DILLON CONSULTING

TOWN OF NEWMARKET

Old Main Street Tertiary Plan

Infrastructure and Natural Heritage Background Study

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Acronyms, Abbreviations, Definitions

– A –

AADT, *Annual Average Daily Traffic*
ATR, *Automatic Traffic Recorder*

– C –

CSP, *Corrugated Steel Pipe*

– D –

dbh, *Diameter at Breast Height*

– E –

EA, *Environmental Assessment*
ESA, *Endangered Species Act*

– H –

HVA, *Highly Vulnerable Aquifer*

– I –

ITE, *Institute of Transportation Engineers*

– L –

LID, *Low Impact Development*
LSRCA*, Lake Simcoe Region Conservation Authority*

– M –

MNRF, *Ministry of Natural Resources and Forestry*

– N –

NHIC, *Natural Heritage Information Centre*

– O –

OMNR, *Ontario Ministry of Natural Resources*

– R –

ROW, *Right of Way*

– S –

SAR, *Species at Risk*
SCC, *Species of Conservation Concern*
– T –

TMC, *Turning Movement Count*

– W –

WPCP, *Water Pollution Control Plant*

– Y –

YDSS, *York Durham Sewerage System*

1.0 Introduction

1.1 Background

The Town of Newmarket (the Town) has retained SvN Architects and Planners (SvN) and Dillon Consulting Limited (Dillon) to develop a Tertiary Plan for the properties on Old Main Street bounded by Bexhill Road to the southwest, St. John's Cemetery to the northwest and Main Street Bypass to the northeast and southeast (**Figure 1**). The Plan is intended to encourage and provide direction for the comprehensive development of the study area, as opposed to piecemeal redevelopments which may have negative impacts on the existing community. The Plan will address matters such as land use, layout of development blocks, and other urban design considerations, as well as the required infrastructure and existing natural heritage system.

The community along Old Main Street was established prior to modern planning and engineering standards, and has developed over the years without an overall or consistent plan. The subdivision of land is haphazard, with lots varying in size from large to small. The road right-of-way does not meet current standards and likely cannot support a full two-lane road (one lane in each direction). Part of the area is in the floodplain of East Holland River, and part of the area is on a steep slope. Residents have reported significant stormwater and flooding issues. Due to its age and physical context, redevelopment of the area is extremely complex.

The study area is designated a "Stable Residential Area" in the Town of Newmarket Official Plan 2006-2016 (Meridian Planning Consultants 2016). The designation permits single and semi-detached dwellings. There is a current development application to create six lots with semi-detached buildings for 12 new homes at N^{os} 172-178 Old Main Street, in the southwest portion of the study area. The Town is also aware of interest in redeveloping some of the larger properties along Old Main Street. Redevelopment in the area was temporarily put on hold to allow a comprehensive study to be undertaken which will determine the best direction for the community. In May 2017, Town Council enacted an Interim Control By-law, to remain in place for one year, which will allow for the Tertiary Plan to be completed and an Official Plan Amendment to be put in place.

1.2 Study Objectives

This background study has been prepared to support the preparation of the Tertiary Plan. Its main objective is to define the existing policy and physical contexts for redevelopment in the study area, with a view to identifying opportunities and constraints to intensification.

The specific objectives of the background study are to:

- Review the existing development policy framework;
- Identify terrestrial natural heritage features (woodlot, wetlands, watercourse, etc.);
- Identify hazard prone areas (areas of high topographic relief, floodplain)
- Review existing traffic and road conditions, and the ability of the road to accommodate the demand resulting from additional units;
- Review the existing water and sanitary services;
- Review existing stormwater management conditions; and
- Propose and outline the feasibility of implementing mitigation measures for existing and future stormwater management and flooding issues.
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2.0 Existing Development Policy Framework

The study area is located in the Town of Newmarket and redevelopment will be subject to guidance in the following:

- The Town of Newmarket Official Plan 2006 – 2026 (Meridian Planning Consultants 2016);
- Tree Policy (Town of Newmarket 2005);
- Corporation of the Town of Newmarket By-law Number 2007-71, A By-law to Prohibit or Regulate the Destruction or Injuring of Woodlot Trees;
- The Town of Newmarket Water and Wastewater Master Plan (WSP 2017);
- The Town of Newmarket Comprehensive Stormwater Management Plan (AECOM 2017); and
- The Town of Newmarket Engineering Design Standards and Criteria (Town of Newmarket 2015).

In addition, the Old Main Street community is situated in the East Holland River subwatershed, which is managed by the Lake Simcoe Region Conservation Authority (LSRCA). A portion of the study area lies within the floodplain of East Holland River and is subject to controls under Ontario Regulation 179/06 - Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses. Redevelopment in the community will also be required to meet guidance in the following:

- East Holland River Subwatershed Plan (LSRCA 2010); and
- Guidelines for the Implementation of Ontario Regulation 179/06, Development, Interference with Wetlands and Alteration to Shorelines and Watercourses Regulation (LSRCA 2015).

The policy framework documents identified above are briefly described in below.

2.1 Town of Newmarket Official Plan

The Town of Newmarket Official Plan 2006 – 2026 contains goals, objectives, and policies to manage and direct physical change and the effects on the social, economic and natural environment of the Town. It focuses on the following four main roles:

- Establishing the basic land use pattern and permitted uses for all land in the Town;
- Planning the coordination of land use and infrastructure requirements to ensure the Town can accommodate anticipated growth;
- Establishing the Town's priorities for financial resources and staff energies; and
- Providing a framework for private investment through land use policies.

The basis of the Official Plan is to maintain and enhance the quality of life by managing change within existing developed areas to accommodate growth. Its focus is on redevelopment, infill and intensification, rather than on expansion of the community. The Town, together with the Regional

Municipality of York (York Region), is working towards the 40% intensification target proposed in the Growth Plan for the Golden Horseshoe, 2006.

The Official Plan is divided into four parts:

- **Part I – The Basis** explains the context and vision of the Plan and its general goals and strategic directions;
- **Part II – Building a Strong Community** outlines the objectives, policies and programs of the Plan's land use designations. It incorporates policies for the protection of heritage resources, urban design, and community improvement. Schedules are provided showing the desired urban form for the Town and key features of the natural heritage system to be enhanced and protected;
- **Part III – Urban Systems** provides a description of the objectives, policies, and programs for the use and development of urban systems or infrastructure, including the transportation network, water and sewer services; and
- **Part IV - Implementation** describes the planning tools to be used to implement the various policies and programs.

A key principle of the Official Plan is the commitment to protect and strengthen existing neighbourhoods. Development must respect the existing character of the area. The Official Plan also requires that development be established or maintained on full municipal water supply, sanitary sewer, and storm sewer services. Development will generally be directed to areas outside of the floodplain and hazard lands, and meadows, woodlots and wetlands identified in the Official Plan schedules must be protected and enhanced.

2.2 Town of Newmarket Tree Policy and Woodlot By-laws

"The Tree Preservation, Protection, Replacement and Enhancement Policy (Tree Policy) establishes the Town's policy for the preservation, protection, replacement and enhancement of *significant trees* respecting the development approval process permitted through the Planning Act…" (Town of Newmarket 2005). The Tree Policy states that no "significant tree" in the Town of Newmarket and subject to a Planning Act Development Application may be removed, injured, pruned or destroyed, unless approved by the Town. A "significant tree" is defined as a tree with a 20 cm diameter-at-breast-height (dbh) or any tree planted as a condition of the application. No tree removal shall take place on lands subject to a Planning Act Development Application until an Arborist Report is approved, securities posted and tree protection fencing installed to the satisfaction of the Town, if applicable.

The Woodlot By-law (No. 2007-71) prohibits or regulates the destruction or injuring of woodlot trees through protection of small urban woodlots (between 0.2 ha to 1.0 ha in area) on privately owned lands (Town of Newmarket 2017). Woodlots are defined as any of the lands designated as a "Natural Heritage System" on Schedule A – Land Use to one woodland in the southwestern portion of and further identified as "Woodlot" on Schedule B – Natural Heritage System of the Town's Official Plan (Meridian

Planning Consultants 2016). The By-law requires land owners of affected lands to apply for a permit to injure or destroy trees. Woodlots greater than 1.0 ha in area fall under the Regional Municipality of York Bill No. 36, which prohibits or regulates the destruction or injury of trees (Town of Newmarket 2017).

2.3 Town of Newmarket Water and Wastewater Plan

The Town of Newmarket Water and Wastewater Master Plan identifies the necessary improvements and/or expansion to the Town's water distribution and wastewater collection systems to support existing and future development to 2041, as provided for in the Official Plan. Within this planning horizon, the Town's residential population is forecast to grow by 25% and its employment population by 18%.

The Master Plan focuses on the Town's local water distribution and wastewater collection systems. The Regional Municipality of York's (York Region) water and wastewater systems are not a part of the Master Plan's scope. York Region is responsible for the bulk supply, treatment, and storage of the Town's drinking water and for the conveyance of the Town's wastewater to wastewater treatment plants.

The Master Plan provides population and employment growth forecasts and specifies water and wastewater design criteria. It identifies deficiencies in the existing water and wastewater systems to support existing and future service requirements, and recommends improvements and/or expansion of the networks. The majority of deficiencies in the Town's water distribution system are due to fire flows that are less than the current design standard. Deficiencies in the Town's wastewater collection system are due to surcharge conditions occurring in several sub-trunk sewers.

2.4 Town of Newmarket Comprehensive Stormwater Management Plan

The Town of Newmarket Comprehensive Stormwater Management Master Plan was prepared to satisfy the requirements of the Lake Simcoe Protection Plan, which identifies urban stormwater runoff as a significant source of phosphorus to Lake Simcoe and its tributaries. The Master Plan provides an integrated assessment of existing and future conditions with respect to stormwater management within the Town, and details opportunities for improvement and recommendations for future actions with the ultimate goal of decreasing phosphorus loadings to Lake Simcoe and its tributaries.

The Master Plan provides a thorough description of the Town's existing physical setting including land uses, watersheds, hydrology, stream morphology, water quality, hydrogeology, aquatic and terrestrial ecology. The effectiveness of existing stormwater systems is examined, notably the conformity of stormwater management facilities to provincial design and maintenance guidelines, the level of sedimentation, phosphorus loading and removal in stormwater management ponds, and the conveyance capacity in sewers greater than 600 mm in diameter. Future changes to the water balance and peak flows in receiving watercourses are evaluated, and potential impacts to stream morphology,

water quality, groundwater recharge, and aquatic and terrestrial ecology are assessed, based on the Town's proposed future land uses.

The Master Plan concludes that the existing stormwater systems are not effective and recommends approaches to address existing and future deficiencies. These are focused on the clean out and retrofit of existing stormwater management facilities, the application of Low Impact Development (LID) practices, the implementation of annual inspections, sediment quantity monitoring and sediment quality testing at stormwater management facilities, and the development of a stormwater management facility database.

2.5 Town of Newmarket Engineering Design Standards and Criteria

The Town's Engineering Design Standards and Criteria provide guidance on the design of roads and services for all land development projects within the Town. While the Ontario Provincial Standard Drawings and Specifications are recognized, the Town's design standards and criteria take precedence where there are conflicts.

Design standards and criteria are provided in the following categories, among others:

- **Transportation:** road classifications, supporting traffic studies, design elements, traffic controls, pavement design, construction requirements, concrete curbs and gutters, sidewalks, driveways, and boulevards;
- **Water mains and appurtenances:** hydraulic design, valve and fire hydrant requirements, service connections, materials, corrosion protection, and testing requirements;
- **Sanitary sewers and appurtenances:** hydraulic design, sewer design, manholes, service connections, materials, and testing; and
- **Storm drainage and stormwater management:** storm drainage policies, stormwater management, stormwater conveyance, storm sewer design, manholes, catch basins, inlets, outfalls and special structures, testing, and private on-site stormwater management facilities.

2.6 East Holland River Subwatershed Plan

The East Holland River subwatershed is one of Lake Simcoe's most populated subwatersheds, and is expected to experience a great deal of growth in the coming years. New housing, employment lands, commercial and institutional buildings will be required, together with critical municipal infrastructure, to service the anticipated increases in the residential and employment populations. LSRCA has prepared a comprehensive and integrated subwatershed plan to provide the blueprint for the conservation authority, municipalities and other stakeholders to mitigate the impacts of land use changes while improving on the existing conditions in the subwatershed.

The East Holland River Subwatershed Plan describes the current status, stressors, management framework, and management gaps and limitations for five subwatershed features (water quality, water

quantity, stream geomorphology, aquatic habitat and terrestrial natural heritage). It defines environmental objectives and targets for the subwatershed, and proposes high level management responses and detailed recommendations to achieve these under the following broad categories:

- Planning and Policy;
- Use of Better Management Practices;
- Changing the Way Things are Done 'On the Ground';
- Applied Research and Science;
- Monitoring;
- Management, Rehabilitation, and Restoration;
- Adaptive Response; and
- Communications.

Better management practices in urban environments are focused on managing the quality of stormwater runoff, and recommended controls and measures including street sweeping programs, road salt management plans, and the installation and use of oil/grit hydrodynamic separators and LID stormwater management practices.

2.7 LSRCA Watershed Development Guidelines

LSRCA has prepared Guidelines for the Implementation of Ontario Regulation 179/06 - Development, Interference with Wetlands and Alterations to Shorelines and Watercourses. The regulation is intended to prevent or restrict development on hazardous lands which are lands that could be unsafe for development because of naturally occurring processes associated with flooding, erosion, wetlands, dynamic beaches or unstable soil or bedrock. The regulation limit for a property is the greatest extent of all hazards plus their prescribed allowances as specified in the regulation. LSRCA has mapped areas subject to the regulation.

Activities in a regulated area requiring written permission under Ontario Regulation 179/06 include, among others, the construction, reconstruction, erection or placing of a building or structure of any kind, changes that would alter the use or potential use of a building or structure, increasing the size of a building or structure or the number of dwelling units in the building or structure, and site grading. LSRCA's watershed development guidelines provide restrictions on fill placement, excavation and lot grading within regulated areas, policies with respect to flood hazard management, and limitations on construction within flood hazard lands.

3.0 Transportation

Main Street North (or Old Main Street as it is commonly known) is a north-south oriented local road under the jurisdiction of the Town of Newmarket. The road extends between Bexhill Road and Main Street North By-Pass, a distance of approximately 527 metres. To the south, it connects to Bexhill Road under stop control. To the north it connects to Main Street North By-Pass at a 4 legged intersection with Jim Barber Court, with the minor roads under stop control. The road serves 26 single-family detached dwellings of varying lot sizes. The road has a posted speed limit of 40 km/h.

3.1 Study Area Issues

The following concerns have been identified for the study area:

- Level of Service – existing traffic operations at the two unsignalized intersections at both ends of Old Main Street and their capacity to accommodate additional development;
- Prevailing vehicle speeds; and
- Neighbourhood infiltration by non-local trips.

With the significant growth in Newmarket north of the study area, and the study area's proximity to the downtown area, Davis Drive and the GO Transit station, travel demands on the Main Street corridor have increased significantly over the years. The resultant traffic volumes are inconsistent with Old Main Street's capacity and the Main Street North By-Pass was constructed immediately to the east, running parallel to Old Main Street, as a new route to accommodate the changing travel demands.

While Main Street is no longer a primary route, it serves today as the local road connecting the existing adjacent development. In its current form, Old Main Street does not meet current road design standards. To meet current standards, the Right of Way (ROW) would have to be widened, requiring land from individual property owners.

Residents of the street have expressed concern that non-resident vehicles infiltrate Old Main Street during the morning peak hour as a result of southbound queuing along Main Street North By-Pass originating at Davis Drive. The noted infiltration is purported to result in increased volume and vehicle speeds in excess of the posted speed limit of 40 km/h.

To confirm these issues, data collection has been undertaken to quantify the travel behaviour of users of Old Main Street. Turning Movement Count (TMC) surveys and a 24-hour speed survey were assessed to determine the magnitude of the capacity and speed issues.

3.2 Road Conditions and Design

Old Main Street is in generally substandard condition with narrow overall pavement widths, with no or minimal shoulders and poorly defined or non-existent road ditches. There are local drainage/ponding issues which results in the existing road-bed not draining adequately for much of the road length leading to poor pavement conditions. There are no sidewalks except at the far south end on the east side from Main Street up to the community mail box site. Utilities are provided along the west side of the road.

The Right-of-Way width is indeterminate but appears to be below 20 m in some sections. As a result of this, and the poor conditions described above, Old Main Street is in need of reconstruction to a more consistent design standard, for example, a 6.0 m pavement width with 1.0 m shoulders (paved or unpaved) and functioning ditches along both sides. Adequate road lighting needs to be reviewed and the provision of a sidewalk on at least one side of the road should be considered, although there may not be the necessary space for this in some sections. Any road way design elements will be part of the Tertiary Plan.

The actual, specific new pavement design and construction requirements should be based upon a geotechnical investigation into subsurface conditions along the road. Old roads such as Old Main Street quite often have buried organic soils under the road leading to an unstable base for new pavement structure. If present, these soils will have to be removed.

3.3 Level of Service

The TMC surveys were conducted by the Town of Newmarket at the two intersections unsignalized intersections during weekday peak periods in November 2016. The south intersection with Bexhill Road was surveyed on November 7, 2016 and the north intersection with Main Street North By-pass was surveyed on November 21, 2016. **Figure 2** depicts the peak hour turning movement volumes for the study area. The full traffic count data is located in **Appendix A**.

