Chapter 5

Infrastructure Located in Aurora and Newmarket

The Regional Municipality of York
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5.1 Overview

The York Durham Sewage System (YDSS) currently services eight of the nine local municipalities in the Regional Municipality of York (York Region) through conveyance infrastructure, directing most of the wastewater flows to Duffin Creek Water Pollution Control Plant (WPCP), with a small portion diverted to the Regional Municipality of Peel (Peel Region) wastewater system. The YDSS also services the City of Pickering and the Town of Ajax in the Regional Municipality of Durham (Durham Region). The YDSS conveys wastewater from Newmarket, Aurora, King City and portions of East Gwillimbury, Markham and Richmond Hill to the Southeast Collector and ultimately to the Duffin Creek WPCP.

The plan to enhance the Aurora and Newmarket areas involves several key steps. These include upgrading current sewage pumping stations (SPS) to handle higher capacities in line with projected demands. Additionally, there's a plan to twin the Aurora SPS inlet Gravity Sewer that connects to the existing Aurora SPS from the north, providing better flow and inline storage. The plan also involves the construction of two new, larger pumping stations and forcemains that connect to the new gravity trunk sewer along the Leslie Street corridor. This will help alleviate the strain on the current pumping stations in both Newmarket and Aurora.

This chapter presents the proposed conceptual designs and anticipated environmental impacts associated with project construction servicing the Aurora and Newmarket area. It considers various aspects of the environment, including natural, cultural, social and built and existing environments. The general locations for the projects included under this chapter are shown in Figure 5.1.

Within sub-sections of this chapter, the discussion of each project component will include:

– A description of the project-component-specific study area
– A description of existing conditions for the social and built, natural, and cultural environments
– A conceptual design
– A discussion of potential environmental impacts and mitigation measures
– Costs, implementation and schedule.

5.1.1 Key Plan

The general locations for the projects included in this chapter are shown in Figure 5.1.

Aurora and Newmarket, located in the Regional Municipality of York (York Region), Ontario, embody vibrant communities with rich history, natural beauty, and a strong sense of unity. Aurora offers picturesque landscapes, parks and a thriving cultural scene with a bustling downtown core. Meanwhile, Newmarket seamlessly blends history and modernity with its charming Main Street and tranquil green spaces. Both communities prioritize assessing and mitigating environmental impacts, considering factors such as the natural environment, cultural heritage, social fabric, built infrastructure and existing conditions to create sustainable and responsible development.

Figure 5.1 **Overview of Aurora and Newmarket Projects**

5.1.2 Existing Conditions

This component examines the existing environmental conditions of the study area. It establishes a baseline against which the potential impacts are assessed. Factors such as land use patterns, wildlife populations and community resources are evaluated to understand the existing state of the environment.

These different aspects are evaluated through various methods, including scientific studies, surveys and consultation with interested persons and Indigenous communities. The following sections define the different environments.

5.1.2.1 Social and Built Environment

This aspect of the assessment considers the effects on the social fabric of the community, including human health, quality of life, social well-being, and community cohesion, as well as the existing built infrastructure and facilities in the study area. It evaluates factors such as traffic, public safety, access to services, capacity constraints and changes in land use patterns, recognizing the interplay between social and built elements in the project's environmental impact.

5.1.2.2 Natural Environment

The natural environment investigations looked at the ecological components such as flora, fauna, ecosystems, and natural resources to provide a baseline for later evaluation of potential impacts on biodiversity, habitats, water quality, air quality, soil quality, and the overall functioning of natural systems. These sections will also discuss subsurface conditions, including geotechnical, hydrogeological and contamination.

5.1.2.3 Cultural Environment

This aspect examines the cultural heritage, which includes archaeological sites, historical structures, traditional practices, and cultural landscapes that may be affected by the proposed project. It considers the potential impacts on cultural identity, traditional knowledge, and the cultural significance of the area.

5.1.3 Conceptual Design

This discussion for each project will outline the general design standards, requirements and assumptions for the construction and implementation of new pumping stations, pumping station upgrades, new gravity sewers and new forcemains. General design parameters have been identified in Chapter 3; site specific conditions have been included within this chapter.

The designs presented are conceptual and were developed to demonstrate proof of concept. The designs will be further refined upon collection of field investigations and in consultation with internal and external stakeholders. Final SPS site locations will be selected considering the impacts and mitigations, results of field studies, procurement requirements, and other design considerations. Similarly, details related to the construction methodology, pipe sizing, number of shafts, shaft sizing, location and property easement requirements will be confirmed during detailed design.

Refer to Table 5.1 for a list of relevant conceptual design drawing appendices for each project.

Table 5.1 Conceptual Design Drawings per Newmarket Aurora Project

Project designation	Project name	Appendix	Sheet number(s)
Y3-B	Aurora B SPS	B	11
Y3-C	Aurora B SPS Forcemain	B	16 to 17
Y10	Aurora SPS Gravity Sewer Twinning	B	13
Y13-A	Leslie Street Trunk Sewer Phase 3	B	14 to 15
Y13-B	Mulock SPS	B	12
Y13-C	Mulock SPS Forcemains	B	18

5.1.4 Environmental and Community Impacts and Mitigation

The desktop assessment of existing environmental conditions was compared against the conceptual designs. The findings identify potential environmental impacts, develop mitigation measures and inform decision-making processes to promote sustainable development that minimizes negative environmental effects while maximizing positive outcomes.

5.1.5 Capital Cost Estimate and Implementation Plan

This chapter discusses the capital cost estimate for each proposed project and the general implementation plan, including future field investigations and permits and approvals required to design and construct the new/upgraded infrastructure. These components will be further reviewed and refined during the preliminary design stage.

5.2 Social and Built Environment Overview

To avoid repetition within this chapter, an overarching discussion on the existing social and built environment across all projects covered under Chapter 5 is presented in this section. Site-specific social and built environment existing conditions are further detailed in sections 5.5 to 5.13.

5.2.1 Town of Newmarket

The Town of Newmarket is located in the upper middle part of York Region. The municipality is a mix of high, medium, and low-density residential neighbourhoods, commercial areas (e.g., Upper Canada Mall, historic downtown), natural heritage systems (Holland River and Oak Ridges Moraine (ORM)), green space and industrial lands (business parks).

5.2.2 Town of Aurora

The Town of Aurora stretches from north of St. Johns Sideroad south to Bloomington Sideroad and from Highway 404 west to Bathurst Street. The municipality is a mix of high, medium, and low-density residential neighbourhoods, commercial areas (e.g., St. Andrew’s Shopping Centre and Yonge Street corridor), industrial lands (e.g., Aurora South Industrial Area and Magna International), small patch of agricultural land (e.g., along St. John’s Sideroad and Highway 404) and green space.

5.2.3 Planning Policy and Land Use

Table 5.2 provides a summary listing of planning policies potentially applicable to the projects located within Newmarket and Aurora, including Leslie Street Trunk Sewer Phase 3 (Y13), which extends north into East Gwillimbury. Table 5.2 also provides comments on the relevance to the projects and highlights pertinent policy content if applicable.

Table 5.2 Summary of Planning Policies and Applicability to the York Region Sewage Works Projects in Newmarket and Aurora

Jurisdiction and planning policy	Applicability to projects
Federal Impact Assessment Act (IAA, 2019)	– The proposed activities are not included in the physical activities list that describes which projects are subject to the IAA. – The York Region Sewage Works Projects are not identified in Schedule 2 of the Act. – The Minister may designate a project upon request or own initiative. – Low likelihood that the projects are subject to this Act.
Provincial Environmental Assessment Act (EAA, 1990)	– The York Region Sewage Works Project is exempt from the EAA under Part IV of the *Supporting Growth and Housing in York and Durham Regions Act, 2022.*
Provincial Provincial Policy Statement (PPS, 2020)	– The PPS provides policy direction on matters of provincial interest related to land use planning and development. – The following sections are relevant to the proposed York Region Sewage Works Projects: • Section 1.1.1: Healthy, liveable, and safe communities are sustained by: • (g) ensuring that necessary infrastructure and public service facilities are or will be available to meet current and projected needs. • Section 1.6.6 provides policies relating to municipal sewage services. • Section 1.6.8.5: The co-location of linear infrastructure should be promoted where appropriate. • Section 2.1 provides policies for the long-term protection of natural features. • Section 2.2 provides policies for the protection of the quality and quantity of water. • Section 2.3 provides for the long-term protection of prime agricultural lands while allowing planning authorities to permit non-agricultural uses in prime agricultural areas for limited non-residential uses provided the conditions established in the policy are met.
Provincial Ontario Water Resources Act (1990)	– Regulates sewage infrastructure and construction water taking in Ontario. – Bans new or increased intra-basin water transfer from one Great Lakes watershed to another, with exceptions subject to strictly regulated conditions. York Region Sewage Works Project will manage the movement of wastewater, and implications of the Project on York Region's existing intra-basin transfer permission are not anticipated but will be explored.
Provincial Clean Water Act (2006) and South Georgian Bay Lake Simcoe Source Protection Plan (2015)	– The Clean Water Act, along with the source protection planning process it establishes, provides protection to current and future sources of residential municipal drinking water. – The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage is one of the prescribed threats (a condition or activity that adversely affects or has the potential to adversely affect the quality or quantity of current or future drinking water). – Newmarket and Aurora are in the South Georgian Bay Lake Simcoe source protection region (Lake Simcoe Area), with a small portion of south Aurora within the jurisdiction of the Toronto and Region Source Protection Area. – The four vulnerable areas addressed in the source water protection plan are: • Wellhead Protection Areas (5 identified in Newmarket, 4 in Aurora) • Intake Protection Zones (none located in Newmarket or Aurora) • Highly Vulnerable Aquifers (present in Aurora) • Significant Groundwater Recharge Areas (present in Aurora).

Jurisdiction and planning policy	Applicability to projects
Provincial Lake Simcoe Protection Plan, 2009, under the Lake Simcoe Protection Act, 2008	– The Lake Simcoe Protection Plan is a watershed-based plan that outlines a coordinated approach to protecting and restoring the ecological integrity of Lake Simcoe: • With reference to Section 6.23 of the Lake Simcoe Protection Plan, development or site alteration is not permitted within a key natural heritage feature, key hydrologic feature and related vegetation protection zone referred to in policy 6.24, except in relation to the following: • (g) Infrastructure, but only if the need for the project has been demonstrated through an Environmental Assessment of other similar environmental approval and there is no reasonable alternative. – Projects located in Newmarket and Aurora are within the Lake Simcoe Protection Plan area and will be subject to the plan's policies.
Provincial Growth Plan for the Greater Golden Horseshoe (2020 Consolidation), issued under the authority of the Places to Grow Act (2005)	– Provides direction on urban structure, and where and how future growth should be accommodated: • Section 3 provides policies related to infrastructure to support growth, specifically Sections 3.2.5 – Infrastructure Corridors, and 3.2.6 – Water and Wastewater Systems. • Section 4.2.3 (1): Outside Settlement Areas, development or site alteration is not permitted in key natural heritage features that are part of the Natural Heritage System for the Growth Plan or in key hydrologic features, except for: • (c) activities that create or maintain infrastructure authorized under an environmental assessment process. – Projects located in Newmarket and Aurora are entirely within the Growth Plan and will be subject to the plan's policies.
Provincial Oak Ridges Moraine Conservation Plan (ORMCP), as set out in O. Reg. 140/02 under the Oak Ridges Moraine Conservation Act, 2001 (ORMC Act)	– The ORMCP is an ecologically based plan that provides land use and resource management direction for the land and water within the ORM landform: • Section 30 provides policies for development and site alteration within Landform Conservation Areas of the ORM. • Section 41 provides policies for the development of infrastructure in or on lands in a natural linkage areas, prime agricultural area and natural core area, and the conditions under which infrastructure is permitted to cross key natural heritage features or key hydrological features. • Section 42(2) states that sewer service trenches shall be planned, designed and constructed so as to keep disruption of the natural groundwater flow to a minimum. – None of the projects discussed in this chapter intersect with areas designated under the ORMCP.
Provincial Greenbelt Plan 2017, under the Greenbelt Act 2005	– The Greenbelt Plan identifies where urbanization should not occur in order to provide permanent protection to the agricultural land base and the ecological and hydrological features, areas and functions occurring on the landscape. – Section 2.1: An application for the development of infrastructure in or on land in a prime agricultural area shall not be approved unless: • (a) the need for the project has been demonstrated, and there is no reasonable alternative that could avoid the development occurring in a prime agricultural area; and • (b) an agricultural impact assessment or equivalent analysis carried out as part of an environmental assessment is undertaken that demonstrates that there will be no adverse impacts to the prime agricultural area or that such impacts will be minimized and mitigated to the extent possible. – Projects discussed in this chapter are outside the Greenbelt Plan area.

Jurisdiction and planning policy	Applicability to projects
Regional Lake Simcoe Region Conservation Authority (LSRCA)	– The projects covered in this chapter are situated within the LSRCA jurisdiction. – Permit under 179/06 Development, Interference with Wetlands and Alterations to Shorelines and Watercourses, will be required for infrastructure within regulated areas (i.e., 120 metres (m) of a Provincially Significant Wetland (PSW) or within 30 m of a watercourse or waterbody).
Regional York Region Official Plan 2022, Office Consolidation June 2023	– The York Region Official Plan sets the direction for growth and development within the region through polices that align with provincial and regional planning documents. – The proposed projects are located on lands designated as Community Areas, with the 80 m and 200 m study areas for some project locations extending into employment areas and agricultural areas. – Relevant sections include the following: • Section 3.2 – Regional Greenlands System • Section 5.1 – Agricultural System • Section 6.4 – Water and Wastewater Servicing.
Municipal East Gwillimbury Official Plan 2010, 2018 Consolidation	– The East Gwillimbury Official Plan provides policies that direct land use and sets long-term goals for development and environmental protection: • Section 4.15.1, public uses, including sewage infrastructure, are permitted in all land use designations, with the exception of environmental protection areas and the ORMCP area designations. • Section 7.3.3.5 notes that new (private or municipal) sewage system infrastructure, wherever possible, should be located outside of significant threat areas 1 and 2
Municipal Newmarket Official Plan 2006, 2022 Consolidation	– The Newmarket Official Plan directs long-term growth and development within the municipality. – Relevant sections include the following: • Section 9.2 – General Natural Heritage Policies • Section 14.0 – Servicing.
Municipal Aurora Official Plan 2010, September 2021 Consolidation	– The Aurora Official Plan directs long-term growth and development within the municipality. – Relevant sections include the following: • Section 12.2 – Greenlands System • Section 14.3 – Sanitary Sewage and Water Supply Services.

5.2.3.1 York Region Official Plan

With reference to the York Region Official Plan 2022 (Office Consolidation June 2023), Section 2.1.3, the regional structure consists of the following land use designations:

- Community areas, where residential, population-related employment and community services are directed to accommodate concentrations of existing and future population and employment growth.
- Employment areas, where clusters of industrial, business, transportation, warehousing and related economic activities are directed and where residential uses are prohibited.
- Hamlets, smaller communities in rural areas where growth potential is limited in accordance with the policies in the Plan.
- Rural areas, lands outside of urban areas and prime agricultural areas which support diverse agricultural, economic, tourism and recreational activities and contain valuable natural resources.
- Agricultural areas, containing a continuous, productive agricultural land base.
- Specialty crop areas for agriculture uses where specialty crops are predominantly grown.

Development and site alteration are restricted within some designations; however, provisions have been made for new wastewater infrastructure subject to demonstrated need and compliance with provincial plans.

Section 3.2 establishes policies for the Regional Greenlands System. While development and site alteration within the system are generally prohibited, some uses, including new wastewater systems, are permitted subject to meeting requirements of applicable provincial plans. With reference to Section 3.2.5 (d), new wastewater systems are permitted if no other reasonable alternative location exists and if an approved Environmental Impact Study demonstrates that it can be constructed without negative impact. The wastewater system shall also be subjected to the policies of the relevant provincial plan, where applicable, or if authorized through an Environmental Assessment.

Section 5.1 provides policies for the Agricultural System. It is understood that the project study areas include active farmland; however, the proposed projects are to be constructed outside of designated agricultural lands.

Section 6.4 provides policies for the delivery of long-term water and wastewater services that are safe, well-managed and sustainable. The following are relevant to the York Region Sewage Works Projects:

- Section 6.4.4: That planning efforts for municipal water and wastewater treatment facilities and infrastructure are coordinated with surrounding jurisdictions and shall be in accordance with provincial regulations, guidelines, standards, procedures and, where possible, minimize and mitigate any potential adverse effects from odour, noise, and other contaminants.
- Section 6.4.12: To achieve water balance in compliance with the Great Lakes Charter and the Great Lakes Charter Annex by ensuring that all infrastructure planning decision-making processes manage intra-basin transfer to permitted quantities and water removed from the Great Lakes is returned at an equivalent or better quality.
- Section 6.4.14: That all improvements or new water and wastewater infrastructure systems shall conform to the applicable provincial plans, including the source protection plans.
- Section 6.4.16: That the planning and design of water and wastewater infrastructure will consider potential impacts from climate change.
- Section 6.4.19: That the location of new municipal sewage system infrastructure, wherever possible, shall be located outside of the vulnerable areas within a Wellhead Protection Area or Intake Protection Zone where it would be identified as a significant drinking water threat. Specific types of sewage infrastructure may not be permitted where the activity is identified as a significant drinking water threat in accordance with the South Georgian Bay Lake Simcoe and the Credit Valley, Toronto and Region and Central Lake Ontario Source Protection Plans.

5.3 Natural Environment Overview

To avoid repetition within this chapter, the well head protection areas (WHPA) across all projects are presented in this section instead of individually for each project. Site-specific natural environment existing conditions are further detailed in sections 5.5 to 5.13. Figure 5.2 illustrates the WHPA displaying study areas for all projects.

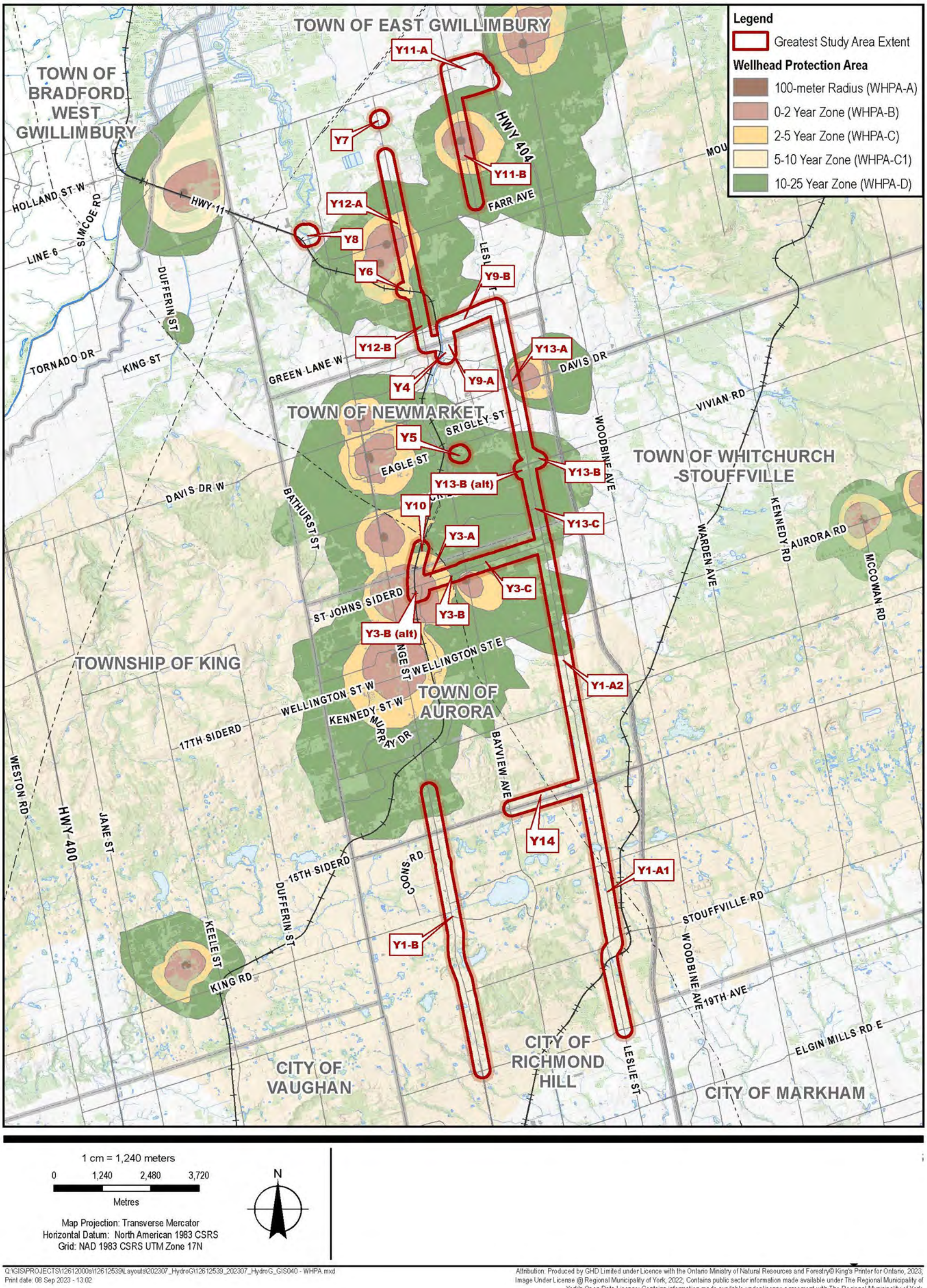


Figure 5.2 **Wellhead Protection Areas**

5.4 Cultural Environment Overview

To avoid repetition within this chapter, an overarching discussion on the existing cultural environment across all projects covered under Chapter 5 is presented in this section. This cultural environment desktop analysis includes a Stage 1 Archaeological Assessment and a Cultural Heritage Report on Existing Conditions and Preliminary Impact Assessment. The following sections will summarize the findings of the desktop studies completed for the study areas within this chapter.

5.4.1 Archaeology

A Stage 1 Archaeological Assessment was conducted to provide a review of current land use, historical and modern maps, past settlement history for the area and consideration of topographic and physiographic features, soils and drainage. It also involved a review of previously registered archaeological resources within 1 km of the study area and previous archaeological assessments within 50 m. The background study indicated that the York Region Sewage Works Project has potential for the recovery of archaeological resources due to the proximity (i.e., within 300 m) of features that signal archaeological potential, namely:

- Areas of 19th-century settlement (Aurora, Bogarttown, Gormley, Holland Landing, Newmarket, Petchville, Richmond Hill and White Rose).
- 19th-century travel routes (e.g., Leslie Street, Bloomington Road, St. John’s Sideroad, Green Lane, etc.).
- Mapped 19th-century structures (numerous homesteads, mills, churches, schools, etc.).
- Historic watercourses (Rouge River, East Holland River and their tributaries).
- Previously registered archaeological sites (104 sites within 300 m, 46 in the study area).
- York Region’s Archaeological Potential Map identifies the study area as having archaeological potential.

The following points outline the cultural heritage value or interest (CHVI) associated with the projects in this chapter.

- The Y3-B Aurora East SPS study area has no archaeological sites with further CHVI.
- The Y4 Newmarket SPS Upgrade study area has no archaeological sites with further CHVI.
- The Y5 study area has no archaeological sites with further CHVI.
- The Y13-B Mulock SPS study area has no archaeological sites with further CHVI.
- The Y3-A Aurora East SPS Gravity Interconnection study area has no archaeological sites with further CHVI.
- The Y10 Aurora SPS Gravity Sewer Twinning study area has no archaeological sites with further CHVI.
- The study area of Y13-A Leslie Street Trunk Sewer Phase 3 study area has no archaeological sites with further CHVI.
- The Y3-C Aurora East SPS Forcemain study area contains two archaeological sites with further CHVI (BaGu-171, BaGu-173). A detailed description of these archaeological sites can be made available upon request. Y3-C Aurora East SPS Forcemain also has one area located south of St. John’s Sideroad and east of Leslie Street containing potential 100 year-old burials that must be taken into consideration during the planning process for this project. Recommendations for Material Testing Report (MTR) and construction monitoring are outstanding for this location.
- The Y13-C Mulock SPS Forcemains study area contains one archaeological site with further CHVI (BaGu-171). A detailed description of these archaeological sites can be made available upon request. Y13-C Mulock SPS Forcemains also has one area located south of St. John’s Sideroad and east of Leslie Street containing potential 100-year-old burials that must be taken into consideration during the planning process for this project. Recommendations for MTR and construction monitoring are outstanding for this location.

5.4.2 Cultural Heritage

A Cultural Heritage Report on Existing Conditions and Preliminary Impact Assessment was produced to provide an overview of the cultural landscape and offer initial insights into potential impacts. The study areas within this chapter pass through the communities of Aurora and Newmarket in York Region. The purpose of the Assessment is to screen, inventory, and conduct preliminary impact assessments in the study area involving multiple properties by:

- Completing a cultural heritage screening that encompasses all properties within the study area based on the MCM criteria for evaluating potential for built heritage resource (BHR) and cultural heritage landscape (CHL).
- Completing a heritage screening for existing heritage conditions through background research and the application of professional judgment to identify all known and potential BHR and CHL in the study area.
- Completing a preliminary heritage impact assessment (HIA) of all identified BHRs and CHLs. The preliminary HIA follows the general format set out in the MCM's Info Sheet #5: Heritage Impact Assessments and Conservation Plans, which is included in the resource Heritage Resources in the Land Use Planning Process within the Ontario Heritage Toolkit. Subsequent site-specific HIAs with the comprehensive application of O. Reg. 9/06 (as amended by O. Reg. 569/22) may be recommended where direct impacts are identified.

During a desktop overview of the existing heritage conditions in Aurora, 74 properties were identified as having known or potential BHR/CHLs. Subsequent field review identified 12 BHRs, five BHR/CHLs and seven CHLs. During a desktop overview of the existing heritage conditions in Newmarket, 1,762 properties were reviewed; of these properties, 131 properties were identified as having known or potential BHR/CHLs. Subsequent field review identified 51 BHRs and four CHLs. A detailed description of these heritage properties can be provided upon request.

In Aurora, the area is predominately rural with agricultural fields, mid-20th century residential development and golf courses comprising much of the landscape on either side of Leslie Street. The rural character of the area is characterized by winding, tree-lined laneways to residential properties that are typically screened by vegetation. Recent suburban and commercial development comprises most of the landscape of Leslie Street north of Bloomington Road to the boundary line with the Town of Newmarket. An east-west segment of the study area travels along St John's Sideroad, which is predominately surrounded by recent suburban development, as well as notable landscapes on ORM, including parts of the Bailey Ecological Park, Nokiidaa and Tom Taylor trails, St. Andrew's Valley Golf Club, Aurora Community Arboretum and the Aurora (McKenzie) Marsh wetlands.

In Newmarket, there are three distinct sections of the study area. The first is a north-south segment that follows along Leslie Street from a boundary line with the Town of Aurora approximately 400 m north of the intersection of Leslie and St. John's Sideroad in the south to a boundary line with East Gwillimbury approximately 500 m south of Leslie Street and Green Lane East. Along this area, relatively recent industrial and commercial development lines most of the east side of Leslie Street. The second section is concentrated in a mature residential neighbourhood composed primarily of late 19th and early 20th century single detached houses located east of Fairy Lake. This area also includes mature parks and infrastructure associated with Bogart Creek. The third section is located west of the Newmarket SPS and York Region Water and Wastewater Operation Centre located at 380 Bayview Parkway. The area includes notable parks and trails along the Holland River. This area is a cultural heritage landscape which is part of the Nokiidaa and Tom Taylor trails and provides linkages to Conservation Areas, including Rogers Reservoir, Wesley Brooks (Fairy Lake) and Mabel Davis Conservation Area.

The Ontario Heritage Act (OHA) provides a framework for municipalities in Ontario to preserve the conservation of properties with CHVI, including the capacity to designate heritage properties. In the Town of Aurora, there are six properties designated under Part IV of the OHA and four properties listed on the Town's Register of Properties of CHVI. In the Town of Newmarket, there are four properties designated under Part IV of the OHA and 21 properties listed on the Town's Municipal Register of Non-designated Heritage Properties. A detailed description of these heritage properties can be made available upon request.

York Region and Durham Region are located on the traditional territory of many Indigenous peoples, including the Anishinaabeg, Haudenosaunee, Huron-Wendat and Métis peoples, and within the treaty territories of the Haudenosaunee, Mississaugas of the Credit First Nation and Williams Treaties First Nations. Most of the study area is located within the Williams Treaties with the Chippewas of Beausoleil, Georgina Island and Rama First Nations and the Mississaugas of Alderville, Curve Lake, Hiawatha and Scugog Island First Nations. The remaining portion of the study area in Richmond Hill is located within Treaty 13 with the Mississaugas of the Credit First Nation (also known as the Toronto Purchase). There are also other land claims and treaty rights involving portions of York Region and Durham Region that have not been definitively resolved.

Since time immemorial, Indigenous peoples use and management of land differed greatly from the much more recent era of colonial development. Instead of roads and highways cut through the landscape, Indigenous travel in this area focused on waterways and the portages between them.[1]

An example of this is the Toronto Carrying Place Trail. Prior to the arrival of Europeans, many Indigenous groups travelled along the Toronto Carrying Place Trail to trade with other nations near and far, as well as to hunt and gather resources. The trail snaked northward along the east bank of the Humber River past Woodbridge in current day Vaughan before heading over the Oak Ridges Moraine towards the West Holland River. A second iteration of the trail started at the Rouge River, moving northwest through the Oak Ridges Moraine and toward the Holland River East Branch near present day Aurora before heading north to Holland Landing. Northern portions of the Trail correspond to the Chippewas Travel Corridor, shown in Figure 5.3.

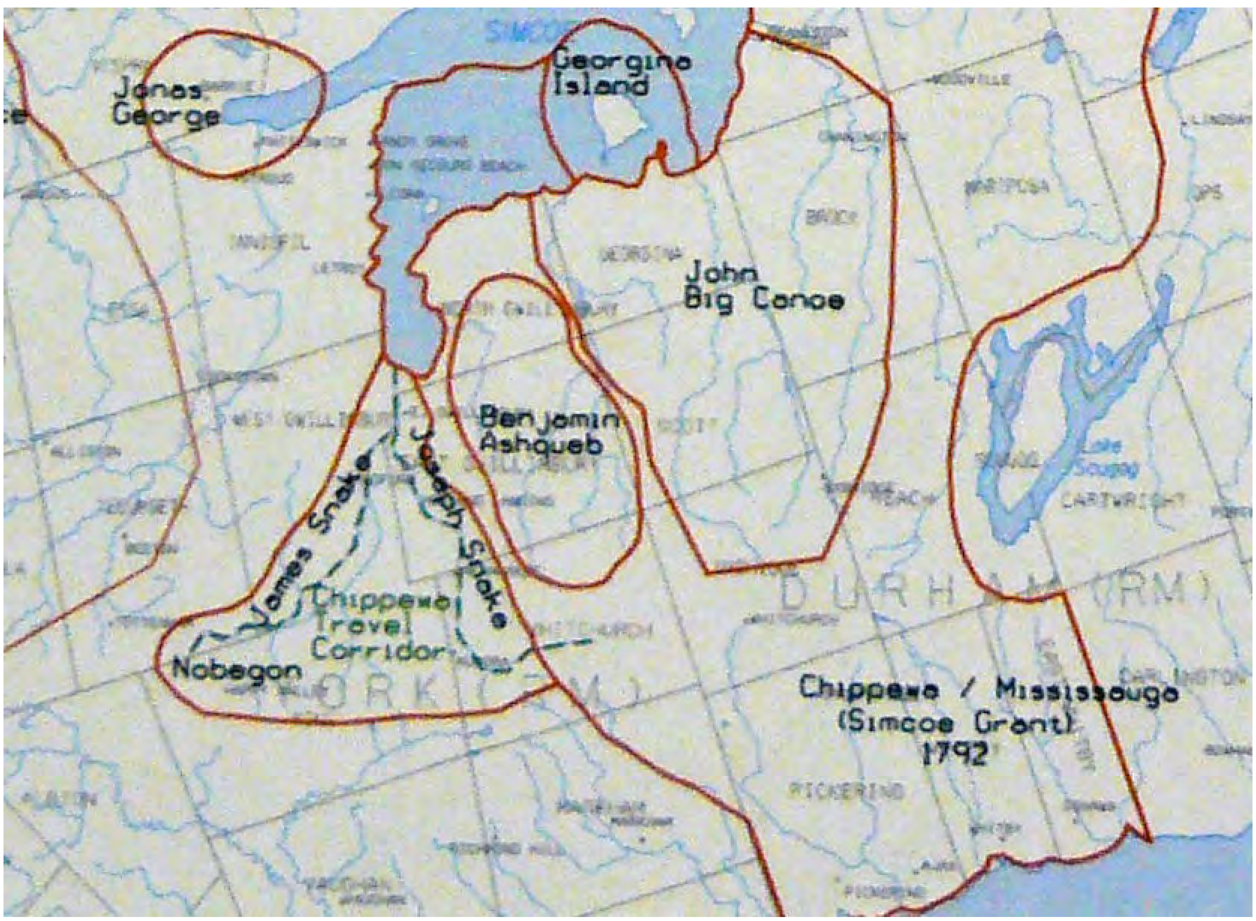


Figure 5.3 **Map of a Portion of Williams Treaties Hunting Territories Showing the East and West Holland Rivers as a Chippewas Travel Corridor (Provided by Chippewas of Rama First Nation)**

[1] TMHC Inc. 2023. Cultural Heritage Report York Region Sewage Works Project Towns of Richmond Hill, Aurora, Newmarket, and East Gwillimbury, Regional Municipality of York (draft)

In addition to fish and other animals, Indigenous communities harvested wild rice and actively managed and maintained nut and berry resources for food.[2] Indigenous landscapes included actively managed meadows (Mishkodeh) and forests (such as Black Oak Savannas).[3] This system of land management is often framed in terms of kinship between people and landscape, a mutual responsibility for each to promote and maintain the health of the other.

Treaties isolated Indigenous communities to relatively small reserves and colonial land development limited the accessibility of lands for subsistence activities. For example, until it was corrected in 2018, the Williams Treaties of 1923 were interpreted by Canada to have extinguished the First Nations' right to hunt, fish and harvest on their traditional territory. Residential schools and cultural discrimination further damaged these traditional lifeways by systematically preventing the transfer of Indigenous knowledge from one generation to the next.

5.5 Y3-B Aurora East SPS

5.5.1 Study Area

The Y3-B Aurora East SPS will provide pumping capability to convey diverted flows from upstream of the existing Aurora SPS via the Y3-A Aurora East SPS Gravity Interconnection to the north end of the new Y1-A2 Leslie Street Trunk Sewer Phase 2.

This section presents a concept design capable of pumping 2500 litres per second (L/s) to the Y1-A2 Leslie Street Trunk Sewer Phase 2. The existing Aurora SPS will remain in operation, primarily pumping flows generated south of the Y3-B Aurora East SPS into the existing YDSS via its existing forcemains or to Y1-A1 Leslie Street Trunk Sewer Phase 1 via the Y14 Bloomington Interceptor Sewer.

The proposed location of the new pumping station will be located within the vicinity of the existing Aurora SPS located on the north side of St. John's Sideroad. A study area of approximately 200 metres wide was applied surrounding the potential site for the pumping station, as shown in Figure 5.4. However, the new pumping station could be located anywhere within this study area or overlapping linear project study areas. In some instances, the study area for the new pumping stations was increased to accommodate for alternative site.

[2] Williams, Doug (Gidigaa Migizi). 2018 Michi Saagiig: This is Our Territory. Winnipeg, MN: ARP Books.
[3] Mishkodeh Centre for Indigenous Knowledge. n.d. History. Available online: https://mishkodeh.org/history/. Accessed October 27, 2022.

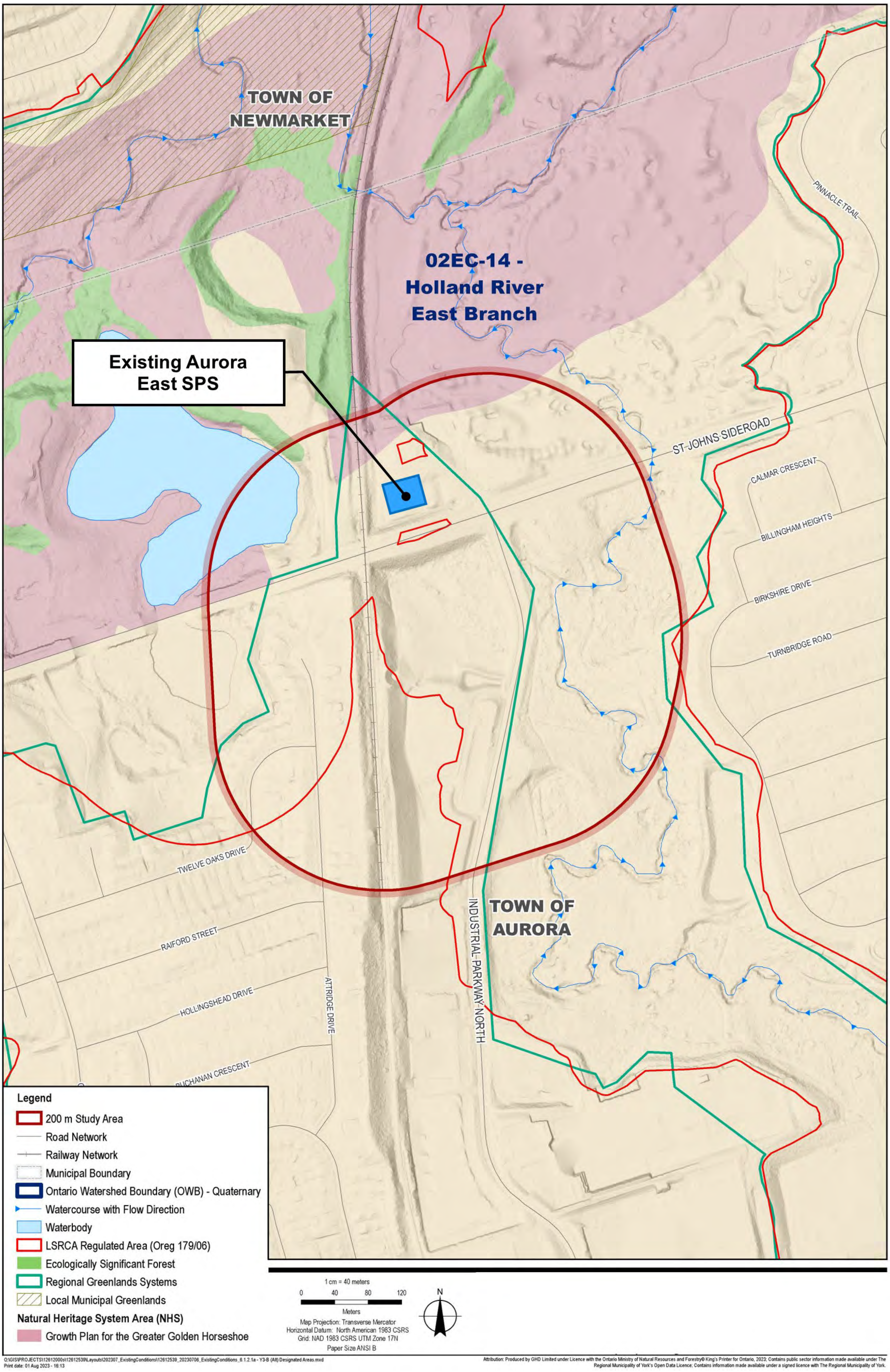


Figure 5.4 Y3-B Aurora East SPS Study Area

5.5.2 Existing Conditions

5.5.2.1 Social and Built Environment

The following sections will summarize the findings of the desktop studies completed within the study area for the Y3-B Aurora East SPS project, including planning and land use, traffic and transportation and utilities.

5.5.2.1.1 Planning Policy and Land Use

Existing Land Use

Along Industrial Parkway North, from Yonge Street to Gateway Drive, land uses consist of the following:

West side:

– Low-density residential housing
– Institutional lands (Aurora Montessori School)
– Canadian National Railway (CNR) rail crossing St. John’s Sideroad
– Aurora SPS
– Public park.

East side:

– Low-density residential housing
– Recreational lands (Golf course)
– Canine commons off leash dog park.

Planning Policy

Regional

The York Region Official Plan (June 2023 Office Consolidation) designates lands within the study area as Community Area and Employment Area. Additionally, lands within the study area are part of the Regional Greenlands System.

Local

The Aurora Official Plan (September 2021 Office Consolidation) designates the lands in the study area as follows:

– Lands north of St. John’s Sideroad, on the west side of the railroad track, are designated as Environmental Protection, Residential Area and Private Parkland.
– Lands north of St. John’s Sideroad, on the east side of the railroad track, are designated as Private Parkland.
– Lands south of St. John’s Sideroad, on the west side of the railroad track, are designated as Public Parkland, Environmental Protection and Stable Neighborhoods.
– Lands south of St. John’s Sideroad, on the east side of the railroad track, are designated as Public Parkland, Existing Employment, General Industrial and Environmental Protection.

Active Development Application

Lands within the Y3-B Aurora East SPS study area contain three active development applications as follows:

– 330 Industrial Parkway North - To rezone a portion of the lands from "E1(206)" and "E1(256)" to common "E1(XX)" Exception Zone to facilitate the extension of the existing Montessori School.
– Twelve Oaks Drive - Proposed subdivision.
– Turnbridge Road - Proposed subdivision.

5.5.2.1.2 Transportation in the Study Area

St. John's Sideroad between Bayview Avenue and Leslie Street is a four-lane 60-kilometre per hour (km/h) posted speed arterial road with a median boulevard and a dedicated cycling lane. Between Bayview Avenue and the rail crossing east of Yonge Street, the road has a painted median instead. For both segments, the outer boulevard is curbed, and there are pedestrian sidewalks on both sides, with a paved multi-use path on the south boulevard, as shown in Figure 5.5.

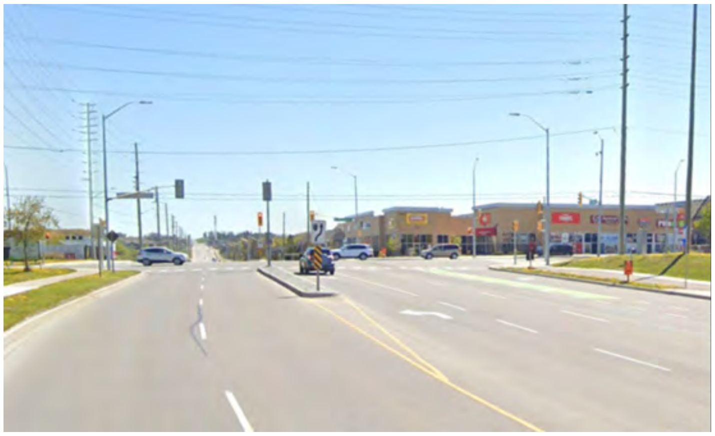


Figure 5.5 **St. John's Sideroad Looking East (1) Towards Bayview Avenue, East of the Proposed Y3-B Aurora East SPS Site, (2) Towards Leslie Street (Google Maps "Streetview," digital images http://maps.google.com)**

The annual average daily traffic (AADT) along St. John's Sideroad between Industrial Parkway and Leslie Street has been counted as 27,172 in the west end as of 2023 and 10,600 in the east end as of 2022. Historical AADT data along the study area roads are presented in Table 5.3.

Table 5.3 **St. John's Sideroad AADT Counts Between Mavrinac Boulevard (East of Bayview Avenue) and Leslie Street**

Description of road limits	2012	2013	2014	2015	2016	2017	2018	2019	2022	2023
Industrial Parkway North and Pinnacle Trail/Gateway Drive	22,035		21,596	22,157		21,468		12,317		27,172
Leslie Street and Mavrinac Boulevard		9218			9292		9155		10,600	

There are no bus routes running along St. John's Sideroad; however, one York Region Transit (YRT) route is along Bayview Avenue (54). There is also a Metrolinx GO Transit rail line and crossing on the west end of the corridor, east of Yonge Street and west of the proposed SPS location.

5.5.2.1.3 Utilities in the Study Area

There are several above/below grade utilities situated within the study area corridor and in the vicinity of the proposed project. These utilities may be temporarily impacted during the construction of the SPS, shaft and work compounds. Formal notification and consent would be required from authorities responsible for these utilities prior to construction.

Buried utilities are typically located within the following limits:

– Shallow-buried electrical and communications cabling are commonly buried between 1.2 and 1.5 metres below ground surface (mbgs).
– Shallow-buried storm drains, sanitary sewers, and watermains are typically buried between 1.2 and 3.5 mbgs.
– Deep-buried utilities are defined as anything buried more deeply than the depths mentioned above.

Known municipal infrastructure that existed on York Region's geographic information system (GIS) database has been provided within the drawing set. A detailed utility investigation program, which would include a "Level A through D" subsurface utility exploration, would be required as part of future site investigations.

5.5.2.2 Natural Environment

The following sections will summarize the findings of the desktop studies completed within the study area for geotechnical, hydrogeology, surface water, natural heritage and contamination (if any).

5.5.2.2.1 Geotechnical

No site-specific reports or borehole records were encountered within the study area.

Based on the Quaternary geology mapping, the native deposit within the study area predominantly comprised of silt and clay matrix, mostly consisting of Glaciolacustrine deposits.

The bedrock consists of shale, limestone, dolostone and siltstone of the Georgian Bay Formation, Blue Mountain Formation and Billings Formation. Typically, bedrock is mapped at depths of 124 to 140 mbgs within the study area and will not be reached during construction.

5.5.2.2.2 Hydrogeological

A hydrogeological desktop review was undertaken within the study area using information from the Ministry of the Environment, Conservation and Parks (MECP) well records, the MECP Source Protection Information Atlas, the Oak Ridges Moraine database, and the Ontario Geological Survey database. Available hydrogeological reports for projects within the area were also reviewed.

The Y3-B Aurora East SPS study area is within the Schomberg Clay Plains physiographic region. A majority of the SPS structure will be constructed through an aquitard, fine-grained glaciolacustrine deposit. Construction may intersect a shallow Oak Ridges Moraine aquifer (from ground surface to 246 to 248 metres above surface level (masl)). Temporary water takings may be required to facilitate construction. The water table is approximately 3 to 6 mbgs. Shallow groundwater flows to the north.

A high groundwater table/hydrostatic groundwater pressure would be expected due to existing soils and anticipated presence of the Oak Ridges Moraine aquifer. Hydraulic conductivity of shallow Oak Ridges Moraine deposit is 10-4 metres per second (m/s).

The SPS structures are located within source water protection wellhead protection areas WHPA-B, C and D.

There are no historic private water supply wells located near the structure to be constructed at Y3-B Aurora East SPS.

Refer to Table 5.4 regarding details on anticipated aquifers and aquitards within the study area.

Table 5.4 Aquifers and Aquitards Through the Y3-B Aurora East SPS Study Area

Aquifers and aquitards	Description	Thickness
Undifferentiated upper sediments at ground surface (Aquifer)	An unconfined aquifer consisting of discontinuous fill and unconsolidated overburden deposits. Underlies topsoil at the east side of the section.	Generally, 2 m
Oak Ridges Moraine Complex (Aquifer)	These sediments consist mostly of silt and fine sand, but also include gravel and minor clay and diamicton. The aquifer is generally unconfined, except the section covered by Halton till on the south flank of the ORM complex. Underlies topsoil at the west side of section.	Ranges between 2 to 5 m
Channel silt aquitard	Silt deposits	Ranges between 10 to 25 m
Channel sand aquifer	Sand deposits	Ranges between 17 to 20 m
Newmarket Till (Aquitard)	A continuous layer that acts as an aquitard to the underlying Thorncliffe Formation.	Ranges between 19 to 31 m
Thorncliffe Formation (Aquifer)	Regionally recognized as a highly productive confined aquifer and is laterally continuous.	Up to 10 m
Sunnybrook drift (Aquitard)	A continuous layer that acts as an aquitard to the underlying Scarborough Formation.	Up to 19 m
Scarborough Formation (Lower aquitard)	A confined aquifer that is discontinuous and appears to consist of channel fill deposits that roughly dip to the east.	Ranges between 15 to 19 m

5.5.2.2.3 Surface Water

Two unnamed creeks, tributaries to the Holland River East Branch (HREB), meet near the structure area and flow north. Small surface warmwater pond located to the south of the structure. Other surface water features of interest include:

– HREB watercourse
– Warmwater pond
– Aurora (McKenzie) Marsh wetland complex.

Refer to Figure 5.6 for a surface water map of existing conditions within the study area.

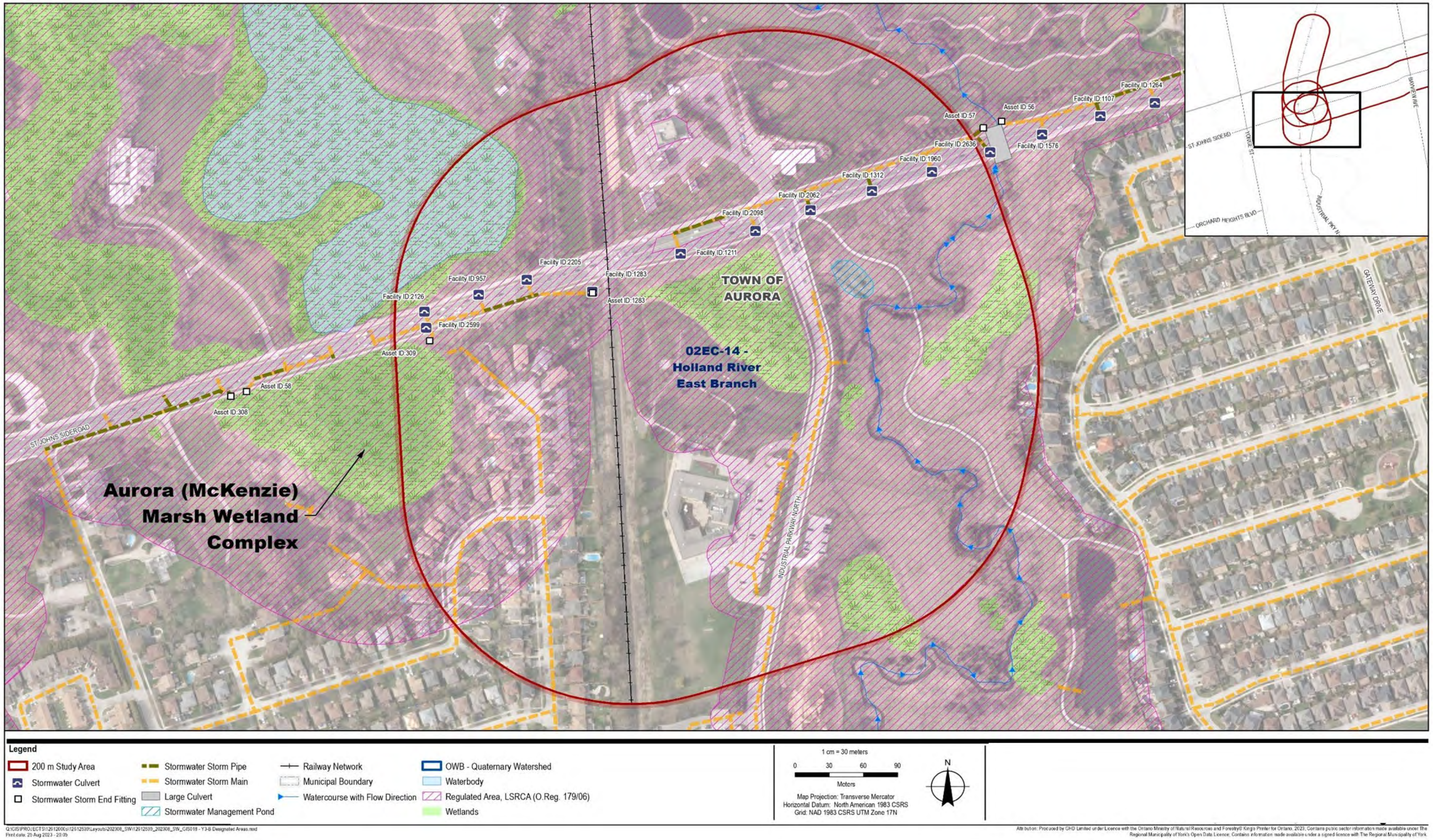


Figure 5.6 Y3-B Aurora East SPS Study Area Surface Water Map for Existing Conditions

5.5.2.2.4 Natural Heritage Characterization

The study area contains ecologically significant forests and areas part of the regional and local municipal Greenlands System under the LSRCA. Unevaluated wetlands consisting of both marshes and swamps are also present within the study area.

The Aurora (McKenzie) Marsh wetland complex is a PSW located at the western end of the study area off both sides of St. John's Sideroad. This wetland consists of open waters, marshes and swamps and is known to support habitat for turtles, amphibians, small mammals and waterfowl. Additionally, along the roadside of this wetland complex are known turtle nesting areas for both snapping and midland painted turtles. This wetland complex is protected under ORMCP with the LSRCA.

Aquatic Habitat

Two waterbodies are present within the Y3-B Aurora East SPS study area. On the eastern portion of the study area, south of St. John's Sideroad and east of Industrial Parkway North, the HREB meanders sinuously northwards through the study area. The HREB is classified to support a coldwater thermal regime. Surrounding land use around the HREB is heavily naturalized as it flows through the Aurora Community Arboretum. This portion of the arboretum where the HREB flows is a meadow, forming a wide riparian area consisting of tall grasses and sedges, with a plantation of coniferous trees in the immediate vicinity of the watercourse. The HREB flows out of this naturalized area under St. John's Sideroad, where it continues for approximately 600 m before forming a confluence with Tannery Creek within a golf course property. This naturalized section of the HREB supports a diverse fish community. Based on this fish community, the HREB found within the study area supports a diverse community of bait/forage fish, as well as a variety of coldwater and warmwater sportfish.

The second waterbody located within the study area is a pond located at the northwest end of the study area, just north of St. John's Sideroad. This waterbody has approximately 45,500 square metres (m^2) of surface area and feeds into Tannery Creek 350 m outside of the study area. Surrounding land use around this waterbody is mostly naturalized, with some residential areas also present. This waterbody is part of the Aurora (McKenzie) Marsh wetland complex, and a large portion of the natural area surrounding it consists of marshland vegetated with cattails and Phragmites spp. Dense sedges and tall deciduous trees can also be found bankside, along with plantations of coniferous trees found on private property located at the waterbody's edge. In accordance with aquatic resource area (ARA) data, this waterbody supports a fish community of bait/forage fish, as well as warmwater sportfish. No redside dace have been recorded within this study area.

Terrestrial Habitat

The lands in the study area are a mix of mid-density residential, commercial, cultural meadow and parkland communities. This study area is also located near the border of Newmarket and Aurora, in the middle of the project area. Elevation mapping illustrates that the eastern half of the study area is at a low elevation and is likely a floodplain for the HREB, which flows through it. Due to the constricted location of the study area, there are limited woodland communities present to provide value to the area. The focus of the study area is the collection of wetland areas that provide valuable heterogeneity and habitat for various species in the area.

All natural and cultural communities present within the study area are considered common in the province.

Significant Wildlife Habitat

Candidate Significant Wildlife Habitat (SWH) for Region 6E, as defined by Ministry of Natural Resources and Forestry (MNRF), was identified in several natural areas within the study area. The greatest concentration of these candidate features is associated with the PSW and Ecologically Significant Areas (ESA) wetland and woodland habitats. A screening and analysis of all Ecological Land Classification (ELC) communities was completed in the study area for Seasonal Concentration Areas of Animals, Rare Vegetation Communities or Specialized Habitat for Wildlife, Habitat for Species of Conservation Concern, and Animal Movement Corridors.

5.5.2.2.5 Areas of Potential Environmental Concern

A review of information from the Environmental Risk Information Services database was completed for properties located within the study area. The review was completed on May 26, 2023, to visually confirm the current land use and associated potential for containing subsurface environmental contamination. This “windshield-level” survey showed that:

– Various residential and commercial properties are present along the majority of the study area.
– Some agricultural and Industrial land use is present within the study area.

No areas at risk of existing contamination were identified for this study area.

5.5.3 Conceptual Design

Conceptual design for this station was based on flow rates and design criteria as described in Chapter 3.

Table 5.5 summarizes the general characteristics and features that will be present from initial construction through to final configuration, as well as the staged aspects of construction that will adjust over time to suit the needs of the system based on forecast populations and flow rates.

Refer to Appendix B, Sheet 11 for the conceptual design drawings relevant to this project.

5.5.3.1 Design Basis

Table 5.5 Staged Sewage Pumping Station Conceptual Design Characteristics for Y3-B Aurora East SPS

Design aspect	2031	2041	2051	Comments
Modelled Peak Flow (L/s)	1700 @ 39 m total dynamic head (TDH)	2500 @ 42 m TDH	1400 @ 36 m TDH	Station total flow rate target under peak event conditions.
Number of pumps	6 – 3 duty +1 standby	6 – 5 duty +1 standby	6 – 5 duty +1 standby	Nominal number of pumps includes main pumps only. Does not include smaller pumps that may be considered during subsequent design stages to manage low-flow conditions.
Number of forcemains in service	1	2	1	Forcemain size has been selected based on a single forcemain conveying 70% of the ultimate peak flow of the station. After reaching peak flows in 2041, the flows to the station will reduce as other systems come online, reverting to a single forcemain in operation.
Nominal firm Capacity (L/s)	2200	2760	2760	Firm capacity is based on installed pumps with n-1 configuration (capacity available with the largest pump out of service).

5.5.3.2 Description of Design

The conceptual level design includes a site footprint for above-grade infrastructure modelled from upgrade works at stations of similar size currently under construction. The stations have a pumping capacity comparable to what is proposed at the Y3-B Aurora East SPS and similar requirements for standby power, electrical distribution, odour management, surge tanks and supporting offices and maintenance areas.

The facility footprint shown allows for separate rooms for electrical systems, control systems, servers, programmable automation controller (PAC) panels, washrooms, office, storage rooms and maintenance bays for equipment. An air management system footprint has been extrapolated from similar sized facilities. It is based on servicing requirements, maintaining a slightly negative pressure within the wet well under most operating conditions and treating the collected air prior to discharge. The odour system is not sized to manage the high rate of ventilation airflow required for staff entry to the wet well area.

The power supply to the facility has been conceptualized to include built-in redundancy, including a dual power feed from the utility, a dual transformer, and a main-tie-main configuration to permit feeding of critical loads from either utility connection or either transformer. Standby power in the conceptual design includes diesel generators and fuel tanks, which is consistent with the current York Region approach of providing redundant power supply to SPS facilities. Generators are located within the building for ease of maintenance and to reduce emitted sound. Noise modelling, additional silencing or sound attenuation required to meet current standards will be determined during detailed design.

The overall footprint for the above-grade conceptual infrastructure is approximately 55 m long x 30 m wide, not including any access roads or driveways. The detailed design stage will incorporate the latest requirements for applicable codes, standards and York Region design guidelines for this SPS.

The Y3-B Aurora East SPS is a new pumping station, considered a large station by York Region design guidelines, requiring a wet well/dry well configuration with pumps mounted in the vertical orientation. The station will include a split wet well with benching, access platforms and ventilation per NFPA 820 and Occupational Health and Safety Act (OHSA) requirements.

The dry well will have bays for a total of six pumps, with three pumps connected to each cell of the wet well. Pumps will be mounted vertically in a dry-pit configuration. Pump riser and discharge header piping is based on York Region standards using stainless steel pipe and knife gate or plug valves depending on the size and function of the valve.

A common discharge header will allow pumps to operate with both forcemains in combined or independent configurations.

There is a space allowance set aside for surge tanks at the facility, with footprint allocated based on extrapolation from similar sized facilities.

General supporting components such as sumps, access platforms and stairs and lifting equipment have also been included in the generation of the anticipated footprint, layout, and costing, based on use within similar York Region facilities.

Table 5.6 describes relevant design aspects for the Y3-B Aurora East SPS.

Table 5.6 General Sewage Pumping Station Conceptual Design Characteristics for Y3-B Aurora East SPS

Design aspect	Value	Comments
Above-grade anticipated footprint of buildings and infrastructure.	55 m x 30 m wide	Facility footprint based on recent design and construction of similar capacity facilities.
Overflow control/location	Aurora SPS equalization tank	This site is conceptualized to act as a common system, overflowing to Aurora EQ with the EQ tank discharging back to either station.
Discharge forcemain diameter	2 x 1,050 mm nominal diameter	
Power supply	4160 V	Medium voltage
Standby power capability	Diesel Standby Generators	Redundant standby power generation.
Air management	Yes	A portion of the planned footprint has been allocated to integrated air management.

5.5.3.3 Construction Methods

The SPS will generally be constructed as circular wet well/dry well below grade to the depths required with ancillary structures as needed above grade. Primary incoming and outgoing infrastructure is anticipated to be constructed via trenchless technology, and connections in the yard to the SPS will be made via open cut excavation.

5.5.3.4 Property Requirements

The proposed infrastructure concept is located on property that is not currently owned by York Region, and therefore, GHD recommends York Region undertake a property selection process to select a final site for the SPS in the vicinity of the existing Aurora SPS.

The proposed property locations and requirements are conceptual only. Final location will be selected considering the impacts and mitigations, results of field studies, procurement requirements, and detailed design. Details related to property easement requirements will be confirmed during detailed design.

5.5.4 Environmental and Community Impacts and Mitigation

Desktop studies were completed to determine the possible extent of potential impacts and to propose mitigation measures that would reduce the likelihood and the consequences should they occur. The major impacts and associated mitigation approaches are described in this section. The assessment criteria and indicators are provided in Table 5.7 and Table 5.8, corresponding to each of the environments (social and built, natural, cultural and traffic impacts) together with a potential effects assessment and identification of avoidance, mitigation and compensation measures for the project.

Table 5.7 Y3-B Aurora East SPS Social and Built Environment Effects and Mitigation

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Social and built environment				
SB-1	Effect on existing views	– Changes are predicted in views from residences in the surrounding area	– Change in existing rear-yard views from residences in the surrounding area (Attridge Drive or Birkshire Drive, Billingham Heights and Calmar Crescent, depending on final location).	– Site the proposed pumping station to minimize the number of views from residences. – Design the proposed pumping station to be architecturally and aesthetically pleasing. – Design and implement a landscape plan for the site to screen the proposed pumping station.
SB-2	Effect on existing residences, businesses, and/or community, institutional, and recreational facilities	– Displacement of residences, businesses, and other facilities is too great – Temporary or permanent disruption to residences, businesses, and other facilities near construction compounds or permanent works is too great	– No displacement of residences, businesses, or community, institutional, and recreational facilities is anticipated. – Disruption to residences, businesses, and community, institutional, and recreational facilities in proximity to construction compounds/permanent installations.	– No avoidance, mitigation, or compensation measures are anticipated. However, if in fact, displacement is required, then York Region would provide market value compensation. – Apply standard construction-related mitigation measures to minimize the disruption effects.
Traffic and transportation				
TT-1	Effect on existing rail/bridge infrastructure	– One or more rail crossings or large infrastructure impacted	– At the rail crossing west of the SPS site, we do not anticipate impacts within the rail right-of-way (ROW) due to distance between locations.	– Coordination with Metrolinx during design development to limit impacts to their rail services.
TT-2	Effect on traffic	– Traffic flows are disrupted too much – Construction occurs too close to congested traffic zones	– Traffic disruption at location of SPS compound, first lane of traffic to allow for truck loading/unloading. – Daily traffic counts between Yonge Street and Bayview Avenue of approximately 27,000. – Traffic movement into and out of construction compound sites will impact pedestrian, cycling and traffic flow on St. John's Sideroad. – Impacts to public transit involving potential rerouting of buses and/or relocation of stops. – Coordination of alternate routing for emergency service vehicles, if needed.	– Where possible, maintain one lane in each direction. This could be achieved through flagging, temporary signals or temporary road widening. – Pedestrian movement should be maintained during construction, with marked pedestrian detours as applicable. – Consider special traffic arrangements for peak hours should be considered in traffic flow directions in the morning and afternoon. – Make special provisions for emergency service vehicle access. – Make special provisions for pedestrian traffic and safety, including signals, detours, and winter maintenance. If feasible, move construction traffic to sideroads.
Utilities				
U-1	Conflict with buried utilities	– Shaft is in direct conflict or falls within clearance limits of nearby utilities	– New construction impacts existing utilities and requires design coordination with utility owners, which increases project cost and schedule.	– Review historic and as-built documents for utility data. – Complete a SUE investigation to identify high risk utilities, including large and/or critical service utilities (e.g., large watermains and all gas mains). – If required, relocate existing utility or move proposed excavation to mitigate conflict.
U-2	Conflict with surface or overhead utilities	– Excavation of shaft is proposed in location of surface infrastructure – Shaft working compound equipment, including cranes will require working directly under overhead utilities or within the hydro wire exclusion zone	– Overhead infrastructure, such as electrical or communications cabling, is mounted on utility poles between 5 and 12 metres above the surface. Depending on the required crane size and operating radius to construct the shaft, equipment extents may fall within hydro line exclusion zone or hit overhead wires causing worker harm or death.	– Working compounds will be designed to allow appropriate and safe movement of workers and equipment around the site, away from live overhead wires or surface utility boxes, based on known utility information and topographic surveys. – If required, relocate existing utility or move proposed excavation to mitigate conflict.
U-3	Damage and/or Deformation to surface and buried utilities	– Soil movement under or next to the utility from shaft/open cut construction	– Ground heave/settlement/horizontal shift along tunnel ahead around shafts and open cut excavations during and post-excavation. This information can be obtained from nearby geotechnical instrumentation. – Deformation or damage to nearby surface or buried utilities as a result of soil movement, which may require rehabilitation or repair (e.g., crack formation, angular rotation, strain, pipe joint rotation or pull out).	– For utilities within the shaft/open cut zone of influence (ZOI), select a shaft or open cut construction method and support of excavation (SOE) appropriate with depth, size and geotechnical and hydrogeological conditions at shaft location. – Analytically assess nearby utilities and structures and propose mitigation methods such as relocation of utilities or, for deep utilities, relocation of the sewer horizon. Should neither of these options be applicable, then investigate ground improvement in proximity of utilities to limit ground movement or investigate modification of the sewer and/or open cut design or construction methodology.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Noise and vibration				
N-1	Operation noise	– Complaints from residents within study area	– Noise disruptions to private residents and commercial areas post-construction, near SPS locations or upgrades.	– Any permanent facility, such as new SPS, SPS upgrades, or supporting air management facilities, will require an Environmental Compliance Approval (ECA) application under Section 9 of the Environmental Protection Act. – Investigate degree of risk and impact in further detail.
N-2	Construction noise	– Complaints from residents within study area	– Noise disruptions to private residents and commercial areas during construction, near construction compounds for new SPS or existing SPS upgrades.	– Propose construction noise monitoring per MECP NPC-115 Construction Equipment requirements. – Consider completing noise monitoring for the duration of the construction and notify the contractor of any exceedances so that corrective action/contingency actions can be implemented. – Use vehicles and equipment (cranes and excavators) with efficient muffling devices or construct enclosures. – Comply with local noise by-laws.
V-1	Construction vibration	– Complaints from residents within study area	– Disruptions to private residents and commercial areas during construction, near construction compounds for new SPS or existing SPS upgrades.	– Propose appropriate construction vibration benchmarks within the tender documents. – Consider pre- and post-construction condition photos.
Air management				
O-1	Operation odour at SPS and existing or proposed sewer connection or SPS	– Odour near SPS and surface connections	– There is potential for odour release due to turbulence at the existing (or upgraded) SPS and at the connections from sewer to SPS.	– Consider implementation of ventilation design systems with odour control. – Extents of risk and impact will be reviewed in further detail upon investigation.
A-1	Construction dust at SPS location	– Fugitive dust is generated – Air quality is poor	– Fugitive dust generation during construction (or upgrades) of SPS and related infrastructure.	– Develop a Dust Best Management Practices Plan to be included in the project Construction Management Plan. – Mitigation should be aimed at minimizing emissions of particulate matter and exposure to particulate matter during the construction phase of the project.

