Dufferin Sanitary Trunk Sewer System Improvements at G. Ross Lord Reservoir Municipal Class Environmental Assessment Study

Project File Report (Issued for 30 Day Review)

Prepared for:
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Revision	Description	Author		Quality Check		Independent Review	
1	DRAFT	J.Hale	20180129	L.Weller	20180102	N. Oliveira	20180206
2	30 DAY REVIEW	J. Hale	20180413	L. Weller	20180415	N. Oliveira	20180416

Sign-off Sheet

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Abbreviations

AI	Andrews Infrastructure
BH	Borehole
BGS	Below Ground Surface
DWF	Dry Weather Flow
EA	Environmental Assessment
EASR	Environmental Activity and Sector Registry
FM	Flow Monitor
GTA	Greater Toronto Area
Ha	Hectare(s)
Hydro One	Hydro Networks Inc.
ID	Internal Diameter
KM	Kilometers
LIO	Land Information Ontario
OMB	Ontario Municipal Board
MH	Maintenance Hole
M	Metre(s)
MBG	Metre(s) Below Ground
MT	Microtunneling
PIE	Public Information Event
TRCA	Toronto and Region Conservation Authority
TTC	Toronto Transit Commission
The City	City of Toronto
The Project	Dufferin Sanitary Trunk Sewer System Improvements at the G. Ross Lord Reservoir
STS	Sanitary Trunk Sewer
WWF	Wet Weather Flow

1.0 INTRODUCTION

This Project File report has been prepared for the City of Toronto (the City) for the completed Municipal Class Environmental Assessment (EA) Study for the Dufferin Sanitary Trunk Sewer (STS) System Improvements at the G. Ross Lord Reservoir (the Project).

The completed Class EA has fulfilled the requirements of the Municipal Engineers Association Municipal Class EA process for a Schedule B undertaking. As a Schedule B undertaking, the EA Study completed Phases 1 and 2 of the Municipal EA process.

The following report also satisfies the deliverables set out in the Project Implementation Plan for the project (dated November 22, 2016) and agreed upon by Stantec Consulting Ltd. (Stantec) and the City in the fall of 2016. This report includes a broad inventory of the socio-economic environment, natural and physical environment, as required under the Municipal Class EA process. The report presents the results of the evaluation of a variety of alternatives to address the stated problem/opportunity statement, based on the potential impacts to the inventoried environment, and presents the preferred alternative, as well as the results of consultation undertaken throughout the EA process with members of the public, agencies, Indigenous communities, and other stakeholders.

1.1 STUDY AREA

The study area is approximately 0.6 km^2, extending from 450 m south of Finch Avenue West, to 400 m north of Finch Avenue West, and from Dufferin Street to 1000 m east of Dufferin Street. The study area boundary was amended during the EA process to include maintenance hole (MH) MH135-006 and MH135-007. The boundaries of the southern area were expanded for the sole purposes of capturing the potential to use the upstream areas for access routes, staging areas, and bypass-pumping routes as identified during the review of longlisted alternatives. The Study Area is presented in **Figure 1-1.** A figure summarizing the environmental inventory within the Study Area is provided in **Appendix A**.

The majority of the Study Area is located on parcels owned by the Toronto and Region Conservation Authority (TRCA), however, there are easements granted to the City for the trunk sewer installation, to four pipeline companies, and to Hydro One Networks Inc. (Hydro One) for an overhead transmission line corridor. The four pipeline companies that own easements within the hydro corridor are Enbridge Pipelines Inc., Trans-Northern Pipelines Inc., Sun-Canadian Pipe Line Company, and Imperial Oil. These pipelines are high pressure oil pipelines regulated by the National Energy Board.

For the purpose of this Class EA, the study area has been separated into the North Area and South Area, as delineated by Finch Avenue West. Alternative solutions were developed separately for the two project areas due to differences in the condition of the existing infrastructure and differences in the project needs within these areas.

Stantec

Legend

- Study Area
- Rain Gauge
- Flow Monitor
- Borehole
- Selected Existing Sanitary Manhole
- Sanitary Sewer - Active
- Sanitary Sewer - Abandoned
- Storm Sewer - Active
- Storm Sewer - Abandoned
- Watermain - Active
- Watermain - Abandoned
- Oil Pipeline

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Notes

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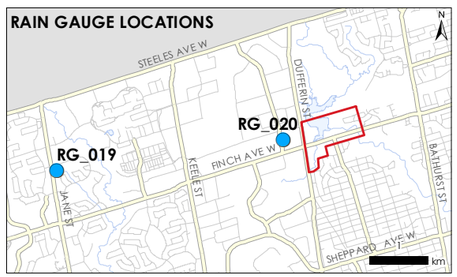
RAIN GAUGE LOCATIONS



Project Location
City of Toronto

165660077 REVA
Prepared by KDB on 2018-04-12

Client/Project
CITY OF TORONTO - DUFFERIN SANITARY TRUNK SEWER SYSTEM IMPROVEMENTS AT G. ROSS LORD DAM
PROJECT FILE REPORT

Figure No.
1-1

Title
Study Area

1.2 PROJECT BACKGROUND

The G. Ross Lord Reservoir (Reservoir), located on the northeast corner of Finch Avenue West and Dufferin Street, receives flow from an upstream catchment area of approximately 660 hectares (ha). The reservoir was created in 1973 to reduce the risk of flooding to downstream communities with the construction of an earth embankment dam across the Don River West Branch near Finch Avenue.

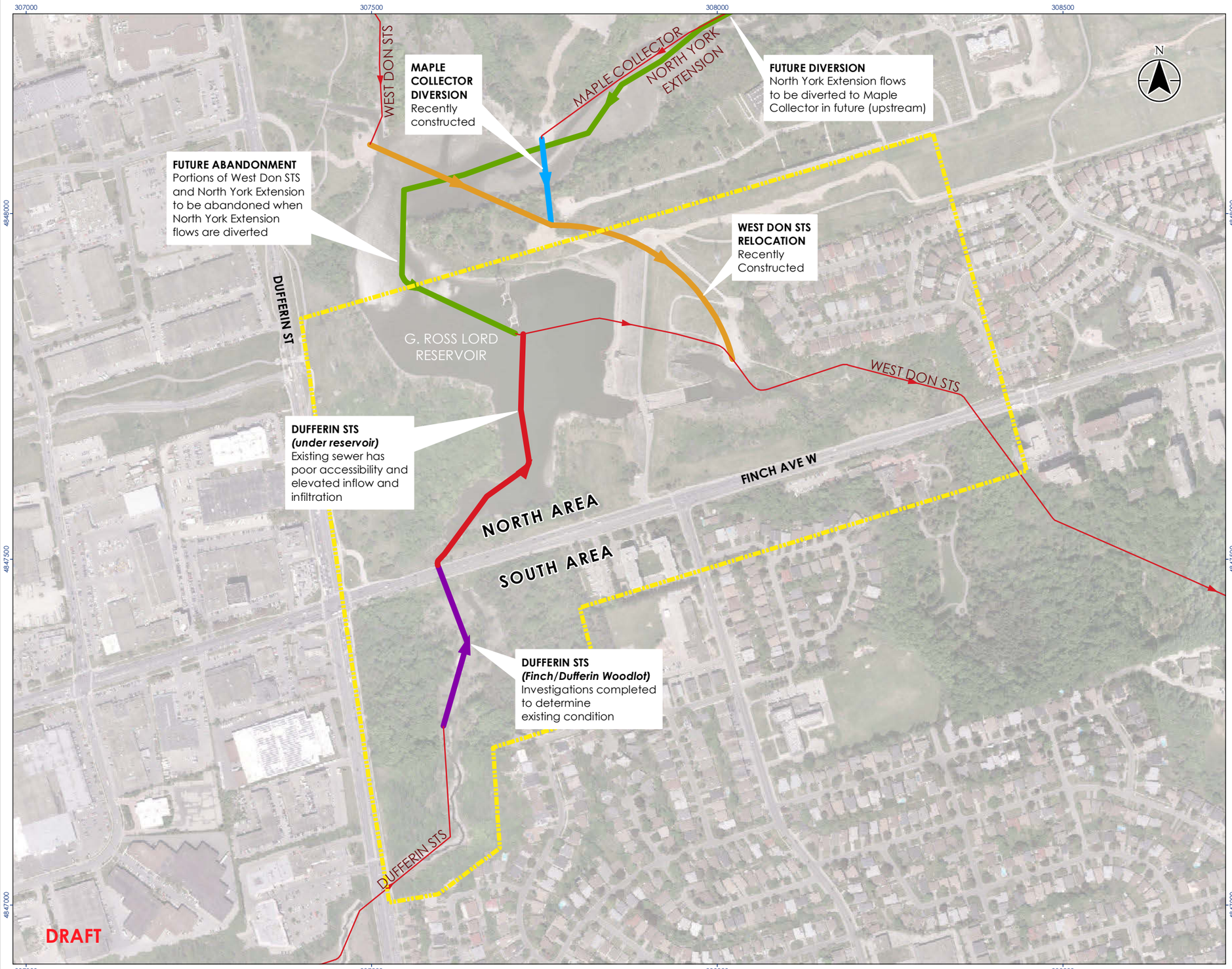
The City's Don STS Collection System, installed prior to the construction of the G. Ross Lord Reservoir, flows underneath the Reservoir in a generally north to south direction. Two sanitary trunk sewers that are part of the City's Don STS Collection System are located underneath the reservoir: West Don STS and the Dufferin STS.

