construction activities and staging should be planned and undertaken to avoid impacts to the identified cultural heritage resources.

Figure 2-3 – Cultural Heritage Environment

2.3 Natural Environmental

2.3.1 Background

The existing land use along Kennedy Road within the project limits is predominantly "agricultural". According to the Town of Caledon's Official Plan, Schedule B (2016), the land use designation within the project limits is "Prime Agricultural". South of the project limits the area is designated as "Residential Area", while to the north, the area is designated as "Environmental Policy Area". No Areas of Natural and Scientific Interest or Provincially Significant Wetlands were identified within the project limits.

The study limits are within the Toronto and Region Conservation Authority (TRCA) jurisdiction. Although there are no watercourses crossing Kennedy Road within the study limits, it is within two watersheds: east of Kennedy Road is the Humber River watershed and west of Kennedy Road is the Etobicoke Creek watershed. Based on preliminary review of the Ministry of Natural Resources and Forestry (MNRF) Natural Heritage Information database: Bobolink and Eastern Meadowlark were documented to be present within the 1 km area from the corridor. These species are listed provincially and federally "Threatened" and protected under the Endangered Species Act. The Natural Environment Report is included in **Appendix Dp**.

2.3.2 Existing Conditions

2.3.2.1 Physiography and Soils

The soils found within the study area are classified as Fox sandy loam and Chinguacousy clay loam. Drainage within the study area varies from good in the Fox sandy loam found in the northern half of the study area, to imperfectly drained in the Chinguacousy clay loam. Slopes are smooth gently sloping, and soils present in the study area have few to no stones and are known to be susceptible to erosion if left exposed.

2.3.2.2 Vegetation and Vegetation Communities Assessment

The vegetation community investigations were based on the Ecological Land Classification for Southern Ontario (Lee et al. 1998).

The ELC community mapping identified one vegetation community in four narrow areas along the roadside: CUM1-1, which is cultural meadow community (see **Figure 2-4**). The remainder of the study area consisted of residential manicured areas and active agricultural fields. The vegetation community areas identified pose little to no constraint to road improvements.

Figure 2-4 – Natural Environment

2.3.2.3 Wildlife Assessment

A general wildlife and breeding bird investigation was conducted in the summer of 2018 that focused on general wildlife, wildlife habitat and screening for rare species. No species that are regulated as Threatened or Endangered under the Endangered Species Act were identified. Bird species documented during our investigations include species commonly found in disturbed settings.

2.4 Utilities

2.4.1 General

There are a number of above ground and below ground utilities in the existing Kennedy Road right-of-way within the study area. Although no planning information was provided by the utility companies, a Level B Subsurface Utility Engineering investigation was undertaken by Planview and their results are included in **Appendix E**.

2.4.2 Watermains

The Region of Peel has two watermains in the study area consisting of a 400 mm concrete pressure pipe (CPP) watermain and a 600 mm CPP feedermain. Both watermains are 2.5m below the existing roadway as indicated on record drawings with the 400 mm watermain located beneath the northbound lane, while the 600 mm watermain is below the southbound lane.

2.4.3 Natural Gas

Enbridge has a 150 mm PE IP gas main located along the east right-of-way.

2.4.4 Hydro One Networks

Hydro One provides an overhead service located along the east property line. An underground primary line exists that drops down from the hydro pole located 130m north of Bonnieglen Farm Boulevard and proceeds along the west property line.

2.4.5 Bell/Rogers

The existing Bell cable is located along the west property line. At this time no existing Rogers infrastructure exists in the study area.

2.5 Drainage and Stormwater Management

The site study is located within two watersheds: Etobicoke Creek watershed to the west and Humber River watershed to the east. The highest point in the road is approximately 220 m north of Bonnieglen Farm Boulevard, the area south of that point is tributary to the existing storm sewer for the Kennedy Trails Residential Sub-division; the remainder drains west to the Etobicoke Creek via ditches connecting into two existing culverts: Culvert 1 - 500 mm CSP and Culvert 2 - 600 mm PVC. The northernmost section (50 m) of the project is within the TRCA Regulated area (See **Appendix F**).

Existing drainage patterns were studied using orthoimagery of the site, contours provided by TRCA and the following drawings and reports provided by the Town of Caledon (**Appendix F**):

- Kennedy Trails Development Ltd. – Storm Drainage Plan (Minor System) Drawing No. 12 prepared by DSEL, 2016
- Southfields Village No. 2 Public School – Servicing Plan prepared by MGM Consulting Inc, 2016

2.6 Soils Pavement Structure Condition

A geotechnical investigation was undertaken by Sola Engineering to outline the soil and groundwater conditions on Kennedy Road to provide pavement and sidewalk design recommendations. The following is a summary of the geotechnical investigation report. The full report is included in **Appendix G**.

2.6.1 Soil Investigation

The field program consisted of drilling thirteen (13) boreholes ranging in depth from approximately 1.98m to 2.13m. The general sequence of strata comprised an asphaltic concrete layer with a thickness varying between 110mm and 150mm overlying a layer of granular base/sub-base materials with a thickness ranging from 75mm to 610mm. The existing pavement structure is supported on fill materials. Generally the fill materials encountered in the boreholes underlying the pavement structure comprised a layer of sandy silt to silty sand or sand with gravel. The groundwater level appeared to be low as the boreholes are dry upon completion of drilling. Other studies in the area show soils surrounding the site consist of silty sands to sandy silt for the upper 2-3 m.

2.6.2 Soil Chemical Testing

At the time of sampling no obvious evidence of staining or odours were observed. Two (2) soil samples were selected at an approximate depth from 0.76mm to 1.22m below ground level and submitted for laboratory testing of metal and inorganics.

Based on the comparison of the soil analysis results to the 2011 MOECC Standards, the measure Electrical Conductivity (EC) and Sodium Absorption Ration (SAR) in one of the samples exceed the MOECC Standards which may have been caused by winter de-icing activities.

2.7 Traffic Noise Study

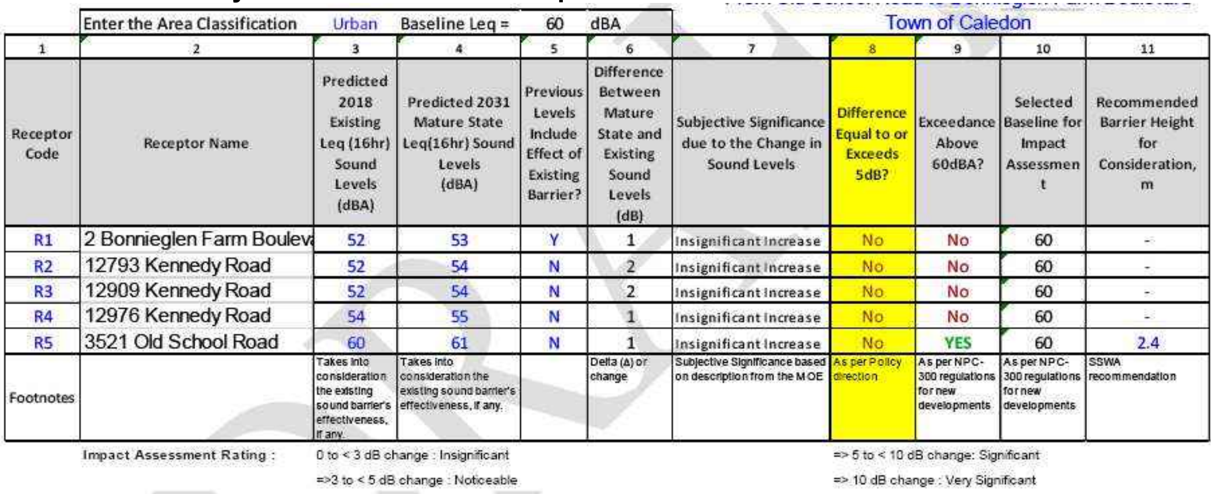
A traffic noise study was undertaken by S.S. Wilson Associates to investigate the noise impacts associated with the Kennedy Road improvements. Sound level predications were preformed at five (5) outdoor living area locations (as noted on **Figure 2-5**) to determine the existing and future sound levels and to assess the warrants and feasibility for noise barriers in accordance with MECP/MTO policy guidelines. The following summarizes the results of this study. A full report is including in **Appendix H**. The five (5) outdoor living area locations as noted in **Figure 2-5** are:

- R1 – 2 Bonniglen Farm Boulevard
- R2 – 12793 Kennedy Road
- R3 – 12909 Kennedy Road
- R4 – 12976 Kennedy Road
- R5 – 3521 Old School Road

Figure 2-5 – Noise Study Receptors

Table 2-1 portrays the results of the noise investigation study. The noise receptors R1, R2, R3, and R4 are within the study area limits and do not exhibit any significant increases in noise level in the planning period to 2031. As well, the sound levels are below the level of 60dBA which would trigger a need for noise mitigation. The property listed as R5 is just beyond the study limits of the Kennedy Road EA but falls within the study area limits of the current Old School Road EA. As such, the issue of the 1 dBA increase over the baseline of 60dBA for impact assessment will be assessed and managed in the current Old School Road EA study.

Table 2-1 – Roadway Environmental Noise Impact Assessment



Enter the Area Classification Urban Baseline Leq = 60 dBA

Town of Caledon

1	2	3	4	5	6	7	8	9	10	11
Receptor Code	Receptor Name	Predicted 2018 Existing Leq (16hr) Sound Levels (dBA)	Predicted 2031 Mature State Leq(16hr) Sound Levels (dBA)	Previous Levels Include Effect of Existing Barrier?	Difference Between Mature State and Existing Sound Levels (dB)	Subjective Significance due to the Change in Sound Levels	Difference Equal to or Exceeds 5dB?	Exceedance Above 60dBA?	Selected Baseline for Impact Assessmen t	Recommended Barrier Height for Consideration, m
R1	2 Bonnieglen Farm Boulev	52	53	Y	1	Insignificant Increase	No	No	60	-
R2	12793 Kennedy Road	52	54	N	2	Insignificant Increase	No	No	60	-
R3	12909 Kennedy Road	52	54	N	2	Insignificant Increase	No	No	60	-
R4	12976 Kennedy Road	54	55	N	1	Insignificant Increase	No	No	60	-
R5	3521 Old School Road	60	61	N	1	Insignificant Increase	No	YES	60	2.4
Footnotes		Takes into consideration the existing sound barrier's effectiveness, if any.	Takes into consideration the existing sound barrier's effectiveness, if any.		Delta (Δ) or change	Subjective Significance based on description from the MOE	As per Policy direction	As per NPC-300 regulations for new developments	As per NPC-300 regulations for new developments	SSWA recommendation

Impact Assessment Rating :

0 to < 3 dB change : Insignificant
=>3 to < 5 dB change : Noticeable
=> 5 to < 10 dB change: Significant
=> 10 dB change : Very Significant

3 Determination of Need and Justification

3.1 Traffic and Transportation Analysis

In order to examine the existing and future traffic conditions based on anticipated development and resultant traffic patterns within the study area, a traffic study was undertaken in support of the Class EA by Paradigm Transportation Solutions. The traffic study is included in its entirety as **Appendix I**.

The analysis included:

- A review of planning background studies
- Existing transportation conditions
- Traffic growth projections

3.2 Planning Background

3.2.1 Growth Plan for the Greater Golden Horseshoe

The first Growth Plan for the Greater Golden Horseshoe – Places to Grow was adopted in June 2006 under the provisions of the Places to Grow Act, 2005. The plan provides the framework for implementing the Provincial government's vision for building stronger, prosperous communities by better managing growth to the year 2041 in the burgeoning Greater Toronto and Hamilton Area (GTHA). After implementation, the plan has been amended to address growth in the County of Simcoe (including the cities of Barrie and Orillia), and provide population and employment forecasts to the year 2041. Recently, the Growth Plan for the Greater Golden Horseshoe, 2017 has been adopted, building on the 2006 version and addressing new challenges faced as growth continues. This plan took effect on 1 July 2017.

The Growth Plan contains specific policies and directives to manage growth and protect the environment by focusing on building complete communities, benefiting from land use planning, maximizing investments in existing and future infrastructure, providing affordable housing, improving transit and active transportation networks, promoting economic development, and protecting natural, agricultural and heritage resources.

The plan forecasts the population of the Region of Peel to grow to 1.77 million by 2031, 1.87 million by 2036, and 1.97 million by 2041, for an annual average growth rate of 1.1 per cent. For employment, Places to Grow forecasts the number of jobs in the Region to reach 880,000 by 2031, 920,000 by 2036, and 970,000 by 2041, for an annual average growth rate of 1.0 per cent.

The plan also offers guidance regarding transportation system development, envisioning a safe and sustainable transportation system providing connectivity and balance between modes. It emphasises the planning and design of complete streets along with the implementation of transportation demand management policies and programs.

3.2.2 Metrolinx "The Big Move" – Regional Transportation Plan for the GTHA

Pursuant to the Metrolinx Act, 2006, the Province created Metrolinx to develop, fund, coordinate and promote transportation within the GTHA municipalities. In 2008, Metrolinx released its Regional Transportation Plan (RTP) for the GTHA, entitled "The Big Move: Transforming Transportation in the Greater Toronto and Hamilton Area". The plan outlines a 25-year vision for sustainable transportation in the GTHA, and the policies, programs and infrastructure investments required to achieve this vision of a seamless, integrated transportation network.

The Big Move is primarily focused on enhancing and expanding public transit. In the vicinity of the Study Area, the RTP identifies Hurontario Street in Caledon, west of the Study Area, as an intensification corridor, supporting growth, development and transit. The plan also includes policies related to goods movement, active transportation (AT) and transit to be considered in developing and improving infrastructure.

3.2.3 GTA West Transportation Corridor Planning

The Ministry of Transportation (MTO) was conducting the Greater Toronto Area (GTA) West Transportation Corridor Planning and Environmental Assessment Study (the GTA West Study) to identify the preferred solution for providing better linkages between Urban Growth Centres in the west part of the GTHA, including Downtown Guelph, Downtown Milton, Brampton City Centre and Vaughan Corporate Centre.

The GTA West Transportation Development Strategy (TDS) released in November 2012 recommended a broad range of measures to address future needs in the northwest part of the GTHA, including a new transportation corridor from Highway 400 westerly to Highway 401 east of the Niagara Escarpment. MTO initiated Stage 2 of the GTA West Study in early 2014. As part of this stage, a Route Planning Study Area was defined, which included Kennedy Road south of Old School Road. However, in February 2018, the MTO decided to move forward with the protected of a narrower corridor, and evaluate the transportation needs through the Greater Golden Horseshoe (GGH) Transportation Plan. **Figure 3-1** shows the narrower protected corridor, located north of the Kennedy Road Study Area.

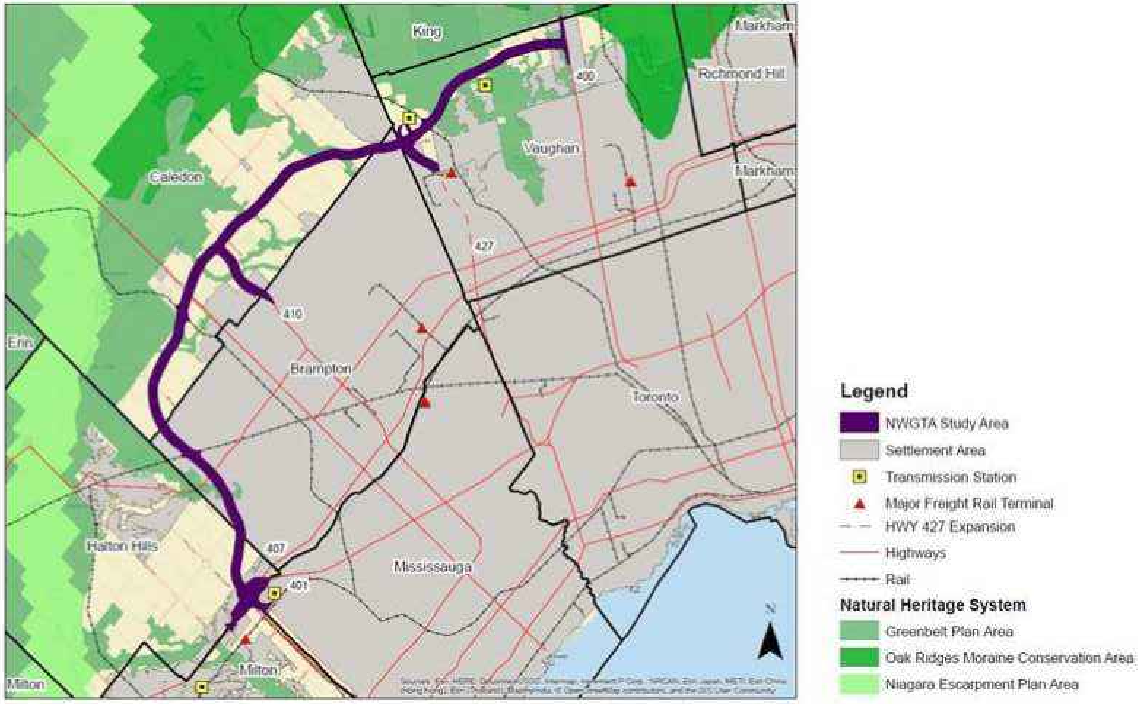
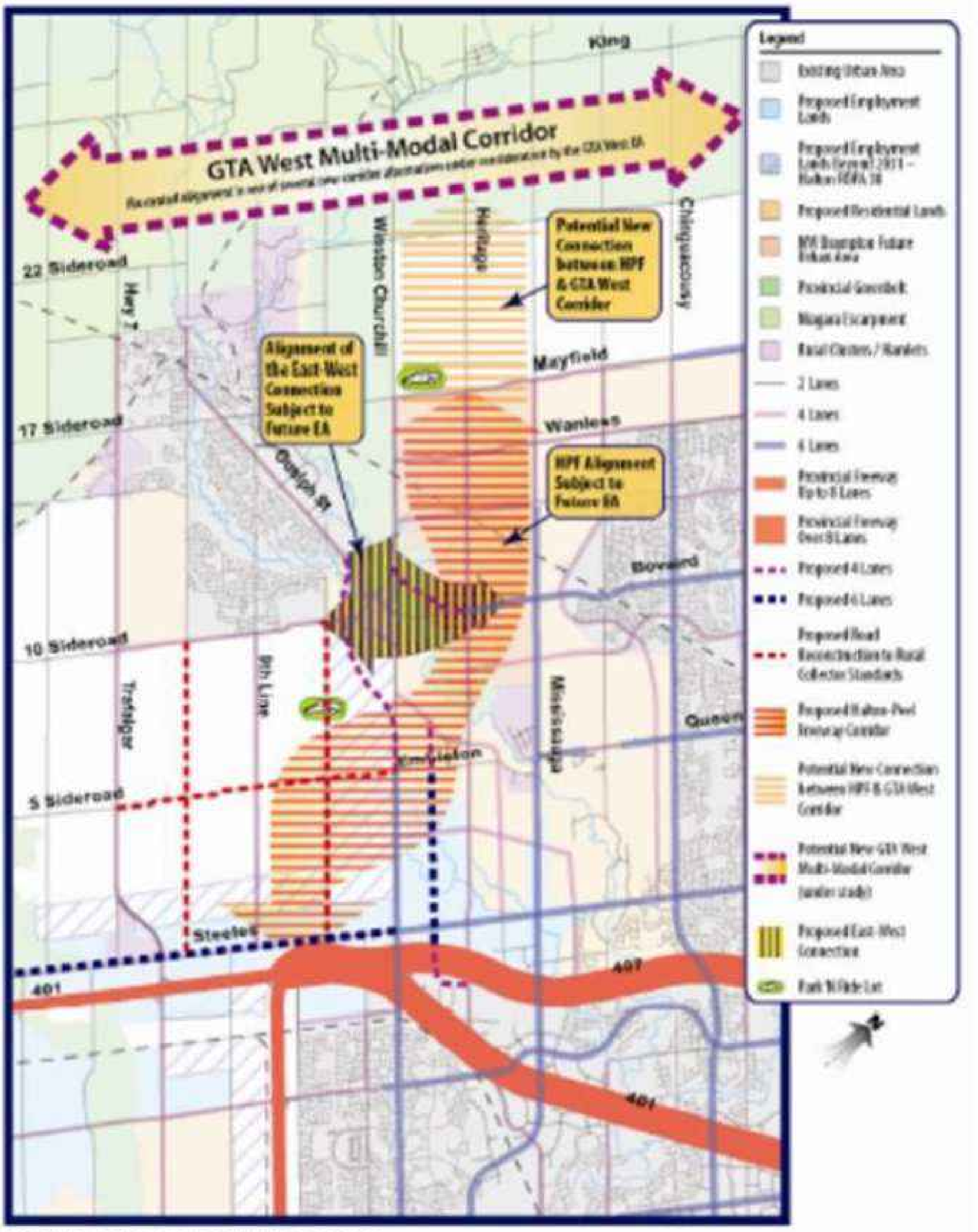


Figure 3-1 – Northwest GTA Corridor

3.2.4 Halton-Peel Boundary Area Transportation Study

The Halton-Peel Boundary Area Transportation Study (HPBATS) was initiated in response to commitments made by the Region of Halton for the approval of Halton Regional Official Plan Amendment (ROPA) 25. HPBATS was conducted jointly by the Region of Peel, Region of Halton, City of Brampton, Town of Caledon and the Town of Halton Hills to identify a long-term (2021-2031) transportation network to serve future demands in the municipal boundary area. Growth projections from the Growth Plan served as the basis for the demand forecasts.



Subject to future Environmental Assessment studies

Figure 3-2 – Halton Peel Boundary Area Transportation Study Recommend Transport Network, 2031

The HPBATS transportation strategy endorsed by Town, City and Regional Councils in May 2012 includes a range of measures designed to promote changes in travel behaviour in addition to essential infrastructure improvements. The strategy features enhancements to the transit, AT and road networks, and the introduction of Transportation Demand Management (TDM) initiatives.

Figure 3-2 illustrates the recommended transportation network for the Halton/Peel boundary area from HPBATS, including a proposed Halton-Peel Freeway extending from the Highways 401 and 407 connection to Mayfield Road and the eventual GTA West Corridor. This proposed freeway would be west of the Study Area, within the south west border of the Town of Caledon.

3.2.5 Region of Peel Long Range Transportation Plan (LRTP)

The LRTP provides strategies, policies and plans for roads, transit and TDM to respond to the Region's transportation challenges over the next 20 years. To address these challenges, the 2012 LRTP Update recommends the broad application of TDM strategies aimed at reducing reliance on SOV travel and sets a goal of 14 per cent reduction in congestion by the year 2031 (when compared with the no TDM measures scenario). Strategies outlined in the plan include AT facilities, Smart Commute programs, employer individualized marketing, a high school pilot program, Safe-Active Routes to School initiatives, among others. The LRTP also recommends that public transit be the first priority in transportation infrastructure planning and major investments. Even with these measures in place, road/highway expansion will be necessary to meet future transportation demands. The LRTP specifies a broad list of Regional Road network improvements, however, none is located within or in proximity to the Study Area and Kennedy Road is not designated as part of Peel's major road network.

3.2.6 Region of Peel Strategic Goods Movement Network Study

The Goods Movement Strategic Plan 2017-2021 was completed in March 2017 with the mission of "have a safe, convenient, efficient, multi-modal, sustainable and integrated goods movement transportation system that supports a vibrant economy, respects the natural and urban environment, meets the diverse needs of industries and residents and contributes to a higher quality of life". It provides an action plan for the Region, and includes the systematic, hierarchical truck route network throughout the Region of Peel developed through the Strategic Goods Movement Network (SGMN) Study completed in May 2013. This study does not identify Kennedy Road, in the Study Area, as a truck route.

3.2.7 Region of Peel Active Transportation Plan

The Active Transportation Plan (ATP) completed in November 2011 articulates a vision for AT within the Region of Peel aimed at creating a place where walking, cycling, and rolling are safe, convenient, appealing and accessible for all citizens, especially children, youth, older adults, persons with disabilities and other priority populations. The ATP sets outs policies to support walking and cycling, and recommends infrastructure improvements to expand the existing pedestrian and bike networks.

3.2.8 Town of Caledon Transportation Master Plan

The Town of Caledon Transportation Master Plan (TMP) was completed in November 2017 to provide a planning strategy to identify and address the Town's transportation needs. It presents existing and future transportation conditions within the Town, with the goals to provide modal choices, sustain growth, protect the environment and character of the Town, and develop a transportation network that is safe, reliable and efficient. It proposes to do so by implementing a combination of Transportation Demand Management (TDM) and roadway improvements.

The plan also provides functional classification, right-of-way and typical cross-sections for Town roadways. As part of its urbanization in the Study Area and the designation of Mayfield West as a Rural Service Centre in the Town's Official Plan, Kennedy Road will become a Rural Main Street. The TMP indicates the following characteristics for Rural Main Streets:

- Rural Service Centre land use designation;
- 2 to 4 through lanes;
- 20 to 26 m of right-of-way;
- Desired operating speeds of 40 to 60 km/h;
- Limited to designated stops or stations transit role;

- Area for pedestrians and other facilities are village specific, and consist of:
  - 1.5 m minimum sidewalk;
  - Furnishing/planting zone;
  - Splash strip; and
  - Utility zone;
- Bicycle facilities are to be behind the curb where design speeds exceed 50 km/h, or on-street otherwise;
- Curb and gutter drainage conditions; and
- Freight allowed for local deliveries only.

The TMP also identifies Kennedy Road as part of the Signed Cycling Routes 2017 Pilot between Etobicoke Creek Trail and Olde Base Line Road, and is identified as a future cycling route.

3.2.9 Old School Road and Kennedy Road EA

An EA study for Old School Road north of this study limits is currently undertaken by others. The Old School Road EA will include the intersection of Old School Road and Kennedy Road, and as such the intersection will not be included in this EA.

3.3 Existing Transportation Conditions

3.3.1 Roadway and Geometry

The study area comprises Kennedy Road, between Old School Road to the north, and Bonnieglen Farm Boulevard to the south, a segment approximately 650 m in length. Within the study area, Kennedy Road is a north-south two-lane road with a posted speed limit of 60 km/h. Recently, the Town has established a community safety zone with a 40 km/h speed limit from Bonnieglen Farm Boulevard to 250m north of Bonnieglen Farm Boulevard. It has a rural cross section, with both paved and unpaved shoulders, and ditches on either side. Heavy trucks are prohibited from using this road section, except for local traffic.

Lane and shoulder widths on northbound and southbound differs but are consistent throughout the study area and were measured approximately 120 m from the centre of the roundabout, to just north of the school construction entrance. From west to east, the widths were measured as:

- Southbound gravel shoulder: 0.7 m
- Southbound paved shoulder: 1.3 m
- Southbound lane: 3.1 m
- Northbound lane: 3.3 m
- Northbound paved shoulder: 1.1 m
- Northbound gravel shoulder: 1.0 m.

Within the study area, Kennedy Road's horizontal alignment is generally straight and has both crest and sag vertical curves.

To the north, Kennedy Road intersects with Old School Road. The intersection is currently signalized, and the south leg of the intersection has a two-lane cross-section. To the south, Kennedy Road intersects with Bonnieglen Farm Boulevard on the east side and Newhouse Boulevard (currently under construction) on the west side. The intersection is a one-lane roundabout with four approaches. The north leg of the intersection has a two-lane cross-section. Street lighting is provided on the approaches to the roundabout.

The land use surrounding Kennedy Road includes a few houses on the north end, a small cemetery and chapel on the east side of the roadway, the Tony Pontes Public School on the west side of the roadway, near the south end of the study area, and agricultural lands. A few accesses are provided along Kennedy Road, from south to north:

- Two driveways access to the Tony Pontes Public School on the west side, north of the intersection with Bonnieglen Farm Boulevard;
- A driveway to the cemetery and chapel on the east side, approximately 240 m from the intersection with Bonnieglen Farm Boulevard, fenced;
- A residential/farm driveway, on the east side, approximately 400 m from the intersection with Bonnieglen Farm Boulevard; and
- A residential driveway on the west side, approximately 50 m from the intersection with Old School Road.

3.3.2 Transit and Active Transportation Network

There is currently no transit service operating on Kennedy Road within the study area.

Kennedy Road is signed as a bicycle route, maintained from 1 May to 31 October, but has no separate bicycle facilities. There is an existing sidewalk on the west side of Kennedy Road, extending from Bonnieglen Farm Boulevard and ends just north of the Tony Pontes Public School. On the east side of Kennedy Road, there is existing sidewalk on the northeast quadrant of the intersection with Bonnieglen Farm Boulevard.

"Yield here to pedestrians" signs are present for northbound drivers entering the roundabout from the south leg, and for northbound drivers exiting the roundabout on the north leg, where the sidewalk on the east side of Kennedy Road connects with the roadway. No crosswalks are provided.

Pedestrian volumes were extremely low during the turning movement count data collection in December 2016. Similarly, no pedestrian or cyclist activity was observed during a site visit in July 2018.

3.3.3 Traffic Volumes

Daily traffic volumes were obtained through 24-hour traffic counts completed by the Town of Caledon on Kennedy Road between Old School Road and Bonnieglen Farm Boulevard in 2017. Total volumes (northbound and southbound) were collected over seven (7) days. Daily traffic varied between 1,700 and 2,700 vehicles per day, with an average of 2,300 vehicles per day. Heavy vehicles accounted for an average of 7% of daily traffic.

Intersection traffic volumes were obtained through the traffic counts completed in 2016 for the Tony Pontes Public School Transportation Impact Study and adjusted to 2018 using the growth rates as calculated in Traffic Growth Projections (**Section 3.4**) of this report. We also assumed that the Tony Pontes school would be completed and operational before the end of the year 2018.

3.3.4 Traffic Operations

The transportation need and justification assessment was based on traffic operations analysis conducted for the midblock sections and intersections within the Study Area. The analyses were completed for both existing (2018) and future (2021 and 2031) conditions during the weekday morning (AM) and afternoon (PM) peak hours to characterize operating conditions and identify locations requiring attention.

For midblock sections, operational performance was characterized based on the volume-to-capacity (v/c) ratio for the link. A v/c ratio of 0.90 or less was deemed acceptable operation for midblock locations, as road segments with volumes exceeding this threshold would typically be candidates for widening.

A theoretical capacity of 1,000 vehicles per hour per lane was assumed for Kennedy Road within the Study Area, as per the Region of Peel travel demand forecasting model. This value reflects the intended function of the road, and accounts for factors such as: the type and number of local streets and private accesses provided; the presence of pedestrians and crossing locations; and typical driving characteristics for this type of facility. The 2018 midblock traffic operations v/c ratios were all found acceptable, as shown in **Table 3-1:**

Table 3-1 – 2018 Midblock Traffic Operations

Peak Hour	Direction	Midblock v/c Ratio
AM	Northbound	0.46
	Southbound	0.34
PM	Northbound	0.19
	Southbound	0.20

For intersection analysis, Intersection Level of Service (LOS) is estimated based on average delay per vehicle and includes deceleration delay, queue move-up time, stopped delay, and final acceleration delay. LOS is a qualitative measure that describes the operating conditions within an intersection, and the perception of those conditions by road users. There are six levels of service defined. Each level has a letter identification from A to F with LOS A representing the best operating conditions and LOS F the worst. **Table 3-2** summarizes the LOS criteria for signalized, stop controlled, and roundabout intersections according to the 2000 and 2010 Highway Capacity Manual (HCM 2000 and HCM 2010).

Table 3-2 – Intersection Level of Service Criteria

Level of Service	Average Control Delay per Vehicle (sec/veh)	
	Signalized Intersections[1]	Stop Controlled[2] and Roundabouts[3]
A	<=10	<=10
B	>10 AND <=20	>10 AND <=15
C	>20 and <=30	>15 and <=25
D	>30 AND <=55	>25 AND <=35
E	>55 and <=80	>35 and <=50
F	>80	>50

The operational performance of the intersections within the Study Area was also assessed based on the v/c ratio. For this study, v/c ratios were calculated at each intersection for individual movements and the entire intersection, with a v/c ratio of 0.90 or less considered an acceptable level of operations.

The following intersections were analyzed:

- Kennedy Road, Bonnieglen Farm Boulevard and Newhouse Boulevard roundabout;
- Two (2) accesses to Tony Pontes Public School:
  - One (1) inbound access, uncontrolled;
  - One (1) outbound access, with the access being stop-controlled;
- Kennedy Road and Old School Road, signalized.

The analysis of 2018 conditions indicated that all intersections and traffic movements are operating at an acceptable level of service and well within capacity. The results are consistent with the field observations conducted.

3.3.5 Road Safety

The Town provided collision information for the years 2015 to June 2018. During this almost 3.5 year period, only two (2) collision were reported:

- A single motor vehicle collision (SMV), causing personal damages (PDO) occurred in 2017 at the intersection of Kennedy Road and Bonnieglen Farm Boulevard. The vehicle was northbound, approaching the roundabout, did not see the roundabout, slid on packed snow and collided into the roundabout.
- A single motor vehicle collision (SMV), causing personal damages (PDO) occurred in 2018 at the intersection of Kennedy Road and Old School Road. The vehicle was travelling northbound and attempted to turn left (westbound) onto Old School Road. It slid on ice and ended in a ditch after colliding with a pole.

Based on the collision history, no collision pattern was established. However, road safety is not only measured by the number of collisions that occur within the study area. Below is a geometric analysis of the study area, in relation to road safety.

According to the MTO Design Supplement for the TAC Geometric Design Guide for Canadian Roads – June 2017, for a design speed of 80 km/h and an AADT over 1,000 vehicles per day, lane widths should be a minimum of 3.25 m wide. The current lane widths are slightly over (3.3 m) and slightly under (3.1 m) the current recommended widths. Lane widths of the reconstructed Kennedy Road should be a minimum of 3.25 m each.

According to the MTO Design Supplement for the TAC Geometric Design Guide for Canadian Roads – June 2017, for a design speed of 80 km/h and an AADT between 2,000 and 3,000 vehicles per day, shoulder widths should be a minimum of 2.0 m wide. The southbound paved shoulder width, where measured (1.3 m), meets the suggested minimum paved shoulder width for rural cross-sections on signed bicycle routes, while the northbound paved shoulder, where measured (1.1 m), is just under the suggested minimum width.

With respect to safety within the clear zone area provided on either side of Kennedy Road there are limited unobstructed, traversable areas beyond the edge of the through travelled way available for use by errant vehicles. Along both the east and west sides of Kennedy Road there are many existing roadside obstacles. Obstacles are characterized by the MTO Roadside Design Manual as "any non-breakaway and non-traversable feature within the roadside environment greater than 100 mm in height that can increase the potential for personal injury and vehicle damage when struck by an errant vehicle leaving the roadway".

It is noted that hydro poles are positioned along the east side of Kennedy Road and many mature trees also exist along both sides of Kennedy Road within the clear zone of the road.

Along the both sides of Kennedy Road, within the study area, there are some sections where the adjacent slopes do not provide a reasonable opportunity for recovery of errant vehicles. In these areas, the slopes are deemed steep and therefore, critical as there is a higher probability of errant vehicles overturning. Consideration should be given to mitigating the roadside obstacles as part of the proposed reconstruction and urbanization of Kennedy Road.

Lighting is provided on the approaches to and at the roundabout with Bonnieglen Farm Boulevard and Newhouse Boulevard. Lighting is also provided at the intersection with Old School Road. No other lighting is provided within the study area.

Pavement condition was generally good throughout the study area. However it was noted that the pavement was in poor condition on the west side of the roundabout, likely due to the construction of Newhouse Boulevard.

In terms of active transportation, there is an existing sidewalk in front of Tony Pontes Public School connecting to the neighborhoods in the south. Within the study area, Kennedy Road is designated as a bicycle route. There appears to be little pedestrian or bicycle activity under the current conditions.

Pavement markings are generally in fair to good condition. There are no yield line markings at the roundabout entries, and the northbound stop bar at the intersection of Kennedy Road and Old School Road is in poor condition. The Town should paint/repaint yield line markings at roundabout entries and the northbound stop bar at the intersection of Kennedy Road and Old School Road.

Signs along Kennedy Road were generally found to be visible and conspicuous. The following signs were noted:

- Southbound, from north to south:
  - Maximum Speed, 60 km/h south of Old School Road;
  - Maximum Speed, 40km/h in the community safety zone at Tony Pontes School;
  - No Heavy Trucks;
  - Roundabout warning sign with "Roundabout Ahead" tab;
  - Yield Ahead warning sign, partially hidden by vegetation;
  - Keep Right sign and Object Marker sign (one direction, left version) on the splitter island;
  - One-Way sign and Roundabout Directional sign, on the central island of the roundabout;
  - Yield sign and "Yield to traffic in roundabout" tab at the entrance to the roundabout;
- Northbound, from south to north:
  - Yield Here to Pedestrians sign at the exit to the roundabout;
  - Maximum Speed, 60 km/h with Begins tab;
  - Bicycle Route Marker with straight arrow tab and "Maintained May 1 – Oct 31" tab;
  - Intersection (controlled) warning sign; and
  - Banty's Roost Golf and Country Club information sign.

The northbound Intersection (controlled) warning sign should be replaced with a Traffic Signal Ahead sign. As per the OTM Book 6, "Controlled intersection signs are used to warn drivers on a through road of an approaching intersection at which the intersecting side road is under stop or yield control." Since the intersection of Kennedy Road and Old School Road is signalized, the Intersection (controlled) warning sign is inappropriate. Additionally, the vegetation should be cut around the southbound Yield Ahead warning sign to make it visible to drivers.

In terms of sight distances, the presence of two crest curves in the vertical alignment of Kennedy Road within the study area hinders drivers' visibility of the roadway ahead. For northbound drivers, the visibility of the intersection (~150 to 200 m) and of the traffic signal heads (~400-450 m) is above the stopping sight distance and therefore sufficient. For southbound drivers, the visibility of the roundabout (~200-230 m) is also above the stopping sight distance and therefore sufficient. However, for a southbound driver, the visibility of the school access is approximately 125 m, which is below the decision sight distance of 140 m for a stopping manoeuvre on a rural road. Similarly, drivers exiting the school access have a visibility of approximately 110 m to their left, below the departure sight distance that should be provided for left turns (170 m) and right turns (145 m). Drivers exiting Tony Pontes Public School can see the roundabout with Bonnieglen Farm Boulevard and Newhouse Boulevard to their right. To their left, the existing vertical crest curve on Kennedy Road shortens the drivers' available sight distance to oncoming traffic. Consideration should also be given during the reconstruction of

Kennedy Road to modifying the vertical alignment to improve sight distances, especially at and around the school accesses.

The posted speed limit on Kennedy Road within the study area is 60 km/h. This speed is consistent with (or just under) the recommended speed according to the TAC Canadian Guidelines for Establishing Posted Speed Limits methodology. Recently the Town of Caledon has implemented Stopping Restrictions and 40 km/h Speed Limit and Community Safety Zone at the Tony Pontes Public School, considering there will be parents and children from Kindergarten to Grade 8 in the area.

The 24-hour counts completed by the Town of Caledon in 2017 over seven (7) days consistently showed 85th percentile speeds higher than 80 km/h, with an overall 85th percentile speed, for both directions for the duration of the counts, of 82 km/h. The counts further show that approximately 15% of vehicles respected the posted 60 km/h speed limit. Given the measured operating speeds, additional measures will likely be required to encourage drivers to comply with the proposed 40 km/h speed limit and school zone. Measures to consider include:

- Modifications to the roadway cross-section, including urbanization;
- Implement traffic calming (e.g. vertical or horizontal deflections, roadway narrowing, pavement markings); and
- Enforcement, including automated speed enforcement systems (photo radar).

3.4 Traffic Growth Projections

The methodology undertaken to forecast future traffic volumes was to apply a growth rate to existing base year volumes. Applicable growth rates were determined from volume outputs extracted from Peel Region’s Travel Demand Forecasting Model.

A screenline analysis was undertaken examining model outputs for the 2011, 2021, and 2031 horizon years. Specifically, the north-south roadways of Chinguacousy Road, McLaughlin Road, Kennedy Road, Heart Lake Road, and Dixie Road all south of Old School Road were captured within the analysis. Hurontario Street/Highway 10 was excluded from the analysis as the influence of traffic to and from Highway 410 may not be representative of the other roadways. Growth rates between the periods of 2011 – 2021, and 2021 – 2031 were calculated and found to be 4.57% and 2.03% compounded per annum, respectively.

In addition to the application of a growth rate to forecast future traffic volumes, site specific trips were accounted for the nearby future school development located within the study area. The school related site traffic assignments were extracted from the development’s supporting Traffic Impact Study.

Within the Study Area, it is assumed that Kennedy Road remains as a two-lane roadway, with one travel lane provided in each direction. Under the 2021 and 2031 model horizons, the link capacity and travel speed along Kennedy Road are assumed to remain the same as the base 2011 scenario. Furthermore, no changes are assumed for the Study Area intersection control devices. The intersection of Kennedy Road/Old School Road will continue to operate under traffic signal control, and the intersection of Kennedy Road/Bonnieglen Farm Road will continue to operate under roundabout control.

Intersection traffic volumes were calculated based on the 2018 volumes used for the existing transportation conditions analysis and using the above noted growth rates. **Figure 3-3** shows the 2021 projected volumes. **Figure 3-4** shows the 2031 projected volumes.

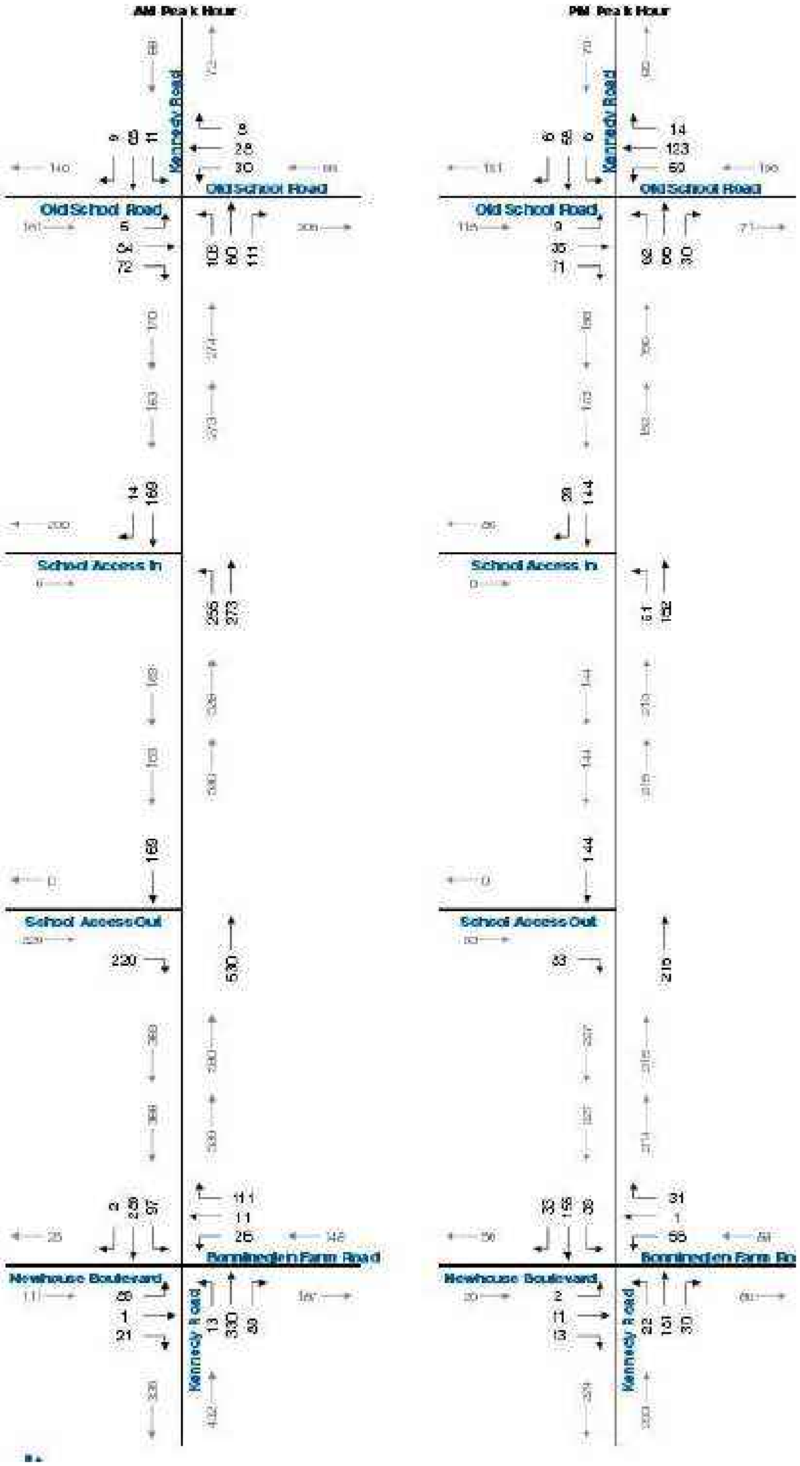


Figure 3-3 – 2021 Projected Volumes

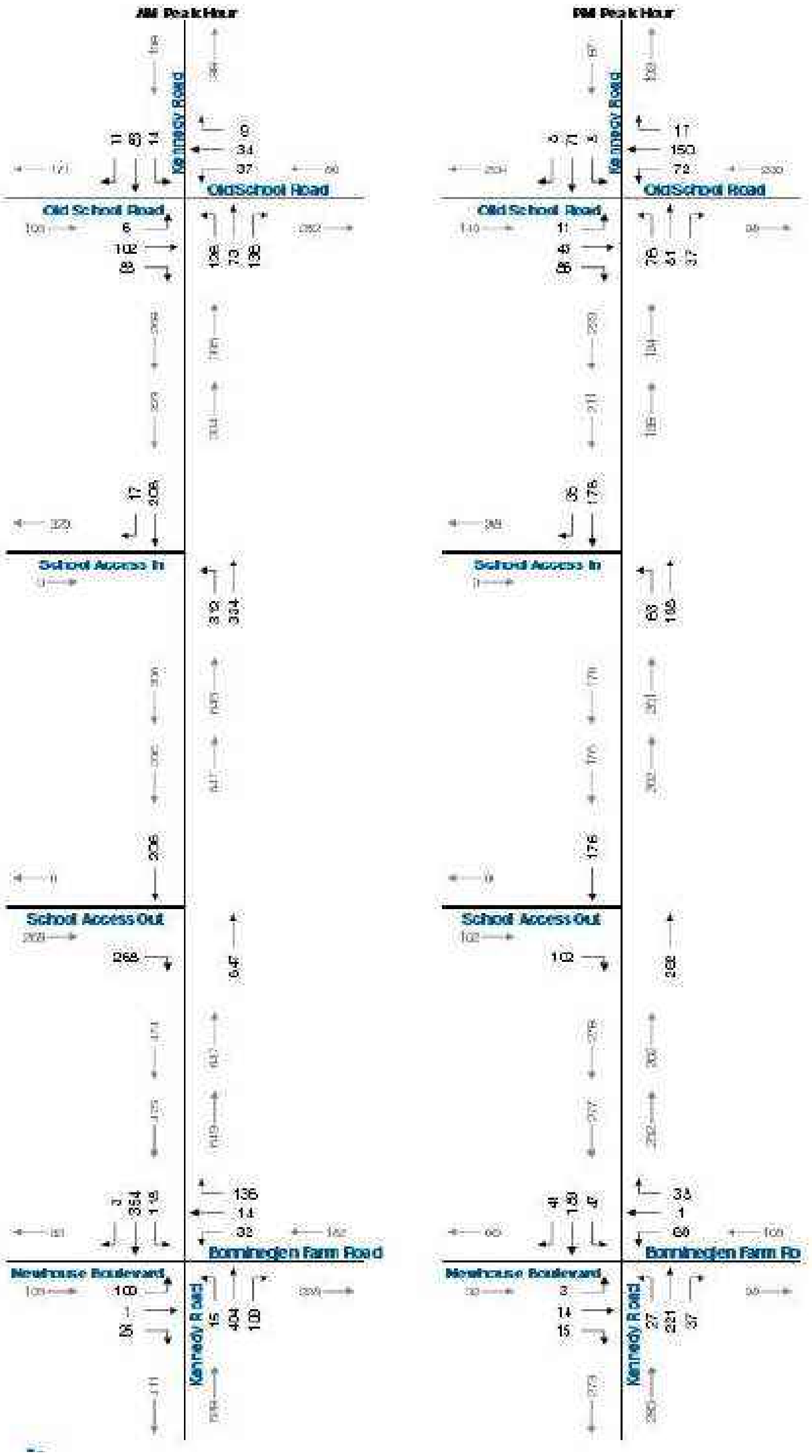


Figure 3-4 – 2031 Projected Volumes

The 2021 and 2031 midblock traffic operations v/c ratios were all found acceptable, as shown in **Table 3-3** and **Table 3-4**, respectively.

Table 3-3 – 2021 Midblock Traffic Operations

Peak Hour	Direction	Midblock v/c Ratio
AM	Northbound	0.53
	Southbound	0.39
PM	Northbound	0.22
	Southbound	0.23

Table 3-4 – 2031 Midblock Traffic Operations

Peak Hour	Direction	Midblock v/c Ratio
AM	Northbound	0.65
	Southbound	0.48
PM	Northbound	0.26
	Southbound	0.28

Under the 2021 and 2031 horizons, all intersections and traffic movements would be slightly worse in comparison to the 2018 traffic conditions. Notwithstanding, all traffic movements are forecast to continue operating at an acceptable level of service and within capacity.

Based on the operational analyses conducted, the findings indicate future traffic conditions can be accommodated on the existing road network without the need for intersection or roadway improvements. Further investigation has been conducted, the findings are as follows:

- No auxiliary turn lanes are anticipated to be required to accommodate the forecast traffic volumes at the intersection of Kennedy Road and Bonnieglen Farm Road. The current single lane roundabout approaches will continue to serve the intersection well up to the 2031 horizon.
- The unsignalized school inbound driveway intersection along Kennedy Road has been analyzed to determine if the forecast traffic volumes warrant the provision of left turn lanes. The warrants for left turn lanes follow the requirements of the MTO Design Supplement for the TAC Geometric Design Guide for Canadian Roads – June 2017. The 80 km/h design speed has been utilized. The nomograph for the highest percentage of left turning vehicles in the approaching volume (40%) was used. It is determined that a northbound left turn lane with 25 metres storage would be warranted for installation based on the forecasts 2021 AM peak hour volumes, and a northbound left turn lane with 30 metre storage would be warranted based on the forecasts 2031 AM peak hour volumes. Considering Tony Pontes School recently opened we recommend monitoring the left turn traffic volumes in the meantime and the proposed cross section is protected for future left turn lane at this section of Kennedy Road (23m ROW available).
- At the intersection of Kennedy Road and Old School Road, the south leg of the intersection (northbound approach) was reviewed to determine if any auxiliary turn lanes would be required. From an operational perspective, the northbound shared left/through/right approach is forecast to operate at a good level of service and well within capacity under the 2021 and 2031 horizons. Review of the forecast traffic volumes indicates that the northbound approach is forecast to have a high volume of left and right turn movements. It should be noted that the ultimate configuration of this intersection will be determined through the Old School Road EA study.

Based on the future traffic operations, it is expected that the intersections within the study area will operate at an acceptable level of service with the current/planned traffic controls. Therefore, signalization of the following intersections will not be required:

- Kennedy Road, Bonnieglen Farm Boulevard, and Newhouse Boulevard;
- Kennedy Road and the Tony Pontes Public School inbound access; and
- Kennedy Road and the Tony Pontes Public School outbound access.

In terms of active transportation facilities, the Tony Pontes Public School can expect that children will walk to school or walk to the school grounds to enjoy the facilities. There is an existing sidewalk on the west side of Kennedy Road and it stops just north of the school. The Town could consider extending pedestrian facilities along the west side as part of proposed road improvements.

Until additional pedestrian generators or sidewalk connections are constructed, it is not recommended that a sidewalk be provided on the east side of Kennedy Road. The presence of a sidewalk on the east side, without any pedestrian destination on that side, could encourage pedestrians to cross Kennedy Road at a midblock location in the vicinity of the school.

In terms of cyclists the Town of Caledon Transportation Master Plan recommends a Separated On-Road Cycling Route along Kennedy Road within the study area.

3.5 Problem Statement

Based on a review of existing conditions and forecasted traffic and development within the study area, and considering the prevailing natural and social conditions, the need and justification for improvements to Kennedy Road is summarized in the following Problem Statement:

"The section of Kennedy Road between Bonnieglen Farm Boulevard and Old School Road be improved to support the projected population, employment and development growth, and to enhance road safety for pedestrians, cyclists, and drivers."

4 Alternative Solutions

4.1 Alternative Solutions

Three alternatives were developed to address the problem or opportunity statement as part of Schedule B Municipal Class EA. These alternatives will be evaluated by natural environment, social/cultural environment, financial factors, and technical criteria. The alternatives are as follows:

4.1.1 Do Nothing

The "Do nothing" alternative identifies what would happen if no action is taken to address the current deficiencies within the corridor in both the short and long term basis. This alternative provides a base line in which other alternatives may be measured.

4.1.2 Rural Cross Section

This alternative would involve the reconstruction of Kennedy Road. It addresses the pavement deterioration, improves the current road shoulder and drainage; however, this alternative does not address the community need for safe pedestrian and cyclist facilities.

4.1.3 Urban Cross Section

This alternative would involve the reconstruction and urbanization of Kennedy Road. It addresses the need for operational and road safety improvements, and the community need for safe pedestrian and cyclists facilities.

4.2 Evaluation and Screening of Alternative Solutions

Each of the Alternative Solutions described in **Section 4.1** was reviewed and evaluated as how they would address the issues within the project problem statement. The purpose of this review is to 'screen' out those alternatives that will not adequately address the needs identified for Kennedy Road, and to identify the alternative solution that should be carried forward for further detailed evaluation.

Table 4-1 outlines the criteria and criteria indicators that were used to screen the alternative solutions within the categories. **Table 4-2** portrays the results of this screening and evaluation of the alternative solutions.

Table 4-1 – Evaluation Criteria

Category	Criteria	Criteria Indicators
Regional and Municipal Transportation Studies	Land use	Support regional and municipal transportation studies recommendations
Cultural Heritage	Heritage and archeological Impacts	Potential adverse effect on archeological and built heritage resources
Natural Environment	Wet Lands and Vegetation	Potential Effect on terrestrial and habitat
	Wildlife Habitat	Potential adverse effect on Wildlife due to loss of habitat
	Species at Risk	Potential adverse effect on species at risk identified in the study area
	Ground Water/Surface Water/Drainage	Potential adverse effect on ground water, wells, surface water quantity
	Trees	Potential adverse effect to existing trees and tree canopies within the study limit
	Fisheries and Water Quality	Potential to minimize impact on aquatic features
Social Environment	Agriculture	Potential adverse effect on loss of agricultural lands
	Property impacts	Potential adverse effect on abutting property in the

		study area
	Utilities	Ability to minimize effect on existing/proposed utilities
	Noise and Air Quality	Potential adverse effect on noise and air quality within the study area
	Construction disruption	Ability to minimize construction constraints and complexity
Transportation	Existing Traffic	How does the alternative serve the culvert volume of vehicular, pedestrian and cycling traffic
	Forecasted Traffic	Does the alternative address the forecasted transportation needs
	Safety	Ability to improve safety
	Access Management	Ability to accommodate traffic access to abutting properties
	Cycling needs	Ability to ensure existing/future cycling needs
	Pedestrian needs	Ability to ensure existing/future pedestrian needs
	Transit needs	Ability to ensure future transit needs
Cost	Utility Relocation	Extent of impacts on existing utilities that must be relocated and/or protected to construct alternative
	Capital cost	Capital cost of improvements
	Operation and Maintenance	Cost to operate and maintain the reconstructed road

Table 4-2 – Kennedy Road Alternative Solutions Screening/Evaluation Summary

Criteria	Do Nothing	Rural Cross Section	Urban Cross Section
Regional and Municipal Transportation Studies	Does not meet the Town of Caledon's Transportation Master Plan (Town's TMP) with respect to lane and shoulder widths.	The Town's TMP has designated Kennedy Road as a 26m ROW Rural Main Street with bike routes; however, the alternative does not fully meet these requirements as it does not provide curb and gutter.	The Town's TMP has designated Kennedy Road as a 26m ROW Rural Main Street with bike routes, the alternative meets these requirements except for the ROW width.
	○	◐	◕
Cultural Heritage	No impacts.	Will require wider than existing ROW which will encroach on the Dixon Union's Cemetery.	Road improvement works will be confined to the existing ROW. No encroachment on private property.
	●	○	●
Natural Environmental	No endangered or species at risk (SAR) have been identified in the area.	No endangered or species at risk (SAR) have been identified in the area; however, tree removal will be required to accommodate this alternative.	No endangered or species at risk (SAR) have been identified in the area. Low impact development (LID) measures will be implemented.

	◕	◕	●
Social Environment	No land acquisition required. No utility relocation required.	Land acquisition will be needed to fit all elements of the rural cross section. Major utility relocation required.	No land acquisition required. Minor utility relocation may be required.
	●	○	◕
Transportation Operations and Safety	No designated facilities for pedestrians and cyclists. 85th percentile of drivers are observed to speed, additional measures needed to encourage drivers to comply with the new 40km/h limit and community safety zone. Existing road profile does not provide adequate stopping sight distance to meet TAC requirements for the posted speed.	Cyclists will be provided with paved shoulders, no opportunity will be provided for pedestrian traffic. No other measures provided to encourage drivers to comply with the new 40km/h limit and community safety zone. Road reconstruction provides an opportunity for stopping sight distance improvements.	Cyclist and pedestrians will be provided with shared bike and platform. Urbanization and narrowing the lanes to 3.0m will further encourage drivers to comply with the new 40km/h limit and community safety zone. Road reconstruction provides an opportunity for stopping sight distance improvements.
	○	◐	●
Cost	No capital cost increase to the previously planned improvements.	Increase in utility relocation and capital cost but maintenance and operation costs will be lower.	Maintenance and operation costs will be lower.
	●	◕	◐
Summary	Alternative does not address the Problem or Opportunity Statement of this EA.	Alternative does not fully address the Problem or Opportunity Statement of this EA. Not carried forward to preliminary design.	Alternative does not have the 26m ROW that the Town's TMP outlined; however, the existing Kennedy Road with 20m ROW will operate well within its capacity based on the 2031 forecasted traffic growth, and road widening now will require relocating the existing hydro poles which will encroach onto the Dixon Union's Cemetery property. Otherwise Alternative addresses the Problem or Opportunity Statement of this EA and will be carried forward to preliminary design.
	○	◐	●

○ ◔ ◑ ◕ ●

Least preferred → Most preferred

4.3 Recommended Alternative Solution

Based on the evaluation and screening of each alternative, Alternative 3: Urban Cross Section was identified as the preferred. Although the Town's TMP has designated Kennedy Road to have 26m ROW; however, widening the ROW will require relocating the existing hydro poles on the east side of Kennedy which will encroach on the Dixon Union's Cemetery property. The new curb and gutter will help contain the road improvement works within the existing 20m ROW, thereby limiting impact to adjacent properties, especially to Dixon Union's Cemetery. The paved shoulders and platform will address cyclist and pedestrian needs. Therefore Alternative 3 addresses the problem or opportunity statement of this EA.

5 Public Information Centre (PIC)

A Public Information Centre (PIC) meeting was held on December 6th, 2018 at Inglewood Community Centre, 15825 McLaughlin Road, Caledon. In advance of the meeting approximately 24 notices were hand delivered to property owners/occupants within the Study Area due to the Canada Post service disruption. It was also advertised in the local newspapers. Agencies with expressed interest in the study were also circulated by direct mailing.

During the open house efforts were made by the study team to encourage all participants to sign in and provide their comments. Eight (8) persons signed in at the PIC. The purpose of the PIC was to provided residents, property owners, and other interested parties with information concerning the findings to date for the Kennedy Road Environmental Assessment Study and to obtain input on the Alternative Solutions being considered.

The information boards on display at the PIC outlined the study process, summary of technical studies undertaken for this project, the Problem Statement, Alternative Solutions, the Recommended Alternative, as well as typical section drawings and other illustration to depict how the Recommended Alternative will fit in the existing study area. A handout was also provided that included a comment sheet that requested comments and suggestions. A full copy of this material including mails outs and advertisements for the PIC are in included in **Appendix J**.

One comment was received from the Tony Pontes School Principal who relayed concerns from parents regarding the hill just north of the school entrance limiting their sight distance for the left turn into the school. Response and resolution to this comment is included in Table 5-1.

5.1 Responses to Public and Agency Comments

Responses to various comments forwarded by members of the public and agencies with an interest are included in Table 5-1 along with a brief description of their response and action required for resolution. Comment sheets received are included in **Appendix J**.

Table 5-1 – Public and Agency Comments

Respondent/Agency	Comments	Response/Resolution
Tony Pontes School	Parents express concerns about the hill just north of our school entrance. As you wait to turn left into our parking lot, you can't see the traffic coming towards you. We will eventually be a school of 800+ students plus staff.	Kennedy Road profile will be lowered to increase sight distance at the left turn movements into the school entrance just south of the hill.
Region of Peel Water Infrastructure	Region of Peel has existing water infrastructure within the Project area and nearby. Requesting to be informed throughout the project to coordinate works and avoid impacts to the regional infrastructure.	No relocation of utilities is required due to the improvement works. Will continue to keep Region of Peel informed of the ongoing study developments.

6 Design Concept

6.1 Introduction and Background

Based up on the results of the evaluation of alternate solutions and the feedback following the Public Information Centre, the Recommended Alternative Solution of urbanizing this section of Kennedy Road was confirmed. The solution includes providing a two-lane pavement with urban shoulders and pedestrian amenities on the west right-of-way. **Figure 6-1** provides a typical cross section, and **Figure 6-2** provides the typical section adjacent to the school.

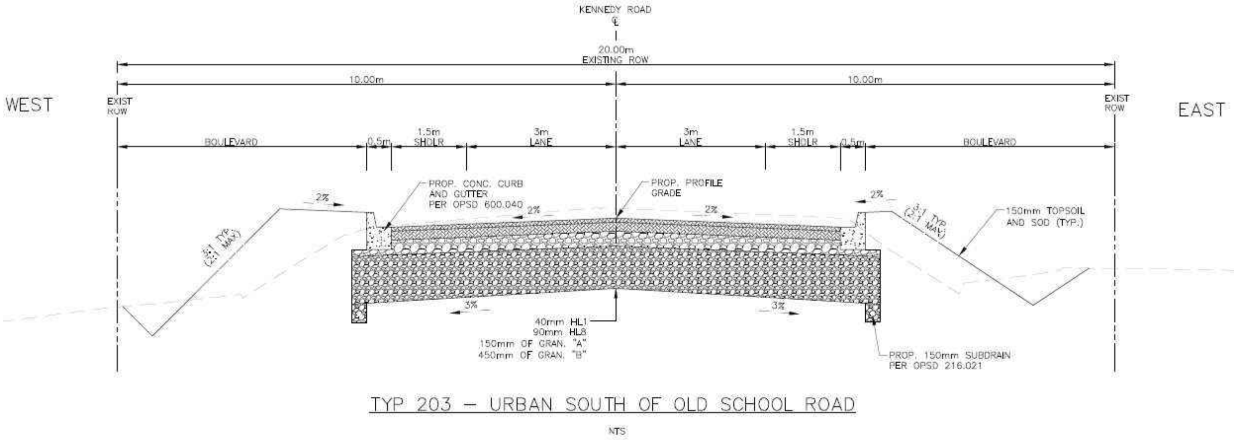


Figure 6-1 – Typical Section – South of Old School Road

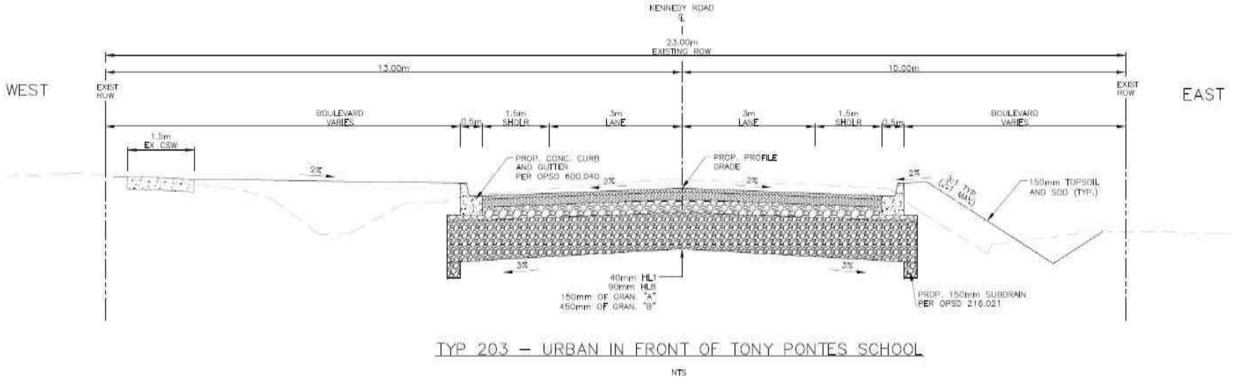


Figure 6-2 – Typical Section – In Front of Tony Pontes School

6.2 Roadway Design Criteria

The following table summarizes the proposed design criteria which forms the basis for the preliminary design as part of the Class EA.

Table 6-1 Roadway Design Criteria

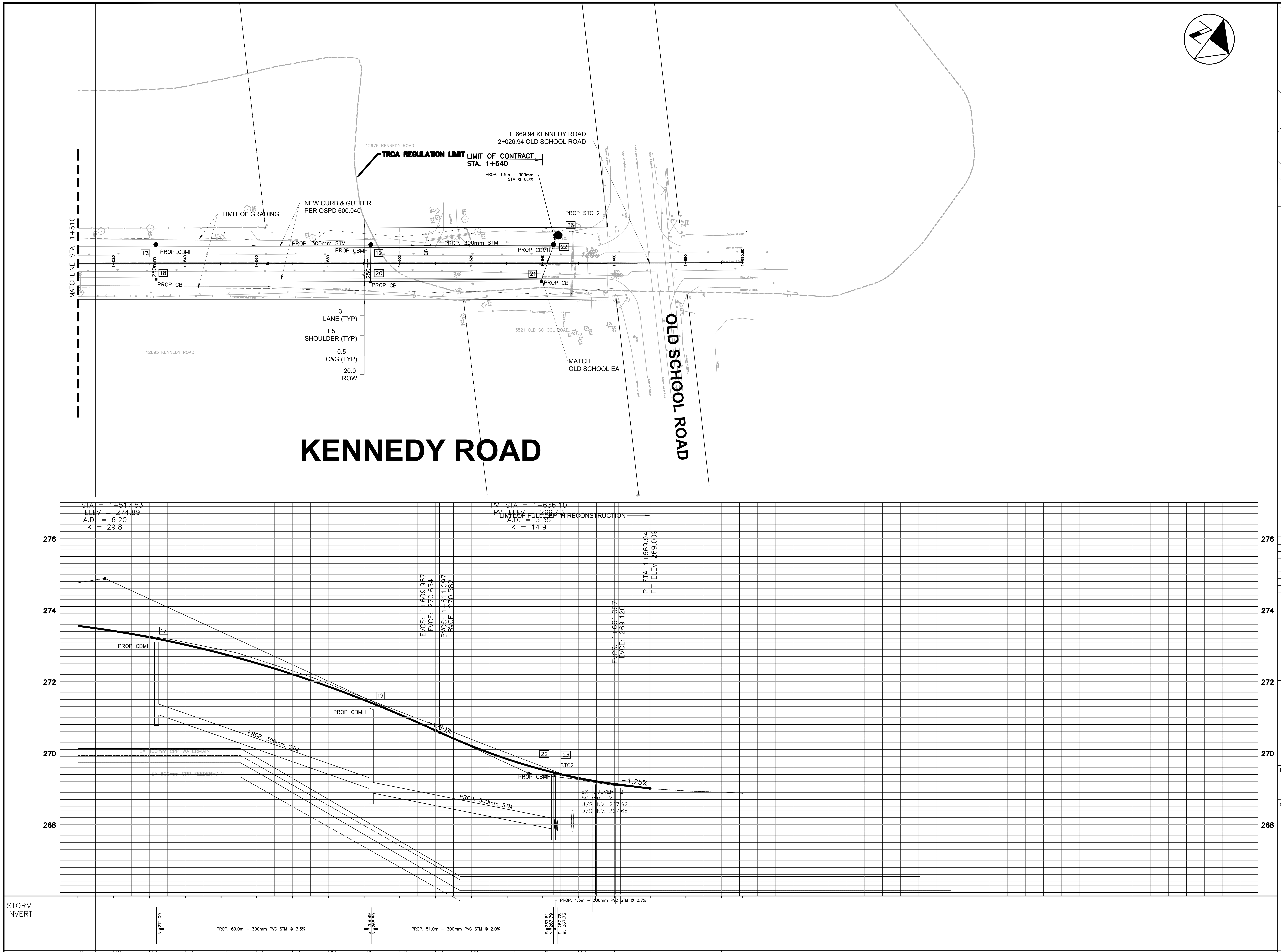
KENNEDY ROAD
(Bonnieglen Farm Boulevard to Old School Road)
Road Design Criteria

	Existing	Standard	Recommended
Road Classification	Collector	Collector (Town Official Plan, Schedule C-1)	No change
ROW Width	20m – 23m	26m (Town Official Plan, Schedule K)	No change (Protect for future 26m)
Posted Speed	60 km/h 40 km/h for southern 180m	50 km/h 40 km/h for southern 180m	50 km/h 40 km/h for southern 180m
Design Speed	Unknown	60km/h 50 km/h for southern 180m	60km/h 50 km/h for southern 180m
AADT	2,300	N/A	3,300
Clear Zone	Varies, some deficiencies with adjacent hydro poles	5.0m (TAC 7.3.1)	3.0m (a)
Cross Section Type	Rural	Urban/Rural	Urban
Lane Width	3.1m – 3.3m 1.1m – 1.3m paved should + (0.7m -1.0m unpaved)	4.35m (Town Std 203)	3.0m 1.5m paved shoulder (b)
Sidewalks	1.5m along school only	Both Sides (Town Std 203)	1.5m along school only
Streetlighting	None (intersections only)	Illuminated	Illuminated throughout
Min. Stopping Sight Distance	Unknown	85 for 60km/h 65 for 50km/h (TAC Table 2.5.2)	85 for 60km/h 65 for 50km/h
Min. K (crest)	17 for 70km/h	11 for 60km/h 7 for 50km/h (TAC Table 3.3.2)	14
Min. K (Sag Comfort)	7 (35km/h)(Approaching Old School Road) 21 (65km/h) (midblock)	8-9 for 60km/h 5-6 for 50km/h (TAC 3.3.5)	14
Max. Grade	4.25%	5%	3.95%
Min. Grade	0.55%	0.50%	0.70%
Minimum Centreline Radius	On Tangent	On Tangent	On Tangent
Taper Ratio	N/A	15:1 (TAC 9.17.1)	15:1
Pavement Structure	Unknown	40mm HL3 90mm HL8 150mm Gran A 450mm Gran B (Town Std 205)	40mm HL3 90mm HL8 150mm Gran A 450mm Gran B

(a). The 3m clear zone available is less than the standard required 5m; however, recent traffic collision analysis has found no collision in this section of Kennedy Rd and the AADT volume in this section is also low. Relocating the existing hydro poles will be cost ineffective and will encroach onto the adjacent Dixon Union Cemetery. We recommend lowering the speed limit to 60km/h as protection from these obstacles.

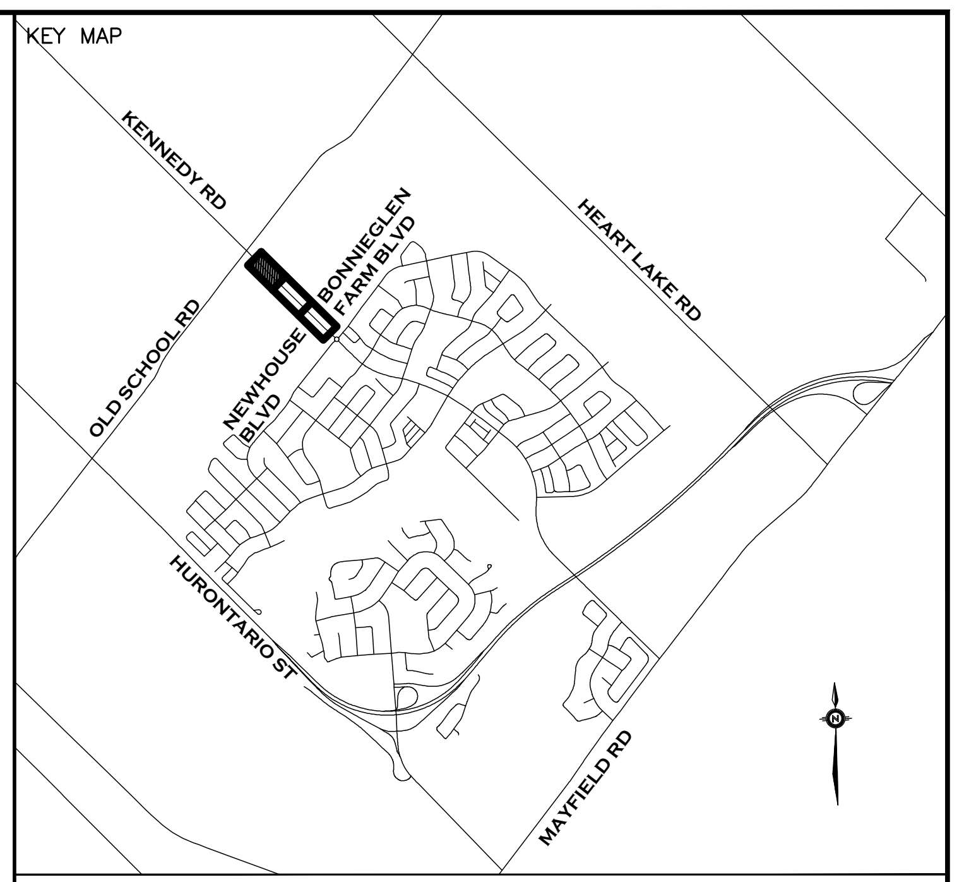
(b). 24-hour counts completed by the Town in 2017 over seven (7) days consistently show 85th percentile speeds higher than 80km/h. The new Tony Pontes School will expect students and parents accessing this area and narrowing the lane width to 3.0m with 1.5m paved shoulder completed with curb and gutter will encourage drivers to slow down.

Figure 6-3 to Figure 6-5 portray the preliminary design for the Kennedy Road EA study.



EXISTING & PROPOSED ℄ RD GRADES	273.57 273.557	273.42 273.415	273.27 273.240	273.10 273.032	272.90 272.789	272.62 272.514	272.30 272.205	271.94 271.862	271.55 271.486	271.16 271.076	270.77 270.633	270.39 270.199	270.00 269.832	269.62 269.533	269.27 269.300	269.09 269.134	269.00	268.94	268.91
℄ CHAINAGE	1+510	1+520	1+530	1+540	1+550	1+560	1+570	1+580	1+590	1+600	1+610	1+620	1+630	1+640	1+650	1+660	1+670	1+680	1+690

KEY MAP



GENERAL NOTES

▢ STRUCTURE NUMBER

NO.	BY	DATE	REVISION	CONS. CHECKED	TOWN APPR'D
1	AO	03/19	PRELIMINARY DESIGN	WW	

BENCH MARK:

ENGINEER'S STAMP

PROJECT NAME

KENNEDY ROAD RECONSTRUCTION

CONSULTANT

Chisholm, Fleming and Associates
consulting engineers

REGION OF PEEL

TOWN OF CALEDON

PLAN AND PROFILE

STA. 1+510 TO STA. 1+670

SCALE: HORIZ. 1:500 VERT. 1:50

PROJECT No. 256–16

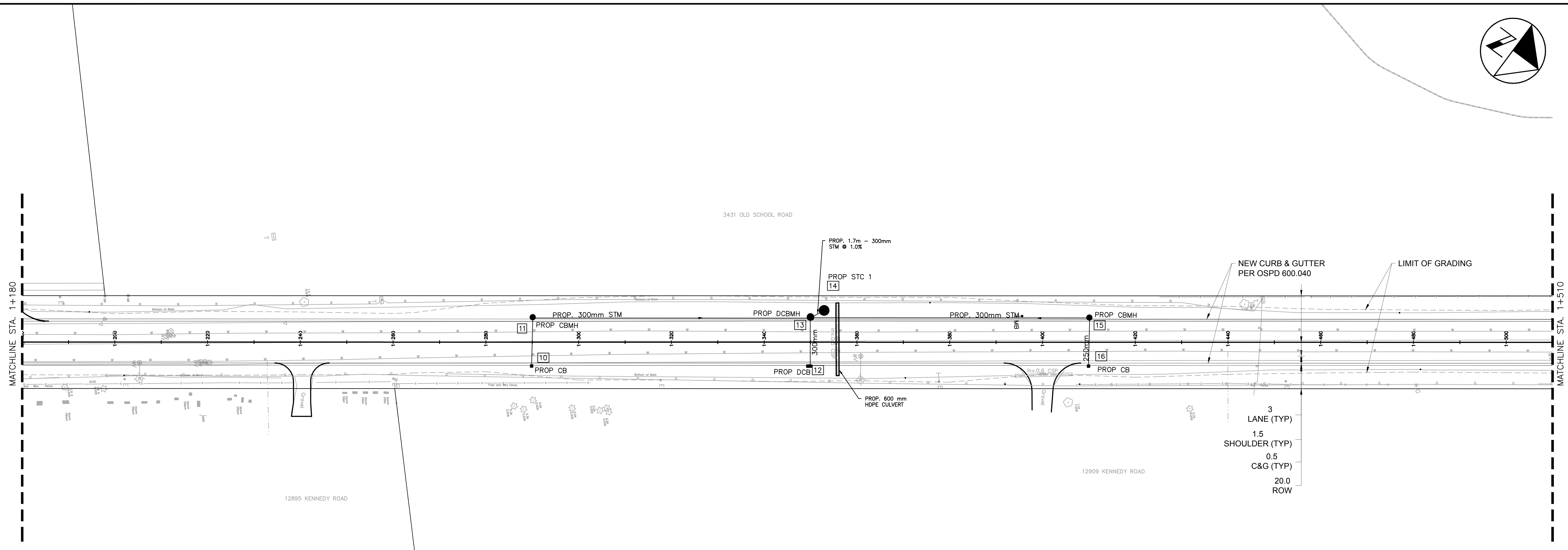
DESIGNED BY: WW

DRAWN BY: AO

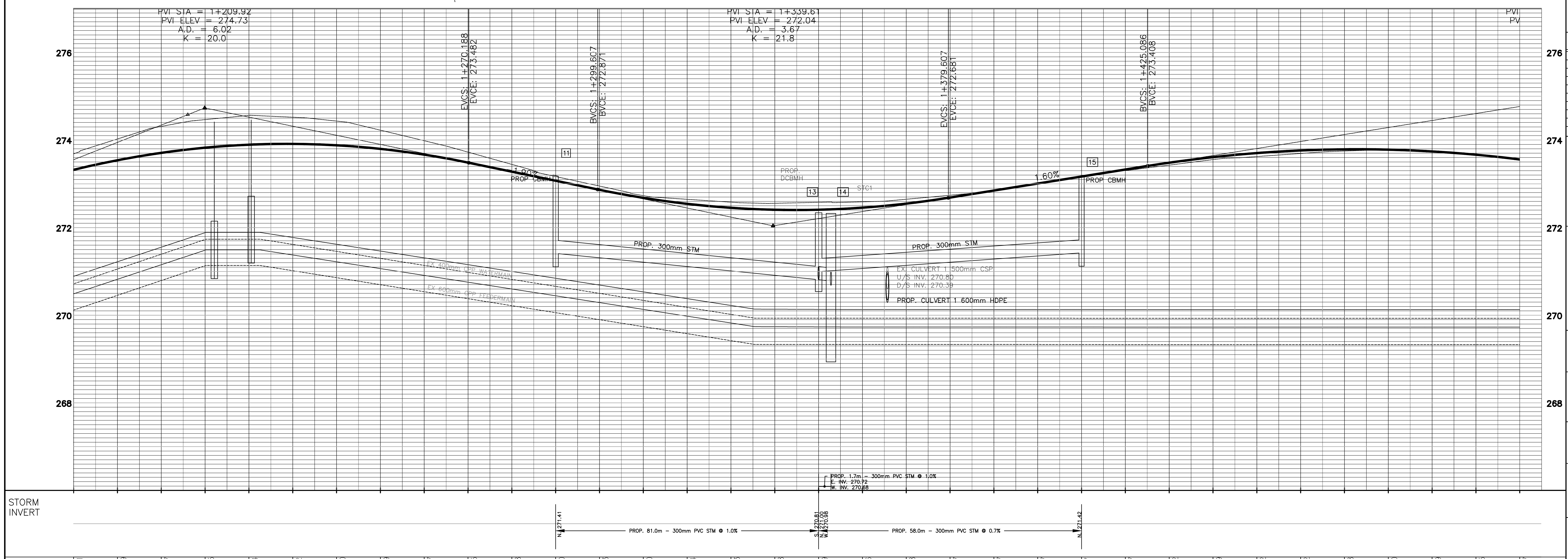
CHECKED BY: MVS

DATE: JANUARY 2019

DRAWING No: PP–3

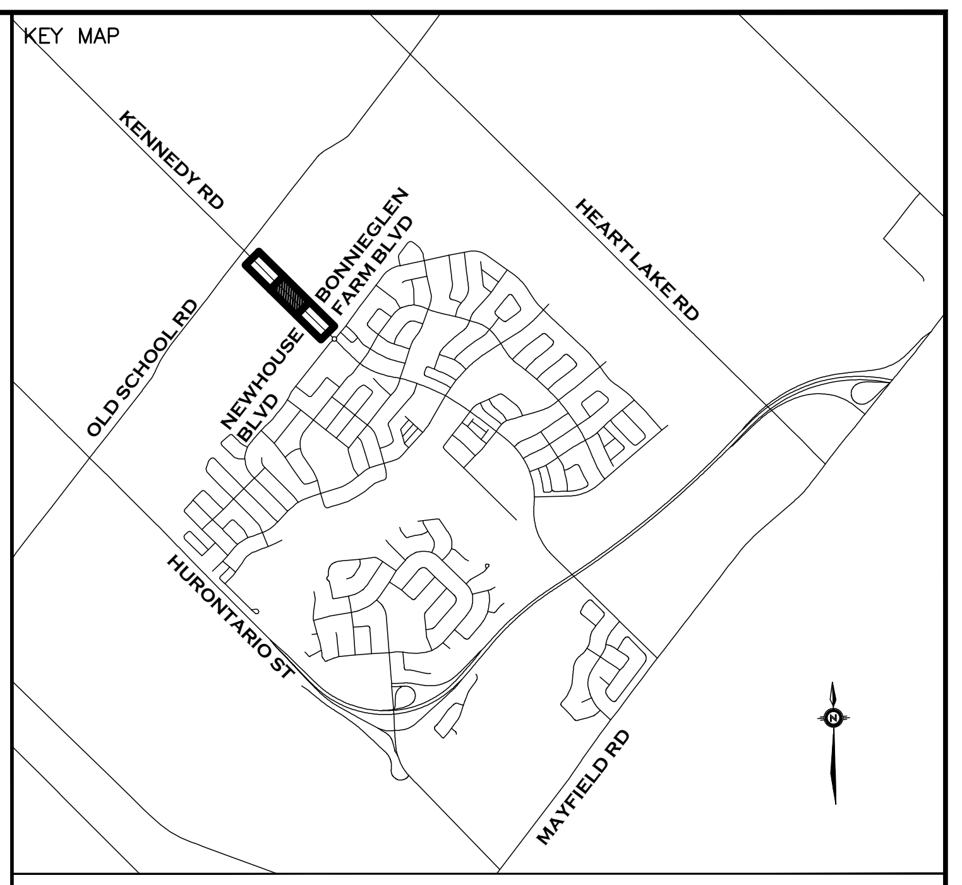


KENNEDY ROAD



℄ CHAINAGE	EXISTING & PROPOSED ℄ RD GRADES	
180		273.321
1+190	274.02	273.539
1+200	274.31	273.707
1+210	274.47	273.825
1+220	274.56	273.894
1+230	274.52	273.912
1+240	274.43	273.880
1+250	274.22	273.799
1+260	273.98	273.667
1+270	273.72	273.485
1+280	273.44	273.278
1+290	273.17	273.070
1+300	272.95	272.863
1+310	272.73	272.680
1+320	272.65	272.544
1+330	272.58	272.453
1+340	272.56	272.408
1+350	272.58	272.409
1+360	272.59	272.456
1+370	272.65	272.548
1+380	272.74	272.687
1+390	272.84	272.847
1+400	273.00	273.007
1+410	273.15	273.167
1+420	273.30	273.327
1+430	273.43	273.482
1+440	273.55	273.609
1+450	273.62	273.702
1+460	273.69	273.762
1+470	273.75	273.788
1+480	273.76	273.780
1+490	273.74	273.739
1+500	273.66	273.665
1+510	273.57	273.557

KEY MAP



GENERAL NOTES

7 STRUCTURE NUMBER

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1	AO	03/19	PRELIMINARY DESIGN	WW	

BENCH MARK:

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PROJECT NAME

KENNEDY ROAD RECONSTRUCTION

CONSULTANT

Chisholm, Fleming and Associates
consulting engineers

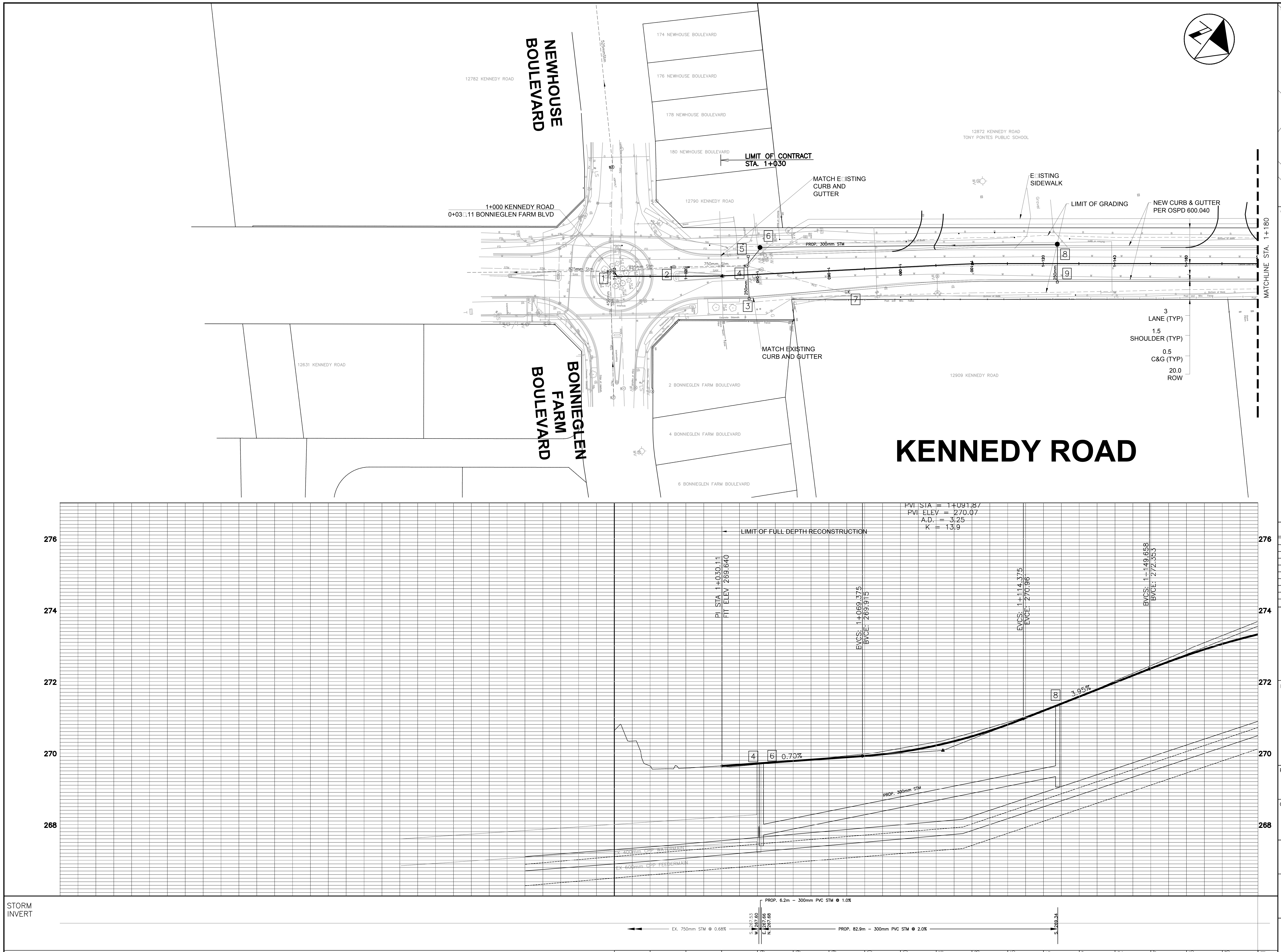
REGION OF PEEL

TOWN OF CALEDON

PLAN AND PROFILE

STA. 1+180 TO STA. 1+510

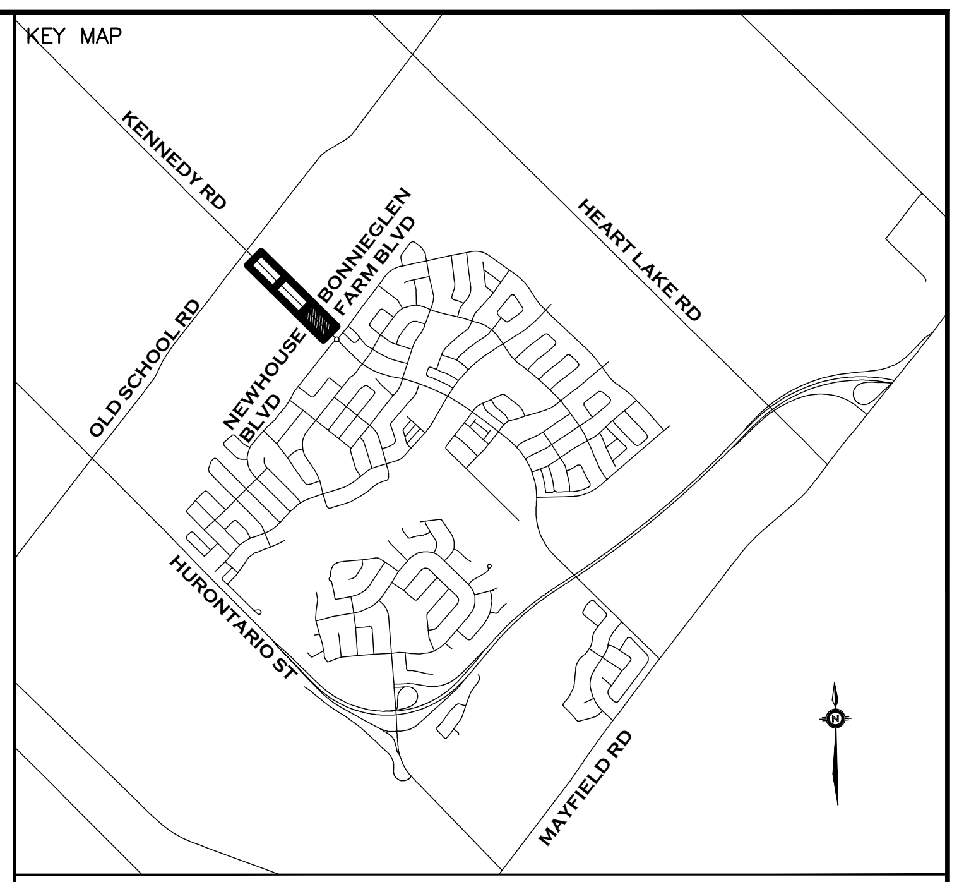
SCALE: HORIZ. 1:500 VERT. 1:50
PROJECT No. 256–16
DESIGNED BY: WW
DRAWN BY: AO
DRAWING No: PP–2
CHECKED BY: MVS
DATE: JANUARY 2019



	1+010	1+020	1+030	1+040	1+050	1+060	1+070	1+080	1+090	1+100	1+110	1+120	1+130	1+140	1+150	1+160	1+170	1+180
EXISTING & PROPOSED ℄ RD GRADES	269.64	269.58	269.64	269.68 269.709	269.78 269.779	269.87 269.849	269.98 269.920	270.13 270.030	270.31 270.213	270.57 270.468	270.86 270.795	271.21 271.183	271.60 271.577	272.02 271.972	272.44 272.367	272.88 272.735	273.29 273.053	273.68 273.321

℄ CHAINAGE

KEY MAP



GENERAL NOTES

NO.	BY	DATE	REVISION	CONS. CHECKED	TOWN APPR'D
1	AO	03/19	PRELIMINARY DESIGN	WW	

BENCH MARK:

ENGINEER'S STAMP

PROJECT NAME

KENNEDY ROAD RECONSTRUCTION

CONSULTANT

Chisholm, Fleming and Associates
consulting engineers

REGION OF PEEL

TOWN OF CALEDON

PLAN AND PROFILE

STA. 1+000 TO STA. 1+180

SCALE: HORIZ. 1:500 VERT. 1:50
DESIGNED BY: WW
DRAWN BY: AO
CHECKED BY: MVS
DATE: JANUARY 2019
PROJECT No. 256–16
DRAWING No: PP–1

6.3 Potential Impacts and Mitigation

During the project study various issues were raised with respect to the proposed undertaking. The following measures should be implemented in order mitigate negative impacts of the proposed project on the environmental features of the study area. Features and conditions that required additional consideration during this study included driveway/site access, noise/vibration/air quality, human health and safety, additional archaeological assessments within the existing right-of-way abutting Dixon's Union Cemetery and permitting requirements. It should be noted that no endangered species were found within the existing right-of-way.

6.3.1 Driveway/Site Access

Driveways on Kennedy Road may be impacted by construction. During construction driveway access is to be maintained, and as well, consultation with property owners should be undertaken if reprofiling impacts the existing driveway to match design.

6.3.2 Noise/Vibration/Air Quality

Temporary nuisance noise may occur during construction and restoration activities. Where required, noise control measures such as restricted hours of operation and the use of appropriate machinery/mufflers are to be implemented. Vehicles/machinery and equipment should be in good repair, equipped with emission controls, as applicable, and operated within regulatory requirements. If required, dust control measures may include the wetting of surfaces using a non-chloride based compound to protect water quality

The noise impact assessment performed by SS Wilson, used the forecasted traffic volumes to determine the need and extent if any of mitigation would be required as part of reconstruction works only Kennedy Road. Table 6-2 summarizes the findings of the noise report.

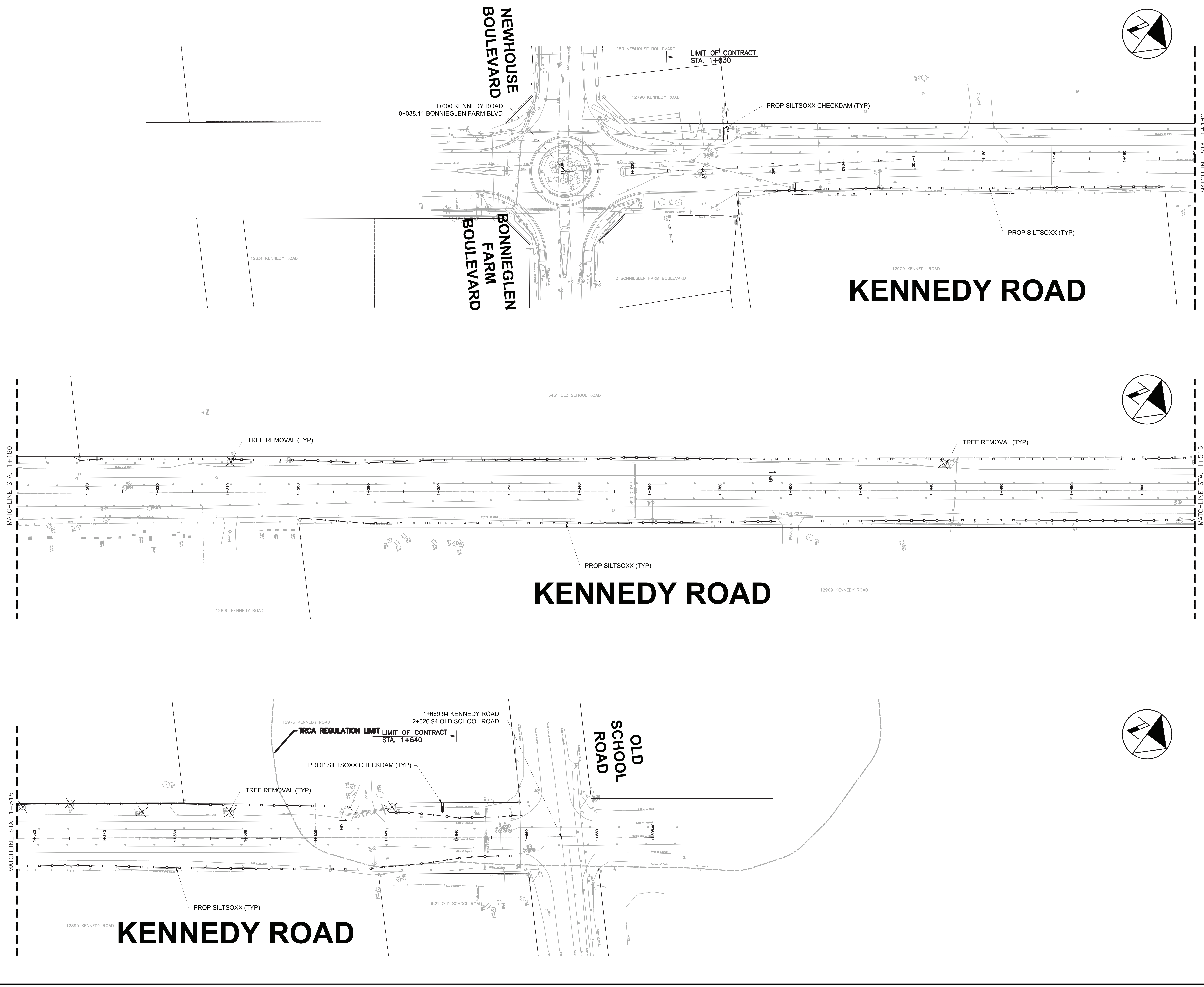
Table 6-2 – Noise Analysis

Receptor	Existing Level	Future Level
R1	52 dBa	52 dBa
R2	52 dBa	53 dBa
R3	52 dBa	53 dBa
R4	52 dBa	53 dBa
R5	58 dBa	60 dBa

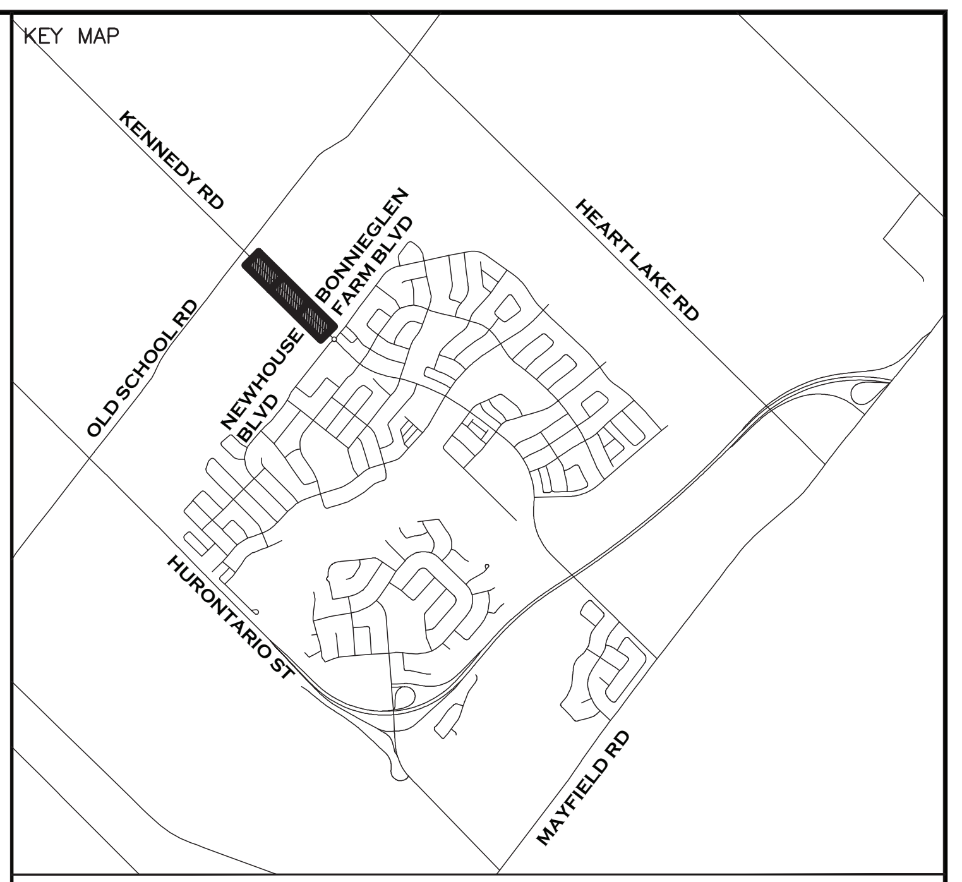
The future level of R5 is found to be in excess of the MECP objective sound level of 55 dBa for outdoor living areas. In order to achieve the objective level sound mitigation would be required. This is ideally done via a sound barrier but to be confirmed by the ongoing Old School Rd EA study.

6.3.3 Erosion and Sediment Control

A Sediment and Erosion Control Plan (SECP) will be prepared in detailed design to reduce impact of construction activities on the study area watershed, including but not limited to Filtrexx Siltsoxx, Siltsoxx check dams and silt traps in the catchbasins. The detailed SECP will meet the requirements of Toronto and Region Conservation Authority (TRCA). The preliminary erosion control measures are depicted in the Removal drawing in **Figure 6-6**.



KEY MAP



GENERAL NOTES

NO.	BY	DATE	REVISION	CONS. CHECKED	TOWN APPR'D
1	AO	03/19	PRELIMINARY DESIGN	WW	

BENCH MARK:

ENGINEER'S STAMP

PROJECT NAME

KENNEDY ROAD RECONSTRUCTION

CONSULTANT

Chisholm, Fleming and Associates
consulting engineers

REGION OF PEEL

TOWN OF CALEDON

REMOVALS & ESC

STA. 1+000 TO STA. 1+670

SCALE: HORIZ. 1:500 VERT. 1:50
PROJECT No.
DESIGNED BY:
DRAWN BY:
DRAWING No. REM-1
CHECKED BY:
DATE:

6.3.4 Human Health and Safety

There may be a potential safety hazard from construction activities, heavy equipment and traffic. The contractor will be required to implement a Health and Safety Plan.

6.3.5 Impact to Utilities

All utility information should be updated prior to construction to ensure that the data is accurate and to confirm relocation requests. The recommended preferred Alternative 3: Urban Cross Section does not anticipate utility relocation subject to further SUE investigation.

6.3.6 Natural Environment

Modification and widening of Kennedy Rd will take place within the existing right-of-way. Minor impacts to adjacent cultural meadow communities and minor vegetation removals is expected. Trees removals due to construction activity is expected, but compensation for the loss of trees will not likely be required as no regulated areas under Credit Valley Conservation (CVC) *O.Reg. 169/06* have been identified. Much of the right-of-way and lands immediately adjacent consist of disturbed low-quality wildlife habitat. Cultural meadow in narrow strips adjacent to the roadway were found to provide wildlife habitat. Given the highly disturbed nature of wildlife habitat within the study area, modification and widening of Kennedy Road within and beyond the right-of-way is not expected to have any significant impact on wildlife and/or wildlife habitat. In addition, the modifications are not expected to have a significant impact on wildlife passage.

6.3.7 Additional Archaeological Assessments

As identified in the Stage 1 Archaeological Assessment, additional study will be required. For work done on private property outside of the right-of-way a Stage 2 Archaeological Assessment. For the area within 10m of the existing cemetery a Stage 3 Archaeological Assessment will be required. These identified additional assessments may define further study to be required prior to implementation of any design.

6.3.8 Stormwater Management

The existing drainage area will be maintained. Road drainage will be conveyed via curb and gutters to catchbasins connected to the proposed underground stormsewer systems. The change in impervious area with the proposed road improvements on Kennedy Rd is negligible based on review of drainage area and runoff coefficient under existing and proposed conditions. LID measures such as bioswales is recommended to improve stormwater quality and help reduce runoff quantity. Refer to **Appendix F**.

6.3.9 Permitting Requirements and Approvals

The preliminary preferred solution has identified that works will be required to be completed with the existing TRCA regulated area. Depending on changes in the limit by TRCA, a permit under regulation 166/06 for the disturbance or alteration within a watercourse will be required for the construction of the roadway that should be obtained during the detailed design.

As the impacts to the natural environment has been as minimal and have not identified any endangered or protected species within the study area, a permit from the *Ministry of Natural Resources and Forestry* is not anticipated to be required.

As identified in the stormwater management brief, it has been noted that storm sewer is required for the capture and transfer of stormwater through the site. A permit from the *Ministry of Environment, Conservation, and Parks* will be required.

6.4 Monitoring

Monitoring of the proposed environmental investigation measures is required before, during, and after construction activities. The specific details of required mitigation, monitoring, and reporting will generally be identified during the design phase and will be included in any permits and/or authorizations used by the approval agencies. The following outlines the general monitoring activities that are recommended.

The following monitoring requirements will be in place and carried out throughout the duration of the project. The monitoring period will extend from just before mobilization by the contractor and ending one year following completion of the works.

- A review of the storm water management controls to ensure that they are operating properly
- Erosion and sedimentation controls are to be inspected weekly and following rainfalls greater than 15mm controls requiring repair or replacement will be addressed immediately
- Traffic management conditions are to be assessed on a daily basis and adjustments made as necessary to ensure safe vehicle operation
- The boundaries of the construction are to be inspected weekly to ensure all works and materials are kept within the assigned limits of the project
- Regular monitoring of the pre-construction measures to ensure maintenance and effectiveness, and that deficient measures are repaired/replaced as necessary
- Pruning and protection of any limbs or roots (of trees to be retained) disrupted during construction
- Fuelling and maintenance of machinery at designated locations away from any sensitive wetland areas and watercourses
- Storage of machinery and material, fill, etc in designated areas only
- Control of equipment movement through natural areas and setbacks
- During the contract's maintenance period, all new vegetation and natural restoration must continue to be watered and monitored
- At the end of the warranty period, inspection and documentation of site restoration measures will be completed to identify restoration success and remedy deficiencies
- Any other monitoring set by TRCA, MNRF, or MECP as conditions of their permits, approvals, and authorization

6.5 Soils and Pavement Design

A geotechnical investigation and chemical analysis were conducted by Sola Engineering in order to obtain information on the soil conditions, to provide recommendations for pavement rehabilitation/reconstruction practices, and to provide preliminary recommendations for structure improvements. A copy of the full report is contained in **Appendix G**. The proposed minimum pavement structure is shown in Table 6-3.