From a traffic operations perspective, **Table 1** shows the Synchro results for existing conditions at both intersections at either end of Old Main Street. Furthermore, a sensitivity analysis was undertaken to determine the maximum number of additional single family dwelling units that could theoretically be built on Old Main Street before signal control is warranted at either intersection. The trip generation for 100 dwelling units was calculated using the 9th edition of the Trip Generation Manual published by the Institute of Transportation Engineers (ITE). ITE Code 210 (Single Family Detached Housing) was selected. This additional volume was then added to each intersection of Old Main Street based on existing percentage turning proportions. Synchro analysis worksheets are located in **Appendix B**.

Table 1: Synchro Results for Existing Traffic Conditions on Old Main Street

Intersection	*Movement*	Weekday AM Peak Hour		Weekday PM Peak Hour	
		Delay (s/veh)	*LOS*	*Delay (s/veh)*	*LOS*
Main St North By-Pass & Old Main St	EB WB	19.6 16.7	C C	17.9 23.6	C C
Main St North By-Pass & Old Main St + 100 Dwelling Units	EB WB	21.2 17.0	C C	19.7 25.5	C D
Bexhill Rd & Old Main St	SB	9.0	A	9.7	A
Bexhill Rd & Old Main St + 100 Dwelling Units	SB	9.6	A	10.1	B

The results demonstrate that both intersections operate at acceptable levels of delay under existing traffic conditions.

With the potential for infill of vacant lands and future redevelopment of existing properties, additional traffic can be expected in the neighbourhood. Currently, a 12 unit semi-detached development has been approved. Additionally, some property is being considered for development, the characteristics of which are not known. Based upon the existing traffic volumes and capacity assessment, it is estimated that the total development threshold from a traffic perspective is approximately 100 single-family units. The 100 units would result in 55 to 65 peak hour, peak direction trips, with a 50-50 distribution to the north and to the south. This volume, along with the existing traffic, is within the theoretical capacity of the existing roadway and could be accommodated at the unsignalized intersections without a change in traffic control (i.e., signalization).

However, it is important to note that such an increase reflects an increase of up to 400% over the existing volume. This reflects a significant change to the characteristics of the road, especially in light of the narrow ROW.

3.4 Vehicle Speeds

With respect to the noted speeding issue, 24-hour speed and Automatic Traffic Recorder (ATR) surveys were conducted at two locations on Old Main Street on November 29, 2016 (one close to Main Street North By-pass and the other closer to Bexhill Road).

The results of the speed survey showed that the 85% percentile speed was between 42km/hr and 44 km/hr, less than 10% over the posted speed limit. With 15% of traffic therefore over this level, and with a single vehicle recorded at 56 km/hr, this is considered notable. The significance of this prevailing speed is magnified given the narrow ROW and pavement width, the road surface condition, and the frequency of driveways.

The Town of Newmarket has a Traffic Management Program aimed at public education to reinforce positive driving habits and discourage negative habits like speeding and aggressive driving. The Town investigates, analyzes and implements various traffic control measures to increase safety and decrease congestion on Newmarket's roads. This process combines three elements; Education, Enforcement and Engineering. From an engineering perspective initiatives include; implementation of signage, physical features aimed at traffic calming (traffic circles, speed bumps, chicanes), designation of community safety zones, implementation of in-street bollards and use of radar boards. These techniques are considered on a case-by-case basis and are evaluated based on a standard set of criteria to determine their appropriateness and effectiveness for the specific area. Most of the potential measures noted do not meet the required thresholds or conditions to be implemented, while others do not make sense from an access and road function perspective.

The most effective way to provide a safer and more controlled environment is through design. Given the current constraints and issues with the current road design, improvements to the road are required. These improvements must be implemented with context sensitive design in mind. Following Complete Streets Design guidelines as used in other areas in the GTA, design features such as sidewalks, curb bump outs, shorter curb corner radii, and landscaping to the side of the street can provide a more defined environment that is safer for all users.

3.5 Neighbourhood Infiltration

Anecdotal information from residents of Old Main Street suggests that traffic from Main Street By-Pass diverts to Old Main Street to avoid southbound congestion in the morning peak hour and to avoid frequent police speed traps on the by-pass (posted speed on the by-pass is 40km/h). This diversion takes two forms:

- Traffic originating from or destined to Bexhill Road to the west; and,
- Southbound Main Street By-Pass traffic attempting to jump the long queues extending from Davis Drive to the Old Main Street intersection with the By-Pass.

Figure 2 shows the turning movement counts during weekday peak hours on Old Main Street, under existing conditions.

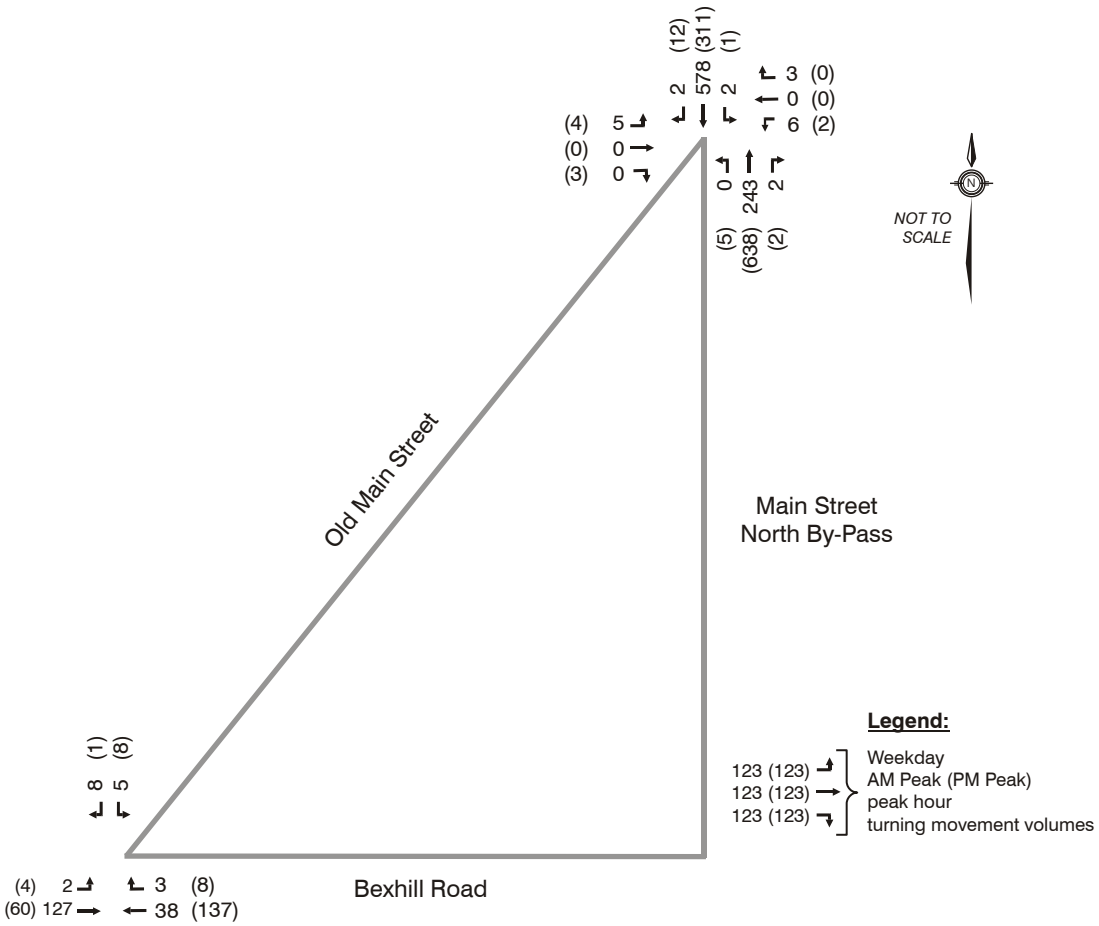


Figure 2: Peak Traffic Volumes on Old Main Street

Using standard ITE trip generation rates, it is estimated that 26 units (as in the existing case) would generate in the order of 20 morning and 25 afternoon peak hour two-way trips. Calculations from the TMC data show that the street is generating 18 morning and 16 afternoon peak hour two-way trips. Given the demographic profile of the street population (retirees, self- employed, locally employed), it is possible that the existing trip generation is less.

A further review of the TMC surveys shows turning movement patterns that may suggest some diversion onto Old Main Street. Bexhill Road is a collector road that serves primarily the residential community to the west of Old Main Street. While it does provide an opportunity to connect to the Yonge Street commercial area via several other collector roads, it does so via very circuitous routes. At the southern end of Old Main Street, 8 vehicles turn right to the west onto Bexhill Road in the morning peak hour. This seems a suspiciously high number as a percentage of the total trip generation of the existing units. However, the corresponding 2 southbound right turns at the Main Street By-Pass / Main Street do not bear out a longer diversion (at most 2 vehicles could be diverted trips). Likewise, the 4 eastbound left turns from Bexhill Road in the afternoon peak hour seem high as a relative portion of the trip generation, with 5 left turns at the By-Pass intersection, a maximum of 4 could be diverted trips.

With respect to trips using Old Main Street in order to jump the queue on the By-Pass, there is insufficient data to determine if this occurred during the day of the count. However, daily patterns on Main Street will fluctuate and diversion could depend on how bad the congestion is on the by-pass.

In summary, the traffic data does not suggest there is any significant component of non-local use of Old Main Street. If it is occurring on a daily basis then the volumes are minimal. Opportunities do exist to minimize the diversion potential. An example is to install signage prohibiting southbound right movements during peak hours, except for local traffic, at the intersection of Old Main Street, Main Street North By-Pass and Jim Barber Court. A sign prohibiting eastbound left movements during peak hours, except for local traffic, can also be installed at the Old Main Street and Bexhill Road intersection. Enforcement of this sign can potentially be undertaken with periodic police presence.

3.6 Conclusions

There are three identified concerns regarding existing traffic operations along Old Main Street – level of service, speeding, and non-local traffic infiltration.

The level of service analysis yielded that both intersections on Old Main Street operate acceptably under existing conditions. The intersections are theoretically capable of accommodating additional development up to a maximum of 100 single family units without needing to implement signal control. Should specific development applications be received, they should be accompanied by a full Traffic Impact Assessment to assess anticipated future traffic conditions and identify. Such development, however, will significantly change the characteristics of the road. Enhancements to the current ROW / roadway design will be required to provide a safe and efficient environment.

The results of the speed survey indicate that speeds are higher than is appropriate for the current character of the road. Options for addressing the potential safety issue that could arise are:

- enhance the design of the road using Complete Streets Design guidelines;
- implement appropriate signage to reinforce identify the area a community safety zone; and/or,
- implement alternative traffic management techniques.

The best fit solution for this area is to enhance the design of the road to promote and encourage more reasonable driving behaviour and to provide a safer environment for the residents.

Infiltration traffic is minimal, both in terms of magnitude, and as a proportion of traffic. Despite the "Local Traffic Only" signs at both ends of Old Main Street, infiltration is still perceived as an issue by residents. To further reduce infiltration, signage that restricts certain movements at specific time periods could be installed. Specifically, southbound right-turn movements during peak periods can be restricted at the Old Main Street and Main Street By-Pass intersection, and restrictions to left-turn movements for eastbound left movements on Bexhill Road can be enforced during peak periods.

4.0 Water Services

4.1 Approach

The assessment of the existing water services consisted of observations recorded during the site visits and a desktop review of the following:

- The Regional Municipality of York Water and Wastewater Master Plan (York Region 2016);
- Geospatial water utility information for the study area provided by the Town;
- The Town of Newmarket Water and Wastewater Master Plan (WSP 2017); and
- Engineering Design Standards and Criteria (Town of Newmarket 2015).

4.2 Water Supply, Treatment, and Storage

York Region acts like a wholesale service provider to its local municipalities (including the Town) and is responsible for the bulk supply, treatment, and storage of drinking water. The study area is located within its York Water System which receives its supplies from Lake Ontario and groundwater sources. The Region does not have direct access to Lake Ontario and has entered into long-term arrangements with the neighbouring City of Toronto and Region of Peel for the supply of treated water to satisfy 88% of its total demand. Water that is sourced from Toronto and Peel is blended with groundwater from the Yonge Street Aquifer and Whitchurch-Stouffville wells to augment supplies. York Region has secured a maximum supply of 509 million litres/day from Toronto and 331 million litres/day from Peel. The capacity of the Yonge Street Aquifer groundwater system is 62 million litres/day (the annual average daily taking limit is 42 million litres/day), and the capacity of the Whitchurch-Stouffville system is 12 million litres/day.

The Region has updated its Water and Wastewater Master Plan (York Region 2016) to meet the needs of its growing municipalities. The Master Plan proposes to expand infrastructure in a way that response to water conservation trends. It puts forward progressively reducing demand rates to be used for infrastructure design, based on a forecast model that takes into account factors such as response to water prices, changes in fixtures and appliances, and conservation patterns and attitudes. The demand rates decrease from 233 litres/capita/day in 2016 to 189 litres/capita/day in 2041. Based on these rates and the existing capacity of the York Water System, York Region is confident of meeting forecasted water demands to 2041 although staged expansion of the existing transmission system is anticipated to meet the net increase in water supplies due to population growth.

4.3 Water Distribution

The Town is responsible for its water distribution and Old Main Street is part of its Newmarket Central Pressure District which receives its supplies from the Newmarket London Elevated Tank, in addition to the Newmarket Wells 1, 2, 13, 15 and 16 and the Aurora Wells 5 and 6 with their associated water storage tanks.

The study area is bisected by two water mains (L0150C and L0149 in **Figure 3**), on the west side of Old Main Street, that supply the community with potable water and fire flows. The two mains are connected with a tee near the intersection with Main Street North By-pass. There is one gate valve in main L0150C and two in L0149, which serve as line valves to regulate the flow of water in the mains. Three service lines from the mains feed fire hydrants located at N^{os} 186, 210 and 244 Old Main Street.

Table 2 below summarizes the design information for the local water mains. The mains L0150C and L0149 are ductile iron pipe and were installed 35 and 51 years ago. PVC is identified as the acceptable material for water main pipe in Engineering Design Standards and Criteria (Town of Newmarket 2015). The spacing of valves along the water mains is within the Town's maximum allowable distance of 300 m.

Table 2: Water Mains Design Information

Asset ID	Pipe Diameter (mm)	Pipe Material	Pipe Length (m)	Year Installed
L0150C	200	Ductile iron	42.32	1982
L0149	200	Ductile iron	485.31	1966

The spacing of hydrants along the water mains exceeds the maximum allowable distance of 120 m in residential areas specified in Engineering Design Standards and Criteria (Town of Newmarket 2015). The hydrant at N^{o} 186 Old Main Street is located inside the minimum required distance of 1.2 m from the edge of the driveway. The distances from the finished ground to the bottom of the flanges of hydrants located at N^{os} 186 and 244 exceed the upper limit of 150 mm specified by the Town.

An assessment of the Town's existing (2014) water distribution network was completed as part of the Town of Newmarket Water and Wastewater Master Plan (WSP 2017). The assessment was limited to modelling of the water distribution network which does not indicate all possible operational issues, or take into consideration the age and condition of existing infrastructure. The modelling exercise was based on following inputs:

- 2006 census information updated with developments that had come online to the 2010;
- An average day water demand of 220 litres/capita/day;
- A maximum day factor of 1.7;
- A peak hour factor of 2.5;
- Fire flow of 117 litres/second for detached and semi-detached dwellings; and
- York Region's boundary conditions planned upgrades and increased demands in Holland Landing and Aurora.

It is important to note that the analysis did not recognize the study area as a future growth area, and population projections were only applied to predetermined areas of development.

Table 3 summarizes water main deficiencies identified in the Master Plan that may impact water supplies to the study area under existing and future conditions. No deficiencies were identified in the water mains on Old Main Street.

Table 3: Water Mains Deficiencies

Water Main	Deficiency	Proposed improvement
Bristol Road	Fire flow less than current standard of 117 litres/second for detached and semi-detached dwellings	Increase diameter from existing 200 mm to 300 mm
Main Street North	None	Increase diameter from existing 200 mm to 300 mm for consistency with proposed improvement to Bristol Road main
Willow Lane	Water main size/velocity not consistent with connecting main	Increase diameter from existing 150 mm to 250 mm

Source: Town of Newmarket Water and Wastewater Master Plan (WSP 2017)

4.4 Conclusions

York Region has identified water conservation as a preferred servicing alternative to meet future growth (The Regional Municipality of York Water and Wastewater Master Plan 2016). Conserving water can form a cost-efficient part of an overall strategy to managing increasing water demand. Water conservation could be encouraged in the community through incentives to retrofit existing development, and requirements to fit new development with high efficiency fixtures, and rain water barrels for non-potable uses such as flushing toilets, laundry, irrigation, etc. Water conservation practices can be promoted through the implementation of education and outreach programs.