The realignment of the West Don STS upstream of the Dufferin STS was undertaken by the City starting in 2015 as a part of an emergency realignment project to address failed sections of the West Don STS. The Dufferin STS is connected to the West Don STS downstream of MH132-113 under the G. Ross Lord Reservoir. As such, the West Don STS from MH132-113-1 to MH132-111-1 was not relocated as part of the West Don STS emergency realignment project. For this reason, the West Don STS from MH132-113-1 to MH132-111-1 and the existing Dufferin STS from MH135-003 to MH132-113 need to be evaluated to determine the preferred solution to address problems with those sections of the STS. Additionally, the sewer performance south of Finch Avenue West between MH135-005 and MH135-003 was identified as a concern based on the findings from CCTV investigations undertaken by Andrews Infrastructure (AI), and therefore these sections of sewers were also evaluated as part of this Class EA study.

The West Don STS collects flows from the local Dufferin Sewer to the north-west of the study area, the Maple Collector, and the North York Extension, both entering from the northeast. The Maple Collector was constructed in 1975 but was abandoned when the Steeles Avenue Interceptor diverted sewage flow from the Maple area to the York-Durham Sewer System. Although this sewer has been taken out of service, further steps are still required to fully decommission the sewer. Observations from the CCTV Investigation indicate that there is still some flow in the Maple Collector leading into the West Don STS, and available flow monitoring data was reviewed which revealed that significant flows are observed in the sewer under wet weather conditions only.

Flows from the local Dufferin Sewer and the Maple Collector were diverted at MH 4A on the Maple Collector and now drain into MH132-110B on the West Don STS. This connection was completed on December 9, 2015.

The North York Extension is to be diverted into the Maple Collector just upstream of Chamber 4, at which time the North York Extension will be decommissioned from MH135-001 to this proposed diversion as upcoming North York Extension diversion work, which is scheduled to begin construction in July 2018, for an approximate construction period of 6-months. This work is also to include the abandonment of the old West Don STS from MH132-113 to MH132-115 which is anticipated to take place late 2018 or early 2019, for an approximate 6-month construction period. All existing sewers are depicted on **Figure 1-2**.



Stantec

Legend
- Study Area
- Existing Trunk Sewer

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Notes
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Project Location
City of Toronto

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Client/Project
CITY OF TORONTO - DUFFERIN SANITARY TRUNK SEWER SYSTEM IMPROVEMENTS AT G. ROSS LORD DAM PROJECT FILE REPORT

Figure No.
1-2

Title
Completed and Ongoing Works

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2.0 EXISTING SANITARY INFRASTRUCTURE

AI completed a condition assessment of the West Don and Dufferin trunk sewers for the City of Toronto in 2010 and 2011. The condition assessment revealed that three sections of the West Don STS were experiencing advanced structural deterioration between several MHs, and that overall the West Don STS is hydraulically overloaded.

AI noted infiltration from cracks and joints through some sewer segments of the West Don STS. Infiltration at MHs was not identified as being of significant concern along the West Don STS within the study area. Surcharged pipes (MH135-004 to MH135-005) were identified within the Dufferin STS. Active infiltration was identified through pipe joints along the Dufferin STS, and evidence of infiltration at MHs was identified at MH135-001 and MH135-002, although infiltration was not encountered during the inspection. The condition assessment information, as provided in the Condition Assessment completed by AI is summarized in **Figure 2-1**.

The Dufferin STS was graded as 'Fair' overall. The assessment revealed signs of slight surface spalling and light encrustation at the joints in multiple locations. Recommendations were that the sewer be inspected in 5 years to monitor the spalling. However, due to the potential for further concrete spalling, structural issues, accessibility issues, and an increase in inflow/infiltration with increasing age of the Dufferin STS, the assessment suggested further improvements to the system.

Capital Sewer Services Inc (Capital). was retained by Stantec to complete an inspection from MH135-005 to MH135-003 in 2017 to supplement the information provided by AI. The inspection was completed between MH135-005 and MH135-004; however, the conditions were not suitable to complete the inspection between MH135-004 and MH135-003. MH inspections at MH135-005 and MH135-003 were completed. Capital identified signs of infiltration in both MH135-004 and MH135-005.

Based upon communication with the City, the realignment of the West Don STS upstream of the Dufferin STS began in 2015 to address the failed sections of the West Don STS. The Dufferin STS is connected to the West Don STS downstream of MH132-113 under the G. Ross Lord Reservoir. As such, the West Don STS from MH132-113 to MH132-111 was not relocated as part of the West Don STS emergency realignment project. For this reason, the West Don STS from MH132-113 to MH132-111 and the existing Dufferin STS from MH135-003 to MH135-001 needed to be evaluated to determine the preferred solution to address problems with those sections of the sanitary trunk sewers.

Stantec

Legend

MH Condition

- 1
- 2
- 3
- 4
- 5
- NOT INSPECTED

Sewer Condition

- NOT INSPECTED
- 1
- 2
- 3
- 4
- 5

General Notes:
1. MH 135-003, MH 135-004, and MH 135-005 and the sewer segment from MH 135-004 to MH 135-005 were inspected by Capital Sewer Inc. in 2017. Sewer inspection ratings are as per PACP.
2. All remaining inspection work was completed by Andrew's Infrastructure in 2008, 2009 and 2011. Sewer inspection ratings are as per Water Research Centre (WRc).

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Notes
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Project Location
City of Toronto

165660077 REVA
Prepared by KDB on 2017-05-24

Client/Project
CITY OF TORONTO - DUFFERIN SANITARY TRUNK SEWER SYSTEM IMPROVEMENTS AT G. ROSS LORD DAM
PROJECT FILE REPORT

Figure No.
2-1

Title
Condition Assessment of Existing Infrastructure

3.0 ENVIRONMENTAL ASSESSMENT PROCESS

3.1 ONTARIO ENVIRONMENTAL ASSESSMENT ACT

The Ontario Environmental Assessments Act (EA Act) outlines a planning and decision-making process intended to assess potential environmental effects of a project before the project begins. The EA Act applies to government ministries and agencies, municipalities, and public bodies such as conservation authorities.

The EA Act outlines requirements for Class EAs (Part II.1 of the EA Act) which are streamlined assessment processes that apply to projects that have predictable and manageable environmental effects. Projects included in the Class EA may be implemented without further approval under the EA Act provided that the approved Class EA planning process is followed.

The environmental assessment process ensures that governments and public bodies consider potential environmental effects before an infrastructure project begins.

The key principles of the Environmental Assessment process under the EA Act include:

- Consultation with affected parties early in and throughout the process;
- Consideration of a reasonable range of alternatives of implementing the solution;
- Identification and consideration of the effects of each alternative on all aspects of the environment;
- Systematic valuation of alternatives to determine their net environmental effects; and,
- Provision of clear and complete documentation of the planning process followed, to allow "traceability" of decision-making with respect to the project.

3.2 MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

The Municipal Class EA document (Municipal Engineer's Association 2000, as amended in 2007, 2011 and 2015) outlines an approved process under the EA Act that applies to municipal infrastructure projects. The Municipal Class EA process categorizes proposed municipal projects based on the complexity of the project and its magnitude of potential environmental effects. The four categories are defined as follows:

- **Schedule A** projects are limited in scale, have minimal adverse environmental effects. These projects are pre-approved and may proceed to implementation without following the full Class EA planning process. Schedule A projects generally include normal or emergency operational and maintenance activities.