The existing pavement structure was reviewed for various reconstruction/rehabilitation options including full depth reconstruction or rehabilitation with pulverization followed by paving. Full depth reconstruction is recommended in order to achieve the most economical service life. Full depth pavement structure will of course be required in the areas requiring widening. The existing granular fill does not meet the OPS gradation specification requirements for Granular A or B. Total reconstruction involves removing the existing pavement to the bottom of the subbase and construct new subbase, base, binder asphalt, and surface asphalt.

Table 6-3 – Recommended Pavement Structure

Pavement Structure	Depth (mm)
HL-3 Asphalt Surface	40
HL-8 Asphalt Binder	90
Granular A	150
Granular B	450

6.6 Road Illumination

The section of Kennedy Rd, from south of Old School Rd to 200m north of Bonnieglen Farm Blvd roundabout will use lighting level for Low Pedestrian Area. This lighting level will be similar to the existing lighting in the subdivision south of Bonnieglen Farm Blvd. The section of Kennedy Rd, from 200m north of Bonnieglen Farm Blvd roundabout to north of Bonnieglen Farm Blvd roundabout will use lighting levels for Medium Pedestrian Area considering there will be students/parents accessing Tony Pontes School. The new streetlight pole will have a setback of minimum 5.0m from the edge of the through vehicular travelled lane, meeting clearzone requirements. See **Appendix K**.

6.7 Property Requirements

The Caledon Official Plan lists Kennedy Road lists Kennedy Road as having an ultimate 26m ROW. The current ROW is 20m. In order to bring the road into agreement with the official plan a 3m property taking on the east and west side of the road will be required. The current needs for this segment of Kennedy road can be accommodated within the existing ROW, therefore no property taking is required at this stage. For all future property development done along Kennedy Road, it is recommended that the Town should establish the necessary 3.0m property dedication at that stage in advance of any further upgrades to the road facility. Any future development occurs the boulevard elements should be upgraded to provide the necessary active transportation facility.

6.8 Roadside Safety

The existing hydro poles are located typically 4m from the existing edge of pavement, with poles as close as 3.2m. These values meet the 1993 guidelines for a 70 km/h design speed roadway (clearzone 3m), but do not meet the current guidance of 5.0m (TAC).

As these obstacles can not be fully removed and it would be impractical to protect them from the road users, other methods to reduce operating speed should be implemented. In accordance with MTOs directive for Road Reconstruction/Rehabilitation projects these obstacles may remain but if they are moved or upgraded they should be located further from the roadway.

6.9 Utility Relocation

As noted in Section 6.3.5 the existing corridor includes multiple utilities. Based on the preferred design there is no practical relocation of utilities required. In the event that a widened right-of-way is obtained prior to replacement or upgrading of the existing hydro infrastructure, the new hydro poles should be located within the newly obtained right-of-way in order to achieve the desired clear zone as prescribed.

6.10 Estimated Project Costs

A preliminary construction cost estimate for the recommended preferred alternative is $1.5 million in 2019 dollars. This amount excludes engineering costs and utility relocation costs.

7 Study Completion

This study and report is the result of a combined effort and extensive input from the study team members, the prime and sub-consultants, various members of the public, various government agencies, and utility companies. The Project File for Kennedy Road will be placed on the public record for a 30-day review period. Following the review period, assuming there are no requests for a Part II Order, the study will be deemed to be completed. Completion of the study will permit the Town of Caledon to proceed with the detailed design and construction of the proposed works.

During the 30-day review period any member of the public, agency, property owner, or other stakeholder may request that the proponent address any concerns that they may have with the project recommendations. If any concerns cannot be resolved through consultation between the Town and the objector, then a formal request may be made to the Ministry of the Environment, Conservation and Parks that a Part II Order be issued. Such a request by the objector must be in writing.

The Project File will be placed for public review with the Town of Caledon and on the Town's website. A copy of the Notice of Study Completion will be advertised twice in the Caledon Enterprise and Caledon Citizen. A copy of the Notice is found in **Appendix L**.

APPENDIX A

Public Consultation

Chisholm, Fleming and Associates consulting engineers
317 Renfrew Drive, Suite 301, Markham, ON L3R 9S8 Tel: 905-474-1458 Fax: 905-474-1910 E-mail: cfa@ChisholmFleming.com
Serving our Clients for over 60 years

June 22, 2018 Our Project No. 256-16

Attention:

RE: Notice of Study Commencement
Kennedy Road (Bonnieglen Farm Boulevard to Old School Road)
Class EA

Dear

On behalf of the Town of Caledon, we are writing to advise you that we have initiated a Schedule “B” Class Environmental Assessment to consider potential upgrades to Kennedy Road between Bonnieglen Farm Boulevard to Old School Road.

The Notice of Commencement, issued on May 17, 2018, for this project is attached.

We are interested in hearing any comments or concerns that you may have with respect to this study. Please contact either of the following for additional information about this project or to be added to the study mailing list for future notifications:

Ryan Tucker
Town Project Manager
Town of Caledon
905-584-2722 ext 4040
ryan.tucker@caledon.ca

Leonard Rach, P.Eng.
Consultant Project Manager
Chisholm, Fleming and Associates
905-474-1458
leonard.rach@chisholmfleming.com

If you would like a hardcopy of this notice for your records, please let us know.

Yours very truly,

CHISHOLM, FLEMING AND ASSOCIATES
Per:

Andrew Ostler, P.Eng

cc Ryan Tucker, P.Eng, Town of Caledon

TOWN OF CALEDON

NOTICE OF STUDY COMMENCEMENT

Kennedy Road (Bonniglen Farm Boulevard to Old School Road)
Class Environmental Assessment Schedule B

THE STUDY:

The Town of Caledon(Town) has initiated a Class Environmental Assessment (Class EA) study for Kennedy Road between Bonnieglen Farm Boulevard and Old School Road (see key map below). The study has been initiated to consider potential upgrades to Kennedy as a 2-lane roadway that are supportive of future land uses. To determine the nature of the problem, an inventory of the local physical, natural, and social environment will be completed. Once the problems are fully understood, a set of alternative solutions will be developed and presented to the public and regulatory agencies for comment. Chisholm, Fleming and Associates has been retained by the Town to assist in completing the Class EA study.

This Class EA is planned as a Schedule B project under the Municipal Class Environmental Assessment document (October 2000, as amended in 2007, 2011, and 2015) for municipal projects. A Public Information Centre (PIC) will be held as the study progresses. Notice advising of the date, time, and location of the PIC will be mailed out to all project stakeholders and advertised in the local newspaper.

COMMENTS:

If you would like to provide us with your comments, require additional information, or would like to be placed on the project mailing list please contact: Comments will be maintained for reference throughout the project and will become part of the public record.

Ryan Tucker, P.Eng.
Project Manager, Structures
Finance and Infrastructure Services
Town of Caledon
6311 Old Church Road
Caledon, ON L7C 1J6
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Markham, ON L3R 9S8
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Notice First Posted: May 17, 2018

Agency Name	SENT	Invitation to PIC Sent	Invitation to PIC Redaction	Comments Received (Blank=none received)	Comments	Response Given	Action Required
CN Rail	7-Jun-18	20-Sep-18	27-Sep-18				
Ministry of Tourism and Culture	7-Jun-18	20-Sep-18	27-Sep-18				
Ministry of Natural Resources and Forestry - Aurora District	7-Jun-18	20-Sep-18	27-Sep-18				
Ministry of Natural Resources and Forestry	7-Jun-18	20-Sep-18	27-Sep-18				
Ministry of Natural Resources and Forestry				I am not sure if you have received any other responses from MNRF. Species at risk to be considered in the area include Butternut (endangered), Bank Swallow (threatened), Barn Swallow (threatened), Bobolink (threatened) and Eastern Meadowlark (threatened). If possible, please provide conceptual design information relative to the project as it may be displayed at the upcoming open house (<10 megabytes).	Listed species were not found present within the study area		Send PIC material and prelim design prior to PIC date.
Ministry of Aboriginal Affairs	7-Jun-18	20-Sep-18	27-Sep-18				
Ministry of the Environment and Climate Change	7-Jun-18	20-Sep-18	27-Sep-18				
Ministry of the Environment and Climate Change	7-Jun-18	20-Sep-18	27-Sep-18				
Ministry of the Environment and Climate Change	7-Jun-18	20-Sep-18	27-Sep-18		June 8 - New Process for EA to follow (began May 1, 2018)	Followed Process for informing	Require sending notice of study completion
Ministry of Environment and Climate Change - Environmental Approvals Branch		20-Sep-18	27-Sep-18				
Canada Post - Central Region (Ontario)		20-Sep-18	27-Sep-18				
Ministry of Municipal Affairs - Central Municpal Service Office	7-Jun-18	20-Sep-18	27-Sep-18				
Infrastructure Ontario	7-Jun-18	20-Sep-18	27-Sep-18				

Agency Name	SENT	Invitation to PIC Sent	Invitation to PIC Redaction	Comments Received (Blank=none received)	Comments	Response Given	Action Required
Toronto and Region Conservation Authority	7-Jun-18	20-Sep-18	27-Sep-18				
Toronto and Region Conservation Authority	7-Jun-18	20-Sep-18	27-Sep-18				
Toronto and Region Conservation Authority	7-Jun-18	20-Sep-18	27-Sep-18				
Toronto and Region Conservation Authority	7-Jun-18	20-Sep-18	27-Sep-18				
Toronto and Region Conservation Authority	7-Jun-18	20-Sep-18	27-Sep-18				
Toronto and Region Conservation Authority							
Niagra Escarpment		20-Sep-18	27-Sep-18				
Town of Caledon	7-Jun-18	20-Sep-18	27-Sep-18				
Town of Caledon	7-Jun-18	20-Sep-18	27-Sep-18				
Town of Caledon	7-Jun-18	20-Sep-18	27-Sep-18				
Town of Caledon	7-Jun-18	20-Sep-18	27-Sep-18				
Town of Caledon	7-Jun-18	20-Sep-18	27-Sep-18				
Caledon Fire & Emergency	7-Jun-18	20-Sep-18	27-Sep-18				
Town of Caledon	7-Jun-18	20-Sep-18	27-Sep-18				
Town of Caledon		20-Sep-18	27-Sep-18				
Town of Caledon		20-Sep-18	27-Sep-18				
Town of Caledon		20-Sep-18	27-Sep-18				
Town of Caledon		20-Sep-18	27-Sep-18				
Town of Caledon	7-Jun-18	20-Sep-18	27-Sep-18				
OPP Caledon Detachment		20-Sep-18	27-Sep-18				
Town of Caledon		20-Sep-18	27-Sep-18				
Rogers Cable TV Limited	7-Jun-18	20-Sep-18	27-Sep-18				
Bell Canada	7-Jun-18	20-Sep-18	27-Sep-18				
Enbridge Gas Distribution Incorporated	7-Jun-18	20-Sep-18	27-Sep-18				
Enbridge Gas Distribution Incorporated		20-Sep-18	27-Sep-18				
Hydro One Networks	7-Jun-18	20-Sep-18	27-Sep-18				
Enersource Hydro Mississauga	7-Jun-18	20-Sep-18	27-Sep-18				
Peel Region Sanitary and Watermain		20-Sep-18	27-Sep-18				

Agency Name	SENT	Invitation to PIC Sent	Invitation to PIC Redaction	Comments Received (Blank=none received)	Comments	Response Given	Action Required
Student Transportation of Peel Region		20-Sep-18	27-Sep-18				
Peel District School Board	8-Jun-18	20-Sep-18	27-Sep-18	Comments RECEIVED	Phone Call from Peel Dec 3, requests copies of PIC material for commenting	Informed them that hey would be available after the meeting on the Towns website, offered to send a copy of the boards via email when available.	copy of boards sent on Dec 12
Peel District School Board		20-Sep-18	27-Sep-18	August 28, 2018 August 29, 2018	August 28 - Thank you for your Notice of Study Commencement letter for the proposed road improvements on Kennedy Road, between Bonnieglen Farm Boulevard and Old School Road. As you are probably aware, Tony Pontes Public School is located on the west side of the study area. Has your team been in contact with anyone from the Board for the proposed improvements? I would like to have a better understanding of how this will affect our school site. August 29 - Provided updated site plan	August 28 - Thanks for responding to the letter that was sent. We are still undergoing the EA process and haven't done any further coordination with the board in regards to what will be recommended for any improvements. By chance would you be able to send the plans that your site is using for construction. The version that we have received are the ones from Jan 2017 for Site Plan approval. Having this information will help ensure that the recommendations will be appropriate given the future as-built configuration of the site.	Further coordination - ensure compliancy with constructed school
Dufferin-Peel Catholic District School Board	7-Jun-18	20-Sep-18	27-Sep-18	7-Jun-18	June 7 - We currently have a school under construction south of the study area located at 500 Dougall Avenue. While we have no comments at this time, we would like to continue to receive updates on the EA.		Provide Updates
Dufferin-Peel Catholic District School Board		20-Sep-18	27-Sep-18				
Region of Peel	7-Jun-18	20-Sep-18	27-Sep-18				
Region of Peel	7-Jun-18	20-Sep-18	27-Sep-18				
Region of Peel	7-Jun-18	20-Sep-18	27-Sep-18				
Region of Peel	7-Jun-18	20-Sep-18	27/09/2018 1/10/2018				
Region of Peel	7-Jun-18	20-Sep-18	27/09/2018 1/10/2018				
Region of Peel	7-Jun-18	20-Sep-18	27-Sep-18				
Region of Peel	7-Jun-18	20-Sep-18	27/09/2018 1/10/2018				
Region of Peel	7-Jun-18	20-Sep-18	27-Sep-18				
Region of Peel	7-Jun-18	20-Sep-18	27-Sep-18				
Region of Peel	7-Jun-18	20-Sep-18	27-Sep-18				
Region of Peel	7-Jun-18	20-Sep-18	27-Sep-18				
Region of Peel	7-Jun-18	20-Sep-18	27-Sep-18	7-Jun-18	These documents have already been received by the Region from the Town and the reviewer will respond through the appropriate avenues.		
Region of Peel	7-Jun-18	20-Sep-18	27-Sep-18				
Region of Peel							
Region of Peel	7-Jun-18	20-Sep-18	27-Sep-18				

Agency Name	SENT	Invitation to PIC Sent	Invitation to PIC Redaction	Comments Received (Blank=none received)	Comments	Response Given	Action Required
Mississaugas of the New Credit First Nation			27-Sep-18				
Metis Nation of Ontario			27-Sep-18				
Tony Pontes Public School							

Agency/Organization	SENT	Invitation to PIC Sent	PIC Redaction Sent	Comments Received (Blank = None Received)	Comments	Response Given	Action Required	Team Project Notes
Mississaugas of the New Credit First Nation	7-Jun-18	21-Sep-18	27-Sep-18		Inform prior to excavation/further archaeological study		Dec 21 _Sent AA - Stage 1 and Natural Enviro	
Métis Nation of Ontario	7-Jun-18	21-Sep-18	27/09/2018 1/10/2018					
Aamjiwnaang First Nation	7-Jun-18	21-Sep-18	27/09/2018 1/10/2018					
Aamjiwnaang First Nation		21-Sep-18	28-Sep-18					
Alderville First Nation	7-Jun-18	21-Sep-18	27-Sep-18					
Aundeck-Omni-Kaning	7-Jun-18	21-Sep-18	27-Sep-18					
Beausoleil First Nation	7-Jun-18	21-Sep-18	27/09/2018 1/10/2018					
Chippewas of Georgina Island	20-Jun-18	21-Sep-18	28-Sep-18	23-Oct-18	2018-10-23 No comments or concerns at this time			
Chippewas of Georgina Island		21-Sep-18	28-Sep-18					
Chippewas of Kettle and Stony Point FN		21-Sep-18	28-Sep-18					
Chippewas of Nawash First Nation	7-Jun-18	21-Sep-18	27-Sep-18					
Saugeen Ojibway Nation	7-Jun-18	21-Sep-18	27-Sep-18	8-Jun-18	Does not require further notification, outside of their territory			
Chippewas of Rama First Nation		21-Sep-18	27-Sep-18	23-Oct-18	I wanted to let you know that we received your notice for the EA Study for Kennedy Road to consider upgrading the road to a two-lane roadway. At this time we have no comments or concerns regarding this project. Thank you for notifying us and please contact us in the future with any projects that may impact our traditional territories.			
Chippewas of the Thames First Nation	7-Jun-18	21-Sep-18	27/09/2018 1/10/2018		Nov 9, 2018 - Outside of territory, have no concerns at this time. Suggested to contact Chippewas of Beausoleil, Georgina Island, Rama, and Mississaugas of New Credit, Alderville, Curve Lake, Hiawatha, Scugog Island Nov 9, 2018	Nov 12 - Thanked for response, noted that have contacted the mentioned first nations.		
Curve Lake First Nation	7-Jun-18	21-Sep-18	27-Sep-18					
Hiawatha First Nation	7-Jun-18	21-Sep-18	27-Sep-18					
M'Chigeen First Nation		21-Sep-18	28-Sep-18					
Mississaugas of Scugog Island First Nation	7-Jun-18	21-Sep-18	27-Sep-18					
Mohawks Council of Akwesasne	7-Jun-18	21-Sep-18	27/09/2018 1/10/2018					
Mohawks of the Bay of Quinte	7-Jun-18	21-Sep-18	27-Sep-18	12-Jun-18	Are not able to be an active party but do request ":Please forward any Archaeological Assessments to Amy Brant, MBQ Research Assistant, at Dec 12 - Send AA when available	AA-Stage 1 sent Dec 20 when final copy received	Send AA - Stage 1 and eventual Stage 3	AA-Stage 1 sent Dec 20
Saugeen First Nation	7-Jun-18	21-Sep-18	27-Sep-18					
Sheguiandah		21-Sep-18	28-Sep-18					
Six Nations of the Grand River	7-Jun-18	21-Sep-18	27-Sep-18					
Walpole Island First Nation (Bkejwanong Territory)		21-Sep-18	28-Sep-18					
Wikwemikong First Nation		21-Sep-18	28-Sep-18					
Zhiibaahaasing First Nation		21-Sep-18	27-Sep-18					

Municipal Address	SENT	Invitation to PIC Sent	PIC Postponement	Comments Received
3538 OLD SCHOOL RD	17-May-18	21-Sep-18	28-Sep-18	
4 BONNIEGLEN F BLVD	17-May-18	21-Sep-18	28-Sep-18	
6 BONNIEGLEN F BLVD	17-May-18	21-Sep-18	28-Sep-18	
22 BONNIEGLEN F BLVD	17-May-18	21-Sep-18	28-Sep-18	June 1, 2018 - I would like more information and to be kept in the loop for the expansion of Kennedy. Also can you share the plans the city has for the land behind the houses on Bonnieglen Farm Blvd.
18 BONNIEGLEN F BLVD	17-May-18	21-Sep-18	28-Sep-18	
24 BONNIEGLEN F BLVD	17-May-18	21-Sep-18	28-Sep-18	
16 BONNIEGLEN F BLVD	17-May-18	21-Sep-18	28-Sep-18	
12909 KENNEDY RD	17-May-18	21-Sep-18	28-Sep-18	
36 BONNIEGLEN F BLVD	17-May-18	21-Sep-18	28-Sep-18	
12976 KENNEDY RD	17-May-18	21-Sep-18	28-Sep-18	
8 BONNIEGLEN F BLVD	17-May-18	21-Sep-18	28-Sep-18	
28 BONNIEGLEN F BLVD	17-May-18	21-Sep-18	28-Sep-18	
12 BONNIEGLEN F BLVD	17-May-18	21-Sep-18	28-Sep-18	
2 BONNIEGLEN F BLVD	17-May-18	21-Sep-18	28-Sep-18	
30 BONNIEGLEN F BLVD	17-May-18	21-Sep-18	28-Sep-18	
14 BONNIEGLEN F BLVD	17-May-18	21-Sep-18	28-Sep-18	
12895 KENNEDY RD	17-May-18	21-Sep-18	28-Sep-18	
26 BONNIEGLEN F BLVD	17-May-18	21-Sep-18	28-Sep-18	
20 BONNIEGLEN F BLVD	17-May-18	21-Sep-18	28-Sep-18	
32 BONNIEGLEN F BLVD	17-May-18	21-Sep-18	28-Sep-18	
34 BONNIEGLEN F BLVD	17-May-18	21-Sep-18	28-Sep-18	
3431 OLD SCHOOL RD	17-May-18	21-Sep-18	28-Sep-18	
38 BONNIEGLEN F BLVD	17-May-18	21-Sep-18	28-Sep-18	
10 BONNIEGLEN F BLVD	17-May-18	21-Sep-18	28-Sep-18	
12976 KENNEDY RD	17-May-18	21-Sep-18	28-Sep-18	

APPENDIX B

Archaeological Assessment
(Archeoworks Inc)

STAGE 1 ARCHAEOLOGICAL ASSESSMENT
KENNEDY ROAD URBANIZATION
PART OF LOT 21-23, CONCESSION 1-2 ECR
(FORMER TOWNSHIP OF CHINGUACOUSY, COUNTY OF PEEL)
TOWN OF CALEDON
REGIONAL MUNICIPALITY OF PEEL, ONTARIO

ORIGINAL REPORT

Prepared for:

Chisholm, Fleming and Associates
317 Renfrew Drive, Suite 301
Markham, ON L3R 9S8

Archaeological Licence # P094 (Merritt)
Ministry of Tourism, Culture and Sport PIF# P094-0285-2018
ASI File: 18EA-035

25 July 2018

ASI Providing Archaeological & Cultural Heritage Services
528 Bathurst Street Toronto, ONTARIO M5S 2P9
416-966-1069 F 416-966-9723 asiheritage.ca

Stage 1 Archaeological Assessment
Kennedy Road Urbanization
Part of Lot 22, Concession 1-2 ECR,
and Lot 21, Concession 2 ECR
(Former Township of Chinguacousy, County of Peel)
Town of Caledon
Regional Municipality of Peel, Ontario

EXECUTIVE SUMMARY

ASI was contracted by Chisholm, Fleming and Associates to conduct a Stage 1 Archaeological Assessment (Background Research and Property Inspection) as part of the Kennedy Road Urbanization in the Town of Caledon. This project involves proposed upgrades to Kennedy Road as a 2-lane roadway that are supportive of future land uses between Bonnieglen Farm Boulevard and Old School Road.

The Stage 1 background study determined that six previously registered archaeological sites are located within one kilometre of the Study Area and that the Dixons Union Cemetery is within the Study Area. A Stage 3 Cemetery Investigation is required within 10 metres of the cemetery boundary, prior to any land disturbing activities. The property inspection determined that parts of the Study Area beyond the disturbed right-of-way exhibit archaeological potential and will require Stage 2 assessment, if impacted.

In light of these results, the following recommendations are made:

1. The Study Area exhibits archaeological potential. These lands require Stage 2 archaeological assessment by test pit/pedestrian survey at five metre intervals, where appropriate, prior to any proposed impacts to the property;

2. The Study Area includes the Dixon's Union Cemetery, which should be avoided by the project design. A Stage 3 Cemetery Investigation will be required on lands within a 10 metre buffer of the cemetery property, prior to any proposed impacts, to confirm the presence or absence of unmarked graves within the Study Area.

    - A Stage 2 test-pit survey at five metre intervals should be conducted within the areas of impact to locate any near-surface finds, prior to the Stage 3 assessment.

    - The Stage 3 entails the mechanical removal of topsoil in a ten metre buffer around the cemetery, under the supervision of a licensed archaeologist. The exposed subsoil will then be shovel-shined and thoroughly examined for the presence of burial shafts. In the event that unmarked grave shafts or cultural features are uncovered during the Stage 3, mechanical topsoil removal should continue 10 metres beyond such features.

3. The remainder of the Study Area does not retain archaeological potential on account of deep and extensive land disturbance or low and wet conditions. These lands do not require further archaeological assessment; and,

4. Should the proposed work extend beyond the current Study Area, further Stage 1 archaeological assessment should be conducted to determine the archaeological potential of the surrounding lands.

PROJECT PERSONNEL

Senior Project Manager:	Lisa Merritt, MSc. (P094) *Partner / Director* *Environmental Assessment Division*
Project Coordinator:	Sarah Jagelewski, Hon. BA (R405) *Lead Archaeologist / Assistant Manager* *Environmental Assessment Division*
Project Director (Licensee):	Lisa Merritt
Project Manager:	Eliza Brandy, MA (R1109) *Associate Archaeologist / Project Manager* *Environmental Assessment Division*
Field Director:	Peter Carruthers, MA (P163) *Senior Associate*
Report Preparation:	Eliza Brandy
Graphics:	Jonas Fernandez, MSc (R281) *Archaeologist / Assistant Manager - Fleet & Geomatics Specialist* *Operations Division*
Report Reviewer:	Lisa Merritt

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1.0 PROJECT CONTEXT

Archaeological Services Inc. (ASI) was contracted by Chisholm, Fleming and Associates to conduct a Stage 1 Archaeological Assessment (Background Research and Property Inspection) as part of the Kennedy Road Urbanization in the Town of Caledon (Figure 1). This project involves proposed upgrades to Kennedy Road as a 2-lane roadway that are supportive of future land uses between Bonnieglen Farm Boulevard and Old School Road

All activities carried out during this assessment were completed in accordance with the *Ontario Heritage Act* (1990, as amended in 2018) and the 2011 *Standards and Guidelines for Consultant Archaeologists* (S & G), administered by the Ministry of Tourism, Culture and Sport (MTCS 2011).

In the S & G, Section 1, the objectives of a Stage 1 archaeological assessment are discussed as follows:

- To provide information about the history, current land conditions, geography, and previous archaeological fieldwork of the Study Area;
- To evaluate in detail the archaeological potential of the Study Area that can be used, if necessary, to support recommendations for Stage 2 archaeological assessment for all or parts of the Study Area; and,
- To recommend appropriate strategies for Stage 2 archaeological assessment, if necessary.

This report describes the Stage 1 archaeological assessment that was conducted for this project and is organized as follows: Section 1.0 summarizes the background study that was conducted to provide the historical and archaeological contexts for the project Study Area; Section 2.0 addresses the field methods used for the property inspection that was undertaken to document its general environment, current land use history and conditions of the Study Area; Section 3.0 analyses the characteristics of the project Study Area and evaluates its archaeological potential; Section 4.0 provides recommendations; and the remaining sections contain other report information that is required by the S & G, e.g., advice on compliance with legislation, works cited, mapping and photo-documentation.

1.1 Development Context

The Study Area is within the traditional territory of the Michi Saagiig (Mississauga Anishinaabeg), Haudenosaunee and Huron-Wendat First Nations.

All work has been undertaken as required by the *Environmental Assessment Act,* RSO (Ministry of the Environment 1990 as amended 2010) and regulations made under the Act, and are therefore subject to all associated legislation. This project is being conducted in accordance with the Municipal Engineers' Association document *Municipal Class Environmental Assessment* (2000 as amended in 2007, 2011 and 2015).

Authorization to carry out the activities necessary for the completion of the Stage 1 archaeological assessment was granted by Chisholm, Fleming and Associates on June 1, 2018.

1.2 Historical Context

The purpose of this section, according to the S & G, Section 7.5.7, Standard 1, is to describe the past and present land use and the settlement history and any other relevant historical information pertaining to the Study Area. A summary is first presented of the current understanding of the Indigenous land use of the Study Area. This is then followed by a review of the historical Euro-Canadian settlement history.

1.2.1 Indigenous Land Use and Settlement

Southern Ontario has been occupied by human populations since the retreat of the Laurentide glacier approximately 13,000 years before present (BP) (Ferris 2013). Populations at this time would have been highly mobile, inhabiting a boreal-parkland similar to the modern sub-arctic. By approximately 10,000 BP, the environment had progressively warmed (Edwards and Fritz 1988) and populations now occupied less extensive territories (Ellis and Deller 1990).

Between approximately 10,000-5,500 BP, the Great Lakes basins experienced low-water levels, and many sites which would have been located on those former shorelines are now submerged. This period produces the earliest evidence of heavy wood working tools, an indication of greater investment of labour in felling trees for fuel, to build shelter, and watercraft production. These activities suggest prolonged seasonal residency at occupation sites. Polished stone and native copper implements were being produced by approximately 8,000 BP; the latter was acquired from the north shore of Lake Superior, evidence of extensive exchange networks throughout the Great Lakes region. The earliest evidence for cemeteries dates to approximately 4,500-3,000 BP and is indicative of increased social organization, investment of labour into social infrastructure, and the establishment of socially prescribed territories (Ellis et al. 1990, 2009; Brown 1995:13).

Between 3,000-2,500 BP, populations continued to practice residential mobility and to harvest seasonally available resources, including spawning fish. Exchange and interaction networks broaden at this time (Spence et al. 1990:136, 138) and by approximately 2,000 BP, evidence exists for macro-band camps, focusing on the seasonal harvesting of resources (Spence et al. 1990:155, 164). By 1500 BP during this period maize was first introduced into southern Ontario, though it would have only supplemented people’s diet. There is phytolithic evidence for maize in central New York State by 2300 BP - it is likely that once similar analyses are conducted on Ontario vessels of the same period, the same evidence will be found (Birch and Williamson 2013:13–15). Bands likely retreated to interior camps during the winter. It is generally understood that these populations were Algonquian-speakers during these millennia of settlement and land use.

From approximately 1,000 BP until approximately 300 BP, lifeways became more similar to that described in early historical documents. During the Early Iroquoian phase, approximately 1000-1300 Common Era (CE), the communal site is replaced by the village focused on horticulture. Seasonal disintegration of the community for the exploitation of a wider territory and more varied resource base was still practised (Williamson 1990:317). By the second quarter of the first millennium BP, during the Middle Iroquoian phase (1300-1450 CE), this episodic community disintegration was no longer practised and populations now communally occupied sites throughout the year (Dodd et al. 1990:343). In the Late Iroquoian phase (1450-1649 CE) this process continued with the coalescence of these small villages into larger communities (Birch and Williamson 2013). Through this process, the socio-political organization of the First Nations, as described historically by the French and English explorers who first visited southern Ontario, was developed. By 1600 CE, the communities within Simcoe County had formed the

Confederation of Nations encountered by the first European explorers and missionaries. In the 1640s, the traditional enmity between the Haudenosaunee[1] and the Huron-Wendat (and their Algonkian allies such as the Nippissing and Odawa) led to the dispersal of the Huron-Wendat.

After the dispersal, the Haudenosaunee established a series of settlements at strategic locations along the trade routes inland from the north shore of Lake Ontario, including Teiaiagon, near the mouth of the Humber River; and Ganestiquiagon, near the mouth of the Rouge River. Their locations near the mouths of the Humber and Rouge Rivers, two branches of the Toronto Carrying Place, strategically linked these settlements with the upper Great Lakes through Lake Simcoe. The west branch of the Carrying Place followed the Humber River valley northward over the drainage divide, skirting the west end of the Oak Ridges Moraine, to the East Branch of the Holland River. Another trail followed the Don River watershed.

When the Senecas established Teiaiagon at the mouth of the Humber, they were in command of the traffic across the peninsula to Lake Simcoe and the Georgian Bay. Later, Mississauga and earliest European presence along the north shore, was therefore also largely defined by the area's strategic importance for accessing and controlling long established economic networks. Prior to the arrival of the Seneca, these economic networks would have been used by indigenous groups for thousands of years. While the trail played an important part during the fur trade, people would also travel the trail in order to exploit the resources available to them across south-central Ontario, including the various spawning runs, such as the salmon coming up from Lake Ontario or herring or lake trout in Lake Simcoe.

Due to both attacks by Anishinaabeg peoples and increased military pressure from the French upon their homelands south of Lake Ontario, the Haudenosaunee abandoned their north shore frontier settlements by the late 1680s, although they did not relinquish their interest in the resources of the area, as they continued to claim the north shore as part of their traditional hunting territory. The territory was immediately occupied by Anishinaabek groups, including the Mississauga, Ojibwa (or Chippewa) and Odawa, who, in the early seventeenth century, occupied the vast area extending from the east shore of Georgian Bay, and the north shore of Lake Huron, to the northeast shore of Lake Superior and into the upper peninsula of Michigan. Some Anishinaabeg elders believe Mississauga and Chippewa people returned to this area having left the region prior to European contact (Migizi and Kapryka 2015). Individual bands were politically autonomous and numbered several hundred people. Nevertheless, they shared common cultural traditions and relations with one another and the land. These groups were highly mobile, with a subsistence economy based on hunting, fishing, gathering of wild plants, and garden farming. Their late seventeenth-century movements southward also brought them into conflict with the Haudenosaunee.

Peace was achieved between the Haudenosaunee and the Anishinaabek Nations in August of 1701 when representatives of more than twenty Anishinaabek Nations assembled in Montreal to participate in peace negotiations (Johnston 2004:10). During these negotiations captives were exchanged and the Iroquois and Anishinaabek agreed to live together in peace. Peace between these nations was confirmed again at council held at Lake Superior when the Iroquois delivered a wampum belt to the Anishinaabek Nations.

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[1] The Haudenosaunee are also known as the New York Iroquois or Five Nations Iroquois and after 1722 Six Nations Iroquois. They were a confederation of five distinct but related Iroquoian–speaking groups - the Seneca, Onondaga, Cayuga, Oneida, and Mohawk. Each lived in individual territories in what is now known as the Finger Lakes district of Upper New York. In 1722 the Tuscarora joined the confederacy.

In 1763, following the fall of Quebec, New France was transferred to British control at the Treaty of Paris. The British government began to pursue major land purchases to the north of Lake Ontario in the early nineteenth century, the Crown acknowledged the Mississaugas as the owners of the lands between Georgian Bay and Lake Simcoe and entered into negotiations for additional tracts of land as the need arose to facilitate European settlement.

The Michi Saagiig left a minimal footprint archaeologically, as they were historically a highly mobile sustainably living society for, but it is known through oral histories and traditional knowledge that the north shore of Lake Ontario has been their homeland for millenia (Kapryka and Migizi 2016; Migizi and Kapryka 2015). A 1736 French report indicated that “Mississagués were dispersed along this lake, some at Kenté [Bay of Quinte], others at the River Toronto [Humber River], and finally at the head of the Lake, to the number of one hundred and fifty [warriors] in all” (O’Callaghan 1887). By 1736, however, French estimates placed the Ojibwa population at 60 men near Lake St. Clair, and 150 men at Quinte, the head of Lake Ontario, the Humber, and Matchedash each, totaling 1000-1500 (Rogers 1978:762). In 1825-26 the Credit Indian Village was established as an agricultural community and Methodist mission near present day Port Credit (Heritage Mississauga 2009; Mississaugas of the New Credit First Nation 2014). By 1840 the village was under significant pressure from Euro-Canadian settlement that plans begun to relocate the settlement. In 1847 the Credit Mississaugas were made a land offer by the Six Nations Council to relocate at the Grand River. In 1847, 266 Mississaugas settled at New Credit, approximately 23 km southwest of Brantford. Although the majority of the former Mississagua Tract had been surrendered by 1856 (Gould 1981), this does not exclude the likelihood that the Mississauga continued to utilise the landscape at large during travel (Ambrose 1982) and for resource extraction.

The eighteenth century saw the ethnogenesis in Ontario of the Métis, when Métis people began to identify as a separate group, rather than as extensions of their typically maternal First Nations and paternal European ancestry (Métis National Council n.d.). Métis populations were predominantly located north and west of Lake Superior, however, communities were located throughout Ontario (MNC n.d.; Stone and Chaput 1978:607,608). During the early nineteenth century, many Métis families moved towards locales around southern Lake Huron and Georgian Bay, including Kincardine, Owen Sound, Penetanguishene, and Parry Sound (MNC n.d.). Recent decisions by the Supreme Court of Canada (Supreme Court of Canada 2003, 2016) have reaffirmed that Métis people have full rights as one of the Indigenous people of Canada under subsection 91(24) of the Constitution Act, 1867.

The Study Area is within Treaty 19, the Ajetance Purchase, signed in 1818 between the Crown and the Mississaugas (Aboriginal Affairs and Northern Development Canada 2013). This treaty, however, excluded lands within one mile on either side of the Credit River, Twelve Mile Creek, and Sixteen Mile Creeks. In 1820, Treaties 22 and 23 were signed which acquired these remaining lands, except a 200 acre parcel along the Credit River (Heritage Mississauga 2012:18).

1.2.2 Euro-Canadian Land Use: Township Survey and Settlement

Historically, the Study Area is located in the Former Chinguacousy Township, County of Peel, in part of Lot 22, Concession 1-2 East of Centre Road (ECR), and Lot 21, Concession 2 ECR.

The S & G stipulates that areas of early Euro-Canadian settlement (pioneer homesteads, isolated cabins, farmstead complexes), early wharf or dock complexes, pioneer churches, and early cemeteries are considered to have archaeological potential. Early historical transportation routes (trails, passes, roads, railways, portage routes), properties listed on a municipal register or designated under the *Ontario Heritage Act* or a federal, provincial, or municipal historic landmark or site are also considered to have archaeological potential.

For the Euro-Canadian period, the majority of early nineteenth century farmsteads (i.e., those that are arguably the most potentially significant resources and whose locations are rarely recorded on nineteenth century maps) are likely to be located in proximity to water. The development of the network of concession roads and railroads through the course of the nineteenth century frequently influenced the siting of farmsteads and businesses. Accordingly, undisturbed lands within 100 m of an early settlement road are also considered to have potential for the presence of Euro-Canadian archaeological sites.

The first Europeans to arrive in the area were transient merchants and traders from France and England, who followed Indigenous pathways and set up trading posts at strategic locations along the well-traveled river routes. All of these occupations occurred at sites that afforded both natural landfalls and convenient access, by means of the various waterways and overland trails, into the hinterlands. Early transportation routes followed existing Indigenous trails, both along the lakeshore and adjacent to various creeks and rivers (ASI 2006a).

Chinguacousy Township

The township is said to have been named by Sir Peregrine Maitland after the Mississauga word for the Credit River meaning “young pine.” Other scholars assert that it was named in honour of the Ottawa Chief Shinguacose, which was corrupted to the present spelling of ‘Chinguacousy,’ “under whose leadership Fort Michilimacinac was captured from the Americans in the War of 1812” (Mika and Mika 1977:416; Rayburn 1997:68). The township was formally surveyed in 1818, and the first legal settlers took up their lands later in that same year. The extant Survey Diaries indicate that the original timber stands within the township included oak, ash, maple, beech, elm, basswood, hemlock, and pine. It was recorded that the first landowners in Chinguacousy included settlers from New Brunswick, the United States, and also United Empire Loyalists and their children (Walker and Miles 1877:65; Mika and Mika 1977:417; Armstrong 1985:142).

Due to the small population of the newly acquired tract, Chinguacousy was initially amalgamated with the Gore of Toronto Township for political and administrative purposes. In 1821, the population of the united townships numbered just 412. By 1837, the population of the township had reached an estimated 1,921. The numbers grew from 3,721 in 1842 to 7,469 in 1851. Thereafter the figures declined to 6,897 in 1861, and to 6,129 by 1871 (Walton 1837:71; Walker and Miles 1877:59). Chinguacousy Township was the largest in Peel County and was described as one of the best settled townships in the Home District. It contained excellent, rolling land which was timbered mainly in hardwood with some pine intermixed. The township contained one grist mill and seven saw mills. By 1851, this number had increased to two grist mills and eight sawmills (Smith 1846:32, 1851:279). It was estimated that the only township in the province which rivaled Chinguacousy in wheat production at that time was Whitby (Smith 1851:279).

Chinguacousy was originally included within the limits of the Home District until 1849, when the old Upper Canadian Districts were abolished. It formed part of the United Counties of York, Ontario and Peel until 1851, when Peel was elevated to independent county status under the Provisions 14 & 15. A provisional council for Peel was not established until 1865, and the first official meeting of the Peel County council occurred in January 1867.

In 1974, part of the township was amalgamated with the City of Brampton, and the remainder was annexed to the Town of Caledon (Walker and Miles 1877:59; Mika and Mika 1977:417–418; Armstrong 1985:152; Rayburn 1997:68).

Dixons Union Cemetery

Dixons Union Cemetery is associated with the former Dixons Primitive Methodist Church and Cemetery, established in 1875 on the northeast side of Kennedy Road, south of Old School Road. The original building, circa 1855, was demolished in a storm in 1874 (The Bone Yard Blogger 2010).

1.2.3 Historical Map Review

The 1819 Patent Plan of Chinguacousy Township, the 1859 Map of the County of Peel, and the 1877 Illustrated Historical Atlas of the County of Peel, Township of Chinguacousy page (Ridout 1819; Tremaine 1859; Walker and Miles 1877) were examined to determine the presence of historic features within the Study Area during the nineteenth century (Figures 2-4).

It should be noted, however, that not all features of interest were mapped systematically in the Ontario series of historical atlases, given that they were financed by subscription, and subscribers were given preference with regard to the level of detail provided on the maps. Moreover, not every feature of interest would have been within the scope of the atlases.

In addition, the use of historical map sources to reconstruct/predict the location of former features within the modern landscape generally proceeds by using common reference points between the various sources. These sources are then geo-referenced in order to provide the most accurate determination of the location of any property on historic mapping sources. The results of such exercises are often imprecise or even contradictory, as there are numerous potential sources of error inherent in such a process, including the vagaries of map production (both past and present), the need to resolve differences of scale and resolution, and distortions introduced by reproduction of the sources. To a large degree, the significance of such margins of error is dependent on the size of the feature one is attempting to plot, the constancy of reference points, the distances between them, and the consistency with which both they and the target feature are depicted on the period mapping.

Table 1: Nineteenth-century property owner(s) and historical features(s) within or adjacent to the Study Area

		1819	*1859*		*1877*	
Lot #	**Con #**	**Property Owner(s)**	**Property Owner(s)**	**Historical Feature(s)**	**Property Owner(s)**	**Historical Feature(s)**
22	1 ECR	Canada Company	Thomas Fead Robert Norris	None	James Topham	Farmstead
	2 ECR	Isaac Lightheart	Robert Norris	None	Robert Norris	Farmstead, church, cemetery
21	2 ECR	Daniel Lightheart	Thos. Edward M. McCartney	None	Neil McDougall	None

The maps illustrate that Kennedy and Old School Roads were historically surveyed. No structures are shown within the Study Area in 1859, but by 1877 there is a farmstead in Lot 22 on both sides of Kennedy Road, and the church with a cemetery was established. The tributaries of the Humber and Etobicoke Creeks are illustrated.

1.2.4 Twentieth-Century Mapping Review

The 1919 and 1994 National Topographic System Bolton Sheets (Department of Militia and Defence 1919; Department of Energy, Mines and Resources 1994), and the 1954 aerial photography of the Town of Caledon (University of Toronto 1954), were examined to determine the extent and nature of development and land uses within the Study Area (Figures 5-7). The 1919 map illustrates that a brick house and church with a cemetery are illustrated within the Study Area. By 1954, the Study Area remained within a rural agricultural landscape. In 1994, the cemetery is shown adjacent to a farmstead with five structures. Structures are shown on either side of Kennedy Road south of Old School Road. A review of available Google satellite imagery shows that the Study Area has remained surrounded by active agricultural fields since 2004. In 2009, construction began on the new alignment of Kennedy Road and the subdivision south of the Study Area.

1.3 Archaeological Context

This section provides background research pertaining to previous archaeological fieldwork conducted within and in the vicinity of the Study Area, its environmental characteristics (including drainage, soils or surficial geology and topography, etc.), and current land use and field conditions. Three sources of information were consulted to provide information about previous archaeological research: the site record forms for registered sites available online from the MTCS through "Ontario's Past Portal"; published and unpublished documentary sources; and the files of ASI.

1.3.1 Current Land Use and Field Conditions

A Stage 1 property inspection was conducted on July 6, 2018 that noted the Study Area is located along Kennedy Road between Old School Road and Bonnieglen Farm Boulevard in the Town of Caledon. Kennedy Road is currently a two lane paved road with gravel shoulder, with utilities along the east side. The topography is gently rolling with active agricultural fields on both sides of the road and twentieth century residential homes near the intersection of Old School Road. Dixons Union Cemetery is located on the east side of the road surrounded by a chain link fence.

1.3.2 Geography

In addition to the known archaeological sites, the state of the natural environment is a helpful indicator of archaeological potential. Accordingly, a description of the physiography and soils are briefly discussed for the Study Area.

The S & G stipulates that primary water sources (lakes, rivers, streams, creeks, etc.), secondary water sources (intermittent streams and creeks, springs, marshes, swamps, etc.), ancient water sources (glacial lake shorelines indicated by the presence of raised sand or gravel beach ridges, relic river or stream channels indicated by clear dip or swale in the topography, shorelines of drained lakes or marshes, cobble beaches, etc.), as well as accessible or inaccessible shorelines (high bluffs, swamp or marsh fields by the edge of a lake, sandbars stretching into marsh, etc.) are characteristics that indicate archaeological potential.

Water has been identified as the major determinant of site selection and the presence of potable water is the single most important resource necessary for any extended human occupation or settlement. Since water sources have remained relatively stable in Ontario since 5,000 BP (Karrow and Warner 1990:Figure 2.16), proximity to water can be regarded as a useful index for the evaluation of archaeological site potential. Indeed, distance from water has been one of the most commonly used variables for predictive modeling of site location.

Other geographic characteristics that can indicate archaeological potential include: elevated topography (eskers, drumlins, large knolls, and plateaux), pockets of well-drained sandy soil, especially near areas of heavy soil or rocky ground, distinctive land formations that might have been special or spiritual places, such as waterfalls, rock outcrops, caverns, mounds, and promontories and their bases. There may be physical indicators of their use, such as burials, structures, offerings, rock paintings or carvings. Resource areas, including; food or medicinal plants (migratory routes, spawning areas) are also considered characteristics that indicate archaeological potential (S & G, Section 1.3.1).

The Study Area is located on drumlinized till plains within the South Slope physiographic region of southern Ontario (Chapman and Putnam 1984:172–174). The South Slope is the southern slope of the Oak Ridges Moraine. The South Slope meets the Moraine at heights of approximately 300 metres above sea level, and descends southward toward Lake Ontario, ending, in some areas, at elevations below 150 metres above sea level. Numerous streams descend the South Slope, having cut deep valleys in the till. In the vicinity of the study area, the South Slope is ground moraine of limited relief.

Figure 8 depicts surficial geology for the Study Area. The surficial geology mapping demonstrates that the Study Area is underlain by clay to silt-textured till and sand, gravel, coarse-textured glaciolacustrine foreshore and basinal deposits (Ontario Geological Survey 2010). Soils in the Study Area consist of Fox sandy loam, a grey-brown podzolic with good drainage; Chinguacousy clay, a grey-brown podzolic with imperfect drainage; and Bottom Land, alluvial deposits with variable drainage (Figure 9).

The Study Area is within the Etobicoke Headwaters subwatershed of the Etobicoke Creek, adjacent to the edge of the West Humber River watershed. The Etobicoke Creek watershed, derived from the Algonkian word "*Wah-do-be kaug*" meaning "place where the alders grow", includes the major tributaries Spring Creek, Little Etobicoke Creek, and West Etobicoke Creek, and drains an area of approximately 211 square kilometres within the cities of Brampton, Mississauga, Toronto, and the Town of Caledon. The creeks flow south from its headwaters in Caledon into Lake Ontario through 68% urban, 27% rural and 5% urbanizing land (Toronto and Region Conservation Authority 2018). The Humber River watershed encompasses and area of 911 square kilometers with a main, east and west branch, originating on the Niagara Escarpment and the Oak Ridges Moraine and flowing through York and Peel Regions into the City of Toronto where it drains into Lake Ontario (Toronto and Region Conservation Authority 2016). The Humber River was designated as a Canadian Heritage River System in 1999 for its Carolinian forests, farms and old mills, and as its 10,000 year history of human settlement and significance as the Carrying Place Trail (Canadian Heritage Rivers System 2016).

1.3.3 Previous Archaeological Research

In Ontario, information concerning archaeological sites is stored in the Ontario Archaeological Sites Database (OASD) maintained by the MTCS. This database contains archaeological sites registered within the Borden system. Under the Borden system, Canada has been divided into grid blocks based on latitude and longitude. A Borden block is approximately 13 km east to west, and approximately 18.5 km north to south. Each Borden block is referenced by a four-letter designator, and sites within a block are numbered sequentially as they are found. The Study Area under review is located in Borden block *AkGx.*

According to the OASD, six previously registered archaeological sites are located within one kilometre of the Study Area, none of which are within 50m (Ministry of Tourism, Culture and Sport 2018). A summary of the sites is provided below.

Table 2: List of previously registered sites within one kilometre of the Study Area

Borden #	Site Name	Cultural Affiliation	Site Type	Researcher
AkGw-334	Dennison	Euro-Canadian	Homestead	ASI 2008
AkGw-335	Edwards	Euro-Canadian	Homestead	ASI 2008
AkGw-336	Mayfield North	Euro-Canadian	Unknown	ASI 2008
AkGw-378	Rowan	Euro-Canadian	Homestead	ASI 2008; Archeoworks 2010
AkGw-397	Dunsmore	Euro-Canadian	Homestead	ASI 2008; Archeoworks 2012, 2013
AkGw-464	Wiggins	Euro-Canadian	Homestead	Archeoworks 2012, 2013

According to the background research, two previous reports detail fieldwork within 50 m of the Study Area.

ASI (2006b) conducted a Stage 1 archaeological assessment for the Mayfield West Community Development Plan on 389 ha, bounded by Mayfield Road to the south, Dixie Road to the east, Old School Road to the north and Highway 10 to the west. A field review in 2005 noted that parts of the current Study Area exhibited archaeological potential and will require Stage 2 survey prior to development.

ASI (2008) conducted a Stage 1 and 2 archaeological assessment of the Moscorp Development Lands approximately 120 ha in part of Lots 19-21, Concession 2 ECR. Phase IC property on Lot 21, Concession 2 ECR, including part of the current Study Area, and was subject to pedestrian survey at five metre intervals, identifying Euro-Canadian homestead site AkGw-335 dating from the early- to mid-nineteenth century and associated with the early log cabin occupation of Thomas Edwards, prior to the sale of the property in 1876. ASI (2013) completed Stage 3 assessment and Stage 4 mitigation of the site. The property is considered clear of archaeological concern.

2.0 FIELD METHODS: PROPERTY INSPECTION

A Stage 1 property inspection must adhere to the S & G, Section 1.2, Standards 1-6, which are discussed below. The entire property and its periphery must be inspected. The inspection may be either systematic or random. Coverage must be sufficient to identify the presence or absence of any features of archaeological potential. The inspection must be conducted when weather conditions permit good visibility of land features. Natural landforms and watercourses are to be confirmed if previously identified. Additional features such as elevated topography, relic water channels, glacial shorelines, well-drained soils within heavy soils and slightly elevated areas within low and wet areas should be identified and documented, if present. Features affecting assessment strategies should be identified and documented such as woodlots, bogs or other permanently wet areas, areas of steeper grade than indicated on topographic mapping, areas of overgrown vegetation, areas of heavy soil, and recent land disturbance such as grading, fill deposits and vegetation clearing. The inspection should also identify and document structures and built features that will affect assessment strategies, such as heritage structures or landscapes, cairns, monuments or plaques, and cemeteries.

The Stage 1 archaeological assessment property inspection was conducted under the field direction of Peter Carruthers (P163) of ASI, on July 6, 2018, in order to gain first-hand knowledge of the geography, topography, and current conditions and to evaluate and map archaeological potential of the Study Area. It was a visual inspection only and did not include excavation or collection of archaeological resources. Fieldwork was only conducted when weather conditions were deemed suitable, per S & G Section 2. Previously identified features of archaeological potential were examined; additional features of archaeological potential not visible on mapping were identified and documented as well as any features that will affect assessment strategies. Field observations are compiled onto the existing conditions of the Study Area in Section 7.0 (Figure 10) and associated photographic plates are presented in Section 8.0 (Plates 1-14).

3.0 ANALYSIS AND CONCLUSIONS

The historical and archaeological contexts have been analyzed to help determine the archaeological potential of the Study Area. These data are presented below in Section 3.1. Results of the analysis of the Study Area property inspection are presented in Section 3.2.

3.1 Analysis of Archaeological Potential

The S & G, Section 1.3.1, lists criteria that are indicative of archaeological potential. The Study Area meets the following criteria indicative of archaeological potential:

- Previously identified archaeological sites (see Table 2);
- Water sources: primary, secondary, or past water source (Upper Etobicoke Creek, West Humber River);
- Early historic transportation routes (Kennedy Rd, Old School Rd);
- Well-drained soils (Fox sandy loam)

According to the S & G, Section 1.4 Standard 1e, no areas within a property containing locations listed or designated by a municipality can be recommended for exemption from further assessment unless the area can be documented as disturbed. The Municipal Heritage Register was consulted and while no properties within the Study Area are Listed or Designated under the Ontario Heritage Act, the Town of Caledon considers the well-maintained late nineteenth century farmstead at 12909 Kennedy Road and Dixon’s Primitive Methodist Church and Dixon’s Union Cemetery at 128958 to be built heritage resources.

These criteria are indicative of potential for the identification of Indigenous and Euro-Canadian archaeological resources, depending on soil conditions and the degree to which soils have been subject to deep disturbance.

3.2 Analysis of Property Inspection Results

The property inspection determined that the Study Area exhibits archaeological potential (Plates 3-11, 13; Figure 10: areas highlighted in green). These areas will require Stage 2 archaeological assessment, prior to any land disturbing activities. According the S & G Section 2.1.1, pedestrian survey is required in actively or recently cultivated fields (eg. Plates 4, 6, 7, 11, 13). According to the S & G Section 2.1.2, test pit survey is required on terrain where ploughing is not viable, such as wooded areas, properties where existing landscaping or infrastructure would be damaged, overgrown farmland with heavy brush or rocky pasture, and narrow linear corridors up to 10 metres wide (eg. Plates 3-5, 7-10).

The Study Area includes the Dixon’s Union Cemetery (Figure 10: areas outlined in blue). The cemetery lands should be avoided by the project design. A Stage 3 Cemetery Investigation will be required on lands within a 10 metre buffer of the cemetery property, prior to any proposed impacts, to confirm the presence or absence of unmarked graves within the Study Area (Figure 10: areas highlighted in purple). A Stage 2 test-pit survey at five metre intervals should be conducted within the areas of impact to locate any near-surface finds, prior to the Stage 3 assessment. The Stage 3 entails the mechanical removal of topsoil in a ten metre buffer around the cemetery, under the supervision of a licensed archaeologist. The exposed subsoil will then be shovel-shined and thoroughly examined for the presence of burial shafts. In the event that unmarked grave shafts or cultural features are uncovered during the Stage 3, mechanical topsoil removal should continue 10 metres beyond such features.

A part of the study area is located in low and wet conditions, and according to the S & G Section 2.1 does not retain potential (Plate 2; Figure 10: areas highlighted in blue). The remainder of the Study Area have been subjected to deep soil disturbance events associated with construction of the existing ROW (approximately 20m wide), twentieth century residential properties near Old School Road, and current redevelopment in the southwest corner of the Study Area. According to the S & G Section 1.3.2 these areas do not retain archaeological potential (Plates 1-6, 10-12, 14; Figure 10: areas highlighted in yellow). These areas do not require further survey.

3.3 Conclusions

The Stage 1 background study determined that six previously registered archaeological sites are located within one kilometre of the Study Area and that the Dixons Union Cemetery is within the Study Area. A Stage 3 Cemetery Investigation is required within 10 metres of the cemetery boundary, prior to any land disturbing activities. The property inspection determined that parts of the Study Area beyond the disturbed right-of-way exhibit archaeological potential and will require Stage 2 assessment, if impacted.

4.0 RECOMMENDATIONS

In light of these results, the following recommendations are made:

1. The Study Area exhibits archaeological potential. These lands require Stage 2 archaeological assessment by test pit/pedestrian survey at five metre intervals, where appropriate, prior to any proposed impacts to the property;

2. The Study Area includes the Dixon's Union Cemetery, which should be avoided by the project design. A Stage 3 Cemetery Investigation will be required on lands within a 10 metre buffer of the cemetery property, prior to any proposed impacts, to confirm the presence or absence of unmarked graves within the Study Area.

    - A Stage 2 test-pit survey at five metre intervals should be conducted within the areas of impact to locate any near-surface finds, prior to the Stage 3 assessment.

    - The Stage 3 entails the mechanical removal of topsoil in a ten metre buffer around the cemetery, under the supervision of a licensed archaeologist. The exposed subsoil will then be shovel-shined and thoroughly examined for the presence of burial shafts. In the event that unmarked grave shafts or cultural features are uncovered during the Stage 3, mechanical topsoil removal should continue 10 metres beyond such features.

3. The remainder of the Study Area does not retain archaeological potential on account of deep and extensive land disturbance or low and wet conditions. These lands do not require further archaeological assessment; and,

4. Should the proposed work extend beyond the current Study Area, further Stage 1 archaeological assessment should be conducted to determine the archaeological potential of the surrounding lands.

NOTWITHSTANDING the results and recommendations presented in this study, ASI notes that no archaeological assessment, no matter how thorough or carefully completed, can necessarily predict, account for, or identify every form of isolated or deeply buried archaeological deposit. In the event that archaeological remains are found during subsequent construction activities, the consultant archaeologist, approval authority, and the Cultural Programs Unit of the MTCS should be immediately notified.

5.0 ADVICE ON COMPLIANCE WITH LEGISLATION

ASI also advises compliance with the following legislation:

- This report is submitted to the Minister of Tourism, Culture and Sport as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, RSO 1990, c 0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological field work and report recommendations ensure the conservation, preservation and protection of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Tourism, Culture and Sport, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

- It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological field work on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeology Reports referred to in Section 65.1 of the *Ontario Heritage Act.*

- Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with sec. 48 (1) of the *Ontario Heritage Act*.

- The *Cemeteries Act*, R.S.O. 1990 c. C.4 and the *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 (when proclaimed in force) require that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services.

- Archaeological sites recommended for further archaeological fieldwork or protection remain subject to Section 48(1) of the Ontario Heritage Act and may not be altered, nor may artifacts be removed from them, except by a person holding an archaeological license.

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7.0 MAPS

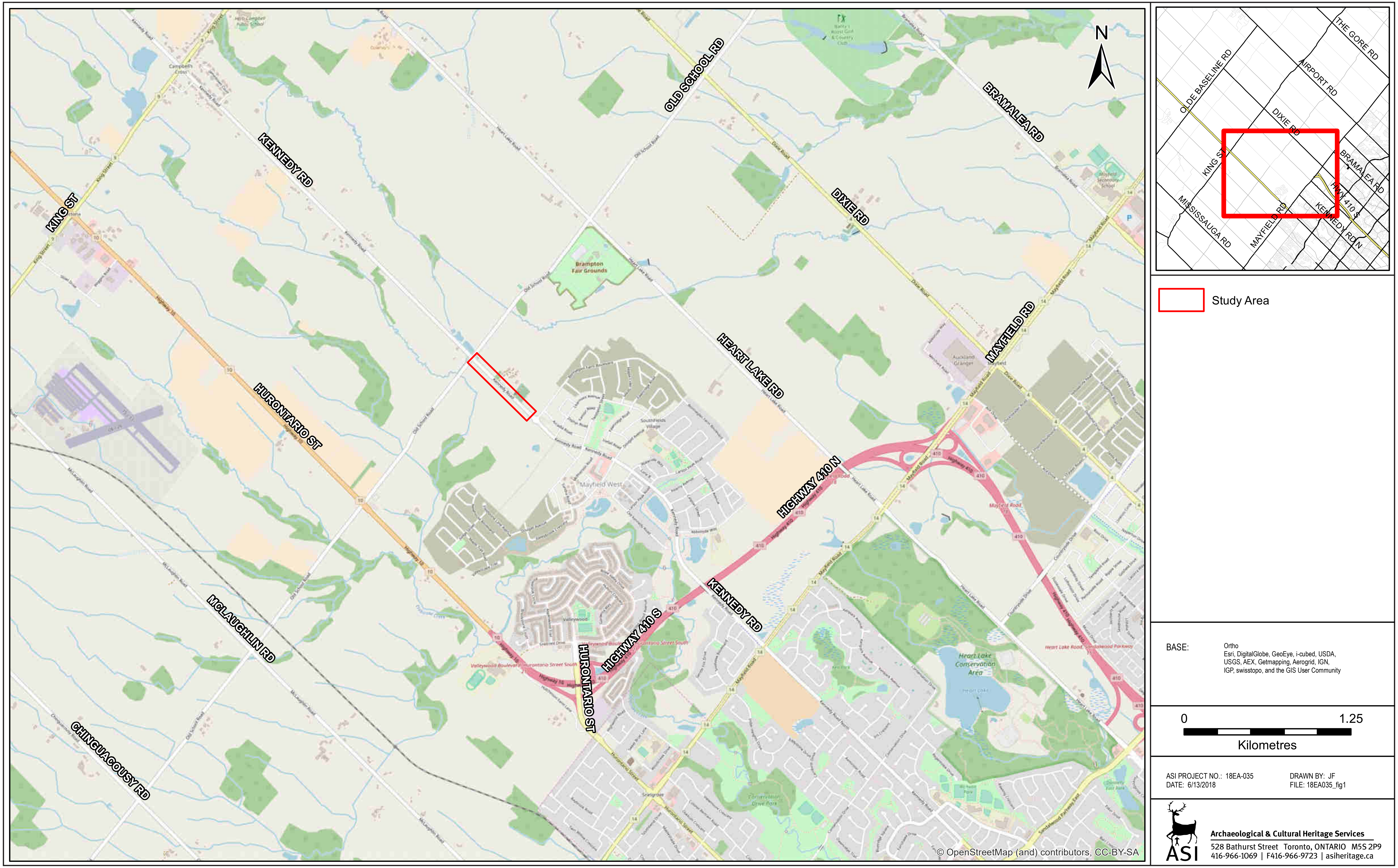

Figure 1: Kennedy Road Urbanization - Location of the Study Area

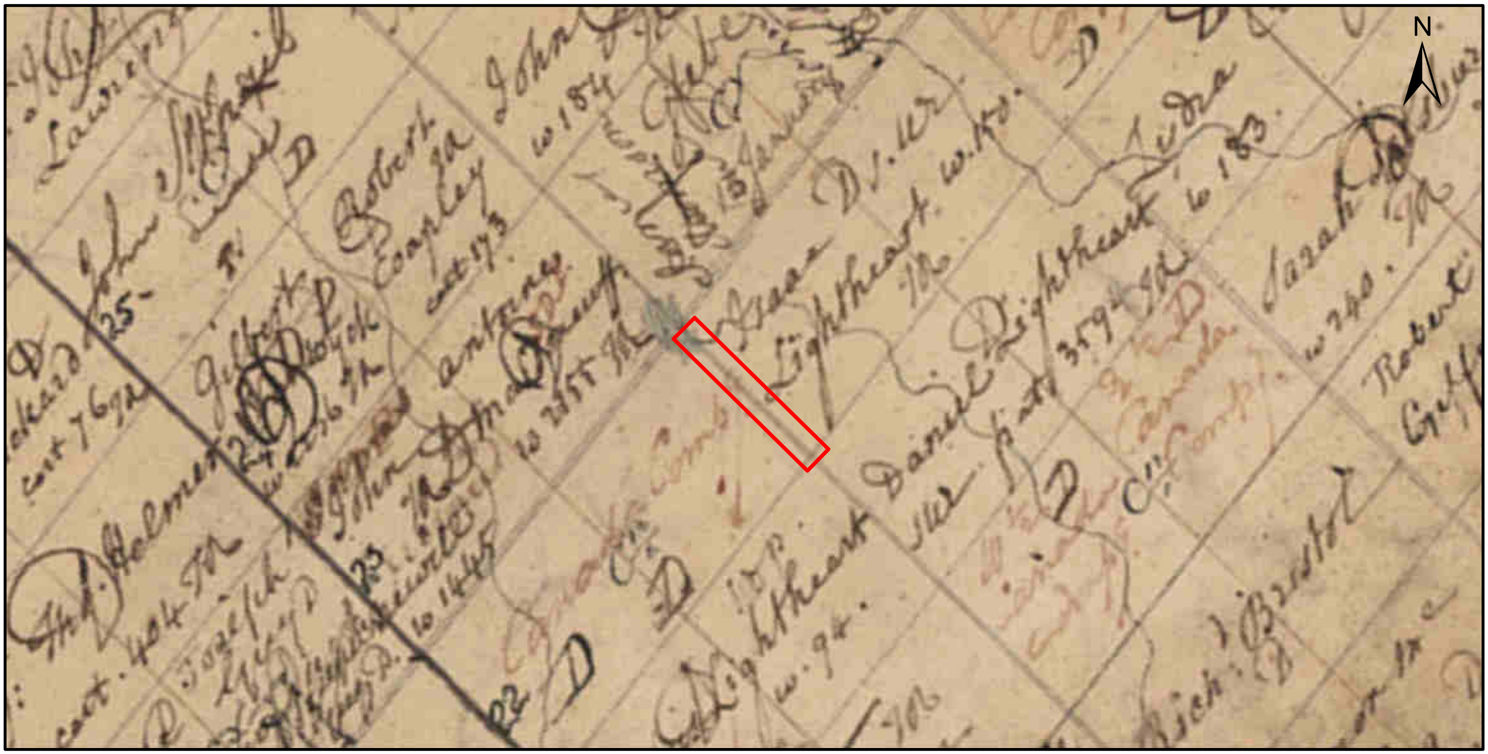

Figure 2: Kennedy Rd Urbanization Study Area (Approximate Location) Overlaid on the 1819 Plan of Chinguacousy Township

Figure 3: Kennedy Rd Urbanization Study Area (Approximate Location) Overlaid on the 1859 Map of the County of Peel

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ASI

🟥 Study Area

Base:
1819 Plan of Chinguacousy Township
1859 Map of the County of Peel

0 500
Metres

ASI PROJECT NO.: 18EA-035
DATE: 6/28/2018

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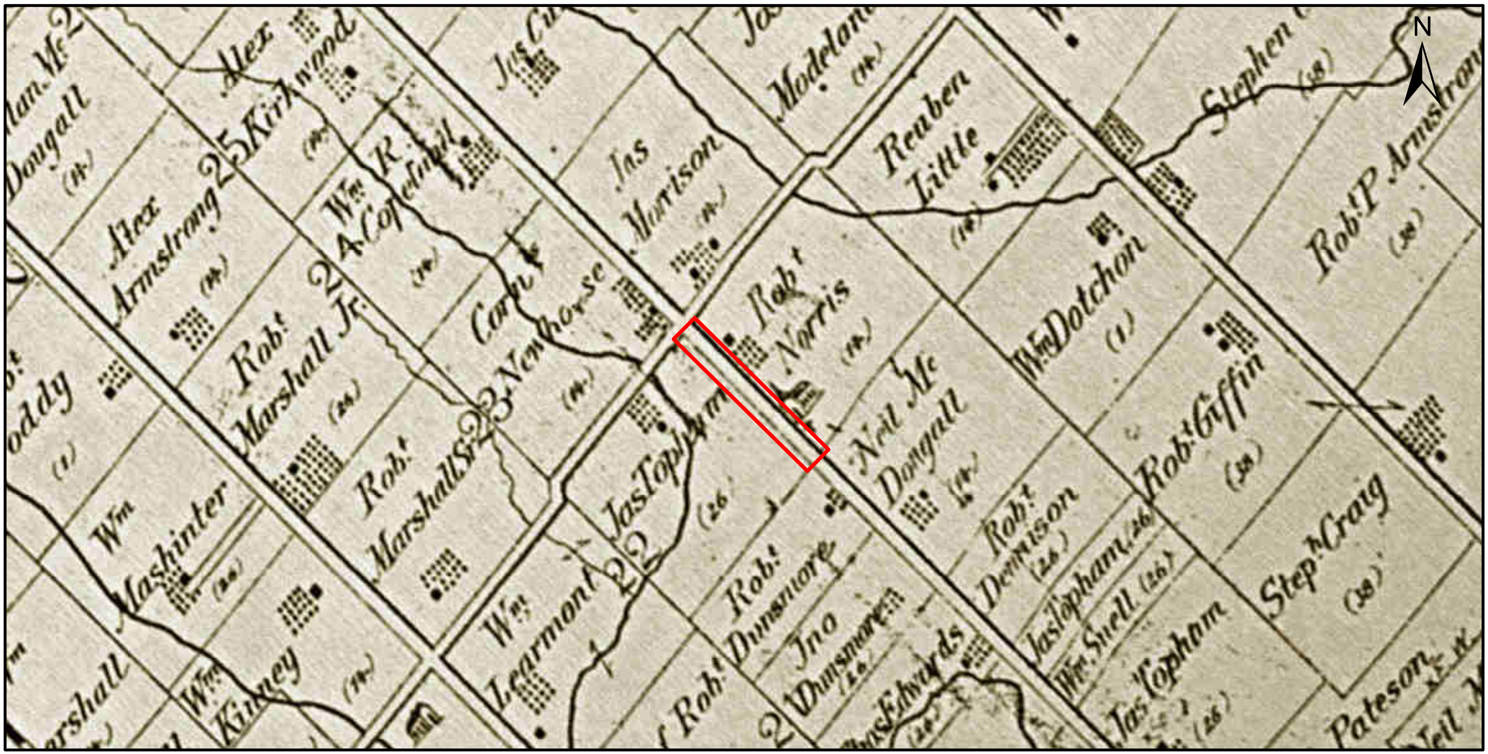

Figure 4: Kennedy Rd Urbanization Study Area (Approximate Location) Overlaid on the 1878 Map of the County of Peel, Northern Part of Chinguacousy page

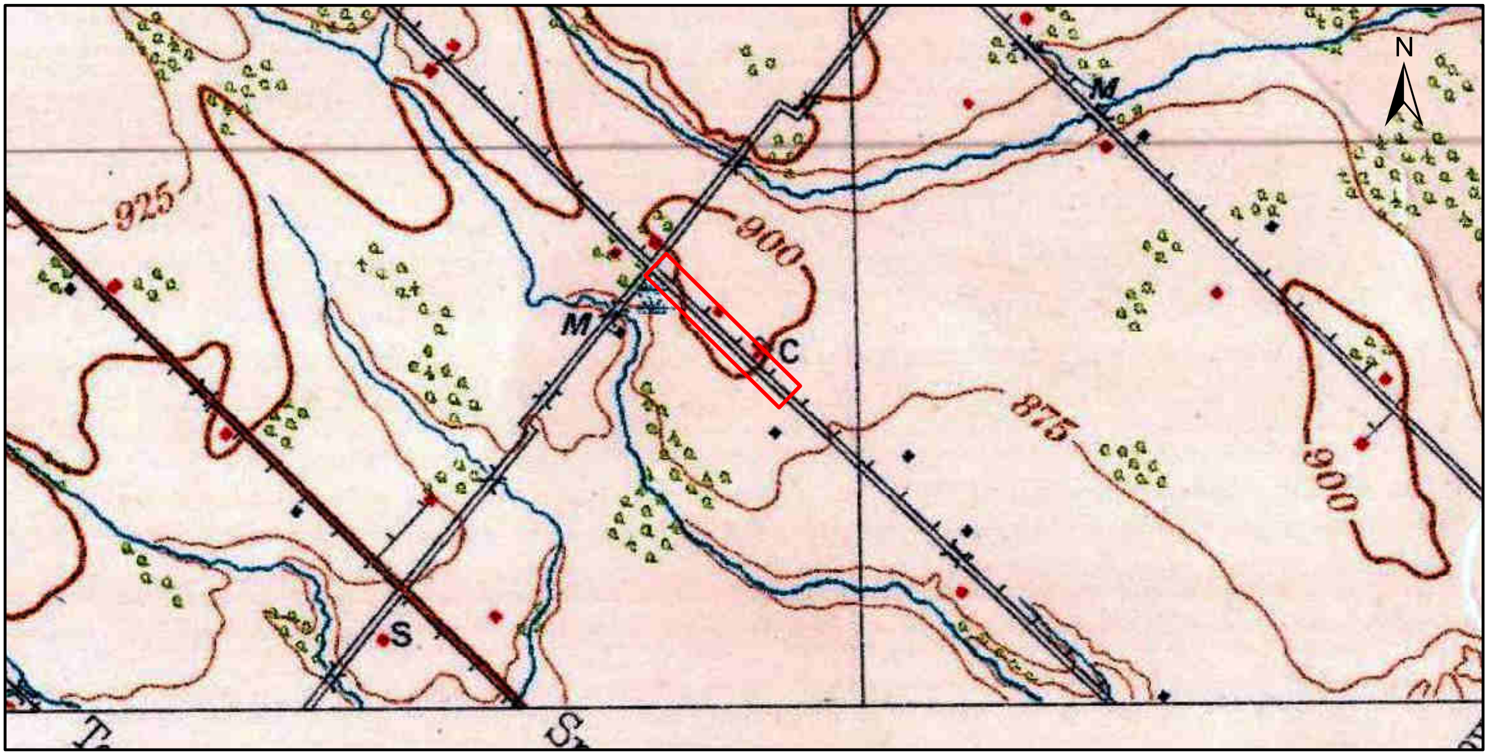

Figure 5: Kennedy Rd Urbanization Study Area (Approximate Location) Overlaid on the 1919 National Topographic System Bolton Sheet

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ASI

▭ Study Area

Base:
1878 Map of the County of Peel
1919 NTS Bolton Sheet

0 500
Metres

ASI PROJECT NO.: 18EA-035
DATE: 6/28/2018

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Figure 6: Kennedy Rd Urbanization Study Area (Approximate Location) Overlaid on the 1954 Aerial Photograph of the Town of Caledon

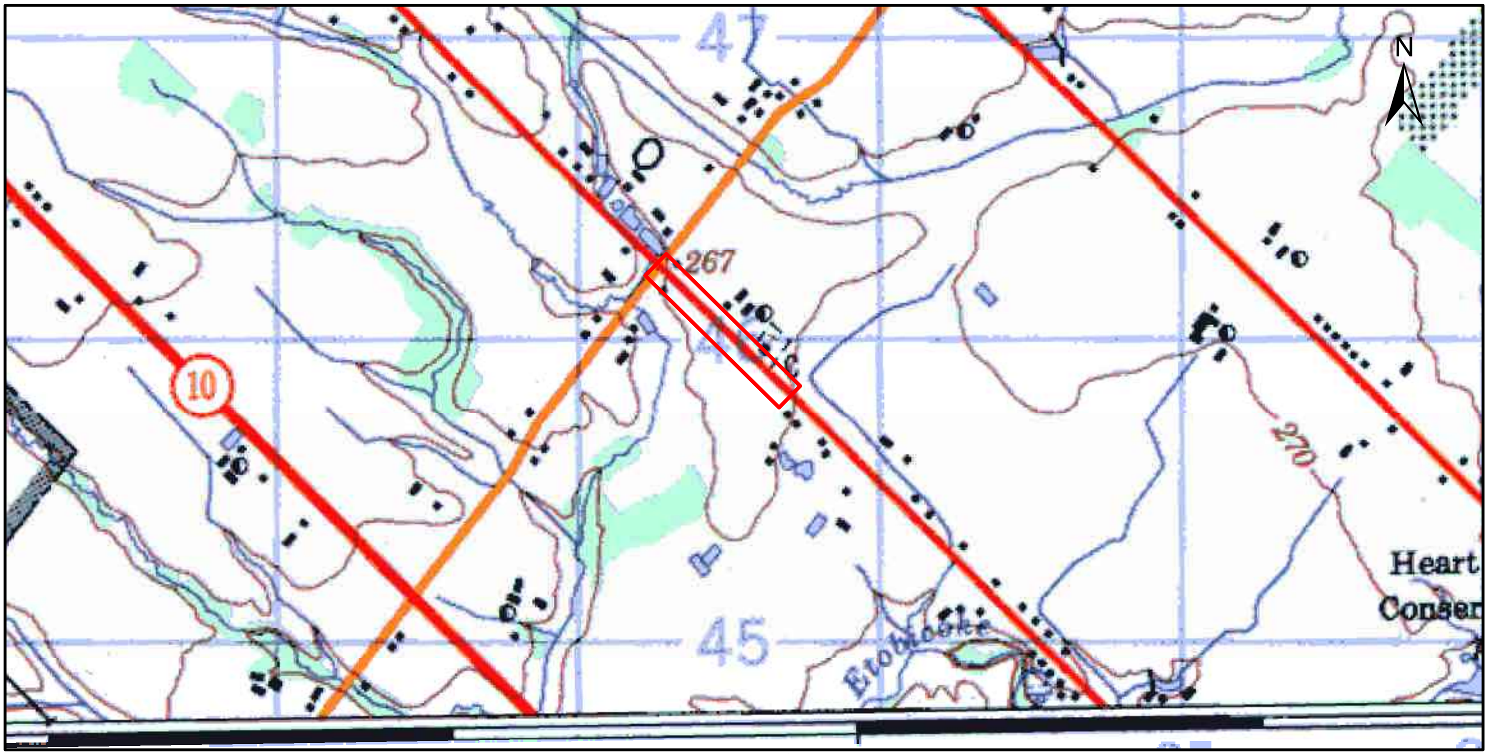

Figure 7: Kennedy Rd Urbanization Study Area (Approximate Location) Overlaid on the 1994 National Topographic System Bolton Sheet

ASI **Archaeological & Cultural Heritage Services** 528 Bathurst Street Toronto, ONTARIO M5S 2P9 416-966-1069 | F416-966-9723 | asiheritage.ca	▭ Study Area	Base: 1954 Aerial Survey of Ontario 1994 NTS Bolton Sheet	0 500 Metres ASI PROJECT NO.: 18EA-035 DRAWN BY: JF DATE: 6/28/2018 FILE: 18EA035_fig6_7_hist

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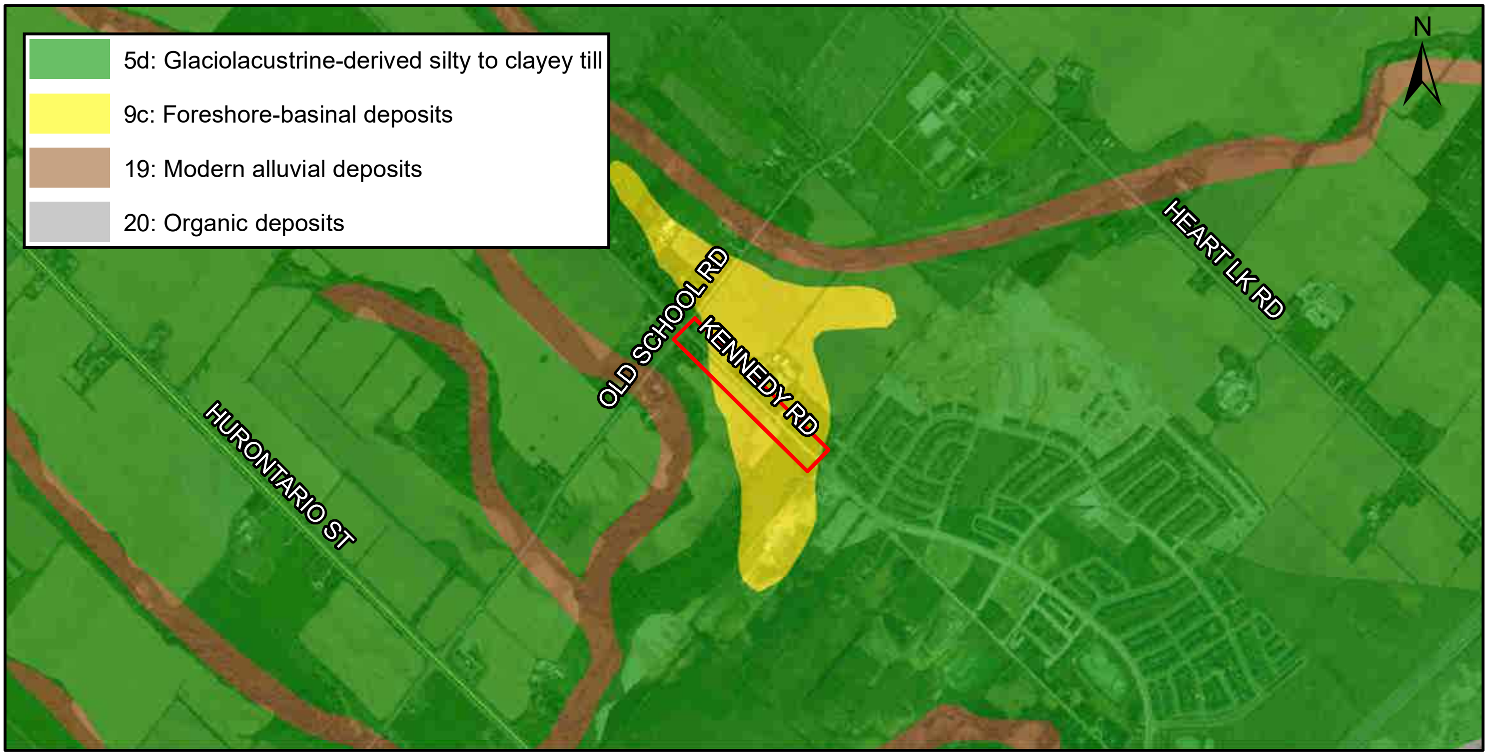

Figure 8: Kennedy Rd Urbanization Study Area - Surficial Geology

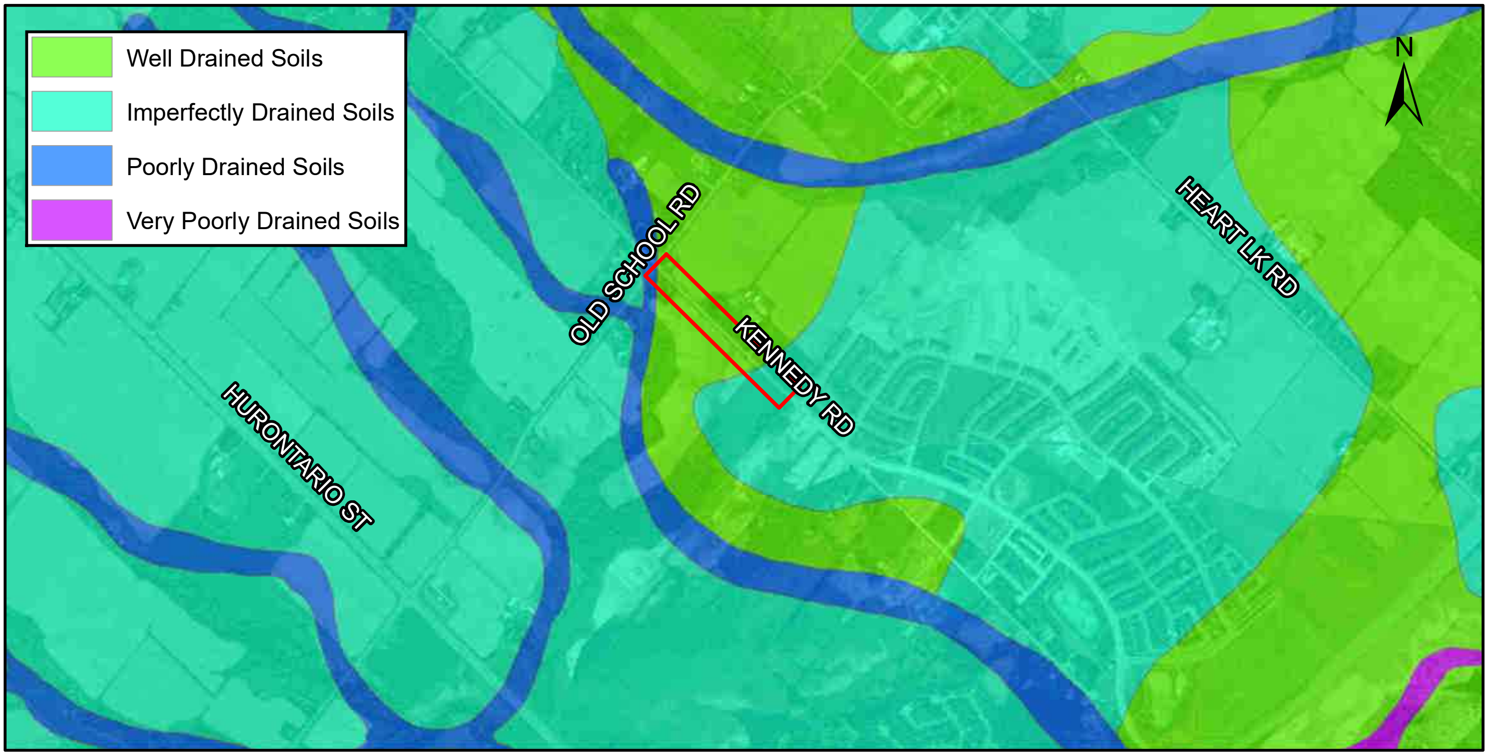

Figure 9: Kennedy Rd Urbanization Study Area - Soil Drainage

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▭ Study Area

Surficial Geology
Ministry of Northern Development
and Mines, © Queen's Printer
for Ontario, 2003.

Ontario Soil Survey
Guelph Geomatics Services,
Ontario Ministry of Agriculture
and AgriFood

0 500
Metres

ASI PROJECT NO.: 18EA-035
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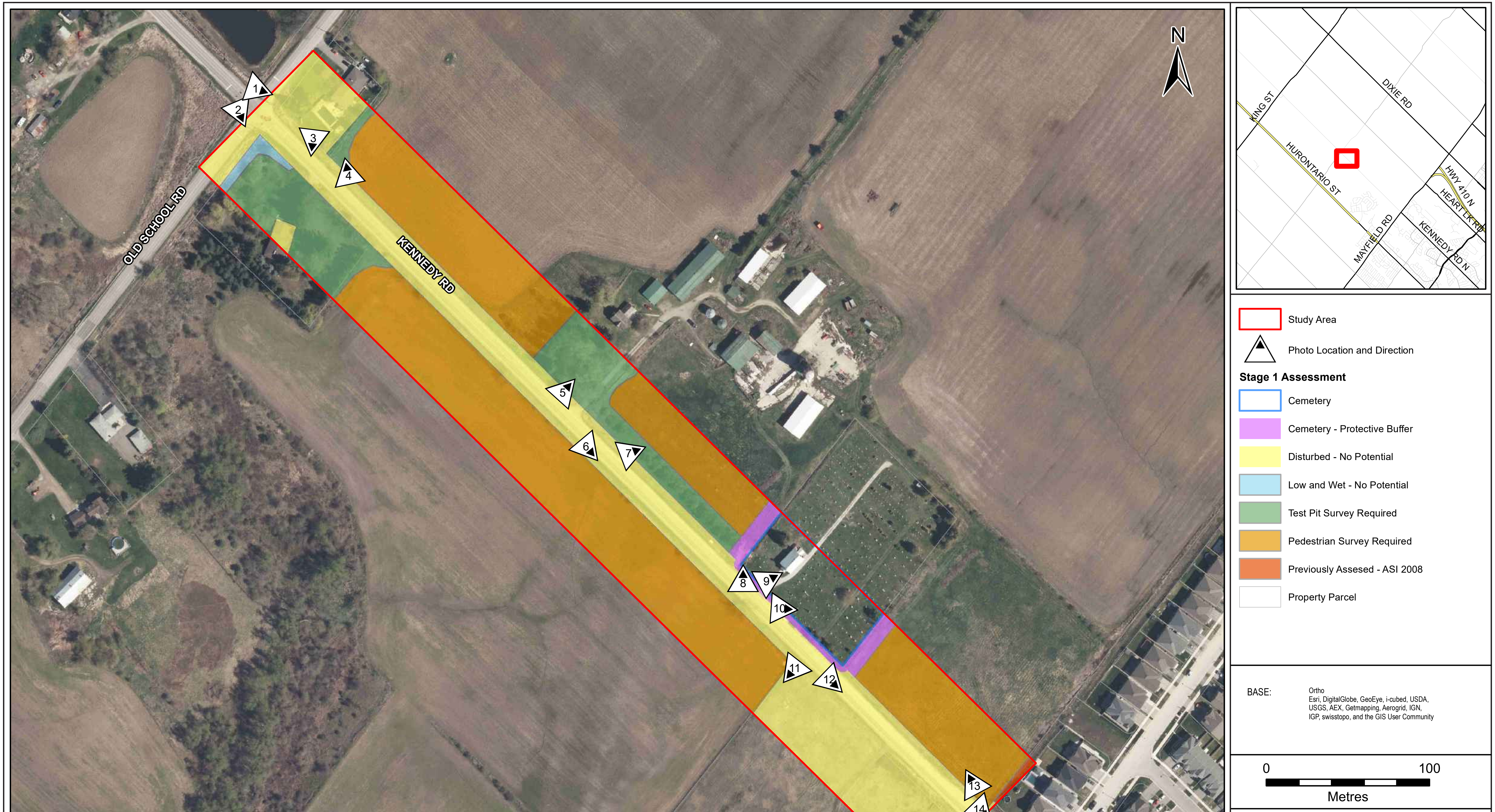

BASE: Ortho
Esri, DigitalGlobe, GeoEye, i-cubed, USDA,
USGS, AEX, Getmapping, Aerogrid, IGN,
IGP, swisstopo, and the GIS User Community

ASI PROJECT NO.: 18EA-035
DATE: 7/13/2018
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Figure 10: Kennedy Rd Urbanization Study Area –Results of the Property Inspection

8.0 IMAGES

Plate 1: East view of Kennedy Rd at Old School Rd; Area is disturbed, no potential

Plate 2: Southeast view of Kennedy Rd at Old School Rd; Area beyond disturbed ROW is low and wet, no potential

Plate 3: South view from Kennedy Rd; Area beyond disturbed ROW surrounding residential property requires test pit survey

Plate 4: North view of Kennedy Rd; Area beyond disturbed ROW requires test pit/pedestrian survey

Plate 5: Northeast view of Kennedy Rd; Area beyond disturbed ROW in historic farmstead requires test pit survey

Plate 6: Southeast view of Kennedy Rd; Area beyond disturbed ROW requires pedestrian survey

Plate 7: East view from Kennedy Rd; Area beyond disturbed ROW requires test pit/pedestrian survey

Plate 8: North view of cemetery; Area beyond disturbed ROW requires Stage 3 cemetery investigation if it cannot be avoided by project design

Plate 9: East view of Dixons Primitive Methodist Church; Area beyond disturbed ROW requires Stage 3 cemetery investigation if it cannot be avoided by project design

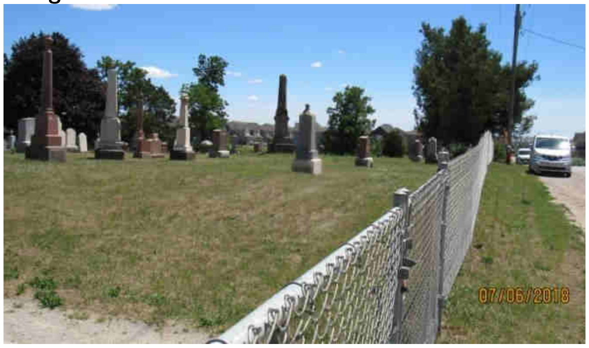

Plate 10: Southeast view of cemetery; Area requires Stage 3 cemetery investigation if it cannot be avoided by project design

Plate 11: Southwest view from Kennedy Rd; Area beyond disturbed ROW and construction requires pedestrian survey

Plate 12: Southeast view of Kennedy Rd; Area is disturbed, no potential

Plate 13: North view from Kennedy Rd; Area beyond disturbed ROW requires pedestrian survey

Plate 14: Southeast view of Kennedy Rd at Bonnieglen Farm Blvd; Area is disturbed, no potential

APPENDIX C

Cultural Heritage Report
(Archeoworks Inc)

Cultural Heritage Resource Assessment:
Built Heritage Resources and Cultural Heritage Landscapes

Existing Conditions and Preliminary Impact Assessment

Kennedy Road Urbanization
Municipal Class Environmental Assessment

Town of Caledon
Regional Municipality of Peel, Ontario

Prepared for:

Chisholm, Fleming and Associates
317 Renfrew Drive, Suite 301
Markham, ON L3R 9S8

ASI File: 18CH-027

July 2018 (Revised April 2019)

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CULTURAL HERITAGE RESOURCE ASSESSMENT:
BUILT HERITAGE RESOURCES AND CULTURAL HERITAGE LANDSCAPES

EXISTING CONDITIONS AND PRELIMINARY IMPACT ASSESSMENT

KENNEDY ROAD URBANIZATION
MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

TOWN OF CALEDON
REGIONAL MUNICIPALITY OF PEEL, ONTARIO

EXECUTIVE SUMMARY

ASI was contracted by Chisolm, Fleming and Associates to conduct a Cultural Heritage Resource Assessment as part of the Kennedy Road Urbanization Municipal Class Environmental Assessment study. The preliminary alternative for the project involves the widening of Kennedy Road, the installation of curbs and gutters, and proposed sewer and culvert installation. The proposed intervention involves improvements to Kennedy Road that are supportive of future land uses between Bonnieglen Farm Boulevard and Old School Road in the Town of Caledon. The study area is generally located in a rural agricultural context adjacent with a residential subdivision to the south.

The results of background historical research and a review of secondary source material revealed a study area with a rural land use history dating back to the early nineteenth century. A field review was conducted for the entire study area to confirm the location of previously identified cultural heritage resources and to document newly discovered ones.

Background research, data collection, and field review was conducted for the study area and it was determined that three cultural heritage resources are located within or adjacent to the Kennedy Road Urbanization EA study area. The preliminary alternative will be primarily confined to the existing Kennedy Road ROW and there are no impacts anticipated for any identified cultural heritage resources. Based on the results of the assessment, the following recommendations have been developed:

1. Construction activities and staging should be suitably planned and undertaken to avoid impacts to identified cultural heritage resources. In particular, no-go zones should be established adjacent to the identified cultural heritage resources (CHLs 1–3) and instructions to construction crews should be issued in order to prevent impacts;

2. Should construction and/or grading result in tree removals within CHL 1–3 post-construction landscaping with historically-sympathetic native tree species should be employed to mitigate impacts to the heritage value of the resource. A qualified arborist or landscape architect should be consulted in this respect;

3. This report should be submitted to Douglas McGlynn, Heritage/Urban Design Planner at the Town of Caledon and the Ministry of Tourism, Culture and Sport for review; and

4. Should future work require an expansion of the study area then a qualified heritage consultant should be contacted in order to confirm the impacts of the proposed work on potential heritage resources.

PROJECT PERSONNEL

Senior Project Manager:	Annie Veilleux, MA, CAHP *Senior Heritage Specialist | Manager Cultural Heritage Division*
Project Manager:	John Sleath, MA *Associate Archaeologist | Project Manager, Cultural Heritage Division*
Project Coordinator:	Sarah Jagelewski, BA (Hon) *Lead Archaeologist | Assistant Manager Environmental Assessment Division*
Report Preparation:	John Sleath
	Kirstyn Allam, Hon. BA, Dip. Advanced Museum Studies *Cultural Heritage Assistant, Cultural Heritage Division*
Graphics Preparation:	Jonas Fernandez, MSc *Lead Archaeologist |Assistant Manager, Fleet and Geomatics Specialist - Operations Division*
Field Review:	Peter Carruthers, MA *Senior Associate*
Report Reviewer:	Katherine Hull, PhD *Partner | Director, Cultural Heritage Division*
	Tara Jenkins, MA, GPCertCHS, CAHP *Cultural Heritage Specialist | Project Manager, Cultural Heritage Division*
	Lindsay Graves, MA *Senior Cultural Heritage Specialist | Senior Project Manager Cultural Heritage Division*

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1.0 INTRODUCTION

ASI was contracted by Chisolm, Fleming and Associates to conduct a Cultural Heritage Resource Assessment as part of the Kennedy Road Urbanization Municipal Class Environmental Assessment study. The preliminary alternative for the project involves the widening of Kennedy Road, the installation of curbs and gutters, and proposed sewer and culvert installation. The proposed intervention involves improvements to Kennedy Road that are supportive of future land uses between Bonnieglen Farm Boulevard and Old School Road. The study area is generally located in a rural agricultural context adjacent with a residential subdivision to the south in the Town of Caledon (Figure 1).

The purpose of this report is to identify existing conditions of the Kennedy Road Urbanization EA study area, present an inventory of cultural heritage resources located within or adjacent to the study area, identify impacts to cultural heritage resources, and propose appropriate mitigation measures. This research was conducted by John Sleath, Cultural Heritage Associate, under the senior project management of Annie Veilleux, Manager of the Cultural Heritage Division, all of ASI.

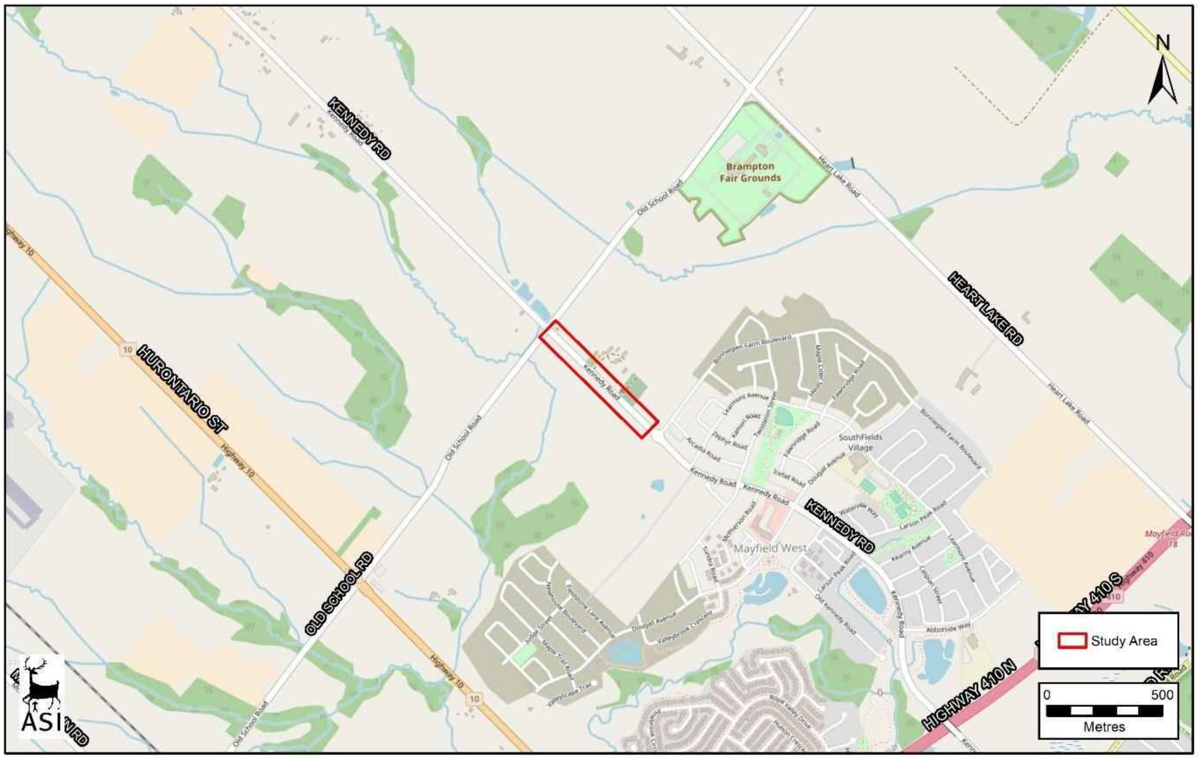

Figure 1: Location of the study area
Base Map: ©OpenStreetMap and contributors, Creative Commons-Share Alike License (CC-BY-SA)

2.0 BUILT HERITAGE RESOURCE AND CULTURAL HERITAGE LANDSCAPE ASSESSMENT CONTEXT

2.1 Legislation and Policy Context

This cultural heritage assessment considers cultural heritage resources in the context of improvements to specified areas, pursuant to the *Environmental Assessment Act*. This assessment addresses above ground cultural heritage resources over 40 years old. Use of a 40-year-old threshold is a guiding principle when conducting a preliminary identification of cultural heritage resources (Ministry of Tourism, Culture and Sport 2016). While identification of a resource that is 40 years old or older does not confer outright heritage significance, this threshold provides a means to collect information about resources that may retain heritage value. Similarly, if a resource is slightly younger than 40 years old, this does not preclude the resource from retaining heritage value.

For the purposes of this assessment, the term cultural heritage resources is used to describe both cultural heritage landscapes and built heritage resources. A cultural landscape is perceived as a collection of individual built heritage resources and other related features that together form farm complexes, roadscapes and nucleated settlements. Built heritage resources are typically individual buildings or structures that may be associated with a variety of human activities, such as historical settlement and patterns of architectural development.

The analysis throughout the study process addresses cultural heritage resources under various pieces of legislation and their supporting guidelines. Under the *Environmental Assessment Act* (1990) environment is defined in Subsection 1(c) to include:

- cultural conditions that influence the life of man or a community, and;
- any building, structure, machine, or other device or thing made by man.

The Ministry of Tourism, Culture and Sport is charged under Section 2 of the *Ontario Heritage Act* with the responsibility to determine policies, priorities and programs for the conservation, protection and preservation of the heritage of Ontario and has published two guidelines to assist in assessing cultural heritage resources as part of an environmental assessment: *Guideline for Preparing the Cultural Heritage Resource Component of Environmental Assessments* (1992), and *Guidelines on the Man-Made Heritage Component of Environmental Assessments* (1980). Accordingly, both guidelines have been utilized in this assessment process.

The *Guidelines on the Man-Made Heritage Component of Environmental Assessments* (Section 1.0) states the following:

> When speaking of man-made heritage we are concerned with the works of man and the effects of his activities in the environment rather than with movable human artifacts or those environments that are natural and completely undisturbed by man.

In addition, environment may be interpreted to include the combination and interrelationships of human artifacts with all other aspects of the physical environment, as well as with the social, economic and cultural conditions that influence the life of the people and communities in Ontario. The *Guidelines on the Man-Made Heritage Component of Environmental Assessments* distinguish between two basic ways of visually experiencing this heritage in the environment, namely as cultural heritage landscapes and as cultural features.

Within this document, cultural heritage landscapes are defined as the following (Section 1.0):

> The use and physical appearance of the land as we see it now is a result of man's activities over time in modifying pristine landscapes for his own purposes. A cultural landscape is perceived as a collection of individual man-made features into a whole. Urban cultural landscapes are sometimes given special names such as townscapes or streetscapes that describe various scales of perception from the general scene to the particular view. Cultural landscapes in the countryside are viewed in or adjacent to natural undisturbed landscapes, or waterscapes, and include such land uses as agriculture, mining, forestry, recreation, and transportation. Like urban cultural landscapes, they too may be perceived at various scales: as a large area of homogeneous character; or as an intermediate sized area of homogeneous character or a collection of settings such as a group of farms; or as a discrete example of specific landscape character such as a single farm, or an individual village or hamlet.

A cultural feature is defined as the following (Section 1.0):

> …an individual part of a cultural landscape that may be focused upon as part of a broader scene, or viewed independently. The term refers to any man-made or modified object in or on the land or underwater, such as buildings of various types, street furniture, engineering works, plantings and landscaping, archaeological sites, or a collection of such objects seen as a group because of close physical or social relationships.

The Minister of Tourism, Culture, and Sport has also published *Standards and Guidelines for Conservation of Provincial Heritage Properties* (2014; *Standards and Guidelines* hereafter). These *Standards and Guidelines* apply to properties the Government of Ontario owns or controls that have cultural heritage value or interest. They are mandatory for Ministries and prescribed public bodies and have the authority of a Management Board or Cabinet directive. Prescribed public bodies include:

- Agricultural Research Institute of Ontario
- Hydro One Inc.
- Liquor Control Board of Ontario
- McMichael Canadian Art Collection
- Metrolinx
- The Niagara Parks Commission
- Ontario Heritage Trust
- Ontario Infrastructure and Lands Corporation
- Ontario Lottery and Gaming Corporation
- Ontario Power Generation Inc.
- Royal Botanical Gardens
- Toronto Area Transit Operating Authority
- St. Lawrence Parks Commission

The *Standards and Guidelines* provide a series of definitions considered during the course of the assessment:

A provincial heritage property is defined as the following (14):

> Provincial heritage property means real property, including buildings and structures on the property, that has cultural heritage value or interest and that is owned by the Crown in right of Ontario or by a prescribed public body; or that is occupied by a ministry or a prescribed public body if the terms of the occupancy agreement are such that the ministry or public body is entitled to make the alterations to the property that may be required under these heritage standards and guidelines.

A provincial heritage property of provincial significance is defined as the following (14):

> Provincial heritage property that has been evaluated using the criteria found in *Ontario Heritage Act* O. Reg. 10/06 and has been found to have cultural heritage value or interest of provincial significance.

A built heritage resource is defined as the following (13):

> …one or more significant buildings (including fixtures or equipment located in or forming part of a building), structures, earthworks, monuments, installations, or remains associated with architectural, cultural, social, political, economic, or military history and identified as being important to a community. For the purposes of these Standards and Guidelines, "structures" does not include roadways in the provincial highway network and in-use electrical or telecommunications transmission towers.

A cultural heritage landscape is defined as the following (13):

> …a defined geographical area that human activity has modified and that has cultural heritage value. Such an area involves one or more groupings of individual heritage features, such as structures, spaces, archaeological sites, and natural elements, which together form a significant type of heritage form distinct from that of its constituent elements or parts. Heritage conservation districts designated under the *Ontario Heritage Act*, villages, parks, gardens, battlefields, mainstreets and neighbourhoods, cemeteries, trails, and industrial complexes of cultural heritage value are some examples.

Additionally, the *Planning Act* (1990) and related *Provincial Policy Statement* (*PPS*), which was updated in 2014, make a number of provisions relating to heritage conservation. One of the general purposes of the *Planning Act* is to integrate matters of provincial interest in provincial and municipal planning decisions. In order to inform all those involved in planning activities of the scope of these matters of provincial interest, Section 2 of the *Planning Act* provides an extensive listing. These matters of provincial interest shall be regarded when certain authorities, including the council of a municipality, carry out their responsibilities under the *Act*. One of these provincial interests is directly concerned with:

> 2.(d) the conservation of features of significant architectural, cultural, historical, archaeological or scientific interest

Part 4.7 of the *PPS* states that:

> The official plan is the most important vehicle for implementation of this Provincial Policy Statement. Comprehensive, integrated and long-term planning is best achieved through official plans.