The Town of Newmarket Water and Wastewater Master Plan (WSP 2017) did not identify capacity deficiencies in the local water mains under existing and future conditions. Deficiencies were identified in nearby mains believed to supply the study area, related to the supply of fire flows and inconsistencies in pipe sizes. However, it is important to note that the analysis did not recognize the study area as a future growth area, and population projections were only applied to predetermined areas of development. Before moving forward with intensification, an analysis of the water distribution system should be completed to confirm it has sufficient capacity to meet the additional demands.

Hydrant installations along Old Main Street do not meet existing design standards (Town of Newmarket Engineering Design Standards and Criteria 2015) with respect to spacing and location (i.e. distance from edge of driveway, height of flange above finished grade). There is an opportunity to bring the hydrants up to standard with redevelopment of the study area. It is recommended that hydrant flow testing be carried out in the community, to confirm that the minimum flows and residual pressures are being met.

5.0 Wastewater Services

5.1 Approach

The assessment of the existing wastewater services was based on a desktop review of the following:

- Geospatial sanitary utility information provided by the Town;
- Town of Newmarket Water and Wastewater Master Plan (WSP 2017);
- The Regional Municipality of York Water and Wastewater Master Plan (York Region 2016);
- East Holland River Subwatershed Plan (LSRCA 2010); and
- Engineering Design Standards and Criteria (Town of Newmarket 2015).

5.2 Septic Services

Six properties in the study area (24% or 5.74 ha of the total lands) are serviced by septic systems (N^{os} 172, 213, 219, 221, 226 and 228), as shown in **Figure 4**. Design information was unavailable but it is expected that these residential septic systems are rated to accept a total daily flow rate less than 10,000 litres/day and therefore subject to the requirements of the Ontario Building Code. Soils are predominantly silt and clay (low to moderate percolation rates), with sand and gravel (moderate to high percolation rates) occurring in the southeast portion of the study area that lies within the floodplain of East Holland River (The Town of Newmarket Comprehensive Stormwater Management Plan, AECOM 2017).

Septic systems are a potential source of nutrient and bacterial contamination to surface and groundwater resources, and are identified as a contributor to phosphorus loadings in East Holland River (East Holland River Subwatershed Plan, LSRCA 2010). The community is located within a LSRCA Highly Vulnerable Aquifer (HVA) area consisting of land surrounding East Holland River (The Town of Newmarket Comprehensive Stormwater Management Plan, AECOM 2017).

5.3 Sanitary Sewer Services

The remaining properties are serviced by the Town's wastewater collection system (**Figure 4**), which connects to the York Durham Sewerage System (YDSS). Flows are collected in local sanitary sewers on the east side of Old Main Street which drain, via gravity, south from manhole MH1775 and north from manhole MH1773 to manhole MH1780 located approximately opposite N^{o} 194 Old Main Street. Flows are conveyed eastwards to connect with the south-north YDSS sanitary sewer carries wastewater to the Newmarket Sanitary Pumping Station (SPS). It should be noted that manhole MH1773 also receives wastewater flows from an upstream sewer network.

Table 4 summarizes the design information for the Town's local sanitary sewers in the study area to the service connection with the YDSS sanitary sewer. All of the sewer lines are at the minimum allowable size of 250 mm specified in Engineering Design Standards and Criteria (Town of Newmarket 2015).

Table 4 indicates that SL1780, SL1781 and SL1782 do not meet the minimum grade requirement of 0.5%, and that the distances between manholes MH1776 and MH1777 and between manholes MH1774 and MH4798 exceeds the maximum allowable spacing of 90 m, for pipes of that size.

Table 4: Sanitary Sewer Design Information

Upstream Manhole	Downstream Manhole	Asset ID	Pipe Diameter (mm)	Pipe Material	Pipe Slope (%)	Pipe Length (m)
MH1775	MH1776	SL1775	250	PVC SDR 35	0.8	39.97
MH1776	MH1777	SL1776	250	PVC SDR 35	0.5	91.18
MH1777	MH1778	SL1777	250	PVC SDR 35	0.5	53.03
MH1778	MH1779	SL1778	250	PVC SDR 35	0.5	51.92
MH1779	MH1778	SL1779	250	PVC SDR 35	0.7	45.07
MH1778	**MH4798**	SL4798	250	PVC SDR 35	0.8	11.78
MH1773	MH1774	SL1773	250	PVC SDR 35	0.5	54.42
MH1774	**MH4798**	SL1774	250	PVC SDR 35	0.5	119.41
MH4798	MH1781	SL1780	250	PVC SDR 35	0.4	61.99
MH1781	MH1782	SL1781	250	PVC SDR 35	0.4	79.87
MH1782	-[(a)]	SL1782	250	PVC SDR 35	0.4	52.37

Notes:

(a) Service connection to YDSS sanitary sewer

Engineering Design Standards and Criteria (Town of Newmarket 2015) specifies a maximum allowable sewer flow rate of 0.074 m^3/s in 250 mm diameter sewer lines. Wastewater flows based on the existing occupancy in homes that are serviced were not assessed. However, surcharge conditions were not identified during recent modelling of the existing conditions (Town of Newmarket Water and Wastewater Master Plan, WSP 2017), which were based on the following inputs:

- A unit wastewater generation rate of 310 litres/capita/day;
- Application of the Harmon peaking factor for peak dry weather flows;
- An infiltration allowance of 0.4 litres/second/hectare (for existing residential areas with foundation drain connections to sump pumps; and
- A boundary condition value as the 25-year design storm hydraulic grade line profile for the YDSS sanitary sewer.

Similar to water services, the analysis did not recognize Old Main Street as a future growth area. However, land in the southeast corner of the intersection of Main Street North By-pass and Jim Barber Court, which is located adjacent to the community, was identified as a development area.

5.4 Wastewater Treatment and Discharge

The YDSS includes the Duffin Creek Water Pollution Control Plant (WPCP) and its associated conveyance system, which are co-owned by the Regional Municipalities of York and Durham. About 80% of the current flow to Duffin Creek WPCP comes from York Region (including the Town of Newmarket). The plant was recently expanded to treat 630 million litres/day but its capacity rating under the existing Environmental Compliance Approval is temporarily limited to 520 million litres/day subject to a Schedule C Class Environmental Assessment (EA) to address outfall capacity limitations at the plant being completed (The Regional Municipality of York Water and Wastewater Master Plan, York Region 2016). The EA has been completed and is currently under review by the Ministry of Environment and Climate Change.

5.5 Conclusions

Septic systems are being used by one quarter of the properties in the study area. Septic systems are identified as a contributor to phosphorus loadings in East Holland River (East Holland River Subwatershed Plan, LSRCA 2010), and should be replaced with sewer services over time, in keeping with the sewer and water policies ofthe Town of Newmarket Official Plan that the entire Town be fully serviced.

The remaining properties are serviced by sanitary sewers. Surcharge conditions were not identified in local sewers, or receiving downstream sewers, under existing and future scenarios by The Town of Newmarket Water and Wastewater Master Plan (WSP 2017). However, similar to water services above, the analysis did not recognize the study area as a future growth area. The capacity of the local and receiving downstream sanitary sewers to receive additional wastewater flows should be confirmed prior to intensification of the community.

Parts of the sewer system do not meet existing design standards (Town of Newmarket Engineering Design Standards and Criteria 2015). Some sewer lines do not meet minimum grade specifications, and manhole spacing requirements are exceeded in a couple of instances..

6.0 Stormwater Management Conditions

6.1 Approach

The assessment of existing stormwater management conditions was based on:

- Visual inspections of existing conditions conducted on September 12 and October 1, 2017; and
- A desktop review of the following:
    - Geospatial data including topography and stormwater management utility information provided by the Town
    - Town of Newmarket Comprehensive Stormwater Management Master Plan (AECOM 2017)
    - East Holland River Subwatershed Plan (LSRCA 2010)
    - Engineering Design Standards and Criteria (Town of Newmarket 2015)
    - Geotechnical Investigation, 172, 178 Old Main Street, Newmarket, Ontario, Azure Homes Inc. (WSP 2016)

6.2 Topography, Soils, Land Use and Groundwater Resources

Lands in the study area slope towards the east southeast and range in elevation approximately from 233 m to 257 m. Much of the fall in elevation occurs on the western side of Old Main Street where the ground has an average slope greater than 10% (the maximum slope of approximately 40% occurs behind No 186 Old Main Street). Lands on the eastern side of the roadway range in elevation from 233 m to 235 m and have an average slope of approximately 4%.

Surficial geology is mapped predominantly as glaciolacustrine deposits (silt and clay), with fluvial deposits (sand and gravel) occurring in the floodplain located to the southeast of the study area (The Town of Newmarket Comprehensive Stormwater Management Plan, AECOM 2017). Boreholes drilled at N^{os} 172 and 178 to support the design and construction of six semi-detached homes encountered topsoil underlain by very loose to very dense sand and/or stiff to very stiff silt/clayey silt (Geotechnical Investigation, Azure Homes Inc., WSP 2016).

Land use currently consists of a mix of single-detached and semi-detached residences, roads and driveways, open areas (meadow), and woodlots. The level of imperviousness is approximately 11%.

The community is located within a LSRCA Highly Vulnerable Aquifer (HVA) area consisting of land surrounding East Holland River (The Town of Newmarket Comprehensive Stormwater Management Plan, AECOM 2017). An HVA area represents an aquifer that is susceptible to contamination due to its proximity to the ground surface and/or the material forming the barrier between the ground surface and the aquifer. Water level observations in three monitoring wells drilled as part of the geotechnical investigation for the above-described proposed development were 3 m to 4 m below ground surface in October 2016.

6.3 Storm Sewer Service Areas

Only 12% of the 7.55 ha study area is currently serviced by storm sewers (**Figure 5**), consisting of 0.08 ha to the north (the north service area) and 0.86 ha to the south (the south service area). In these areas the storm sewers represent the minor system; the major system consists of overland flow routes along Old Main Street.

Sewers in the north service area drain northwards to the downstream end of a larger storm sewer network servicing a total catchment area of 43.82 ha, that conveys flows eastwards to discharge via outfall OF278 to East Holland River. The sewers receive runoff from the portion of Old Main Street north of the intersection with the access road to St. John's Cemetery. The road is curbed on its western side, and drains to an unidentified catch basin north of manhole ST0633 (**Figure 5**). Flows into the catch basin are conveyed via service line T5407 to sub-trunk sewer T0678. The sub-trunk sewer connects manholes ST0633 and ST0632 and also receives flows from a second catch basin CB1150, south of manhole ST0633, via service line T4964. Catch basin CB1150 collects from N^{o} 468 Dover Crescent which is located outside the study area.

Sewers in the south portion of the study area similarly drain southwards to the downstream end of a larger storm sewer network servicing a total catchment area of 10.96 ha, that conveys flows eastwards to discharge via outfall OF016 to a ditch on the east side of Main Street North By-pass. The sewers receive runoff from N^{os} 172 and 178 on the west side of Old Main Street and a portion of the roadway, which drain to catch basins CB1149 and CB1146 (**Figure 5**). The road has a cross fall to the west that directs drainage to a grassed swale at the perimeter of N^{o} 172. The sewers also receive runoff from a portion of Bexhill Road, which drains to catch basin CB1148 on the north side of the road. Flows intercepted by catch basins CB1149 and CB1146 are conveyed via service lines T8754 and T7780 to trunk sewer T0492 which discharges to manhole ST2382. Flows intercepted by catch basin CB1148 are conveyed via service line T8752 to trunk sewer T2570 which connects manholes ST2382 and ST2383.

Table 5 summarizes the available sewer design information, which has significant data gaps. Sewer mains T0678 and T0492 were installed in 1984 and 1981 respectively. The year of installation of T2570 is not known. Flows from both service areas appear to be discharged via the sewer networks directly to East Holland River: onsite stormwater quantity or quality controls have not been provided in the geospatial utility data provided by the Town.

Table 5: Storm Sewer Design Information

Upstream Node	Downstream Node	Asset ID	Pipe Diameter (mm)	Pipe Material	Pipe Slope (%)	Pipe Length (m)	Maximum Allowable Sewer Capacity[a] (m^3/s)	Year Installed
North Service Area								
CB1150	ST0633	T4964	-[b]	-[b]	-[b]	35.94[c]	-[d]	1984
-[b]	-[e]	T5407	-[b]	-[b]	-[b]	1.97[c]	-[d]	-[b]
ST0633	ST0632	T0678	450	Concrete	0.78	57.19[c]	0.32	1984
South Service Area								
CB1149	CB1146	T8754	-[b]	-[b]	-[b]	32.72[c]	-[d]	-[b]
CB1146	-[f]	T7780	-[b]	-[b]	-[b]	11.37[c]	-[d]	-[b]
ST0612	ST2382	T0492	525	Concrete (Class IV)	4.5	84.65	0.47	1981
CB1148	-[g]	T8752	-[b]	-[b]	-[b]	4.83[c]	-[d]	-[b]
ST2382	ST2383	T2570	-[b]	Concrete (Class III)	1.75	26.71	1.1	1981
ST2383	OF016	T3537	825	Concrete (Class III)	1.7	26.93[c]	1.5	1981

Notes:

(a) From Table C-3 in Engineering Design Standards and Criteria (Town of Newmarket 2015)
(b) Information not available
(c) Estimated from geospatial data provided by the Town
(d) Cannot be determined since pipe size unavailable
(e) Service connection directly to sub-trunk sewer T0678
(f) Service connection directly to trunk sewer T0492
(g) Service connection directly to trunk sewer T2570

During major storm events, when runoff exceeds the capacities of the sewers, flows in the north service area will be conveyed via the roadway to the intersection with Main Street North By-pass. In the south service area, flows will be carried by the roadway to the sag opposite N° 194 or to the intersection with Bexhill Road.

6.4 Surface Drainage Service Area

A surface drainage system (**Figure 5**) provides stormwater management service to 88% (6.61 ha) of the study area during minor and major storm events.

During minor storm events, the properties on the west side of Old Main Street between N^{os} 186 and 244 drain via overland flow to shallow, vegetated roadside swales which convey water north and south. Runoff from N^{o} 244 Old Main Street drains under the roadway via a 450 mm diameter corrugated steel pipe (CSP) culvert which discharges to a swale on the east side of the road. The swale conveys flows northwards to the intersection with Main Street By-pass and connects to a densely vegetated ditch running north-south along the west side of the By-pass. Runoff from N^{os} 186 to 238 is conveyed through various driveway culverts to a sag in the road opposite N^{o} 194. At this location, flows collecting in the swales appear to be conveyed under the road via a 250 mm diameter CSP and discharged to a short unlined watercourse that drains east to a densely vegetated ditch running south-north on the west side of Main Street North By-pass. The culvert under the roadway is crushed and filled with sediment. (**Photo 1**).

Photo: 1: Outlet of culvert under roadway at No 194 Old Main Street

During major storm events, runoff from these western properties that exceeds the capacities of the vegetated swales on Old Main Street is conveyed via the roadway, which has a cross fall to the east from N^{o} 244 northwards and a cross fall to the west from N^{os} 194 to 238. Flows are expected to overtop the roadway at the sag opposite N^{o} 194 and discharge into the small unlined watercourse described above.

Runoff from the properties on the east side of Old Main Street during minor and major storms drains eastwards via overland flow and is intercepted by the densely vegetated ditches on the west side of Main Street North By-pass. Runoff in the southeast corner of the community may also collect in a grassed swale opposite N^{o} 178 which drains towards one of the Main Street North By-pass ditches. The roadside ditches along Main Street North By-pass drain south and north to a 900 mm diameter CSP culvert, located approximately at the rear of N^{o} 211 Old Main Street, which conveys water under the roadway (**Photos 2 and 3**). The culvert barrel was clear of sediment at both ends at the time of the site visits.

Photo 2: Entrance of culvert under Main Street North By-pass

Photo 3: Outlet of culvert under Main Street North By-pass

A level of onsite water quality control is provided by the vegetated swales and ditches, which filter the stormwater runoff.

6.5 Downstream Drainage System

Flows from the study area converge with flows from offsite areas on the east side of Main Street North By-pass, and are conveyed via a low gradient, meandering, unlined watercourse through a wooded area to a multiple-culvert crossing under the GO Transit rail line. There is a large tree root obstructing flow in

the channel approximately 10-15 m downstream of the culvert, immediately followed by an uprooted tree on the left bank.

Photo 4: Large tree root obstructing flow in watercourse

The multiple-culvert crossing under the rail line consists of two concrete pipes (1060 mm inside diameter) and an overflow CSP (750 mm inside diameter) on the left bank (looking downstream). There is a small amount of inflow to the watercourse at the entrance to the culverts on the right bank via a 150 mm diameter corrugated plastic pipe. At the time of the site visit, water was flowing out of the plastic pipe and the entrances to the culverts were observed to be partially blocked by organic debris. Flow through the culverts discharges into a small depression (9 m x 5 m) between the rail line and the Nokiidaa bike trail, before being conveyed under the trail and discharged to East Holland River. Sediment deposits 180 mm and 290 mm thick were measured at the outlets of the right and middle concrete pipes respectively.

Photo 5: Entrance to concrete pipe culverts under GO Transit rail line

Photo: 6: Outlet of multiple-barrel crossing under GO Transit rail line

Flows collecting in the small depression are carried under the Nokiidaa bike trail via a 900 mm diameter CSP before being discharged to East Holland River. Riprap protection is installed at the culvert entrance and outlet, and there is a small amount of sediment deposited at the culvert entrance.