- **Schedule A+** are similar to Schedule A projects; they are pre-approved and include municipal operations and maintenance activities, however, they also require public notification.
- **Schedule B** projects have the potential for some adverse environmental effects. The proponent is required to undertake a screening process, involving mandatory consultation with directly affected public and relevant review agencies so that they are aware of the project and that their concerns are addressed. Schedule B projects generally include improvements and minor expansions to existing facilities.
- **Schedule C** projects have the potential for significant environmental effects and must proceed under the full planning and documentation procedures specified in the Municipal Class EA document. Schedule C projects generally include the construction of new facilities and major expansions to existing facilities.

This Project is classified as a Schedule B undertaking. The completed Class EA has addressed the requirements of the approved MEA Class EA process, in keeping with the requirements for a Schedule B undertaking.

The main elements of the Municipal Class EA process are separated into five phases which are shown in **Figure 3-1**. As a Schedule B undertaking, completion of Phases 1 and 2 of the Municipal Class EA process is required prior to implementation (Phase 5).

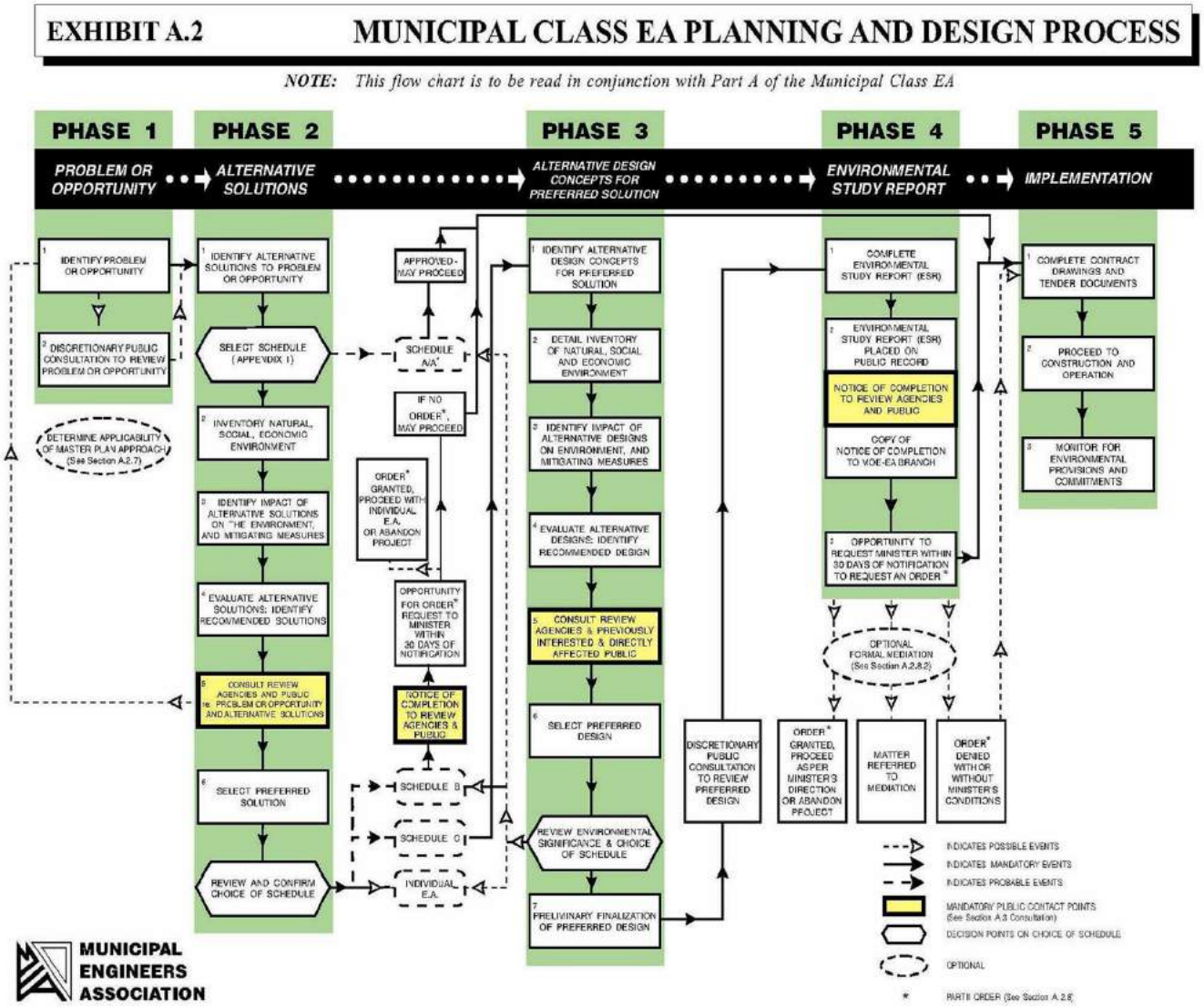


Figure 3-1: Five Phases of the Municipal Class EA Process

4.0 PROBLEM/OPPORTUNITY STATEMENT

Phase 1 of the Class EA process involves identification of the need and justification for undertaking the study, leading to a clear statement of the problems and opportunities being addressed as part of the study.

Based on the structural and operational deficiencies identified, the following problem/ opportunity statement for the Dufferin STS System Improvements at G. Ross Lord Reservoir was developed during Phase 1 of the Municipal Class EA:

> *Built in the early 1960s, the Dufferin STS is part of the City's Don Sanitary Trunk Sewer Collection System. Sections of the Dufferin STS in the Dufferin Street and Finch Avenue West area are located under the G. Ross Lord Reservoir, which was built in 1973 to reduce the risk of flooding to downstream communities. As a result of the Dufferin STS' deterioration over the years and its alignment under the reservoir, there is a significant amount of infiltration and inflow of stormwater into the trunk sewer and there are trunk sewer sections and maintenance holes that are inaccessible for maintenance, which poses operational challenges.*
>
> *The Dufferin Sanitary Trunk Sewer System Improvements at G. Ross Lord Municipal Class EA is being undertaken to identify preferred solutions to address the deterioration of the system under the reservoir as they relate to the safety, structural condition, performance and applicable design standards. This Class EA will be undertaken in accordance with the Municipal Class Environmental Assessment process (Municipal Engineer's Association 2000, as amended in 2007, 2011 and 2015).*

5.0 ENVIRONMENTAL INVENTORY

Determining the existing environmental conditions of the Study Area is required in order to accurately assess the impacts that may be associated with the alternative solutions identified for the Project.

The following sections summarize the existing socio-economic, natural and physical environments within the Study Area and surrounding lands.

5.1 SOCIO-ECONOMIC ENVIRONMENT

5.1.1 Cultural Heritage

The City of Toronto's heritage register indicates one heritage property immediately adjacent to the Study Area, at 685 Finch Avenue West. A preliminary review of potential impacts to heritage features in the vicinity of the Study Area has determined that no negative impacts are anticipated to occur to heritage features as a result of the proposed works. A Heritage Impact Assessment has been completed to confirm potential heritage impacts. The Assessment included consultation with the City of Toronto, the Ministry of Tourism, Culture and Sport (MTCS), and the Ontario Heritage Trust to confirm heritage resources in the study area, a site visit, and an assessment of potential impacts to heritage resources that are identified. The study concluded that adverse impacts to heritage features is not anticipated due to the proposed construction works.

5.1.2 Archaeological Resources

A Stage 1 Archaeological Assessment has been conducted for the Project Study Area. The Stage 1 Archaeological Assessment determined that both the Aboriginal and Euro-Canadian archaeological potential of the Study Area are moderate to high. A Stage 2 Archaeological Assessment is recommended for portions of the Study Area. The exact extent for further Stage 2 Archaeological Assessment work will be determined and the assessment will be completed during detailed design activities.

A copy of the completed Stage 1 Archaeological Assessment Report was submitted to the City's Engineering and Construction Services Group and the City's Heritage Unit, as well as the TRCA for review, followed by submission to MTCS for review and inclusion into the Public Register of Archaeological Reports. A copy of the Stage 1 Archaeological Assessment Report, and the MTCS review and approval letter dated May 3, 2017, is provided in **Appendix B**.

5.1.3 Current Land Uses and Land Users

The Study Area is located in the City of Toronto Ward 10 York Centre. Ward 10 generally extends from Steeles Avenue West to Highway 401 between Dufferin Street/William R. Allen Road and

Bathurst Street. The Ward 10 York Centre Profiles were created from the Statistics Canada 2011 Census and National Household Survey (City of Toronto 2011, 2011b). The Ward Profiles indicate that the population of Ward 10 is 64,830, a 4.4% increase since 2006. The population density of the ward is 4,240 people per square kilometer (km).