> Official plans shall identify provincial interests and set out appropriate land use designations and policies. To determine the significance of some natural heritage features and other resources, evaluation may be required.
>
> Official plans should also coordinate cross-boundary matters to complement the actions of other planning authorities and promote mutually beneficial solutions. Official plans shall provide clear, reasonable and attainable policies to protect provincial interests and direct development to suitable areas.
>
> In order to protect provincial interests, planning authorities shall keep their official plans up-to-date with this Provincial Policy Statement. The policies of this Provincial Policy Statement continue to apply after adoption and approval of an official plan.

Those policies of relevance for the conservation of heritage features are contained in Section 2- Wise Use and Management of Resources, wherein Subsection 2.6 - Cultural Heritage and Archaeological Resources, makes the following provisions:

> 2.6.1 Significant built heritage resources and significant cultural heritage landscapes shall be conserved.

A number of definitions that have specific meanings for use in a policy context accompany the policy statement. These definitions include built heritage resources and cultural heritage landscapes.

A *built heritage resource* is defined as: “a building, structure, monument, installation or any manufactured remnant that contributes to a property’s cultural heritage value or interest as identified by a community, including an Aboriginal community” (Ministry of Municipal Affairs and Housing 2014).

A *cultural heritage landscape* is defined as “a defined geographical area that may have been modified by human activity and is identified as having cultural heritage value or interest by a community, including an Aboriginal community. The area may involve features such as structures, spaces, archaeological sites or natural elements that are valued together for their interrelationship, meaning or association” (Ministry of Municipal Affairs and Housing 2014). Examples may include, but are not limited to farmscapes, historical settlements, parks, gardens, battlefields, mainstreets and neighbourhoods, cemeteries, trailways, and industrial complexes of cultural heritage value.

In addition, significance is also more generally defined. It is assigned a specific meaning according to the subject matter or policy context, such as wetlands or ecologically important areas. With regard to cultural heritage and archaeology resources, resources of significance are those that are valued for the important contribution they make to our understanding of the history of a place, an event, or a people (Ministry of Municipal Affairs and Housing 2014).

Criteria for determining significance for the resources are recommended by the Province, but municipal approaches that achieve or exceed the same objective may also be used. While some significant resources may already be identified and inventoried by official sources, the significance of others can only be determined after evaluation (Ministry of Municipal Affairs and Housing 2014).

Accordingly, the foregoing guidelines and relevant policy statement were used to guide the scope and methodology of the cultural heritage assessment.

2.2 Municipal Heritage Policies

As the subject property is located within the Town of Caledon, the *Town of Caledon Official Plan* (2015) regarding cultural heritage resources was reviewed as part of this assessment:

3.3.3.1.3 Cultural Heritage Planning Statements

> Where the concentration and/or significance of cultural heritage resources in an area requires that detailed guidance be provided to conserve and enhance the cultural heritage of an area, the Town will prepare Cultural Heritage Planning Statements. The Cultural Heritage Planning Statements will be prepared in part to guide development and redevelopment proposals. Cultural Heritage Planning Statements shall be incorporated through an amendment to this Plan. Where the Cultural Heritage Planning Statement forms part of a secondary planning process, the Cultural Heritage Planning Statement will be incorporated into this Plan by way of that secondary planning process.
>
> In the context of conserving and enhancing the cultural heritage of an area, the Cultural Heritage Planning Statement shall address the following:
>
> a) Historical development context of the area;
> b) Existence of cultural heritage resources and their significance;
> c) Priorities as to the conservation of these cultural heritage resources;
> d) Redevelopment concerns;
> e) Improved public access to the area or individual site;
> f) The inclusion of areas of open space;
> g) The provision of interpretive devices such as plaques and displays;
> h) Architectural design guidelines; and,
> i) Streetscape guidelines.

3.3.3.1.4 Cultural Heritage Surveys

> All development or redevelopment proposals will be reviewed by the Town to determine whether a Cultural Heritage Survey is required or whether, as appropriate, a Cultural Heritage Survey will be requested. In making this determination, the Town will consider the scope of the proposal and, through reference to the archaeological master plan, built heritage resources inventory, cultural heritage landscape inventory, or local information, the likelihood of significant cultural heritage resources being encountered.
>
> Where a Cultural Heritage Survey is required, the proponent is encouraged to consult with the Town and other relevant agencies concerning the scope of the work to be undertaken. The Cultural Heritage Survey will be the responsibility of the proponent and must be undertaken by a qualified professional with appropriate expertise, and it should generally:
>
> a) Identify the level of significance of any cultural heritage resources, including archaeological resources and potential, existing on and in close proximity to the subject lands; and,
> b) Make recommendations for the conservation of the cultural heritage resources including whether a Cultural Heritage Impact Statement should be prepared.

3.3.3.1.5 Cultural Heritage Impact Statements

a) Where it is determined that further investigations of cultural heritage resources beyond a Cultural Heritage Survey or Cultural Heritage Planning Statement are required, a Cultural Heritage Impact Statement may be required. The determination of whether a Cultural Heritage Impact Statement is required will be based on the following:

   i) the extent and significance of cultural heritage resources identified, including archaeological resources and potential, in the Cultural Heritage Survey or Cultural Heritage Planning Statement and the recommendations of the Cultural Heritage Survey or Cultural Heritage Planning Statement;
   ii) the potential for adverse impacts on cultural heritage resources; and,
   iii) the appropriateness of following other approval processes that consider and address impacts on cultural heritage resources.

b) Where it is determined that a Cultural Heritage Impact Statement should be prepared, the Cultural Heritage Impact Statement shall be undertaken by a qualified professional with expertise in heritage studies and contain the following:

   i) a description of the proposed development;
   ii) a description of the cultural heritage resource(s) to be affected by the development;
   iii) a description of the effects upon the cultural heritage resource(s) by the proposed development;
   iv) a description of the measures necessary to mitigate the adverse effects of the development upon the cultural heritage resource(s); and,
   v) a description of how the policies and guidance of any relevant Cultural Heritage Planning Statement have been incorporated and satisfied.

Where a Cultural Heritage Impact Statement is required, the proponent is encouraged to consult with the Town and other relevant agencies concerning the scope of the work to be undertaken.

2.3 Data Collection and Methodology

In the course of the cultural heritage assessment, all potentially affected cultural heritage resources are subject to inventory. Short form names are usually applied to each resource type, (e.g. barn, residence). Generally, when conducting a preliminary identification of cultural heritage resources, three stages of research and data collection are undertaken to appropriately establish the potential for and existence of cultural heritage resources in a particular geographic area.

Background historical research, which includes consultation of primary and secondary source research and historical mapping, is undertaken to identify early settlement patterns and broad agents or themes of change in a study area. This stage in the data collection process enables the researcher to determine the presence of sensitive heritage areas that correspond to nineteenth and twentieth-century settlement and development patterns. To augment data collected during this stage of the research process, federal, provincial, and municipal databases and/or agencies are consulted to obtain information about specific properties that have been previously identified and/or designated as retaining cultural heritage value. Typically, resources identified during these stages of the research process are reflective of particular architectural styles, associated with an important person, place, or event, and contribute to the contextual facets of a particular place, neighbourhood, or intersection.

A field review is then undertaken to confirm the location and condition of previously identified cultural heritage resources. The field review is also used to identify cultural heritage resources that have not been previously identified on federal, provincial, or municipal databases.

Several investigative criteria are utilised during the field review to appropriately identify new cultural heritage resources. These investigative criteria are derived from provincial guidelines, definitions, and past experience. During the course of the environmental assessment, a built structure or landscape is identified as a cultural heritage resource if it is considered to be 40 years or older, and if the resource satisfies at least one of the following criteria:

Design/Physical Value:

- It is a rare, unique, representative or early example of a style, type, expression, material or construction method.
- It displays a high degree of craftsmanship or artistic merit.
- It demonstrates a high degree of technical or scientific achievement.
- The site and/or structure retains original stylistic features and has not been irreversibly altered so as to destroy its integrity.
- It demonstrates a high degree of excellence or creative, technical or scientific achievement at a provincial level in a given period.

Historical/Associative Value:

- It has a direct association with a theme, event, belief, person, activity, organization, or institution that is significant to: the Town of Caledon; the Province of Ontario; or Canada.
- It yields, or has the potential to yield, information that contributes to an understanding of the history of: the Town of Caledon; the Province of Ontario; or Canada.
- It demonstrates or reflects the work or ideas of an architect, artist builder, designer, or theorist who is significant to: the Town of Caledon; the Province of Ontario; or Canada.
- It represents or demonstrates a theme or pattern in Ontario’s history.
- It demonstrates an uncommon, rare or unique aspect of Ontario’s cultural heritage.
- It has a strong or special association with the entire province or with a community that is found in more than one part of the province. The association exists for historical, social, or cultural reasons or because of traditional use.
- It has a strong or special association with the life or work of a person, group or organization of importance to the province or with an event of importance to the province.

Contextual Value:

- It is important in defining, maintaining, or supporting the character of an area.
- It is physically, functionally, visually, or historically linked to its surroundings.
- It is a landmark.
- It illustrates a significant phase in the development of the community or a major change or turning point in the community’s history.

- The landscape contains a structure other than a building (fencing, culvert, public art, statue, etc.) that is associated with the history or daily life of that area or region.
- There is evidence of previous historical and/or existing agricultural practices (e.g. terracing, deforestation, complex water canalization, apple orchards, vineyards, etc.)
- It is of aesthetic, visual or contextual important to the province.

If a resource meets one of these criteria it will be identified as a cultural heritage resource and is subject to further research where appropriate and when feasible. Typically, detailed archival research, permission to enter lands containing heritage resources, and consultation is required to determine the specific heritage significance of the identified cultural heritage resource.

When identifying cultural heritage landscapes, the following categories are typically utilized for the purposes of the classification during the field review:

Farm complexes:	comprise two or more buildings, one of which must be a farmhouse or barn, and may include a tree-lined drive, tree windbreaks, fences, domestic gardens and small orchards.
Roadscapes:	generally two-lanes in width with absence of shoulders or narrow shoulders only, ditches, tree lines, bridges, culverts and other associated features.
Waterscapes:	waterway features that contribute to the overall character of the cultural heritage landscape, usually in relation to their influence on historical development and settlement patterns.
Railscapes:	active or inactive railway lines or railway rights of way and associated features.
Historical settlements:	groupings of two or more structures with a commonly applied name.
Streetscapes:	generally consist of a paved road found in a more urban setting, and may include a series of houses that would have been built in the same time period.
Historical agricultural landscapes:	generally comprise a historically rooted settlement and farming pattern that reflects a recognizable arrangement of fields within a lot and may have associated agricultural outbuildings, structures, and vegetative elements such as tree rows.
Cemeteries:	land used for the burial of human remains.

Results of the desktop data collection and field review are contained in Section 3.0, while Sections 4.0 and 5.0 contain conclusions and recommendations with respect to potential impacts of the undertaking on the identified cultural heritage resource. A cultural heritage resource inventory is provided in Section 7.0, while location mapping is in Section 8.0.

3.0 BUILT HERITAGE RESOURCE AND CULTURAL HERITAGE LANDSCAPE ASSESSMENT

This section provides a brief summary of historical research and a description of identified above ground cultural heritage resources that may be affected by the proposed undertaking.

3.1 Background Historical Summary

A review of available primary and secondary source material was undertaken to produce a contextual overview of the study area, including a general description of physiography, as well as Indigenous and Euro-Canadian land use and settlement.

3.1.1 Physiography

The study area is located on drumlinized till plains within the South Slope physiographic region of southern Ontario (Chapman and Putnam 1984:172–174). The South Slope is the southern slope of the Oak Ridges Moraine. The South Slope meets the Moraine at heights of approximately 300 metres above sea level, and descends southward toward Lake Ontario, ending, in some areas, at elevations below 150 metres above sea level. Numerous streams descend the South Slope, having cut deep valleys in the till. In the vicinity of the study area, the South Slope is ground moraine of limited relief.

The study area is within the Etobicoke Headwaters subwatershed of the Etobicoke Creek, adjacent to the edge of the West Humber River watershed. The Etobicoke Creek watershed, derived from the Algonkian word "*Wah-do-be kaug*" meaning "place where the alders grow", includes the major tributaries Spring Creek, Little Etobicoke Creek, and West Etobicoke Creek, and drains an area of approximately 211 square kilometres within the cities of Brampton, Mississauga, Toronto, and the Town of Caledon. The creeks flow south from its headwaters in Caledon into Lake Ontario through 68% urban, 27% rural and 5% urbanizing land (Toronto and Region Conservation Authority 2018). The Humber River watershed encompasses an area of 911 square kilometers with a main, east, and west branch, originating on the Niagara Escarpment and the Oak Ridges Moraine and flowing through York and Peel Regions into the City of Toronto where it drains into Lake Ontario (Toronto and Region Conservation Authority 2016). The Humber River was designated as a Canadian Heritage River System in 1999 for its Carolinian forests, farms, and old mills, and as its 10,000 year history of human settlement and significance as the Carrying Place Trail (Canadian Heritage Rivers System 2016).

3.1.2 Indigenous Land Use and Settlement

Southern Ontario has been occupied by human populations since the retreat of the Laurentide glacier, approximately 13,500 before present (BP) (Ferris 2013:13). Populations at this time would have been highly mobile, inhabiting a boreal-parkland similar to the modern sub-arctic. By approximately 10,000 BP, the environment had progressively warmed (Edwards and Fritz 1988), and populations now occupied less extensive territories (Ellis and Deller 1990:62-63).

Between approximately 10,000-5,500 BP, the Great Lakes basins experienced low-water levels, and many sites which would have been located on those former shorelines were then submerged. This period produces the earliest evidence of heavy wood working tools and is indicative of greater investment of labour in felling trees for fuel, to build shelter, or to produce tools, and is ultimately indicative of prolonged seasonal residency at sites (Brown 1995:13; Parker Pearson 1999:141). Between approximately 4,500-3,000 BP, there is evidence for construction of fishing weirs. These structures indicate not only the group sharing of resources, but also the organization of communal labour (Ellis *et al.* 1990; Ellis *et al.* 2009).

Between 3,000-2,500 BP, populations continued with residential mobility harvesting of seasonally available resources, including spawning fish. Exchange and interaction networks broaden at this time (Spence *et al.* 1990:136, 138) and by approximately 2,000 BP, evidence exists for macro-band camps, focusing on the seasonal harvesting of resources (Spence *et al.* 1990:155, 164). It is also during this period that maize was first introduced into southern Ontario, though it would have only supplemented people's diet (Birch and Williamson 2013:13-15). Bands likely retreated to interior camps during the winter.

From approximately 1,000 BP until approximately 300 BP, lifeways became more similar to that described in early historical documents. During the Early Iroquoian phase (AD 1000-1300), the communal site is replaced by the village focused on horticulture. Seasonal disintegration of the community for the exploitation of a wider territory and more varied resource base was still practised (Williamson 1990:317). By the second quarter of the first millennium BP, during the Middle Iroquoian phase (AD 1300-1450), this episodic community disintegration was no longer practised and populations now communally occupied sites throughout the year (Dodd et al. 1990:343). In the Late Iroquoian phase (AD 1450-1649) this process continued with the coalescence of these small villages into larger communities (Birch and Williamson 2013). Through this process, the socio-political organization of the First Nations, as described historically by the French and English explorers who first visited southern Ontario, was developed. By AD 1600, the communities within Simcoe County had formed the Confederation of Nations encountered by the first European explorers and missionaries. In the 1640s, the traditional enmity between the Haudenosaunee[1] and the Huron-Wendat (and their Algonkian allies such as the Nippissing and Odawa) led to the dispersal of the Huron-Wendat.

After the dispersal, the Haudenosaunee established a series of settlements at strategic locations along the trade routes inland from the north shore of Lake Ontario, including Teiaiagon, near the mouth of the Humber River; and Ganestiquiagon, near the mouth of the Rouge River. Their locations near the mouths of the Humber and Rouge Rivers, two branches of the Toronto Carrying Place, strategically linked these settlements with the upper Great Lakes through Lake Simcoe. The west branch of the Carrying Place followed the Humber River valley northward over the drainage divide, skirting the west end of the Oak Ridges Moraine, to the East Branch of the Holland River. Another trail followed the Don River watershed.

When the Senecas established Teiaiagon at the mouth of the Humber, they were in command of the traffic across the peninsula to Lake Simcoe and the Georgian Bay. Later, Mississauga and earliest European presence along the north shore, was therefore also largely defined by the area's strategic importance for accessing and controlling long established economic networks. Prior to the arrival of the Seneca, these economic networks would have been used by indigenous groups for thousands of years. While the trail played an important part during the fur trade, people would also travel the trail in order to exploit the

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[1] The Haudenosaunee are also known as the New York Iroquois or Five Nations Iroquois and after 1722 Six Nations Iroquois. They were a confederation of five distinct but related Iroquoian–speaking groups - the Seneca, Onondaga, Cayuga, Oneida, and Mohawk. Each lived in individual territories in what is now known as the Finger Lakes district of Upper New York. In 1722 the Tuscarora joined the confederacy.

resources available to them across south-central Ontario, including the various spawning runs, such as the salmon coming up from Lake Ontario or herring or lake trout in Lake Simcoe.

Due, in large part, to increased military pressure from the French upon their homelands south of Lake Ontario, the Haudenosaunee abandoned their north shore frontier settlements by the late 1680s, although they did not relinquish their interest in the resources of the area, as they continued to claim the north shore as part of their traditional hunting territory. The territory was immediately occupied or re-occupied by Anishinaabek groups, including the Mississauga, Ojibwa (or Chippewa) and Odawa, who, in the early seventeenth century, occupied the vast area extending from the east shore of Georgian Bay, and the north shore of Lake Huron, to the northeast shore of Lake Superior and into the upper peninsula of Michigan. Individual bands were politically autonomous and numbered several hundred people. Nevertheless, they shared common cultural traditions and relations with one another and the land. These groups were highly mobile, with a subsistence economy based on hunting, fishing, gathering of wild plants, and garden farming. Their movement southward also brought them into conflict with the Haudenosaunee.

Peace was achieved between the Haudenosaunee and the Anishinaabek Nations in August of 1701 when representatives of more than twenty Anishinaabek Nations assembled in Montreal to participate in peace negotiations (Johnston 2004:10). During these negotiations captives were exchanged and the Iroquois and Anishinaabek agreed to live together in peace. Peace between these nations was confirmed again at council held at Lake Superior when the Iroquois delivered a wampum belt to the Anishinaabek Nations.

In 1763, following the fall of Quebec, New France was transferred to British control at the Treaty of Paris. The British government began to pursue major land purchases to the north of Lake Ontario in the early nineteenth century, the Crown acknowledged the Mississaugas as the owners of the lands between Georgian Bay and Lake Simcoe and entered into negotiations for additional tracts of land as the need arose to facilitate European settlement.

The eighteenth century saw the ethnogenesis in Ontario of the Métis, when Métis people began to identify as a separate group, rather than as extensions of their typically maternal First Nations and paternal European ancestry (Métis National Council n.d.). Living in both Euro-Canadian and Indigenous societies, the Métis acted as agents and subagents in the fur trade but also as surveyors and interpreters. Métis populations were predominantly located north and west of Lake Superior, however, communities were located throughout Ontario (MNC n.d.; Stone and Chaput 1978:607,608). During the early nineteenth century, many Métis families moved towards locales around southern Lake Huron and Georgian Bay, including Kincardine, Owen Sound, Penetanguishene, and Parry Sound (MNC n.d.). By the mid-twentieth century, Indigenous communities, including the Métis, began to advance their rights within Ontario and across Canada, and in 1982, the Métis were federally recognized as one of the distinct Indigenous peoples in Canada. Recent decisions by the Supreme Court of Canada (Supreme Court of Canada 2003, 2016) have reaffirmed that Métis people have full rights as one of the Indigenous people of Canada under subsection 91(24) of the Constitution Act, 1867.

The study area is within Treaty 19, the Ajetance Purchase. In 1818, the Chippewa ceded lands to the Crown in the Lake Simcoe-Nottawasaga Treaty, prompting the Crown to seek a treaty for the lands immediately adjacent to the south, which was signed the same year by the Mississaugas Chief Ajetance (Aboriginal Affairs and Northern Development Canada 2013:19; Mississaugas of the New Credit First Nation 2017).

3.1.3 Historical Euro-Canadian Land Use: Township Survey and Settlement

Historically, the study area is located in the Former Chinguacousy Township, County of Peel, in part of Lot 22, Concession 1, East of Centre Road (ECR), and Lot 22, Concession 2, ECR.
Chinguacousy Township

The land now encompassed by the Township of Chinguacousy has a cultural history which begins approximately 10,000 years ago and continues to the present. The study area is located within lands of the 1818 “Ajetance Treaty” between the Crown and the Mississauga Nation of the River Credit, Twelve and Sixteen Mile Creeks (Aboriginal Affairs and Northern Development Canada 2013). This treaty, however, excluded lands within one mile on either side of the Credit River, Twelve Mile Creek and Sixteen Mile Creek. In 1820, Treaties 22 and 23 were signed which acquired these remaining lands except a 200 acre parcel along the Credit River (Heritage Mississauga 2012:18).

The township is said to have been named by Sir Peregrine Maitland after the Mississauga word for the Credit River meaning “young pine.” Other scholars assert that it was named in honour of the Ottawa Chief Shinguacose, which was corrupted to the present spelling of ‘Chinguacousy,’ “under whose leadership Fort Michilimacinac was captured from the Americans in the War of 1812” (Mika and Mika 1977:416; Rayburn 1997:68). The township was formally surveyed in 1818, and the first legal settlers took up their lands later in that same year. The extant Survey Diaries indicate that the original timber stands within the township included oak, ash, maple, beech, elm, basswood, hemlock, and pine. It was recorded that the first landowners in Chinguacousy included settlers from New Brunswick, the United States, and also United Empire Loyalists and their children (Walker and Miles 1877:65; Mika and Mika 1977:417; Armstrong 1985:142).

Due to the small population of the newly acquired tract, Chinguacousy was initially amalgamated with the Gore of Toronto Township for political and administrative purposes. In 1821, the population of the united townships numbered just 412. By 1837, the population of the township had reached an estimated 1,921. The numbers grew from 3,721 in 1842 to 7,469 in 1851. Thereafter the population declined to 6,897 in 1861, and to 6,129 by 1871 (Walton 1837:71; Walker and Miles 1877:59). Chinguacousy Township was the largest in Peel County and was described as one of the best settled townships in the Home District. It contained excellent, rolling land which was timbered mainly in hardwood with some pine intermixed. Excellent wheat was grown here. The township contained one grist mill and seven saw mills. By 1851, this number had increased to two grist mills and eight sawmills (Smith 1846:32, 1851:279). The principal crops grown in Chinguacousy included wheat, oats, peas, potatoes, and turnips. It was estimated that the only township in the province which rivaled Chinguacousy in wheat production at that time was Whitby. Other farm products included maple sugar, wool, cheese, and butter (Smith 1851:279).

Chinguacousy was originally included within the limits of the Home District until 1849, when the old Upper Canadian Districts were abolished. It formed part of the United Counties of York, Ontario and Peel until 1851, when Peel was elevated to independent county status under the Provisions 14 & 15. A provisional council for Peel was not established until 1865, and the first official meeting of the Peel County council occurred in January 1867.

In 1974, part of the township was amalgamated with the City of Brampton, and the remainder was annexed to the Town of Caledon (Walker and Miles 1877:59; Mika and Mika 1977:417–418; Armstrong 1985:152; Rayburn 1997:68).

Dixon's Union Cemetery

The cemetery is located in Lot 22, Concession 2 ECR, to the south of Dixon's Primitive Methodist Church located on the east side of Kennedy Road, south of Old School Road (The Bone Yard Blogger 2010). The church was originally built in 1855. A strong wind destroyed the church in 1874 and in 1875 was rebuilt. The earliest monument shows the name of an infant who died in 1849 (Geocaching.com 2016).

3.1.4 Review of Historical Mapping

The 1819 *Patent Plan of Chinguacousy Township*, the 1859 *Map of the County of Peel*, and the 1877 *Illustrated Historical Atlas of the County of Peel*, Township of Chinguacousy page (Ridout 1819; Tremaine 1859; Walker and Miles 1877) were examined to determine the presence of historic features within the study area during the nineteenth century (Figures 2-4).

It should be noted, however, that not all features of interest were mapped systematically in the Ontario series of historical atlases, given that they were financed by subscription, and subscribers were given preference about the level of detail provided on the maps. Moreover, not every feature of interest would have been within the scope of the atlases. In addition, the use of historical map sources to reconstruct/predict the location of former features within the modern landscape generally proceeds by using common reference points between the various sources. These sources are then geo-referenced in order to provide the most accurate determination of the location of any property on historical mapping sources. The results of such exercises are often imprecise or even contradictory, as there are numerous potential sources of error inherent in such a process, including the vagaries of map production (both past and present), the need to resolve differences of scale and resolution, and distortions introduced by reproduction of the sources. To a large degree, the significance of such margins of error is dependent on the size of the feature one is attempting to plot, the constancy of reference points, the distances between them, and the consistency with which both they and the target feature are depicted on the period mapping.

Historically, the study area is located in former Chinguacousy Township, County of Peel. Details of historical property owners and historical features in the study area are listed in Table 1.

Table 1: Kennedy Road Study Area – Nineteenth-century property owner(s) and historical features(s)

		1819 Patent Plan	*1859 Tremaine Map*		*1877 Illustrated Historical Atlas*	
Lot #	**Con #**	**Property Owner(s)**	**Property Owner(s)**	**Historical Feature(s)**	**Property Owner(s)**	**Historical Feature(s)**
22	1 ECR	Canada Company	Thomas Fead Robert Norris	None	James Topham	Farmstead and orchard
	2 ECR	Isaac Lightheart	Robert Norris	None	Robert Norris	Farmstead, orchard church, cemetery

The nineteenth-century maps illustrate that Kennedy and Old School Roads were historically surveyed. No structures are shown within the study area on the 1819 or 1859 maps (Figures 2 and 3). By 1877 the Historical Atlas map (Figure 4) shows that there is a farmstead in Lot 22, Concession 2 ECR, fronting Kennedy Road. The map also illustrates a church with a steeple and cemetery in that lot. Lot 22, Concession 1 ECR has a farmstead fronting Old School Road. The tributaries of the Humber and

Etobicoke Creeks are illustrated. The study area is depicted in a rural agricultural context throughout the nineteenth-century.

In addition to nineteenth-century mapping, topographic mapping and aerial photographs from the twentieth century were examined. This report presents maps and aerial photographs from 1914, 1954, and 1994. These do not represent the full range of maps consulted for the purpose of this study but were judged to cover the full range of land uses that occurred in the area during each period.

The twentieth-century mapping revealed that the study area retained a rural agricultural character throughout the twentieth-century. The 1914 topographical map illustrates that a brick house and brick church with a cemetery are illustrated within the study area (Figure 5). The 1954 aerial photograph depicts the study area within a similar rural agricultural landscape, with the same roadways and same structures evident as in earlier mapping (Figure 6). In 1994, the cemetery is shown adjacent to a farmstead with five structures. Structures are shown on either side of Kennedy Road south of Old School Road (Figure 7).

A review of available Google satellite imagery shows that the study area has remained surrounded by active agricultural fields since 2004. In 2009, construction began on the new alignment of Kennedy Road and the subdivision south of the study area.

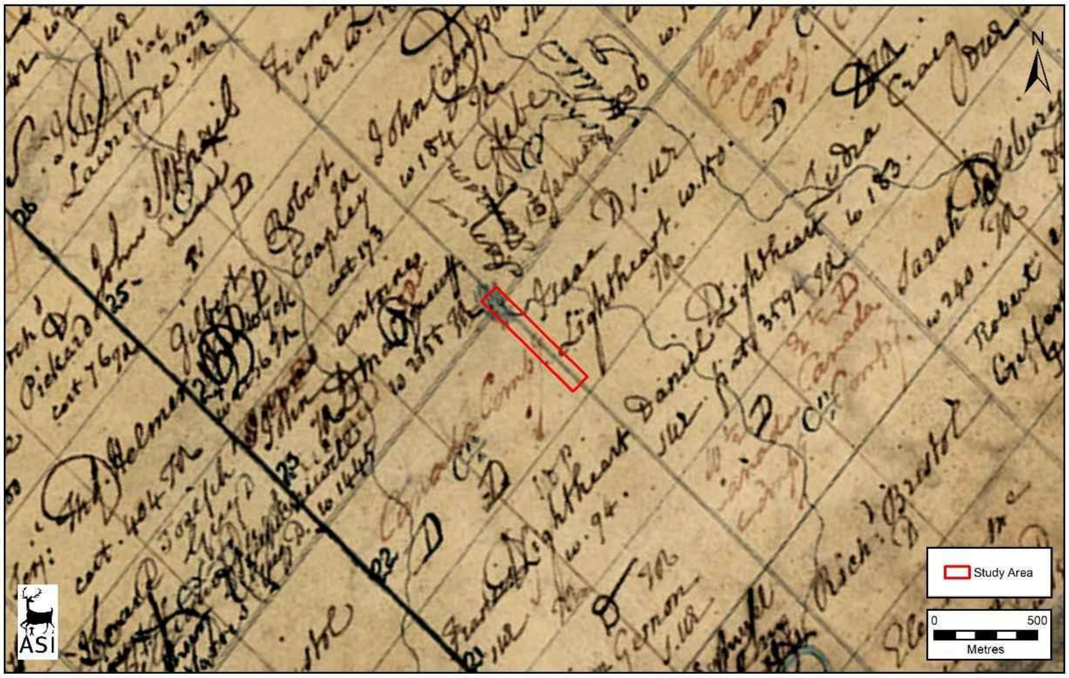

Figure 2: The study area overlaid on the 1819 *Patent Plan of Chinguacousy Township*
Base Map: Ridout 1819

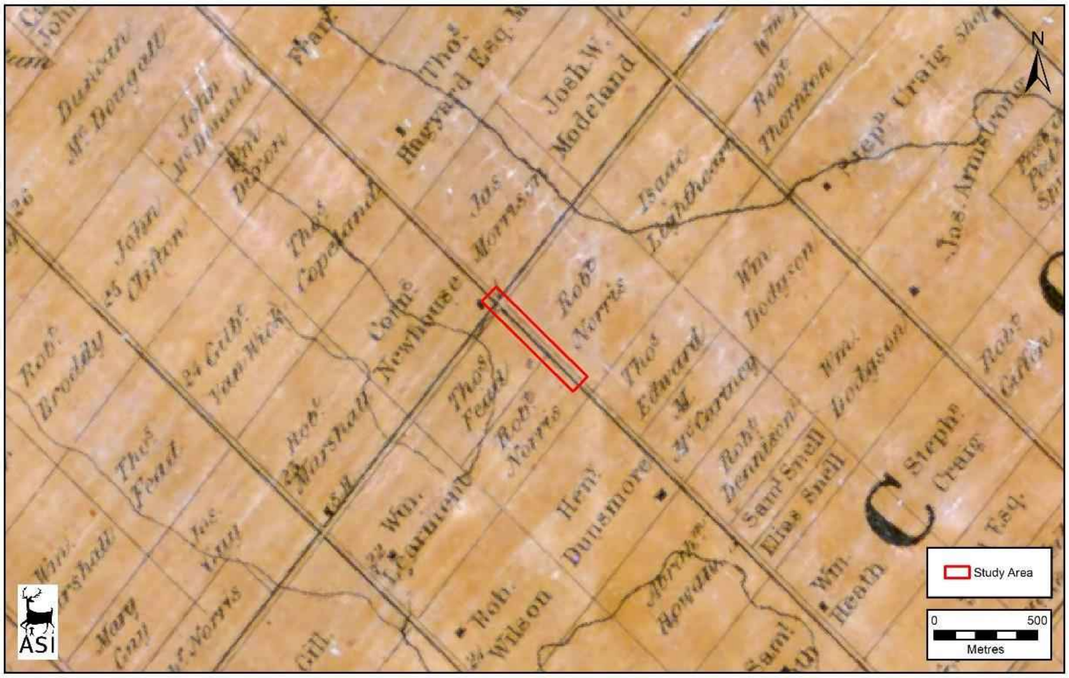

Figure 3: The study area overlaid on the 1859 *Tremaine's Map*

Base Map: Tremaine 1859

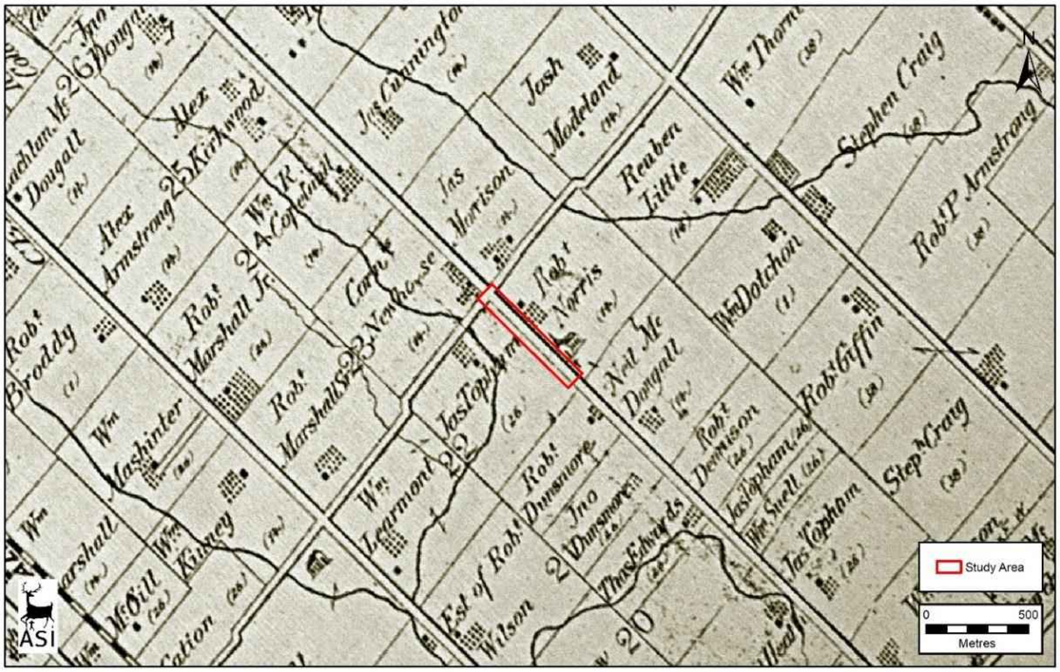

Figure 4: The study area overlaid on the 1877 *Illustrated Historical Atlas*

Base Map: Walker and Miles 1877

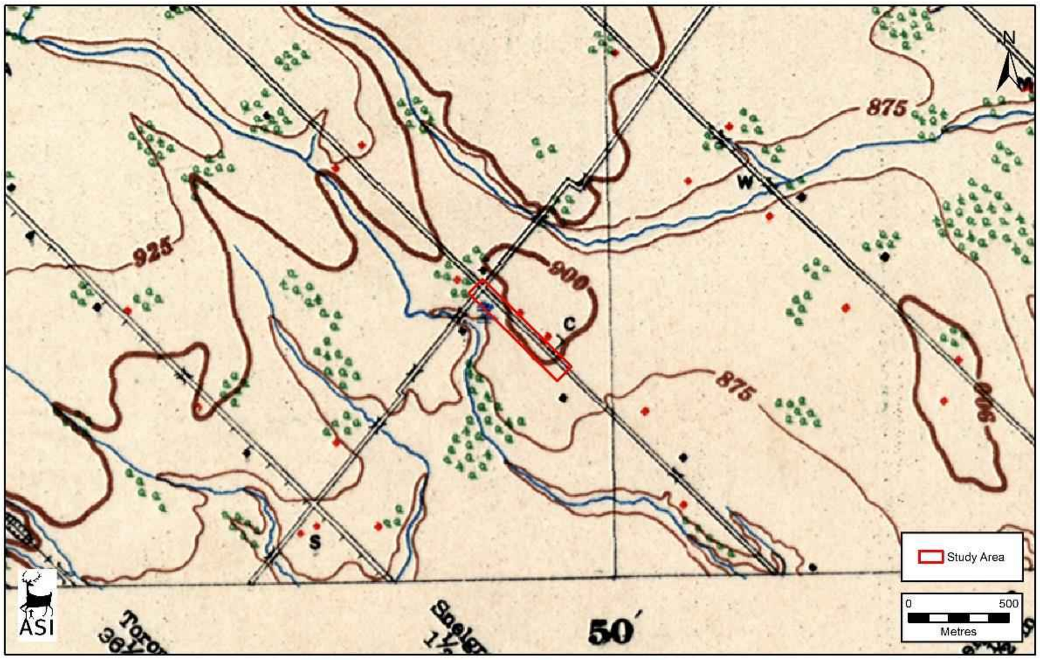

Figure 5: The study area overlaid on the 1914 Bolton NTS map
Base Map: NTS Sheet No. 59 (Department of Militia and Defense 1914)

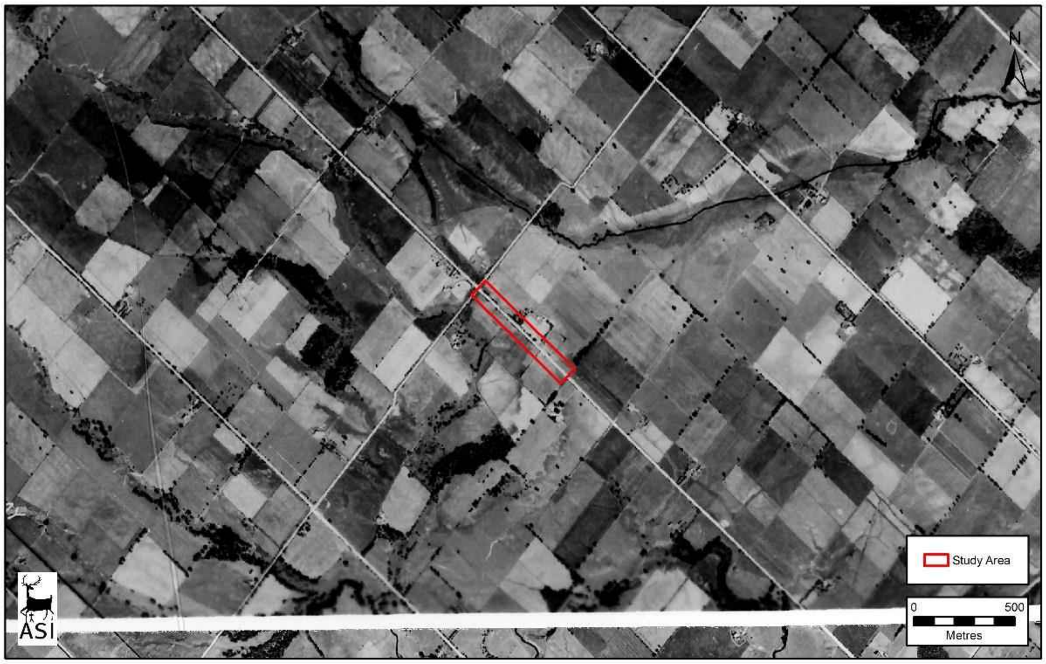

Figure 6: The study area overlaid on the 1954 aerial photograph
Reference: Plate 437.794 (Hunting Survey Corporation 1954)

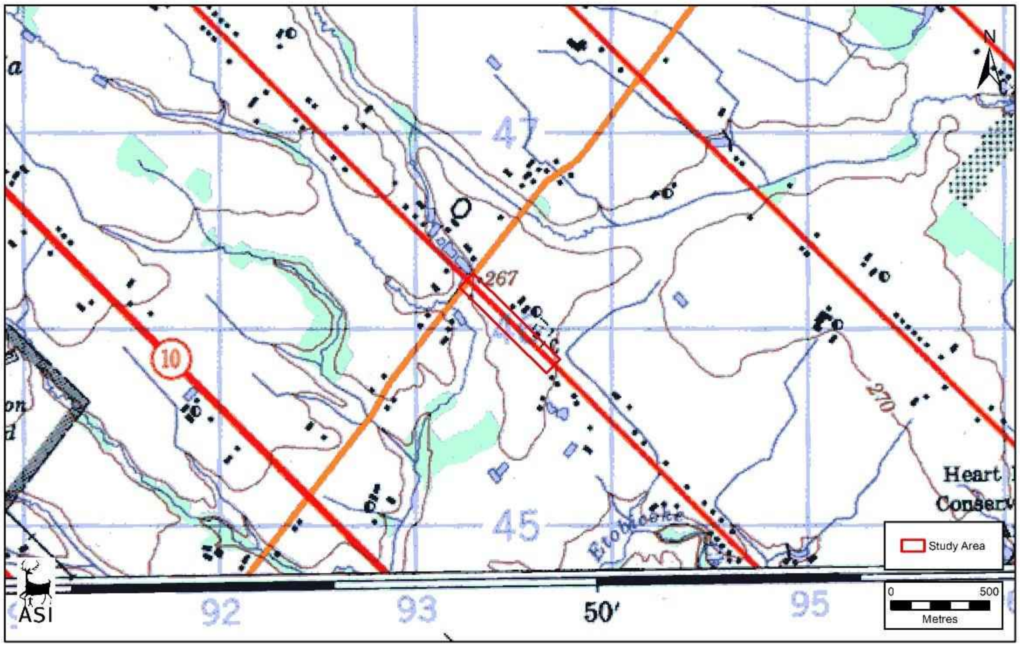

Figure 7: The study area overlaid on the 1994 Bolton NTS map
Base Map: NTS Sheet 30/M-13 (Department of Energy, Mines and Resources 1994)

3.2 Existing Conditions

3.2.1 Review of Existing Heritage Inventories

In order to make an identification of existing cultural heritage resources within the study area, a number of resources were consulted (MTCS 2016). They include:

- The Town of Caledon's *Heritage Register* provides a list of cultural heritage resources that are designated under Part IV and Part V of the *Ontario Heritage Act*. The register also provides a list of non-designated properties that are of cultural heritage value or interest;[2]
- The *Town of Caledon Built Heritage Resources Inventory Report of Findings* (Stewart and Dilse 2008) a municipal inventory that contains information on heritage properties including those listed and designated under Part IV and V of the *Ontario Heritage Act*. This inventory is updated frequently, with the most recent inventory available through the Town of Caledon;
- The Town of Caledon's *Cultural Heritage Landscapes* Inventory (Scheinman 2009);
- The inventory of Ontario Heritage Trust easements;[3]
- The Ontario Heritage Trust's *Ontario Heritage Plaque Guide*, an online, searchable database of Ontario Heritage Plaques;[4]
- *Ontario's Historical Plaques* website;[5]
- Inventory of known cemeteries/burial sites in the Ontario Genealogical Society's online databases;[6]
- Parks Canada's *Canada's Historic Places* website: available online, the searchable register provides information on historic places recognized for their heritage value at the local, provincial, territorial, and national levels;[7]
- Parks Canada's *Directory of Federal Heritage Designations*, a searchable on-line database that identifies National Historic Sites, National Historic Events, National Historic People, Heritage Railway Stations, Federal Heritage Buildings, and Heritage Lighthouses;[8]
- Canadian Heritage River System. The Canadian Heritage River System is a national river conservation program that promotes, protects and enhances the best examples of Canada's river heritage;[9] and,
- United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Sites.[10]

In addition, the following stakeholders were contacted to gather information on potential cultural heritage resources, active and inactive cemeteries, and areas of identified Indigenous interest within and/or adjacent to the study area:

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[2] Reviewed 15 June 2018 (https://www.caledon.ca/en/live/listing.asp)
[3] Reviewed 15 June 2018 (http://www.heritagetrust.on.ca/en/index.php/property-types/easement-properties)
[4] Reviewed 15 June 2018 (http://www.heritagetrust.on.ca/Resources-and-Learning/Online-Plaque-Guide.aspx)
[5] Reviewed 15 June 2018 (www.ontarioplaques.com)
[6] Reviewed 15 June 2018 (http://vitacollections.ca/ogscollections/2818487/data?grd=3186
[7] Reviewed 15 June 2018 (http://www.historicplaces.ca/en/pages/about-apropos.aspx)
[8] Reviewed 15 June 2018 (http://www.pc.gc.ca/apps/dfhd/search-recherche_eng.aspx)
[9] Reviewed 15 June 2018 (http://chrs.ca/the-rivers/)
[10] Reviewed 15 June 2018 (http://whc.unesco.org/en/list/)

- Pamela Vega, Heritage Coordinator, Town of Caledon, was contacted to gather any information on potential cultural heritage resources or concerns within and/or adjacent to the study area (email communication 15 and 18 June 2018). A response received provided information on an additional previously identified resource.

- The Ministry of Tourism, Culture and Sport (email communication 7 June 2018). A response was still outstanding at the time of report submission.[11]

Based on the review of available provincial and federal data, there are three previously identified cultural heritage resources within and/or adjacent to the Kennedy Road Urbanization study area.

3.2.2 Kennedy Road Urbanization Study Area– Field Review

A field review of the study area was undertaken by Peter Carruthers, Senior Archaeologist, on 15 June 2018 to document the existing conditions of the study area. The field review was preceded by a review of available, current and historical, aerial photographs and maps (including online sources such as Bing and Google maps). These large-scale maps were reviewed for any potential cultural heritage resources which may be extant in the study area. The existing conditions of the study area are described below. Identified cultural heritage resources are discussed in Section 3.2.3 and are mapped in Section 8.0 of this report. Photographic plates locations (Plates 1-8) are noted in Section 8.0.

The study area is centered on Kennedy Road, and is approximately 660 metres in length between Bonnieglen Farm Boulevard in the south and Old School Road in the north. Kennedy road is oriented in a northwest-southeast alignment, but for the purposes of this report it will be described as having a north-south orientation. Kennedy road is a two lane paved road with narrow gravel shoulders.

The study area is generally located in a rural agricultural context adjacent to a recent residential subdivision construction south of Bonnieglen Farm Boulevard. According to a review of satellite imagery, this subdivision was constructed between 2009 and 2013. Dixon United Cemetery and associated Dixon Primitive Methodist Church is located north of Bonnieglen Farm Boulevard on the east side of Kennedy Road. Adjacent to the church and cemetery is a nineteenth-century farm complex at 12909 Kennedy Road, and a late twentieth-century residence at the southeast corner of Old School Road and Kennedy Road.

The west side of Kennedy Road features a residential subdivision northwest of the intersection of Bonnieglen Farm Boulevard and Kennedy Road under construction at the time of field review, and a heavily-treed twentieth century residence at the southwest corner of the intersection with Old School Road. The entire central portion of the study area features active agricultural fields on the west side of Kennedy Road (Plates 1-8).

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[11] Contacted 15 June, 2018 at registrar@ontario.ca.

Plate 1: Southern portion of the study area, looking south on Kennedy Road towards Bonnieglen Farm Boulevard

Plate 2: Southern portion of the study area, looking south on Kennedy Road towards Bonnieglen Farm Boulevard

Plate 3: Early twenty-first century residences along Bonnieglen Farm Boulevard, with agricultural field in foreground, looking east

Plate 4: Dixon Union Cemetery, looking northeast from Kennedy Road

Plate 5: Agricultural fields west of Kennedy Road, looking southeast

Plate 6: Agricultural fields west of Kennedy Road, looking west

Plate 7: Dense tree cover at 12909 Kennedy Road, looking northeast from Kennedy Road

Plate 8: Northern portion of the study area, looking northwest towards Old School Road

3.2.3 Kennedy Road Urbanization Study Area– Identified Cultural Heritage Resources

Based on the results of the background research and field review, three cultural heritage resources (CHR) were identified within and/or adjacent to the Kennedy Road Urbanization study area (seeFigure 8). The cultural heritage resources include three cultural heritage landscapes (CHLs) (Table 2). A detailed inventory of these cultural heritage resources within the study area is presented in Section 7.0 and mapping of the features along with photographic plate locations is provided in Section 8.0 of this report.

Table 2: Summary of built heritage resources (BHR) and cultural heritage landscapes (CHL) in the study area

Feature ID	Address/Location	Resource Type	Heritage Recognition
CHL 1	12909 Kennedy Road	Farmscape	Identified as a property of High Significance in the *Town of Caledon Built Heritage Resources Inventory Report of Findings* (Stewart and Dilse 2008)
CHL 2	12895 Kennedy Road	Church and Cemetery	Identified in as a property of High Significance in the *Town of Caledon Built Heritage Resources Inventory Report of Findings* (Stewart and Dilse 2008)
CHL 3	3431 Old School Road	Farmscape	Identified in the *Town of Caledon Built Heritage Resource Inventory* (Stewart and Dilse 2008)

3.3 Screening for Potential Impacts

To assess the potential impacts of the undertaking identified cultural heritage resources are considered against a range of possible impacts as outlined in the document entitled *Ontario Heritage Tool Kit* (MCL 2006) which include:

- Destruction of any, or part of any, significant heritage attributes or features;
- Alteration that is not sympathetic, or is incompatible, with the historic fabric and appearance;
- Shadows created that alter the appearance of a heritage attribute or change the viability of a natural feature or plantings, such as a garden;

- Isolation of a heritage attribute from its surrounding environment, context or a significant relationship;
- Direct or indirect obstruction of significant views or vistas within, from, or of built and natural features;
- A change in land use such as rezoning a battlefield from open space to residential use, allowing new development or site alteration to fill in the formerly open spaces;
- Land disturbances such as a change in grade that alters soils, and drainage patterns that adversely affect an archaeological resource.

A number of additional factors are also considered when evaluating potential impacts on identified cultural heritage resources. These are outlined in a document set out by the Ministry of Culture and Communications (now Ministry of Tourism, Culture and Sport) and the Ministry of the Environment entitled *Guideline for Preparing the Cultural Heritage Resource Component of Environmental Assessments* (October 1992) and include:

- Magnitude: the amount of physical alteration or destruction which can be expected;
- Severity: the irreversibility or reversibility of an impact;
- Duration: the length of time an adverse impact persists;
- Frequency: the number of times an impact can be expected;
- Range: the spatial distribution, widespread or site specific, of an adverse impact; and
- Diversity: the number of different kinds of activities to affect a heritage resource.

Where any above-ground cultural heritage resources which may be affected by direct or indirect impacts are identified, appropriate mitigation measures should be developed. This may include completing a heritage impact assessment or documentation report, or employing suitable measures such as landscaping, buffering or other forms of mitigation, where appropriate. In this regard, provincial guidelines should be consulted for advice and further heritage assessment work should be undertaken as necessary.

3.3.1 Potential Impacts of the Proposed Undertaking

The proposed undertaking for the Kennedy Road Urbanization Municipal Class Environmental Assessment study area consists of a preliminary alternative involving roadway widening, additional curbs and gutters installation, and proposed sewers and culvert additions. The preliminary alternative will result in improvements to approximately 660 metres of Kennedy Road including grading adjacent to the existing Kennedy Road ROW. The proposed undertaking is anticipated to result in the removal of vegetation within the ROW. With the exception of minor impacts associated with the existing entrance driveways into the farmscape at 12909 Kennedy Road (CHL 1) and the cemetery (CHL 2), the proposed undertaking is anticipated to be confined to the exiting Kennedy Road ROW. Grading limits, photographic plate locations, and the location of identified cultural heritage resources are depicted in Figure 8. The complete preliminary design including curb placement and proposed culvert modification are included in Appendix A.

The preliminary alternative is not anticipated to impact the three previously identified cultural heritage resources within the study area adjacent to the Kennedy Road ROW. No structures within the farmscapes, nor the church and cemetery are anticipated to be impacted as a result of proposed undertaking. Further, no significant tree removals are anticipated on any of the identified heritage properties.

Table 3: Preferred Alternative - Potential Impacts to Cultural Heritage Resources

Feature ID	Potential Impact(s)	Proposed Mitigation Measures
CHL 1	• CHL 1 is not anticipated to be impacted by the grading within the ROW and grading to the entrance driveway. • The residence, barn, and outbuildings are not anticipated to be impacted as a result of the proposed undertaking.	• Staging and construction activities should be suitably planned to avoid impacts to CHL 1. • Access to the property should be maintained during and after construction.
CHL 2	• CHL 2 is not anticipated to be impacted by the grading within the ROW and grading to the driveway. • The church and cemetery are not anticipated to be impacted as a result of the proposed undertaking.	• Staging and construction activities should be suitably planned to avoid impacts to CHL 2. • Access to the property should be maintained during and after construction.
CHL 3	• CHL 3 is not anticipated to be impacted by the grading adjacent to the ROW. • The residence, barn, and outbuildings are not anticipated to be impacted as a result of the proposed undertaking.	• Staging and construction activities should be suitably planned to avoid impacts to CHL 3.

Based on available documentation, the preferred alternative will be confined to the existing Kennedy Road ROW with no impacts anticipated outside of the Kennedy Road ROW. Should tree removals in any of adjacent cultural heritage resources be anticipated, post-construction landscaping with historically-sympathetic native tree species should be employed to mitigate impacts to the heritage value of the resource. A qualified arborist or landscape architect should be consulted in this respect.

There are no direct impacts to the residences, barns, outbuildings, or the church and cemetery associated with CHL 1 – 3 are anticipated as a result of the proposed undertaking.

4.0 CONCLUSIONS

The results of background historical research and a review of secondary source material, including historical mapping, revealed a study area with a rural land use history dating to the early nineteenth century. A review of federal registers and municipal and provincial inventories revealed that there are three previously identified features of cultural heritage value within the Kennedy Road Urbanization Municipal Class EA study area.

Key Findings

- A field review of the study area confirmed that there are three cultural heritage resources consisting of three cultural heritage landscapes (CHLs) within or immediately adjacent to the study area;

- The identified cultural heritage resources include two farmscapes (CHL 1 and CHL 3) and one church and associated cemetery (CHL 2);

- The identified cultural heritage resources include two properties of high significance in the *Town of Caledon's Built Heritage Resource Inventory* (*BHRI*) (CHL 1 and CHL 2), and one property identified in the *BHRI* (CHL 3); and

- The identified cultural heritage resources are historically and contextually associated with late-nineteenth century and early twentieth century land use patterns in the Geographic Township of Chinguacousy.

Impact Assessment

- The preliminary alternative will be primarily confined to the existing Kennedy Road ROW and there are no impacts anticipated for any identified cultural heritage resources (CHL 1-3).

5.0 RECOMMENDATIONS

The background research, data collection, and field review conducted for the study area determined that three cultural heritage resources are located within or adjacent to the Kennedy Road Urbanization Municipal Class EA study area. The results of impact assessment indicate that the preliminary alternative will be primarily confined to the existing Kennedy Road ROW and there are no impacts anticipated for any identified cultural heritage resources. Based on the results of the assessment, the following recommendations have been developed:

1. Construction activities and staging should be suitably planned and undertaken to avoid impacts to identified cultural heritage resources. In particular, no-go zones should be established adjacent to the identified cultural heritage resources (CHL 1 – 3) and instructions to construction crews should be issued in order to prevent impacts;

2. Should construction and/or grading result in tree removals within CHL 1–3 post-construction landscaping with historically-sympathetic native tree species should be employed to mitigate impacts to the heritage value of the resource. A qualified arborist or landscape architect should be consulted in this respect;

3. This report should be submitted to Douglas McGlynn, Heritage/ Urban Design Planner at the Town of Caledon and the Ministry of Tourism, Culture and Sport for review; and

4. Should future work require an expansion of the study area then a qualified heritage consultant should be contacted in order to confirm the impacts of the proposed work on potential heritage resources.

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7.0 CULTURAL HERITAGE RESOURCE INVENTORY

Table 4: Inventory of cultural heritage resources (CHR) in the study area

Feature ID	Address/Location	Resource Type	Heritage Recognition	Description	Photos
CHL 1	12909 Kennedy Road	Farmscape	Identified as a property of High Significance in the *Town of Caledon Built Heritage Resources Inventory Report of Findings* (Stewart and Dilse 2008)	Historical: -Residence constructed between 1875 and 1899 (Stewart and Dilse 2008) Design: -Residence is one-and-a-half storeys with a T-shaped plan. It is constructed of cut stone in Gothic Revival architectural style (Stewart and Dilse 2008). The residence is set back from the road and obscured by mature trees. -Farmscape includes several barns and outbuildings -Landscape features include active agricultural fields, established circulation routes, work areas, and mature sugar maple trees. Context: -Located on the east side of Kennedy Road, south of Old School Road, both early transportation routes in the Township of Chinguacousy -Reflects nineteenth-century settlement and agricultural practices in the Township of Chinguacousy -Adjacent to the church at 12895 Kennedy Road	 Outbuildings to the east of the residence, looking north.  View of the residence (BHRI: Inventory ID 1174)

Feature ID	Address/Location	Resource Type	Heritage Recognition	Description	Photos
CHL 2	12895 Kennedy Road	Church and Cemetery	Identified in as a property of High Significance in the *Town of Caledon Built Heritage Resources Inventory Report of Findings* (Stewart and Dilse 2008)	Historical: -Dixon Primitive Methodist Church, established in 1875. Date stone reads: "Dixons/Primitive Methodist/Church/1875". -Dixon Union Cemetery, established in 1875. Ground sign reads: "Dixon's Union/Cemetery/Established 1875". Note, however, the earliest visible monument dates to 1849. Design: -The rural church is constructed of polychromatic brick in Picturesque Gothic architectural style (Stewart and Dilse 2008) -The cemetery and church grounds occupy approximately 2.6 acres. -Landscape features include mature trees, central circulation route, and well-maintained lawns over the interments. -The cemetery is enclosed by a chain link fence. Gravestones are evenly distributed across the cemetery and are made of marble and granite. Context: -Located on the east side of Kennedy Road, south of Old School Road, both early transportation routes in the Township of Chinguacousy -Reflects late nineteenth-century burial practices in the Township of Chinguacousy	 View of the church and cemetery, looking north.  Bird's Eye view of church and cemetery (Google Map, 2018)
CHL 3	3431 Old School Road	Farmscape	Identified in the *Built Heritage Resource Inventory*	Historical: -Residence constructed between 1900 and 1924 (Stewart and Dilse 2008) -Associated barn constructed c. 1875-1899 (Stewart and Dilse 2008) Design: -Residence is a one-and-a-half-storey frame structure clad in synthetic siding. The residence has a T-shaped plan with an attached garage addition. -Barn is clad in vertical wooden boards with a corrugated metal gambrel roof. -Landscape features established activity areas and circulation routes, active agricultural fields, and mature plantings. There are two entrances to the property from Old School Road. Sugar maples mark the entrance to the old lane leading to the barn. Context: -Located on the south side of Old School Road, west of Kennedy Road, both early transportation routes in the Township of Chinguacousy -Reflects late nineteenth-century settlement and agricultural practices in the Township of Chinguacousy	 North Elevation of residence, looking south from Old School Road (Google Streetview, 2015)

8.0 CULTURAL HERITAGE RESOURCE MAPPING

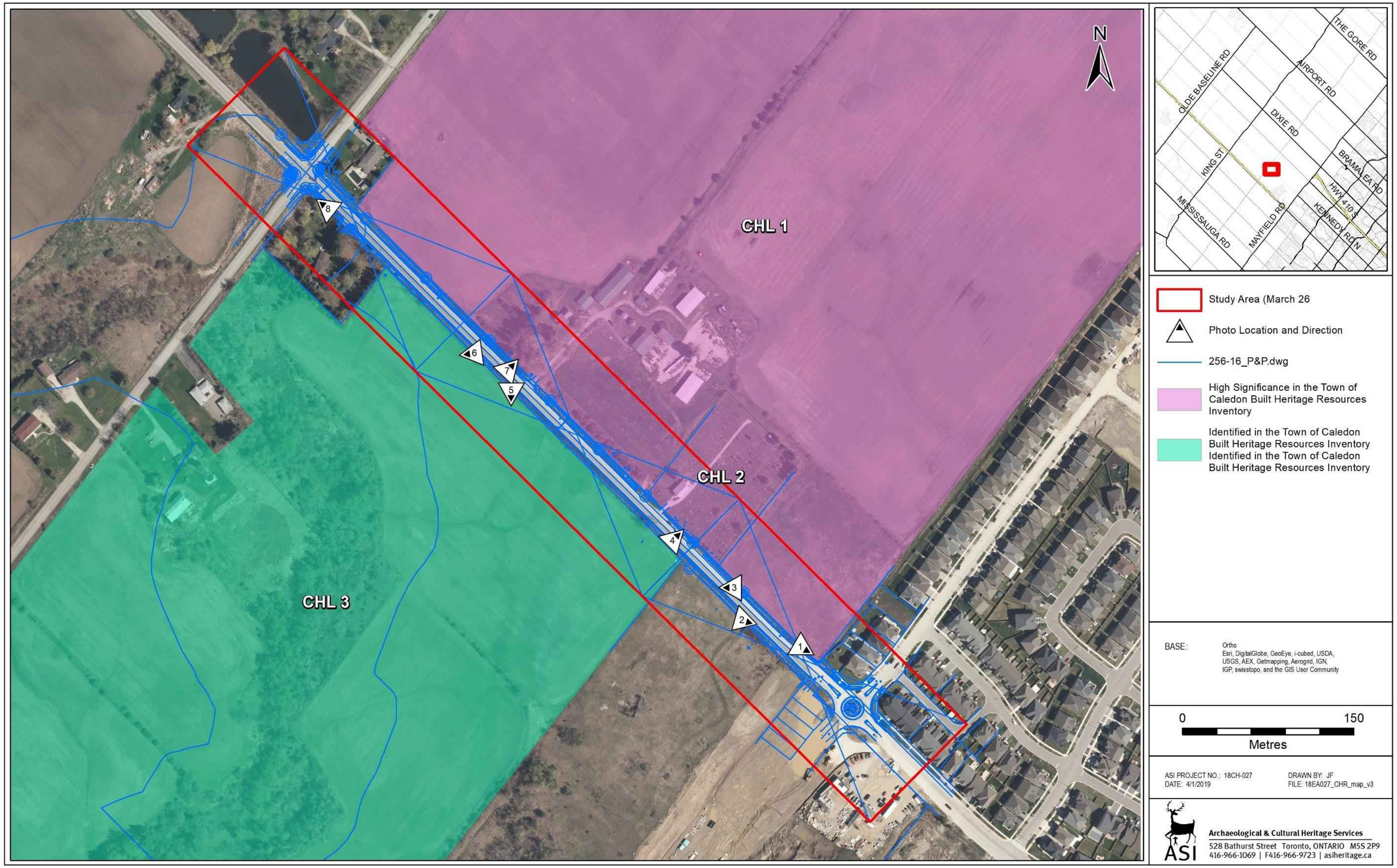
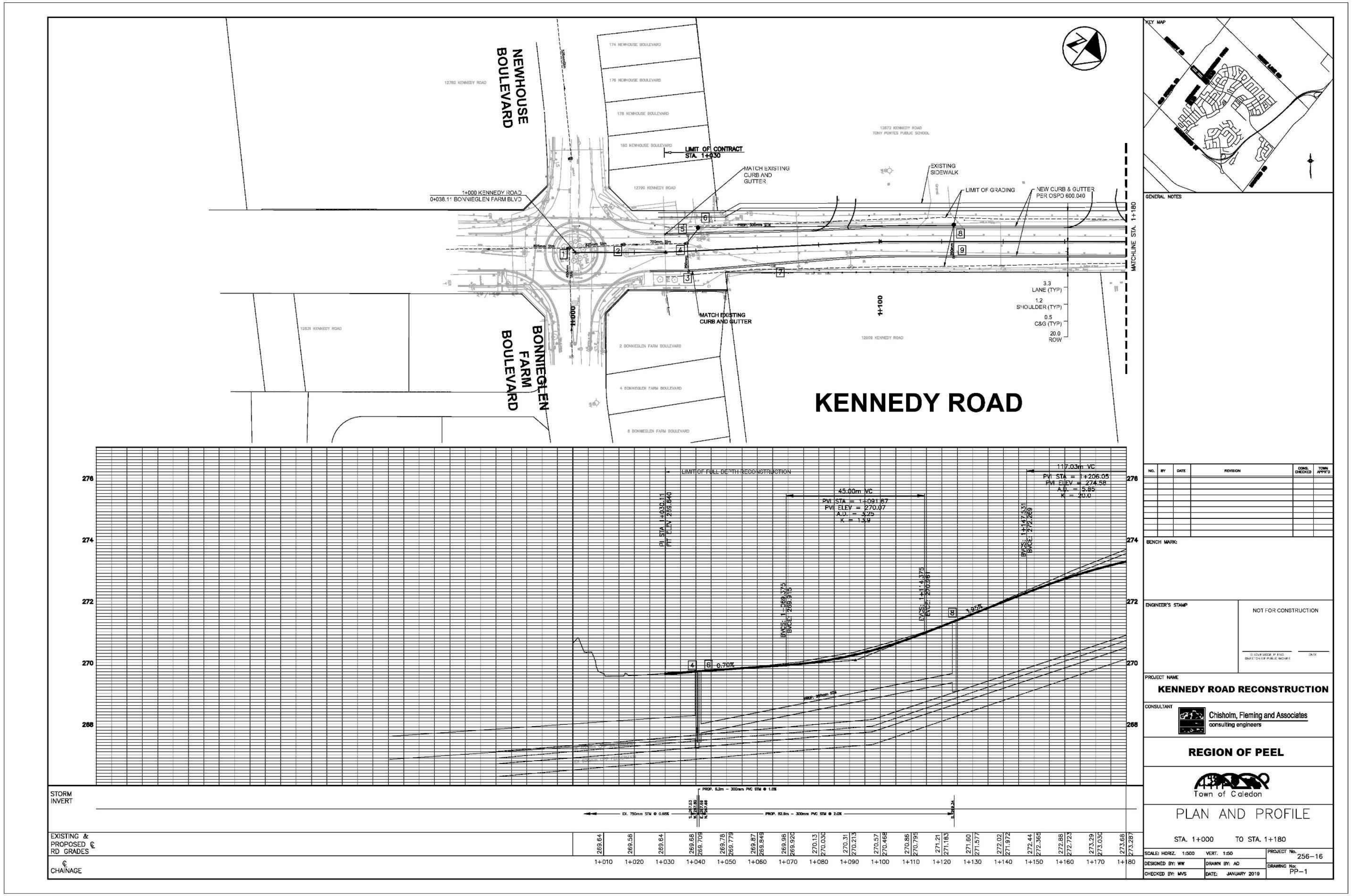


Figure 8: Location of Cultural Heritage Resources in the Kennedy Road study area

APPENDIX A: PRELIMINARY DESIGN OF THE PROPOSED UNDERTAKING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BONNIEGLEN FARM BOULEVARD
KENNEDY ROAD
1+000 KENNEDY ROAD
0+038.11 BONNIEGLEN FARM BLVD
LIMIT OF CONTRACT STA. 1+030
MATCH EXISTING CURB AND GUTTER
EXISTING SIDEWALK
LIMIT OF GRADING
NEW CURB & GUTTER PER OSPD 600.040
3.3 LANE (TYP)
1.2 SHOULDER (TYP)
0.5 C&G (TYP)
20.0 ROW
MATCHLINE STA. 1+180
1+000
1+100
KEY MAP
GENERAL NOTES
BENCH MARK
ENGINEER'S STAMP
NOT FOR CONSTRUCTION
LIMIT OF FULL DEPTH RECONSTRUCTION
45.00m VC
PVI STA = 1+091.87
PVI ELEV = 270.07
117.03m VC
PVI STA = 1+206.05
PVI ELEV = 274.58
0.70%
3.95%
276
274
272
270
268
STORM INVERT
EXISTING & PROPOSED ℄ RD GRADES
℄ CHAINAGE
1+010
1+020
1+030
1+040
1+050
1+060
1+070
1+080
1+090
1+100
1+110
1+120
1+130
1+140
1+150
1+160
1+170
1+180
PROJECT NAME
KENNEDY ROAD RECONSTRUCTION
CONSULTANT
Chisholm, Fleming and Associates
consulting engineers
REGION OF PEEL
Town of Caledon
PLAN AND PROFILE
STA. 1+000 TO STA. 1+180
SCALE: HORIZ. 1:500 VERT. 1:50
PROJECT No. 256–16
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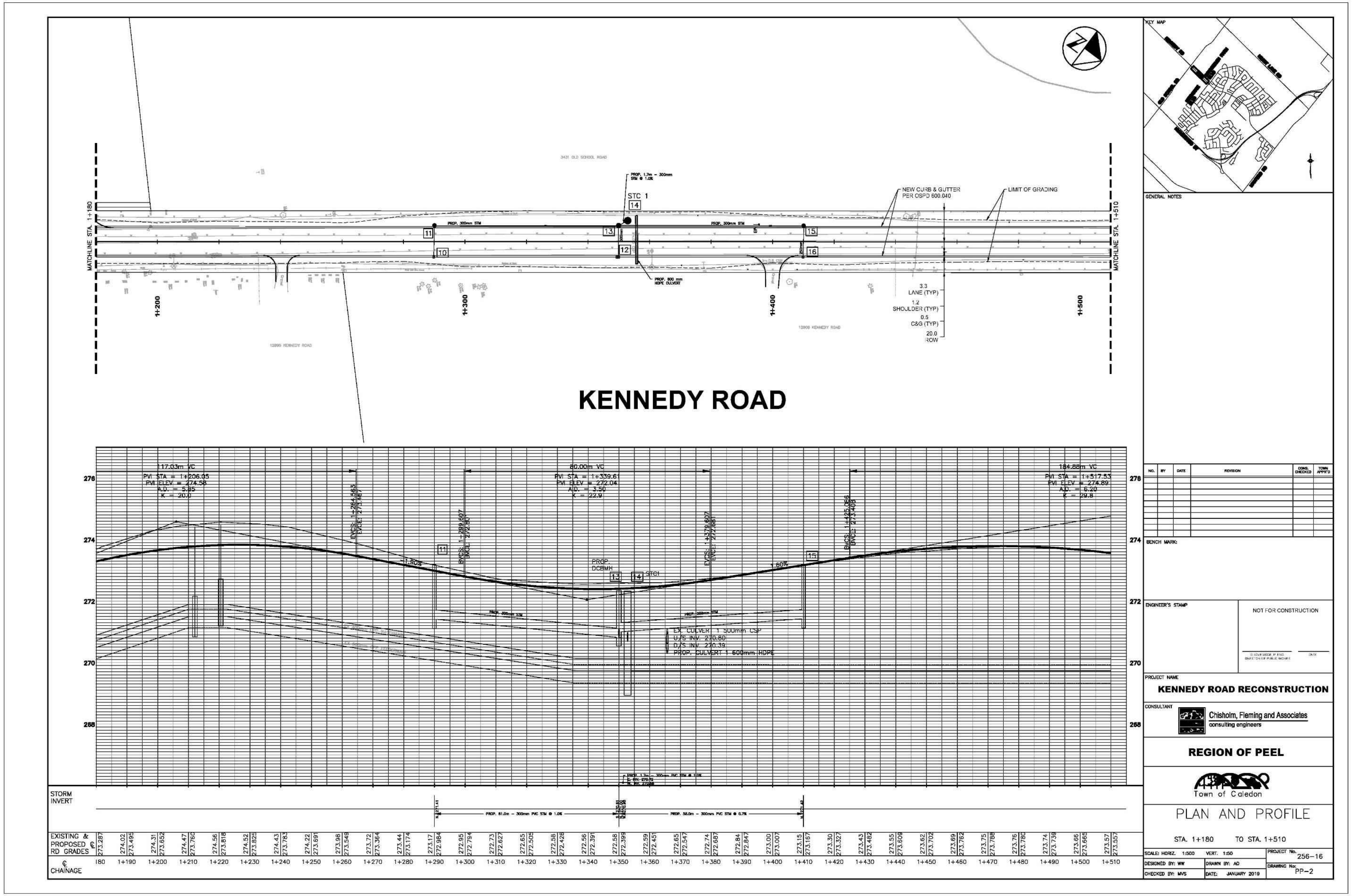
DRAWN BY: AO
CHECKED BY: MVS
DATE: JANUARY 2019
DRAWING No: PP–1


KENNEDY ROAD
MATCHLINE STA. 1+180
MATCHLINE STA. 1+510
STC 1
NEW CURB & GUTTER PER OSPD 600.040
LIMIT OF GRADING
3.3 LANE (TYP)
1.2 SHOULDER (TYP)
0.5 C&G (TYP)
20.0 ROW
1+200
1+300
1+400
1+500
117.03m VC
PVI STA = 1+206.05
PVI ELEV = 274.58
A.D. = 5.85
K = 20.0
80.00m VC
PVI STA = 1+339.61
PVI ELEV = 272.04
A.D. = 3.50
K = 22.9
184.88m VC
PVI STA = 1+517.53
PVI ELEV = 274.69
A.D. = 6.20
K = 29.8
PROP. DCBMH
STC1
EX. CULVERT 1-500mm CSP
U/S INV. 270.80
D/S INV. 270.39
PROP. CULVERT 1-600mm HDPE
STORM INVERT
EXISTING & PROPOSED ℄ RD GRADES
℄ CHAINAGE
KEY MAP
GENERAL NOTES
BENCH MARK
ENGINEER'S STAMP
NOT FOR CONSTRUCTION
PROJECT NAME
KENNEDY ROAD RECONSTRUCTION
CONSULTANT
Chisholm, Fleming and Associates consulting engineers
REGION OF PEEL
Town of Caledon
PLAN AND PROFILE
STA. 1+180 TO STA. 1+510
SCALE: HORIZ. 1:500 VERT. 1:50
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DRAWN BY: AD
CHECKED BY: MVS
DATE: JANUARY 2019
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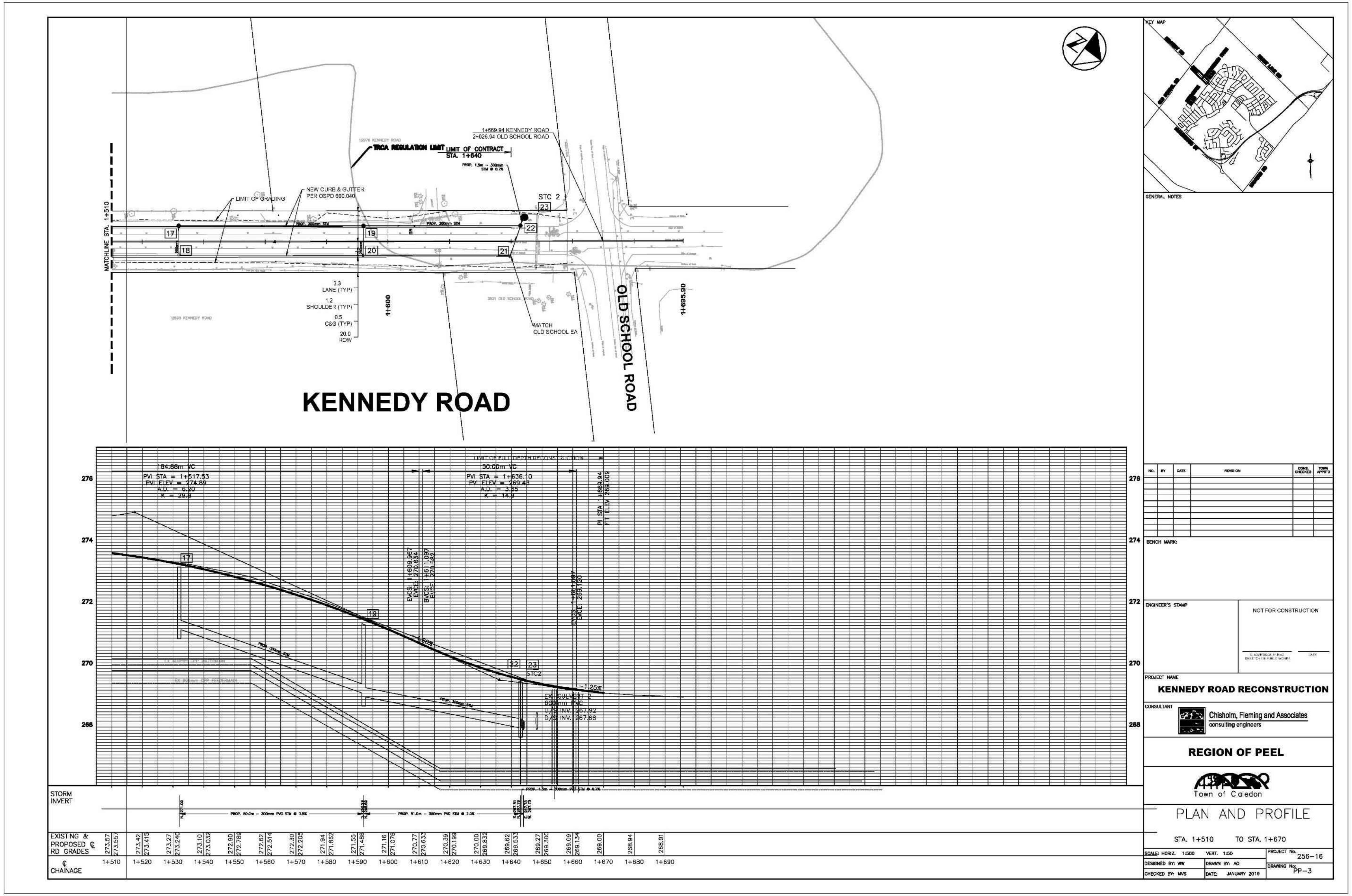
KENNEDY ROAD
OLD SCHOOL ROAD
MATCHLINE STA. 1+510
1+669.94 KENNEDY ROAD
2+026.94 OLD SCHOOL ROAD
TRCA REGULATION LIMIT
LIMIT OF CONTRACT
STA. 1+640
PROP. 1.5m – 300mm STM @ 0.7%
LIMIT OF GRADING
NEW CURB & GUTTER
PER OSPD 600.040
PROP. 300mm STM
STC 2
17
18
19
20
21
22
23
3.3
LANE (TYP)
1.2
SHOULDER (TYP)
0.5
C&G (TYP)
20.0
ROW
1+600
1+695.90
MATCH
OLD SCHOOL EA
12976 KENNEDY ROAD
12893 KENNEDY ROAD
2521 OLD SCHOOL ROAD
LIMIT OF FULL DEPTH RECONSTRUCTION
184.88m VC
PVI STA = 1+517.53
PVI ELEV = 274.89
A.D. = 6.20
K = 29.8
50.00m VC
PVI STA = 1+636.10
PVI ELEV = 269.43
A.D. = 3.35
K = 14.9
PI STA 1+669.94
FT ELEV 269.009
EX. CULVERT 2
U/S INV. 267.92
D/S INV. 267.88
276
274
272
270
268
STORM
INVERT
PROP. 60.0m – 300mm PVC STM @ 3.5%
PROP. 51.0m – 300mm PVC STM @ 2.0%
EXISTING &
PROPOSED ℄
RD GRADES
273.57 273.557
273.42 273.415
273.27 273.240
273.10 273.032
272.90 272.789
272.62 272.514
272.30 272.205
271.94 271.862
271.55 271.486
271.16 271.076
270.77 270.633
270.39 270.199
270.00 269.832
269.62 269.533
269.27 269.300
269.09 269.134
269.00
268.94
268.91
℄
CHAINAGE
1+510
1+520
1+530
1+540
1+550
1+560
1+570
1+580
1+590
1+600
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1+640
1+650
1+660
1+670
1+680
1+690
KEY MAP
GENERAL NOTES
NO.
BY
DATE
REVISION
CONS. CHECKED
TOWN APPR'D
BENCH MARK:
ENGINEER'S STAMP
NOT FOR CONSTRUCTION
DATE
PROJECT NAME
KENNEDY ROAD RECONSTRUCTION
CONSULTANT
Chisholm, Fleming and Associates
consulting engineers
REGION OF PEEL
Town of Caledon
PLAN AND PROFILE
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VERT. 1:50
PROJECT No. 256–16
DESIGNED BY: WW
DRAWN BY: AO
DRAWING No. PP–3
CHECKED BY: MVS
DATE: JANUARY 2019

APPENDIX D

Natural Environment Report
(LGL Limited)

LIMITED
environmental research associates

LGL Limited
22 Fisher Street, P.O. Box 280
King City, Ontario CANADA L7B 1A6
Tel: (905) 833-1244 Fax: (905) 833-1255
Email: kingcity@lgl.com web: www.lgl.com

February 12, 2019

Andrew Ostler, P.Eng.
Proposal Manager
Chisholm, Fleming and Associates
317 Renfrew Drive, Suite 301
Markham, ON L3R 9S8

Dear Andrew:

Re: Environmental Assessment and Detailed Design for Kennedy Road Urbanization, Town of Caledon – Natural Heritage Features – Impact Assessment Report

1.0 Introduction

The Town of Caledon is proposing reconstruction and urbanization of Kennedy Road between Bonnieglen Farm Boulevard and Old School Road, excluding the intersection improvements at Old School Road (see **Figure 1**). LGL Limited staff completed natural heritage investigation during the summer of 2018 to document vegetation communities and tree resources, and wildlife and wildlife habitat. No watercourses or significant drainage features were identified in the study area.

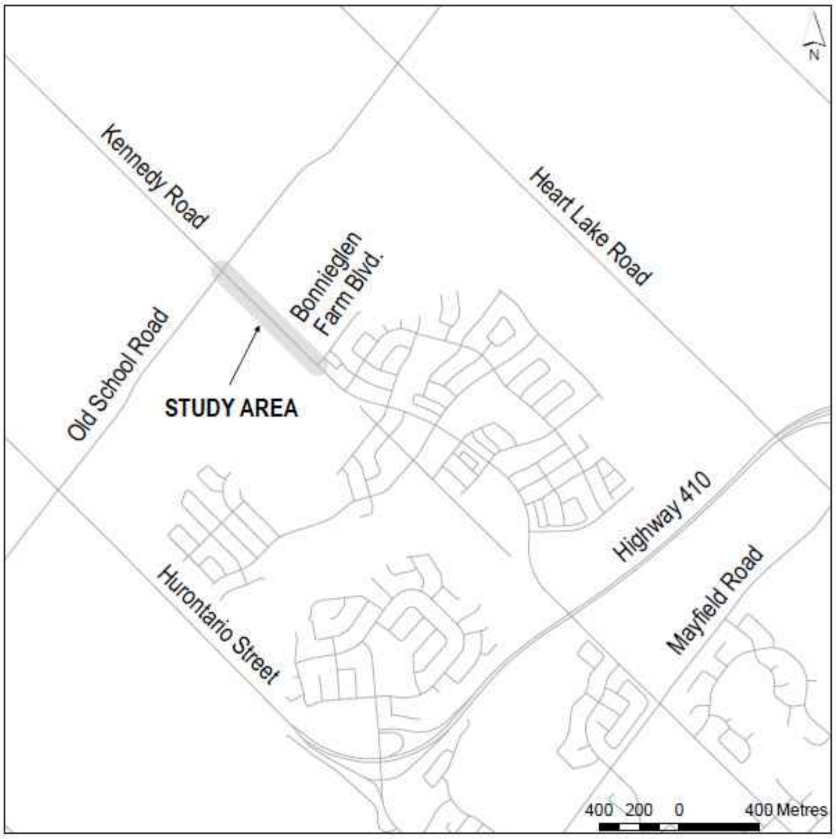


Figure 1. Key Plan

2.0 Background

The existing land use along Kennedy Road within the project limits is predominantly “agricultural”. According to the Town of Caledon’s Official Plan, Schedule ‘B’ (2016), the land use designation within the project limits is “Prime Agricultural”. South of the project limits the area is designated as “Residential Area”, while to the north, the area is designated as “Environmental Policy Area”. No Areas of Natural and Scientific Interest or Provincially Significant Wetlands were identified within the project limits.

The study limits are within the Toronto and Region Conservation Authority (TRCA) jurisdiction. Although there are no watercourses crossing Kennedy Road within the study limits, it is within two watersheds: east of Kennedy Road is the Humber River watershed and west of Kennedy Road is the Etobicoke Creek watershed. Based on preliminary review of the Ministry of Natural Resources and Forestry (MNRF) Natural Heritage Information database: Bobolink and Eastern Meadowlark were documented to be present within the 1 km area from the corridor. These species are listed provincially and federally “Threatened” and protected under the *Endangered Species Act.*

3.0 Existing Conditions

Physiography and Soils

The soils found within the study area are classified as Fox sandy loam and Chinguacousy clay loam. Drainage within the study area varies from good in the Fox sandy loam found in the northern half of the study area, to imperfectly drained in the Chinguacousy clay loam. Slopes are smooth gently sloping, and soils present in the study area have few to no stones, and are known to be susceptible to erosion if left exposed. The physiography of the study area is classified as South Slope.

Vegetation and Vegetation Communities Assessment

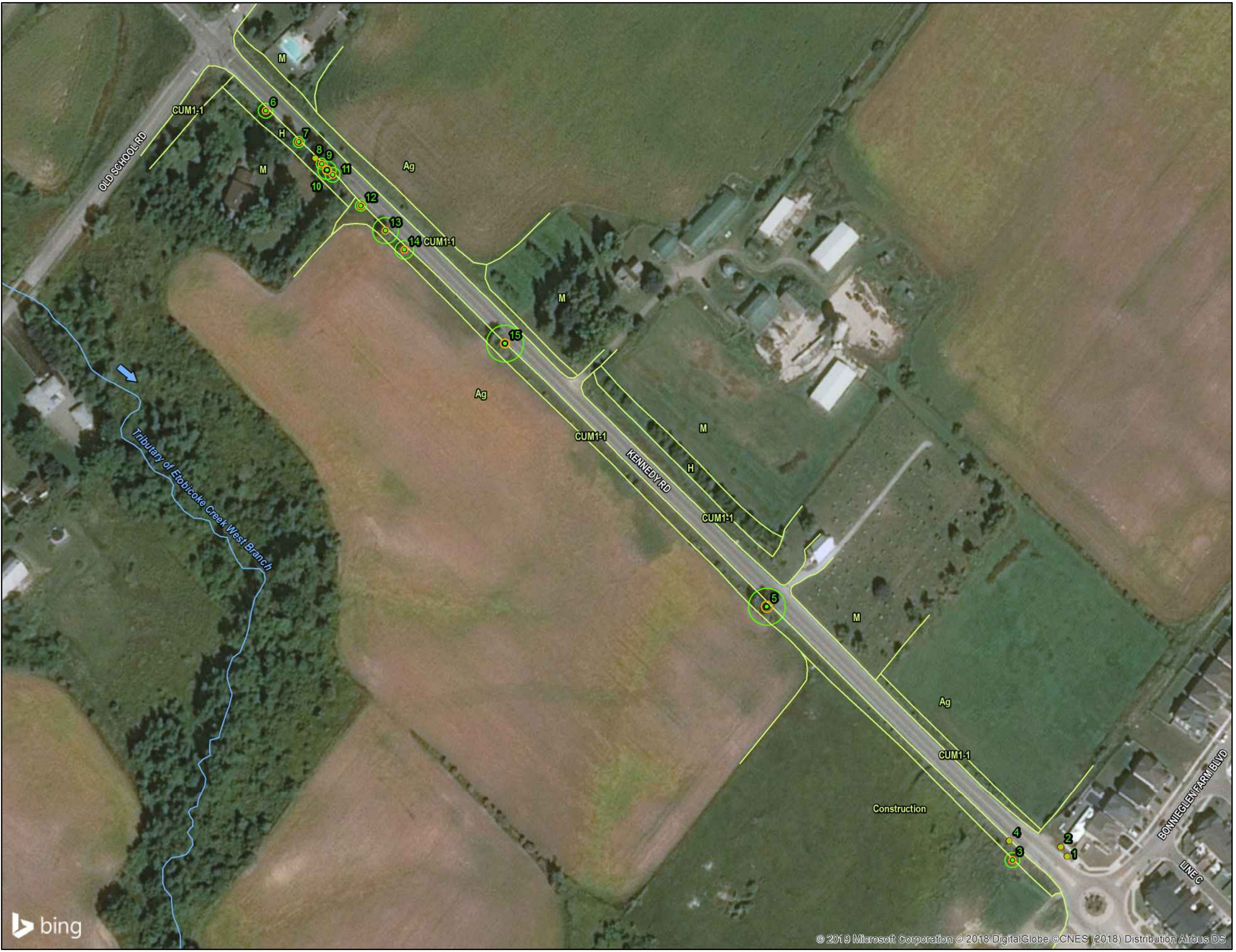
The vegetation community investigations were based on the *Ecological Land Classification for Southern Ontario* (Lee et al. 1998). A tree inventory, although not included as part of the scope of work, was completed.

The ELC community mapping identified one vegetation community in four narrow areas along the roadside: CUM1-1, which is cultural meadow community (see **Figure 2**). The reminder of the study area consisted of residential manicured areas and active agricultural fields. The vegetation community areas identified pose little to no constraint to road improvements.

Wildlife Assessment

A general wildlife and breeding bird investigation was conducted in the summer of 2018 that focused on general wildlife, wildlife habitat and screening for rare species. No species that are regulated as Threatened or Endangered under the *Endangered Species Act* were identified. Bird species documented during our investigations include species commonly found in disturbed settings. For a list of wildlife documented in the study area see **Table 1** below.

The federal *Migratory Birds Convention Act* (MBCA) prevents the disturbance to the nests, nesting birds, or the young of species covered by the Act. It is likely that birds use trees, shrubs and other vegetation in the study area for nesting. It is suggested that any road improvements be completed outside of the breeding bird nesting period (April 1 – August 31) in order to avoid any disturbance to nests or nesting birds.



LEGEND

⬅	Watercourse Flow Direction
—	Watercourse

Tree Resources

●	Tree
15	Tree Tag ID
○	Dripline
○	Tree Protection Zone

Vegetation Communities

—	Vegetation Community Boundary
CUM1-1	Dry-Moist Old Field Meadow Type
H	Hedgerow
M	Manicured
Ag	Agriculture

Data Sources: LGL Limited field surveys, Toronto and Region Conservation Authority.

0 20 40 80 Metres

N

NATURAL HERITAGE

LGL LIMITED
environmental research associates

Project: TA8834	**Figure:** 2
Date: January, 2019	**Prepared By:** JJP
Scale: 1 : 2000	**Checked By:** LMC

D:\OneDrive - LGL Limited_TA\TA8834 - Kennedy Road from Old School to Bonnieglen Farm\Maps\NH_JP.mxd

TABLE 1.
WILDLIFE SPECIES DOCUMENTED IN THE STUDY AREA BY LGL (2018)

Wildlife	Scientific Name	Common Name	SARA	ESA	Legal Status	Other
Birds	*Larus delawarensis*	Ring-billed Gull			MBCA	L4
	Columba livia	Rock Dove (Pigeon)			-	L+
	Zenaida macroura	Mourning Dove			MBCA	L5
	Cyanocitta cristata	Blue Jay			FWCA(P)	L5
	Corvus brachyrhynchos	American Crow			MBCA	L5
	Tyrannus tyrannus	Eastern Kingbird			MBCA	L4
	Sturnus vulgaris	European Starling			-	L+
	Spizella passerina	Chipping Sparrow			MBCA	L5
	Passerculus sandwichensis	Savannah Sparrow			MBCA	L4
	Melospica melodia	Song Sparrow			MBCA	L5
	Agelaius phoeniceus	Red-winged Blackbird			-	L5
	Molothrus ater	Brown-headed Cowbird			-	L5
	Troglodytes aedon	House Wren			MBCA	L5
	Quiscalus quiscula	Common Grackle			MBCA	L5
	Sitta carolinensis	White-breasted nuthatch			MBCA	L4
Mammals	*Procyon lotor*	Northern Raccoon			FWCA(F)	L5

4.0 Impact Assessment

Vegetation and Vegetation Communities

The proposed improvements to Kennedy Road will remain within the existing right-of-way however, minor impacts may occur to the cultural meadow communities adjacent to the road. A total of 0.25 ha of CUM1-1 will be impacted by the proposed road improvements.

Cultural vegetation communities are generally disturbed and contain a high proportion of invasive and non-native plant species. These communities typically persist in areas that are subject to regular disturbance. Consequently, the impacts to the cultural meadow are considered minor. Cultural communities are widespread throughout Ontario and the loss of a portion of these vegetation communities is not anticipated to have any negative impacts to the remaining cultural meadows within the study area.

In addition, minor vegetation removals may occur within the manicured areas associated with the roadway. The overall significance of the impacts to these lands is considered low.

All of the vegetation communities identified within the study area are considered to be widespread and common in Ontario and secure globally. No plant species that are regulated under the Ontario Endangered Species Act, 2007 or the Canada Species at Risk Act were observed during LGL's botanical investigation. In addition, no plant species that are provincially ranked as "critically imperilled" to "vulnerable" (S1 to S3) were observed within the study area. As a result, there will be no impacts on rare, threatened or endangered vegetation and vegetation communities.

Tree Impacts

Impacts to trees as a result of the proposed improvements to Kennedy Road. A total of 15 trees were identified within the study area, all of which will be removed or negatively impacted by the proposed road improvements (see **Figure 3** and **Table 2**). Trees located within and immediately adjacent to the edge of the grading limits are considered to be impacted by the construction activities and were identified for removal. Compensation for the loss of the 15 trees identified will not likely be required, as no regulated areas under Credit Valley Conservation (CVC) *O.Reg. 160/06* have been identified. However, it is expected that through the roadway landscaping plan, that these trees will be replaced.

Wildlife and Wildlife Habitat

Modification and widening of Kennedy Road, within the Town of Caledon have the potential to result in the displacement of and disturbance to wildlife and wildlife habitat.

Effects on wildlife related to these modifications may include:

- displacement of wildlife and wildlife habitat;
- barrier effects on wildlife passage;
- wildlife/vehicle conflicts;
- disturbance to wildlife from noise, light and visual intrusion;
- potential impacts to migratory birds; and,
- displacement of rare, threatened or endangered wildlife.

Modification and widening of Kennedy Road will take place within the existing right-of-way. Much of the right-of-way and lands immediately adjacent consist of disturbed low-quality wildlife habitat (see **Figure 2**). Cultural meadow in narrow strips adjacent to the roadway were found to provide wildlife habitat.

Only minimal infringement to the edge of the above-mentioned natural heritage features will occur as a result of road modification and widening of Kennedy Road. Given the highly disturbed nature of wildlife habitat within the study area, modification and widening of Kennedy Road within and beyond the right-of-way is not expected to have any significant impact on wildlife and/or wildlife habitat. The proposed activities at this site should occur outside of the breeding bird window of April 1 to August 31 in order to minimize disturbance to birds and other wildlife species utilizing habitats within the study area.

No new permanent migratory barriers to wildlife will be created as a result of road modifications and widening. The existing barrier posed by the current Kennedy Road will be greater due to proposed widening. Given the disturbed nature of the lands found within the study area, the modifications are not expected to have a significant impact on wildlife passage.

The proposed road modifications and widening will increase the width of the travelled surface resulting in an increased risk of mortality for wildlife that elects to cross the roads. The existing Kennedy Road right-of-way poses a potential barrier to wildlife movement. While the increase in width of road increases exposure of wildlife to vehicle conflicts, the potential increase in wildlife mortality above existing conditions is considered minor.

Noise, light and visual intrusion may alter wildlife activities and patterns. In human-influenced settings, such as the study area, wildlife has become acclimatized to anthropogenic conditions and only those fauna that are tolerant of human activities remain. Given that wildlife are acclimatized to the presence of the existing Kennedy Road right-of-way in the study area, the tolerance of the wildlife assemblage to human activities and the limited zone of influence of the proposed widening, disturbance to wildlife from noise, light and visual intrusion will have no significant adverse effects.

D:\OneDrive - LGL Limited_TA\TA8834 - Kennedy Road from Old School to Bonnieglen Farm\Maps\ImpactAssessment.mxd

LEGEND

15 Tree ID
Watercourse Flow Direction
Watercourse
Grading Limit

Vegetation Communities

Vegetation Community Boundary
CUM1-1 Dry-Moist Old Field Meadow Type
H Hedgerow
M Manicured
Ag Agriculture

Data Sources: LGL Limited field surveys, Toronto and Region Conservation Authority.

0 20 40 80 Metres
N

IMPACT ASSESSMENT

LGL LIMITED
environmental research associates

Project: TA8834	**Figure:** 3
Date: January, 2019	**Prepared By:** JJP
Scale: 1 : 2000	**Checked By:** LMC

Project: TA8835

Client:

Date:

Collectors: LMC

Area:

Tree #	Scientific Name	Common Name	DBH (cm)	Additional Stems	CONDITION																	Tree Protection Measures	
					TI	CS	CV	Radial Dripline (m)	Canopy Die Back (%)	Co-dominant stem	Included Bark	Lean, Dir.	Fungus	Insects	Cavity	Rot	Wound	Frost Crack	Epicormic	EAB	Canker	Tree Protection Zone (m)	ESA/SARA
1	*Acer freemanii*	Freeman's maple	5.0		g	g	g	1														1.20	
2	*Acer freemanii*	Freeman's maple	5.0		g	g	g	1														1.20	
3	*Tilia americana*	basswood	15.0	8,10,11	g	g	g	4		x	x								x			1.80	
4	*Fraxinus pennsylvanica*	red ash	7.0	5.0	g	g	g	1														1.20	
5	*Acer saccharinum*	silver maple	45.0	40,34,40,15	g	g	g	10		x	x						x					3.00	
6	*Juglans nigra*	black walnut	15.0		g	g	g	4														1.80	
7	*Quercus rubra*	red oak	15.0		g	g	g	3														1.80	
8	*Picea glauca*	white spruce	6.0		g	g	g	1														1.20	
9	*Pinus sylvestris*	Scots pine	12.0		g	g	g	3														1.80	
10	*Populus deltoides*	cottonwood	35.0		g	g	g	5														2.40	
11	*Pinus sylvestris*	Scots pine	14.0		g	g	g	4														1.80	
12	*Pinus sylvestris*	Scots pine	12.0		g	g	g	3														1.80	
13	*Juglans nigra*	black walnut	25.0	20.0	g	g	g	7		x	x					x	x					1.80	
14	*Crataegus laevigata*	English hawthorn	18.0	15,10,10,5	g	g	g	5	10	x	x											1.80	
15	*Acer saccharinum*	silver maple	26.0	20,15,21,22	g	g	g	10		x	x											2.40	

As identified above, numerous bird species listed under the *Migratory Birds Convention Act* (MBCA) are located within the study area. The MBCA prohibits the killing, capturing, injuring, taking or disturbing of migratory birds (including eggs) or the damaging, destroying, removing or disturbing of nests. While migratory insectivorous and non-game birds are protected year-round, migratory game birds are only protected from March 10 to September 1.

The study area lands fall within Environment Canada's Nesting Zone C2 (Nesting Period: end of March – end of August). Consequently, to comply with the requirements of the MBCA, it is recommended that disturbance, clearing or disruption of vegetation where birds may be nesting should be completed outside the window of April 1 to August 31 to avoid the breeding bird season for the majority of the bird species protected under the act. In the event that these activities must be undertaken from April 1 to August 31, a nest screening survey will be conducted by a qualified avian biologist. If an active nest is located, a mitigation plan shall be developed and provided to Environment Canada – Ontario Region for review prior to implementation.

5.0 Regulatory Approvals, Authorizations and Permits

The potential approvals, authorization and permits for a municipal roadway improvement project include the following:

Federal Approvals

- *Fisheries Act*
- *Migratory Birds Convention Act*
- *Species at Risk Act*

Provincial Approvals

- *Conservation Authorities Act (O.Reg 160/06)*
- *Ontario Endangered Species Act*
- *Ontario Trees Act*

Municipal Approvals

- *Municipal Act*

Of these approvals, the only one which applies is the *Migratory Birds Convention Act* which prohibits the harming of breeding birds and their young and regulates the timing of works with regard to breeding birds and their young.

6.0 Mitigation, Contingency and Emergency Response Measures

This section describes the measures that the contractor and owner will be required to follow during construction, operations and maintenance to respond to emergencies and unforeseen events. Contingency and emergency response measures are designed to protect worker and public health, the environment and infrastructure.

Fuel and Hazardous Materials Spills Response

The potential exists for spills of fuel or hazardous materials during construction. The emphasis of the spills response will be to protect worker and public safety and property. For this reason, rapid containment is essential.

Contingency and emergency response measures will include:

- the first person on the scene of a spill is responsible for securing the site and notifying emergency response personal including the MOECC Spill Response Hotline;

- if it is safe to do so, efforts will be made to contain the spill;
- a readily accessible supply of spill containment materials will be maintained at the construction site including absorbent materials;
- control of the response will be turned over to the emergency response personnel upon their arrival; and
- assist emergency response personnel with the containment and cleanup of the spilled material and contaminated soil.

Failure of Erosion and Sedimentation Control Measures

Erosion and sedimentation control measures are critical to the protection of adjacent property and surface water. Despite careful design and implementation, unanticipated rain events or snow melt can weaken or cause the occasional failure of these structures. Rapid and effective response to such conditions is essential to minimize the introduction of sediments to adjacent property, catch basins/storm sewers and surface water features.

Contingency and emergency response measures will include:

- a readily available supply of erosion and sedimentation control materials on hand including silt fence, rock and straw bales, erosion control blanket, machinery, etc.;
- rapid response to breaches/failures in the erosion and sedimentation control structures;
- stabilization of soils with seed and mulch, sod or erosion control blanket; and
- clean up of deposited sediments.

Encounters with Species at Risk

If a species that is regulated as ‘Endangered’ or ‘Threatened’ under the Ontario *Endangered Species Act* is encountered during construction, construction must stop immediately in the vicinity of the location of the species at risk; the Contract Administrator must be notified. If there is an imminent threat to the species, it must be moved out of harm’s way in a manner that will not cause harm to the species. For example, turtles should not be picked up by the tail, but should be picked up by holding the shell. Work shall not recommence until the MNRF has been consulted to determine the appropriate actions necessary to comply with the Ontario *Endangered Species Act*.

It is the responsibility of the Contractor to provide the necessary resources and staff to ensure that workers are familiar with how to identify potential species at risk within the work zone, and how to respond if a species is encountered.

I trust that this letter impact assessment report provides a sufficient detail for the protection of natural heritage features in the study area. If you wish to discuss any aspects of this letter, please contact me.

Yours sincerely,

LGL Limited
environmental research associates

Joseph Cavallo
Senior Biologist

APPENDIX E

Subsurface Utility Investigation (Telecon)

Subsurface Utility Investigation Report

Prepared for:

CHISHOLM FLEMING AND ASSOCIATES

LEVEL B SURVEY

KENNEDY ROAD

FROM BONNIEGLEN FARM BOULEVARD TO OLD SCHOOL ROAD

KENNEDY ROAD URBANIZATION PROJECT

TORONTO, ONTARIO

PLANVIEW PROJECT #18-3-00021

JULY 18, 2018

Contents

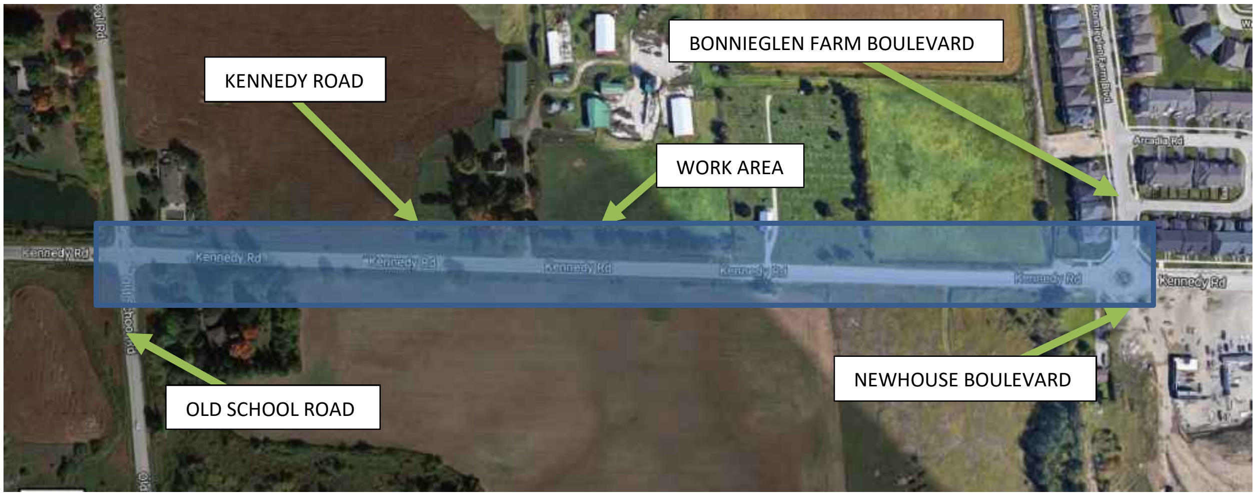
1 Project Details

1.1 Executive Summary

Planview Utility Services (Planview) was retained by Chisholm Fleming And Associates to provide a Level B investigation along the Kennedy Road from Bonnieglen Farm Boulevard to Old School Road, towards Kennedy Road Urbanization Project in Caledon, Ontario.

1.2 Scope of Work

The scope of work was a Level B, C and D investigation for the along Kennedy Road, South of Old School Road to Bonnieglen Farm Boulevard, in Caledon, Ontario. The investigation was required to identify various buried utilities which could impact the design of the proposed Kennedy Road Urbanization Project. The work extents are from Bonnieglen Farm Boulevard to Old School Road including road intersection as illustrated below:



The field work was completed on June 19, 2018.

1.3 Project Background

Chisholm Fleming And Associates provided a detailed plan illustrating the location of the required investigation for this project.

1.4 Investigation Procedures

The following summarizes the procedures used by Planview to complete the utility investigation:

Step 1

The original site plan provided by Chisholm Fleming And Associates was used to order Level D markup record drawings from the utility companies. Markup documentation is available at the Planview office.

Step 2

Once the markup drawings were received, a Level B field investigation was initiated to locate all underground utilities.

Step 3

All captured Level B data was placed on a composite utility plan. The sewer invert data was not required. Some of the existing utilities could not be located during the Level B study, for various reasons, and were instead placed as Level D within the utility composite plan.

2 Locate Data (Level B)

Utility locates were completed within the work area. The physical markings for the utilities were surveyed and added to the CAD file accompanying this report. The linework between the collected data points was determined by interpolation. All data have limitations in terms of positional accuracy and so the data should be utilized accordingly. The results of the Level B investigation were surveyed using a total station and an RTK GPS unit. Some of the existing utilities could not be toned during the Level B study but were instead placed on the drawing as Level D.