Photo 7: Entrance to culvert under Nokiidaa Bike Trail

Photo 8: Outlet of culvert under Nokiidaa Bike Trail

Offsite water quality and water quantity control is provided by the small depression and undersized culvert at the point of discharge from the surface drainage system to East Holland River, which permit the retention of water and settling out of suspended solids.

6.6 Existing Stormwater Management and Flooding Issues

The Town has indicated that residents have reported significant stormwater management and flooding issues in the area. The Town identified properties at N^{os} 209 and 211 Old Main Street, on the eastern side of the roadway, as having been impacted. The rear of these two properties is located in the lowest part of the study area, and the vicinity of the entrance to the culvert under Main Street North By-pass.

During a walking tour in the community on October 19, 2017, residents indicated that all the properties on the east side of Old Main Street are experiencing flooding issues due to a combination of stormwater management and groundwater conditions. Stormwater runoff from the west side of the road overtops the swales and either is conveyed via the road to the sag opposite N^{o} 194 where it ponds, or overtops the road and discharges onto the eastern properties. The residents reported that the swales are not regularly maintained and expressed the opinion that increases to the swale cross-sections would be constrained by the existing road right-of-way which is already at the property limits. Artesian groundwater conditions are known to exist on the top of the hill in Saint John Cemetery, and are believed to be a result of confining clay layers. Residents reported that the water table follows the topography and is shallow (approximately 1.8 m below ground surface) where the terrain levels out. Basement sump pumps are run year round, not only during wet weather, in properties on the east side of Old Main Street.

The reported flooding issues are likely due to a combination of factors, as outlined below:

- The conveyance capacities of the swales and driveway culverts on the west side of Old Main Street;
- The conveyance capacities of the drainage ditches on the west side of Main Street North By-pass;
- The hydraulic capacity of the Main Street North By-pass culvert, which is affected by conditions at its upstream and downstream ends; and
- A shallow groundwater table that fluctuates seasonally.

The swales and driveway culverts along Old Main Street, and the drainage ditches along the Main Street North By-pass, may be being impacted by infrequent maintenance. In some sections, swale cross-sections were not well defined and/or were overgrown with vegetation. Driveway culverts varied in size and in some instances were partially or fully blocked. The drainage ditches along the By-pass were densely vegetated at the time of the site visits.

The culvert under the By-pass is aligned perpendicular to the flow in the ditches, and projects from the road embankment into the channel. Its hydraulic capacity could be increased with redesign of the entrance to better direct flows into the barrel. The tailwater at the culvert outlet may also affect its hydraulic capacity. Based on observations collected during the site visits, the conditions downstream of the culvert are affected by the following:

- The additional offsite flows converging with flows from the study area at the culvert outlet;
- The conveyance capacity of the small unnamed receiving watercourse on the east side of the By-pass, which is impacted by the tree root obstructing the flow and its densely vegetated banks;
- The capacities of the three culverts under the GO Transit rail line, which are affected by sediment deposits in the barrels and tailwater conditions arising from the reduction in flow area to the single culvert under the Nokiidaa bike trail; and
- The capacity of the culvert under the bike trail, which is affected by sediment deposits in the barrel and tailwater conditions depending on the water level in East Holland River.

A detailed topographic survey, comprehensive hydrologic and hydraulic modelling, and a groundwater study are required to determine the causes and optimum solution to the existing stormwater management and flooding issues. However, regular maintenance of the swales, drainage ditches, culverts, and small receiving watercourse is a relatively low cost activity that can be immediately implemented to improve conditions.

6.7 Conclusions

The existing stormwater management system is haphazard. Only about one tenth of the community is currently serviced by storm sewers, consisting of small areas to the north and south which drain to separate storm catchments. The remaining area is serviced by a surface drainage system consisting of overland flow routes, swales, ditches, and culverts. While a level of water quality and water quantity control is provided both onsite and offsite for flows in the surface drainage system, it is doubtful that current environmental standards and criteria are being met.

Residents of the community have reported stormwater management and flooding issues, in part due to capacity issues with the existing stormwater management system, which could be exacerbated by intensification and an increase in the impervious level (currently 11%) within the community. Without improvements, the existing stormwater management system represents a major constraint to redevelopment of Old Main Street.

The impacts of discharges of urban stormwater runoff to East Holland River are also a key factor to be considered. LSRCA has identified urban stormwater runoff as a source of pollution to the river, notably suspended solids and phosphorus (East Holland River Subwatershed Plan, LSRCA 2010). In addition, occurrences of failed channel hardening in the vicinity of points of stormwater discharge from the community are also documented (Town of Newmarket Comprehensive Stormwater Management Plan, AECOM 2017).

The Town of Newmarket Official Plan 2006 – 2026 (Meridian Planning Consultants 2016) recognizes the importance of proper stormwater management and puts forward the following policies to manage development:

- New development will provide appropriate stormwater management facilities, sized for the ultimate buildout within the development area, to control the quantity and enhance the quality of urban stormwater runoff entering receiving watercourses; and
- Stormwater drainage facilities will be designed and constructed to protect receiving watercourses and adjacent land uses from any potential adverse impacts of stormwater runoff.

LSRCA requires stormwater treatment to provide an enhanced level of protection or 80% suspended solids for all new developments in the subwatershed (East Holland River Subwatershed Plan, LSRCA

2010). Intensification of the community represents an opportunity to meet both the Town's policy objectives and LSRCA's requirements.

What is the way forward? There are significant gaps in the available design information for the local storm sewers, and it is recommended that these be filled as a first step to improvements to the existing stormwater management system. A second step would be to complete comprehensive modelling of the local storm sewer and surface drainage systems for a better understanding of the causes of the current stormwater management issues, and to evaluate alternatives for improving and expanding the system to manage stormwater runoff under existing and future conditions.

Table 6 identifies possible alternatives for stormwater management on Old Main Street that could be considered. It is expected that a combination of alternatives will be necessary to achieve the desired level of service. One preferred alternative would be to direct runoff from the properties on the west side of Old Main Street to a depression storage area or more formal stormwater management facility located in the existing open space in the southeast portion of the study area (**Figure 6**), and release it at a controlled rate to the ditch along the By-pass. Construction of such a facility within the floodplain of East Holland River would require consultation with LSRCA and will be subject to approval under Ontario Regulation 179/06. However, it could provide peak flow attenuation and stormwater treatment, as well as increase the flood storage capacity within the floodplain resulting in a reduction of the extent/depth of floodwaters.

Table 6: Stormwater Management Alternatives for Existing and Future Conditions

Option N°	Description	Pros	Cons
1	Maintenance/increase in swale and driveway culvert cross-sections on west side of Old Main Street	• Increases conveyance capacity for stormwater flows from west properties and mitigates overtopping onto road and east properties	• Improvements may be constrained by existing road right-of-way and property limits
2	Maintenance/increase in cross-sections of drainage ditches on west side of Main Street North By-pass	• Increases conveyance capacity and storage for stormwater flows from study area and mitigates overtopping onto rear of east properties	• Improvements may be constrained by existing property limits
3	Redesign entrance of culvert under Main Street North By-pass	• Improves hydraulic capacity of culvert and conveyance of stormwater flows away from the study area	• Reduces onsite attenuation of peak flows • Requires construction works on Main Street North By-pass with possible traffic disruptions
4	Construct a depression storage area or stormwater management facility in the southeast portion of the study area to retain stormwater runoff	• Provides additional onsite attenuation of peak flows • Can be designed to provide additional water quality control • Increases floodplain storage	• Located on flood hazard lands and subject to approval by LSRCA • The Town will need to assume responsibility for facility maintenance • Requires major earthworks
5	Retrofit existing development with LID practices (rainwater harvesting, infiltration, and bioretention), and include LID practices in new development or redevelopment activities	• Provides additional onsite attenuation of peak flows • Provides additional water quality control • Encourages infiltration and maintains water balance, to compensate for increases in impervious level	• Infiltration LID practices are dependent on soil infiltration rates • The Town will need to assume responsibility for maintenance if LID practices are to remain effective
6	Extend storm sewer services in the community		• Does not provide additional water quantity and water quality controls

7.0 Natural Heritage Features

7.1 Approach

The assessment of the existing natural heritage features was based on a desktop review of the following:

- Geospatial information provided by the Town, including the Official Plan Schedules and LSRCA regulatory floodplain;
- Geospatial information identified through Land Information Ontario;
- East Holland River Subwatershed Plan (LSRCA 2010); and
- Natural Heritage Information Centre (NHIC).

7.2 Terrestrial Natural Heritage Features

There is one terrestrial natural heritage feature in the study area (**Figure 7**). A natural heritage feature is located in the southwestern portion of the study area and is identified as a Woodlot on Schedule B – Natural Heritage System of the Town's Official Plan. There is another Woodlot south of the study area and separated from it by Bexhill Road. There is a Significant Forest Area associated with another woodland east of the study area on the eastern side of the East Holland River. Moreover, some of the eastern woodland is identified as unevaluated wetland approximately 100 m east of the study area.

Under the Forestry Act, "woodlands" means land with at least:

- *1,000 trees of any size per hectare; or*
- *750 trees measuring over 5 centimeters in diameter, per hectare; or*
- *500 trees measuring over 12 centimeters in diameter, per hectare; or*
- *250 trees measuring over 20 centimeters in diameter, per hectare.*

Other treed areas within the study area have not been identified as Woodlot; however, one treed area is contiguous with a mapped Woodlot feature and could meet the definition of woodlands under the Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005 (OMNR 2010) or the *Forestry Act, 1990*; and therefore, may require further consideration in subsequent stages in the land use planning process.

The Significant Wildlife Habitat Technical Guide (OMNR 2000) defines Species of Conservation Concern (SCC) as globally, nationally, provincially, regionally, or locally rare (S-Rank of S2 or S3) but do not include Species at Risk (SAR) listed as *endangered* or *threatened* under the *Endangered Species Act (ESA), 2007*. A review of the Ministry of Natural Resources and Forestry (MNRF) background data suggests that significant wildlife habitat for breeding birds may occur in association with treed areas within the study area. A total of 13 SCC have been identified to occur within the vicinity of the study area. However, only one of these species has the potential for habitat to occur within the study area, Eastern Wood-Pewee (*Contopus virens*), which is listed provincially as *special concern*. This species has the potential to occur

within open, deciduous, mixed or coniferous forests, predominated by oak with little understory. Further investigation into the suitability of the study area as potential SCC habitat is recommended to identify the potential for additional environmental constraints.

7.2.1 Species at Risk

Several SAR listed as *endangered* or *threatened* under the ESA, 2007 have been identified to occur within the vicinity of the study area. However, only five of these species have the potential for habitat to occur within the study area (see **Table 7**). It should also be noted that the study area does not overlap with established Natural Heritage Information Centre (NHIC) squares, and as such, there is no specific tracking of SAR, SCC and provincially rare species within the study area.

Table 7: Species at Risk with the Potential to Occur within the Study Area

Scientific Name	Common Name	SARA	ESA	S-RANK[1]	Info Source[2]	Potential Habitat in the Study Area
Vascular Plants						
Juglans cinerea	Butternut	END	END	S3?	---	This species has the potential to occur in moist to moderately dry areas with well-drained, rich soils.
Birds						
Chaetura pelagica	Chimney Swift	THR	THR	S4B,S4N	OBBA	This species has the potential to be found in urban areas near buildings, and is less likely nesting in hollow trees or chimneys.
Hirundo rustica	Barn Swallow	---	THR	S4B	MNRF, OBBA	This species has the potential to nest in buildings or other man-made structures.
Mammals						
Myotis lucifugus	Little Brown Myotis	END	END	S4	OMA	This species has the potential to roost in hollow trees or buildings.
Myotis septentrionalis	Northern Myotis	END	END	S3	OMA	This species has the potential to roost in houses, man-made structures, and hollow trees or under loose bark.

[1]S-Rank is an indicator of commonness in the Province of Ontario. A scale between 1 and 5, with 5 being very common and 1 being the least common. [2]Information sources include: MNRF = Ministry of Natural Resources and Forestry; OBBA = Ontario Breeding Bird Atlas; OMA = Ontario Mammals Atlas --- denotes no information or not applicable.

7.2.2 Fish Habitat

As stated within the East Holland River Subwatershed Plan, fisheries data has been collected within the East Holland River Subwatershed from 1930 to 2007 (LSRCA 2010). The most recent sampling was conducted by the LSRCA from 1930 to 2007, yielding a total of 35 species included in **Table 8**, below.

Table 8: Fish Species Identified in LSRCA Surveys from 1930-2007

Scientific Name	Common Name	SARA	ESA	S-RANK[1]
Ambloplites rupestris	Rock Bass	---	---	S5
Ameiurus nebulosus	Brown Bullhead	---	---	S5
Amia calva	Bowfin	---	---	S4
Carassius auratus	Goldfish	---	---	SNA
Catostomus commersoni	White Sucker	---	---	S5
Clinostomus elongatus	Redside Dace	END	END	S2
Cottus bairdi	Mottled Sculpin	---	---	S5
Cottus cognatus	Slimy Sculpin	---	---	S5
Culaea inconstans	Brook Stickleback	---	---	S5
Cyprinus carpio	Common Carp	---	---	SNA
Esox lucius	Northern Pike	---	---	S5
Etheostoma blennioides	Greenside Darter	---	---	S4
Etheostoma caeruleum	Rainbow Darter	---	---	S4
Etheostoma exile	Iowa Darter	---	---	S5
Hybognathus hankinsoni	Brassy Minnow	---	---	S5
Lepomis gibbosus	Pumpkinseed	---	---	S5
Lepomis macrochirus	Bluegill	---	---	S5
Luxilus cornutus	Common Shiner	---	---	S5
Micropterus salmoides	Largemouth Bass	---	---	S5
Notemigonus crysoleucas	Golden Shiner	---	---	S5
Notropis atherinoides	Emerald Shiner	---	---	S5
Notropis heterodon	Blackchin Shiner	---	---	S4
Notropis heterolepis	Blacknose Shiner	---	---	S5
Notropis hudsonius	Spottail Shiner	---	---	S5
Notropis stramineus	Sand Shiner	---	---	S4
Perca flavescens	Yellow Perch	---	---	S5
Phoxinus eos	Northern Redbelly Dace	---	---	S5
Pimephales notatus	Bluntnose Minnow	---	---	S5
Pimephales promelas	Fathead Minnow	---	---	S5
Pomoxis nigromaculatus	Black Crappie	---	---	S4
Rhinichthys atratulus	Blacknose Dace	---	---	S5
Rhinichthys cataractae	Longnose Dace	---	---	S5

Scientific Name	Common Name	SARA	ESA	S-RANK[1]
Salvelinus fontinalis fontinalis	Brook Trout	---	---	S5
Semotilus atromaculatus	Creek Chub	---	---	S5
Umbra limi	Central Mudminnow	---	---	S5

[1]S-Rank is an indicator of commonness in the Province of Ontario. A scale between 1 and 5, with 5 being very common and 1 being the least common. --- denotes no information or not applicable.

Background MNRF mapping indicates that no watercourses are present within the study area (**Figure 7**). As a result, suitable habitat for fish does not exist within the study area. However, East Holland River is located 100 m east of the community and receives stormwater runoff from the study area.

7.3 Regulatory Floodplain

A portion of the study area lies within the regulatory floodplain of East Holland River (**Figure 8**). Ten of the properties on the east side of Old Main Street (N^{os} 205, 207, 209, 211, 213, 215, 217, 219, 221 and 231), the open space in the southeast corner of the study area, and approximately 180 m of the roadway are located on flood hazard lands which occupy 2.15 ha or 28% of the study area. New development and site alterations within the limit of the floodplain plus a 30 m setback are subject to Ontario Regulation 179/06 under the *Conservation Authorities Act*, *1990* and approval from LSRCA.

The regulatory floodplain is defined by the flood level corresponding to the regional storm, which is Hurricane Hazel (285 mm of rain in 48 hours occurring in October 1954). It is based on hydraulic modelling of East Holland River with the flood flow inputs developed using hydrologic models. The regulatory flood line is periodically updated by LSRCA to reflect changes to the river morphology, hydraulic structures, and changes in topography and land use in the contributing watershed. The flood line shown in **Figure 8** was provided by the Town and is dated January 2015. Communication with LSRCA revealed that the hydraulic model was updated as recently as July 2017, but with flood flow inputs from hydrologic modelling completed in 2005.

The floodplain shown in **Figure 8** corresponds approximately to elevation 235 m. However, given the date of the flood line provided by the Town and the date of the hydrologic modelling, it should be noted that the floodplain may not be representative of existing conditions.

7.4 Conclusions

7.4.1 Terrestrial Natural Heritage Features

The Woodlot in the southwestern portion of the study area is identified as Schedule B – Natural Heritage System of the Town's Official Plan, which is a terrestrial natural heritage constraint feature. This feature could also be contiguous with a treed area within the study area that has not been formally identified as a Woodlot. A field assessment to determine the condition and boundaries of the existing Woodlot is recommended.

There could be habitat for SCC (e.g., Eastern Wood-Pewee) and SAR (e.g., Butternut, Barn Swallow, Chimney Swift, Little Brown Myotis and Northern Myotis) in the study area. Field assessments are required to determine the potential for endangered or threatened SAR habitat and contravention to the *ESA, 2007*, as well as habitat for SCC.