Table 5.8 Y3-B Aurora East SPS Natural Environment Effects and Mitigation

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Hydrogeology				
N-1	Effect on groundwater quantity	– Temporary and/or long-term changes in groundwater quantity	– Temporary change to groundwater quantity because construction may intersect a shallow ORM aquifer (from ground surface to 246 – 248 masl). ORM aquifer is underlain by aquitard. Temporary water takings may be required to facilitate construction. A high groundwater table/hydrostatic groundwater pressure would be expected due to existing soils and anticipated presence of the ORM aquifer. Majority of structure will be constructed through the underlying aquitard. – No long-term change to groundwater quantity is anticipated as no active or passive groundwater takings related to the SPS are anticipated. – Potential ground settlement as a result of active dewatering/depressurization. – Change in shallow groundwater flow patterns resulting from operation of sewer pipe resulting from increased inflow and infiltration (I&I) and/or preferential movement of groundwater within trench sediments.	– Implement construction methods that minimize dewatering requirements. – Establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water).
N-2	Effect on groundwater quality	– Temporary and/or long-term changes in groundwater quality	– Potential temporary change in groundwater quality because construction may intersect shallow aquifer. Temporary water takings may be required to facilitate construction. – No long-term change to groundwater quality is anticipated.	– Implement construction methods that minimize dewatering requirements, including sealed shafts. – Develop and implement a spills response plan for construction to mitigate the effect of a spill should one occur. – Establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water). – During design, complete a contaminant source investigation to mitigate the risk of drawing contamination from one source to another location.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
N-3	Effect on Municipal Well(s), Wellhead Protection Area (WHPA)	– Intersects WHPA-B, C and D – Located on a highly vulnerable aquifer	– Source Water Protection Plan, Clean Water Act (2006) sanitary sewer infrastructure WHPA-B, C, D and policy compliance evaluation. – Entire construction plan is on a WHPA-B, C and D and highly vulnerable aquifer.	– Source Water Protection Plan, Clean Water Act (2006) sanitary sewer infrastructure WHPA-B, C, D and Highly Vulnerable Aquifers (HVA) policy, mitigation and monitoring evaluation. – As of January 2023, source water protection requirements under the York Region Municipal Sewage Works CLI ECA apply for any new or alterations to existing sewage works in WHPA-A or B, Vulnerability Score of 10, which applies to a portion of this alignment. These requirements include: • Design must include a Source Protection Supplementary Report that demonstrates that the proposed design recognized the significant drinking water threat and has implemented mitigation measures to protect drinking water sources. The report should identify drinking water sources, how the sewage works has met the requirements of the CWA and the ministry's design and operational requirements and how the works considered the Risk Management Measures Catalogue (e.g., monitoring, reporting requirements), as amended, to address the risks. • Designs must be accompanied with a monitoring and reporting plan. • Designs must be accompanied with a Spill Prevention and Contingency Plan, covering information requirements as per O. Reg. 224/07 to prevent, eliminate or ameliorate any adverse drinking water effects that result or may result from spills of pollutants. This includes steps taken in the event drinking water sources are contaminated, for example, notifying members of the public who may be directly affected by a spill. – New and replacement sewers are to be constructed of materials and with joints that are equivalent to watermain standards of construction and are to be pressure tested in accordance with Division 441 (formerly 701) of the Ontario Provincial Standards Specification (OPSS).
N-4	Effect on private wells - temporary construction dewatering	– Temporary construction dewatering private well interference (quantity/quality)	– No private wells located near structure. Temporary decrease in private well quantity/quality could occur further away during construction activities depending on the location, depth and construction, methodology and duration.	– Implement construction methods that minimize dewatering requirements, as needed. – Address construction dewatering private well interference complaints through existing York Region private well assessment and mitigation policy. – Proactively identify any high-risk wells during design and prepare site-specific preventative mitigation and corrective action plans as part of design. Corrective actions should align to York Region's private well assessment and mitigation policy.
N-5	Effect on private wells – long term	– Long-term private well interference (quantity/quality	– No long-term groundwater quantity/quality interference is anticipated as no active or passive groundwater takings related to the SPS are anticipated.	– If needed, establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water). – Proactively identify any high-risk wells during design and prepare site-specific preventative mitigation and corrective action plans as part of design. Corrective actions should align to York Region's private well assessment and mitigation policy.
N-6	Effect on surface water quantity/quality	– Temporary changes in surface water quantity/quality	– Temporary changes in surface water quantity/quality could occur during construction activities depending on the location, depth and construction, methodology and duration. – A high groundwater table resulting in groundwater/surface water interaction would be expected due to existing soils and anticipated presence of ORM aquifer. – Presence of known turtle nesting areas within the Aurora (McKenzie) Marsh wetland complex. – Change in groundwater-surface water interaction (reversal of vertical hydraulic gradient) results in impact to terrestrial and aquatic habitat and associated Species at Risk (SAR) (where applicable) - reduction in baseflow. – Change in surface water temperature from groundwater taking and/or discharge to surface water features. – Changes to stream morphology resulting from the release of groundwater dewatering water. The potential reduction in baseflow due to water taking in a lower confined aquifer due to increased downward hydraulic gradients across the aquitard separating the stream and the confined aquifer.	– Field verification of groundwater-surface water interaction suggested for watercourses and wetlands within the study area. – Complete outlet receiver assessment(s) should temporary groundwater discharge be required to surface water. Establish pre-construction baseline surface water quality and quantity conditions and develop implementation plans for monitoring during and post-construction. – Implement/construct treatment (i.e., settlement tanks, etc.) of construction water prior to discharge to storm sewer/surface water. – Minimize construction area disturbance and duration. Implement erosion and sedimentation control measures (e.g., silt fencing, check dams, etc.). – Adhere to fish timing windows to prevent negative impacts on known sensitive fish species within the study area. – Consider completing a geomorphology study during design. – Refer to the Natural Heritage section of the table for further mitigation approaches associated with surface water impacts.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
			– The potential reduction in baseflow from a stream reach that intersects an aquifer in which the water taking is occurring.	
Geotechnical				
G-1	Effect on soil quality	– Contaminant seepage into soil during excavation of shaft	– Chemicals such as drilling fluids, lubricants, ground improvement material, or fuel from construction equipment may contaminate soil.	– Perform regular equipment checks and maintenance. – Prepare an environmental management plan prior to construction in case of contamination.
G-2	Soil movement around shafts	– Vertical or horizontal ground movement around shafts during and post excavation – Deformation or damage to nearby structures and/or utilities	– Ground heave/settlement/horizontal shift at surface around shafts. – Deformation or damage to nearby structures and utilities (e.g., crack formation, angular rotation, strain, or pipe joint rotation or pull out) that may require rehabilitation or repair.	– Select shaft or open cut construction method and SOE appropriate with depth, size and geotechnical and hydrogeological conditions at shaft or open cut locations. – Complete soil displacement analytical assessments at all shaft locations.
G-3	Encounter contaminated soil during shaft excavation	– Soil encountered during shaft excavation is tested to surpass allowable contaminant levels	– Spoil must be dispatched at an approved contaminated soil disposal site.	– Complete appropriate geotechnical investigations and contaminants testing during design development to identify confirmed contaminated soil locations or at-risk areas based on historical land use. – Identify and confirm availability of appropriate soil disposal sites based on anticipated contaminants for use during construction.
Natural heritage				
EG-1	Effect on aquatic habitat or functions	– The study area contains coldwater watercourses – The study area contains wetlands and is considered provincially significant	– Temporary or permanent loss of aquatic features or categorical loss of functions by type, including PSWs, Locally Significant Wetlands, watercourses by sensitivity type, and others. – During construction, water quality may be impaired due to elevated total suspended solids (TSS) in surface water runoff from study area locations which can affect aquatic species/habitats. Some concentrations above background may occur temporarily. – Potential spill hazard when refuelling equipment. – Change in surface water temperature from groundwater taking and/or discharge to surface water features	– Complete site investigations to evaluate potential effects on aquatic habitat function. – Implement best management practices to control surface water runoff and minimize TSS effects. – Where feasible, discharging of surface water during construction should be directed into the municipal storm sewer system to mitigate thermal impacts to watercourses. Should discharge of surface waters be directed to watercourses, additional mitigation measures would need to be adhered to (e.g., enhanced erosion and control measures and water quality guidelines). – Use of erosion and sediment control measures and timing of construction to avoid spawning and egg incubation periods will reduce the potential for effect to fish and aquatic life. – Conduct equipment maintenance and refuelling at the designated and properly contained maintenance areas or at industrial garages located well away from creek banks and wetlands and outside vegetation areas. – Develop a Spills Prevention Plan.
EG-2	Effect on stream geomorphology	– Change in geomorphic form/function/stability in affected channels within the study area	– Change in geomorphic form/function/stability in affected channels.	– Any disturbances near a watercourse during construction will need to be restored with native seeding and/or planting. – Use of erosion and sediment control measures to avoid sedimentation into the stream. – Consider completing a geomorphology study during design, where applicable.
EG-3	Effect on aquatic species, including SAR, species of local concern, native species, and invasive species	– Aquatic species	– Number and type of aquatic species potentially affected temporarily or permanently. – No anticipated impacts to aquatic SAR as there are no aquatic SAR identified within the study area.	– Preventing death of fish or impacts to downstream fish habitat through the use of appropriate timing windows.
EG-4	Effect on terrestrial habitat or functions	– The study area does not contain Areas of Natural and Scientific Interest (ANSIs) – The study area contains ecologically significant forests – Wildlife habitat	– Temporary or permanent loss of natural heritage features (e.g., ESAs, ANSIs, wildlife corridors, and others). – Potential effects on terrestrial habitat (e.g., direct vegetation (and wildlife habitat) loss, alteration, and fragmentation) may occur from the physical footprint of study area locations. – Project preparation, construction, and operation may increase the risk of nest destruction and mortality of migratory birds.	– Site investigations to evaluate potential terrestrial habitat function/significance. – During design, prepare construction constraints with consideration of timing windows to mitigate where possible, vegetation clearing to occur outside of the migratory bird nesting season, bat maternity roosting season, turtle overwintering and amphibian breeding. – Limit the area of project footprint and limit disturbance during construction and operations phases. – The presence of wildlife will be monitored and communicated to site personnel. – Vehicle use will be restricted to designated areas. – Where practical, rehabilitate habitat for plants and wildlife.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
EG-5	Effect on terrestrial species, including SAR, species of local concern, native species, invasive species, and area-sensitive species	– SAR have the potential to occur within the study areas, including amphibians, insects, birds, reptiles, mammals and tree species	– Number and type of terrestrial species potentially affected temporarily or permanently. – Construction activities have the potential to disturb wildlife within adjacent natural heritage areas. – Project preparation, construction and operation may increase the risk of nest/habitat destruction and mortality of terrestrial SAR. – Project may result in wildlife-vehicle collisions and may cause injury/mortality to individual animals.	– Site investigations to evaluate potential occurrence of terrestrial SAR within the study area. – During design, prepare construction constraints with consideration of timing windows to mitigate where possible, vegetation clearing to occur outside of the migratory bird nesting season, bat maternity roosting season, turtle overwintering and amphibian breeding. – Clearly demarcate work limits at outset of construction and minimize unnecessary vegetation clearing.

5.6 Y4 Newmarket SPS Upgrade

5.6.1 Study Area

The Y4 Newmarket SPS Upgrade will provide capability for the pump station to convey capacity increases within the Newmarket SPS catchment area. In addition, a temporary pump station and forcemain will also be constructed to convey flows from the terminus of the Y12-B 2nd Concession South Gravity Sewer and future site of the Y9-A Newmarket East SPS to the existing Newmarket SPS until the Y9-A Newmarket East SPS is constructed. No modifications or alterations are anticipated to be outside of the limits of these areas. A study area of approximately 200 m surrounding the existing pumping station was applied as summarized in Figure 5.7.

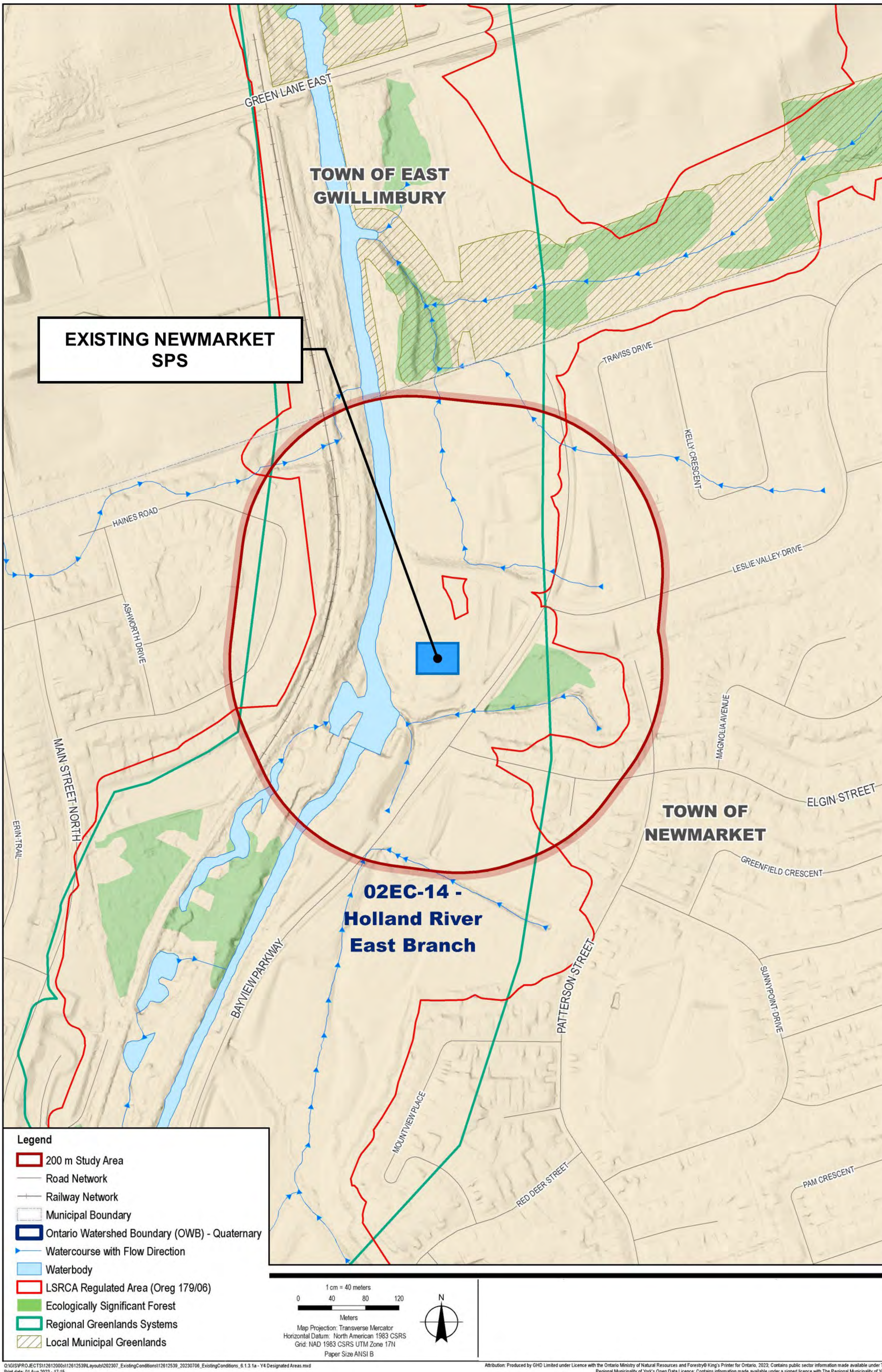


Figure 5.7 Y4 Newmarket SPS Upgrade Study Area

5.6.2 Existing Conditions

5.6.2.1 Social and Built Environment

The following sections will summarize the findings of the desktop studies completed within the study area for the Y4 Newmarket SPS Upgrade project, including planning and land use, traffic and transportation and utilities.

5.6.2.1.1 Planning Policy and Land Use

Existing Land Use

Along Bayview Parkway, land use consists of the following:

West side:

- Low density residential housing
- Recreational lands (Newmarket micro soccer fields)
- York Region water and wastewater plant
- Newmarket SPS
- Nokiidaa Trail
- CNR railway tracks
- HREB.

East side:

- Low density residential housing
- Parking facility southeast of Bayview Parkway.

Planning Policy

Regional

The York Region Official Plan (June 2023 Office Consolidation) designates lands within the study area as Community Area. Additionally, lands within the study area are part of the Regional Greenlands System.

Local

– The 2022 Newmarket Official Plan designates the lands in the study area as Parks and Open Space and Residential Area.

Active Development Applications

Lands within the Y4 Newmarket SPS Upgrade study area contain several active development applications as follows:

- Town of Newmarket – Haines Road - Two applications. To amend the Town's Zoning By-law as part of the Established Neighbourhoods Compatibility Study. Proposed subdivision.
- Town of Newmarket – Bayview Parkway - To amend the Town's Zoning By-Law as part of the Established Neighbourhoods Compatibility Study.
- 380 Bayview Parkway - Two applications. Pre-application submission to review the submission materials prior to accepting a formal application submission to facilitate development of a telecommunications tower. To amend the Town's Zoning By-Law as part of the Established Neighbourhoods Compatibility Study.

5.6.2.1.2 Transportation in the Study Area

The Newmarket SPS is located between Green Lane East to the north and Davis Drive to the south, along the north end of Bayview Parkway. Bayview Parkway is a 30 km/h posted speed, two-lane collector road with paved shoulders and no sidewalks, as shown in Figure 5.8.

Figure 5.8 Bayview Parkway Looking North Towards the Existing Newmarket SPS (Google Maps "Streetview," digital images http://maps.google.com)

There are no AADT volumes available for Bayview Parkway or Davis Drive, which connects to Bayview Parkway.

There is one public transit route which passes by Bayview Parkway, which is YRT Route 55. There is a Metrolinx GO Transit rail line west of Bayview Parkway, running north south to connect the Newmarket GO Transit station at Davis Drive and the East Gwillimbury Go Transit station at Green Lane East. The rail line runs behind the SPS working area.

5.6.2.1.3 Utilities in the Study Area

There are several above/below grade utilities situated within the study area corridor and in the vicinity of the proposed project; however, we clarify that the works completed will be limited to the extent of the SPS facilities; therefore, minor or no impacts are anticipated to nearby utilities. For any utilities which are identified to be temporarily impacted during the construction of the SPS upgrades, formal notification and consent would be required from the authorities responsible for these utilities prior to construction.

Known large infrastructure within the study area include the following:

– A CNR railway running parallel to the existing SPS property.

The railway along the study area will require specific geotechnical instrumentation and monitoring requirements to receive infrastructure owner approval of the design. No construction work will be completed outside of the existing SPS property limits. Based on the distance between the rail from the proposed works and the scale of the work, impacts to the track are not anticipated to be extensive but will be assessed as part of a Construction Impact Assessment during design development should the structure fall within the zone of influence (ZOI) of any excavation work.

Known municipal infrastructure that existed on York Region’s GIS database has been provided within the drawing set. A detailed utility investigation program, which would include a “Level A through D" subsurface utility exploration, would be required as part of future site investigations.

5.6.2.2 Natural Environment

The following sections will summarize the findings of the desktop studies completed within the study area for geotechnical, hydrogeology, surface water, natural heritage and contamination.

5.6.2.2.1 Geotechnical

No site-specific reports or borehole records were encountered within the study area.

Based on the Quaternary geology mapping, the native deposit within the study area predominantly comprised silt and clay matrix, mostly consisting of Glaciolacustrine deposits.

The bedrock consists of limestone, dolostone, shale, arkose and sandstone and Ottawa Group, Simcoe Group and Shadow Lake Formation. Typically, bedrock is mapped at depths of 71 m to 76 mbgs within the study area and will not be reached during construction.

The Y4 Newmarket SPS Upgrade study area surficial geology consists of alluvial deposits.

5.6.2.2.2 Hydrogeological

A hydrogeological desktop review was undertaken within the study area using information from MECP well records, the MECP Source Protection Information Atlas, the Oak Ridges Moraine database, and the Ontario Geological Survey database. Available hydrogeological reports for projects within the area were also reviewed.

The upgrades related to the Y4 Newmarket SPS Upgrade project are anticipated to be within the existing building and are not expected to involve construction excavations below the water table. The Y4 Newmarket SPS Upgrade study area is within the Schomberg Clay Plains physiographic region. The SPS is located outside of a WHPA. Shallow groundwater flows towards the HREB.

The closest private well is located approximately 450 m away. There are no private wells in the surrounding area.

Refer to Table 5.9 regarding details on anticipated aquifers and aquitards within the study area.

Table 5.9 Aquifers and Aquitards Through the Y4 Study Area

Aquifers and aquitards	Description	Thickness
Alluvial deposits	Surficial alluvial deposits.	Varies
Oak Ridges Moraine Complex (Aquifer)	These sediments consist mostly of silt and fine sand, but also include gravel and minor clay and diamicton. The aquifer is generally unconfined, except for the section covered by Halton Till on the south flank of the ORM complex. The sediments slope up towards the north.	Ranges between 4 to 10 m
Channel silt aquitard	Silt deposits. The sediments slope up towards the north.	Ranges between 14 to 24 m
Undifferentiated upper sediments recent deposits (Aquifer)	An unconfined aquifer consisting of discontinuous fill and unconsolidated overburden deposits. Deposits surface towards the east of the study area.	Varies
Newmarket Till (Aquitard)	A continuous layer that acts as an aquitard to the underlying Thorncliffe Formation. Deposits surface towards the east of the study area.	Varies
Thorncliffe Formation (Aquifer)	Regionally recognized as a highly productive confined aquifer and is laterally continuous.	The deposits range in varies but have been observed at 5 to 9 m depth near the HEPC

5.6.2.2.3 Surface Water

There is one sub-watershed within the study area, the HREB. The SPS is located adjacent to HREB.

Refer to Figure 5.9 for a surface water map of existing conditions within the study area.

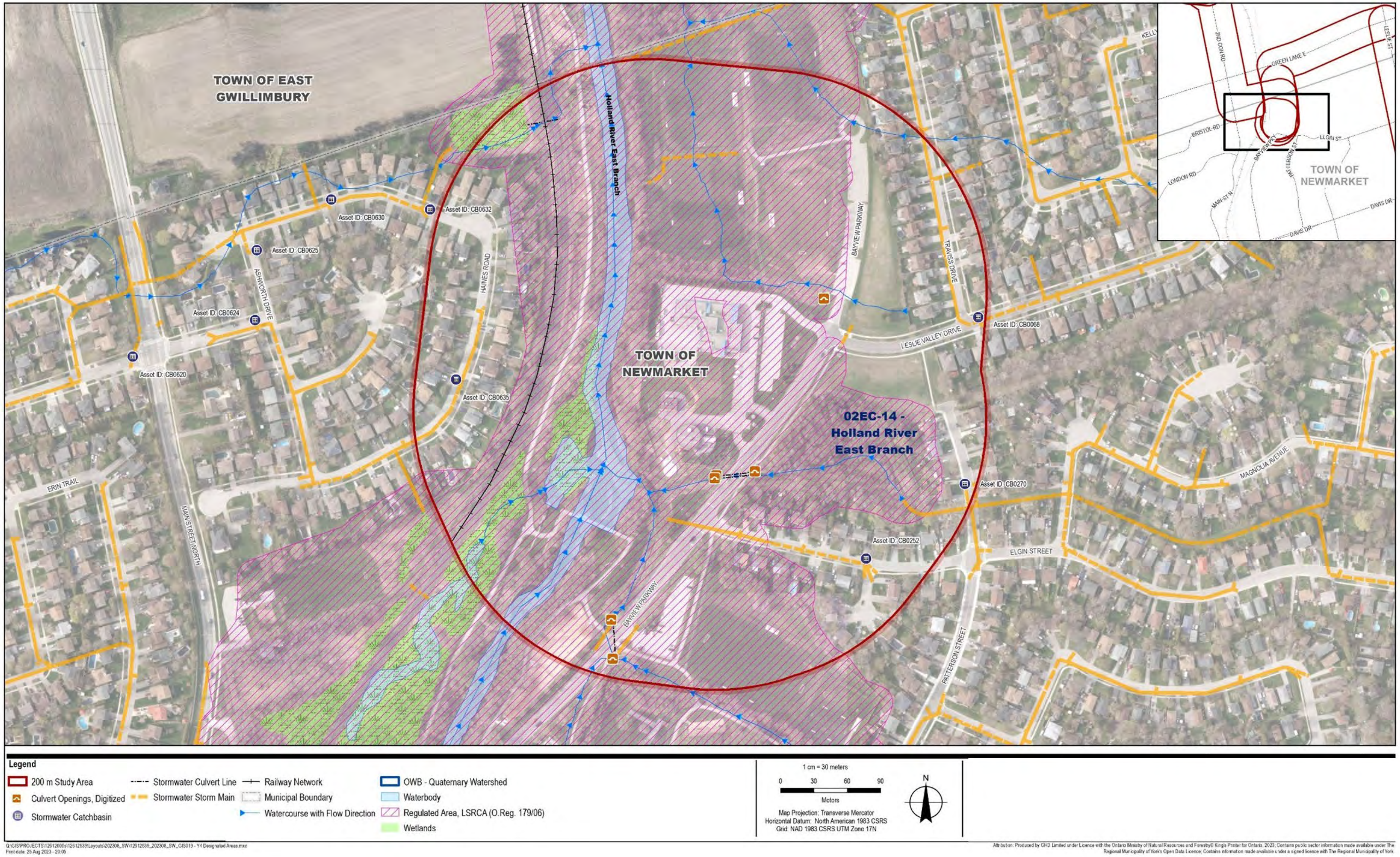


Figure 5.9 Y4 Newmarket SPS Upgrade Study Area Surface Water Map for Existing Conditions

5.6.2.2.4 Natural Heritage Characterization

The study area contains ecologically significant forests, unevaluated wetlands, areas under the Greenbelt Plan and areas associated with the Regional Greenlands System regulated under the LSRCA.

Aquatic Habitat

The Y4 Newmarket SPS Upgrade study area has the HREB flowing through it, along with four tributaries of the HREB. Each watercourse within the study area is considered to have a warmwater thermal regime, with flow generally moving in a south to north direction. Surrounding land use is primarily residential, with some natural green spaces and parks. The riparian characteristics of this portion of the HREB show a relatively wide, grassy, vegetated floodplain with sparse trees and gentle sloping along the banks. Parts of the channel, both within the riparian floodplain and stream channel, have been confined with concrete embankment.

ARA data suggests fish presence within these watercourses. Based on the anticipated fish community, the HREB within this study area and its tributaries are expected to support primarily forage/baitfish species with limited warmwater sportfish present. No redside dace have been recorded within this study area.

Terrestrial Habitat

The lands in the study area consist mainly of institutional, medium density residential and woodland communities, with the HREB flowing south to north, just west of the existing SPS in the study area. A large portion of the study area sits at a lower elevation within the HREB valley, with the housing developments on the eastern and western extents perched on the valley's edge. The focus of the study area is the woodland communities which run along the HREB and border the existing SPS on the west and south sides.

All natural and cultural communities present within the study area are considered common in the province.

Significant Wildlife Habitat

Potential Candidate SWH for Region 6E, as defined by MNRF has been identified in several natural areas within the study area. The greatest concentration of these potentials is likely to be found in wetland and woodland habitats associated with the HREB and ESAs. A screening and analysis of all ELC communities were completed in the study area for Seasonal Concentration Areas of Animals, Rare Vegetation Communities or Specialized Habitat for Wildlife, Habitat for Species of Conservation Concern and Animal Movement Corridors.

5.6.2.2.5 Areas of Potential Environmental Concern

A review of information from the Environmental Risk Information Services database was completed for properties located within the study area. The review was completed on May 26, 2023, to visually confirm the current land use and associated potential for containing subsurface environmental contamination. This "windshield-level" survey showed that:

– Various residential and commercial properties are present along the majority of the study area.
– Some agricultural and Industrial land use is present within the study area.

No areas at risk of existing contamination were identified for this study area.

5.6.3 Conceptual Design

Conceptual design for this station was based on flow rates and design criteria as described in Chapter 3. The Newmarket SPS facility has an existing firm design capacity of 1290 L/s, as defined in the current ECA.

Table 5.10 summarizes the general characteristics and features that will be present from initial construction through to final configuration. As the Newmarket SPS is an existing station, any required upgrades will be related to the replacement of existing pumps and ancillary equipment as required to convey the projected flows through the existing forcemains. It is expected that this upgrade will be limited to the existing property for the station.

A temporary pumping solution will be implemented to provide conveyance of the flows from the Y12-B 2nd Concession South Gravity Sewer to the Newmarket SPS until the Y9-A Newmarket East SPS is constructed.

5.6.3.1 Design Basis

Table 5.10 Staged Sewage Pumping Station Conceptual Design Characteristics for Y4 Newmarket SPS Upgrade

Design aspect	2031	2041	2051	Comments
Modelled Peak Flow (L/s)	1214 L/s	1270 L/s	1120 L/s	Station total flow rate target under peak event conditions.
Number of pumps	4, 3 duty +1 standby	4, 3 active +1 standby	4, 3 active +1 standby	
Number of forcemains in service	1	1	1	Forcemain size has been selected based on a single forcemain conveying 70% of the ultimate peak flow of the station.
Nominal firm capacity (L/s)	1290 L/s	1290 L/s	1290 L/s	Firm capacity at this stage of development.

5.6.3.2 Description of Design

Upgrades of the existing Newmarket SPS will include improvements within the existing building footprint to efficiently convey the projected flows. This includes but is not limited to replacement of the pumps and supporting ancillary equipment. No changes to the build footprint are anticipated.

The location of the proposed temporary pumping station was selected within the future footprint of the proposed Y9-A Newmarket East SPS. It is beneficial for the two stations to be located within close proximity of one another as it allows for staging of infrastructure construction.

This site is located to the north at a junction of existing forcemains within a greenspace that has no major constraints to size. Further, this location allows for shorter gravity sewer and forcemain interconnections as it is located at a junction on the existing network.

During design, consideration must be given to access and parking, fencing and security, grading and drainage, landscaping, and flood protection designed to comply with current standards. At this conceptual stage, these aspects have only been considered at a general level using parametric approximations for both footprint and cost.

The conceptual design does not include a site footprint for above-grade infrastructure as the pumps are to be installed below-grade within a tunnelling shaft. No above-grade infrastructure is expected to be required at this stage.

The station will be considered a small station by York Region design guidelines. GHD has conceptually envisioned a wet well with two submersible pumps installed. Wet well controls for flow, level and alarms will be confirmed during detailed design but will be consistent with typical York Region installations with both a primary and a backup method of level measurement.

General supporting components such as sumps, access platforms and stairs and lifting equipment have also been included by GHD, referencing the use of similar facilities with similar characteristics in the generation of the anticipated footprint, layout and costing.

5.6.3.3 Construction Methods

Upgrades on the Newmarket SPS are focused within the existing building footprint and on-site yard piping.

The temporary SPS will be constructed as circular wet well below grade to the depths required, with minimal ancillary structures required at grade. Primary incoming infrastructure is anticipated to be constructed via trenchless technology and connection to the Newmarket SPS and installation of the forcemain via open cut excavation.

5.6.3.4 Property Requirements

This location will require the acquisition of land from the Town of Newmarket. This property is covered under Chapter 4 and is associated with the Y9-A Newmarket East SPS and Y12-B 2nd Concession South Gravity Sewer.

Permanent property requirements will depend on the final location of the temporary pump station, which is expected to be located at the future site of the Y9-A Newmarket East SPS. The shaft locations are not currently within York Region right-of-way (ROW), and property easements may be required for permanent access to the maintenance holes. Exact details on shaft sizing, location and property easement requirements will be confirmed during detailed design.

York Region ROW and property easements may be required for permanent access to the maintenance holes.

5.6.4 Environmental and Community Impacts and Mitigation

Desktop studies were done to determine the possible extent of potential impacts and to propose mitigation measures that would reduce the likelihood and the consequences should they occur. The major impacts and associated mitigation approaches are described in this section.

It is noted that for the temporary SPS works, impacts and mitigations are covered under Y9-A Newmarket East SPS and Y12-B 2nd Concession South Gravity Sewer. The below sections are applicable only to the Newmarket SPS Upgrades within the existing building footprint. The assessment criteria and indicators are provided in Table 5.11 and Table 5.12, corresponding to each of the environments (social and built, natural, cultural and traffic impacts) together with a potential effects assessment and identification of avoidance, mitigation and compensation measures for the project.

Table 5.11 Y4 Newmarket SPS Upgrade Social and Built Environment Effects and Mitigation

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Social and built environment				
SB-1	Effect on existing views	– Predicted changes in views from residences in the surrounding area	– No change in existing views from residences in the surrounding area.	– No avoidance, mitigation, or compensation measures required.
SB-2	Effect on existing residences, businesses, and/or community, institutional, and recreational facilities	– Extent of displacement of residences, businesses, and other facilities – Extent of temporary or permanent disruption to residences, businesses, and other facilities in proximity to construction compounds/permanent installations	– No displacement of residences, businesses, or community, institutional, and recreational facilities is anticipated. – Temporary disruption to residences, businesses, and community, institutional, and recreational facilities in proximity to construction compounds/permanent installations.	– No avoidance, mitigation, or compensation measures are anticipated. However, if in fact, displacement is required, then York Region would provide market value compensation. – Apply standard construction-related mitigation measures to minimize the temporary disruption effects.
Traffic and transportation				
TT-1	Effect on existing rail/bridge infrastructure	– Number of rail crossings impacted	– At the rail west of the SPS, we do not anticipate the compound area or traffic management to extend within the rail ROW.	– Coordination with Metrolinx during design development to limit impacts to their rail services.
TT-2	Effect on traffic	– Extent of disruption to traffic flows – Proximity to congested traffic zones	– Minimal traffic disruption at location of SPS compound; shoulder lane may be used to allow for truck loading/unloading. – Traffic movement into and out of Construction compound sites will impact cycling and traffic flow on Bayview Parkway. – Impacts to public transit involving potential rerouting of buses and/or relocation of stops. – Coordination of alternate routing for emergency service vehicles, if needed.	– Where possible, maintain one lane in each direction. This could be achieved through flagging, temporary signals or temporary road widening. – Pedestrian movement should be maintained during construction, with marked pedestrian detours as applicable. – Consider special traffic arrangements for peak hours should be considered in traffic flow directions in the morning and afternoon. – Make special provisions for emergency service vehicle access. – Make special provisions for pedestrian traffic and safety, including signals, detours, and winter maintenance. If feasible, move construction traffic to sideroads.
Utilities				
U-1	Conflict with buried utilities	– Excavation work (if any) is in direct conflict or falls within clearance limits of nearby utilities	– New construction for sewer connections impacts existing utilities and requires design coordination with utility owners, which increases project cost and schedule.	– Review historic and as-built documents for utility data. – Complete a SUE investigation to identify high risk utilities, including large and/or critical service utilities (e.g., large watermains and all gas mains). – If required, relocate existing utility or move proposed excavation to mitigate conflict.
U-2	Conflict with surface or overhead utilities	– Working compound equipment, including cranes, will require working directly under overhead utilities or within the hydro wire exclusion zone.	– Overhead infrastructure, such as electrical or communications cabling, is mounted on utility poles between 5 and 12 metres above the surface. Depending on the required crane size and operating radius to construct the shaft, equipment extents may fall within hydro line exclusion zone or hit overhead wires causing worker harm or death.	– Working compounds will be designed to allow appropriate and safe movement of workers and equipment around the site, away from live overhead wires or surface utility boxes, based on known utility information and topographic surveys. – If required, relocate existing utility or move proposed excavation to mitigate conflict.
Noise and vibration				
N-1	Operation noise	– Noise monitors surpass established limit – Complaints from residents within study area	– Noise disruptions to private residents and commercial areas post-construction, near SPS locations or upgrades.	– Any permanent facility, such as new SPS, SPS upgrades, or supporting air management facilities, will require an ECA application under Section 9 of the Environmental Protection Act. – Investigate degree of risk and impact in further detail.
N-2	Construction noise	– Complaints from residents within study area	– Noise disruptions to private residents and commercial areas during construction, near construction compounds for new SPS or existing SPS upgrades.	– Propose construction noise monitoring per MECP NPC-115 Construction Equipment requirements. – Consider completing noise monitoring for the duration of the construction and notify the contractor of any exceedances so that corrective action/contingency actions can be implemented. – Use vehicles and equipment (cranes and excavators) with efficient muffling devices or construct enclosures. – Construction to comply with local noise by-laws

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
V-1	Construction vibration	– Complaints from residents within study area	– Disruptions to private residents and commercial areas during construction, near construction compounds for new SPS or existing SPS upgrades.	– Propose appropriate construction vibration benchmarks within the tender documents. – Consider pre- and post-construction condition photos.
Air management				
O-1	Operation odour at SPS and existing or proposed sewer connection	– Complaints are received from residents within the study area	– There is potential for odour release due to turbulence at the existing (or upgraded) SPS and at the connections from sewer to SPS.	– Consider implementation of ventilation design systems with odour control. – Extents of risk and impact will be reviewed in further detail upon investigation.
O-2	Construction odour	– Complaints are received from residents within the study area	– During live connection of infrastructure, there is the potential for odour release.	– Advance notification to residents, advising them of what work is being completed and the duration of the work.
A-1	Construction dust at SPS location	– Fugitive dust is generated – Air quality is poor	– Fugitive dust generation during construction (or upgrades) of SPS and related infrastructure.	– Develop a Dust Best Management Practices Plan to be included in the project Construction Management Plan. – Mitigation should be aimed at minimizing emissions of particulate matter and exposure to particulate matter during the construction phase of the project.

Table 5.12 Y4 Newmarket SPS Upgrade Natural Environment Effects and Mitigation

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Natural heritage				
EG-1	Effect on aquatic habitat or functions	– The study area contains warm water watercourses – The study area contains wetlands	– Temporary or permanent loss of aquatic features or categorical loss of functions by type, including PSWs, Locally Significant Wetlands, watercourses by sensitivity type, and others. – During construction, water quality may be impaired due to elevated TSS in surface water runoff from study area locations which can affect aquatic species/habitats. Some concentrations above background may occur temporarily. – Potential spill hazard when refuelling equipment.	– Complete site investigations to evaluate potential effects on aquatic habitat function. – Implement best management practices to control surface water runoff and minimize TSS effects. – Where feasible, discharging of surface water during construction should be directed into the municipal storm sewer system to mitigate thermal impacts to watercourses. Should discharge of surface waters be directed to watercourses, additional mitigation measures would need to be adhered to (e.g., enhanced erosion and control measures and water quality guidelines). – Use of erosion and sediment control measures and timing of construction to avoid spawning and egg incubation periods will reduce the potential for effect to fish and aquatic life. – Conduct equipment maintenance and refuelling at the designated and properly contained maintenance areas or at industrial garages located well away from creek banks and wetlands and outside vegetation areas. – Develop a Spills Prevention Plan.
EG-2	Effect on stream geomorphology	– Change in geomorphic form/function/stability in affected channels within the study area	– Change in geomorphic form/function/stability in affected channels.	– Any disturbances near a watercourse during construction will need to be restored with native seeding and/or planting. – Use of erosion and sediment control measures to avoid sedimentation into the stream. – Consider completing a geomorphology study during design, where applicable.
EG-3	Effect on aquatic species, including SAR, species of local concern, native species, and invasive species	– Aquatic species	– Number and type of aquatic species potentially affected temporarily or permanently. – No anticipated impacts to aquatic SAR as there are no aquatic SAR identified within the study area.	– Preventing death of fish or impacts to downstream fish habitat through the use of appropriate timing windows.
EG-4	Effect on terrestrial habitat or functions	– The study area does not contain ANSIs – The study area contains Ecologically Significant Forests – Wildlife habitat	– Temporary or permanent loss of natural heritage features (e.g., ESAs, ANSIs, wildlife corridors, and others). – Potential effects on terrestrial habitat (e.g., direct vegetation (and wildlife habitat) loss, alteration, and fragmentation) may occur from the physical footprint of study area locations.	– Site investigations to evaluate potential terrestrial habitat function/significance. – During design, prepare construction constraints with consideration of timing windows to mitigate where possible, vegetation clearing to occur outside of the migratory bird nesting season, bat maternity roosting season, turtle overwintering and amphibian breeding.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
			– Project preparation, construction, and operation may increase the risk of nest destruction and mortality of migratory birds.	– Limit the area of project footprint and limit disturbance during construction and operations phases. – The presence of wildlife will be monitored and communicated to site personnel. – Vehicle use will be restricted to designated areas. – Where practical, rehabilitate habitat for plants and wildlife.
EG-5	Effect on terrestrial species, including SAR, species of local concern, native species, invasive species and area-sensitive species	– SAR have the potential to occur within the study areas, including amphibians, insects, birds, reptiles, mammals and tree species	– Number and type of terrestrial species potentially affected temporarily or permanently. – Construction activities have the potential to disturb wildlife within adjacent natural heritage areas. – Project preparation, construction and operation may increase the risk of nest/habitat destruction and mortality of terrestrial SAR. – Project may result in wildlife-vehicle collisions and may cause injury/mortality to individual animals.	– Site investigations to evaluate potential occurrence of terrestrial SAR within the study area. – During design, prepare construction constraints with consideration of timing windows to mitigate where possible, vegetation clearing to occur outside of the migratory bird nesting season, bat maternity roosting season, turtle overwintering and amphibian breeding. – Clearly demarcate work limits at outset of construction and minimize unnecessary vegetation clearing.

5.7 Y5 Bogart SPS Upgrade

5.7.1 Study Area

The Y5 Bogart SPS is located at 319 Hamilton Street in Newmarket and receives flows from the local collection systems. The flow is currently pumped into either of the existing Newmarket SPS forcemains and conveyed towards Aurora SPS. The upgrades will be limited to pump replacements to meet any required increase in capacity within the current catchment area. Based on current modelling efforts, no significant increases are anticipated.

The proposed permanent modifications to the facility are not anticipated to extend beyond the existing property limits, but temporary easements or mitigation impacts or requirements may extend onto or impact adjacent properties. A study area of approximately 200 metres surrounding the existing pumping station was applied as summarized in Figure 5.10.

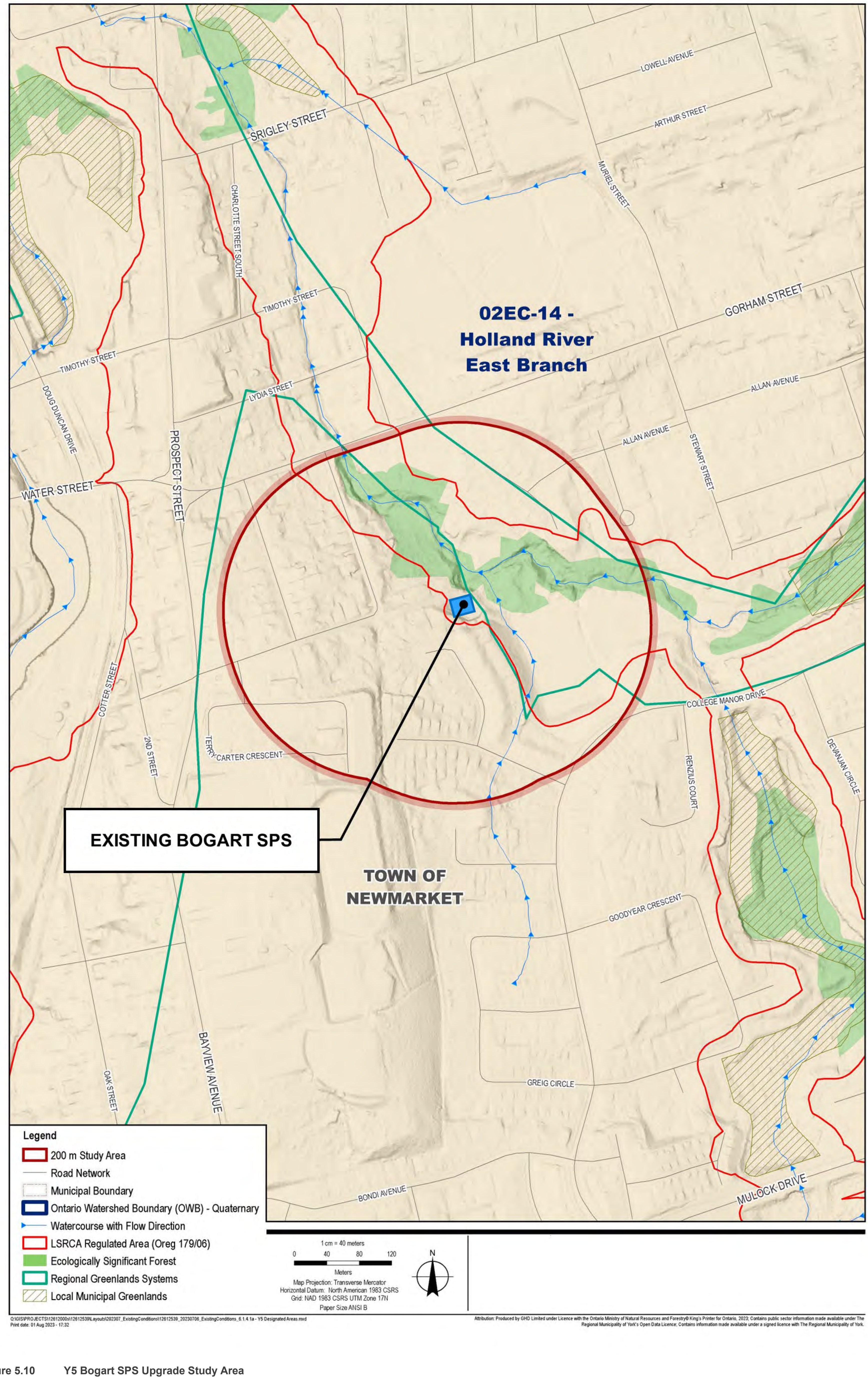


Figure 5.10 **Y5 Bogart SPS Upgrade Study Area**

5.7.2 Existing Conditions

5.7.2.1 Social and Built Environment

The following sections will summarize the findings of the desktop studies completed within the study area for the Y5 Bogart SPS project, including planning and land use, traffic and transportation and utilities.

5.7.2.1.1 Planning Policy and Land Use

Study area between Gorham Street and College Manor Drive, land uses consist of the following:

- Low density residential housing
- Recreational lands (Baseball diamond, College Manor Park)
- Institutional use (Awaken church).

Planning Policy

Regional

The York Region Official Plan (June 2023 Office Consolidation) designates lands within the study area as Community Area. Additionally, lands within the study area are part of the Regional Greenlands System.

Local

The 2022 Newmarket Official Plan (August 2022 Consolidation) designates the lands in the study area as Residential Area and Parks and Open Space.

Active Development Applications

Lands within the Y5 Bogart SPS Upgrade study area contain several active development applications as follow:

- Town of Newmarket – Hamilton Street - To amend the Town's Zoning By-Law as part of the Established Neighbourhoods Compatibility Study.
- Town of Newmarket – Sheridan Court - Two applications. Draft plan of subdivision. To amend the Town's Zoning By-Law as part of the Established Neighbourhoods Compatibility Study.
- Town of Newmarket – Pickering College - Three applications. Proposed redevelopment of an existing private college. To amend the Town's Zoning By-Law as part of the Established Neighbourhoods Compatibility Study. Application for a Site Plan.
- Town of Newmarket – Gaston Plaza - Two applications. Subdivision proposal. To amend the Town's Zoning By-Law as part of the Established Neighbourhoods Compatibility Study.

5.7.2.1.2 Transportation in the Study Area

The Bogart Creek SPS is located within a suburban area west of Prospect Street between Mulock Drive and Davis Drive. The SPS is located at the corner of local roads Timothy Street and Pine Street, which connect to Prospect Street and Gorham Street, respectively. The local roads transition to one another and are two-lane local roads, with a sidewalk on the east and north sides and a 20 km/h speed limit at the curve. Photos of the above streets and relevant intersections are shown in Figure 5.11.

Figure 5.11 (1) Pine Street Looking North Towards Bogart Creek SPS, (2) Prospect Avenue Looking North at Timothy Street Intersection, (3) Gorham Street Looking East at Pine Street intersection. (Google Maps "Streetview," digital images http://maps.google.com)

There are no AADT counts within the study area; however, counts taken along Mulock Drive southeast of the area are 28,699, based on the latest available 2023 data. Counts for local roads are anticipated to be much lower. Historical AADT data near the study area are presented in Table 5.13.

Table 5.13 Mulock Drive AADT counts between Harry Walker Parkway South and Kingdale Road (southwest of study area)

Description of road limits	2013	2015	2016	2017	2018	2019	2022	2023
Harry Walker Parkway South and Kingdale Road	24,692	23,381	24,111	23,407	26,964	28,110	29,247	28,699

There is one public transit route which passes along Gorham Street, which is YRT Route 56. This route is located near the SPS but away from direct access to the site.

5.7.2.1.3 Utilities in the Study Area

There are several above/below grade utilities situated within the study area corridor and in the vicinity of the proposed project; however, we clarify that the works completed will be limited to the extent of the SPS facilities; therefore, minor or no impacts are anticipated to nearby utilities. For any utilities which are identified to be temporarily impacted during the construction of the SPS upgrades, formal notification and consent would be required from the authorities responsible for these utilities prior to construction.

Known municipal infrastructure that existed on York Region's GIS database has been provided within the drawing set. A detailed utility investigation program, which would include a "Level A through D" subsurface utility exploration, would be required as part of future site investigations.

5.7.2.2 Natural Environment

The following sections will summarize the findings of the desktop studies completed within the study area for geotechnical, hydrogeology, surface water, natural heritage and contamination.

5.7.2.2.1 Geotechnical

The Y5 study area is bordered by residential properties within the boundaries of the Town of Newmarket.

Based on historical boreholes (1962) advanced to 7 m depth, northwest of the current study area (about 325 m away), the near surface condition generally comprised of silty clayey sand (0.6 m to 1 m thick) overlying silty sand to sandy silt till (very dense relative density). A thick fill layer (about 5 m thick) was encountered in both boreholes. It should be noted that the above-mentioned subsurface condition was encountered northwest of the Y5 study area (about 0.3 km away from the study area).

The native deposit within the study area predominantly comprised silt and clay matrix, mostly consisting of Glaciolacustrine deposits.

The bedrock within the west and north portions of the study area consists of limestone, dolostone, shale, arkose and sandstone and Ottawa Group, Simcoe Group and Shadow Lake Formation. The bedrock within the east and south portions of the study area consists of shale, limestone, dolostone and siltstone of the Georgian Bay Formation, Blue Mountain Formation and Billings Formation. Typically, bedrock is mapped at depths of 87 to 100 mbgs within the study area and will not be reached during construction.

5.7.2.2.2 Hydrogeological

A hydrogeological desktop review was undertaken within the study area using information from MECP well records, the MECP Source Protection Information Atlas, the Oak Ridges Moraine database, and the Ontario Geological Survey database. Available hydrogeological reports for projects within the area were also reviewed.

The Y5 Bogart SPS Upgrade is anticipated to be within the existing building and is not expected to involve construction excavations below the water table. The study area is within the Schomberg Clay Plains physiographic region. The SPS is located within WHPA-D. The water table is approximately 4 to 5 mbgs due to proximity to Fairy Lake. There, shallow groundwater flows eastward from a topographical high located west of the structure.

Refer to Table 5.14 regarding details on anticipated aquifers and aquitards within the study area.

Table 5.14 Aquifers and Aquitards Through the Y5 Study Area

Aquifers and aquitards	Description	Thickness
Undifferentiated upper sediments at ground surface (Aquifer)	An unconfined aquifer consisting of discontinuous fill and unconsolidated overburden deposits. Underlies topsoil at the east side of the section.	Generally, 2 m
Halton till (Aquitard)	A discontinuous aquitard that acts as a low-permeability cap on the underlying Upper and Lower Oak Ridges Aquifer Complex (ORAC).	Ranges between 1 to 3 m
Oak Ridges Moraine Complex (Aquifer)	These sediments consist mostly of silt and fine sand, but also include gravel and minor clay and diamicton. The aquifer is generally unconfined, except the section covered by Halton till on the south flank of the ORM complex. Underlies topsoil at the west side of section.	Ranges between 1 to 28 m
Channel silt aquitard	Silt deposit	Ranges between 1 to 15 m
Channel sand aquifer	Sand deposits	Ranges between 10 to 50 m
Newmarket till (Aquitard)	A continuous layer that acts as an aquitard to the underlying Thorncliffe Formation.	Ranges between 19 to 31 m
Thorncliffe Formation (Aquifer)	Regionally recognized as a highly productive confined aquifer and is laterally continuous.	Ranges between 6 to 20 m
Sunnybrook drift (Aquitard)	A continuous layer that acts as an aquitard to the underlying Scarborough Formation.	Up to 14 m
Scarborough Formation (Lower aquitard)	A confined aquifer that is discontinuous and appears to consist of channel fill deposits that roughly dip to the east.	Up to 23 m

There are no private wells in the surrounding area.

5.7.2.2.3 Surface Water

There is one sub-watershed within the study area, the HREB. Other surface features of interest include the following:

- Confluence of an unnamed headwater and Bogart Creek.

Refer to Figure 5.12 for a surface water map of existing conditions within the study area.

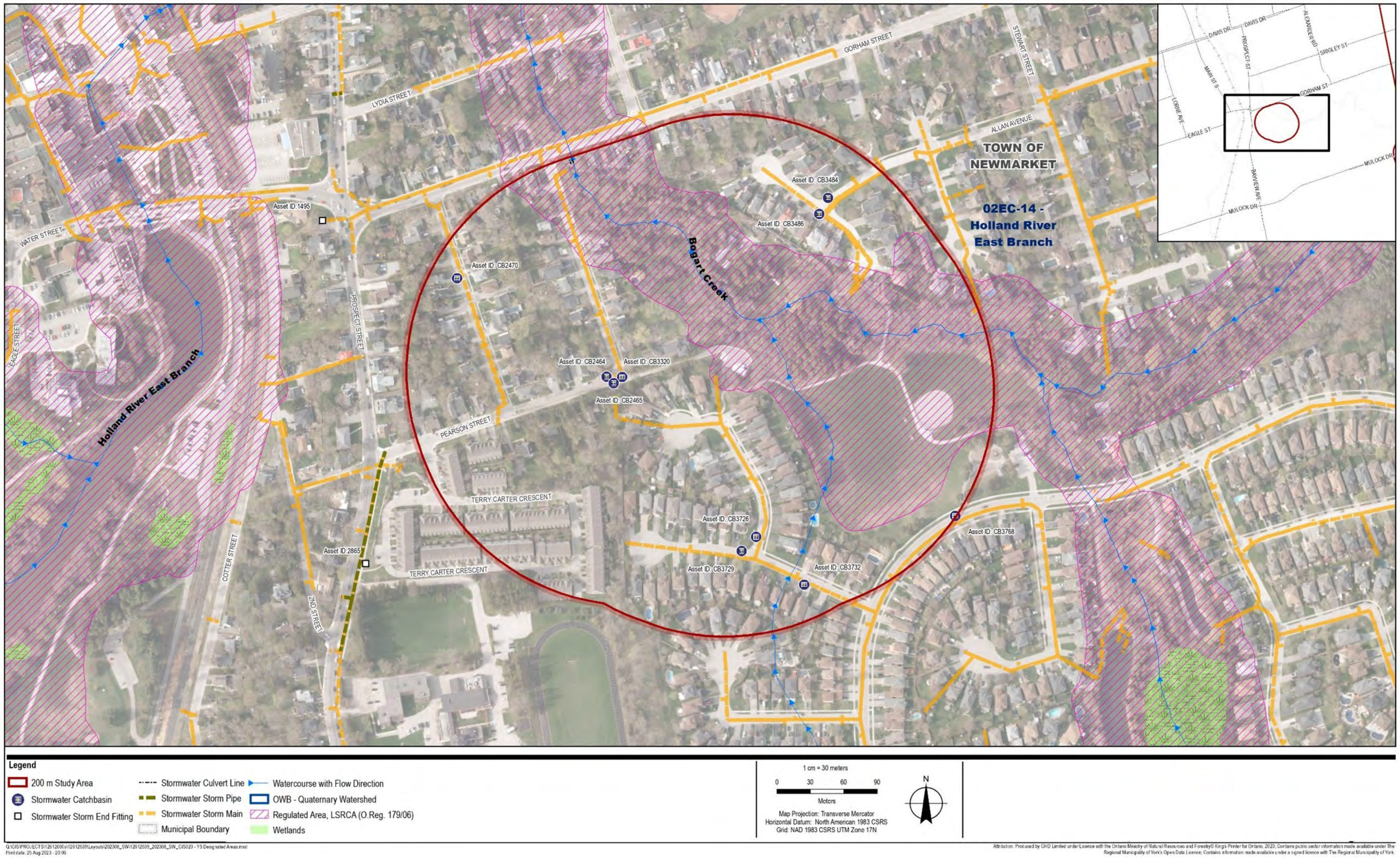


Figure 5.12 Y5 Study Area Surface Water Map for Existing Conditions

5.7.2.2.4 Natural Heritage Characterization

The study area contains ecologically significant forests, areas under the Greenbelt Plan, and areas associated with the Regional Greenlands System regulated by the LSRCA.

Aquatic Habitat

Two tributaries to Bogart Creek are present within the Y5 Bogart SPS Upgrade study area. The study area is located in an urban setting, made mostly of residential areas with some naturalized parks. The two tributaries enter the study area from the south and east through the natural park area and eventually merge into one watercourse. The watercourse continues flowing in a northwest direction through a dense riparian buffer of deciduous trees and shrubs, creating thick canopy cover. Bogart Creek continues to flow northwest, leaving the study area, flowing through residential areas, and eventually draining into the HREB approximately 1 km downstream. The tributaries to Bogart Creek are both considered to have a warmwater thermal regime. Based on the anticipated fish community, this portion of Bogart Creek and the unnamed tributary support bait/forage fish, with little sportfish present. No redside dace have been recorded within this study area.

Terrestrial Habitat

The lands in the study area are predominantly mid-density residential, with a small, forested region running through the centre. This study area is quite isolated from the other study areas, landing itself in the middle of the study area. The focus of the study area is the forested regions, which make up a large portion of the centre of the study area, though the limited natural area present is heavily fragmented.

All natural and cultural communities present within the study area are considered common in the province.

Significant Wildlife Habitat

Potential Candidate SWH for Region 6E as defined by MNRF has been identified in several natural areas within the study area. The greatest concentration of these potentials is likely to be found in woodland habitats associated with the watercourses. A screening and analysis of all ELC communities was completed in the study area for Seasonal Concentration Areas of Animals, Rare Vegetation Communities or Specialized Habitat for Wildlife, Habitat for Species of Conservation Concern, and Animal Movement Corridors.

5.7.2.2.5 Areas of Potential Environmental Concern

A review of information from the Environmental Risk Information Services database was completed for properties located within the study area. The review was completed on May 26, 2023, to visually confirm the current land use and associated potential for containing subsurface environmental contamination. This “windshield-level” survey showed that:

– Various residential and commercial properties are present along the majority of the study area.
– Some agricultural and Industrial land use is present within the study area.

No areas at-risk of existing contamination were identified for this study area.

5.7.3 Conceptual Design

Conceptual design for this station was based on flow rates and design criteria as described in Chapter 3. The Bogart SPS facility has an existing firm design capacity of 312 L/s, as defined in the current ECA.

Table 5.15 summarizes the general characteristics and features that will be present from initial construction through to final configuration, as well as the staged aspects of construction that will adjust over time to suit the needs of the system based on forecast populations and flow rates.

5.7.3.1 Design Basis

Table 5.15 Staged Sewage Pumping Station Conceptual Design Characteristics for Y5 Bogart SPS Upgrade

Design aspect	2031	2041	2051	Comments
Modelled Peak Flow (L/s)	228 L/s	231 L/s	227 L/s	Station total flow rate target under peak event conditions.
Number of pumps	4, 3 active +1 standby	4, 3 active +1 standby	4, 3 active +1 standby	
Number of forcemains in service	1	1	1	Forcemain size has been selected based on a single forcemain conveying 70% of the ultimate peak flow of the station.
Nominal firm capacity (L/s)	312 L/s @ 35 m TDH	312 L/s @ 35 m TDH	312 L/s @ 35 m TDH	Firm capacity is based on installed pumps with N+1 configuration (capacity available with the largest pump out of service).

5.7.3.2 Description of Design

Preliminary analysis indicates that the current plan for expansion and increase in capacity will be sufficient for the forecast flows, but detailed design will confirm this once detailed design conditions (particularly pressure) are known for the Bogart forcemain, where it connects to the existing Newmarket forcemains.

No increases to the station capacity are required at this stage as projected flows are within the ECA rated capacity of the existing station.

5.7.3.3 Construction Methods

Work for the Bogart SPS Upgrade is focused within the existing building footprint and on-site yard piping.

Staging and programming will be considered during detailed design, but the existing infrastructure includes four pump bays and two discharge forcemains, including isolation valves, so it is anticipated that staging will be manageable without significant bypass pumping/planning or temporary systems.

5.7.3.4 Property Requirements

Temporary property easements may be required for construction compounds for staging and storage depending on the final General Contractor requirements.

Permanent property requirements for the SPS facility are not anticipated to change based on the SPS upgrade portion of the works.

5.7.4 Environmental and Community Impacts and Mitigation

Desktop studies were done to determine the possible extent of potential impacts and to propose mitigation measures that would reduce the likelihood and the consequences should they occur. The major impacts and associated mitigation approaches are described in this section. The assessment criteria and indicators are provided in Table 5.16 and Table 5.17, corresponding to each of the environments (social and built, natural, cultural and traffic impacts) together with a potential effects assessment and identification of avoidance, mitigation and compensation measures for the project.