2.1 Intersection of Kennedy Road and Bonnieglen Farm Boulevard/Newhouse Boulevard

Intersection of Kennedy Road and Bonnieglen Farm Boulevard/Newhouse Boulevard was investigated as a part of study area. Various buried utilities were located as per obtained utility records in requested area and added to the drawing as Level B. There were several factors which limited the ability to locate some of the utilities within the work extent. Some of these factors are as follows:

Figure 1

- Asphalt trench road cut was observed during the survey at Kennedy Road and Bonnieglen Farm Boulevard see **Figure 1**., however no readable electromagnetic tone was obtained along the cut at the time of survey. Possible empty ducts were installed for future cable installation.
- Found ground level hand-well utility box with four 75 mm ducts see **Figure 2**. Ducts were empty at the time of the survey.

Figure 2

2.2 Intersection of Kennedy Road and Old School Road

Intersection of Kennedy Road and Old School Road was investigated as a part of study area. Various buried utilities were located as per obtained utility records in requested area and added to the drawing as Level B. There were no factors which limited the survey in particular area.

2.3 Kennedy Road

The utilities along the Kennedy Road from Old School Road to Bonnieglen Farm Boulevard/Newhouse Boulevard were located and added to the drawing as Level B. We were not able to receive readable tone on third cable in Bell pedestal approximately 220 meters south of Old School Road on the west side of Kennedy Road see **Figure 3.**

Figure 3

We were not able to locate and tone water services along Kennedy Road due to lack of hook-up point. They were placed in the drawing as Level D data based on record and as-built drawings.

2.4 Aerial Utilities

Aerial Utilities survey was not required.

3 Invert Pipe Data (Level C)

The invert data, sanitary sewer manholes survey was not required. Sewer, water and catchbasin lids were served within the limits of the work area. The data gathered has been compiled and added to utility plan drawing as quality Level C.

4 Records and Markup Drawings (Level D)

Record and as-built drawings were requested at the outset of the project. The records are on file at the Planview office. These records were used to locate the utilities in the field. If the utility was unlocatable, it was placed in the drawing as Level D data.

5 Statement of Limitations

This report contains information, including but not limited to, drawings, field observations and data that represent professional judgement. The information may be based upon facts that have been provided to Planview by third party organizations. The Information has not been independently verified.

The report was prepared for specific purposes as outlined in the scope of work in section 1.2 and must be read as a whole.

Planview accepts no responsibility for any municipal infrastructure and utility activity that may have occurred since the date this report was issued.

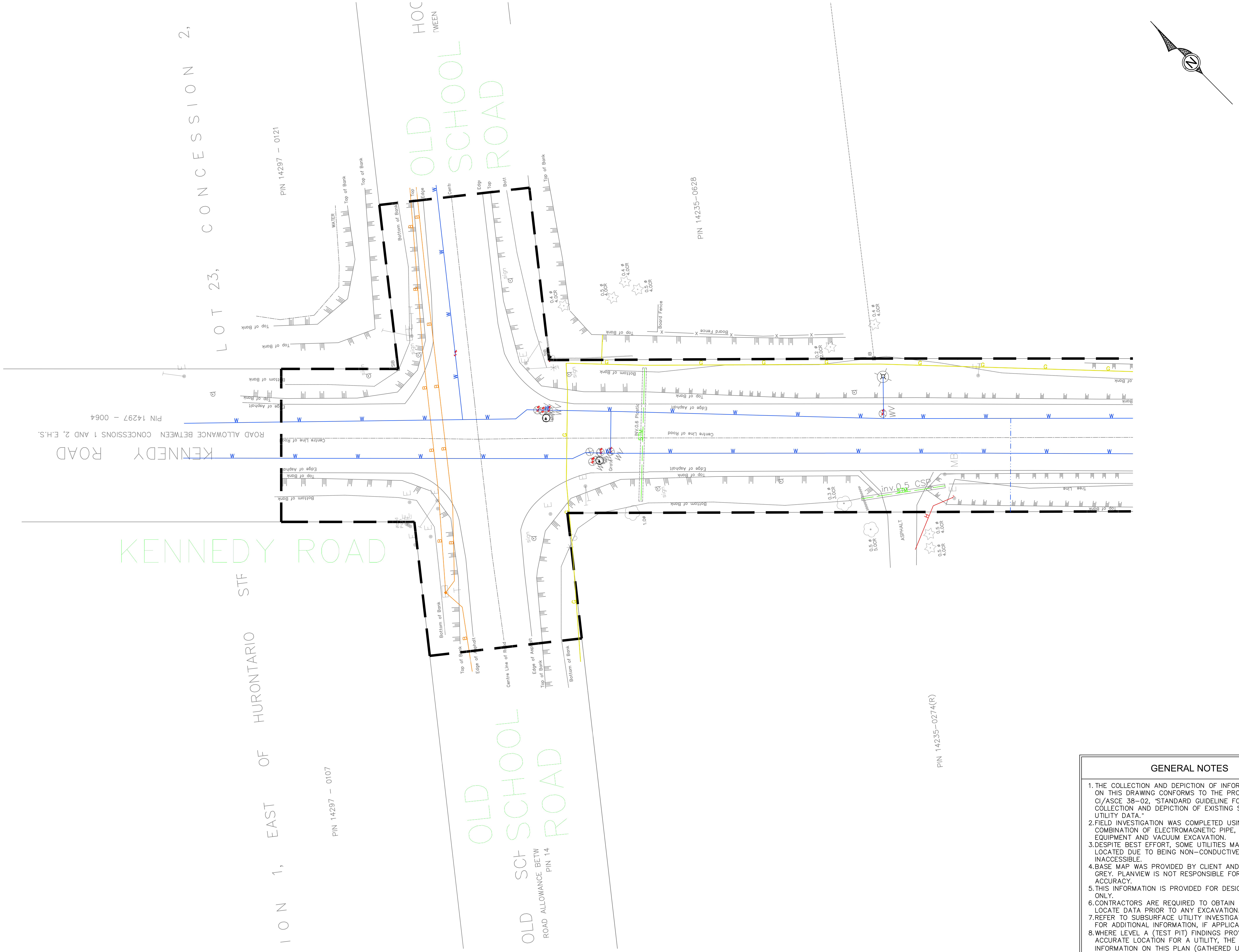
This report is to be treated as confidential and should not be shared with any third party without the consent of Planview. Planview denies any liability whatsoever, for any damage resulting from any third party using the Information in this report.

6 Conclusion

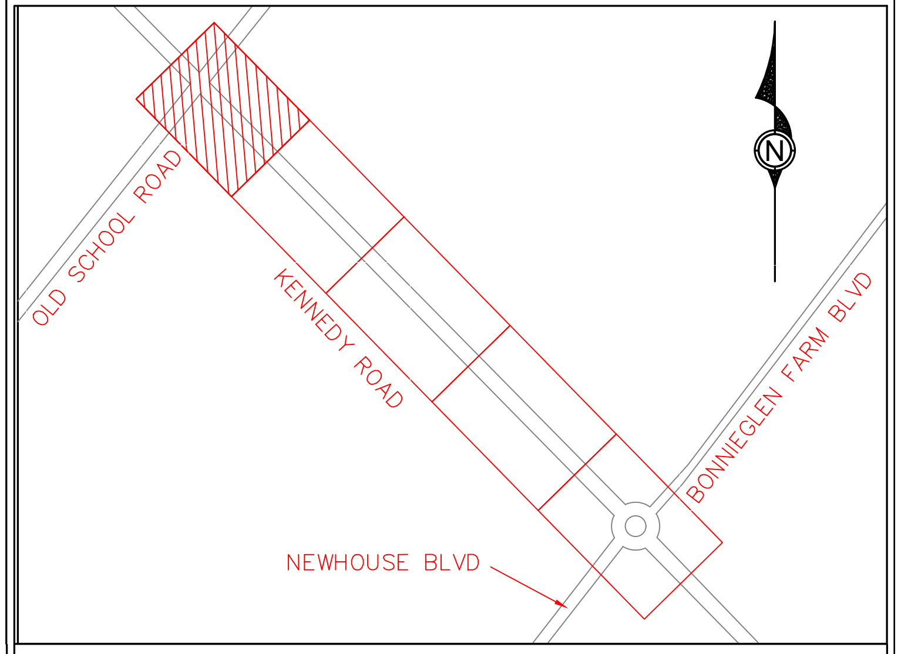
The Level B, C and D Investigation along the Kennedy Road has been summarized within this report. The data captured in the field will provide essential utility data in advance of the Kennedy Road Urbanization Project in Caledon, Ontario.

Appendix B

Level B Plans



KEY MAP (N.T.S)



CITY OF CALEDON

LEGEND

G	GASMAIN
B	BELL CANADA
FO	BELL FIBER OPTIC
TV	ROGERS CABLE
W	WATERMAIN
TC	TRAFFIC CONTROL
SL	STREETLIGHT
H	HYDRO
STM	STORM SEWER
SAN	SANITARY SEWER
———	LEVEL B
— — —	LEVEL C
—· · ·	LEVEL D

SEAL:

CLIENT:

Chisholm, Fleming & Associates
CONSULTING ENGINEERS

NO.	DATE	DESCRIPTION	BY
2	27–JUN–18	LEVEL B ISSUED TO CLIENT	DK
1	19–JUN–18	LEVEL B SURVEY	DK

GENERAL NOTES

1. THE COLLECTION AND DEPICTION OF INFORMATION SHOWN ON THIS DRAWING CONFORMS TO THE PROVISIONS OF CI/ASCE 38–02, "STANDARD GUIDELINE FOR THE COLLECTION AND DEPICTION OF EXISTING SUBSURFACE UTILITY DATA."
2. FIELD INVESTIGATION WAS COMPLETED USING A COMBINATION OF ELECTROMAGNETIC PIPE, CABLE LOCATE EQUIPMENT AND VACUUM EXCAVATION.
3. DESPITE BEST EFFORT, SOME UTILITIES MAY NOT BE LOCATED DUE TO BEING NON–CONDUCTIVE OR INACCESSIBLE.
4. BASE MAP WAS PROVIDED BY CLIENT AND IS SHOWN IN GREY. PLANVIEW IS NOT RESPONSIBLE FOR ITS ACCURACY.
5. THIS INFORMATION IS PROVIDED FOR DESIGN PURPOSES ONLY.
6. CONTRACTORS ARE REQUIRED TO OBTAIN THEIR OWN LOCATE DATA PRIOR TO ANY EXCAVATION.
7. REFER TO SUBSURFACE UTILITY INVESTIGATION REPORT FOR ADDITIONAL INFORMATION, IF APPLICABLE.
8. WHERE LEVEL A (TEST PIT) FINDINGS PROVIDE A MORE ACCURATE LOCATION FOR A UTILITY, THE LEVEL B INFORMATION ON THIS PLAN (GATHERED USING UTILITY LOCATING DEVICES) HAS BEEN ADJUSTED TO ALIGN WITH MORE PRECISE TEST PIT INFORMATION, IF APPLICABLE.

PLANVIEW
Utility Services Ltd.

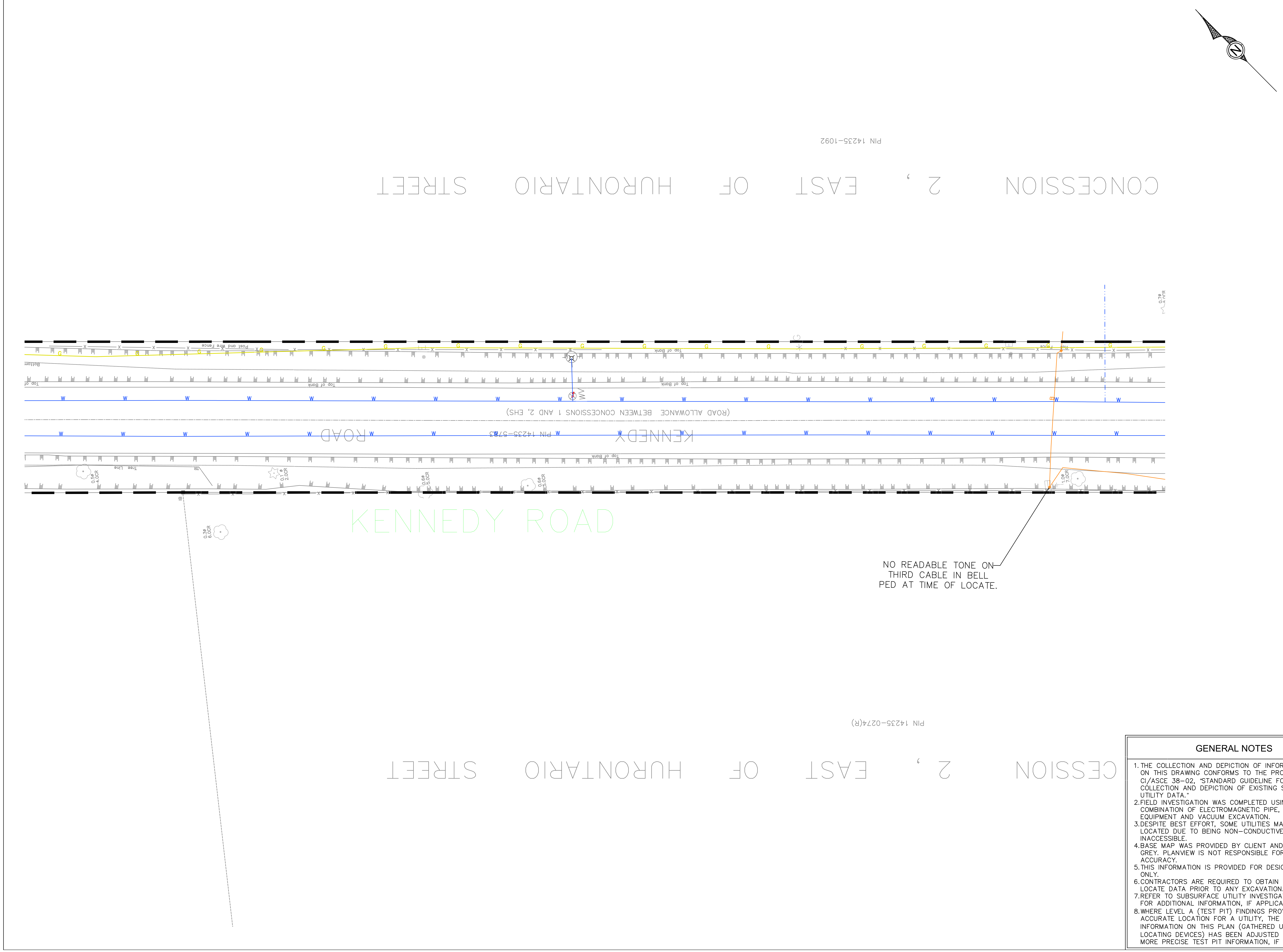
SUBSURFACE UTILITY INVESTIGATION

DESCRIPTION:
LEVEL B SURVEY

AREA:
KENNEDY ROAD

DRAWN BY:	PLANVIEW NO.:	CLIENT NO.:
PLANVIEW	18–3–0021	–

DRAWING NO.:	REVISION:	SCALE: 1: 250 SHEET SIZE: 22x34
1 of 5	0	DATE: 27–JUN–18



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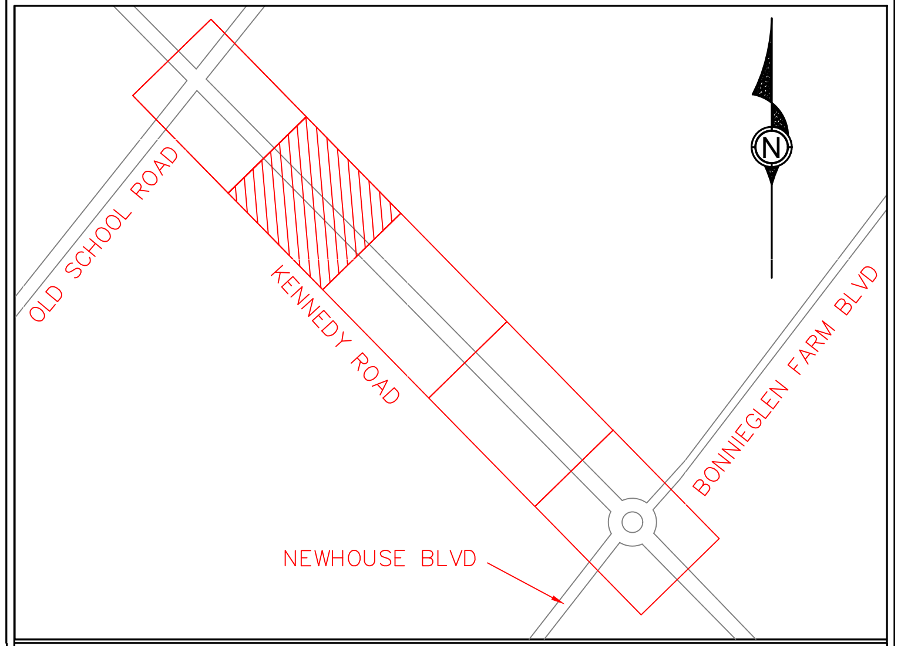

CITY OF CALEDON

LEGEND

G	GASMAIN
B	BELL CANADA
FO	BELL FIBER OPTIC
TV	ROGERS CABLE
W	WATERMAIN
TC	TRAFFIC CONTROL
SL	STREETLIGHT
H	HYDRO
STM	STORM SEWER
SAN	SANITARY SEWER
———	LEVEL B
— — —	LEVEL C
—· · ·—	LEVEL D

SEAL:

CLIENT:

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PLANVIEW
Utility Services Ltd.

SUBSURFACE UTILITY INVESTIGATION

DESCRIPTION:
LEVEL B SURVEY

AREA:
KENNEDY ROAD

DRAWN BY: PLANVIEW
PLANVIEW NO.: 18–3–0021
CLIENT NO.: –
DRAWING NO.: 2 of 5
REVISION: 0
SCALE: 1: 250
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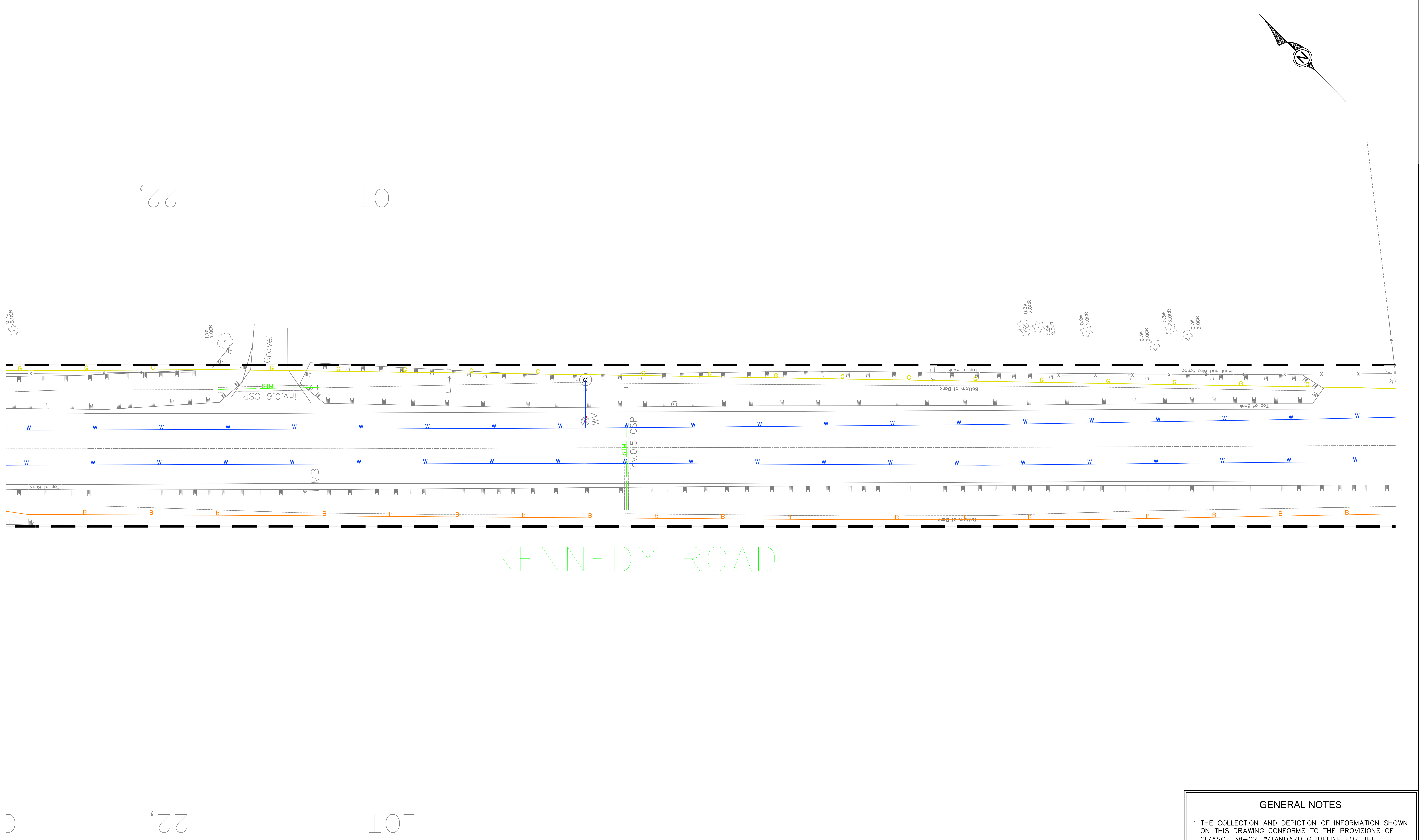
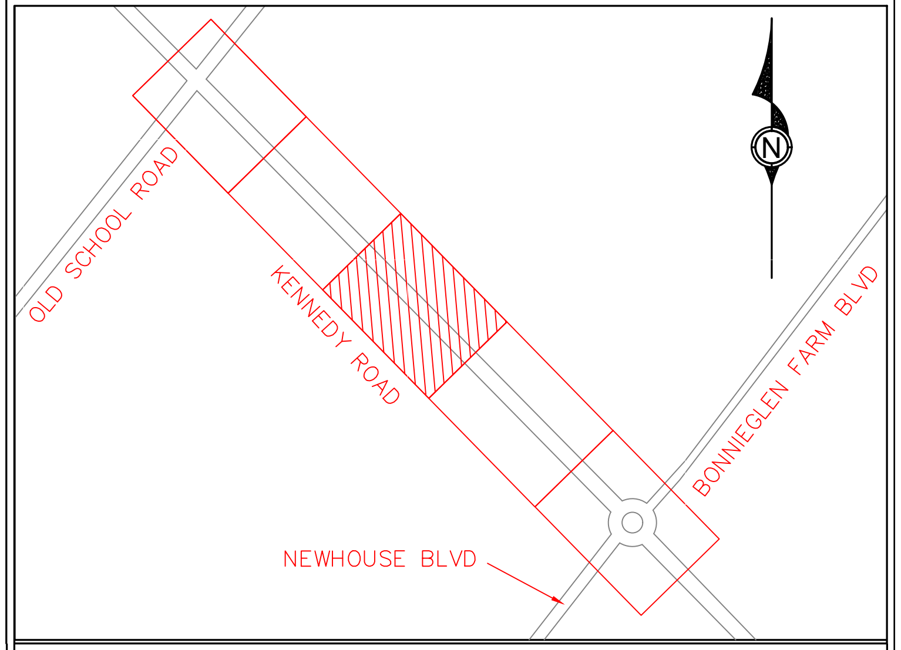
DATE: 27–JUN–18



KEY MAP (N.T.S)



CITY OF CALEDON

LEGEND

G	GASMAIN
B	BELL CANADA
FO	BELL FIBER OPTIC
TV	ROGERS CABLE
W	WATERMAIN
TC	TRAFFIC CONTROL
SL	STREETLIGHT
H	HYDRO
STM	STORM SEWER
SAN	SANITARY SEWER
———	LEVEL B
— — —	LEVEL C
—·—·—	LEVEL D

SEAL:

CLIENT:

Chisholm, Fleming & Associates
CONSULTING ENGINEERS

NO.	DATE	DESCRIPTION	BY
2	27–JUN–18	LEVEL B ISSUED TO CLIENT	DK
1	19–JUN–18	LEVEL B SURVEY	DK

GENERAL NOTES

1. THE COLLECTION AND DEPICTION OF INFORMATION SHOWN ON THIS DRAWING CONFORMS TO THE PROVISIONS OF CI/ASCE 38–02, "STANDARD GUIDELINE FOR THE COLLECTION AND DEPICTION OF EXISTING SUBSURFACE UTILITY DATA."
2. FIELD INVESTIGATION WAS COMPLETED USING A COMBINATION OF ELECTROMAGNETIC PIPE, CABLE LOCATE EQUIPMENT AND VACUUM EXCAVATION.
3. DESPITE BEST EFFORT, SOME UTILITIES MAY NOT BE LOCATED DUE TO BEING NON–CONDUCTIVE OR INACCESSIBLE.
4. BASE MAP WAS PROVIDED BY CLIENT AND IS SHOWN IN GREY. PLANVIEW IS NOT RESPONSIBLE FOR ITS ACCURACY.
5. THIS INFORMATION IS PROVIDED FOR DESIGN PURPOSES ONLY.
6. CONTRACTORS ARE REQUIRED TO OBTAIN THEIR OWN LOCATE DATA PRIOR TO ANY EXCAVATION.
7. REFER TO SUBSURFACE UTILITY INVESTIGATION REPORT FOR ADDITIONAL INFORMATION, IF APPLICABLE.
8. WHERE LEVEL A (TEST PIT) FINDINGS PROVIDE A MORE ACCURATE LOCATION FOR A UTILITY, THE LEVEL B INFORMATION ON THIS PLAN (GATHERED USING UTILITY LOCATING DEVICES) HAS BEEN ADJUSTED TO ALIGN WITH MORE PRECISE TEST PIT INFORMATION, IF APPLICABLE.

PLANVIEW
Utility Services Ltd.

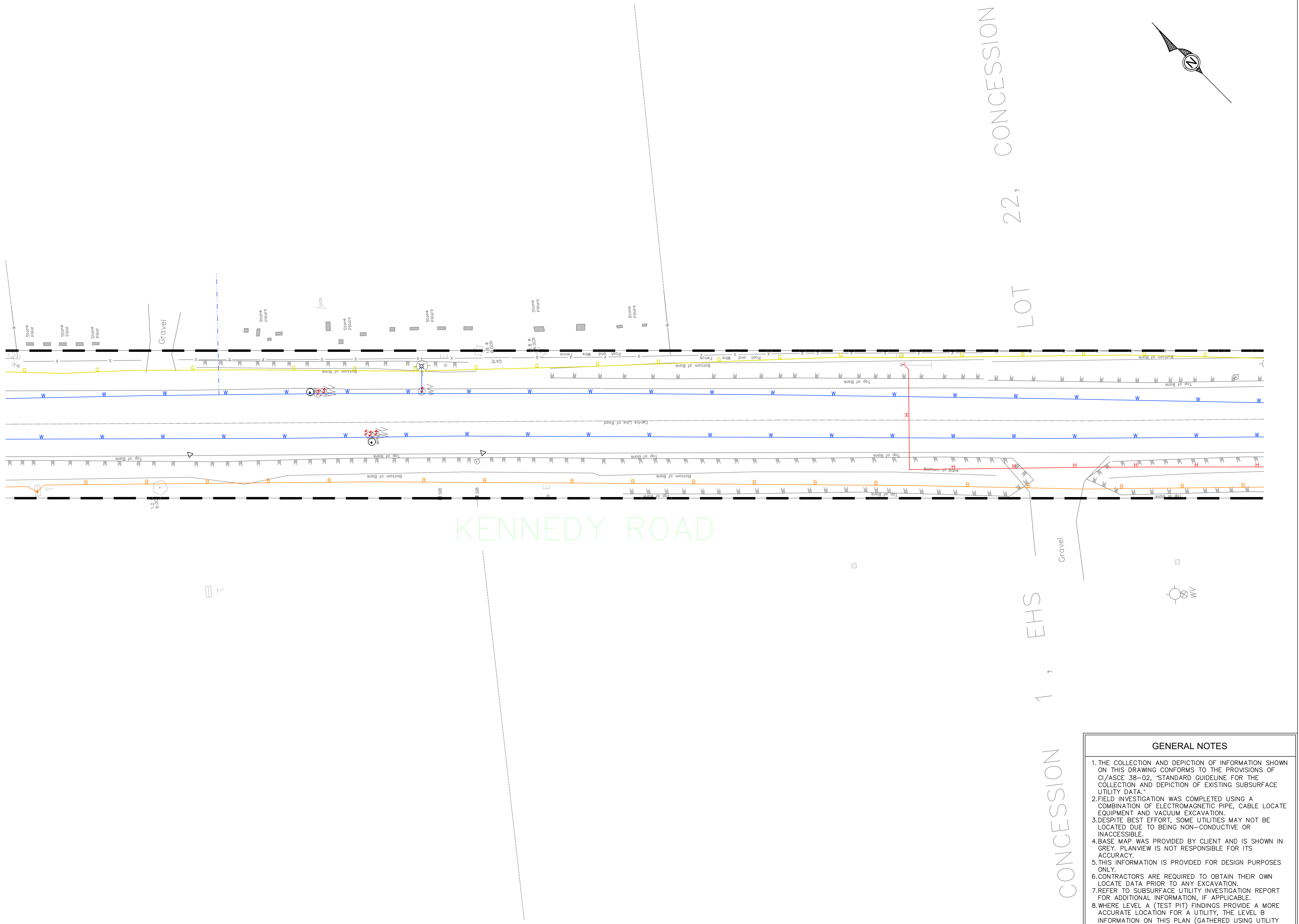
SUBSURFACE UTILITY INVESTIGATION

DESCRIPTION:
LEVEL B SURVEY

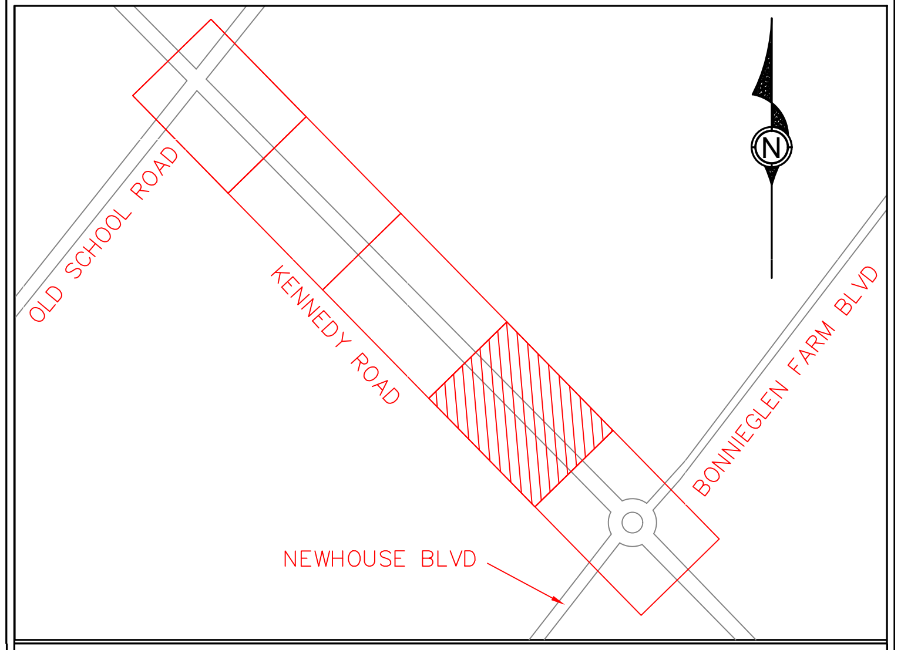
AREA:
KENNEDY ROAD

DRAWN BY:	PLANVIEW NO.:	CLIENT NO.:
PLANVIEW	18–3–0021	–

DRAWING NO.:	REVISION:	
3 of 5	0	SCALE: 1:250 SHEET SIZE: 22x34 DATE: 27–JUN–18



KEY MAP (N.T.S)



CITY OF CALEDON

LEGEND

G	GASMAIN
B	BELL CANADA
FO	BELL FIBER OPTIC
TV	ROGERS CABLE
W	WATERMAIN
TC	TRAFFIC CONTROL
SL	STREETLIGHT
H	HYDRO
STM	STORM SEWER
SAN	SANITARY SEWER
———	LEVEL B
— — —	LEVEL C
—·-·—	LEVEL D

SEAL:

CLIENT:

Chisholm, Fleming & Associates
CONSULTING ENGINEERS

NO.	DATE	DESCRIPTION	BY
2	27–JUN–18	LEVEL B ISSUED TO CLIENT	DK
1	19–JUN–18	LEVEL B SURVEY	DK

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PLANVIEW
Utility Services Ltd.

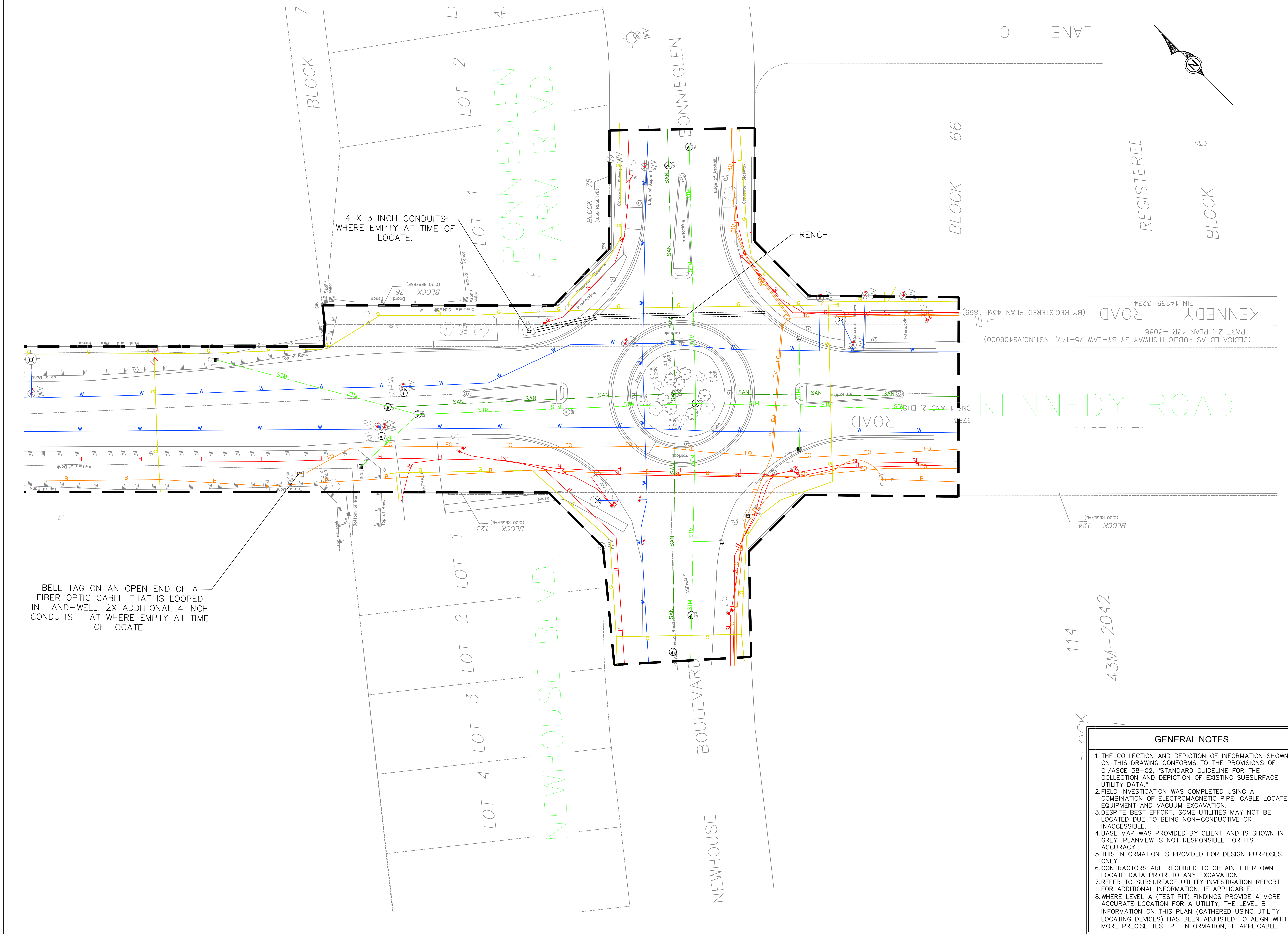
SUBSURFACE UTILITY INVESTIGATION

DESCRIPTION:
LEVEL B SURVEY

AREA:
KENNEDY ROAD

DRAWN BY:	PLANVIEW NO.:	CLIENT NO.:
PLANVIEW	18–3–0021	–

DRAWING NO.: 4 of 5
REVISION: 0
SCALE: 1: 250
SHEET SIZE: 22x34
DATE: 27–JUN–18



4 X 3 INCH CONDUITS WHERE EMPTY AT TIME OF LOCATE.

TRENCH

BELL TAG ON AN OPEN END OF A FIBER OPTIC CABLE THAT IS LOOPED IN HAND-WELL. 2X ADDITIONAL 4 INCH CONDUITS THAT WHERE EMPTY AT TIME OF LOCATE.

GENERAL NOTES

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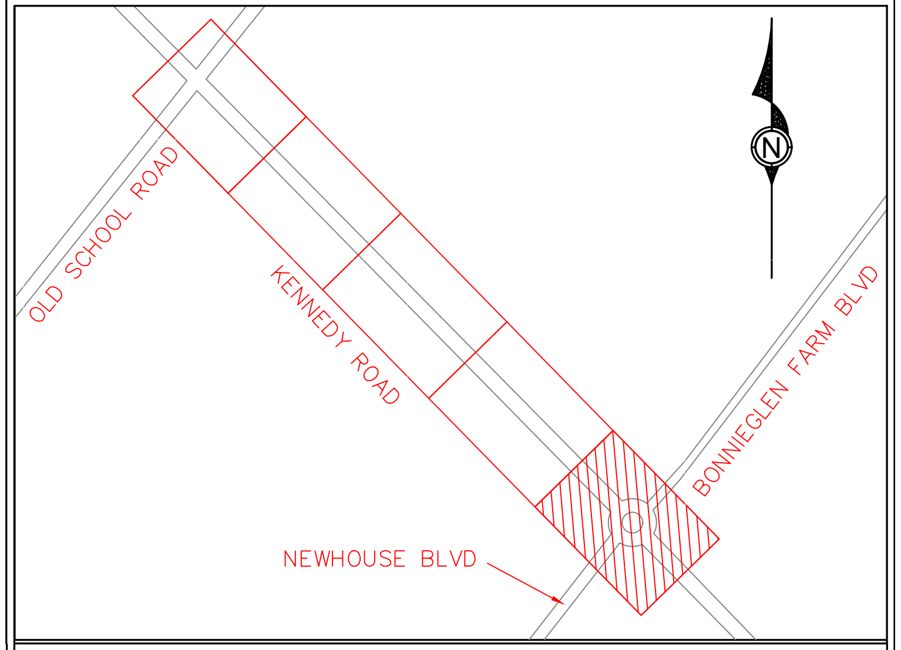
KEY MAP (N.T.S)



CITY OF CALEDON

LEGEND

G	GASMAIN
B	BELL CANADA
FO	BELL FIBER OPTIC
TV	ROGERS CABLE
W	WATERMAIN
TC	TRAFFIC CONTROL
SL	STREETLIGHT
H	HYDRO
STM	STORM SEWER
SAN	SANITARY SEWER
———	LEVEL B
— — —	LEVEL C
—·—·—	LEVEL D

SEAL:

CLIENT:

Chisholm, Fleming & Associates
CONSULTING ENGINEERS

2	27-JUN-18	LEVEL B ISSUED TO CLIENT	DK
1	19-JUN-18	LEVEL B SURVEY	DK
NO.	DATE	DESCRIPTION	BY

PLANVIEW
Utility Services Ltd.

SUBSURFACE UTILITY INVESTIGATION

DESCRIPTION:
LEVEL B SURVEY

AREA:
KENNEDY ROAD

DRAWN BY: PLANVIEW	PLANVIEW NO.: 18-3-0021	CLIENT NO.: -
DRAWING NO.: 5 of 5	REVISION: 0	SCALE: 1: 250 SHEET SIZE: 22x34
		DATE: 27-JUN-18

APPENDIX F

Stormwater Management Report

KENNEDY ROAD
BONNIEGLEN FARM BOULEVARD
TO OLD SCHOOL ROAD
TOWN OF CALEDON

STORM WATER MANAGEMENT REPORT

PREPARED BY:
CHISHOLM, FLEMING & ASSOCIATES

APRIL 2019

STORM WATER MANAGEMENT REPORT

Site

The study area for this project is Kennedy Road from Bonnieglen Farm Boulevard to Old School Road, in the Town of Caledon, with a distance of 650 metres and an existing road allowance width of 20 m. The location of the site is shown in Figure 1. Kennedy Road currently is a two lane rural road with ditches on both sides. The surrounding land use is primarily agricultural, residential, and a cemetery.

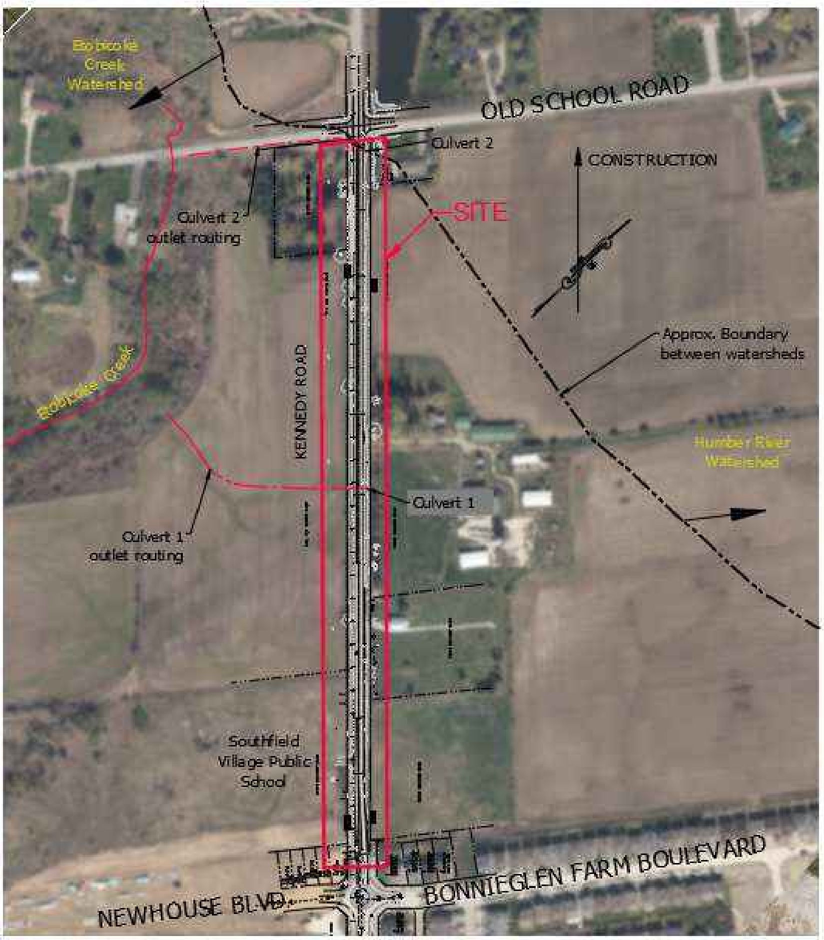


Figure 1 – Site Location

Existing Condition

The site study is located within two watersheds: Etobicoke Creek watershed to the west and Humber River watershed to the east. The highest point in the road is approximately 220 m north of Bonnieglen Farm Boulevard, the area south of that point is tributary to the existing storm sewer for the Kennedy Trails Residential Sub-division; the remainder drains west to the Etobicoke Creek via ditches connecting into two existing culverts: Culvert 1 - 500 mm CSP and Culvert 2 - 600 mm PVC. The northernmost section (50 m) of the project is within the TRCA Regulated area (See Appendix 1).

Existing drainage patterns were studied using orthoimagery of the site, contours provided by TRCA and the following drawings and reports provided by the Town of Caledon (Appendix 2):

- Kennedy Trails Development Ltd. – Storm Drainage Plan (Minor System) Drawing No. 12 prepared by DSEL, 2016
- Southfields Village No. 2 Public School – Servicing Plan prepared by MGM Consulting Inc, 2016

Soils

A Geotechnical Investigation was conducted to obtain information on the soil and groundwater conditions at the site by means of 13 staggered boreholes and depths ranging from 1.98 m to 2.13 m. The results show that the existing pavement structure is supported on fill materials, which in general comprises a layer of sandy silt to silty sand or sand with gravel.

The groundwater level appeared to be low as all the boreholes were dry upon completion of drilling.

Other studies in the area show soils surrounding the site consist of silty sands to sandy silt for the upper 2-3 m.

Proposed Construction

The proposed road reconstruction consists of a 20 m R.O.W. with an urban cross-section of 3.0 m general purpose lanes, 1.5 m paved shoulders for on-road cyclists completed with 0.5 m curb and gutter (see Appendix 3). The Kennedy Road and Old School Road intersection is not part of this Study.

Stormwater Management

The Drainage Area for the proposed condition is illustrated in Appendix 4. The drainage patterns will be maintained, a section of 120 m will be connected to the existing Kennedy Trails' storm sewer while 360 m will drain west towards the Etobicoke Creek through the existing routing channels. A storm sewer system will convey the minor storm event; the flows have been calculated based on the Rational Method using the Town of Caledon's IDF Curve for a 10 year return period and a time of concentration of 10 minutes (Appendix 5).

The minor system drains completely to the Etobicoke Creek watershed, while a portion of the overland flow routing drains to the Humber River watershed.

In order to provide adequate conveyance for drainage within the study area, for the paved road and the external catchment, as well as to connect to future development drainage infrastructure, the proposed stormwater management plan includes:

- Maintain the existing drainage patterns.
- Table 7-1 shows the existing and proposed lane and shoulder widths for Kennedy Rd. The existing Kennedy Rd's shoulder width ranges between 1.1m to 1.3m, with majority section of it being at the upper limit. Appendix 4A shows the drainage areas measured for each section and the correspondent runoff coefficient. Under the proposed road design, the total drainage area and the composite runoff coefficient remains the same as existing conditions. The bioswale, included in our design as an LID measure to improve the stormwater quality, would also help to reduce the runoff quantity; the implementation of bioswales should be further examined during the detailed design stage.
- External catchment area east of Kennedy Road will be collected via ditches to the existing culvert crossings. Ditches will be 0.5 m deep with max. 2:1 side slope.
- Road drainage will be conveyed via curb and gutters to catch basins connected to the proposed underground storm sewer systems.
- Per Directive B100 – MTO any culvert on a collector road shall be designed for the 25 year storm event or greater. With the existing conditions Culvert 1 has enough capacity to convey the 25 year storm event and Culvert 2 could pass the 100 year storm event without overtopping the road. Culvert 1 will be replaced with a 600 mm HDPE at 0.8%, with enough capacity to carry the 100 year storm (See Appendix 6)
- The routing for the crossing culverts outlet will be maintained with minor adjustments due to the road upgrade works.

Treatment Train

The geotechnical report shows fill materials below the pavement, consisting of sandy silt to silty sand and sand with gravel overlying silty clay to silt till. These findings concur with the geotechnical study prepared for the construction of the Southfield No. 2 Public School (located within the study area). A hydrogeological investigation was also completed for the construction of the school; the report indicates that based on the characteristics of the site an infiltration rate of 15mm/hr can be expected.

The capacity of infiltration of the soils within the ROW is suitable for the implementation of LID measures; in this case the ditches on both sides of the road will reduce the runoff, enhance the appeal of the road, attenuate the peak flow and provide storage during storm events.

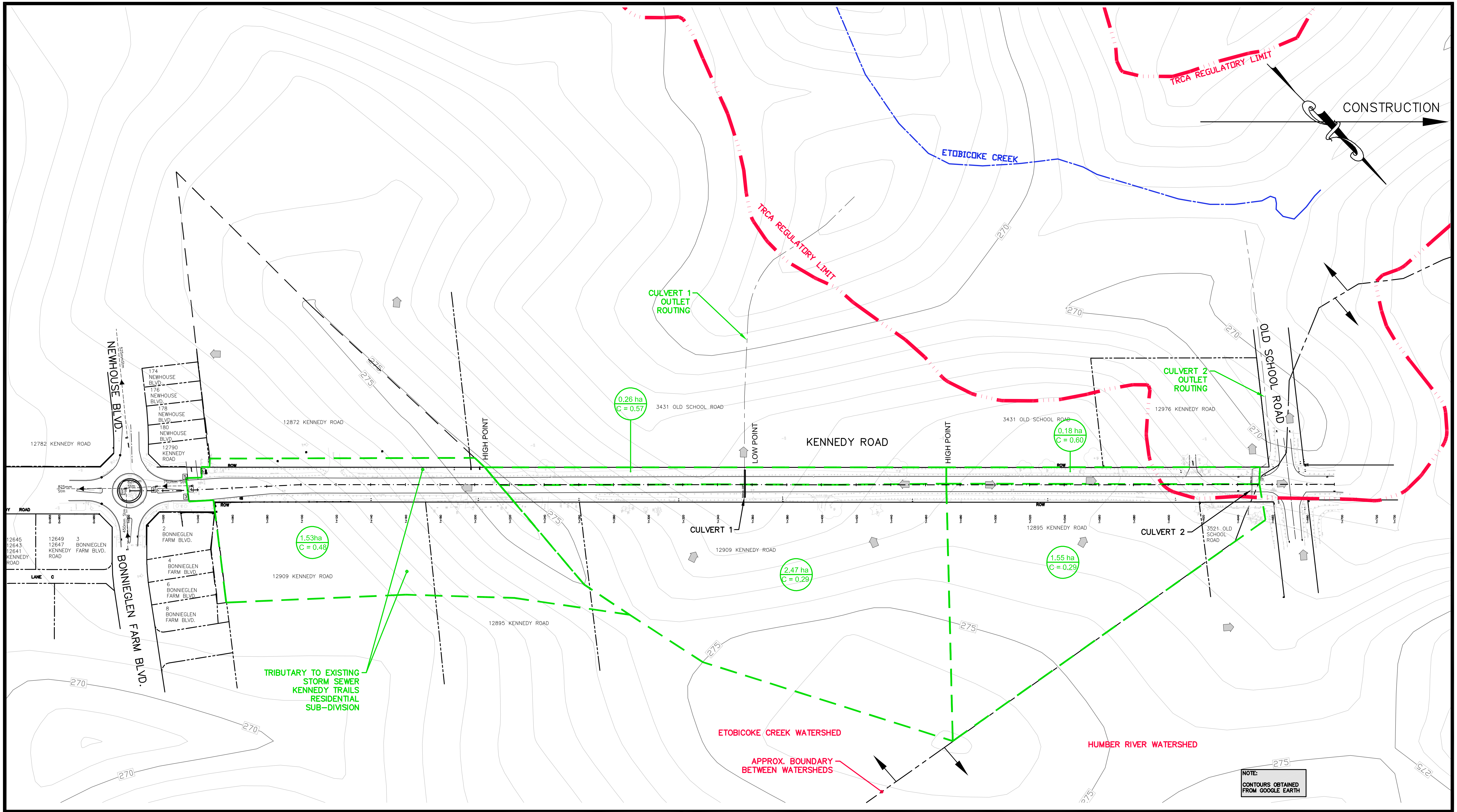
The quality control for paved areas will consist of catch basin inserts (CB shields), end of pipe measure such OGS; for this project two STC-750 units are being proposed at each outlet of the proposed storm sewer; they have been modelled using the PCSWMM for Stormceptor from Imbrium Systems (See Appendix 7). Although both reports show that the removal of TSS by the stormceptor units will be higher than 84%, for this project it has been assumed 50% will be achieved by each STC-750. Further treatment downstream of the OGS unit could consist of an enhanced vegetated swale, if the property required for such measure is granted; additional evaluation of this alternative and/or others LID measures will be required as part of the Detailed Design Stage.

Erosion Control

A Sediment and Erosion Control Plan (SECP) will be prepared in detailed design to reduce impact of construction activities on the study area watershed, including but not limited to Filtrexx Siltsoxx, Siltsoxx check dams and silt traps in the catchbasins. The detailed SECP will meet the requirements of Toronto and Region Conservation Authority (TRCA). The preliminary erosion control measures are depicted in the Removal drawing 256-16_ESC-REM-1.

Appendices:

1. Drainage Area Plan Existing Condition
2. a. As-Constructed Storm Drainage Plan (Drawing No. 12) - Kennedy Trails Residential Sub-division prepared by DSEL, 2016
   b. Southfields Village No. 2 Public School – Servicing Plan prepared by MGM Consulting Inc. 2016
3. Proposed Typical Cross Section
4. Drainage Area Plan Proposed Condition
5. Storm Drainage Chart – Kennedy Road
6. Crossing culverts calculations
7. Detailed Stormceptor Sizing Report – Kennedy Road
8. Roadway Design - Kennedy Road - Plan and Profile Drawings



LEGEND

1.51ha — STORM DRAINAGE AREA IN ha

0.63 — RUNOFF COEFICIENT

▶ DENOTES SEWER DIRECTION

⇨ DENOTES OVERLAND FLOW

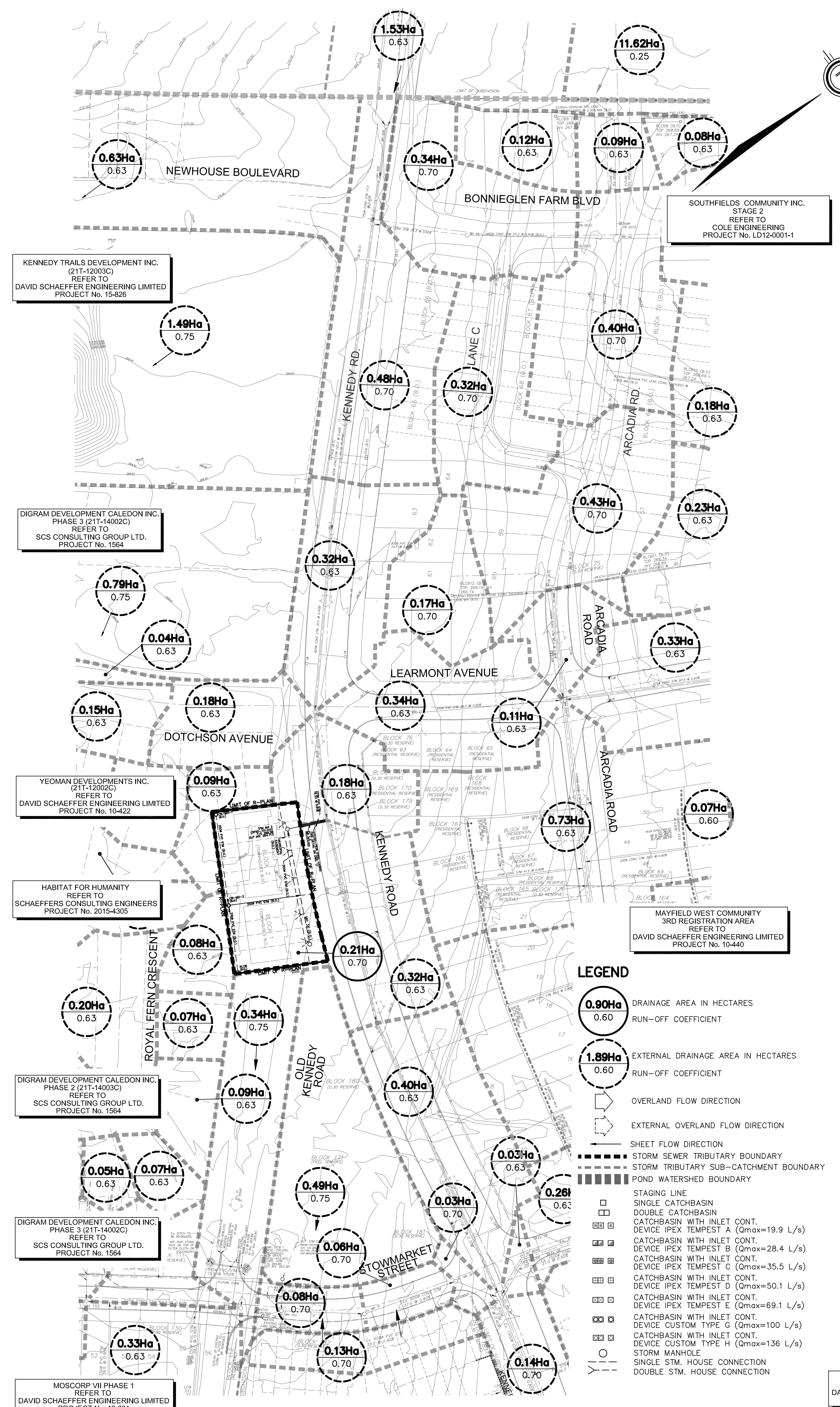
Scale 20 10 0 20

CONSULTANT

Chisholm, Fleming and Associates
consulting engineers

APPENDIX 1 - KENNEDY ROAD
DRAINAGE AREA PLAN
STORM SEWER
EXISTING CONDITION

Town of Caledon



STORM DRAINAGE PLAN

SOUTHFIELDS COMMUNITY INC.
STAGE 2
REFER TO
COLE ENGINEERING
PROJECT No. LD12-0001-1

KENNEDY TRAILS DEVELOPMENT INC.
(21T-12003C)
REFER TO
DAVID SCHAEFFER ENGINEERING LIMITED
PROJECT No. 15-826

DIGRAM DEVELOPMENT CALEDON INC.
PHASE 3 (21T-14002C)
REFER TO
SCS CONSULTING GROUP LTD.
PROJECT No. 1564

YEOMAN DEVELOPMENTS INC.
(21T-12002C)
REFER TO
DAVID SCHAEFFER ENGINEERING LIMITED
PROJECT No. 10-422

HABITAT FOR HUMANITY
REFER TO
SCHAEFFERS CONSULTING ENGINEERS
PROJECT No. 2015-4305

DIGRAM DEVELOPMENT CALEDON INC.
PHASE 2 (21T-14003C)
REFER TO
SCS CONSULTING GROUP LTD.
PROJECT No. 1564

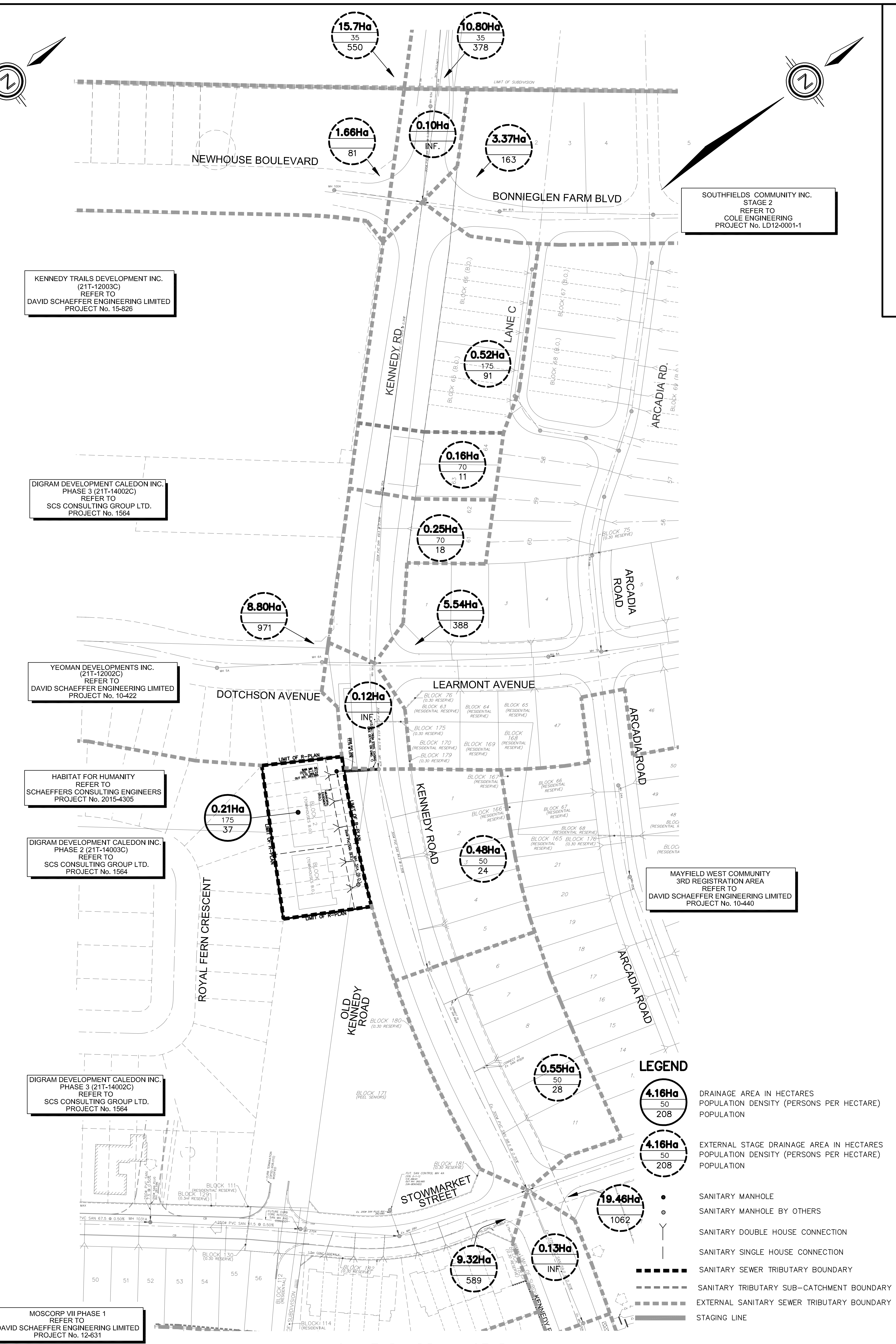
DIGRAM DEVELOPMENT CALEDON INC.
PHASE 3 (21T-14002C)
REFER TO
SCS CONSULTING GROUP LTD.
PROJECT No. 1564

MOSCORP VIII PHASE 1
REFER TO
DAVID SCHAEFFER ENGINEERING LIMITED
PROJECT No. 12-631

MAYFIELD WEST COMMUNITY
3RD REGISTRATION AREA
REFER TO
DAVID SCHAEFFER ENGINEERING LIMITED
PROJECT No. 10-440

LEGEND

- 0.90Ha / 0.60: DRAINAGE AREA IN HECTARES / RUN–OFF COEFFICIENT
- 1.89Ha / 0.60: EXTERNAL DRAINAGE AREA IN HECTARES / RUN–OFF COEFFICIENT
- OVERLAND FLOW DIRECTION
- EXTERNAL OVERLAND FLOW DIRECTION
- SHEET FLOW DIRECTION
- STORM SEWER TRIBUTARY BOUNDARY
- STORM TRIBUTARY SUB–CATCHMENT BOUNDARY
- POND WATERSHED BOUNDARY
- STAGING LINE
- SINGLE CATCHBASIN
- DOUBLE CATCHBASIN
- CATCHBASIN WITH INLET CONT. DEVICE IPEX TEMPEST A (Qmax=19.9 L/s)
- CATCHBASIN WITH INLET CONT. DEVICE IPEX TEMPEST B (Qmax=28.4 L/s)
- CATCHBASIN WITH INLET CONT. DEVICE IPEX TEMPEST C (Qmax=35.5 L/s)
- CATCHBASIN WITH INLET CONT. DEVICE IPEX TEMPEST D (Qmax=50.1 L/s)
- CATCHBASIN WITH INLET CONT. DEVICE IPEX TEMPEST E (Qmax=69.1 L/s)
- CATCHBASIN WITH INLET CONT. DEVICE CUSTOM TYPE G (Qmax=100 L/s)
- CATCHBASIN WITH INLET CONT. DEVICE CUSTOM TYPE H (Qmax=136 L/s)
- STORM MANHOLE
- SINGLE STM. HOUSE CONNECTION
- DOUBLE STM. HOUSE CONNECTION



SANITARY DRAINAGE PLAN

SOUTHFIELDS COMMUNITY INC.
STAGE 2
REFER TO
COLE ENGINEERING
PROJECT No. LD12-0001-1

KENNEDY TRAILS DEVELOPMENT INC.
(21T-12003C)
REFER TO
DAVID SCHAEFFER ENGINEERING LIMITED
PROJECT No. 15-826

DIGRAM DEVELOPMENT CALEDON INC.
PHASE 3 (21T-14002C)
REFER TO
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REFER TO
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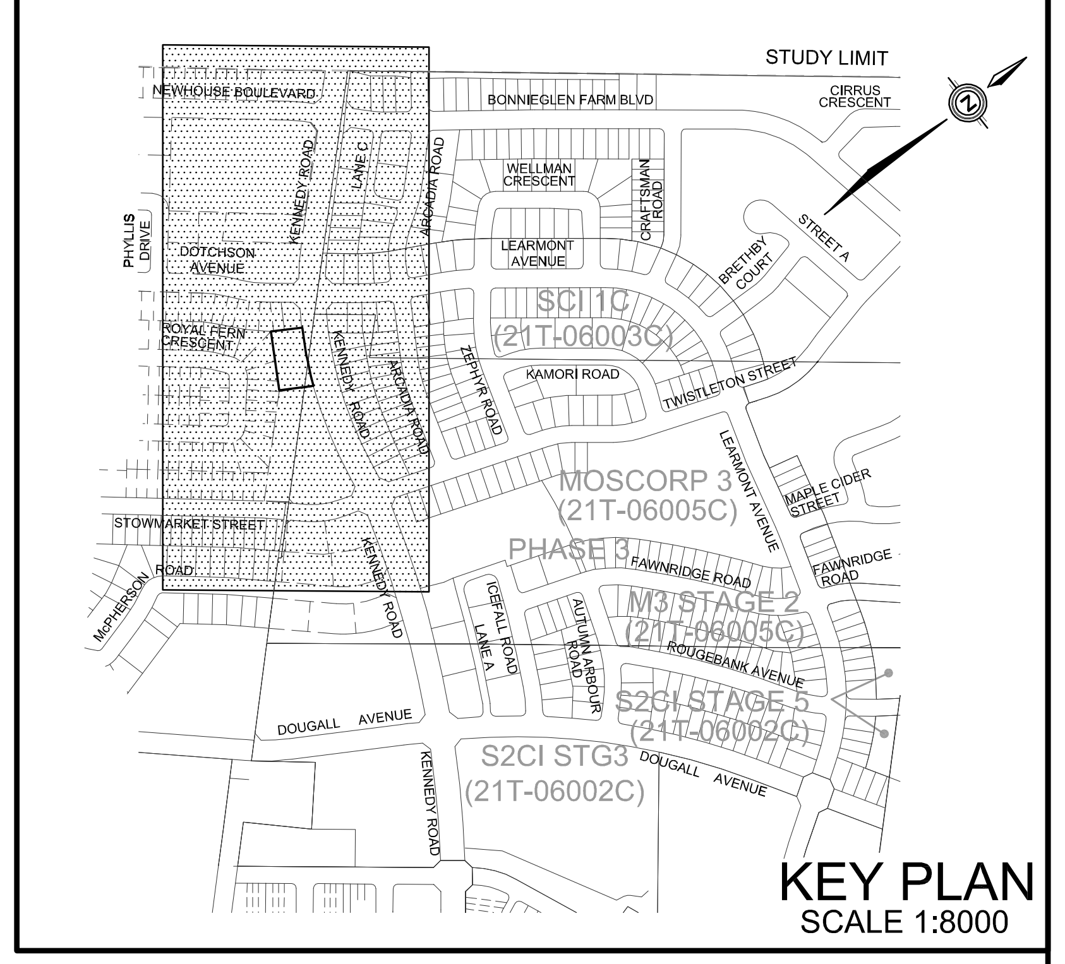
PROJECT No. 1564

MOSCORP VIII PHASE 1
REFER TO
DAVID SCHAEFFER ENGINEERING LIMITED
PROJECT No. 12-631

LEGEND

- 4.16Ha / 50 / 208: DRAINAGE AREA IN HECTARES / POPULATION DENSITY (PERSONS PER HECTARE) / POPULATION
- 4.16Ha / 50 / 208: EXTERNAL STAGE DRAINAGE AREA IN HECTARES / POPULATION DENSITY (PERSONS PER HECTARE) / POPULATION
- SANITARY MANHOLE
- SANITARY MANHOLE BY OTHERS
- SANITARY DOUBLE HOUSE CONNECTION
- SANITARY SINGLE HOUSE CONNECTION
- SANITARY SEWER TRIBUTARY BOUNDARY
- SANITARY TRIBUTARY SUB–CATCHMENT BOUNDARY
- EXTERNAL SANITARY SEWER TRIBUTARY BOUNDARY
- STAGING LINE



KEY PLAN
SCALE 1:8000

TOPOGRAPHIC INFORMATION

TOPOGRAPHIC INFORMATION PROVIDED BY RADY–PENTEK & EDWARD SURVEYING LTD.,
PROJECT No. 07–285, TOPOGRAPHIC SURVEY DATED ON FEBRUARY 12, 2010,
PROJECT No. 07–285, TOPOGRAPHIC SURVEY DATED ON AUGUST 19, 2010.

SITE PLAN INFORMATION

R–PLAN PROVIDED BY KLM PLANNING PARTNERS INC.,
PROJECT No. 12–2205–REF 2, DATED JANUARY 29, 2015

AS-CONSTRUCTED

NO.	BY	DATE	REVISION	CONS. CHECKED	TOWN APPR'D
7	K.A.	17–12–08	AS–CONSTRUCTED SUBMISSION (UNDERGROUNDS ONLY)		
6	W.L.	17–07–20	REVISED AS PER REGION'S COMMENTS		
5	Z.L.	17–02–15	REVISED AS PER REGION'S COMMENTS		
4	Z.L.	16–12–09	4th SUBMISSION		
3	Z.L.	16–12–01	3rd SUBMISSION		
2	Z.L.	16–10–25	2nd SUBMISSION		
1	Z.L.	14–10–24	1st SUBMISSION		

APPROVED FOR CONSTRUCTION
THIS APPROVAL CONSTITUTES A GENERAL REVIEW AND DOES NOT CERTIFY DIMENSIONAL ACCURACY.

THIS APPROVAL IS SUBJECT TO THE FURTHER CERTIFICATION OF THE "AS CONSTRUCTED" WORKS BY A REGISTERED PROFESSIONAL ENGINEER OF THE PROVINCE OF ONTARIO.

DATE :________________ APPROVED BY:________________________

MARY HALL, MCIP, RPP
DIRECTOR OF DEVELOPMENT APPROVAL
AND PLANNING POLICY

BENCH MARK:

ELEVATIONS ARE GEODETIC AND ARE REFERRED TO THE CITY OF BRAMPTON BENCHMARK No. J1–313, HAVING AN ELEVATION OF 252.147 METRES. LOCATED ON SOUTH FACE OF CONCRETE PORCH DECK ON WHITE SIDE BUNGALOW No. 11575 DIXIE ROAD, BEING 0.55km SOUTH OF MAYFIELD ROAD. TABLET IS SET 0.07m BELOW TOP OF DECK AND 0.27m EAST OF SOUTHEAST CORNER OF DECK.

ELEVATION = 252.147 m

T.D.MCNAIR
100151569
17–12–08
FOR AS–CONSTRUCTED INFORMATION

ORIGINALLY
SIGNED BY
WILL LIU, P.ENG.
DATED
JULY 20, 2017

HABITAT FOR HUMANITY
R-PLAN No. 43R-36348 REGION PROJECT No. C-07.304

david schaeffer engineering ltd
600 Alden Road, Suite 500
Markham, Ontario, L3R 0E7
Tel. (905) 475-3080
Fax. (905) 475-3081
www.DSEL.ca

Region of Peel
Public Works

TOWN OF CALEDON

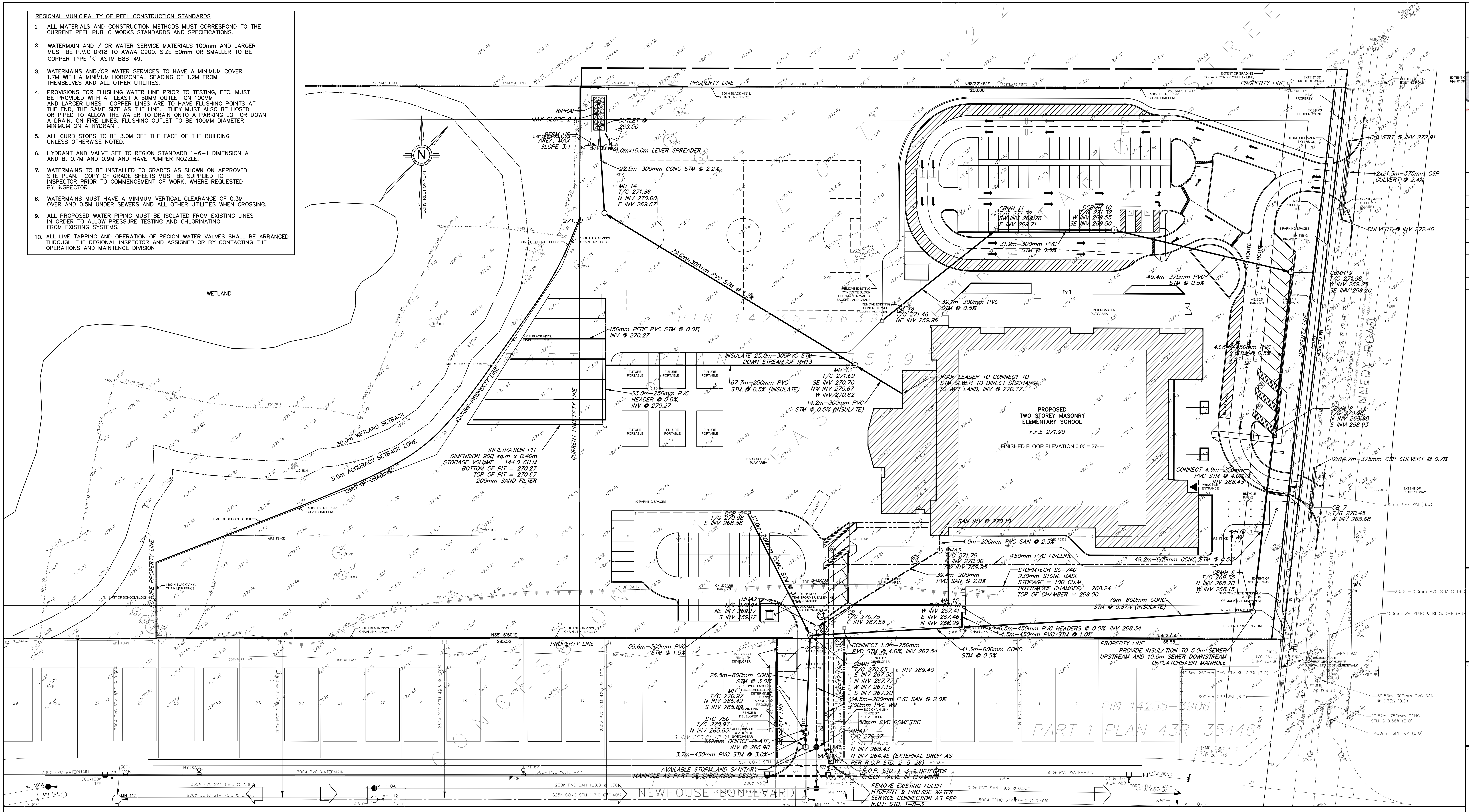
SANITARY DRAINAGE PLAN /
STORM DRAINAGE PLAN
(MINOR SYSTEM)
(ULTIMATE CONDITION)

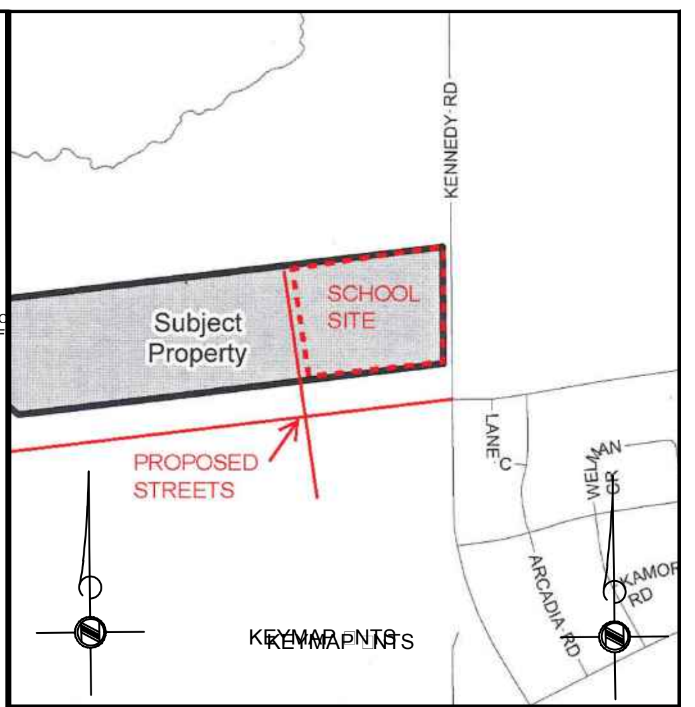
SCALE: 1:1000		PROJECT No. 14–750
DESIGNED BY: K.M.	DRAWN BY: C.M.	DRAWING No. 3
CHECKED BY: K.M.	DATE: OCTOBER 2014	

Appendix 2a

REGIONAL MUNICIPALITY OF PEEL CONSTRUCTION STANDARDS

1. ALL MATERIALS AND CONSTRUCTION METHODS MUST CORRESPOND TO THE CURRENT PEEL PUBLIC WORKS STANDARDS AND SPECIFICATIONS.
2. WATERMAIN AND / OR WATER SERVICE MATERIALS 100mm AND LARGER MUST BE P.V.C DR18 TO AWWA C900. SIZE 50mm OR SMALLER TO BE COPPER TYPE 'K' ASTM B88-49.
3. WATERMAINS AND/OR WATER SERVICES TO HAVE A MINIMUM COVER 1.7M WITH A MINIMUM HORIZONTAL SPACING OF 1.2M FROM THEMSELVES AND ALL OTHER UTILITIES.
4. PROVISIONS FOR FLUSHING WATER LINE PRIOR TO TESTING, ETC. MUST BE PROVIDED WITH AT LEAST A 50MM OUTLET ON 100MM AND LARGER LINES. COPPER LINES ARE TO HAVE FLUSHING POINTS AT THE END, THE SAME SIZE AS THE LINE. THEY MUST ALSO BE HOSED OR PIPED TO ALLOW THE WATER TO DRAIN ONTO A PARKING LOT OR DOWN A DRAIN. ON FIRE LINES, FLUSHING OUTLET TO BE 100MM DIAMETER MINIMUM ON A HYDRANT.
5. ALL CURB STOPS TO BE 3.0M OFF THE FACE OF THE BUILDING UNLESS OTHERWISE NOTED.
6. HYDRANT AND VALVE SET TO REGION STANDARD 1-6-1 DIMENSION A AND B, 0.7M AND 0.9M AND HAVE PUMPER NOZZLE.
7. WATERMAINS TO BE INSTALLED TO GRADES AS SHOWN ON APPROVED SITE PLAN. COPY OF GRADE SHEETS MUST BE SUPPLIED TO INSPECTOR PRIOR TO COMMENCEMENT OF WORK, WHERE REQUESTED BY INSPECTOR
8. WATERMAINS MUST HAVE A MINIMUM VERTICAL CLEARANCE OF 0.3M OVER AND 0.5M UNDER SEWERS AND ALL OTHER UTILITIES WHEN CROSSING.
9. ALL PROPOSED WATER PIPING MUST BE ISOLATED FROM EXISTING LINES IN ORDER TO ALLOW PRESSURE TESTING AND CHLORINATING FROM EXISTING SYSTEMS.
10. ALL LIVE TAPPING AND OPERATION OF REGION WATER VALVES SHALL BE ARRANGED THROUGH THE REGIONAL INSPECTOR AND ASSIGNED OR BY CONTACTING THE OPERATIONS AND MAINTENCE DIVISION





No.	DATE	DRAWING ISSUE DESCRIPTION
1.	□AN□16□201□	ISSUED TO CLIENT
2.	□AN□23□201□	ISSUED FOR SITE PLAN APPROVAL
3.	APR□20□201□	REISSUED FOR SPA

LEGEND

▤	EX.SURVEY MONUMENT FOUND
	EX.SURVEY MONUMENT PLANTED
IB	EX.IRON BAR
SIB	EX.STANDARD IRON BAR
SSIB	EX.SHORT STANDARD IRON BAR
TC	EX.TOP OF CURB
BC	EX.BOTTOM OF CURB
CCT	EX.CURB CUT
SANMH	EX.SANITARY MANHOLE
STMMH	EX.STORM MANHOLE
WMH	EX.WATER MANHOLE
DICB	EX.DITCH INLET CATCH BASIN
WUP	EX.WOOD UTILITY POLE
WV	EX.WATER VALVE
SIGN	EX.ROAD SIGN
FH	EX.FIRE HYDRANT
○	EX.DECIDUOUS TREE
○	EX.CONIFEROUS TREE
○ MH 14	PROPOSED STORM MANHOLE
DCBMH 10	PROPOSED STORM DOUBLE CATCHBASIN MANHOLE
CBMH 13	PROPOSED STORM CATCHBASIN MANHOLE
DCB 5	PROPOSED STORM DOUBLE CATCHBASIN
CB 3	PROPOSED STORM CATCHBASIN
○ MHA2	PROPOSED SANITARY MANHOLE
━ ━ ━	PROPOSED SANITARY SEWER
━ - - ━	PROPOSED WATERMAIN
━━━	PROPOSED STORM SEWER

M. L. STAIRS
APR 20□201□

CONSULTANTS□

MGM CONSULTING INC
Consulting Engineering & Project Management
400 Bronte Street South
Suite 201
Milton, Ontario
L9T 0H□
Tel□ (905)56□□6□□
Fa□□ (905)□□5□1339
Email□ mgm□ mgm.on.ca
□□□.mgm.on.ca

CLIENT□

MG Architects Inc.
1□ Kuhl A□enue
Toronto, Ontario M5B 5□9
Canada
T□F□416□239□1933

PRO□ECT□

peel District School Board

SOUTHFIELDS VILLAGE NO. 2
PUBLIC SCHOOL

CALEDON, ON

DRAWING□

SERVICING PLAN

DRAWN BY□	CHECKED BY□	□OB CAPTAIN□
CD	MS	CD
SCALE□ 1□500	PRO□ECT NO.□ 2016□060	DATE□ DEC□2016
	CURRENT REV□ 1	SHEET NO.□ CV□3

REGION OF PEEL NOTES:
1. LOCATION OF ALL EXISTING UTILITIES IN THE FIELD TO BE ESTABLISHED BY THE CONTRACTOR.
2. THE CONTRACTOR(S) SHALL BE SOLELY RESPONSIBLE FOR LOCATES, EXPOSING, SUPPORTING AND PROTECTING OF ALL UNDERGROUND AND OVERHEAD UTILITIES AND STRUCTURES EXISTING AT THE TIME OF CONSTRUCTION IN THE AREA OF HIS WORK. WHETHER SHOWN ON THE PLANS OR NOT, AND FOR ALL REPAIRS AND CONSEQUENCES RESULTING FROM DAMAGE TO SAME.
3. THE CONTRACTOR(S) SHALL BE SOLELY RESPONSIBLE TO GIVE 72 HOURS WRITTEN NOTICE TO UTILITIES PRIOR TO CROSSING SUCH UTILITIES, FOR THE PURPOSE OF INSPECTION BY THE CONCERNED UTILITY. THIS INSPECTION WILL BE FOR THE DURATION OF THE CONSTRUCTION, WITH THE CONTRACTOR RESPONSIBLE FOR ALL COSTS ARISING FROM SUCH INSPECTION.

BENCHMARK□

ELEVATIONS ARE REFERRED TO CANADIAN GEODETIC VERTICAL DATUM-1928, AND WERE DERIVED FROM TOWN OF CALEDON BENCHMARK NO. 012, HAVING A PUBLISHED ELEVATION OF 270.662 METERS.

TOPOGRAPHIC SURVEY PROVIDED BY TARASICK MCMILLAN KUBICKI LIMITED FILE NO. T-7396-7 DATED DECEMBER 6, 2016.

SERVICING & GRADING INFORMATION ON NEW HOUSE BOULEVARD AND SUBDIVISION TAKEN FROM DAVID SCHAEFFER ENGINEERING LTD, FILE NO. 11-478, PART OF KENNEDY TRAILS DEVELOPMENT.

REGION OF PEEL NOTES:

1. LOCATION OF ALL EXISTING UTILITIES IN THE FIELD TO BE ESTABLISHED BY THE CONTRACTOR.
2. THE CONTRACTOR(S) SHALL BE SOLELY RESPONSIBLE FOR LOCATES, EXPOSING, SUPPORTING AND PROTECTING OF ALL UNDERGROUND AND OVERHEAD UTILITIES AND STRUCTURES EXISTING AT THE TIME OF CONSTRUCTION IN THE AREA OF HIS WORK. WHETHER SHOWN ON THE PLANS OR NOT, AND FOR ALL REPAIRS AND CONSEQUENCES RESULTING FROM DAMAGE TO SAME.
3. THE CONTRACTOR(S) SHALL BE SOLELY RESPONSIBLE TO GIVE 72 HOURS WRITTEN NOTICE TO UTILITIES PRIOR TO CROSSING SUCH UTILITIES, FOR THE PURPOSE OF INSPECTION BY THE CONCERNED UTILITY. THIS INSPECTION WILL BE FOR THE DURATION OF THE CONSTRUCTION, WITH THE CONTRACTOR RESPONSIBLE FOR ALL COSTS ARISING FROM SUCH INSPECTION.
4. ALL PROPOSED WATER PIPING MUST BE ISOLATED THROUGH A TEMPORARY CONNECTION THAT SHALL INCLUDE AN APPROPRIATE CROSS-CONNECTION CONTROL DEVICE, CONSISTENT WITH THE DEGREE OF HAZARD, FOR BACKFLOW PREVENTION OF THE ACTIVE DISTRIBUTION SYSTEM, CONFORMING TO REGION OF PEEL STANDARDS 1-7-7 OR 1-7-8.

CONSTRUCTION NOTES:

1. ALL SEWER CONSTRUCTION SHALL BE CARRIED OUT IN ACCORDANCE WITH OPSS 410.
2. ALL MANHOLE AND CATCHBASIN CONSTRUCTION SHALL BE CARRIED OUT IN ACCORDANCE WITH OPSS 407.
3. ALL ADJUSTMENTS TO MANHOLES AND CATCHBASINS SHALL BE CARRIED OUT IN ACCORDANCE WITH OPSS 408.
4. GRATES AND COVERS OF CATCHBASINS AND MANHOLES ARE TO BE SET TO FINAL PAVEMENT OR GROUND ELEVATIONS.
5. TRENCH BACKFILL MATERIAL UNDER ROADWAY AREAS IS TO BE IMPORTED UNSHIRKABLE FILL COMPACTED TO 100% STANDARD PROCTOR DENSITY. TRENCH BACKFILL OUTSIDE OF ROADWAY AREAS IS TO BE SUITABLE NATIVE EARTH MATERIAL COMPACTED TO 98% STANDARD PROCTOR DENSITY.
6. CONTRACTOR TO VERIFY ALL INVERTS PRIOR TO CONSTRUCTION.

CONSTRUCTION NOTES:

1. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EX. SERVICES DURING CONSTRUCTION.
2. ALL DIMENSIONS AND INVERTS MUST BE VERIFIED PRIOR TO CONSTRUCTION.
3. ALL REMOVALS SHALL BE IN ACCORDANCE WITH OPSS 510. ALL REMOVED MATERIALS SHALL BE DISPOSED OFF SITE
4. SILTATION CONTROL SHALL BE MAINTAINED DURING ALL PHASES OF CONSTRUCTION.
5. ALL GRADING WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH OPSS 206.
6. THE CONTRACTOR TO NOTIFY ENGINEER PRIOR TO SAWCUTTING EXISTING ASPHALT FOR CONFIRMATION OF POSITIVE DRAINAGE.
7. ALL GRANULAR MATERIALS SHALL CONFORM TO OPSS 1010, AND BE INSTALLED IN ACCORDANCE WITH OPSS 314.
8. ALL ASPHALT MATERIALS SHALL BE IN ACCORDANCE WITH OPSS 1101 AND BE INSTALLED IN ACCORDANCE WITH OPSS 310.
9. CONCRETE SHALL BE IN ACCORDANCE WITH OPSS 1350 AND HAVE A MINIMUM COMPRESSIVE STRENGHT OF 30MPa AFTER 28 DAYS
10. SEWER CONSTRUCTION SHALL BE IN ACCORDANCE WITH OPSS 410. TRENCH BACKFILL TO BE APPROVED NATIVE MATERIAL.
11. TRENCH DRAIN CONSTRUCTION SHALL BE IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS
12. CATCHBASIN AND MANHOLE ADJUSTMENTS SHALL BE COMPLETED IN ACCORDANCE WITH OPSS 408.
13. MANHOLES SHALL BE AS PER OPSD 705.010 WITH FRAME AND COVER AS PER OPSD 401.010
14. CATCBASIN MANHOLES AND CATCHBASINS, SHALL HAVE FRAME AND GRATE AS PER OPSD 400.010
15. SEWER PIPE EMBEDMENT AND BACKFILL SHALL BE IN ACCORDANCE WITH OPSD 802.010
16. WHERE PVC IS SPECIFIED, STORM SEWERS TO BE PVC-SDR-35, SANITARY SEWERS TO BE PVC-SDR-28
17. ALL DISTURBED GRASSED AREAS ARE TO BE RESTORED WITH 200mm DEPTH TOPSOIL AND SOD
18. TOPSOIL SHALL BE IN ACCORDANCE WITH OPSS 570 AND SOD IN ACCORDANCE WITH OPSS 571.

NOTE:
CONTRACTOR TO CONTACT MGM CONSULTING INC. IMMEDIATELY SHOULD THERE BE ANY CONFLICTS BETWEEN EXISTING CONDITIONS AND PROPOSED GRADING AND/OR SERVICING DESIGN, OR CONFLICTS IN CONSTRUCTING THE WORK AS PER THE INTENT OF THE APPROVED DESIGN PRIOR TO CONSTRUCTION.

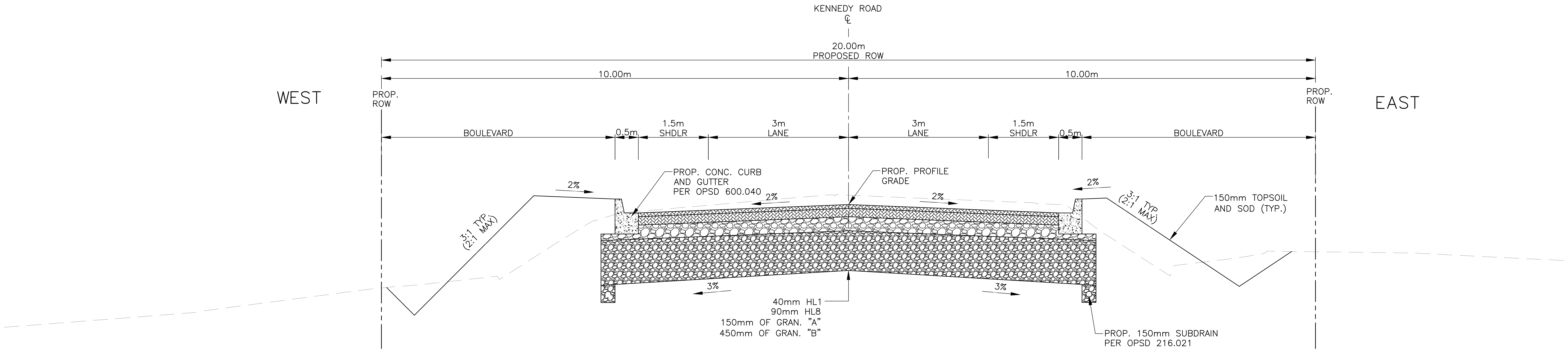
NOTE:
1. ALL WORK TO CONFORM TO THE LATEST MUNICIPAL STANDARDS AND SPECIFICATIONS AS WELL AS THE LATEST ADOPTED ONTARIO PROVINCIAL STANDARD DRAWINGS AND SPECIFICATIONS.
2. ALL DISTURBED AREAS TO BE RESTORED TO ORIGINAL CONDITION OR BETTER TO SATISFACTION OF THE MUNICIPALITY AND MGM CONSULTING INC.
3. CONTRACTOR TO LOCATE AND PROTECT ALL EXISTING SERVICES AND UTILITIES PRIOR TO AND DURING CONSTRUCTION
4. CONTRACTOR TO LOCATE AND CONFIRM ALL EXISTING UTILITIES AND SERVICE INFORMATION PRIOR CONSTRUCTION
5. CONTRACTOR TO ENSURE ADEQUATE CLEARANCE FROM ALL EXISTING SERVICES AND UTILITIES
6. CONTRACTOR TO CONFIRM ALL EXISTING INVERTS PRIOR TO INTERNAL SERVICING.