There were no aquatic natural heritage constraint features identified in the study area; however, surface water drainage from the study area is released to the East Holland River, which has known fish communities and ecological sensitivities. Potential opportunities and constraints associated with the discharge of urban stormwater runoff to the East Holland River are discussed in **Section 6.7**.

7.4.2 Regulatory Floodplain

Approximately 28% of the study area is occupied by flood hazard lands within the regulatory floodplain of East Holland River. New development and site alterations within the limit of the floodplain plus a 30 m setback are subject to regulation by LSRCA under the *Conservation Authorities Act, 1990*. The control of development within flood hazard lands is intended to mitigate injury and loss of life, property damages, and social disruptions, as well as to conserve and enhance natural resources.

LSRCA has prepared Guidelines for the Implementation of Ontario Regulation 179/06 - Development, Interference with Wetlands and Alterations to Shorelines and Watercourses (2015). The construction of new residential structures and residential additions to a maximum of 50% of the original foundation area may be permitted where there is no alternative location outside the flood hazard, subject to conditions outlined in the guidelines.

The percentage of flood hazard lands within the study area, and LSRCA's conditions for development and site alteration, are considered a major constraint to redevelopment and intensification of the Old Main Street community.

8.0 Closing Summary

The existing policy framework for redevelopment of the study area is provided by the following guidance documents:

- The Town of Newmarket Official Plan 2006 – 2026 (Meridian Planning Consultants 2016);
- Tree Policy (Town of Newmarket 2005);
- Corporation of the Town of Newmarket By-law Number 2007-71, A By-law to Prohibit or Regulate the Destruction or Injuring of Woodlot Trees;
- The Town of Newmarket Water and Wastewater Master Plan (WSP 2017);
- The Town of Newmarket Comprehensive Stormwater Management Plan (AECOM 2017);
- The Town of Newmarket Engineering Design Standards and Criteria (Town of Newmarket 2015);
- East Holland River Subwatershed Plan (LSRCA 2010); and
- Guidelines for the Implementation of Ontario Regulation 179/06, Development, Interference with Wetlands and Alteration to Shorelines and Watercourses Regulation (LSRCA 2015).

Constraints identified to the redevelopment of the Old Main Street community include:

- The current road condition and narrow right of way will limit the amount of development that can occur. The current roadway is not built to today's standard and with increased traffic, efficiency and safety will be reduced as more development occurs;
- Groundwater conditions in the study area, specifically the high water table reported by residents, may be the cause of basement flooding;
- The existing stormwater management system which is haphazard (it consists of a surface drainage system and storm sewers), is suspected to have capacity issues, and is not regularly maintained;
- The Woodlot in the southwestern portion of the study area, which is identified as a natural heritage feature in Schedule B of the Town of Newmarket Official Plan 2006 – 2026, is to be protected;
- There is potential habitat for Species of Conservation Concern (Eastern Wood-Pewee) and Species at Risk (Butternut, Barn Swallow, Chimney Swift, Little Brown Myotis and Northern Myotis) within the study area; and
- The regulatory floodplain of the East Holland River, which occupies 28% of the study area, development within which (plus a 30 m setback) is subject to regulation.

Conversely, redevelopment of the study area will provide the opportunity to:

- Bring the roadway up to current design standards;
- Encourage water conservation practices through incentives to retrofit existing development and requirements to fit new development with high efficiency plumbing fixtures and rain water barrels for non-potable uses, and the implementation of education and outreach programs;
- Upgrade hydrant installations along Old Main Street to existing engineering design standards with respect to spacing and location;
- Connect all properties to the municipal sanitary sewer (septic systems are currently being used on one quarter of the properties in the study area);
- Upgrade the municipal sanitary sewer to existing design standards for minimum sewer line grades and manhole spacing;
- Upgrade the existing stormwater management works to achieve current environmental standards and criteria for water quality and water quantity control;
- Resolve the existing stormwater management and flooding issues currently being experienced by residents in the community; and
- Identify, design and implement Woodlot restoration and enhancement.

This background study is based on a desktop review of available data and reports, and the following studies are recommended to better inform plans for redevelopment of the study area:

- Future traffic studies for development applications with specific site plans and unit densities;
- A hydraulic assessment to confirm the capacity of the water mains (within and supplying the study areas) to meet flow and pressure requirements under future conditions (the Town of Newmarket Water and Wastewater Master Plan did not identify study area as future growth area in its capacity assessment);
- Hydrant flow testing to confirm that the minimum flows and residual pressures are currently being achieved;
- A hydraulic assessment to confirm the capacity of the local and receiving (downstream) sanitary sewers to receive wastewater flows under future conditions (the Town of Newmarket Water and Wastewater Master Plan did not identify study area as future growth area in its capacity assessment);
- A groundwater study to better characterize existing groundwater conditions;
- A detailed topographic survey and comprehensive hydrologic and hydraulic modelling of the local stormwater management system and receiving (downstream) drainage system to determine the causes and optimum solution to the existing stormwater management and flooding issues;
- A Woodlot condition assessment and boundary staking site visit;
- A field assessment to determine the presence of Species of Conservation Concern (Eastern Wood-Pewee) and Species at Risk (Butternut, Barn Swallow, Chimney Swift, Little Brown Myotis and Northern Myotis) habitat and/or individuals within the study area; and

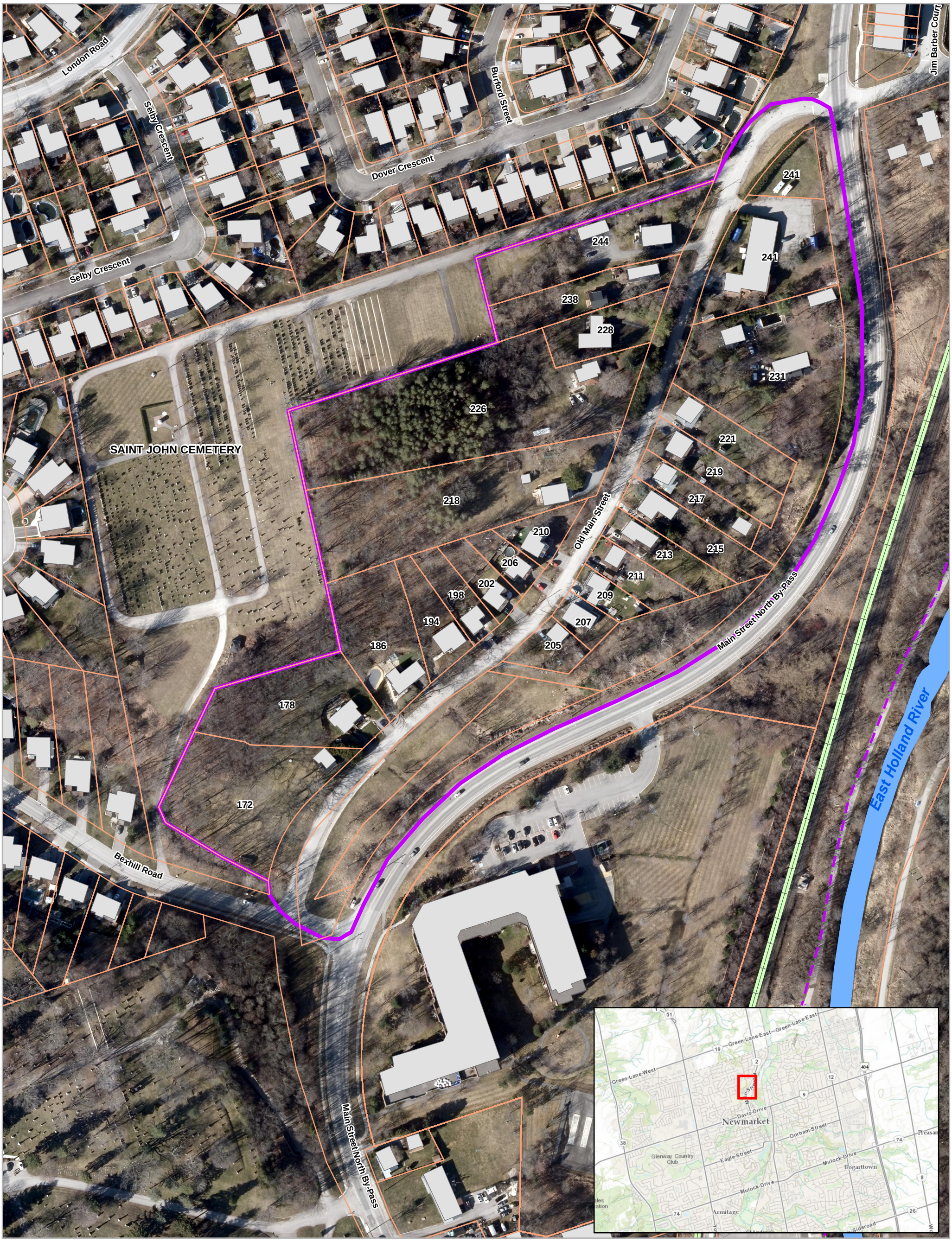
- Updated hydrologic and hydraulic modelling to confirm the extent of the regulatory floodplain of East Holland River (flood flow inputs to LSRCA's latest hydraulic model are based on hydrologic modelling completed in 2005).

Report Signatories

DILLON CONSULTING LIMITED

Paul Bumstead, B.E.S.
Partner

Figures



Town of Newmarket
Old Main St Tertiary Plan Background Study

Tertiary Plan Study Area
FIGURE 1

Go Transit Rail Line
Nokiidaa Bike Trail
Parcels
Tertiary Plan Study Area: OldMainSt
Building Footprint
Waterbody

DILLON CONSULTING

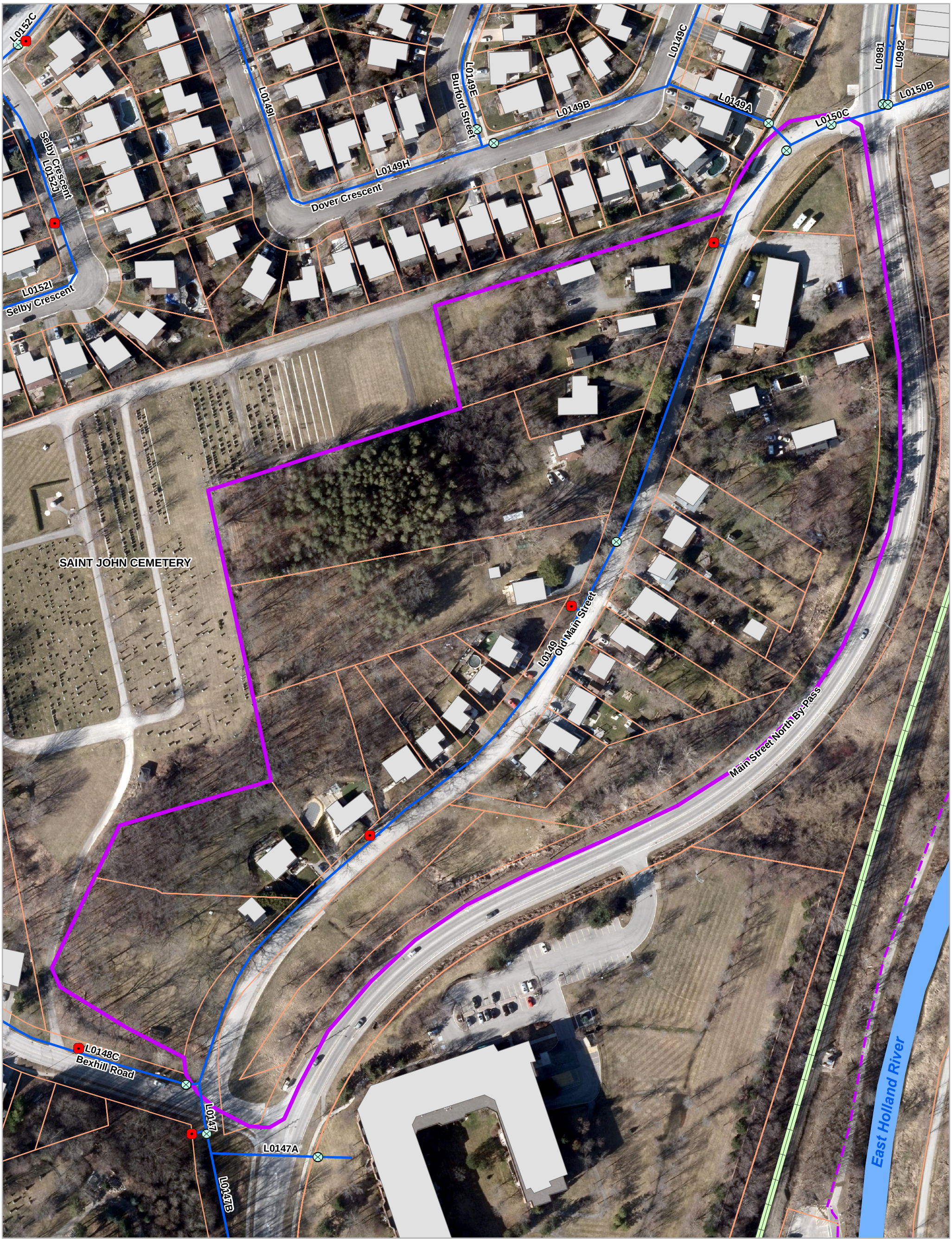
MAP DRAWING INFORMATION:
DATA PROVIDED BY TOWN OF NEWMARKET

MAP CREATED BY: SCM
MAP CHECKED BY: CC
MAP PROJECTION: NAD 1983 UTM Zone 17N

0 25 50 100
Meters

N W E S

PROJECT:17-6363 Date: 12/14/2017



Town of Newmarket
Old Main St Tertiary Plan Background Study

Water Distribution
FIGURE 3

Line Valves	Go Transit Rail Line	Tertiary Plan Study Area: OldMainSt
Hydrants	Nokiidaa Bike Trail	Building Footprint
Water Pipes	MPAC Parcels	Waterbody

DILLON CONSULTING

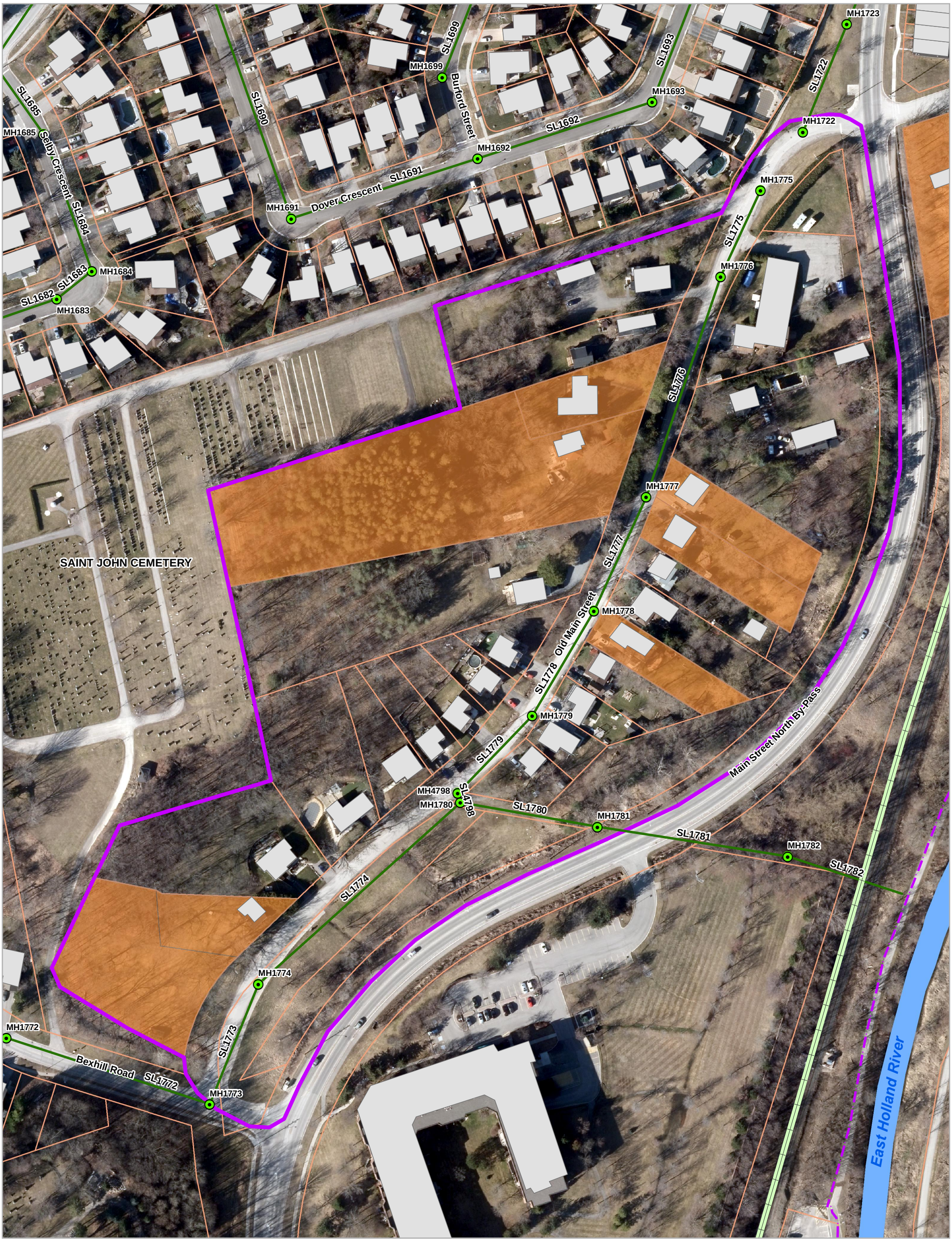
MAP DRAWING INFORMATION:
DATA PROVIDED BY TOWN OF NEWMARKET

MAP CREATED BY: SCM
MAP CHECKED BY: CC
MAP PROJECTION: NAD 1983 UTM Zone 17N

0 25 50 100
Meters

N W E S

PROJECT:17-6363 Date: 12/14/2017



Town of Newmarket
Old Main St Tertiary Plan Background Study

Wastewater Collection
FIGURE 4

Sanitary Sewer Manholes
Sanitary Sewer Pipes
Go Transit Rail Line
Nokiidaa Bike Trail
Parcels
MPAC Parcels
Tertiary Plan Study Area: OldMainSt
Septic Service Areas
Building Footprint
Waterbody