Table 5.16 Y5 Bogart SPS Upgrade Social and Built Environment Effects and Mitigation

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Social and built environment				
SB-1	Effect on existing views	– Predicted changes in views from residences in the surrounding area	– No change in existing views from residences in the surrounding area.	– No avoidance, mitigation, or compensation measures required.
SB-2	Effect on existing residences, businesses, and/or community, institutional, and recreational facilities	– Extent of displacement of residences, businesses, and other facilities – Extent of temporary or permanent disruption to residences, businesses, and other facilities in proximity to construction compounds/permanent installations	– No displacement of residences, businesses, or community, institutional, and recreational facilities is anticipated. – Disruption to residences, businesses, and community, institutional, and recreational facilities in proximity to construction compounds/permanent installations.	– No avoidance, mitigation, or compensation measures are anticipated. However, if in fact displacement is required then York Region would provide market value compensation. – Apply standard construction-related mitigation measures to minimize the disruption effects.
Traffic and transportation				
TT-1	Effect on traffic	– Extent of disruption to traffic flows – Proximity to congested traffic zones	– The project may occupy one lane of traffic on Pine Street/Timothy Street, allowing for trucks to unload and load in this dedicated construction traffic lane for the SPS works. – Traffic movement in to and out of Construction compound sites will impact pedestrian, cycling and traffic flow on Pine Street/Timothy Street. – Coordination of alternate routing for emergency service vehicles, if needed.	– Where possible, maintain one lane in each direction. This could be achieved through flagging, temporary signals or temporary road widening. – Pedestrian movement should be maintained during construction, with marked pedestrian detours as applicable. – Consider special traffic arrangements for peak hours should be considered in traffic flow directions in the morning and afternoon. – Make special provisions for emergency service vehicle access. – Make special provisions for pedestrian traffic and safety, including signals, detours and winter maintenance. If feasible, move construction traffic to sideroads.
Utilities				
U-1	Conflict with buried utilities	– Excavation work (if any) is in direct conflict or falls within clearance limits of nearby utilities	– New construction for sewer connections impacts existing utilities and requires design coordination with utility owners which increases project cost and schedule.	– Review historic and as-built documents for utility data. – Complete a SUE investigation to identify high risk utilities, including large and/or critical service utilities (e.g., large watermains and all gas mains). – If required, relocate existing utility or move proposed excavation to mitigate conflict.
U-2	Conflict with surface or overhead utilities	– Working compound equipment, including cranes will require working directly under overhead utilities or within the hydro wire exclusion zone	– Overhead infrastructure such as electrical or communications cabling is mounted on utility poles between 5 and 12 m above the surface. Depending on the required crane size and operating radius to construct the shaft equipment extents may fall within hydro line exclusion zone or hit overhead wires causing worker harm or death.	– Working compounds will be designed to allow appropriate and safe movement of workers and equipment around the site, away from live overhead wires or surface utility boxes, based on known utility information and topographic surveys. – If required, relocate existing utility or move proposed excavation to mitigate conflict.
Noise and vibration				
N-1	Operation noise	– Complaints from residents within study area	– Noise disruptions to private residents and commercial areas post-construction, near SPS locations or upgrades.	– Any permanent facility, such as new SPS, SPS upgrades, or supporting air management facilities, will require an ECA application under Section 9 of the Environmental Protection Act. – Investigate degree of risk and impact in further detail.
N-2	Construction noise	– Complaints from residents within study area	– Noise disruptions to private residents and commercial areas during construction, near construction compounds for new SPS or existing SPS upgrades.	– Propose construction noise monitoring per MECP NPC-115 Construction Equipment requirements. – Consider completing noise monitoring for the duration of the construction and notify the contractor of any exceedances so that corrective action/contingency actions can be implemented. – Use vehicles and equipment (cranes and excavators) with efficient muffling devices or construct enclosures. – Construction to comply with local noise by-laws
V-1	Construction vibration	– Complaints from residents within study area	– Disruptions to private residents and commercial areas during construction, near construction compounds for new SPS or existing SPS upgrades.	– Propose appropriate construction vibration benchmarks within the tender documents. – Consider pre- and post-construction condition photos.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Air management				
O-1	Operation odour at SPS and existing or proposed sewer connection	– MECP odour units at nearest receptor to SPS and surface connections	– There is potential for odour release due to turbulence at the existing (or upgraded) SPS and at the connections from sewer to SPS.	– Consider implementation of ventilation design systems with odour control. – Extents of risk and impact, will be reviewed in further detail upon investigation.
O-2	Construction odour	– Complaints are received from residents within the study area	– During live connection of infrastructure, there is the potential for odour release.	– Advance notification to residents, advising them of what work is being completed and the duration of the work.
A-1	Construction dust at SPS location	– Fugitive dust is generated – Air quality is poor	– Fugitive dust generation during construction (or upgrades) of SPS and related infrastructure.	– Develop a Dust Best Management Practices Plan to be included in the project Construction Management Plan. – Mitigation should be aimed at minimizing emissions of particulate matter and exposure to particulate matter during the construction phase of the project.

Table 5.17 Y5 Bogart SPS Upgrade Natural Environment Effects and Mitigation

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Natural heritage				
EG-1	Effect on aquatic habitat or functions	– The study area contains warm water watercourses	– Temporary or permanent loss of aquatic features or categorical loss of functions by type, including PSWs, Locally Significant Wetlands, watercourses by sensitivity type and others. – During construction, water quality may be impaired due to elevated TSS in surface water runoff from study area locations which can affect aquatic species/habitats. Some concentrations above background may occur temporarily. – Potential spill hazard when refuelling equipment. – Change in surface water temperature from groundwater taking and/or discharge to surface water features	– Complete site investigations to evaluate potential effects on aquatic habitat function. – Implement best management practices to control surface water runoff and minimize TSS effects. – Where feasible, discharging of surface water during construction should be directed into the municipal storm sewer system to mitigate thermal impacts to watercourses. Should discharge of surface waters be directed to watercourses, additional mitigation measures would need to be adhered to (e.g., enhanced erosion and control measures, water quality guidelines). – Use of erosion and sediment control measures and timing of construction to avoid spawning and egg incubation periods will reduce the potential for effect to fish and aquatic life. – Conduct equipment maintenance and refuelling at the designated and properly contained maintenance areas or at industrial garages located well away from creek banks and wetlands and outside vegetation areas. – Develop a Spill Prevention Plan.
EG-2	Effect on stream geomorphology	– Change in geomorphic form/function/stability in affected channels within the study area	– Change in geomorphic form/function/stability in affected channels.	– Any disturbances near a watercourse during construction will need to be restored with native seeding and/or planting. – Use of erosion and sediment control measures to avoid sedimentation into the stream. – Consider completing a geomorphology study during design, where applicable.
EG-3	Effect on aquatic species including SAR, species of local concern, native species, and invasive species	– Aquatic species	– Number and type of aquatic species potentially affected temporarily or permanently. – No anticipated impacts to aquatic SAR as there are no aquatic SAR identified within the study area.	– Preventing death of fish or impacts to downstream fish habitat through the use of appropriate timing windows.
EG-4	Effect on terrestrial habitat or functions	– The study area does not contain ANSIs – The study area contains Ecologically Significant Forests – Wildlife habitat	– Temporary or permanent loss of natural heritage features (e.g., ESAs, ANSIs, wildlife corridors, and others). – Potential effects on terrestrial habitat (e.g., direct vegetation (and wildlife habitat) loss, alteration, and fragmentation) may occur from the physical footprint of study area locations. – Project preparation, construction and operation may increase the risk of nest destruction and mortality of migratory birds.	– Site investigations to evaluate potential terrestrial habitat function/significance. – During design, prepare construction constraints with consideration of timing windows to mitigate where possible, vegetation clearing to occur outside of the migratory bird nesting season, bat maternity roosting season, turtle overwintering and amphibian breeding. – Limit the area of project footprint and limit disturbance during construction and operations phases. – The presence of wildlife will be monitored and communicated to site personnel. – Vehicle use will be restricted to designated areas. – Where practical, rehabilitate habitat for plants and wildlife.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
EG-5	Effect on terrestrial species, including SAR, species of local concern, native species, invasive species and area-sensitive species	– SAR have the potential to occur within the study areas, including amphibians, insects, birds, reptiles, mammals and tree species	– Number and type of terrestrial species potentially affected temporarily or permanently. – Construction activities have the potential to disturb wildlife within adjacent natural heritage areas. – Project preparation, construction and operation may increase the risk of nest/habitat destruction and mortality of terrestrial SAR. – Project may result in wildlife-vehicle collisions and may cause injury/mortality to individual animals.	– Site investigations to evaluate potential occurrence of terrestrial SAR within the study area. – During design, prepare construction constraints with consideration of timing windows to mitigate where possible, vegetation clearing to occur outside of the migratory bird nesting season, bat maternity roosting season, turtle overwintering and amphibian breeding. – Clearly demarcate work limits at outset of construction and minimize unnecessary vegetation clearing.

5.8 Y13-B Mulock SPS

5.8.1 Study Area

Y13-B Mulock SPS will provide pumping from the Y13-A Leslie Street Trunk Sewer Phase 3 to the top end of Y1-A Leslie Street Trunk Sewer Phase 1 and 2. The Y13-B Mulock SPS will be located in the vicinity of Leslie Street and Mulock Drive. The discharge location of the forcemains will be at Leslie Street and St. Johns Sideroad. Primary access to this station would be from the Bogartown Curve off Leslie Street North.

A study area of approximately 200 metres wide was applied surrounding the potential site for the pumping station as shown in Figure 5.13. However, the new pumping station could be located anywhere within this study area or overlapping linear project study areas. In some instances, the study area for the new pumping stations was increased to accommodate for alternative sites.

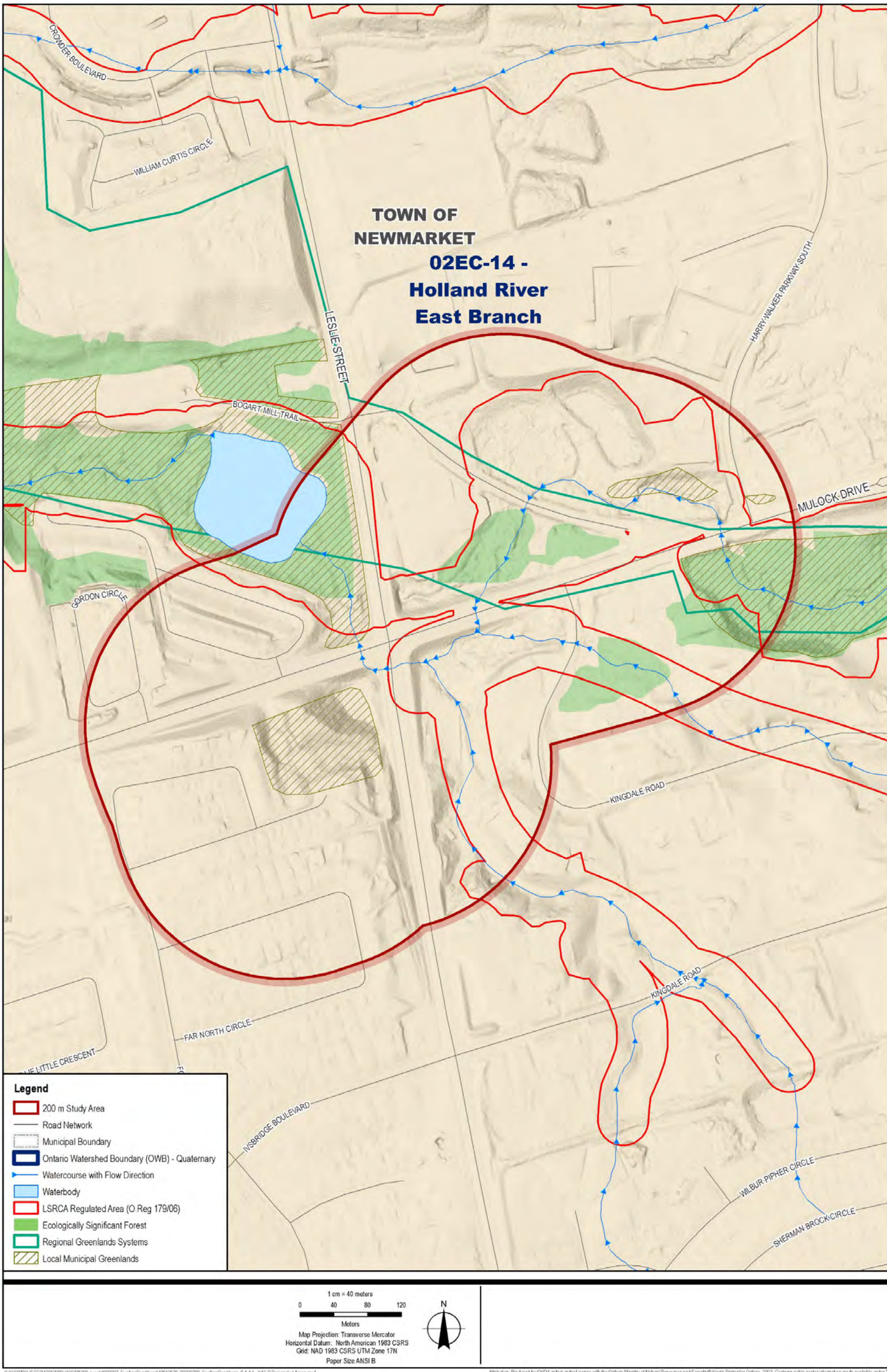


Figure 5.13 Y13-B Mulock SPS Study Area

5.8.2 Existing Conditions

5.8.2.1 Social and Built Environment

The following sections will summarize the findings of the desktop studies completed within the study area, including planning and land use, traffic and transportation and utilities.

5.8.2.1.1 Planning Policy and Land Use

Existing Land Use

Along Mulock Drive from Foxcroft Boulevard to Harry Walker Parkway, land uses consist of the following:

North side:

- Low density residential housing
- Commercial lands (Audi Newmarket, BK Consulting, Esso, Tim Hortons, Risi Stone Inc.)
- Institutional lands (Veterinary Emergency Services)
- Bogart Pond.

South side:

- Low density residential housing.

Planning Policy

Regional

The York Region Official Plan (June 2023 Office Consolidation) designates lands within the study area as Community Area. Additionally, lands within the study area are part of the Regional Greenlands System.

Local

The 2022 Newmarket Official Plan designates the lands in the study area as follows:

- Lands on the northeast corner of Mulock and Leslie Street are designated as Business Park - Mixed Employment.
- Lands on the northwest corner of Mulock and Leslie Street are designated as Natural Heritage System and Residential Area.
- Lands on the southeast corner of Mulock and Leslie Street are designated as Natural Heritage System and Residential Area.
- Lands on the southwest corner of Mulock and Leslie Street are designated as Residential Area and Parks and Open Space.

Active Development Applications

Lands within the Y13-B study area contain several active development applications as follow:

- Town of Newmarket - To amend the Town's Zoning By-Law as part of the Established Neighbourhoods Compatibility Study. Draft Plan of Condominium.
- 17188 Leslie Street - To facilitate a three-storey private school with daycare and associated parking lot.
- 18326 Leslie Street - To permit a temporary sales trailer.
- Newmarket - Foxcroft Boulevard. -Two applications. Proposed subdivision. Zoning by-law amendment.
- Newmarket - Kingdale Road - Two applications. Proposed subdivision. Zoning-by-law amendment.
- 16775 Leslie Street - Two applications. To facilitate the parking lot expansion of Pfaff Audi Dealership. To amend the Town's Zoning By-Law as part of the Established Neighbourhoods Compatibility Study.

5.8.2.1.2 Transportation in the Study Area

The Y13-B Mulock SPS will be located southwest of the Mulock Drive and Leslie Street intersection. Mulock Drive is a four-lane arterial, 60 km/h posted speed road, with sidewalks on both sides of the curbed road. Leslie Street is also a four-lane arterial, 60 km/h posted speed road, with sidewalks on both sides of the curbed road. Both roads looking towards the location of the SPS are shown in Figure 5.14.

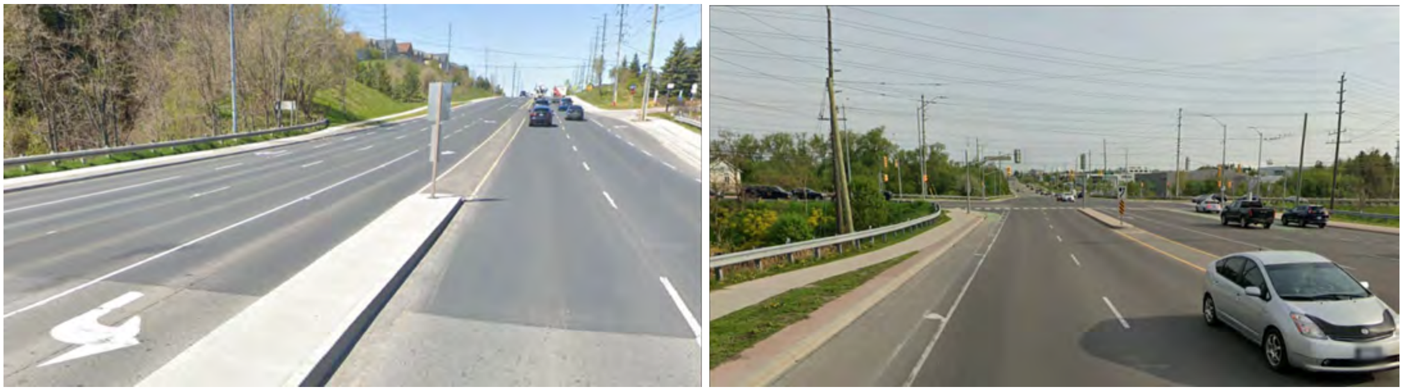


Figure 5.14 (1) Mulock Drive Looking West of Leslie Street (2) Leslie Street Looking North Towards Mulock Drive. (Google Maps "Streetview," digital images http://maps.google.com)

There are AADT counts taken along Mulock Drive, east of the proposed SPS location, at 28,699, based on the latest available 2023 data. For counts along Leslie Street, the latest count is 16,890 based on 2022 data. Historical AADT data within the study area are presented in Table 5.18.

Table 5.18 Mulock Drive and Leslie Street AADT Counts within Study Area

Description of road limits	2013	2015	2016	2017	2018	2019	2022	2023
Mulock Drive between Harry Walker Parkway South and Kingdale Road	24,692	23,381	24,111	23,407	26,964	28,110	29,247	28,699
Leslie Street between Ivsbridge Boulevard/Kingdale Road and Mulock Drive	14,630		14,225		15,901		16,890	

There is one public transit route which runs along Leslie Street or Mulock Drive within the study area, which is YRT Route 57 (Mulock Drive to Davis Drive at the 404 centre). There are no rail crossings or other transit infrastructure within the study area.

5.8.2.1.3 Utilities in the Study Area

There are several above/below grade utilities situated within the study area corridor and in the vicinity of the proposed project. These utilities may be temporarily impacted during the construction of SPS, shaft and work compounds. Formal notification and consent would be required from the authorities responsible for these utilities prior to construction.

Buried utilities are typically located within the following limits:

- Shallow-buried electrical and communications cabling are commonly buried between 1.2 and 1.5 mbgs.
- Shallow-buried storm drains, sanitary sewers, and watermains are typically buried between 1.2 and 3.5 mbgs.
- Deep-buried utilities are defined as anything buried more deeply than the depths mentioned above.

Known municipal infrastructure that existed on York Region’s GIS database has been provided within the drawing set. A detailed utility investigation program, which would include a “Level A through D" subsurface utility exploration, would be required as part of future site investigations.

5.8.2.2 Natural Environment

The following sections will summarize the findings of the desktop studies completed within the study area for geotechnical, hydrogeology, surface water, natural heritage and contamination.

5.8.2.2.1 Geotechnical

The study area of Y13-B is bordered by residential/commercial properties within the boundaries of the Town of Newmarket.

Four historical boreholes (1978) from about 19 m to 22 m below existing grade identified the near surface condition generally comprised of clayey silt deposit (stiff to hard) overlying sand, silt and gravel till (very dense) followed by clayey silt deposit (hard). The remaining historical boreholes encountered a silt layer (compact relative density) overlying clayey silt deposit (very stiff to hard consistency) followed by sand, silt and gravel till (very dense).

Another set of boreholes (2012) advanced a total of 51 boreholes to about 2 m to 5 m below existing grade and covered a larger area, including five (5) within the study area for Y13-C. Deep earth fill (about 3.3 m) was encountered within the study area. As per borehole records, the near surface condition generally comprised of sandy silt till deposit (very dense) with intermittent sand layer and silty clay/sand deposit.

The native deposit within the south side of the study area predominantly comprised silt and clay matrix, mostly consisting of Glaciolacustrine deposits. The north portion of the study area predominantly comprised of Kettleby till (predominantly silt to silty clay matrix), mostly consisting of Pleistocene deposits.

The bedrock consists of shale, limestone, dolostone and siltstone of the Georgian Bay Formation, Blue Mountain Formation and Billings Formation. Typically, bedrock is mapped at depths of 101 to 132 mbgs within the study area and will not be reached during construction.

5.8.2.2.2 Hydrogeological

A hydrogeological desktop review was undertaken within the study area using information from MECP well records, the MECP Source Protection Information Atlas, the Oak Ridges Moraine database, and the Ontario Geological Survey database. Available hydrogeological reports for projects within the area were also reviewed.

The Y13-B Mulock SPS study area is within the Schomberg Clay Plains physiographic region. A majority of the SPS structure will be constructed through a low permeability glaciolacustrine deposit (Newmarket Till - aquitard). Construction may intersect a high water table (2 to 5 mbgs). The SPS structures are not located within any source water protection WHPA. The shallow groundwater generally flows westward/southwest towards the tributaries to the HREB.

Based on historical boreholes (1978), the ground surface elevation at the boreholes varied from Elevation 275.2 m to 271.1 m, and the groundwater table varied from elevation 273.7 m to 270.4 m. It should be noted that the above-mentioned subsurface condition was encountered 2 km south of study area Y13-B Mulock SPS, and groundwater is typically found at shallow depths below the ground surface. Other locations advanced to 5 m depth were dry and did not encounter groundwater.

There are multiple private wells along Leslie Street.

Refer to Table 5.19 regarding details on anticipated aquifers and aquitards within the study area.

Table 5.19 Aquifers and Aquitards Through the Y13-B Study Area

Aquifers and aquitards	Description	Thickness
Undifferentiated upper sediments at ground surface (Aquifer)	An unconfined aquifer consisting of discontinuous fill and unconsolidated overburden deposits. Underlies topsoil at the east side of the section.	Ranges between 0 to 3 m
Upper Newmarket till (Aquitard)	A continuous layer that acts as an aquitard to the underlying Thorncliffe Formation.	Ranges between 7 to 10 m
Inter-Newmarket sediments (Aquifer)	Regionally recognized as a highly productive confined aquifer and is laterally continuous.	Unknown

5.8.2.2.3 Surface Water

There is one sub-watershed within the study area: HREB. The SPS is located near tributaries of HREB.

Other surface features of interest include the following:

- Unnamed tributary of the HREB
- Bogart Creek
- Bogart Pond
- Two tributaries of Bogart Creek
- Wetlands.

Refer to Figure 5.15 for a surface water map of existing conditions within the study area.

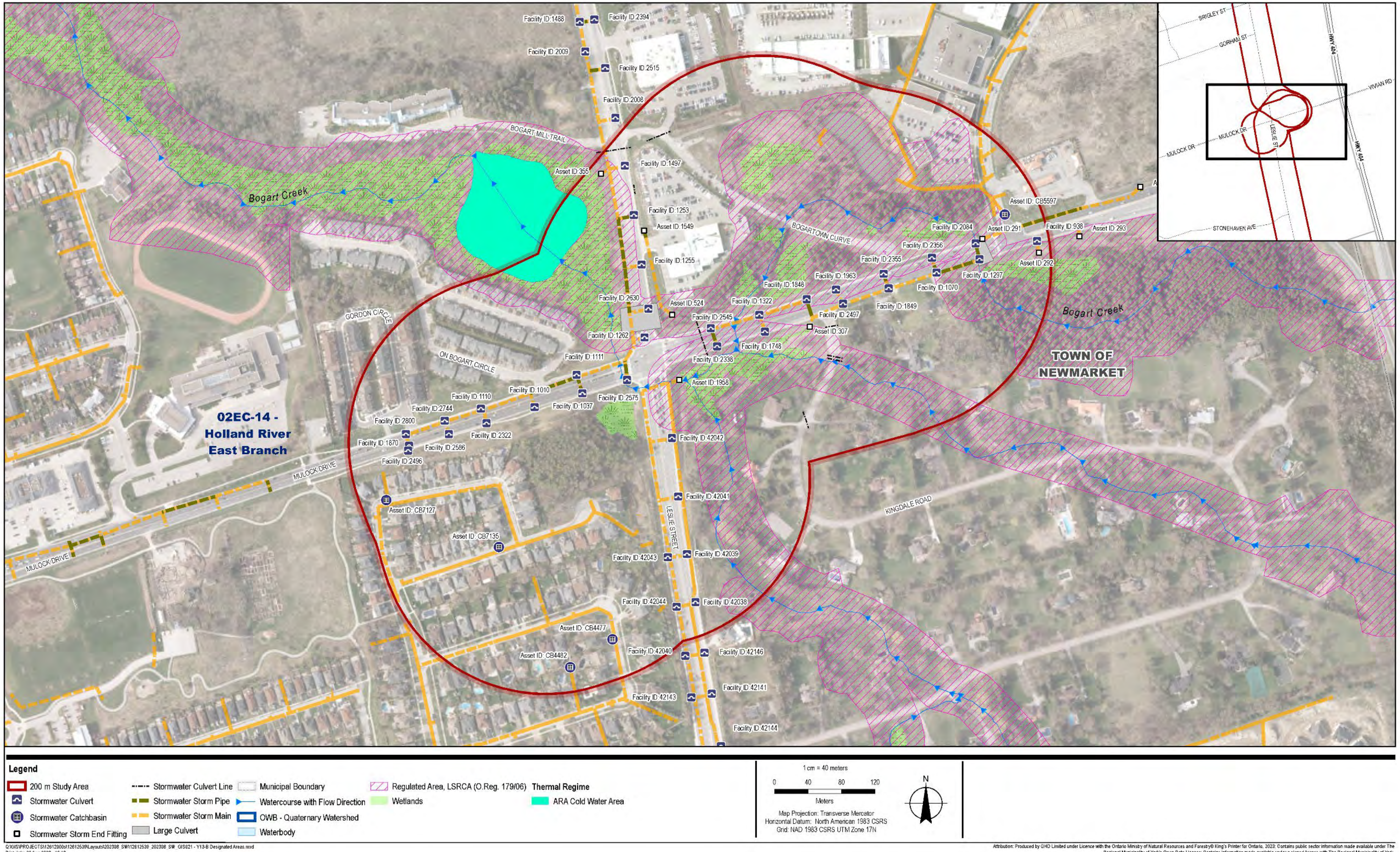


Figure 5.15 Y13-B Study Area Surface Water Map for Existing Conditions

5.8.2.2.4 Natural Heritage Characterization

Two overlapping study areas, Y13-B Mulock SPS and Y13-B (Alternative Site) Mulock SPS Alternative Site, were assessed during the conceptual design phase, which will be discussed in the sections that follow.

The study area contains ecologically significant forests, unevaluated wetlands, areas under the Greenbelt Plan and areas associated with both the Regional and Local Municipal Greenlands System regulated under the LSRCA.

Aquatic Habitat

The most prominent watercourse within the Y13-B study area is Bogart Creek. Bogart Creek flows in a westerly direction with a high degree of meandering and passes under Mulock Drive three times within the study area before flowing northwards into Bogart Pond. Surrounding land use along Bogart Creek is a mix of low-density residential areas, commercial areas, and some naturalized mixed forest areas, especially around Bogart Pond. The riparian characteristics around Bogart Creek show a mix of tall grasses, dense sedges and both tall coniferous and deciduous trees providing a high degree of overhead stream shading. Bogart Pond is located at the western limits of the study area and has a surface area of approximately 16,700 m2, and is associated with a large swamp within the riparian area.

Two smaller tributaries to Bogart Creek are also present within the study area and merge with the main branch of Bogart Creek near the intersection of Mulock Drive and Leslie Street. The watercourses and ponds are considered coldwater environments. Based on the anticipated fish community, these aquatic environments support a diverse community of bait/forage fish, with potential for both warmwater and coldwater sportfish. No redside dace have been recorded within this study area.

The aquatic habitat within the Y13-B (Alternative Site) study is the same as the Y13-B study area; thus, all information provided for Y13-B above applied to the Alternative Site.

Terrestrial Habitat

The lands within the Y13-B study area consist of mainly commercial and residential development but contain natural areas such as wetlands, forests, and two ponds.

The lands within the Y13-B (Alternative Site) consist of mainly urban residential uses, with natural areas being largely relegated to the intersection of Leslie Street and Mulock Drive. The landscape is mostly flat, with some lower topographies associated with watercourses and wetland features.

All natural and cultural communities present within both study areas are considered common in the province.

Significant Wildlife Habitat

For both the Y13-B and Y13-B (Alternative Site) study areas, Potential Candidate SWH for Region 6E, as defined by MNRF has been identified in several natural areas within the study area. The greatest concentration of these potentials is likely to be found in wetland and woodland habitats associated with the unevaluated wetlands and ESAs. A screening and analysis of all ELC communities was completed in the study area for Seasonal Concentration Areas of Animals, Rare Vegetation Communities or Specialized Habitat for Wildlife, Habitat for Species of Conservation Concern and Animal Movement Corridors.

5.8.2.2.5 Areas of Potential Environmental Concern

A review of information from the Environmental Risk Information Services database was completed for properties located within the study area. The review was completed on May 26, 2023, to visually confirm the current land use and associated potential for containing subsurface environmental contamination. This “windshield-level” survey showed that:

- Various residential and commercial properties are present along the majority of the study area.
- Some agricultural and Industrial land use is present within the study area.

No areas at-risk of existing contamination were identified for this study area.

5.8.3 Conceptual Design

Conceptual design for this station was based on flow rates and design criteria as described in Chapter 3.

Table 5.20 summarizes the general characteristics and features that will be present from initial construction through to final configuration, as well as the staged aspects of construction that will adjust over time to suit the needs of the system based on forecast populations and flow rates.

Refer to Appendix B, Sheet 12 for the conceptual design drawings relevant to this project.

5.8.3.1 Design Basis

Table 5.20 Staged Sewage Pumping Station Conceptual Design Characteristics for Y13-B Mulock SPS

Design aspect	2031	2041	2051	Comments
Modelled Peak Flow (L/s)	N/A	N/A	1750 @ 25 m TDH	Station total flow rate target under peak event conditions. Ultimate build out to 2500 L/s @ 29 m TDH.
Number of pumps	N/A	N/A	6, 5 duty +1 standby	Nominal number of pumps includes main pumps only. Does not include smaller pumps that may be considered during subsequent design stages to manage low-flow conditions.
Number of forcemains in service	N/A	N/A	2	Forcemain size has been selected based on a single forcemain conveying 70% of the ultimate peak flow of the station.
Nominal Firm Capacity (L/s)	N/A	N/A	2550 L/s @ 29 m TDH	Firm capacity is based on installed pumps with n+1 configuration (capacity available with the largest pump out of service).

5.8.3.2 Description of Design

The location of the proposed Mulock SPS has been selected within a greenspace that has less constraints to size. It is located at an elevation low point within the area, which allows for straightforward drainage of gravity sewers and minimizes the required depth of the SPS. A secondary access to this location is available via the Bogartown Curve.

The conceptual level design includes a site footprint for above-grade infrastructure modelled from upgrade works at stations of similar size currently under construction. The stations have a pumping capacity comparable to what is proposed at the Y3-B and similar requirements for standby power, electrical distribution, odour management, surge tanks and supporting office and maintenance areas.

The facility footprint shown allows for separate rooms for electrical systems, control systems, servers, PAC panels, washrooms, offices, storage rooms, and maintenance bays for equipment. An air management system footprint has been extrapolated from similar sized facilities. It is based on servicing requirements, maintaining a slightly negative pressure within the wet well under most operating conditions and treating the collected air prior to discharge.

The power supply to the facility has been conceptualized to include built-in redundancy, including a dual power feed from the utility, a dual transformer, and a main-tie-main configuration to permit feeding of critical loads from either utility connection or either transformer. Standby power in the conceptual design includes diesel generators and fuel tanks, which is consistent with the current York Region approach of providing redundant power supply to SPS facilities. Generators are located within the building for ease of maintenance and to reduce emitted sound. Noise modelling, additional silencing or sound attenuation required to meet current standards will be determined during detailed design.

The overall footprint for the above-grade conceptual infrastructure is approximately 55 m long x 30 m wide, not including any access roads or driveways. The detailed design stage will incorporate the latest requirements for applicable codes and standards and York Region design guidelines for this SPS.

The Mulock SPS is a new pumping station, considered a large station by the York Region design guidelines, requiring a wet well/dry well configuration with pumps mounted in the vertical orientation. The station will include a split wet well with benching, access platforms, and ventilation per NFPA 820 and OHSA requirements.

The dry well will have bays for a total of six pumps, with three pumps connected to each cell of the wet well. Pumps will be mounted vertically in a dry-pit configuration. Pump riser and discharge header piping is based on York Region standards using stainless steel pipe and knife gate or plug valves depending on the size and function of the valve.

A common discharge header will allow pumps to operate with both forcemains in combined or independent configurations.

There is a space allowance set aside for surge tanks at the facility, with footprint allocated based on extrapolation from similar sized facilities.

General supporting components such as sumps, access platforms and stairs and lifting equipment have also been included in the generation of the anticipated footprint, layout, and costing, based on use within similar York Region facilities.

Table 5.21 General Sewage Pumping Station Conceptual Design Characteristics for SPS Project Y13-B Mulock SPS

Design aspect	Value	Comments
Above-grade anticipated footprint of buildings and infrastructure	55 m x 30 m wide	Facility footprint based on recent design and construction of similar capacity facilities.
Overflow control/location	To adjacent surface water	This site is located at a low point adjacent to an existing creek. However, this station is designed to convey flows from the Leslie Street Trunk Sewer Phase 3, which is fed only by the Newmarket East SPS. Upstream base flows could be diverted through the existing spine in an emergency to avoid overflow at this station.
Discharge forcemain diameter	2 x 1050 mm nominal diameter	
Power supply	4160 V	Medium voltage
Standby power capability	Diesel standby generators	Redundant standby power generation.
Air management	Yes	A portion of the planned footprint has been allocated to integrated air management.

5.8.3.3 Construction Methods

The sewage pumping station will generally be constructed as circular wet well/dry well below grade to the depths required with ancillary structures as needed above grade. Primary incoming and outgoing infrastructure is anticipated to be constructed via trenchless technology, and connections in the yard to the SPS will be made via open cut excavation.

5.8.3.4 Property Requirements

The proposed infrastructure concept is located on property that is not currently owned by York Region, and therefore, GHD recommends York Region undertake a property selection process to select a final site for the pump station in the vicinity of Mulock Drive and Leslie Street.

The proposed property locations and requirements are conceptual only. Final location will be selected considering the impacts and mitigations, results of field studies, procurement requirements and detailed design. Details related to property easement requirements will be confirmed during detailed design.

5.8.4 Environmental and Community Impacts and Mitigation

Desktop studies were done to determine the possible extent of potential impacts and to propose mitigation measures that would reduce the likelihood and the consequences should they occur. The major impacts and associated mitigation approaches are described in this section.

The assessment criteria and indicators are provided in Table 5.22 and Table 5.23, corresponding to each of the environments (social and built, natural, cultural and traffic impacts) together with a potential effects assessment and identification of avoidance, mitigation and compensation measures for the project.

Table 5.22 Y13-B Mulock SPS Social and Built Environment Effects and Mitigation

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Social and built environment				
SB-1	Effect on existing views	– Predicted changes in views from residences in the surrounding area	– Change in existing views from residences along the south side of Mulock Drive.	– Site the proposed pumping station to minimize the number of views from residences. – Design the proposed pumping station to be architecturally and aesthetically pleasing. – Design and implement a landscape plan for the site to screen the proposed pumping station.
SB-2	Effect on existing residences, businesses, and/or community, institutional, and recreational facilities	– Extent of displacement of residences, businesses and other facilities – Extent of temporary or permanent disruption to residences, businesses, and other facilities in proximity to construction compounds/permanent installations	– No displacement of residences, businesses, or community, institutional, and recreational facilities is anticipated. – Disruption to residences, businesses, and community, institutional, and recreational facilities in proximity to construction compounds/permanent installations.	– No avoidance, mitigation, or compensation measures are anticipated. However, if in fact displacement is required then York Region would provide market value compensation. – Apply standard construction-related mitigation measures to minimize the disruption effects.
Traffic and transportation				
TT-1	Effect on traffic	– Extent of disruption to traffic flows – Proximity to congested traffic zones	– The project may occupy the first lane of traffic on the south side of Mulock Drive and west side of Leslie Street allow for trucks to unload and load in this dedicated construction traffic lane. – Traffic movement in to and out of Construction compound sites will impact pedestrian, cycling and traffic flow on Leslie Street and Mulock Avenue. – Impacts to public transit involving potential rerouting of buses and/or relocation of stops. – Coordination of alternate routing for emergency service vehicles, if needed.	– Where possible, maintain one lane in each direction. This could be achieved through flagging, temporary signals or temporary road widening. – Pedestrian movement should be maintained during construction, with marked pedestrian detours as applicable. – Consider special traffic arrangements for peak hours should be considered in traffic flow directions in the morning and afternoon. – Make special provisions for emergency service vehicle access. – Make special provisions for pedestrian traffic and safety, including signals, detours, and winter maintenance. If feasible, move construction traffic to sideroads.
Utilities				
U-1	Conflict with buried utilities	– Shaft is in direct conflict or falls within clearance limits of nearby utilities	– New construction impacts existing utilities and requires design coordination with utility owners which increases project cost and schedule.	– Review historic and as-built documents for utility data. – Complete a SUE investigation to identify high risk utilities, including large and/or critical service utilities (e.g., large watermains and all gas mains). – If required, relocate existing utility or move proposed excavation to mitigate conflict.
U-2	Conflict with surface or overhead utilities	– Excavation of shaft is proposed in location of surface infrastructure – Shaft working compound equipment including cranes will require working directly under overhead utilities or within the hydro wire exclusion zone	– Overhead infrastructure such as electrical or communications cabling is mounted on utility poles between 5 and 12 metres above the surface. Depending on the required crane size and operating radius to construct the shaft equipment extents may fall within hydro line exclusion zone or hit overhead wires causing worker harm or death.	– Working compounds will be designed to allow appropriate and safe movement of workers and equipment around the site, away from live overhead wires or surface utility boxes, based on known utility information and topographic surveys. – If required, relocate existing utility or move proposed excavation to mitigate conflict.
U-3	Damage and/or Deformation to surface and buried utilities	– Soil movement under or next to the utility from shaft/open cut construction	– Ground heave/settlement/horizontal shift along tunnel ahead around shafts and open cut excavations during and post-excavation. This information can be obtained from nearby geotechnical instrumentation. – Deformation or damage to nearby surface or buried utilities as a result of soil movement, which may require rehabilitation or repair (e.g., crack formation, angular rotation, strain, pipe joint rotation or pull out).	– For utilities within the shaft/open cut ZOI, select a shaft or open cut construction method and SOE appropriate with depth, size, and geotechnical and hydrogeological conditions at shaft location. – Analytically assess nearby utilities and structures and propose mitigation methods such as relocation of utilities or, for deep utilities, relocation of the sewer horizon. Should neither of these options be applicable, then investigate ground improvement in proximity of utilities to limit ground movement or investigate modification of the sewer and/or open cut design or construction methodology.
Noise and vibration				
N-1	Operation noise	– Complaints from residents within study area	– Noise disruptions to private residents and commercial areas post-construction, near SPS locations or upgrades.	– Any permanent facility, such as new SPS, SPS upgrades, or supporting air management facilities, will require an ECA application under Section 9 of the Environmental Protection Act. – Investigate degree of risk and impact in further detail.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
N-2	Construction noise	– Complaints from residents within study area	– Noise disruptions to private residents and commercial areas during construction, near construction compounds for new SPS or existing SPS upgrades.	– Propose construction noise monitoring per MECP NPC-115 Construction Equipment requirements. – Consider completing noise monitoring for the duration of the construction and notify the contractor of any exceedances so that corrective action/contingency actions can be implemented. – Use vehicles and equipment (cranes and excavators) with efficient muffling devices or construct enclosures. – Comply with local noise by-laws.
V-1	Construction vibration	– Complaints from residents within study area	– Disruptions to private residents and commercial areas during construction, near construction compounds for new SPS or existing SPS upgrades.	– Propose appropriate construction vibration benchmarks within the tender documents. – Consider pre- and post-construction condition photos.
Air management				
O-1	Operation odour at SPS and existing or proposed sewer connection	– Odour near SPS and surface connections	– There is potential for odour release due to turbulence at the existing (or upgraded) SPS and at the connections from sewer to SPS.	– Consider implementation of ventilation design systems with odour control.
A-1	Construction dust at SPS location	– Fugitive dust – Poor air quality	– Fugitive dust generation during construction (or upgrades) of SPS and related infrastructure.	– Develop a Dust Best Management Practices Plan to be included in the project Construction Management Plan. – Mitigation should be aimed at minimizing emissions of particulate matter and exposure to particulate matter during the construction phase of the project.

Table 5.23 Y13-B Mulock SPS Natural Environment Effects and Mitigation

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Hydrogeology				
N-1	Effect on groundwater quantity	– Temporary and/or long-term changes in groundwater quantity	– Potential temporary changes to groundwater quantity are minimal because construction expected to mainly intersect Newmarket till aquitard and potentially some Inter Newmarket Sediment. Water table anticipated to be encountered at approximately 2 to 5 mbgs. Water level anticipated to be higher towards the tributary to the north. – No long-term changes to groundwater quantity are anticipated because no water takings are required during operation of the SPS. – Potential ground settlement as a result of active dewatering/depressurization. – Change in shallow groundwater flow patterns resulting from operation of sewer pipe resulting from increased I&I and/or preferential movement of groundwater within trench sediments.	– Implement construction methods that minimize dewatering requirements. – Establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water).
N-2	Effect on groundwater quality	– Temporary and/or long-term changes in groundwater quality	– Temporary change in groundwater quality is minimal because construction is anticipated to mainly intersect low permeability till. – No long-term changes to groundwater quality are anticipated. – Potential effects on groundwater water quality as a result of potential mobilization of contaminated water where active dewatering/depressurization is required. – Reduction in groundwater quality from spills or the mismanagement of fuel/chemical in work areas	– Implement construction methods that minimize dewatering requirements, as needed. – Develop and implement a spills response plan for construction to mitigate the effect of a spill should one occur. – Establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water). – During design, complete a contaminant source investigation to mitigate the risk of drawing contamination from one source to another location.
N-3	Effect on private wells - temporary construction dewatering	– Temporary construction dewatering private well interference (quantity/quality)	– Temporary decrease in private well quantity/quality not anticipated due to intersection of low permeability till. – Limited dewatering is expected during construction.	– Implement construction methods that minimize dewatering requirements, as needed. – Address construction dewatering private well interference complaints through existing York Region private well assessment and mitigation policy. – Proactively identify any high-risk wells during design and prepare site-specific preventative mitigation and corrective action plans as part of design. Corrective actions should align to York Region's private well assessment and mitigation policy.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
N-4	Effect on private wells – long term	– Long term private well interference (quantity/quality)	– No long-term groundwater quantity/quality interference is anticipated as no active or passive long-term groundwater takings related to the pump station are anticipated.	– If needed, establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water). – Proactively identify any high-risk wells during design and prepare site-specific preventative mitigation and corrective action plans as part of design. Corrective actions should align to York Region's private well assessment and mitigation policy.
N-5	Effect on surface water quantity/quality	– Temporary change in surface water quantity/quality	– Temporary change in surface water quantity/quality is not anticipated based on intersection of low permeability till. – Limited dewatering is expected during construction. – Change in groundwater-surface water interaction (reversal of vertical hydraulic gradient) results in impact to terrestrial and aquatic habitat and associated SAR (where applicable) - reduction in baseflow. – Change in surface water temperature from groundwater taking and/or discharge to surface water features. – Changes to stream morphology resulting from the release of groundwater dewatering water. The potential reduction in baseflow due to water taking in a lower confined aquifer due to increased downward hydraulic gradients across the aquitard separating the stream and the confined aquifer. – The potential reduction in baseflow from a stream reach that intersects an aquifer in which the water taking is occurring.	– Field verification of groundwater-surface water interaction suggested for watercourses and wetlands within the study area. – Complete outlet receiver assessment(s) should temporary groundwater discharge be required to surface water. Establish pre-construction baseline surface water quality and quantity conditions and develop implementation plans for monitoring during and post-construction. – Implement/construct treatment (i.e., settlement tanks, etc.) of construction water prior to discharge to storm sewer/surface water. – Minimize construction area disturbance and duration. Implement erosion and sedimentation control measures (e.g., silt fencing, check dams, etc.). – Adhere to fish timing windows to prevent negative impacts on known sensitive fish species within the study area. – Refer to the Natural Heritage section of the table for further mitigation approaches associated with surface water impacts.
Geotechnical				
G-1	Effect on soil quality	– Contaminant seepage into soil during excavation of shaft	– Chemicals such as drilling fluids, lubricants, ground improvement material, or fuel from construction equipment may contaminate soil.	– Perform regular equipment checks and maintenance. – Prepare an environmental management plan prior to construction in case of contamination.
G-2	Soil movement around shafts	– Vertical or horizontal ground movement around shafts during and post excavation – Deformation or damage to nearby structures and/or utilities	– Ground heave/settlement/horizontal shift at surface around shafts. – Deformation or damage to nearby structures and utilities (e.g., crack formation, angular rotation, strain, or pipe joint rotation or pull out) that may require rehabilitation or repair.	– Select shaft or open cut construction method and SOE appropriate with depth, size, and geotechnical and hydrogeological conditions at shaft or open cut locations. – Complete soil displacement analytical assessments at all shaft locations.
G-2	Encounter contaminated soil during shaft excavation	– Soil encountered during shaft excavation is tested to surpass allowable contaminant levels	– Spoil must be dispatched at an approved contaminated soil disposal site.	– Complete appropriate geotechnical investigations and contaminants testing during design development to identify confirmed contaminated soil locations or at-risk areas based on historical land use. – Identify and confirm availability of appropriate soil disposal sites based on anticipated contaminants for use during construction.
Natural heritage				
EG-1	Effect on aquatic habitat or functions	– The study area contains cold water watercourses – The study area contains wetlands	– Temporary or permanent loss of aquatic features or categorical loss of functions by type, including PSWs, Locally Significant Wetlands, watercourses by sensitivity type and others. – During construction water quality may be impaired due to elevated TSS in surface water runoff from study area locations which can affect aquatic species/habitats. Some concentrations above background may occur temporarily. – Potential spill hazard when refuelling equipment. – Change in surface water temperature from groundwater taking and/or discharge to surface water features	– Complete site investigations to evaluate potential effects on aquatic habitat function. – Implement best management practices to control surface water runoff and minimize TSS effects. – Where feasible, discharging of surface water during construction should be directed into the municipal storm sewer system to mitigate thermal impacts to watercourses. Should discharge of surface waters be directed to watercourses, additional mitigation measures would need to be adhered to (e.g., enhanced erosion and control measures, water quality guidelines). – Use of erosion and sediment control measures and timing of construction to avoid spawning and egg incubation periods will reduce the potential for effect to fish and aquatic life. – Conduct equipment maintenance and refuelling at the designated and properly contained maintenance areas or at industrial garages located well away from creek banks and wetlands and outside vegetation areas. – Develop a Spill Prevention Plan.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
EG-2	Effect on stream geomorphology	– Change in geomorphic form/function/stability in affected channels within the study area	– Change in geomorphic form/function/stability in affected channels.	– Employ erosion and sediment controls to limit deposition of construction-mobilized soils into watercourses. – Consider completing a geomorphology study during design, where applicable.
EG-3	Effect on aquatic species including SAR, species of local concern, native species and invasive species	– Aquatic species	– Number and type of aquatic species potentially affected temporarily or permanently. – No anticipated impacts to aquatic SAR as there are no aquatic SAR identified within the study area.	– Preventing death of fish or impacts to downstream fish habitat through the use of appropriate timing windows.
EG-4	Effect on terrestrial habitat or functions	– The study area does not contain ANSIs – The study area contains Ecologically Significant Forests – Wildlife habitat	– Temporary or permanent loss of natural heritage features (e.g., ESAs, ANSIs, wildlife corridors, and others). – Potential effects on terrestrial habitat (e.g., direct vegetation (and wildlife habitat) loss, alteration, and fragmentation) may occur from the physical footprint of study area locations. – Project preparation, construction, and operation may increase the risk of nest destruction and mortality of migratory birds.	– Site investigations to evaluate potential terrestrial habitat function/significance. – During design, prepare construction constraints with consideration of timing windows to mitigate where possible, vegetation clearing to occur outside of the migratory bird nesting season, bat maternity roosting season, turtle overwintering and amphibian breeding. – Limit the area of project footprint and limit disturbance during construction and operations phases. – The presence of wildlife will be monitored and communicated to site personnel. – Vehicle use will be restricted to designated areas. – Where practical, rehabilitate habitat for plants and wildlife.
EG-5	Effect on terrestrial species, including SAR, species of local concern, native species, invasive species and area-sensitive species	– SAR have the potential to occur within the study areas, including amphibians, insects, birds, reptiles, mammals and tree species	– Number and type of terrestrial species potentially affected temporarily or permanently. – Construction activities have the potential to disturb wildlife within adjacent natural heritage areas. – Project preparation, construction and operation may increase the risk of nest/habitat destruction and mortality of terrestrial SAR. – Project may result in wildlife-vehicle collisions and may cause injury/mortality to individual animals.	– Site investigations to evaluate potential occurrence of terrestrial SAR within the study area. – During design, prepare construction constraints with consideration of timing windows to mitigate where possible, vegetation clearing to occur outside of the migratory bird nesting season, bat maternity roosting season, turtle overwintering and amphibian breeding. – Clearly demarcate work limits at outset of construction and minimize unnecessary vegetation clearing.

5.9 Y3-A Aurora East SPS Gravity Interconnection

5.9.1 Study Area

The Y3-A Aurora East SPS Gravity Interconnection is an interceptor sewer capable of conveying flows upstream of the existing Aurora SPS from the existing Aurora Gravity Sewer and new Y10 Aurora SPS Gravity Sewer Twinning via a distribution chamber to the new Y3-B Aurora East SPS. This allows for offloading or splitting flows normally flowing to Aurora SPS to Y3-B Aurora East SPS and ultimately to the new Y1-A Leslie Street Trunk Sewer. The study area is limited to the combination of the Aurora SPS site and the new Y3-B Aurora East SPS site, along with St. John's Sideroad between the two sites. A study area of approximately 200 metres surrounding the centerline of the right of way was applied as shown in Figure 5.16.

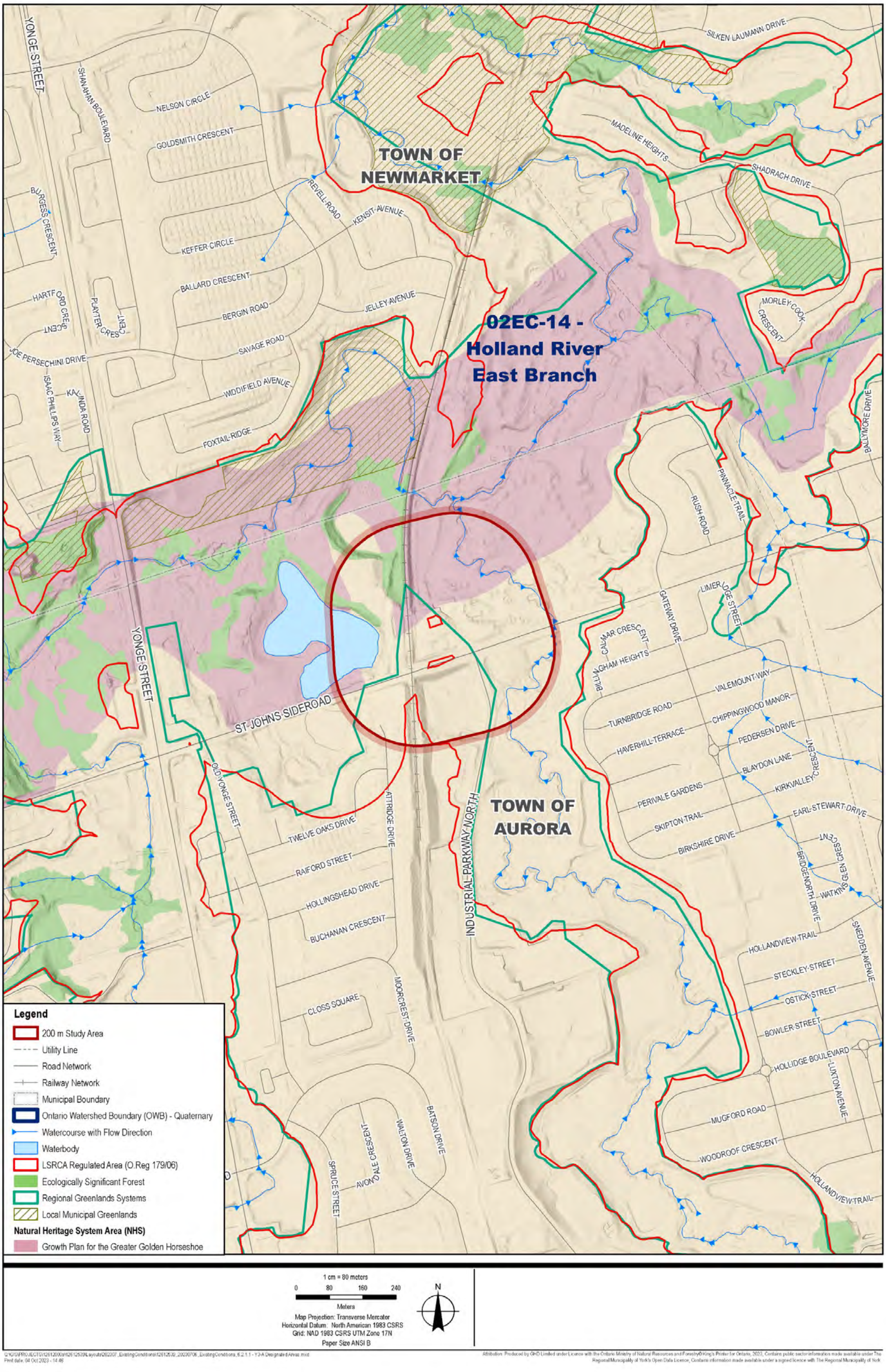


Figure 5.16 Y3-A Aurora East SPS Gravity Interconnection

5.9.2 Existing Conditions

5.9.2.1 Social and Built Environment

The following sections will summarize the findings of the desktop studies completed within the study area, including planning and land use, traffic and transportation and utilities.

5.9.2.1.1 Planning Policy and Land Use

Existing Land Use

Study area at the intersection of Industrial Parkway North and St. John's Sideroad, land use consists of the following:

- Low density residential housing
- Recreational lands (Golf course)
- Aurora Pumping Station
- CNR rail crossing St John's Sideroad
- Public park.

Planning Policy

Regional

The York Region Official Plan (June 2023 Office Consolidation) designates lands within the study area as Community Area. Additionally, lands within the study area are part of the Regional Greenlands System.

Local

With reference to the Aurora Official Plan (September 2021 Office Consolidation), land within the study area is designated as follows:

- Environmental Protection
- Private Parkland
- Public Parkland
- Stable Neighbourhood
- Existing Employment – General Industrial.

Active Development Applications

Lands within the Y3-A study area contain two active development applications.

- 330 Industrial Parkway North - To rezone a portion of the lands from "E1(206)" and "E1(256)" to common "E1(XX)" Exception Zone to facilitate the extension of the existing Montessori School.
- Twelve Oaks Drive - Proposed subdivision.

5.9.2.1.2 Transportation in the Study Area

St. John's Sideroad between Industrial Parkway and Bayview Avenue is a four-lane 60 km/h posted speed (dropping to 50 km/h west of Industrial Parkway towards the rail crossing) arterial road. There are pedestrian sidewalks on both sides, with a multi-use path on the north boulevard, as shown in Figure 5.17.

Figure 5.17 **St. John's Sideroad Looking West Towards the Rail Crossing West of Industrial Parkway. (Google Maps "Streetview," digital images http://maps.google.com)**

The AADT along St. John's Sideroad between Industrial Parkway and Leslie Street has been counted as 27,172 in the west end as of 2023 and 10,600 in the east end as of 2022. Historical AADT data along the study area roads are presented in Table 5.24.

Table 5.24 **St. John's Sideroad AADT Counts Between Industrial Parkway North and Pinnal Trail**

Description of road limits	2012	2014	2015	2017	2019	2023
Industrial Parkway North and Pinnacle Trail/Gateway Drive	22,035	21,596	22,157	21,468	12,317	27,172

There are no bus routes running along the study area, but there is also a GO rail line and crossing on the west end of the corridor, east of Yonge Street and west of the existing Aurora SPS upgrade project and proposed Y3-B Aurora East SPS locations.

5.9.2.1.3 Utilities in the Study Area

There are several above/below grade utilities situated within the study area corridor and in the vicinity of the proposed project. These utilities may be temporarily impacted during the construction of tunnel, shaft and work compounds. Formal notification and consent would be required from the authorities responsible for these utilities prior to construction.

Buried utilities are typically located within the following limits:

- Shallow-buried electrical and communications cabling are commonly buried between 1.2 and 1.5 mbgs.
- Shallow-buried storm drains, sanitary sewers, and watermains are typically buried between 1.2 and 3.5 mbgs.
- Deep-buried utilities are defined as anything buried more deeply than the depths mentioned above.

Known municipal infrastructure that existed on York Region's GIS database has been provided within the drawing set. A detailed utility investigation program, which would include a "Level A through D" subsurface utility exploration, would be required as part of future site investigations.

Known large infrastructure within the study area include:

– A CNR rail crossing, used by Metrolinx Go Transit, at the northwest limit of the alignment, above the sewer.

The rail infrastructure will require specific geotechnical instrumentation and monitoring requirements to receive infrastructure owner approval of the design. Any construction impacts on the tracks will be assessed as part of a construction impact assessment report (CIAR) during design development.

5.9.2.2 Natural Environment

The following sections will summarize the findings of the desktop studies completed within the study area for: geotechnical, hydrogeology, surface water, natural heritage and contamination.

5.9.2.2.1 Geotechnical

The study area for Y3-A is split into two sections, with the east portion of the study area bordered by residential properties, whereas the west portion of the property is bordered by forested areas, both within the boundaries of the Town of Aurora.

It should be noted that no site-specific reports or borehole records were encountered within the study area.

Based on the Quaternary geology mapping, the native deposit within the study area predominantly comprised silt and clay matrix, mostly consisting of Glaciolacustrine deposits.

The bedrock consists of shale, limestone, dolostone and siltstone of the Georgian Bay Formation, Blue Mountain Formation and Billings Formation. Typically, bedrock is mapped at depths of 124 m to 140 mbgs within the study area and will not be reached during construction.

5.9.2.2.2 Hydrogeological

A hydrogeological desktop review was undertaken within the study area using information from MECP well records, the MECP Source Protection Information Atlas, the Oak Ridges Moraine database, and the Ontario Geological Survey database. Available hydrogeological reports for projects within the area were also reviewed.

The Y3-A study area is within the Schomberg Clay Plains physiographic region. A majority of the linear infrastructure (gravity sewer) will involve a shallow excavation that will intersect a low permeability glaciolacustrine deposit. Proposed deeper shaft excavations associated with the three (3) manholes (15 mbgs) may intercept modern alluvial deposits and the Oak Ridges Moraine requiring temporary water takings. Hydraulic conductivity of deeper alluvial deposits and Oak Ridges Moraine deposits of 10-4 m/s. The linear infrastructure is located within the source water protection areas of WHPA-B, C, and D. Linear infrastructure section along St. John Sideroad intersects WHPA-B, C and D and borders on WHPA-B with proximity to WHPA-A.

The water table is approximately 2 to 14 mbgs.

Shallow groundwater flows towards an unnamed creek that passes through the west side of the structure.

Borehole logs surrounding Aurora SPS suggest finer grained materials may be found at shallow depths (approximately 4 to 6 mbgs). GHD study shows fine grained materials (silt to silty clay), which were interpreted to form an aquitard, contradicting with ORM database; more information needed.

There are no historic private water supply wells located within the section to be laid along Y3-A. One supply well and several observation wells are nearby.

Refer to Table 5.25 regarding details on anticipated aquifers and aquitards within the study area.

Table 5.25 Aquifers and Aquitards Through the Y3-A Aurora East SPS Gravity Interconnection Study Area

Aquifers and aquitards	Description	Thickness
Undifferentiated upper sediments at ground surface (Aquifer)	An unconfined aquifer consisting of discontinuous fill and unconsolidated overburden deposits.	Generally, maximum of 1.5 m
Oak Ridges Moraine Complex (Aquifer)	These sediments consist mostly of silt and fine sand, but also include gravel and minor clay and diamicton. The aquifer is generally unconfined, except the section covered by Halton till on the south flank of the ORM complex. Underlies topsoil in small areas along section.	Generally, 6 m
Channel silt aquitard	Silt deposits	Generally, 20 m. Increases in thickness from east to west
Channel sand aquifer	Sand deposits	Ranges between 10 to 30 m
Newmarket till (Aquitard)	A continuous layer that acts as an aquitard to the underlying Thorncliffe Formation.	Ranges between 4 to 45 m
Thorncliffe Formation (Aquifer)	Regionally recognized as a highly productive confined aquifer and is laterally continuous.	Up to 9 m
Sunnybrook Drift (Aquitard)	A continuous layer that acts as an aquitard to the underlying Scarborough Formation.	Up to 20 m
Scarborough Formation (Lower aquitard)	A confined aquifer that is discontinuous and appears to consist of channel fill deposits that roughly dip to the east.	Ranges between 5 to 22 m

5.9.2.2.3 Surface Water

There is one sub-watershed within the study area, the HREB. An unnamed creek, which is a tributary to the HREB, intersects section to be laid along Y3-A. Numerous surface water features associated with St. Andrews's Valley Golf Course are located just north of the section.

Other surface features of interest include:

– Warmwater pond
– Aurora (McKenzie) Marsh wetland complex
– HREB.

Refer to Figure 5.18 for a surface water map of existing conditions within the study area.

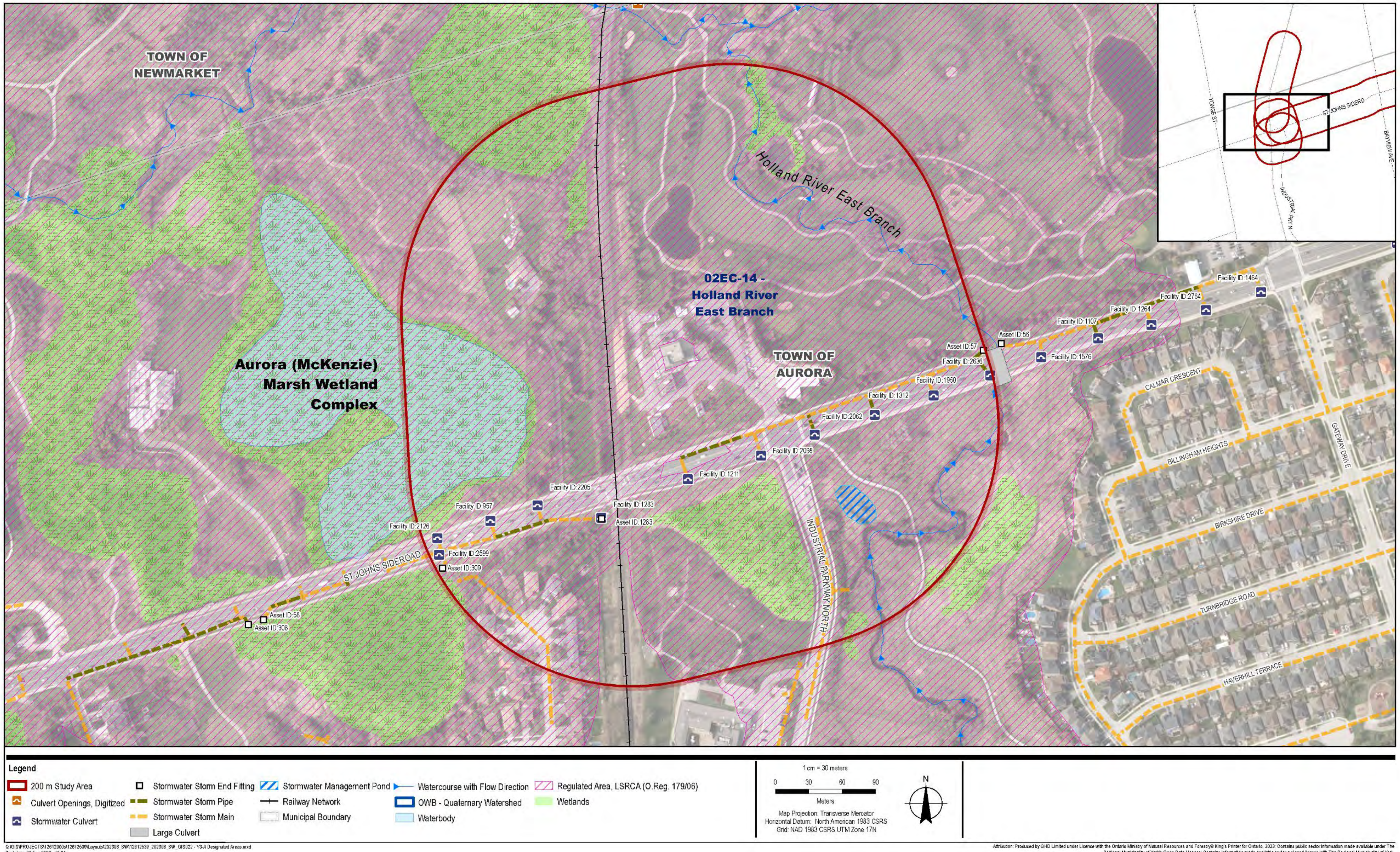


Figure 5.18 Y3-A Aurora East SPS Gravity Interconnection Study Area Surface Water Map for Existing Conditions

5.9.2.2.4 Natural Heritage Characterization

The study area contains ecologically significant forests, unevaluated wetlands, areas under the Greenbelt Plan and areas associated with both the Regional and Local Municipal Greenlands System regulated by the LSRCA.