STRUCTURE	OPSD STANDARDS DWG		R.O.P STANDARD
	STRUCTURE	FRAME/GRATE	STRUCTURE
MH 1A	701.010	401.010	2-5-3
MH 2A	701.010	401.010	2-5-3
MH 3A	701.010	401.010	2-5-3

CROSSINGS			
No.	INV UPPER	OBV LOWER	CLEARANCE
C1	269.09 SAN	268.17 STM	0.92m
C2	268.53 WM	268.13 STM	0.36m
C3	269.23 SAN	268.73 WM	0.50m
C4	269.81 SAN	268.73 WM	1.08m

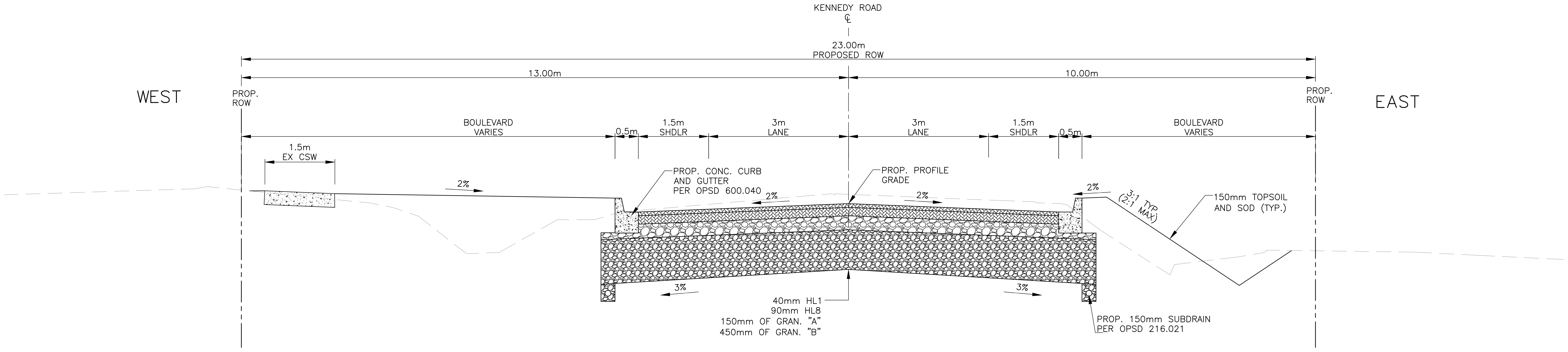
STRUCTURE	OPSD STANDARDS DWG	
	STRUCTURE	FRAME/GRATE
MH 1	701.011	401.010
CBMH 2	701.011	400.010
CB 3	705.010	400.010
CB 4	705.010	400.010
DCB 5	705.020	400.010
MH 15	701.011	401.010
CBMH 6	701.010	400.010
CB 7	705.010	400.010
CBMH 8	701.010	400.010
CBMH 9	701.010	400.010
DCBMH10	703.021	400.010
CBMH 11	701.010	400.010
CB 12	705.010	400.010
MH 13	701.010	401.010
MH 14	701.010	401.010

Appendix 2b



TYP 203 – URBAN SOUTH OF OLD SCHOOL ROAD

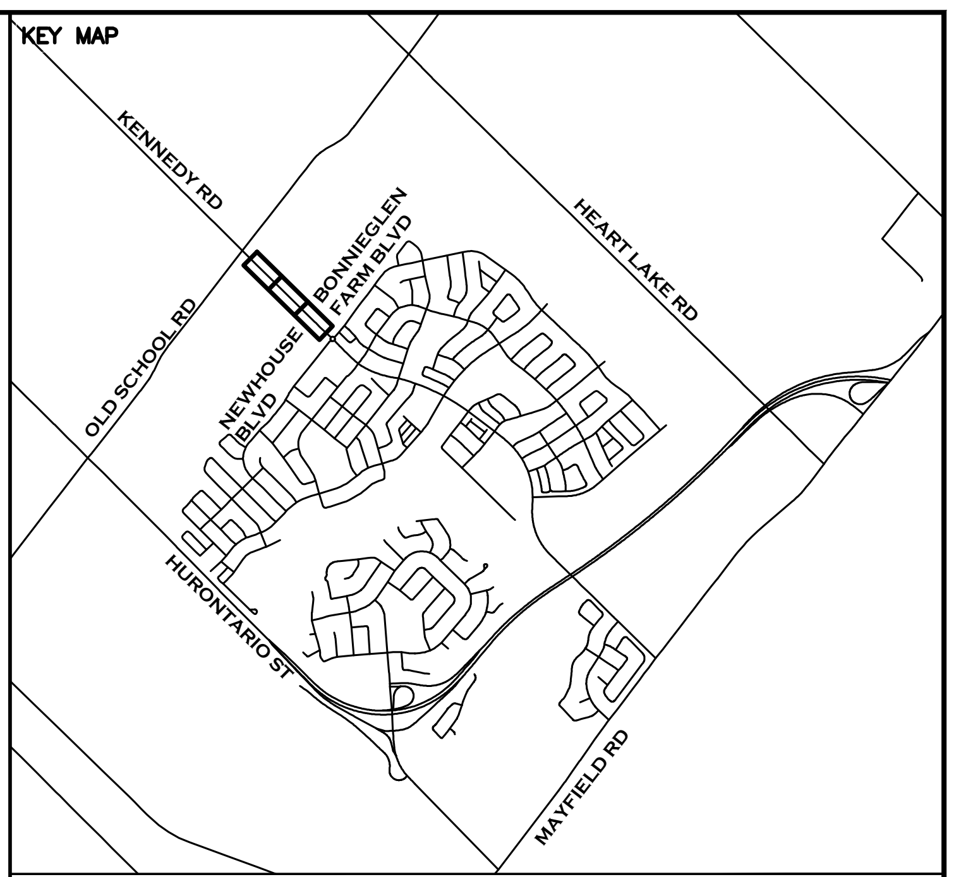
NTS



TYP 203 – URBAN IN FRONT OF TONY PONTES SCHOOL

NTS

KEY MAP



GENERAL NOTES

NO.	BY	DATE	REVISION	CONS. CHECKED	TOWN APPR'D
1	AO	03/19	PRELIMINARY DESIGN	WW	

BENCH MARK:

ENGINEER'S STAMP

PROJECT NAME

KENNEDY ROAD RECONSTRUCTION

CONSULTANT

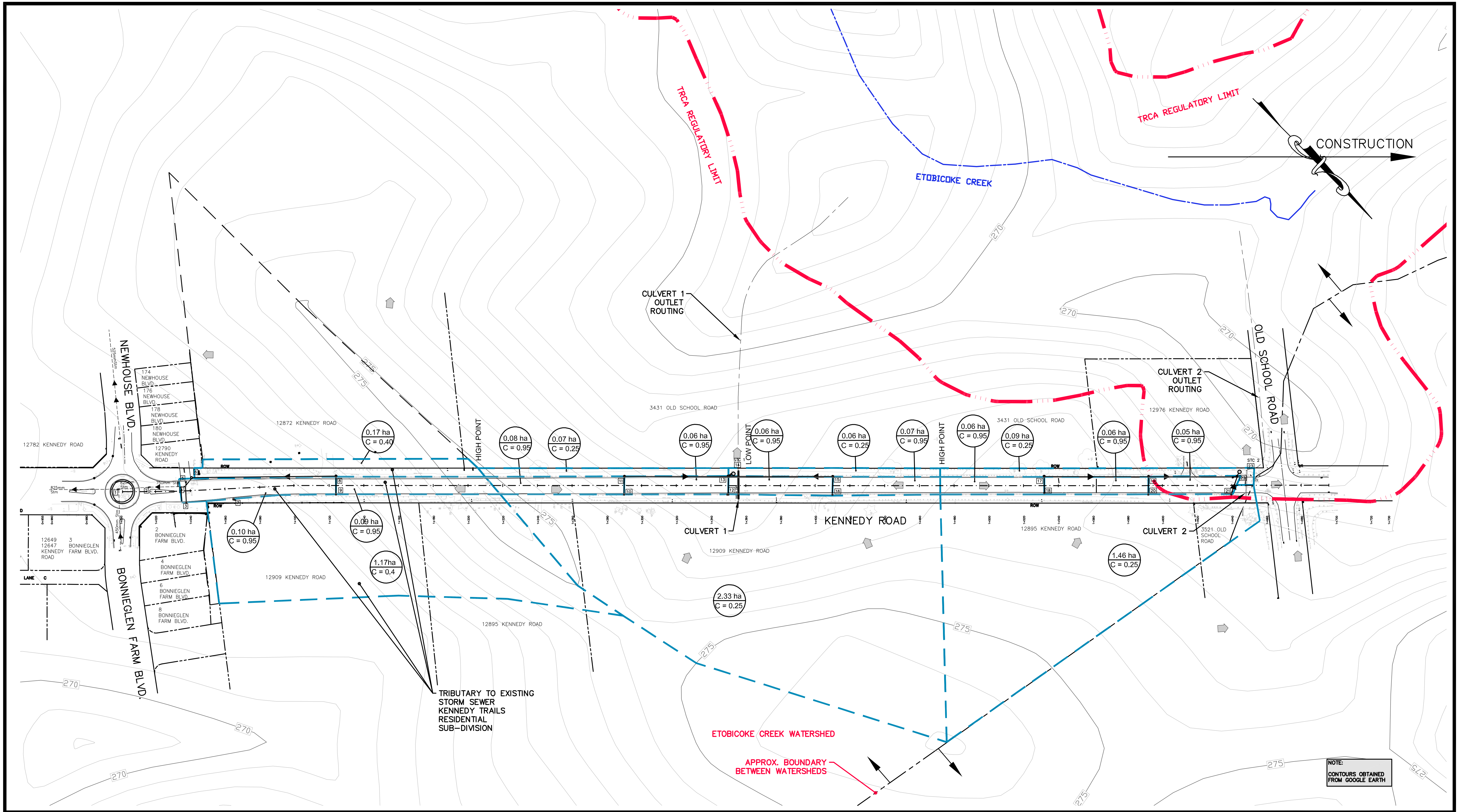
Chisholm, Fleming and Associates
consulting engineers

REGION OF PEEL

TOWN OF CALEDON

TYPICAL SECTION

SCALE: HORIZ. VERT.
DESIGNED BY: WW
DRAWN BY: AO
CHECKED BY: MVS
DATE: JANUARY 2019
PROJECT No. 256–16
DRAWING NO: TS



LEGEND

1.37ha — STORM DRAINAGE AREA IN ha

0.25 — RUNOFF COEFICIENT

▶ DENOTES SEWER DIRECTION

⇨ DENOTES OVERLAND FLOW

Scale 20 10 0 20

CONSULTANT

Chisholm, Fleming and Associates
consulting engineers

APPENDIX 4 - KENNEDY ROAD
DRAINAGE AREA PLAN
STORM SEWER
PROPOSED CONDITION

Town of Caledon

Appendix 4A. Drainage areas and runoff coefficients

Drainage Areas	Existing A (ha)	C	Proposed A (ha)	C
Stations 1+000 to 1+210				
Hard surface	0.223	0.95	0.191	0.95
Soft surface	1.307	0.40	1.339	0.40
Total	1.53	0.48	1.53	0.47
Stations 1+210 to 1+470				
East				
Hard surface	0.13	0.95		
Soft surface	2.34	0.25	2.33	0.25
Road			0.135	0.95
Total	2.47	0.29	2.465	0.29
West				
Hard surface	0.12	0.95		
Soft surface	0.14	0.25	0.13	0.25
Road			0.135	0.95
Total	0.26	0.57	0.265	0.61
Stations 1+470 to 1+650				
East				
Hard surface	0.094	0.95		
Soft surface	1.456	0.25	1.46	0.25
Road			0.09	0.95
Total	1.55	0.29	1.55	0.29
West				
Hard surface	0.09	0.95		
Soft surface	0.09	0.25	0.09	0.25
Road			0.085	0.95
Total	0.18	0.6	0.175	0.59
Total Project	5.99	0.36	5.985	0.36

$$i_{10} = \frac{2221}{(td + 12)^{0.908}}$$

TOWN OF CALEDON

SHEET No. 1 OF 1 DATE Nov. 2018

PUBLIC WORKS AND ENGINEERING DEPARTMENT
Appendix 5
STORM DRAINAGE DESIGN CHART
10 YEAR EVENT

CONSULTANT: CHISHOLM, FLEMING AND ASSOCIATES

MAJOR DRAINAGE AREA: KENNEDY ROAD BETWEEN BONNIEGLEN FARM BOULEVARD AND OLD SCHOOL ROAD

DESIGNED BY: Mercedes Hincapie

CHECKED BY: Mark Van Slooten

LOCATION					**DRAINAGE AREA**				**RUNOFF**				**PIPE SELECTION**								**PROFILE**						**NOTES / DESCRIPTIONS**
STREET	**FROM**		**TO**		A ha.	C	A*C	Cumul. A*C	Tc External min	Cumul. Tc min	i mm/h	Q m^3/s	Pipe L m	Pipe So m/m	Pipe Dia. mm	Actual Capacity (full) m^3/s	V (Average) m/s	ΔV Change in Velocity m/s	Time of Flow min	q/Q	**UPSTREAM**			**DOWNSTREAM**			
	MH No.	Sta.	MH No.	Sta.																	Surface Elev. m	Invert Elev. m	Cover m	Surface Elev. m	Invert Elev. m	Cover m	
Kennedy Road	8	1+124	6	1+043	0.09	0.95	0.086	0.086		10.00	134.162	0.032	82.9	0.0200	300	0.14	1.98		0.70	0.23	271.36	269.34	1.72	269.63	267.682	1.65	
	6	1+043	4	1+037	0.17	0.4	0.068	0.154		10.70	130.400	0.056	6.2	0.0100	300	0.10	1.41		0.07	0.56	269.63	267.66	1.67	269.71	267.598	1.81	
	4	1+037	2	1+017	0.10 1.17	0.95 0.40	0.563	0.717		10.77	130.036	0.259	20.5	0.0068	750	0.91	2.06		0.17	0.28	269.71	267.53	1.43		267.3906		
	11	1+290	13	1+350	0.06	0.95	0.057	0.057		10.00	134.162	0.021	60.0	0.0100	300	0.10	1.36		1.48	0.22	273.18	271.41	1.47	272.33	270.81	1.22	
	15	1+410	13	1+350	0.06	0.95	0.057	0.114		11.48	126.460	0.040	60.0	0.0070	300	0.08	1.13	0.22	0.88	0.50	273.07	271.42	1.35	272.33	271.00	1.03	
	13	1+350	14	STC1	0.12	0.95	0.114	0.228		12.36	99.877	0.063	1.7	0.0100	300	0.10	1.41	0.28	0.02	0.63	272.33	270.98	1.05		270.96		
	17	1+532	19	1+592	0.06	0.95	0.057	0.057		10.00	134.162	0.021	60.0	0.0350	300	0.18	2.54		1.48	0.12	273.11	271.09	1.72	271.31	268.99	2.02	
	19	1+592	22	1+644	0.06	0.95	0.057	0.114		11.48	126.460	0.040	54.0	0.0200	300	0.14	1.98	0.56	0.45	0.29	271.31	268.89	2.12	269.46	267.81	1.35	
	22	1+644	23	STC2	0.05	0.95	0.048	0.162		11.93	101.521	0.046	1.5	0.0070	300	0.08	1.13	0.85	0.02	0.57	269.46	267.79	1.37		267.78		

Y:\256-16 Kennedy Road Urbanization\2-PRELIMINARY DESIGN\Storm\Kennedy Rd-Storm Design.xls

Appendix 6

256-16 - Kennedy Road Crossing Culverts

Characteristic	**Existing Condition**		**Proposed Condition**	
	Culvert 1	**Culvert 2**	**Culvert 1**	**Culvert 2**
Material	CSP	PVC	HDPE	PVC
Diam. (mm)	500	600	600	600
L (m)	15.2	17.5	15.2	17.5
U/S Inv.	270.8	267.92	270.41	267.92
D/S Inv	270.39	267.68	270.29	267.68
S (%)	2.7	1.37	0.8	1.37
n, Manning Coef.	0.024	0.013	0.013	0.013
Station	1+355.7	1+648.3	1+355.7	1+648.4
Capacity (m^3/s)	0.34	0.72	0.55	0.72
Tributary Area (ha)	2.47	1.55	2.33	1.46
Composite Runoff Coefficient - C	0.29	0.30	0.25	0.25
Storm Events based on Town's IFD Curves and Tc = 10 min				
10 Year Storm				
$i_{10} = \frac{2221}{(td + 12)^{0.908}}$	134.162	134.162	134.162	134.162
Flow to be conveyed (m^3/s) Rational Method Q = 0.0028*C*I*A	0.27	0.17	0.22	0.14
100 Year Storm				
$i_{100} = \frac{3158}{(td + 15)^{0.9334}}$	196.536	196.536	196.536	196.536
Q (m^3/s)	0.394	0.256	0.321	0.201

Appendix 7a. OGS Units

STC-1			
Station 1+352			
	0.09 ha @	0.95 =	0.09
	0.07 ha @	0.95 =	0.07
	0.14 ha @	0.95 =	0.13
Total =	0.30 ha		0.29
C_{comp} =	0.95		
Impervious % =		107.1 %	use 100%
Impervious Area =		0.3 ha	0.30
Therefore: (Stormceptor Model 750)			

STC-2			
Station 1+615			
	0.07 ha @	0.95 =	0.07
	0.07 ha @	0.95 =	0.07
	0.06 ha @	0.95 =	0.06
Total =	0.20 ha		0.19
C_{comp} =	0.95		
Impervious % =		107.1 %	use 100%
Impervious Area =		0.2 ha	0.20
Therefore: (Stormceptor Model 750)			

* Impervious % = (C_{comp} - 0.2) / 0.7

* Impervious % = (C_{comp} - 0.2) / 0.7

Appendix 7a. OGS Units

STC-1			
Station 1+352			
	0.09 ha @	0.95 =	0.09
	0.07 ha @	0.95 =	0.07
	0.14 ha @	0.95 =	0.13
Total =	0.30 ha		0.29
C_{comp} =	0.95		
Impervious % =		107.1 %	use 100%
Impervious Area =		0.3 ha	0.30
Therefore: (Stormceptor Model 750)			

* Impervious % = (C_{comp} - 0.2) / 0.7

STC-2			
Station 1+615			
	0.07 ha @	0.95 =	0.07
	0.07 ha @	0.95 =	0.07
	0.06 ha @	0.95 =	0.06
Total =	0.20 ha		0.19
C_{comp} =	0.95		
Impervious % =		107.1 %	use 100%
Impervious Area =		0.2 ha	0.20
Therefore: (Stormceptor Model 750)			

* Impervious % = (C_{comp} - 0.2) / 0.7

Detailed Stormceptor Sizing Report – Kennedy Road

Project Information & Location			
Project Name	Kennedy Road	**Project Number**	256-16
City	Caledon	**State/ Province**	Ontario
Country	Canada	**Date**	12/6/2018
Designer Information		**EOR Information (optional)**	
Name	Maria Mercedes Hincapie	**Name**	
Company	Chisholm, Fleming and Associates	**Company**	
Phone #	905-474-1458	**Phone #**	
Email	mercedes.hincapie@chisholmfleming.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	Kennedy Road
Recommended Stormceptor Model	STC 750
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	84
PSD	Fine Distribution
Rainfall Station	TORONTO CENTRAL

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary

Stormceptor Model	% TSS Removal Provided	% Runoff Volume Captured Provided
STC 300	75	91
STC 750	84	96
STC 1000	85	96
STC 1500	85	96
STC 2000	88	98
STC 3000	89	98
STC 4000	92	100
STC 5000	92	100
STC 6000	93	100
STC 9000	95	100
STC 10000	95	100
STC 14000	97	100
StormceptorMAX	Custom	Custom

Stormceptor

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.
Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology

Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour).
Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

State/Province	Ontario	**Total Number of Rainfall Events**	2719
Rainfall Station Name	TORONTO CENTRAL	**Total Rainfall (mm)**	13185.4
Station ID #	0100	**Average Annual Rainfall (mm)**	732.5
Coordinates	45°30'N, 90°30'W	**Total Evaporation (mm)**	1309.4
Elevation (ft)	328	**Total Infiltration (mm)**	0.0
Years of Rainfall Data	18	**Total Rainfall that is Runoff (mm)**	11876.0

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Drainage Area

Total Area (ha)	0.3
Imperviousness %	100.0

Up Stream Storage

Storage (ha-m)	**Discharge (cms)**
0.000	0.000

Water Quality Objective

TSS Removal (%)	80.0
Runoff Volume Capture (%)	90.00
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	79.00
Water Quality Flow Rate (L/s)	79.00

Up Stream Flow Diversion

Max. Flow to Stormceptor (cms)	

Design Details

Stormceptor Inlet Invert Elev (m)	270.96
Stormceptor Outlet Invert Elev (m)	270.91
Stormceptor Rim Elev (m)	272.33
Normal Water Level Elevation (m)	
Pipe Diameter (mm)	300
Pipe Material	PVC - plastic
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution

Particle Diameter (microns)	**Distribution %**	**Specific Gravity**
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	Kennedy Road

Site Details

Drainage Area	
Total Area (ha)	0.3
Imperviousness %	100.0

Surface Characteristics	
Width (m)	110.00
Slope %	2
Impervious Depression Storage (mm)	0.508
Pervious Depression Storage (mm)	5.08
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency	
Maintenance Frequency (months) >	12

Infiltration Parameters	
Horton's equation is used to estimate infiltration	
Max. Infiltration Rate (mm/hr)	61.98
Min. Infiltration Rate (mm/hr)	10.16
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation	
Daily Evaporation Rate (mm/day)	2.54

Dry Weather Flow	
Dry Weather Flow (lps)	0

Winter Months	
Winter Infiltration	0

TSS Loading Parameters

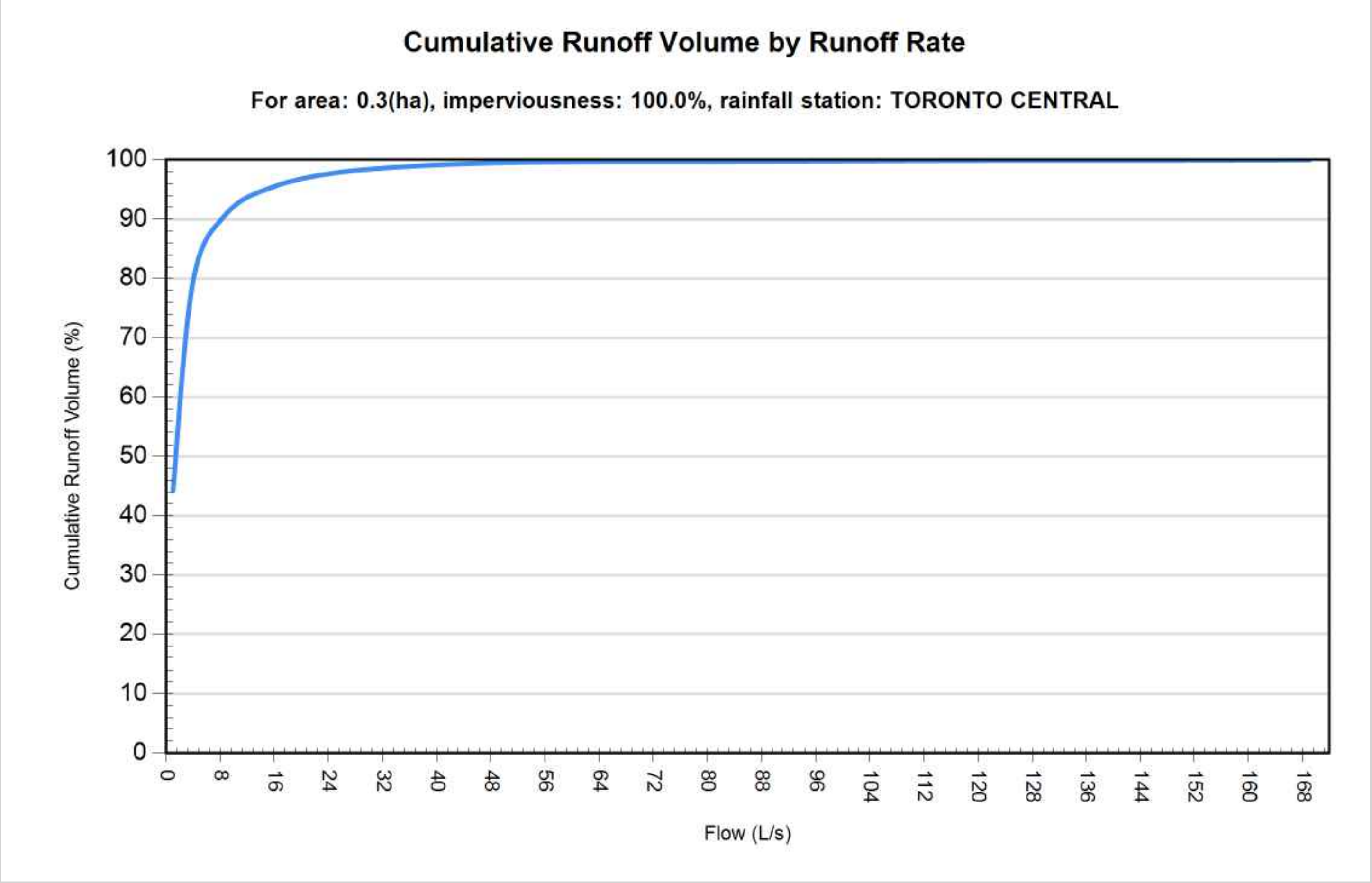
TSS Loading Function	

Buildup/Wash-off Parameters	
Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

TSS Availability Parameters	
Availability Constant A	
Availability Factor B	
Availability Exponent C	
Min. Particle Size Affected by Availability (micron)	

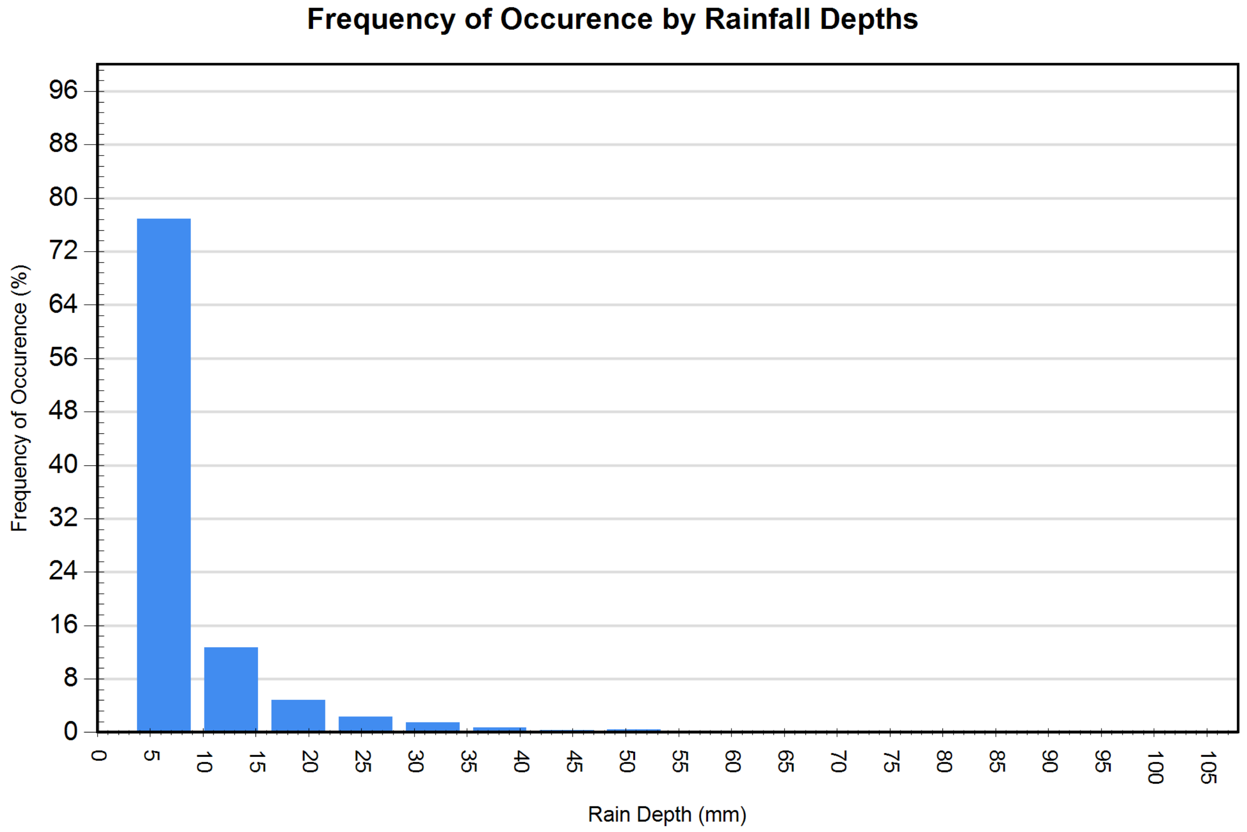
Cumulative Runoff Volume by Runoff Rate

Runoff Rate (L/s)	Runoff Volume (m³)	Volume Over (m³)	Cumulative Runoff Volume (%)
1	15888	20053	44.2
4	28650	7292	79.7
9	32697	3245	91.0
16	34342	1600	95.5
25	35155	787	97.8
36	35561	381	98.9
49	35762	180	99.5
64	35817	125	99.7
81	35848	95	99.7
100	35871	71	99.8
121	35890	52	99.9
144	35910	32	99.9
169	35933	9	100.0



Rainfall Event Analysis

Rainfall Depth (mm)	No. of Events	Percentage of Total Events (%)	Total Volume (mm)	Percentage of Annual Volume (%)
6.35	2091	76.9	3344	25.4
12.70	345	12.7	3201	24.3
19.05	131	4.8	2062	15.6
25.40	63	2.3	1358	10.3
31.75	42	1.5	1185	9.0
38.10	20	0.7	678	5.1
44.45	9	0.3	377	2.9
50.80	11	0.4	521	4.0
57.15	3	0.1	159	1.2
63.50	1	0.0	61	0.5
69.85	0	0.0	0	0.0
76.20	1	0.0	73	0.6
82.55	1	0.0	80	0.6
88.90	1	0.0	85	0.6
95.25	0	0.0	0	0.0
101.60	0	0.0	0	0.0



For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications

Detailed Stormceptor Sizing Report – Kennedy Road

Project Information & Location			
Project Name	Kennedy Road	**Project Number**	256-16
City	Caledon	**State/ Province**	Ontario
Country	Canada	**Date**	12/6/2018
Designer Information		**EOR Information (optional)**	
Name	Maria Mercedes Hincapie	**Name**	
Company	Chisholm, Fleming and Associates	**Company**	
Phone #	905-474-1458	**Phone #**	
Email	mercedes.hincapie@chisholmfleming.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	Kennedy Road
Recommended Stormceptor Model	STC 750
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	87
PSD	Fine Distribution
Rainfall Station	TORONTO CENTRAL

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary		
Stormceptor Model	**% TSS Removal Provided**	**% Runoff Volume Captured Provided**
STC 300	79	94
STC 750	87	98
STC 1000	88	98
STC 1500	89	98
STC 2000	91	99
STC 3000	92	99
STC 4000	94	100
STC 5000	94	100
STC 6000	95	100
STC 9000	97	100
STC 10000	97	100
STC 14000	98	100
StormceptorMAX	Custom	Custom

Stormceptor
The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.
Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology
Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour).
Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

State/Province	Ontario	**Total Number of Rainfall Events**	2719
Rainfall Station Name	TORONTO CENTRAL	**Total Rainfall (mm)**	13185.4
Station ID #	0100	**Average Annual Rainfall (mm)**	732.5
Coordinates	45°30'N, 90°30'W	**Total Evaporation (mm)**	1291.9
Elevation (ft)	328	**Total Infiltration (mm)**	0.0
Years of Rainfall Data	18	**Total Rainfall that is Runoff (mm)**	11893.5

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Drainage Area

Total Area (ha)	0.2
Imperviousness %	100.0

Up Stream Storage

Storage (ha-m)	**Discharge (cms)**
0.000	0.000

Water Quality Objective

TSS Removal (%)	80.0
Runoff Volume Capture (%)	90.00
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	79.00
Water Quality Flow Rate (L/s)	79.00

Up Stream Flow Diversion

Max. Flow to Stormceptor (cms)	

Design Details

Stormceptor Inlet Invert Elev (m)	267.78
Stormceptor Outlet Invert Elev (m)	267.73
Stormceptor Rim Elev (m)	269.46
Normal Water Level Elevation (m)	
Pipe Diameter (mm)	300
Pipe Material	PVC - plastic
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution

Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	Kennedy Road

Site Details

Drainage Area

Total Area (ha)	0.2
Imperviousness %	100.0

Surface Characteristics

Width (m)	89.00
Slope %	2
Impervious Depression Storage (mm)	0.508
Pervious Depression Storage (mm)	5.08
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency

Maintenance Frequency (months) >	12

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (mm/hr)	61.98
Min. Infiltration Rate (mm/hr)	10.16
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation

Daily Evaporation Rate (mm/day)	2.54

Dry Weather Flow

Dry Weather Flow (lps)	0

Winter Months

Winter Infiltration	0

TSS Loading Parameters

TSS Loading Function	

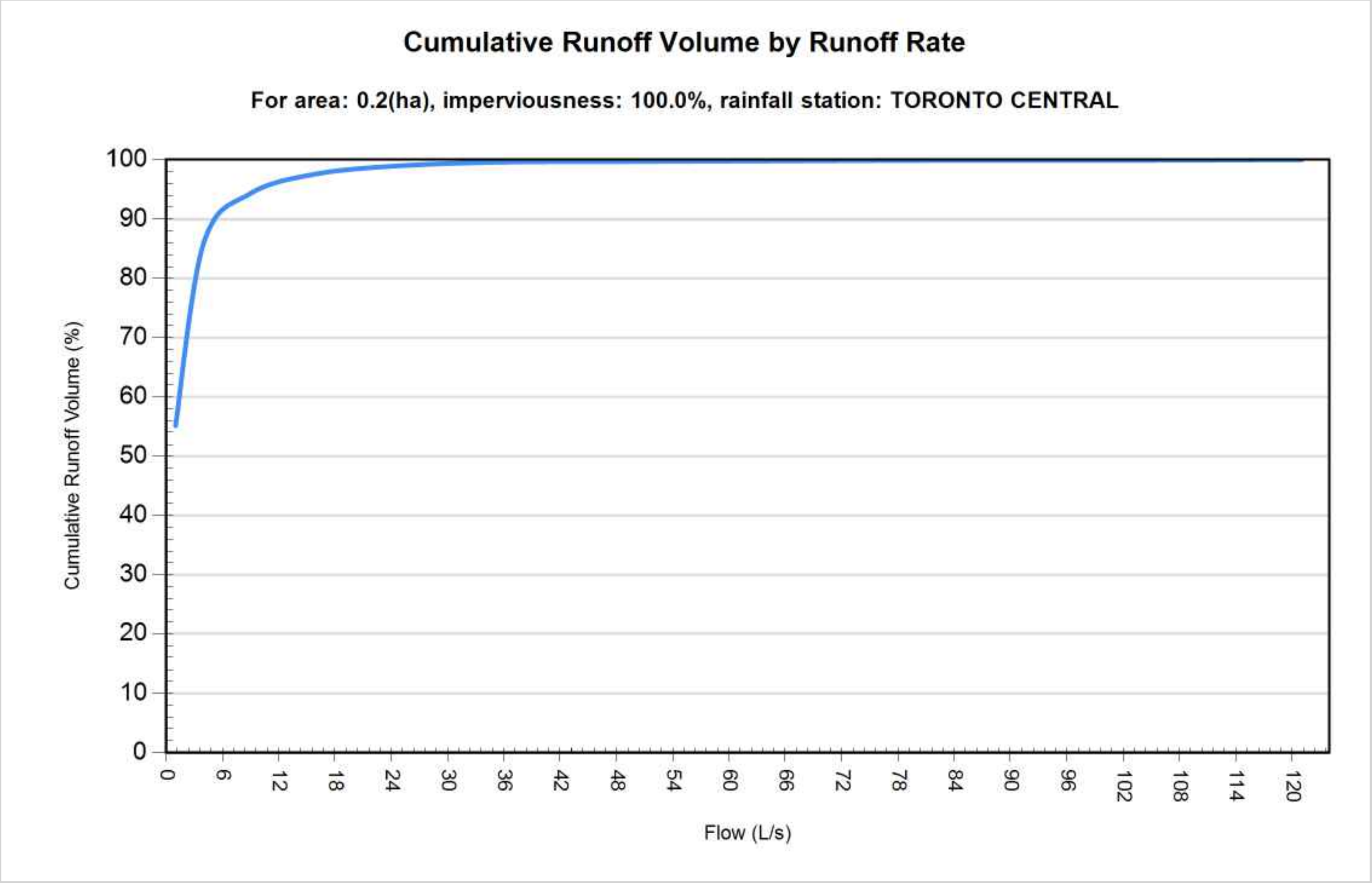
Buildup/Wash-off Parameters

Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

TSS Availability Parameters

Availability Constant A	
Availability Factor B	
Availability Exponent C	
Min. Particle Size Affected by Availability (micron)	

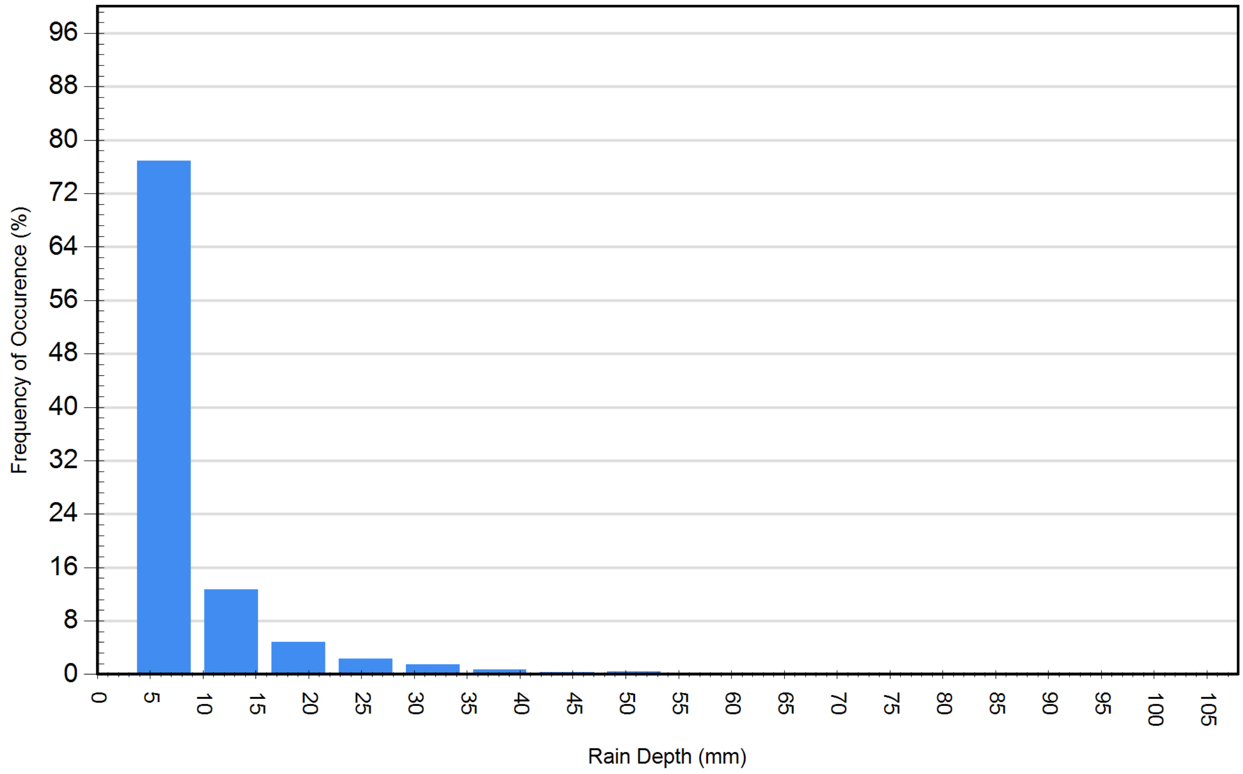
Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (L/s)	Runoff Volume (m³)	Volume Over (m³)	Cumulative Runoff Volume (%)
1	13233	10777	55.1
4	20652	3357	86.0
9	22645	1365	94.3
16	23436	573	97.6
25	23774	235	99.0
36	23907	102	99.6
49	23937	72	99.7
64	23959	50	99.8
81	23974	35	99.9
100	23991	18	99.9
121	24009	0	100.0



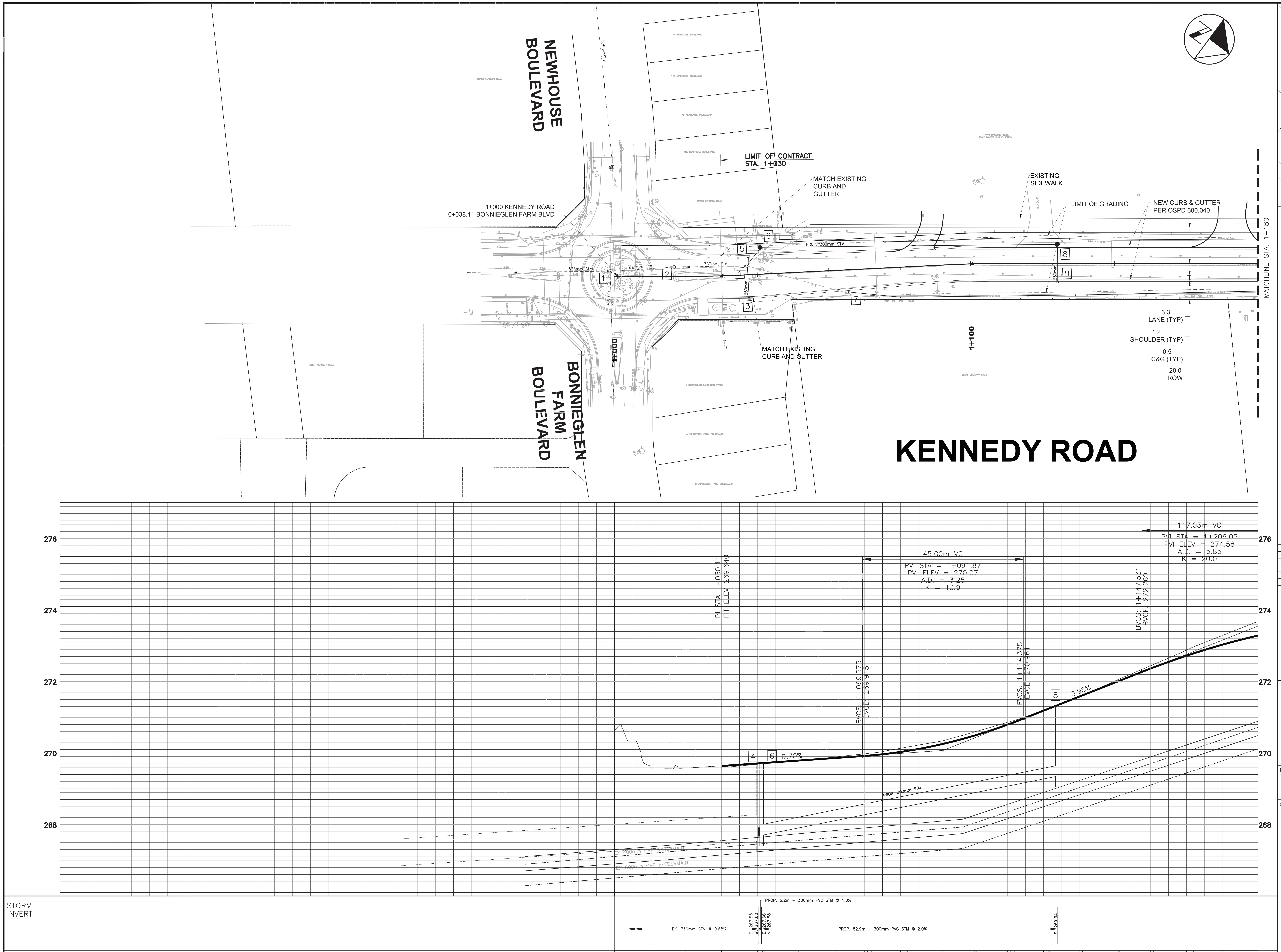
Rainfall Event Analysis

Rainfall Depth (mm)	No. of Events	Percentage of Total Events (%)	Total Volume (mm)	Percentage of Annual Volume (%)
6.35	2091	76.9	3344	25.4
12.70	345	12.7	3201	24.3
19.05	131	4.8	2062	15.6
25.40	63	2.3	1358	10.3
31.75	42	1.5	1185	9.0
38.10	20	0.7	678	5.1
44.45	9	0.3	377	2.9
50.80	11	0.4	521	4.0
57.15	3	0.1	159	1.2
63.50	1	0.0	61	0.5
69.85	0	0.0	0	0.0
76.20	1	0.0	73	0.6
82.55	1	0.0	80	0.6
88.90	1	0.0	85	0.6
95.25	0	0.0	0	0.0
101.60	0	0.0	0	0.0

Frequency of Occurence by Rainfall Depths

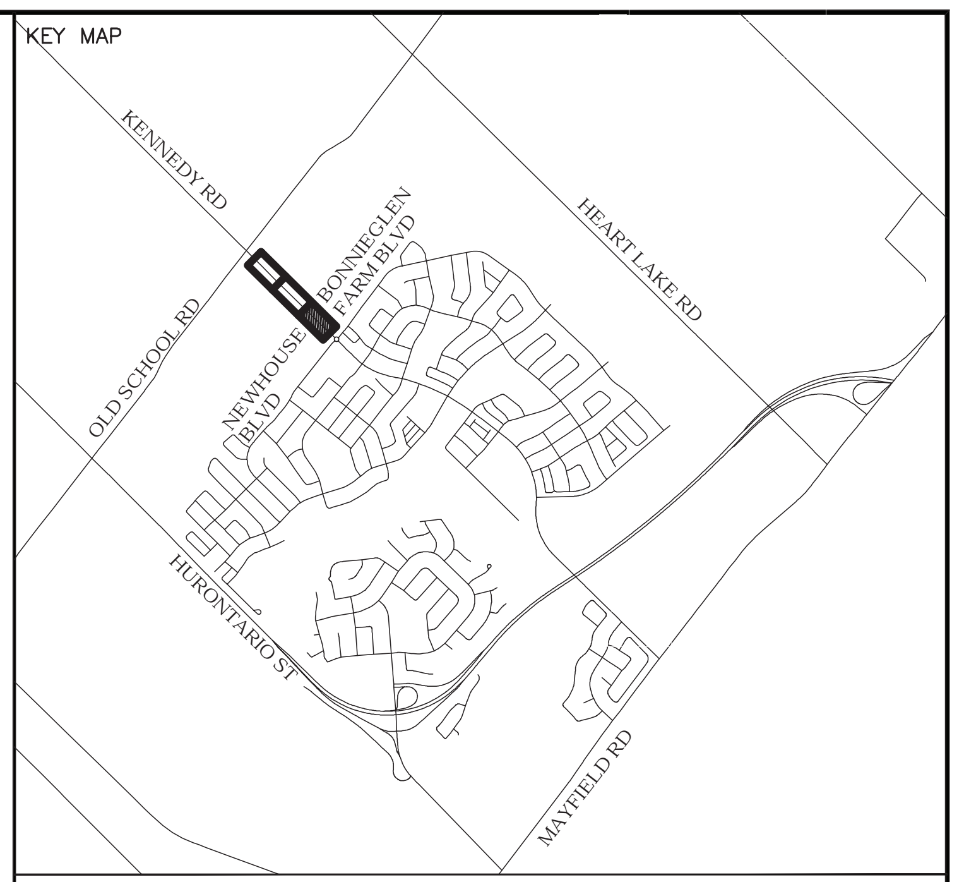


For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications



℄ CHAINAGE	EXISTING & PROPOSED ℄ RD GRADES	
1+010	269.64	
1+020	269.58	
1+030	269.64	
1+040	269.68	269.709
1+050	269.78	269.779
1+060	269.87	269.849
1+070	269.98	269.920
1+080	270.13	270.030
1+090	270.31	270.213
1+100	270.57	270.468
1+110	270.86	270.795
1+120	271.21	271.183
1+130	271.60	271.577
1+140	272.02	271.972
1+150	272.44	272.365
1+160	272.88	272.723
1+170	273.29	273.030
1+	273.68	

KEY MAP



GENERAL NOTES

NO.	BY	DATE	REVISION	CONS. CHECKED	TOWN APPR'D

BENCH MARK:

ENGINEER'S STAMP

NOT FOR CONSTRUCTION

D. LOVERIDGE, P. ENG.
DIRECTOR OF PUBLIC WORKS

DATE

PROJECT NAME

KENNEDY ROAD RECONSTRUCTION

CONSULTANT

Chisholm, Fleming and Associates
consulting engineers

REGION OF PEEL

Town of Caledon

PLAN AND PROFILES

STA. 1+000 TO STA. 1+180

SCALE: HORIZ. 1:500 VERT. 1:50

PROJECT No.

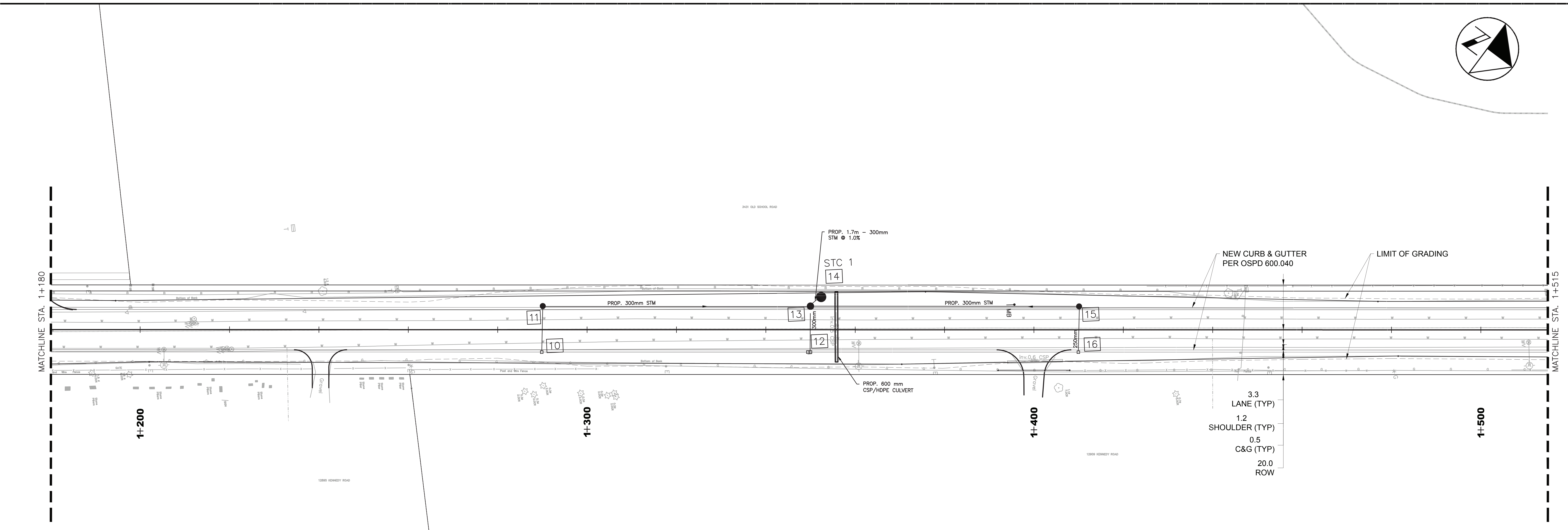
DESIGNED BY:

DRAWN BY:

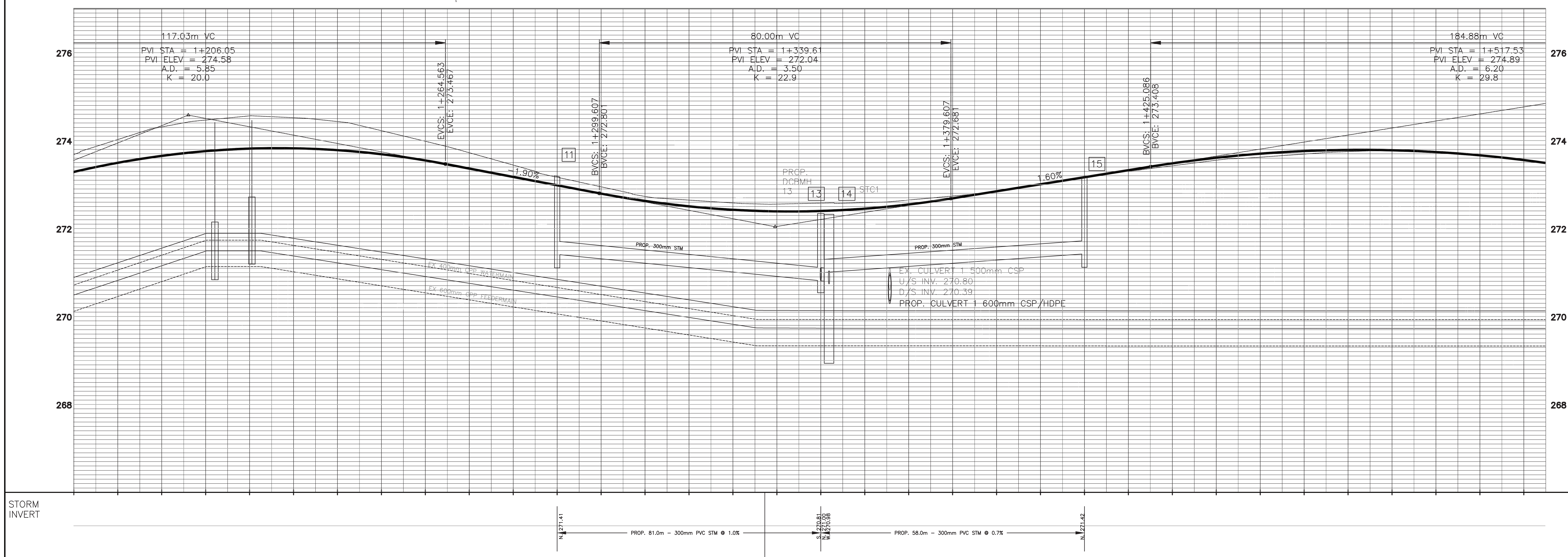
CHECKED BY:

DATE:

FIGURE: 6–3



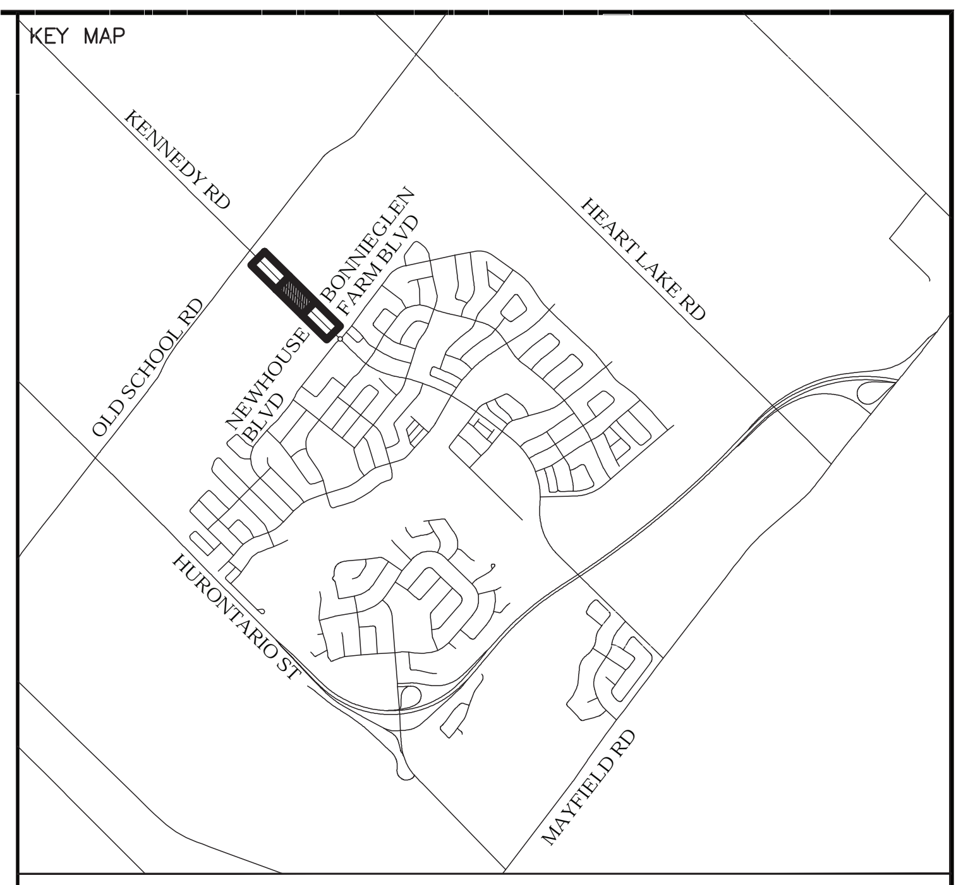
KENNEDY ROAD



EXISTING & PROPOSED ℄ RD GRADES	273.287	274.02 273.495	274.31 273.652	274.47 273.760	274.56 273.818	274.52 273.825	274.43 273.783	274.22 273.691	273.98 273.549	273.72 273.364	273.44 273.174	273.17 272.984	272.95 272.794	272.73 272.627	272.65 272.505	272.58 272.426	272.56 272.391
℄ CHAINAGE	180	1+190	1+200	1+210	1+220	1+230	1+240	1+250	1+260	1+270	1+280	1+290	1+300	1+310	1+320	1+330	1+340

EXISTING & PROPOSED ℄ RD GRADES	272.58 272.399	272.59 272.451	272.65 272.547	272.74 272.687	272.84 272.847	273.00 273.007	273.15 273.167	273.30 273.327	273.43 273.482	273.55 273.609	273.62 273.702	273.69 273.762	273.75 273.788	273.76 273.780	273.74 273.739	273.66 273.665	273.57 273.557
℄ CHAINAGE	1+350	1+360	1+370	1+380	1+390	1+400	1+410	1+420	1+430	1+440	1+450	1+460	1+470	1+480	1+490	1+500	1+510

KEY MAP



GENERAL NOTES

NO.	BY	DATE	REVISION	CONS. CHECKED	TOWN APPR'D

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D. LOVERIDGE, P. ENG.
DIRECTOR OF PUBLIC WORKS

DATE

PROJECT NAME

KENNEDY ROAD RECONSTRUCTION

CONSULTANT

Chisholm, Fleming and Associates
consulting engineers

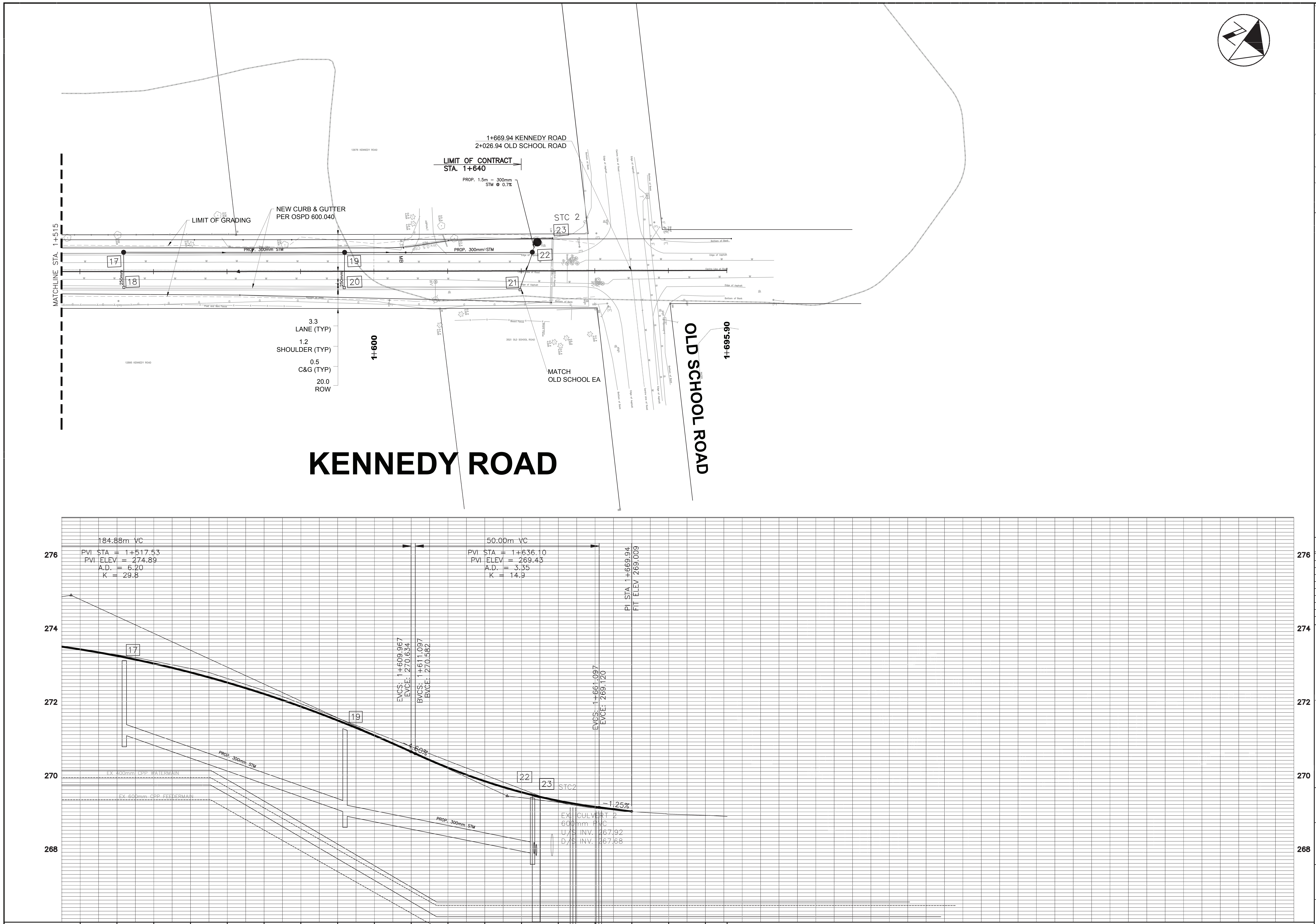
REGION OF PEEL

Town of Caledon

PLAN AND PROFILES

STA. 1+180 TO STA. 1+515

SCALE: HORIZ. 1:500 VERT. 1:50
PROJECT No.
DESIGNED BY:
DRAWN BY:
CHECKED BY:
DATE:
FIGURE: 6–4



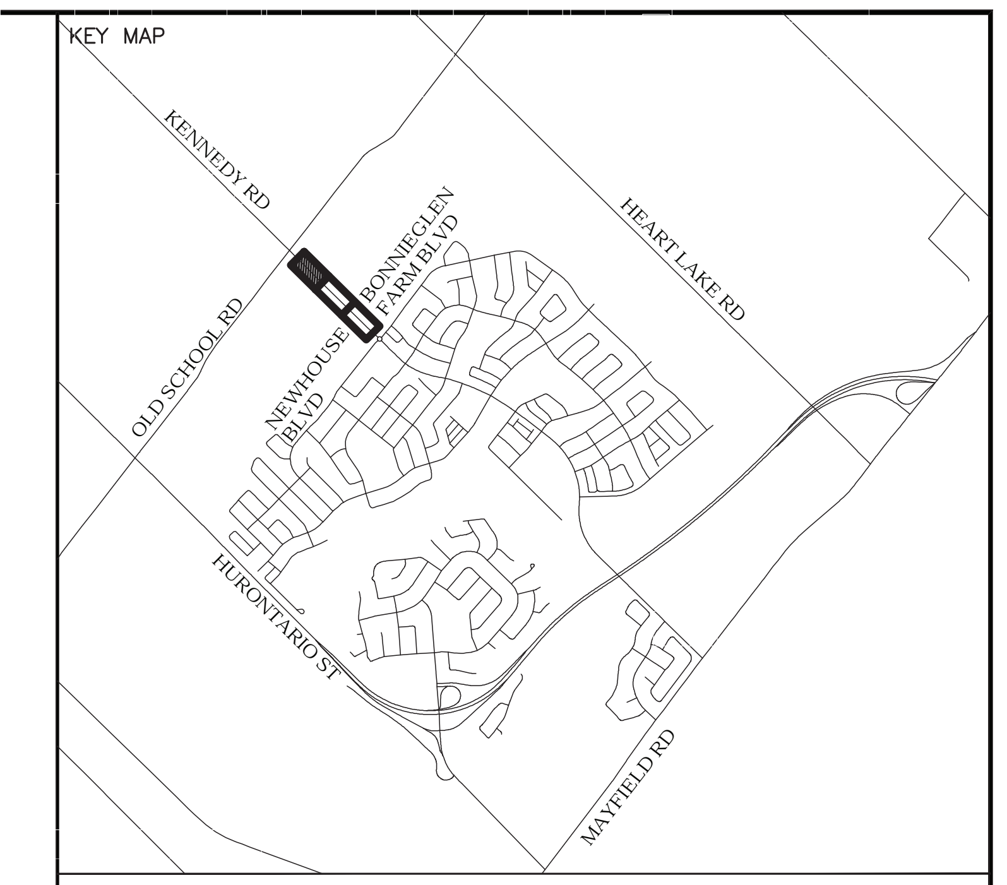
STORM INVERT

N. 271.09 ← PROP. 60.0m – 300mm PVC STM @ 3.5% → S. 268.99 N. 268.89 ← PROP. 51.0m – 300mm PVC STM @ 2.0% → S. 267.81 N. 267.79 E. 267.78 W. 267.73

PROP. 1.5m – 300mm PVC STM @ 0.7%

℄ CHAINAGE	1+520	1+530	1+540	1+550	1+560	1+570	1+580	1+590	1+600	1+610	1+620	1+630	1+640	1+650	1+660	1+670	1+680	1+690
EXISTING & PROPOSED ℄ RD GRADES	273.42 273.415	273.27 273.240	273.10 273.032	272.90 272.789	272.62 272.514	272.30 272.205	271.94 271.862	271.55 271.486	271.16 271.076	270.77 270.633	270.39 270.199	270.00 269.832	269.62 269.533	269.27 269.300	269.09 269.134	269.00	268.94	268.91

KEY MAP



GENERAL NOTES

NO.	BY	DATE	REVISION	CONS. CHECKED	TOWN APPR'D

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ENGINEER'S STAMP

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CONSULTANT

Chisholm, Fleming and Associates
consulting engineers

REGION OF PEEL

Town of Caledon

PLAN AND PROFILES

STA. 1+515 TO STA. 1+690

SCALE: HORIZ. 1:500 VERT. 1:50

PROJECT No.

DESIGNED BY:

DRAWN BY:

CHECKED BY:

DATE:

FIGURE: 6–5

APPENDIX G

Geotechnical and Geoenvironmental Report (SOLA)

SOLA
ENGINEERING

RE: GEOTECHNICAL INVESTIGATION
PROPOSED KENNEDY ROAD URBANIZATION
KENNEDY ROAD BETWEEN BONNIEGLEN FARM BLVD AND OLD SCHOOL ROAD
CALEDON, ONTARIO

FOR: Chisholm Fleming and Associates
317 Renfrew Drive, Suite 301
Markham, Ontario
L3R 9S8

ATTENTION: Mr. Andrew Ostler

REPORT NO.: 2018-12448

DATE: December 21, 2018

DISTRIBUTION: PDF Copy: Chisholm Fleming and Associates
- Mr. Andrew Ostler [Andrew.ostler@chisholmfleming.com]

Original: (File No. 10433-S0221-GEO)

TABLE OF CONTENTS

TABLES

ENCLOSURES

APPENDIX A

SOIL CHEMICAL TESTING RESULTS

December 21, 2018 **REPORT NO.: 2018-12448**

FILE NO.: 10433-S0221-GEO

1.0 INTRODUCTION

Sola Engineering Inc. (Sola) was retained by Mr. Andrew Ostler of Chisholm Fleming and Associates (the Client) to carry out a geotechnical investigation for the proposed Kennedy Road urbanization located on Kennedy Road between Bonnieglen Farm Boulevard and Old School Road, in Caledon, Ontario (the subject site or site). Authorization to proceed with the investigation was received on August 14, 2018 through the acceptance of Sola's Proposal No. 2018-1674 dated March 9, 2018, in response to RFP 2018-35.

As per the scope of services detailed in Sola's proposal, the purpose of this investigation is to collect information on the soil and groundwater conditions at the subject site and based on the investigation data, provide recommendations to assist with the design of the proposed site works.

This report presents the details of Sola's fieldwork and laboratory testing, outlines the soil and groundwater conditions at the site, and provides comments on the aforementioned items.

This report has been prepared for the Client, and their nominated engineers and designers. Third party use or reproduction, in part or in full, of this report is prohibited without written authorization from Sola. This report is also subject to the Statement of Limitations which forms an integral part of this document.

2.0 SITE SETTING

2.1 SITE LOCATION, DESCRIPTION AND PROPOSED DEVELOPMENT

The subject site is located on Kennedy Road between Bonnieglen Farm Boulevard and Old School Road, in Caledon, Ontario. The subject site is currently occupied by an existing roadway under the jurisdiction of the Town of Caledon.

The roadway section is mainly used for daily commuters, local commercial tenants as well as agricultural facility users. Occasional heavy vehicles were observed during the time of the field work.

The total length of the roadway investigated is approximately 650 meters. It is proposed to carry out road urbanization at the subject site.

2.2 PUBLISHED GEOLOGY

Based on a review of the existing geological publication for the site area, Ontario Geological Survey (OGS) Map 2275: “*Quaternary Geology, Bolton (Southern Ontario)”,* the site surrounding area is underlain by Deltaic and lacustrine sands, some silt and gravels. According to the OGS Map M2544: “*Bedrock Geology of Ontario – Southern Ontario*”, the superficial geology is underlain by bedrock of the Upper Ordovician Queenston Formation, comprising Shale, Limestone, Dolostone, and Siltstone. Based on the data from records for Borehole ID 590056, the soil profile comprises mainly sand.

3.0 GROUND INVESTIGATION

3.1 FIELD INVESTIGATION

3.1.1 Soil Investigation

Prior to undertaking field drilling, Sola obtained clearances of existing public utility services to the site from all applicable agencies and companies. In addition, private utility locates were also carried out.

The geotechnical field program was carried out on September 26 and 27, 2018 and comprised the drilling of thirteen (13) boreholes. The boreholes were advanced through the existing ground surface to the depths ranging from approximately 1.98 m to 2.13 m below the ground surface using a Beaver drill rig with solid stem continuous flight auger and rope hammer for split spoon sampling. The approximate locations of the boreholes are shown in **Enclosures 1A to 1C**.

All drilling equipment was supplied and operated by Geotech Support Services of Markham, Ontario, and the drilling works were completed under the full-time supervision of a qualified Sola Technician.

Standard Penetration Tests (SPTs) split spoon samples were collected in the drilled borehole using a 50 mm outer diameter and 35 mm inner diameter split barrel sampler driven with a 63.5 kg hammer dropping 760 mm. All soil samples were logged in the field and returned to Sola’s laboratory in Vaughan for review and subsequent laboratory testing.

The logs of the boreholes completed are presented in **Enclosures 2 to 14**.

3.1.2 Groundwater Investigation

Groundwater level observations were made during drilling and in the open borehole upon completion of the drilling operations. Details of groundwater observations for the boreholes are presented on the borehole logs in **Enclosures 2 to 14**. Further discussion on groundwater is provided in **Section 5.2** of this report.

3.2 GEOTECHNICAL LABORATORY TESTING

All soil samples were submitted to Sola's laboratory for natural moisture content determination. The results of the moisture content are presented in the borehole logs in **Enclosures 2 to 14**. In addition, four (4) granular base/sub-base samples were submitted for particle size analysis. The results of the laboratory tests are provided in **Enclosures 17 to 20**.

4.0 PAVEMENT

No historical information was available about Kennedy Road at the time of preparing this report. Prior to the advancement of the boreholes in the investigation, the condition of the roadway was briefly assessed.

The overall asphalt pavement appeared good to excellent. The pavement surface was generally even with local transverse cracking and edge cracking. In general, frequent slight to moderate pavement shoulder edge drop-off was observed. Surface cracks unsealed. It appears that the ditch is functioning.

Figure 1: Overall Pavement Condition - Noting Local Transverse Cracking and Pavement Shoulder Edge Drop Off [GH 20180824]

5.0 SUBSURFACE CONDITIONS

5.1 SOIL CHARACTERISATION

5.1.1 Pavement

A layer of asphaltic concrete was initially encountered at all boreholes and the thicknesses ranged from approximately 110 mm to 150 mm.

Below the asphaltic concrete layer, a layer of granular base/sub-base layer was encountered and the thicknesses ranged from approximately 75 mm to 610 mm.

5.1.2 Fill Materials (including Probable Fill)

Fill materials were encountered below the pavement structure at all borehole locations. The thicknesses of the fill materials were from approximately 0.91 m to 1.76 m.

Fill was not fully penetrated in boreholes BH2 to BH7, BH9, BH10, BH12 and BH13.

Fill materials generally consisted sandy silt to silty sand and sand with gravel. The fill was dark brown to brown in colour. In-situ resistance testing result ranged from 3 to 100 blows per 300 mm of spoon penetration, indicating that the fill was lightly to highly compacted.

In the fill layer, the moisture content ranged from 2.0% to 18.7%, indicating a moist condition.

5.1.3 Native Soils

Sandy silt till and silty sand was encountered below the fill materials in boreholes BH1, BH8 and BH11 at depth of approximately 1.52 m below the ground surface.

SPT "N" values for the native soils were recorded between 9 to 18 blows per 300 mm of spoon penetration, indicating the layer to be in a loose to compact condition.

In the native soils, the moisture content ranged from 7.5% to 12.7%, indicating a moist condition.

5.2 GROUNDWATER

The groundwater condition encountered during drilling and cave in depths are presented on the borehole logs in **Enclosures 2 to 14** as well as in **Table 1**.

Table 1: Borehole Water Depth and Cave-in upon Completion of Drilling

Borehole Number	Water Depth Upon Drilling Completion (mBGS)	Cave-in Depth Upon Drilling Completion (mBGS)
1	Dry	0.69
2	Dry	1.22
3	Dry	1.07
4	Dry	0.91
5	Dry	1.27
6	Dry	0.91
7	Dry	0.91
8	Dry	1.07
9	Dry	1.22
10	Dry	0.91
11	Dry	0.97
12	Dry	0.76
13	Dry	0.91

Note: mBGS = meters below ground surface

It should be noted that water levels can vary in response to seasonal fluctuations and major weather events. In addition, a perched water condition can occur due to the accumulation of surface water in the more pervious fill overlying less pervious deposits, especially during seasonally wetter periods.

5.3 FIELD INVESTIGATION DATA AND LABORATORY TESTING RESULTS

A detailed description of the subsurface conditions encountered in the boreholes completed at the site is presented on the borehole logs in **Enclosures 2 to 14**. The generalized sub-surface conditions encountered are summarized as follows.

The general sequence of strata comprised an asphaltic concrete layer with a thickness varying between 110 mm and 150 mm overlying a layer of granular base/sub-base materials with a thickness ranging from 75 mm to 610 mm.

The existing pavement structure is supported on fill materials. The borehole data shows relative consistency in the character and condition of the subgrade soil across the site. Generally, the fill materials encountered in the boreholes underlying the pavement structure comprised a layer of sandy silt to silty sand or sand with gravel. The native soil strata encountered in boreholes BH1, BH8 and BH11 underlying the fill materials comprised a layer of sandy silt till or silty sand.

Based on the geology encountered during the investigation, the groundwater level appeared to be low as all the boreholes are dry upon completion of drilling.

The natural moisture content indicated a moist condition of the subgrade. Based on local experience, the sandy subgrade is considered low frost susceptible but at some locations, where silt content is high, should be considered as moderate frost susceptible.

Pavement life expectancy is related to its course thicknesses and the material qualities. As a rule of thumb in the imperial pavement design, the pavement strength can be estimated based on the Granular Base Equivalency (GBE).

The encountered strata are presented on the attached Borehole Records in **Enclosures 2 to 14** of this report. The borehole profiles are shown in **Table 2.**

Table 2: Details of Layer Thicknesses for Pavement Structure and Fill Materials

Borehole Number	Layer Thicknesses (mm)		Initial GBE	Observed Pavement Condition
	Asphaltic Concrete	Granular Base/Sub-base		
BH1	115	495	725	Good
BH2	150	405	705	Good
BH3	150	485	785	Good
BH4	150	460	760	Good
BH5	150	610	910	Good
BH6	150	75	375	Good
BH7	150	150	450	Good
BH8	150	460	760	Good
BH9	150	150	450	Good
BH10	130	330	590	Good
BH11	115	340	570	Good
BH12	150	410	710	Poor to fair
BH13	110	250	470	Poor to fair
Average	140	355	635	

Note: the split spoon sampler has a size limitation for the samples which can be taken from the ground. Auger samples tend to represent a mixture of multiple soil layers. The gradation distributions of granular layers cannot be accurately estimated based on the small samples taken from the borehole investigation.

6.0 DISCUSSION AND RECOMMENDATIONS

The investigation and comments should be considered ongoing as new information of the underground conditions will continue to become available. When more specific information is available with respect to the soil conditions, the interpretation and the recommendations of this report must therefore be checked through field inspections carried out by Sola to validate the information for use during construction.

6.1 FROST PROTECTION

For design purposes, a frost depth of 1.4 m should be used.

6.2 PAVEMENT

In general, all roadway work shall conform with the Town of Caledon's Standard Specifications.

Pavement structure adjoining the proposed urbanization areas should be protected from damages resulting from construction activities. All heavy vehicles should be appropriately planned and re-routed to avoid such damages.

The pavement structure abutting existing pavement should match the depth of the existing pavement structure, if applicable, to allow drainage flow.

Where the new asphalt abuts existing pavement, if any, proper lap joints should be constructed in accordance with OPSS 310. The existing asphalt edges should be provided with a proper sawcut edge prior to the construction of new asphalt or the curb and/or the gutter. It should be ensured that any undermined or broken edges resulting from the construction activities are removed by sawcut.

6.2.1 Pavement Thickness Design

For pavement construction, if contemplated, the existing subgrade soils, when compacted and proof rolled, will be competent to support a conventional pavement structural thickness. Any unsuitable soils, such as topsoil/organic mixed soil and other spongy materials, if found, should be sub-excavated and replaced with approved materials and the profiled subgrade compacted to 98% of its Standard Proctor Maximum Dry Density (SPMDD).

The pavement construction may consist of upfilling (if applicable) from the prepared subgrade surface to the underside of the granular base layer using well-graded granular subbase material (OPSS Granular B-Type I) up to a maximum thickness of 500 mm. The material should be laid and compacted in thin lifts to at least 100% of its SPMDD. For local roadway, the pavement thickness design should conform to the Town of Caledon's Standard Designs No. 203 to 205 as shown in **Table 3**.

Table 3: Recommended Pavement Design

Pavement Component	Local Urban/Rural (mm)	Local Through/Urban and Neighbourhood Collector (mm)	Compaction Requirements
OPSS Asphaltic Concrete Surface Course (HL-3)	40	40	Minimum of 92.0% of Maximum Relative Density (MRD)
OPSS Asphaltic Concrete Binder Course (HL-8)	65	90	
Granular Base (OPSS Granular A)	150	150	100% SPMDD
Granular Sub-Base (OPSS Granular B Type I)	300	450	

All pavement component materials should be produced and laid in accordance with current OPSS requirements. Asphaltic concrete materials would be compacted to 92% of their Maximum Relative Density (MRD), or higher. Granular materials would be compacted to at least 100% of its SPMDD.

The recommended pavement structure should be considered for preliminary design purposes only. A functional design life of eight (8) to ten (10) years has been used to establish the pavement recommendations. This represents the number of years to the first rehabilitation, assuming regular maintenance is carried out. If required, a more refined pavement structure design can be performed based on specific design life requirements. Such further analysis will also involve specific laboratory tests to determine frost susceptibility and strength characteristics of the subgrade soils.

6.2.2 Pavement Construction Considerations

For pavement construction, the subgrade must be compacted to at least 98% SPMDD, for at least the upper 300 mm, unless an alternative is approved by Sola.

The long-term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure uniform subgrade moisture and density conditions are achieved. Additional comments on the construction of pavement areas are as follows:

- The subgrade preparation should include stripping of any objectionable materials, e.g. loose fill with organics. The base should be properly shaped and thoroughly proof rolled using a loaded truck. Soft and/or unstable subgrade areas should be further sub-excavated and backfilled to the design subgrade level using an approved material, placed in thin lifts and compacted to 98% of its SPMDD;
- The locations and extent of sub-drainage required within the paved areas should be reviewed by this office in conjunction with the proposed grading. Assuming that satisfactory crossfalls in the order of 3.0% have been provided, subdrains extending from and between catch basins may be satisfactory. In the event that flatter crossfalls are considered, a more extensive system of sub-drainage may be necessary and should be reviewed by Sola; and,
- The most severe loading conditions on the pavement areas and subgrade may occur during construction. Consequently, special provisions such as restricted access routes, half-loads during paving, etc., may be required, especially if construction is carried out during unfavourable weather.

It is recommended that Sola be retained to review the final pavement structure designs and drainage plans prior to construction to ensure that they are consistent with the recommendations in this report.

New pavement curbs and/or gutters may be designed in general conformance with OPSD 600 or the Town of Caledon Standard Drawings No. 203 to 205.

Stockpiled material in the vicinity of construction should be managed, otherwise they can temporarily impair the surface drainage. During the winter seasons, melted water will form ice sheet in the middle of the road which could cause road hazard to the public. Additional salting, plowing and dewatering measures may be necessary for the winter program.

6.3 SIDEWALKS

During the construction activities, new sidewalks may be constructed. At the areas where the proposed sidewalks will be, the subgrade should be prepared in the following manner:

- The existing topsoil and any other organic mixed soil, if found, should be removed;

- The exposed subgrade comprising existing fill should then be compacted to an acceptable level with heavy compaction equipment prior to placing the granular subbase;
- If required, the subgrade surface should be reworked and compacted; and,
- If the grade requires to be raised, it should be carried out using OPSS Granular B material, placed in thin layers and compacted to at least 98% of the SPMDD.

The prepared subgrade as well as the pavement surfaces should be shaped to provide rapid drainage towards catch basins. Collector drains should be provided below the subgrade level around the catch basin locations to intercept and drain the water in their close proximity.

The design and construction of the sidewalks should be as per OPSD 310.010 or the Town of Caledon sidewalk Standard Drawing No. 218.

6.4 SERVICE INSTALLATION CONSIDERATIONS (WHERE APPLICABLE)

6.4.1 General

The materials found in the boreholes at the expected elevations of the proposed servicing trench generally consist of competent soils. In general, the site materials are suitable for pipeline support. Localized loose/soft subgrade conditions, if encountered during construction, should be sub excavated to a depth of at least 300 mm or to a firm base, if shallower, and backfilled with clean, compactable materials and stabilized as per the project specifications.

Prior to placement of bedding, the exposed subgrade at the bottom of each servicing trench excavation should be inspected by a Geotechnical Engineer to identify any soft, lose or disturbed base conditions. All disturbed soils resulting from construction activities should be removed and replaced as noted above.

Design and construction consideration for both flexible (PVC) and rigid (concrete) pipes are included in the following sections.

6.4.2 Excavations and Health and Safety Considerations

It is assumed that all excavations for the utilities will be open cut. In order to enable entry into excavations during the construction process, all excavations must comply with the definitions prescribed by the "*Occupational Health and Safety Act*" (OHSA), Ontario Regulation 213/91 "*Construction Projects*".

The borehole data indicate that the fill and native should present as a Type 3 soil as defined in the OHSA and Regulations for Construction Projects (Part III Excavations, Section 226). Excavations in these materials should be constructed in conformance with the regulations. It is noted that the above soil classifications have been estimated based on small, discontinuous samples from boreholes. The excavation conditions must be confirmed and/or modified on the basis of field inspections during construction stage, when large scale observations can be made with ease.

As defined by the OHSA, excavation walls within the Type 3 soils will require battering back at slopes no steeper than 1H (horizontal):1V (vertical).

Depending on the construction feasibility the excavation walls can be supported by temporary shoring systems. During excavations, adjacent existing structures, if present, must be protected by proper shoring or sloping.

Based on the findings of the investigation, it is considered that excavation of the overburden native soils at the site can be carried out using a conventional backhoe excavator.

It is important to note that the above discussion about the excavation is for information purposes only. Contractor bidding on the projects must make their own assessment based on the real site conditions.

It is assumed that the groundwater will be lowered to 1.0 m below the required excavation depth to enable the construction be carried out in the ‘dry’ condition. It is expected that the ‘perched water’ can be controlled by conventional ‘sump and pump’ methodology. If more aggressive dewatering methods are required, a dewatering specialist should be consulted.

6.4.3 Bedding

The fill or native subgrade in an undisturbed state will provide adequate support for the proposed service pipes and will allow the use of normal Class B type bedding. The bedding should conform to the current Ontario Provincial Standard Specifications (OPSS 1010) and/or the Town of Caledon standards for bedding stone gradation requirements. The pipes should be placed with a minimum bedding thickness in conformance with Ontario Provincial Standard Drawing OPSD 802.010 (for flexible pipes) or OPSD 802.031 (for rigid pipes), though the bedding thickness will be subject to variation and ultimately be based on the proposed pipe diameter, bedding specifications used, etc.

On completion of the servicing pipe installation, a granular surround of the same bedding material should be placed around the pipe to cover it to at least 300 mm above the pipe obvert.

The backfill above the bedding and cover materials may consist of clean, compactable fill which possesses similar properties to the existing subgrade soil. Based on the borehole data it is anticipated that the local soil material may be reused as trench backfill. Some moisture conditioning of the soil may be required to facilitate soil compaction. In the event that imported soil is used as trench backfill, it must be ensured that the drainage properties of the subgrade are maintained and that there is no differential frost movement. Trench backfill should be compacted to at least 95% of the material's SPMDD, or Town of Caledon standards, whichever is more stringent.

6.4.4 Trench Backfill

Backfilling During Dry-Weather Conditions

The excavated subgrade soils are considered suitable for re-use as fill to backfill wider service trenches, provided that heavy compaction equipment can be used to compact the fill material. In confined areas, consideration may be also given to backfilling the areas with a well graded, compacted granular soil such as Granular 'B' material. As such material, if thoroughly compacted, would reduce the post construction settlements to an acceptable level and may also expedite the compaction process.

Each lift should be no greater than 300 mm thick and compacted using an appropriate heavy compaction machine to at least 95 % of the material's SPMDD to within 1 m of the top of the subgrade, and then to 98 % SPMDD up to the required grade.

Exposed, excavated soil stockpiles that are to be re-used as fill on site should be compacted at the surface or temporarily covered during wet weather to help maintain their original moisture content. Such stockpiles are prone to wet weather exposure and, as such, the increased moisture contents will make these materials too wet to achieve the required levels of compaction.

Conversely, if the excavated native soils are too dry to achieve the required levels of compaction, some moisture addition/conditioning by means of water hosing or misting should be expected if the trench excavation works are to be undertaken during the dry seasons.

We recommend the subgrade be observed and approved by a Geotechnical Engineer prior to the placement of the bedding material to confirm that the subgrade conditions are consistent with the recommendations given in this report. Where unsuitable subgrade conditions are observed, remedial procedures can be established in the field to avoid construction delays.

Backfilling During Winter Months

Should this project proceed during the winter months, the following additional recommendations will apply in order to avoid any detrimental effects of frost.

In this situation, it is imperative that the excavation and backfilling operations follow simultaneously. This procedure is required to avoid time gaps between the two constructions stages, as prolonged exposure to frost may lead to inclusion of frozen material during backfilling. It is recommended that prior to resuming backfilling over the frozen surface, all frost should be removed to achieve a satisfactory bond between the current and previously laid fills. Also, this procedure would prevent leaving frozen layers of soils which could cause long term settlements while undergoing slow thawing.

In order to ensure that no frozen material is being backfilled in the trenches, it is recommended that the backfilling and compaction operations should be supervised and closely monitored by Sola on a continuous basis.

For the construction of the road, the final subgrade should be prepared during 'dry weather' conditions so as to achieve a satisfactory end product.

6.5 ENGINEERED FILL

On-site excavated, clean inorganic earth (native and/or fill) may be reused as engineered fill material, provided the moisture contents are strictly controlled.

If imported inorganic mineral soils are used for engineered fill construction, they must meet the applicable environmental guidelines, and their moisture contents should preferably be close to their respective optimum water content values.

For the on-site excavated clean fill/native soils or similar imported soils, heavy compaction equipment should be employed to achieve the specified degree of field density.

Consideration may be also given to backfilling excavations with a well graded, compacted granular soil such as Granular B as it, if thoroughly compacted, would reduce the post construction settlements to an acceptable level and may also expedite the compaction process.

Prior to the placement of the engineered fill, the subgrade should be properly prepared. The subgrade preparation should include stripping of any objectionable materials, e.g. loose fill with organics. The base should be properly shaped and thoroughly proof rolled. Soft and/or unstable subgrade areas should be further sub-excavated to a maximum depth of 450 mm and backfilled to the design subgrade level using inorganic soil, placed in thin lifts and compacted to 98% of its SPMDD.

Fill materials required for replacing locally softened soils, or raising grades within the footprint of the structures are to comprise suitably organic free materials approved for use by the Geotechnical Engineer. Fill materials are to be placed in lifts of a maximum thickness of 300 mm and compacted, using appropriate compaction equipment, to 98 % of its SPMDD.

Fill located in areas outside of the footprint of any proposed structure or roadway should be compacted to at least 95 % of the material's SPMDD to within 1.0 m of the subgrade level, and then to 98 % of its SPMDD up to the required grade. Imported granular fill used in confined areas should be compacted using only hand-held compaction equipment.
Sola recommends that any and all engineered subgrades beneath proposed structures be inspected and/or proof rolled prior to construction.

7.0 SOIL CHEMICAL TESTING

As part of the geotechnical investigation carried out for the Client, Sola conducted limited Soil Chemical Testing to scan for the general soil conditions at the borehole locations. At the time of sampling, no obvious evidence of staining or odours was observed in the samples collected at the sampling locations. Two (2) soil samples were selected from the collected samples, named BH4-SS2 and BH13-SS2, at approximate depth from 0.76 m to 1.22 m below the ground surface. The samples were submitted to AGAT Laboratories (AGAT) of Mississauga for laboratory analyses of metal and inorganics (M&I) parameters under Ontario Regulation 153/04 (O. Reg 153/04).

The soil analytical results were compared to the Ontario Ministry of the Environmental and Climate Change (MOECC) "soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", 2011, Table 1: Full Depth Background Site Condtion Standards for Residential/Parkland/Instititional/Industrial/Commercial/ Community Property Uses. The laboratory analysis results are enclosed in the Laboratory Certificates of Analysis, in **Appendix A** and the approximate locations of the boreholes are shown in **Enclosures 1A to 1C**.

Based on the comparison of the soil analysis results to the 2011 MOECC Standards, the measured Electrical Conductivity (EC) and Sodium Absorption Ratio (SAR) in the sample BH13-SS2 exceeded the MOECC

Standards. The details are presented in the Guideline Violation section of the Laboratory Certificates of Analysis in **Appendix A**.

It should be noted that the selected samples for analysis of M&I were taken from public roadways. As a result, the exceeded EC and SAR values in the tested soil samples may likely be caused by winter de-icing activities

It should be noted that the soil may vary between sampling locations and further chemical testing may be required by the receiving site, if applicable.

8.0 MATERIAL TESTING AND INSPECTION

It is recommended that Sola be appointed to carry out field inspection and materials testing during construction to ensure that the construction complies with the design recommendations.

9.0 DRAWING REVIEW

Once the final design drawings for this project are prepared, it is recommended that one (1) set of the drawings should be submitted to Sola for review and to make any amendments to our recommendations that may be required, prior to starting construction.

Sola should also 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, Sola will assume no responsibility for the interpretation of the recommendations in this report.

The comments given in this report are preliminary and intended only for the guidance of design engineers. Contractors bidding on or undertaking the works should make their own interpretations of the factual borehole results, so that they may draw their own conclusions on how the subsurface conditions may affect them.

The information in this report only reflects on the scanning of the general soil conditions at the borehole locations. The other environmental aspects of the soil conditions at the site were beyond the scope and terms of reference.

10.0 CLOSURE

This report is subject to the Statement of Limitations which forms an integral part of this document. The Statement of Limitations is not intended to reduce the level of responsibility accepted by Sola, but rather to ensure that all parties who have been given reliance for this report are aware of the responsibilities each assumes in so doing.

We trust that this report meets your needs. Should you have any queries, please contact the Sola office.

Sincerely,

SOLA ENGINEERING INC.

LICENSED PROFESSIONAL ENGINEER
Bill Feng
B. FENG
100050651
Dec. 21, 2018
PROVINCE OF ONTARIO

George Hao (EIT)

Bill Feng P.Eng.

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Enclosures

STATEMENT OF LIMITATIONS

Standard of Care and Basis of this Report
Sola Engineering Inc. (“Sola Engineering”) has prepared this report in a manner consistent with generally accepted engineering and/or environmental practices in the jurisdiction in which the specified services were provided. The information and conclusions set out in this report reflects Sola Engineering’s best professional judgment in light of the information available to Sola Engineering at the time of preparation. Sola Engineering disclaims any and all warranties, express or implied, including without limitation any warranty of merchantability and/or fitness for a particular purpose, and makes no representations concerning the legal effect, interpretation or significance of this report or the information, conclusions or recommendations contained in it.

The conclusions and recommendations provided in this report have been prepared in relation to the specified site (the “Site”) and the proposed project (the “Project”), as described by the Client to Sola Engineering. Given the nature of the work undertaken by Sola Engineering as part of this report, the Client acknowledges that ground conditions may vary over distances and may change over time. Should there arise any changes to the conditions of the Site or the Project (as to purpose or design), Sola Engineering is to be notified within a reasonable period of time, and in any event within 24 hours of the Client’s learning of such changes, so as to give Sola Engineering an opportunity to review and revise this report in light of such changes. Sola Engineering accepts no liability or responsibility for any use of this report or reliance on this report following any changes to the conditions of the Site or the Project.

The scope of professional services provided by Sola Engineering for the Project are as set out in this report. Should such services be limited to those of a geotechnical nature, Sola Engineering shall not be held liable or responsible for any environmental services that may be required, nor shall this report be interpreted to reflect any environmental aspects of the Project. Alternatively, should such services be limited to those of an environmental nature, Sola Engineering shall not be held liable or responsible for any geotechnical services that may be required, nor shall this report be interpreted to reflect any geotechnical aspects of the Project.

This report is not intended to provide recommendations for possible future conditions or use of the Site or adjoining properties. Should the need arise for such recommendations Sola Engineering may need to conduct further investigations.

Use of this Report
This report is intended to be read and used in its entirety. No reliance may be made upon any individual portion or section of this report without reference to the entire report as a whole. In preparing this report, Sola Engineering has relied on information, instructions and communications given by the Client to Sola Engineering, the applicability, truth and accuracy of which is the sole responsibility of the Client.

This report with the information, sampling data, analysis, conclusions and recommendations contained in it (if any), has been prepared for and may only be used by the Client and only for the specific purpose as specified by the Client to Sola Engineering in connection with the Project. Without prior written consent from Sola Engineering, use of this report or any portion thereof by any person or entity other than the Client, or for any purpose other than as communicated by the Client to Sola Engineering, is strictly prohibited. Sola Engineering accepts no liability or responsibility for the unauthorized use of this report. This report and all documents that form part of it are the sole property of Sola Engineering. Sola Engineering relies on and retains any and all intellectual property rights it has in this report, including any copyright to which it is entitled. The Client shall not give, lend or sell this report, or any portion thereof, to any entity, person or association without the express prior written consent of Sola Engineering. This report and the information contained herein shall be treated as strictly confidential.

The contents of this report, inclusive of Sola Engineering’s conclusions and recommendations in relation to the Project, are intended only for the guidance of the Client in carrying out the specified services for the Project, as described by the Client to Sola Engineering. Accordingly, Sola Engineering does not accept any liability or responsibility for any inaccuracy contained in this report arising as a result of or in any way connected with any exclusion, oversight or falsification of the information provided to Sola Engineering by the Client. This report, including the effect of the subsurface conditions as described in this report, is to be interpreted at the risk and discretion of the Client and any contractors or others bidding on or undertaking contractual work to be performed as part of the Project who may come into possession of or learn of this report or its contents. It is exigent that all contractors bidding or undertaking the work are to rely on their own interpretations of the data contained in this report in addition to their own investigations and conclusions. Sola Engineering shall not be held liable or responsible for any interpretation of or conclusions that may be drawn from the data or information contained in this report.

The information, recommendations and conclusions presented in this report are based on Sola Engineering’s interpretation of conditions revealed through the limited investigation conducted within a defined scope of services. In no event will Sola Engineering be held responsible or liable to the Client or any other person or entity for any special, indirect, incidental, punitive or consequential loss or damage (including, loss of use, lost profits or expenses incurred) resulting from or in any way related to the independent interpretations, interpolations, conclusions or decisions of the Client or any other person or entity, based on the information contained in this report. The restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.

Notwithstanding the exclusions of liability contained herein but without in any way limiting their effect or generality, if there is found to be any finding of liability or responsibility whatsoever on the part of Sola Engineering which in any way relates to or arises from this report, or the information, conclusions or recommendations contained in it, such liability and/or responsibility shall cease and forever be extinguished from and after the date which is two (2) years from the date of this report. In no event shall any liability or responsibility of Sola Engineering exceed the fees charged by Sola Engineering to the Client for the preparation of this report (excluding any arms’ length disbursements or expenditures made or incurred by Sola Engineering as a result thereof and reimbursed by the Client).

Site Conditions
The material conditions, classifications, conclusions and recommendations contained in this report were based on the site conditions observed or tested by Sola Engineering or otherwise communicated to Sola Engineering by the Client. The description, identification and classification of soils, rocks, chemical contamination and other materials have been made based on limited investigations, sampling and testing of materials performed by Sola Engineering and its qualified representatives in reliance on the use of relevant or applicable equipment, all in accordance with commonly acceptable standards in the geotechnical and/or environmental disciplines. Accordingly, this report may include assumptions of conditions which are based on discrete sample locations and thus some conditions may not have been detected. The Client accepts all liability and risk for the use of this report and the information and data contained in it. Sola Engineering shall not be held liable or responsible for any conditions beyond the scope of tests conducted on samples of the subsurface and soil conditions of the subject property as set out in this report.

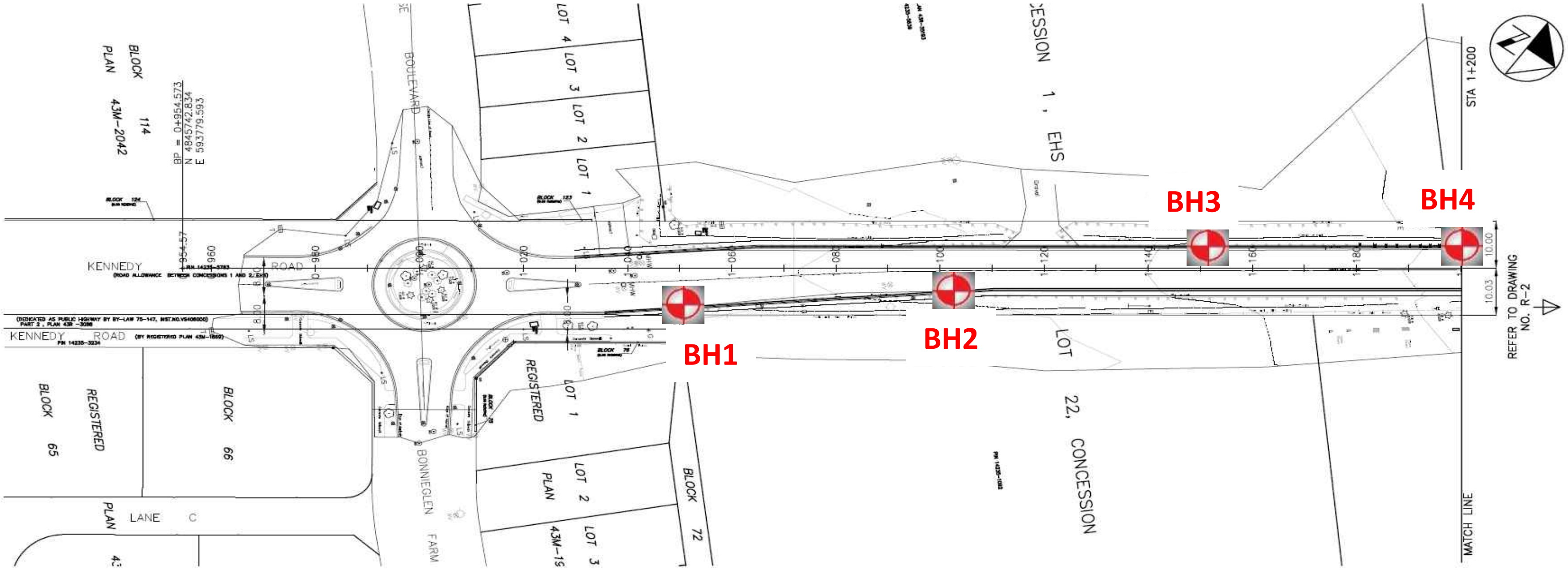
For clarity, the Client acknowledges and accepts that unique risks exist whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive sampling and testing program may fail to detect certain conditions. The environmental, geological, geotechnical, geochemical and hydrogeological conditions that Sola Engineering interprets to exist between sampling points may differ from those that actually exist. As a result, the Client acknowledges and accepts that because of the inherent uncertainties in subsurface evaluations, unanticipated underground conditions may occur or become known subsequent to Sola Engineering’s investigation that could affect conclusions, recommendations, total Project cost and/or execution.

Indemnification of Risk
Though Sola Engineering adheres to the highest degree of integrity and employs due diligence in limiting the potential release of toxins and hazardous substances, the risk of accidental release of such substances is a possibility when providing geotechnical and environmental services.

In consideration of the provision of services by Sola Engineering, the Client agrees to defend, indemnify and hold Sola Engineering and its employees and agents harmless from and against any and all claims, liabilities, damages, causes of action, judgments, costs or expenses (including reasonable legal fees and disbursements), resulting from or arising by reason of the death or bodily injury to persons, damage to property, or other loss, whether related to an accidental release of pollutants or hazardous substances occurring as a result of carrying out this Project or otherwise, and whether or not resulting from Sola Engineering’s negligent actions or omissions. This indemnification shall include and extend to any and all third party claims brought or threatened against Sola Engineering under any federal or provincial law or statute as a result of Sola Engineering conducting work on the Project. In addition to and notwithstanding the foregoing, the Client further agrees to unconditionally and irrevocably release Sola Engineering from, and not to bring any claims against Sola Engineering in connection with, any of the aforementioned claims or causes.

Subconsultants and Contractor Services
In conjunction with the services provided by Sola Engineering’s own employees, external services provided by other persons or entities that are specializing in services other than those offered by Sola Engineering, such as drilling, excavation and laboratory testing, are often employed in order to carry out the defined scope of work. If such external services have been employed for this Project, the Client acknowledges that Sola Engineering is not in any way liable or responsible for any costs, claims or damages in relation to the services rendered by such other persons or entities or payment therefor, nor shall Sola Engineering be liable or responsible for damages for errors, omissions or negligence caused by such other persons or entities while providing such external services.

Work and Job Site Safety
Sola Engineering shall be responsible only for its activities and that of its employees on the Site. Sola Engineering shall not direct any of the fieldwork nor the work of any other person or entity on the Project. The presence of Sola Engineering staff on the Site does not relieve the Client or any contractor on the Site from their responsibilities pertaining to site safety. The Client at all times retains any and all responsibility for the safety of those individuals present on the Site and/or working on the Project, including Sola Engineering’s employees.



LEGEND

⊕ Borehole Locations

SOLA ENGINEERING

File No.: 10433-S0221-GEO

Report Number: 2018-12448

Date: October 9, 2018

Borehole Location Plan

Proposed Kennedy Road Urbanization
from Bonnieglen Farm Blvd. to Old School Road
Caledon, Ontario

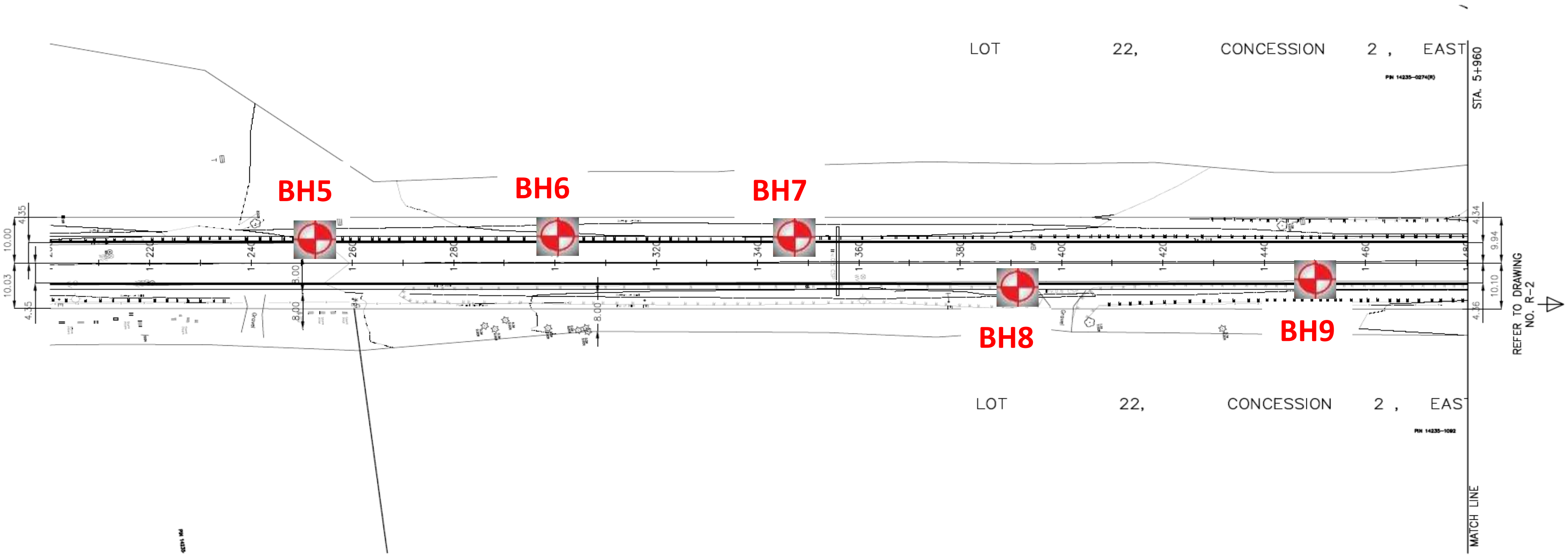
Chisholm, Fleming and Associates

The figure provided is for the intended purpose of presenting the approximate borehole locations. This figure should not be used for any other purposes including construction, architecture or for accuracy of dimensions and orientation of objects.

Enclosure No.:

1A

Not to Scale



LEGEND

⊕ Borehole Locations

SOLA
ENGINEERING

File No.: 10433-S0221-GEO

Report Number: 2018-12448

Date: October 9, 2018

Borehole Location Plan

Proposed Kennedy Road Urbanization
from Bonnieglen Farm Blvd. to Old School Road
Caledon, Ontario

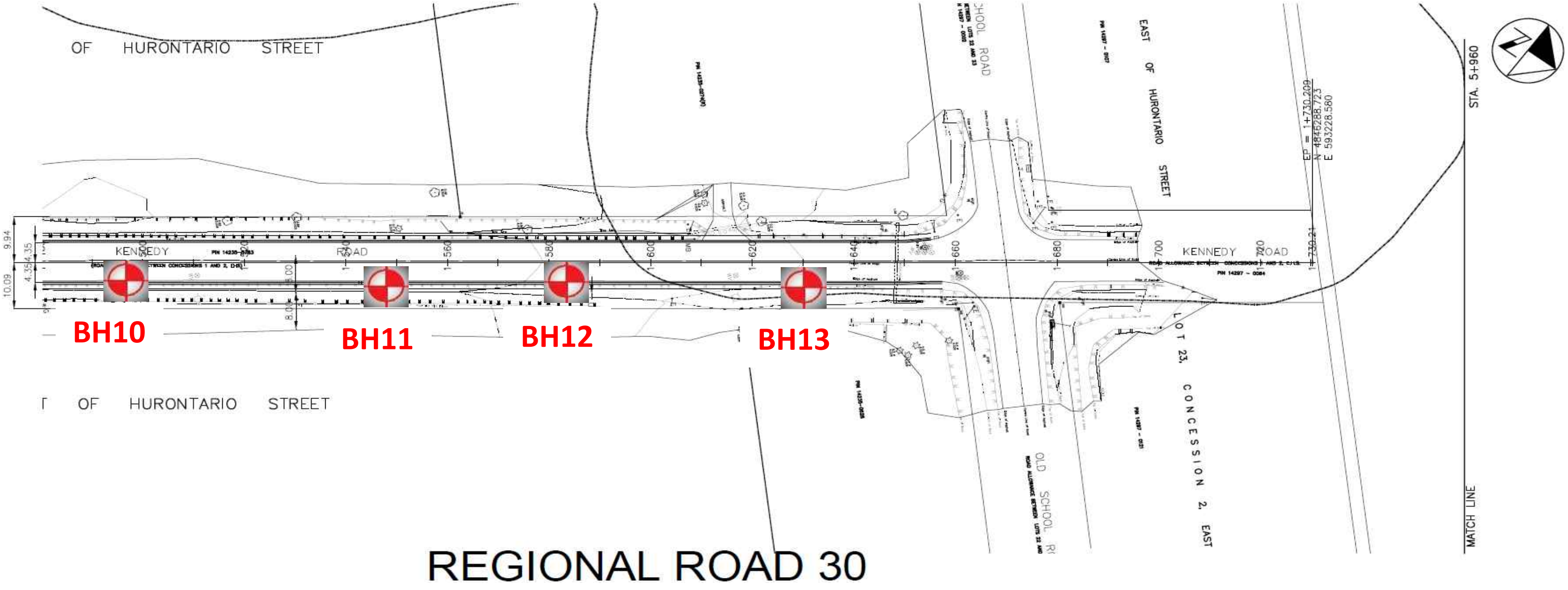
Chisholm, Fleming and Associates

The figure provided is for the intended purpose of presenting the approximate borehole locations. This figure should not be used for any other purposes including construction, architecture or for accuracy of dimensions and orientation of objects.

Enclosure No.:

1B

Not to Scale



LEGEND

🔴 Borehole Locations

SOLA ENGINEERING	File No.: 10433-S0221-GEO	**Borehole Location Plan**	The figure provided is for the intended purpose of presenting the approximate borehole locations. This figure should not be used for any other purposes including construction, architecture or for accuracy of dimensions and orientation of objects.	Enclosure No.: **1C**
	Report Number: 2018-12448	**Proposed Kennedy Road Urbanization from Bonnieglen Farm Blvd. to Old School Road Caledon, Ontario**		
	Date: October 9, 2018	**Chisholm, Fleming and Associates**		Not to Scale

BOREHOLE LOG

BOREHOLE NO.: 1

ENCLOSURE 2
PAGE 1 **OF** 1

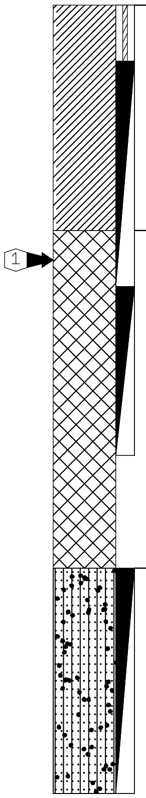
PROJECT NO.: 10433
DATE: September 26, 2018
PROJECT: Proposed Kennedy Road Urbanization

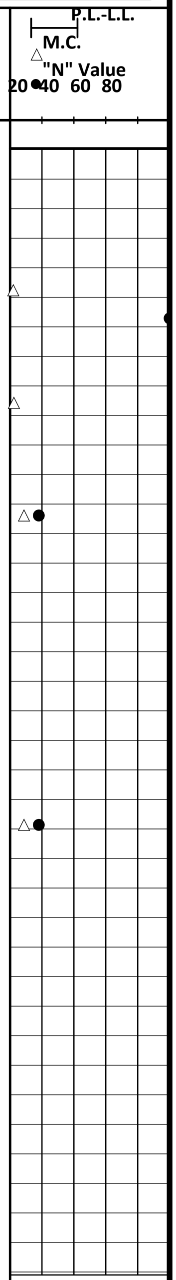
CLIENT: Chisholm, Fleming and Associates
LOCATION: Kennedy Road, Town of Caledon, Ontario
ELEVATION (M):
CAVED AT DEPTH (M): 0.69
WATER LEVEL DEPTH (M): Dry
DRILLING METHOD: Solid Stem Auger
DRILLER: Geotech Support Services
DRILL RIG: Beaver
LOGGED BY: PV
REVIEWED BY: GH

LEGEND:

◩	SS - SPLIT SPOON
▥	AS - AUGER SAMPLE
▨	ST - SHELBY TUBE
◨	CS - CORE SAMPLE
▼	WATER LEVEL
➡	CAVED AT
"N"	BLOWS / 0.3 M
M.C.	NATURAL MOISTURE CONTENT (%)
O.V.M	ORGANIC VAPOUR MONITOR
P.L.	PLASTIC LIMIT (%)
L.L.	LIQUID LIMIT (%)

ELEV./ DEPTH (m)	WELL/ PIEZO. DETAIL	SYMBOLS, SAMPLERS TEST DATA	DESCRIPTION	Moisture Content	STANDARD PENETRATION TESTS BLOW COUNTS	STANDARD PENETRATION TESTS "N" VALUE	ELEV./ DEPTH (m)
0			ASPHALTIC CONCRETE - 115 mm thick				0
			GRANULAR BASE/SUB-BASE - 495 mm thick				
0.4		1A		2.0	28-50-50/10cm	100/25cm	0.4
		1B	PROBABLE FILL - sandy silt, trace gravel, trace clay, dark brown to brown, moist	2.4			
0.8		1					0.8
		2		8.7	5-7-11	18	
1.2							1.2
1.6			SANDY SILT TILL - trace gravel, trace clay, brown, compact, moist				1.6
			- becoming grey				
		3		8.7	12-9-9-12	18	
2			End of Borehole at Targeted Depth 2.13 m; Borehole Dry upon Completion of Drilling; Caved at 0.69 m below Ground Surface.				2
2.4							2.4
2.8							2.8





Notes:

This information pertains only to this borehole and should not be interpreted as being indicative of the site.

BOREHOLE LOG

BOREHOLE NO.: 2

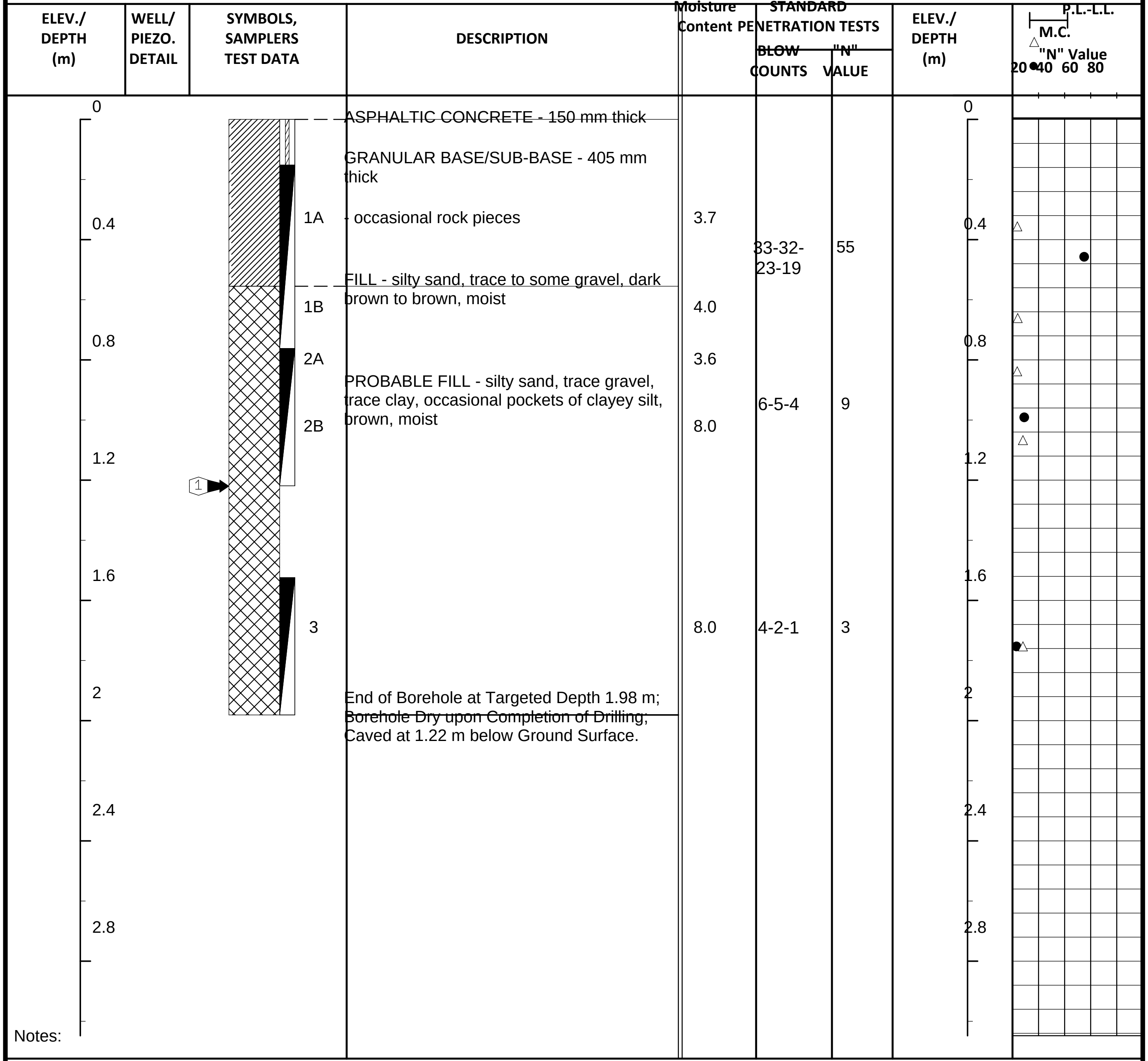
ENCLOSURE 3
PAGE 1 **OF** 1

PROJECT NO.: 10433
DATE: September 26, 2018
PROJECT: Proposed Kennedy Road Urbanization

CLIENT: Chisholm, Fleming and Associates
LOCATION: Kennedy Road, Town of Caledon, Ontario
ELEVATION (M):
CAVED AT DEPTH (M): 1.22
WATER LEVEL DEPTH (M): Dry
DRILLING METHOD: Solid Stem Auger
DRILLER: Geotech Support Services
DRILL RIG: Beaver
LOGGED BY: PV
REVIEWED BY: GH

LEGEND:

◩	SS - SPLIT SPOON
▥	AS - AUGER SAMPLE
⧄	ST - SHELBY TUBE
◨	CS - CORE SAMPLE
▼	WATER LEVEL
⬡▶	CAVED AT
"N"	BLOWS / 0.3 M
M.C.	NATURAL MOISTURE CONTENT (%)
O.V.M	ORGANIC VAPOUR MONITOR
P.L.	PLASTIC LIMIT (%)
L.L.	LIQUID LIMIT (%)



SYMBOLS, SAMPLERS TEST DATA	DESCRIPTION	Moisture Content	STANDARD PENETRATION TESTS BLOW COUNTS	"N" VALUE
	ASPHALTIC CONCRETE - 150 mm thick			
	GRANULAR BASE/SUB-BASE - 405 mm thick			
1A	- occasional rock pieces	3.7	33-32-23-19	55
1B	FILL - silty sand, trace to some gravel, dark brown to brown, moist	4.0		
2A		3.6		
2B	PROBABLE FILL - silty sand, trace gravel, trace clay, occasional pockets of clayey silt, brown, moist	8.0	6-5-4	9
3		8.0	4-2-1	3
	End of Borehole at Targeted Depth 1.98 m; Borehole Dry upon Completion of Drilling; Caved at 1.22 m below Ground Surface.			