DILLON CONSULTING

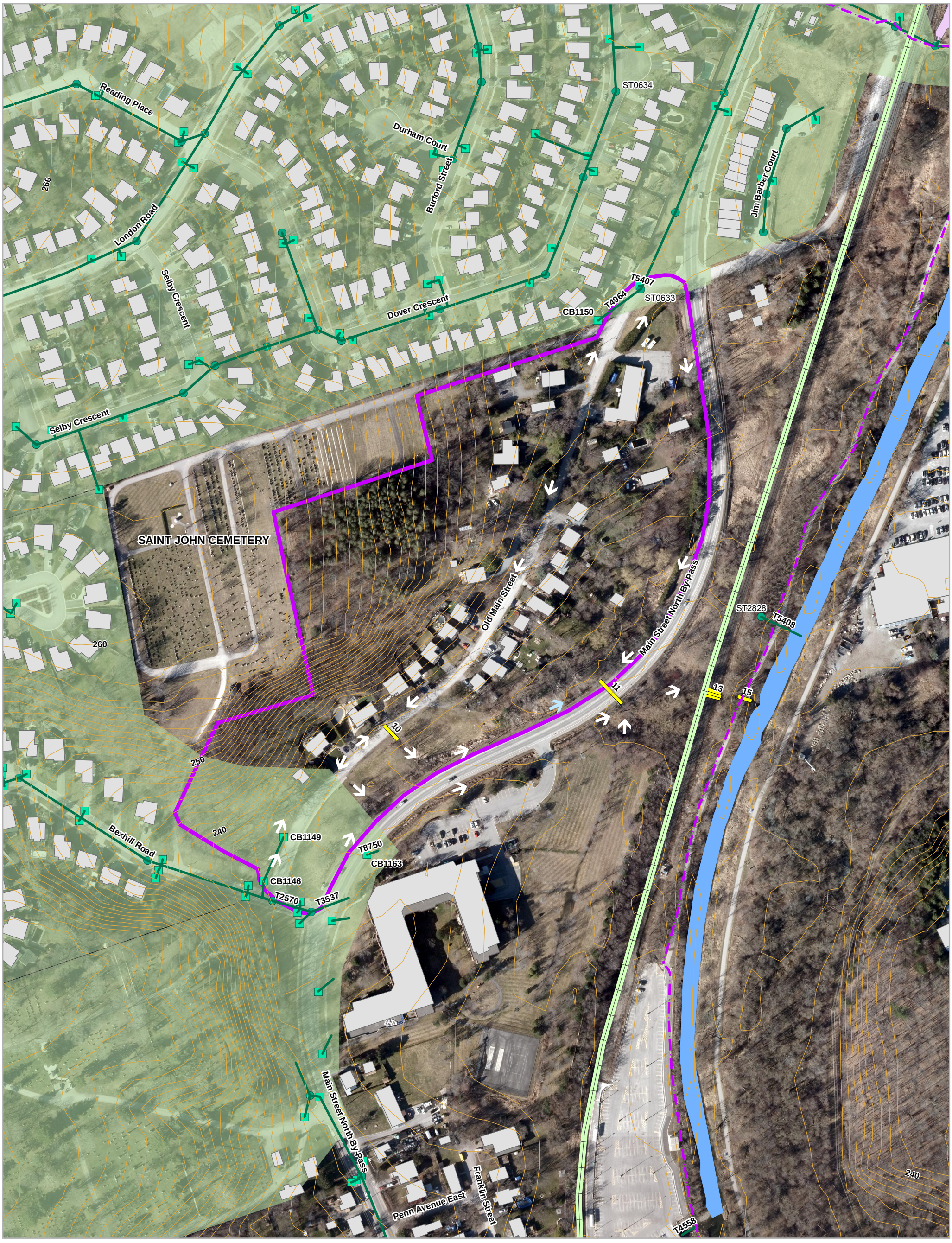
MAP DRAWING INFORMATION:
DATA PROVIDED BY TOWN OF NEWMARKET

MAP CREATED BY: SCM
MAP CHECKED BY: CC
MAP PROJECTION: NAD 1983 UTM Zone 17N

0 25 50 100
Meters

N W E S

PROJECT:17-6363 Date: 12/14/2017



Town of Newmarket
Old Main St Tertiary Plan Background Study

Existing Stormwater Management
FIGURE 5

- Storm Catchbasins
- Storm Manholes
- Storm Pipes
- Contours (1m interval)
- Culvert
- Go Transit Rail Line
- Nokiidaa Bike Trail
- Stormwater Catchment Areas
- Tertiary Plan Study Area: OldMainSt
- Building Footprint
- Waterbody
- Flow Direction

DILLON CONSULTING

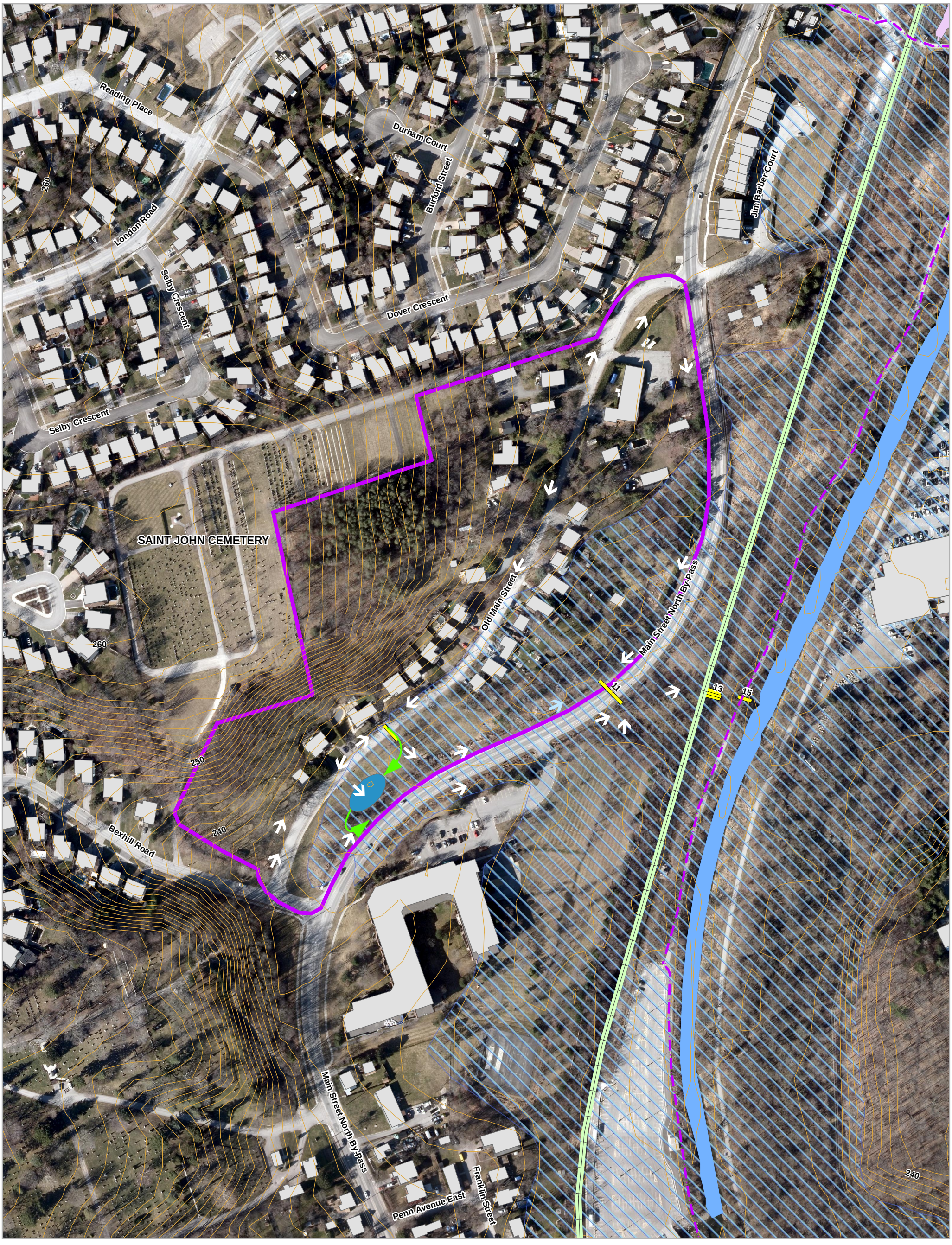
MAP DRAWING INFORMATION:
DATA PROVIDED BY TOWN OF NEWMARKET

MAP CREATED BY: SCM
MAP CHECKED BY: CC
MAP PROJECTION: NAD 1983 UTM Zone 17N

0 25 50 100
Meters

N W E S

PROJECT:17-6363 STATUS: DRAFT Date: 12/14/2017



Town of Newmarket
Old Main St Tertiary Plan Background Study

Proposed Stormwater Detention/Retention Storage Area
FIGURE 6

Contours (1m interval)
Culvert
Go Transit Rail Line
Nokiidaa Bike Trail
Tertiary Plan Study Area: OldMainSt
Building Footprint
Waterbody
Flow Direction
Conceptual Stormwater Detention/Retention Pond
Conceptual Flow through Detention/Retention Pond

DILLON CONSULTING

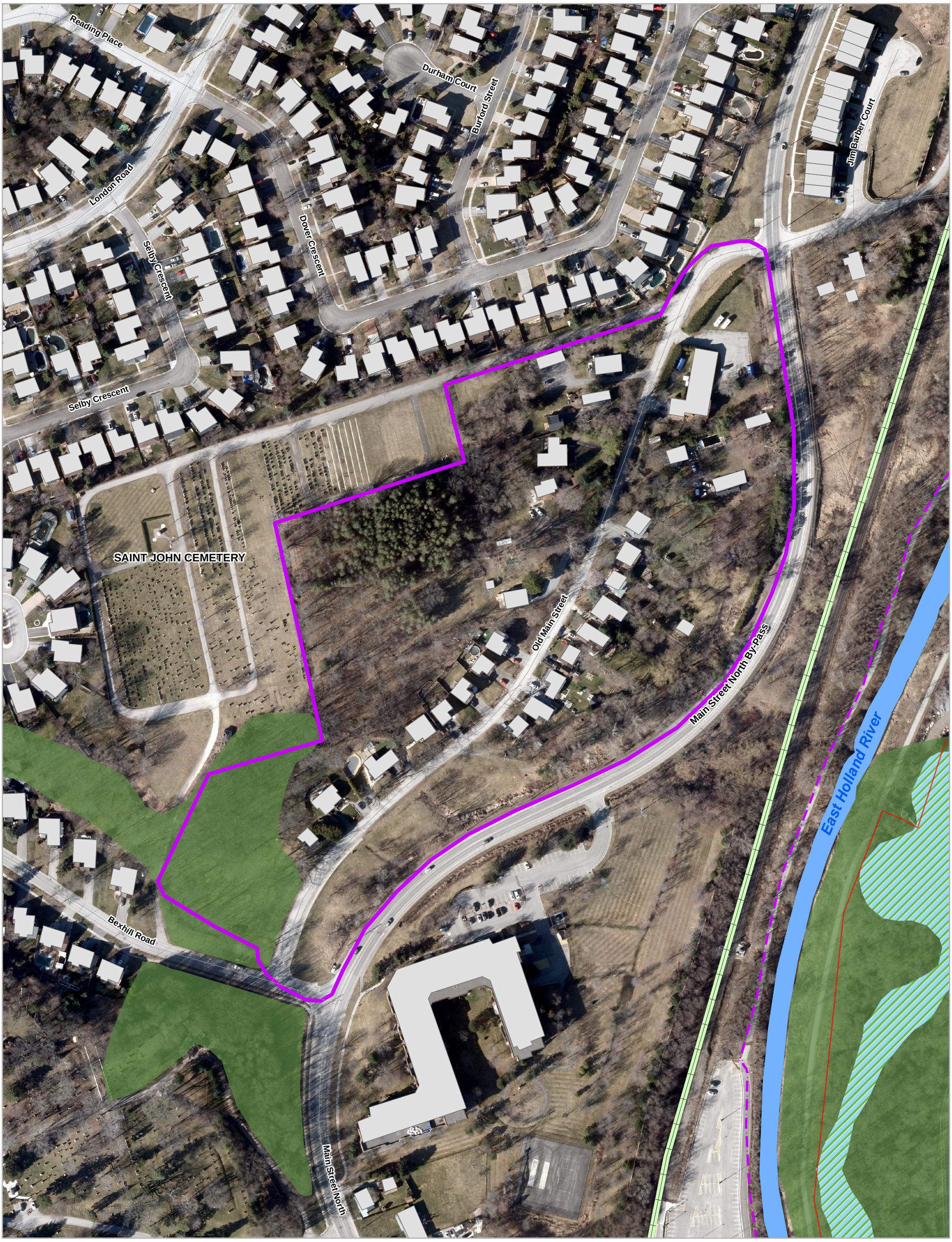
MAP DRAWING INFORMATION:
DATA PROVIDED BY TOWN OF NEWMARKET

MAP CREATED BY: SCM
MAP CHECKED BY: CC
MAP PROJECTION: NAD 1983 UTM Zone 17N

0 25 50 100
Meters

N W E S

PROJECT:17-6363 STATUS: DRAFT Date: 12/14/2017



Town of Newmarket
Old Main St Tertiary Plan Background Study

Terrestrial Natural Heritage Features
FIGURE 7

Go Transit Rail Line
Nokiidaa Bike Trail
Tertiary Plan Study Area: OldMainSt
Woodlot (Town of Newmarket Schedule B)
Significant Forest Area (York Region)
Wetland not Evaluated per OWES (LIO Data)
Building Footprint
Waterbody

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY TOWN OF NEWMARKET

MAP CREATED BY: SCM
MAP CHECKED BY: CC
MAP PROJECTION: NAD 1983 UTM Zone 17N

0 25 50 100
Meters

N W E S

PROJECT:17-6363 Date: 12/14/2017

Reading Place
Durham Court
Burford Street
Jim Barber Court
London Road
Selby Crescent
Dover Crescent
Selby Crescent
SAINT JOHN CEMETERY
Old Main Street
Main Street North By-Pass
East Holland River
Bexhill Road
Main Street North By-Pass
Penn Avenue East
Franklin Street

Town of Newmarket
Old Main St Tertiary Plan Background Study

East Holland River Regulatory Floodplain
FIGURE 8

Go Transit Rail Line
Nokiidaa Bike Trail
30m Buffer of Floodplain
LSRCA Floodplain
MPAC Parcels
Tertiary Plan Study Area: OldMainSt
Building Footprint
Waterbody

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY TOWN OF NEWMARKET

MAP CREATED BY: SCM
MAP CHECKED BY: CC
MAP PROJECTION: NAD 1983 UTM Zone 17N

0 25 50 100
Meters

N W E S

PROJECT:17-6363 Date: 12/14/2017

Appendix A

Traffic Count Data

Ontario Traffic Inc

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 8:00:00
To: 9:00:00

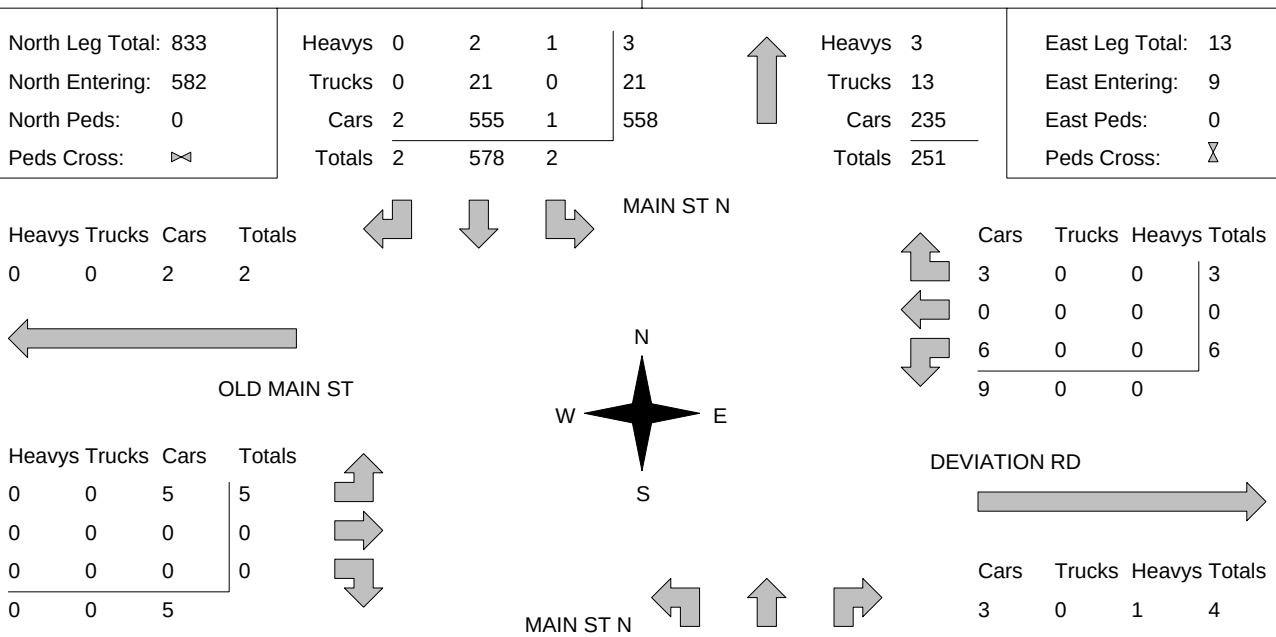
Municipality: Newmarket
Site #: 0000000680
Intersection: MAIN ST N & OLD MAIN ST
TFR File #: 2
Count date: 21-Nov-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: MAIN ST N runs N/S