The Aurora (McKenzie) Marsh wetland complex is a PSW located at the western end of the study area. This wetland consists of open waters, marshes and swamps, and is known to support habitat for turtles, amphibians, small mammals, and waterfowl. Additionally, along the roadside of this wetland complex is known turtle nesting areas for both snapping and midland painted turtles. This wetland complex is protected under ORMCP with the LSRCA.

Aquatic Habitat

Two small warmwater tributaries of the HREB flow northwards under St. John's Sideroad into Hamilton Park, where they enter the eastern extent of the Y3-A study area. The tributaries merge into one main channel and flow northward through a mix of naturalized mix forest, wetland, and parkland space. Approximately 140 m north of the study area, the tributary merges with another feature and continues northwest through a naturalized area and golf course for approximately 580 m before draining into the HREB. The riparian buffer for the watercourses is fairly narrow and vegetated with dense, tall grasses, sedges and some deciduous trees that obscure the stream channel with overhead cover. Beyond the thin riparian buffer, the vegetation mostly consists of mowed lawns. At the northern limits of the study area, the stream channel becomes more sinuous, and the riparian characteristics change as the watercourse flows into a deciduous forest. ARA data shows this warmwater watercourse fish community consists of brook stickleback, brook trout, creek chub, fathead minnow, pumpkinseed, and white sucker. Based on this fish community, this watercourse supports mostly bait/forage fish, with potential to support some coldwater sportfish.

On the western portion of the study area, south of St. John's Sideroad and east of Industrial Parkway N, the HREB meanders sinuously northwards through the study area. This section of the HREB is classified as a coldwater watercourse. Surrounding land use around the HREB is heavily naturalized, as it flows through the Aurora Community Arboretum. This portion of the Arboretum where the HREB flows is a meadow, forming a wide riparian area consisting of tall grasses and sedges, with a planation of coniferous trees in the immediate vicinity of the watercourse. The HREB flows out of this naturalized area under St. John's Sideroad, where is continues for approximately 600 m before forming a confluence with Tannery Creek within a golf course property. This naturalized section of the HREB supports a diverse fish community. Based on the anticipated fish community, the HREB found within the Y3-A study area supports a diverse community of bait/forage fish, as well as a variety of coldwater and warmwater sportfish.

Lastly, a pond is located at the western extent of the study area, just north of St. John's Sideroad. This waterbody has approximately 45,500 m^2 of surface area and feeds into Tannery Creek 350 m outside of the study area. Surrounding land use around this waterbody is mostly naturalized, with some residential areas also present. This waterbody is part of the Aurora (McKenzie) Marsh wetland complex, and a large portion of the natural area surrounding it consists of marshland vegetated with cattails and *Phragmites spp.* Dense sedges and tall deciduous trees can also be found bankside, along with plantations of coniferous trees found on private property located at the waterbody's edge. ARA data shows a fish community consisting of blacknose dace, bluntnose minnow, brook stickleback, common shiner, creek chub, fathead minnow, largemouth bass, longnose dace, mottled sculpin, pumpkinseed and white sucker. This waterbody found within the Y3-A study area supports bait/forage fish, as well as warmwater sportfish. No redside dace have been recorded within this study area.

Terrestrial Habitat

The lands within the study area consist of golf courses, parkland, Evaluated (Aurora PSW) and unevaluated Wetland and urban development in the central study area.

All natural and cultural communities present within the study area are considered common in the province.

Significant Wildlife Habitat

Potential Candidate SWH for Region 6E as defined by MNRF has been identified in several natural areas within the study area. The greatest concentration of these potentials is likely to be found in wetland and woodland habitats associated with the PSWs and ESAs. A screening and analysis of all ELC communities was completed in the study area for Seasonal Concentration Areas of Animals, Rare Vegetation Communities or Specialized Habitat for Wildlife, Habitat for Species of Conservation Concern and Animal Movement Corridors.

5.9.2.2.5 Areas of Potential Environmental Concern

A review of information from the Environmental Risk Information Services database was completed for properties located within the study area. The review was completed on May 26, 2023, to visually confirm the current land use and associated potential for containing subsurface environmental contamination. This “windshield-level” survey showed that:

– Various residential and commercial properties are present along the majority of the study area.
– Some agricultural and Industrial land use is present within the study area.

No areas at-risk of existing contamination were identified for this study area.

5.9.3 Concept Design

Conceptual design for this gravity sewer was based on flow rates and design criteria as described in Chapter 3.

The gravity sewer is required to convey flows from north of Aurora SPS via the existing gravity sewer and the new Y10 Aurora SPS Gravity Sewer Twinning to the new Y3-B Aurora East SPS.

5.9.3.1 Design Basis

For design basis specifics relevant to Y3-A Aurora East SPS Gravity Interconnection, refer to Table 5.26.

Table 5.26 **Design Basis for the Development of Y3-A Aurora East SPS Gravity Interconnection**

Design basis	Assumptions
Study area	250 m area along infrastructure alignment
Study area boundaries	St. John's Sideroad, east and west of existing SPS
Nominal diameter	1500 mm
Sewer type	Gravity
Upstream connection point	St. John's Sideroad, east of SPS
Downstream connection point	St. John's Sideroad, east of SPS
Design criteria	Based on York Region Design Guidelines (2021), including: – Pipe size and material – Hydraulic design – Air management – Method of construction – Major utility crossings – End connection points
Method of construction	Tunnelling within ROW
Land use	Mixture of residential and commercial land uses
Modelled Peak Flow	1442 L/s
Major infrastructure considerations	– Rapid transit networks (Metrolinx GO Transit rail) – Rail crossing St. John's Sideroad west of Industrial Parkway N – Hydro corridor
Environmental feature considerations	– Public walking and cycling trails – Wetlands – Several wooded areas

5.9.3.2 Description of Design

The Y3-A Aurora East SPS Gravity Interconnection conceptual design is based on a sewer that will be a 250 m long, 1500 mm diameter, high-density polyethylene (HDPE) lined reinforced concrete gravity sewer at a slope between 0.10% and 0.30%. The top end of this new installation will be immediately north of the Aurora SPS, following along the west property limit of the site before crossing St. John's Sideroad. South of St. John's Sideroad, the sewer will then turn east towards the new Y3-B Aurora East SPS wet well.

The gravity sewer will include a new distribution chamber adjacent to the Aurora SPS, allowing for the flows from the north to be conveyed either to the existing Aurora SPS or the new Y3-B Aurora East SPS.

The existing ground profile along the gravity sewer starts at 247 m, starting at the north end of Aurora SPS, and quickly reaches 254 m at St. John's Sideroad. Grade then falls back down to 246 m at the Y3-B Aurora East SPS site. This allows for a gradual sloped gravity sewer limited only by utility crossings at St. John's Sideroad and the elevation of the Y3-B Aurora East SPS.

Preliminary capacity calculations conclude that a 1500 mm diameter sanitary sewer is needed hydraulically to install this new line at a uniform grade of 0.10% from north to south, representing the shallowest installation possible to convey peak flows. We note that the sewer grade is subject to change during design development. This uniform grade will result in a maximum depth of close to 15 m at the peak on St. John's Sideroad. Detailed design will confirm slopes and velocities at flows other than peaks to confirm that scour velocities are maintained.

5.9.3.3 Construction Methods

The gravity interconnection is conceptualized to be constructed via mix of open cut and trenchless methods. The connections of the gravity connection at the existing Aurora SPS and new Y3-B Aurora East SPS are anticipated to be constructed via open cut. The crossing of St. John's Sideroad will be completed via trenchless methods due to the depth and to mitigate impacts to traffic.

5.9.3.3.1 Tunnel Construction

Trenchless installations of this diameter gravity sewer are typically installed via microtunnelling boring machines (MTBMs). MTBMs employ the slurry pressure balance principle in combination with pipe jacking for pipe installation as described above, although the machines are operated remotely from the surface, and workers do not enter the tunnel. For production operations except for tunnel boring machine (TBM) maintenance and survey, making it a safer method with lower construction crew requirements. MTBMs are sized to install pipes ranging from 0.5 to 3.4 m inner diameter (i.d.). Microtunnel drives close to and above 1000 m are becoming increasingly common with industry innovation and compounding experience. Below are some recent examples:

- Hunua 4 Section 11, Watermain project, Auckland: 1296 m drive for 3000 mm i.d., completed in 2020.
- YDSS Forcemain Twinning Project, Newmarket, Ontario, Canada: 1132 m drive for 1800 mm i.d., completed in 2020.
- Raw Water Intake, Painesville, Ohio: 1203 m drive for 1520 mm i.d., completed in 2019.
- Sea outfall, Sur de Texas-Tuxpan gas pipeline, Altamira, Mexico: 2246 m drive for 3200 mm i.d. in 2019.
- West Cumbria Water Supplies Project for United Utilities, United Kingdom: 1241 m drive for 2280 mm i.d., completed in 2018.
- Kingsbury Run Culvert Repair project for the Northeast Ohio Regional Sewer District (NEORSD), Cleveland, Ohio: 830 m curved drive for 1520 mm i.d., completed in 2017.

Typical drive lengths can vary from 200 m to over 1000 m, with construction being more economical the longer the drive. Constructible length of drive is typically related to the size of the tunnel, with larger MTBMs able to achieve longer drives than smaller diameter machines.

One key concern with microtunnelling jacking pipe installation relates to any sensitive infrastructure along or crossing the tunnel alignment. In the case of Y3-A, there is one CNR rail crossing St. John's Sideroad, west of Yonge Street.

Tunnelling adjacent to railways using any of the above methodologies will require additional design considerations, particularly for the vibrations and soil heave and/or settlement impacting the tracks, which can be generated by the MTBMs. Some horizontal displacement of soil is also anticipated during tunnelling and shaft excavation works. These displacements can generate structural deformations on rail infrastructure, including tracks. Depending on the type and intensity of the deformation, the tracks may become unsuitable for safe travel and closure of the tracks may be required to repair the tracks. As these are high traffic, heavy rails, neither short- nor long-term closure of the rails will be accepted for this project, and special attention must be provided to avoid or mitigate deformations induced by soil movement during and post-construction.

Any construction works within CNR rail corridors require extensive stakeholder coordination and communication on the progress of the design to achieve infrastructure owner approval for construction, as well as including a visual pre- and post-construction conditions assessment of the structure and CNR specified geotechnical instruments and monitoring requirements (per document "Utility Crossing/Encroachment Application Packet" dated December 4, 2018). In addition, as all rail crossings are considered critical infrastructure, they will automatically be considered for construction impact assessment, which involves an analytical review of ground movement induced structural deformations by the tunnelling and nearby shafts excavation works.

Both CNR and Metrolinx GO Transit have standards for review and alert limits for vertical and horizontal displacement thresholds for their infrastructure (per "Metrolinx Trenchless Utility Works Design and Construction Guidelines on Metrolinx Right-of-Way (Heavy Rail)" dated October 31, 2019,) which will act as a key design standard for all excavations near (within calculated ZOI from excavation settlement) or under active rails.

All rail infrastructure is deemed critical infrastructure and thus will automatically require a CIAR to predict anticipated ground movement during and post-construction until the proposed design soil displacement remains below limits established by both CNR and Metrolinx GO Transit. Should the limits be surpassed, the team will apply modifications to the relevant shaft and/or tunnel designs or construction methodology or propose pre-excavation mitigation methods such as ground improvement, whichever is considered more appropriate, with approval from CNR and Metrolinx GO Transit.

Further design development, including completion of geotechnical and hydrogeological investigation, will assist in shortlisting the types of TBMs and tunnel lining methodologies that might be adopted for the tunnelled sections. In general, MTBMs and Earth Pressure Balance Tunnel Boring Machines (EPBTBMs) have performed well in the difficult water bearing and boulder laden glacial deposits around the Greater Toronto Area (GTA) and on some projects, the selection of construction approach is left to the contractor, subject to certain basic methodology requirements and capabilities being satisfied.

5.9.3.3.2 Shaft Construction

Shafts are required for launch of TBMs, servicing tunnelling operations and TBM retrieval, and are commonly used to house maintenance holes, access chambers and other permanent facilities.

From a tunnel construction perspective, the required shaft dimensions, particularly shape and internal diameter, are a function of the following:

- Length of tunnel segments (pipe or PCTL)
- Tunnel diameter
- Tunnelling machine dimensions, particularly length
- Thrust wall design
- Jacking rig size
- Tunnel eye sealing ring
- Guide rail systems.

The shaft details proposed on the concept alignment for the Y3-A gravity sewer are as follows. Methodologies for shaft excavation and support are commonly classified as sealed or unsealed, depending on the degree of leakage into the shaft and impacts on the surrounding water table that occur during construction. As highlighted previously, it is expected that the shafts will be constructed in a variety of soft ground conditions, largely below the water table. Both shaft classifications are further described in the sections below.

Unsealed Shafts

Unsealed shafts are typically specified where ground conditions are stable, where there are no restrictions on dewatering to permit lowering the surrounding water table, or where conditions are dry, and dewatering is not required for shaft construction). Common methods are described below.

Steel liner plate

Steel liner plates provide a relatively lightweight, easy-to-handle, safe support for soft ground tunnelling because the ground that supplies the loading also supplies the resistance to the load. The liner plate assembly simply distributes and transmits the load to the surrounding earth.

Driven sheet pile

Sheet pile walls are used as an earth retention system in soils that allow driving from the surface to bottom of shaft. They do not work well in soil conditions with boulders or large obstructions. Sheet piles are prefabricated steel sheet sections with interlocking edges. As the sheets are installed, they form a continuous barrier in the ground. The sheets are typically driven with vibratory hammers or drop hammers. More recently, this type of construction can also be sealed but requires specialty sealants to be applied at joints, which increase construction schedule, cost and failure modes.

Soldier piles with timber laggings

Soldier piles are steel H piles that are vertically driven or drilled into the earth at regular intervals prior to excavation. As excavation progresses in stages, horizontal lagging in the form of timber is added behind the flanges to create the wall structure with connecting joints.

Sealed Shafts

Sealed shafts are typically specified where unstable ground conditions exist or where there are restrictions on dewatering to lower the surrounding water table. Sealed shafts tend to be more expensive than unsealed shafts, although they have become almost mandatory in many Canadian jurisdictions where there are strict environmental requirements to minimize groundwater lowering and effects on adjacent water courses as well as infrastructure. Common sealed shaft methodologies include:

Secant pile walls

Secant pile shafts utilize bored piling methods (incorporating use of temporary steel casings driven, or vibrated into place, in advance of pile excavation to prevent ground collapse) to create a vertical perimeter of interlocking poured concrete cylindrical piles. The overlapping of piles creates a waterproof liner and supporting wall. It cannot be used as a final structure and will require a permanent structure such as a manhole chamber to be installed within the shaft.

Concrete sinking caissons

The method involves sinking the shaft in several lifts by building a circular (or oval) shaft structure on the surface and placing kentledge blocks (weights) or rams on top of it. Many contractors assist the sinking operation by lubricating the annular gap between the outer walls and surrounding ground. A clamshell grab (granular soils) or mini excavator (competent soils such as clays or rock) is then used for shaft excavation, and the shaft structure slowly sinks to fill the excavated void. The shaft structure is typically constructed using precast concrete segments or cast-in-place reinforced concrete. Once the shaft has been sunk to the desired formation elevation, a mass concrete base plug is placed using a tremie (underwater) concreting, if the shaft is in a flooded condition. A major advantage of this method is that the shaft wall can be used as future permanent structure for maintenance.

Slurry (diaphragm) walls

To commence excavation, guide walls are installed around the desired shaft location. These guide walls act as a guide for installation of the slurry walls. A trench is then excavated between the guide walls, typically several metres long and 1 to 1.5 m wide and extending to the required depth. A bentonite slurry mix is pumped into the trench as it is excavated to support the surrounding soil. The slurry is composed of water, bentonite clay and other additives to achieve the desired properties, acting as a temporary support system to prevent collapse. Once the trench reaches the desired depth, steel cages or vertical steel sections are inserted for reinforcement, enhancing the wall's load-bearing capacity. As the concrete is pumped into position, the slurry is displaced to the surface, where it can be collected, treated, and used for subsequent wall construction. The slurry wall shaft construction method is highly advantageous for constructing deep excavations in urban environments.

Pending geotechnical and hydrogeological field investigation and laboratory testing results along the sewer alignment and at shaft locations, a preferred shaft construction methodology cannot be selected. The appropriate methods will be assessed and compared in a future phase of design development.

5.9.3.4 Property Requirements

Permanent property requirements will depend on the final location of the new Y3-B Aurora East SPS. The concept design shaft locations are currently within York Region ROW or existing Aurora SPS site.

Temporary and permanent property easements may be required for construction and operation of the trunk sewer. Permanent property requirements will depend on the final location of the shafts, which are expected to contain a manhole structure that must be accessible by York Region staff for sewer maintenance purposes.

The proposed property locations and requirements for construction of the shafts are conceptual only. Details related to the number of shafts, shaft sizing, location and property easement requirements will be confirmed during detailed design.

5.9.4 Environmental and Community Impacts and Mitigation

Desktop studies were done to determine the possible extent of potential impacts and to propose mitigation measures that would reduce the likelihood and the consequences should they occur. The major impacts and associated mitigation approaches are described in this section.

Because the current designs are only at the conceptual level, potential impacts and mitigation measures could change during design development depending on:

- The ability to co-locate the proposed design with other planned infrastructure to minimize community effects, to be investigated after field investigations are completed. This change will depend on the number and scale of other planned infrastructure (e.g., utilities, transportation) in the ROW or area.
- Confirmation of available property for temporary and permanent use. The extent of temporary easements or acquired private property, as well as the construction schedule. may dictate future design changes or mitigation measures.

The assessment criteria and indicators are provided in Table 5.27 and Table 5.28, corresponding to each of the environments (social and built, natural, cultural and traffic impacts) together with a potential effects assessment and identification of avoidance, mitigation and compensation measures for the project.

Table 5.27 Y3-A Aurora East SPS Gravity Interconnection Social and Built Environment Effects and Mitigation

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Social and built environment				
SB-1	Effect on existing views	– Predicted changes in views from residences in the surrounding area	– No change in existing views from residences in the surrounding area.	– No avoidance, mitigation, or compensation measures required.
SB-2	Effect on existing residences, businesses, and/or community, institutional and recreational facilities	– Extent of displacement of residences, businesses and other facilities – Extent of temporary or permanent disruption to residences, businesses and other facilities in proximity to construction compounds/permanent installations	– No displacement of residences, community, institutional, or recreational facilities is anticipated; however, partial removal of St. Andrew's Valley Golf Club may be required. – Disruption to residences, businesses and community, institutional and recreational facilities in proximity to construction compounds/permanent installations.	– If in fact displacement is required, then York Region would provide market value compensation. – Apply standard construction-related mitigation measures to minimize the disruption effects.
Traffic and transportation				
TT-1	Effect on existing rail/bridge infrastructure	– Number of rail crossings impacted	– At the rail crossing west of the SPS site, we do not anticipate impacts within the rail ROW due to distance between locations.	– Coordination with Metrolinx during design development to limit impacts to their rail services.
TT-2	Effect on traffic	– Extent of disruption to traffic flows – Proximity to congested traffic zones	– Traffic disruption at location of SPS compound, first lane of traffic to allow for truck loading/unloading. – Traffic movement in to and out of Construction compound sites will impact pedestrian, cycling and traffic flow on St. John's Sideroad. – Impacts to public transit involving potential rerouting of buses and/or relocation of stops. – Coordination of alternate routing for emergency service vehicles, if needed.	– A minimum of one lane in each direction is to be always maintained during construction. – Temporary traffic signal systems to direct general traffic. – Consider special traffic arrangements for peak hours based on traffic flow directions in the morning and afternoon. – Pay duty police officers may be required to direct traffic. – Make special provisions for emergency service vehicle access. – Make special provisions for pedestrian traffic and safety, including signals, detours, and winter maintenance. If feasible, move construction traffic to sideroads.
Utilities				
U-1	Conflict with buried utilities	– Sewer or shaft is in direct conflict or falls within clearance limits of nearby utilities.	– New construction impacts existing utilities and requires design coordination with utility owners which increases project cost and schedule.	– Review historic and as-built documents for utility data. – Complete a SUE investigation to identify high-risk utilities, including large and/or critical service utilities (e.g., large watermains and all gas mains). – If a conflict occurred with a proposed sewer tunnel, construction shaft or overall work compound location following receipt of utility information, consider temporary or permanent relocation of utilities safely around or through the work area. Depending on the utility, it may be possible to support the utility above an open cut excavation to be reburied. Modifications of the alignment and shaft locations may also be proposed during design development to mitigate utility conflicts.
U-2	Conflict with surface or overhead utilities	– Excavation of shaft is proposed in location of surface infrastructure. – Shaft working compound equipment including cranes will require working directly under overhead utilities or within the hydro wire exclusion zone.	– Overhead infrastructure such as electrical or communications cabling is mounted on utility poles between 5 and 12 metres above the surface. Depending on the required crane size and operating radius to construct the shaft and lower the TBM, equipment extents may fall within hydro line exclusion zone, or hit overhead wires causing worker harm or death.	– Working compounds will be designed to allow appropriate and safe movement of workers and equipment around the site, away from live overhead wires or surface utility boxes, based on known utility information and topographic surveys. – If a conflict occurred with a proposed sewer tunnel, construction shaft or overall work compound location, following receipt of utility information, modifications of the alignment and shaft locations may be proposed during design development; the utilities would need to be temporarily or permanently relocated safely around or through the work area.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
U-3	Damage and/or Deformation to surface and buried utilities	– Soil movement under or next to the utility from tunnel or shaft/open cut construction	– Ground heave/settlement/horizontal shift along tunnel ahead of and along excavated alignment and around shafts and open cut excavations during and post-excavation. This information can be obtained from nearby geotechnical instrumentation. – Deformation or damage to nearby surface or buried utilities as a result of soil movement, which may require rehabilitation or repair (e.g., crack formation, angular rotation, strain, pipe joint rotation or pull out).	– For utilities within tunnel ZOI: Select a tunnel excavation method capable of limiting volume losses at the cutting face (limit overcutting of excavation) to limit ground losses. – For utilities near shaft/open cut ZOI: Select a shaft or open cut construction method and SOE appropriate with depth, size and geotechnical and hydrogeological conditions at shaft location. – Analytically assess nearby utilities and structures and propose mitigation methods such relocation of utilities, or for deep utilities, relocation of the sewer horizon. Should neither of these options be applicable, then investigate ground improvement in proximity of utilities to limit ground movement or investigate modification of the sewer and/or open- cut design or construction methodology.
Noise and vibration				
N-1	Operation noise	– Complaints from residents within study area	– Noise disruptions to private residents and commercial areas post-construction, near manholes and other surface connections, SPS locations.	– Any permanent facility, such as supporting air management facilities, will require an ECA application under Section 9 of the Environmental Protection Act. – Investigate degree of risk and impact in further detail.
N-2	Construction noise	– Complaints from residents within study area	– Noise disruptions to private residents and commercial areas during construction near construction compounds.	– Propose construction noise monitoring per MECP NPC-115 Construction Equipment requirements. – Consider completing noise monitoring for the duration of the construction and notify the contractor of any exceedances so that corrective action/contingency actions can be implemented. – Use vehicles and equipment (cranes and excavators) with efficient muffling devices or construct enclosures. – Limit truck movements to comply with noise by-laws for 24/7 construction operations.
V-1	Construction vibration	– Complaints from residents within study area	– Disruptions to private residents and commercial areas during construction, near construction compounds.	– Propose appropriate construction vibration benchmarks within the tender documents. – Consider pre- and post-construction condition photos.
Air management				
O-1	Operation odour at existing or proposed sewer connection	– Odour near surface connections	– There is potential for odour release due to turbulence at the connection of the proposed sewer to existing sewers.	– Consider implementation of ventilation design systems with odour control.
O-2	Construction odour	– Complaints are received from residents within the study area	– During live connection of infrastructure, there is the potential for odour release.	– Advance notification to residents, advising them of what work is being completed and the duration of the work.
A-1	Construction dust at sewer construction locations	– Fugitive dust – Poor air quality	– Fugitive dust generation during construction of gravity sewer, interconnecting shaft/chambers, including the connection points.	– Develop a Dust Best Management Practices Plan to be included in the project Construction Management Plan. – Mitigation should be aimed at minimizing emissions of particulate matter and exposure to particulate matter during the construction phase of the project.
A-2	Construction dust at air management infrastructure	– Fugitive dust – Poor air quality	– Fugitive dust generation during construction of the potential air management infrastructure.	– Develop a Dust Best Management Practices Plan to be included in the project Construction Management Plan. – Mitigation should be aimed at minimizing emissions of particulate matter and exposure to particulate matter during the construction phase of the project.

Table 5.28 Y3-A Aurora East SPS Gravity Interconnection Natural Environment Effects and Mitigation

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Hydrogeology				
N-1	Effect on groundwater quantity	– Temporary and/or long-term change in groundwater quantity	– Potential temporary change to groundwater quantity is minimal because construction expected to intersect the till aquitard underlying ORM sediment. Shallow water table or perched water anticipated to be encountered within till. Shafts anticipated to go through ORM aquifer sediments. – No long-term change to groundwater quantity is anticipated because no water takings are required during operation of the sewer. – Potential ground settlement as a result of active dewatering/depressurization. – Change in shallow groundwater flow patterns resulting from operation of sewer pipe resulting from increased I&I and/or preferential movement of groundwater within trench sediments.	– Implement construction methods that minimize dewatering requirements. – Establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water).
N-2	Effect on groundwater quality	– Temporary and/or long-term change in groundwater quality	– Temporary change in groundwater quality is minimal because construction is anticipated to mainly intersect low permeability till. Shafts anticipated to go through ORM aquifer sediments. – No long-term change to groundwater quality is anticipated. – Potential effects on groundwater water quality as a result of potential mobilization of contaminated water where active dewatering/depressurization is required. – Reduction in groundwater quality from spills or the mismanagement of fuel/chemical in work areas.	– Implement construction methods that minimize dewatering requirements, as needed. – Develop and implement a spills response plan for construction to mitigate the effect of a spill should one occur. – Establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water). – During design, complete a contaminant source investigation to mitigate the risk of drawing contamination from one source to another location.
N-3	Effect on Municipal Well(s), WHPA	– Intersects WHPA-B, C, D – Located on a highly vulnerable aquifer	– Source Water Protection Plan, Clean Water Act (2006) sanitary sewer infrastructure WHPA-B, C, D and policy compliance evaluation. – Section along St. John's Sideroad intersects WHPA-B, C and D and borders on WHPA-B with proximity to WHPA-A.	– Source Water Protection Plan, Clean Water Act (2006) sanitary sewer infrastructure WHPA-B, C, D and HVA policy, mitigation and monitoring evaluation. – As of January 2023, source water protection requirements under the York Region Municipal Sewage Works CLI ECA apply for any new or alterations to existing sewage works in WHPA-A or B, Vulnerability Score of 10, which applies to a portion of this alignment. These requirements include: • Design must include a Source Protection Supplementary Report that demonstrates that the proposed design recognized the significant drinking water threat and has implemented mitigation measures to protect drinking water sources. The report should identify drinking water sources, how the sewage works has met the requirements of the CWA and the ministry's design and operational requirements and how the works considered the Risk Management Measures Catalogue (e.g., monitoring, reporting requirements), as amended, to address the risks. • Designs must be accompanied with a monitoring and reporting plan. • Designs must be accompanied with a Spill Prevention and Contingency Plan, covering information requirements as per O. Reg. 224/07 to prevent, eliminate or ameliorate any adverse drinking water effects that result or may result from spills of pollutants. This includes steps taken in the event drinking water sources are contaminated, for example, notifying members of the public who may be directly affected by a spill. – New and replacement sewers are to be constructed of materials and with joints that are equivalent to watermain standards of construction and are to be pressure tested in accordance with Division 441 (formerly 701) of the Ontario Provincial Standards Specification (OPSS).
N-4	Effect on private wells - temporary construction dewatering	– Temporary construction dewatering private well interference (quantity/quality)	– Temporary decrease in private well quantity/quality not anticipated due to intersection of low permeability till. – Limited dewatering is expected during construction.	– Implement construction methods that minimize dewatering requirements, as needed. – Address construction dewatering private well interference complaints through existing York Region private well assessment and mitigation policy. – Proactively identify any high-risk wells during design and prepare site-specific preventative mitigation and corrective action plans as part of design. Corrective actions should align to York Region's private well assessment and mitigation policy.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
N-5	Effect on private wells – long term	– Long term private well interference (quantity/quality)	– No long-term groundwater quantity/quality interference is anticipated as no active or passive long-term groundwater takings related to the sewer are anticipated.	– If needed, establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water). – Proactively identify any high-risk wells during design and prepare site-specific preventative mitigation and corrective action plans as part of design. Corrective actions should align to York Region's private well assessment and mitigation policy.
N-6	Effect on surface water quantity/quality	– Temporary change in surface water quantity/quality	– Temporary change in surface water quantity/quality could occur during construction activities depending on the location, depth and construction, methodology and duration. – A high groundwater table resulting in groundwater/surface water interaction would be expected due to existing soils and anticipated presence of the ORM aquifer. – Sewer passes under tributary to HREB. – Change in groundwater-surface water interaction (reversal of vertical hydraulic gradient) results in impact to terrestrial and aquatic habitat and associated SAR (where applicable) – reduction in baseflow. – Change in surface water temperature from groundwater taking and/or discharge to surface water features. – Changes to stream morphology resulting from the release of groundwater dewatering water. The potential reduction in baseflow due to water taking in a lower confined aquifer due to increased downward hydraulic gradients across the aquitard separating the stream and the confined aquifer. – The potential reduction in baseflow from a stream reach that intersects an aquifer in which the water taking is occurring.	– Field verification of groundwater-surface water interaction suggested for watercourses and wetlands within the study area. – Complete outlet receiver assessment(s) should temporary groundwater discharge be required to surface water. Establish pre-construction baseline surface water quality and quantity conditions and develop implementation plans for monitoring during and post-construction. – Implement/construct treatment (i.e., settlement tanks, etc.) of construction water prior to discharge to storm sewer/surface water. – Minimize construction area disturbance and duration. Implement erosion and sedimentation control measures (e.g., silt fencing, check dams, etc.). – Adhere to fish timing windows to prevent negative impacts on known sensitive fish species within the study area. – Consider completing a geomorphology study during design. – Refer to the Natural Heritage section of the table for further mitigation approaches associated with surface water impacts.
Geotechnical				
G-1	Effect on soil quality	– Contaminant seepage into soil during excavation of shaft	– Chemicals such as drilling fluids, lubricants, ground improvement material, or fuel from construction equipment may contaminate soil.	– Perform regular equipment checks and maintenance. – Prepare an environmental management plan prior to construction in case of contamination.
G-2	Soil movement around shafts	– Vertical or horizontal ground movement around shafts during and post excavation – Deformation or damage to nearby structures and/or utilities	– Ground heave/settlement/horizontal shift at surface around shafts. – Deformation or damage to nearby structures and utilities (e.g., crack formation, angular rotation, strain, or pipe joint rotation or pull out) that may require rehabilitation or repair.	– Select shaft or open cut construction method and SOE appropriate with depth, size and geotechnical and hydrogeological conditions at shaft or open cut locations. – Complete soil displacement analytical assessments at all shaft locations.
G-3	Soil movement along tunnel	– Vertical or horizontal ground movement along tunnel during and post excavation – Movement or damage to nearby structures and/or utilities	– Ground heave/settlement/horizontal shift along tunnel ahead of and along excavated alignment. – Deformation or damage to nearby structures and utilities (e.g., crack formation, angular rotation, strain, or pipe joint rotation or pull out) that may require rehabilitation or repair.	– Select tunnel excavation method capable of limiting volume losses at the cutting face (limit overcutting of excavation) to limit ground losses. – Complete soil displacement analytical assessments for at-risk tunnel locations, including low soil cover locations or areas where the tunnel crosses or runs parallel in close proximity to sensitive natural features, utilities and critical infrastructure such as creeks, gas main, structural culverts, bridges and rail crossings
G-4	Encounter boulders during shaft and/or tunnel excavation	– Boulders encountered during excavation of shaft and/or tunnel	– For tunnels, boulder presence and properties may require change of preferred excavation methodology (segmented tunnel vs pipe jacking) and tunnel boring machine technical specifications. – For shafts, boulder presence and properties may require change of preferred shaft SOE methodology.	– Complete appropriate geotechnical investigations with strength testing for any encountered boulders. – Prepare a geological baseline report during design development with appropriate baseline for boulder strength, sizing and anticipated encounter rates and locations. – Recommend a shaft construction SOE capable of maintaining verticality in boulder-prone soils. – Recommend appropriate technical specifications for tunnel boring machine.
G-5	Frac-out of drilling fluids along tunnel	– Drilling fluid breaches surface during tunnel excavation – Unanticipated change in drilling fluid pressure and/or volume	– Drilling fluid may breach beds of water bodies such as creeks, lakes and rivers. – Drilling fluid may breach aquifers. – Drilling fluid may cause cracking on surface infrastructure such as pavement and may require closure of traffic lanes to clean up fluid at surface.	– Select contractor with experienced MTBM or TBM operators. – Require a "frac-out contingency plan" be prepared prior to construction for cleanup of drilling fluids.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
G-6	Encounter contaminated soil during shaft and/or tunnel excavation	– Soil encountered during shaft and/or tunnel excavation is tested to surpass allowable contaminant levels	– Spoil must be dispatched at an approved contaminated soil disposal site.	– Complete appropriate geotechnical investigations and contaminants testing during design development to identify confirmed contaminated soil locations or at-risk areas based on historical land use. – Identify and confirm availability of appropriate soil disposal sites based on anticipated contaminants for use during construction.
G-7	Encounter weak or incompetent soil during tunnel excavation	– Accelerated soil movement at surface and depths	– Soil heave, soil settlement or sinkhole formation at surface.	– Complete appropriate geotechnical investigations with strength testing for anticipated soils along tunnel horizon. – Prepare a geological baseline report during design development with appropriate baseline for soil properties, including stratigraphic profile inferred from borehole investigations. – Recommend appropriate preventative or compensation ground improvement for at-risk locations.
Natural heritage				
EG-1	Effect on aquatic habitat or functions	– The study area contains cold, warm or unknown thermal regime water watercourses. – The study area contains wetlands. – The wetland within this study area is considered provincially significant	– Temporary or permanent loss of aquatic features or categorical loss of functions by type, including PSWs, Locally Significant Wetlands, watercourses by sensitivity type and others. – During construction water quality may be impaired due to elevated TSS in surface water runoff from study area locations which can affect aquatic species/habitats. Some concentrations above background may occur temporarily. – Potential spill hazard when refuelling equipment. – Change in surface water temperature from groundwater taking and/or discharge to surface water features.	– Need to complete site investigations to evaluate potential effects on aquatic habitat function. – Implement best management practices to control surface water runoff and minimize TSS effects. – Where feasible, discharging of surface water during construction should be directed into the municipal storm sewer system to mitigate thermal impacts to watercourses. Should discharge of surface waters be directed to watercourses, additional mitigation measures would need to be adhered to (e.g., enhanced erosion and control measures). Use of erosion and sediment control measures and timing of construction (see Table 10.1) to avoid spawning and egg incubation periods will reduce the potential for effect to fish and aquatic life. – Conduct equipment maintenance and refuelling at the designated and properly contained maintenance areas or at industrial garages located well away from creek banks and wetlands and outside vegetation areas. – Develop a Spill Prevention Plan.
EG-2	Effect on stream geomorphology	Change in geomorphic form/function/stability in affected channels within the study area	– No anticipated impacts to stream geomorphology in affected channels.	– Employ erosion and sediment controls to limit deposition of construction-mobilized soils into watercourses. – Consider completing a geomorphology study during design, where applicable.
EG-3	Effect on aquatic species including SAR, species of local concern, native species and invasive species	Aquatic species	– Number and type of aquatic species potentially affected temporarily or permanently. – No anticipated impacts to aquatic SAR as there are no aquatic SAR identified within the study area.	– Preventing death of fish or impacts to downstream fish habitat through the use of appropriate timing windows.
EG-4	Effect on terrestrial habitat or functions	– The study area does not contain ANSIs – The study area contains Ecologically Significant Forests – Wildlife habitat	– Temporary or permanent loss of natural heritage features (e.g., ESAs, ANSIs, wildlife corridors and others). – Potential effects on terrestrial habitat (e.g., direct vegetation (and wildlife habitat) loss, alteration and fragmentation) may occur from the physical footprint of study area locations. – Project preparation, construction and operation may increase the risk of nest destruction and mortality of migratory birds.	– Site investigations to evaluate potential terrestrial habitat function/significance. – During design, prepare construction constraints with consideration of timing windows to mitigate where possible, vegetation clearing to occur outside of the migratory bird nesting season, bat maternity roosting season, turtle overwintering and amphibian breeding. – Limit the area of project footprint and limit disturbance from employees. – The presence of wildlife will be monitored and communicated to site personnel. – Vehicle use will be restricted to designated areas. – Where practical, rehabilitate habitat for plants and wildlife.
EG-15	Effect on terrestrial species, including SAR, species of local concern, native species, invasive species and area-sensitive species	SAR have the potential to occur within the study areas including amphibians, insects, birds, reptiles, mammals and tree species	– Number and type of terrestrial species potentially affected temporarily or permanently. – Construction activities have the potential to disturb wildlife within adjacent natural heritage areas. – Project preparation, construction and operation may increase the risk of nest/habitat destruction and mortality of terrestrial SAR. – Project may result in wildlife-vehicle collisions and may cause injury/mortality to individual animals.	– Site investigations to evaluate potential occurrence of terrestrial SAR within the study area. – During design, prepare construction constraints with consideration of timing windows to mitigate where possible, vegetation clearing to occur outside of the migratory bird nesting season, bat maternity roosting season, turtle overwintering and amphibian breeding. – Clearly demarcate work limits at outset of construction and minimize unnecessary vegetation clearing.

5.10 Y10 Aurora SPS Gravity Sewer Twinning

5.10.1 Study Area

Y10 Aurora SPS Gravity Sewer Twinning will provide a twin of the existing 1,050 mm gravity sewer upstream of the Aurora SPS, relieving the surcharging that currently occurs in this section of the system. Flows will originate at the terminus of the Newmarket SPS forcemains and flow through either the existing 1,050 mm or new gravity sewer and combine in a new distribution chamber capable of directing flows to either the existing Aurora SPS or to the new Y3-B Aurora East SPS via the Y3-A Aurora SPS Gravity Interconnection. The study area is limited to an area parallel to the existing sewer and easement from the discharge chamber to the Aurora SPS Site. A study area of approximately 200 metres surrounding the existing gravity sewer was applied as shown in Figure 5.19.

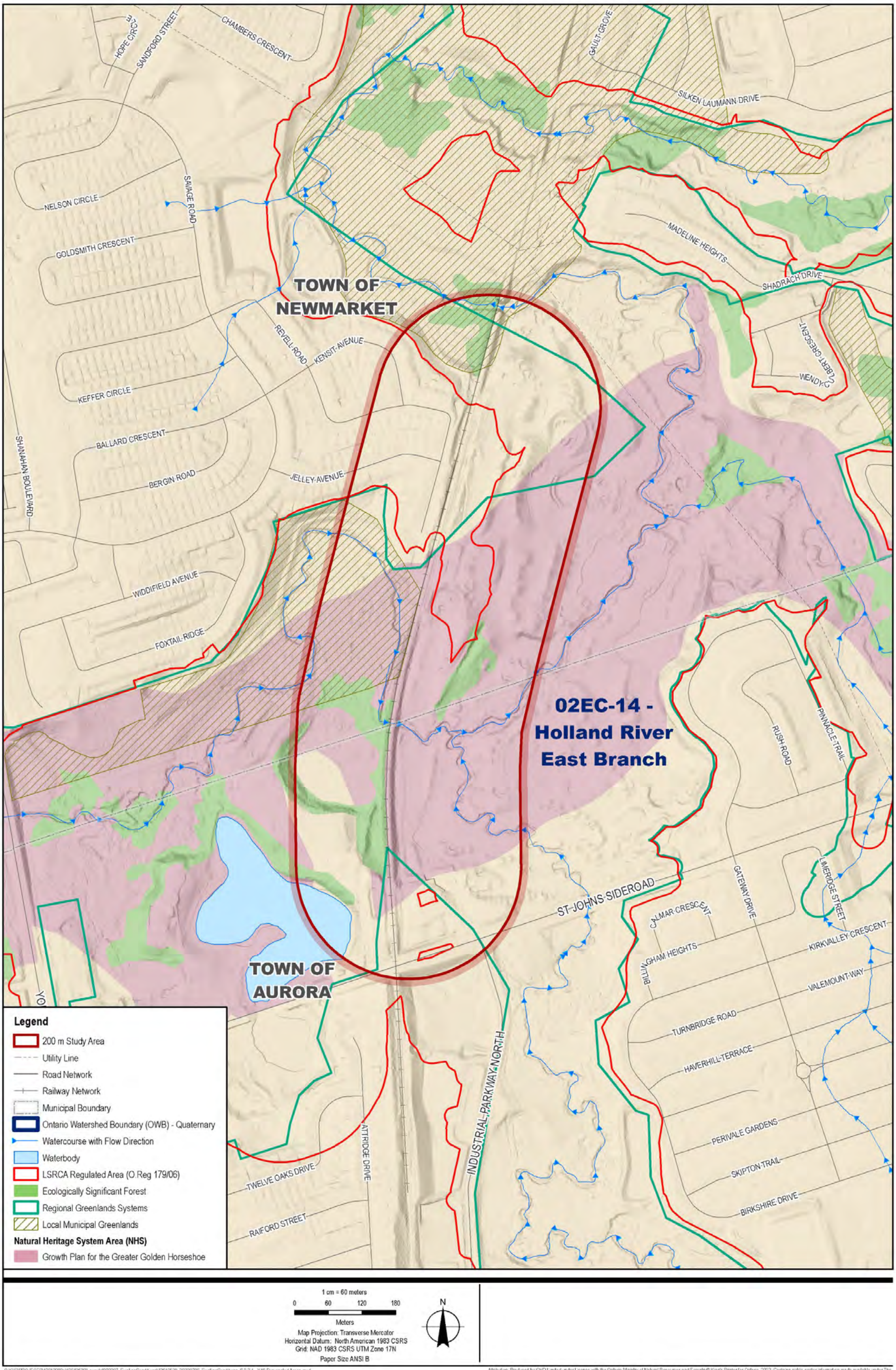


Figure 5.19 Y10 Aurora SPS Gravity Sewer Twinning Study Area

5.10.2 Existing Conditions

5.10.2.1 Social and Built Environment

The following sections will summarize the findings of the desktop studies completed within the study area, including planning and land use, traffic and transportation and utilities.

5.10.2.1.1 Planning Policy and Land Use

Existing Land Use

Along CNR railway tracks, from Madeline Heights to St John’s Sideroad, land uses consist of the following:

– West side:
  - Low density residential housing
  - Nokiidaa Trail.
– East side:
  - Recreational lands (Golf course)
  - Aurora SPS.

Planning Policy

Regional

The York Region Official Plan (June 2023 Office Consolidation) designates lands within the study area as Community Area. Additionally, lands within the study area are part of the Regional Greenlands System.

Local

The study area crosses the municipal boundary between Newmarket and Aurora. With reference to the Newmarket Official Plan (August 2022 Office Consolidation), land in the study area is designated as Parks and Open Spaces, Natural Heritage System and Residential Area. With reference to the Aurora Official Plan (September 2021 Office Consolidation), land within the study area is designated as Environmental Protection and Private Parkland.

Active Development Applications

Lands within the Y10 Aurora SPS Gravity Sewer Twinning study area contain several active development applications.

– Town of Newmarket – Foxtail Ridge - Two applications. To amend the Town's Zoning By-Law as part of the Established Neighbourhoods Compatibility Study. Proposed subdivision.
– Bosworth Court - Two applications. Proposed subdivision. To amend the Town's Zoning By-Law as part of the Established Neighbourhoods Compatibility Study.
– Town of Newmarket – Madeline Heights - Two applications. Proposed subdivision. By-law amendment.

5.10.2.1.2 Transportation in the Study Area

The study area is not located along an existing roadway but is along a rail corridor within the rail company ROW. The study area connects to St. John’s Sideroad near Industrial Parkway and spans northward about 1 km along the rail corridor. A photo of the rail crossing from St. John’s Sideroad is shown in Figure 5.20.

Figure 5.20 **(1) Rail crossing looking north from St. John's Sideroad west of Industrial Parkway and (2) Looking west towards rail crossing and Nokiidaa bike trail/Tom Taylor Trail from Jelley Avenue. (Google Maps "Streetview," digital images http://maps.google.com)**

Due to the nature of the sewer installation by tunnelling, working compounds and access will be required south and north of the study area, which may impact traffic along St. John's Sideroad.

There is no AADT relevant to the study area as it does not cross any roads. For AADT applicable to the adjacent study area for project Y3-A of St. John's Sideroad between Industrial Parkway and Leslie Street, please refer to section 5.9.2.1.

There is a GO rail line crossing St. John's Sideroad near Industrial Parkway, which spans the study area and runs in parallel with the proposed gravity sewer twinning for the Aurora SPS.

5.10.2.1.3 Utilities in the Study Area

There are several above/below grade utilities situated within the study area corridor and in the vicinity of the proposed project. These utilities may be temporarily impacted during the construction of tunnel, shaft and work compounds. Formal notification and consent would be required from the authorities responsible for these utilities prior to construction.

Buried utilities are typically located within the following limits:

- Shallow-buried electrical and communications cabling are commonly buried between 1.2 and 1.5 mbgs.
- Shallow-buried storm drains, sanitary sewers and watermains are typically buried between 1.2 and 3.5 mbgs.
- Deep-buried utilities are defined as anything buried more deeply than the depths mentioned above.

Known municipal infrastructure that existed on York Region's GIS database has been provided within the drawing set. A detailed utility investigation program, which would include a "Level A through D" subsurface utility exploration, would be required as part of future site investigations.

Known large infrastructure within the study area include:

- A CNR railway following the sewer alignment.

The rail infrastructure will require specific geotechnical instrumentation and monitoring requirements to receive infrastructure owner approval of the design. Any construction impacts to the tracks will be assessed as part of a CIAR during design development.

5.10.2.2 Natural Environment

The following sections will summarize the findings of the desktop studies completed within the study area for: geotechnical, hydrogeology, surface water, natural heritage and contamination.

5.10.2.2.1 Geotechnical

It should be noted that no site-specific reports or borehole record were encountered within the study area.

Based on the Quaternary geology mapping, the native deposit within the study area predominantly comprised silt and clay matrix, mostly consisting of Glaciolacustrine deposits.

The bedrock consists of shale, limestone, dolostone and siltstone of the Georgian Bay Formation, Blue Mountain Formation and Billings Formation. Typically, bedrock is mapped at depths of 119 to 127 mbgs within the study area and will not be reached during construction.

5.10.2.2.2 Hydrogeological

A hydrogeological desktop review was undertaken within the study area using information from MECP well records, the MECP Source Protection Information Atlas, the Oak Ridges Moraine database and the Ontario Geological Survey database. Available hydrogeological reports for projects within the area were also reviewed.

The Y10 Aurora SPS Gravity Sewer Twinning study area is within the Schomberg Clay Plains physiographic region.

Gravity sewer twinning is anticipated to be installed up to depths of 15 mbgs and intersect fine-grained glaciolacustrine deposits. Potential to intersect Oak Ridges Moraine aquifer at shallow depths. A high groundwater table/hydrostatic groundwater pressure would be expected due to existing soils and anticipated presence of the Oak Ridges Moraine aquifer. Hydraulic conductivity of deeper alluvial deposits and Oak Ridges Moraine deposits of 10-4 m/s. The linear infrastructure is located within the source water protection areas of WHPA-C, D. Section along St. John’s Sideroad intersects WHPA-B, C and D and borders on WHPA-B.

The water table is approximately 2 to 8 mbgs. Surrounding borehole logs suggest finer grained materials may be found at shallow depths (~12 mbgs).

There are two historic private water supply wells located near the section to be laid along Y10 Aurora SPS Gravity Sewer Twinning.

Refer to Table 5.29 regarding details on anticipated aquifers and aquitards within the study area.

Table 5.29 Aquifers and Aquitards Through the Y10 Study Area

Aquifers and aquitards	Description	Thickness
Undifferentiated upper sediments at ground surface (Aquifer)	An unconfined aquifer consisting of discontinuous fill and unconsolidated overburden deposits, underlying topsoil at certain extents of Y10.	Generally maximum of 7 m.
Oak Ridges Moraine Complex (Aquifer)	These sediments consist mostly of silt and fine sand, but also include gravel and minor clay and diamicton. The aquifer is generally unconfined, except the section covered by Halton till on the south flank of the ORM complex, underlying topsoil at certain extents of Y10.	Ranges between 3 to 12 m.
Channel silt aquitard	Silt deposits	Ranges between 42 to 71 m.
Channel sand aquifer	Sand deposits	Ranges between 3 to 37 m.
Newmarket till (Aquitard)	A continuous layer that acts as an aquitard to the underlying Thorncliffe Formation.	Ranges between 1 to 9 m.
Thorncliffe Formation (Aquifer)	Regionally recognized as a highly productive confined aquifer and is laterally continuous.	Ranges between 1 to 9 m.
Sunnybrook drift (Lower aquitard)	A continuous layer that acts as an aquitard to the underlying Scarborough Formation.	Ranges between 1 to 23 m.
Scarborough Formation (Lower aquitard)	A confined aquifer that is discontinuous and appears to consist of channel fill deposits that roughly dip to the east.	Ranges between 10 to 109 m.

5.10.2.2.3 Surface Water

There is one sub-watershed within the study area, the HREB. A tributary of the HREB flows on the north side of the section to be laid along Y10.

Other surface features of interest include:

- Tannery Creek
- HREB
- Coldwater creek
- Swamp
- Aurora (McKenzie) Marsh wetland complex.

Refer to Figure 5.21 for a surface water map of existing conditions within the study area.

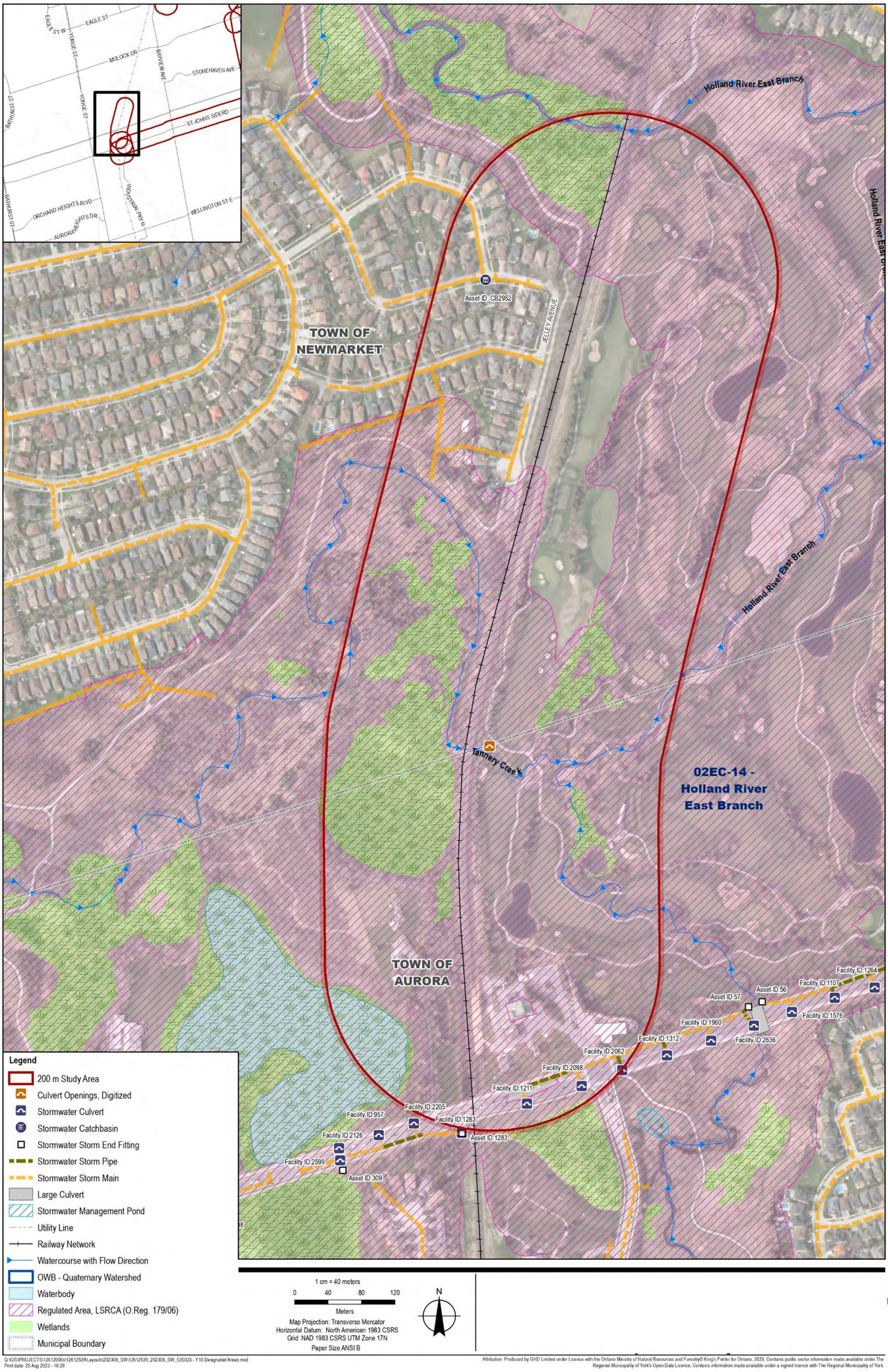


Figure 5.21 Y10 Study Area Surface Water Map for Existing Conditions

5.10.2.2.4 Natural Heritage Characterization

The study area contains ecologically significant forests, unevaluated wetlands, areas under the Greenbelt Plan and areas associated with both the Regional and Local Municipal Greenlands System regulated under the LSRCA.

The Aurora (McKenzie) Marsh wetland complex is a PSW located at the southwestern end of the study area. This wetland consists of open waters, marshes, swamps, and is known to support habitat for turtles, amphibians, small mammals, and waterfowl. Additionally, along the roadside of this wetland complex is known turtle nesting areas for both snapping and Midland painted turtles. This wetland complex is protected under ORMCP with the LSRCA.

Aquatic Habitat

A pond is located at the southwestern extent of the Y10 study area, just north of St. John's Sideroad. This waterbody has approximately 45,500 m^2 of surface area and feeds into Tannery Creek 350 m outside of the study area. Surrounding land use around this waterbody is mostly naturalized, with some residential areas also present. This waterbody is part of the Aurora (McKenzie) Marsh wetland complex, and a large portion of the natural area surrounding it consists of marshland vegetated with cattails and *Phragmites spp.* Dense sedges and tall deciduous trees can also be found bankside, along with plantations of coniferous trees found on private property located at the waterbodies edge. ARA data shows a fish community consisting of blacknose dace, bluntnose minnow, brook stickleback, common shiner, creek chub, fathead minnow, largemouth bass, longnose dace, mottled sculpin, pumpkinseed and white sucker. This waterbody found within the Y10 study area supports bait/forage fish, as well as warmwater sportfish.

Two watercourses enter the study area and eventually merge to continue flowing as one watercourse, locally known as Tannery Creek. Tannery Creek is a warmwater watercourse that originates at the western portion of the Y10 study area near the Nokiidae and Tom Taylor trails, where it flows in an east direction into the study area. The HREB is the second watercourse which enters the study area at the southern extent and flows northward. These two watercourses merge and continue flowing in a northeast direction through a golf course. Surrounding land use around Tannery Creek is mostly naturalized, where it meanders through a mixed forest with part of the riparian area consisting of swamp and the Aurora (McKenzie) Marsh wetland complex before passing through a golf course where it meets the HREB. The riparian area within the mixed forest and swamp provides a thick riparian buffer consisting of sedges and large trees, both deciduous and coniferous. The segment of the watercourse that flows through the golf course has significantly less of a riparian buffer, with a narrow strip of grasses and sedges. Based on the anticipated fish community, Tannery Creek supports bait/forage fish, along with warmwater sportfish. No redside dace have been recorded within this study area.

Terrestrial Habitat

The lands within the study area consist of golf courses, parkland, Evaluated (Aurora PSW) and unevaluated Wetland, and some urban development in the north study area.

All natural and cultural communities present within the study area are considered common in the province.

Significant Wildlife Habitat

Potential Candidate SWH for Region 6E as defined by MNRF has been identified in several natural areas within the study area. The greatest concentration of these potentials is likely to be found in wetland and woodland habitats associated with the PSW and ESAs. A screening and analysis of all ELC communities was completed in the study area for Seasonal Concentration Areas of Animals, Rare Vegetation Communities or Specialized Habitat for Wildlife, Habitat for Species of Conservation Concern and Animal Movement Corridors.

5.10.2.2.5 Areas of Potential Environmental Concern

A review of information from the Environmental Risk Information Services database was completed for properties located within the study area. The review was completed on May 26, 2023, to visually confirm the current land use and associated potential for containing subsurface environmental contamination. This "windshield-level" survey showed that:

– Various residential and commercial properties are present along the majority of the study area.
– Some agricultural and Industrial land use is present within the study area.

No areas at-risk of existing contamination were identified for this study area.

5.10.3 Concept Design

Conceptual design for this gravity sewer was based on flow rates and design criteria as described in Chapter 3.

The gravity sewer is required to convey flows from the Newmarket SPS forcemain discharge chamber south to the Aurora SPS. This project will provide a twin of the existing system to offload existing capacity limitations of the 1050 mm diameter gravity sewer.

Refer to Appendix B, Sheet 13, for the conceptual design drawings relevant to this project.

5.10.3.1 Design Basis

For design basis specifics relevant to Y10, refer to Table 5.30.

Table 5.30 Design Basis for the Development of Y10 Aurora SPS Gravity Sewer Twinning

Design basis	Assumptions
Study area	200 m area along infrastructure alignment
Study area boundaries	CNR railway, bounded by St. John's Sideroad to the south and Jelley Avenue to the north
Nominal diameter	1350 mm and 2400 mm
Sewer type	Gravity
Upstream connection point	Connection chamber at sta. 0+879
Downstream connection point	Aurora SPS
Design criteria	Based on York Region Design Guidelines (2021), including: – Pipe size and material – Hydraulic design – Air management – Method of construction – Major utility crossings – End connection points
Method of construction	Tunnelling and open cut
Land use	Existing golf course
Modelled peak flow	1,495 L/s
Major infrastructure considerations	– Rapid transit networks (Metrolinx GO Transit rail)
Environmental feature considerations	– Public walking and cycling trail – Wetlands – Several wooded areas

5.10.3.2 Description of Design

The Y10 Aurora SPS Gravity Sewer Twinning conceptual design is based on a sewer that will be 830 m long, 2400 mm diameter and 1350 mm diameter, HDPE lined reinforced concrete gravity sewer at a slope between 0.10% and 0.30%. The proposed sewer will also act as inline storage under peak flow conditions. The top end of this new installation will be immediately south of the Newmarket SPS Forcemain connection chamber; the sewer will parallel the existing gravity sewer south along the West property limit of the St. Andrews Golf Course, where it will connect to the Y3-A gravity interconnection providing flows to either the Aurora SPS or the Y3-B Aurora East SPS.

The existing ground profile along the gravity sewer starts at 252 m starting at the north end of the alignment and reaches 255 m within the golf course. Grade then falls back down to 244 m creek crossing, necessitating a decrease in pipe diameter. This alignment allows for a gradual sloped gravity sewer limited by the creek crossing and the elevation of the existing Aurora SPS Gravity Sewer.

Preliminary capacity calculations indicate a 2400 mm and 1350 mm diameter sanitary sewer is needed hydraulically to install this new line at a uniform grade of 0.10% below the existing creek and 0.30% from the creek to the north limit. This grade will result in a maximum depth of close to 12 m within the golf course and as low as 1m at the creek crossing. Detailed design will confirm slopes and velocities at flows other than peaks to confirm scour velocities are maintained.

5.10.3.3 Construction Methods

The sewer twinning is conceptualized to be constructed via mix of open cut and trenchless methods. The connections of the existing are anticipated to be constructed via open cut as well as the 1350 mm creek crossing south to the Aurora SPS site. The 2400 mm diameter installation is anticipated to be trenchless through the golf course from north of the creek crossing to the Newmarket SPS Forcemain connection chamber.

5.10.3.3.1 Open Cut

Open cut sewer installation is a conventional method for laying sewer pipes and infrastructure in urban and rural areas. This process involves excavating a trench along the designated route, typically using heavy machinery like backhoes and bulldozers. Once the trench is dug to the required depth and dimensions, sewer pipes are carefully placed and connected within it. Afterward, the trench is backfilled with soil and compacted, and the surface is restored to its original condition.

The depth of the 1350 mm portion of the sewer is shallow enough that the zone of influence is limited in width. The shallow crossing of the creek can be accomplished more quickly and easily utilizing open cut versus trenchless, thereby reducing risk.

Open cut sewer installation is a widely used technique due to its simplicity, cost-effectiveness and suitability for a variety of soil conditions, making it a fundamental approach in the construction and maintenance of sewage systems.

5.10.3.3.2 Tunnel Construction

Tunnelled installation using Earth Pressure Balance Tunnel Boring Machine (EPBTBM) and Slurry Pressure Balance Tunnel Boring Machine (SPBTBM), or the smaller remote version Microtunnelling Boring Machines (MTBM) fall within the size range of this sewer if proposing an oversized casing (~3000 mm i.d.) inside of which a regular, non-jacking carrier pipe (2400 mm i.d.) can be installed. Further design development, including completion of geotechnical and hydrogeological investigation will assist in shortlisting the types of TBMs and tunnel lining methodologies that might be adopted for the tunnelled sections. In general, MTBMs and EPBTBMs have performed well in the difficult water bearing and boulder laden glacial deposits around the GTA and on some projects the selection of construction approach is left to the contractor, subject to certain basic methodology requirements and capabilities being satisfied.

There are three categories of Tunnel Boring Machines (TBMs) that are potentially suitable for dealing with the anticipated ground conditions, which are described as follows:

Slurry Pressure Balance Tunnel Boring Machine (SPBTBM)

A closed face machine where pressurized slurry is used to counteract soil and groundwater pressures acting at the face of the machine. This type of machine is typically used in granular ground deposits below the water table but may also be used in more competent clay and till materials. The minimum size of these machines is typically 2500 mm i.d. and they can be configured for installation of jacking pipe or precast concrete tunnel linings (PCTL).

Slurry machines use pressurized slurry that is circulated in the mucking chamber behind the cutter head via slurry supply and return lines, to balance soil and hydrostatic pressures. The slurry supply and return lines run the full length of the tunnel and are extended as the tunnel advances, with the return line being used to remove the spoil (excavated material, suspended in slurry) from the tunnel. This spoil is then discharged to a surface separation unit comprising a system of screens, cyclones and centrifuges that separate the excavated material from the slurry. The treated slurry is then recycled back through the tunnel for further advancement of the tunnel, while the spoil is collected in a pile for removal from site.

The cutterheads of the SPBTBMs can be configured to deal with boulders that will be encountered in the glacial soils along the route. Cutter tools are typically rear loading and permit replacement of worn cutters from behind the cutterhead. To manage the risk of major stoppages due to boulder obstructions, a trailing airlock can be used with the slurry TBM. The airlock permits pressurization of the mucking chamber and tunnel face and permits workers to access the chamber for manual removal of boulders and cutterhead repairs.

Microtunnelling Boring Machines (MTBM)

Most MTBMs employ the slurry pressure balance principle in combination with pipe jacking for pipe installation as described above, although the machines are operated remotely from the surface, and workers do not enter the tunnel for production operations except for TBM maintenance and survey, making it a safer method with lower construction crew requirements. MTBMs are sized to install pipes ranging from 0.5 to 3.4 m i.d. For larger diameter pipe sizes (>1.8 m i.d.), tunnel drive lengths of greater than 1 km, with a minimum horizontal curve radius of approximately 500 m are being achieved nowadays.

Microtunnel drives close to and above 1000 m are becoming increasingly common with industry innovation and compounding experience. Below are some recent examples:

- Hunua 4 Section 11, Watermain project, Auckland: 1296 m drive for 3000 mm i.d., completed in 2020.
- YDSS Forcemain Twinning Project, Newmarket, Ontario, Canada: 1132 m drive for 1800 mm i.d., completed in 2020.
- Raw Water Intake, Painesville, Ohio: 1203 m drive for 1520 mm i.d., completed in 2019.
- Sea outfall, Sur de Texas-Tuxpan gas pipeline, Altamira, Mexico: 2246 m drive for 3200 mm i.d. in 2019.
- West Cumbria Water Supplies Project for United Utilities, United Kingdom: 1241 m drive for 2280 mm i.d., completed in 2018.
- Kingsbury Run Culvert Repair project for the Northeast Ohio Regional Sewer District (NEORSD), Cleveland, Ohio: 830 m curved drive for 1520 mm i.d., completed in 2017.