The 2011 census data along with City Planning Data were used to calculate the contributing populations for the Dufferin STS. The contributing populations were calculated for 2011, a summary is provided in **Table 5-1**.

Table 5-1: Contributing Population to the Dufferin STS

Population	2011
Residential	2,644
Employment	14,549
Total	17,193

Dwellings are much older in Ward 10 with 6% being built after 2000. In the City of Toronto, 12% of dwellings were built after 2000. Private households are owned by 46% of the population in Ward 10 compared to 55% in the City of Toronto.

Land uses within and surrounding the Study Area are designated by the City of Toronto. The City of Toronto is a single-tier municipality. An assessment of land use within the Study Area was conducted through a review of the City of Toronto Official Plan (June 2015 consolidation), and the City of Toronto Zoning By-law 569-2013 (last amended September 2016). Additionally, visits to the Study Area by the Project Team and air photo interpretation were used to identify existing land use within and surrounding the Study Area that could be affected by the Project.

The Study Area is currently occupied by the G. Ross Lord Reservoir and Park and remnant woodlands. Park facilities include bike trails, a cricket pitch field, an off-leash dog area, and riding stables. A Hydro One overhead high-voltage hydro transmission line corridor runs east-west intersecting the Study Area. The hydro corridor also contains four underground oil pipelines.

Additional parkland and woodlands, Westminster Memorial Gardens Cemetery, a government office building, an industrial complex, University of Toronto Institute for Aerospace Studies, and a large subdivision of single detached houses are located north of the Study Area. South of Finch Avenue West is a natural valley land owned by the TRCA, which includes a portion of the Dufferin Creek. Southeast of the Study Area are several recreational facilities, as well as a secondary school, a public library, a synagogue, and a community food bank. South of Finch Avenue there are several care facilities and numerous mid to high rise apartment buildings surrounded by woodlands. A small residential subdivision comprised predominantly of semi-detached homes is located in the southeast portion of the Study Area. South of the Study Area is a large subdivision containing detached homes, an elementary school, and a middle school.

West of the Study Area, across Finch Avenue is a large commercial area including restaurants, banks, gas stations, leisure and recreational amenities and big-box stores.

5.1.3.1 City of Toronto Official Plan

The City of Toronto Official Plan was approved by the Ontario Municipal Board (OMB) in June 2015. The Study Area is predominantly designated as Natural Areas, Parks, and Other Open Space Areas but also includes Neighbourhoods, Apartment Neighbourhoods, and Institutional Areas south of Finch Avenue. According to Policies 2 and 3 in Section 4.3 of the Official Plan, public works and utilities are permitted in Parks and Open Space Areas, where supported by appropriate assessment, and Natural Areas allow for public works and utilities for which no reasonable alternatives are available and that are designed to have only minimal adverse impacts on natural features and functions. Land use designations surrounding the Study Area also include Mixed Use Areas to the south and east and Employment Areas to the west. The Study Area is also identified as City Parkland and is part of the City's Natural Heritage System.

5.1.3.2 City of Toronto Zoning By-law

The City of Toronto Zoning By-law 569-2013 was approved by the OMB in September 2016. The Study Area is zoned predominantly as Open Space Natural (ON), but also includes Open Space Recreational (OR), Residential Semi Detached (RS), Residential Detached (RD), and Residential Apartment (RA) zones. According to Section 5.10.20.1 (1) of the Zoning By-law, facilities for public services are permitted in any zone.

5.1.4 Transportation and Transit

The Study Area is located immediately east of Dufferin Street and the southern portion of the Study Area is intersected by Finch Avenue West. The Study Area also includes the northern extent of Wilmington Avenue. According to the City's Official Plan (2015), Dufferin Avenue has a 45 m or greater right-of-way, Finch Avenue West has a 36 m wide right-of-way, and Wilmington Avenue has a 27 m wide right-of-way.

The nearest existing Toronto Transit Commission (TTC) subway station is the Downsview Station located at Allen Road and Sheppard Avenue West. Downsview Station is on the Yonge-University Line which runs from Union Station to the Vaughan Station. The Study Area is also serviced by numerous TTC bus routes including the 105 and 117 along Dufferin Street, and the 36 and 199B Express along Finch Avenue West. TTC night bus routes include the 329 along Dufferin Street and the 336 along Finch Avenue West.

The Study Area is located along a Potential Greater Toronto Area (GTA) Transit Corridor as identified in the City's Official Plan (2015). The hydro corridor in the northern portion of the Study Area contains the Finch Avenue Corridor Recreational Trail and is identified as a Transit Corridor Expansion Element, along with Dufferin Avenue.

5.1.5 Ongoing Planning Studies and Future Development

A review of Community Planning activity in North York District (City of Toronto 2016a) and Urban Design Featured Programs (City of Toronto 2016b) identified several ongoing planning studies in the vicinity of the Study Area.

5.1.5.1 Neighbourhood Urban Design Guidelines

The City has initiated a study for the creation of a "Template" for Neighbourhood Urban Design Guidelines and an accompanying "How-To" Manual. These documents are intended to be applied by communities that wish to prepare neighbourhood specific design guidelines. The Template would enable communities to develop tailored design guidelines specific to their neighbourhood, while ensuring consistent content and format with other neighbourhood specific design guidelines throughout the City. The study includes a pilot project in the Willowdale neighbourhood which extends into the eastern portion of the Study Area. The study was completed in early 2017.

5.1.5.2 Cycling Network and Trails Plan

The City developed a Cycling Network and Trails Plan in 2016. There is an existing cycling network through the G. Ross Lord Park which extends from Finch Avenue West to the northeast of the study area. The Cycling Network and Trails Plan identifies a proposed cycling/trail route along Dufferin Street north of Finch Avenue West, and along Finch Avenue West east of Dufferin Street. Cycling routes have also been proposed along Wilmington Avenue which cross Finch Avenue West and continue on the north side of Finch Avenue West.

5.1.5.3 Keele Finch Plus Study

The TTC is currently constructing a subway station at the Keele Street and Finch Avenue West intersection, and Metrolinx is investing in the Finch West Light Rail Transit line. Both of these lines will result in improvements to public transit service to and from the Finch Avenue West and Keele Street area, and will significantly improve mobility and transportation options for Torontonians, while also bringing a number of city building opportunities. As a result of these transportation infrastructure improvements, the City is undertaking the Keele Finch Plus Study to build on the opportunities presented by rapid transit investment. Plan implementation is currently targeted for spring 2018.

5.1.5.4 Etobicoke-Finch West Light Rail Transit

The City of Toronto and the Toronto Transit Commission (TTC) have undertaken the Transit Project Assessment Process (TPAP) study for the 17 km long Etobicoke-Finch West Light Rail Transit (EFWLRT) corridor. The Etobicoke-Finch West Light Rail Transit, Transit Project Assessment, Environmental Project Report was completed in March 2010. This study recommends that bus services along the Finch Avenue West corridor be replaced by Light Rail Transit (LRT) with

electrically powered "light rail" vehicles. The LRT would span from Yonge Street to Highway 27. In conjunction with the LRT project, the City has scheduled Finch Avenue West for a road widening, which will include a widening of the existing bridge over the West Don River.

5.1.5.5 Yonge Street North Planning Study

The Province's Growth Plan for the Greater Golden Horseshoe identifies North York Centre as an 'urban growth centre', where significant employment and population growth is to occur. The Yonge Street North Planning Study was initiated by the City to develop a vision for the future of the Yonge Street corridor between Finch Avenue West and Steeles Avenue by providing a comprehensive set of planning tools to realize the vision for the area and respond to increasing development pressures in the area. The application was submitted in October 2009 and is currently under review.

5.1.5.6 York University Secondary Plan and Southwest Precinct Plan

The existing York University Secondary Plan Area is generally bound by Steeles Avenue to the north, Murray Ross Parkway to the south, Keele Street to the east and Black Creek to the west. The Secondary Plan was developed to affirm the long-term vision for the York University Secondary Plan area, recognize major planned transit initiatives, and guide future development and land use decisions for the Secondary Plan area.

The York University Secondary Plan requires the preparation of a Precinct Plan prior to the approval of non-university development in the Edge Precincts. The York University Southwest Precinct Plan was initiated to build on the principles of the Secondary Plan and is intended to guide development in the Southwest Precinct. As part of the Southwest Precinct Plan, York University has submitted a Plan of Subdivision application to develop 8 mixed-use lots, two future north/south public streets and two future north/south private streets within the larger block bound by The Pond Road to the north, Sentinel Road to the west, the extension of Ian Macdonald Road to the east and Assiniboine Road to the south.