Comments

Ontario Traffic Inc

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:30:00
To: 17:30:00

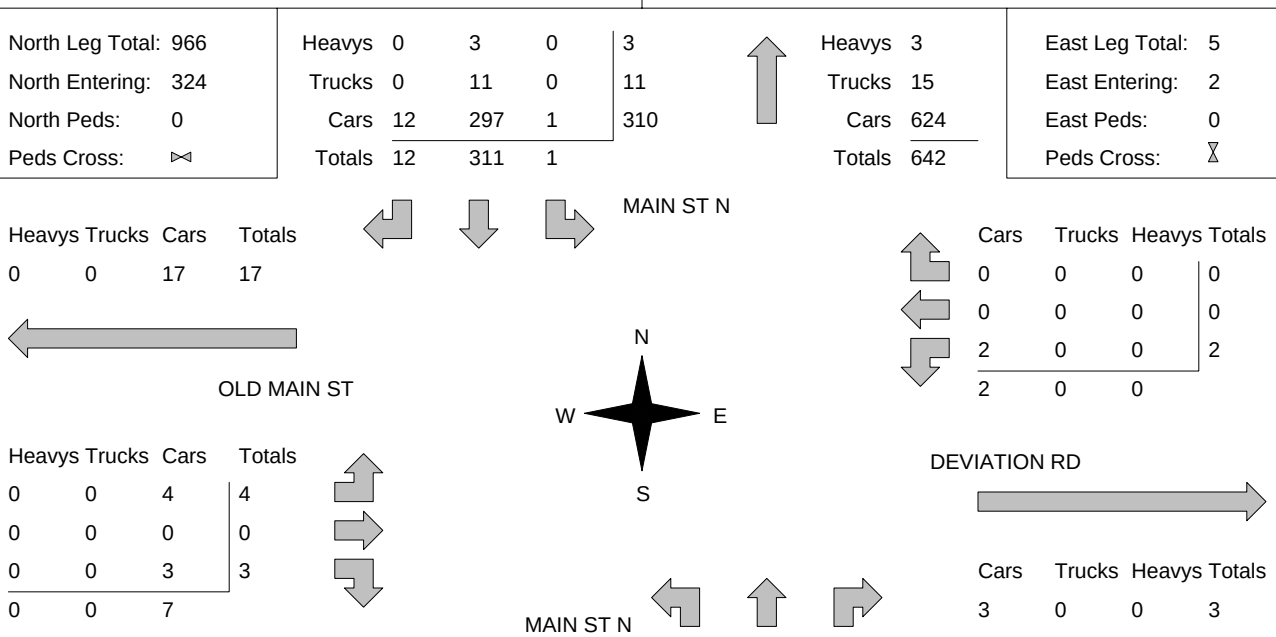
Municipality: Newmarket
Site #: 0000000680
Intersection: MAIN ST N & OLD MAIN ST
TFR File #: 2
Count date: 21-Nov-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: MAIN ST N runs N/S



Comments

Ontario Traffic Inc

Total Count Diagram

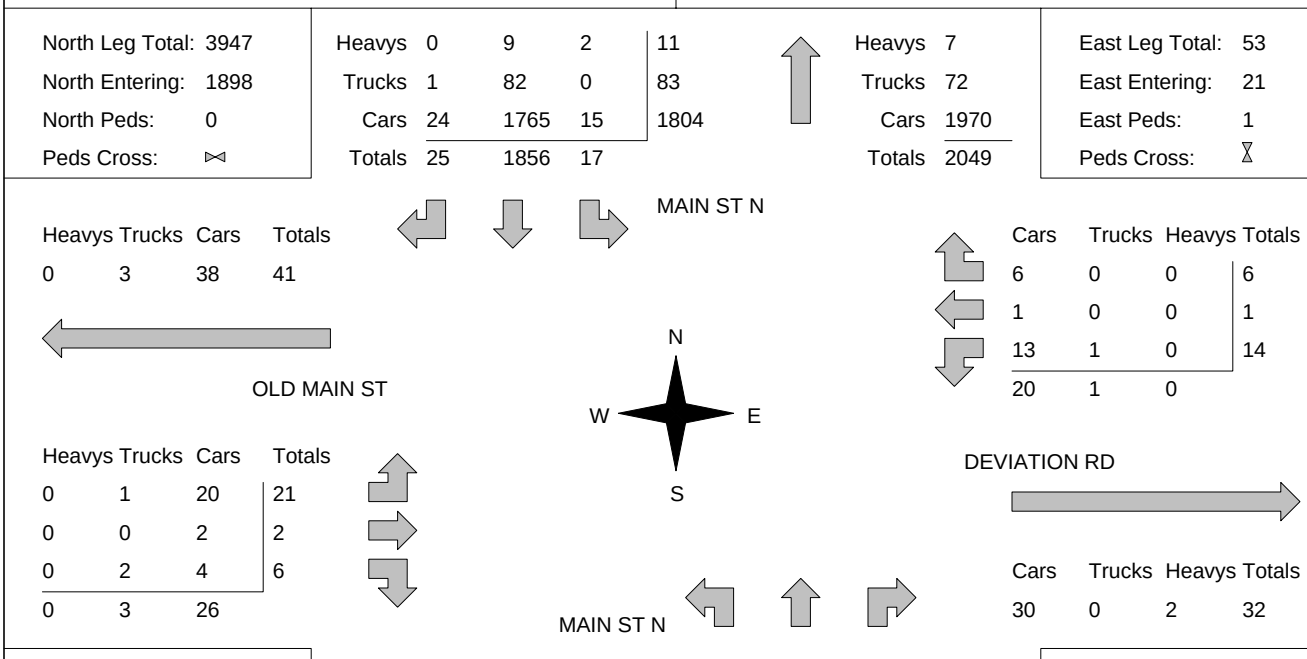
Municipality: Newmarket
Site #: 0000000680
Intersection: MAIN ST N & OLD MAIN ST
TFR File #: 2
Count date: 21-Nov-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: MAIN ST N runs N/S



Comments

Ontario Traffic Inc
Traffic Count Summary

Intersection: MAIN ST N & OLD MAIN ST | **Count Date:** 21-Nov-16 | **Municipality:** Newmarket

North Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches
7:00:00	0	0	0	0	0	0
8:00:00	3	330	1	334	0	464
9:00:00	2	578	2	582	0	827
15:00:00	0	6	0	6	0	8
16:00:00	8	326	4	338	0	829
17:00:00	1	333	8	342	0	969
18:00:00	3	283	10	296	0	851
Totals:	17	1856	25	1898	0	3948

South Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0
8:00:00	2	127	1	130	0
9:00:00	0	243	2	245	0
15:00:00	0	2	0	2	0
16:00:00	3	485	3	491	0
17:00:00	4	620	3	627	0
18:00:00	6	545	4	555	1
	15	2022	13	2050	1

East Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches
7:00:00	0	0	0	0	0	0
8:00:00	4	0	1	5	0	10
9:00:00	6	0	3	9	0	14
15:00:00	0	0	0	0	0	0
16:00:00	2	1	1	4	0	11
17:00:00	0	0	0	0	0	5
18:00:00	2	0	1	3	1	10
Totals:	14	1	6	21	1	50

West Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0
8:00:00	2	2	1	5	0
9:00:00	5	0	0	5	0
15:00:00	0	0	0	0	0
16:00:00	7	0	0	7	0
17:00:00	2	0	3	5	0
18:00:00	5	0	2	7	0
	21	2	6	29	0

Calculated Values for Traffic Crossing Major Street

Hours Ending:	7:00	8:00	9:00	15:00	16:00	17:00	18:00	18:00
Crossing Values:	0	8	11	0	10	2	8	8

Ontario Traffic Inc

Count Date: 21-Nov-16 Site #: 0000000680

Interval Time	Passenger Cars - North Approach						Trucks - North Approach						Heavys - North Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		North Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	3	3	10	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	3	0	61	51	0	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0
7:45:00	3	0	169	108	0	0	0	0	15	10	1	1	0	0	0	0	0	0	0	0
8:00:00	3	0	312	143	0	0	0	0	18	3	1	0	0	0	0	0	0	0	0	0
8:15:00	3	0	420	108	0	0	0	0	24	6	1	0	0	0	0	0	0	0	0	0
8:30:00	4	1	558	138	0	0	0	0	25	1	1	0	0	0	1	1	0	0	0	0
8:45:00	4	0	711	153	1	1	0	0	33	8	1	0	1	1	2	1	0	0	0	0
9:00:00	4	0	867	156	2	1	0	0	39	6	1	0	1	0	2	0	0	0	0	0
9:01:09	4	0	867	0	2	0	0	0	39	0	1	0	1	0	2	0	0	0	0	0
15:00:00	4	0	873	6	2	0	0	0	39	0	1	0	1	0	2	0	0	0	0	0
15:15:00	7	3	948	75	3	1	0	0	41	2	1	0	1	0	2	0	0	0	0	0
15:30:00	11	4	1019	71	4	1	0	0	47	6	1	0	1	0	2	0	0	0	0	0
15:45:00	12	1	1084	65	5	1	0	0	50	3	1	0	1	0	4	2	0	0	0	0
16:00:00	12	0	1177	93	6	1	0	0	58	8	1	0	1	0	5	1	0	0	0	0
16:15:00	12	0	1271	94	8	2	0	0	61	3	1	0	2	1	6	1	0	0	0	0
16:30:00	12	0	1344	73	9	1	0	0	66	5	1	0	2	0	6	0	0	0	0	0
16:45:00	12	0	1422	78	10	1	0	0	70	4	1	0	2	0	8	2	0	0	0	0
17:00:00	12	0	1492	70	14	4	0	0	72	2	1	0	2	0	9	1	0	0	0	0
17:15:00	13	1	1565	73	19	5	0	0	75	3	1	0	2	0	9	0	0	0	0	0
17:30:00	13	0	1641	76	21	2	0	0	77	2	1	0	2	0	9	0	0	0	0	0
17:45:00	14	1	1714	73	23	2	0	0	80	3	1	0	2	0	9	0	0	0	0	0
18:00:00	15	1	1765	51	24	1	0	0	82	2	1	0	2	0	9	0	0	0	0	0
18:05:44	15	0	1765	0	24	0	0	0	82	0	1	0	2	0	9	0	0	0	0	0

Ontario Traffic Inc

Count Date: 21-Nov-16 Site #: 0000000680

Interval Time	Passenger Cars - East Approach						Trucks - East Approach						Heavys - East Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		East Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45:00	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00:00	4	3	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15:00	5	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30:00	5	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45:00	7	2	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00:00	10	3	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:01:09	10	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:00:00	10	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:15:00	10	0	0	0	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:30:00	10	0	0	0	5	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
15:45:00	10	0	0	0	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
16:00:00	11	1	1	1	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15:00	11	0	1	0	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30:00	11	0	1	0	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45:00	11	0	1	0	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
17:00:00	11	0	1	0	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15:00	13	2	1	0	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30:00	13	0	1	0	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45:00	13	0	1	0	6	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1
18:00:00	13	0	1	0	6	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
18:05:44	13	0	1	0	6	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0

Ontario Traffic Inc

Count Date: 21-Nov-16 Site #: 0000000680

Interval Time	Passenger Cars - South Approach						Trucks - South Approach						Heavys - South Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		South Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	2	2	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	2	0	34	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45:00	2	0	76	42	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0
8:00:00	2	0	122	46	1	1	0	0	5	3	0	0	0	0	0	0	0	0	0	0
8:15:00	2	0	173	51	1	0	0	0	7	2	0	0	0	0	2	2	0	0	0	0
8:30:00	2	0	233	60	1	0	0	0	10	3	0	0	0	0	3	1	0	0	0	0
8:45:00	2	0	300	67	2	1	0	0	13	3	0	0	0	0	3	0	0	0	0	0
9:00:00	2	0	349	49	3	1	0	0	18	5	0	0	0	0	3	0	0	0	0	0
9:01:09	2	0	349	0	3	0	0	0	18	0	0	0	0	0	3	0	0	0	0	0
15:00:00	2	0	351	2	3	0	0	0	18	0	0	0	0	0	3	0	0	0	0	0
15:15:00	2	0	436	85	4	1	0	0	27	9	0	0	0	0	3	0	0	0	0	0
15:30:00	3	1	576	140	4	0	2	2	31	4	0	0	0	0	3	0	0	0	0	0
15:45:00	3	0	709	133	4	0	2	0	34	3	0	0	0	0	3	0	0	0	0	0
16:00:00	3	0	814	105	6	2	2	0	39	5	0	0	0	0	4	1	0	0	0	0
16:15:00	5	2	962	148	7	1	2	0	43	4	0	0	0	0	4	0	0	0	0	0
16:30:00	5	0	1096	134	8	1	2	0	49	6	0	0	0	0	4	0	0	0	0	0
16:45:00	5	0	1245	149	9	1	2	0	54	5	0	0	0	0	4	0	0	0	0	0
17:00:00	7	2	1413	168	9	0	2	0	57	3	0	0	0	0	7	3	0	0	0	0
17:15:00	9	2	1561	148	9	0	2	0	60	3	0	0	0	0	7	0	0	0	0	0
17:30:00	10	1	1716	155	10	1	2	0	64	4	0	0	0	0	7	0	0	0	1	1
17:45:00	12	2	1833	117	11	1	2	0	67	3	0	0	0	0	7	0	0	0	1	0
18:00:00	13	1	1944	111	13	2	2	0	71	4	0	0	0	0	7	0	0	0	1	0
18:05:44	13	0	1944	0	13	0	2	0	71	0	0	0	0	0	7	0	0	0	1	0

Ontario Traffic Inc

Count Date: 21-Nov-16 Site #: 0000000680

Interval Time	Passenger Cars - West Approach						Trucks - West Approach						Heavys - West Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		West Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	1	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45:00	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00:00	2	1	2	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
8:15:00	2	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
8:30:00	2	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
8:45:00	4	2	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
9:00:00	7	3	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
9:01:09	7	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
15:00:00	7	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
15:15:00	8	1	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
15:30:00	9	1	2	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0
15:45:00	10	1	2	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
16:00:00	13	3	2	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
16:15:00	13	0	2	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
16:30:00	14	1	2	0	1	1	1	0	0	0	2	1	0	0	0	0	0	0	0	0
16:45:00	14	0	2	0	1	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0
17:00:00	15	1	2	0	2	1	1	0	0	0	2	0	0	0	0	0	0	0	0	0
17:15:00	16	1	2	0	3	1	1	0	0	0	2	0	0	0	0	0	0	0	0	0
17:30:00	18	2	2	0	4	1	1	0	0	0	2	0	0	0	0	0	0	0	0	0
17:45:00	20	2	2	0	4	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0
18:00:00	20	0	2	0	4	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0
18:05:44	20	0	2	0	4	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0

Ontario Traffic Inc

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 7:30:00
To: 8:30:00

Municipality: Newmarket
Site #: 0000000681
Intersection: OLD MAIN ST & BEXHILL RD
TFR File #: 3
Count date: 7-Nov-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