Notes:

This information pertains only to this borehole and should not be interpreted as being indicative of the site.

ENCLOSURE 4
PAGE 1 **OF** 1

BOREHOLE LOG
BOREHOLE NO.: 3

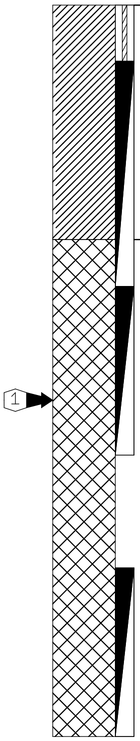
SOLA ENGINEERING

PROJECT NO.: 10433
DATE: September 27, 2018
PROJECT: Proposed Kennedy Road Urbanization

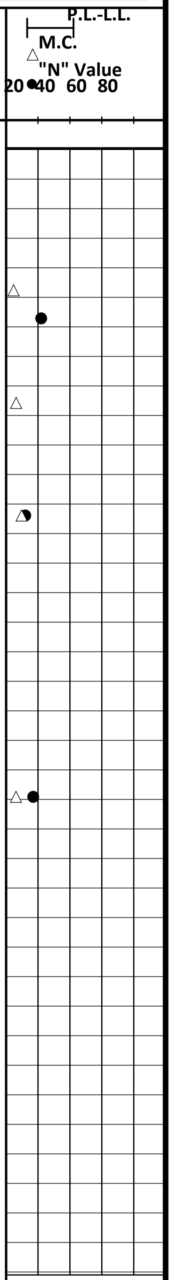
CLIENT: Chisholm, Fleming and Associates
LOCATION: Kennedy Road, Town of Caledon, Ontario
ELEVATION (M):
CAVED AT DEPTH (M): 1.07
WATER LEVEL DEPTH (M): Dry
DRILLING METHOD: Solid Stem Auger
DRILLER: Geotech Support Services
DRILL RIG: Beaver
LOGGED BY: PV
REVIEWED BY: GH

LEGEND:

◩	SS - SPLIT SPOON
▥	AS - AUGER SAMPLE
◸	ST - SHELBY TUBE
◧	CS - CORE SAMPLE
▼	WATER LEVEL
⬡►	CAVED AT
"N"	BLOWS / 0.3 M
M.C.	NATURAL MOISTURE CONTENT (%)
O.V.M	ORGANIC VAPOUR MONITOR
P.L.	PLASTIC LIMIT (%)
L.L.	LIQUID LIMIT (%)



ELEV./ DEPTH (m)	WELL/ PIEZO. DETAIL	SYMBOLS, SAMPLERS TEST DATA	DESCRIPTION	Moisture Content	STANDARD PENETRATION TESTS BLOW COUNTS	"N" VALUE	ELEV./ DEPTH (m)
0			ASPHALTIC CONCRETE - 150 mm thick				0
			GRANULAR BASE/SUB-BASE - 485 mm thick				
0.4		1A	- occasional cobbles inferred	4.7	15-10-12-12	22	0.4
		1B	FILL - silty sand, trace gravel, trace clay, dark brown, moist	6.3			
0.8							0.8
		2		9.7	5-8-4	12	
1.2							1.2
1.6			- occasional pockets of clayey silt, moist to very moist				1.6
		3		6.2	4-8-9	17	
2			End of Borehole at Targeted Depth 1.98 m; Borehole Dry upon Completion of Drilling; Caved at 1.07 m below Ground Surface.				2
2.4							2.4
2.8							2.8



Notes:

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ENCLOSURE 5
PAGE 1 **OF** 1

BOREHOLE LOG

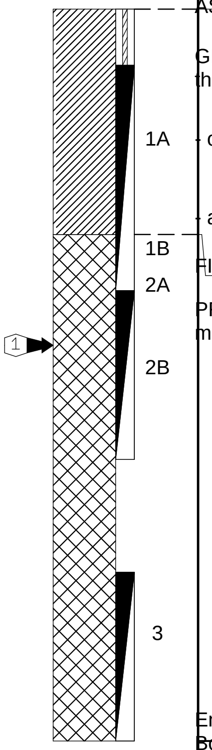
BOREHOLE NO.: 4

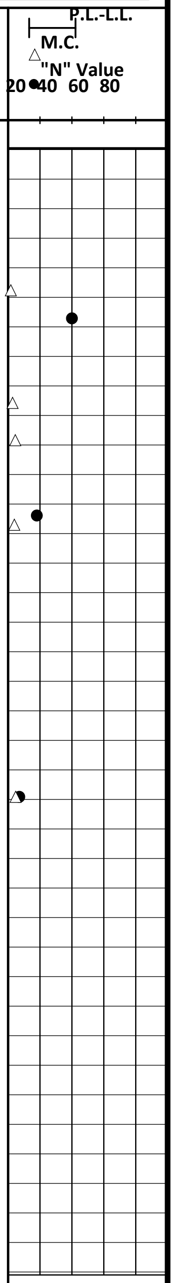
PROJECT NO.: 10433
DATE: September 27, 2018
PROJECT: Proposed Kennedy Road Urbanization
CLIENT: Chisholm, Fleming and Associates
LOCATION: Kennedy Road, Town of Caledon, Ontario
ELEVATION (M):
CAVED AT DEPTH (M): 0.91
WATER LEVEL DEPTH (M): Dry
DRILLING METHOD: Solid Stem Auger
DRILLER: Geotech Support Services
DRILL RIG: Beaver
LOGGED BY: PV
REVIEWED BY: GH

LEGEND:

◩	SS - SPLIT SPOON
▥	AS - AUGER SAMPLE
⍁	ST - SHELBY TUBE
◧	CS - CORE SAMPLE
▼	WATER LEVEL
⬡➡	CAVED AT
"N"	BLOWS / 0.3 M
M.C.	NATURAL MOISTURE CONTENT (%)
O.V.M	ORGANIC VAPOUR MONITOR
P.L.	PLASTIC LIMIT (%)
L.L.	LIQUID LIMIT (%)

ELEV./ DEPTH (m)	WELL/ PIEZO. DETAIL	SYMBOLS, SAMPLERS TEST DATA	DESCRIPTION	Moisture Content	STANDARD PENETRATION TESTS BLOW COUNTS	"N" VALUE	ELEV./ DEPTH (m)
0			ASPHALTIC CONCRETE - 150 mm thick				0
			GRANULAR BASE/SUB-BASE - 460 mm thick				
0.4		1A	- occasional cobbles inferred	1.7	14-20-20-15	40	0.4
			- auger grinding				
		1B		2.8			
0.8			FILL - sand with gravel, dark brown, moist				0.8
		2A	PROBABLE FILL - sand, trace silt, brown, moist	4.5			
		1					
		2B		3.9	7-8-10	18	
1.2							1.2
1.6							1.6
		3		4.7	3-3-4	7	
2			End of Borehole at Targeted Depth 1.98 m; Borehole Dry upon Completion of Drilling; Caved at 0.91 m below Ground Surface.				2
2.4							2.4
2.8							2.8





Notes:

This information pertains only to this borehole and should not be interpreted as being indicative of the site.

ENCLOSURE 6
PAGE 1 **OF** 1

BOREHOLE LOG

BOREHOLE NO.: 5

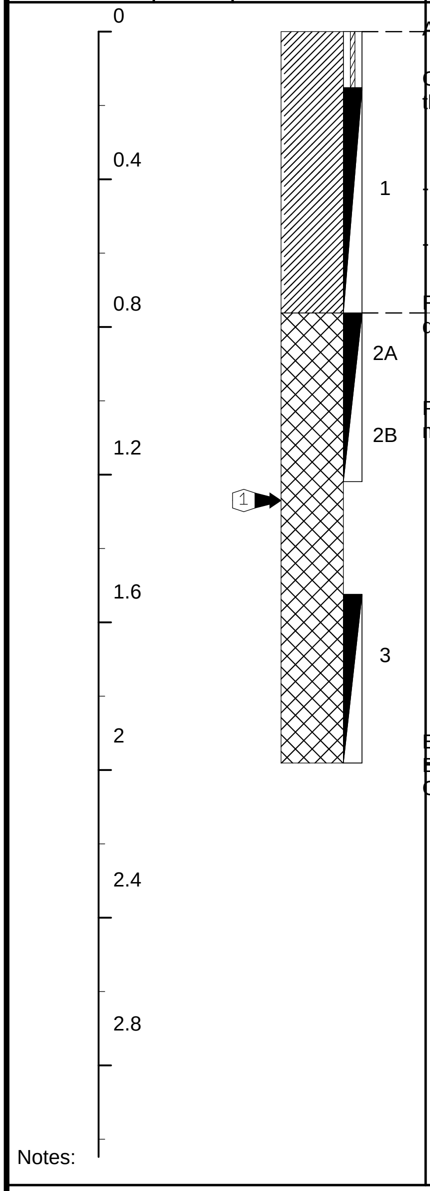
SOLA ENGINEERING

PROJECT NO.: 10433
DATE: September 27, 2018
PROJECT: Proposed Kennedy Road Urbanization

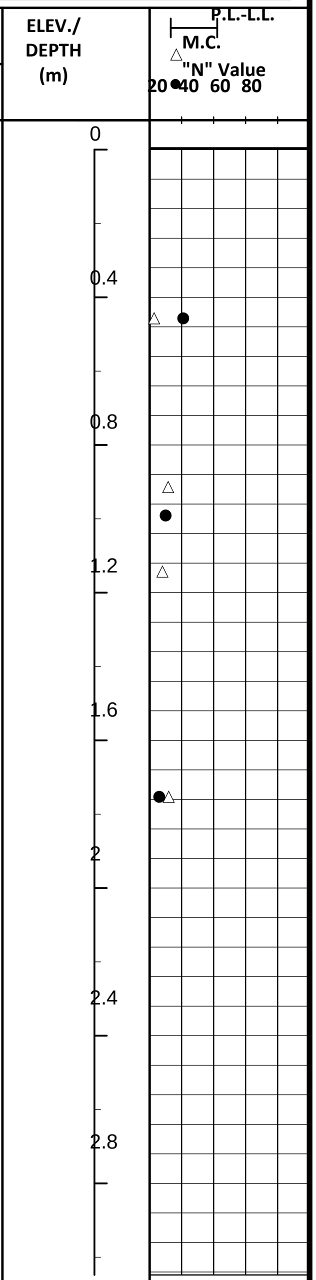
CLIENT: Chisholm, Fleming and Associates
LOCATION: Kennedy Road, Town of Caledon, Ontario
ELEVATION (M):
CAVED AT DEPTH (M): 1.27
WATER LEVEL DEPTH (M): Dry
DRILLING METHOD: Solid Stem Auger
DRILLER: Geotech Support Services
DRILL RIG: Beaver
LOGGED BY: PV
REVIEWED BY: GH

LEGEND:

◩	SS - SPLIT SPOON
▥	AS - AUGER SAMPLE
◿	ST - SHELBY TUBE
◫	CS - CORE SAMPLE
▼	WATER LEVEL
⬡➤	CAVED AT
"N"	BLOWS / 0.3 M
M.C.	NATURAL MOISTURE CONTENT (%)
O.V.M	ORGANIC VAPOUR MONITOR
P.L.	PLASTIC LIMIT (%)
L.L.	LIQUID LIMIT (%)



SYMBOLS, SAMPLERS TEST DATA	DESCRIPTION	Moisture Content	STANDARD PENETRATION TESTS BLOW COUNTS	"N" VALUE
	ASPHALTIC CONCRETE - 150 mm thick			
	GRANULAR BASE/SUB-BASE - 610 mm thick			
1	- occasional cobbles inferred	2.8	14-11-10-7	21
	- auger grinding			
	FILL - silty sand, trace gravel, trace clay, dark brown to brown, moist			
2A		11.6	5-5-5	10
2B	PROBABLE FILL - sand, trace silt, brown, moist	8.0		
3		11.9	3-3-3	6
	End of Borehole at Targeted Depth 1.98 m; Borehole Dry upon Completion of Drilling; Caved at 1.27 m below Ground Surface.			



Notes:

This information pertains only to this borehole and should not be interpreted as being indicative of the site.

ENCLOSURE 7
PAGE 1 **OF** 1

BOREHOLE LOG

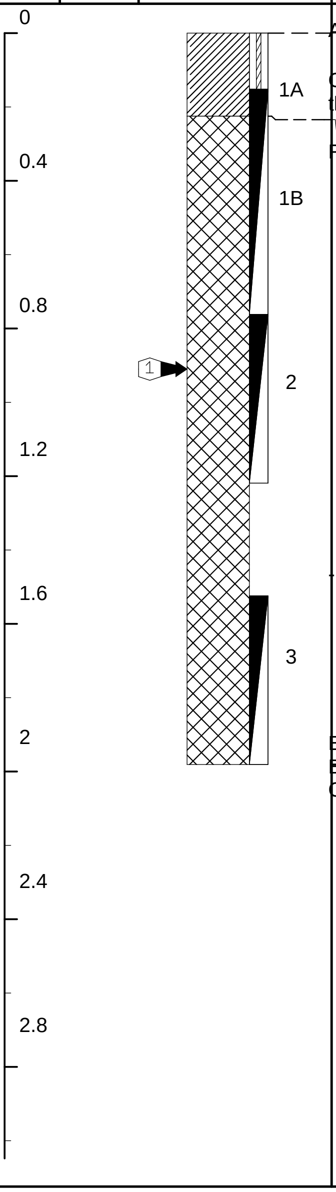
BOREHOLE NO.: 6

PROJECT NO.: 10433
DATE: September 27, 2018
PROJECT: Proposed Kennedy Road Urbanization

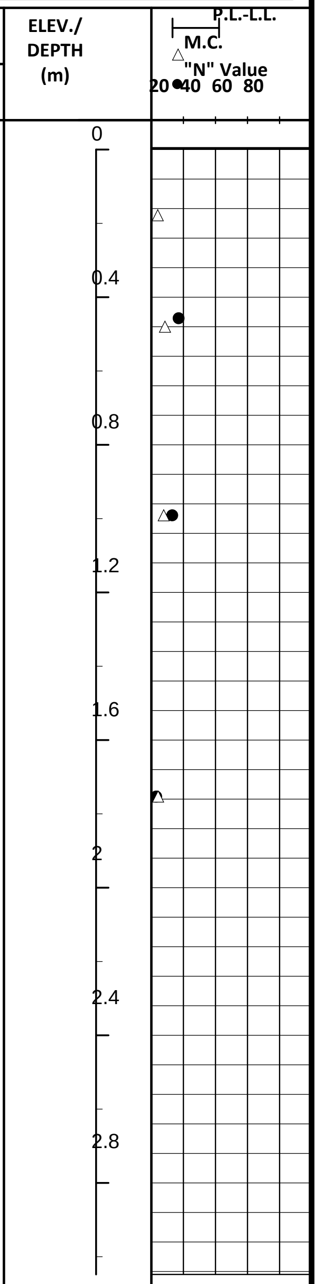
CLIENT: Chisholm, Fleming and Associates
LOCATION: Kennedy Road, Town of Caledon, Ontario
ELEVATION (M):
CAVED AT DEPTH (M): 0.91
WATER LEVEL DEPTH (M): Dry
DRILLING METHOD: Solid Stem Auger
DRILLER: Geotech Support Services
DRILL RIG: Beaver
LOGGED BY: PV
REVIEWED BY: GH

LEGEND:

◩	SS - SPLIT SPOON
▥	AS - AUGER SAMPLE
▨	ST - SHELBY TUBE
◨	CS - CORE SAMPLE
▼	WATER LEVEL
⬡▶	CAVED AT
"N"	BLOWS / 0.3 M
M.C.	NATURAL MOISTURE CONTENT (%)
O.V.M	ORGANIC VAPOUR MONITOR
P.L.	PLASTIC LIMIT (%)
L.L.	LIQUID LIMIT (%)



DESCRIPTION	Moisture Content	STANDARD PENETRATION TESTS BLOW COUNTS	"N" VALUE
ASPHALTIC CONCRETE - 150 mm thick			
GRANULAR BASE/SUB-BASE - 75 mm thick	4.0		
FILL - silty sand, trace gravel, brown, moist	8.5	7-8-9-8	17
	7.7	6-6-7	13
- moist to wet	4.2	3-1-2	3
End of Borehole at Targeted Depth 1.98 m; Borehole Dry upon Completion of Drilling; Caved at 0.91 m below Ground Surface.			



Notes:

This information pertains only to this borehole and should not be interpreted as being indicative of the site.

ENCLOSURE 8
PAGE 1 **OF** 1

BOREHOLE LOG

BOREHOLE NO.: 7

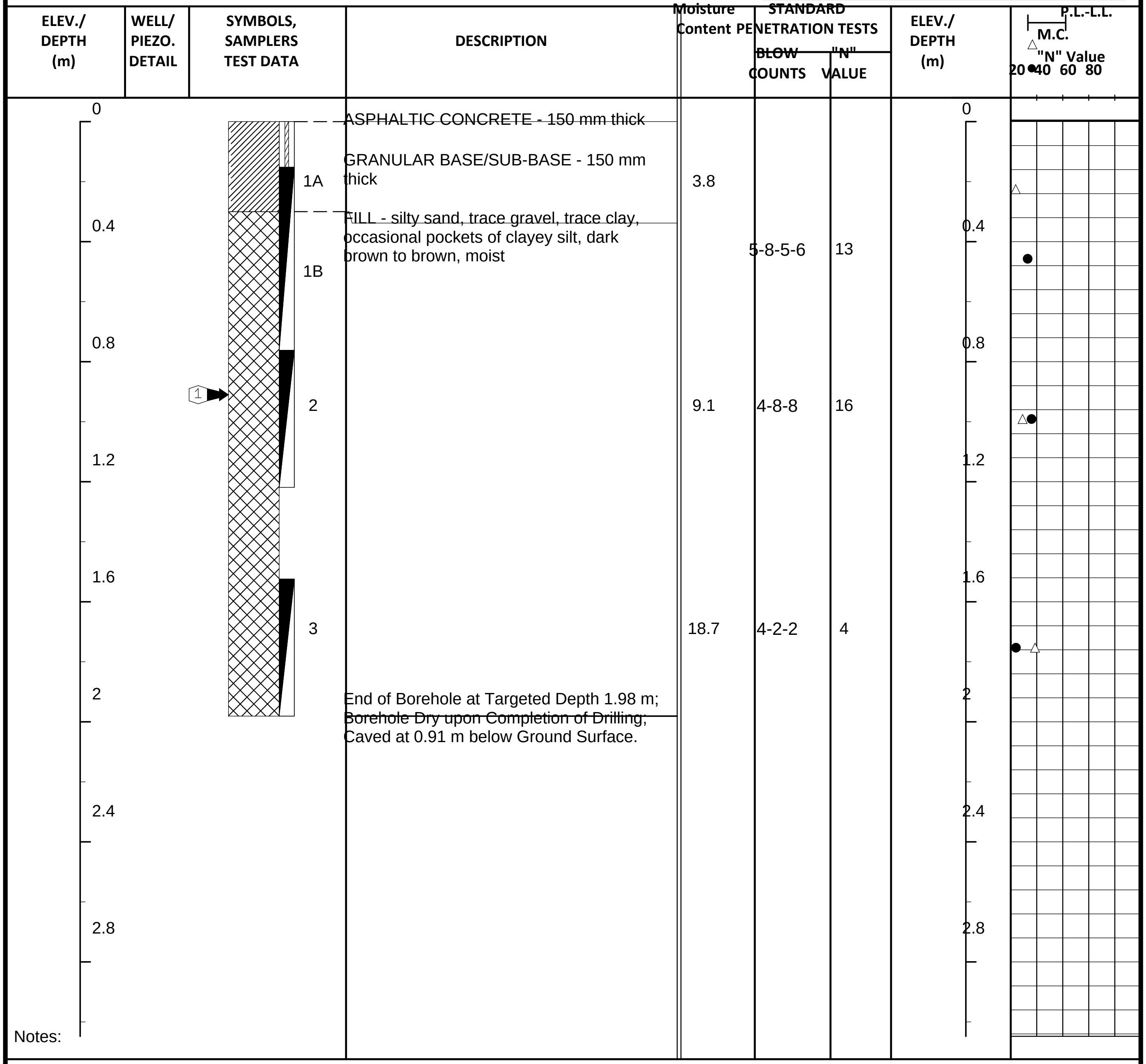
SOLA ENGINEERING

PROJECT NO.: 10433
DATE: September 26, 2018
PROJECT: Proposed Kennedy Road Urbanization

CLIENT: Chisholm, Fleming and Associates
LOCATION: Kennedy Road, Town of Caledon, Ontario
ELEVATION (M):
CAVED AT DEPTH (M): 0.91
WATER LEVEL DEPTH (M): Dry
DRILLING METHOD: Solid Stem Auger
DRILLER: Geotech Support Services
DRILL RIG: Beaver
LOGGED BY: PV
REVIEWED BY: GH

LEGEND:

◩	SS - SPLIT SPOON
▥	AS - AUGER SAMPLE
◿	ST - SHELBY TUBE
◨	CS - CORE SAMPLE
▼	WATER LEVEL
⬡►	CAVED AT
"N"	BLOWS / 0.3 M
M.C.	NATURAL MOISTURE CONTENT (%)
O.V.M	ORGANIC VAPOUR MONITOR
P.L.	PLASTIC LIMIT (%)
L.L.	LIQUID LIMIT (%)



SYMBOLS, SAMPLERS TEST DATA	DESCRIPTION	Moisture Content	STANDARD PENETRATION TESTS BLOW COUNTS	"N" VALUE
	ASPHALTIC CONCRETE - 150 mm thick			
1A	GRANULAR BASE/SUB-BASE - 150 mm thick	3.8		
1B	FILL - silty sand, trace gravel, trace clay, occasional pockets of clayey silt, dark brown to brown, moist		5-8-5-6	13
2		9.1	4-8-8	16
3		18.7	4-2-2	4
	End of Borehole at Targeted Depth 1.98 m; Borehole Dry upon Completion of Drilling; Caved at 0.91 m below Ground Surface.			

Notes:

This information pertains only to this borehole and should not be interpreted as being indicative of the site.

ENCLOSURE 9
PAGE 1 **OF** 1

BOREHOLE LOG

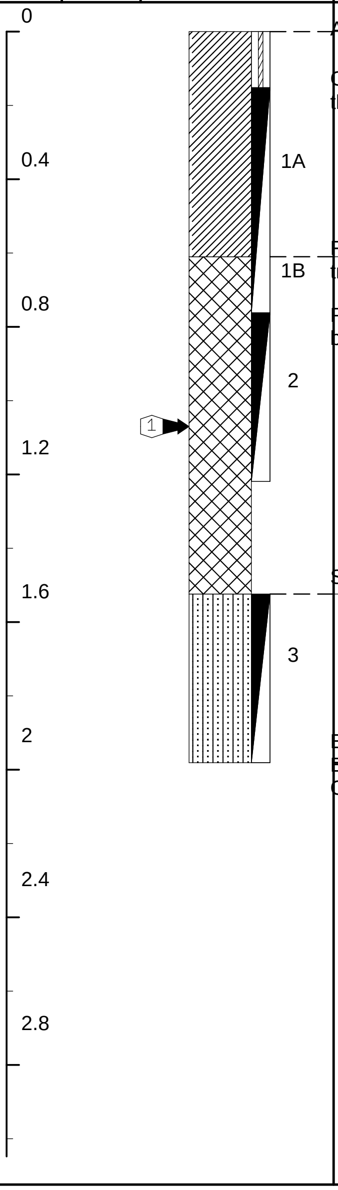
BOREHOLE NO.: 8

PROJECT NO.: 10433
DATE: September 26, 2018
PROJECT: Proposed Kennedy Road Urbanization

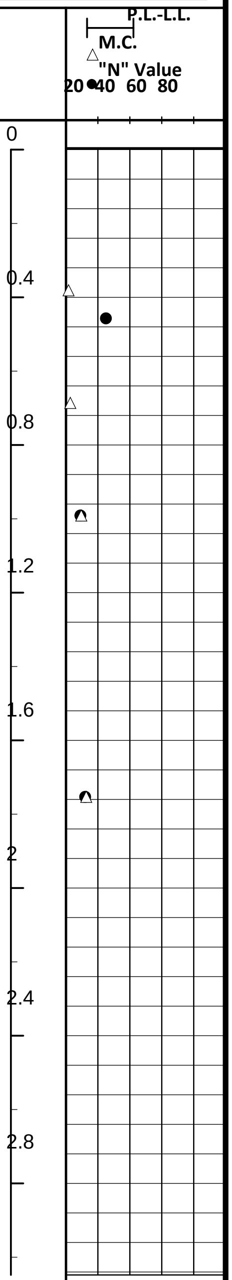
CLIENT: Chisholm, Fleming and Associates
LOCATION: Kennedy Road, Town of Caledon, Ontario
ELEVATION (M):
CAVED AT DEPTH (M): 1.07
WATER LEVEL DEPTH (M): Dry
DRILLING METHOD: Solid Stem Auger
DRILLER: Geotech Support Services
DRILL RIG: Beaver
LOGGED BY: PV
REVIEWED BY: GH

LEGEND:

◩	SS - SPLIT SPOON
▥	AS - AUGER SAMPLE
◫	ST - SHELBY TUBE
◧	CS - CORE SAMPLE
▼	WATER LEVEL
⬡▶	CAVED AT
"N"	BLOWS / 0.3 M
M.C.	NATURAL MOISTURE CONTENT (%)
O.V.M	ORGANIC VAPOUR MONITOR
P.L.	PLASTIC LIMIT (%)
L.L.	LIQUID LIMIT (%)



ELEV./ DEPTH (m)	SYMBOLS, SAMPLERS TEST DATA	DESCRIPTION	Moisture Content	STANDARD PENETRATION TESTS BLOW COUNTS	"N" VALUE
0		ASPHALTIC CONCRETE - 150 mm thick			
		GRANULAR BASE/SUB-BASE - 460 mm thick			
0.4	1A		1.6	9-15-10-8	25
	1B	FILL - silty sand, trace to some gravel, trace clay, dark brown, moist	2.7		
0.8		PROBABLE FILL - silty sand, trace gravel, brown, moist			
	2		9.6	5-4-5	9
1.2					
1.6		SILTY SAND - brown, compact, moist			
	3		12.7	3-4-8	12
2		End of Borehole at Targeted Depth 1.98 m; Borehole Dry upon Completion of Drilling; Caved at 1.07 m below Ground Surface.			
2.4					
2.8					



Notes:

This information pertains only to this borehole and should not be interpreted as being indicative of the site.

ENCLOSURE 10
PAGE 1 **OF** 1

BOREHOLE LOG

BOREHOLE NO.: 9

SOLA ENGINEERING

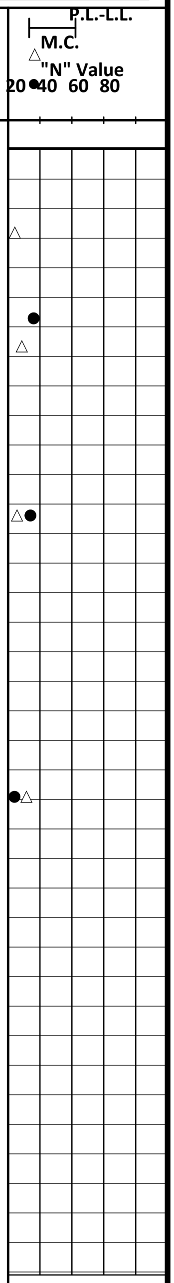
PROJECT NO.: 10433
DATE: September 27, 2018
PROJECT: Proposed Kennedy Road Urbanization

CLIENT: Chisholm, Fleming and Associates
LOCATION: Kennedy Road, Town of Caledon, Ontario
ELEVATION (M):
CAVED AT DEPTH (M): 1.22
WATER LEVEL DEPTH (M): Dry
DRILLING METHOD: Solid Stem Auger
DRILLER: Geotech Support Services
DRILL RIG: Beaver
LOGGED BY: PV
REVIEWED BY: GH

LEGEND:

◩	SS - SPLIT SPOON
▥	AS - AUGER SAMPLE
◿	ST - SHELBY TUBE
◧	CS - CORE SAMPLE
▼	WATER LEVEL
⬡➤	CAVED AT
"N"	BLOWS / 0.3 M
M.C.	NATURAL MOISTURE CONTENT (%)
O.V.M	ORGANIC VAPOUR MONITOR
P.L.	PLASTIC LIMIT (%)
L.L.	LIQUID LIMIT (%)

ELEV./ DEPTH (m)	WELL/ PIEZO. DETAIL	SYMBOLS, SAMPLERS TEST DATA	DESCRIPTION	Moisture Content	STANDARD PENETRATION TESTS BLOW COUNTS	"N" VALUE	ELEV./ DEPTH (m)
0			ASPHALTIC CONCRETE - 150 mm thick				0
		1A	GRANULAR BASE/SUB-BASE - 150 mm thick	4.2			
0.4			FILL - silty sand, trace gravel, trace clay, brown, moist		12-9-7-7	16	0.4
		1B		8.6			
0.8							0.8
		2		5.6	9-8-6	14	
1.2		⬡1➤					1.2
1.6			PROBABLE FILL - silty sand, trace gravel, brown, moist				1.6
		3		11.5	3-2-2	4	
2			End of Borehole at Targeted Depth 1.98 m; Borehole Dry upon Completion of Drilling; Caved at 1.22 m below Ground Surface.				2
2.4							2.4
2.8							2.8



Notes:

This information pertains only to this borehole and should not be interpreted as being indicative of the site.

ENCLOSURE 11
PAGE 1 **OF** 1

BOREHOLE LOG

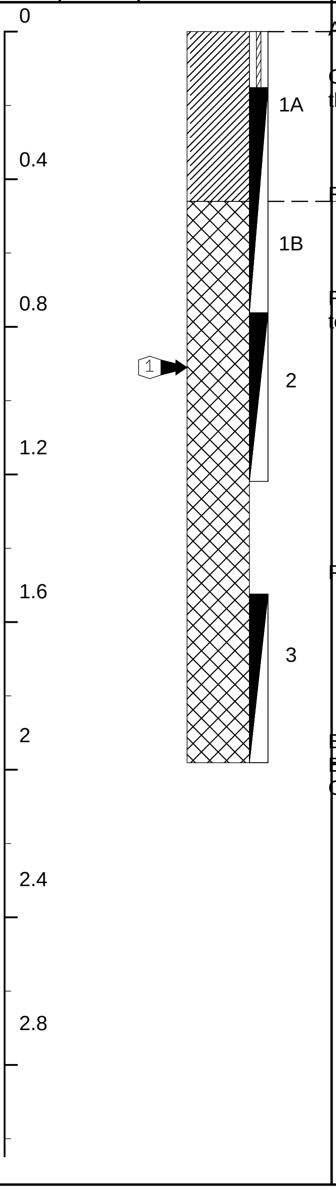
BOREHOLE NO.: 10

PROJECT NO.: 10433
DATE: September 26, 2018
PROJECT: Proposed Kennedy Road Urbanization

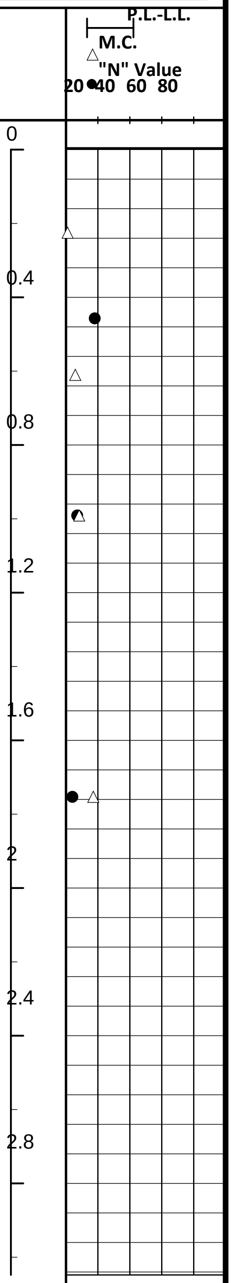
CLIENT: Chisholm, Fleming and Associates
LOCATION: Kennedy Road, Town of Caledon, Ontario
ELEVATION (M):
CAVED AT DEPTH (M): 0.91
WATER LEVEL DEPTH (M): Dry
DRILLING METHOD: Solid Stem Auger
DRILLER: Geotech Support Services
DRILL RIG: Beaver
LOGGED BY: PV
REVIEWED BY: GH

LEGEND:

◩	SS - SPLIT SPOON
▥	AS - AUGER SAMPLE
▧	ST - SHELBY TUBE
◫	CS - CORE SAMPLE
▼	WATER LEVEL
⬡➡	CAVED AT
"N"	BLOWS / 0.3 M
M.C.	NATURAL MOISTURE CONTENT (%)
O.V.M	ORGANIC VAPOUR MONITOR
P.L.	PLASTIC LIMIT (%)
L.L.	LIQUID LIMIT (%)



SYMBOLS, SAMPLERS TEST DATA	DESCRIPTION	Moisture Content	STANDARD PENETRATION TESTS BLOW COUNTS	"N" VALUE
	ASPHALTIC CONCRETE - 130 mm thick			
1A	GRANULAR BASE/SUB-BASE - 330 mm thick	1.0		
	FILL - sand with gravel, dark brown, moist		8-8-10-8	18
1B		5.8		
	FILL - silty sand, trace gravel, dark brown to brown, moist			
2		8.3	7-4-3	7
	PROBABLE FILL - silty sand, brown, moist			
3		17.1	2-2-2	4
	End of Borehole at Targeted Depth 1.98 m; Borehole Dry upon Completion of Drilling; Caved at 0.91 m below Ground Surface.			



Notes:

This information pertains only to this borehole and should not be interpreted as being indicative of the site.

BOREHOLE LOG

BOREHOLE NO.: 11

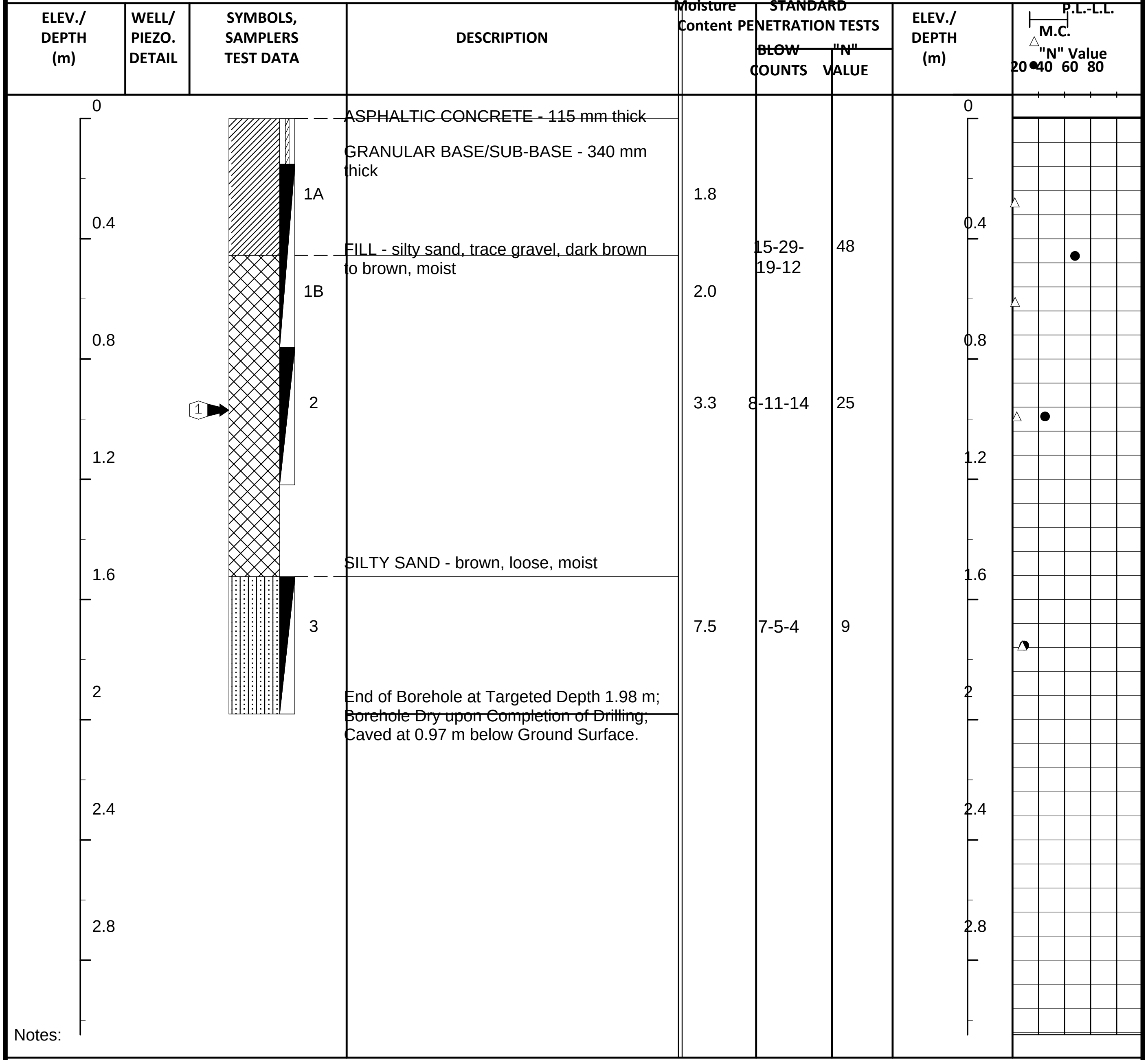
ENCLOSURE 12
PAGE 1 **OF** 1

PROJECT NO.: 10433
DATE: September 26, 2018
PROJECT: Proposed Kennedy Road Urbanization

CLIENT: Chisholm, Fleming and Associates
LOCATION: Kennedy Road, Town of Caledon, Ontario
ELEVATION (M):
CAVED AT DEPTH (M): 0.97
WATER LEVEL DEPTH (M): Dry
DRILLING METHOD: Solid Stem Auger
DRILLER: Geotech Support Services
DRILL RIG: Beaver
LOGGED BY: PV
REVIEWED BY: GH

LEGEND:

◩	SS - SPLIT SPOON
▥	AS - AUGER SAMPLE
◿	ST - SHELBY TUBE
◫	CS - CORE SAMPLE
▼	WATER LEVEL
⬡➤	CAVED AT
"N"	BLOWS / 0.3 M
M.C.	NATURAL MOISTURE CONTENT (%)
O.V.M	ORGANIC VAPOUR MONITOR
P.L.	PLASTIC LIMIT (%)
L.L.	LIQUID LIMIT (%)



ELEV./ DEPTH (m)	SAMPLE	DESCRIPTION	Moisture Content	BLOW COUNTS	"N" VALUE
0		ASPHALTIC CONCRETE - 115 mm thick			
		GRANULAR BASE/SUB-BASE - 340 mm thick			
	1A		1.8	15-29-19-12	48
		FILL - silty sand, trace gravel, dark brown to brown, moist			
	1B		2.0		
	2		3.3	8-11-14	25
		SILTY SAND - brown, loose, moist			
	3		7.5	7-5-4	9
		End of Borehole at Targeted Depth 1.98 m; Borehole Dry upon Completion of Drilling; Caved at 0.97 m below Ground Surface.			

Notes:

This information pertains only to this borehole and should not be interpreted as being indicative of the site.

ENCLOSURE 13
PAGE 1 **OF** 1

BOREHOLE LOG

BOREHOLE NO.: 12

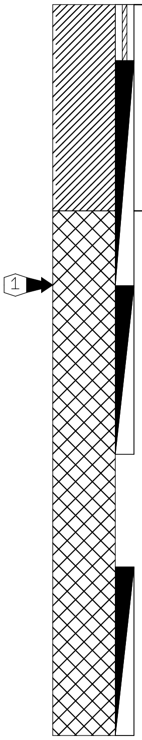
PROJECT NO.: 10433
DATE: September 26, 2018
PROJECT: Proposed Kennedy Road Urbanization

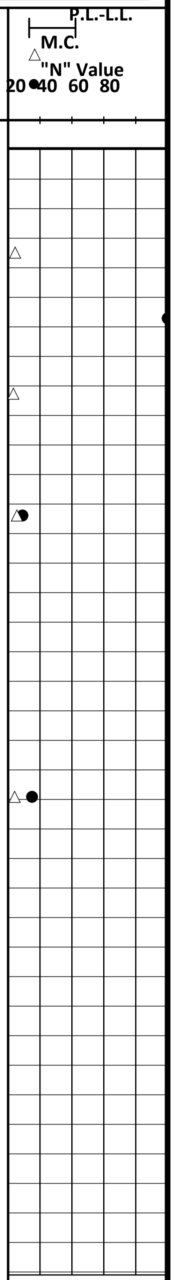
CLIENT: Chisholm, Fleming and Associates
LOCATION: Kennedy Road, Town of Caledon, Ontario
ELEVATION (M):
CAVED AT DEPTH (M): 0.76
WATER LEVEL DEPTH (M): Dry
DRILLING METHOD: Solid Stem Auger
DRILLER: Geotech Support Services
DRILL RIG: Beaver
LOGGED BY: PV
REVIEWED BY: GH

LEGEND:

◩	SS - SPLIT SPOON
▥	AS - AUGER SAMPLE
⧄	ST - SHELBY TUBE
◧	CS - CORE SAMPLE
▼	WATER LEVEL
⬡➤	CAVED AT
"N"	BLOWS / 0.3 M
M.C.	NATURAL MOISTURE CONTENT (%)
O.V.M	ORGANIC VAPOUR MONITOR
P.L.	PLASTIC LIMIT (%)
L.L.	LIQUID LIMIT (%)

ELEV./ DEPTH (m)	SYMBOLS, SAMPLERS TEST DATA	DESCRIPTION	Moisture Content	STANDARD PENETRATION TESTS BLOW COUNTS	"N" VALUE
0		ASPHALTIC CONCRETE - 150 mm thick			
		GRANULAR BASE/SUB-BASE - 410 mm thick			
	1A		4.4		
0.4				22-50-50-10	100
		FILL - sand with gravel, dark brown, moist			
	1B		3.3		
0.8	1				
	2		5.5	4-4-5	9
1.2					
1.6		PROBABLE FILL - sand, trace silt, brown, moist			
	3		4.1	7-7-8	15
2		End of Borehole at Targeted Depth 1.98 m; Borehole Dry upon Completion of Drilling; Caved at 0.76 m below Ground Surface.			
2.4					
2.8					





Notes:

This information pertains only to this borehole and should not be interpreted as being indicative of the site.

ENCLOSURE 14
PAGE 1 **OF** 1

BOREHOLE LOG

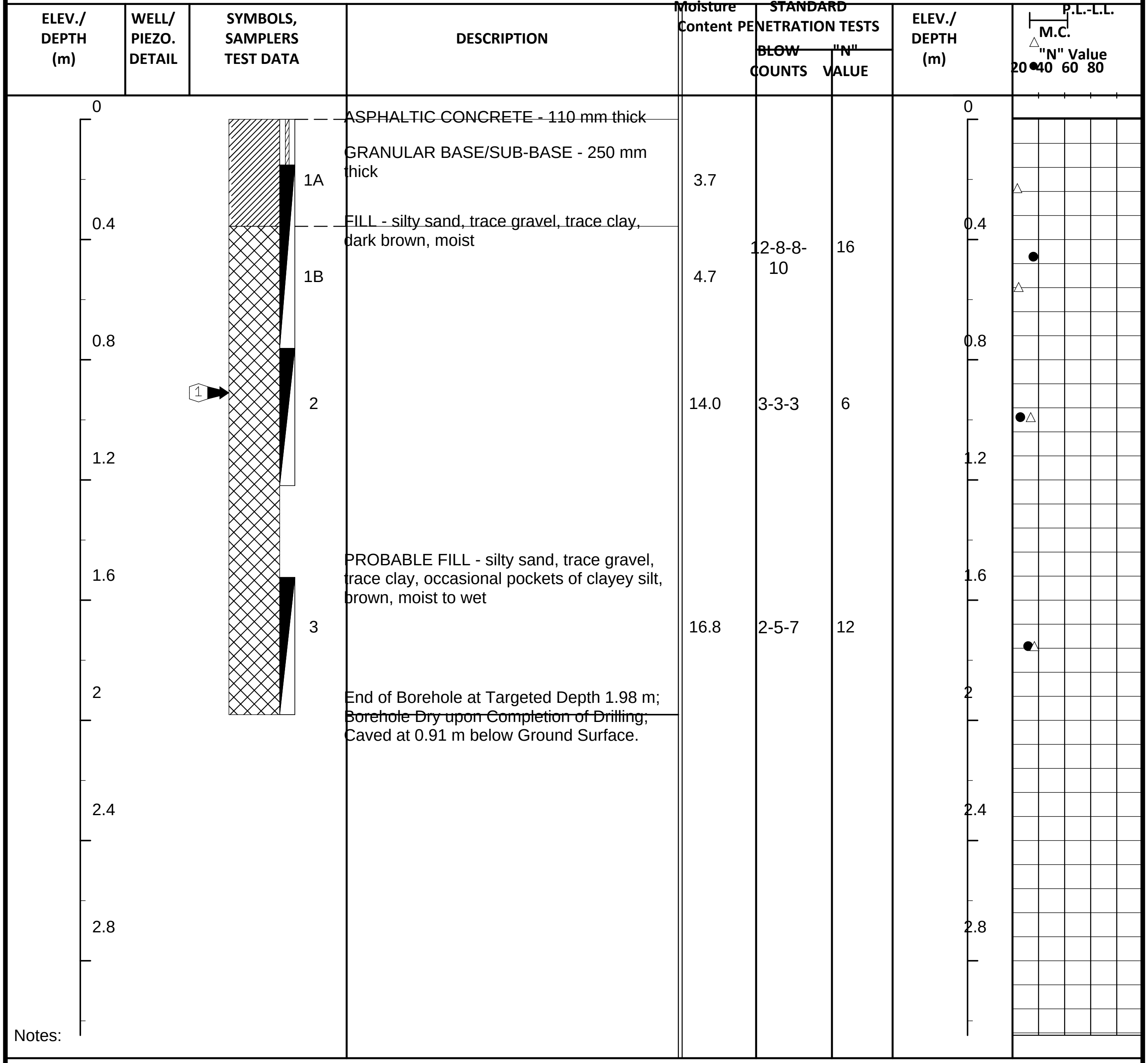
BOREHOLE NO.: 13

PROJECT NO.: 10433
DATE: September 26, 2018
PROJECT: Proposed Kennedy Road Urbanization

CLIENT: Chisholm, Fleming and Associates
LOCATION: Kennedy Road, Town of Caledon, Ontario
ELEVATION (M):
CAVED AT DEPTH (M): 0.91
WATER LEVEL DEPTH (M): Dry
DRILLING METHOD: Solid Stem Auger
DRILLER: Geotech Support Services
DRILL RIG: Beaver
LOGGED BY: PV
REVIEWED BY: GH

LEGEND:

◩	SS - SPLIT SPOON
▥	AS - AUGER SAMPLE
◹	ST - SHELBY TUBE
▮	CS - CORE SAMPLE
▼	WATER LEVEL
⬡▶	CAVED AT
"N"	BLOWS / 0.3 M
M.C.	NATURAL MOISTURE CONTENT (%)
O.V.M	ORGANIC VAPOUR MONITOR
P.L.	PLASTIC LIMIT (%)
L.L.	LIQUID LIMIT (%)



ELEV./ DEPTH (m)	WELL/ PIEZO. DETAIL	SYMBOLS, SAMPLERS TEST DATA	DESCRIPTION	Moisture Content	STANDARD PENETRATION TESTS BLOW COUNTS	"N" VALUE	ELEV./ DEPTH (m)
0			ASPHALTIC CONCRETE - 110 mm thick				0
		1A	GRANULAR BASE/SUB-BASE - 250 mm thick	3.7			
0.4		1B	FILL - silty sand, trace gravel, trace clay, dark brown, moist	4.7	12-8-8-10	16	0.4
0.8							0.8
		2		14.0	3-3-3	6	
1.2							1.2
1.6		3	PROBABLE FILL - silty sand, trace gravel, trace clay, occasional pockets of clayey silt, brown, moist to wet	16.8	2-5-7	12	1.6
2			End of Borehole at Targeted Depth 1.98 m; Borehole Dry upon Completion of Drilling; Caved at 0.91 m below Ground Surface.				2
2.4							2.4
2.8							2.8

Notes:

This information pertains only to this borehole and should not be interpreted as being indicative of the site.

KEY TO SYMBOLS

Enclosure 15
Report No. : 2018-12448
File No. : 10433-S0221-GEO

Strata symbols

Symbol	Description
▨	**Pavement**
▩	**Fill**
▦	**Sandy silt till**
▥	**Silty sand**

Misc. Symbols

Symbol	Description
⬡1➡	**Borehole Caved At**
△	**Natural Moisture Content**

Soil Samplers

Symbol	Description
▯	**Auger Samples**
◩	**Split Spoon**

Notes:

Terms describing RELATIVE DENSITY, based on Standard Penetration Test "N"-Value for COURSE GRAINED soils (major portion retained on No. 200 sieve).

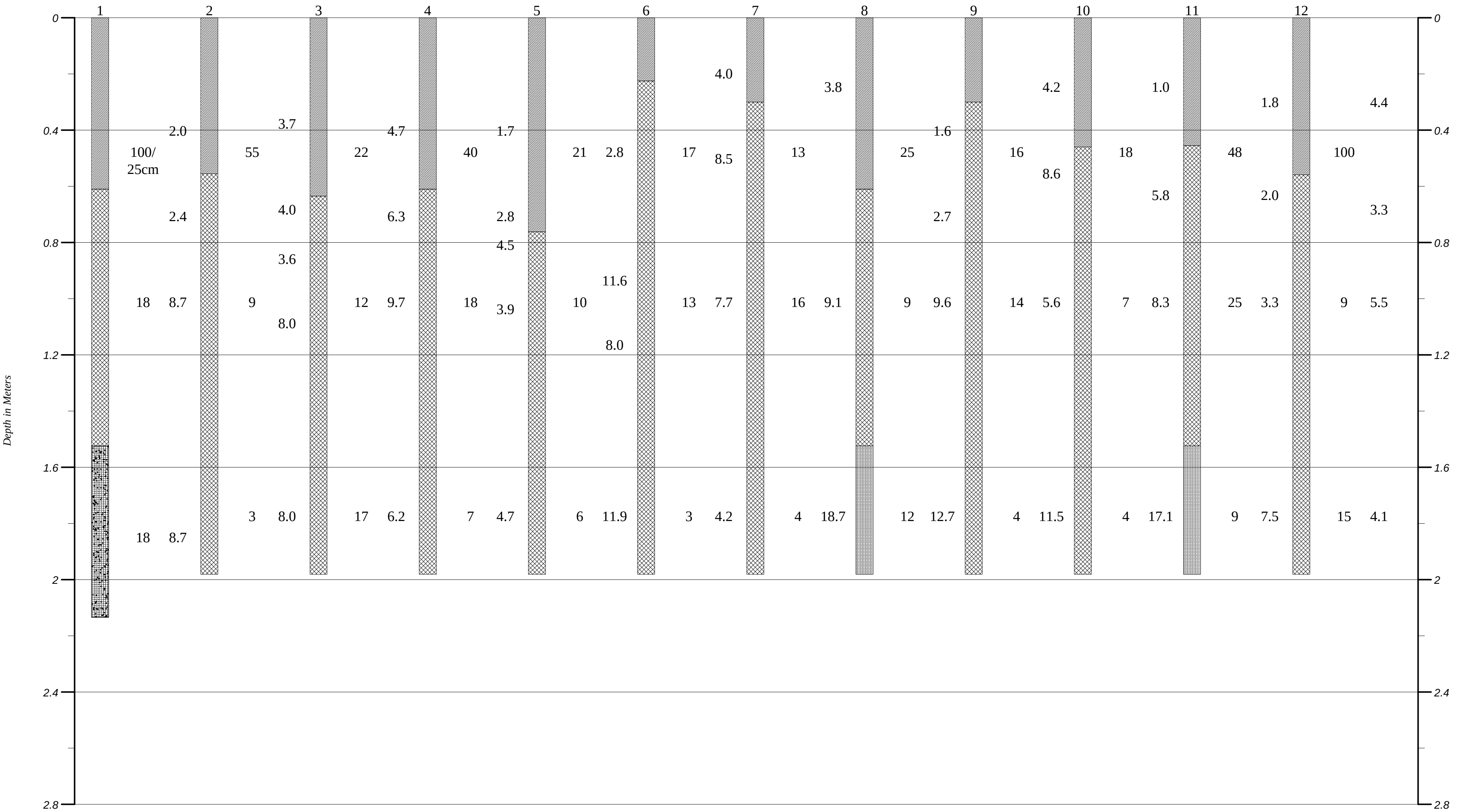
DESCRIPTIVE TERM ["N"-Value (blows/0.3m), Relative Density (%)]

- **Very Loose [less than 4, less than 15]**
- **Loose [4 to 10, 15 to 35]**
- **Compact or Medium [10 to 30, 35 to 65]**
- **Dense [30 to 50, 65 to 85]**
- **Very Dense [greater than 50, greater than 85]**

Terms describing CONSISTENCY, based on Standard Penetration Test "N"-Value for FINE GRAINED soils (major portion passing No. 200 sieve)

DESCRIPTIVE TERM [Unconfined Compressive Strength (kPa), "N"-Value (blows/0.3m)]

Very Soft [less than 25, less than 2]
Soft [25 to 50, 2 to 4]
Firm [50 to 100, 4 to 8]
Stiff [100 to 200, 8 to 15]
Very Stiff [200 to 400, 15 to 30]
Hard [greater than 400, greater than 30]



Plan View

Strata symbols

▨ Pavement

▦ Fill

▩ Sandy silt till

▥ Silty sand

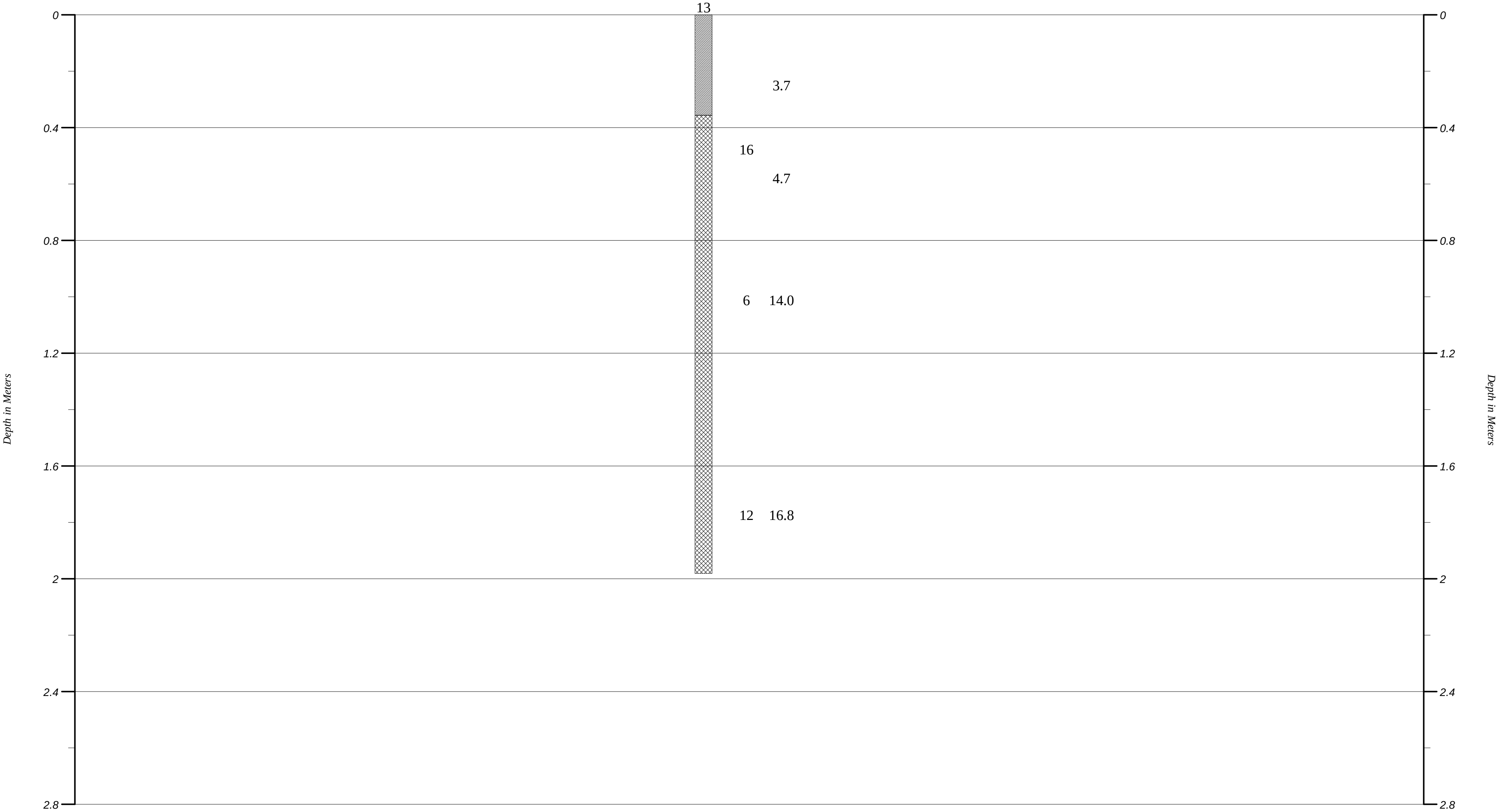
SOLA ENGINEERING INC.
CONCEPTUAL SOIL PROFILE

HORIZONTAL SCALE:	DRAWN BY/APPROVED BY	
VERTICAL SCALE: 1"=20'		

Proposed Kennedy Road Urbanization

PROJECT NO. 10433

Enclosure 16A



Plan View

Strata symbols

- ▨ Pavement
- ▩ Fill
- ▦ Sandy silt till
- ▥ Silty sand

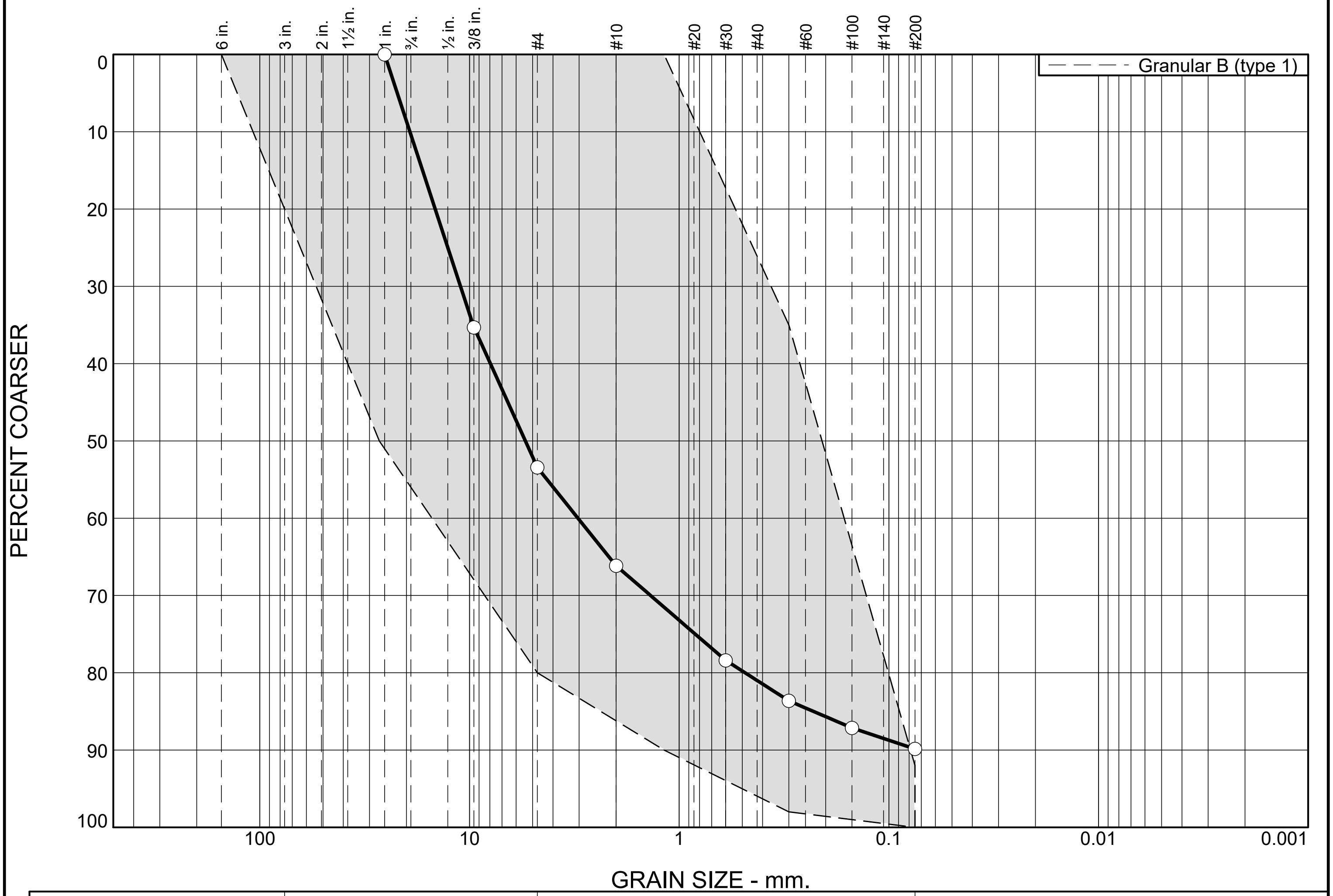
SOLA ENGINEERING INC.
CONCEPTUAL SOIL PROFILE

HORIZONTAL SCALE:
VERTICAL SCALE: 1"=20'
DRAWN BY/APPROVED BY

Proposed Kennedy Road Urbanization

PROJECT NO. 10433
Enclosure 16B

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines
		Coarse	Fine	Coarse	Medium	Fine	
○	0	10	43	13	15	9	10

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			16.7450	7.9549	5.4173	1.3696	0.2287			

Material Description	USCS	AASHTO
○ GRANULAR BASE/SUB-BASE		

Project No. 10433 **Client:** Chisholm, Fleming and Associates

Project: Proposed Kennedy Road Urbanization

○ **Location:** BH 1 **Sample Number:** 18-455

Remarks:

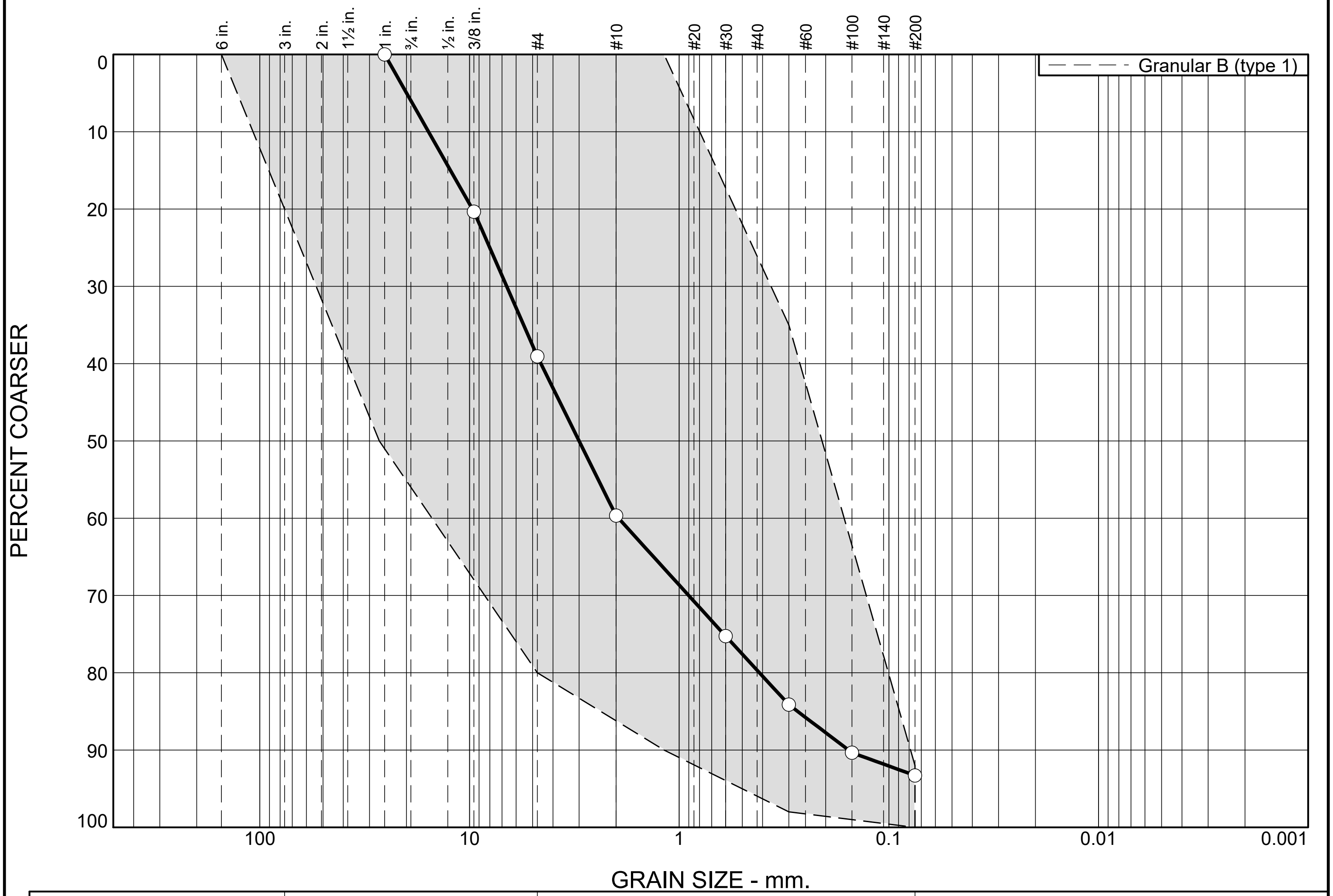
○ Sampled by: Puneet Verma
Date: September 26,2018

SOLA ENGINEERING INC.

Enclosure 17

Tested By: Behnam

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines
		Coarse	Fine	Coarse	Medium	Fine	
○	0	6	33	21	20	13	7

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			12.3208	4.5651	3.0004	0.9007	0.2720	0.1557	1.14	29.33

Material Description	USCS	AASHTO
○ GRANULAR BASE/SUB-BASE		

Project No. 10433 **Client:** Chisholm, Fleming and Associates

Project: Proposed Kennedy Road Urbanization

○ **Location:** BH 5 **Sample Number:** 18-456

Remarks:

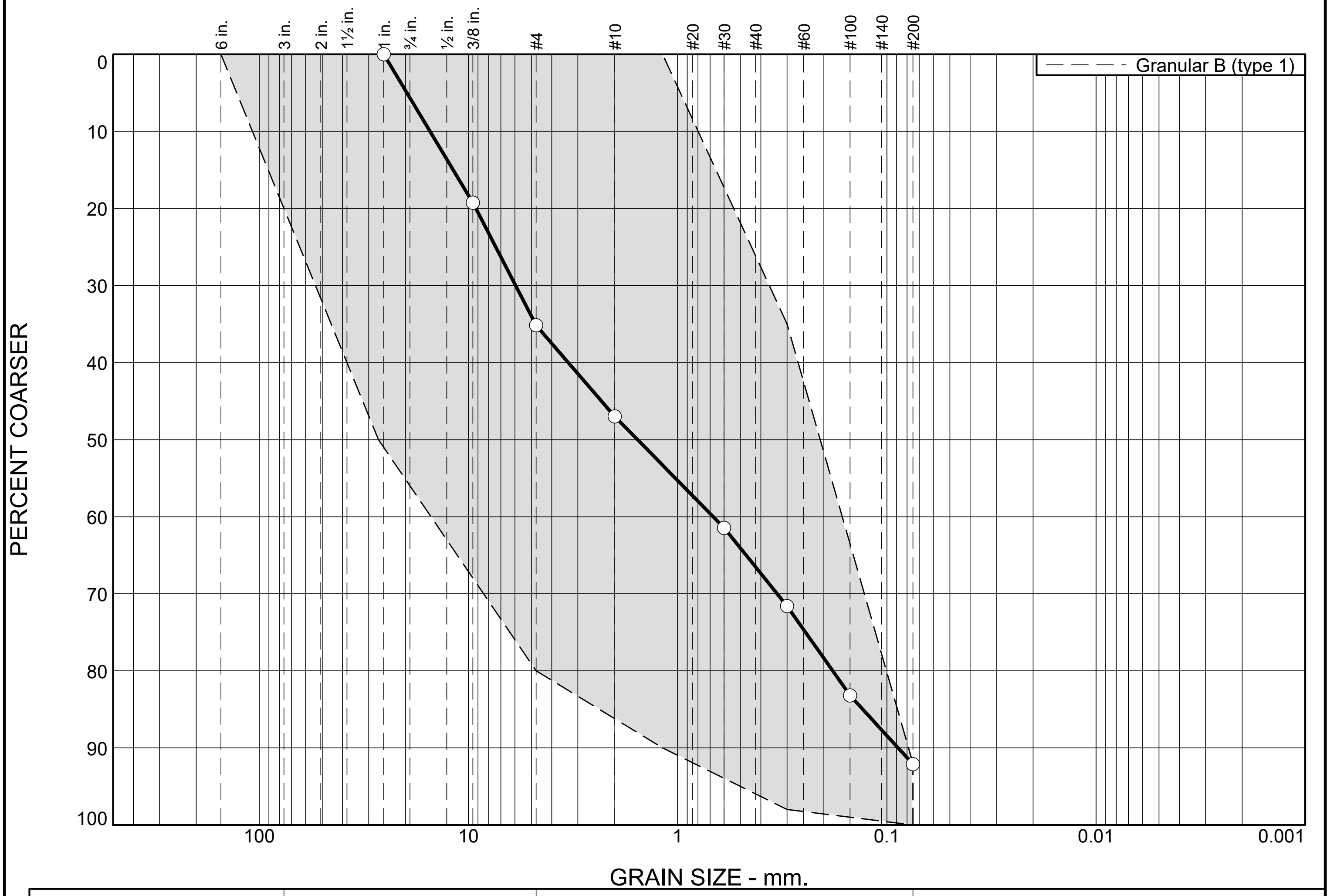
○ Sampled By: Puneet Verma
Date: September 26, 2018

SOLA ENGINEERING INC.

Enclosure 18

Tested By: Behnam

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines
		Coarse	Fine	Coarse	Medium	Fine	
○	0	6	29	12	19	26	8

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			11.8339	3.3333	1.5553	0.3345	0.1303	0.0883	0.38	37.73

Material Description	USCS	AASHTO
○ GRANULAR BASE/SUB-BASE		

Project No. 10433 **Client:** Chisholm, Fleming and Associates

Project: Proposed Kennedy Road Urbanization

○ **Location:** BH 9 **Sample Number:** 18-457

Remarks:

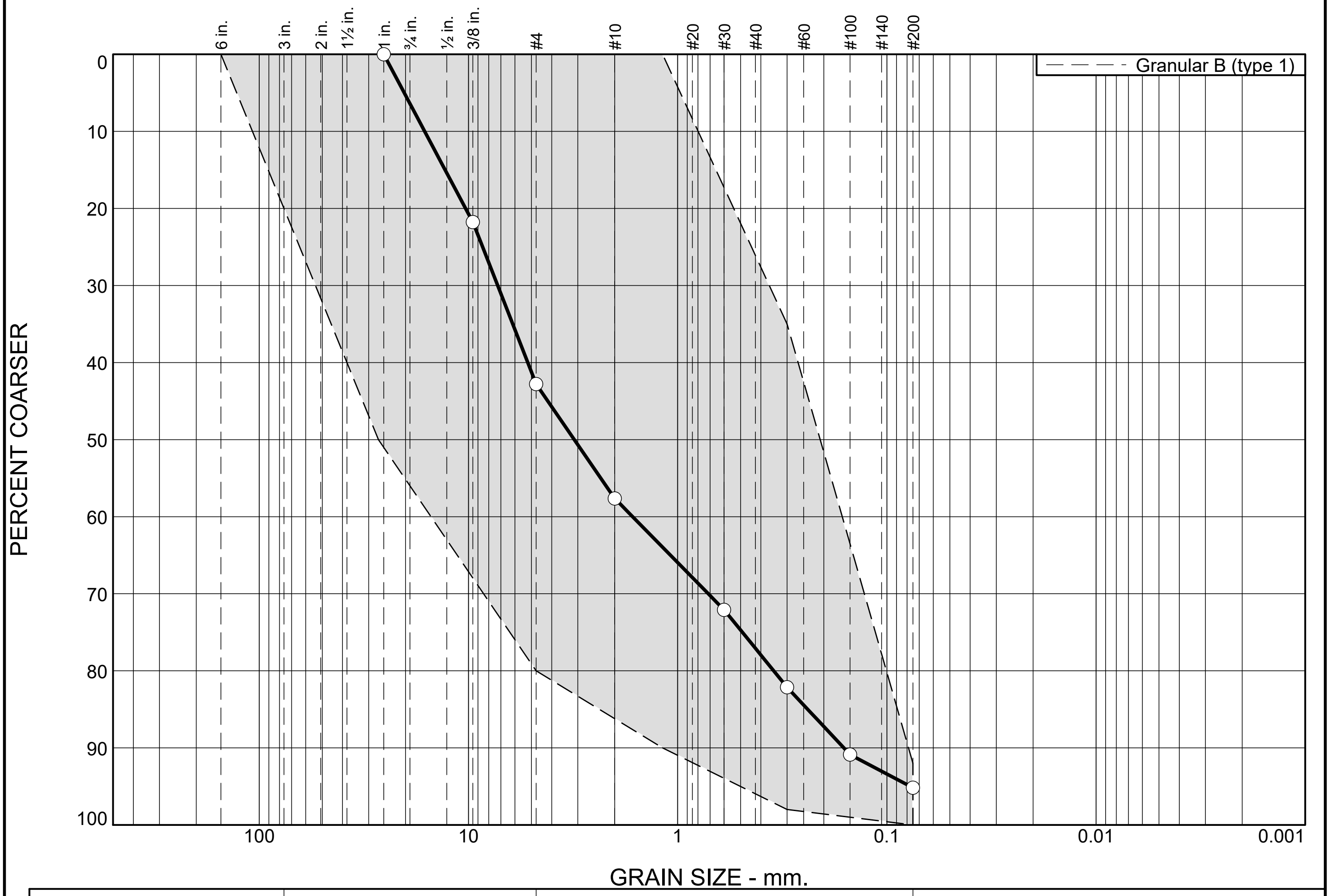
○ Sampled By: Puneet Verma
Date: September 27,2018

SOLA ENGINEERING INC.

Enclosure 19

Tested By: Behnam

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines
		Coarse	Fine	Coarse	Medium	Fine	
○	0	6	37	15	19	18	5

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			12.9250	5.2082	3.1192	0.7137	0.2388	0.1607	0.61	32.42

Material Description	USCS	AASHTO
○ GRANULAR BASE/SUB-BASE	SP	

Project No. 10433 **Client:** Chisholm, Fleming and Associates

Project: Proposed Kennedy Road Urbanization

○ **Location:** BH 12 **Sample Number:** 18-458

Remarks:

○ Sample By:Puneet Verma
Date: September 26,2018

SOLA ENGINEERING INC.

Enclosure 20

Tested By: Behnam

Appendix A

Soil Chemical Testing

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

CLIENT NAME: SOLA ENGINEERING
25 - 390 EDGELEY BOULEVARD
VAUGHAN, ON L4K3Z6
(905) 760-9501

ATTENTION TO: George

PROJECT: 10433

AGAT WORK ORDER: 18T397707

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Supervisor

DATE REPORTED: Oct 23, 2018

PAGES (INCLUDING COVER): 7

VERSION*: 1

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

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 18T397707
PROJECT: 10433

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

CLIENT NAME: SOLA ENGINEERING
SAMPLING SITE:

ATTENTION TO: George
SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2018-10-16

DATE REPORTED: 2018-10-23

			SAMPLE DESCRIPTION:	BH4 - SS2 2.5 FT TO 4 FT	BH13 - SS2 2.5 FT TO 4 FT
			SAMPLE TYPE:	Soil	Soil
			DATE SAMPLED:	2018-09-27 10:00	2018-09-26 10:00
Parameter	Unit	G / S	RDL	9631394	9631396
Antimony	µg/g	1.3	0.8	<0.8	<0.8
Arsenic	µg/g	18	1	2	3
Barium	µg/g	220	2	21	37
Beryllium	µg/g	2.5	0.5	<0.5	<0.5
Boron	µg/g	36	5	<5	<5
Boron (Hot Water Soluble)	µg/g	NA	0.10	<0.10	0.13
Cadmium	µg/g	1.2	0.5	<0.5	<0.5
Chromium	µg/g	70	2	5	9
Cobalt	µg/g	21	0.5	2.3	4.3
Copper	µg/g	92	1	9	17
Lead	µg/g	120	1	4	14
Molybdenum	µg/g	2	0.5	<0.5	<0.5
Nickel	µg/g	82	1	5	9
Selenium	µg/g	1.5	0.4	<0.4	<0.4
Silver	µg/g	0.5	0.2	<0.2	<0.2
Thallium	µg/g	1	0.4	<0.4	<0.4
Uranium	µg/g	2.5	0.5	<0.5	<0.5
Vanadium	µg/g	86	1	10	17
Zinc	µg/g	290	5	15	33
Chromium VI	µg/g	0.66	0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	<0.040	<0.040
Mercury	µg/g	0.27	0.10	<0.10	<0.10
Electrical Conductivity	mS/cm	0.57	0.005	0.298	1.63
Sodium Adsorption Ratio	NA	2.4	NA	0.116	26.3
pH, 2:1 CaCl2 Extraction	pH Units		NA	7.47	7.80

Amanjot Bhela

ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO
CHARTERED
AMANJOT BHELA
CHEMIST

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 18T397707
PROJECT: 10433

CLIENT NAME: SOLA ENGINEERING
ATTENTION TO: George
SAMPLING SITE:
SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2018-10-16
DATE REPORTED: 2018-10-23

Comments:	RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
9631394-9631396	EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio. Samples were received and analyzed beyond recommended hold time for Cyanide analysis.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Amanjot Bhela

ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO
CHARTERED
AMANJOT BHELA
CHEMIST

Guideline Violation

AGAT WORK ORDER: 18T397707

PROJECT: 10433

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

CLIENT NAME: SOLA ENGINEERING

ATTENTION TO: George

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
9631396	BH13 - SS2 2.5 FT TO 4 FT	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	mS/cm	0.57	1.63
9631396	BH13 - SS2 2.5 FT TO 4 FT	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	NA	2.4	26.3

Quality Assurance

CLIENT NAME: SOLA ENGINEERING
AGAT WORK ORDER: 18T397707
PROJECT: 10433
ATTENTION TO: George
SAMPLING SITE:
SAMPLED BY:

Soil Analysis

RPT Date: Oct 23, 2018			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	9631349		<0.8	<0.8	NA	< 0.8	104%	70%	130%	107%	80%	120%	88%	70%	130%
Arsenic	9631349		2	2	NA	< 1	110%	70%	130%	110%	80%	120%	115%	70%	130%
Barium	9631349		59	60	1.7%	< 2	101%	70%	130%	99%	80%	120%	100%	70%	130%
Beryllium	9631349		<0.5	0.5	NA	< 0.5	101%	70%	130%	105%	80%	120%	91%	70%	130%
Boron	9631349		5	5	NA	< 5	72%	70%	130%	107%	80%	120%	91%	70%	130%
Boron (Hot Water Soluble)	9631394	9631394	<0.10	<0.10	NA	< 0.10	90%	60%	140%	83%	70%	130%	88%	60%	140%
Cadmium	9631349		<0.5	<0.5	NA	< 0.5	110%	70%	130%	102%	80%	120%	105%	70%	130%
Chromium	9631349		15	15	0.0%	< 2	94%	70%	130%	109%	80%	120%	92%	70%	130%
Cobalt	9631349		4.6	4.7	2.2%	< 0.5	105%	70%	130%	110%	80%	120%	103%	70%	130%
Copper	9631349		20	20	0.0%	< 1	94%	70%	130%	115%	80%	120%	101%	70%	130%
Lead	9631349		7	7	0.0%	< 1	106%	70%	130%	108%	80%	120%	100%	70%	130%
Molybdenum	9631349		<0.5	<0.5	NA	< 0.5	110%	70%	130%	107%	80%	120%	103%	70%	130%
Nickel	9631349		9	9	0.0%	< 1	101%	70%	130%	106%	80%	120%	98%	70%	130%
Selenium	9631349		<0.4	0.7	NA	< 0.4	129%	70%	130%	98%	80%	120%	106%	70%	130%
Silver	9631349		0.4	0.4	NA	< 0.2	103%	70%	130%	106%	80%	120%	97%	70%	130%
Thallium	9631349		<0.4	<0.4	NA	< 0.4	102%	70%	130%	102%	80%	120%	96%	70%	130%
Uranium	9631349		<0.5	<0.5	NA	< 0.5	104%	70%	130%	103%	80%	120%	101%	70%	130%
Vanadium	9631349		20	20	0.0%	< 1	103%	70%	130%	109%	80%	120%	102%	70%	130%
Zinc	9631349		50	51	2.0%	< 5	100%	70%	130%	114%	80%	120%	108%	70%	130%
Chromium VI	9625984		<0.2	<0.2	NA	< 0.2	73%	70%	130%	95%	80%	120%	95%	70%	130%
Cyanide	9625249		<0.040	<0.040	NA	< 0.040	95%	70%	130%	99%	80%	120%	102%	70%	130%
Mercury	9631349		<0.10	<0.10	NA	< 0.10	101%	70%	130%	105%	80%	120%	102%	70%	130%
Electrical Conductivity	9631394	9631394	0.298	0.303	1.7%	< 0.005	96%	90%	110%	NA			NA		
Sodium Adsorption Ratio	9631394	9631394	0.116	0.116	0.0%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	9629865		6.29	6.34	0.8%	NA	101%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL

Certified By: Amanjot Bhela

CHARTERED
AMANJOT BHELA
CHEMIST

Method Summary

CLIENT NAME: SOLA ENGINEERING

PROJECT: 10433

SAMPLING SITE:

AGAT WORK ORDER: 18T397707

ATTENTION TO: George

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Laboratory Use Only

Work Order #: 18T397707

Cooler Quantity:

Arrival Temperatures: 23 2 | 23 |

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes: no ice

Chain of Custody Record

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

Report Information:

Company: Sola Engineering Inc.
Contact: George
Address: 390 Edgeley Blvd., Unit 25
Vaughan
Phone: 905 760 9501 Fax: 905 761 1822
Reports to be sent to:
1. Email: info@solaengineering.ca
2. Email: georgeh@solaengineering.ca

Regulatory Requirements:

☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 1
Indicate One
☐ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture (Check One)
☐ Coarse
☐ Fine

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

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

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

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

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: 10433
Site Location: Kennedy Road, Caledon
Sampled By: Puneet
AGAT Quote #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company: Same as above
Contact:
Address:
Email:

Sample Matrix Legend

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

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI Y / N	O. Reg 153 Metals and Inorganics			Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐TP ☐NH$_3$ ☐TKN ☐NO$_3$ ☐NO$_2$ ☐NO$_3$+NO$_2$	Volatiles: ☐VOC ☐BTEX ☐THM	CCME Fractions 1 to 4	ABNs	PAHs	PCBs: ☐Total ☐Aroclors	Organochlorine Pesticides	TCLP: ☐M&I ☐VOCs ☐ABNs ☐B(a)P ☐PCBs	Sewer Use						
								☐All Metals ☐153 Metals (excl. Hydrides) ☐Hydride Metals ☐153 Metals (Incl. Hydrides)	ORPs: ☐B-HWS ☐Cl ☐CN ☐Cr^{6+} ☐EC ☐FOC ☐Hg ☐pH ☐SAR																	
BH4 - SS2- 2.5 FT TO 4 FT	09/27/2018	10.00 am	1	S			☑																			
BH13 - SS2- 2.5 FT TO 4 FT	09/26/2018	10.00 am	1	S			☑																			

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time	
George	10/16/2018		L. Bachynsky	Oct 16/18	2:40pm	
Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign) Simon 18/10/18	Date	Time 3:30	Page ____ of ____
Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time	Nº:

Pink Copy - Client | Yellow Copy - AGAT | White Copy- AGAT

APPENDIX H

Noise Study
(SS Wilson & Associates)

SS WILSON ASSOCIATES
Consulting Engineers

REPORT NO. WA18-040

NOISE ASSESSMENT STUDY, AND RETROFIT SOUND BARRIER ANALYSIS MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT WIDENING OF KENNEDY ROAD

(FROM OLD SCHOOL ROAD TO BONNIEGLEN FARM BOULEVARD)

TOWN OF CALEDON

PREPARED FOR:

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JANUARY 3RD, 2019

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NOISE ASSESSMENT STUDY, AND
RETROFIT SOUND BARRIER ANALYSIS
MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT
WIDENING OF KENNEDY ROAD
(FROM OLD SCHOOL ROAD TO BONNIEGLEN FARM BOULEVARD)
TOWN OF CALEDON

INDEX PAGE

1.0 INTRODUCTION

1.1 The services of SS Wilson Associates were retained by Chisholm, Fleming and Associates to prepare a Noise Assessment Study for the Detailed Design phase in connection with a Barrier Retrofit Analysis as a result of the widening of Kennedy Road between Old School Road and Bonnieglen Farm Boulevard in the Town of Caledon.

Figure 1 illustrates the general location of the study area.

1.2 The purpose of the report is to perform a detailed noise analysis and to recommend sound barrier details (the need to consider noise mitigation, extents, elevations, locations, etc.) for the Town of Caledon to consider, in areas that are projected to meet the criteria for barrier retrofit in the MOE/MTO protocol or exceed the MECP maximum sound level criteria outlined in NPC-300 as a result of the expansion.

1.3 The difference between the ultimate sound levels for the “Mature State of Development” (Year 2031) and the existing (Year 2018) predicted sound levels is used for this study which establishes the need for retrofit noise barriers. Additionally, compliance with the MECP Noise Standards for Outdoor Living Area sound levels is also considered.

1.4 The primary objective of this study is to evaluate vehicular traffic noise as part of the Guideline/Policy for further consideration by the Town and for implementation by the Prime Consultant responsible for the detailed design phase of this project.

1.5 The specific objectives of this study are summarized as follows:

- Predict the existing and future noise environments by means of computer modeling with greater accuracy by using multiple segment calculations corresponding to ground elevation differences, angles of exposure, and vehicle classes.
- Assess the noise environment against the relevant MOE/MTO Protocol which covers barrier retrofits.
- Recommend to the Town where sound barriers are warranted, design details for consideration, and sound barrier alternative heights and alignments to meet the applicable sound level criteria. One of the important activities for this study is to conduct site specific investigations to check on the conditions of existing property line fences and sound barriers, establish their effectiveness, and determine whether improvement needs to be made.

2.0 SOUND LEVEL CRITERIA

2.1 TOWN OF CALEDON NOISE GUIDLEINES

Section 3.18 of the Town of Caledon's document entitled "Development Standards, Policies & Guidelines" dated January 2009, serves as the main municipal framework for Noise Assessment within the boundaries of the Town. The Town's guidelines for noise are essentially similar to the Provincial MECP NPC-300 guidelines with some variation including:

- For assessment of road traffic noise, a traffic speed 10km/h over the posted speed shall be used.
- OLA points of reception shall not exceed LAeq(day) 16 hrs of 55 dB.
- The use of wood in noise control barriers is prohibited.
- The maximum barrier wall height shall be 2.4 m, although greater heights can be obtained using a combination of berm and wall.

2.2 SOUND BARRIER RETROFIT GUIDELINES

To the best of SSWA's knowledge, The Town of Caledon and the Region of Peel both do not have published policies on their standards for qualifying for retrofit sound barriers. In the absence of a policy to follow SSWA has evaluated the sound levels in the study area with respect to the noise standards in the MOE/MTO 1986 Policy for roadway noise (adjusted at a later date by the MOE to suit Municipal Roads).

The MOE/MTO Noise Protocol is a joint effort of both the former Ministry of the Environment (MOE and now, the MECP) and the Ministry of Transportation (MTO) as modified for Municipal projects and as outlined in the document titled "A Protocol for Dealing with Noise Concerns During the Preparation, Review and Evaluation of Provincial Highways Environmental Assessments", February 1986. It primarily applies to Provincial Highway undertakings such as Freeways and King's Highways.

The MECP has informally extended the use of the MOE/MTO Noise Protocol criteria to also embrace other roadways, such as Regional and Local Municipal roads subject to the provisions of the Environmental Assessment Act (EAA) administered by the MECP. Since there is no formal direction published by the MECP on the application of the Protocol, it is recommended that the same direction with regards to mitigation that applies to the MTO projects be applied also for municipal project. The criteria apply to mitigation within the road R.O.W. and noise impact assessment only applies to Outdoor Living (amenity) Areas. While the Protocol does not specify whether the Leq sound levels should be 24-hr based or some other time frame, the MECP extended the appropriate technical logic to municipal roads by requesting calculations to be done on the basis of daytime Leq (16 hrs).

The other point worth noting is that despite the presence of a Provincial objective for outdoor levels of Leq 55 dBA*[1], the decision for mitigation depends primarily on the significance of relative noise increases attributable to the future road widening above the ambient situation when dealing with urban roads.

The noise mitigation effort included in the MOE/MTO Protocol can be summarized as follows:

- If the difference between the future with the undertaking and the ambient sound levels is equal to or less than 5 dBA, then noise mitigation measures need not be considered.
- If the difference between the future with the undertaking and the ambient sound levels is greater than 5 dBA, then the following is considered:
    - If the future with the undertaking sound levels is at or below the Government Objective for <u>urban areas of Leq 55 dBA,</u> then mitigation measures need not be considered.
    - If the future with the undertaking sound levels is over Leq 55 dBA, then these levels should be mitigated as close as technically, economically and administratively feasible to the higher of the ambient sound level or Leq 55 dBA.

It should be noted that the MOE/MTO Noise Protocol requires assessment of the future sound levels based on traffic projections ten years after completion. If such future 10 years information is not available, the Protocol suggests the use of “best available data” instead.

For existing alignments, it is generally the experience of roadway authorities that the projected increase in future volumes is gradual without any major overnight change in traffic volumes when the expanded roadway is opened to the public. Therefore, it is predicted that the change in traffic volumes will be gradual with a gradual rise in the road traffic sound levels.

Appendix A includes a copy of the MOE/MTO Noise Protocol.

The major shortcoming of the MOE/MTO Protocol are; firstly there is no specific limit on how high the current and future sound levels can up to and secondly, the minimum change that can trigger the need to consider mitigation is 5 or more dB, which is considered a “noticeable change” (a change of over 2-3 dBA is generally perceived by humans as being “hardly or barely perceptible”).

3.0 ANALYSIS AND RESULTS

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*[1] Leq is an energy averaging concept adopted by the MOE to sum the time-varying noise generated by vehicular traffic. The resulting levels are expressed in dBA; i.e. a logarithmic scale that approximates the response of human ears to noise.

The general procedures and analysis presented herein are partly based on the technical procedures incorporated in the MECP general technical procedures for traffic noise predictions.

3.1 NOISE IMPACT METHODOLOGY

Road traffic sound levels in this study have been predicted using the technique developed by the U.S. Federal Highway Administration (FHWA) enhanced by the Ministry of Transportation (MTO) and the Ministry of Environment, Conservation and Parks (MECP).

The U.S. FHWA model was jointly revised by the MTO and the MECP to incorporate procedures for the calculation of additional attenuation due to intervening ground features. A computerized version of the Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT) model was used (STAMSON) for calculating the sound levels in this study. The Ministry of the Environment requires the use of this method to assess the noise impact from existing roadways on planned residential land uses, to assess the noise impact of roadway projects, and to establish the ambient noise level criterion for the purposes of approval of new noise sources and for complaint investigation.

The calculations are primarily based on the annual average daily traffic volumes (AADT), percentages of medium and heavy trucks, traffic speed based on 85% percentile speed, day/night and directional split of traffic volumes, road to receptor distance, ground elevation information, roadway gradient, pavement type, and the type of ground cover between the road and the receptor in question. In addition, the extents, locations, heights, and ground elevations of existing sound barriers, if any, and the shielding of the receptors by the dwelling buildings themselves were accounted for in the sound level calculations for the existing and future conditions.

Based on the current practices of the MECP, the equivalent daytime sound level in dBA, Leq corresponding to the average hourly traffic volume of the 16 hours (7 a.m. to 11 p.m.) was used, i.e. Leq (16hr) in dBA.

As part of the significant drive to improve the accuracy of sound level modeling for this detailed design assignment, Chisholm, Fleming and Associates provided baseline drawings showing surveyed ground elevations where required for sound level modeling purposes.

3.2 SITE VISITS

Throughout the process of preparing the noise study, the subject area was visited by members of our staff to identify possible restrictions, sound propagation factors, and unusual field conditions that are likely to affect the sound levels, and for making decisions with respect to other technical requirements.

It was determined that one acoustic barrier exists along the alignment (located at Receptor 1 (denoted R1) as shown in Photograph 1), and that all other residences with outdoor living areas either have privacy fences or no fence at all which provide no acoustic protection.

3.3 PROJECT DETAILS

The detailed assessment of sound levels was based on data and project drawings provided by Chisholm, Fleming and Associates, which included Base Plans, Road Profiles, Topographic data, Traffic Counts, and the Subdivision Plans.

For the purposes of this report, the excess above the applicable sound level criteria of the MECP is defined as the difference between the future mature state sound levels and the existing sound levels for two cases: existing developments without a sound barrier and existing developments that have an existing sound barrier that is still in a good state of repair/condition.

The decision depended on comparing the future mature state levels with the predicted sound levels with the only the existing privacy fence in place.

3.4 SELECTED RECEPTORS

For the purpose of this study, five receptor locations (denoted R1 to R5) have been selected to represent the entire area surrounding the proposed undertaking which may be potentially affected by noise.

The following provides description of the selected receptors:

R1: 2 Bonnieglen Farm Boulevard
R2: 12793 Kennedy Road
R3: 12909 Kennedy Road
R4: 12976 Kennedy Road
R5: 3521 Old School Road

Figures 2.1 and 2.2 show the locations of the selected receptors described above. All other residences within the study area are located on Bonnieglen Farm Boulevard and are conservatively represented by Receptor 1.

3.5 SOURCE OF NOISE

The dominant sources of noise in the study area are the existing vehicular traffic movements on Kennedy Road.

3.6 ROAD TRAFFIC DATA

The traffic data used in this study was provided by The Town of Caledon. The provided traffic data included existing and mature state year 2031 projections, truck percentages, day/night traffic split, directional split, 85th percentile speed, and posted speed limit along the subject road and broken down into segments separated by intersections.

In accordance with MOE/MTO practices, the following table summarizes the traffic parameters used in this study, which are considered to produce the most conservative sound levels:

Kennedy Road

TRAFFIC PARAMETER	DATA USED IN THIS STUDY
Current AADT (Year 2017)	2,300 vpd
Ultimate AADT (Mature State Year 2031)	3,300
Posted Speed Limit	60 km/hr [2]
Percentage of Trucks to Total Road Volume • Medium Trucks (assumed) • Heavy Trucks	14% 7% 7%
Day/Night Split (assumed)	92%/8%
Directional Split (assumed)	50% NB /50% SB

Appendix B include the traffic data used in this report

3.7 SOUND LEVEL PREDICTIONS

Traffic sound level predictions were performed using a computerized spreadsheet version of the MECP noise prediction model ORNAMENT to determine the following:

- Existing sound levels.
- Future sound levels without the effect of possible new sound barriers.
- Future sound levels with the effect of assumed/new sound barriers.

The prediction results are discussed in detail in the following sections of the report. For the purposes of this Detailed Design assessment, reliance was made on the following data and procedures:

- Ground Survey Elevations

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[2] As per the Town of Caledon regulations a 10 km/hr increase has been applied to this speed for all calculations.

- Any acoustic shielding or loss of ground attenuation as a result of interrupting the line-of-sight from the source to the receptor
- The traffic parameters mentioned in Section 3.6.
- Existing and future road alignments provided by the project team

All the sound levels are expressed in terms of Leq (16h) dBA. Appendix C includes sample sound level calculations.

3.8 NOISE IMPACT ASSESSMENT

The noise impact of the road widening is assessed for Outdoor Living Areas (OLAs) and is based on the predicted sound levels compared to the applicable criteria during the daytime (7am to 11pm).

In order to gain an understanding of the reaction of people to noise, it is useful to rate the subjective impact of noise in the context of compliance with the criteria. A typical rating is presented in the following table which could be found in several MECP publications and other open scientific literature. The table below shows several categories of excess above the sound level criteria, the corresponding subjective loudness of noise and the extent of the noise impact. The application of the data in the following table is limited to the assessment of the outdoor noise impact produced by surface transportation sources.

The following table illustrates the subjective impact at different ranges of excesses above the sound level criteria.

Excess Above Sound Level Criterion, dB	Change in Subjective Loudness	Subjective Rating of Noise Impact
No excess	---	No expected noise impact
1 to 3 inclusive	Generally imperceptible	Insignificant
3 to 5 inclusive	Clearly perceptible	Noticeable
5 to 10 inclusive	Almost twice as loud	Significant
10 and over	More than twice as loud	Very Significant

Table 1 shows the comparison between the predicted existing and future sound levels at each of the selected receptors, and whether or not the investigation for construction of sound barriers is warranted according to the MOE/MTO Protocol.

Based on our investigation and prediction results, sound barriers should be considered for the entire study area as per the MOE/MTO Policy. Table 1 illustrates the comparison of the predicted noise impact levels (existing and future) and the need for investigation when compared with the applicable criteria. Under the MOE/MTO Policy no lots in the study area exceed the 5 dB difference to trigger a mandatory barrier retrofit.

One of the studied lots (R5) has predicted sound levels above 60 dBA for the ultimate traffic condition of the road. As a result, the 60 dBA upper limit for Outdoor Living Areas (OLAs) of the MECP's NPC-300 noise regulation document is predicted to be exceeded at this lot in the future.

SSWA therefore recommends that a retrofit barrier be constructed for R5 to bring the future OLA sound levels to under 60 dBA which is required for new developments Province wide.

Various sound barrier height alternatives were investigated. It should be noted that a minimum 6 dB reduction ensures that a sound barrier is creating an acoustic "shadow zone" at a receptor thus providing "significant" (i.e. better than "noticeable") subjective reaction to the expected future traffic noise at the OLA. Based on the provided existing grade elevations at the receptors, the property line, and the road, sound barrier heights to meet the minimum 6 dB reduction and objective sound level have been examined.

With regards to the possible construction of sound barriers, the following information summarizes the results and conclusions of this investigation of the sound barriers:

R1: No Barrier Required
R2: No Barrier Required
R3: No Barrier Required
R4: No Barrier Required
R5: No Barrier Required – 2.4m retrofit acoustic barrier recommended

3.9 MITIGATION

For existing roadways with limited chances for changes to the horizontal and vertical alignments or for reduction of post speed limits for noise control purposes, the most widely accepted noise control measure is to construct sound barriers at appropriate locations to protect the outdoor living areas of the receptors of concern. The usually accepted location of a possible barrier is at the outer limit of the right-of-way of the roadway alignment to facilitate barrier maintenance by the Region and to avoid physically severing lands. A minimum reduction of 6 dB at the receptor location is considered as the lowest sound level reduction to justify the consideration for the use of a sound barrier.

Should the Town find it technically and economically feasible to install noise barriers, we recommend that they consider the application of a sound barrier along the alignments shown schematically in Figures 3.1 to 3.2. The use of such sound barrier will result in significant reductions in sound levels (i.e. minimum 6 dB) within the OLA identified to be in excess of 60 dBA.

Section 3.8 above summarizes locations where sound barriers are recommended for consideration. Table 2 includes barrier height alternatives and the resulting predicted sound levels at the selected receptors where a barrier should be considered. Table 2 also includes the details of the barriers recommended for consideration.

The sound barriers should be constructed of a durable material having a minimum 20kg/m^2 (4 lb/sq.ft.) of surface area density and be in a continuous line without openings or gaps. Barrier material and design shall meet standards acceptable to the Town of Caledon for noise barriers.

It is important to note that the sound barriers must also meet other criteria related to technical and economic feasibility including important factors such as drainage and no interference with utilities and existing mature trees.

4.0 SUMMARY AND RECOMMENDATIONS

4.1 SUMMARY

This study has been carried out to investigate the potential noise impact of the Kennedy Road widening on the adjacent residences between Bonnieglen Farm Boulevard and Old School Road in the Town of Caledon.

The purpose of the report is to perform a detailed noise analysis and to determine alternative noise barrier heights for the areas that warranted installation of sound barriers based on this investigation.

The study addressed the future ultimate sound levels associated with Kennedy Road and Old School Road within the limits of the study area.

Sound level predictions were performed at the five Outdoor Living Area locations within the study area based on the most up-to-date grade elevations at the receptors, the property lines, and within the R.O.W. The newly performed sound level predictions were carried out to determine the existing and future sound levels, and to assess the warrants and feasibility for noise barriers in accordance with MOE/MTO Policy guidelines.

The predicted existing sound levels showed no increases in traffic noise significant to warrant a retrofit sound barrier under the MOE/MTO policy.

However, for R5 the future sound level was predicted to have an $L_{eq\ day}$ of over 60 dBA. Therefore, SSWA recommends that a retrofit acoustic sound barrier with a height of 2.4m be constructed for this Receptor.

The predicted future sound levels at the OLAs of the residences of concern were calculated without and with sound barrier alternative heights are shown in Table 2. Figures 3.1 to 3.2 illustrate the possible barrier alignments considered in this report. The proposed sound barriers are designed to provide a minimum sound level reduction of 6 dB.

4.2 OTHER RECOMMENDATIONS

It is recommended that the Prime Consultant responsible for the Detailed Design stage consider the findings of this study as approved by the Town and to prepare the recommended sound barrier cross-sections and profiles for review and further design iterations by all concerned parties based on other engineering considerations. Other considerations to be also pursued by the Prime Consultant include the preparation of tree preservation plans, drainage plans and potential interference with utilities; if any.

The Detailed Design drawings by the Prime Consultant for tender purposes shall also be considered by the selected Contractor who should be required to also submit the necessary Shop Drawings for the barriers to the Town of Caledon and the project Consultants for approval prior to finalization and construction of the designs. In particular the following information should be made available:

1. Copy of the most up-to-date grading plan of the specific area on which the sound barriers will be erected.
2. Barrier material details including actual thickness, wood species, gauge, ornamental details, etc.
3. Barrier heights, extent specified in linear meters shown on a drawing to a suitable scale, return sections and barrier flanking.