5.1.5.7 Proposed Future Development

A search on the City's website (2017) for current development applications within or surrounding the Study Area determined that there are currently numerous developments applications and planning studies near the Study Area:

- Site Plan approval and rezoning at the existing Sanofi Pasteur complex at 1755 Steeles Avenue W to permit alteration to existing development and construction of a new 3-storey, 15,000 m² manufacturing building on the southern portion of the site. The application was submitted in November 2016 and is currently under review.
- Rezone of an existing apartment neighbourhood located at 6040 Bathurst Street and 5 Fisherville Road to permit construction of two additional apartment buildings (19

and 29 storeys). The application was submitted in November 2016 and is currently under review.

- Part Lot Control exemption at 55 Antibes Drive to extend the expiry date of the original Part Lot Control By-law for three townhouse blocks (28 units) currently under construction. The application was submitted in April 2016 and is currently under review.
- Site Plan approval, Official Plan Amendment, and Rezoning at the existing Advent Health facility at 555 Finch Avenue W to permit construction of a five-storey retirement home and assisted living facility. The application was approved in April 2014.
- Plan of Subdivision and Site Plan approval, Official Plan Amendment, and rezoning at the existing Bathurst Manor Plaza at 221-245 Wilmington Avenue to permit the redevelopment of the existing plaza into two 6-storey mixed-use residential buildings, 44 townhouse units (totaling 394 units), a private parkette, and a new public street and public walkway. The application was submitted in March 2011 and is currently under review.
- Site Plan Control review at 147 Elder Street to revise existing on-site storm water management to accommodate a three-storey, 823.61 m² addition to the existing seniors residential care facility. Only the revisions to the on-site storm water management are subject to site plan control review, as the addition was deemed exempt from the process. The application was submitted in November of 2014 and is currently under review.
- Site Plan approval, Official Plan amendment and rezoning at 4588 Bathurst Street to permit construction of an integrated complex that includes a community centre, theatre, chapel, offices, private school, day-care, art gallery, artist studio, museum, library, fitness centres, food services and swimming facilities. The proposal also includes significant landscaping and connections to the Don River Valley. The proposed development is the second phase of work on the lands. The application was submitted in December 2007 and was approved in August 2011.

5.2 NATURAL ENVIRONMENT

A Natural Heritage Report was completed by Stantec Consulting Ltd., to document the natural heritage inventory of the Study Area. The results were documented in a report titled "Dufferin Sanitary Trunk Sewer Natural Heritage Report" which is included in **Appendix C**.

The following sections include a summary of the key findings noted in the Natural Heritage Report.

5.2.1 Wetlands

There are no Provincially Significant Wetlands identified in the Study Area. Three small unevaluated wetlands were identified through Land Information Ontario (LIO) mapping adjacent to the G. Ross Lord Park Reservoir and Dufferin Creek.

5.2.2 Significant Woodlands

The woodlands south of Finch Avenue surrounding Dufferin Creek should be considered significant as they are 10.3 ha in size, and are part of a steep valleyland that serves a water protection function. The smaller woodlands south of Finch Avenue and east of Wilmington are part of a large woodland feature (>40 ha) that extends further south of the Study Area, and should also be considered significant.

Although the woodland north of Finch Avenue on the west side of the reservoir is less than 4 ha in size, it is part of the Natural Heritage System in the City's Official Plan and serves a water protection function, and should be considered significant. The woodland north of Finch Avenue on the east side of the reservoir is approximately 4 ha in size, and should be considered significant because it is part of the Natural Heritage System in the City's Official Plan, and serves a water protection function.

5.2.3 Significant Valleylands

The valleylands south of Finch Avenue should be considered significant since they have a well-defined valley morphology (e.g., floodplains, meander belts, valley slopes) and an average width over 25 m. Mature woodlands surrounding the southern edge of the G. Ross Lord Reservoir should also be considered significant valleylands since they are naturally occurring, distinctive landforms within the landscape.

5.2.4 Habitat of Endangered and Threatened Species

The G. Ross Lord Dam, and the steep, exposed bank along the east side of Dufferin Creek near Dufferin Street provides nesting opportunities for Barn Swallow. The woodlands south of Finch Avenue, the woodlands north of Finch Avenue and the community associated with the Don River West Branch all provide potential roosting habitat for endangered bats.

5.2.5 Significant Wildlife Habitat

There are four general types of significant wildlife habitat: seasonal concentration areas, rare or specialized habitat, habitat for species of conservation concern, and wildlife movement corridors. These are discussed in more detail below.

5.2.5.1 Seasonal Concentration Areas

Although the G. Ross Lord Reservoir provides potential habitat for waterfowl stopover and staging areas, shorebird migratory stopover areas and turtle wintering areas, it does not qualify as significant wildlife habitat.

Candidate significant wildlife habitat for bat maternity colonies occurred within the woodland communities. These communities have an abundance of large diameter trees that have the potential to support roosting bats in tree cavities and/or under peeling bark.

Candidate significant wildlife habitat for overwintering turtles occurs in the Don River West Branch.

Candidate significant wildlife habitat for colonial nesting birds occurred within the exposed banks on the east side of Dufferin Creek close to Dufferin Street. Exposed banks provide potential habitat for nesting Cliff Swallows, Northern Rough-winged Swallows and Bank Swallows.

5.2.5.2 Rare or Specialized Habitat

No significant rare habitats were identified in the Study Area.

Potential candidate habitat for turtle nesting areas occurred in exposed mineral soils adjacent to the G. Ross Lord Reservoir and the Don River West Branch. Some of these soils are associated with the recreation trail system through G. Ross Lord Park.

Potential candidate amphibian breeding habitat (woodlands) occurred in the wetland associated with the west bank of Dufferin Creek, immediately south of Finch Avenue West.

5.2.5.3 Species of Conservation Concern

Candidate habitat for marsh breeding birds occurred within the wetland associated with the west bank of Dufferin Creek, immediately south of Finch Avenue West.

5.2.5.4 Wildlife Movement Corridors

No significant habitat for breeding amphibians (wetlands) were identified in the Study Area, and therefore no candidate wildlife movement corridors were identified.

5.2.6 Aquatic Habitat

Habitat within the Study Area is suitable to support many of the species that are known to inhabit the West Don River. The G. Ross Lord Reservoir provides suitable habitat for species such as Brown Bullhead and Pumpkinseed, while the riverine habitat in Dufferin Creek and the West Don River is suitable for the other species. The dam functions as a barrier to fish movement between the reservoir and the West Don River channel. The confluence of Dufferin Creek with the reservoir allows fish movement between the two habitats. Sensitive or limiting habitats were

not observed within the Study Area. The three reaches provide fish habitat for a fish community comprised of tolerant warmwater species.

5.3 PHYSICAL ENVIRONMENT

A preliminary geotechnical investigation was completed in the vicinity of the Study Area in 2013 by SPL Consultants Limited. The results were documented in a report titled "Report on Preliminary Geotechnical Investigation, West Don Trunk Sewer Replacement, G. Ross Lord Reservoir, Toronto".

A hydrogeological investigation was completed for the West Don Rehabilitation Project in 2013 by GENIVAR Inc. The results were documented in a report titled "Hydrogeological Investigations in Support of a Category 3 Permit to Take Water Application, West Don Sanitary Trunk Sewer Rehabilitation, City of Toronto".

The previously completed geotechnical and hydrogeological studies were used to provide a preliminary understanding of the subsurface conditions. A geotechnical and hydrogeological investigation will be completed within the proposed study area as part of the preliminary design stage of the project. These studies will provide site specific information which will aid in the design of the preferred solution. The subsurface information will be used to inform design decisions such as the selection of pipe material and installation methods which are suited to the subsurface conditions.

The following sections include a summary of the preliminary geotechnical investigation and hydrogeological investigation, and includes information from the Toronto and Region Source Protection Area Assessment Report (2015).

5.3.1 Physiography and Surficial Geology

The Study Area is located within the Peel Plain Physiographic Region (Chapman and Putnam 1984) which is characterized by bevelled till plain with fine grained lake deposits of silt and clay shallowly overlying till.

The Study Area contains a brown clayey silt till underlain by cohesive deposits of sandy silt with some clay. Below the cohesive deposits are randomly deposited cohesionless granular soils consisting of silt and sand, gravel, silty sand and gravel, often with till-like texture interlayered with cohesive silty clay/clayey silt glacial tills. These deposits are underlain by a varved clay deposit. In the river valley, the surficial brown clay till deposits are overlain by a thin layer of alluvium.