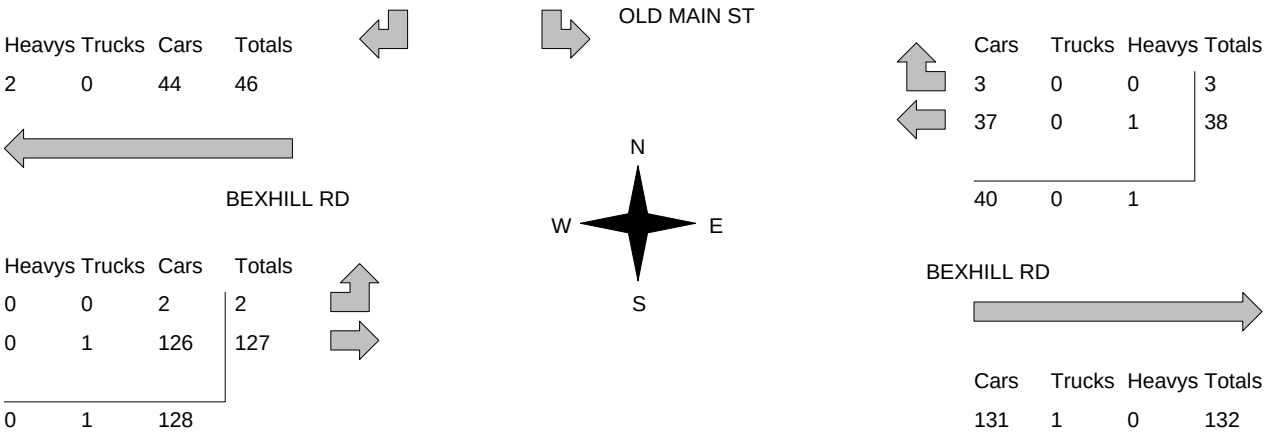
Major Road: OLD MAIN ST runs N/S

North Leg Total: 18
North Entering: 13
North Peds: 0
Peds Cross: ⋈

Heavys	1	0	1
Trucks	0	0	0
Cars	7	5	12
Totals	8	5	

Heavys	0
Trucks	0
Cars	5
Totals	5

East Leg Total: 173
East Entering: 41
East Peds: 0
Peds Cross: ⧖



Peds Cross: ⧖
West Peds: 0
West Entering: 129
West Leg Total: 175

Comments

Ontario Traffic Inc

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:15:00
To: 17:15:00

Municipality: Newmarket
Site #: 0000000681
Intersection: OLD MAIN ST & BEXHILL RD
TFR File #: 3
Count date: 7-Nov-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: OLD MAIN ST runs N/S

North Leg Total: 21
North Entering: 9
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0
Trucks	0	0	0
Cars	1	8	9
Totals	1	8	

Heavys	0
Trucks	0
Cars	12
Totals	12

East Leg Total: 213
East Entering: 145
East Peds: 0
Peds Cross: ⧖

OLD MAIN ST

Heavys	Trucks	Cars	Totals
0	1	137	138

BEXHILL RD

Heavys	Trucks	Cars	Totals
0	0	4	4
1	4	55	60
1	4	59	

N
W E
S

Cars	Trucks	Heavys	Totals
8	0	0	8
136	1	0	137
144	1	0	

BEXHILL RD

Cars	Trucks	Heavys	Totals
63	4	1	68

Peds Cross: ⧖
West Peds: 0
West Entering: 64
West Leg Total: 202

Comments

Ontario Traffic Inc

Total Count Diagram

Municipality: Newmarket
Site #: 0000000681
Intersection: OLD MAIN ST & BEXHILL RD
TFR File #: 3
Count date: 7-Nov-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: OLD MAIN ST runs N/S

North Leg Total: 84
North Entering: 45
North Peds: 0
Peds Cross: ⋈

Heavys	1	0	1
Trucks	0	0	0
Cars	16	28	44
Totals	17	28	

Heavys	0
Trucks	0
Cars	39
Totals	39

East Leg Total: 842
East Entering: 436
East Peds: 0
Peds Cross: ⧖

OLD MAIN ST

Heavys	Trucks	Cars	Totals
5	7	416	428

BEXHILL RD

Heavys	Trucks	Cars	Totals
0	0	14	14
5	7	366	378
5	7	380	

N
W E
S

Cars	Trucks	Heavys	Totals
25	0	0	25
400	7	4	411
425	7	4	

BEXHILL RD

Cars	Trucks	Heavys	Totals
394	7	5	406

Peds Cross: ⧖
West Peds: 0
West Entering: 392
West Leg Total: 820

Comments

Ontario Traffic Inc
Traffic Count Summary

Intersection: OLD MAIN ST & BEXHILL RD | **Count Date:** 7-Nov-16 | **Municipality:** Newmarket

North Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches
7:00:00	0	0	0	0	0	0
8:00:00	2	0	2	4	0	4
9:00:00	5	0	8	13	0	13
15:00:00	0	0	0	0	0	0
16:00:00	7	0	4	11	0	11
17:00:00	7	0	1	8	0	8
18:00:00	7	0	2	9	0	9
Totals:	28	0	17	45	0	45

South Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0
8:00:00	0	0	0	0	0
9:00:00	0	0	0	0	0
15:00:00	0	0	0	0	0
16:00:00	0	0	0	0	0
17:00:00	0	0	0	0	0
18:00:00	0	0	0	0	0
	0	0	0	0	0

East Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches
7:00:00	0	0	0	0	0	0
8:00:00	0	20	2	22	0	119
9:00:00	0	39	2	41	0	156
15:00:00	0	0	0	0	0	0
16:00:00	0	87	5	92	0	148
17:00:00	0	142	8	150	0	209
18:00:00	0	123	8	131	0	196
Totals:	0	411	25	436	0	828

West Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0
8:00:00	2	95	0	97	0
9:00:00	2	113	0	115	0
15:00:00	0	0	0	0	0
16:00:00	4	52	0	56	0
17:00:00	4	55	0	59	0
18:00:00	2	63	0	65	0
	14	378	0	392	0

Calculated Values for Traffic Crossing Major Street

Hours Ending:	7:00	8:00	9:00	15:00	16:00	17:00	18:00	18:00
Crossing Values:	0	97	115	0	91	146	125	125

Ontario Traffic Inc

Count Date: 7-Nov-16 **Site #: 0000000681**

Interval Time	Passenger Cars - North Approach						Trucks - North Approach						Heavys - North Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		North Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45:00	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
8:00:00	2	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
8:15:00	4	2	0	0	2	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
8:30:00	7	3	0	0	7	5	0	0	0	0	0	0	0	0	0	0	1	0	0	0
8:45:00	7	0	0	0	9	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0
9:00:00	7	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
9:00:17	7	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
15:00:00	7	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
15:15:00	8	1	0	0	10	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
15:30:00	10	2	0	0	12	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0
15:45:00	13	3	0	0	12	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
16:00:00	14	1	0	0	13	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
16:15:00	15	1	0	0	13	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
16:30:00	17	2	0	0	13	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
16:45:00	18	1	0	0	13	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
17:00:00	21	3	0	0	14	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
17:15:00	23	2	0	0	14	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
17:30:00	25	2	0	0	16	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0
17:45:00	26	1	0	0	16	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
18:00:00	28	2	0	0	16	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
18:00:32	28	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0

Ontario Traffic Inc

Count Date: 7-Nov-16 **Site #: 0000000681**

Interval Time	Passenger Cars - East Approach						Trucks - East Approach						Heavys - East Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		East Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	0	0	2	2	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
7:45:00	0	0	9	7	1	1	0	0	0	0	0	0	0	0	2	1	0	0	0	0
8:00:00	0	0	18	9	2	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0
8:15:00	0	0	26	8	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
8:30:00	0	0	39	13	3	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0
8:45:00	0	0	46	7	3	0	0	0	1	1	0	0	0	0	2	0	0	0	0	0
9:00:00	0	0	55	9	4	1	0	0	2	1	0	0	0	0	2	0	0	0	0	0
9:00:17	0	0	55	0	4	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0
15:00:00	0	0	55	0	4	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0
15:15:00	0	0	77	22	4	0	0	0	2	0	0	0	0	0	3	1	0	0	0	0
15:30:00	0	0	99	22	6	2	0	0	2	0	0	0	0	0	3	0	0	0	0	0
15:45:00	0	0	120	21	6	0	0	0	3	1	0	0	0	0	4	1	0	0	0	0
16:00:00	0	0	138	18	9	3	0	0	4	1	0	0	0	0	4	0	0	0	0	0
16:15:00	0	0	171	33	11	2	0	0	5	1	0	0	0	0	4	0	0	0	0	0
16:30:00	0	0	211	40	12	1	0	0	6	1	0	0	0	0	4	0	0	0	0	0
16:45:00	0	0	244	33	14	2	0	0	6	0	0	0	0	0	4	0	0	0	0	0
17:00:00	0	0	278	34	17	3	0	0	6	0	0	0	0	0	4	0	0	0	0	0
17:15:00	0	0	307	29	19	2	0	0	6	0	0	0	0	0	4	0	0	0	0	0
17:30:00	0	0	336	29	22	3	0	0	7	1	0	0	0	0	4	0	0	0	0	0
17:45:00	0	0	366	30	25	3	0	0	7	0	0	0	0	0	4	0	0	0	0	0
18:00:00	0	0	400	34	25	0	0	0	7	0	0	0	0	0	4	0	0	0	0	0
18:00:32	0	0	400	0	25	0	0	0	7	0	0	0	0	0	4	0	0	0	0	0

Ontario Traffic Inc

Count Date: 7-Nov-16 **Site #: 0000000681**

Interval Time	Passenger Cars - South Approach						Trucks - South Approach						Heavys - South Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		South Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00:17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:00:32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Ontario Traffic Inc

Count Date: 7-Nov-16 **Site #: 0000000681**

Interval Time	Passenger Cars - West Approach						Trucks - West Approach						Heavys - West Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		West Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	1	1	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	1	0	24	16	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0
7:45:00	2	1	54	30	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
8:00:00	2	0	92	38	0	0	0	0	1	1	0	0	0	0	2	0	0	0	0	0
8:15:00	2	0	123	31	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0
8:30:00	3	1	150	27	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0
8:45:00	3	0	175	25	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0
9:00:00	4	1	204	29	0	0	0	0	1	0	0	0	0	0	3	1	0	0	0	0
9:00:17	4	0	204	0	0	0	0	0	1	0	0	0	0	0	3	0	0	0	0	0
15:00:00	4	0	204	0	0	0	0	0	1	0	0	0	0	0	3	0	0	0	0	0
15:15:00	4	0	214	10	0	0	0	0	1	0	0	0	0	0	3	0	0	0	0	0
15:30:00	4	0	225	11	0	0	0	0	2	1	0	0	0	0	4	1	0	0	0	0
15:45:00	7	3	246	21	0	0	0	0	2	0	0	0	0	0	4	0	0	0	0	0
16:00:00	8	1	254	8	0	0	0	0	2	0	0	0	0	0	4	0	0	0	0	0
16:15:00	8	0	263	9	0	0	0	0	2	0	0	0	0	0	4	0	0	0	0	0
16:30:00	10	2	279	16	0	0	0	0	2	0	0	0	0	0	5	1	0	0	0	0
16:45:00	11	1	292	13	0	0	0	0	3	1	0	0	0	0	5	0	0	0	0	0
17:00:00	12	1	305	13	0	0	0	0	5	2	0	0	0	0	5	0	0	0	0	0
17:15:00	12	0	318	13	0	0	0	0	6	1	0	0	0	0	5	0	0	0	0	0
17:30:00	12	0	332	14	0	0	0	0	6	0	0	0	0	0	5	0	0	0	0	0
17:45:00	13	1	350	18	0	0	0	0	7	1	0	0	0	0	5	0	0	0	0	0
18:00:00	14	1	366	16	0	0	0	0	7	0	0	0	0	0	5	0	0	0	0	0
18:00:32	14	0	366	0	0	0	0	0	7	0	0	0	0	0	5	0	0	0	0	0

Appendix B

Synchro Analysis Worksheets

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	0	0	6	0	3	0	243	2	2	578	2
Future Volume (vph)	5	0	0	6	0	3	0	243	2	2	578	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.959			0.999				
Flt Protected		0.950			0.966							
Satd. Flow (prot)	0	1825	0	0	1780	0	0	1794	0	0	1848	0
Flt Permitted		0.950			0.966							
Satd. Flow (perm)	0	1825	0	0	1780	0	0	1794	0	0	1848	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		592.4			185.1			548.3			205.3	
Travel Time (s)		44.4			13.9			41.1			15.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	7%	0%	0%	4%	0%
Adj. Flow (vph)	6	0	0	7	0	3	0	270	2	2	642	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	6	0	0	10	0	0	272	0	0	646	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 42.1%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	0	0	6	0	3	0	243	2	2	578	2
Future Volume (Veh/h)	5	0	0	6	0	3	0	243	2	2	578	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	0	0	7	0	3	0	270	2	2	642	2
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	921	919	643	918	919	271	644			272		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	921	919	643	918	919	271	644			272		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	100	97	100	100	100			100		
cM capacity (veh/h)	252	273	477	254	273	773	951			1303		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	6	10	272	646
Volume Left	6	7	0	2
Volume Right	0	3	2	2
cSH	252	318	951	1303
Volume to Capacity	0.02	0.03	0.00	0.00
Queue Length 95th (m)	0.6	0.7	0.0	0.0
Control Delay (s)	19.6	16.7	0.0	0.0
Lane LOS	C	C		A
Approach Delay (s)	19.6	16.7	0.0	0.0
Approach LOS	C	C		

Intersection Summary				
Average Delay	0.3			
Intersection Capacity Utilization	42.1%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	2	127	38	3	5	8
Future Volume (vph)	2	127	38	3	5	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	30.0			0.0	0.0	0.0
Storage Lanes	0			0	1	0
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.991		0.919	
Flt Protected		0.999			0.980	
Satd. Flow (prot)	0	1900	1852	0	1614	0
Flt Permitted		0.999			0.980	
Satd. Flow (perm)	0	1900	1852	0	1614	0
Link Speed (k/h)		60	60		48	
Link Distance (m)		134.4	37.6		592.4	
Travel Time (s)		8.1	2.3		44.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	1%	3%	0%	0%	12%
Adj. Flow (vph)	2	141	42	3	6	9
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	143	45	0	15	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.7	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 18.3%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	127	38	3	5	8
Future Volume (Veh/h)	2	127	38	3	5	8
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	2	141	42	3	6	9
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	45				188	44
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	45				188	44
tC, single (s)	4.1				6.4	6.3
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.4
p0 queue free %	100				99	99
cM capacity (veh/h)	1576				804	999

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	143	45	15
Volume Left	2	0	6
Volume Right	0	3	9
cSH	1576	1700	911
Volume to Capacity	0.00	0.03	0.02
Queue Length 95th (m)	0.0	0.0	0.4
Control Delay (s)	0.1	0.0	9.0
Lane LOS	A		A
Approach Delay (s)	0.1	0.0	9.0
Approach LOS			A

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	18.3%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	0	3	2	0	0	5	638	2	1	311	12
Future Volume (vph)	4	0	3	2	0	0	5	638	2	1	311	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.942									0.995	
Flt Protected		0.972			0.950							
Satd. Flow (prot)	0	1759	0	0	1825	0	0	1848	0	0	1791	0
Flt Permitted		0.972			0.950							
Satd. Flow (perm)	0	1759	0	0	1825	0	0	1848	0	0	1791	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		592.4			185.1			548.3			205.3	
Travel Time (s)		44.4			13.9			41.1			15.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	7%	0%
Adj. Flow (vph)	4	0	3	2	0	0	6	709	2	1	346	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	7	0	0	2	0	0	717	0	0	360	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 47.3%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	0	3	2	0	0	5	638	2	1	311	12
Future Volume (Veh/h)	4	0	3	2	0	0	5	638	2	1	311	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	4	0	3	2	0	0	6	709	2	1	346	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	1076	1078	352	1080	1083	710	359			711		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1076	1078	352	1080	1083	710	359			711		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	100	99	100	100	100			100		
cM capacity (veh/h)	198	219	696	196	218	437	1211			898		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	7	2	717	360
Volume Left	4	2	6	1
Volume Right	3	0	2	13
cSH	285	196	1211	898
Volume to Capacity	0.02	0.01	0.00	0.00
Queue Length 95th (m)	0.6	0.2	0.1	0.0
Control Delay (s)	17.9	23.6	0.1	0.0
Lane LOS	C	C	A	A
Approach Delay (s)	17.9	23.6	0.1	0.0
Approach LOS	C	C		

Intersection Summary				
Average Delay	0.3			
Intersection Capacity Utilization	47.3%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	4	60	137	8	8	1
Future Volume (vph)	4	60	137	8	8	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	30.0			0.0	0.0	0.0
Storage Lanes	0			0	1	0
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.992		0.986	
Flt Protected		0.997			0.957	
Satd. Flow (prot)	0	1862	1888	0	1813	0
Flt Permitted		0.997			0.957	
Satd. Flow (perm)	0	1862	1888	0	1813	0
Link Speed (k/h)		60	60		48	
Link Distance (m)		134.4	37.6		592.4	
Travel Time (s)		8.1	2.3		44.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	1%	3%	1%	0%	0%	0%
Adj. Flow (vph)	4	67	152	9	9	1
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	71	161	0	10	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.7	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		1.6	1.6		1.6	
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24			14	24	14
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	17.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	4	60	137	8	8	1
Future Volume (Veh/h)	4	60	137	8	8	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	4	67	152	9	9	1
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	161				232	156
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	161				232	156
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1424				759	894

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	71	161	10
Volume Left	4	0	9
Volume Right	0	9	1
cSH	1424	1700	771
Volume to Capacity	0.00	0.09	0.01
Queue Length 95th (m)	0.1	0.0	0.3
Control Delay (s)	0.4	0.0	9.7
Lane LOS	A		A
Approach Delay (s)	0.4	0.0	9.7
Approach LOS			A

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	17.7%	ICU Level of Service	A
Analysis Period (min)	15		

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