Typical drive lengths can vary from 200 m to over 1000 m, with construction being more economical the longer the drive. Constructible length of drive is typically related to the size of the tunnel, with larger MTBMs able to achieve longer drives than smaller diameter machines.

One key risk with microtunnelling and pipe installation is that pipes can be damaged by the action of hard boulders and cobbles that cause significant wear to the pipe exterior as they are jacked through the ground. This risk can be mitigated by good bentonite practice, including employing the use of 'automatic bentoniting' system and appropriate slurry mixture design and pressure.

For larger MTBMs, an airlock can be installed in the machine to allow workers access to the machine face if repairs or maintenance is required. Such airlocks work in a similar fashion to that described for the SPBTBM above.

Earth Pressure Balance Tunnel Boring Machine (EPBTBM)

EPBTBMs are most commonly used in fine granular soils below the water table, although they have also been used in sands and gravels and for excavating soft rock. A precast concrete segmental lining is commonly installed behind these closed-face machines as the tunnel advances, although they can also be configured for installing pipe. The machines use an auger screw that penetrates a sealed bulkhead immediately behind the EPBTBM cutterhead to permit controlled removal of the spoil at the tunnel face. A balancing pressure is maintained at the tunnel face via simultaneous slow rotation of the auger (for spoil removal) and forward propulsion of the EPBTBM. Spoil is typically removed using a conveyor belt immediately behind the auger screw and a line of rail-mounted muck cars travelling back and forth between the launch shaft and the EPBTBM. A crane on the surface deposits the excavated material from the muck cars into a spoil pile for removal from the project site. Trailing airlocks can also be used with EPBTBMs so that cutterheads can be repaired and boulder obstructions can be removed.

Tunnelling adjacent to railways using any of the above methodologies will require additional design considerations, particularly for the vibrations and soil heave and/or settlement impacting the tracks, which can be generated by the TBMs. In the case of Y-10, an existing railway will be within the ZOI of the trenchless construction, crossing St. John’s Sideroad near Industrial Parkway and running in parallel with the proposed gravity sewer twinning for the Aurora SPS. Some horizontal displacement of soil is also anticipated during tunnelling and shaft excavation works. These displacements can generate structural deformations on rail infrastructure, including tracks. Depending on the type and intensity of the deformation, the tracks may become unsuitable for safe travel and closure of the tracks may be required to repair the tracks. As these are high traffic, heavy rails, neither short- nor long-term closure of the rails will be accepted for this project and special attention must be provided to avoid or mitigate deformations induced by soil movement during and post-construction.

Any construction works within CNR railway corridors require extensive stakeholder coordination and communication on the progress of the design, to achieve infrastructure owner approval for construction, as well as including a visual pre- and post-construction conditions assessment of the structure, and CNR specified geotechnical instruments and monitoring requirements (per document “Utility Crossing/Encroachment Application Packet” dated December 4, 2018). In addition, as all rail crossings are considered a critical infrastructure, it will automatically be considered for construction impact assessment, which involves an analytical review of ground movement induced structural deformations by the tunnelling and nearby shafts excavation works.

Both CNR and Metrolinx GO Transit have standards for review and alert limits for vertical and horizontal displacement thresholds for their infrastructure (per “Metrolinx Trenchless Utility Works Design and Construction Guidelines on Metrolinx Right-of-Way (Heavy Rail)” dated October 31, 2019) which will act as a key design standard for all excavations near (within calculated ZOI from excavation settlement) or under active rails.

All rail infrastructure is deemed critical infrastructure and thus will automatically require a CIAR to predict anticipated ground movement during and post-construction until the proposed design soil displacement remains below limits established by both CNR and Metrolinx GO Transit. Should the limits be surpassed, the team will apply modifications to the relevant shaft and/or tunnel designs or construction methodology, or proposing pre-excavation mitigation methods such as ground improvement, whichever is considered more appropriate, with approval from CNR and Metrolinx GO Transit.

Further design development, including completion of geotechnical and hydrogeological investigation will assist in shortlisting the types of TBMs and tunnel lining methodologies that might be adopted for the tunnelled sections. In general, MTBMs and EPBTBMs have performed well in the difficult water bearing and boulder laden glacial deposits around the GTA and on some projects the selection of construction approach is left to the contractor, subject to certain basic methodology requirements and capabilities being satisfied.

5.10.3.3.3 Shaft Construction

Shafts are required for launch of TBMs, servicing tunnelling operations and TBM retrieval, and are commonly used to house maintenance holes, access chambers and other permanent facilities.

From a tunnel construction perspective, the required shaft dimensions, particularly shape and internal diameter, are a function of the following:

- Length of tunnel segments (pipe or PCTL)
- Tunnel diameter
- Tunnelling machine dimensions, particularly length
- Thrust wall design
- Jacking rig size
- Tunnel eye sealing ring
- Guide rail systems.

The shaft details proposed on the concept alignment for the Y10 gravity sewers are as follows. Methodologies for shaft excavation and support are commonly classified as sealed or unsealed, depending on the degree of leakage into the shaft and impacts on the surrounding water table that occur during construction. As highlighted previously, it is expected that the shafts will be constructed in a variety of soft ground conditions, largely below the water table. Both shaft classifications are further described in the sections below.

Unsealed Shafts

Unsealed shafts are typically specified where ground conditions are stable, where there are no restrictions on dewatering to permit lowering the surrounding water table, or where conditions are dry, and dewatering is not required for shaft construction). Common methods are described below.

Steel liner plate

Steel liner plates provide a relatively light-weight, easy-to-handle, safe support for soft ground tunnelling because the ground that supplies the loading also supplies the resistance to the load. The liner plate assembly simply distributes and transmits the load to the surrounding earth.

Driven sheet pile

Sheet pile walls are used as an earth retention system in soils that allow driving from the surface to bottom of shaft. They do not work well in soil conditions with boulders or large obstructions. Sheet piles are prefabricated steel sheet sections with interlocking edges. As the sheets are installed, they form a continuous barrier in the ground. The sheets are typically driven with vibratory hammers or drop hammers. More recently, this type of construction can also be sealed but requires specialty sealants to be applied at joints, which increase construction schedule, cost and failure modes.

Soldier piles with timber laggings

Soldier piles are steel H piles that are vertically driven or drilled into the earth at regular intervals prior to excavation. As excavation progresses in stages, horizontal lagging in the form of timber is added behind the flanges to create the wall structure with connecting joints.

Sealed Shafts

Sealed shafts are typically specified where unstable ground conditions exist or where there are restrictions on dewatering to lower the surrounding water table. Sealed shafts tend to be more expensive than unsealed shafts, although they have become almost mandatory in many Canadian jurisdictions where there are strict environmental requirements to minimize groundwater lowering and effects on adjacent water courses as well as infrastructure. Common sealed shaft methodologies include:

Secant pile walls

Secant pile shafts utilize bored piling methods (incorporating use of temporary steel casings driven, or vibrated into place, in advance of pile excavation to prevent ground collapse) to create a vertical perimeter of interlocking poured concrete cylindrical piles. The overlapping of piles creates a waterproof liner and supporting wall. It cannot be used as a final structure and will require a permanent structure such as a manhole chamber to be installed within the shaft.

Concrete sinking caissons

The method involves sinking the shaft in several lifts by building a circular (or oval) shaft structure on the surface and placing kentledge blocks (weights) or rams on top of it. Many contractors assist the sinking operation by lubricating the annular gap between the outer walls and surrounding ground. A clamshell grab (granular soils) or mini excavator (competent soils such as clays or rock) is then used for shaft excavation, and the shaft structure slowly sinks to fill the excavated void. The shaft structure is typically constructed using precast concrete segments or cast-in-place reinforced concrete. Once the shaft has been sunk to the desired formation elevation, a mass concrete base plug is placed using a tremie (underwater) concreting, if the shaft is in a flooded condition. A major advantage of this method is that the shaft wall can be used as future permanent structure for maintenance.

Slurry (diaphragm) walls

To commence excavation, guide walls are installed around the desired shaft location. These guide walls act as a guide for installation of the slurry walls. A trench is then excavated between the guide walls, typically several metres long and 1 to 1.5 m wide and extending to the required depth. A bentonite slurry mix is pumped into the trench as it is excavated to support the surrounding soil. The slurry is composed of water, bentonite clay and other additives to achieve the desired properties, acting as a temporary support system to prevent collapse. Once the trench reaches the desired depth, steel cages or vertical steel sections are inserted for reinforcement, enhancing the wall's load-bearing capacity. As the concrete is pumped into position, the slurry is displaced to the surface where it can be collected, treated and used for subsequent wall construction. The slurry wall shaft construction method is highly advantageous for constructing deep excavations in urban environments.

Pending geotechnical and hydrogeological field investigation and laboratory testing results along the sewer alignment and at shaft locations, a preferred shaft construction methodology cannot be selected. The appropriate methods will be assessed and compared in a future phase of design.

5.10.3.4 Property Requirements

Permanent property requirements will depend on the final location of the new twin sewer. Property easements will be required for permanent access to maintenance holes depending on the final location of the Aurora SPS Gravity Sewer Twinning. Exact details on shaft sizing, location and property easement requirements will be confirmed during detailed design.

Temporary and permanent property easements may be required for construction and operation of the trunk sewer. Permanent property requirements will depend on the final location of the shafts, which are expected to contain a manhole structure that must be accessible by York Region staff for sewer maintenance purposes. The shaft locations are not currently within the York Region ROW, and property easements may be required for permanent access to the maintenance holes.

The proposed property locations and requirements for construction of the shafts are conceptual only. Details related to the number of shafts, shaft sizing, location and property easement requirements will be confirmed during detailed design.

5.10.4 Environmental and Community Impacts and Mitigation

Desktop studies were done to determine the possible extent of potential impacts and to propose mitigation measures that would reduce the likelihood and the consequences should they occur. The major impacts and associated mitigation approaches are described in this section.

Because the current designs are only at the conceptual level, potential impacts and mitigation measures could change during design development, depending on:

- The ability to co-locate the proposed design with other planned infrastructure to minimize community effects, to be investigated after field investigations are completed. This change will depend on the number and scale of other planned infrastructure (e.g., utilities, transportation) in the ROW or area.
- Confirmation of available property for temporary and permanent use. The extent of temporary easements or acquired private property, as well as the construction schedule may dictate future design changes or mitigation measures.

The assessment criteria and indicators are provided in Table 5.31, Table 5.32 and Table 5.33, corresponding to each of the environments (social and built, natural, cultural and traffic impacts) together with a potential effects assessment and identification of avoidance, mitigation and compensation measures for the project.

Table 5.31 Y10 Aurora SPS Gravity Sewer Twinning Social and Built Environment Effects and Mitigation

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Social and built environment				
SB-1	Effect on existing views	– Predicted changes in views from residences in the surrounding area	– No change in existing views from residences in the surrounding area	– No avoidance, mitigation, or compensation measures required.
SB-2	Effect on existing residences, businesses, and/or community, institutional and recreational facilities	– Extent of displacement of residences, businesses and other facilities – Extent of temporary or permanent disruption to residences, businesses and other facilities in proximity to construction compounds/permanent installations	– No displacement of residences, businesses, or community, institutional and recreational facilities is anticipated. – Disruption to residences, businesses, and community, institutional and recreational facilities in proximity to construction compounds/permanent installations.	– No avoidance, mitigation, or compensation measures are anticipated. However, if in fact displacement is required then York Region would provide market value compensation. – Apply standard construction-related mitigation measures to minimize the disruption effects.
Traffic and transportation				
TT-1	Effect on existing roadway/rail/bridge infrastructure	– Number of rail crossings impacted	– Sewer installation will occur within the rail ROW and may cause vibrations or ground movement during and post-construction.	– Coordination with Metrolinx during design development to limit impacts to their rail services.
TT-2	Effect on traffic	– Extent of disruption to traffic flows – Proximity to congested traffic zones	– Traffic disruption at construction compounds, compound staging may extend into the travelled portion of the ROW. – Access roads may be required south and north of the study area, which may impact traffic along St. John's Sideroad and local traffic along Jelley Avenue. – Traffic movement in to and out of construction compound sites will impact pedestrian, cycling and traffic flow on St. John's Sideroad. – Coordination of alternate routing for emergency service vehicles, if needed.	– Where possible, maintain one lane in each direction. This could be achieved through flagging, temporary signals or temporary road widening. – Pedestrian movement should be maintained during construction, with marked pedestrian detours as applicable. – Consider special traffic arrangements for peak hours should be considered in traffic flow directions in the morning and afternoon. – Make special provisions for emergency service vehicle access. – Make special provisions for pedestrian traffic and safety, including signals, detours and winter maintenance. If feasible, move construction traffic to sideroads.
Utilities				
U-1	Conflict with buried utilities	– Sewer or shaft is in direct conflict or falls within clearance limits of nearby utilities	– New construction impacts existing utilities and requires design coordination with utility owners which increases project cost and schedule.	– Review historic and as-built documents for utility data. – Complete a SUE investigation to identify high-risk utilities, including large and/or critical service utilities (e.g., large watermains and all gas mains). – If a conflict occurred with a proposed sewer tunnel, construction shaft or overall work compound location following receipt of utility information, consider temporary or permanent relocation of utilities safely around or through the work area. Depending on the utility, it may be possible to support the utility above an open cut excavation to be reburied. Modifications of the alignment and shaft locations may also be proposed during design development to mitigate utility conflicts.
U-2	Conflict with surface or overhead utilities	– Excavation of shaft is proposed in location of surface infrastructure – Shaft working compound equipment including cranes will require working directly under overhead utilities or within the hydro wire exclusion zone	– Overhead infrastructure such as electrical or communications cabling is mounted on utility poles between 5 and 12 metres above the surface. Depending on the required crane size and operating radius to construct the shaft and lower the TBM, equipment extents may fall within hydro line exclusion zone, or hit overhead wires causing worker harm or death.	– Working compounds will be designed to allow appropriate and safe movement of workers and equipment around the site, away from live overhead wires or surface utility boxes, based on known utility information and topographic surveys. – If a conflict occurred with a proposed sewer tunnel, construction shaft or overall work compound location, following receipt of utility information, modifications of the alignment and shaft locations may be proposed during design development; the utilities would need to be temporarily or permanently relocated safely around or through the work area.
U-3	Damage and/or Deformation to surface and buried utilities	– Soil movement under or next to the utility from tunnel or shaft/open cut construction	– Ground heave/settlement/horizontal shift along tunnel ahead of and along excavated alignment, and around shafts and open cut excavations during and post-excavation. This information can be obtained from nearby geotechnical instrumentation. – Deformation or damage to nearby surface or buried utilities as a result of soil movement, which may require rehabilitation or repair (e.g., crack formation, angular rotation, strain, pipe joint rotation or pull out).	– For utilities within tunnel ZOI: Select a tunnel excavation method capable of limiting volume losses at the cutting face (limit overcutting of excavation) to limit ground losses. – For utilities near shaft/open cut ZOI: Select a shaft or open cut construction method and SOE appropriate with depth, size and geotechnical and hydrogeological conditions at shaft location. – Analytically assess nearby utilities and structures and propose mitigation methods such relocation of utilities, or for deep utilities, relocation of the sewer horizon. Should neither of these options be applicable, then investigate ground improvement in proximity of utilities to limit ground movement or investigate modification of the sewer and/or open cut design or construction methodology.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Noise and vibration				
N-1	Operation noise	– Complaints from residents within study area	– Noise disruptions to private residents and commercial areas post-construction, near manholes and other surface connections, SPS locations.	– Any permanent facility, such as supporting air management facilities, will require an ECA application under Section 9 of the Environmental Protection Act. – Investigate degree of risk and impact in further detail.
N-2	Construction noise	– Complaints from residents within study area	– Noise disruptions to private residents and commercial areas during construction, near construction compounds.	– Propose construction noise monitoring per MECP NPC-115 Construction Equipment requirements. – Consider completing noise monitoring for the duration of the construction and notify the contractor of any exceedances so that corrective action/contingency actions can be implemented. – Use vehicles and equipment (cranes and excavators) with efficient muffling devices or construct enclosures. – Limit truck movements to comply with noise by-laws for 24/7 construction operations.
V-1	Construction vibration	– Complaints from residents within study area	– Disruptions to private residents and commercial areas during construction, near construction compounds.	– Propose appropriate construction vibration benchmarks within the tender documents. – Consider pre- and post-construction condition photos.
Air management				
O-1	Operation odour at existing or proposed sewer connection	– Odour near surface connections	– There is potential for odour release due to turbulence at the connection of the proposed sewer to existing sewers.	– Consider implementation of ventilation design systems with odour control.
O-2	Construction odour	– Complaints are received from residents within the study area	– During live connection of infrastructure, there is the potential for odour release.	– Advance notification to residents, advising them of what work is being completed and the duration of the work.
A-1	Construction dust at sewer construction locations	– Fugitive dust is generated – Air quality is poor	– Fugitive dust generation during construction of gravity sewer, interconnecting shaft/chambers, including the connection points.	– Develop a Dust Best Management Practices Plan to be included in the project Construction Management Plan. – Mitigation should be aimed at minimizing emissions of particulate matter and exposure to particulate matter during the construction phase of the project.
A-2	Construction dust at air management infrastructure	– Fugitive dust is generated – Air quality is poor	– Fugitive dust generation during construction of the potential air management infrastructure.	– Develop a Dust Best Management Practices Plan to be included in the project Construction Management Plan. – Mitigation should be aimed at minimizing emissions of particulate matter and exposure to particulate matter during the construction phase of the project.

Table 5.32 Y10 Aurora SPS Gravity Sewer Twinning Natural Environment Effects and Mitigation

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Hydrogeology				
N-1	Effect on groundwater quantity	– Temporary and/or long-term change in groundwater quantity	– Temporary change to groundwater quantity because construction may intersect a shallow ORM aquifer. Temporary water takings may be required to facilitate construction. A high groundwater table/hydrostatic groundwater pressure would be expected due to existing soils and anticipated presence of the ORM aquifer. – Potential local leakage and long-term change in groundwater quality during operation. Majority of gravity sewer anticipated to have high groundwater table/hydrostatic groundwater pressures such that there would be minimal leakage (i.e., primarily potential infiltration). – Potential ground settlement as a result of active dewatering/depressurization. – Change in shallow groundwater flow patterns resulting from operation of sewer pipe resulting from increased I&I and/or preferential movement of groundwater within trench sediments	– Implement construction methods that minimize dewatering requirements, including sealed shafts and tunnel face stability control (e.g., Earth Pressure Balance Tunnelling Machine). – Establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water).

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
N-2	Effect on groundwater quality	– Temporary and/or long-term change in groundwater quality	– Potential temporary change in groundwater quality because construction may intersect ORM aquifer. Temporary water takings may be required to facilitate construction. – No long-term change to groundwater quality is anticipated. – Potential effects on groundwater water quality as a result of potential mobilization of contaminated water where active dewatering/depressurization is required. – Reduction in groundwater quality from spills or the mismanagement of fuel/chemical in work areas.	– Implement construction methods that minimize dewatering requirements including sealed shafts and tunnel face stability control (e.g., Earth Pressure Balance Tunnelling Machine). – Develop and implement a spills response plan for construction to mitigate the effect of a spill should one occur. – Establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water). – During design, complete a contaminant source investigation to mitigate the risk of drawing contamination from one source to another location.
N-3	Effect on Municipal Well(s), Wellhead Protection Area (WHPA)	– Intersects WHPA-C, D	– Source Water Protection Plan, Clean Water Act (2006) sanitary sewer infrastructure WHPA- C, D and HVA policy compliance evaluation. – Section near St. John's Sideroad intersects WHPA-C and D and borders on WHPA-B.	– Source Water Protection Plan, Clean Water Act (2006) sanitary sewer infrastructure WHPA-C, D and HVA policy, mitigation and monitoring evaluation.
N-4	Effect on private wells - temporary construction dewatering	– Temporary construction dewatering private well interference (quantity/quality)	– Temporary decrease in private well quantity/quality could occur during construction activities depending on the location, depth and construction, methodology and duration.	– Implement construction methods that minimize dewatering requirements, as needed. – Address construction dewatering private well interference complaints through existing York Region private well assessment and mitigation policy. – Proactively identify any high-risk wells during design and prepare site-specific preventative mitigation and corrective action plans as part of design. Corrective actions should align to York Region's private well assessment and mitigation policy.
N-5	Effect on private wells – long term	– Long term private well interference (quantity/quality)	– Potential long-term change in groundwater quality during operation of the gravity sewer.	– If needed, establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water). – Proactively identify any high-risk wells during design and prepare site-specific preventative mitigation and corrective action plans as part of design. Corrective actions should align to York Region's private well assessment and mitigation policy.
N-6	Effect on surface water quantity/quality	– Temporary change in surface water quantity/quality	– Temporary change in surface water quantity/quality could occur during construction activities depending on the location, depth and construction, methodology and duration. – A high groundwater table resulting in groundwater/surface water interaction would be expected due to existing soils and anticipated presence of the ORM aquifer. – Section crosses under tributary to HREB. – Change in groundwater-surface water interaction (reversal of vertical hydraulic gradient) results in impact to terrestrial and aquatic habitat and associated SAR (where applicable) - reduction in baseflow. – Change in surface water temperature from groundwater taking and/or discharge to surface water features. – Changes to stream morphology resulting from the release of groundwater dewatering water. The potential reduction in baseflow due to water taking in a lower confined aquifer due to increased downward hydraulic gradients across the aquitard separating the stream and the confined aquifer. – The potential reduction in baseflow from a stream reach that intersects an aquifer in which the water taking is occurring.	– Field verification of groundwater-surface water interaction suggested for watercourses and wetlands within the study area. – Complete outlet receiver assessment(s) should temporary groundwater discharge be required to surface water. Establish pre-construction baseline surface water quality and quantity conditions and develop implementation plans for monitoring during and post-construction. – Implement/construct treatment (i.e., settlement tanks, etc.) of construction water prior to discharge to storm sewer/surface water. – Minimize construction area disturbance and duration. Implement erosion and sedimentation control measures (e.g., silt fencing, check dams, etc.). – Adhere to fish timing windows to prevent negative impacts on known sensitive fish species within the study area. – Consider completing a geomorphology study during design. – Refer to the Natural Heritage section of the table for further mitigation approaches associated with surface water impacts.
Geotechnical				
G-1	Effect on soil quality	– Contaminant seepage into soil during excavation of shaft	– Chemicals such as drilling fluids, lubricants, ground improvement material, or fuel from construction equipment may contaminate soil.	– Perform regular equipment checks and maintenance. – Prepare an environmental management plan prior to construction in case of contamination.
G-2	Soil movement around shafts	– Vertical or horizontal ground movement around shafts during and post excavation – Deformation or damage to nearby structures and/or utilities	– Ground heave/settlement/horizontal shift at surface around shafts. – Deformation or damage to nearby structures and utilities (e.g., crack formation, angular rotation, strain, or pipe joint rotation or pull out) that may require rehabilitation or repair.	– Select shaft or open cut construction method and SOE appropriate with depth, size, and geotechnical and hydrogeological conditions at shaft or open cut locations. – Complete soil displacement analytical assessments at all shaft locations.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
G-3	Soil movement along tunnel	– Vertical or horizontal ground movement along tunnel during and post excavation – Movement or damage to nearby structures and/or utilities	– Ground heave/settlement/horizontal shift along tunnel ahead of and along excavated alignment. – Deformation or damage to nearby structures and utilities (e.g., crack formation, angular rotation, strain, or pipe joint rotation or pull out) that may require rehabilitation or repair.	– Select tunnel excavation method capable of limiting volume losses at the cutting face (limit overcutting of excavation) to limit ground losses. – Complete soil displacement analytical assessments for at-risk tunnel locations, including low soil cover locations or areas where the tunnel crosses or runs parallel in close proximity to sensitive natural features, utilities and critical infrastructure such as creeks, gas main, structural culverts, bridges and rail crossings
G-4	Encounter boulders during shaft and/or tunnel excavation	– Boulders encountered during excavation of shaft and/or tunnel	– For tunnels, boulder presence and properties may require change of preferred excavation methodology (segmented tunnel versus pipe jacking) and tunnel boring machine technical specifications. – For shafts, boulder presence and properties may require change of preferred shaft SOE methodology.	– Complete appropriate geotechnical investigations with strength testing for any encountered boulders. – Prepare a geological baseline report during design development with appropriate baseline for boulder strength, sizing and anticipated encounter rates and locations. – Recommend a shaft construction SOE capable of maintaining verticality in boulder-prone soils. – Recommend appropriate technical specifications for tunnel boring machine.
G-5	Frac-out of drilling fluids along tunnel	– Drilling fluid breaches surface during tunnel excavation – Unanticipated change in drilling fluid pressure and/or volume	– Drilling fluid may breach beds of water bodies such as creeks, lakes and rivers. – Drilling fluid may breach aquifers. – Drilling fluid may cause cracking on surface infrastructure such as pavement and may require closure of traffic lanes to clean up fluid at surface.	– Select contractor with experienced MTBM or TBM operators. – Require a “frac-out contingency plan” be prepared prior to construction for cleanup of drilling fluids.
G-6	Encounter contaminated soil during shaft and/or tunnel excavation	– Soil encountered during shaft and/or tunnel excavation is tested to surpass allowable contaminant levels	– Spoil must be dispatched at an approved contaminated soil disposal site.	– Complete appropriate geotechnical investigations and contaminants testing during design development to identify confirmed contaminated soil locations or at-risk areas based on historical land use. – Identify and confirm availability of appropriate soil disposal sites based on anticipated contaminants for use during construction.
G-7	Encounter weak or incompetent soil during tunnel excavation	– Accelerated soil movement at surface and depths	– Soil heave, soil settlement or sinkhole formation at surface.	– Complete appropriate geotechnical investigations with strength testing for anticipate soils along tunnel horizon. – Prepare a geological baseline report during design development with appropriate baseline for soil properties, including stratigraphic profile inferred from borehole investigations. – Recommend appropriate preventative or compensation ground improvement for at-risk locations.
Natural heritage				
EG-1	Effect on aquatic habitat or functions	– The study area contains cold, warm or unknown thermal regime water watercourses – The study area contains wetlands	– Temporary or permanent loss of aquatic features or categorical loss of functions by type, including PSWs, Locally Significant Wetlands, watercourses by sensitivity type and others. – During construction water quality may be impaired due to elevated TSS in surface water runoff from study area locations which can affect aquatic species/habitats. Some concentrations above background may occur temporarily. – Potential spill hazard when refuelling equipment. – Change in surface water temperature from groundwater taking and/or discharge to surface water features	– Need to complete site investigations to evaluate potential effects on aquatic habitat function. – Implement best management practices to control surface water runoff and minimize TSS effects. – Where feasible, discharging of surface water during construction should be directed into the municipal storm sewer system to mitigate thermal impacts to watercourses. Should discharge of surface waters be directed to watercourses, additional mitigation measures would need to be adhered to (e.g., enhanced erosion and control measures). Use of erosion and sediment control measures and timing of construction (see Table 10.1) to avoid spawning and egg incubation periods will reduce the potential for effect to fish and aquatic life. – Conduct equipment maintenance and refuelling at the designated and properly contained maintenance areas or at industrial garages located well away from creek banks and wetlands and outside vegetation areas. – Develop a Spills Prevention Plan.
EG-2	Effect on stream geomorphology	– Change in geomorphic form/function/stability in affected channels within the study area	– No anticipated impacts to stream geomorphology in affected channels.	– Employ erosion and sediment controls to limit deposition of construction-mobilized soils into watercourses. – Consider completing a geomorphology study during design, where applicable.
EG-3	Effect on aquatic species including SAR, species of local concern, native species and invasive species	– Aquatic species	– Number and type of aquatic species potentially affected temporarily or permanently. – No anticipated impacts to aquatic SAR as there are no aquatic SAR identified within the study area.	– Preventing death of fish or impacts to downstream fish habitat through the use of appropriate timing windows.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
EG-4	Effect on terrestrial habitat or functions	– The study area does not contain ANSIs – The study area contains Ecologically Significant Forests – Wildlife habitat	– Temporary or permanent loss of natural heritage features (e.g., ESAs, ANSIs, wildlife corridors and others). – Potential effects on terrestrial habitat (e.g., direct vegetation (and wildlife habitat) loss, alteration and fragmentation) may occur from the physical footprint of study area locations. – Project preparation, construction and operation may increase the risk of nest destruction and mortality of migratory birds.	– Site investigations to evaluate potential terrestrial habitat function/significance. – During design, prepare construction constraints with consideration of timing windows to mitigate where possible, vegetation clearing to occur outside of the migratory bird nesting season, bat maternity roosting season, turtle overwintering and amphibian breeding. – Limit the area of project footprint and limit disturbance from employees. – The presence of wildlife will be monitored and communicated to site personnel. – Vehicle use will be restricted to designated areas. – Where practical, rehabilitate habitat for plants and wildlife.
EG-5	Effect on terrestrial species, including SAR, species of local concern, native species, invasive species and area-sensitive species	– SAR have the potential to occur within the study areas including amphibians, insects, birds, reptiles, mammals and tree species	– Number and type of terrestrial species potentially affected temporarily or permanently. – Construction activities have the potential to disturb wildlife within adjacent natural heritage areas. – Project preparation, construction and operation may increase the risk of nest/habitat destruction and mortality of terrestrial SAR. – Project may result in wildlife-vehicle collisions and may cause injury/mortality to individual animals.	– Site investigations to evaluate potential occurrence of terrestrial SAR within the study area. – During design, prepare construction constraints with consideration of timing windows to mitigate where possible, vegetation clearing to occur outside of the migratory bird nesting season, bat maternity roosting season, turtle overwintering and amphibian breeding. – Clearly demarcate work limits at outset of construction and minimize unnecessary vegetation clearing.

Table 5.33 Y10 Aurora SPS Gravity Sewer Twinning Cultural Environment Effects and Mitigation

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation

CE-1	Effect on *Ontario Heritage Act* (OHA) designated properties and properties listed on municipal heritage registries	Project components are in the vicinity of the heritage property/landscape	– Encroachment onto the property/landscape, resulting in a physical impact to the potential BHR and/or CHL.
			– New structures or landscape features and/or alterations to the property/landscape that result in a physical impact to the potential BHRs and/or CHL.
			– Relocation of all or part of the potential BHRs and/or CHL.
			– Demolition or destruction of all or part of the potential BHRs and/or CHL.
			– Vibration impacts to the potential heritage buildings identified on the property/landscape in and on adjacent properties.
			– Ground disturbance impacts relating to landscape features on the property/landscape in and on adjacent properties.
				– Based on the potential impacts outlined in the previous column, the following mitigation options are considered alongside mitigation recommendations.
				– Preferred option:
				• Project design avoids the property/landscape resulting in no direct or indirect impacts. This includes maintaining a sufficient buffer of at least 50 m between Project activities and the potential BHRs and/or CHLs.
				– Alternative options:
				• If direct impacts are unavoidable, the following options and mitigations should be considered:
				• A. Design Project to minimize encroachment on the property/landscape while avoiding all impacts to the potential BHRs and/or CHLs.
				  • i. Consult with the Town during detailed design to determine if any approvals or permits are required as a result of physical impacts to the property/landscape.
				• B. If avoidance of the property/landscape or Option A are not feasible, and if a physical impact to potential BHRs and/or CHLs is unavoidable, then the following is required:
				  • i. Consult with the Town during detailed design to determine if any approvals or permits are required as a result of physical impacts to the property/landscape.
				  • ii. Complete a property-specific CHER/HIA prior to any alterations, including evaluation of the property against O. Reg. 9/06 and, if necessary, detailed documentation of any confirmed BHRs and/or CHLs and recommendation of specific mitigation measures for impacts to any identified heritage attributes.
				  • iii. The CHER/HIA should also consider the compatibility of new structures or landscape features with existing heritage attributes, layouts and designs of the property/landscape.

5.11 Y13-A Leslie Street Trunk Sewer Phase 3

5.11.1 Study Area

The Y13-A Leslie Street Trunk Sewer Phase 3 will provide conveyance along the Leslie Street ROW from Green Lane East to Mulock Drive. Primarily, this trunk sewer will convey the discharge of the Newmarket East SPS and its forcemains; however, at locations of shafts, there is potential for future interconnections to intercept local collection from the east side of Leslie. These flows have not been considered under this scope of work.

The study area is limited to the ROW between those streets, along with the Bogartown Curve just north of Mulock Drive. A study area of approximately 200 metres surrounding the centerline of the right of way was applied as shown in Figure 5.22.

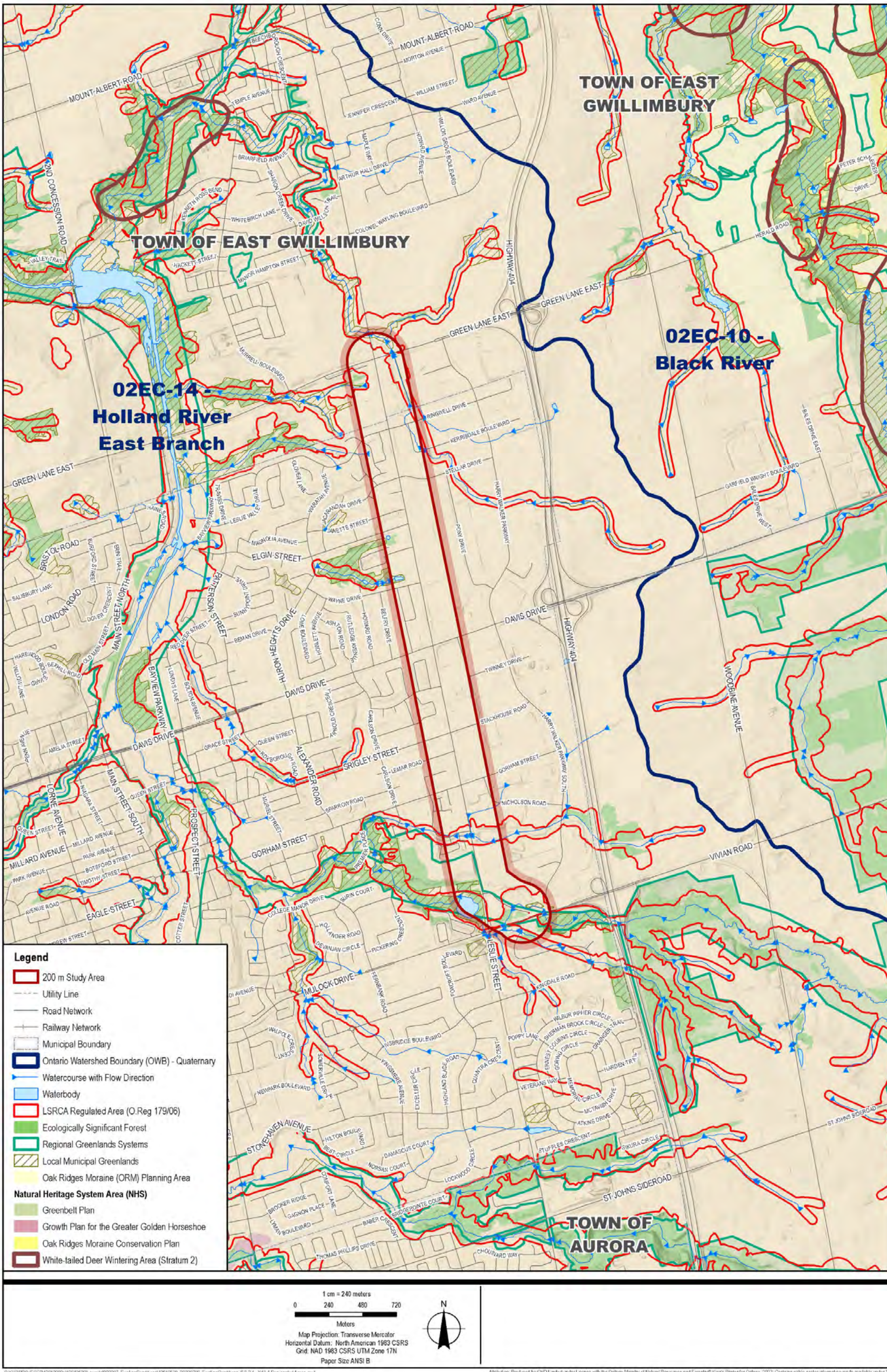


Figure 5.22 Y13-A Leslie Street Trunk Sewer Phase 3 Study Area

5.11.2 Existing Conditions

5.11.2.1 Social and Built Environment

The following sections will summarize the findings of the desktop studies completed within the study area, including planning and land use, traffic and transportation and utilities.

5.11.2.1.1 Planning Policy and Land Use

Existing Land Use

Along Leslie Street, from Green Lane East to Elgin Street, land uses consist of the following:

- West side:
  - Low density residential housing
  - Agricultural lands
  - Commercial lands (gas station, restaurant).
- East side:
  - Commercial lands (gas station, bank, auto shops, Superstore, restaurants and miscellaneous businesses)
  - Institutional lands (Church).

Along Leslie Street, from Elgin Street to Davis Drive, land uses consist of the following:

- West side:
  - Low density residential housing
  - Commercial lands (medical facility, restaurants and cell phone store)
  - Institutional lands (Church).
- East side:
  - Commercial lands (bank, auto shops, medical facility, Superstore, restaurants and miscellaneous businesses)
  - Institutional lands (Canada Post and UPS).

Along Leslie Street, from Davis Drive to Mulock Drive, land uses consist of the following:

- West side:
  - Low density residential housing
  - Commercial lands (restaurants)
  - Public park (Charles E Boyd Park)
  - Bogart Pond.
- East side:
  - Commercial lands (Car dealerships, medical facility, wellness centre, restaurants, Innocon concrete plant and miscellaneous businesses)
  - Institutional lands (94 Newmarket Royal Canadian and Veterinary Emergency Services)
  - Recreational lands (Newmarket Squash Club).

Planning Policy

Regional

The York Region Official Plan (June 2023 Office Consolidation) designates lands within the study area east of Leslie Street as Employment Area and Community Area. The west side of Leslie Street is designated Community Area. Areas of Regional Greenlands System traverse the study area north of Mulock Drive.

Local

The study area crosses the municipal boundary between East Gwillimbury and Newmarket. With reference to the Town of East Gwillimbury Official Plan (2018 Consolidation), lands within the study area are designated as Employment Areas east of Leslie Street and Community Area west of Leslie Street. South of Green Lane East, the Newmarket Official Plan (August 2022 Consolidation) designates the lands within the study area as follows:

– Commercial Area
– Residential Area
– Business Park
– Major Institutional Area
– Parks and Open Space.

Active Development Applications

Lands within the Y13-A Leslie Street Trunk Sewer Phase 3 study area contains several active development applications. This list of applications is not exhaustive, as several applications may be linked to the same property address. Overall, the general nature of these planning applications are centred around expansion of proposed subdivisions and increase of commercial/retail spaces.

– Town of Newmarket - To amend the Town's Zoning By-Law as part of the Established Neighbourhoods Compatibility Study.
– 18326 Leslie Street - To permit a temporary sales trailer.
– 17188 Leslie Street - To facilitate a new three-storey private school with daycare and associated parking lot.
– 16775 Leslie Street -Two applications. To facilitate the parking lot expansion of Pfaff Audi Dealership. To amend the Town's Zoning By-Law as part of the Established Neighbourhoods Compatibility Study.
– North of Mulock Drive, on west side of Leslie Street - Five applications. To re-zone the subject lands from I-C, OS-EP, R1-B and R5-S Zone to Open Space (OS-1), Environmental Protection Open Space (OS-EP), Residential Townhouse Condominium Plan Dwelling (R4-CP), Residential Townhouse Dwelling 3 (R4-R) and Dual zone - Residential Apartment Dwelling/Residential Condominium Plan Dwelling (R5-T/R4-CP) to facilitate development. To facilitate the development of 256 block townhouses and 50 single-detached units. To re-designate the subject lands from Major Institutional to Emerging Residential, Parks & Open Space and Natural Heritage System. Proposed development of a telecommunications tower. To amend the Town's Zoning By-Law as part of the Established Neighbourhoods Compatibility Study.
– 17680 Leslie Street - Three applications. To rezone the lands from Residential Stacked Townhouse Dwelling Zone to permit the construction of a residential development comprised of 88 stacked townhouse dwellings. To re-designate lands from Commercial to Emerging Residential designation and adding stacked townhouse units as a permitted use to facilitate 88 townhouse dwellings within four blocks. To amend the Town's Zoning By-Law as part of the Established Neighbourhoods Compatibility Study.

5.11.2.1.2 Transportation in the Study Area

The proposed Y13-A Leslie Street Trunk Sewer Phase 3 gravity sewer will span Leslie Street between Mulock Drive to Green Lane East, where it will connect to the new Newmarket East SPS and forcemain. Leslie Street is a 60 km/h posted speed, four-lane arterial road with dedicated center turning lane with curbed boulevard with sidewalks on both sides, as shown in Figure 5.23.

Figure 5.23 Leslie Street Looking North (1) from Mulock Drive, (2) Towards Davis Drive and (3) Towards Green Lane East. (Google Maps "Streetview," digital images http://maps.google.com)

The AADT along Leslie Street between Lvsbridge Boulevard to Green Lane East has been counted between 16,890 in the south end and 26,738 in the north end, based on the latest available 2022 data. Historical AADT data along the study area are presented in Table 5.34.

Table 5.34 Leslie Street AADT Counts Between Ivsbridge Boulevard to Green Lane East

Description of road limits	2012	2013	2014	2016	2018	2022
Ivsbridge Boulevard/Kingdale Road and Mulock Drive		14,630		14,225	15,901	16,890
Leslie Valley Drive/Ringwell Drive and Green Lane East	21,330	26,661	23,393	23,826	22,847	26,738

There are several public transit routes which run on Leslie Street between Mulock Drive and Green Lane East, which include:

- YRT Route 50 (Running along Davis Drive and Leslie north of Davis Drive)
- YRT Route 55 (running along Leslie Street between Davis Drive and Leslie Valley Drive/Ringwell Drive)
- YRT Route 56 (Crossing Leslie Street at Gorham Street and running along Leslie between Leslie Valley Drive/Ringwell Drive and Davis Drive)
- YRT Route 57 (Mulock Drive to Davis Drive at the 404 centre)
- YRT Viva Yellow (crossing Leslie Street at Davis Drive).

5.11.2.1.3 Utilities in the Study Area

There are several above/below grade utilities situated within the study area corridor and in the vicinity of the proposed project. These utilities may be temporarily impacted during the construction of tunnel, shaft and work compounds. Formal notification and consent would be required from the authorities responsible for these utilities prior to construction.

Buried utilities are typically located within the following limits:

- Shallow-buried electrical and communications cabling are commonly buried between 1.2 and 1.5 mbgs.
- Shallow-buried storm drains, sanitary sewers and watermains are typically buried between 1.2 and 3.5 mbgs.
- Deep-buried utilities are defined as anything buried more deeply than the depths mentioned above.

Known municipal infrastructure that existed on York Region's GIS database has been provided within the drawing set. A detailed utility investigation program, which would include a "Level A through D" subsurface utility exploration, would be required as part of future site investigations.

Known large infrastructure within the study area include:

– A structural box culvert crossing at the Bogartown Curve at sta. 0+110. The sewer will cross under the culvert.

Critical infrastructure will require specific geotechnical instrumentation and monitoring requirements to receive owner approval of the design. Any construction impacts to the tracks will be assessed as part of a CIAR during design development.

5.11.2.2 Natural Environment

The following sections will summarize the findings of the desktop studies completed within the study area for: geotechnical, hydrogeology, surface water, natural heritage and contamination.

5.11.2.2.1 Geotechnical

The study area for Y13-A is bordered by residential/commercial properties, within the boundaries of the Town of Newmarket.

Per historical boreholes (1978) advanced from about 3 m to 16 m depth, the near surface condition generally comprised of clayey silt (stiff to hard) underlain by clayey silt till (hard), which is further underlain by clayey silt (hard) followed by silty sand deposit (very dense).

The native deposit within the north side of the study area predominantly comprised silt and clay matrix, mostly consisting of Glaciolacustrine deposits. The middle portion of the study area is predominantly comprised of Newmarket till (sandy silt to silt matrix), mostly consisting of Pleistocene deposits. The southern portion of the study area consists of Kettleby till (predominantly silt to silty clay matrix), mostly consists of Pleistocene deposit.

The bedrock consists of shale, limestone, dolostone and siltstone of the Georgian Bay Formation, Blue Mountain Formation and Billings Formation. Typically, bedrock is mapped at depths of 100 m to 118 mbgs within the study area and will not be reached during construction.

5.11.2.2.2 Hydrogeological

A hydrogeological desktop review was undertaken within the study area using information from MECP well records, the MECP Source Protection Information Atlas, the Oak Ridges Moraine database and the Ontario Geological Survey database. Available hydrogeological reports for projects within the area were also reviewed.

The study area for Y13-A Leslie Street Trunk Sewer Phase 3 is within the Schomberg Clay Plains physiographic region. The gravity sewer is anticipated to be installed at depths ranging from 4 to 26 mbgs and intersects fine-grained glaciolacustrine deposits (Newmarket till aquitard). Shallow groundwater is encountered at depths between 2 to 8 mbgs for the section of the trunk sewer south of David Dr and approximately 7 to 13 mbgs for the section of the trunk sewer north of David Drive and generally flows towards the west. The gravity sewer is not located within any source water protection wellhead protection areas.

Historical boreholes (1978) advanced within the study area from about 3 m to 16 m depth and were found dry.

Refer to Table 5.35 regarding details on anticipated aquifers and aquitards within the study area.

Table 5.35 Aquifers and Aquitards Through the Y13-A Study Area

Aquifers and aquitards	Description	Thickness
Undifferentiated upper sediments at ground surface (Aquifer)	An unconfined aquifer consisting of discontinuous fill and unconsolidated overburden deposits.	Ranges between 1 to 2 m
Upper Newmarket till (Aquitard)	A continuous layer that acts as an aquitard to the underlying Thorncliffe Formation.	Ranges between 7 to 20 m. There is a ~1 km section between Green Lane and Davis Drive, which may have a 5 m thick section of ORM sediments.
Inter-Newmarket sediments (Aquifer)	Regionally recognized as a highly productive confined aquifer and is laterally continuous.	Ranges between 5 to 23 m
Lower Newmarket till (Aquitard)	A continuous layer that acts as an aquitard to the underlying Thorncliffe Formation.	Unknown
Thorncliffe Formation (Aquifer)	Regionally recognized as a highly productive confined aquifer and is laterally continuous.	Unknown

There are multiple private wells along Leslie Street.

5.11.2.2.3 Surface Water

There is one sub-watershed within the study area, the HREB. The sewer crosses under a creek near Crowder Boulevard a tributary of the HREB).

Other surface features of interest include:

- Three ponds
- Intermittent stream
- Unnamed watercourse
- Wetland feature.

Refer to Figure 5.24 for a surface water map of existing conditions within the study area, north section.

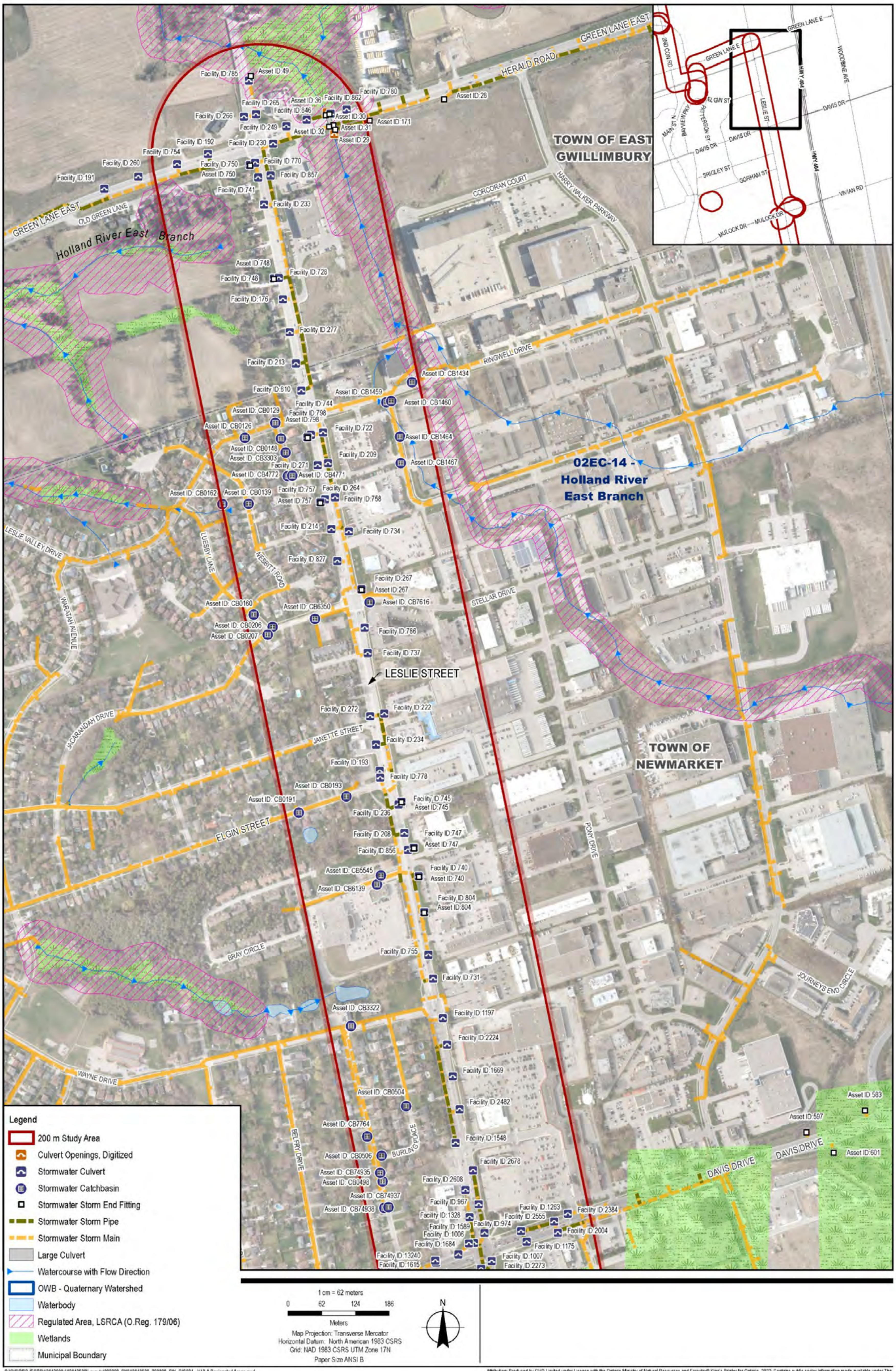


Figure 5.24 Y13-A Study Area Surface Water Map for Existing Conditions, North Section

5.11.2.2.4 Natural Heritage Characterization

The study area contains ecologically significant forests, wetlands, areas under the Greenbelt Plan and areas associated with both the Regional and Local Municipal Greenlands System regulated under the LSRCA.

Aquatic Habitat

A number of watercourses are found within the Y13-A study area. An unnamed coldwater watercourse and its tributary are located at the northern extent of the study area at the intersection of Leslie Street and Herald Road (Green Lane East). This small tributary flows into the larger unnamed stream immediately upon entering the study area, where the confluence meanders northwards and passes under Herald Road before exiting the study area. Surrounding land use around this watercourse is a mix of low density residential, commercial and naturalized areas, with most of the watercourse being confined in a meadow. This meadow provides a wide riparian buffer around the channel, consisting mainly of sedges, tall grasses and sparser populations of small deciduous trees. Based on the anticipated fish community, the unnamed watercourse and its small coldwater tributary support mostly bait/forage fish with potential for some coldwater sportfish.

A pond can be found within the Y13-A study area near the intersection of Leslie Street and Wayne Drive. This pond is located within a semi-naturalized area, confined within a park surrounded by large deciduous trees. Surrounding land use is majority low residential areas, along with some commercial areas to the north of the pond. The thermal regime of this pond is unknown, with no recorded ARA fish community data.

The confluence of an intermittent stream and unnamed watercourse is present further south within the study area, near the intersection of Leslie Street and Crowder Boulevard. Surrounding land use around this confluence is mostly residential and commercial, with some naturalized area as the stream flows westerly from an unevaluated wetland located at the eastern side of the study area. The riparian characteristic for this watercourse ranges between mostly grasses with some deciduous trees in the wetland area, and as it passes under Leslie Street into the residential areas, it sees heavy shading from tall deciduous and coniferous tree plantations along the stream bank, heavily obscuring the watercourse and providing a plethora of shading. This watercourse is considered warmwater. Based on the anticipated fish community, this watercourse supports bait/forage fish, along with some warmwater sportfish.

Occupying the southern limit of the Y13-A study area is Bogart Creek. Bogart Creek flows westerly in a sinuous structure, passing under Mulock Drive three times before flowing northwards into Bogart Pond. Surrounding land use along Bogart Creek is a mix of low-density residential areas, commercial areas and some naturalized mixed forest areas, especially around Bogart Pond. The riparian characteristics around Bogart Creek show a mix of tall grasses, dense sedges and both tall coniferous and deciduous trees providing lots of overhead cover for the stream, along with supplying a plethora of woody debris within the stream channel. Bogart Pond, with a surface area of approximately 16,700 m^2, continues this trend, being confined in a highly naturalized area occupied by a mixed forest rich with tall grasses, shrubs and the presence of a swamp that takes up a large portion of its catchment area. Both Bogart Creek and Pond are considered coldwater environments, with the additional two tributaries of Bogart Creek south of Mulock Drive in the study area also being considered coldwater. Based on the anticipated fish community, these aquatic environments support a diverse community of bait/forage fish and both warmwater and coldwater sportfish. No redside dace have been recorded within this study area.

Terrestrial Habitat

The lands in the study area consist mainly of mid-density residential and commercial communities, with pockets of woodland and wetland communities congregated at the northern and southern extents. This study area runs along the east side of Newmarket, dividing its residential and commercial cores. It is also further bound by Highway 404, which runs further east of the study area. This location within the city is already highly developed and leaves little space for natural areas and wildlife. The focus of the study area is the collections of wetland and woodland areas currently present at its northern and southern tips.

All natural and cultural communities present within the study area are considered common in the province.

Significant Wildlife Habitat

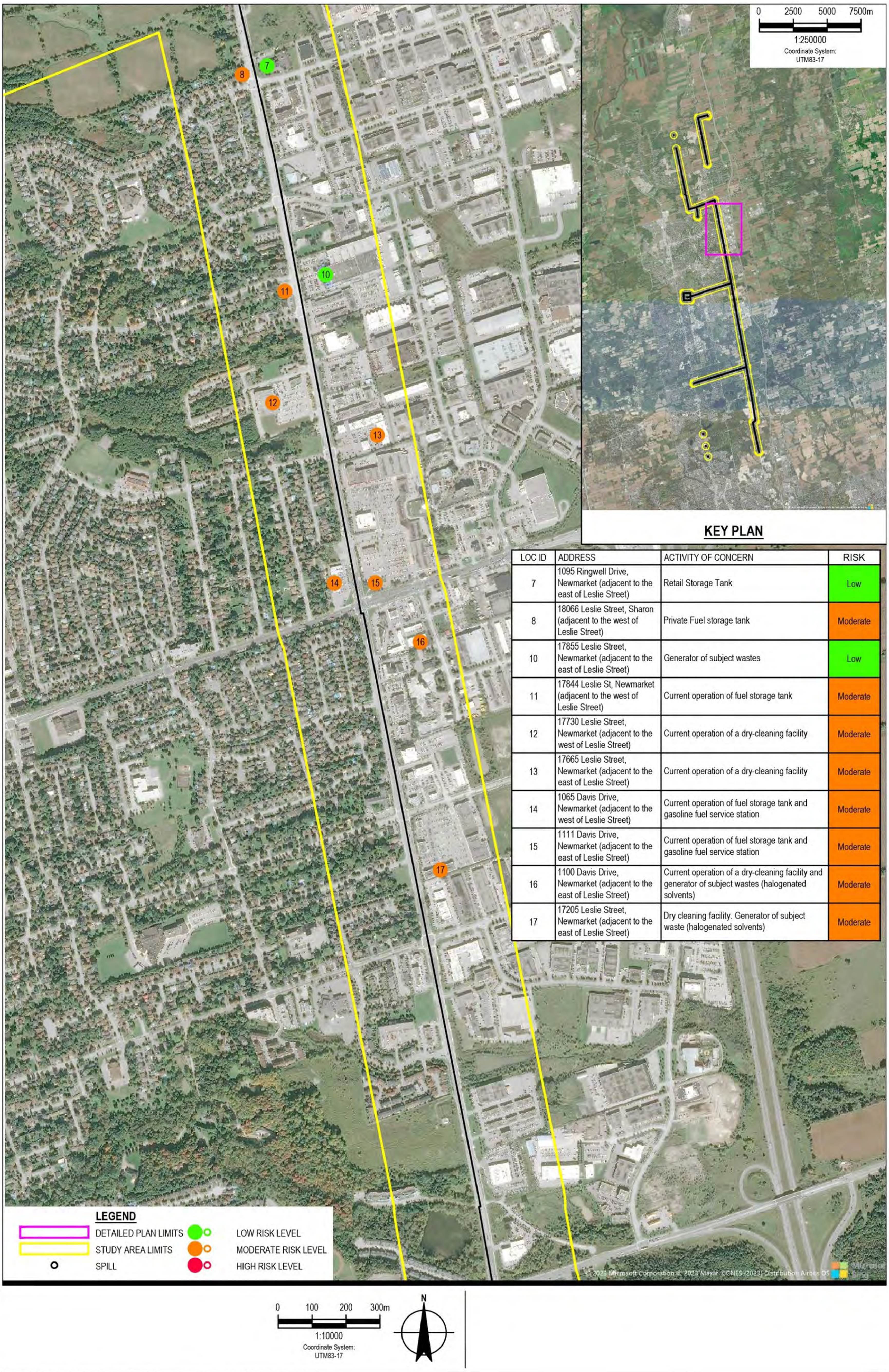
Potential Candidate SWH for Region 6E as defined by MNRF has been identified in several natural areas within the study area. The greatest concentration of these potentials is likely to be found in wetland and woodland habitats associated with the wetlands, Greenlands System and ESAs. A screening and analysis of all ELC communities was completed in the study area for Seasonal Concentration Areas of Animals, Rare Vegetation Communities or Specialized Habitat for Wildlife, Habitat for Species of Conservation Concern and Animal Movement Corridors.

5.11.2.2.5 Areas of Potential Environmental Concern

A review of information from the Environmental Risk Information Services database was completed for properties located within the study area. The review was completed on May 26, 2023, to visually confirm the current land use and associated potential for containing subsurface environmental contamination. This “windshield-level” survey showed that:

– Various residential and commercial properties are present along the majority of the study area.
– Some agricultural and Industrial land use is present along the northern and southern portions of the study area.
– Various gas stations and dry-cleaning operations were present along the entire study area, which are potential environmental concerns.

Figure 5.25 and Figure 5.26 show locations with known spills, as well as those with existing contamination risk that is low (green circle), moderate (orange circle), or high (red circle). The figure does not necessarily show all risk categories. The numbers in the circles are identifiers relevant to the entire York Region Sewage Works Project rather than to any particular project component.



LOC ID	ADDRESS	ACTIVITY OF CONCERN	RISK
7	1095 Ringwell Drive, Newmarket (adjacent to the east of Leslie Street)	Retail Storage Tank	Low
8	18066 Leslie Street, Sharon (adjacent to the west of Leslie Street)	Private Fuel storage tank	Moderate
10	17855 Leslie Street, Newmarket (adjacent to the east of Leslie Street)	Generator of subject wastes	Low
11	17844 Leslie St, Newmarket (adjacent to the west of Leslie Street)	Current operation of fuel storage tank	Moderate
12	17730 Leslie Street, Newmarket (adjacent to the west of Leslie Street)	Current operation of a dry-cleaning facility	Moderate
13	17665 Leslie Street, Newmarket (adjacent to the east of Leslie Street)	Current operation of a dry-cleaning facility	Moderate
14	1065 Davis Drive, Newmarket (adjacent to the west of Leslie Street)	Current operation of fuel storage tank and gasoline fuel service station	Moderate
15	1111 Davis Drive, Newmarket (adjacent to the east of Leslie Street)	Current operation of fuel storage tank and gasoline fuel service station	Moderate
16	1100 Davis Drive, Newmarket (adjacent to the east of Leslie Street)	Current operation of a dry-cleaning facility and generator of subject wastes (halogenated solvents)	Moderate
17	17205 Leslie Street, Newmarket (adjacent to the east of Leslie Street)	Dry cleaning facility. Generator of subject waste (halogenated solvents)	Moderate

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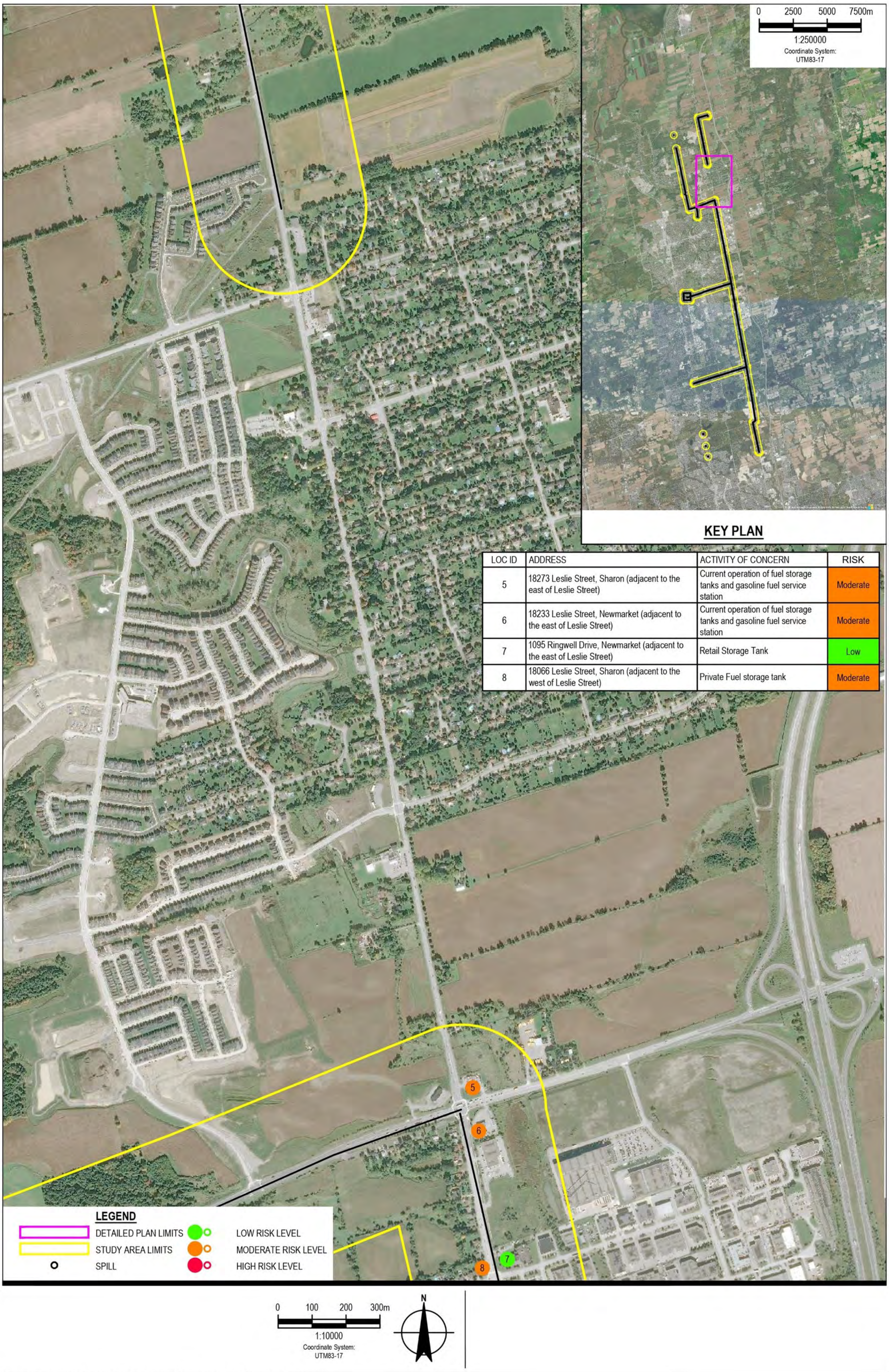
Figure 5.25 Areas of Potential Environmental Concern within Y13-A Study Area, South Portion



LOC ID	ADDRESS	ACTIVITY OF CONCERN	RISK
5	18273 Leslie Street, Sharon (adjacent to the east of Leslie Street)	Current operation of fuel storage tanks and gasoline fuel service station	Moderate
6	18233 Leslie Street, Newmarket (adjacent to the east of Leslie Street)	Current operation of fuel storage tanks and gasoline fuel service station	Moderate
7	1095 Ringwell Drive, Newmarket (adjacent to the east of Leslie Street)	Retail Storage Tank	Low
8	18066 Leslie Street, Sharon (adjacent to the west of Leslie Street)	Private Fuel storage tank	Moderate

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Figure 5.26 Areas of Potential Environmental Concern within Y13-A Study Area, North Portion

5.11.3 Concept Design

Conceptual design for this gravity sewer was based on flow rates and design criteria as described in Chapter 3.