5.3.2 Bedrock Geology

The bedrock geology within the Study Area is grey shale and limestone of the Georgian Bay Formation from the Upper Devonian Period. The upper contact of the bedrock was encountered between 40 and 50 meters below ground (mbg) during the investigations for the dam and reservoir.

5.3.3 Hydrogeology

MOECC Water Well Records database (2016) indicate that there are 12 water wells located within the Study Area (see **Figure 1, Appendix A**). Only two water wells have reported static water levels; they are 17.7 mbg and 38.1 mbg. According to the geotechnical and hydrogeological investigations, groundwater levels range between 0.4 mbg and 6.8 mbg (165.6 to 173.4 m ASL).

5.3.4 Source Water Protection

The Study Area is located in the Toronto and Region Source Protection Area. Municipal drinking water in North York is sourced from surface water intakes in Lake Ontario and municipal wells located through the Source Protection Area (Credit Valley, Toronto and Region and Central Lake Ontario Source Protection Committee 2015). The Study Area is not located within an Intake Protection Zone or Wellhead Protection Zone. The nearest intake to the Study Area is the municipal well in Kleinburg, Vaughan, located approximately 15 kilometres (km) northwest.

The Study Area is located within a highly vulnerable aquifer, and a significant groundwater recharge area (when applying Rule 44 (1) and Threshold by Toronto and Region Source Protection Area jurisdiction).

6.0 IDENTIFICATION OF ALTERNATIVE SOLUTIONS

As part of the Class EA planning process, reasonable and feasible alternative solutions to the Phase 1 Problem/Opportunity statement are identified and described in Phase 2. A summary of the identified solutions is provided in the following subsections. The alternative solutions have been reviewed against a set of criteria (presented in **Section 8.0**), this evaluation process helps to determine the significant advantages and disadvantages with respect to the Natural Environment, Social/Cultural, Technical, and Economic/Financial components of the Project.

6.1 LONGLIST OF ALIGNMENT ALTERNATIVE SOLUTIONS

A long list of alternatives was developed which is intended to include many potential broad level alternative solutions. A review of the longlisted alternatives is subsequently completed which typically eliminates alternatives that are not feasible or not suitable for this application. The remaining alternatives will be considered "shortlisted" and will be further evaluated as part of the EA process.

The longlisted alternatives identified fall into the following three categories:

- **Alternative 1**: "Do Nothing"
- **Alternative 2**: Rehabilitation of existing portions of Dufferin STS and West Don STS in need of repair
- **Alternative 3**: Realignment of existing portions of Dufferin STS and West Don STS in need of repair

A summary of all longlisted options considered under each alternative solution is provided in the following sections. A technical review of each longlisted alternative has been completed to establish feasibility and to shortlist the alternatives to be considered for further review. Additional details can be found in the Pre-Design Report, provided in **Appendix D**.

6.1.1 Alternative 1 - Do Nothing

The "Do Nothing" alternative is a required review consideration for all Class EAs, and acts as a baseline for comparison of alternatives. Under this scenario, no improvements would be identified, and maintenance and repairs would continue on a reactive, as-needed basis.

Increased inflow and infiltration would be expected under this alternative until such time that repairs could be undertaken, which could significantly stress the downstream conveyance and treatment systems. Failure of the Dufferin STS would result in large amounts of wastewater entering the reservoir, and subsequently contaminate the natural drainage system in its vicinity and downstream, potentially triggering a very costly remediation project.

In addition, this alternative does not provide for future land access to the maintenance chambers within the reservoir for operation and maintenance needs, which currently necessitates draining the reservoir for access. Refer to **Figure 1-1** for MH locations.

While this alternative does not address the identified problem and opportunity statement, it is being carried forward as a baseline against which the other alternatives can be assessed.

6.1.2 Alternative 2 - Rehabilitation Technologies

A variety of technologies were identified for potential use in rehabilitation of the Dufferin STS. Each longlisted alternative was reviewed to determine suitability and feasibility for the application at hand.

Potential rehabilitation methods can be classified under two categories, 'dry' rehabilitation (Alternative 2a) and 'wet' rehabilitation, either under controlled flow (Alternative 2b) or with no flow control measure in place (Alternative 2c). The longlisted rehabilitation technologies have been organized into these categories.

Dry rehabilitation methods require by-pass pumping to divert all sewage flows from the rehabilitated sewer segment during the works to create 'dry' working condition. Typically, an overflow mechanism is established to allow wet weather flows to enter the pipe to avoid surcharge upstream. Rehabilitation in the 'wet' allows flow to continue through the pipe during the rehabilitation process. Rehabilitation under 'flow controlled' conditions involves the use of flow control mechanisms to reduce the flow through the pipe while it undergoes rehabilitation. This allows the flows to be reduced to a manageable level, and does not require all flows to be diverted. Flow control mechanisms for 'flow controlled' conditions are typically achieved using a combination of weirs and upstream in-line storage.

The longlist of Rehabilitation Alternatives, including commercially available technologies, is provided below for each alternative:

- Alternative 2a: Dry Rehabilitation
    - Cured-in-Place Pipe (CIPP)
    - Fold-and-Form
    - Centrifugally Cast Concrete Pipe (CCCP)
    - Polymer-Based Coatings
    - Sliplining (in the dry)
- Alternative 2b: Flow Controlled Rehabilitation
    - SPR PE (Contec)
    - SEKISUI SPR EX (Close-fit Liner)

- Alternative 2c: Wet Rehabilitation
    - Sliplining (in the wet)

The rehabilitation options for Alternative 2 are not being considered for the shortlist of alternatives for the North Area as they do not address the project's Problem/Opportunity Statement which is to move the Dufferin STS away from the reservoir to address existing maintenance and operational issues. In addition, the reservoir would need to be drained for access to the existing maintenance chambers located within the reservoir.

A concept review has been conducted for each of the longlisted installation methods for the South Area. This review has allowed the unsuitable alternatives to be eliminated. The shortlisted alternatives are further evaluated in **Section 6.2** of this report. See **Tables 6-1** and **6-2** for a summary of the review of the longlisted alternatives.

Table 6-1: Alternative 2a - Dry Rehabilitation Methods

Category	Comments	Overall Assessment
Cured-in-Place Pipe (CIPP)	• Potentially suitable for application.	**CONSIDERED**
Fold-and-Form PVC Liner	• At this time, available products could be used for the rehabilitation of pipes up to 600 mm ID only	**ELIMINATED**
Centrifugally Cast Concrete Pipe (CCCP)	• Poor corrosion resistance. • Sensitive to moisture, therefore infiltration of groundwater may cause challenges during construction.	**ELIMINATED**
Polymer Based Coatings	• Sensitive to moisture, therefore infiltration of groundwater may cause challenges during construction.	**ELIMINATED**

Table 6-2: Alternatives 2b and 2c - Wet Installation (Full or Controlled Flow Condition)

Category	Comments	Overall Assessment
SPR PE	• Technically viable technology provided all work can be done through existing MH structures • Licensed installers available in Canada	**CONSIDERED**
Sliplining	• Relatively large access shaft is required; excavating such a shaft either at MH135-005 or MH135-003 to a depth of 8 m or 15 m is not feasible	**ELIMINATED**
SEKISUI SPR EX	• Technically a viable method, however no known installers in eastern Canada at this time	**ELIMINATED**

Two (2) rehabilitation alternatives have been identified as potentially feasible for application within the South Area, including Alternative 2a using CIPP and Alternative 2b SPR PE spiral wound. Additional information on the review of longlisted alternatives can be found in the Pre-Design Report.

6.1.3 Alternative 3 - Realignment Alternatives

6.1.3.1 Realignment Alternatives

A series of potential alignment alternatives were identified, which form the longlisted alternatives. A summary of the longlisted alignment alternatives is provided in the subsections below for the North Area and for the South Area. Overview maps showing each longlisted alternative is provided in **Appendix E**.