TABLES

File Number : WA18-040

SS WILSON ASSOCIATES

TABLE 1

ROADWAY ENVIRONMENTAL NOISE IMPACT ASSESSMENT

Kennedy Road Expansion
From Old School Road to Bonnieglen Farm Boulevard
Town of Caledon

Enter the Area Classification Urban Baseline Leq = 60 dBA

1	2	3	4	5	6	7	8	9	10	11
Receptor Code	**Receptor Name**	**Predicted 2018 Existing Leq (16hr) Sound Levels (dBA)**	**Predicted 2031 Mature State Leq(16hr) Sound Levels (dBA)**	**Previous Levels Include Effect of Existing Barrier?**	**Difference Between Mature State and Existing Sound Levels (dB)**	**Subjective Significance due to the Change in Sound Levels**	**Difference Equal to or Exceeds 5dB?**	**Exceedance Above 60dBA?**	**Selected Baseline for Impact Assessment**	**Recommended Barrier Height for Consideration, m**
R1	2 Bonnieglen Farm Boulev	52	53	Y	1	Insignificant Increase	No	No	60	-
R2	12793 Kennedy Road	52	54	N	2	Insignificant Increase	No	No	60	-
R3	12909 Kennedy Road	52	54	N	2	Insignificant Increase	No	No	60	-
R4	12976 Kennedy Road	54	55	N	1	Insignificant Increase	No	No	60	-
R5	3521 Old School Road	60	61	N	1	Insignificant Increase	No	YES	60	2.4
Footnotes		Takes into consideration the existing sound barrier's effectiveness, if any.	Takes into consideration the existing sound barrier's effectiveness, if any.		Delta (Δ) or change	Subjective Significance based on description from the MOE	As per Policy direction	As per NPC-300 regulations for new developments	As per NPC-300 regulations for new developments	SSWA recommendation

Impact Assessment Rating : 0 to < 3 dB change : Insignificant
=>3 to < 5 dB change : Noticeable
=> 5 to < 10 dB change: Significant
=> 10 dB change : Very Significant

SS WILSON ASSOCIATES

File Number : WA18-040

TABLE 2

SUMMARY OF PREDICTED SOUND LEVELS WITH VARYING BARRIER HEIGHTS

Kennedy Road Widening

Old School Road to Bonnieglen Farm Boulevard

Town of Caledon

1	2	3	4	5	6	7	8	9	12	13	14
Receptor	Existing Barrier	Predicted Future Mature State (2031) Leq, dBA						Predicted Barrier Height to Achieve Δ6dB Reduction	Receptor Elevation, m	Barrier Base Elevation, m	Minimum Top of Barrier Elevation, m
		Future (2031) Leq(16hr) Sound Level with Existing Barrier	2.2m	2.4m	2.6m	2.8m	3.0m				
R5	Privacy Fence	61	56	55	-	-	-	2.4m	267.30	267.30	270.50

FIGURES

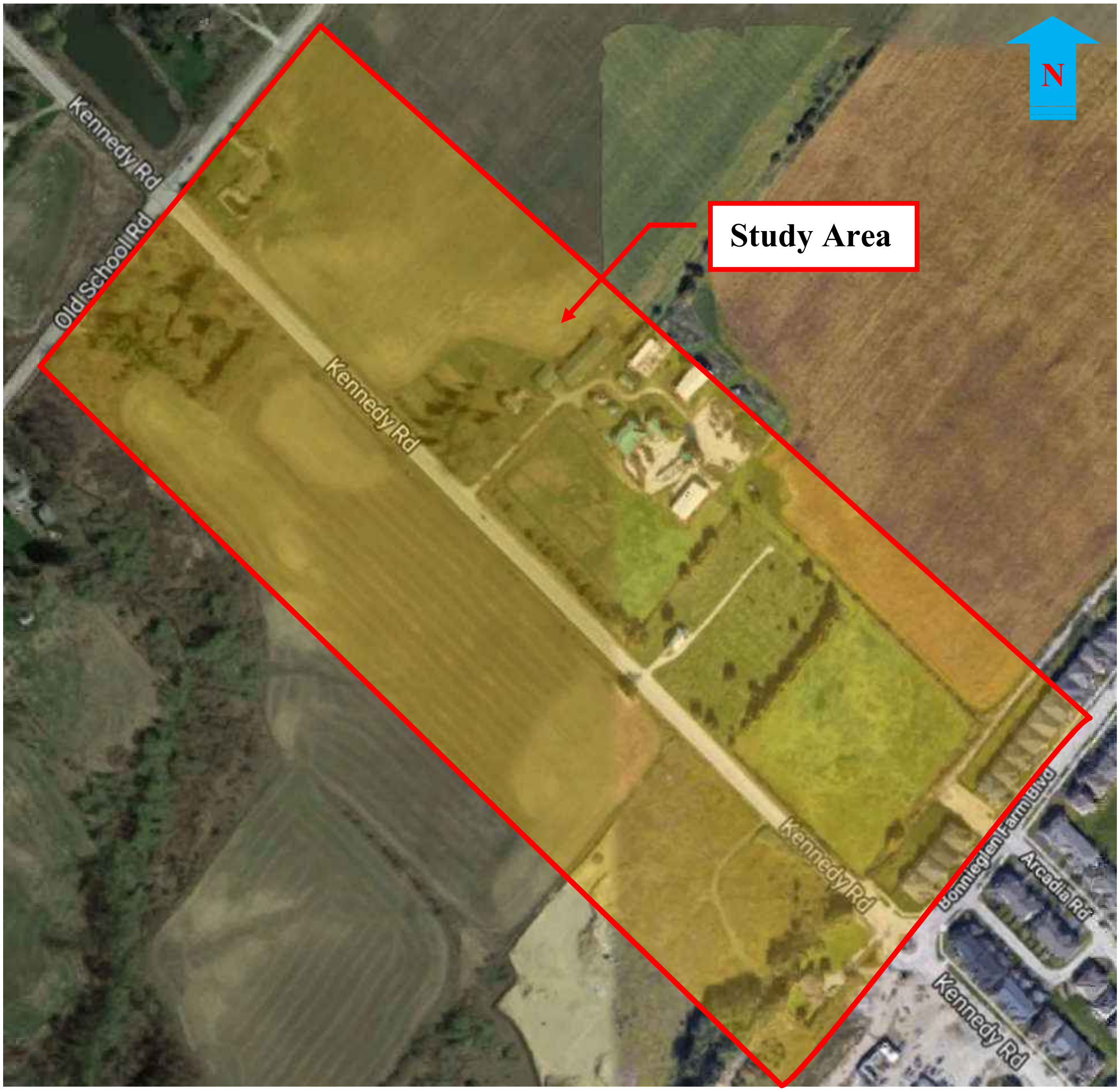

FIGURE 1
STUDY AREA

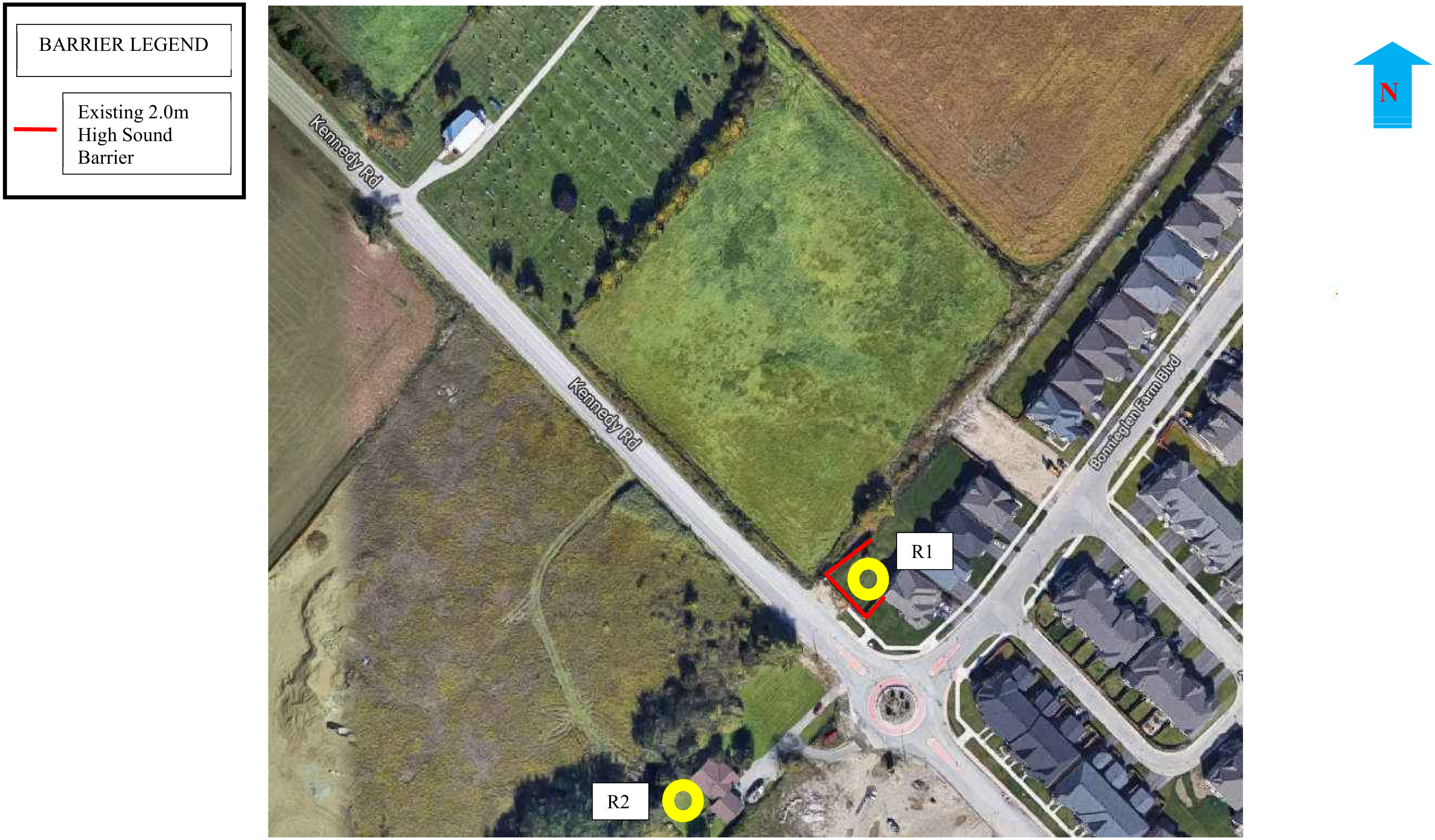

Figure 2.1: Receptor Locations and Existing Barrier Conditions

Page 1 of 2

NTS

SS Wilson Associates
Consulting Engineers

Figure 2.2: Receptor Locations and Existing Barrier Conditions

Page 2 of 2

NTS

SS Wilson Associates

Consulting Engineers

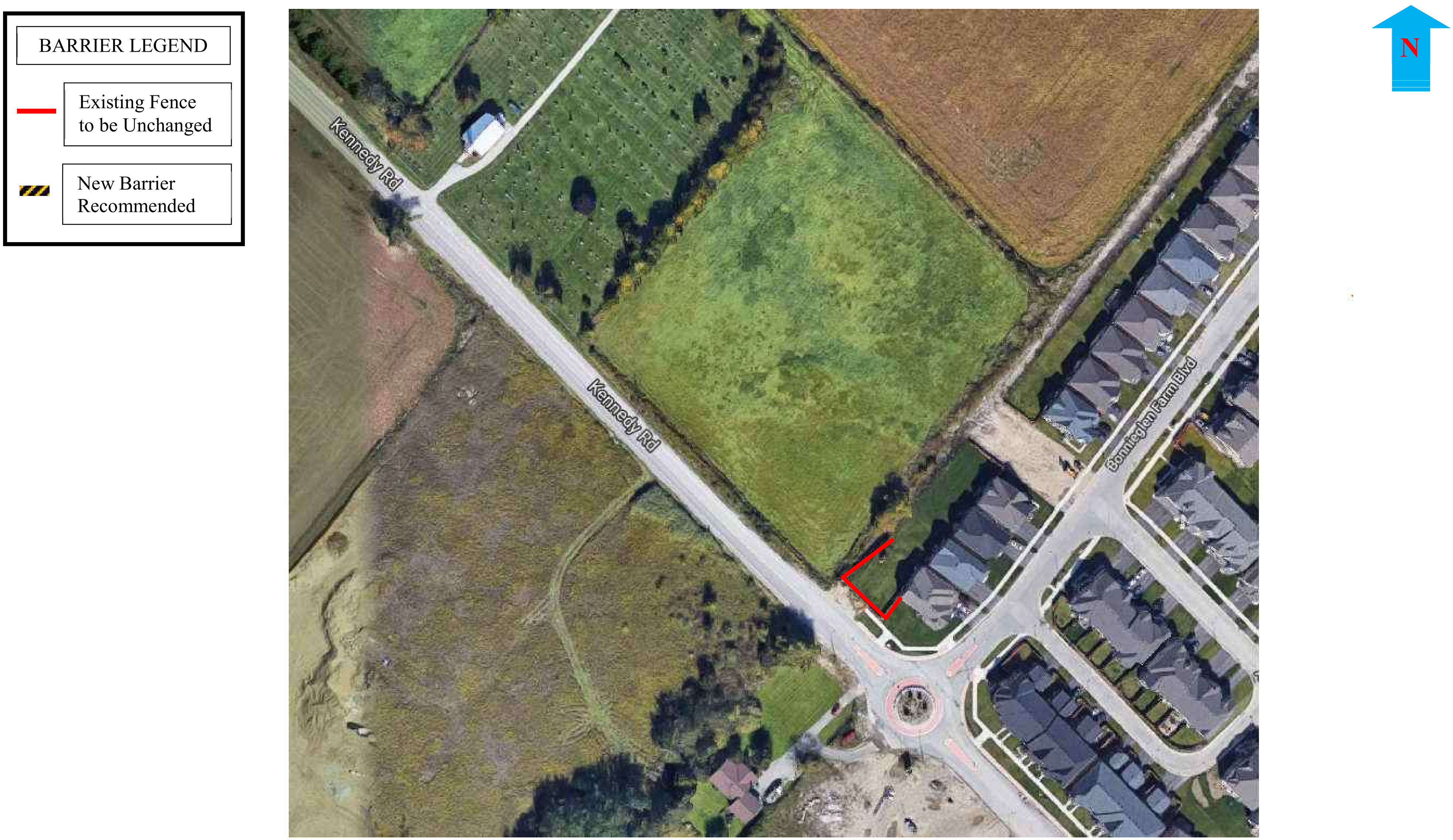

Figure 3.1: Proposed Barrier Alignment Design

Page 1 of 2

NTS

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Consulting Engineers

BARRIER LEGEND

······	Existing Fence to be Unchanged
▨	New Barrier Recommended

2.4m High Sound Barrier Recommended

Figure 3.2: Proposed Barrier Alignment Design

Page 1 of 2

NTS

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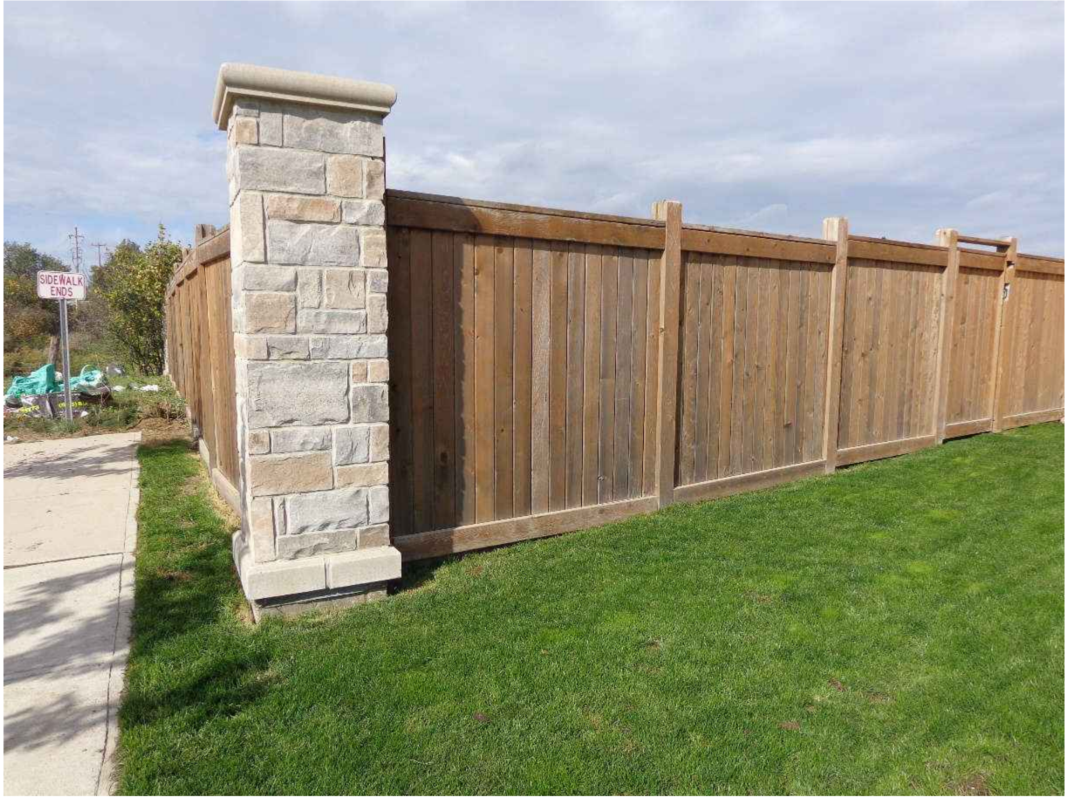
Consulting Engineers

PHOTOGRAPHS



PHOTOGRAPH 1
EXISTING SOUND BARRIER – R1

PHOTOGRAPH 2
EXISTING PRIVACY FENCE – R5

APPENDIX A

MOE/MTO PROTOCOL

This Protocol contains areas of policy agreement between the Ministries of Transportation and Communications, and Environment for dealing with noise concerns during the preparation, review and evaluation of environmental assessments for Provincial Highway undertakings.

As common understandings are resolved for any outstanding issues, these will be added to the Protocol by formal agreement.

D.P. Caplice

D.P. Caplice
Assistant Deputy Minister
Operations Division
Ministry of Environment

J.R. Barr
Assistant Deputy Minister
Engineering and Construction
Ministry of Transportration
and Communications

FEBRUARY
1986

1. Retrofit The MTC policy for retrofit of existing freeways with sound barriers will remain in effect and unchanged.

2. Scope of Protocol

   This protocol applies to the MTC Capital Construction Program for all classes of MTC Provincial roads, both urban and rural. The policy for each situation may require different noise control measures and further, that an assessment of the feasibility of providing noise control measures includes technical and economic considerations.

3. Definition of Noise Sensitive Areas

   To be clearly defined, as guided by the One-Stage Procedural Guidelines and the specific definitions of "residential areas" and "quiet zones" found in the municipal noise control by-laws, approved by MOE under the Environmental Protection Act.

4. Establishing Existing and Future Noise Levels

   Presently used prediction methodologies and measurement procedures are satisfactory. Any future changes, in noise prediction methodologies or measurement procedures, shall be compatible with those of both MOE and MTC.

   Staff of MTC and MOE together shall set a standard for ambient noise levels in rural areas where predictions cannot be done.

5. Impact Assessment

   Noise impacts for all MTC Provincial roads will be predicted based on traffic projections ten years after completion, or best available data when 10-year projections are not available.

   The study area shall be defined using the smaller of one of the two following methods; using 5 decibel contour lines extending from the source to the point where there is no increase above the ambient level, or a distance of 600 m from the source.

   The noise impact on noise-sensitive land uses will be determined for outdoor spaces.

   All reference to 65 dBA as a "target" and 70 dBA as a "maximum" will be removed from MTC directives A-1 and B-94. Further, reference to a 70 dBA maximum should be removed from the Provincial Policy. The objective for outdoor sound levels is the higher of the Leq 55 dBA or the existing ambient. The significance of a noise impact will be quantified by using this objective in addition to the change in noise level above the ambient.

Mitigation will attempt to achieve levels as close to, or lower than, the objective level as is technically, economically, and administratively feasible.

6. Noise Control Measures

The attached Table summarizes the degree of mitigation effort to be applied for various noise level increases.

On right-of-way mitigation measures will be identified, considered and implemented where warranted.

Mitigation measures within the right-of-way include: barriers, berms, vertical and horizontal alignments, pavement surfaces, etc.

Where noise increases above the ambient do not exceed 5 dBA no mitigation is required.

Where noise increases above the ambient exceed 5 dBA MTC will:
- investigate noise control measures within the right-of-way
- if project costs are not significantly affected and where averaged over first row receivers, a minimum attenuation of 5 dBA can be achieved, MTC will introduce the selected measures within the right-of-way.

Where a freeway is to be expanded through an existing residential area that has been included on the retrofit priority list, noise attenuation measures should be considered as part of the freeway expansion project when the MTC policy for Retrofit of Existing Freeways can be satisfied.

7. Documentation

MTC will increase its E.A. documentation with respect to the feasibility of all potential mitigation measures within the right-of-way. The feasibility of each measure would be evaluated by such factors as effectiveness and technical and economic feasibility.

8. Construction Noise

The following is a brief outline of the procedures to be followed in handling construction noise during the Environmental Assessment process and during the construction phase. Commitment to the following shall be made in all E.A. Documents:

(a) Noise sensitive areas will be identified;

(b) Applicable municipal noise control by-laws will be identified and obeyed. Where timing constraints, or any other municipal by-law may cause hardship to MTC, an explanation of this will be outlined in the EA document, and an exemption from such by-law will be sought directly from the municipality in question.

(c) General noise control measures (not sound level criteria) will be referred to, or placed into MTC contract documents;

(d) Any initial complaint from the public will require verification by MTC that the general noise control measures agreed to are in effect; MTC will investigate any noise concerns, warn the contractor of any problems, and enforce its contract;

(e) Notwithstanding compliance with the "general noise control measures", a persistent complaint will require a contractor to comply with MOE sound level criteria for construction equipment contained in the MOE Model Municipal Noise Control By-Law. Subject to the results of field investigation, alternative noise control measures will be required, where these are reasonably available; and

(f) In selecting the appropriate construction noise control and mitigation measures, MTC will give consideration to the technical, administrative, and economic feasibility of the various alternatives.

9. Miscellaneous

(a) All future technical documents referred to in this agreement and prepared to become part of the Protocol shall be jointly approved by MOE and MTC. These include:

- o ambient levels in Rural Areas where predictions cannot be done;
- o general construction noise control measures; and
- o any other alterations to this Protocol.

(b) As the intent of this Protocol will be followed during their preparation, joint MOE/MTC approval is not required for MOE or MTC procedural/operational documents such as:

- o internal directives;
- o contract documents; and
- o E.A. procedural/technical guidelines.

TABLE 1: SUMMARY OF MITIGATION EFFORT

CHANGE IN NOISE LEVEL ABOVE AMBIENT	MITIGATION EFFORT
0 - 5 dBA	- None
> 5 dBA	- Investigate noise control measures on R.O.W. - If project cost is not significantly affected introduce noise control measure within R.O.W. - Noise control measures, where introduced, should achieve a minimum of 5 dBA attenuation, over first row receivers. - Mitigate to ambient, as administratively, economically, and technically feasible.

APPENDIX B

ROAD TRAFFIC DATA

paradigm
TRANSPORTATION SOLUTIONS LIMITED
20 YEARS

5A-150 Pinebush Road
Cambridge ON N1R 8J8
p: 519.896.3163
905.381.2229
416.479.9684

www.ptsl.com

18 September 2018
Project: 180142

Andrew Ostler, P.Eng.
Chisholm Fleming and Associates
317 Renfrew Dr., Suite 301
Markham, ON L3R 9S8

Dear Mr. Ostler:

RE: ENVIRONMENTAL ASSESSMENT AND DETAILED DESIGN KENNEDY ROAD URBANIZATION, TOWN OF CALEDON TRAFFIC GROWTH, TRANSPORTATION AND TRAFFIC ANALYSIS REPORT

The Town of Caledon has initiated a Schedule B Municipal Class Environmental Assessment (EA) and detailed design for the proposed reconstruction and urbanization of Kennedy Road from Bonnieglen Farm Boulevard to south of Old School Road.

This **Traffic Growth, Transportation and Traffic Analysis Report** has been prepared to address short and long term transportation needs related to planned growth to the year 2031 within the Study Area.

Figure 1 illustrates the Study Area for this report.

It is noted that this report will not be finalized until the conclusion of Phase 3 of the Municipal Class EA process, as a component of the analysis examines the anticipated performance of the Preferred Design Concept, which will be further detailed through the preliminary design tasks in later stages of the study.

This letter report is organized as follows:

- Information on the Planning Context;
- Part A – Traffic Growth Projections Report;
- Part B – Transportation and Traffic Study Report, including the following sub-sections:
  - Existing Transportation Conditions;
  - Future Transportation Conditions (2021 and 2031 future horizons);
  - Alternative Solutions; and
  - Conclusions and Recommendations.

- A driveway to the subdivision sales centre, which may become a residential driveway, on the west side of Kennedy Road, approximately 30 m north of the intersection with Bonnieglen Farm Boulevard, and a few meters north of the north leg splitter island;
- A construction access to the Tony Pontes school site, approximately 115 m north of the intersection with Bonnieglen Farm Boulevard;
- A driveway to the cemetery and chapel, on the east side, approximately 240 m from the intersection with Bonnieglen Farm Boulevard, fenced;
- A residential/farm driveway, on the east side, approximately 400 m from the intersection with Bonnieglen Farm Boulevard; and
- A residential driveway on the west side, approximately 50 m from the intersection with Old School Road.

Transit and Active Transportation Network

There is currently no transit service operating on Kennedy Road within the study area.

Kennedy Road is signed as a bicycle route, maintained from 1 May to 31 October, but has no separate bicycle facilities. Generally, there are no sidewalks present on either side of Kennedy Road. The sidewalk from the north side of Bonnieglen Farm Boulevard extends to the east side of Kennedy Road, and ends just north of the intersection.

"Yield here to pedestrians" signs are present for northbound drivers entering the roundabout from the south leg, and for northbound drivers exiting the roundabout on the north leg, where the sidewalk on the east side of Kennedy Road connects with the roadway. No crosswalks are provided.

Pedestrian volumes were extremely low during the turning movement count data collection in December 2016. Similarly, no pedestrian or cyclist activity was observed during our site visit in July 2018.

Traffic Volumes

Daily traffic volumes were obtained through 24-hour traffic counts completed by the Town of Caledon on Kennedy Road between Old School Road and Bonnieglen Farm Boulevard in 2017. Total volumes (northbound and southbound) were collected over seven (7) days. Daily traffic varied between 1,700 and 2,700 vehicles per day, with an average of 2,300 vehicles per day. Heavy vehicles accounted for an average of 7% of daily traffic.

Intersection traffic volumes were obtained through the traffic counts completed in 2016 for the Tony Pontes Public School Transportation Impact Study[3] and adjusted to 2018 using the growth rates calculated in Part A – Traffic Growth Projection of this report. We also assumed

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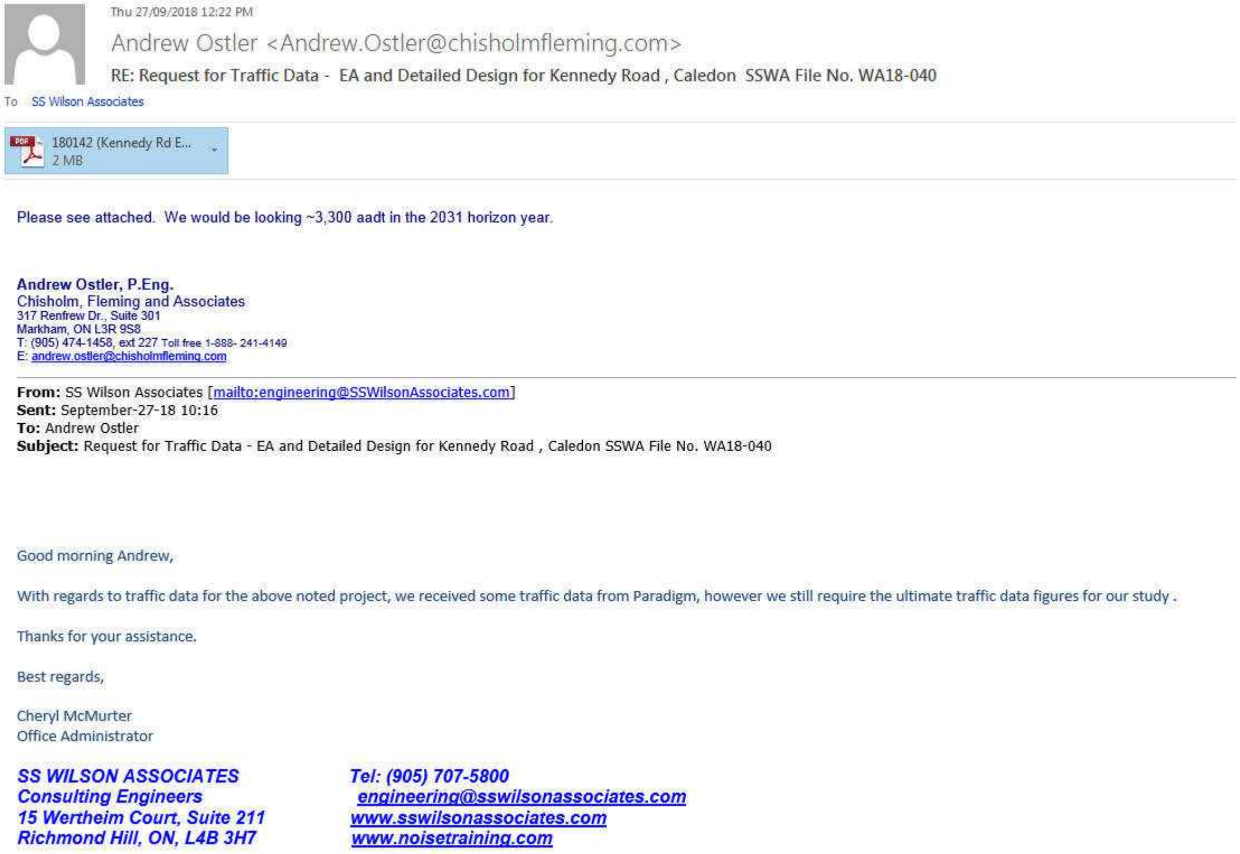
[3] MMM Group. January 2017. *Southfields Public School and Child Care Centre Traffic Impact Study*. 80 pages.



Thu 27/09/2018 12:22 PM

Andrew Ostler <Andrew.Ostler@chisholmfleming.com>

RE: Request for Traffic Data - EA and Detailed Design for Kennedy Road , Caledon SSWA File No. WA18-040

To SS Wilson Associates

180142 (Kennedy Rd E...
2 MB

Please see attached. We would be looking ~3,300 aadt in the 2031 horizon year.

Andrew Ostler, P.Eng.
Chisholm, Fleming and Associates
317 Renfrew Dr., Suite 301
Markham, ON L3R 9S8
T: (905) 474-1458, ext 227 Toll free 1-888- 241-4149
E: andrew.ostler@chisholmfleming.com

From: SS Wilson Associates [mailto:engineering@SSWilsonAssociates.com]
Sent: September-27-18 10:16
To: Andrew Ostler
Subject: Request for Traffic Data - EA and Detailed Design for Kennedy Road , Caledon SSWA File No. WA18-040

Good morning Andrew,

With regards to traffic data for the above noted project, we received some traffic data from Paradigm, however we still require the ultimate traffic data figures for our study .

Thanks for your assistance.

Best regards,

Cheryl McMurter
Office Administrator

SS WILSON ASSOCIATES
Consulting Engineers
15 Wertheim Court, Suite 211
Richmond Hill, ON, L4B 3H7

Tel: (905) 707-5800
engineering@sswilsonassociates.com
www.sswilsonassociates.com
www.noisetraining.com

APPENDIX C

SAMPLE SOUND LEVEL CALCULATIONS

SS WILSON ASSOCIATES - TRAFFIC NOISE PREDICTION MODEL

Consulting Engineers, Richmond Hill, Ontario *August 28, 2014*

Source(s) of Road Traffic Noise: **Kennedy Road**
Receptor Name: **R5 OLA (2018) - No Barrier**
SSWA Project Number WA18-040

Record Number	1	2	3	4
Include the following Segments in the calculations? (0 or 1)	1 Yes	0 No	0 No	0 No
Road Name & Direction	Kennedy Road			
Segment Detail				
Section/Segment Number	S1	[illegible]	[illegible]	[illegible]
MOE Topographic Case (1-11)-See Instructions	1  S and R on flat ground			
Traffic Data Input Method	24 hour Data	24 hour Data	24 hour Data	24 hour Data
Alpha (α) Input; Manual or Auto?	Automatic			
Notes on your choice of α	As per MOE Procedures			
Manual Alpha				
Intermediate Surface; Absorptive or Reflective	Absorptive			
Pavement Type	Asphalt-Concret	Asphalt-Concret	Asphalt-Concret	Asphalt-Concret
Include Effect of Dense Woods?	No			
Measured Angle Case Number	3	3	3	3
Angle description	+θ1 & +θ2 Both on the Right	+θ1 & +θ2 Both on the Right	[illegible]	+θ1 & +θ2 Both on the Right
Angle Theta 1	-90	-40	0	0
Angle Theta 2	90	30	50	50
Angle Theta Error Detection Flag				
Subtended Angle (Angle of Exposure), °	180	70	50	50
% increase / year	2.50%	2.00%	2.00%	2.00%
Number of years	1	8	15	15
24 Hour Traffic Data	2300	35000	64750	27750
Medium Truck %	7.00%	3.00%	2.00%	2.00%
Heavy Truck %	7.00%	3.00%	2.00%	2.00%
Daytime Traffic Split	92.00%	94.00%	88.80%	66.80%
Daytime Hours	16	16	16	16
Posted Speed (Km/Hr) [S]	70	70	100	100
Road Gradient (%) [Gradient]	2.00%	2.00%	2.00%	2.00%
Wood Depth (m)	0	0	0	0
Number of Rows of Houses	0	0	0	0
Night time Number of Rows of Houses	0	0	0	0
Percentage of Row Occupied by Houses	80%	80%	80%	80%
Height of Row of House [HH]	7	7	7	7
Receiver Height (m) [RH]	1.5	1.5	1.5	1.5
Night time Reciever Height (m) [NRH]	4.5	4.5	4.5	4.5
Source-Receiver Distance [SRD]	25	25	850	850
Night time Source-Receiver Distance [NSRD]	25	25	850	850
Barrier Height (m) [BH]	0	0	0	0
Barrier-Receiver Distance (m)	0	4	4	4
Ground Elevation Difference (m) [e]	0	0	0	0
Source Ground Elevation (m)	269.78	0	0	0
Receiver Ground Elevation (m)	267.3	0	0	0
Barrier Ground Elevation (m)	267.3	0	0	0
Source Height Input [Manual or Auto]	Automatic	Automatic	Automatic	Automatic
Manual Source Height (m) [MSH]		1.00	1.00	1.00
Dominant Octave Frequency Band (Hz) [F]	500			
Additionl dBA Correction Factor 1- Specify	0			
Additionl dBA Correction Factor 2- Specify	0			

RESULTS FOR SEGMENTS

24 Hour Daily Segment Leq	58.19	-50.00	-50.00	-50.00
Day Time [16 hours] Segment Leq	59.59	-50.00	-50.00	-50.00
Night Time [8 hours] Segment Leq	52.35	-50.00	-50.00	-50.00

FINAL/OVERALL	24 Hour Daily Leq	Day Time Leq	Night Time Leq
	58	60	52

SS WILSON ASSOCIATES - TRAFFIC NOISE PREDICTION MODEL

Consulting Engineers, Richmond Hill, Ontario *August 28, 2014*

OLA calc for 2031 Horizon Year

Text

Source(s) of Road Traffic Noise: **Kennedy Road**

Receptor Name: **R5 OLA (2031) - No Barrier**

SSWA Project Number WA18-040

Record Number	1	2	3	4
Include the following Segments in the calculations? (0 or 1)	1 Yes	0 No	0 No	0 No
Road Name & Direction	Kennedy Road			
Segment Detail				
Section/Segment Number	S1	[illegible]	[illegible]	[illegible]
MOE Topographic Case (1-11)-See Instructions	1  S and R on flat ground			
Traffic Data Input Method	24 hour Data	24 hour Data	24 hour Data	24 hour Data
Alpha (α) Input; Manual or Auto?	Automatic			
Notes on your choice of α	As per MOE Procedures			
Manual Alpha				
Intermediate Surface; Absorptive or Reflective	Absorptive			
Pavement Type	Asphalt-Concret	[illegible]	[illegible]	[illegible]
Include Effect of Dense Woods?	No			
Measured Angle Case Number	3	3	3	3
Angle description	+θ1 & +θ2 Both on the Right	[illegible]	[illegible]	[illegible]
Angle Theta 1	-90	-40	0	0
Angle Theta 2	90	30	50	50
Angle Theta Error Detection Flag				
Subtended Angle (Angle of Exposure), °	180	[illegible]	[illegible]	[illegible]
% increase / year	0.00%	[illegible]	[illegible]	[illegible]
Number of years	0	[illegible]	[illegible]	[illegible]
24 Hour Traffic Data	3300	35000	64750	27750
Medium Truck %	7.00%	3.00%	2.00%	2.00%
Heavy Truck %	7.00%	3.00%	2.00%	2.00%
Daytime Traffic Split	92.00%	94.00%	88.80%	86.80%
Daytime Hours	16	16	16	16
Posted Speed (Km/Hr) [S]	70	70	100	100
Road Gradient (%) [Gradient]	2.00%	2.00%	2.00%	2.00%
Wood Depth (m)	0	0	0	0
Number of Rows of Houses	0	[illegible]	[illegible]	[illegible]
Night time Number of Rows of Houses	0	[illegible]	[illegible]	[illegible]
Percentage of Row Occupied by Houses	80%	[illegible]	[illegible]	[illegible]
Height of Row of House [HH]	7	[illegible]	[illegible]	[illegible]
Receiver Height (m) [RH]	1.5	[illegible]	[illegible]	[illegible]
Night time Reciever Height (m) [NRH]	4.5	[illegible]	[illegible]	[illegible]
Source-Receiver Distance [SRD]	25	25	850	850
Night time Source-Receiver Distance [NSRD]	25	25	850	850
Barrier Height (m) [BH]	0	0	0	0
Barrier-Receiver Distance (m)	0	4	4	4
Ground Elevation Difference (m) [e]	0	0	0	0
Source Ground Elevation (m)	269.78	0	0	0
Receiver Ground Elevation (m)	267.3	0	0	0
Barrier Ground Elevation (m)	267.3	0	0	0
Source Height Input [Manual or Auto]	Automatic	Automatic	Automatic	Automatic
Manual Source Height (m) [MSH]		1.00	1.00	1.00
Dominant Octave Frequency Band (Hz) [F]	500			
Additionl dBA Correction Factor 1- Specify	0			
Additionl dBA Correction Factor 2- Specify	0			
RESULTS FOR SEGMENTS				
24 Hour Daily Segment Leq	59.65	-50.00	-50.00	-50.00
Day Time [16 hours] Segment Leq	61.05	-50.00	-50.00	-50.00
Night Time [8 hours] Segment Leq	53.81	-50.00	-50.00	-50.00

FINAL/OVERALL	24 Hour Daily Leq	Day Time Leq	Night Time Leq
	60	61	54

SS WILSON ASSOCIATES - TRAFFIC NOISE PREDICTION MODEL

Consulting Engineers, Richmond Hill, Ontario *August 28, 2014*

OLA calc for 2031 Horizon Year

Text

Source(s) of Road Traffic Noise: **Kennedy Road**

Receptor Name: **R5 OLA (2031) - With Barrier**

SSWA Project Number WA18-040

Record Number	*1*	*2*	*3*	*4*
Include the following Segments in the calculations? (0 or 1)	1 Yes	0 No	0 No	0 No
Road Name & Direction	Kennedy Road			
Segment Detail				
Section/Segment Number	S1	[illegible]	[illegible]	[illegible]
MOE Topographic Case (1-11)-See Instructions	1 			
	S and R on flat ground			
Traffic Data Input Method	24 hour Data	24 hour Data	24 hour Data	24 hour Data
Alpha (α) Input; Manual or Auto?	Automatic			
Notes on your choice of α	As per MOE Procedures			
Manual Alpha				
Intermediate Surface; Absorptive or Reflective	Absorptive			
Pavement Type	Asphalt-Concret	[illegible]	[illegible]	[illegible]
Include Effect of Dense Woods?	No			
Measured Angle Case Number	3	3	3	3
Angle description	+θ1 & +θ2 Both on the Right	[illegible]	[illegible]	[illegible]
Angle Theta 1	-90	-40	0	0
Angle Theta 2	90	30	50	50
Angle Theta Error Detection Flag				
Subtended Angle (Angle of Exposure), °	180	[illegible]	[illegible]	[illegible]
% increase / year	0.00%	[illegible]	[illegible]	[illegible]
Number of years	0	[illegible]	[illegible]	[illegible]
24 Hour Traffic Data	3300	35000	64750	27750
Medium Truck %	7.00%	3.00%	2.00%	2.00%
Heavy Truck %	7.00%	3.00%	2.00%	2.00%
Daytime Traffic Split	92.00%	94.00%	66.60%	66.60%
Daytime Hours	16	16	16	16
Posted Speed (Km/Hr) [S]	70	70	100	100
Road Gradient (%) [Gradient]	2.00%	2.00%	2.00%	2.00%
Wood Depth (m)	0	0	0	0
Number of Rows of Houses	0	[illegible]	[illegible]	[illegible]
Night time Number of Rows of Houses	0	[illegible]	[illegible]	[illegible]
Percentage of Row Occupied by Houses	80%	[illegible]	[illegible]	[illegible]
Height of Row of House [HH]	7	[illegible]	[illegible]	[illegible]
Receiver Height (m) [RH]	1.5	1.5	1.5	1.5
Night time Reciever Height (m) [NRH]	4.5	4.5	4.5	4.5
Source-Receiver Distance [SRD]	25	25	850	850
Night time Source-Receiver Distance [NSRD]	25	25	850	850
Barrier Height (m) [BH]	2.4	0	0	0
Barrier-Receiver Distance (m)	5	4	4	4
Ground Elevation Difference (m) [e]	0	0	0	0
Source Ground Elevation (m)	269.78	0	0	0
Receiver Ground Elevation (m)	267.3	0	0	0
Barrier Ground Elevation (m)	267.3	0	0	0
Source Height Input [Manual or Auto]	Automatic	Automatic	Automatic	Automatic
Manual Source Height (m) [MSH]		1.00	1.00	1.00
Dominant Octave Frequency Band (Hz) [F]	500			
Additionl dBA Correction Factor 1- Specify	0			
Additionl dBA Correction Factor 2- Specify	0			
RESULTS FOR SEGMENTS				
24 Hour Daily Segment Leq	54.10	-50.00	-50.00	-50.00
Day Time [16 hours] Segment Leq	55.50	-50.00	-50.00	-50.00
Night Time [8 hours] Segment Leq	53.64	-50.00	-50.00	-50.00

FINAL/OVERALL	24 Hour Daily Leq	Day Time Leq	Night Time Leq
	54	55	54

APPENDIX I

Traffic Study
(Paradigm)

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11 January 2019
Project: 180142

Andrew Ostler, P.Eng.
Chisholm Fleming and Associates
317 Renfrew Dr., Suite 301
Markham, ON L3R 9S8

Dear Mr. Ostler:

**RE: ENVIRONMENTAL ASSESSMENT AND DETAILED DESIGN
KENNEDY ROAD URBANIZATION, TOWN OF CALEDON
TRAFFIC GROWTH, TRANSPORTATION AND TRAFFIC ANALYSIS REPORT**

The Town of Caledon has initiated a Schedule B Municipal Class Environmental Assessment (EA) and detailed design for the proposed reconstruction and urbanization of Kennedy Road from Bonnieglen Farm Boulevard to south of Old School Road.

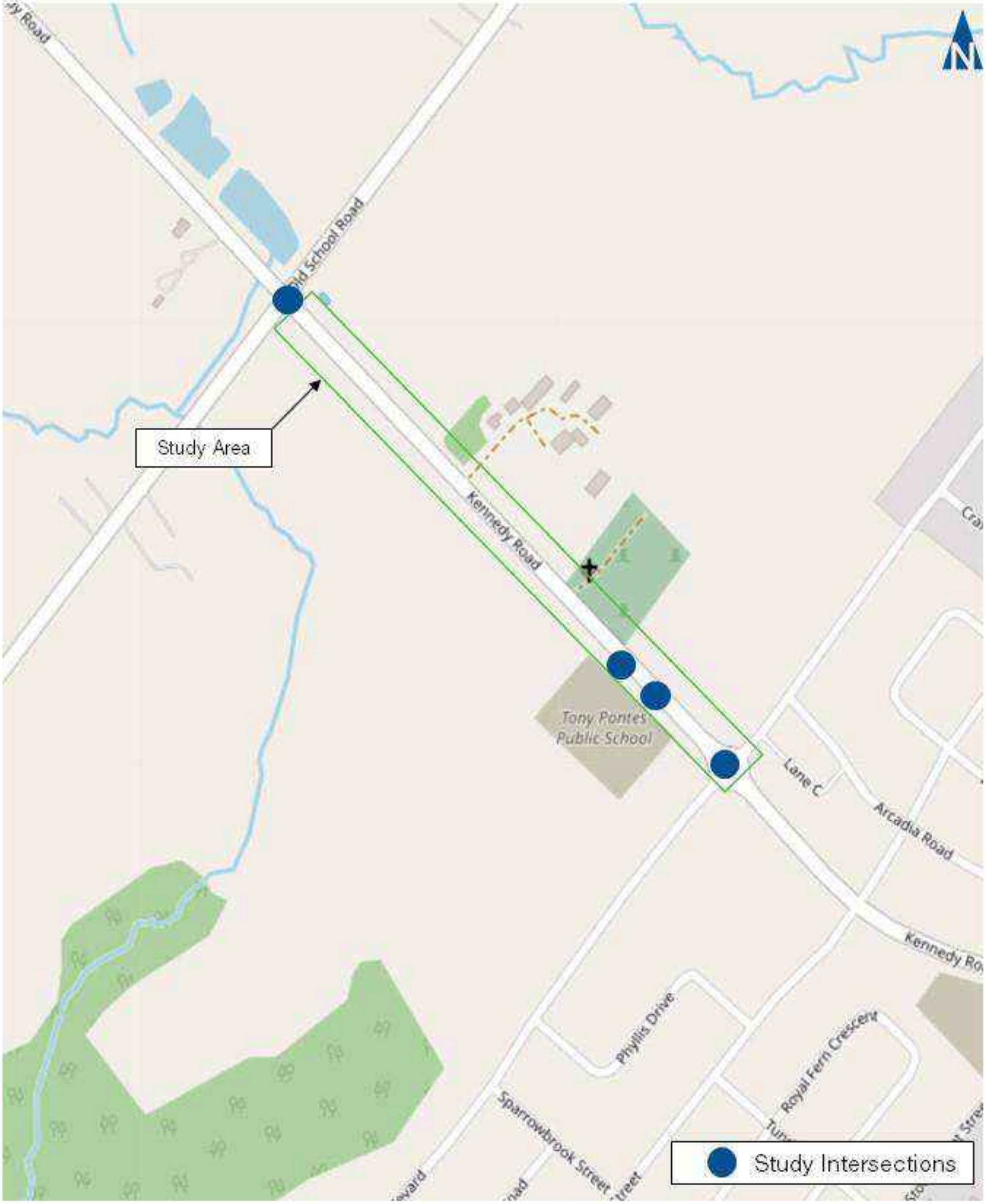
This **Traffic Growth, Transportation and Traffic Analysis Report** has been prepared to address short and long term transportation needs related to planned growth to the year 2031 within the Study Area.

Figure 1 illustrates the Study Area for this report.

It is noted that this report will not be finalized until the conclusion of Phase 3 of the Municipal Class EA process, as a component of the analysis examines the anticipated performance of the Preferred Design Concept, which will be further detailed through the preliminary design tasks in later stages of the study.

This letter report is organized as follows:

- Information on the Planning Context;
- Part A – Traffic Growth Projections Report;
- Part B – Transportation and Traffic Study Report, including the following sub-sections:
  - Existing Transportation Conditions;
  - Future Transportation Conditions (2021 and 2031 future horizons);
  - Alternative Solutions; and
  - Conclusions and Recommendations.



Study Area & Intersections

Figure 1

Planning Context

Growth Plan for the Greater Golden Horseshoe

The first Growth Plan for the Greater Golden Horseshoe – Places to Grow was adopted in June 2006 under the provisions of the *Places to Grow Act*, *2005.* The plan provides the framework for implementing the Provincial government's vision for building stronger, prosperous communities by better managing growth to the year 2041 in the burgeoning Greater Toronto and Hamilton Area (GTHA). After implementation, the plan has been amended to address growth in the County of Simcoe (including the cities of Barrie and Orillia), and provide population and employment forecasts to the year 2041.

Recently, the Growth Plan for the Greater Golden Horseshoe, 2017 has been adopted, building on the 2006 version and addressing new challenges faced as growth continues. This plan took effect on 1 July 2017.

The Growth Plan contains specific policies and directives to manage growth and protect the environment by focusing on building complete communities, benefiting from land use planning, maximizing investments in existing and future infrastructure, providing affordable housing, improving transit and active transportation networks, promoting economic development, and protecting natural, agricultural and heritage resources.

The plan forecasts the population of the Region of Peel to grow to 1.77 million by 2031, 1.87 million by 2036, and 1.97 million by 2041, for an annual average growth rate of 1.1 per cent. For employment, Places to Grow forecasts the number of jobs in the Region to reach 880,000 by 2031, 920,000 by 2036, and 970,000 by 2041, for an annual average growth rate of 1.0 per cent.

The plan also offers guidance regarding transportation system development, envisioning a safe and sustainable transportation system providing connectivity and balance between modes. It emphasises the planning and design of *complete streets* along with the implementation of *transportation demand management* policies and programs.

Metrolinx "The Big Move" – Regional Transportation Plan for the GTHA

Pursuant to the *Metrolinx Act, 2006*, the Province created Metrolinx to develop, fund, coordinate and promote transportation within the GTHA municipalities. In 2008, Metrolinx released its Regional Transportation Plan (RTP) for the GTHA, entitled "The Big Move: Transforming Transportation in the Greater Toronto and Hamilton Area". The plan outlines a 25-year vision for sustainable transportation in the GTHA, and the policies, programs and infrastructure investments required to achieve this vision of a seamless, integrated transportation network.

The Big Move is primarily focused on enhancing and expanding public transit. In the vicinity of the Study Area, the RTP identifies Hurontario Street in Caledon, west of the Study Area, as an intensification corridor, supporting growth, development and transit. The plan also includes policies related to goods movement, active transportation (AT) and transit to be considered in developing and improving infrastructure.

GTA West Transportation Corridor Planning

The Ministry of Transportation (MTO) was conducting the Greater Toronto Area (GTA) West Transportation Corridor Planning and Environmental Assessment Study (the GTA West Study) to identify the preferred solution for providing better linkages between Urban Growth Centres in the west part of the GTHA, including Downtown Guelph, Downtown Milton, Brampton City Centre and Vaughan Corporate Centre.

The *GTA West Transportation Development Strategy* (TDS) released in November 2012 recommended a broad range of measures to address future needs in the northwest part of the GTHA, including a new transportation corridor from Highway 400 westerly to Highway 401 east of the Niagara Escarpment. MTO initiated Stage 2 of the GTA West Study in early 2014. As part of this stage, a Route Planning Study Area was defined, which included Kennedy Road south of Old School Road. However, in February 2018, the MTO decided to move forward with the protected of a narrower corridor, and evaluate the transportation needs through the Greater Golden Horseshoe (GGH) Transportation Plan. **Figure 2** shows the narrower protected corridor, located north of the Town of Caledon Kennedy Road Study Area.

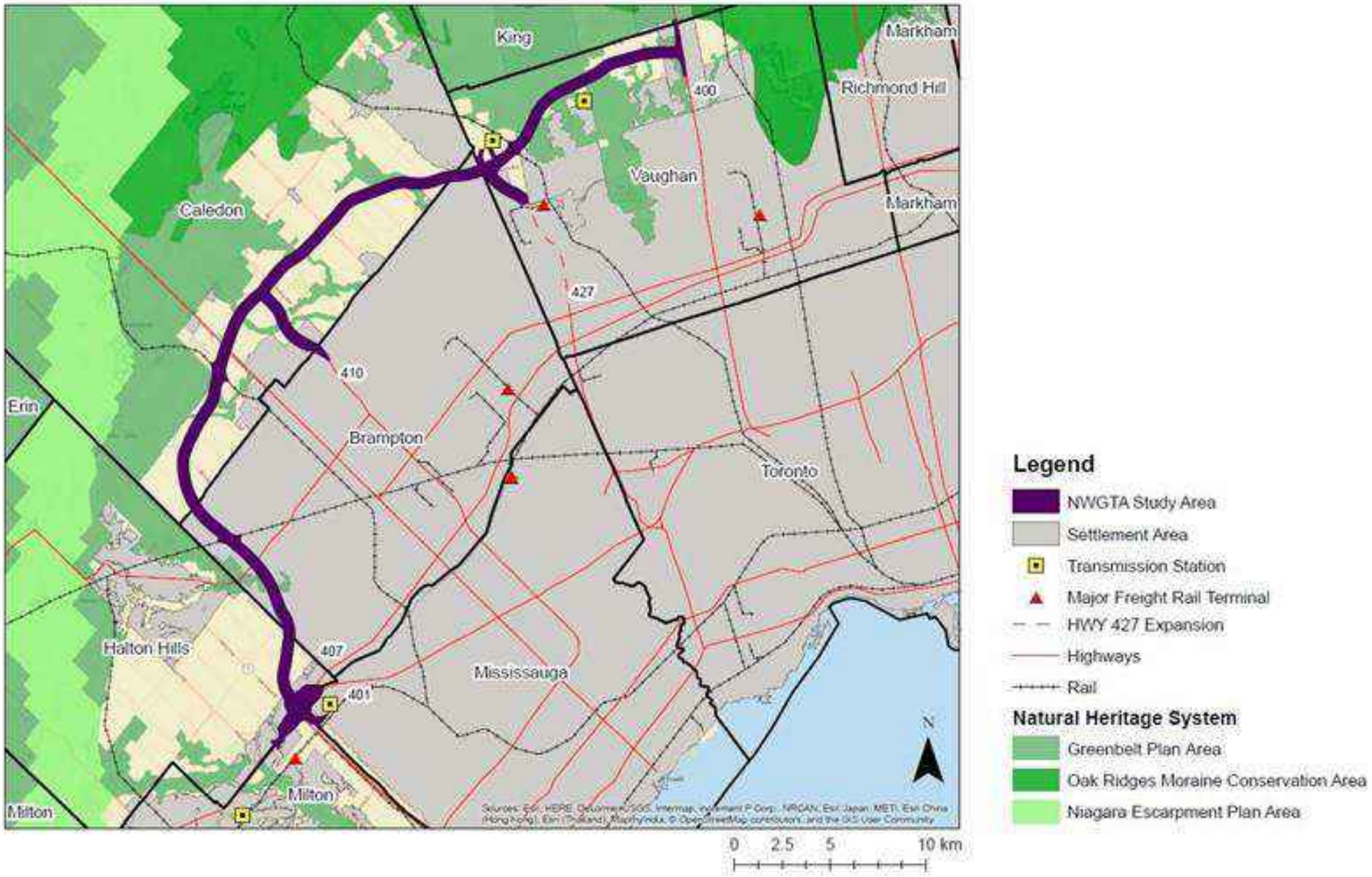
Halton-Peel Boundary Area Transportation Study

The Halton-Peel Boundary Area Transportation Study (HPBATS) was initiated in response to commitments made by the Region of Halton for the approval of Halton Regional Official Plan Amendment (ROPA) 25. HPBATS was conducted jointly by the Region of Peel, Region of Halton, City of Brampton, Town of Caledon and the Town of Halton Hills to identify a long-term (2021-2031) transportation network to serve future demands in the municipal boundary area. Growth projections from the Growth Plan served as the basis for the demand forecasts.

The HPBATS transportation strategy endorsed by Town, City and Regional Councils in May 2012 includes a range of measures designed to promote changes in travel behaviour in addition to essential infrastructure improvements. The strategy features enhancements to the transit, AT and road networks, and the introduction of Transportation Demand Management (TDM) initiatives.

Figure 3 illustrates the recommended transportation network for the Halton/Peel boundary area from HPBATS, including a proposed Halton-Peel Freeway extending from the Highways 401 and 407 connection to Mayfield Road and the eventual GTA West Corridor. This proposed freeway would be west of the Study Area, within the south west border of the Town of Caledon.

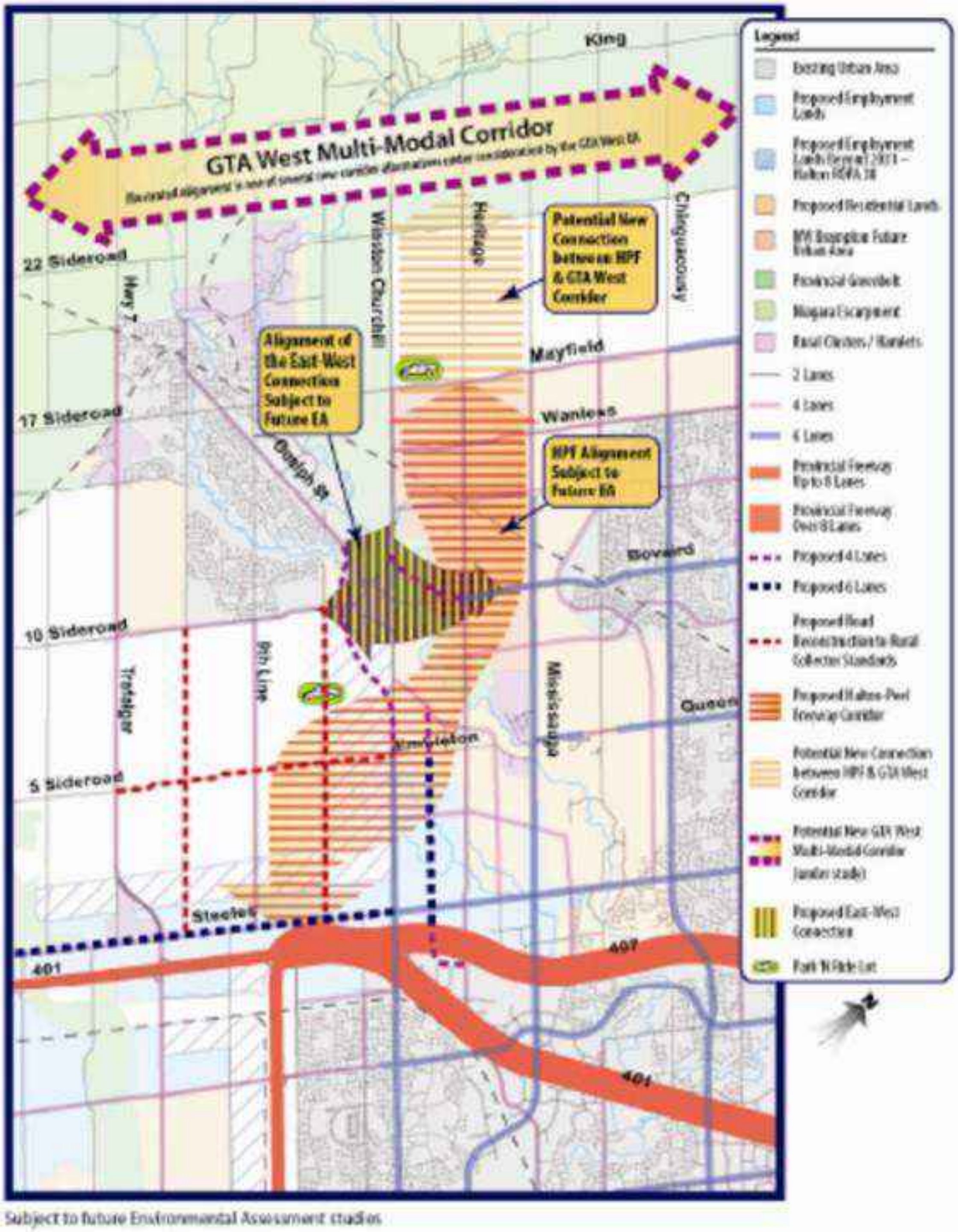
Northwest GTA Corridor Identification Study Area



Source: MTO – Northwest GTA Corridor Identification Study
http://www.mto.gov.on.ca/english/publications/gta-west-report/north-west-gta-corridor.shtml

Northwest GTA Corridor Identification Study Area

Figure 2



Subject to future Environmental Assessment studies

Exhibit 8-3: HPBATS Recommended Road Network, 2031

Source: Halton-Peel Boundary Area Transportation Study

Recommended Transportation Network, Halton-Peel Boundary Area Transportation Study

Figure 3

Region of Peel Official Plan

The Region of Peel Official Plan (PROP) guides Regional Council in managing growth and development through interpretation of the intent of Provincial legislation and policies, and providing a long term strategic policy framework. The PROP includes a transportation network and related polices to serve planned growth, including TDM policies and programs to foster travel options and reduce traffic congestion in the Region. Kennedy Road is not designated as part of the major road network (Schedule E).

Region of Peel Long Range Transportation Plan

The LRTP provides strategies, policies and plans for roads, transit and TDM to respond to the Region's transportation challenges over the next 20 years. To address these challenges, the 2012 LRTP Update recommends the broad application of TDM strategies aimed at reducing reliance on SOV travel and sets a goal of 14 per cent reduction in congestion by the year 2031 (when compared with the no TDM measures scenario). Strategies outlined in the plan include AT facilities, Smart Commute programs, employer individualized marketing, a high school pilot program, Safe-Active Routes to School initiatives, among others. The LRTP also recommends that public transit be the first priority in transportation infrastructure planning and major investments. Even with these measures in place, road/highway expansion will be necessary to meet future transportation demands. The LRTP specifies a broad list of Regional Road network improvements, however, none is located within or in proximity to the Study Area.

Region of Peel Strategic Goods Movement Network Study

The Goods Movement Strategic Plan 2017-2021 was completed in March 2017 with the mission of "*have a safe, convenient, efficient, multi-modal, sustainable and integrated goods movement transportation system that supports a vibrant economy, respects the natural and urban environment, meets the diverse needs of industries and residents and contributes to a higher quality of life*".[1] It provides an action plan for the Region, and includes the systematic, hierarchical truck route network throughout the Region of Peel developed through the Strategic Goods Movement Network (SGMN) Study completed in May 2013. This study does not identify Kennedy Road, in the Study Area, as a truck route.

Region of Peel Active Transportation Plan

The Active Transportation Plan (ATP) completed in November 2011 articulates a vision for AT within the Region of Peel aimed at creating a place where walking, cycling, and rolling are safe, convenient, appealing and accessible for all citizens, especially children, youth, older adults, persons with disabilities and other priority populations. The ATP sets outs policies to support walking and cycling, and recommends infrastructure improvements to expand the existing pedestrian and bike networks.

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[1] Peel Region. 2017. *Goods Movement Strategic Plan 2017-2021*

Town of Caledon Official Plan

The Town of Caledon Official Plan, consolidated in April 2018, sets principles, goals, objectives and policies to guide Council, committees, municipal departments and others in the provision of services within the Town of Caledon, with the goal of enhancing the residents' quality of life throughout future developments and changes. The plan promotes a safe, convenient, efficient and multi-modal sustainable transportation network, which is integrated with land use planning.

Mayfield West Secondary Plan

The Plan identifies the Study Area as part as the Mayfield West Area, subject to the Mayfield West Secondary Plan. Mayfield West is designated as a Rural Service Centre, a new compact, mixed-use pedestrian-oriented community to host a population of approximately 9,000 people living in approximately 2,845 dwelling units. The area will also include approximately 180 gross hectares (444 acres) of employment, commercial and community land uses. It defines Kennedy Road as a Major Collector Road between Mayfield Road and Old School Road, with a right-of-way of 26 to 36 m, which is to be confirmed in the Mayfield West Community Design Plan.

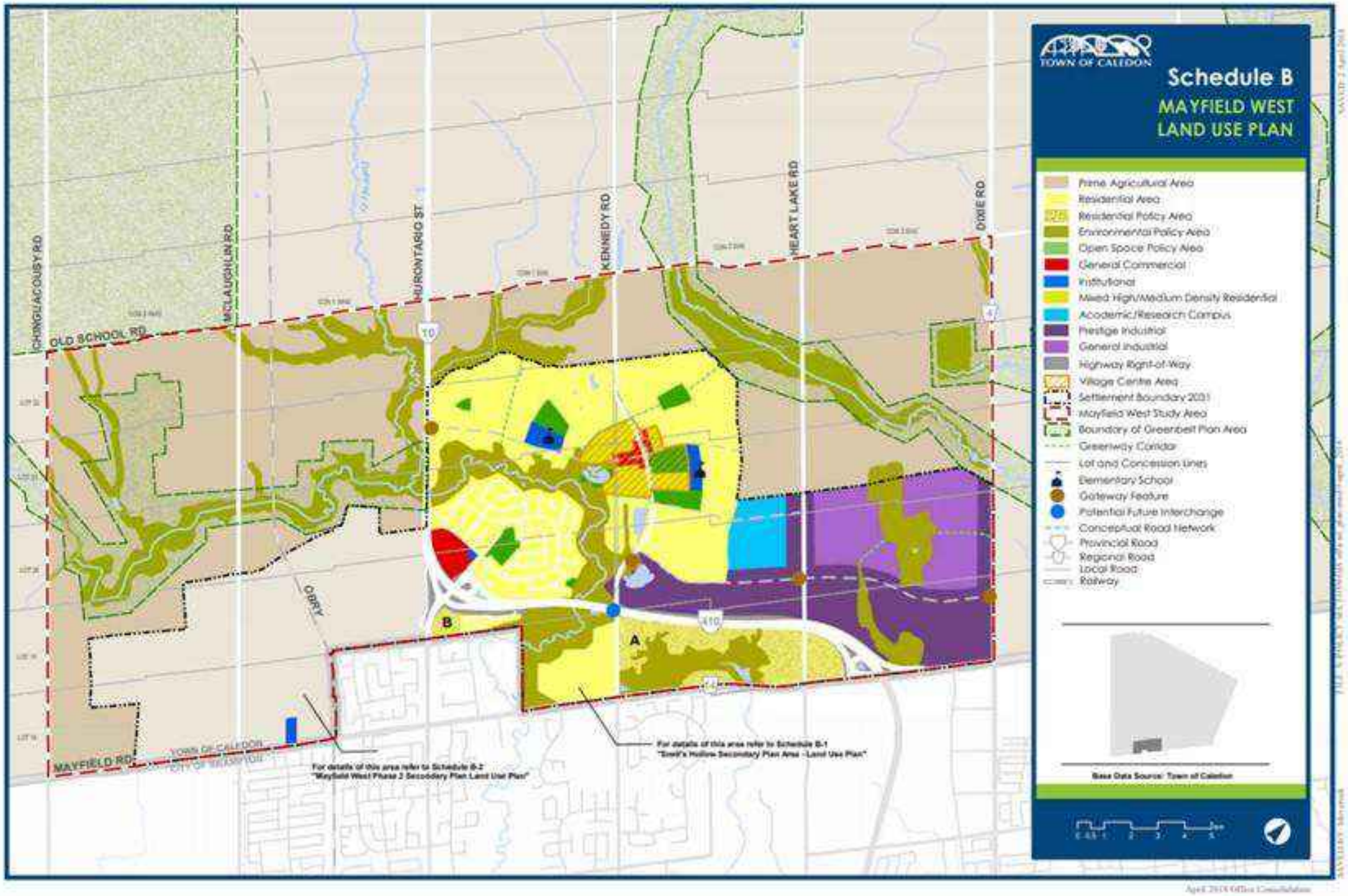
As shown in **Figure 4**, Kennedy Road, within the Study Area, is located north of the planned residential area, within prime agricultural areas.

Town of Caledon Transportation Master Plan

The Town of Caledon Transportation Master Plan (TMP) was completed in November 2017 to provide a planning strategy to identify and address the Town's transportation needs. It presents existing and future transportation conditions within the Town, with the goals to provide modal choices, sustain growth, protect the environment and character of the Town, and develop a transportation network that is safe, reliable and efficient. It proposes to do so by implementing a combination of Transportation Demand Management (TDM) and roadway improvements.

The plan also provides functional classification, right-of-way and typical cross-sections for Town roadways. As part of its urbanization in the Study Area and the designation of Mayfield West as a Rural Service Centre in the Town's Official Plan, Kennedy Road will become a Rural Main Street. The TMP indicates the following characteristics for Rural Main Streets:

- Rural Service Centre land use designation;
- 2 to 4 through lanes;
- 20 to 26 m of right-of-way;
- Desired operating speeds of 40 to 60 km/h;
- Limited to designated stops or stations transit role;



Source: Town of Caledon Official Plan

Town of Caledon Official Plan Schedule B
Mayfield West Land Use Plan

Figure 4

- Area for pedestrians and other facilities are village specific, and consist of:
  - 1.5 m minimum sidewalk;
  - Furnishing/planting zone;
  - Splash strip; and
  - Utility zone;
- Bicycle facilities are to be behind the curb where design speeds exceed 50 km/h, or on-street otherwise;
- Curb and gutter drainage conditions; and
- Freight allowed for local deliveries only.

The typical cross-section for Rural Main Streets is illustrated in **Figure 5**.

The TMP also identifies Kennedy Road as part of the Signed Cycling Routes 2017 Pilot between Etobicoke Creek Trail and Olde Base Line Road, and is identified as a future cycling route.

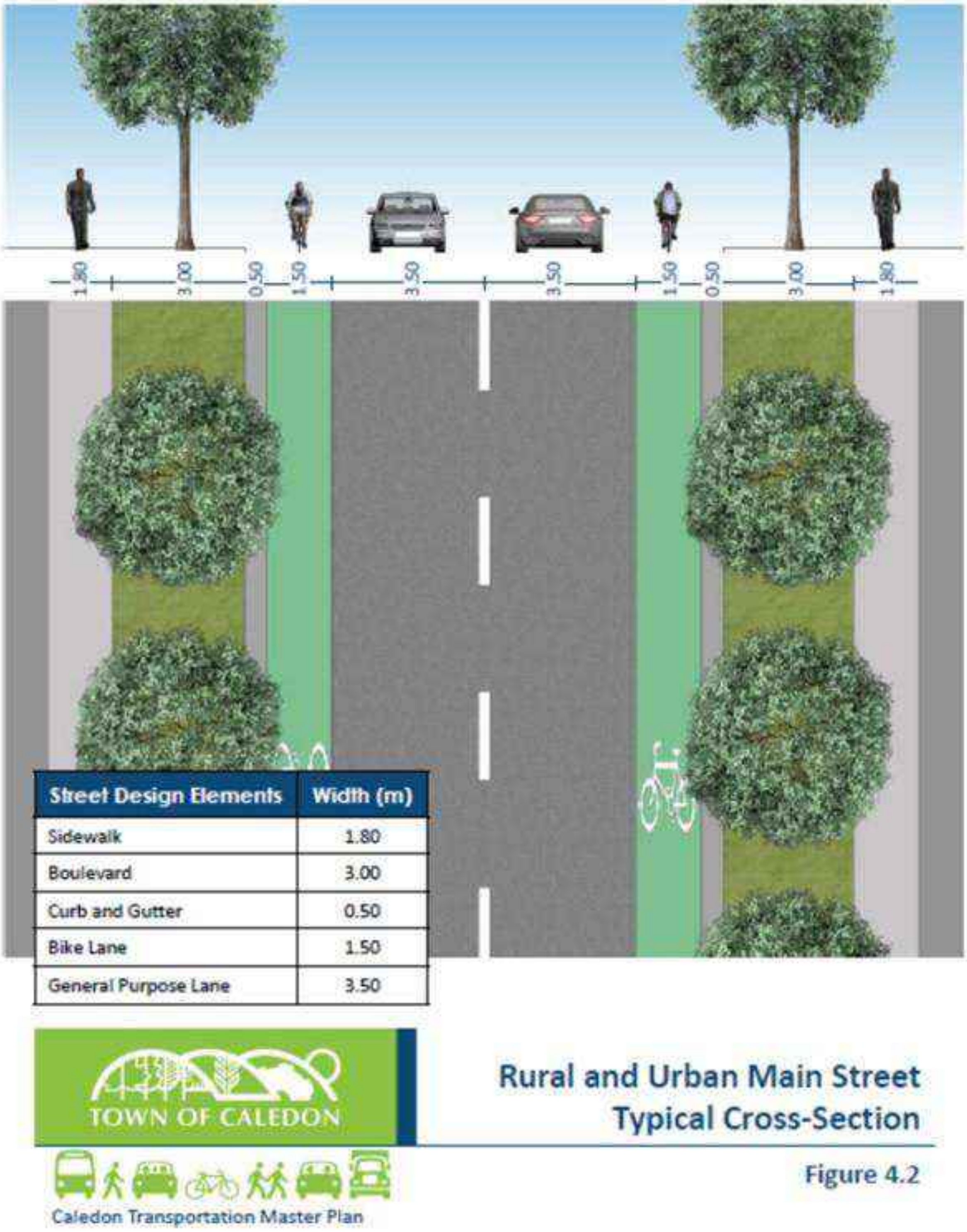
Mayfield West Community Design Plan

The Mayfield West Community Design Plan was completed in November 2007 to detail the planning and design of the new Mayfield West community. It provides streetscape design for Kennedy Road within the Village Centre and the Residential North and South areas, south of Bonnieglen Farm Blvd, and does not include the Study Area.

Implications for the Kennedy Road Urbanization EA and Detailed Design

The previous sections have highlighted the planned growth expected within the Region and the Town, along with the creation of a new Rural Service Centre, Mayfield West, where the Study Area is located. Kennedy Road is planned to become the major north/south link within the community, providing access to the residential neighbourhoods, the village centre and the employment areas, as well as being a gateway to the community from the south.

The above plans and studies have designated both the type of roadway and the associated characteristics for a reconstruction of Kennedy Road in the Study Area. The urbanization and design of Kennedy Road must be assessed on its own merits pursuant to this Municipal Class EA study, however the direction provided in the existing plans should also be considered while generating and assessing alternative solutions.



Street Design Elements	Width (m)
Sidewalk	1.80
Boulevard	3.00
Curb and Gutter	0.50
Bike Lane	1.50
General Purpose Lane	3.50

Rural and Urban Main Street Typical Cross-Section

Figure 4.2

Source: Town of Caledon Transportation Master Plan

Town of Caledon Transportation Master Plan – Rural and Urban Main Street Typical Cross-Section

Figure 5

Part A – Traffic Growth Projections

The methodology undertaken to forecast future traffic volumes was to apply a growth rate to existing base year volumes. Applicable growth rates were determined from volume outputs extracted from Peel Region’s Travel Demand Forecasting Model.

The travel demand model provides information regarding how various transportation policies and programs will affect future travel patterns, while accounting for all planned and anticipated development-related growth. This model information is useful in determining future transportation improvements, policies, and services and programs.

A screenline analysis was undertaken examining model outputs for the 2011, 2021, and 2031 horizon years. Specifically, the north-south roadways of Chinguacousy Road, McLaughlin Road, Kennedy Road, Heart Lake Road, and Dixie Road all south of Old School Road were captured within the analysis. Hurontario Street/Highway 10 was excluded from the analysis as the influence of traffic to and from Highway 410 may not be representative of the other roadways. Growth rates between the periods of 2011 – 2021, and 2021 – 2031 were calculated and found to be 4.57% and 2.03% compounded per annum, respectively.

In addition to the application of a growth rate to forecast future traffic volumes, site specific trips were accounted for the nearby future school development located within the study area. The school related site traffic assignments were extracted from the development’s supporting Traffic Impact Study (TIS)[2].

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[2] MMM Group. January 2017. *Southfields Public School and Child Care Centre Traffic Impact Study.* 80 pages.

Part B – Transportation and Traffic Study Report

Existing Transportation Conditions

A site visit was conducted by our staff on 24 July 2018 to observe existing transportation conditions. Information was also gathered from Google Maps and Streetview, data provided by the Town of Caledon, and information provided on the Peel Region model.

Roadway and Geometry

The study area comprises Kennedy Road, between Old School Road to the north, and Bonnieglen Farm Boulevard to the south, a segment approximately 650 m in length. Within the study area, Kennedy Road is a north-south two-way two-lane road with a posted speed limit of 60 km/h. It has a rural cross section, with both paved and unpaved shoulders, and ditches on either side. Heavy trucks are prohibited from using this road section, except for local traffic.

Lane and shoulder widths seemed consistent throughout the study area and were measured approximately 120 m from the centre of the roundabout, to just north of the school construction entrance. From west to east, the widths were measured as:

- Southbound gravel shoulder: 0.7 m
- Southbound paved shoulder: 1.3 m
- Southbound lane: 3.1 m
- Northbound lane: 3.3 m
- Northbound paved shoulder: 1.1 m
- Northbound gravel shoulder: 1.0 m.

Within the study area, Kennedy Road is straight and has vertical curves and two vertical crests. The vertical curves reduce visibility along Kennedy Road.

To the north, Kennedy Road intersects with Old School Road. The intersection is currently signalized, and the south leg of the intersection has a two-lane cross-section. To the south, Kennedy Road intersects with Bonnieglen Farm Boulevard on the east side and Newhouse Boulevard (currently under construction) on the west side. The intersection is a one-lane roundabout with four approaches. The north leg of the intersection has a two-lane cross-section. Street lighting is provided on the approaches to the roundabout.

The land use surrounding Kennedy Road includes a few houses on the north end, a small cemetery and chapel on the east side of the roadway, the Tony Pontes Public School (under construction) on the west side of the roadway, near the south end of the study area, and agricultural lands. A few accesses are provided along Kennedy Road, from south to north:

- A driveway to the subdivision sales centre, which may become a residential driveway, on the west side of Kennedy Road, approximately 30 m north of the intersection with Bonnieglen Farm Boulevard, and a few meters north of the north leg splitter island;
- A construction access to the Tony Pontes school site, approximately 115 m north of the intersection with Bonnieglen Farm Boulevard;
- A driveway to the cemetery and chapel, on the east side, approximately 240 m from the intersection with Bonnieglen Farm Boulevard, fenced;
- A residential/farm driveway, on the east side, approximately 400 m from the intersection with Bonnieglen Farm Boulevard; and
- A residential driveway on the west side, approximately 50 m from the intersection with Old School Road.

Transit and Active Transportation Network

There is currently no transit service operating on Kennedy Road within the study area.

Kennedy Road is signed as a bicycle route, maintained from 1 May to 31 October, but has no separate bicycle facilities. Generally, there are no sidewalks present on either side of Kennedy Road. The sidewalk from the north side of Bonnieglen Farm Boulevard extends to the east side of Kennedy Road, and ends just north of the intersection.

“Yield here to pedestrians” signs are present for northbound drivers entering the roundabout from the south leg, and for northbound drivers exiting the roundabout on the north leg, where the sidewalk on the east side of Kennedy Road connects with the roadway. No crosswalks are provided.

Pedestrian volumes were extremely low during the turning movement count data collection in December 2016. Similarly, no pedestrian or cyclist activity was observed during our site visit in July 2018.

Traffic Volumes

Daily traffic volumes were obtained through 24-hour traffic counts completed by the Town of Caledon on Kennedy Road between Old School Road and Bonnieglen Farm Boulevard in 2017. Total volumes (northbound and southbound) were collected over seven (7) days. Daily traffic varied between 1,700 and 2,700 vehicles per day, with an average of 2,300 vehicles per day. Heavy vehicles accounted for an average of 7% of daily traffic.

Intersection traffic volumes were obtained through the traffic counts completed in 2016 for the Tony Pontes Public School Transportation Impact Study[3] and adjusted to 2018 using the growth rates calculated in Part A – Traffic Growth Projection of this report. We also assumed

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[3] MMM Group. January 2017. *Southfields Public School and Child Care Centre Traffic Impact Study.* 80 pages.

that the Tony Pontes school would be completed and operational before the end of the year 2018.

Figure 6 shows the 2018 traffic volumes.

Traffic Operations

Approach and Methodology

The transportation need and justification assessment was based on traffic operations analysis conducted for the midblock sections and intersections within the Study Area. The analyses were completed for both existing (2018) and future (2021 and 2031) conditions during the weekday morning (AM) and afternoon (PM) peak hours to characterize operating conditions and identify locations requiring attention. The methodologies applied for the analyses are described as follows.

Midblock Analysis:

For midblock sections, operational performance was characterized based on the volume-to-capacity (v/c) ratio for the link. The v/c ratio provides a measure of traffic volume demand to available capacity, with an at-capacity condition represented by a v/c ratio of 1.00 (i.e. volume demand equals theoretical capacity). A v/c ratio of 0.90 or less was deemed acceptable operation for midblock locations, as road segments with volumes exceeding this threshold would typically be candidates for widening.

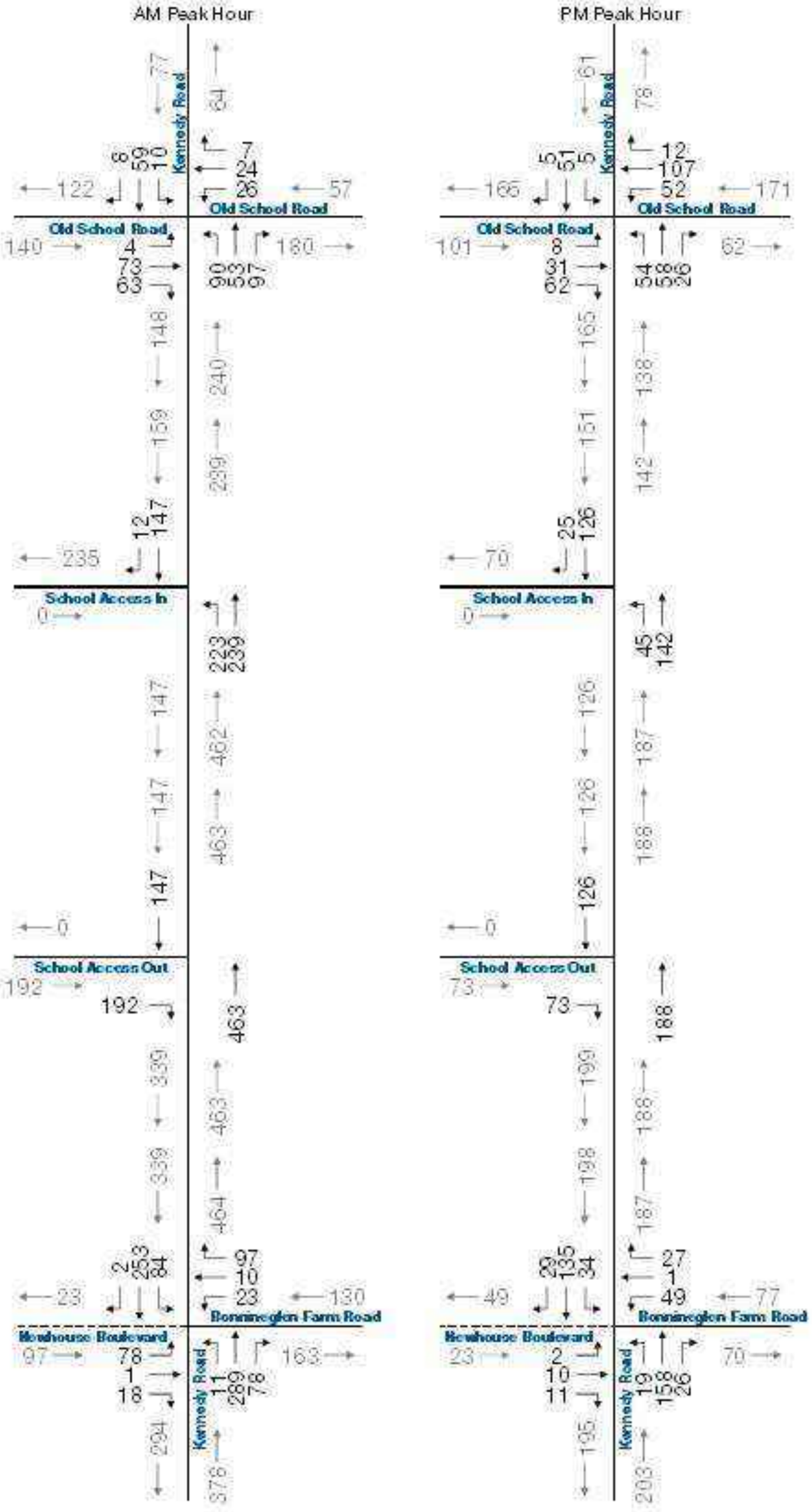
The midblock v/c ratios were calculated by dividing the traffic link volume (existing or forecasted) by the theoretical capacity for the subject link (i.e. the maximum hourly rate at which vehicles can be expected reasonably to traverse the section of roadway within a given time period, under prevailing roadway, traffic and control conditions). A theoretical capacity of 1,000 vehicles per hour per lane was assumed for Kennedy Road within the Study Area, as per the Region of Peel travel demand forecasting model.

This value reflects the intended function of the road, and accounts for factors such as: the type and number of local streets and private accesses provided; the presence of pedestrians and crossing locations; and typical driving characteristics for this type of facility.

The 2018 midblock traffic operations v/c ratios were all found acceptable, as shown in **Table 1**:

TABLE 1: 2018 MIDBLOCK TRAFFIC OPERATIONS

Peak Hour	Direction	Midblock v/c ratio
AM	Northbound	0.46
	Southbound	0.34
PM	Northbound	0.19
	Southbound	0.20



2018 Traffic Volumes

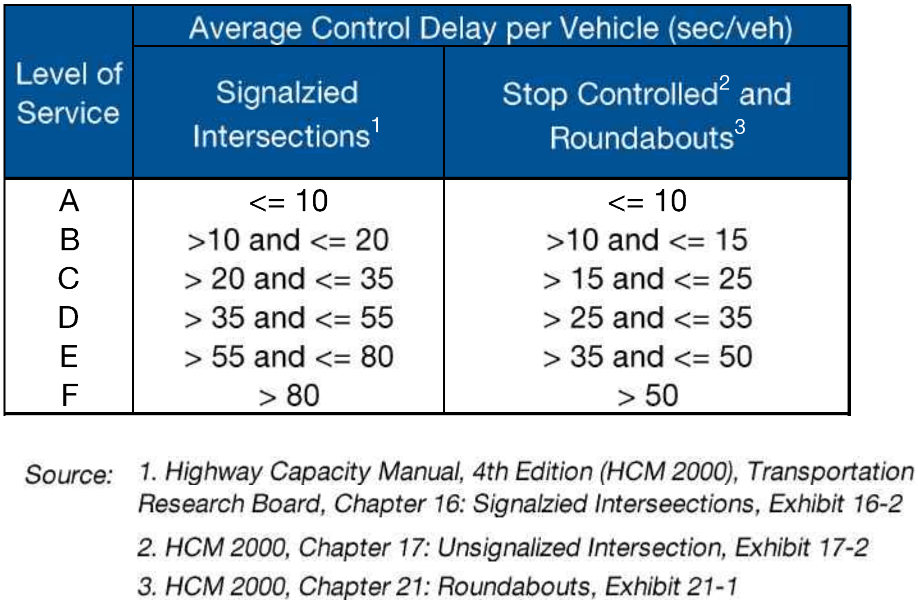
Figure 6

Intersection Analysis:

Intersection Level of Service (LOS) is estimated based on average delay per vehicle and includes deceleration delay, queue move-up time, stopped delay, and final acceleration delay. LOS is a qualitative measure that describes the operating conditions within an intersection, and the perception of those conditions by road users. There are six levels of service defined. Each level has a letter identification from A to F with LOS A representing the best operating conditions and LOS F the worst. **Table 2** summarizes the LOS criteria for signalized, stop controlled, and roundabout intersections according to the 2000 and 2010 Highway Capacity Manual (HCM 2000 and HCM 2010).

The operational analysis for the signalized and roundabout intersections was conducted using Synchro Version 9.1, which implements the methods contained in HCM 2000 and HCM 2010. A Synchro network was developed specifically for this study and further refined through the analyses.

TABLE 2: INTERSECTION LEVEL OF SERVICE CRITERIA



Level of Service	Average Control Delay per Vehicle (sec/veh)	
	Signalzied Intersections[1]	Stop Controlled[2] and Roundabouts[3]
A	<= 10	<= 10
B	>10 and <= 20	>10 and <= 15
C	> 20 and <= 35	> 15 and <= 25
D	> 35 and <= 55	> 25 and <= 35
E	> 55 and <= 80	> 35 and <= 50
F	> 80	> 50

Source: *1. Highway Capacity Manual, 4th Edition (HCM 2000), Transportation Research Board, Chapter 16: Signalzied Interseections, Exhibit 16-2*

2. HCM 2000, Chapter 17: Unsignalized Intersection, Exhibit 17-2

3. HCM 2000, Chapter 21: Roundabouts, Exhibit 21-1

The operational performance of the intersections within the Study Area was also assessed based on the v/c ratio. For this study, v/c ratios were calculated at each intersection for individual movements and the entire intersection, with a v/c ratio of 0.90 or less considered an acceptable level of operations.

The following intersections were analyzed:

- Kennedy Road, Bonnieglen Farm Boulevard and Newhouse Boulevard roundabout;
- Two (2) accesses to Tony Pontes Public School:
  - One (1) inbound access, uncontrolled;

  - One (1) outbound access, with the access being stop-controlled;
- Kennedy Road and Old School Road, signalized.

It should however be noted that the intersection of Kennedy Road and Old School Road was analyzed with an assumed traffic signal timing plan for the purposes of understanding the general LOS and v/c ratio for the south leg of the intersection. The intersection itself is part of the Old School Road Environmental Assessment study, and analysis of that intersection should be discussed as part of that Study.

Table 3 summarizes the results of the 2018 operating conditions, indicating the levels of service (LOS), average delays, volume to capacity (v/c) ratios, and 95th percentile queues experienced within the Study Area for the AM and PM peak hours.

The analysis of 2018 conditions indicate that all intersections and traffic movements are operating at an acceptable level of service and well within capacity. The results are consistent with the field observations conducted.

TABLE 3: 2018 INTERSECTION TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	OVERALL
AM Peak Hour	Bonnieglen Farm Blvd & Kennedy Rd	RBT	LOS	<	A	>	A	<	A	>	A	<	B	>	A	<	A	>	A	
			Delay	<	7	>		<	7	>		<	10	>		<	8	>		
			V/C	<	0.15	>		<	0.20	>		<	0.48	>		<	0.39	>		
			95th	<	1	>		<	1	>		<	3	>		<	2	>		
	School Inbound & Kennedy Rd	TWSC	LOS									<	A		A		A	>	A	
			Delay									<	5				0	>		
			V/C									<	0.17				0.10	>		
			95th									<	5				0	>		
	School Outbound & Kennedy Rd	TWSC	LOS			B	A						A		A		A		A	
			Delay			10							0				0			
			V/C			0.24							0.30				0.09			
			95th			7							0				0			
	Old School Rd & Kennedy Rd*	TCS	LOS	<	B	>	**B**	<	B	>	**B**	<	B	>	**B**	<	B	>	**B**	**B**
			Delay	<	19	>	**19**	<	18	>	**18**	<	17	>	**17**	<	13	>	**13**	**17**
			V/C	<	0.20	>		<	0.11	>		<	0.37	>		<	0.11	>		**0.30**
			95th	<	25	>		<	15	>		<	42	>		<	16	>		
PM Peak Hour	Bonnieglen Farm Blvd & Kennedy Rd	RBT	LOS	<	A	>	A	<	A	>	A	<	A	>	A	<	A	>	A	
			Delay	<	5	>		<	6	>		<	6	>		<	6	>		
			V/C	<	0.03	>		<	0.11	>		<	0.23	>		<	0.23	>		
			95th	<	0	>		<	0	>		<	1	>		<	1	>		
	School Inbound & Kennedy Rd	TWSC	LOS									<	A		A		A	>	A	
			Delay									<	2				0	>		
			V/C									<	0.03				0.10	>		
			95th									<	1				0	>		
	School Outbound & Kennedy Rd	TWSC	LOS			A	A						A		A		A		A	
			Delay			9							0				0			
			V/C			0.09							0.11				0.08			
			95th			2							0				0			
	Old School Rd & Kennedy Rd*	TCS	LOS	<	B	>	**B**	<	B	>	**B**	<	B	>	**B**	<	B	>	**B**	**B**
			Delay	<	15	>	**15**	<	17	>	**17**	<	17	>	**17**	<	15	>	**15**	**16**
			V/C	<	0.10	>		<	0.25	>		<	0.20	>		<	0.08	>		**0.23**
			95th	<	14	>		<	35	>		<	27	>		<	14	>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Veh. (S)
Q - 95th Percentile Queue Length
TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control
< - Shared Through/Left Turn Lane
> - Shared Through/Right Turn Lane
RBT - Roundabouts HCM 2010

*Note: The intersection of Kennedy Road and Old School Road was only included to understand the south leg/northbound approach to the intersection. As such, the traffic signal timing plan was assumed for this intersection.

Road Safety

Collision Analysis:

The Town has provided collision information for the years 2015 to June 2018. During this almost 3.5 year period, only two (2) collision were reported:

- A single motor vehicle collision (SMV), causing personal damages (PDO) occurred in 2017 at the intersection of Kennedy Road and Bonnieglen Farm Boulevard. The vehicle was northbound, approaching the roundabout, did not see the roundabout, slid on packed snow and collided into the roundabout.
- A single motor vehicle collision (SMV), causing personal damages (PDO) occurred in 2018 at the intersection of Kennedy Road and Old School Road. The vehicle was travelling northbound and attempted to turn left (westbound) onto Old School Road. It slid on ice and ended in a ditch after colliding with a pole.

Based on the collision history, no collision pattern was established. However, road safety is not only measured by the number of collisions that occur within the study area. Below is a geometric analysis of the study area, in relation to road safety.

Lane widths:

According to the MTO *Design Supplement for the TAC Geometric Design Guide for Canadian Roads – June 2017*[4], for a design speed of 80 km/h and an AADT over 1,000 vehicles per day, lane widths should be a minimum of 3.25 m wide. The current lane widths are slightly over (3.3 m) and slightly under (3.1 m) the current recommended widths. Lane widths of the reconstructed Kennedy Road should be a minimum of 3.25 m each.

Shoulder widths:

According to the MTO *Design Supplement for the TAC Geometric Design Guide for Canadian Roads – June 2017*[5], for a design speed of 80 km/h and an AADT between 2,000 and 3,000 vehicles per day, shoulder widths should be a minimum of 2.0 m wide. Based on the total shoulder width (paved and gravel), the existing shoulder widths seem to meet the guidance. The southbound paved shoulder width, where measured (1.3 m), meets the suggested minimum paved shoulder width for rural cross-sections on signed bicycle routes, while the northbound paved shoulder, where measured (1.1 m), is just under the suggested minimum width.[6] Unless other bicycle facilities are provided, the paved shoulder widths of the reconstructed Kennedy Road should be a minimum of 1.2 m, and preferably 1.5 m each given that Kennedy Road is designated as a bicycle route.

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[4] MTO. 2017. *Design Supplement for TAC Geometric Design Guide for Canadian Roads – June 2017*, Exhibit 4-B.

[5] MTO. 2017. *Design Supplement for TAC Geometric Design Guide for Canadian Roads – June 2017*, Exhibit 4-G.

[6] MTO. 2014. *Ontario Traffic Manual Book 18 – Cycling Facilities*. Table 4.2.

Roadside Safety:

A review of the existing roadside environment has been undertaken. Based on the field visit and Google Map satellite imagery, the following is noted.

Within the clear zone area provided on either side of Kennedy Road there are limited unobstructed, traversable areas beyond the edge of the through travelled way available for use by errant vehicles.

Along both the east and west sides of Kennedy Road there are many existing roadside obstacles. Obstacles are characterized by the MTO *Roadside Design Manual* as “any non-breakaway and non-traversable feature within the roadside environment greater than 100 mm in height that can increase the potential for personal injury and vehicle damage when struck by an errant vehicle leaving the roadway”.[7]

It is noted that hydro poles are positioned along the east side of Kennedy Road and many mature trees also exist along both sides of Kennedy Road within a short offset distance from the travelled lanes.

Along the both sides of Kennedy Road within the study area, there are some sections where the adjacent slopes do not provide a reasonable opportunity for recovery of errant vehicles. In these areas, the slopes are deemed steep and therefore, critical as there is a higher probability of errant vehicles overturning.

Within the study area, this section of Kennedy Road is not a high-speed section. Furthermore, according to the collision data no mid-block collisions have occurred.

Consideration should be given to mitigating the roadside obstacles as part of the proposed reconstruction and urbanization of Kennedy Road.

Roadway alignment:

Within the study area, Kennedy Road is generally straight, with no horizontal curve.

Lighting:

Lighting is provided on the approaches to and at the roundabout with Bonnieglen Farm Boulevard and Newhouse Boulevard. Lighting is also provided at the intersection with Old School Road. No other lighting is provided within the study area.

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[7] MTO. 2017. *Roadside Design Manual – December 2017*. Appendix B – Glossary.

Pavement condition:

Pavement condition was generally good throughout the study area. Pavement was in poor condition on the west side of the roundabout, likely due to the construction of Newhouse Boulevard.

Active transportation:

As described above, there are generally no sidewalks or crosswalks provided along Kennedy Road within the study area. Within the study area, Kennedy Road is designated as a bicycle route. There appears to be little pedestrian or bicycle activity under the current conditions. However, given the new presence of a school, a sidewalk access should be provided, at a minimum on the west side of Kennedy Road, between the Tony Pontes Public School and the neighbourhoods to the south. Similarly, crosswalks should be provided at the roundabout with Bonnieglen Farm Boulevard and Newhouse Boulevard. Also as a minimum, the paved shoulder widths should be increased to provide the Minimum Desired Width of 1.5 m[8]. However, the Town may wish to consider providing bicycle lanes or cycle tracks.

Pavement markings:

Pavement markings are generally in fair to good condition. There are no yield line markings at the roundabout entries, and the northbound stop bar at the intersection of Kennedy Road and Old School Road is in poor condition. The Town should paint/repaint yield line markings at roundabout entries and the northbound stop bar at the intersection of Kennedy Road and Old School Road.

Signing:

Signs along Kennedy Road were generally found to be visible and conspicuous. The following signs were noted:

- Southbound, from north to south:
    - Maximum Speed, 60 km/h;
    - No Heavy Trucks;
    - Roundabout warning sign with “Roundabout Ahead” tab;
    - Yield Ahead warning sign, partially hidden by vegetation;
    - Maximum Speed Advisory, 40 km/h (for construction);
    - Keep Right sign and Object Marker sign (one direction, left version) on the splitter island;
    - One-Way sign and Roundabout Directional sign, on the central island of the roundabout;

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[8] MTO. 2014. *Ontario Traffic Manual Book 18 – Cycling Facilities*. Table 4.2.

  - Yield sign and "Yield to traffic in roundabout" tab at the entrance to the roundabout;
- Northbound, from south to north:
  - Yield Here to Pedestrians sign at the exit to the roundabout;
  - Maximum Speed, 60 km/h with Begins tab;
  - Bicycle Route Marker with straight arrow tab and "Maintained May 1 – Oct 31" tab;
  - Intersection (controlled) warning sign; and
  - Banty's Roost Golf and Country Club information sign.

The northbound Intersection (controlled) warning sign should be replaced with a Traffic Signal Ahead sign. As per the OTM Book 6, "Controlled intersection signs are used to warn drivers on a through road of an approaching intersection at which the intersecting side road is under stop or yield control."[9] Since the intersection of Kennedy Road and Old School Road is signalized, the Intersection (controlled) warning sign is inappropriate. Additionally, the vegetation should be cut around the southbound Yield Ahead warning sign to make is visible to drivers.

Sight distances:

The presence of two crest curves in the vertical alignment of Kennedy Road within the study area hinders drivers' visibility of the roadway ahead. For northbound drivers, the visibility of the intersection (~150 to 200 m) and of the traffic signal heads (~400-450 m) is above the stopping sight distance and therefore sufficient. For southbound drivers, the visibility of the roundabout (~200-230 m) is also above the stopping sight distance and therefore sufficient. However, for a southbound driver, the visibility of the current school construction access is approximately 125 m, which is below the decision sight distance of 140 m for a stopping manoeuvre on a rural road.[10] Similarly, drivers exiting the current school construction access have a visibility of approximately 110 m to their left, below the departure sight distance that should be provided for left turns (170 m) and right turns (145 m).[11] Drivers exiting the current school construction access can see the roundabout with Bonnieglen Farm Boulevard and Newhouse Boulevard to their right. It is recognized that the current school construction access may not be in the same location as the planned inbound or outbound school accesses, therefore sight distances should be measured from the school accesses, once constructed, to evaluate their appropriateness. Consideration should also be given during the reconstruction of Kennedy Road to modifying the vertical alignment to improve sight distances, especially at and around the school accesses.

Speed limit:

The posted speed limit on Kennedy Road within the study area is 60 km/h. This speed is consistent with (or just under) the recommended speed according to the TAC *Canadian*

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[9] MTO. 2001. *Ontario Traffic Manual Book 6 – Warning Signs*. Page 42.

[10] MTO. 2017. *Design Supplement for TAC Geometric Design Guide for Canadian Roads – June 2017*, Exhibit 2-C.

[11] TAC. 2017. *Geometric Design Guide for Canadian Roads.* Table 9.9.4 and Table 9.9.6

Guidelines for Establishing Posted Speed Limits methodology. Given the construction of the Tony Pontes Public School, which will host children from Kindergarten to Grade 8, the Town of Caledon should move forward with the recommended proposed No Stopping Restrictions and proposed 40 km/h Speed Limit and Community Safety Zone, as shown in **Figure 7**.

However, 24-hour counts completed by the Town of Caledon in 2017 over seven (7) days consistently showed 85th percentile speeds higher than 80 km/h, with an overall 85th percentile speed, for both directions for the duration of the counts, of 82 km/h. The counts further show that approximately 15% of vehicles respected the posted 60 km/h speed limit. Given the measured operating speeds, additional measures will likely be required to encourage drivers to comply with the proposed 40 km/h speed limit and school zone. Measures to consider include:

- Modifications to the roadway cross-section, including urbanization;
- Implement traffic calming (e.g. vertical or horizontal deflections, roadway narrowing, pavement markings); and
- Enforcement, including automated speed enforcement systems (photo radar).

It should be noted that the additional measures should not negatively impact active transportation users, for example roadway narrowing should be considered in combination with the provision of a separated cycling facility.

Appendix"A" – Tony Pontes School Zone Location Map

Source: Provided by Town of Caledon staff

Tony Pontes School Zone Location Map

Figure 7

References

Ontario Ministry of Transportation. March 2000. *Ontario Traffic Manual Book 5 – Regulatory Signs.* 188 pages.

Ontario Ministry of Transportation. July 2001. *Ontario Traffic Manual Book 6 – Warning Signs.* 164 pages.

Ontario Ministry of Transportation. January 2014. *Ontario Traffic Manual Book 7 – Temporary Conditions.* 299 pages.

Ontario Ministry of Transportation. December 2013. *Ontario Traffic Manual Book 18 – Cycling Facilities*. 201 pages.

Ontario Ministry of Transportation. December 2017. *Roadside Design Manual – December 2017*. 276 pages.

Ontario Ministry of Transportation. 2017. *MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads – June 2017.* 313 pages.

Transportation Association of Canada. December 2009. *Canadian Guidelines for Establishing Posted Speed Limits*. 65 pages.

Transportation Association of Canada. January 2017. *Canadian Roundabout Design Guide.* 198 pages.

Transportation Association of Canada. June 2017. *Geometric Design Guide for Canadian Roads.*

Transportation Association of Canada. January 2014*. Manual of Uniform Traffic Control Devices for Canada – Fifth Edition*. 590 pages.

Future Transportation Conditions

Network Assumptions

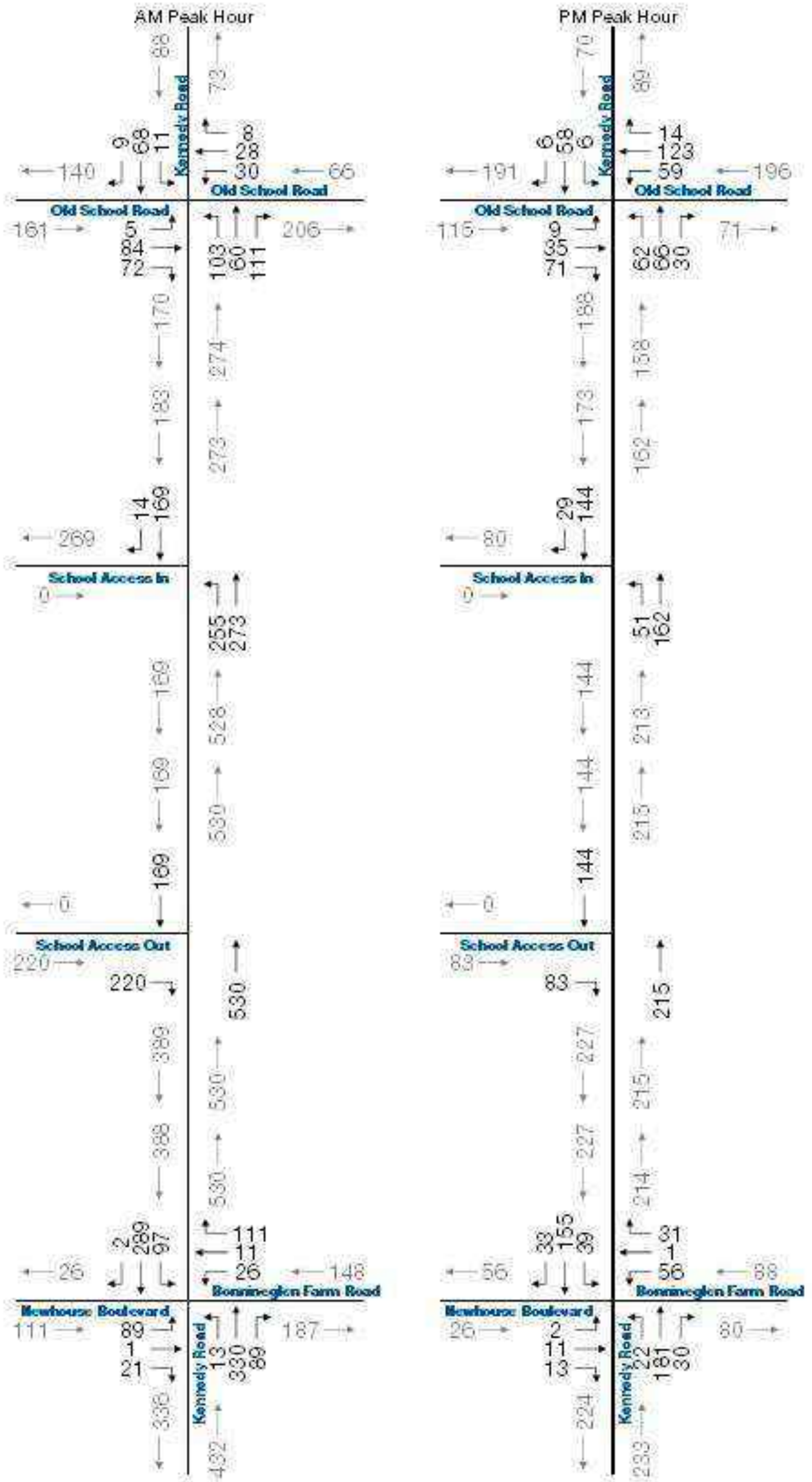
Within the Peel Region's Travel Demand Forecasting Model, used to determine traffic growth projections, the model's 2021 and 2031 network accounts for roadway improvements identified within Peel Region's Long Range Transportation Plan. It is noted the majority of these roadway improvements are external to the immediate Study Area.

Specifically, within our Study Area, it is assumed that Kennedy Road remains as a two-lane roadway, with one travel lane provided in each direction. Under the 2021 and 2031 model horizons, the link capacity and travel speed along Kennedy Road are assumed to remain the same as the base 2011 scenario. Furthermore, no changes are assumed for the Study Area intersection control devices. The intersection of Kennedy Road/Old School Road will continue operate under traffic signal control, and the intersection of Kennedy Road/Bonnieglen Farm

Road will continue operating under roundabout control. The exception would be at Kennedy Road/Bonnieglen Farm Road where with future adjacent development, a west leg is added to the current three-legged roundabout (Newhouse Boulevard).