The gravity sewer is required to convey flows from the Newmarket East SPS forcemain discharge chamber south to the Mulock SPS. This project will provide primary conveyance of all flows, a twin of the existing system to offload existing capacity limitations of the 1050 mm diameter gravity sewer.

Refer to Appendix B, Sheets 14 to 15, for the conceptual design drawings relevant to this project.

5.11.3.1 Design Basis

For design basis specifics relevant to Y13-A Leslie Street Trunk Sewer Phase 3, refer to Table 5.36.

Table 5.36 Design Basis for the Development of Y13-A Leslie Street Trunk Sewer Phase 3

Design basis	Assumptions
Study area	200 m area along infrastructure alignment
Study area boundaries	Leslie Street, bounded by Mulock Drive (SPS) to the south to Green Lane East to the north
Nominal diameter	1800 mm
Sewer type	Gravity
Upstream connection point	Leslie Street and Green Lane East
Downstream connection point	Mulock SPS
Design criteria	Based on York Region Design Guidelines (2021), including: – Pipe size and material – Hydraulic Design – Air management – Method of construction – Major Utility Crossings – End Connection Points
Method of construction	Tunnelling within the ROW
Land use	Mixture of residential, recreational and commercial land uses
Modelled Peak Flow	2,038 L/s
Major infrastructure considerations	– Rapid transit networks (YRT Viva Yellow) – Structural box culvert at Bogartown Curve at sta. 0+110 – Hydro corridor
Environmental feature considerations	– Wetlands – Several wooded areas

5.11.3.2 Description of Design

The proposed Y13-A gravity sewer will be an approximately 3,860 m long, 1800 mm diameter, HDPE lined reinforced concrete gravity sewer at a slope between 0.1% and 0.3% at a depth that will require installation by tunnelling. The start (north end) of this new installation will be approximately 300 m south of the intersection of Green Lane and Leslie Street in Newmarket. The discharge (south end) will be at the new Mulock Drive SPS (Y13-B) to be constructed near the northeast corner of Leslie Street and Mulock Drive. The proposed location of the Mulock Station will require the gravity sewer to follow a small side street (Bogartown Curve) to reach the inlet to the pumping station.

Since installation using this method requires sending and receiving shafts at locations requiring large open areas for equipment and materials, it will be necessary to meander the horizontal alignment to cross from one side of Leslie Street to the other and back multiple times.

The vertical profile of this four-kilometre section of Leslie Street from Green Lane in the north to Mulock Drive has a number of significant changes in elevation. The single profile slope of the gravity sewer will result in some very deep shaft construction, tunnelling works and sewer pipe installation requirements. The proposed depth of installation along this alignment varies between 6.0 m and 22 m to maintain a uniform downward grade. At these depths, interference with major utilities is not expected but will be verified by thorough investigations during detailed design.

From a ground elevation of 265 m AMSL at Green Lane, Leslie Street rises for about one kilometre at an average grade of one percent (1%) to an elevation of 275 m, remaining constant near this grade for the next 500 m. The road rises by two-and-a-half percent (2.5%) over the next 400 m – its steepest grade - to its high point of 285 m along the gravity sewer alignment, just north of Davis Drive.

From this point, the remaining 2.3 km south to Mulock Drive falls to 274 m at 0.5 km, rises back up to 277 m at 1.0 km, falls to 262 m at 1.6 km, a rise back up to 264 m and falls down to 257 m at the proposed location of the Mulock Drive SPS.

The current conceptual design shows that the first 335 m of the southbound wastewater line will be a continuation of the Y9-B forcemain along Green Lane from the west. From this point, an 1800-mm diameter gravity sewer at a grade of 0.10% to 0.30% from north to south is proposed.

The maximum cover of the proposed tunnelled installation is at the aforementioned point north of Davis Drive at a depth of nearly 25 m.

5.11.3.3 Construction Methods

The sewer twinning is conceptualized to be constructed via a mix of open cut and trenchless methods. The connections of the gravity sewer at the Mulock SPS are anticipated to be constructed via open cut, and the remainder is required to be constructed via trenchless technology.

The size of the gravity sewer allows for multiple possible trenchless construction methods, which will limit the above-grade impacts of the project’s construction.

5.11.3.3.1 Tunnel Construction

Tunnelled installation using EPBTBM and SPBTBM also falls within the size range of this sewer if proposing an oversized casing (~3000 mm i.d.) inside of which a regular, non-jacking carrier pipe (1800 mm i.d.) can be installed. Further design development, including completion of geotechnical and hydrogeological investigation will assist in shortlisting the types of TBMs and tunnel lining methodologies that might be adopted for the tunnelled sections. In general, MTBMs and EPBTBMs have performed well in the difficult water bearing and boulder laden glacial deposits around the GTA and on some projects the selection of construction approach is left to the contractor, subject to certain basic methodology requirements and capabilities being satisfied.

There are three categories of TBMs that are potentially suitable for dealing with the anticipated ground conditions, which are described as follows:

Slurry Pressure Balance Tunnel Boring Machine (SPBTBM)

A closed face machine where pressurized slurry is used to counteract soil and groundwater pressures acting at the face of the machine. This type of machine is typically used in granular ground deposits below the water table but may also be used in more competent clay and till materials. The minimum size of these machines is typically 2500 mm i.d. and they can be configured for installation of jacking pipe or precast concrete tunnel linings (PCTL).

Slurry machines use pressurized slurry that is circulated in the mucking chamber behind the cutter head, via slurry supply and return lines, to balance soil and hydrostatic pressures. The slurry supply and return lines run the full length of the tunnel and are extended as the tunnel advances, with the return line being used to remove the spoil (excavated material, suspended in slurry) from the tunnel. This spoil is then discharged to a surface separation unit comprising a system of screens, cyclones and centrifuges that separate the excavated material from the slurry. The treated slurry is then recycled back through the tunnel for further advancement of the tunnel, while the spoil is collected in a pile for removal from site.

The cutterheads of slurry TBMs can be configured to deal with boulders to that will be encountered in the glacial soils along the route. Cutter tools are typically rear loading and permit replacement of worn cutters from behind the cutterhead. To manage the risk of major stoppages due to boulder obstructions, a trailing airlock can be used with the slurry TBM. The airlock permits pressurization of the mucking chamber and tunnel face and permits workers to access the chamber for manual removal of boulders and cutterhead repairs.

Microtunnelling Boring Machines (MTBM)

Most MTBMs employ the slurry pressure balance principle in combination with pipe jacking for pipe installation as described above, although the machines are operated remotely from the surface, and workers do not enter the tunnel for production operations except for TBM maintenance and survey, making it a safer method with lower construction crew requirements. MTBMs are sized to install pipes ranging from 0.5 to 3.4 m i.d. For larger diameter pipe sizes (>1.8 m i.d.), tunnel drive lengths of greater than 1 km, with minimum horizontal curve radius of approximately 500 m, are being achieved nowadays.

Microtunnel drives close to, and above 1000 m are becoming increasingly common with industry innovation and compounding experience. Below are some recent examples:

- Hunua 4 Section 11, Watermain project, Auckland: 1296 m drive for 3000 mm i.d., completed in 2020.
- YDSS Forcemain Twinning Project, Newmarket, Ontario, Canada: 1132 m drive for 1800 mm i.d., completed in 2020.
- Raw Water Intake, Painesville, Ohio: 1203 m drive for 1520 mm i.d., completed in 2019.
- Sea outfall, Sur de Texas-Tuxpan gas pipeline, Altamira, Mexico: 2246 m drive for 3200 mm i.d. in 2019.
- West Cumbria Water Supplies Project for United Utilities, United Kingdom: 1241 m drive for 2280 mm i.d., completed in 2018.
- Kingsbury Run Culvert Repair project for the Northeast Ohio Regional Sewer District (NEORSD), Cleveland, Ohio: 830 m curved drive for 1520 mm i.d., completed in 2017.

Typical drive lengths can vary from 200 m to over 1000 m, with construction being more economical the longer the drive. Constructible length of drive is typically related to the size of the tunnel, with larger MTBMs able to achieve longer drives than smaller diameter machines.

One key risk with microtunnelling and pipe installation is that pipes can be damaged by the action of hard boulders and cobbles that cause significant wear to the pipe exterior as they are jacked through the ground. This risk can be mitigated by good bentonite practise, including employing the use of 'automatic bentoniting' system and appropriate slurry mixture design and pressure.

For larger MTBMs, an airlock can be installed in the machine to allow worker access to the machine face if repairs or maintenance is required. Such airlocks work in a similar fashion to that described for the SPBTBM above.

Earth Pressure Balance Boring Machine (EPBTBM)

EPBTBMs are most commonly used in fine granular soils below the water table, although they have also been used in sands and gravels and for excavating soft rock. A precast concrete segmental lining is commonly installed behind these closed-face machines as the tunnel advances, although they can also be configured for installing pipe. The machines use an auger screw that penetrates a sealed bulkhead immediately behind the EPBTBM cutterhead to permit controlled removal of the spoil at the tunnel face. A balancing pressure is maintained at the tunnel face via simultaneous slow rotation of the auger (for spoil removal) and forward propulsion of the EPBTBM. Spoil is typically removed using a conveyor belt immediately behind the auger screw and a line of rail-mounted muck cars travelling back and forth between the launch shaft and the EPBTBM. A crane on the surface deposits the excavated material from the muck cars into a spoil pile for removal from the project site. Trailing airlocks can also be used with EPBTBMs so that cutterheads can be repaired and boulder obstructions can be removed.

One key concern with trenchless or tunnelled excavations, regarding selected methodologies, relates to any sensitive infrastructure along or crossing the tunnel alignment. In the case of Y13-A, there is one structural box culvert crossing located at sta. 0+110, where the sewer will cross under the culvert. As all structural culverts and bridges are considered critical infrastructure, it will automatically be considered for construction impact assessment, which involves an analytical review of ground movement induced structural deformations by the tunnelling and nearby shafts excavation works.

Further design development, including completion of geotechnical and hydrogeological investigation will assist in shortlisting the types of TBMs and tunnel lining methodologies that might be adopted for the tunnelled sections. In general, MTBMs and EPBTBMs have performed well in the difficult water bearing and boulder laden glacial deposits around the GTA and on some projects the selection of construction approach is left to the contractor, subject to certain basic methodology requirements and capabilities being satisfied.

5.11.3.3.2 Shaft Construction

Shafts are required for launch of TBMs, servicing tunnelling operations, and TBM retrieval and are commonly used to house maintenance holes, access chambers and other permanent facilities.

From a tunnel construction perspective, the required shaft dimensions, particularly shape and internal diameter, are a function of the following:

- Length of tunnel segments (pipe or PCTL)
- Tunnel diameter
- Tunnelling machine dimensions, particularly length
- Thrust wall design
- Jacking rig size
- Tunnel eye sealing ring
- Guide rail systems.

The shaft details proposed on the concept alignment for the Y13-A forcemains are as follows. Methodologies for shaft excavation and support are commonly classified as sealed or unsealed, depending on the degree of leakage into the shaft and impacts on the surrounding water table that occur during construction. As highlighted previously, it is expected that the shafts will be constructed in a variety of soft ground conditions, largely below the water table. Both shaft classifications are further described in the sections below.

Unsealed Shafts

Unsealed shafts are typically specified where ground conditions are stable, where there are no restrictions on dewatering to permit lowering the surrounding water table, or where conditions are dry, and dewatering is not required for shaft construction). Common methods are described below.

Steel liner plate

Steel liner plates provide a relatively light-weight, easy-to-handle, safe support for soft ground tunnelling because the ground that supplies the loading also supplies the resistance to the load. The liner plate assembly simply distributes and transmits the load to the surrounding earth.

Driven sheet pile

Sheet pile walls are used as an earth retention system in soils that allow driving from the surface to bottom of shaft. They do not work well in soil conditions with boulders or large obstructions. Sheet piles are prefabricated steel sheet sections with interlocking edges. As the sheets are installed, they form a continuous barrier in the ground. The sheets are typically driven with vibratory hammers or drop hammers. More recently, this type of construction can also be sealed but requires specialty sealants to be applied at joints, which increase construction schedule, cost and failure modes.

Soldier piles with timber laggings

Soldier piles are steel H piles that are vertically driven or drilled into the earth at regular intervals prior to excavation. As excavation progresses in stages, horizontal lagging in the form of timber is added behind the flanges to create the wall structure with connecting joints.

Sealed Shafts

Sealed shafts are typically specified where unstable ground conditions exist or where there are restrictions on dewatering to lower the surrounding water table. Sealed shafts tend to be more expensive than unsealed shafts, although they have become almost mandatory in many Canadian jurisdictions where there are strict environmental requirements to minimize groundwater lowering and effects on adjacent water courses as well as infrastructure. Common sealed shaft methodologies include:

Secant pile walls

Secant pile shafts utilize bored piling methods (incorporating use of temporary steel casings driven, or vibrated into place, in advance of pile excavation to prevent ground collapse) to create a vertical perimeter of interlocking poured concrete cylindrical piles. The overlapping of piles creates a waterproof liner and supporting wall. It cannot be used as a final structure and will require a permanent structure such as a manhole chamber to be installed within the shaft.

Concrete sinking caissons

The method involves sinking the shaft in several lifts by building a circular (or oval) shaft structure on the surface and placing kentledge blocks (weights) or rams on top of it. Many contractors assist the sinking operation by lubricating the annular gap between the outer walls and surrounding ground. A clamshell grab (granular soils) or mini excavator (competent soils such as clays or rock) is then used for shaft excavation, and the shaft structure slowly sinks to fill the excavated void. The shaft structure is typically constructed using precast concrete segments or cast-in-place reinforced concrete. Once the shaft has been sunk to the desired formation elevation, a mass concrete base plug is placed using a tremie (underwater) concreting, if the shaft is in a flooded condition. A major advantage of this method is that the shaft wall can be used as future permanent structure for maintenance.

Slurry (diaphragm) walls

To commence excavation, guide walls are installed around the desired shaft location. These guide walls act as a guide for installation of the slurry walls. A trench is then excavated between the guide walls, typically several metres long and 1 to 1.5 metres wide and extending to the required depth. A bentonite slurry mix is pumped into the trench as it is excavated to support the surrounding soil. The slurry is composed of water, bentonite clay and other additives to achieve the desired properties, acting as a temporary support system to prevent collapse. Once the trench reaches the desired depth, steel cages or vertical steel sections are inserted for reinforcement, enhancing the wall's load-bearing capacity. As the concrete is pumped into position, the slurry is displaced to the surface where it can be collected, treated and used for subsequent wall construction. The slurry wall shaft construction method is highly advantageous for constructing deep excavations in urban environments.

Pending geotechnical and hydrogeological field investigation and laboratory testing results along the sewer alignment and at shaft locations, a preferred shaft construction methodology cannot be selected. The appropriate methods will be assessed and compared in a future phase of design.

5.11.3.4 Property Requirements

Permanent property requirements will depend on the final location of the new trunk sewer. Property easements may be required for permanent access to maintenance holes depending on the final location of the infrastructure. Exact details on shaft sizing, location and property easement requirements will be confirmed during detailed design.

Temporary and permanent property easements may be required for construction and operation of the trunk sewer. Permanent property requirements will depend on the final location of the shafts, which are expected to contain a manhole structure that must be accessible by York Region staff for sewer maintenance purposes. Easements may be required for permanent access to the maintenance holes.

The proposed property locations and requirements for construction of the shafts are conceptual only. Details related to the number of shafts, shaft sizing, location and property easement requirements will be confirmed during detailed design.

5.11.4 Environmental and Community Impacts and Mitigation

Desktop studies were done to determine the possible extent of these impacts and to propose mitigation measures that would reduce the likelihood and the consequences should they occur. The major impacts and associated mitigation approaches are described in this section.

Because the current designs are only at the conceptual level, potential impacts and mitigation measures could change during design development, depending on:

- The ability to co-locate the proposed design with other planned infrastructure to minimize community effects, to be investigated after field investigations are completed. This change will depend on the number and scale of other planned infrastructure (e.g., utilities, transportation) in the ROW or area.
- Confirmation of available property for temporary and permanent use. The extent of temporary easements or acquired private property, as well as the construction schedule may dictate future design changes or mitigation measures.

The assessment criteria and indicators are provided in Table 5.37, Table 5.38 and Table 5.39, corresponding to each of the environments (social and built, natural, cultural and traffic impacts) together with a potential effects assessment and identification of avoidance, mitigation and compensation measures for the project.

Table 5.37 Y13-A Leslie Street Trunk Sewer Phase 3 Social and Built Environment Effects and Mitigation

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Social and built environment				
SB-1	Effect on existing views	– Predicted changes in views from residences in the surrounding area	– No change in existing views from residences in the surrounding area.	– No avoidance, mitigation, or compensation measures required.
SB-2	Effect on existing residences, businesses, and/or community, institutional and recreational facilities	– Extent of displacement of residences, businesses and other facilities – Extent of temporary or permanent disruption to residences, businesses and other facilities in proximity to construction compounds/permanent installations	– No displacement of residences, businesses, or community, institutional and recreational facilities is anticipated. – Disruption to residences, businesses, and community, institutional and recreational facilities in proximity to construction compounds/permanent installations.	– No avoidance, mitigation, or compensation measures are anticipated. However, if in fact displacement is required then York Region would provide market value compensation. – Apply standard construction-related mitigation measures to minimize the disruption effects.
Traffic and transportation				
TT-1	Effect on traffic	– Extent of disruption to traffic flows – Proximity to congested traffic zones	– Traffic disruption at construction compounds, compound staging may extend into the travelled portion of the ROW. – Traffic movement in to and out of Construction compound sites will impact pedestrian, cycling and traffic flow on Leslie Street. – Impacts to public transit involving potential rerouting of buses and/or relocation of stops. – Coordination of alternate routing for emergency service vehicles, if needed.	– Where possible, maintain one lane in each direction. This could be achieved through flagging, temporary signals or temporary road widening. – Pedestrian movement should be maintained during construction, with marked pedestrian detours as applicable. – Consider special traffic arrangements for peak hours should be considered in traffic flow directions in the morning and afternoon. – Pay duty police officers may be required to direct traffic. – Make special provisions for emergency service vehicle access. – Make special provisions for pedestrian traffic and safety, including signals, detours and winter maintenance. If feasible, move construction traffic to sideroads. – Access to private entrances to be maintained, or alternative access solution provided.
Utilities				
U-1	Conflict with buried utilities	– Sewer or shaft is in direct conflict or falls within clearance limits of nearby utilities	– New construction impacts existing utilities and requires design coordination with utility owners which increases project cost and schedule.	– Review historic and as-built documents for utility data. – Complete a SUE investigation to identify high-risk utilities, including large and/or critical service utilities (e.g., large watermains and all gas mains). – If a conflict occurred with a proposed sewer tunnel, construction shaft or overall work compound location following receipt of utility information, consider temporary or permanent relocation of utilities safely around or through the work area. Depending on the utility, it may be possible to support the utility above an open cut excavation to be reburied. Modifications of the alignment and shaft locations may also be proposed during design development to mitigate utility conflicts.
U-2	Conflict with surface or overhead utilities	– Excavation of shaft is proposed in location of surface infrastructure – Shaft working compound equipment, including cranes will require working directly under overhead utilities or within the hydro wire exclusion zone	– Overhead infrastructure such as electrical or communications cabling is mounted on utility poles between 5 and 12 metres above the surface. Depending on the required crane size and operating radius to construct the shaft and lower the TBM, equipment extents may fall within hydro line exclusion zone, or hit overhead wires causing worker harm or death.	– Working compounds will be designed to allow appropriate and safe movement of workers and equipment around the site, away from live overhead wires or surface utility boxes, based on known utility information and topographic surveys. – If a conflict occurred with a proposed sewer tunnel, construction shaft or overall work compound location, following receipt of utility information, modifications of the alignment and shaft locations may be proposed during design development; the utilities would need to be temporarily or permanently relocated safely around or through the work area.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
U-3	Damage and/or Deformation to surface and buried utilities	– Soil movement under or next to the utility from tunnel or shaft/open cut construction	– Ground heave/settlement/horizontal shift along tunnel ahead of and along excavated alignment, and around shafts and open cut excavations during and post-excavation. This information can be obtained from nearby geotechnical instrumentation. – Deformation or damage to nearby surface or buried utilities as a result of soil movement, which may require rehabilitation or repair (e.g., crack formation, angular rotation, strain, pipe joint rotation or pull out).	– For utilities within tunnel ZOI: Select a tunnel excavation method capable of limiting volume losses at the cutting face (limit overcutting of excavation) to limit ground losses. – For utilities near shaft/open cut ZOI: Select a shaft or open cut construction method and SOE appropriate with depth, size and geotechnical and hydrogeological conditions at shaft location. – Analytically assess nearby utilities and structures and propose mitigation methods such relocation of utilities, or for deep utilities, relocation of the sewer horizon. Should neither of these options be applicable, then investigate ground improvement in proximity of utilities to limit ground movement or investigate modification of the sewer and/or open cut design or construction methodology.
Noise and vibration				
N-1	Operation noise	– Complaints from residents within study area	– Noise disruptions to private residents and commercial areas post-construction, near manholes and other surface connections, SPS locations.	– Any permanent facility, such as supporting air management facilities, will require an ECA application under Section 9 of the Environmental Protection Act. – Investigate degree of risk and impact in further detail.
N-2	Construction noise	– Complaints from residents within study area	– Noise disruptions to private residents and commercial areas during construction, near construction compounds.	– Propose construction noise monitoring per MECP NPC-115 Construction Equipment requirements. – Consider completing noise monitoring for the duration of the construction and notify the contractor of any exceedances so that corrective action/contingency actions can be implemented. – Use vehicles and equipment (cranes and excavators) with efficient muffling devices or construct enclosures. – Limit truck movements to comply with noise by-laws for 24/7 construction operations.
V-1	Construction vibration	– Complaints from residents within study area	– Disruptions to private residents and commercial areas during construction, near construction compounds.	– Propose appropriate construction vibration benchmarks within the tender documents. – Consider pre- and post-construction condition photos.
Air management				
O-1	Operation odour at Drop Structures	– Odour near surface connections	– Where there are bends in the gravity sewer and drop structures, there may be the potential for fugitive releases of odour. The potential for odour at these locations will depend on the ventilation design systems and specific venting locations.	– Consider implementation of ventilation design systems with specific venting locations.
O-2	Construction odour	– Complaints are received from residents within the study area	– During live connection of infrastructure, there is the potential for odour release.	– Advance notification to residents, advising them of what work is being completed and the duration of the work.
A-1	Construction dust at sewer construction locations	– Fugitive dust is generated – Air quality is poor	– Fugitive dust generation during construction of gravity sewer, interconnecting shaft/chambers, including the connection points.	– Develop a Dust Best Management Practices Plan to be included in the project Construction Management Plan. – Mitigation should be aimed at minimizing emissions of particulate matter and exposure to particulate matter during the construction phase of the project.
A-2	Construction dust at air management infrastructure	– Fugitive dust is generated – Air quality is poor	– Fugitive dust generation during construction of the potential air management infrastructure.	– Develop a Dust Best Management Practices Plan to be included in the project Construction Management Plan. – Mitigation should be aimed at minimizing emissions of particulate matter and exposure to particulate matter during the construction phase of the project.

Table 5.38 Y13-A Leslie Street Trunk Sewer Phase 3 Natural Environment Effects and Mitigation

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Hydrogeology				
N-1	Effect on groundwater quantity	– Temporary and/or long-term change in groundwater quantity	– Potential temporary change to groundwater quantity is minimal because construction expected to mainly intersect Newmarket till aquitard and potentially some Inter Newmarket Sediment. Water table anticipated to be encountered at approximately 2 - 8 mbgs for the section of the trunk sewer south of David Drive and approximately 7 - 13 mbgs for the section of the trunk sewer north of David Drive. – No long-term change to groundwater quantity is anticipated because no water takings are required during operation of the sewer. – Potential ground settlement as a result of active dewatering/depressurization. – Change in shallow groundwater flow patterns resulting from operation of sewer pipe resulting from increased I&I and/or preferential movement of groundwater within trench sediments.	– Implement construction methods that minimize dewatering requirements. – Establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water).
N-2	Effect on groundwater quality	– Temporary and/or long-term change in groundwater quality	– Temporary change in groundwater quality is minimal because construction is anticipated to mainly intersect low permeability till. – No long-term change to groundwater quality is anticipated. – Potential effects on groundwater water quality as a result of potential mobilization of contaminated water where active dewatering/depressurization is required. – Reduction in groundwater quality from spills or the mismanagement of fuel/chemical in work areas.	– Implement construction methods that minimize dewatering requirements, as needed. – Develop and implement a spills response plan for construction to mitigate the effect of a spill should one occur. – Establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water). – During design, complete a contaminant source investigation to mitigate the risk of drawing contamination from one source to another location.
N-4	Effect on private wells - temporary construction dewatering	– Temporary construction dewatering private well interference (quantity/quality)	– Temporary decrease in private well quantity/quality not anticipated due to intersection of low permeability till. – Limited dewatering is expected during construction.	– Implement construction methods that minimize dewatering requirements, as needed. – Address construction dewatering private well interference complaints through existing York Region private well assessment and mitigation policy. – Proactively identify any high-risk wells during design and prepare site-specific preventative mitigation and corrective action plans as part of design. Corrective actions should align to York Region's private well assessment and mitigation policy.
N-5	Effect on private wells – long term	– Long term private well interference (quantity/quality)	– No long-term groundwater quantity/quality interference is anticipated as no active or passive long-term groundwater takings related to the forcemain are anticipated.	– If needed, establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water). – Proactively identify any high-risk wells during design and prepare site-specific preventative mitigation and corrective action plans as part of design. Corrective actions should align to York Region's private well assessment and mitigation policy.
N-6	Effect on surface water	– Temporary change in surface water quantity/quality	– Temporary change in surface water quantity/quality is not anticipated based on intersection of low permeability till. – Limited dewatering is expected during construction. – Sewer passes under tributary to HREB. – Change in groundwater-surface water interaction (reversal of vertical hydraulic gradient) results in impact to terrestrial and aquatic habitat and associated SAR (where applicable) - reduction in baseflow. – Change in surface water temperature from groundwater taking and/or discharge to surface water features. – Changes to stream morphology resulting from the release of groundwater dewatering water. The potential reduction in baseflow due to water taking in a lower confined aquifer due to increased downward hydraulic gradients across the aquitard separating the stream and the confined aquifer. – The potential reduction in baseflow from a stream reach that intersects an aquifer in which the water taking is occurring.	– Field verification of groundwater-surface water interaction suggested for watercourses and wetlands within the study area. – Complete outlet receiver assessment(s) should temporary groundwater discharge be required to surface water. Establish pre-construction baseline surface water quality and quantity conditions and develop implementation plans for monitoring during and post-construction. – Implement/construct treatment (i.e., settlement tanks, etc.) of construction water prior to discharge to storm sewer/surface water. – Minimize construction area disturbance and duration. Implement erosion and sedimentation control measures (e.g., silt fencing, check dams, etc.). – Adhere to fish timing windows to prevent negative impacts on known sensitive fish species within the study area. – Consider completing a geomorphology study during design. – Refer to the Natural Heritage section of the table for further mitigation approaches associated with surface water impacts.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Areas of Potential Environmental Concern				
C-1	Low Risk Contamination	– An area of potential environmental concern is not located directly in or immediately adjacent to the project ROW – Low potential for contaminants to be present and if present, are likely limited in extent and likely only present in surficial soil – Migration, exposure pathways and receptors are limited – Impacts can be easily managed prior to or during construction	– 1095 Ringwell Drive: Retail Storage Tank. Operation located adjacent to Leslie Street with potential for contaminants of concern (COCs) (petroleum hydrocarbons (PHCs) and benzene, toluene, ethylbenzene and xylenes (BTEX)). – 17855 Leslie Street: Generator of subject wastes. Low potential for presence of COCs based on operation for volatile organic compounds (VOCs).	– No mitigation required.
C-2	Moderate Risk Contamination	– An area of potential environmental concern is located within or immediately adjacent to the project ROW – Moderate potential for contaminants to be present within the area of potential environmental concern – Moderate potential for contaminants to be present in soil and/or groundwater, or there is evidence that contaminants are present – Migration, exposure pathways and/or receptors may be present – Impacts would need to be assessed and addressed prior to acquisition, design and/or construction.	– 18273 Leslie Street: Current operation of fuel storage tanks and gasoline fuel service station. Potential for PHCs and BTEX. – 18233 Leslie Street: Current operation of fuel storage tanks and gasoline fuel service station. Potential for PHCs and BTEX. – 18066 Leslie Street: Private Fuel storage tank. Potential for PHCs and BTEX. – 17844 Leslie St: Current operation of fuel storage tank. Potential for PHCs and BTEX. – 17730 Leslie Street: Current operation of a dry-cleaning facility. Potential for VOCs. – 17665 Leslie Street: Current operation of a dry-cleaning facility. Potential for VOCs. – 1065 Davis Drive: Current operation of fuel storage tank and gasoline fuel service station. Potential for PHCs and BTEX. – 1111 Davis Drive: Current operation of fuel storage tank and gasoline fuel service station. Potential for PHCs and BTEX. – 17665 Leslie Street: Current operation of a dry-cleaning facility and generator of subject wastes (halogenated solvents. Potential for VOCs. – 17205 Leslie Street: Dry-cleaning facility. Generator of subject waste (halogenated solvents). Potential for VOCs.	– Advance boreholes as part of the detailed design of the proposed improvements, should be placed in the vicinity of the areas of potential environmental concern having moderate risk, to assess for potential subsurface impacts that may affect the proposed construction work. Soil samples should be collected from these boreholes for laboratory analysis of metals and inorganics (including electrical conductivity (EC) and SAR), PHCs, BTEX and VOCs.
Geotechnical				
G-1	Effect on soil quality	– Contaminant seepage into soil during excavation of shaft	– Chemicals such as drilling fluids, lubricants, ground improvement material, or fuel from construction equipment may contaminate soil.	– Perform regular equipment checks and maintenance. – Prepare an environmental management plan prior to construction in case of contamination.
G-2	Soil movement around shafts	– Vertical or horizontal ground movement around shafts during and post excavation – Deformation or damage to nearby structures and/or utilities	– Ground heave/settlement/horizontal shift at surface around shafts. – Deformation or damage to nearby structures and utilities (e.g., crack formation, angular rotation, strain, or pipe joint rotation or pull out) that may require rehabilitation or repair.	– Select shaft or open cut construction method and SOE appropriate with depth, size and geotechnical and hydrogeological conditions at shaft or open cut locations. – Complete soil displacement analytical assessments at all shaft locations.
G-3	Soil movement along tunnel	– Vertical or horizontal ground movement along tunnel during and post excavation – Movement or damage to nearby structures and/or utilities	– Ground heave/settlement/horizontal shift along tunnel ahead of and along excavated alignment. – Deformation or damage to nearby structures and utilities (e.g., crack formation, angular rotation, strain, or pipe joint rotation or pull out) that may require rehabilitation or repair.	– Select tunnel excavation method capable of limiting volume losses at the cutting face (limit overcutting of excavation) to limit ground losses. – Complete soil displacement analytical assessments for at-risk tunnel locations, including low soil cover locations or areas where the tunnel crosses or runs parallel in close proximity to sensitive natural features, utilities and critical infrastructure such as creeks, gas main, structural culverts, bridges and rail crossings
G-4	Encounter boulders during shaft and/or tunnel excavation	– Boulders encountered during excavation of shaft and/or tunnel	– For tunnels, boulder presence and properties may require change of preferred excavation methodology (segmented tunnel vs pipe jacking) and tunnel boring machine technical specifications. – For shafts, boulder presence and properties may require change of preferred shaft SOE methodology.	– Complete appropriate geotechnical investigations with strength testing for any encountered boulders. – Prepare a geological baseline report during design development with appropriate baseline for boulder strength, sizing and anticipated encounter rates and locations. – Recommend a shaft construction SOE capable of maintaining verticality in boulder-prone soils. – Recommend appropriate technical specifications for tunnel boring machine.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
G-5	Frac-out of drilling fluids along tunnel	– Drilling fluid breaches surface during tunnel excavation – Unanticipated change in drilling fluid pressure and/or volume	– Drilling fluid may breach beds of water bodies such as creeks, lakes and rivers. – Drilling fluid may breach aquifers. – Drilling fluid may cause cracking on surface infrastructure such as pavement and may require closure of traffic lanes to clean up fluid at surface.	– Select contractor with experienced MTBM or TBM operators. – Require a “frac-out contingency plan” be prepared prior to construction for cleanup of drilling fluids.
G-6	Encounter contaminated soil during shaft and/or tunnel excavation	– Soil encountered during shaft and/or tunnel excavation is tested to surpass allowable contaminant levels	– Spoil must be dispatched at an approved contaminated soil disposal site.	– Complete appropriate geotechnical investigations and contaminants testing during design development to identify confirmed contaminated soil locations or at-risk areas based on historical land use. – Identify and confirm availability of appropriate soil disposal sites based on anticipated contaminants for use during construction.
G-7	Encounter weak or incompetent soil during tunnel excavation	– Accelerated soil movement at surface and depths	– Soil heave, soil settlement or sinkhole formation at surface.	– Complete appropriate geotechnical investigations with strength testing for anticipate soils along tunnel horizon. – Prepare a geological baseline report during design development with appropriate baseline for soil properties, including stratigraphic profile inferred from borehole investigations. – Recommend appropriate preventative or compensation ground improvement for at-risk locations.
Natural heritage				
EG-1	Effect on aquatic habitat or functions	– The study area contains cold, warm or unknown thermal regime water watercourses. – The study area contains wetlands.	– Temporary or permanent loss of aquatic features or categorical loss of functions by type, including PSWs, Locally Significant Wetlands, watercourses by sensitivity type and others. – During construction water quality may be impaired due to elevated TSS in surface water runoff from study area locations which can affect aquatic species/habitats. Some concentrations above background may occur temporarily. – Potential spill hazard when refuelling equipment. – Change in surface water temperature from groundwater taking and/or discharge to surface water features	– Need to complete site investigations to evaluate potential effects on aquatic habitat function. – Implement best management practices to control surface water runoff and minimize TSS effects. – Where feasible, discharging of surface water during construction should be directed into the municipal storm sewer system to mitigate thermal impacts to watercourses. Should discharge of surface waters be directed to watercourses, additional mitigation measures would need to be adhered to (e.g., enhanced erosion and control measures). Use of erosion and sediment control measures and timing of construction (see Table 10.1) to avoid spawning and egg incubation periods will reduce the potential for effect to fish and aquatic life. – Conduct equipment maintenance and refuelling at the designated and properly contained maintenance areas or at industrial garages located well away from creek banks and wetlands and outside vegetation areas. – Develop a Spill Prevention Plan.
EG-2	Effect on stream geomorphology	– Change in geomorphic form/function/stability in affected channels within the study area	– No anticipated impacts to stream geomorphology in affected channels.	– Employ erosion and sediment controls to limit deposition of construction-mobilized soils into watercourses. – Consider completing a geomorphology study during design, where applicable.
EG-3	Effect on aquatic species, including SAR, species of local concern, native species and invasive species	– Aquatic species	– Number and type of aquatic species potentially affected temporarily or permanently. – No anticipated impacts to aquatic SAR as there are no aquatic SAR identified within the study area.	– Preventing death of fish or impacts to downstream fish habitat through the use of appropriate timing windows.
EG-4	Effect on terrestrial habitat or functions	– The study area does not contain ANSIs – The study area contains Ecologically Significant Forests – Wildlife habitat	– Temporary or permanent loss of natural heritage features (e.g., ESAs, ANSIs, wildlife corridors and others). – Potential effects on terrestrial habitat (e.g., direct vegetation (and wildlife habitat) loss, alteration and fragmentation) may occur from the physical footprint of study area locations. – Project preparation, construction and operation may increase the risk of nest destruction and mortality of migratory birds.	– Site investigations to evaluate potential terrestrial habitat function/significance. – During design, prepare construction constraints with consideration of timing windows to mitigate where possible, vegetation clearing to occur outside of the migratory bird nesting season, bat maternity roosting season, turtle overwintering and amphibian breeding. – Limit the area of project footprint and limit disturbance from employees. – The presence of wildlife will be monitored and communicated to site personnel. – Vehicle use will be restricted to designated areas. – Where practical, rehabilitate habitat for plants and wildlife.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
EG-5	Effect on terrestrial species, including SAR, species of local concern, native species, invasive species and area-sensitive species	– SAR have the potential to occur within the study areas, including amphibians, insects, birds, reptiles, mammals and tree species	– Number and type of terrestrial species potentially affected temporarily or permanently. – Construction activities have the potential to disturb wildlife within adjacent natural heritage areas. – Project preparation, construction and operation may increase the risk of nest/habitat destruction and mortality of terrestrial SAR. – Project may result in wildlife-vehicle collisions and may cause injury/mortality to individual animals.	– Site investigations to evaluate potential occurrence of terrestrial SAR within the study area. – During design, prepare construction constraints with consideration of timing windows to mitigate where possible, vegetation clearing to occur outside of the migratory bird nesting season, bat maternity roosting season, turtle overwintering and amphibian breeding. – Clearly demarcate work limits at outset of construction and minimize unnecessary vegetation clearing.

Table 5.39 Y13-A Leslie Street Trunk Sewer Phase 3 Cultural Environment Effects and Mitigation

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation

CE-1	Effect on *Ontario Heritage Act* (OHA) designated properties and properties listed on municipal heritage registries	– Project components are in the vicinity of the heritage property/landscape	– Encroachment onto the property/landscape resulting in a physical impact to the potential BHRs and/or CHL.
			– New structures or landscape features and/or alterations to the property/landscape that result in a physical impact to the potential BHRs and/or CHL.
			– Relocation of all or part of the potential BHRs and/or CHL.
			– Demolition or destruction of all or part of the potential BHR and/or CHL.
			– Vibration impacts to the potential heritage buildings identified on the property/landscape in and on adjacent properties.
			– Ground disturbance impacts relating to landscape features on the property/landscape in and on adjacent properties.
				– Based on the potential impacts outlined in the previous column, the following mitigation options are considered alongside mitigation recommendations.
				– Preferred Option:
				• Project design avoids the property/landscape resulting in no direct or indirect impacts. This includes maintaining a sufficient buffer of at least 50 m between Project activities and the potential BHRs and/or CHLs.
				– Alternative Options:
				• If direct impacts are unavoidable the following options and mitigations should be considered:
				• A. Design Project to minimize encroachment on the property/landscape while avoiding all impacts to the potential BHRs and/or CHLs.
				  • i. Consult with the Town during detailed design to determine if any approvals or permits are required as a result of physical impacts to the property/landscape.
				• B. If avoidance of the property/landscape or Option A are not feasible, and if a physical impact to potential BHRs and/or CHLs is unavoidable, then the following is required:
				  • i. Consult with the Town during detailed design to determine if any approvals or permits are required as a result of physical impacts to the property/landscape.
				  • ii. Complete a property-specific CHER/HIA prior to any alterations, including evaluation of the property against O. Reg. 9/06 and, if necessary, detailed documentation of any confirmed BHRs and/or CHLs and recommendation of specific mitigation measures for impacts to any identified heritage attributes.
				  • iii. The CHER/HIA should also consider the compatibility of new structures or landscape features with existing heritage attributes, layouts and designs of the property/landscape.

5.12 Y3-C Aurora East SPS Forcemains

5.12.1 Study Area

The Y3-C Aurora East SPS Forcemains will provide conveyance of flows from the Y3-B Aurora East SPS east along St. John's Sideroad to Leslie Street, where the forcemains will discharge into the top end of the Y1-A2 Leslie Street Trunk Sewer Phase 2. The forcemain is located within the ROW of St. John's Sideroad. A study area of approximately 200 metres surrounding the centerline of the right of way was applied as shown in Figure 5.27.

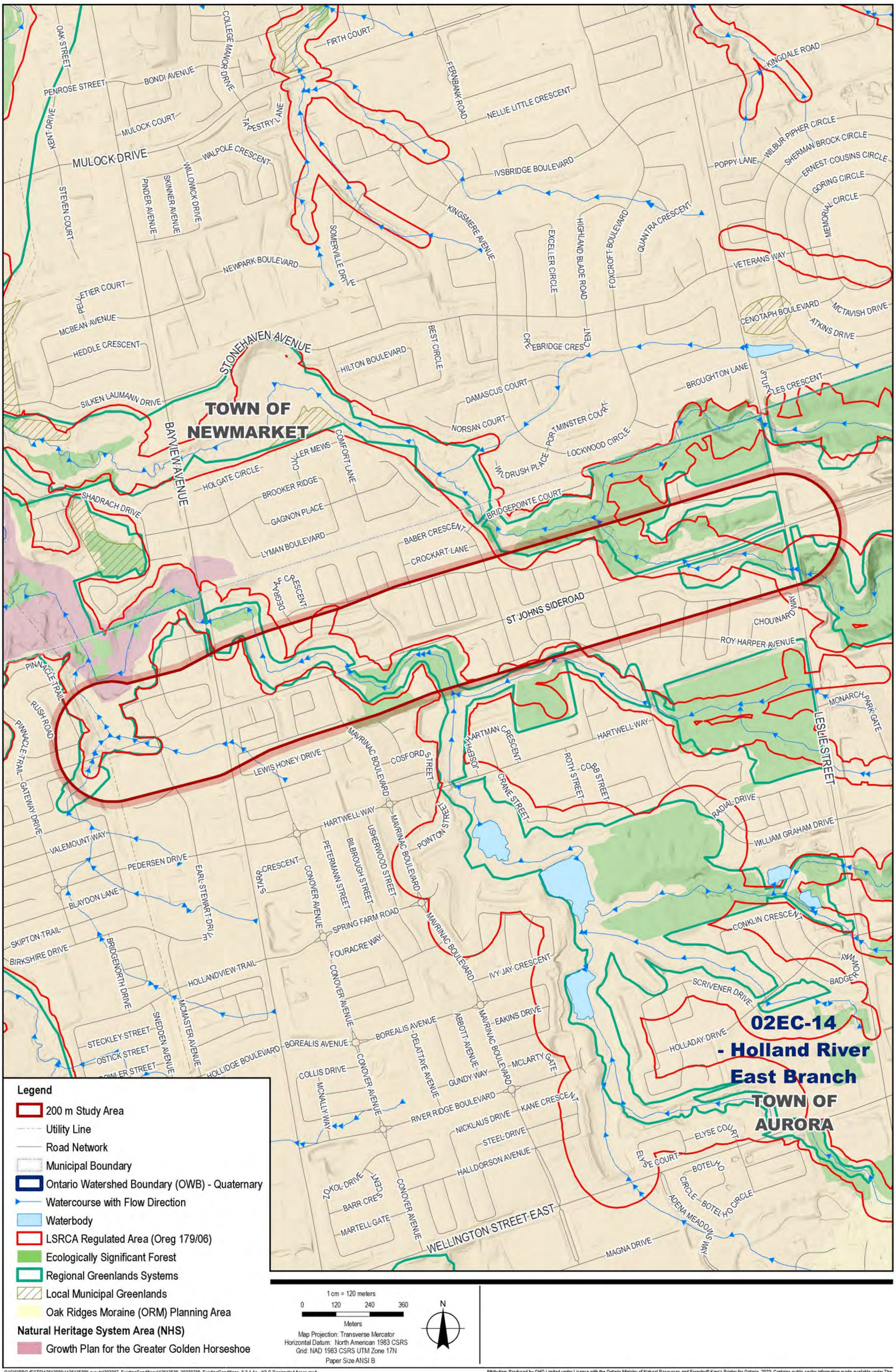

Figure 5.27 Y3-C Aurora East SPS Forcemain Study Area

5.12.2 Existing Conditions

5.12.2.1 Social and Built Environment

The following sections will summarize the findings of the desktop studies completed within the study area, including planning and land use, traffic and transportation and utilities.

Planning Policy and Land Use

Existing Land Use

Along St. John's Sideroad, from CNR tracks to Bayview Avenue, land uses consist of the following:

- North side:
  - Low density residential housing
  - Aurora SPS
  - Recreational lands (Golf course and public park).
- South side:
  - Low density residential housing
  - Commercial lands (car dealership, superstore)
  - Institutional lands (Aurora Fire Station).

Along St John's Sideroad, from Bayview Avenue to Leslie Street, land uses consist of the following:

- North side:
  - Low density residential housing
  - Commercial lands (restaurants and supermarket).
- South side:
  - Low density residential housing
  - Commercial lands (restaurants)
  - Agricultural lands.

Planning Policy

Regional

The York Region Official Plan (June 2023 Office Consolidation) designates lands within the study area east of Leslie St as Employment Area. The remainder of the study area is designated Community Area. Areas of Regional Greenlands System traverse the study area.

Local

With reference to the Aurora Official Plan (September 2021 Office Consolidation), the study area traverses the following land use designations:

- Business Park
- Environmental Protection Area
- Private and Public Parkland
- Urban Residential
- Low-Medium Residential
- Medium-High Density Residential

- Stable Neighbourhood
- Linear and Other Open Space
- Stormwater Management Facility
- Existing Commercial
- Existing Employment – Light Industrial Service.

Active Development Applications

Lands within the Y3-C Aurora East SPS Forcemain study area contains several active development applications. These applications propose new developments of residential subdivisions or townhouse dwellings. The remaining applications are associated with new developments for commercial and retail buildings.

Residential subdivision applications:

- 1001 St John's Sideroad - Proposed subdivision.
- 929 St John's Sideroad - To facilitate the development of 33 single-detached units, ten single-detached part lots, a future development block open space and roads within a 3.76-hectare (ha) site.
- 15933 Bayview Avenue - Proposed townhouse development.
- Trent Street - Proposed subdivision.
- Rush Road - Proposed subdivision.
- Gateway Drive - Proposed subdivision.

Commercial development applications:

- 1588 St John's Sideroad - Four applications. All applications associated with a Site plan to facilitate a 3-storey self-storage building with a total gross area of 9,289.50 square metres.
- 1625 St John's Sideroad - Three applications. All applications related to a re-zoning of lands from “Rural (RU) Zone” to “Business Park”.
- 1335 St.Johns Sideroad - Proposed development of a commercial plaza.
- 15933 Bayview Avenue - Proposed commercial plaza development.
- 16005 Bayview Avenue - Three applications. Proposed development of a Grocery Store and other Retail. To redesignate the lands from "Convenience Commercial" to "Medium High Density Residential" to facilitate a six-storey residential building containing 79 units. To rezone the lands from “Community Commercial (C4-463) Exception 463” to “Second Density Apartment Residential (RA2-XX) Exception XX Zone” to facilitate a 6-storey residential building with 79 apartment units.
- 330 Industrial Parkway North - To rezone a portion of the lands from "E1(206)" and "E1(256)" to common "E1(XX)" Exception Zone to facilitate the extension of the existing Montessori School.

5.12.2.1.1 Transportation in the Study Area

St. John’s Sideroad between Bayview Avenue and Leslie Street is a four-lane 60 km/h posted speed arterial road with median boulevard and a dedicated cycling lane. The outer boulevard is curbed with pedestrian sidewalks on both sides, with a multi-use path (MUP) on the north boulevard shown in Figure 5.28.

Figure 5.28 St. John's Sideroad Looking East Towards Leslie Street. (Google Maps "Streetview," digital images http://maps.google.com)

The AADT along St. John's Sideroad between Leslie Street and Mavrinac Boulevard (west of Bayview Avenue) has been counted as 10,600 based on the latest available 2022 data. Historical AADT data along the study area are presented in Table 5.40.

Table 5.40 St. John's Sideroad AADT counts between Mavrinac Boulevard (east of Bayview Avenue) and Leslie Street

Description of road limits	2013	2016	2018	2022
Leslie Street and Mavrinac Boulevard	9218	9292	9155	10,600

There are no bus routes running along St. John's Sideroad within the study area; however, one YRT route is along Bayview Avenue (54) and will cross the study area.

5.12.2.1.2 Utilities in the Study Area

There are several above/below grade utilities situated within the study area corridor and in the vicinity of the proposed project. These utilities may be temporarily impacted during the construction of tunnel, shaft and work compounds. Formal notification and consent would be required from the authorities responsible for these utilities prior to construction.

Buried utilities are typically located within the following limits:

– Shallow-buried electrical and communications cabling are commonly buried between 1.2 and 1.5 mbgs.
– Shallow-buried storm drains, sanitary sewers and watermains are typically buried between 1.2 and 3.5 mbgs.
– Deep-buried utilities are defined as anything buried more deeply than the depths mentioned above.

Known municipal infrastructure that existed on York Region's GIS database has been provided within the drawing set. A detailed utility investigation program, which would include a "Level A through D" Subsurface Utility Exploration, would be required as part of future site investigations.

Known large infrastructure within the study area include:

– A structural culvert crossing at sta. 3+180, west of the Leslie Street and St. John's Sideroad intersection, under which the sewer will pass.

– Critical infrastructure will require specific geotechnical instrumentation and monitoring requirements to receive owner approval of the design. Any construction impacts to the tracks will be assessed as part of a CIAR during design development.

5.12.2.2 Natural Environment

The following sections will summarize the findings of the desktop studies completed within the study area for: geotechnical, hydrogeology, surface water, natural heritage and contamination.

5.12.2.2.1 Geotechnical

The study area for Y3-C Aurora East SPS Forcemain is split into two sections, with the east portion of the study area bordered by residential properties and the west portion of the property bordered by forested area, both within the boundaries of the Town of Aurora.

It should be noted that no site-specific reports or borehole record were encountered within the study area.

Based on the Quaternary geology mapping, the native deposit within the study area predominantly comprised silt and clay matrix, mostly consisting of Glaciolacustrine deposits.

The bedrock consists of shale, limestone, dolostone and siltstone of the Georgian Bay Formation, Blue Mountain Formation and Billings Formation. Typically, bedrock is mapped at depths of 124 m to 140 mbgs within the study area and will not be reached during construction.

5.12.2.2.2 Hydrogeological

A hydrogeological desktop review was undertaken within the study area using information from MECP well records, the MECP Source Protection Information Atlas, the Oak Ridges Moraine database and the Ontario Geological Survey database. Available hydrogeological reports for projects within the area were also reviewed.

The study area for Y3-C Aurora East SPS Forcemain is within the Schomberg Clay Plains physiographic region. Section is located on vulnerable aquifer. The water table is approximately 2 to 17 mbgs, with shallow groundwater flows to the northwest. SPS forcemain will involve a shallow excavation (5 to 18 mbgs) that will intersect a low permeability glaciolacustrine deposit; hydraulic conductivity is 2.2 x 10-7 m/s. Proposed SPS forcemain deeper shaft excavations associated with the six (6) manholes (17 mbgs) may intercept modern alluvial deposits and the Oak Ridges Moraine requiring temporary water takings.

The hydraulic conductivity of deeper alluvial deposits and Oak Ridges Moraine deposits is in the order of 10-4 m/s.

The linear infrastructure is located within the source water protection areas of WHPA-B, C, D. Linear infrastructure section along St. John's Sideroad intersects WHPA-B, C and D and borders on WHPA-B with proximity to WHPA-A.

There are seven historic private water supply wells located near the section to be constructed at Y3-C Aurora East SPS Forcemain.

Refer to Table 5.41 regarding details on anticipated aquifers and aquitards within the study area east of Bayview Avenue.

Table 5.41 Aquifers and Aquitards through the Y3-C Study Area, East of Bayview Avenue

Aquifers and aquitards	Description	Thickness
Oak Ridges Moraine Complex (Aquifer)	These sediments consist mostly of silt and fine sand, but also include gravel and minor clay and diamicton. The aquifer is generally unconfined, except the section covered by Halton till on the south flank of the ORM complex.	The deposits range in thickness between 1 to 5 m
Channel silt aquitard	Silt deposits	Ranges between 1 to 21 m
Channel sand aquifer	Sand deposits	Ranges between 1 to 24 m
Newmarket till (Aquitard)	A continuous layer that acts as an aquitard to the underlying Thorncliffe Formation.	Ranges between 19 to 70 m
Thorncliffe Formation (Aquifer)	Regionally recognized as a highly productive confined aquifer and is laterally continuous.	Up to 10 m
Sunnybrook drift (Lower aquitard)	A continuous layer that acts as an aquitard to the underlying Scarborough Formation.	Ranges between 18 to 24 m
Scarborough Formation (Lower aquitard)	A confined aquifer that is discontinuous and appears to consist of channel fill deposits that roughly dip to the east.	Ranges between 9 to 23 m

Refer to Table 5.42 regarding details on anticipated aquifers and aquitards within the study area, west of Bayview Avenue.

Table 5.42 Aquifers and Aquitards through the Y3-C Study Area, West of Bayview Avenue

Aquifers and aquitards	Description	Thickness
Undifferentiated upper sediments at ground surface (Aquifer)	An unconfined aquifer consisting of discontinuous fill and unconsolidated overburden deposits. Underlies topsoil at the east side of the section.	Generally maximum of 4 m
Newmarket till (Aquitard)	A continuous layer that acts as an aquitard to the underlying Thorncliffe Formation.	Ranges between 29 to 70 m
Thorncliffe Formation (Aquifer)	Regionally recognized as a highly productive confined aquifer and is laterally continuous.	Ranges between 12 to 45 m
Sunnybrook drift (Lower aquitard)	A continuous layer that acts as an aquitard to the underlying Scarborough Formation.	Ranges between 14 to 24 m
Scarborough Formation (Lower aquitard)	A confined aquifer that is discontinuous and appears to consist of channel fill deposits that roughly dip to the east.	Ranges between 2 to 23 m

5.12.2.2.3 Surface Water

There is one sub-watershed within the study area, the HREB. The sewer passes through two unnamed creeks that connect small tributaries to the HREB.

Other surface features of interest include:

- Unnamed tributary of the HREB
- Bogart Creek wetland complex
- Unnamed watercourse
- Coldwater stream
- Marshland
- Swamp.

Refer to Figure 5.29 for a surface water map of existing conditions within the study area, west section.

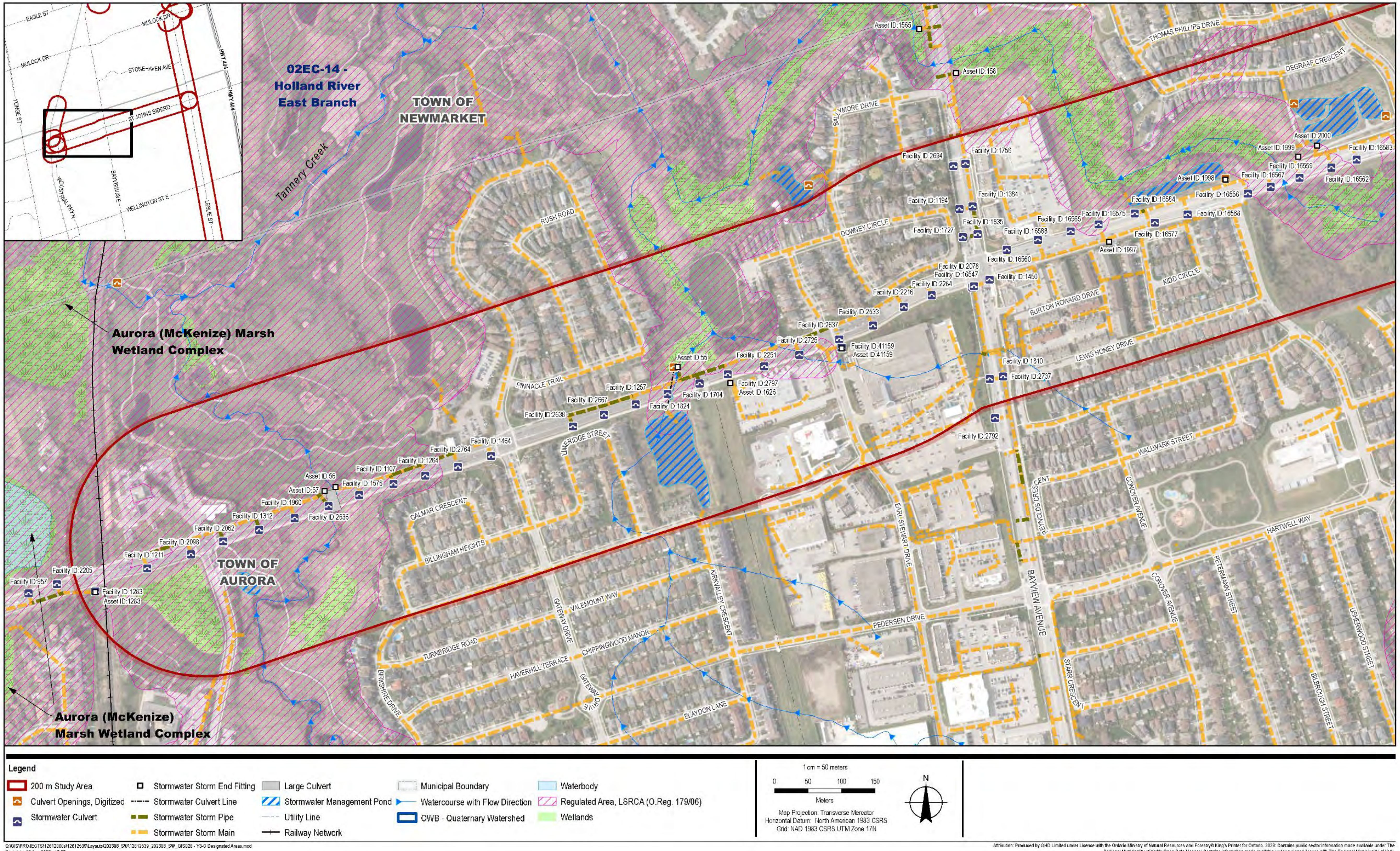

Figure 5.29 Y3-C Study Area Surface Water Map for Existing Conditions, West Section

5.12.2.2.4 Natural Heritage Characterization

The study area contains ecologically significant forests, wetlands, areas under the Greenbelt Plan and areas associated with both the Regional and Local Municipal Greenlands System regulated under the LSRCA.

The Bogart Creek wetland complex is a PSW found at the western end of the Y3-C study area. This portion of the wetland complex is a small marsh with a watercourse running through it, surrounded by a mixed forest.

Aquatic Habitat

Within the Y3-C study area, two small, warmwater tributaries of the HREB flow northwards under St. John’s Sideroad through into Hamilton Park, where they form a confluence. That watercourse continues to flow northwards before meeting another tributary and flowing out of the north side of the study area. Sinuous flow continues northwest through a naturalized area and golf course for approximately 580 m before draining into the HREB. Surrounding land use for this warmwater stream network within the study area is primarily residential on the north side of St. John’s Sideroad, while the majority is commercial on the south side, along with a stormwater management (SWM) pond settled within a hedgerow where one of the watercourses originates from. On the north side of St. John’s Sideroad, the immediate vicinity of the watercourse is mostly naturalized as it flows through Hamilton Park. The riparian buffer for the watercourses is thin yet dense with tall grasses, sedges and some deciduous trees that obscure the stream channel with overhead cover. Beyond the thin riparian buffer, the vegetation mostly consists of mowed lawn. At the northern limits of the study area, the stream channel becomes more sinuous, and the riparian characteristics change as the watercourse flows into a deciduous forest. Based on the anticipated fish community, this warmwater stream network supports mostly bait/forage fish, with some coldwater sportfish likely present within the heavily shaded portions of the stream on the north side of the study area.

Approximately 80 m west of Mavrinac Boulevard at St. John’s Sideroad, an unnamed watercourse flows sinuously eastwards for approximately 550 m before meandering northwards and flowing northeast for another approximate 450 m exiting the study area. Surrounding land use around this unnamed watercourse is mostly residential, with some commercial; however, the stream itself is confined within a large natural area. This natural area is a shallow valley consisting of a mosaic of both marshland and swamp wetlands along the stream channel. This provides the watercourse with a riparian buffer consisting of tall sedges providing streambank cover and grasses along the streambanks. Tall deciduous and some coniferous trees grow on the outer limits of the streamside wetlands that provide the stream with overhead shading and some woody debris found within the stream channel. This unnamed watercourse is classified as warmwater. Based on the anticipated fish community, this stream supports bait/forage fish and some coldwater sportfish likely found within the heavily shaded areas of the stream.

At the eastern end of the Y3-C study area, 150 m south of the Leslie Street and St. John’s Sideroad intersection, a coldwater stream flows westerly under Leslie Street and continues to flow for approximately 400 m before meandering northwards, passing under St. John’s Sideroad, flowing northwest for another approximate 300 m then exiting the study area. Surrounding land use for this watercourse is residential, with much of the area also being naturalized. The stream is confined within a shallow valley, passing through the Bogart Creek Wetland Complex. Riparian vegetation consists mostly of mixed forest, with an additional dense layer of sedges providing direct overhead cover for the stream, along with some more open grassy areas near the road crossings. Based on the anticipated fish community, this unnamed watercourse supports bait/forage fish, along with coldwater sportfish. No redside dace have been recorded within this study area.

Terrestrial Habitat

The lands within the study area consist mainly of urban residential and commercial; however, some deciduous, mixed and coniferous forests are present in varying stages of maturity. The landscape is mostly flat, with some lower topographies associated with watercourses and unevaluated and evaluated wetland features.

All natural and cultural communities present within the study area are considered common in the province.

Significant Wildlife Habitat

Potential Candidate SWH for Region 6E as defined by MNRF has been identified in several natural areas within the study area. The greatest concentration of these potentials is likely to be found in wetland and woodland habitats associated with the PSWs, Greenlands System and ESAs. A screening and analysis of all ELC communities was completed in the study area for Seasonal Concentration Areas of Animals, Rare Vegetation Communities or Specialized Habitat for Wildlife, Habitat for Species of Conservation Concern and Animal Movement Corridors.

5.12.2.2.5 Areas of Potential Environmental Concern

A review of information from the Environmental Risk Information Services database was completed for properties located within the study area. The review was completed on May 26, 2023, to visually confirm the current land use and associated potential for containing subsurface environmental contamination. This “windshield-level” survey showed that:

– Various residential and commercial properties are present along the majority of the study area.
– Some agricultural and Industrial land use is present within the study area.

No areas at-risk of existing contamination were identified for this study area.

5.12.3 Conceptual Design

Conceptual design for this forcemain was based generally on flow rates and design criteria, as described in Chapter 3.

Table 5.43 summarizes the General characteristics and features that will be present from initial construction through to final configuration.

Refer to Appendix B, Sheets 16 to 17, for the conceptual design drawings relevant to this project.

5.12.3.1 Design Basis

Table 5.43 Staged Sewage Pumping Station Conceptual Design Characteristics for Y3-C Aurora East SPS Forcemain

Design aspect	2031	2041	2051	Comments
Modelled peak flow (L/s)	1700 @ 39 m TDH	2500 @ 42 m TDH	1400 @ 36 m TDH	Station total flow rate target under peak event conditions.
Forcemains in service	1	2	1	Forcemain size has been selected based on a single forcemain conveying 70% of the ultimate peak flow of the station.
Forcemain velocity at peak flow	1.96 m/s	1.44 m/s	1.61 m/s	

For design basis specifics relevant to Y3-C, refer to Table 5.44.

Table 5.44 Design Basis for the Development of Y3-C Aurora East SPS Forcemain

Design basis	Assumptions
Study area	200 m area along infrastructure alignment
Study area boundaries	St. John's Sideroad, bounded by Aurora SPS to the west and Leslie Street to the east
Nominal diameter	1050 mm
Sewer type	Forcemain
Upstream connection point	Aurora SPS
Downstream connection point	Leslie Street and St. John's Sideroad
Design criteria	Based on York Region Design Guidelines (2021), including: – Pipe size and material – Hydraulic design – Air management – Method of construction – Major utility crossings – End connection points Note: If the final alignment resulting from detailed design coincides with wellhead protection areas, Source Water Protection requirements will be implemented, including additional standards of construction, material and joint selection and pressure testing.
Method of construction	Tunnelling within ROW
Land use	Mixture of residential and commercial land uses
Modelled peak flow	Refer to Table 5.43
Major infrastructure considerations	– Structural culvert at 3+180 – Hydro corridor
Environmental feature considerations	– Wetlands – Several wooded areas

5.12.3.2 Description of Design

The proposed twinned forcemains will be approximately 2,600 m in length each. The lines will run parallel from the Y3-B Aurora East SPS easterly along St. John's Sideroad, approximately 2.6 km, to a discharge point at approximately the southwest corner of Leslie Street and St. Johns Sideroad.

At this intersection, wastewater forcemains from the north (Mulock SPS) also empty into the Leslie Street Trunk Sewer.

This alignment utilizes existing corridors and minimizes property requirements to be associated with temporary compound locations. This alignment will require confirmation for conflict with existing major infrastructure.

Existing grades along the proposed alignment are generally consistent between 251 and 281m AMSL. Preliminary profile drawings suggest the forcemains will be installed at a depth of between 4 m and 18 m below existing grade. Effort is made to have a gradual upward alignment, meaning the need for intermediate air release and drainage chambers is minimized. This is generally considered an ideal vertical alignment for a forcemain.

Table 5.45 summarizes the general characteristics and features that will be present from initial construction through to final configuration.