Longlisted Alternative for the North Area:

- **Alternative 3a**: Realign the section of the Dufferin and West Don STS from MH135-003 to an intermediate point between MH132-110 and MH132-110B. The proposed section of sewer would run along the greenspace between the Reservoir and Finch Avenue West, and tie into a new MH at the east end, installed on the existing West Don STS. The existing trunk sewer between MH135-003 and MH132-110B would be abandoned, and the existing sewer left in service would be rehabilitated as required.
- **Alternative 3b**: Realign the section of the Dufferin and West Don STS from MH135-003 to a new MH south of MH132-110 on the West Don STS. The proposed section of sewer would run along the greenspace between the Reservoir and Finch Avenue West. The existing trunk sewer between MH135-003 and MH132-110B would be abandoned, and the existing sewer left in service would be rehabilitated as required.
- **Alternative 3c**: Realign the section of the Dufferin and West Don STS from MH135-003 to MH132-109. The proposed section of sewer would run along the greenspace between the Reservoir and Finch Avenue West, tying into MH132-109 approaching from the west. The existing trunk sewer between MH135-003 and MH132-110B would be abandoned, and the existing sewer left in service would be rehabilitated as required.
- **Alternative 3d**: Realign the section of the Dufferin STS and West Don STS running from MH135-003 to a new maintenance hole south of MH132-109, north of Finch Avenue West, on the West Don STS. Due to existing utilities adjacent to MH 132-109, the alignment would extend east of MH 132-109, and then connect to the existing trunk sewer to the east side of the existing West Don STS. The proposed section of sewer would run along the greenspace between the Reservoir and Finch Avenue West, tying into the new maintenance hole upstream of MH 132-109 from the west side. The

existing trunk sewer between MH135-003 and MH132-110B would be abandoned, and the existing sewer left in place would be rehabilitated as required.

- **Alternative 3e**: Realign the section of the Dufferin STS and West Don STS from an intermediate point between MH135-003 and MH135-004 (south of Finch Avenue West), to an intermediate point between MH132-110 and MH132-109. The proposed section of sewer would run along the greenspace between Finch Avenue West and the neighbourhood of Bathurst Manor south of Finch Avenue West, tying into a new maintenance hole on the existing trunk sewers at both the east and west ends. The existing trunk sewer between the new west end MH and MH132-110B would be abandoned, and the existing sewer between MH 132-110B to MH 132-109 would be left in place and rehabilitated as required. The existing 250 mm diameter and 300 mm diameter tributaries would be realigned to connect into the new west end MH.

- **Alternative 3f**: Realign the section of the Dufferin STS and West Don STS from MH135-003, to an intermediate point between MH132-110 and MH132-109, south of Dufferin Creek. The proposed section of sewer would run along the greenspace between the Reservoir and Finch Avenue West and tie into a new MH at the east end, installed on the existing West Don STS. The existing trunk sewer between MH135-003 and 132-110B would be abandoned, and the existing sewer left in place would be rehabilitated as required. Due to the location of the east tie-in location between MH 132-109 and MH 132-110, a river crossing on the east end of the study area is not required.

- **Alternative 3g**: Realign the section of the Dufferin STS and West Don STS from MH135-003 to a location south of MH132-109 on the West Don STS within Finch Avenue West. This alternative would be constructed using open cut methods along Finch Avenue and would be located within the right-of-way. The alignment would tie into the new MH at the east end on the West Don STS. The existing trunk sewer between MH135-003 and 132-110B would be abandoned, and the existing sewer between MH 132-110B and MH 132-109 would be left in place and rehabilitated as required.

A concept review has been conducted for each of the longlisted installation methods for the South Area. This review has allowed the unsuitable alternatives to be eliminated. The shortlisted alternatives are further evaluated in **Section 6.2** of this report.

Alternatives 3b, 3d, and 3f appear to be the most feasible realignment options for the North Area and will be addressed further in the following sections. Additional discussion on the selection of shortlisted alternatives can be found in the Pre-Design Report.

Longlisted Alternative for the South Area:

- **Alternative 3a**: Realign the section of Dufferin STS from MH135-005 to MH135-003 along the river valley, west of the existing trunk sewer. The existing trunk sewer between MH135-003 and MH135-005 would be abandoned.
- **Alternative 3b**: Realign the section of Dufferin STS from MH135-007-1 to MH135-003. The proposed section would run north along greenspace east of Dufferin Street, then east along the greenspace north of Finch Avenue West. The existing trunk sewer between MH135-003 and MH135-007 would be abandoned.

Compared to rehabilitation, realigning the trunk sewer will result in an increased impact to the environment and public, substantially higher construction costs, and significantly longer schedule to complete the work; therefore Alternative 3 was not shortlisted for further review with respect to the South Area.

Table 6-3 provides an overview of the longlisted realignment options for each area, and the recommended options that have been shortlisted for further review.

Table 6-3: Alternatives 3 – Realignment Alternatives

Alternative Description	Comment	Overall Assessment
North Area		
Alternative 3a	The connection to the existing West Don STS at MH132-111 falls right adjacent to the riverbank. Therefore, significant disruption to the banks would be anticipated. This option has been eliminated for this reason.	**ELIMINATED**
Alternative 3b	Connection locations to the existing West Don STS and Dufferin STS appear to be feasible. Feasibility to be confirmed based on riverbed elevations.	**CONSIDERED**
Alternative 3c	Connection to existing West Don STS at east end of the study area is in conflict with existing watermain infrastructure. For this reason, the alternative has been eliminated from further review.	**ELIMINATED**
Alternative 3d	Reduced impacts to traffic because alignment is not within roadway. Feasibility to be confirmed based on riverbed elevations.	**CONSIDERED**
Alternative 3e	Construction along the south side of Finch Avenue West poses significant challenges due to very steep embankments and proximity to private property.	**ELIMINATED**
Alternative 3f	This alternative allows for the elimination of a second creek crossing at the east side of the study area. Therefore, reduced impacts to the river and aquatic life are anticipated.	**CONSIDERED**

Alternative Description	Comment	Overall Assessment
Alternative 3g	This alternative would require major traffic interruptions because the infrastructure would be constructed entirely within the roadway along Finch Avenue West.	**ELIMINATED**
South Area		
Alternative 3a	Realignment of the sewer through the valley land would cause significant disruption to the natural area. Cost is anticipated to be significantly higher than the rehabilitation options (Alternative 2). For these reasons, this alternative has been eliminated from further review.	**ELIMINATED**
Alternative 3b	Realignment of the sewer along Dufferin St and Finch Avenue West would cause significant disruption to traffic flow and/or the natural area when compared to the rehabilitation alternatives (Alternative 2). Cost is anticipated to be significantly higher than the rehabilitation options (Alternative 2). For these reasons, this alternative has been eliminated from further review.	**ELIMINATED**

6.1.3.2 Realignment Installation Methods

Once the shortlisted realignment options were determined through the initial screening and technical assessment, a series of installation methods were then reviewed for the realignment installation methods. A longlist of installation methods is provided below:

- Pipe Jacking
- Microtunnelling
- Hand Tunnelling
- Horizontal Directional Drilling
- Auger Boring/Pilot Tube Guide Auger Boring
- Direct Pipe

A brief summary of each method, which has been shortlisted for further review, is provided in the **Table 6-4**.

Table 6-4: Summary of Trenchless Installation Methodologies

Method	Comments	Overall Assessment
Pipe Jacking – open face	Good for shorter distances in suitable soil conditions. Changing ground conditions can be problematic.	**ELIMINATED**
Microtunnelling	Precise control of line and grade. Applicable in a wide range of soils and below the water table.	**CONSIDERED**
Hand Tunneling	Hand-tunnelling requires non-collapsible soil conditions. This method includes additional safety concerns due to the presence of human workers at the excavation face.	**CONSIDERED** (only to be used for short tie-in connections of deep shafts)
Horizontal Directional Drilling	HDD can be installed with a relatively high degree of accuracy at relatively low cost. The method can accommodate long spans.	**CONSIDERED**
Auger Boring / Pilot Tube Guided Auger Boring	Typically used for spans of less than 100m depending on soil conditions. Not suitable in all soil conditions.	**ELIMINATED**
Direct Pipe™ (Pipe thrusting)	Although high levels of accuracy can be achieved, this method has higher cost than HDD where HDD is feasible.	**ELIMINATED**

Of the six (6) installation methods that were considered, both HDD and Microtunnelling have been determined to be technically feasible and potentially appropriate methods for the proposed re-alignment of the Dufferin STS. Hand-tunneling is considered for tie-in connections only, as a secondary installation method for the trunk sewer.

Due to the staging requirements for the HDD installation method, which includes a setback of approximately 35 m from the 'punch-in' location, and a pipe laydown of approximately 400 m in-line with the proposed alignment, only Alternative 3d is viable from a constructability perspective using the HDD installation method. Additional information on the review of longlisted alternatives can be found in the Pre-Design Report.

6.2 SHORTLISTED ALTERNATIVES IN THE NORTH AREA

A short list of alternative options has been compiled for the North Area. The shortlisted alternatives include the following:

1. Alternative 1 - Do Nothing
2. Alternative 3b-MT – Microtunnelling
3. Alternative 3d-MT – Microtunnelling
4. Alternative 3d-HDD – Horizontal Directional Drilling
5. Alternative 3f – MT – Microtunnelling

A summary of each shortlisted alternative is provided in the sections below. Concept plan and profile figures for each realignment alternative is also provided. An evaluation of each alternative has been completed with consideration for the impacts to the social, economic, and natural environments and is summarized in **Section 8.0**.