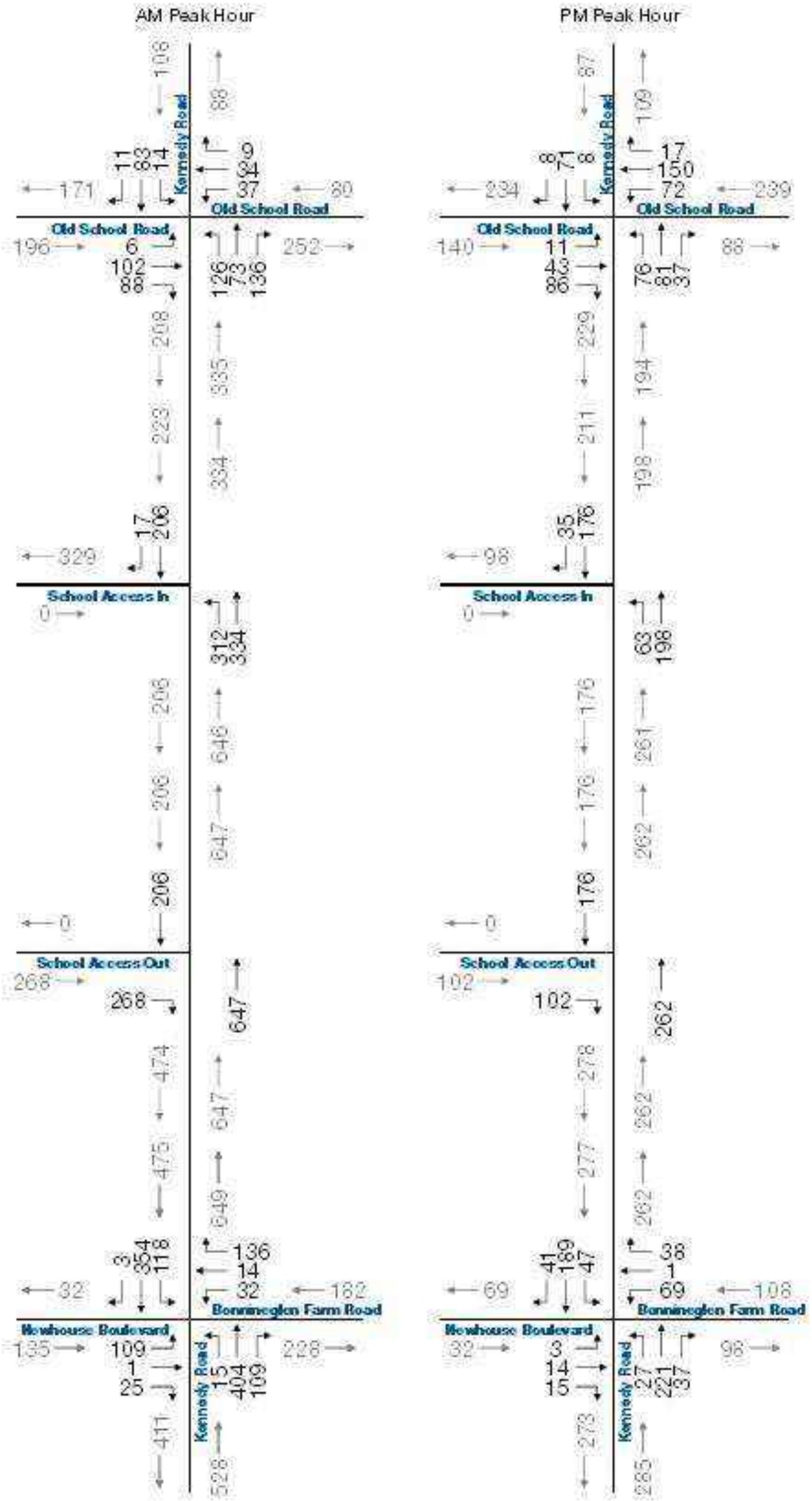
Traffic Forecasts

Intersection traffic volumes were calculated based on the 2018 volumes used for the existing transportation conditions analysis and using the growth rates calculated in Part A – Traffic Growth Projections. **Figure 8** shows the 2021 projected volumes. **Figure 9** shows the 2031 projected volumes.



2021 Projected Traffic Volumes

Figure 8



2031 Projected Traffic Volumes

Figure 9

Future Traffic Operations

Midblock Analysis

The methodology followed for this analysis was the same as described above. The 2021 and 2031 midblock traffic operations v/c ratios were all found acceptable, as shown in **Table 4** and **Table 5**, respectively.

TABLE 4: 2021 MIDBLOCK TRAFFIC OPERATIONS

Peak Hour	Direction	Midblock v/c ratio
AM	Northbound	0.53
	Southbound	0.39
PM	Northbound	0.22
	Southbound	0.23

TABLE 5: 2031 MIDBLOCK TRAFFIC OPERATIONS

Peak Hour	Direction	Midblock v/c ratio
AM	Northbound	0.65
	Southbound	0.48
PM	Northbound	0.26
	Southbound	0.28

Intersection Analysis

The methodology followed for this analysis was the same as described above. The 2021 and 2031 intersection traffic operations are shown in **Table 6** and **Table 7**, respectively.

Under the 2021 and 2031 horizons, all intersections and traffic movements would be slightly worse in comparison to the 2018 traffic conditions. Notwithstanding, all traffic movements are forecast to continue operating at an acceptable level of service and within capacity.

It should be noted, again, that the intersection of Kennedy Road and Old School Road was analyzed with an assumed traffic signal timing plan for the purposes of understanding the general LOS and v/c ratio for the south leg of the intersection. The intersection itself is part of the Old School Road Environmental Assessment study, and analysis of that intersection should be discussed as part of that Study.

Auxiliary Turn Lanes

Based on the operational analyses conducted, the findings indicate future traffic conditions can be accommodated on the existing road network without the need for intersection or roadway improvements. Further investigation has been conducted, the findings are as follows:

- No auxiliary turn lanes are anticipated to be required to accommodate the forecast traffic volumes at the intersection of Kennedy Road and Bonnieglen Farm Road. The current single lane roundabout approaches will continue to serve the intersection well up to the 2031 horizon.
- The unsignalized school inbound driveway intersection along Kennedy Road has been analyzed to determine if the forecast traffic volumes warrant the provision of left turn lanes. The warrants for left turn lanes follow the requirements of the MTO *Design Supplement for the TAC Geometric Design Guide for Canadian Roads – June 2017*[12]. The 80 km/h design speed has been utilized. The nomograph for the highest percentage of left turning vehicles in the approaching volume (40%) was used.

  It is determined that a northbound left turn lane with 25 metres storage would be warranted for installation based on the forecasts 2021 AM peak hour volumes, and a northbound left turn lane with 30 metre storage would be warranted based on the forecasts 2031 AM peak hour volumes.
- At the intersection of Kennedy Road and Old School Road, the south leg of the intersection (northbound approach) was reviewed to determine if any auxiliary turn lanes would be required. From an operational perspective, the northbound shared left/through/right approach is forecast to operate at a good level of service and well within capacity under the 2021 and 2031 horizons. Review of the forecast traffic volumes indicates the northbound approach is forecast to have a high volume of left and right turn movements.

  Referencing the TAC Geometric Design Guide, in general, an exclusive right turn lane should be considered for implementation when the volume of right turning vehicles is 10 to 20 percent of the through volume, subject to a minimum of 60 vehicles per hour in the design hour. The forecast traffic volumes satisfy these criteria, indicating consideration for the provision of a northbound right turn lane is warranted.

  If the intersection is planned to be improved under the future horizons it would be beneficial to provide auxiliary left turn lanes on all intersection approaches as the intersection currently operates under signal control. Based on future operational analysis, the northbound approach is forecast to operate without issue under the existing shared left/through/right configuration. Aforementioned, the intersection is included within the Old School Road Environmental Assessment study, and therefore, analysis and recommendations for intersection improvements should be discussed and confirmed as part of that Study.

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[12] MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads, Appendix 9A for Section 9.17 Left-Turn Lanes of Chapter 9: Intersections, June 2017

TABLE 6: 2021 INTERSECTION TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	OVERALL
AM Peak Hour	Bonnieglen Farm Blvd & Kennedy Rd	RBT	LOS	<	A	>	**A**	<	A	>	**A**	<	B	>	**A**	<	A	>	**A**	
			Delay	<	7	>		<	8	>		<	12	>		<	9	>		
			V/C	<	0.18	>		<	0.25	>		<	0.56	>		<	0.44	>		
			95th	<	1	>		<	1	>		<	4	>		<	2	>		
	School Inbound & Kennedy Rd	TWSC	LOS									<	A		**A**		A	>	**A**	
			Delay									<	5				0	>		
			V/C									<	0.20				0.12	>		
			95th									<	6				0	>		
	School Outbound & Kennedy Rd	TWSC	LOS			B	**A**						A		**A**		A		**A**	
			Delay			11							0				0			
			V/C			0.28							0.34				0.11			
			95th			9							0				0			
	Old School Rd & Kennedy Rd*	TCS	LOS	<	C	>	**C**	<	B	>	**B**	<	B	>	**B**	<	B	>	**B**	**B**
			Delay	<	20	>	**20**	<	19	>	**19**	<	17	>	**17**	<	13	>	**13**	**17**
			V/C	<	0.25	>		<	0.14	>		<	0.43	>		<	0.12	>		**0.35**
			95th	<	31	>		<	17	>		<	48	>		<	17	>		
PM Peak Hour	Bonnieglen Farm Blvd & Kennedy Rd	RBT	LOS	<	A	>	**A**	<	A	>	**A**	<	A	>	**A**	<	A	>	**A**	
			Delay	<	5	>		<	6	>		<	6	>		<	7	>		
			V/C	<	0.03	>		<	0.13	>		<	0.27	>		<	0.27	>		
			95th	<	0	>		<	0	>		<	1	>		<	1	>		
	School Inbound & Kennedy Rd	TWSC	LOS									<	A		**A**		A	>	**A**	
			Delay									<	2				0	>		
			V/C									<	0.04				0.11	>		
			95th									<	1				0	>		
	School Outbound & Kennedy Rd	TWSC	LOS			A	**A**						A		**A**		A		**A**	
			Delay			10							0				0			
			V/C			0.10							0.14				0.09			
			95th			3							0				0			
	Old School Rd & Kennedy Rd*	TCS	LOS	<	B	>	**B**	<	B	>	**B**	<	B	>	**B**	<	B	>	**B**	**B**
			Delay	<	15	>	**15**	<	17	>	**17**	<	18	>	**18**	<	16	>	**16**	**17**
			V/C	<	0.11	>		<	0.28	>		<	0.24	>		<	0.10	>		**0.26**
			95th	<	15	>		<	39	>		<	32	>		<	16	>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Veh. (S)
Q - 95th Percentile Queue Length
TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control
< - Shared Through/Left Turn Lane
> - Shared Through/Right Turn Lane
RBT - Roundabouts HCM 2010

*Note: The intersection of Kennedy Road and Old School Road was only included to understand the south leg/northbound approach to the intersection. As such, the traffic signal timing plan was assumed for this intersection.

TABLE 7: 2031 INTERSECTION TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	OVERALL
AM Peak Hour	Bonnieglen Farm Blvd & Kennedy Rd	RBT	LOS	<	A	>	**A**	<	B	>	**A**	<	C	>	**A**	<	B	>	**A**	
			Delay	<	9	>		<	11	>		<	18	>		<	11	>		
			V/C	<	0.24	>		<	0.34	>		<	0.72	>		<	0.55	>		
			95th	<	1	>		<	1	>		<	6	>		<	3	>		
	School Inbound & Kennedy Rd	TWSC	LOS									<	A		**A**		A	>	**A**	
			Delay									<	6				0	>		
			V/C									<	0.26				0.14	>		
			95th									<	8				0	>		
	School Outbound & Kennedy Rd	TWSC	LOS			B	**A**						A		**A**		A		**A**	
			Delay			12							0				0			
			V/C			0.36							0.41				0.13			
			95th			13							0				0			
	Old School Rd & Kennedy Rd*	TCS	LOS	<	C	>	**C**	<	B	>	**B**	<	B	>	**B**	<	B	>	**B**	**B**
			Delay	<	21	>	**21**	<	19	>	**19**	<	18	>	**18**	<	13	>	**13**	**18**
			V/C	<	0.31	>		<	0.17	>		<	0.50	>		<	0.15	>		**0.42**
			95th	<	38	>		<	20	>		<	58	>		<	20	>		
PM Peak Hour	Bonnieglen Farm Blvd & Kennedy Rd	RBT	LOS	<	A	>	**A**	<	A	>	**A**	<	A	>	**A**	<	A	>	**A**	
			Delay	<	5	>		<	7	>		<	7	>		<	8	>		
			V/C	<	0.04	>		<	0.17	>		<	0.33	>		<	0.34	>		
			95th	<	0	>		<	1	>		<	1	>		<	2	>		
	School Inbound & Kennedy Rd	TWSC	LOS									<	A		**A**		A	>	**A**	
			Delay									<	2				0	>		
			V/C									<	0.05				0.13	>		
			95th									<	1				0	>		
	School Outbound & Kennedy Rd	TWSC	LOS			A	**A**						A		**A**		A		**A**	
			Delay			10							0				0			
			V/C			0.13							0.17				0.11			
			95th			4							0				0			
	Old School Rd & Kennedy Rd*	TCS	LOS	<	B	>	**B**	<	B	>	**B**	<	B	>	**B**	<	B	>	**B**	**B**
			Delay	<	15	>	**15**	<	18	>	**18**	<	19	>	**19**	<	16	>	**16**	**17**
			V/C	<	0.14	>		<	0.35	>		<	0.31	>		<	0.12	>		**0.33**
			95th	<	17	>		<	48	>		<	39	>		<	19	>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Veh. (S)

Q - 95th Percentile Queue Length
TCS - Traffic Control Signal
TWSC - Two-Way Stop Control

AWSC - All-Way Stop Control
< - Shared Through/Left Turn Lane
> - Shared Through/Right Turn Lane

RBT - Roundabouts HCM 2010

*Note: The intersection of Kennedy Road and Old School Road was only included to understand the south leg/northbound approach to the intersection. As such, the traffic signal timing plan was assumed for this intersection.

Traffic Signals

Based on the future traffic operations, as shown in Table 6 and Table 7, it is expected that the intersections within the study area will operate at an acceptable level of service with the current/planned traffic controls. Therefore, signalization of the following intersections will not be required:

- Kennedy Road, Bonnieglen Farm Boulevard and Newhouse Boulevard;
- Kennedy Road and the Tony Pontes Public School inbound access; and
- Kennedy Road and the Tony Pontes Public School outbound access.

Active Transportation Facilities

Pedestrians:

With the construction of the Tony Pontes Public School, it can be expected that children will walk to school, or walk to the school grounds to enjoy the facilities. The Town should therefore provide pedestrian access through sidewalks, at a minimum on the west side of Kennedy Road, between the school and the neighbourhoods to the south.

Until additional pedestrian generators or sidewalk connections are constructed, it is not recommended that a sidewalk be provided on the east side of Kennedy Road. The presence of a sidewalk on the east side, without any pedestrian destination on that side, could encourage pedestrians to cross Kennedy Road at a midblock location in the vicinity of the school.

Cyclists:

The Town of Caledon Transportation Master Plan[13] recommends a Separated On-Road Cycling Route along Kennedy Road within the study area. Separated On-Road Cycling Routes include the following facility types:

- Conventional Bike Lane;
- Buffered Bike Lane;
- Cycle track; and
- Paved Shoulder.

Consistent with the Town’s Transportation Master Plan, the Town should provide, at a minimum, paved shoulders with a minimum width of 1.2 m, and preferably 1.5 m. The Town should also consider providing bicycle lanes or cycle tracks.

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[13] Town of Caledon. November 2017. *Transportation Master Plan.* Section 4.3.4 and Appendix H.

Alternative Solutions

Do Nothing

The “Do Nothing” alternative identifies what would happen if no action is taken to address the current deficiencies within the corridor in both the short and long term basis. This alternative provides a base line in which other alternatives may be measured.

Rehabilitate existing Two Lane Roadway

This alternative addresses the pavement deterioration, improves the current shoulders and drainage. However, this alternative does not address the need for road improvements nor does it address the community need for safe pedestrian and cyclist needs.

Two Lane Urbanization

This alternative would involve the reconstruction and urbanization of Kennedy Road to fulfill the developer agreement in relation to the Southfields residential development. This alternative would address the need for operational and roadside safety improvements and the community need for safe pedestrian and cyclists movements.

Assessment of Alternative Solutions

Table 8 summarizes the recommendations, and assesses if each recommendation can be addressed, partially addressed or cannot be addressed by each alternative solution.

TABLE 8: ASSESSMENT OF ALTERNATIVE SOLUTIONS

Recommendation	Alternative		
	Do Nothing	Rehabilitate existing Two Lane Roadway	Two Lane Urbanization
Lane widths should be a minimum of 3.25 m each	x	✓	✓
Paved shoulder widths should be a minimum of 1.2 m each, and preferably 1.5 m each	x	✓	✓
Consider mitigating roadside obstacles	~	✓	✓
Sidewalk access should be provided between Tony Pontes Public School and the neighbourhoods to the south	x	x	✓
Crosswalks should be provided at the roundabout with Bonnieglen Farm Boulevard and Newhouse Boulevard	x	~	✓
Consider providing bicycle lanes or cycle tracks	x	x	✓
Paint or repaint the yield line markings at the roundabout entries	✓	✓	✓
Paint or repaint the northbound stop bar at the intersection of Kennedy Road and Old School Road	✓	✓	✓
Replace the northbound Intersection (controlled) warning sign with a Traffic Signal Ahead sign	✓	✓	✓
Cut vegetation around the southbound Yield Ahead warning sign	✓	✓	✓
After construction of the school accesses, measure sight distances for all turning movements and evaluate their appropriateness	✓	✓	✓
Consider modifying the vertical alignment of Kennedy Road to improve sight distances, especially at and around the school accesses	x	x	✓
Move forward with the proposed No Stopping Restrictions and proposed 40 km/h Speed Limit and Community Zone, as shown on Figure 7	✓	✓	✓
Consider additional measures to encourage drivers to comply with the proposed 40 km/h speed limit and school zone	x	~	✓
Install a northboundd left turn lane with a minimum of 30 m storage at the school inbound driveway	x	x	✓
Analyse the need for turning lanes at the intersection of Kennedy Road and Old School Road as part of the Old School Road EA Study	x	x	✓
Recommendation for Implementation			✓

LEGEND

✓	Can be addressed by alternative
~	Can be partially addressed by alternative
x	Cannot be addressed by alternative

Conclusions and Recommendations

Based on the analyses completed for this study, it is recommended that:

- Lane widths should be a minimum of 3.25 m each;
- Paved shoulder widths should be a minimum of 1.2 m each, and preferably 1.5 m each;
- Consider mitigating roadside obstacles;
- Sidewalk access should be provided between Tony Pontes Public School and the neighbourhoods to the south, on the west side of Kennedy Road;
- Crosswalks should be provided at the roundabout with Bonnieglen Farm Boulevard and Newhouse Boulevard;
- Consider providing bicycle lanes or cycle tracks;
- Paint or repaint the yield line markings at the roundabout entries;
- Paint or repaint the northbound stop bar at the intersection of Kennedy Road and Old School Road;
- Replace the northbound Intersection (controlled) warning sign with a Traffic Signal Ahead sign;
- Cut vegetation around the southbound Yield Ahead warning sign;
- After construction of the school accesses, measure sight distances for all turning movements and evaluate their appropriateness;
- Consider modifying the vertical alignment of Kennedy Road to improve sight distances, especially at and around the school accesses;
- Move forward with the proposed No Stopping Restrictions and proposed 40 km/h Speed Limit and Community Zone, as shown on Figure 7;
- Consider additional measures to encourage drivers to comply with the proposed 40 km/h speed limit and school zone;
- Install a northbound left turn lane with a minimum of 30 m storage at the school inbound driveway; and
- Analyse the need for turning lanes at the intersection of Kennedy Road and Old School Road as part of the Old School Road EA Study.

Based on the assessment of the possibility to address each recommendation with each alternative solution, the preferred alternative solution, from a transportation perspective, is the Two Lane Urbanization.

Thank you for the opportunity to assist Chisholm Fleming and Associates and the Town of Caledon with this assignment. Please contact the undersigned if you have any questions or require further clarification.

Yours truly,

PARADIGM TRANSPORTATION SOLUTIONS LIMITED

Josée Dumont

Josée Dumont
M.A.Sc., P.Eng., MITE
Senior Project Manager

Appendix A

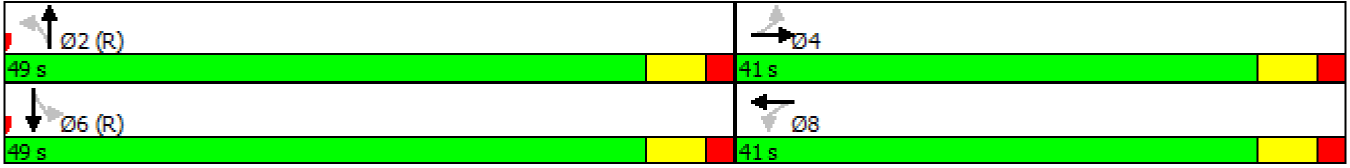
Synchro Traffic Operations Reports

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations		✥		✥		✥		✥
Traffic Volume (vph)	4	73	26	24	90	53	10	59
Future Volume (vph)	4	73	26	24	90	53	10	59
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Total Split (s)	41.0	41.0	41.0	41.0	49.0	49.0	49.0	49.0
Total Split (%)	45.6%	45.6%	45.6%	45.6%	54.4%	54.4%	54.4%	54.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0		0.0		0.0
Total Lost Time (s)		6.0		6.0		6.0		6.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)		35.0		35.0		43.0		43.0
Actuated g/C Ratio		0.39		0.39		0.48		0.48
v/c Ratio		0.24		0.12		0.40		0.11
Control Delay		13.4		16.6		14.1		12.2
Queue Delay		0.0		0.0		0.0		0.0
Total Delay		13.4		16.6		14.1		12.2
LOS		B		B		B		B
Approach Delay		13.4		16.6		14.1		12.2
Approach LOS		B		B		B		B

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 50
Control Type: Pretimed
Maximum v/c Ratio: 0.40
Intersection Signal Delay: 13.9 Intersection LOS: B
Intersection Capacity Utilization 46.9% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Kennedy Rd & Old School Rd



	→	←	↑	↓
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	163	66	280	90
v/c Ratio	0.24	0.12	0.40	0.11
Control Delay	13.4	16.6	14.1	12.2
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	13.4	16.6	14.1	12.2
Queue Length 50th (m)	12.8	6.6	25.0	7.8
Queue Length 95th (m)	25.2	14.5	41.5	15.5
Internal Link Dist (m)	69.7	86.5	464.8	31.8
Turn Bay Length (m)				
Base Capacity (vph)	677	557	705	801
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.24	0.12	0.40	0.11

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Volume (vph)	4	73	63	26	24	7	90	53	97	10	59	8
Future Volume (vph)	4	73	63	26	24	7	90	53	97	10	59	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.94			0.98			0.95			0.99	
Flt Protected		1.00			0.98			0.98			0.99	
Satd. Flow (prot)		1664			1638			1641			1741	
Flt Permitted		0.99			0.85			0.85			0.95	
Satd. Flow (perm)		1657			1419			1420			1669	
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	5	85	73	30	28	8	105	62	113	12	69	9
RTOR Reduction (vph)	0	32	0	0	5	0	0	27	0	0	5	0
Lane Group Flow (vph)	0	131	0	0	61	0	0	253	0	0	85	0
Heavy Vehicles (%)	50%	3%	9%	17%	9%	0%	9%	13%	3%	12%	7%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		35.0			35.0			43.0			43.0	
Effective Green, g (s)		35.0			35.0			43.0			43.0	
Actuated g/C Ratio		0.39			0.39			0.48			0.48	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		644			551			678			797	
v/s Ratio Prot												
v/s Ratio Perm		c0.08			0.04			c0.18			0.05	
v/c Ratio		0.20			0.11			0.37			0.11	
Uniform Delay, d1		18.2			17.6			14.9			12.9	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.7			0.4			1.6			0.3	
Delay (s)		19.0			18.0			16.5			13.2	
Level of Service		B			B			B			B	
Approach Delay (s)		19.0			18.0			16.5			13.2	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	16.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	46.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

6: Kennedy Rd & Bonnieglen Farm Blvd

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	78	1	18	23	10	97	11	289	78	84	253	2
Future Volume (veh/h)	78	1	18	23	10	97	11	289	78	84	253	2
Peak Hour Factor	0.92	0.92	0.92	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	85	1	20	25	11	107	12	318	86	92	278	2
Approach Volume (veh/h)		106			143			416			372	
Crossing Volume (veh/h)		395			415			178			48	
High Capacity (veh/h)		1015			999			1205			1334	
High v/c (veh/h)		0.10			0.14			0.35			0.28	
Low Capacity (veh/h)		827			813			998			1115	
Low v/c (veh/h)		0.13			0.18			0.42			0.33	

Intersection Summary			
Maximum v/c High	0.35		
Maximum v/c Low	0.42		
Intersection Capacity Utilization	60.8%	ICU Level of Service	B

Intersection	
Intersection Delay, s/veh	8.7
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	106	143	416	372
Demand Flow Rate, veh/h	108	148	448	414
Vehicles Circulating, veh/h	438	436	186	49
Vehicles Exiting, veh/h	25	198	360	535
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	6.6	7.4	10.2	8.0
Approach LOS	A	A	B	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	108	148	448	414
Cap Entry Lane, veh/h	729	731	938	1076
Entry HV Adj Factor	0.981	0.965	0.928	0.898
Flow Entry, veh/h	106	143	416	372
Cap Entry, veh/h	716	705	871	966
V/C Ratio	0.148	0.203	0.478	0.385
Control Delay, s/veh	6.6	7.4	10.2	8.0
LOS	A	A	B	A
95th %tile Queue, veh	1	1	3	2

8: Kennedy Rd & School Outbound

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↱		↑	↑	
Traffic Volume (veh/h)	0	192	0	463	147	0
Future Volume (Veh/h)	0	192	0	463	147	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	209	0	503	160	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	663	160	160			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	663	160	160			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	76	100			
cM capacity (veh/h)	426	885	1419			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	209	503	160
Volume Left	0	0	0
Volume Right	209	0	0
cSH	885	1700	1700
Volume to Capacity	0.24	0.30	0.09
Queue Length 95th (m)	7.3	0.0	0.0
Control Delay (s)	10.3	0.0	0.0
Lane LOS	B		
Approach Delay (s)	10.3	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	27.7%	ICU Level of Service	A
Analysis Period (min)	15		

10: Kennedy Rd & School Inbound

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations				↰	↱	
Traffic Volume (veh/h)	0	0	223	239	147	12
Future Volume (Veh/h)	0	0	223	239	147	12
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	242	260	160	13
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	910	166	173			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	910	166	173			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	83			
cM capacity (veh/h)	252	878	1404			

Direction, Lane #	NB 1	SB 1
Volume Total	502	173
Volume Left	242	0
Volume Right	0	13
cSH	1404	1700
Volume to Capacity	0.17	0.10
Queue Length 95th (m)	5.0	0.0
Control Delay (s)	4.8	0.0
Lane LOS	A	
Approach Delay (s)	4.8	0.0
Approach LOS		

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	40.0%	ICU Level of Service	A
Analysis Period (min)	15		

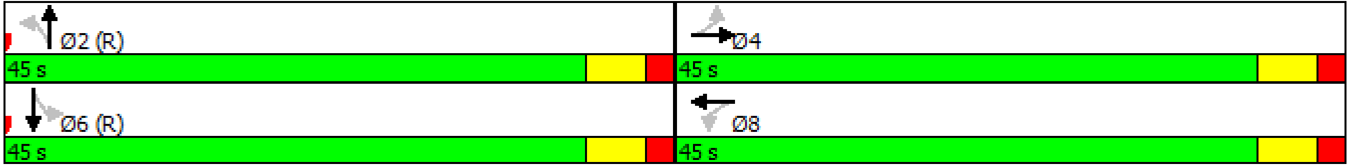
3: Kennedy Rd & Old School Rd

	↗	→	↙	←	↖	↑	↘	↓
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations		✥		✥		✥		✥
Traffic Volume (vph)	8	31	52	107	54	58	5	51
Future Volume (vph)	8	31	52	107	54	58	5	51
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Total Split (s)	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0		0.0		0.0
Total Lost Time (s)		6.0		6.0		6.0		6.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)		39.0		39.0		39.0		39.0
Actuated g/C Ratio		0.43		0.43		0.43		0.43
v/c Ratio		0.15		0.25		0.21		0.08
Control Delay		7.6		17.0		15.0		14.5
Queue Delay		0.0		0.0		0.0		0.0
Total Delay		7.6		17.0		15.0		14.5
LOS		A		B		B		B
Approach Delay		7.6		17.0		15.0		14.5
Approach LOS		A		B		B		B

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 50
Control Type: Pretimed
Maximum v/c Ratio: 0.25
Intersection Signal Delay: 14.1 Intersection LOS: B
Intersection Capacity Utilization 40.2% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Kennedy Rd & Old School Rd



3: Kennedy Rd & Old School Rd

	→	←	↑	↓
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	108	182	147	64
v/c Ratio	0.15	0.25	0.21	0.08
Control Delay	7.6	17.0	15.0	14.5
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	7.6	17.0	15.0	14.5
Queue Length 50th (m)	4.3	19.9	14.2	6.1
Queue Length 95th (m)	13.9	34.5	26.9	13.7
Internal Link Dist (m)	69.7	86.5	464.8	31.8
Turn Bay Length (m)				
Base Capacity (vph)	744	716	688	759
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.15	0.25	0.21	0.08

Intersection Summary

3: Kennedy Rd & Old School Rd

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Volume (vph)	8	31	62	52	107	12	54	58	26	5	51	5
Future Volume (vph)	8	31	62	52	107	12	54	58	26	5	51	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.92			0.99			0.97			0.99	
Flt Protected		1.00			0.99			0.98			1.00	
Satd. Flow (prot)		1665			1830			1759			1768	
Flt Permitted		0.98			0.89			0.87			0.98	
Satd. Flow (perm)		1633			1648			1568			1746	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	9	33	66	55	114	13	57	62	28	5	54	5
RTOR Reduction (vph)	0	37	0	0	3	0	0	10	0	0	3	0
Lane Group Flow (vph)	0	71	0	0	179	0	0	137	0	0	61	0
Heavy Vehicles (%)	0%	10%	2%	0%	1%	9%	2%	4%	4%	0%	7%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		39.0			39.0			39.0			39.0	
Effective Green, g (s)		39.0			39.0			39.0			39.0	
Actuated g/C Ratio		0.43			0.43			0.43			0.43	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		707			714			679			756	
v/s Ratio Prot												
v/s Ratio Perm		0.04			c0.11			c0.09			0.04	
v/c Ratio		0.10			0.25			0.20			0.08	
Uniform Delay, d1		15.1			16.2			15.8			15.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.3			0.8			0.7			0.2	
Delay (s)		15.4			17.1			16.5			15.2	
Level of Service		B			B			B			B	
Approach Delay (s)		15.4			17.1			16.5			15.2	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	16.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	40.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
6: Kennedy Rd & Bonnieglen Farm Blvd

Existing PM Base Year 2018
180142: Design Kennedy Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	2	10	11	49	1	27	19	158	26	34	135	29
Future Volume (veh/h)	2	10	11	49	1	27	19	158	26	34	135	29
Peak Hour Factor	0.92	0.92	0.92	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	2	11	12	56	1	31	22	180	30	39	153	33
Approach Volume (veh/h)		25			88			232			225	
Crossing Volume (veh/h)		248			204			52			79	
High Capacity (veh/h)		1140			1180			1330			1302	
High v/c (veh/h)		0.02			0.07			0.17			0.17	
Low Capacity (veh/h)		939			976			1111			1086	
Low v/c (veh/h)		0.03			0.09			0.21			0.21	

Intersection Summary			
Maximum v/c High	0.17		
Maximum v/c Low	0.21		
Intersection Capacity Utilization	35.4%	ICU Level of Service	A

Intersection	
Intersection Delay, s/veh	5.8
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	25	88	232	225
Demand Flow Rate, veh/h	25	103	249	241
Vehicles Circulating, veh/h	273	217	52	89
Vehicles Exiting, veh/h	57	84	246	231
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	4.5	5.8	5.8	6.0
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	25	103	249	241
Cap Entry Lane, veh/h	860	910	1073	1034
Entry HV Adj Factor	0.991	0.854	0.933	0.932
Flow Entry, veh/h	25	88	232	225
Cap Entry, veh/h	853	777	1001	964
V/C Ratio	0.029	0.113	0.232	0.233
Control Delay, s/veh	4.5	5.8	5.8	6.0
LOS	A	A	A	A
95th %tile Queue, veh	0	0	1	1

8: Kennedy Rd & School Outbound

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↱		↑	↑	
Traffic Volume (veh/h)	0	73	0	168	126	0
Future Volume (Veh/h)	0	73	0	168	126	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	79	0	183	137	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	320	137	137			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	320	137	137			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	91	100			
cM capacity (veh/h)	673	911	1447			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	79	183	137
Volume Left	0	0	0
Volume Right	79	0	0
cSH	911	1700	1700
Volume to Capacity	0.09	0.11	0.08
Queue Length 95th (m)	2.3	0.0	0.0
Control Delay (s)	9.3	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.3	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	17.8%	ICU Level of Service	A
Analysis Period (min)	15		

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations				↰↑	↑↱	
Traffic Volume (veh/h)	0	0	45	142	126	25
Future Volume (Veh/h)	0	0	45	142	126	25
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	49	154	137	27
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	402	150	164			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	402	150	164			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	97			
cM capacity (veh/h)	583	896	1414			

Direction, Lane #	NB 1	SB 1
Volume Total	203	164
Volume Left	49	0
Volume Right	0	27
cSH	1414	1700
Volume to Capacity	0.03	0.10
Queue Length 95th (m)	0.9	0.0
Control Delay (s)	2.1	0.0
Lane LOS	A	
Approach Delay (s)	2.1	0.0
Approach LOS		

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	24.8%	ICU Level of Service	A
Analysis Period (min)	15		

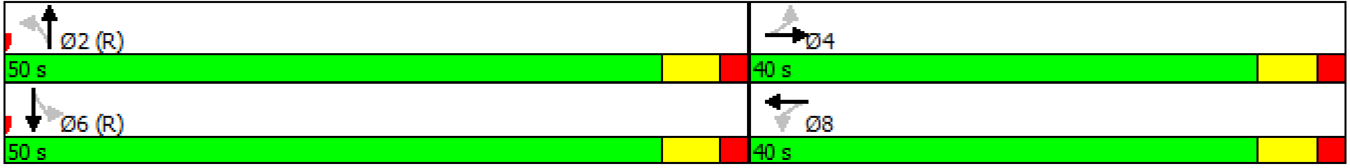
3: Kennedy Rd & Old School Rd

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations		✣		✣		✣		✣
Traffic Volume (vph)	5	84	30	28	103	60	11	68
Future Volume (vph)	5	84	30	28	103	60	11	68
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Total Split (s)	40.0	40.0	40.0	40.0	50.0	50.0	50.0	50.0
Total Split (%)	44.4%	44.4%	44.4%	44.4%	55.6%	55.6%	55.6%	55.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0		0.0		0.0
Total Lost Time (s)		6.0		6.0		6.0		6.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)		34.0		34.0		44.0		44.0
Actuated g/C Ratio		0.38		0.38		0.49		0.49
v/c Ratio		0.29		0.15		0.45		0.12
Control Delay		15.3		17.3		14.7		11.9
Queue Delay		0.0		0.0		0.0		0.0
Total Delay		15.3		17.3		14.7		11.9
LOS		B		B		B		B
Approach Delay		15.3		17.3		14.7		11.9
Approach LOS		B		B		B		B

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 50
Control Type: Pretimed
Maximum v/c Ratio: 0.45
Intersection Signal Delay: 14.8 Intersection LOS: B
Intersection Capacity Utilization 50.6% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Kennedy Rd & Old School Rd



3: Kennedy Rd & Old School Rd

	→	←	↑	↓
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	188	77	319	102
v/c Ratio	0.29	0.15	0.45	0.12
Control Delay	15.3	17.3	14.7	11.9
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	15.3	17.3	14.7	11.9
Queue Length 50th (m)	16.5	8.0	29.7	8.8
Queue Length 95th (m)	30.5	16.6	48.0	16.7
Internal Link Dist (m)	69.7	86.5	464.8	31.8
Turn Bay Length (m)				
Base Capacity (vph)	657	531	713	818
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.29	0.15	0.45	0.12

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Volume (vph)	5	84	72	30	28	8	103	60	111	11	68	9
Future Volume (vph)	5	84	72	30	28	8	103	60	111	11	68	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.94			0.98			0.95			0.99	
Flt Protected		1.00			0.98			0.98			0.99	
Satd. Flow (prot)		1663			1639			1641			1742	
Flt Permitted		0.99			0.83			0.84			0.95	
Satd. Flow (perm)		1655			1391			1405			1664	
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	6	98	84	35	33	9	120	70	129	13	79	10
RTOR Reduction (vph)	0	32	0	0	6	0	0	27	0	0	5	0
Lane Group Flow (vph)	0	156	0	0	71	0	0	292	0	0	97	0
Heavy Vehicles (%)	50%	3%	9%	17%	9%	0%	9%	13%	3%	12%	7%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		34.0			34.0			44.0			44.0	
Effective Green, g (s)		34.0			34.0			44.0			44.0	
Actuated g/C Ratio		0.38			0.38			0.49			0.49	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		625			525			686			813	
v/s Ratio Prot												
v/s Ratio Perm		c0.09			0.05			c0.21			0.06	
v/c Ratio		0.25			0.14			0.43			0.12	
Uniform Delay, d1		19.2			18.4			14.8			12.5	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.0			0.5			1.9			0.3	
Delay (s)		20.2			18.9			16.8			12.8	
Level of Service		C			B			B			B	
Approach Delay (s)		20.2			18.9			16.8			12.8	
Approach LOS		C			B			B			B	

Intersection Summary

HCM 2000 Control Delay	17.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	50.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
6: Kennedy Rd & Bonnieglen Farm Blvd

Future 2021 Weekday Peak AM
180142: Design Kennedy Road

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	89	1	21	26	11	111	13	330	89	97	289	2
Future Volume (veh/h)	89	1	21	26	11	111	13	330	89	97	289	2
Peak Hour Factor	0.92	0.92	0.92	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	97	1	23	29	12	122	14	363	98	107	318	2
Approach Volume (veh/h)		121			163			475			427	
Crossing Volume (veh/h)		454			474			205			55	
High Capacity (veh/h)		968			953			1179			1327	
High v/c (veh/h)		0.12			0.17			0.40			0.32	
Low Capacity (veh/h)		785			772			975			1108	
Low v/c (veh/h)		0.15			0.21			0.49			0.39	

Intersection Summary			
Maximum v/c High	0.40		
Maximum v/c Low	0.49		
Intersection Capacity Utilization	72.6%	ICU Level of Service	C

Intersection	
Intersection Delay, s/veh	10.1
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	121	163	475	427
Demand Flow Rate, veh/h	123	169	512	474
Vehicles Circulating, veh/h	502	498	213	56
Vehicles Exiting, veh/h	28	227	412	611
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.4	8.4	12.3	8.9
Approach LOS	A	A	B	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	123	169	512	474
Cap Entry Lane, veh/h	684	687	913	1068
Entry HV Adj Factor	0.984	0.963	0.928	0.900
Flow Entry, veh/h	121	163	475	427
Cap Entry, veh/h	673	661	848	962
V/C Ratio	0.180	0.246	0.561	0.444
Control Delay, s/veh	7.4	8.4	12.3	8.9
LOS	A	A	B	A
95th %tile Queue, veh	1	1	4	2

8: Kennedy Rd & School Outbound

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↱		↑	↑	
Traffic Volume (veh/h)	0	220	0	530	169	0
Future Volume (Veh/h)	0	220	0	530	169	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	239	0	576	184	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	760	184	184			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	760	184	184			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	72	100			
cM capacity (veh/h)	374	858	1391			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	239	576	184
Volume Left	0	0	0
Volume Right	239	0	0
cSH	858	1700	1700
Volume to Capacity	0.28	0.34	0.11
Queue Length 95th (m)	9.1	0.0	0.0
Control Delay (s)	10.8	0.0	0.0
Lane LOS	B		
Approach Delay (s)	10.8	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	31.2%	ICU Level of Service	A
Analysis Period (min)	15		

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations				↰↑	↓↳	
Traffic Volume (veh/h)	0	0	255	273	169	14
Future Volume (Veh/h)	0	0	255	273	169	14
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	277	297	184	15
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1042	192	199			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1042	192	199			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	80			
cM capacity (veh/h)	203	850	1373			

Direction, Lane #	NB 1	SB 1
Volume Total	574	199
Volume Left	277	0
Volume Right	0	15
cSH	1373	1700
Volume to Capacity	0.20	0.12
Queue Length 95th (m)	6.0	0.0
Control Delay (s)	5.0	0.0
Lane LOS	A	
Approach Delay (s)	5.0	0.0
Approach LOS		

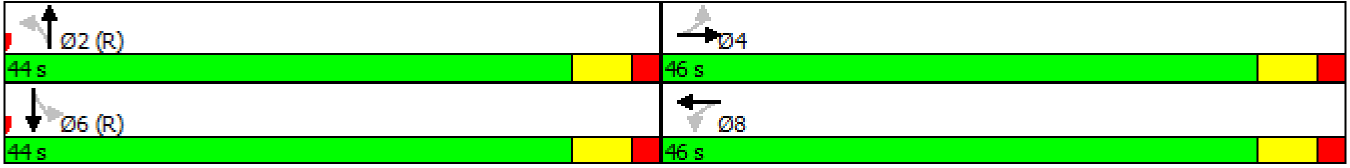
Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	44.9%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations		✣		✣		✣		✣
Traffic Volume (vph)	9	35	59	123	62	66	6	58
Future Volume (vph)	9	35	59	123	62	66	6	58
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Total Split (s)	46.0	46.0	46.0	46.0	44.0	44.0	44.0	44.0
Total Split (%)	51.1%	51.1%	51.1%	51.1%	48.9%	48.9%	48.9%	48.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0		0.0		0.0
Total Lost Time (s)		6.0		6.0		6.0		6.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)		40.0		40.0		38.0		38.0
Actuated g/C Ratio		0.44		0.44		0.42		0.42
v/c Ratio		0.16		0.29		0.25		0.10
Control Delay		7.2		16.8		16.4		15.0
Queue Delay		0.0		0.0		0.0		0.0
Total Delay		7.2		16.8		16.4		15.0
LOS		A		B		B		B
Approach Delay		7.2		16.8		16.4		15.0
Approach LOS		A		B		B		B

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 50
Control Type: Pretimed
Maximum v/c Ratio: 0.29
Intersection Signal Delay: 14.4 Intersection LOS: B
Intersection Capacity Utilization 42.7% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Kennedy Rd & Old School Rd



Queues

3: Kennedy Rd & Old School Rd

	→	←	↑	↓
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	123	209	168	74
v/c Ratio	0.16	0.29	0.25	0.10
Control Delay	7.2	16.8	16.4	15.0
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	7.2	16.8	16.4	15.0
Queue Length 50th (m)	4.7	22.7	17.2	7.2
Queue Length 95th (m)	14.7	38.5	31.6	15.7
Internal Link Dist (m)	69.7	86.5	464.8	31.8
Turn Bay Length (m)				
Base Capacity (vph)	766	729	662	738
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.16	0.29	0.25	0.10

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Volume (vph)	9	35	71	59	123	14	62	66	30	6	58	6
Future Volume (vph)	9	35	71	59	123	14	62	66	30	6	58	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.92			0.99			0.97			0.99	
Flt Protected		1.00			0.99			0.98			1.00	
Satd. Flow (prot)		1664			1830			1759			1768	
Flt Permitted		0.98			0.88			0.86			0.98	
Satd. Flow (perm)		1629			1632			1548			1741	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	10	37	76	63	131	15	66	70	32	6	62	6
RTOR Reduction (vph)	0	42	0	0	3	0	0	9	0	0	3	0
Lane Group Flow (vph)	0	81	0	0	206	0	0	159	0	0	71	0
Heavy Vehicles (%)	0%	10%	2%	0%	1%	9%	2%	4%	4%	0%	7%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		40.0			40.0			38.0			38.0	
Effective Green, g (s)		40.0			40.0			38.0			38.0	
Actuated g/C Ratio		0.44			0.44			0.42			0.42	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		724			725			653			735	
v/s Ratio Prot												
v/s Ratio Perm		0.05			c0.13			c0.10			0.04	
v/c Ratio		0.11			0.28			0.24			0.10	
Uniform Delay, d1		14.6			15.9			16.7			15.7	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.3			1.0			0.9			0.3	
Delay (s)		14.9			16.9			17.6			15.9	
Level of Service		B			B			B			B	
Approach Delay (s)		14.9			16.9			17.6			15.9	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	16.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	42.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

6: Kennedy Rd & Bonnieglen Farm Blvd

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	2	11	13	56	1	31	22	181	30	39	155	33
Future Volume (veh/h)	2	11	13	56	1	31	22	181	30	39	155	33
Peak Hour Factor	0.92	0.92	0.92	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	2	12	14	64	1	35	25	206	34	44	176	38
Approach Volume (veh/h)		28			100			265			258	
Crossing Volume (veh/h)		284			233			58			90	
High Capacity (veh/h)		1108			1154			1323			1291	
High v/c (veh/h)		0.03			0.09			0.20			0.20	
Low Capacity (veh/h)		911			952			1105			1076	
Low v/c (veh/h)		0.03			0.11			0.24			0.24	

Intersection Summary			
Maximum v/c High	0.20		
Maximum v/c Low	0.24		
Intersection Capacity Utilization	38.6%	ICU Level of Service	A

Intersection	
Intersection Delay, s/veh	6.3
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	28	100	265	258
Demand Flow Rate, veh/h	28	118	284	277
Vehicles Circulating, veh/h	314	247	58	102
Vehicles Exiting, veh/h	65	94	284	263
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	4.7	6.2	6.3	6.5
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	28	118	284	277
Cap Entry Lane, veh/h	825	883	1066	1020
Entry HV Adj Factor	0.992	0.847	0.932	0.933
Flow Entry, veh/h	28	100	265	258
Cap Entry, veh/h	819	748	993	952
V/C Ratio	0.034	0.134	0.266	0.271
Control Delay, s/veh	4.7	6.2	6.3	6.5
LOS	A	A	A	A
95th %tile Queue, veh	0	0	1	1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
	⤴	⤵	↰	↑	↓	↲
Lane Configurations		↱		↑	↑	
Traffic Volume (veh/h)	0	83	0	215	144	0
Future Volume (Veh/h)	0	83	0	215	144	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	90	0	234	157	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	391	157	157			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	391	157	157			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	90	100			
cM capacity (veh/h)	613	889	1423			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	90	234	157
Volume Left	0	0	0
Volume Right	90	0	0
cSH	889	1700	1700
Volume to Capacity	0.10	0.14	0.09
Queue Length 95th (m)	2.7	0.0	0.0
Control Delay (s)	9.5	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.5	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	19.4%	ICU Level of Service	A
Analysis Period (min)	15		

10: Kennedy Rd & School Inbound

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations				↰	↱	
Traffic Volume (veh/h)	0	0	51	162	144	29
Future Volume (Veh/h)	0	0	51	162	144	29
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	55	176	157	32
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	459	173	189			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	459	173	189			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	96			
cM capacity (veh/h)	538	871	1385			

Direction, Lane #	NB 1	SB 1
Volume Total	231	189
Volume Left	55	0
Volume Right	0	32
cSH	1385	1700
Volume to Capacity	0.04	0.11
Queue Length 95th (m)	1.0	0.0
Control Delay (s)	2.1	0.0
Lane LOS	A	
Approach Delay (s)	2.1	0.0
Approach LOS		

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	27.4%	ICU Level of Service	A
Analysis Period (min)	15		

3: Kennedy Rd & Old School Rd

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations		✣		✣		✣		✣
Traffic Volume (vph)	6	102	37	34	126	73	14	83
Future Volume (vph)	6	102	37	34	126	73	14	83
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Total Split (s)	40.0	40.0	40.0	40.0	50.0	50.0	50.0	50.0
Total Split (%)	44.4%	44.4%	44.4%	44.4%	55.6%	55.6%	55.6%	55.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0		0.0		0.0
Total Lost Time (s)		6.0		6.0		6.0		6.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)		34.0		34.0		44.0		44.0
Actuated g/C Ratio		0.38		0.38		0.49		0.49
v/c Ratio		0.35		0.18		0.52		0.16
Control Delay		17.0		18.2		17.0		12.4
Queue Delay		0.0		0.0		0.0		0.0
Total Delay		17.0		18.2		17.0		12.4
LOS		B		B		B		B
Approach Delay		17.0		18.3		17.0		12.4
Approach LOS		B		B		B		B

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 50

Control Type: Pretimed

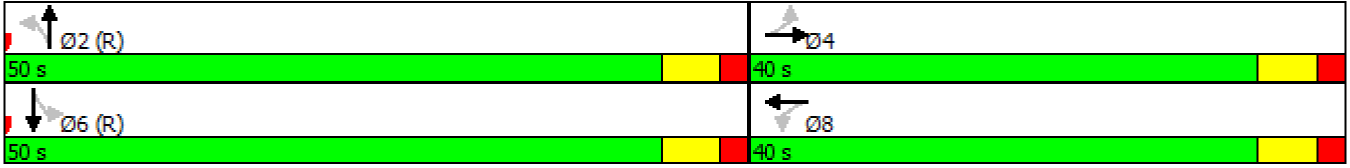
Maximum v/c Ratio: 0.52

Intersection Signal Delay: 16.4 Intersection LOS: B

Intersection Capacity Utilization 54.4% ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: Kennedy Rd & Old School Rd



Queues

3: Kennedy Rd & Old School Rd

	→	←	↑	↓
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	228	93	354	126
v/c Ratio	0.35	0.18	0.52	0.16
Control Delay	17.0	18.2	17.0	12.4
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	17.0	18.2	17.0	12.4
Queue Length 50th (m)	21.9	10.1	36.9	11.2
Queue Length 95th (m)	37.9	19.9	58.1	20.3
Internal Link Dist (m)	69.7	86.5	464.8	31.8
Turn Bay Length (m)				
Base Capacity (vph)	657	512	684	811
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.35	0.18	0.52	0.16

Intersection Summary

3: Kennedy Rd & Old School Rd

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (vph)	6	102	88	37	34	9	126	73	105	14	83	11
Future Volume (vph)	6	102	88	37	34	9	126	73	105	14	83	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.94			0.99			0.95			0.99	
Flt Protected		1.00			0.98			0.98			0.99	
Satd. Flow (prot)		1664			1638			1645			1741	
Flt Permitted		0.99			0.80			0.81			0.94	
Satd. Flow (perm)		1655			1344			1359			1651	
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	7	119	102	43	40	10	147	85	122	16	97	13
RTOR Reduction (vph)	0	32	0	0	5	0	0	21	0	0	5	0
Lane Group Flow (vph)	0	196	0	0	88	0	0	333	0	0	121	0
Heavy Vehicles (%)	50%	3%	9%	17%	9%	0%	9%	13%	3%	12%	7%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		34.0			34.0			44.0			44.0	
Effective Green, g (s)		34.0			34.0			44.0			44.0	
Actuated g/C Ratio		0.38			0.38			0.49			0.49	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		625			507			664			807	
v/s Ratio Prot												
v/s Ratio Perm		c0.12			0.07			c0.25			0.07	
v/c Ratio		0.31			0.17			0.50			0.15	
Uniform Delay, d1		19.8			18.6			15.6			12.7	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.3			0.7			2.7			0.4	
Delay (s)		21.1			19.4			18.3			13.1	
Level of Service		C			B			B			B	
Approach Delay (s)		21.1			19.4			18.3			13.1	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	18.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	54.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	109	1	25	32	14	136	15	404	109	116	354	3
Future Volume (veh/h)	109	1	25	32	14	136	15	404	109	116	354	3
Peak Hour Factor	0.92	0.92	0.92	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	118	1	27	35	15	149	16	444	120	127	389	3
Approach Volume (veh/h)		146			199			580			519	
Crossing Volume (veh/h)		551			578			246			66	
High Capacity (veh/h)		896			877			1142			1315	
High v/c (veh/h)		0.16			0.23			0.51			0.39	
Low Capacity (veh/h)		721			704			941			1098	
Low v/c (veh/h)		0.20			0.28			0.62			0.47	

Intersection Summary			
Maximum v/c High	0.51		
Maximum v/c Low	0.62		
Intersection Capacity Utilization	85.8%	ICU Level of Service	E

Intersection	
Intersection Delay, s/veh	13.7
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	146	199	580	519
Demand Flow Rate, veh/h	149	207	625	578
Vehicles Circulating, veh/h	612	607	256	68
Vehicles Exiting, veh/h	34	274	505	746
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	9.1	10.8	18.3	11.0
Approach LOS	A	B	C	B

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	149	207	625	578
Cap Entry Lane, veh/h	613	616	875	1056
Entry HV Adj Factor	0.980	0.960	0.929	0.899
Flow Entry, veh/h	146	199	580	519
Cap Entry, veh/h	600	591	812	949
V/C Ratio	0.243	0.336	0.715	0.548
Control Delay, s/veh	9.1	10.8	18.3	11.0
LOS	A	B	C	B
95th %tile Queue, veh	1	1	6	3

HCM Unsignalized Intersection Capacity Analysis
8: Kennedy Rd & School Outbound

Future 2031 Weekday Peak AM
180142: Design Kennedy Road

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↱		↑	↑	
Traffic Volume (veh/h)	0	268	0	647	206	0
Future Volume (Veh/h)	0	268	0	647	206	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	291	0	703	224	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	927	224	224			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	927	224	224			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	64	100			
cM capacity (veh/h)	298	815	1345			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	291	703	224
Volume Left	0	0	0
Volume Right	291	0	0
cSH	815	1700	1700
Volume to Capacity	0.36	0.41	0.13
Queue Length 95th (m)	13.0	0.0	0.0
Control Delay (s)	11.8	0.0	0.0
Lane LOS	B		
Approach Delay (s)	11.8	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	37.4%	ICU Level of Service	A
Analysis Period (min)	15		

10: Kennedy Rd & School Inbound

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations				↰	↱	
Traffic Volume (veh/h)	0	0	312	334	206	17
Future Volume (Veh/h)	0	0	312	334	206	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	339	363	224	18
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1274	233	242			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1274	233	242			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	74			
cM capacity (veh/h)	137	806	1324			

Direction, Lane #	NB 1	SB 1
Volume Total	702	242
Volume Left	339	0
Volume Right	0	18
cSH	1324	1700
Volume to Capacity	0.26	0.14
Queue Length 95th (m)	8.2	0.0
Control Delay (s)	5.6	0.0
Lane LOS	A	
Approach Delay (s)	5.6	0.0
Approach LOS		

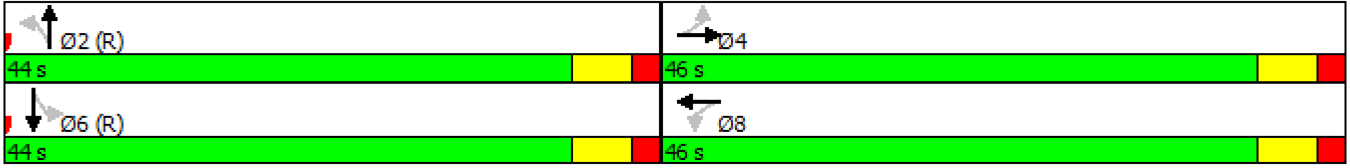
Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	53.4%	ICU Level of Service	A
Analysis Period (min)	15		

	↗	→	↙	←	↖	↑	↘	↓
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations		✣		✣		✣		✣
Traffic Volume (vph)	11	43	72	150	76	81	8	71
Future Volume (vph)	11	43	72	150	76	81	8	71
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Total Split (s)	46.0	46.0	46.0	46.0	44.0	44.0	44.0	44.0
Total Split (%)	51.1%	51.1%	51.1%	51.1%	48.9%	48.9%	48.9%	48.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0		0.0		0.0
Total Lost Time (s)		6.0		6.0		6.0		6.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)		40.0		40.0		38.0		38.0
Actuated g/C Ratio		0.44		0.44		0.42		0.42
v/c Ratio		0.19		0.36		0.32		0.13
Control Delay		7.2		18.0		17.6		15.3
Queue Delay		0.0		0.0		0.0		0.0
Total Delay		7.2		18.0		17.6		15.3
LOS		A		B		B		B
Approach Delay		7.2		18.0		17.6		15.3
Approach LOS		A		B		B		B

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 50
Control Type: Pretimed
Maximum v/c Ratio: 0.36
Intersection Signal Delay: 15.2 Intersection LOS: B
Intersection Capacity Utilization 53.4% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Kennedy Rd & Old School Rd



Queues
3: Kennedy Rd & Old School Rd

	→	←	↑	↓
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	149	255	206	94
v/c Ratio	0.19	0.36	0.32	0.13
Control Delay	7.2	18.0	17.6	15.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	7.2	18.0	17.6	15.3
Queue Length 50th (m)	5.9	29.0	22.3	9.4
Queue Length 95th (m)	17.0	47.8	39.1	19.1
Internal Link Dist (m)	69.7	86.5	464.8	31.8
Turn Bay Length (m)				
Base Capacity (vph)	772	715	651	732
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.19	0.36	0.32	0.13

Intersection Summary

3: Kennedy Rd & Old School Rd

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (vph)	11	43	86	72	150	17	76	81	37	8	71	8
Future Volume (vph)	11	43	86	72	150	17	76	81	37	8	71	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.92			0.99			0.97			0.99	
Flt Protected		1.00			0.99			0.98			1.00	
Satd. Flow (prot)		1665			1831			1759			1767	
Flt Permitted		0.97			0.86			0.85			0.97	
Satd. Flow (perm)		1623			1605			1521			1725	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	12	46	91	77	160	18	81	86	39	9	76	9
RTOR Reduction (vph)	0	51	0	0	3	0	0	9	0	0	4	0
Lane Group Flow (vph)	0	98	0	0	252	0	0	197	0	0	90	0
Heavy Vehicles (%)	0%	10%	2%	0%	1%	9%	2%	4%	4%	0%	7%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		40.0			40.0			38.0			38.0	
Effective Green, g (s)		40.0			40.0			38.0			38.0	
Actuated g/C Ratio		0.44			0.44			0.42			0.42	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		721			713			642			728	
v/s Ratio Prot												
v/s Ratio Perm		0.06			c0.16			c0.13			0.05	
v/c Ratio		0.14			0.35			0.31			0.12	
Uniform Delay, d1		14.8			16.5			17.3			15.8	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.4			1.4			1.2			0.3	
Delay (s)		15.2			17.9			18.5			16.2	
Level of Service		B			B			B			B	
Approach Delay (s)		15.2			17.9			18.5			16.2	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	17.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	53.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

6: Kennedy Rd & Bonnieglen Farm Blvd

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	3	14	15	69	1	38	27	221	37	47	189	41
Future Volume (veh/h)	3	14	15	69	1	38	27	221	37	47	189	41
Peak Hour Factor	0.92	0.92	0.92	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	3	15	16	78	1	43	31	251	42	53	215	47
Approach Volume (veh/h)		34			122			324			315	
Crossing Volume (veh/h)		346			285			71			110	
High Capacity (veh/h)		1055			1107			1310			1271	
High v/c (veh/h)		0.03			0.11			0.25			0.25	
Low Capacity (veh/h)		863			910			1093			1058	
Low v/c (veh/h)		0.04			0.13			0.30			0.30	

Intersection Summary			
Maximum v/c High	0.25		
Maximum v/c Low	0.30		
Intersection Capacity Utilization	44.0%	ICU Level of Service	A

Intersection	
Intersection Delay, s/veh	7.2
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	34	122	324	315
Demand Flow Rate, veh/h	34	143	348	337
Vehicles Circulating, veh/h	381	304	71	125
Vehicles Exiting, veh/h	81	115	344	322
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	5.1	7.0	7.1	7.5
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	34	143	348	337
Cap Entry Lane, veh/h	772	834	1052	997
Entry HV Adj Factor	0.991	0.853	0.932	0.933
Flow Entry, veh/h	34	122	324	315
Cap Entry, veh/h	765	711	981	931
V/C Ratio	0.044	0.172	0.331	0.338
Control Delay, s/veh	5.1	7.0	7.1	7.5
LOS	A	A	A	A
95th %tile Queue, veh	0	1	1	2

8: Kennedy Rd & School Outbound

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↱		↑	↑	
Traffic Volume (veh/h)	0	102	0	262	176	0
Future Volume (Veh/h)	0	102	0	262	176	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	111	0	285	191	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	476	191	191			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	476	191	191			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	87	100			
cM capacity (veh/h)	548	851	1383			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	111	285	191
Volume Left	0	0	0
Volume Right	111	0	0
cSH	851	1700	1700
Volume to Capacity	0.13	0.17	0.11
Queue Length 95th (m)	3.6	0.0	0.0
Control Delay (s)	9.9	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.9	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	22.2%	ICU Level of Service	A
Analysis Period (min)	15		

10: Kennedy Rd & School Inbound

Movement	EBL	EBR	NBL	NBT	SBT	SBR
	↗	↘	↖	↑	↓	↙
Lane Configurations				↰	↱	
Traffic Volume (veh/h)	0	0	63	198	176	35
Future Volume (Veh/h)	0	0	63	198	176	35
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	68	215	191	38
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	561	210	229			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	561	210	229			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	95			
cM capacity (veh/h)	464	830	1339			

Direction, Lane #	NB 1	SB 1
Volume Total	283	229
Volume Left	68	0
Volume Right	0	38
cSH	1339	1700
Volume to Capacity	0.05	0.13
Queue Length 95th (m)	1.3	0.0
Control Delay (s)	2.2	0.0
Lane LOS	A	
Approach Delay (s)	2.2	0.0
Approach LOS		

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	32.0%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX J

Public Information Centre

TOWN OF CALEDON

NOTICE OF PUBLIC INFORMATION CENTRE

Kennedy Road (Bonnieglen Farm Boulevard to Old School Road)
Class Environmental Assessment Schedule B

THE STUDY:

The Town of Caledon (Town) has initiated a Class Environmental Assessment (Class EA) study for Kennedy Road between Bonnieglen Farm Boulevard and Old School Road (see key map). The study has been initiated to consider potential upgrades to Kennedy as a 2-lane roadway that are supportive of future land uses. To determine the nature of the problem, an inventory of the local physical, natural, and social environment will be completed. Once the problems are fully understood, a set of alternative solutions will be developed and presented to the public and regulatory agencies for comment. Chisholm, Fleming and Associates has been retained by the Town to assist in completing the Class EA study.

This Class EA is planned as a Schedule B project under the Municipal Class Environmental Assessment document (October 2000, as amended in 2007, 2011, and 2015) for municipal projects.

PUBLIC CONSULTATION:

Public consultation is a vital component to this study. A public information centre (PIC) is being held to receive your input, comments, and concerns on the class environmental assessment (Class EA). At the PIC, the Town of Caledon will display information in an open house format showing conceptual design information relative to the project and to answer any questions and discuss next steps. Anyone with an interest in the Study is invited to attend and participate.

DATE & TIME: Thursday, December 6, 2018 | 6:00 – 8:00PM

LOCATION: Inglewood Community Centre,
15825 McLaughlinRoad, Caledon, Ont. L7C 1H4

COMMENTS:

We are interested in hearing any comments that you may have about the Study. With the exception of personal information, all comments will become part of the public record.

To provide comments or to request additional information concerning this project, please contact either of the following individuals:

Mike Ip, C.E.T.
Project Manager, Structures
Finance and Infrastructure Services
Town of Caledon
6311 Old Church Road
Caledon, ON L7C 1J6
Tel: 905-584-2272 x4171
Fax: 905-584-4325
E-mail: Mike.Ip@caledon.ca

Andrew Ostler, P.Eng
Project Engineer
Chisholm Fleming & Associates.
307 Renfrew Drive, Suite 301
Markham, ON L3R 9S8
Tel: 905-474-1458 x 227
Fax: 905-474-1910
E-mail: andrew.ostler@chisholmfleming.com

Notice First Posted: November 8th, 2018

Chisholm, Fleming and Associates
consulting engineers

TOWN OF CALEDON

Welcome!

Public Information Centre 6:00 to 8:00 pm

December 6, 2018

Inglewood Community Centre
15825 McLaughlin Road, Caledon

Kennedy Road Environmental Assessment

From Bonnieglen Farm Boulevard to Old School Road

Kennedy Road Improvements
Bonnieglen Farm Boulevard to Old School Road
Municipal Class Environmental Assessment

WELCOME to the Public Information Centre for the
Kennedy Road Environmental Assessment

This project is being completed in accordance with the Ministry of the Environment, Conservation, and Parks guidance for a Municipal Class Environmental Assessment (Schedule B); Municipal Road Project under the Environmental Assessment Act.

The Study is being directed by a Project Team made up of staff from the Town of Caledon and Chisholm, Fleming and Associates

Project Study Area

Purpose of the Public Information Center

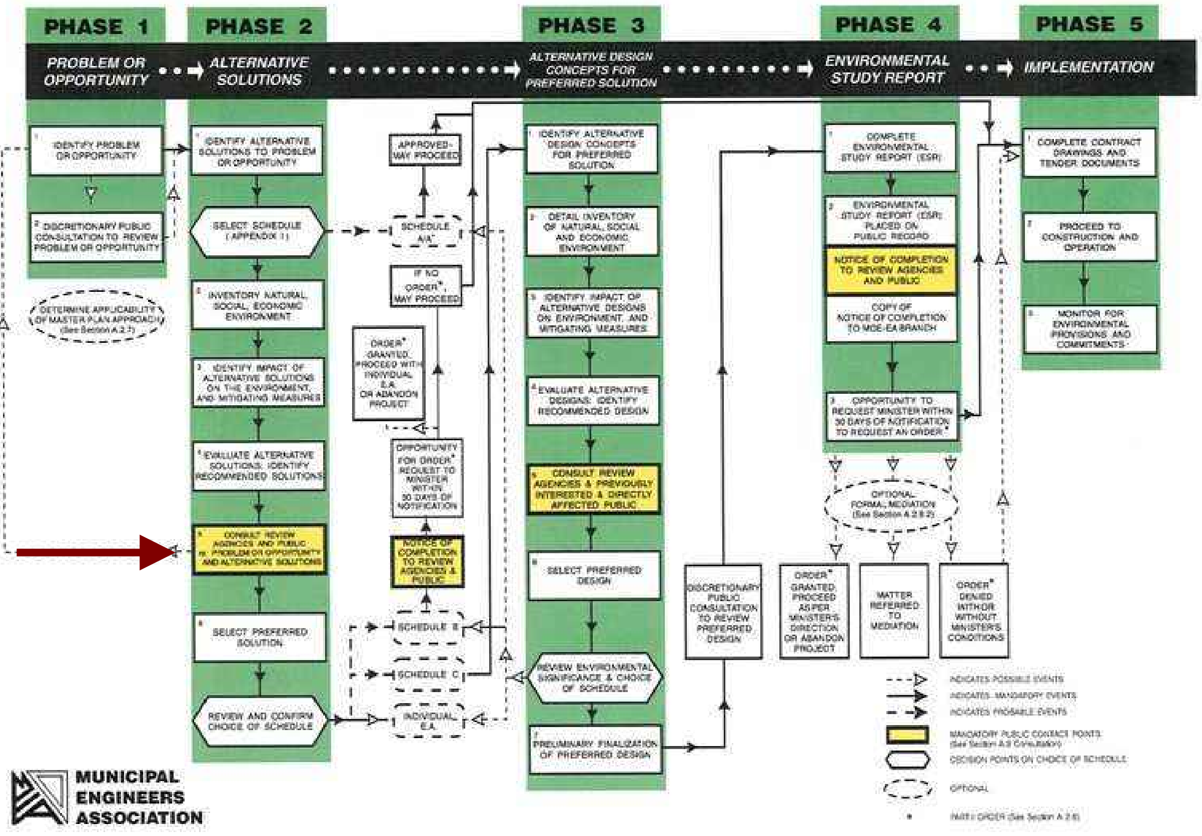
- To provide an overview of the Class Environmental Assessment Study Process
- To provide study background information
- To provide a forum for comments
- To present the problem statement and alternate solutions
- To present the evaluation of alternative solutions and a recommended design concept
- To outline the next steps in the study process

All attendees at this meeting are invited to:

- Meet with Project Team Members
- Review displays depicting the study area and current information
- Complete a study “comment sheet” outlining your suggestions, concerns, support, recommendations, or other thoughts concerning proposals to improve Kennedy Road between Bonnieglen Farm Boulevard and Old School Road.
- Sign attendance register

Municipal Class EA Planning and Design Process

NOTE: This flow chart is to be read in conjunction with Part A of the Municipal Class EA



We are here

Project Background

- Kennedy Road within the study area is currently a two lane road with a rural cross section
- The objective of this Municipal Class Environmental Assessment Study is to examine improvement needs between Old School Road and Bonnieglen Farm Boulevard to the year 2031 and to ensure that any recommendations are compatible with the latest statistical and environmental data

Problem or Opportunity Statement

With the ongoing development in the area, the Town of Caledon in previous studies has identified Kennedy Road to operate as a 2 lane major collector road at an acceptable level of service by the year 2031.

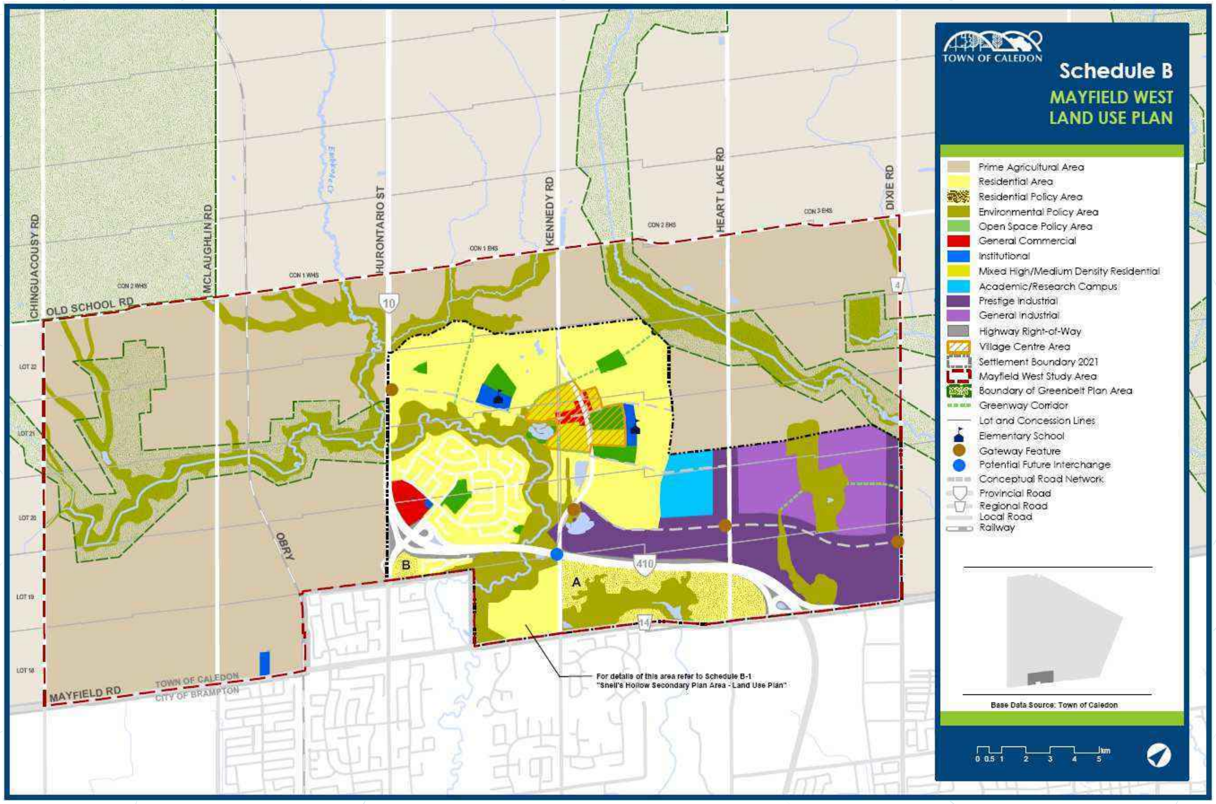
The following problem or opportunity statement which sets the framework for this study is as follows:

The section of Kennedy Road between Bonnieglen Farm Boulevard and Old School Road be improved to support the projected population, employment and development growth, and to enhance road safety for pedestrians, cyclists, and drivers.

Official Plan

The Mayfield West Phase 2 Secondary Plan, as described in the Town's Official Plan governs the development and redevelopment of land as shown on Schedule B Mayfield West Land Use Plan. The area has been planned on a complete community that is pedestrian and cyclist friendly and transit oriented. Collectively, these attributions support the development of a healthy, safe and balanced community.

The current right-of-way (ROW) width is 20m and has an ultimate ROW width of 26m as per the Official Plan.



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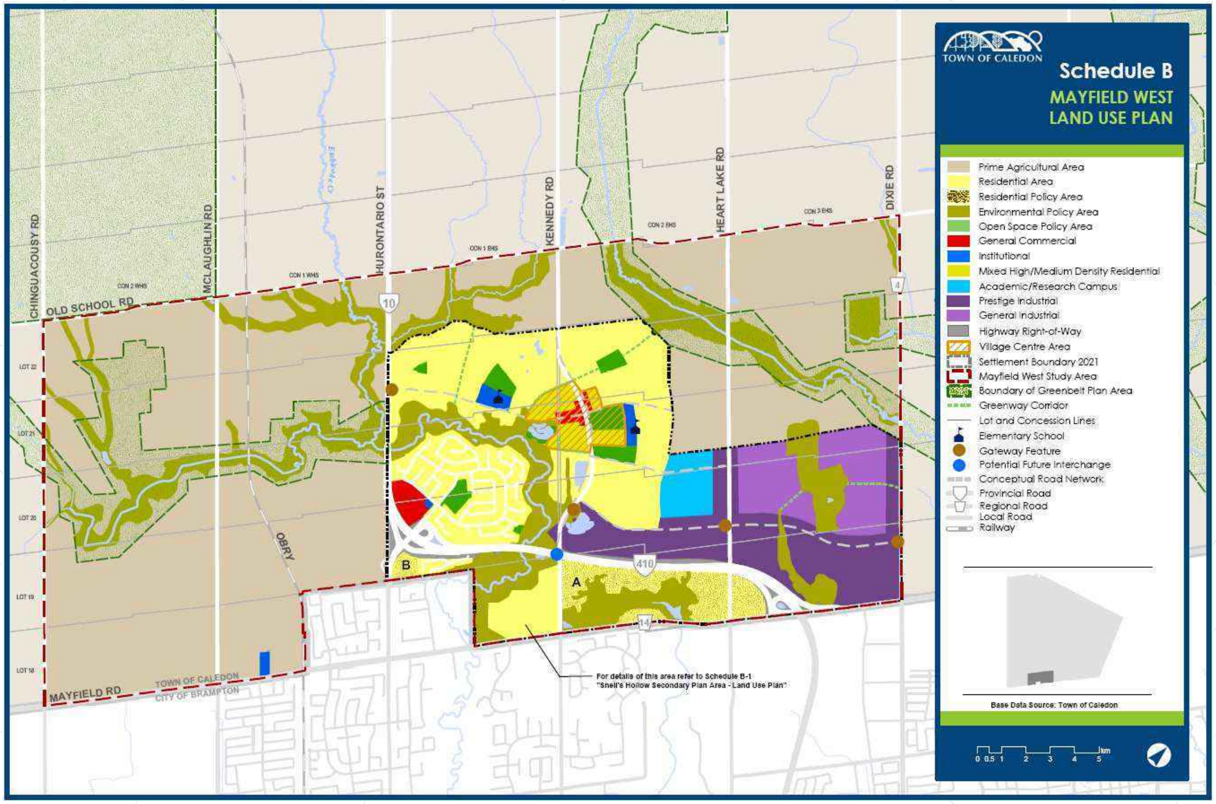


Cultural Heritage

The Cultural Heritage resource assessment revealed that there are three previously identified features of cultural heritage value within or immediately adjacent to the Kennedy Road Study area. These include two farmscapes and one church and an associated cemetery outside the existing right of way limits.

Archaeological Assessment

- A Stage 1 Archaeological Assessment of the area determined that there are six previously registered archaeological sites within one kilometre of the study area and Dixon's Union Cemetery adjacent to the Kennedy Road right of way
- A Stage 2 Investigations will be required for work outside of the existing ROW
- A Stage 3 Investigation will be required within a 10 metre buffer of the cemetery property (within the existing right of way) to confirm the presence or absence of unmarked graves within the existing right of way of Kennedy Road

Natural Environmental Assessment

- One vegetation community along the roadside is a cultural meadow at the southwest corner of Old School Road, the remainder is residential manicured areas, and active agricultural fields
- No threatened or endangered vegetative species were found within the project limits

- No threatened or endangered species were identified within the project limits
  - Bobolink and Eastern Meadowlark have been documented within 1 km of the site but have not been documented within the project limits
  - All identified species documented are common species found in disturbed settings.
- Located within watersheds for the Humber River and Etobicoke Creek
  - No crossing watercourse
  - No threatened or endangered aquatic species

Alternative Solutions

The following alternate solutions have been considered and evaluated as part of the Schedule B Municipal Class EA.

1.Do Nothing.

The "Do Nothing" alternative identifies what would happen if no action is taken to address the current deficiencies within the corridors in both the short and long term basis. This alternative provides a base line in which other alternatives may be measured.

2. Rural Cross Section

This alternative would involve the reconstruction of Kennedy Road. It addresses the pavement deterioration, improves the current road shoulder and drainage. However, this alternative does not address the community need for safe pedestrian and cyclist facilities.

3. **Two Lane Urbanization**

This alternative would involve the reconstruction and urbanization of Kennedy Road. It addresses the need for operational and road safety improvements, and the community need for safe pedestrian and cyclists facilities.

Transportation

- The existing traffic volume on Kennedy Road is 2,300 vehicles per day with a peak volume of 460 vehicles per hour
  - This operates up to 46% of capacity
  - This represents Level of Service of B indicating the road operating condition is good and well within capacity
- The forecast 2031 volumes are 3,300 vehicles per day with a peak volume of 650 vehicles per hour
  - This would operate up to 65% of capacity
  - This represents Level of Service of C indicating the road operating condition is acceptable and within capacity
- The road is currently posted at 60kph; however, 24 hour traffic counts completed in 2017 revealed the 85th percentile of users traveling at 82km/h
- Stopping sight distances available on the current road profile does not meet TAC requirements for the posted 60km/h speed limit
- Analysis of the Old School Road and Kennedy Road intersection to be completed by the Old School Road EA study

Noise

- 5 outdoor living areas within the site area have been assessed to determine the requirements for any noise mitigation
- Requirements for noise levels to be 55 dBa or below
- R5 has been identified as being in excess of the objective under the current conditions
- The predicted increase in sound levels is 1-2 dBa which is classified as an insignificant increase
- Mitigation measures for R5 will be determined based on recommendations of the Old School Road as part of the Old School Road EA study

Evaluation Criteria

Category	Criteria	Criteria Indicators
Natural Environment	Wet Lands and Vegetation	Potential Effect on terrestrial and habitat
	Wildlife Habitat	Potential adverse effect on Wildlife due to loss of habitat
	Species Risk	Potential adverse effect on species at risk identified in the study area
	Ground Water/Surface Water/Drainage	Potential adverse effect on ground water, wells, surface water quantity
	Trees	Potential adverse effect to existing trees and tree canopies within the study limit
	Fisheries and Water Quality	Potential to minimize impact on aquatic features
Social Environment	Land use	Support the Official Plan and Secondary Plan Objective
	Heritage and archeological Impacts	Potential adverse effect on archeological and built heritage resources
	Agriculture	Potential adverse effect on loss of agricultural lands
	Property impacts	Potential adverse effect on abutting property in the study area
	Utilities	Ability to minimize effect on existing/proposed utilities
	Noise and Air Quality	Potential adverse effect on noise and air quality within the study area
	Construction disruption	Ability to minimize construction constraints and complexity

Category	Criteria	Criteria Indications
Transportation	Existing Traffic	How does the alternative serve the culvert volume of vehicular, pedestrian and cycling traffic
	Forecasted Traffic	Does the alternative address the forecasted transportation needs
	Safety	Ability to improve safety
	Access Management	Ability to accommodate traffic access to abutting properties
	Cycling needs	Ability to ensure existing/future cycling needs
	Pedestrian needs	Ability to ensure existing/future pedestrian needs
	Transit needs	Ability to ensure future transit needs
Cost	Utility Relocation	Extent of impacts on existing utilities that must be relocated and/or protected to construct alternative
	Capital cost	Capital cost of improvements
	Operation and Maintenance	Cost to operate and maintain the reconstructed road

○ ◔ ◑ ◕ ●

Least preferred → Most preferred

ALTERNATIVE SCREENING

Criteria	Do Nothing	Rural Cross Section	Urban Cross Section
Regional and Municipal Transportation Studies	Does not meet the Town of Caledon's Transportation Master Plan (Town's TMP) with respect to lane and shoulder widths and cycling facilities.	The Town's TMP has designated Kennedy Road as a 26m ROW Rural Main Street with bike routes; however, the alternative does not fully meet these requirements as it does not provide curb and gutter.	The Town's TMP has designated Kennedy Road as a 26m ROW Rural Main Street with bike routes, the alternative fully meets these requirements.
	○	◑	◕
Cultural Heritage	No impacts.	Will require wider than existing ROW which will encroach on the Dixon Union's Cemetery.	Road improvement works will be confined to the existing ROW.
	●	○	●
Natural Environmental	No endangered or species at risk (SAR) have been identified in the area.	No endangered or species at risk (SAR) have been identified in the area; however tree removal will be required to accommodate this alternative.	No endangered or species at risk (SAR) have been identified in the area. Low impact development (LID) measures will be implemented.
	◕	◕	●
Socio-Economic	No land acquisition required. No utility relocation required.	Land acquisition will be needed to fit all elements of the rural cross section. Major utility relocation required.	No land acquisition required. Minor utility relocation may be required.
	●	○	◕

○ ◔ ◑ ◕ ●

Least preferred → Most preferred

ALTERNATIVE SCREENING

Criteria	**Do Nothing**	**Rural Cross Section**	**Urban Cross Section**
Transportation Operations and Safety	No designated facilities for pedestrians and cyclists. 85th percentile of drivers are observed to speed, additional measures needed to encourage drivers to comply with the new 40km/h limit. Existing road profile does not provide adequate stopping sight distance to meet TAC requirements for the posted speed.	Cyclists will be provided with paved shoulders, no opportunity will be provided for pedestrian traffic. No other measures provided to encourage drivers to comply with the new 40km/h limit. Road reconstruction provides an opportunity for stopping sight distance improvements.	Cyclist and pedestrians will be provided with shared bike and platform. Urbanization will further encourage drivers to comply with the new 40km/h limit. Road reconstruction provides an opportunity for stopping sight distance improvements.
	○	◐	●
Cost	No capital cost increase to the previously planned improvements.	Increase in utility relocation and capital cost but maintenance and operation costs will be lower.	Increase in utility relocation and capital cost but maintenance and operation costs will be lower.
	●	◕	◐
Summary	Alternative does not address the Problem or Opportunity Statement of this EA.	Alternative does not fully address the Problem or Opportunity Statement of this EA. Not carried forward to preliminary design.	Alternative does not have the 26m ROW that the Town's TMP outlined; however, the existing Kennedy Road with 20m ROW will operate well within its capacity based on the 2031 forecasted traffic growth, and road widening now will encroach the Dixon Union's Cemetery. Otherwise Alternative addresses the Problem or Opportunity Statement of this EA and will be carried forward to preliminary design.
	○	◐	●

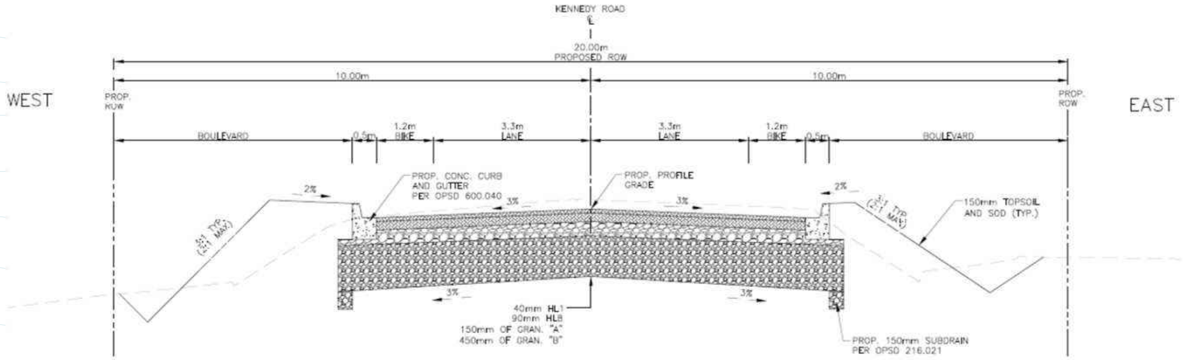
TECHNICALLY PREFERRED

Sample Photo

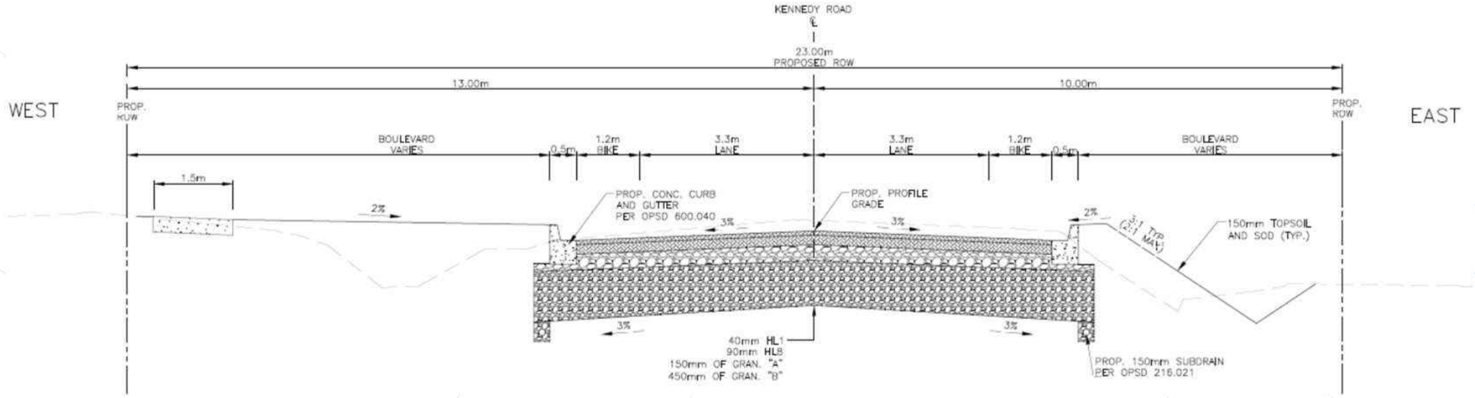
Sample photo of the proposed Kennedy Road cross section

Preferred Solution

The technically preferred solution is for Kennedy Road to be reconstructed as a two lane urban roadway to accommodate a shared bike lane and pedestrian sidewalk/ platform where warranted.



TYPICAL SECTION



TYPICAL SECTION – AT TONY PONTES SCHOOL

NEXT STEPS

- Please submit comments by **December 21, 2018**
- Project team will review and refine preferred planning alternative in light of comments received from public and agencies
- Confirm environmental commitments
- Finalize the preferred design concept and complete detailed impact analysis
- Prepare and file Project File
- Place the Project File on public review for 30 days
- Issue Notice of Study Completion

THANK YOU FOR YOUR PARTICIPATION

HOW YOU CAN PROVIDE YOUR COMMENTS ON THE PROJECT

Please complete the comment sheet in and place in the Comment Box or send your comments by email/fax/letter to any the following project team members by **December 21, 2018**

You can view tonight's information boards on the Town of Caledon website
http://www.townofcaledon.ca

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Mike Ip, C.E.T.
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Project Manager, Engineering Services
Town of Caledon
6311 Old Church Road
Caledon, Ont, L7C 1J6
905-584-2272 ext 4171

TOWN OF CALEDON

Chisholm
Fleming &
Associates

COMMENT SHEET

PROJECT: Kennedy Roadd Environmental Assessment
(Bonnieglen Farm Blvd to Old School Rd)
PUBLIC INFORMATION CENTRE DATE: December 6, 2018 6:00 - 8:00 p.m.
LOCATION: Inglewood Community Centre

Your comments will allow us to gain an understanding of what is important to you for this project.

1. Where do you live?
   - ☑ Town of Caledon
   - ☐ Other

2. My Interest is (please check all that apply)
   - ☐ Area Resident
   - ☑ User of Kennedy Road
   - ☐ User of Old School Road
   - ☐ Other (please specify)
   - ☐ General Interest
   - ☑ Property Owner
     ↳ Principal of Tony Pontes PS

3. Do you have any comments on the study information presented and/or the preliminary recommended design?

- parents express concerns about the hill just north of our school entrance
- as you wait to turn left into our parking lot, you can't see the traffic coming towards you
- we will eventually be a school of 800+ students plus staff

4. If you would us to contact you, please provide your name, address, telephone number, and/or email address:

Sheryl Johnston 905-452-3194
12872 Kennedy Rd.
sheryl.johnston@peelsb.com

Please place the completed comments sheet in the comment box or mail to the following by December 21, 2018.

Andrew Ostler
Chisholm Fleming & Associates
317 Renfrew Drive, Suite 301
Markham Ont L3R 9S8
T: 905-474-1458 ext 227
andrew.ostler@chisholmfleming.com

Comments regarding this project are being collected to assist the Town of Caledon in meeting the requirements of the Environmental Assessment Act. With the exception of personal information all comments will be include in the Environmental Assessment Report and become a part of the public record.

TOWN OF CALEDON

Chisholm
Fleming &
Associates

COMMENT SHEET

PROJECT: Kennedy Roadd Environmental Assessment
(Bonnieglen Farm Blvd to Old School Rd)
PUBLIC INFORMATION CENTRE DATE: December 6, 2018 6:00 - 8:00 p.m.
LOCATION: Inglewood Community Centre

Your comments will allow us to gain an understanding of what is important to you for this project.

1. Where do you live?
   - ☐ Town of Caledon
   - ☑ Other

2. My Interest is (please check all that apply)
   - ☐ Area Resident
   - ☐ User of Kennedy Road
   - ☐ User of Old School Road
   - ☑ Other (please specify) Water Infrastructure Owner (Region of Peel)
   - ☐ General Interest
   - ☐ Property Owner

3. Do you have any comments on the study information presented and/or the preliminary recommended design?

Region of Peel has existing water infrastructure within the Project area and nearby. Requesting to be informed throughout the project to coordinate works and avoid impacts to the regional infrastructure.

4. If you would us to contact you, please provide your name, address, telephone number, and/or email address:

Zak Zakeria
10 Peel Centre Dr., Suite A, Brampton
(905)-791-7800 Ext. 4598 (zak.zakeria@peelregion.ca)

Please place the completed comments sheet in the comment box or mail to the following by December 21, 2018.

Andrew Ostler
Chisholm Fleming & Associates
317 Renfrew Drive, Suite 301
Markham Ont L3R 9S8
T: 905-474-1458 ext 227

APPENDIX K

Preliminary Streetlighting Design

tsl consulting + design group ltd.
243 Main Street East
Grimsby, ON L3M 1P5
t. 289.238.8493
tslconsulting.ca

February 12, 2019

Winnie Wong, P.Eng., PMP
Chisholm, Fleming and Associates
317 Renfrew Drive
Markham, ON
L3R 9S8

Dear Winnie:

This letter is provided to summarize our **preliminary street lighting** design works for the Kennedy Road (Old School Road to North of the Bonnieglen Farm Boulevard) project.

PROJECT/STUDY LOCATION

Kennedy Road, from south of Old School Road to north of Bonnieglen Farm Boulevard.

LIGHTING DESIGN CRITERIA

SL1 - Kennedy Road, from south of Old School Road to 200m north of Bonnieglen Farm Boulevard roundabout

Street Classification: MAJOR

Pedestrian Area Classification: LOW

SL2 - Kennedy Road, from 200m north of Bonnieglen Farm Boulevard roundabout to north of Bonnieglen Farm Boulevard roundabout

Street Classification: MAJOR

Pedestrian Area Classification: MEDIUM

See Attachments 1 and 2 for lighting design criteria.

CLEAR ZONE AND POLE SETBACKS

CFA has advised that the clear zone within the project limits is 5m. As our selected pole butt diameter is 0.347m, the resultant pole setback from the edge of the through vehicular travelled lane is 5.170m.

LIGHTING EQUIPMENT

Poles: The selected poles are 12.1m (40’) round Class C concrete Stresscrete poles, catalog number E-400-CPR-G.

Luminaires are calculated to be mounted at 11.4m from the finished road surface. Pole heights may vary to achieve this mounting height due to grading. Final pole heights shall be confirmed during detailed design, based on grading.

Luminaire Arm Brackets: The selected luminaire arm brackets are 3.7m aluminum Aluminous arm brackets, catalog number ALS-RE12M.

Luminaires: As the lighting design criteria changes within the project limits, two luminaires were selected for this project.

For the section of road from south of Old School Road to 200m north of the roundabout, the luminaries are GE Evolve 84W ERL1 LED luminaires, catalog number ERL1009A340AGRAYILR (4000k, 120-277v, ANSI PR7, 84w).

For the section of Road from 200m north of the roundabout to the roundabout, the luminaries are GE Evolve 82W ERLH LED luminaires, catalog number ERLH010A340AGRAYILR (4000k, 120-277v, ANSI PR7, 82w).

LIGHTING CALCULATION

Lighting calculations have been completed to confirm equipment selected and the proposed pole spacing. The lighting design criteria has been met and lighting uniformities have been exceeded.

See Attachments 3 and 4 for lighting calculation results.

LIGHTING POLE LAYOUT

An AutoCAD file has been provided that shows the preliminary proposed pole, arm and luminaire layout. The drawing is provided and intended to be referenced into your preliminary geometric design for coordination and presentation purposes.

See attachment 'PRELIMINARY LIGHTING POLE LAYOUT.dwg' for preliminary lighting pole, arm and luminaire layout.

LIGHTING CONSTRUCTION COST ESTIMATE

The preliminary design utilizes 14 poles, arms and luminaires. For the purpose of providing a high-level construction cost estimate to cover the supply and installation of the entire street lighting system, we can assume a unit figure (per location) of $7000.00. Therefore, the complete street lighting system estimated construction cost is approximately $98,000.

Note: All design works are considered preliminary based on the preliminary geometric information provided. All proposed lighting design elements shall be confirmed and calculated during the detailed design stage.

TSL Project File: P-18.0149

Sincerely,

Gregg Hyde
Project Manager

Attachments

STREET LIGHTING: LIGHTING DESIGN CRITERIA

FINAL APPROVED

STREET LIGHTING – ILLUMINANCE

RP-8-14

Table 3 (Converted to Illuminance per 4.0 Lighting Recommendations)

STREET CLASSIFICATION	PEDESTRIAN AREA CLASSIFICATION	PAVEMENT CLASSIFICATION (Minimum Maintained Average Values in Lux)		AVG. UNIFORMITY E_{avg}/E_{min}
		R1 (10 x multiplier) Concrete	R3 (15 x multiplier) Asphalt	
MAJOR	HIGH	12.0	18.0	3.0
	MEDIUM	9.0	13.5	3.0
	LOW	6.0	9.0	3.0
COLLECTOR	HIGH	8.0	12.0	4.0
	MEDIUM	6.0	9.0	4.0
	LOW	4.0	6.0	4.0
LOCAL	HIGH	6.0	9.0	6.0
	MEDIUM	5.0	7.5	6.0
	LOW	3.0	4.5	6.0

STREET LIGHTING:
SL1 - KENNEDY ROAD (SOUTH OF OLD SCHOOL RD TO 200m
NORTH OF BONNIEGLEN FARM BLVD ROUNDABOUT)

ATTACHMENT 1

STREET LIGHTING: LIGHTING DESIGN CRITERIA

FINAL APPROVED

STREET LIGHTING – ILLUMINANCE

RP-8-14
Table 3 (Converted to Illuminance per 4.0 Lighting Recommendations)

STREET CLASSIFICATION	PEDESTRIAN AREA CLASSIFICATION	PAVEMENT CLASSIFICATION (Minimum Maintained Average Values in Lux)		AVG. UNIFORMITY E_{avg}/E_{min}
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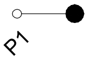
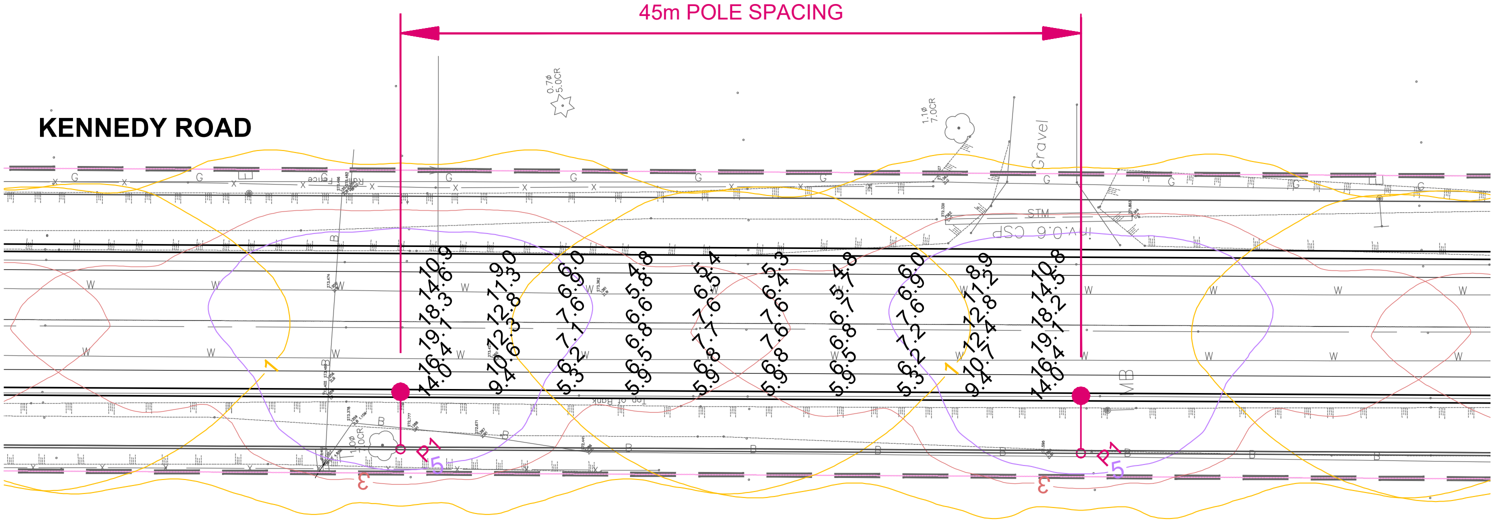
MAJOR	HIGH	12.0	18.0	3.0
	MEDIUM	9.0	13.5	3.0
	LOW	6.0	9.0	3.0
COLLECTOR	HIGH	8.0	12.0	4.0
	MEDIUM	6.0	9.0	4.0
	LOW	4.0	6.0	4.0
LOCAL	HIGH	6.0	9.0	6.0
	MEDIUM	5.0	7.5	6.0
	LOW	3.0	4.5	6.0

STREET LIGHTING:
SL2 - KENNEDY ROAD (200m NORTH OF BONNIEGLEN FARM BLVD ROUNDABOUT TO NORTH OF THE BONNIEGLEN FARM BLVD ROUNDABOUT)

ATTACHMENT 2



GE LIGHTING SOLUTIONS ERL1_09A340_____
GE LIGHTING SOLUTIONS-EAST CLEVELAND OH USA test report no. 17040521 17040522 17040523 17040627 17040628 17040721
lamp(s):   LEDs 757G-V1
candela file 'ERL1_09A340_____.IES'
1 lamp(s) per luminaire, photometry is absolute
Light Loss Factor = 0.770, watts per luminaire = 84
Outreach (from mounting axis to photometric center)= 3800 mm
mounting height= 11.4 m
number locations= 10, number luminaires= 10
kw all locations= 0.8



45m SPACING
60 points
HORIZONTAL LUX

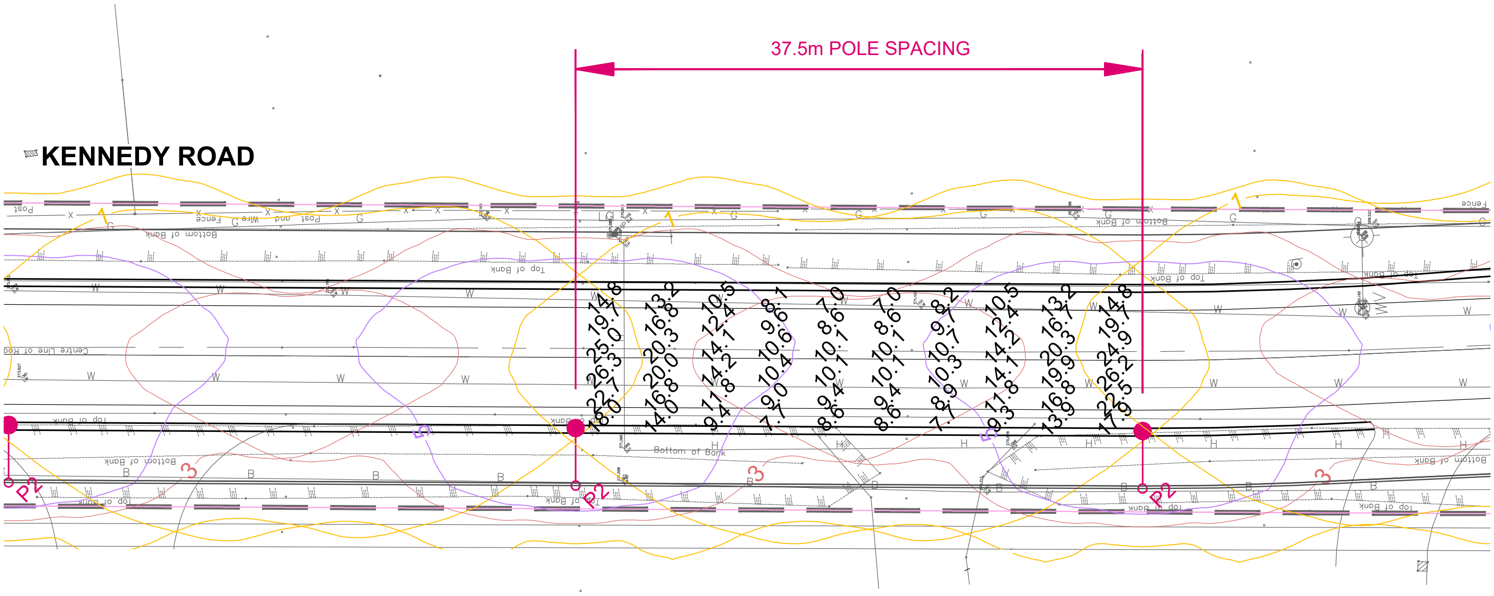
Average	9.1
Maximum	19.1
Minimum	4.8
Avg:Min	1.90
Max:Min	3.98
Coef Var	0.43

CALCULATION FOR AREA SL1

ATTACHMENT 3

P2

GE LIGHTING SOLUTIONS ERLH_10A340_____
GE LIGHTING SOLUTIONS-EAST CLEVELAND OH USA test report no. 17041021 17041022 17041023 17040621 17040622 17040623
lamp(s):   LEDs E21A
candela file 'ERLH_10A340_____.IES'
1 lamp(s) per luminaire, photometry is absolute
Light Loss Factor = 0.860, watts per luminaire = 82
Outreach (from mounting axis to photometric center)= 3800 mm
mounting height= 11.4 m
number locations= 4, number luminaires= 4
kw all locations= 0.3



37.5m SPACING
60 points
HORIZONTAL LUX

Average	13.6
Maximum	26.3
Minimum	7.0
Avg:Min	1.95
Max:Min	3.76
Coef Var	0.38

CALCULATION FOR AREA SL2

ATTACHMENT 4

APPENDIX L

Notice of Study Completion

TOWN OF CALEDON

NOTICE OF STUDY COMPLETION

Kennedy Road (Bonnieglen Farm Boulevard to Old School Road)
Class Environmental Assessment Schedule B

THE STUDY:

The Town of Caledon has completed the Municipal Class Environmental Assessment (EA) Study for Kennedy Road between Bonnieglen Farm Boulevard and Old School Road to consider potential upgrades to Kennedy as a 2-lane roadway that are supportive of future land uses.

The findings of this EA Study and consultation is documented in the Project File, which is available for public review at caledon.ca/notices and at the following locations:

The Corporation of the Town of Caledon
Caledon Services Counter
6311 Old Church Road
Caledon, ON, L7C 1J6
Tel: 905-584-2272

Caledon Public Library (Margaret Dunn Valleywood Branch)
20 Snelcrest Drive
Caledon, ON, L7C 1B5
Tel: 905-843-0457

Interested persons should provide written comment on the findings to the CFA Project Manager noted below within the 30-day review beginning on **May 16, 2019** and ending on **June 17, 2019**:

Mike Ip, C.E.T.
Project Manager, Engineering Services
Town of Caledon, Finance & Infrastructure Services
6311 Old Church Road
Caledon, ON L7C 1J6
Tel: 905-584-2272 x 4171
Email: mike.ip@caledon.ca

Andrew Ostler, P.Eng.
CFA Project Manager
Chisholm Fleming & Associates.
307 Renfrew Drive, Suite 301
Markham, ON L3R 9S8
Tel: 905-474-1458 x227
E-mail: Andrew.Ostler@chisholmfleming.com

If concerns regarding this EA Study raised during the review period cannot be resolved with the Town or with CFA, then any interested person may request a Part II Order to be issued by the Minister of Environment, Conservation and Parks as per Section A.2.8.2 of the Municipal Class Environmental Assessment document (October 2000, as amended in 2007, 2011, and 2015). The request must be made in writing to the Minister and the Director of the Ministry of Environment, Conservation and Parks at the addresses below, with a copy to CFA sent to the address noted above by June 17, 2019.

Honourable Rod Phillips
Ministry of Environment, Conservation and Parks
777 Bay Street West, 5th Fl.
Toronto, ON M7A 2T5
Email: Minister.mecp@ontario.ca

Director, Environmental Assessment and Permissions Branch
Ministry of the Environment, Conservation and Parks
135 St. Clair Ave. W, 1st Fl.
Toronto, ON M4V 1P5
Email: enviropermissions@ontario.ca

If no requests are received by June 17, 2019 the Town may proceed with the project as outlined in the Project File.

Notice First Posted: May 16, 2019.

Please note that all personal information included in a Part II Order submission – such as name, address, telephone number and property location – is collected, maintained and disclosed by the Ministry of the Environment, Conservation and Parks for the purpose of transparency and consultation. The information is collected under the authority of the Environmental Assessment Act and/or is collected and maintained for the purpose of creating a record that is available to the general public as described in s. 37 of the Freedom of Information and Protection of Privacy Act. 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. For more information, please contact the ministry’s Freedom of Information and Privacy Coordinator at 416-327-1434.