Table 5.45 General Sewage Pumping Station Conceptual Design Characteristics for Y3-C Aurora East SPS Forcemain

Design aspect	Value	Comments
Number of forcemains	2	Twin forcemains sized at 70% of peak flow
Diameter	2 @ 1050 mm	3000 mm diameter tunnel with twin 1,050 mm forcemains
Material of construction	CPP	Concrete pressure pipe
Roughness	C= 100 to 140	Range to create envelope of possible operating conditions
Elevations		
Starting invert (m)	234.68	
Discharge invert (m)	269.00	
High point invert (m)	269.00	
Static head (m)	34.32	Static head of forcemain only, excluding pump station piping
Chambers		
Air release points	None required	
Air management	At forcemain discharge chamber	Where water surface interacts with air (i.e., air release chambers if required, or discharge locations)
Valve chamber(s) and access points	At each shaft location	Dictated by construction method, determined during detailed design

5.12.3.3 Construction Methods

Due to the significant depths of the forcemains, tunnelling and/or microtunnelling are proposed for construction of the project. Opencut construction is typically not economical for sewer depths greater than 6 to 8 m. The soil cover along the forcemains varies between 4 m and 18 m.

5.12.3.3.1 Tunnel Construction

Tunnelled installation using EPBTBMs and SPBTBMs also falls within the size range of this sewer if proposing an oversized casing (~3000 mm i.d.) inside of which a regular, non-jacking carrier pipe (in the case of this project, there will be two 1050 mm i.d. carrier pipes) can be installed. Further design development, including completion of geotechnical and hydrogeological investigation will assist in shortlisting the types of TBMs and tunnel lining methodologies that might be adopted for the tunnelled sections. In general, MTBMs and EPBTBMs have performed well in the difficult water bearing and boulder laden glacial deposits around the GTA and on some projects the selection of construction approach is left to the contractor, subject to certain basic methodology requirements and capabilities being satisfied.

There are three categories of TBMs that are potentially suitable for dealing with the anticipated ground conditions, which are described as follows:

Slurry Pressure Balance Tunnel Boring Machine (SPBTBM)

A closed face machine where pressurized slurry is used to counteract soil and groundwater pressures acting at the face of the machine. This type of machine is typically used in granular ground deposits below the water table but may also be used in more competent clay and till materials. The minimum size of these machines is typically 2500 mm i.d. and they can be configured for installation of jacking pipe or precast concrete tunnel linings (PCTL).

Slurry machines use pressurized slurry that is circulated in the mucking chamber behind the cutter head, via slurry supply and return lines, to balance soil and hydrostatic pressures. The slurry supply and return lines run the full length of the tunnel and are extended as the tunnel advances, with the return line being used to remove the spoil (excavated material, suspended in slurry) from the tunnel. This spoil is then discharged to a surface separation unit comprising a system of screens, cyclones and centrifuges that separate the excavated material from the slurry. The treated slurry is then recycled back through the tunnel for further advancement of the tunnel, while the spoil is collected in a pile for removal from site.

The cutterheads of the SPBTBM can be configured to deal with boulders to that will be encountered in the glacial soils along the route, Cutter tools are typically rear loading and permit replacement of worn cutters from behind the cutterhead. To manage the risk of major stoppages due to boulder obstructions, a trailing airlock can be used with the SPBTBM. The airlock permits pressurisation of the mucking chamber and tunnel face and permits workers to access the chamber for manual removal of boulders and cutterhead repairs.

Microtunnelling Boring Machines (MTBM)

Most MTBMs employ the slurry pressure balance principle in combination with pipe jacking for pipe installation as described above, although the machines are operated remotely from the surface, and workers do not enter the tunnel for production operations except for TBM maintenance and survey, making it a safer method with lower construction crew requirements. MTBMs are sized to install pipes ranging from 0.5 to 3.4 m i.d. For larger diameter pipe sizes (>1.8 m i.d.), tunnel drive lengths of greater than 1 km, with minimum horizontal curve radius of approximately 500 m, are being achieved nowadays.

Microtunnel drives close to, and above 1000 m are becoming increasingly common with industry innovation and compounding experience. Below are some recent examples:

– Hunua 4 Section 11, Watermain project, Auckland: 1296 m drive for 3000 mm i.d., completed in 2020.
– YDSS Forcemain Twinning Project, Newmarket, Ontario, Canada: 1132 m drive for 1800 mm i.d., completed in 2020.
– Raw Water Intake, Painesville, Ohio: 1203 m drive for 1520 mm i.d., completed in 2019.
– Sea outfall, Sur de Texas-Tuxpan gas pipeline, Altamira, Mexico: 2246 m drive for 3200 mm i.d. in 2019.
– West Cumbria Water Supplies Project for United Utilities, United Kingdom: 1241 m drive for 2280 mm i.d., completed in 2018.
– Kingsbury Run Culvert Repair project for the Northeast Ohio Regional Sewer District (NEORSD), Cleveland, Ohio: 830 m curved drive for 1520 mm i.d., completed in 2017.

Typical drive lengths can vary from 200 m to over 1000 m, with construction being more economical the longer the drive. Constructible length of drive is typically related to the size of the tunnel, with larger MTBMs able to achieve longer drives than smaller diameter machines.

One key risk with microtunnelling and pipe installation is that pipes can be damaged by the action of hard boulders and cobbles that cause significant wear to the pipe exterior as they are jacked through the ground. This risk can be mitigated by good bentonite practise, including employing the use of 'automatic bentoniting' system and appropriate slurry mixture design and pressure.

For larger MTBMs, an airlock can be installed in the machine to allow worker access to the machine face if repairs or maintenance is required. Such airlocks work in a similar fashion to that described for SPBTBM above.

Earth Pressure Balance Tunnel Boring Machine (EPBTBM)

EPBTBMs are most commonly used in fine granular soils below the water table, although they have also been used in sands and gravels and for excavating soft rock. A precast concrete segmental lining is commonly installed behind these closed-face machines as the tunnel advances, although they can also be configured for installing pipe. The machines use an auger screw that penetrates a sealed bulkhead immediately behind the EPBTBM cutterhead to permit controlled removal of the spoil at the tunnel face. A balancing pressure is maintained at the tunnel face via simultaneous slow rotation of the auger (for spoil removal) and forward propulsion of the EPBTBM. Spoil is typically removed using a conveyor belt immediately behind the auger screw and a line of rail-mounted muck cars travelling back and forth between the launch shaft and the EPBTBM. A crane on the surface deposits the excavated material from the muck cars into a spoil pile for removal from the project site. Trailing airlocks can also be used with EPBTBMs so that cutterheads can be repaired and boulder obstructions can be removed.

One key concern with trenchless or tunnelled excavations, regarding selected methodologies, relates to any sensitive infrastructure along or crossing the tunnel alignment. In the case of Y3-C, there is one structural culvert located at sta. 3+180, under which the sewer will pass. As all structural culverts and bridge structures are considered critical infrastructure, it will automatically be considered for construction impact assessment, which involves an analytical review of ground movement induced structural deformations by the tunnelling and nearby shafts excavation works.

Further design development, including completion of geotechnical and hydrogeological investigation will assist in shortlisting the types of TBMs and tunnel lining methodologies that might be adopted for the tunnelled sections. In general, MTBMs and EPBTBMs have performed well in the difficult water bearing and boulder laden glacial deposits around the GTA and on some projects the selection of construction approach is left to the contractor, subject to certain basic methodology requirements and capabilities being satisfied.

5.12.3.3.2 Shaft Construction

Shafts are required for launch of TBMs, servicing tunnelling operations, and TBM retrieval and are commonly used to house maintenance holes, access chambers and other permanent facilities.

From a tunnel construction perspective, the required shaft dimensions, particularly shape and internal diameter, are a function of the following:

- Length of tunnel segments (pipe or PCTL)
- Tunnel diameter
- Tunnelling machine dimensions, particularly length
- Thrust wall design
- Jacking rig size
- Tunnel eye sealing ring
- Guide rail systems.

The shaft details proposed on the concept alignment for the Y3-C forcemain are as follows. Methodologies for shaft excavation and support are commonly classified as sealed or unsealed, depending on the degree of leakage into the shaft and impacts on the surrounding water table that occur during construction. As highlighted previously, it is expected that the shafts will be constructed in a variety of soft ground conditions, largely below the water table. Both shaft classifications are further described in the sections below.

Unsealed Shafts

Unsealed shafts are typically specified where ground conditions are stable, where there are no restrictions on dewatering to permit lowering the surrounding water table, or where conditions are dry, and dewatering is not required for shaft construction). Common methods are described below.

Steel liner plate

Steel liner plates provide a relatively light-weight, easy-to-handle, safe support for soft ground tunnelling because the ground that supplies the loading also supplies the resistance to the load. The liner plate assembly simply distributes and transmits the load to the surrounding earth.

Driven sheet pile

Sheet pile walls are used as an earth retention system in soils that allow driving from the surface to bottom of shaft. They do not work well in soil conditions with boulders or large obstructions. Sheet piles are prefabricated steel sheet sections with interlocking edges. As the sheets are installed, they form a continuous barrier in the ground. The sheets are typically driven with vibratory hammers or drop hammers. More recently, this type of construction can also be sealed but requires specialty sealants to be applied at joints, which increase construction schedule, cost and failure modes.

Soldier piles with timber laggings

Soldier piles are steel H piles that are vertically driven or drilled into the earth at regular intervals prior to excavation. As excavation progresses in stages, horizontal lagging in the form of timber is added behind the flanges to create the wall structure with connecting joints.

Sealed Shafts

Sealed shafts are typically specified where unstable ground conditions exist or where there are restrictions on dewatering to lower the surrounding water table. Sealed shafts tend to be more expensive than unsealed shafts, although they have become almost mandatory in many Canadian jurisdictions where there are strict environmental requirements to minimize groundwater lowering and effects on adjacent water courses as well as infrastructure. Common sealed shaft methodologies include:

Secant pile walls

Secant pile shafts utilize bored piling methods (incorporating use of temporary steel casings driven, or vibrated into place, in advance of pile excavation to prevent ground collapse) to create a vertical perimeter of interlocking poured concrete cylindrical piles. The overlapping of piles creates a waterproof liner and supporting wall. It cannot be used as a final structure and will require a permanent structure such as a manhole chamber to be installed within the shaft.

Concrete sinking caissons

The method involves sinking the shaft in several lifts by building a circular (or oval) shaft structure on the surface and placing kentledge blocks (weights) or rams on top of it. Many contractors assist the sinking operation by lubricating the annular gap between the outer walls and surrounding ground. A clamshell grab (granular soils) or mini excavator (competent soils such as clays or rock) is then used for shaft excavation, and the shaft structure slowly sinks to fill the excavated void. The shaft structure is typically constructed using precast concrete segments or cast-in-place reinforced concrete. Once the shaft has been sunk to the desired formation elevation, a mass concrete base plug is placed using a tremie (underwater) concreting, if the shaft is in a flooded condition. A major advantage of this method is that the shaft wall can be used as future permanent structure for maintenance.

Slurry (diaphragm) walls

To commence excavation, guide walls are installed around the desired shaft location. These guide walls act as a guide for installation of the slurry walls. A trench is then excavated between the guide walls, typically several metres long and 1 to 1.5 metres wide and extending to the required depth. A bentonite slurry mix is pumped into the trench as it is excavated to support the surrounding soil. The slurry is composed of water, bentonite clay and other additives to achieve the desired properties, acting as a temporary support system to prevent collapse. Once the trench reaches the desired depth, steel cages or vertical steel sections are inserted for reinforcement, enhancing the wall's load-bearing capacity. As the concrete is pumped into position, the slurry is displaced to the surface where it can be collected, treated and used for subsequent wall construction. The slurry wall shaft construction method is highly advantageous for constructing deep excavations in urban environments.

Pending geotechnical and hydrogeological field investigation and laboratory testing results along the sewer alignment and at shaft locations, a preferred shaft construction methodology cannot be selected. The appropriate methods will be assessed and compared in a future phase of design.

5.12.3.4 Property Requirements

Permanent property requirements will depend on the final location of the new trunk sewer and Aurora East SPS. Property easements may be required for permanent access to maintenance holes depending on the final location of the infrastructure. Exact details on shaft sizing, location and property easement requirements will be confirmed during detailed design.

Temporary and permanent property easements may be required for construction and operation of the trunk sewer. Permanent property requirements will depend on the final location of the shafts, which are expected to contain a manhole structure that must be accessible by York Region staff for sewer maintenance purposes. Easements may be required for permanent access to the maintenance holes.

The proposed property locations and requirements for construction of the shafts are conceptual only. Details related to the number of shafts, shaft sizing, location and property easement requirements will be confirmed during detailed design.

5.12.4 Environmental and Community Impacts and Mitigation

Desktop studies were done to determine the possible extent of these impacts and to propose mitigation measures that would reduce the likelihood and the consequences should they occur. The major impacts and associated mitigation approaches are described in this section.

Because the current designs are only at the conceptual level, potential impacts and mitigation measures could change during design development, depending on:

- The ability to co-locate the proposed design with other planned infrastructure to minimize community effects, to be investigated after field investigations are completed. This change will depend on the number and scale of other planned infrastructure (e.g., utilities, transportation) in the ROW or area.
- Confirmation of available property for temporary and permanent use. The extent of temporary easements or acquired private property, as well as the construction schedule may dictate future design changes or mitigation measures.

The assessment criteria and indicators are provided in Table 5.46, Table 5.47 and Table 5.48, corresponding to each of the environments (social and built, natural, cultural and traffic impacts) together with a potential effects assessment and identification of avoidance, mitigation and compensation measures for the project.

Table 5.46 Y3-C Aurora East SPS Forcemain Social and Built Environment Effects and Mitigation

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Social and built environment				
SB-1	Effect on existing views	– Predicted changes in views from residences in the surrounding area	– No change in existing views from residences in the surrounding area.	– No avoidance, mitigation, or compensation measures required.
SB-2	Effect on existing residences, businesses, and/or community, institutional and recreational facilities	– Extent of displacement of residences, businesses and other facilities – Extent of temporary or permanent disruption to residences, businesses and other facilities in proximity to construction compounds/permanent installations	– No displacement of residences, businesses, or community, institutional and recreational facilities is anticipated. – Disruption to residences, businesses, and community, institutional and recreational facilities in proximity to construction compounds/permanent installations.	– No avoidance, mitigation, or compensation measures are anticipated. However, if in fact displacement is required then York Region would provide market value compensation. – Apply standard construction-related mitigation measures to minimize the disruption effects.
Traffic and transportation				
TT-1	Effect on traffic	– Extent of disruption to traffic flows – Proximity to congested traffic zones	– Traffic disruption at construction compounds, compound staging may extend into the travelled portion of the ROW. – Traffic movement in to and out of Construction compound sites will impact pedestrian, cycling and traffic flow on St. John's Sideroad. – Impacts to public transit involving potential rerouting of buses and/or relocation of stops. – Coordination of alternate routing for emergency service vehicles, if needed.	– Where possible, maintain one lane in each direction. This could be achieved through flagging, temporary signals or temporary road widening. – Pedestrian movement should be maintained during construction, with marked pedestrian detours as applicable. – Consider special traffic arrangements for peak hours should be considered in traffic flow directions in the morning and afternoon. – Pay duty police officers may be required to direct traffic. – Make special provisions for emergency service vehicle access. – Make special provisions for pedestrian traffic and safety, including signals, detours and winter maintenance. If feasible, move construction traffic to sideroads. – Access to private entrances to be maintained, or alternative access solution provided.
Utilities				
U-1	Conflict with buried utilities	– Sewer or shaft is in direct conflict or falls within clearance limits of nearby utilities	– New construction impacts existing utilities and requires design coordination with utility owners which increases project cost and schedule.	– Review historic and as-built documents for utility data. – Complete a SUE investigation to identify high-risk utilities, including large and/or critical service utilities (e.g., large watermains and all gas mains). – If a conflict occurred with a proposed sewer tunnel, construction shaft or overall work compound location following receipt of utility information, consider temporary or permanent relocation of utilities safely around or through the work area. Depending on the utility, it may be possible to support the utility above an open cut excavation to be reburied. Modifications of the alignment and shaft locations may also be proposed during design development to mitigate utility conflicts.
U-2	Conflict with surface or overhead utilities	– Excavation of shaft is proposed in location of surface infrastructure. – Shaft working compound equipment, including cranes will require working directly under overhead utilities or within the hydro wire exclusion zone.	– Overhead infrastructure such as electrical or communications cabling is mounted on utility poles between 5 and 12 metres above the surface. Depending on the required crane size and operating radius to construct the shaft and lower the TBM, equipment extents may fall within hydro line exclusion zone, or hit overhead wires causing worker harm or death.	– Working compounds will be designed to allow appropriate and safe movement of workers and equipment around the site, away from live overhead wires or surface utility boxes, based on known utility information and topographic surveys. – If a conflict occurred with a proposed sewer tunnel, construction shaft or overall work compound location, following receipt of utility information, modifications of the alignment and shaft locations may be proposed during design development; the utilities would need to be temporarily or permanently relocated safely around or through the work area.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
U-3	Damage and/or Deformation to surface and buried utilities	– Soil movement under or next to the utility from tunnel or shaft/open cut construction	– Ground heave/settlement/horizontal shift along tunnel ahead of and along excavated alignment, and around shafts and open cut excavations during and post-excavation. This information can be obtained from nearby geotechnical instrumentation. – Deformation or damage to nearby surface or buried utilities as a result of soil movement, which may require rehabilitation or repair (e.g., crack formation, angular rotation, strain, pipe joint rotation or pull out).	– For utilities within tunnel ZOI: Select a tunnel excavation method capable of limiting volume losses at the cutting face (limit overcutting of excavation) to limit ground losses. – For utilities near shaft/open cut ZOI: Select a shaft or open cut construction method and SOE appropriate with depth, size and geotechnical and hydrogeological conditions at shaft location. – Analytically assess nearby utilities and structures and propose mitigation methods such relocation of utilities, or for deep utilities, relocation of the sewer horizon. Should neither of these options be applicable, then investigate ground improvement in proximity of utilities to limit ground movement or investigate modification of the sewer and/or open cut design or construction methodology.
Noise and vibration				
N-1	Operation noise	– Complaints from residents within study area	– Noise disruptions to private residents and commercial areas post-construction, near manholes and other surface connections, SPS locations.	– Any permanent facility, such as supporting air management facilities, will require an ECA application under Section 9 of the Environmental Protection Act. – Investigate degree of risk and impact in further detail.
N-2	Construction noise	– Complaints from residents within study area	– Noise disruptions to private residents and commercial areas during construction, near construction compounds.	– Propose construction noise monitoring per MECP NPC-115 Construction Equipment requirements. – Consider completing noise monitoring for the duration of the construction and notify the contractor of any exceedances so that corrective action/contingency actions can be implemented. – Use vehicles and equipment (cranes and excavators) with efficient muffling devices or construct enclosures. – Limit truck movements to comply with noise by-laws for 24/7 construction operations.
V-1	Construction vibration	– Complaints from residents within study area	– Disruptions to private residents and commercial areas during construction, near construction compounds.	– Propose appropriate construction vibration benchmarks within the tender documents. – Consider pre- and post-construction condition photos.
Air management				
O-1	Operation odour at existing or proposed sewer connection	– Odour near surface connections	– There is potential for odour release due to turbulence at the connection of the proposed sewer to existing sewers	– Consider implementation of ventilation design systems with odour control.
O-2	Construction odour	– Complaints are received from residents within the study area	– During live connection of infrastructure, there is the potential for odour release.	– Advance notification to residents, advising them of what work is being completed and the duration of the work.
A-1	Construction dust at sewer construction locations	– Fugitive dust is generated – Air quality is poor	– Fugitive dust generation during construction of gravity sewer, interconnecting shaft/chambers, including the connection points.	– Develop a Dust Best Management Practices Plan to be included in the project Construction Management Plan. – Mitigation should be aimed at minimizing emissions of particulate matter and exposure to particulate matter during the construction phase of the project.
A-2	Construction dust at air management infrastructure	– Fugitive dust is generated – Air quality is poor	– Fugitive dust generation during construction of the potential air management infrastructure.	– Develop a Dust Best Management Practices Plan to be included in the project Construction Management Plan. – Mitigation should be aimed at minimizing emissions of particulate matter and exposure to particulate matter during the construction phase of the project.

Table 5.47 Y3-C Aurora East SPS Forcemain Natural Environment Effects and Mitigation

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Hydrogeology				
Structure Y3-C west of Bayview Avenue				
N-1	Effect on groundwater quantity	– Temporary and/or long-term change in groundwater quantity	– Potential temporary change to groundwater quantity. Construction anticipated to intersect low permeability till aquitard that is underlying shallow aquifer. Temporary water takings may be required to facilitate construction. More information needed to evaluate geology along specific alignments at proposed depths. – No long-term change to groundwater quantity is anticipated as no active or passive long-term groundwater takings related to the forcemain are anticipated. – Potential ground settlement as a result of active dewatering/depressurization. – Change in shallow groundwater flow patterns resulting from operation of sewer pipe resulting from increased I&I and/or preferential movement of groundwater within trench sediments.	– Implement construction methods that minimize dewatering requirements. – Establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water).
N-2	Effect on groundwater quality	– Temporary and/or long-term change in groundwater quality	– Potential temporary change in groundwater quality because construction may intersect aquitard soils underlying a shallow aquifer. Temporary water takings may be required to facilitate construction. – No long-term change to groundwater quality is anticipated. – Potential effects on groundwater water quality as a result of potential mobilization of contaminated water where active dewatering/depressurization is required. – Reduction in groundwater quality from spills or the mismanagement of fuel/chemical in work areas.	– Implement construction methods that minimize dewatering requirements, including sealed shafts and tunnel face stability control (e.g., Earth Pressure Balance Tunnelling Machine). – Develop and implement a spills response plan for construction to mitigate the effect of a spill should one occur. – Establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water). – During design, complete a contaminant source investigation to mitigate the risk of drawing contamination from one source to another location.
N-3	Effect on Municipal Well(s), Wellhead Protection Area (WHPA)	– Intersects WHPA-C, D. Located on a highly vulnerable aquifer	– Source Water Protection Plan, Clean Water Act (2006) sanitary sewer infrastructure WHPA-B, C, D and policy compliance evaluation. – Section along St. John Sideroad intersects WHPA-C and D and borders on WHPA-B with proximity to WHPA-A.	– Source Water Protection Plan, Clean Water Act (2006) sanitary sewer infrastructure WHPA-B, C, D and HVA policy, mitigation and monitoring evaluation. – As of January 2023, source water protection requirements under the York Region Municipal Sewage Works CLI ECA apply for any new or alterations to existing sewage works in WHPA-A or B, Vulnerability Score of 10, which applies to a portion of this alignment. These requirements include: • Design must include a Source Protection Supplementary Report that demonstrates that the proposed design recognized the significant drinking water threat and has implemented mitigation measures to protect drinking water sources. The report should identify drinking water sources, how the sewage works has met the requirements of the CWA and the ministry's design and operational requirements and how the works considered the Risk Management Measures Catalogue (e.g., monitoring, reporting requirements), as amended, to address the risks. • Designs must be accompanied with a monitoring and reporting plan. • Designs must be accompanied with a Spill Prevention and Contingency Plan, covering information requirements as per O. Reg. 224/07 to prevent, eliminate or ameliorate any adverse drinking water effects that result or may result from spills of pollutants. This includes steps taken in the event drinking water sources are contaminated for example, notifying members of the public who may be directly affected by a spill. – New and replacement sewers are to be constructed of materials and with joints that are equivalent to watermain standards of construction and are to be pressure tested in accordance with Division 441 (formerly 701) of the Ontario Provincial Standards Specification (OPSS).

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
N-4	Effect on private wells - temporary construction dewatering	– Temporary construction dewatering private well interference (quantity/quality).	– Temporary decrease in private well quantity/quality could occur during construction activities depending on the location, depth and construction, methodology and duration.	– Implement construction methods that minimize dewatering requirements, as needed. – Address construction dewatering private well interference complaints through existing York Region private well assessment and mitigation policy. – Proactively identify any high-risk wells during design and prepare site-specific preventative mitigation and corrective action plans as part of design. Corrective actions should align to York Region's private well assessment and mitigation policy.
N-5	Effect on surface water	– Temporary change in surface water quantity/quality	– Temporary change in surface water quantity/quality could occur during construction activities depending on the location, depth and construction, methodology and duration. – Section passes through two unnamed creeks that connect small surface water tributaries to the HREB. – Change in groundwater-surface water interaction (reversal of vertical hydraulic gradient) results in impact to terrestrial and aquatic habitat and associated SAR (where applicable) - reduction in baseflow. – Change in surface water temperature from groundwater taking and/or discharge to surface water features. – Changes to stream morphology resulting from the release of groundwater dewatering water. The potential reduction in baseflow due to water taking in a lower confined aquifer due to increased downward hydraulic gradients across the aquitard separating the stream and the confined aquifer. – The potential reduction in baseflow from a stream reach that intersects an aquifer in which the water taking is occurring.	– Field verification of groundwater-surface water interaction suggested for watercourses and wetlands within the study area. – Complete outlet receiver assessment(s) should temporary groundwater discharge be required to surface water. Establish pre-construction baseline surface water quality and quantity conditions and develop implementation plans for monitoring during and post-construction. – Implement/construct treatment (i.e., settlement tanks, etc.) of construction water prior to discharge to storm sewer/surface water. – Minimize construction area disturbance and duration. Implement erosion and sedimentation control measures (e.g., silt fencing, check dams, etc.). – Adhere to fish timing windows to prevent negative impacts on known sensitive fish species within the study area. – Consider completing a geomorphology study during design. – Refer to the Natural Heritage section of the table for further mitigation approaches associated with surface water impacts.
Structure Y3-C east of Bayview Avenue				
N-1	Effect on groundwater quantity	– Temporary and/or long-term change in groundwater quantity	– Minimal change to groundwater quantity because construction is expected to intersect Newmarket till (from ground surface to 188 – 236 masl). Minor temporary water takings may be required to facilitate construction. A high groundwater table is expected closer to Bayview Avenue, with increasing depth to groundwater as the section approaches Leslie Street. Perched groundwater is anticipated to be encountered. – No long-term change to groundwater quantity is anticipated, because no water takings are required during operation of the sewer. – Potential ground settlement as a result of active dewatering/depressurization. – Change in shallow groundwater flow patterns resulting from operation of sewer pipe resulting from increased I&I and/or preferential movement of groundwater within trench sediments.	– Implement construction methods that minimize dewatering requirements. – Establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water).
N-2	Effect on groundwater quality	– Temporary and/or long-term change in groundwater quality	– Temporary change in groundwater quality is minimal because construction is anticipated to mainly intersect low permeability till. – No long-term change to groundwater quality is anticipated. – Potential effects on groundwater water quality as a result of potential mobilization of contaminated water where active dewatering/depressurization is required. – Reduction in groundwater quality from spills or the mismanagement of fuel/chemical in work areas.	– Implement construction methods that minimize dewatering requirements, including sealed shafts and tunnel face stability control (e.g., Earth Pressure Balance Tunnelling Machine). – Develop and implement a spills response plan for construction to mitigate the effect of a spill should one occur. – Establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water). – During design, complete a contaminant source investigation to mitigate the risk of drawing contamination from one source to another location.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
N-3	Effect on Municipal Well(s), Wellhead Protection Area (WHPA)	– Intersects WHPA-C, D – Located on a highly vulnerable aquifer	– Source Water Protection Plan, Clean Water Act (2006) sanitary sewer infrastructure WHPA-B, C, D and policy compliance evaluation. – Section along St. John Sideroad intersects WHPA-C and D and borders on WHPA-B with proximity to WHPA-A.	– Source Water Protection Plan, Clean Water Act (2006) sanitary sewer infrastructure WHPA-B, C, D and HVA policy, mitigation and monitoring evaluation. – As of January 2023, source water protection requirements under the York Region Municipal Sewage Works CLI ECA apply for any new or alterations to existing sewage works in WHPA-A or B, Vulnerability Score of 10, which applies to a portion of this alignment. These requirements include: • Design must include a Source Protection Supplementary Report that demonstrates that the proposed design recognized the significant drinking water threat and has implemented mitigation measures to protect drinking water sources. The report should identify drinking water sources, how the sewage works has met the requirements of the CWA and the ministry's design and operational requirements and how the works considered the Risk Management Measures Catalogue (e.g., monitoring, reporting requirements), as amended, to address the risks. • Designs must be accompanied with a monitoring and reporting plan. • Designs must be accompanied with a Spill Prevention and Contingency Plan, covering information requirements as per O. Reg. 224/07 to prevent, eliminate or ameliorate any adverse drinking water effects that result or may result from spills of pollutants. This includes steps taken in the event drinking water sources are contaminated for example, notifying members of the public who may be directly affected by a spill. – New and replacement sewers are to be constructed of materials and with joints that are equivalent to watermain standards of construction and are to be pressure tested in accordance with Division 441 (formerly 701) of the Ontario Provincial Standards Specification (OPSS).
N-4	Effect on private wells - temporary construction dewatering	– Temporary construction dewatering private well interference (quantity/quality)	– Temporary decrease in private well quantity/quality not anticipated due to intersection of low permeability till. – Limited dewatering is expected during construction.	– Implement construction methods that minimize dewatering requirements, as needed. – Address construction dewatering private well interference complaints through existing York Region private well assessment and mitigation policy. – Proactively identify any high-risk wells during design and prepare site-specific preventative mitigation and corrective action plans as part of design. Corrective actions should align to York Region's private well assessment and mitigation policy.
N-5	Effect on private wells – long term	– Long term private well interference (quantity/quality)	– No long-term groundwater quantity/quality interference is anticipated as no active or passive groundwater takings related to the forcemain are anticipated.	– If needed, establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water). – Proactively identify any high-risk wells during design and prepare site-specific preventative mitigation and corrective action plans as part of design. Corrective actions should align to York Region's private well assessment and mitigation policy.
N-6	Effect on surface water	– Temporary change in surface water quantity/quality	– Temporary change in surface water quantity/quality is not anticipated based on intersection of low permeability till. – Limited dewatering is expected during construction. – Change in groundwater-surface water interaction (reversal of vertical hydraulic gradient) results in impact to terrestrial and aquatic habitat and associated SAR (where applicable) - reduction in baseflow. – Change in surface water temperature from groundwater taking and/or discharge to surface water features. – Changes to stream morphology resulting from the release of groundwater dewatering water. The potential reduction in baseflow due to water taking in a lower confined aquifer due to increased downward hydraulic gradients across the aquitard separating the stream and the confined aquifer. – The potential reduction in baseflow from a stream reach that intersects an aquifer in which the water taking is occurring.	– Field verification of groundwater-surface water interaction suggested for watercourses and wetlands within the study area. – Complete outlet receiver assessment(s) should temporary groundwater discharge be required to surface water. Establish pre-construction baseline surface water quality and quantity conditions and develop implementation plans for monitoring during and post-construction. – Implement/construct treatment (i.e., settlement tanks, etc.) of construction water prior to discharge to storm sewer/surface water. – Minimize construction area disturbance and duration. Implement erosion and sedimentation control measures (e.g., silt fencing, check dams, etc.). – Adhere to fish timing windows to prevent negative impacts on known sensitive fish species within the study area. – Consider completing a geomorphology study during design. – Refer to the Natural Heritage section of the table for further mitigation approaches associated with surface water impacts.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Geotechnical				
G-1	Effect on soil quality	– Contaminant seepage into soil during excavation of shaft	– Chemicals such as drilling fluids, lubricants, ground improvement material, or fuel from construction equipment may contaminate soil.	– Perform regular equipment checks and maintenance. – Prepare an environmental management plan prior to construction in case of contamination.
G-2	Soil movement around shafts	– Vertical or horizontal ground movement around shafts during and post excavation – Deformation or damage to nearby structures and/or utilities	– Ground heave/settlement/horizontal shift at surface around shafts. – Deformation or damage to nearby structures and utilities (e.g., crack formation, angular rotation, strain, or pipe joint rotation or pull out) that may require rehabilitation or repair.	– Select shaft or open cut construction method and SOE appropriate with depth, size and geotechnical and hydrogeological conditions at shaft or open cut locations. – Complete soil displacement analytical assessments at all shaft locations.
G-3	Soil movement along tunnel	– Vertical or horizontal ground movement along tunnel during and post excavation – Movement or damage to nearby structures and/or utilities	– Ground heave/settlement/horizontal shift along tunnel ahead of and along excavated alignment. – Deformation or damage to nearby structures and utilities (e.g., crack formation, angular rotation, strain, or pipe joint rotation or pull out) that may require rehabilitation or repair.	– Select tunnel excavation method capable of limiting volume losses at the cutting face (limit overcutting of excavation) to limit ground losses. – Complete soil displacement analytical assessments for at-risk tunnel locations, including low soil cover locations or areas where the tunnel crosses or runs parallel in close proximity to sensitive natural features, utilities and critical infrastructure such as creeks, gas main, structural culverts, bridges and rail crossings
G-4	Encounter boulders during shaft and/or tunnel excavation	– Boulders encountered during excavation of shaft and/or tunnel	– For tunnels, boulder presence and properties may require change of preferred excavation methodology (segmented tunnel vs pipe jacking) and tunnel boring machine technical specifications. – For shafts, boulder presence and properties may require change of preferred shaft SOE methodology.	– Complete appropriate geotechnical investigations with strength testing for any encountered boulders. – Prepare a geological baseline report during design development with appropriate baseline for boulder strength, sizing and anticipated encounter rates and locations. – Recommend a shaft construction SOE capable of maintaining verticality in boulder-prone soils. – Recommend appropriate technical specifications for tunnel boring machine.
G-5	Frac-out of drilling fluids along tunnel	– Drilling fluid breaches surface during tunnel excavation – Unanticipated change in drilling fluid pressure and/or volume	– Drilling fluid may breach beds of water bodies such as creeks, lakes and rivers. – Drilling fluid may breach aquifers. – Drilling fluid may cause cracking on surface infrastructure such as pavement and may require closure of traffic lanes to clean up fluid at surface.	– Select contractor with experienced MTBM or TBM operators. – Require a “frac-out contingency plan” be prepared prior to construction for cleanup of drilling fluids.
G-6	Encounter contaminated soil during shaft and/or tunnel excavation	– Soil encountered during shaft and/or tunnel excavation is tested to surpass allowable contaminant levels	– Spoil must be dispatched at an approved contaminated soil disposal site.	– Complete appropriate geotechnical investigations and contaminants testing during design development to identify confirmed contaminated soil locations or at-risk areas based on historical land use. – Identify and confirm availability of appropriate soil disposal sites based on anticipated contaminants for use during construction.
G-7	Encounter weak or incompetent soil during tunnel excavation	– Accelerated soil movement at surface and depths	– Soil heave, soil settlement or sinkhole formation at surface.	– Complete appropriate geotechnical investigations with strength testing for anticipate soils along tunnel horizon. – Prepare a geological baseline report during design development with appropriate baseline for soil properties, including stratigraphic profile inferred from borehole investigations. – Recommend appropriate preventative or compensation ground improvement for at-risk locations.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Natural heritage				
EG-1	Effect on aquatic habitat or functions	– The study area contains cold and warm water watercourses. – The study area contains wetlands. – The wetland within this study area is considered provincially significant	– Temporary or permanent loss of aquatic features or categorical loss of functions by type, including PSWs, Locally Significant Wetlands, watercourses by sensitivity type and others. – During construction water quality may be impaired due to elevated TSS in surface water runoff from study area locations which can affect aquatic species/habitats. Some concentrations above background may occur temporarily. – Potential spill hazard when refuelling equipment. – Change in surface water temperature from groundwater taking and/or discharge to surface water features	– Need to complete site investigations to evaluate potential effects on aquatic habitat function. – Implement best management practices to control surface water runoff and minimize TSS effects. – Where feasible, discharging of surface water during construction should be directed into the municipal storm sewer system to mitigate thermal impacts to watercourses. Should discharge of surface waters be directed to watercourses, additional mitigation measures would need to be adhered to (e.g., enhanced erosion and control measures). Use of erosion and sediment control measures and timing of construction to avoid spawning and egg incubation periods will reduce the potential for effect to fish and aquatic life. – Conduct equipment maintenance and refuelling at the designated and properly contained maintenance areas or at industrial garages located well away from creek banks and wetlands and outside vegetation areas. – Develop a Spills Prevention Plan.
EG-2	Effect on stream geomorphology	– Change in geomorphic form/function/stability in affected channels within the study area	– No anticipated impacts to stream geomorphology in affected channels.	– Employ erosion and sediment controls to limit deposition of construction-mobilized soils into watercourses.
EG-3	Effect on aquatic species, including SAR, species of local concern, native species and invasive species	– Aquatic species.	– Number and type of aquatic species potentially affected temporarily or permanently. – No anticipated impacts to aquatic SAR as there are no aquatic SAR identified within the study area.	– Preventing death of fish or impacts to downstream fish habitat through the use of appropriate timing windows.
EG-4	Effect on terrestrial habitat or functions	– The study area does not contain ANSIs. – The study area contains Ecologically Significant Forests. – Wildlife habitat.	– Temporary or permanent loss of natural heritage features (e.g., ESAs, ANSIs, wildlife corridors and others). – Potential effects on terrestrial habitat (e.g., direct vegetation (and wildlife habitat) loss, alteration and fragmentation) may occur from the physical footprint of the study area locations. – Project preparation, construction and operation may increase the risk of nest destruction and mortality of migratory birds.	– Site investigations to evaluate potential terrestrial habitat function/significance. – During design, prepare construction constraints with consideration of timing windows to mitigate where possible, vegetation clearing to occur outside of the migratory bird nesting season, bat maternity roosting season, turtle overwintering and amphibian breeding. – Limit the area of project footprint and limit disturbance from employees. – The presence of wildlife will be monitored and communicated to site personnel. – Vehicle use will be restricted to designated areas. – Where practical, rehabilitate habitat for plants and wildlife.
EG-5	Effect on terrestrial species, including SAR, species of local concern, native species, invasive species and area-sensitive species	– SAR have the potential to occur within the study areas, including amphibians, insects, birds, reptiles, mammals and tree species.	– Number and type of terrestrial species potentially affected temporarily or permanently. – Construction activities have the potential to disturb wildlife within adjacent natural heritage areas. – Project preparation, construction and operation may increase the risk of nest/habitat destruction and mortality of terrestrial SAR. – Project may result in wildlife-vehicle collisions and may cause injury/mortality to individual animals.	– Site investigations to evaluate potential occurrence of terrestrial SAR within the study area. – During design, prepare construction constraints with consideration of timing windows to mitigate where possible, vegetation clearing to occur outside of the migratory bird nesting season, bat maternity roosting season, turtle overwintering and amphibian breeding. – Clearly demarcate work limits at outset of construction and minimize unnecessary vegetation clearing.

Table 5.48 Y3-C Aurora East SPS Forcemain Cultural Environment Effects and Mitigation

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
CE-1	Effect on *Ontario Heritage Act* (OHA) designated properties and properties listed on municipal heritage registries	– Project components are in the vicinity of the heritage property/landscape	– Encroachment onto the property/landscape resulting in a physical impact to the potential BHRs and/or CHLs. – New structures or landscape features and/or alterations to the property/landscape that result in a physical impact to the potential BHRs and/or CHLs. – Relocation of all or part of the potential BHRs and/or CHLs. – Demolition or destruction of all or part of the potential BHRs and/or CHLs. – Vibration impacts to the potential heritage buildings identified on the property/landscape in and on adjacent properties. – Ground disturbance impacts relating to landscape features on the property/landscape in and on adjacent properties.	– Based on the potential impacts outlined in the previous column, the following mitigation options are considered alongside mitigation recommendations. – Preferred Option: • Project design avoids the property/landscape resulting in no direct or indirect impacts. This includes maintaining a sufficient buffer of at least 50 m between Project activities and the potential BHRs and/or CHLs. – Alternative Options: • If direct impacts are unavoidable the following options and mitigations should be considered: • A. Design Project to minimize encroachment on the property/landscape while avoiding all impacts to the potential BHRs and/or CHLs. • i. Consult with the Town during detailed design to determine if any approvals or permits are required as a result of physical impacts to the property/landscape. • B. If avoidance of the property/landscape or Option A are not feasible, and if a physical impact to potential BHRs and/or CHLs is unavoidable, then the following is required: • i. Consult with the Town during detailed design to determine if any approvals or permits are required as a result of physical impacts to the property/landscape. • ii. Complete a property-specific CHER/HIA prior to any alterations, including evaluation of the property against O. Reg. 9/06 and, if necessary, detailed documentation of any confirmed BHRs and/or CHLs and recommendation of specific mitigation measures for impacts to any identified heritage attributes. • iii. The CHER/HIA should also consider the compatibility of new structures or landscape features with existing heritage attributes, layouts and designs of the property/landscape.
CE-2	Effect on archeological sites	– Project components are in the vicinity of the archeological sites	– Encroachment onto the site resulting in a physical impact. – New structures or landscape features and/or alterations to the site that result in a physical impact. – Demolition or destruction of all or part of the archeological sites. – Vibration impacts to the archeological sites identified on the property/landscape. – Ground disturbance impacts to the archeological sites.	– Should impacts be proposed within the vicinity of the site, then additional assessment may be required. Depending on the location of the proposed impacts, this may be Stage 2 archaeological assessment, Stage 3 archaeological assessment, or Stage 4 avoidance and protection. Stage 3 test unit excavation must be completed across the remainder of the site as per Sections 3.2.2 and 3.2.3 of the Standards and Guidelines (CP 2011:49-53). – However, if proposed impacts will avoid the site, but construction-related activities will occur within the vicinity of the site, then the site will require Stage 4 avoidance and protection monitoring, to be conducted by a licensed consultant archaeologist. The avoidance, protection and construction monitoring requirements for construction activities would include: – Erection a temporary barrier that extends a minimum of 10 m beyond site limits. – Issuing “no go” instructions to all on-site construction crews and personnel during construction. – Depicting the 10 m protective buffer zone on all contract drawings with explicit instructions that a licensed consultant archaeologist will be present to monitor construction. – Ensuring the presence of a licensed archaeologist during construction to monitor the area to be avoided and verify the effectiveness of the avoidance strategy. – If any archaeological materials are identified during construction, then all construction activities must stop until the archaeological materials are evaluated and mitigated, if necessary, by a licensed archaeologist. – After the completion of the soil disturbing activities, having licensed archaeologist inspect the site area and prepare a report for the MCM on the effectiveness of the avoidance strategy and in ensuring that the area to be avoided remained intact.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
CE-3	Effect on registered cemeteries	– Project components are in the vicinity of registered cemeteries	– Encroachment onto the cemetery resulting in a physical impact. – New structures or landscape features and/or alterations to the cemetery that result in a physical impact. – Demolition or destruction of all or part of the cemetery. – Vibration impacts to the cemetery identified on the property/landscape. – Ground disturbance impacts to the cemetery.	– As per ASI (2021, 2022), at the demand of MCM, MTR as per Section 4.2.3 of the Standards and Guidelines must be carried out prior to any construction within the monitoring zone established around the purported location of human burials on the property. The entire monitoring zone must be assessed for the presence or absence of unmarked graves. – A Cemetery Investigation Authorization issued by the Bereavement Authority of Ontario must also be requested.

5.13 Y13-C Mulock SPS Forcemains

5.13.1 Study Area

The Y13-C Mulock SPS Forcemains will provide conveyance of flows from the Mulock SPS south along Leslie Street from Mulock Drive to St. John’s Sideroad where the forcemains will discharge into the top end of the Y1-A2 Leslie Street Trunk Sewer Phase 2. The study area is limited to the ROW between those streets, along with the short section of Mulock Drive between Leslie Street and the Bogartown curve. A study area of approximately 200 metres surrounding the centerline of the right of way was applied as shown in Figure 5.30.

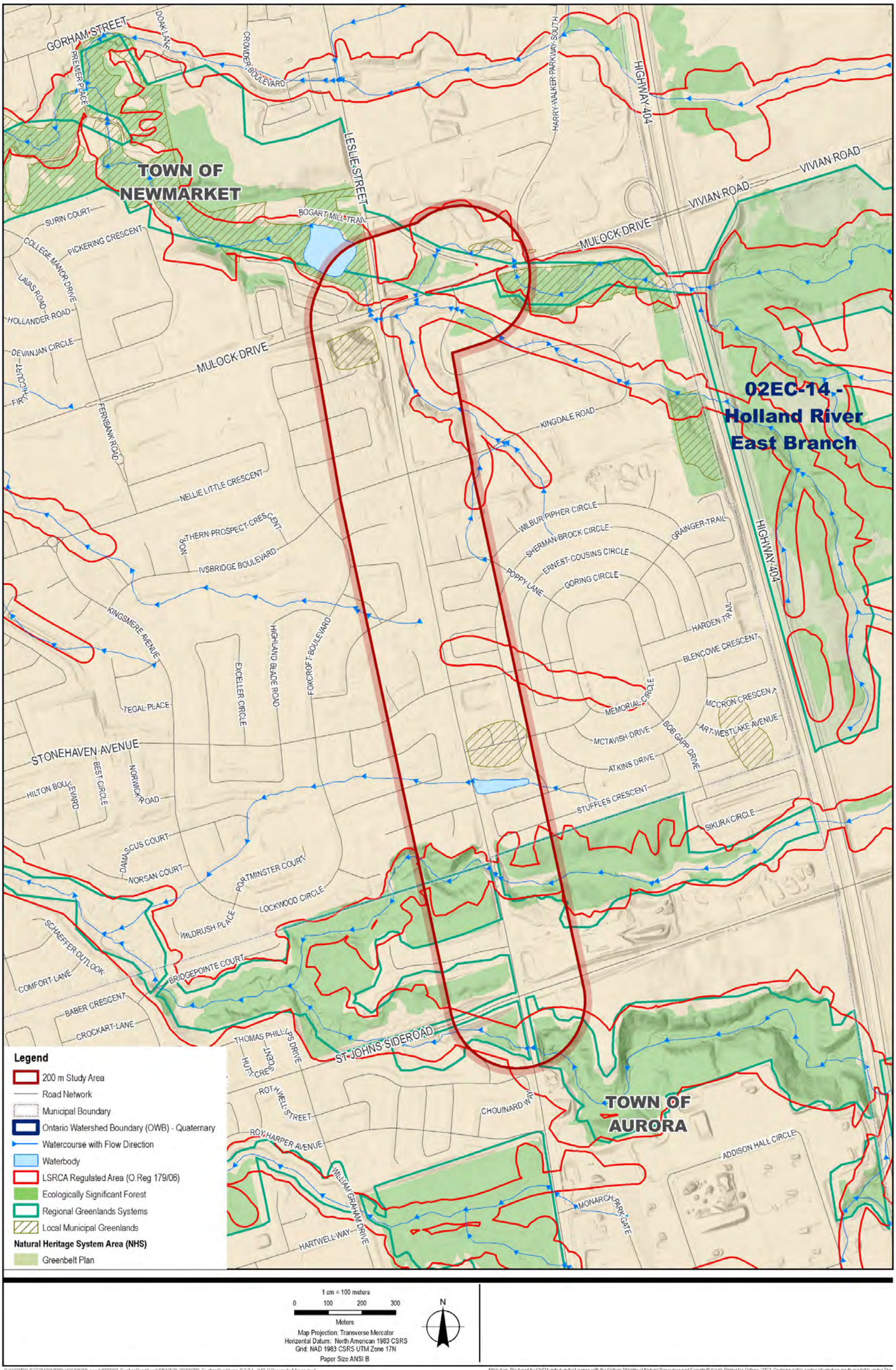

Figure 5.30 Y13-C Mulock SPS Forcemains Study Area

5.13.2 Existing Conditions

5.13.2.1 Social and Built Environment

The following sections will summarize the findings of the desktop studies completed within the study area, including planning and land use, traffic and transportation and utilities.

5.13.2.1.1 Planning Policy and Land Use

Existing Land Use

Along Mulock Drive, from Foxcroft Boulevard to Harry Walker Parkway, land uses consist of the following:

– North side:
  - Low density residential housing
  - Commercial lands (Audi Newmarket, BK Consulting, Esso, Tim Hortons and Risi Stone Inc.)
  - Institutional lands (Veterinary Emergency Services)
  - Bogart Pond.

– South side:
  - Low density residential housing.

Planning Policy

Regional

The York Region Official Plan (June 2023 Office Consolidation) designates lands within the study area northeast of the intersection of Mulock Drive and Leslie Street as Employment Area. The remainder of the study area is designated Community Area. Lands in the northeast portion of the study area are part of the Regional Greenlands System.

Local

With reference to the Newmarket Official Plan (August 2022 Office Consolidation), the study area contains the following land use designations:

– Business Park – Mixed Employment
– Residential Area
– Parks and Open Space
– Natural Heritage System.

Active Development Applications

Lands within the Y13-C study area contain several active development applications:

– Town of Newmarket - To amend the Town's Zoning By-Law as part of the Established Neighbourhoods Compatibility Study. Draft Plan of Condominium.
– 17188 Leslie Street - To facilitate a three-storey private school with daycare and associated parking lot.
– 18326 Leslie Street - To permit a temporary sales trailer.
– Newmarket – Foxcroft Boulevard. -Two applications. Proposed subdivision. Zoning by-law amendment.
– Newmarket – Kingdale Road - Two applications. Proposed subdivision. Zoning-by-law amendment.
– 16775 Leslie Street - Two applications. To facilitate the parking lot expansion of Pfaff Audi Dealership. To amend the Town's Zoning By-Law as part of the Established Neighbourhoods Compatibility Study.

5.13.2.1.2 Transportation in the Study Area

The proposed Y13-C will span Leslie Street between St. John's Sideroad to Mulock Drive where it will connect to the proposed Y13-B. Leslie Street at this location is a 60 km/h posted speed, four-lane arterial road, with dedicated on-road cycling lanes and sidewalks, as shown in Figure 5.31.

Figure 5.31 Leslie Street Looking North (1) from St. John's Sideroad and (2) Towards Mulock Drive. (Google Maps "Streetview," digital images http://maps.google.com)

The AADT along Leslie Street between St. John's Sideroad and Mulock Drive has been counted between 12,266 in the south end and 16,890 in the north end, with the highest AADT north of Birchwood Drive at 26,097, based on the latest available 2023, 2022 and 2022 data, respectively. Historical AADT data along the study area are presented in Table 5.49.

Table 5.49 Leslie Street AADT Counts Between St. John's Sideroad and Mulock Drive

Description of Road Limits	2012	2013	2014	2015	2016	2017	2018	2019	2022	2023
St John's Sideroad & State Farm Way	10,037			9543		9913		11,380		12,266
Entrance to 404 Town Centre & Wayne Drive		23,102		21,649		19,044		20,029		23,868
Birchwood Drive & Stackhouse Road/Srigley Street	21,817		21,527			21,784	24,243		26,097	
Crowder Boulevard & Gorham Street	20,400		20,144	19,883		19,940		23,756		25,598
Ivsbridge Boulevard/Kingdale Road and Mulock Drive		14,630			14,225		15,901		16,890	

There is one public transit route which runs on Leslie Street between Wellington Street East and Desjardin Way, which is YRT Route 33.

5.13.2.1.3 Utilities in the Study Area

There are several above/below grade utilities situated within the study area corridor and in the vicinity of the proposed project. These utilities may be temporarily impacted during the construction of tunnel, shaft and work compounds. Formal notification and consent would be required from the authorities responsible for these utilities prior to construction.

Buried utilities are typically located within the following limits:

- Shallow-buried electrical and communications cabling are commonly buried between 1.2 and 1.5 mbgs.
- Shallow-buried storm drains, sanitary sewers and watermains are typically buried between 1.2 and 3.5 mbgs.
- Deep-buried utilities are defined as anything buried more deeply than the depths mentioned above.
- Deep-buried utilities are defined as anything buried more deeply than the depths mentioned above.

Known municipal infrastructure that existed on York Region's GIS database has been provided within the drawing set. A detailed utility investigation program, which would include a "Level A through D" subsurface utility exploration, would be required as part of future site investigations.

Known large infrastructure within the study area include:

- A structural culvert crossing near Leslie Street and Mulock Drive intersection at sta. 4+225. The exact vertical alignment of the sewer relative to the structure is not confirmed currently, but the sewer is likely to cross above the culvert.
- Large box culvert on Leslie Street at sta. 2+550. The exact vertical alignment of the sewer relative to the structure is not confirmed currently, but the sewer is likely to cross above the culvert.

Critical infrastructure will require specific geotechnical instrumentation and monitoring requirements to receive owner approval of the design. Any construction impacts to the tracks will be assessed as part of a CIAR during design development.

5.13.2.2 Natural Environment

The following sections will summarize the findings of the desktop studies completed within the study area for geotechnical, hydrogeology, surface water, natural heritage and contamination.

5.13.2.2.1 Geotechnical

The study area Y13-C Mulock SPS Forcemains is bordered by residential/commercial properties. Most of the study area is located within the boundaries of the Town of Newmarket, with a small south portion of the study area is located within the boundaries of Town of Aurora.

Per historical boreholes (1978) advanced from about 19 m to 22 m below existing grade, 1 km east of the study area, four (4) identified near surface conditions generally comprised of clayey silt deposit (stiff to hard) overlying sand, silt and gravel till (very dense) followed by clayey silt deposit (hard). The rest of the boreholes encountered silt layer (compact relative density) overlying clayey silt deposit (very stiff to hard consistency) followed by sand, silt and gravel till (very dense).

Per historical boreholes (2012) advanced to about 2 m to 5 m below existing grade, deep earth fill (about 3.3 m) was encountered within the study area in several boreholes. As per majority of the borehole records, the near surface condition generally comprised of clayey silt till/sandy silt till or combination of both tills.

The native deposit within the study area predominantly comprised silt and clay matrix, mostly consisting of Glaciolacustrine deposits.

The bedrock consists of shale, limestone, dolostone and siltstone of the Georgian Bay Formation, Blue Mountain Formation and Billings Formation. Typically, bedrock is mapped at depths of 100 m to 158 mbgs within the study area and will not be reached during construction.

5.13.2.2.2 Hydrogeological

A hydrogeological desktop review was undertaken within the study area using information from MECP well records, the MECP Source Protection Information Atlas, the Oak Ridges Moraine database and the Ontario Geological Survey database. Available hydrogeological reports for projects within the area were also reviewed.

The study area for Y13-C Mulock SPS Forcemains is within the Schomberg Clay Plains physiographic region. The SPS forcemain upgrades are to be installed at depths up to 30 mbgs and intersect fine-grained glaciolacustrine deposits (Newmarket till aquitard). Shallow groundwater is encountered at depths between 7-23 mbgs, with perched groundwater above these elevations. Shallow groundwater generally flows towards the west to northwest along the alignment. Sections of the SPS forcemain upgrades may intersected modern alluvial deposits and stone poor, sandy silt to silty sand textured till (Inter-Newmarket sediment). The gravity sewer is not located within any source water protection wellhead protection areas.

Per historical boreholes (1978), the ground surface elevation at the boreholes varied from Elevation 275.2 m to 271.1 m and groundwater table varied from elevation 273.7 m to 270.4 m. It should be noted that the above-mentioned subsurface condition was encountered 2 km south of the study area for Y13-B and groundwater is typically found at shallow depths below the ground surface.

Per historical boreholes (2012), the groundwater table was measured at about 0.3 m below grade in one borehole, with the remaining boreholes dry upon the completion of drilling.

Multiple private wells are located along Leslie Street.

Refer to Table 5.50 regarding details on anticipated aquifers and aquitards within the study area.

Table 5.50 Aquifers and Aquitards Through the Y13-C Study Area

Aquifers and aquitards	Description	Thickness
Undifferentiated upper sediments at ground surface (Aquifer)	An unconfined aquifer consisting of discontinuous fill and unconsolidated overburden deposits.	Generally, 2 m.
Upper Newmarket till (Aquitard)	A continuous layer that acts as an aquitard to the underlying Inter-Newmarket Sediment.	Ranges between 11 to 25 m.
Inter-Newmarket sediments (Aquifer)	Regionally recognized as a highly productive confined aquifer and is laterally continuous.	Ranges between 15 to 20 m towards Mulock Drive and St. John's Sideroad and pinches out towards the centre of the alignment for Y13-C.
Lower Newmarket till (Aquitard)	A continuous layer that acts as an aquitard to the underlying Thorncliffe Formation.	Ranges between 6 to 31 m.
Thorncliffe Formation (Aquifer)	Regionally recognized as a highly productive confined aquifer and is laterally continuous.	The deposits peak in centre of alignment at 254 metres above mean sea level (mamsl) (23 to 32 mbgs).

5.13.2.2.3 Surface Water

There is one sub-watershed within the Y13-C Mulock SPS Forcemains study area, the HREB. The sewer crosses under HREB approximately 366 m north of St. John Sideroad.

Other surface features of interest include:

- Intermittent coldwater stream
- Warmwater pond
- Coldwater stream and small pond
- Bogart Creek Wetland Complex
- Bogart Creek
- Bogart Pond.

Refer to Figure 5.32 for a surface water map of existing conditions within the study area, north section.

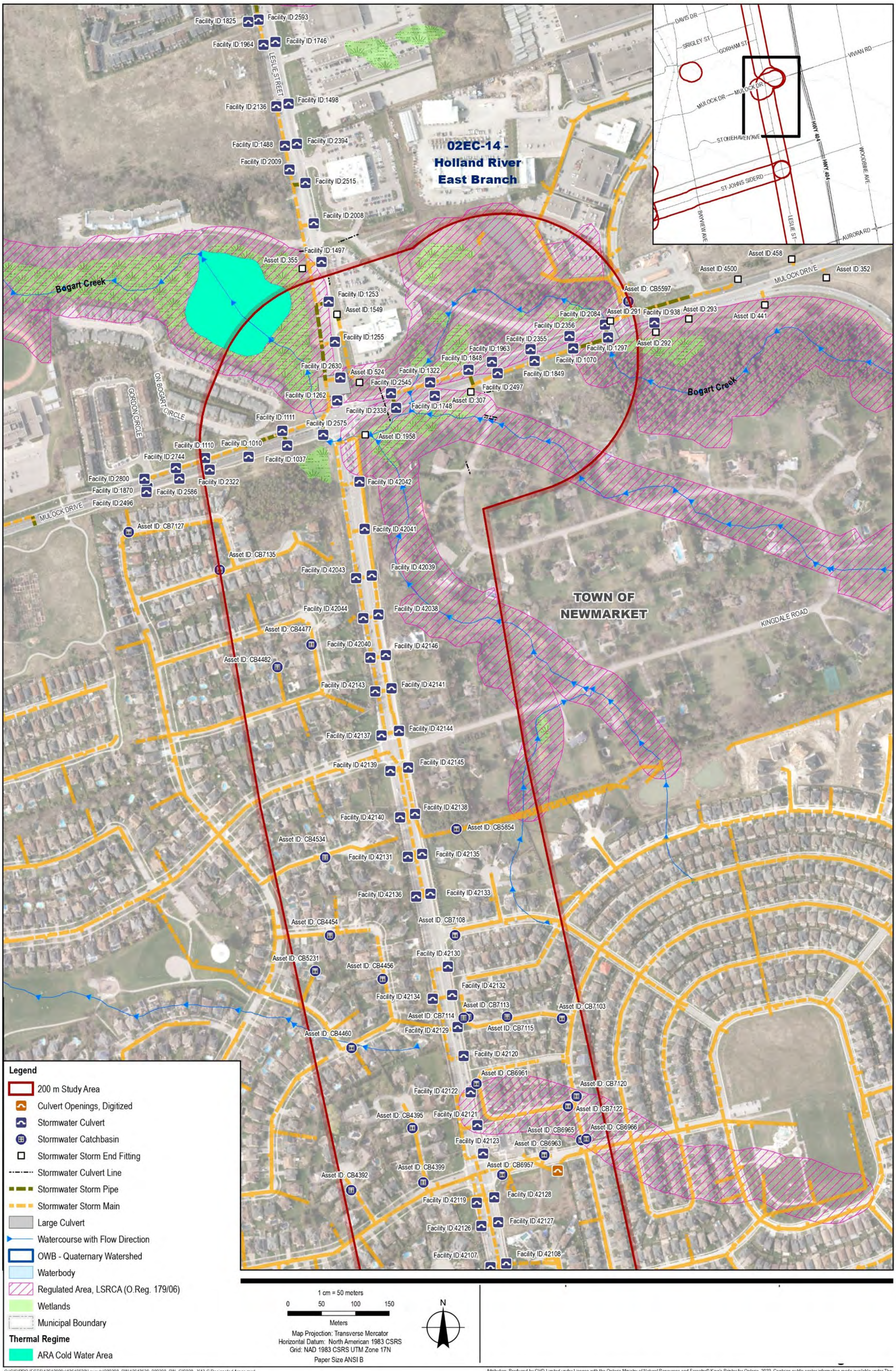

Figure 5.32 Y13-C Study Area Surface Water Map for Existing Conditions, North Section

5.13.2.2.4 Natural Heritage Characterization

The study area contains ecologically significant forests, wetlands, areas under the Greenbelt Plan and areas associated with both the Regional and Local Municipal Greenlands System regulated under the LSRCA.

The Bogart Creek wetland complex is a PSW found at the southern end of the Y13-C study area. This portion of the wetland complex is a small marsh with a watercourse running through it surrounded by a mixed forest.

Aquatic Habitat

Occupying the northern limits of the Y13-C study area is Bogart Creek. Bogart Creek flows westerly in a sinuous structure, passing under Mulock Drive three times before flowing northwards into Bogart Pond. Surrounding land use along Bogart Creek is a mix of low-density residential areas, commercial areas, and some naturalized mixed forest areas, especially around Bogart Pond. The riparian characteristics around Bogart Creek show a mix of tall grasses, dense sedges and both tall coniferous and deciduous trees providing lots of overhead cover for the stream, along with supplying a plethora of woody debris within the stream channel. Bogart Pond, with a surface area of approximately 16,700 m^2, continues this trend, being confined in a highly naturalized area occupied by a mixed forest rich with tall grasses, shrubs and the presence of a swamp that takes up a large portion of its catchment area. Both Bogart Creek and Pond are considered cold-water environments, with the additional two tributaries of Bogart Creek south of Mulock Drive in the study area also being considered coldwater. Based on the anticipated fish community, these aquatic environments support a diverse community of bait/forage fish, and both warmwater and coldwater sportfish.

An intermittent stream near Hans Plaff Crescent is found within the study area, flowing northwards. The surrounding land use around this intermittent stream is residential, with some natural areas near the low residential areas it flow northerly into. Riparian characteristics are limited, with mostly residential lawns making up the surrounding riparian area and some tree plantations found along the stream bank. This intermittent stream is considered to have a coldwater thermal regime, with no ARA data showing a fish community present.

Approximately 30 m north of Stuffles Crescent just off Leslie Street, a pond with a warmwater thermal regime can be found within the study area. The pond has an inlet on the eastern side of the study area and an outlet feature that flows westerly underneath Leslie Street. Surrounding land use around this pond is residential, with the pond itself being within a semi-naturalized area. A mixed plantation of trees can be found growing around the unnamed pond, along with *Phragmites spp. and* mowed lawn. Based on the anticipated fish community, the pond and its associated watercourses can support bait/forage fish, along with some warmwater sportfish.

Approximately 220 m north of Forest Grove Crescent, a coldwater stream flows westerly under Leslie Street. This stream is confined within a naturalized area, with the surrounding land use being primarily residential. On the eastern side of Leslie Street this stream meanders through a floodplain approximately 30 m in width, with the stream draining into a small pond. An outlet stream to this small pond can be found on its west side, where flow continues westerly. Directly streamside vegetation consists mostly of sedges and grasses, where at the edges of the floodplain exists a coniferous forest. This provides the stream with a dense riparian buffer but little vegetative overhang or cover. On the western side of Leslie Street, the stream enters a coniferous forest, with streamside vegetation now consisting mostly of deciduous trees which obscures the stream with dense vegetative cover. After entering the deciduous forest, the stream flows for another approximately 230 m before exiting the study area. Based on the anticipated fish community, this stream and small pond support bait/forage fish.

An additional stream meanders southwards where it enters the study area near the southern limits of the Y13-C south of Leslie Street and St. John's Sideroad. This coldwater stream flows westerly under Leslie Street and travels for approximately 400 m before meandering northwards under St. John's Sideroad and continues northwest for another approximate 300 m then exiting the study area. Surrounding land use for this watercourse is residential, with much of the area also being naturalized. The stream is confined within a shallow valley, passing through the Bogart Creek Wetland Complex and multiple other unassessed wetlands under the canopy of a mixed forest. Riparian vegetation consists mostly of the mixed forest, with an additional dense layer of sedges providing direct overhead cover for the stream, along with some more open grassy areas near the road crossings. Based on the anticipated fish community, this unnamed watercourse supports bait/forage fish, along with coldwater sportfish. No redside dace have been recorded within this study area.

Terrestrial Habitat

The lands within the study area consist of mainly urban residential, commercial; however, some deciduous, mixed and coniferous forests are present in varying stages of maturity. The landscape is mostly flat, with some lower topographies associated with watercourses and unevaluated and evaluated wetland features.

All natural and cultural communities present within the study area are considered common in the province.

Significant Wildlife Habitat

Potential Candidate SWH for Region 6E as defined by MNRF has been identified in several natural areas within the study area. The greatest concentration of these potentials is likely to be found in wetland and woodland habitats associated with the PSWs and ESAs. A screening and analysis of all ELC communities was completed in the study area for Seasonal Concentration Areas of Animals, Rare Vegetation Communities or Specialized Habitat for Wildlife, Habitat for Species of Conservation Concern and Animal Movement Corridors.

5.13.2.2.5 Areas of Potential Environmental Concern

A review of information from the Environmental Risk Information Services database was completed for properties located within the study area. The review was completed on May 26, 2023, to visually confirm the current land use and associated potential for containing subsurface environmental contamination. This “windshield-level” survey showed that:

– Various residential and commercial properties are present along the majority of the study area.
– Some agricultural and Industrial land use is present within the study area.

No areas at-risk of existing contamination were identified for this study area.

5.13.3 Conceptual Design

Conceptual design for this gravity sewer was based generally on flow rates and design criteria as described in Chapter 3.

Refer to Appendix B, Sheet 18 for the conceptual design drawings relevant to this project.

5.13.3.1 Design Basis

Table 5.51 summarizes the general characteristics and features that will be present from initial construction through to final configuration.

Table 5.51 Staged Sewage Pumping Station Conceptual Design Characteristics for Y13-C Mulock SPS Forcemains

Design aspect	2031	2041	2051	Comments
Modelled peak flow (L/s)	N/A	N/A	1,750 @ 36 m TDH	Station total flow rate target under peak event conditions.
Forcemains in service	N/A	N/A	1	Forcemain size has been selected based on a single forcemain conveying 70% of the ultimate peak flow of the station.
Forcemain velocity at peak flow	N/A	N/A	2.02 m/s	

For design basis specifics relevant to Y13-C, refer to Table 5.52.

Table 5.52 Design Basis for the Development of Y13-C Mulock SPS Forcemains

Design basis	Assumptions
Study area	200 m area along infrastructure alignment
Study area boundaries	St. John's Sideroad to the south, Mulock Drive to the north, Leslie Street to the west, Mulock SPS to the east
Nominal diameter	1050 mm
Sewer type	Forcemain
Upstream connection point	Mulock SPS
Downstream connection point	Leslie Street and St. John's Sideroad
Design criteria	Based on York Region Design Guidelines (2021), including: – Pipe size and material – Hydraulic design – Air management – Method of construction – Major utility crossings – End connection points
Method of construction	Tunnelling within ROW
Land use	Mixture of residential, industrial and commercial land uses
Modelled peak flow	Refer to Table 5.51
Major infrastructure considerations	Hydro corridor
Environmental feature considerations	– Bogart Pond – Wetlands – Several wooded areas

5.13.3.2 Description of Design

Conceptual design for this forcemain was based generally on flow rates and design criteria as described in Chapter 3.

The twinned forcemains will each be approximately 2,440 m in length. The forcemains will run parallel west from the Mulock SPS to the intersection of Mulock Road and Leslie Street and then continue south to St. Johns Sideroad and Leslie Street.

At this intersection, wastewater forcemains from the west and the new Y3-B Aurora East SPS also empty into the Leslie Street Trunk Sewer.

This alignment utilizes existing corridors and minimizes property requirement to be associated with temporary compound locations. This alignment will require confirmation for conflict with existing major infrastructure.

Existing grades along the proposed alignment are consistent and rise from 258 to 288 m AMSL. Preliminary profile drawings suggest the forcemains will be installed at a depth of between 4 m and 28 m below existing grade.

Table 5.53 summarizes the general characteristics and features that will be present from initial construction through to final configuration.

Table 5.53 General Sewage Pumping Station Conceptual Design Characteristics for Y13-C Mulock SPS Forcemains

Design aspect	Value	Comments
Number of forcemains	2	Twin forcemains sized at 70% of peak flow
Diameter	2 @ 1,050 mm	3000 mm diameter tunnel with twin 1,050mm forcemains
Material of construction	CPP	Concrete Pressure Pipe
Roughness	C= 100 to 140	Range to create envelope of possible operating conditions
Elevations		
Starting invert (m)	254.70	
Discharge invert (m)	269.00	
High point invert (m)	269.00	
Static head (m)	13.3	Static head of forcemain only excluding pump station piping
Chambers		
Air release points	None required	
Air management	At forcemain discharge chamber	Where water surface interacts with air (i.e., air release chambers if required, or discharge locations)
Valve chamber(s) and access points	At each shaft location	Dictated by construction method, determined during detailed design

5.13.3.3 Construction Methods

Due to the significant depths of the forcemains, tunnelling and/or microtunnelling is proposed for construction of the project. Open cut construction is typically not economic for sewer depths greater than 6 to 8 m. The soil cover varies between 4 m and 28 m.

5.13.3.3.1 Tunnel Construction

Tunnelled installation using EPBTBM and SPBTBM also fall within the size range of this sewer, if proposing an oversized casing (~3000 mm i.d.) inside of which a regular, non-jacking carrier pipe (for this project it will be two 1050 mm i.d.) can be installed. Further design development, including completion of geotechnical and hydrogeological investigation will assist in shortlisting the types of TBMs and tunnel lining methodologies that might be adopted for the tunnelled sections. In general, MTBMs and EPBTBMs have performed well in the difficult water bearing and boulder laden glacial deposits around the GTA and on some projects the selection of construction approach is left to the contractor, subject to certain basic methodology requirements and capabilities being satisfied.

There are three categories of TBMs that are potentially suitable for dealing with the anticipated ground conditions, which are described as follows:

Slurry Pressure Balance Tunnel Boring Machine (SPBTBM)

A closed face machine where pressurized slurry is used to counteract soil and groundwater pressures acting at the face of the machine. This type of machine is typically used in granular ground deposits below the water table but may also be used in more competent clay and till materials. The minimum size of these machines is typically 2500 mm i.d. and they can be configured for installation of jacking pipe or precast concrete tunnel linings (PCTL).

Slurry machines use pressurized slurry that is circulated in the mucking chamber behind the cutter head, via slurry supply and return lines, to balance soil and hydrostatic pressures. The slurry supply and return lines run the full length of the tunnel, and are extended as the tunnel advances, with the return line being used to remove the spoil (excavated material, suspended in slurry) from the tunnel. This spoil is then discharged to a surface separation unit comprising a system of screens, cyclones and centrifuges that separate the excavated material from the slurry. The treated slurry is then recycled back through the tunnel for further advancement of the tunnel, while the spoil is collected in a pile for removal from site.

The cutterheads of SPBTBM s can be configured to deal with boulders to that will be encountered in the glacial soils along the route, Cutter tools are typically rear loading and permit replacement of worn cutters from behind the cutterhead. To manage the risk of major stoppages due to boulder obstructions, a trailing airlock can be used with the SPBTBM. The airlock permits pressurisation of the mucking chamber and tunnel face and permits workers to access the chamber for manual removal of boulders and cutterhead repairs.

Microtunnelling Boring Machines (MTBM)

Most MTBMs employ the slurry pressure balance principle in combination with pipe jacking for pipe installation as described above, although the machines are operated remotely from the surface and workers do not enter the tunnel. For production operations except for TBM maintenance and survey, making it a safer method with lower construction crew requirements. MTBMs are sized to install pipes ranging from 0.5 to 3.4 m i.d. For larger diameter pipe sizes (> 1.8 m i.d.) tunnel drives lengths of greater than 1 km, with minimum horizontal curve radius of approximately 500 m, are being achieved nowadays.

Microtunnel drives close to, and above 1000 m are becoming increasingly common with industry innovation and compounding experience. Below are some recent examples:

- Hunua 4 Section 11, Watermain project, Auckland: 1296 m drive for 3000 mm i.d., completed in 2020.
- YDSS Forcemain Twinning Project, Newmarket, Ontario, Canada: 1132 m drive for 1800 mm i.d., completed in 2020.
- Raw Water Intake, Painesville, Ohio: 1203 m drive for 1520 mm i.d., completed in 2019.
- Sea outfall, Sur de Texas-Tuxpan gas pipeline, Altamira, Mexico: 2246 m drive for 3200 mm i.d. in 2019.
- West Cumbria Water Supplies Project for United Utilities, United Kingdom: 1241 m drive for 2280 mm i.d., completed in 2018.
- Kingsbury Run Culvert Repair project for the Northeast Ohio Regional Sewer District (NEORSD), Cleveland, Ohio: 830 m curved drive for 1520 mm i.d., completed in 2017.

Typical drive lengths can vary from 200 m to over 1000 m, with construction being more economical the longer the drive. Constructible length of drive is typically related to the size of the tunnel, with larger MTBMs able to achieve longer drives than smaller diameter machines.

One key risk with microtunnelling and pipe installation is that pipes can be damaged by the action of hard boulders and cobbles that cause significant wear to the pipe exterior as they are jacked through the ground. This risk can be mitigated by good bentonite practise, including employing the use of 'automatic bentoniting' system and appropriate slurry mixture design and pressure.

For larger MTBMs, an airlock can be installed in the machine to allow worker access to the machine face if repairs or maintenance is required. Such airlocks work in a similar fashion to that described for the SPBTBM above.

Earth Pressure Balance Tunnel Boring Machine (EPBTBM)

EPBTBMs are most commonly used in fine granular soils below the water table, although they have also been used in sands and gravels and for excavating soft rock. A precast concrete segmental lining is commonly installed behind these closed-face machines as the tunnel advances, although they can also be configured for installing pipe. The machines use an auger screw that penetrates a sealed bulkhead immediately behind the EPBTBM cutterhead to permit controlled removal of the spoil at the tunnel face. A balancing pressure is maintained at the tunnel face via simultaneous slow rotation of the auger (for spoil removal) and forward propulsion of the EPBTBM. Spoil is typically removed using a conveyor belt immediately behind the auger screw and a line of rail-mounted muck cars travelling back and forth between the launch shaft and the EPBTBM. A crane on the surface deposits the excavated material from the muck cars into a spoil pile for removal from the project site. Trailing airlocks can also be used with EPBTBMs so that cutterheads can be repaired and boulder obstructions can be removed.

One key concern with trenchless or tunnelled excavations, regarding of selected methodologies, relates to any sensitive infrastructure along or crossing the tunnel alignment. In the case of Y13-C Mulock SPS Forcemains, there are two structural culverts located at the Leslie Street and Mulock Drive intersection (sta. 3+180) and south of Mulock Drive (sta. 2+550). As all structural culverts and bridge structures are considered critical infrastructure, it will automatically be considered for construction impact assessment, which involves an analytical review of ground movement induced structural deformations by the tunnelling and nearby shafts excavation works.

Further design development, including completion of geotechnical and hydrogeological investigation will assist in shortlisting the types of TBMs and tunnel lining methodologies that might be adopted for the tunnelled sections. In general, MTBMs and EPBTBMs have performed well in the difficult water bearing and boulder laden glacial deposits around the GTA and on some projects the selection of construction approach is left to the contractor, subject to certain basic methodology requirements and capabilities being satisfied.

5.13.3.3.2 Shaft Construction

Shafts are required for launch of TBMs, servicing tunnelling operations, and TBM retrieval, and are commonly used to house maintenance holes, access chambers and other permanent facilities.

From a tunnel construction perspective, the required shaft dimensions, particularly shape and internal diameter, are a function of the following:

- Length of tunnel segments (pipe or PCTL)
- Tunnel diameter
- Tunnelling machine dimensions, particularly length
- Thrust wall design
- Jacking rig size
- Tunnel eye sealing ring
- Guide rail systems.

The shaft details proposed on the concept alignment for the Y13-C forcemains are as follows. Methodologies for shaft excavation and support are commonly classified as sealed or unsealed, depending on the degree of leakage into the shaft and impacts on the surrounding water table that occur during construction. As highlighted previously, it is expected that the shafts will be constructed in a variety of soft ground conditions, largely below the water table. Both shaft classifications are further described in the sections below.

Unsealed Shafts

Unsealed shafts are typically specified where ground conditions are stable, where there are no restrictions on dewatering to permit lowering the surrounding water table, or where conditions are dry, and dewatering is not required for shaft construction). Common methods are described below.

Steel liner plate

Steel liner plates provide a relatively light-weight, easy-to-handle, safe support for soft ground tunnelling because the ground that supplies the loading also supplies the resistance to the load. The liner plate assembly simply distributes and transmits the load to the surrounding earth.

Driven sheet pile

Sheet pile walls are used as an earth retention system in soils that allow driving from the surface to bottom of shaft. They do not work well in soil conditions with boulders or large obstructions. Sheet piles are prefabricated steel sheet sections with interlocking edges. As the sheets are installed, they form a continuous barrier in the ground. The sheets are typically driven with vibratory hammers or drop hammers. More recently, this type of construction can also be sealed but requires specialty sealants to be applied at joints, which increase construction schedule, cost and failure modes.

Soldier piles with timber laggings

Soldier piles are steel H piles that are vertically driven or drilled into the earth at regular intervals prior to excavation. As excavation progresses in stages, horizontal lagging in the form of timber is added behind the flanges to create the wall structure with connecting joints.

Sealed Shafts

Sealed shafts are typically specified where unstable ground conditions exist or where there are restrictions on dewatering to lower the surrounding water table. Sealed shafts tend to be more expensive than unsealed shafts, although they have become almost mandatory in many Canadian jurisdictions where there are strict environmental requirements to minimize groundwater lowering and effects on adjacent water courses as well as infrastructure. Common sealed shaft methodologies include the following:

Secant pile walls

Secant pile shafts utilize bored piling methods (incorporating use of temporary steel casings driven, or vibrated into place, in advance of pile excavation to prevent ground collapse) to create a vertical perimeter of interlocking poured concrete cylindrical piles. The overlapping of piles creates a waterproof liner and supporting wall. It cannot be used as a final structure and will require a permanent structure such as a manhole chamber to be installed within the shaft.

Concrete sinking caissons

The method involves sinking the shaft in several lifts by building a circular (or oval) shaft structure on the surface and placing kentledge blocks (weights) or rams on top of it. Many contractors assist the sinking operation by lubricating the annular gap between the outer walls and surrounding ground. A clamshell grab (granular soils) or mini excavator (competent soils such as clays or rock) is then used for shaft excavation, and the shaft structure slowly sinks to fill the excavated void. The shaft structure is typically constructed using precast concrete segments or cast in place reinforced concrete. Once the shaft has been sunk to the desired formation elevation, a mass concrete base plug is placed using a tremie (underwater) concreting, if the shaft is in a flooded condition. A major advantage of this method is that the shaft wall can be used as future permanent structure for maintenance.

Slurry (diaphragm) walls

To commence excavation, guide walls are installed around the desired shaft location. These guide walls act as a guide for installation of the slurry walls. A trench is then excavated between the guide walls, typically several metres long and 1 to 1.5 metres wide and extending to the required depth. A bentonite slurry mix is pumped into the trench as it is excavated to support the surrounding soil. The slurry is composed of water, bentonite clay and other additives to achieve the desired properties, acting as a temporary support system to prevent collapse. Once the trench reaches the desired depth, steel cages or vertical steel sections are inserted for reinforcement, enhancing the wall's load-bearing capacity. As the concrete is pumped into position, the slurry is displaced to the surface where it can be collected, treated and used for subsequent wall construction. The slurry wall shaft construction method is highly advantageous for constructing deep excavations in urban environments.

Pending geotechnical and hydrogeological field investigation and laboratory testing results along the sewer alignment and at shaft locations, a preferred shaft construction methodology cannot be selected. The appropriate methods will be assessed and compared in a future phase of design.

5.13.3.4 Property Requirements

Permanent property requirements will depend on the final location of the new trunk sewer and Mulock SPS. Property easements may be required for permanent access to maintenance holes depending on the final location of the infrastructure. Exact details on shaft sizing, location and property easement requirements will be confirmed during detailed design.

Temporary and permanent property easements may be required for construction and operation of the trunk sewer. Permanent property requirements will depend on the final location of the shafts, which are expected to contain a manhole structure that must be accessible by York Region staff for sewer maintenance purposes. Easements may be required for permanent access to the maintenance holes.

The proposed property locations and requirements for construction of the shafts are conceptual only. Details related to the number of shafts, shaft sizing, location and property easement requirements will be confirmed during detailed design.

5.13.4 Environmental and Community Impacts and Mitigation

Desktop studies were done to determine the possible extent of these impacts and to propose mitigation measures that would reduce the likelihood and the consequences should they occur. The major impacts and associated mitigation approaches are described in this section.

Because the current designs are only at the conceptual level, potential impacts and mitigation measures could change during design development, depending on:

- The ability to co-locate the proposed design with other planned infrastructure to minimize community effects, to be investigated after field investigations are completed. This change will depend on the number and scale of other planned infrastructure (e.g., utilities, transportation) in the ROW or area.
- Confirmation of available property for temporary and permanent use. The extent of temporary easements or acquired private property, as well as the construction schedule may dictate future design changes or mitigation measures.

The assessment criteria and indicators are provided in Table 5.54, Table 5.55 and Table 5.56, corresponding to each of the environments (social and built, natural, cultural and traffic impacts) together with a potential effects assessment and identification of avoidance, mitigation and compensation measures for the project.

Table 5.54 Y13-C Mulock SPS Forcemains Social and Built Environment Effects and Mitigation

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Social and Built Environment				
SB-1	Effect on existing views	– Predicted changes in views from residences in the surrounding area	– No change in existing views from residences in the surrounding area.	– No avoidance, mitigation, or compensation measures required.
SB-2	Effect on existing residences, businesses, and/or community, institutional and recreational facilities	– Extent of displacement of residences, businesses and other facilities – Extent of temporary or permanent disruption to residences, businesses and other facilities in proximity to construction compounds/permanent installations	– No displacement of residences, businesses, or community, institutional and recreational facilities is anticipated. – Disruption to residences, businesses, and community, institutional and recreational facilities in proximity to construction compounds/permanent installations.	– No avoidance, mitigation, or compensation measures are anticipated. However, if in fact displacement is required then York Region would provide market value compensation. – Apply standard construction-related mitigation measures to minimize the disruption effects.
Traffic and Transportation				
TT-1	Effect on traffic	– Extent of disruption to traffic flows – Proximity to congested traffic zones	– Traffic disruption at construction compounds, compound staging may extend into the travelled portion of the ROW. – Traffic movement in to and out of Construction compound sites will impact pedestrian, cycling and traffic flow on Leslie Street. – Impacts to public transit involving potential rerouting of buses and/or relocation of stops. – Coordination of alternate routing for emergency service vehicles, if needed.	– Where possible, maintain one lane in each direction. This could be achieved through flagging, temporary signals or temporary road widening. – Pedestrian movement should be maintained during construction, with marked pedestrian detours as applicable. – Consider special traffic arrangements for peak hours should be considered in traffic flow directions in the morning and afternoon. – Pay duty police officers may be required to direct traffic. – Make special provisions for emergency service vehicle access. – Make special provisions for pedestrian traffic and safety, including signals, detours and winter maintenance. If feasible, move construction traffic to sideroads. – Access to private entrances to be maintained, or alternative access solution provided.
Utilities				
U-1	Conflict with buried utilities	– Sewer or shaft is in direct conflict or falls within clearance limits of nearby utilities	– New construction impacts existing utilities and requires design coordination with utility owners which increases project cost and schedule.	– Review historic and as-built documents for utility data. – Complete a SUE investigation to identify high-risk utilities, including large and/or critical service utilities (e.g., large watermains and all gas mains). – If a conflict occurred with a proposed sewer tunnel, construction shaft or overall work compound location following receipt of utility information, consider temporary or permanent relocation of utilities safely around or through the work area. Depending on the utility, it may be possible to support the utility above an open cut excavation to be reburied. Modifications of the alignment and shaft locations may also be proposed during design development to mitigate utility conflicts.
U-2	Conflict with surface or overhead utilities	– Excavation of shaft is proposed in location of surface infrastructure – Shaft working compound equipment, including cranes will require working directly under overhead utilities or within the hydro wire exclusion zone	– Overhead infrastructure such as electrical or communications cabling is mounted on utility poles between 5 and 12 metres above the surface. Depending on the required crane size and operating radius to construct the shaft and lower the TBM, equipment extents may fall within hydro line exclusion zone, or hit overhead wires causing worker harm or death.	– Working compounds will be designed to allow appropriate and safe movement of workers and equipment around the site, away from live overhead wires or surface utility boxes, based on known utility information and topographic surveys. – If a conflict occurred with a proposed sewer tunnel, construction shaft or overall work compound location, following receipt of utility information, modifications of the alignment and shaft locations may be proposed during design development; the utilities would need to be temporarily or permanently relocated safely around or through the work area.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
U-3	Damage and/or Deformation to surface and buried utilities	– Soil movement under or next to the utility from tunnel or shaft/open cut construction	– Ground heave/settlement/horizontal shift along tunnel ahead of and along excavated alignment, and around shafts and open cut excavations during and post-excavation. This information can be obtained from nearby geotechnical instrumentation. – Deformation or damage to nearby surface or buried utilities as a result of soil movement, which may require rehabilitation or repair (e.g., crack formation, angular rotation, strain, pipe joint rotation or pull out).	– For utilities within tunnel ZOI: Select a tunnel excavation method capable of limiting volume losses at the cutting face (limit overcutting of excavation) to limit ground losses. – For utilities near shaft/open cut ZOI: Select a shaft or open cut construction method and SOE appropriate with depth, size and geotechnical and hydrogeological conditions at shaft location. – Analytically assess nearby utilities and structures and propose mitigation methods such relocation of utilities, or for deep utilities, relocation of the sewer horizon. Should neither of these options be applicable, then investigate ground improvement in proximity of utilities to limit ground movement or investigate modification of the sewer and/or open cut design or construction methodology.
Noise and Vibration				
N-1	Operation Noise	– Complaints from residents within study area	– Noise disruptions to private residents and commercial areas post-construction, near manholes and other surface connections, SPS locations.	– Any permanent facility, such as supporting air management facilities, will require an ECA application under Section 9 of the Environmental Protection Act. – Investigate degree of risk and impact in further detail.
N-2	Construction Noise	– Complaints from residents within study area	– Noise disruptions to private residents and commercial areas during construction, near construction compounds.	– Propose construction noise monitoring per MECP NPC-115 Construction Equipment requirements. – Consider completing noise monitoring for the duration of the construction and notify the contractor of any exceedances so that corrective action/contingency actions can be implemented. – Use vehicles and equipment (cranes and excavators) with efficient muffling devices or construct enclosures. – Limit truck movements to comply with noise by-laws for 24/7 construction operations.
V-1	Construction Vibration	– Complaints from residents within study area	– Disruptions to private residents and commercial areas during construction, near construction compounds.	– Propose appropriate construction vibration benchmarks within the tender documents. – Consider pre- and post-construction condition photos.
Air Management				
O-1	Operation odour at existing or proposed sewer connection	– Odour near surface connections	– There is potential for odour release due to turbulence at the connection of the proposed sewer to existing sewers	– Consider implementation of ventilation design systems with odour control.
O-2	Construction odour	– Complaints are received from residents within the study area	– During live connection of infrastructure, there is the potential for odour release.	– Advance notification to residents, advising them of what work is being completed and the duration of the work.
A-1	Construction dust at sewer construction locations	– Fugitive dust is generated – Air quality is poor	– Fugitive dust generation during construction of gravity sewer, interconnecting shaft/chambers, including the connection points.	– Develop a Dust Best Management Practices Plan to be included in the project Construction Management Plan. – Mitigation should be aimed at minimizing emissions of particulate matter and exposure to particulate matter during the construction phase of the project.
A-2	Construction dust at air management infrastructure	– Fugitive dust is generated – Air quality is poor	– Fugitive dust generation during construction of the potential air management infrastructure.	– Develop a Dust Best Management Practices Plan to be included in the project Construction Management Plan. – Mitigation should be aimed at minimizing emissions of particulate matter and exposure to particulate matter during the construction phase of the project.

Table 5.55 Y13-C Mulock SPS Forcemains Natural Environment Effects and Mitigation

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Hydrogeology				
N-1	Effect on groundwater quantity	– Temporary and/or long-term change in groundwater quantity	– Potential temporary change to groundwater quantity is minimal because construction expected to mainly intersect Newmarket till aquitard and potentially some Inter Newmarket Sediment. Perched water table anticipated to be encountered. Water table anticipated to be encountered between 7 to 23 mbgs. – No long-term change to groundwater quantity is anticipated, because no water takings are required during operation of the forcemain. – Potential ground settlement as a result of active dewatering/depressurization. – Change in shallow groundwater flow patterns resulting from operation of sewer pipe resulting from increased I&I and/or preferential movement of groundwater within trench sediments.	– Implement construction methods that minimize dewatering requirements. – Establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water).
N-2	Effect on groundwater quality	– Temporary and/or long-term change in groundwater quality	– Temporary change in groundwater quality is minimal because construction is anticipated to mainly intersect low permeability till. – No long-term change to groundwater quality is anticipated. – Potential effects on groundwater water quality as a result of potential mobilization of contaminated water where active dewatering/depressurization is required. – Reduction in groundwater quality from spills or the mismanagement of fuel/chemical in work areas.	– Implement construction methods that minimize dewatering requirements, as needed. – Develop and implement a spills response plan for construction to mitigate the effect of a spill should one occur. – Establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water).
N-3	Effect on private wells - temporary construction dewatering	– Temporary construction dewatering private well interference (quantity/quality)	– Temporary decrease in private well quantity/quality not anticipated due to intersection of low permeability till. – Limited dewatering is expected during construction.	– Implement construction methods that minimize dewatering requirements, as needed. – Address construction dewatering private well interference complaints through existing York Region private well assessment and mitigation policy. – Proactively identify any high-risk wells during design and prepare site-specific preventative mitigation and corrective action plans as part of design. Corrective actions should align to York Region's private well assessment and mitigation policy.
N-4	Effect on private wells – long term	– Long term private well interference (quantity/quality)	– No long-term groundwater quantity/quality interference is anticipated as no active or passive long-term groundwater takings related to the forcemain are anticipated.	– If needed, establish pre-construction baseline groundwater quality and quantity conditions and develop implementation plans for monitoring during and post-construction (install and monitor wells and surface water). – Proactively identify any high-risk wells during design and prepare site-specific preventative mitigation and corrective action plans as part of design. Corrective actions should align to York Region's private well assessment and mitigation policy.
N-5	Effect on surface water	– Temporary change in surface water quantity/quality	– Temporary change in surface water quantity/quality is not anticipated based on intersection of low permeability till. – Limited dewatering is expected during construction. – Sewer passes under tributary to HREB. – Change in groundwater-surface water interaction (reversal of vertical hydraulic gradient) results in impact to terrestrial and aquatic habitat and associated SAR (where applicable) - reduction in baseflow. – Change in surface water temperature from groundwater taking and/or discharge to surface water features. – Changes to stream morphology resulting from the release of groundwater dewatering water. The potential reduction in baseflow due to water taking in a lower confined aquifer due to increased downward hydraulic gradients across the aquitard separating the stream and the confined aquifer. – The potential reduction in baseflow from a stream reach that intersects an aquifer in which the water taking is occurring.	– Field verification of groundwater-surface water interaction suggested for watercourses and wetlands within the study area. – Complete outlet receiver assessment(s) should temporary groundwater discharge be required to surface water. Establish pre-construction baseline surface water quality and quantity conditions and develop implementation plans for monitoring during and post-construction. – Implement/construct treatment (i.e., settlement tanks, etc.) of construction water prior to discharge to storm sewer/surface water. – Minimize construction area disturbance and duration. Implement erosion and sedimentation control measures (e.g., silt fencing, check dams, etc.). – Adhere to fish timing windows to prevent negative impacts on known sensitive fish species within the study area. – Consider completing a geomorphology study during design. – Refer to the Natural Heritage section of the table for further mitigation approaches associated with surface water impacts.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Geotechnical				
G-1	Effect on soil quality	– Contaminant seepage into soil during excavation of shaft	– Chemicals such as drilling fluids, lubricants, ground improvement material, or fuel from construction equipment may contaminate soil.	– Perform regular equipment checks and maintenance. – Prepare an environmental management plan prior to construction in case of contamination.
G-2	Soil movement around shafts	– Vertical or horizontal ground movement around shafts during and post excavation – Deformation or damage to nearby structures and/or utilities	– Ground heave/settlement/horizontal shift at surface around shafts. – Deformation or damage to nearby structures and utilities (e.g., crack formation, angular rotation, strain, or pipe joint rotation or pull out) that may require rehabilitation or repair.	– Select shaft or open cut construction method and SOE appropriate with depth, size and geotechnical and hydrogeological conditions at shaft or open cut locations. – Complete soil displacement analytical assessments at all shaft locations.
G-3	Soil movement along tunnel	– Vertical or horizontal ground movement along tunnel during and post excavation – Movement or damage to nearby structures and/or utilities	– Ground heave/settlement/horizontal shift along tunnel ahead of and along excavated alignment. – Deformation or damage to nearby structures and utilities (e.g., crack formation, angular rotation, strain, or pipe joint rotation or pull out) that may require rehabilitation or repair.	– Select tunnel excavation method capable of limiting volume losses at the cutting face (limit overcutting of excavation) to limit ground losses. – Complete soil displacement analytical assessments for at-risk tunnel locations, including low soil cover locations or areas where the tunnel crosses or runs parallel in close proximity to sensitive natural features, utilities and critical infrastructure such as creeks, gas main, structural culverts, bridges and rail crossings
G-4	Encounter boulders during shaft and/or tunnel excavation	– Boulders encountered during excavation of shaft and/or tunnel	– For tunnels, boulder presence and properties may require change of preferred excavation methodology (segmented tunnel vs pipe jacking) and tunnel boring machine technical specifications. – For shafts, boulder presence and properties may require change of preferred shaft SOE methodology.	– Complete appropriate geotechnical investigations with strength testing for any encountered boulders. – Prepare a geological baseline report during design development with appropriate baseline for boulder strength, sizing and anticipated encounter rates and locations. – Recommend a shaft construction SOE capable of maintaining verticality in boulder-prone soils. – Recommend appropriate technical specifications for tunnel boring machine.
G-5	Frac-out of drilling fluids along tunnel	– Drilling fluid breaches surface during tunnel excavation – Unanticipated change in drilling fluid pressure and/or volume	– Drilling fluid may breach beds of water bodies such as creeks, lakes and rivers. – Drilling fluid may breach aquifers. – Drilling fluid may cause cracking on surface infrastructure such as pavement and may require closure of traffic lanes to clean up fluid at surface.	– Select contractor with experienced MTBM or TBM operators. – Require a “frac-out contingency plan” be prepared prior to construction for cleanup of drilling fluids.
G-6	Encounter contaminated soil during shaft and/or tunnel excavation	– Soil encountered during shaft and/or tunnel excavation is tested to surpass allowable contaminant levels	– Spoil must be dispatched at an approved contaminated soil disposal site.	– Complete appropriate geotechnical investigations and contaminants testing during design development to identify confirmed contaminated soil locations or at-risk areas based on historical land use. – Identify and confirm availability of appropriate soil disposal sites based on anticipated contaminants for use during construction.
G-7	Encounter weak or incompetent soil during tunnel excavation	– Accelerated soil movement at surface and depths	– Soil heave, soil settlement or sink hole formation at surface.	– Complete appropriate geotechnical investigations with strength testing for anticipate soils along tunnel horizon. – Prepare a geological baseline report design development with appropriate baseline for soil properties, including stratigraphic profile inferred from borehole investigations. – Recommend appropriate preventative or compensation ground improvement for at-risk locations.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
Natural Heritage				
EG-1	Effect on aquatic habitat or functions	– The study area contains cold or warm water watercourses – The study area contains wetlands	– Temporary or permanent loss of aquatic features or categorical loss of functions by type, including PSWs, Locally Significant Wetlands, watercourses by sensitivity type and others. – During construction water quality may be impaired due to elevated TSS in surface water runoff from study area locations which can affect aquatic species/habitats. Some concentrations above background may occur temporarily. – Potential spill hazard when refuelling equipment. – Change in surface water temperature from groundwater taking and/or discharge to surface water features	– Need to complete site investigations to evaluate potential effects on aquatic habitat function. – Implement best management practices to control surface water runoff and minimize TSS effects. – Where feasible, discharging of surface water during construction should be directed into the municipal storm sewer system to mitigate thermal impacts to watercourses. Should discharge of surface waters be directed to watercourses, additional mitigation measures would need to be adhered to (e.g., enhanced erosion and control measures). Use of erosion and sediment control measures and timing of construction to avoid spawning and egg incubation periods will reduce the potential for effect to fish and aquatic life. – Conduct equipment maintenance and refuelling at the designated and properly contained maintenance areas or at industrial garages located well away from creek banks and wetlands and outside vegetation areas. – Develop a Spills Prevention Plan.
EG-2	Effect on stream geomorphology	– Change in geomorphic form/function/ stability in affected channels within the study area	– No anticipated impacts to stream geomorphology in affected channels.	– Employ erosion and sediment controls to limit deposition of construction-mobilized soils into watercourses.
EG-3	Effect on aquatic species, including SAR, species of local concern, native species and invasive species	– Aquatic species	– Number and type of aquatic species potentially affected temporarily or permanently. – No anticipated impacts to aquatic SAR as there are no aquatic SAR identified within the study area.	– Preventing death of fish or impacts to downstream fish habitat through the use of appropriate timing windows.
EG-4	Effect on terrestrial habitat or functions	– The study area does not contain ANSIs – The study area contains Ecologically Significant Forests – Wildlife habitat	– Temporary or permanent loss of natural heritage features (e.g., ESAs, ANSIs, wildlife corridors and others). – Potential effects on terrestrial habitat (e.g., direct vegetation (and wildlife habitat) loss, alteration and fragmentation) may occur from the physical footprint of the study area locations. – Project preparation, construction and operation may increase the risk of nest destruction and mortality of migratory birds.	– Site investigations to evaluate potential terrestrial habitat function/significance. – During design, prepare construction constraints with consideration of timing windows to mitigate where possible, vegetation clearing to occur outside of the migratory bird nesting season, bat maternity roosting season, turtle overwintering and amphibian breeding. – Limit the area of project footprint and limit disturbance from employees. – The presence of wildlife will be monitored and communicated to site personnel. – Vehicle use will be restricted to designated areas. – Where practical, rehabilitate habitat for plants and wildlife.
EG-5	Effect on terrestrial species, including SAR, species of local concern, native species, invasive species and area-sensitive species	– SAR have the potential to occur within the study areas, including amphibians, insects, birds, reptiles, mammals and tree species	– Number and type of terrestrial species potentially affected temporarily or permanently. – Construction activities have the potential to disturb wildlife within adjacent natural heritage areas. – Project preparation, construction and operation may increase the risk of nest/habitat destruction and mortality of terrestrial SAR. – Project may result in wildlife-vehicle collisions and may cause injury/mortality to individual animals.	– Site investigations to evaluate potential occurrence of terrestrial SAR within the study area. – During design, prepare construction constraints with consideration of timing windows to mitigate where possible, vegetation clearing to occur outside of the migratory bird nesting season, bat maternity roosting season, turtle overwintering and amphibian breeding. – Clearly demarcate work limits at outset of construction and minimize unnecessary vegetation clearing.

Table 5.56 Y13-C Mulock SPS Forcemains Cultural Environment Effects and Mitigation

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
CE-1	Effect on *Ontario Heritage Act* (OHA) designated properties and properties listed on municipal heritage registries	– Project components are in the vicinity of the heritage property/landscape	– Encroachment onto the property/landscape resulting in a physical impact to the potential BHRs and/or CHLs. – New structures or landscape features and/or alterations to the property/landscape that result in a physical impact to the potential BHRs and/or CHLs. – Relocation of all or part of the potential BHRs and/or CHLs. – Demolition or destruction of all or part of the potential BHRs and/or CHLs. – Vibration impacts to the potential heritage buildings identified on the property/landscape in and on adjacent properties.	Based on the potential impacts outlined in the previous column, the following mitigation options are considered alongside mitigation recommendations: Preferred option: – Project design avoids the property/landscape resulting in no direct or indirect impacts. This includes maintaining a sufficient buffer of at least 50 m between project activities and the potential BHRs and/or CHLs.

Item no.	Criteria	Indicators	Potential effects (Positive/Negative)	Avoidance/Mitigation/Compensation
			– Ground disturbance impacts relating to landscape features on the property/landscape in and on adjacent properties.	Alternative options: – If direct impacts are unavoidable, design project to minimize encroachment on the property/landscape while avoiding all impacts to the potential BHRs and/or CHLs. The following options and mitigations should be considered: • Consult with the Town during detailed design to determine if any approvals or permits are required as a result of physical impacts to the property/landscape. – If avoidance of the property/landscape or above-noted options are not feasible, and if a physical impact to potential BHRs and/or CHLs is unavoidable, then the following is required: • Consult with the Town during detailed design to determine if any approvals or permits are required as a result of physical impacts to the property/landscape. • Complete a property-specific CHER/HIA prior to any alterations, including evaluation of the property against O. Reg. 9/06 and, if necessary, detailed documentation of any confirmed BHRs and/or CHLs and recommendation of specific mitigation measures for impacts to any identified heritage attributes. • The CHER/HIA should also consider the compatibility of new structures or landscape features with existing heritage attributes, layouts and designs of the property/landscape.
CE-2	Effect on archaeological sites	– Project components are in the vicinity of the archaeological sites	– Encroachment onto the site resulting in a physical impact. – New structures or landscape features and/or alterations to the site that result in a physical impact. – Demolition or destruction of all or part of the archeological sites. – Vibration impacts to the archeological sites identified on the property/landscape. – Ground disturbance impacts to the archeological sites.	– Should impacts be proposed within the vicinity of the site, then additional assessment may be required. Depending on the location of the proposed impacts, this may be Stage 2 archaeological assessment, Stage 3 archaeological assessment, or Stage 4 avoidance and protection. Stage 3 test unit excavation must be completed across the remainder of the site as per Sections 3.2.2 and 3.2.3 of the Standards and Guidelines (MCM 2011:49-53). – However, if proposed impacts will avoid the site, but construction-related activities will occur within the vicinity of the site, then the site will require Stage 4 Avoidance and Protection Monitoring, to be conducted by a licensed consultant archaeologist. The avoidance, protection and construction monitoring requirements for construction activities would include: • Erection a temporary barrier that extends a minimum of 10 m beyond site limits. • Issuing “no go” instructions to all on-site construction crews and personnel during construction. • Depicting the 10 m protective buffer zone on all contract drawings with explicit instructions that a licensed consultant archaeologist will be present to monitor construction. • Ensuring the presence of a licensed archaeologist during construction to monitor the area to be avoided and verify the effectiveness of the avoidance strategy. • If any archaeological materials are identified during construction, then all construction. • Activities must stop until the archaeological materials are evaluated and mitigated, if necessary, by a licensed archaeologist. • After the completion of the soil disturbing activities, having licensed archaeologist inspect the site area and prepare a report for the MCM on the effectiveness of the avoidance strategy and in ensuring that the area to be avoided remained intact.
CE-3	Effect on registered cemeteries	– Project components are in the vicinity of registered cemeteries	– Encroachment onto the cemetery resulting in a physical impact. – New structures or landscape features and/or alterations to the cemetery that result in a physical impact. – Demolition or destruction of all or part of the cemetery. – Vibration impacts to the cemetery identified on the property/landscape. – Ground disturbance impacts to the cemetery.	– As per ASI (2021, 2022), at the demand of MCM, MTR as per Section 4.2.3 of the Standards and Guidelines must be carried out prior to any construction within the monitoring zone established around the purported location of human burials on the property. – The entire monitoring zone must be assessed for the presence or absence of unmarked graves. – A Cemetery Investigation Authorization issued by the Bereavement Authority of Ontario must also be requested.

5.14 Capital Cost Estimate

The cost estimate methodology and the estimate basis are from the Association for the Association for the Advancement of Cost Estimates (AACE) International methodology and represent a Class 5 cost estimate with an accuracy to -50% to +100%. The estimate reflects the probable cost obtained for the Greater Toronto Area and is a determination of fair market value for the proposed scope of work. Allowances and markups were also included in the estimate for additional items such as design contingency, construction contingency, property acquisition and future investigations.

The provided cost estimate is presented in 2023 dollars, meaning that it reflects the monetary value as of the present year. In this context, the cost estimate does not incorporate any adjustments for potential future increases in prices due to inflation. As a result, it offers a snapshot of the projected costs in terms of the currency's current value, providing a clear and unadjusted perspective on the financial aspects at play. It's important to note that the absence of inflation adjustment in the cost estimate could impact its accuracy over an extended period, especially if the project or analysis spans several years.

This cost estimate has been prepared for guidance in project evaluation and implementation based on the information available at the time of the estimate. The final costs of the project will depend on the following factors:

- Actual labour and material costs
- Competitive market conditions
- Implementation schedule
- Other variables

As a result, the final project costs will likely vary from the estimate presented herein. Due to this fact, project feasibility and funding needs must be carefully reviewed before making specific financial decisions to help support a proper evaluation and adequate funding.

5.14.1 Cost Assumptions

5.14.1.1 Scope of Work

The capital cost estimate was developed based on project specific assumptions. It is important to emphasize that certain assumptions, including but not limited to the number of shafts, may undergo modifications as the project progresses.

Based on this concept, the scope of work used for the purposes of determining the construction costs includes the following:

- Construction of Aurora East SPS.
- Upgrades to Newmarket SPS.
- Upgrades to Bogart SPS.
- Construction of Mulock SPS.
- Construction of the 1500 mm diameter Aurora East SPS Gravity Interconnection via a 250 m tunnel.
- Construction of the 1350 mm diameter (via open cut) and 2400 mm diameter (via tunnel) Aurora SPS Gravity Sewer Twinning for a length of 830 m.
- Construction of 4 shafts and associated chambers and maintenance holes for Aurora SPS Gravity Sewer Twinning.
- Construction of the 1800 mm diameter sanitary sewer Leslie Street Trunk Sewer Phase 3 via a 3860 m tunnel.
- Construction of 7 shafts and associated chambers and maintenance holes for Leslie Street Trunk Sewer Phase 3.

- Construction of two 1050 mm diameter Aurora East SPS Forcemains via a 2600 m tunnel.
- Construction of 8 shafts and associated chambers and maintenance holes for Aurora East SPS Forcemains.
- Construction of two 1050 mm diameter Mulock SPS Forcemains via a 2440 m tunnel.
- Construction of 4 shafts and associated chambers and maintenance holes for Mulock SPS Forcemains.
- Connections between infrastructure components
- Site preparation and restoration.

5.14.1.2 General Assumptions

The cost estimate was developed based on general assumptions and allowances, which include, but are not limited to:

1. Due to limited information at this conceptual design stage, the prices used are based on similar projects and/or conceptual drawings.
2. Estimates are based on historical data from past or recently tendered similar projects, with allowances for installation based on ratios of the material cost.
3. No rock excavation.
4. There is a reasonable project schedule, with no overtime accounted for.
5. Each project will be constructed under a single contract.
6. An allowance of 15 percent design contingency is considered to cover design and pricing unknowns in the preparation of this estimate. The allowance is not meant to cover additional scope of work or quality modifications, but rather to provide some flexibility as the design develops. The design allowance typically decreases as the design progresses and is a nominal percentage at the pretender stage.
7. An allowance of 10 percent construction contingency is considered to cover the unexpected increase in costs or unforeseen site conditions resulted in design modifications during the construction phase.
8. An allowance of 15 percent is considered to cover the cost of engineering services.
9. An allowance of 10 percent contingency is considered to cover any property acquisition for projects where permanent and temporary easements are required.
10. An allowance of 2 percent contingency is considered to cover any property acquisition for sanitary sewer upgrades projects that will only require temporary easements for staging during construction.
11. An allowance of 4 percent is considered to the cost of future investigations.

5.14.1.3 Linear Infrastructure

The following assumptions have been developed in preparation of cost estimates for linear assets:

- Tunnelling method of construction is preferred for depths greater than 8 m due to cost and impacts on existing highways, traffic and the natural environment.
- Tunnel shafts are located at all significant sewer bends and spaced at up to 2000 metres along straight runs depending on installation method.
- Access/maintenance chambers are assumed to be situated at shaft locations.
- Shaft sizing does not need to consider oversizing of the shaft to accommodate a maintenance hole that can fit stairways.
- For gravity sewer diameters of 1800 mm or less, tunnelling construction has been assumed to be via micro-tunnelling and includes a non-structural liner to protect against H_2S.
- For gravity sewer diameters above 1800 mm, tunnelling construction has been assumed to be via earth pressuring boring, with a two-pass system and includes a non-structural liner to protect against H_2S.
- A two-pass system has been assumed for trenchless installation of the forcemains; the carrier pipe has been assumed to be concrete pressure pipe.

– Tunnel and pipe lengths and invert elevations were noted, and invert depth differential and average depth of segments were calculated from the alignment drawings. The length, average depth, diameter and location of the pipes shown in the alignment figure were used to calculate the tunnel and pipe installation costs. Installation cost assumptions were informed by previous projects of similar scope and experience, and these were used as a basis for the unit prices applied in the pipe installation estimate.
– A diameter was assumed for each shaft based on whether it was a launch or reception shaft, as well as the size and number of tunnels to be installed. This assumption was informed by previous tunnelling projects, calculation of unit costs and tunnel equipment supplier minimum requirements. The depth of each shaft was identified from the alignment figures, and over-excavation for a shaft base slab was added. A unit price for installation per metre depth was used in the calculation of the cost of the shaft. Additional costs were added for the shafts located within the ORM to deal with the added complexity of deep shaft construction in high-water aquifers. Finally, a price for the installation of maintenance holes (MHs) was added to this to determine the total cost of installation.

5.14.1.4 Facilities

Air management has been included at identified locations with an allowance of $2,850,000 per location. This is intended to cover the additional cost of a small permanent building at a selected shaft location with air management installed within. The size, type and number of these units will be determined during detailed design.

5.14.2 Excluded Costs

The following costs have not been included in the construction cost estimates:

1. Market contingency
2. Non-construction costs for the following items:
    a. Legal
    b. Owner administration costs
    c. Any unforeseen significant increase in material prices
3. Unavailability of materials and skilled labour
4. Accelerated or delayed schedule
5. Overtime premiums.

5.14.3 Cost Estimate

The estimate construction costs for each of the projects in this chapter are presented in Table 5.57 to Table 5.74. Excluding rate escalation and HST, project construction cost estimate ranges from -50% to +100% these values are presented for each project in Table 5.57, Table 5.59, Table 5.61, Table 5.63, Table 5.65, Table 5.67, Table 5.69, Table 5.71 and Table 5.73.

Table 5.57 Estimated Construction Costs for Y3-B

Low range (-50%) (CAD 2023, excluding HST)	Estimated costs (CAD 2023, excluding HST)	High range (+100%) (CAD 2023, excluding HST)
51,750,000	103,500,000	207,000,000

Table 5.58 Estimated Cost for Y3-B Aurora East SPS

Item	Description	Amount (CAD 2023)
1	General construction cost	9,200,000
2	Tunnel construction cost	0
3	Shaft construction cost	0
4	Facility cost (pump stations/air)	74,000,000
5	Design contingency (15%)	12,000,000
6	Construction contingency (10%)	8,300,000
	Total construction cost	**103,500,000**
7	Engineering services (15%)	16,000,000
8	Property acquisition (10%)	10,000,000
9	Future investigations (4%)	4,100,000
	Total capital cost (excluding HST)	**133,600,000**

Table 5.59 Estimated Construction Costs for Y4

Low range (-50%) (CAD 2023, excluding HST)	Estimated costs (CAD 2023, excluding HST)	High range (+100%) (CAD 2023, excluding HST)
5,820,000	11,630,000	23,260,000

Table 5.60 Estimated Cost for Y4 Newmarket SPS Upgrade

Item	Description	Amount (CAD 2023)
1	General construction cost	1,000,000
2	Tunnel construction cost	2,100,000
3	Shaft construction cost	0
4	Facility cost (pump stations/air)	6,200,000
5	Design contingency (15%)	1,400,000
6	Construction contingency (10%)	930,000
	Total construction cost	**11,630,000**
7	Engineering services (15%)	1,700,000
8	Property acquisition (10%)	230,000
9	Future investigations (4%)	470,000
	Total capital cost (excluding HST)	**14,030,000**

Table 5.61 Estimated Construction Costs for Y5

Low range (-50%) (CAD 2023, excluding HST)	Estimated costs (CAD 2023, Excluding HST)	High range (+100%) (CAD 2023, excluding HST)
3,300,000	6,600,000	13,200,000

Table 5.62 Estimated Cost for Y5 Bogart SPS Upgrade

Item	Description	Amount (CAD 2023)
1	General construction cost	580,000
2	Tunnel construction cost	0
3	Shaft construction cost	0
4	Facility cost (pump stations/air)	4,700,000
5	Design contingency (15%)	790,000
6	Construction contingency (10%)	530,000
	Total construction cost	**6,600,000**
7	Engineering services (15%)	990,000
8	Property acquisition (10%)	130,000
9	Future investigations (4%)	260,000
	Total capital cost (excluding HST)	**7,980,000**

Table 5.63 Estimated Construction Costs for Y13-B

Low range (-50%) (CAD 2023, excluding HST)	Estimated costs (CAD 2023, excluding HST)	High range (+100%) (CAD 2023, excluding HST)
51,750,000	103,500,000	207,000,000

Table 5.64 Estimated Cost for Y13-B Mulock SPS

Item	Description	Amount (CAD 2023)
1	General construction cost	9,200,000
2	Tunnel construction cost	0
3	Shaft construction cost	0
4	Facility cost (pump stations/air)	74,000,000
5	Design contingency (15%)	12,000,000
6	Construction contingency (10%)	8,300,000
	Total construction cost	**103,500,000**
7	Engineering services (15%)	16,000,000
8	Property acquisition (10%)	10,000,000
9	Future investigations (4%)	4,100,000
	Total capital cost (excluding HST)	**133,600,000**

Table 5.65 Estimated Construction Costs for Y3-A

Low range (-50%) (CAD 2023, excluding HST)	Estimated costs (CAD 2023, excluding HST)	High range (+100%) (CAD 2023, excluding HST)
6,800,000	13,600,000	27,200,000

Table 5.66 Estimated Cost for Y3-A Aurora East SPS Gravity Interconnection

Item	Description	Amount (CAD 2023)
1	General construction cost	1,200,000
2	Tunnel construction cost	4,400,000
3	Shaft construction cost	5,300,000
4	Facility cost (pump stations/air)	0
5	Design contingency (15%)	1,600,000
6	Construction contingency (10%)	1,100,000
	Total construction cost	**13,600,000**
7	Engineering services (15%)	2,000,000
8	Property acquisition (10%)	270,000
9	Future investigations (4%)	540,000
	Total capital cost (excluding HST)	**16,410,000**

Table 5.67 Estimated Construction Costs for Y10

Low range (-50%) (CAD 2023, excluding HST)	Estimated costs (CAD 2023, excluding HST)	High range (+100%) (CAD 2023, excluding HST)
20,550,000	41,100,000	82,200,000

Table 5.68 Estimated Cost for Y10 Aurora SPS Gravity Sewer Twinning

Item	Description	Amount (CAD 2023)
1	General construction cost	3,600,000
2	Tunnel construction cost	26,000,000
3	Shaft construction cost	3,300,000
4	Facility cost (pump stations/air)	0
5	Design contingency (15%)	4,900,000
6	Construction contingency (10%)	3,300,000
	Total construction cost	**41,100,000**
7	Engineering services (15%)	6,200,000
8	Property acquisition (10%)	4,100,000
9	Future investigations (4%)	1,600,000
	Total capital cost (excluding HST)	**53,000,000**

Table 5.69 Estimated Construction Costs for Y13-A

Low Range (-50%) (CAD 2023, Excluding HST)	Estimated Costs (CAD 2023, Excluding HST)	High Range (+100%) (CAD 2023, Excluding HST)
73,650,000	147,300,000	294,600,000

Table 5.70 Estimated Cost for Y13-A Leslie Street Trunk Sewer Phase 3

Item	Description	Amount (CAD 2023)
1	General construction cost	13,000,000
2	Tunnel construction cost	83,000,000
3	Shaft construction cost	19,000,000
4	Facility cost (pump stations/air)	2,300,000
5	Design contingency (15%)	18,000,000
6	Construction contingency (10%)	12,000,000
	Total construction cost	**147,300,000**
7	Engineering services (15%)	22,000,000
8	Property acquisition (10%)	15,000,000
9	Future investigations (4%)	5,900,000
	Total capital cost (excluding HST)	**190,200,000**

Table 5.71 Estimated Construction Costs for Y3-C

Low range (-50%) (CAD 2023, excluding HST)	Estimated costs (CAD 2023, excluding HST)	High range (+100%) (CAD 2023, excluding HST)
92,000,000	184,000,000	368,000,000

Table 5.72 Estimated Cost for Y3-C Aurora East SPS Forcemain

Item	Description	Amount (CAD 2023)
1	General construction cost	16,000,000
2	Tunnel construction cost	110,000,000
3	Shaft construction cost	21,000,000
4	Facility cost (pump stations/air)	0
5	Design contingency (15%)	22,000,000
6	Construction contingency (10%)	15,000,000
	Total construction cost	**184,000,000**
7	Engineering services (15%)	28,000,000
8	Property acquisition (10%)	18,000,000
9	Future investigations (4%)	7,400,000
	Total capital cost (excluding HST)	**237,400,000**

Table 5.73 Estimated Construction Costs for Y13-C

Low range (-50%) (CAD 2023, excluding HST)	Estimated costs (CAD 2023, excluding HST)	High range (+100%) (CAD 2023, excluding HST)
64,000,000	128,000,000	256,000,000

Table 5.74 Estimated Cost for Y13-C Mulock SPS Forcemains

Item	Description	Amount (CAD 2023)
1	General construction cost	11,000,000
2	Tunnel construction cost	76,000,000
3	Shaft construction cost	16,000,000
4	Facility cost (pump stations/air)	0
5	Design contingency (15%)	15,000,000
6	Construction contingency (10%)	10,000,000
	Total construction cost	**128,000,000**
7	Engineering services (15%)	19,000,000
8	Property acquisition (10%)	13,000,000
9	Future Investigations (4%)	5,100,000
	Total capital cost (excluding HST)	**165,100,000**

5.15 Implementation Plan

5.15.1 Field Investigations

The conceptual designs of the projects are based on a desktop review of available information. Field investigations are required prior to and during the design stage to ascertain factual data required for preliminary and detailed design, which could either confirm or modify the concept. Table 5.75 outlines the field investigations that are anticipated for the design phase of the project. Table 5.75 outlines the field investigations that are anticipated for the design phase of the project.

Table 5.75 Future Field Investigations

Field investigation	Comments
Topographic survey	– Topographic survey to collect surface features within the ROW and private properties. – Survey for preparation of r-plans.
Subsurface utility engineering (SUE)	– Quality Level B SUE within the ROW and private properties. – QL-A SUE as required.
Geotechnical investigations	– An initial drilling program is proposed to support setting the vertical alignment. – The first phase of drilling leverages boreholes at approximately 1 km spacing, and the second phase will decrease the spacing based on final alignment. – Approximately 142 boreholes are expected for the projects within this chapter.

Field investigation	Comments
Hydrogeological investigations	– An initial drilling program is proposed to support setting the vertical alignment. – The first phase of drilling leverages boreholes at approximately 1 km spacing, and the second phase will decrease the spacing based on final alignment. Investigations will include hydrogeological scope and soil management and excess soil testing. – Investigation scope may involve the following: Installation of nested monitoring wells, groundwater quality sampling, hydraulic testing (i.e. slug tests) to understand in-situ hydraulic conductivities and the local hydrogeological setting for dewatering estimate purposes and confirmation of use of private supply wells in within the study area.
Excess soils management	– Desktop and field investigations are required for compliance with O. Reg. 406/19. – Soil sampling will be completed in tandem with the geotechnical investigations.
Archaeological assessment	– Pending results of the Stage 1 Archaeological Assessment and shaft locations, a Stage 2 Archaeological Assessment, which would include field test pitting, may be required.
Natural environment studies	– An arborist inventory and field natural environment studies would be required, based on shaft locations and private property requirements.
Phase One and Two ESA	– Phase One and Phase Two ESAs may be required, depending on the final shaft locations and property requirements.

5.15.2 Permit and Approval Requirements

All projects constructed in Ontario must follow O. Reg. 406/19: On-Site and Excess Soil Management, under the Environmental Protection Act, R.S.O. 1990, c. E.19. Reports and testing will be completed during detailed design.

Table 5.76 summarizes the anticipated permits and assumed timeline for approval that will be considered as part of the scheduled assessment. The anticipated permits are based on a conceptual level of design/assessment and will need to be confirmed as part of both the detailed design and pre-construction stages.

In addition to the permits listed in All projects constructed in Ontario must follow O. Reg. 406/19: On-Site and Excess Soil Management, under the Environmental Protection Act, R.S.O. 1990, c. E.19. Reports and testing will be completed during detailed design.

Table 5.76 that may be required to allow the project to proceed to construction; there are several regulations, guidelines and policies that will need to be confirmed and addressed as part of the detailed design and pre-construction stages. Figure 5.33 shows the anticipated permits and approvals timeline.

All projects constructed in Ontario must follow O. Reg. 406/19: On-Site and Excess Soil Management, under the Environmental Protection Act, R.S.O. 1990, c. E.19. Reports and testing will be completed during detailed design.

Table 5.76 Permits and Timelines

Agency	Anticipated permit	Assumed approval timeline
Environment and Climate Change Canada (ECCC)	Species at Risk Act (SARA) permit	Minimum 90 days
Department of Fisheries and Ocean (DFO)	Project Authorization	2 to 5 months
Department of Fisheries and Ocean (DFO)	SARA permit	3 months
Department of Fisheries and Ocean (DFO)	In-Water Construction Authorization	1 to 2 months (if applicable)

Agency	Anticipated permit	Assumed approval timeline
Transport Canada	Railway Safety Act (RSA) – Crossing in accordance with TC E-10 Standards Respecting Pipeline Crossings Under Railways pursuant to the RSA to verify conformance/requirements met)	Minimum 60 days
Ministry of Environment, Conservation and Parks (MECP)	ECAs - Environmental Protection Act – ECA, water and air Section 53 of the Ontario Water Resources Act for Sewage Works Note: If the final alignment resulting from detailed design coincides with wellhead protection areas, Source Water Protection requirements will be implemented, including additional standards of construction, material and joint selection and pressure testing.	Minimum 12 months
MECP	Permit to Take Water (PTTW) - Ontario Water Resources Act	6 to 12 months
MECP	Endangered Species Act (i.e., activity registry and overall benefit permit)	Minimum 12 months
Ministry of Citizenship and Multiculturalism (MCM)	Clearance letter (Ontario Heritage Act) for archaeological assessments	Minimum 12 weeks
Ministry of Transportation	Encroachment permit	Minimum 4 weeks
York Region	Dewatering Activity Discharge Approval - Municipal Sewer Use By-Law No. 2011-56 and 2012-70	To be determined
York Region	Traffic Management Plan	To be determined
York Region	Tree cutting permit - Forest Conservation By-Law No. TR – 0004-2005-036	To be determined
York Region	Road occupancy permits	Minimum 1 week
Lake Simcoe Region Conservation Authority (LSRCA)	LSRCA permit for Development, Interference with Wetlands and Alterations to Shorelines and Watercourses - Conservation Authorities Act and O. Reg. 179/06	1 month
Local Area Municipalities	Sanitary-storm sewer discharge permit	To be determined
Local Area Municipalities	Site Plan approval and building permit	To be determined (Dependent on Municipality)
Local Area Municipalities	Road occupancy permits	Minimum 2 weeks
Local Area Municipalities	Noise by-laws	To be determined (Dependent on Municipality)
Local Area Municipalities	Fill by-laws	To be determined (Dependent on Municipality)
Utilities	Utility relocations	To be determined (Dependent on Utility)
Metrolinx	Consent from Metrolinx	To be determined
CNR	Consent from CNR	To be determined
Infrastructure Ontario	Approval under the Ministry of Infrastructure Public Work Class EA	To be determined

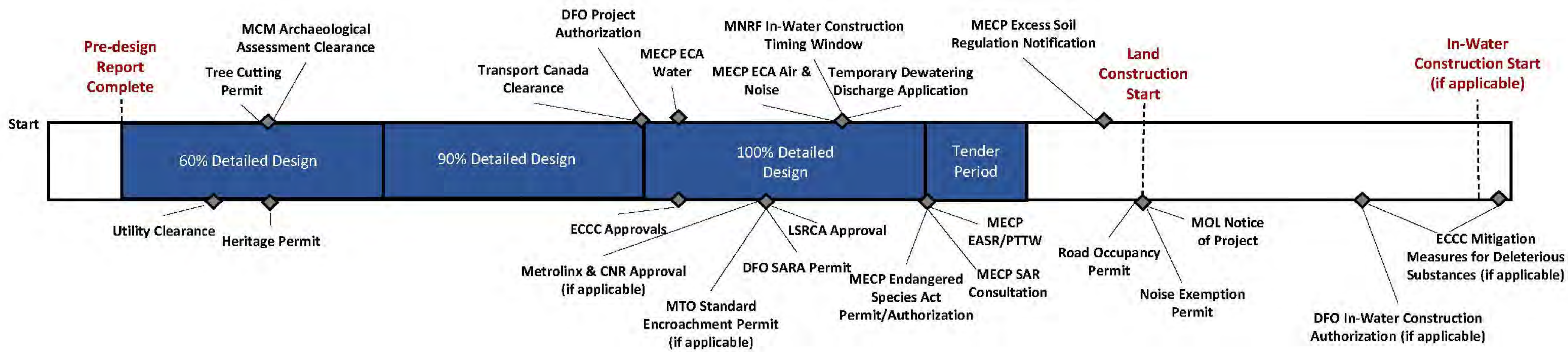

Figure 5.33 Typical Permits and Approvals Timeline

5.15.3 Project Delivery Schedule

The schedules for the individual implementation of the Newmarket Aurora components are shown in Table 5.77 to Table 5.85. The schedules are based on a traditional design-bid-build delivery method. Preliminary design, including initial field investigations, starts in year one (1).

Property acquisition can take up to 18 months, should expropriation be required, and should be a key consideration in development of the detailed project schedules during the design phase.

Procurement of design consultants would fall half a year ahead of commencing the planning and design phase.

The following assumptions were considered in the preparation of the schedules for the projects:

– A conservative "planning and design" process timeline, inclusive of the delivery in accordance with York Region's Consultant Requirements Manual, was established as 18 months. Exact months required may be adjusted over the course of design development, depending on the findings of the field investigations.
– Construction start does not consider any early works, such as utility relocations. Where applicable, these works should be conducted in parallel with detailed design.
– Construction timeline is based on typical construction production rates for the means and methods described herein for linear sewer and vertical infrastructure, as well as similar projects recently completed in the area.
– The schedule assumes 5 days/week of construction for most components of construction. Tunnelling works typically operate on a 6-day/week schedule. Durations are subject to change based on final construction methodology and contractor means and methods.
– Shaft construction timelines are subject to change based on selected construction methodology, to be determined in a future phase.
– Sewer construction timelines are subject to change based on selected construction methodology, to be determined in a future phase.
– There may be overlap between "construction" and "commission and operations", although this is not shown in the below tables.

Individual timelines are provided for the Newmarket/Aurora projects in Table 5.77 to Table 5.85. The symbol X in Table 5.77 to Table 5.85 denotes the project stage duration.

Table 5.77 Proposed Schedule for Y3-B Aurora East SPS

Description	Duration (years)	1	2	3	4	5	6	7
Planning and design	1.5	X	X					
Procurement	0.5		X					
Construction	3			X	X	X		
Commissioning and operations	2						X	X

Table 5.78 Proposed Schedule for Y4 Newmarket SPS Upgrade

Description	Duration (years)	1	2	3	4	5	6
Planning and design	2	X	X				
Procurement	1		X				
Construction	4		X	X	X	X	
Commissioning and operations	1						X

Table 5.79 Proposed Schedule for Y5 Bogart SPS Upgrade

Description	Duration (years)	1		2		3	4	5	6
Planning and design	1.5	X		X					
Procurement	0.5				X				
Construction	2					X	X		
Commissioning and operations	2							X	X

Table 5.80 Proposed Schedule for Y13-B Mulock SPS

Description	Duration (years)	1	2		3	4	5	6	7
Planning and design	1.5	X	X						
Procurement	0.5			X					
Construction	3				X	X	X		
Commissioning and operations	2							X	X

Table 5.81 Proposed Schedule for Y3-A Aurora East SPS Gravity Interconnection

Description	Duration (years)	1	2		3	4
Planning and design	1.5	X	X			
Procurement	0.5			X		
Construction	1				X	
Commissioning and operations	1					X

Table 5.82 Proposed Schedule for Y10 Aurora SPS Gravity Sewer Twinning

Description	Duration (years)	1	2		3	4
Planning and design	1.5	X	X			
Procurement	0.5			X		
Construction	1				X	
Commissioning and operations	1					X

Table 5.83 Proposed Schedule for Y13-A Leslie Street Trunk Sewer Phase 3

Description	Duration (years)	1	2		3	4	5
Planning and design	1.5	X	X				
Procurement	0.5			X			
Construction	2				X	X	
Commissioning and operations	1						X

Table 5.84 Proposed Schedule for Y3-C Aurora East SPS Forcemain

Description	Duration (years)	1	2	3	4	5	6
Planning and design	1.5	X	X				
Procurement	0.5		X				
Construction	2.5			X	X	X	
Commissioning and operations	1					X	X

Table 5.85 Proposed Schedule for Y13-C Mulock SPS Forcemains

Description	Duration (years)	1	2	3	4	5	6
Planning and design	1.5	X	X				
Procurement	0.5		X				
Construction	2.5			X	X	X	
Commissioning and operations	1					X	X

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