6.2.1 Alternative 1: Do Nothing

The "Do Nothing" alternative involves no improvements or upgrades to the existing system. Under this alternative, it is anticipated that maintenance and repairs would continue on a reactive, as-needed basis.

Under the "Do Nothing" alternative, elevated levels of inflow and infiltration would be expected under this alternative until such time that repairs could be undertaken. Additional inflow and infiltration can cause additional stress to the downstream conveyance and treatment systems.

An additional concern with the "Do Nothing" alternative is the risk of failure. In the unlikely event of a failure of the Dufferin STS or the West Don STS, large amount of wastewater would be released into the environment with a high risk of entering the reservoir, and subsequently contaminate the natural drainage system in its vicinity, potentially triggering a very costly remediation project. The "Do Nothing" alternative does not reduce this risk to the reservoir.

Failure of the Dufferin STS or the West Don STS could affect wastewater collections for the upstream catchment. The impacts could include sewer back-ups and basement flooding, and potential release to the environment. Emergency bypass and repair work can be costly to the City.

Furthermore, some portions of the existing infrastructure are inaccessible due to proximity to the reservoir and watercourse. The "Do Nothing" alternative does not improve access to the infrastructure, and therefore would not improve the maintainability of the infrastructure.

While this alternative does not address the identified problem and opportunity statement, it is being carried forward as a baseline against which the other alternatives can be assessed.

6.2.2 Alternative 3: Sewer Realignment

The sewer realignment alternative involves the realignment of the Dufferin STS which would by-pass the reservoir, to address the existing issues with maintenance and risk of extraneous inflow and infiltration. Various alignment options were reviewed as part of the longlist evaluation and three (3) shortlisted for further review and consideration. This alternative would also include the abandonment of the section of the Dufferin STS between MH135-003 to MH135-001, and the West Don Trunk from MH132-113 to MH132-110B much of which is currently located under the G. Ross Lord Reservoir. The alternative would also include the cleaning and rehabilitation of MH135-003.

The pipe diameter and material are to be confirmed during the Preliminary Design phase. However, a pipe diameter of 800mm to 1200mm is anticipated based on a preliminary review of sewer flows and hydraulic capacity.

The following subsections provide additional information on each shortlisted realignment option for the North Area.

6.2.2.1 Alternative 3b MT: Sewer Realignment

Alternative 3b using Microtunneling includes the installation of a new section of trunk sewer, which would be connected to the existing trunk sewer just north of MH135-003 at the upstream end, and just southeast of MH132-110 at the downstream end. The proposed alignment for Alternative 3b using Microtunnelling is depicted in **Figure 6-1**.

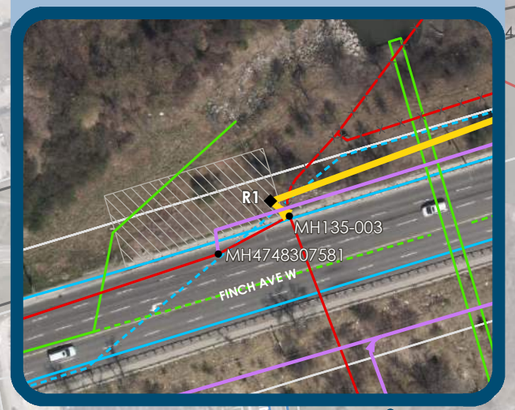
The anticipated installation length is approximately 670 m, and would be installed in three (3) sections. Four shafts will be required to install the new trunk sewer, including two jacking shafts and two receiving shafts. Four new 1800 mm diameter MHs will be installed along the proposed alignment at each shaft location. Rehabilitation of the existing MH135-003 is recommended as part of this work.

Due to the length of each microtunnelled drive (between MHs), a minimum internal diameter of 1,050 mm (~1,300 mm external diameter) was identified as the minimum required pipe size to ensure that the pipe is rigid enough to withstand the forces and stresses exerted onto the pipe during the installation process. However, due to available boring machines within the local industry, it is anticipated that an internal diameter of 1200 mm will be selected. The pipe diameter is to be confirmed during the preliminary design phase of the project.

This alternative includes two (2) crossings of the river, and includes disturbance to significant valleyland and significant woodland. The alignment crosses through some areas of archaeological potential, and therefore a Stage 2 Archaeological Assessment will be required prior to construction in areas that may be impacted.

West Tie-in and Receiving Shaft

- Existing utilities such as the storm culvert crossing Finch Ave W and existing local sanitary sewer.
- Consider installing shaft immediately northwest of MH135-003 for recovery of tunnelling shield and tie-in to existing sewer.
- Extend existing access road coming from Dufferin St eastward to staging area.

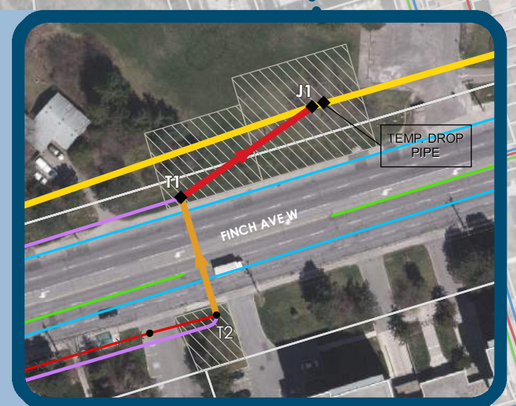


East Tie-in and Receiving Shaft

- 1070 mm dia. sanitary sewer, installed 1959.
- Tree clearing and temporary access likely required.
- Staging area is accessible through paved access roads within the park.
- Steep slope adjacent to residential properties, which limits working area.
- Exit shaft to be constructed on top of existing trunk. Trunk to be supported during shaft construction.
- Watercourse Crossing.

Jacking Shaft/Bypass Crossing

- Boring machine and jacks are installed into shaft. Sewer pipe is lowered into shaft and jacked behind tunnelling shield.
- 750 mm pipe to be installed via trenchless method across Finch Ave W. to facilitate bypass plan.
- Access to staging area via existing Park access road. Park access impacts to be confirmed during detailed design.



Jacking Shaft

- Boring machine and jacks are installed into shaft. Sewer pipe is lowered into shaft and jacked behind tunnelling shield.
- Tree removal, natural area disturbance required.
- Due to low-lying area, a temporary granular base may be installed in the staging area during construction.

Stantec

Legend

- Selected Existing Sanitary Manhole
- Sanitary Sewer - Active
- Sanitary Sewer - Abandoned
- Storm Sewer - Active
- Storm Sewer - Abandoned
- Culvert
- Watermain - Active
- Watermain - Abandoned
- Oil Pipeline

Proposed Sanitary Sewer Works

- New Sanitary Manhole
- Temporary Forcemain
- Reconstruction - Microtunnelling (1200 mm)
- Reconstruction - Trenchless Crossing Method (750 mm)
- Reconstruction - Open Cut (750 mm)
- x x Abandon

Construction Details

- Staging Area

0 100 200 metres

1:5,000 (At original document size of 11x17)

Notes

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Project Location
City of Toronto

165660077 REVA
Prepared by KDB on 2018-04-19

Client/Project
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Figure No.
6-1

Title
Construction Staging Requirements for the North Area Alternative 3b - Microtunnelling

V:\0165\active\165660077\preliminary\analysis\gis\mxd\Pre-Design\165660077_PD_Fig5-1_ATBb_Micro.mxd Revised: 2018-04-19 By: kbuchanan

The proposed receiving shaft/MH at the west connection point (adjacent to MH135-003) will be accessible directly from Finch Avenue West. The central jacking shafts will be accessible from the existing parking lot and access roads in the G. Ross Lord Park. This area includes a low-lying vegetated area with poor access, therefore a permanent access road is recommended to facilitate future operations and maintenance activities. The proposed MH adjacent to MH132-110, at the east connection point, is accessible via the existing access roads within the G. Ross Lord Park. A MH will be installed in the location of each shaft, therefore a total of four (4) MHs are to be installed along the proposed trunk sewer. The west connection will include hand-tunneling from the microtunnelling shaft to the existing MH135-003.

The installation method requires a new MH to be placed adjacent to MH135-003 and MH132-110. The methodology calls to driving a new shaft adjacent to the wall of the existing MH, and connect them by coring the connecting wall. However, from an operational perspective, it is preferred to avoid placing two MHs adjacent to each other where possible. We will explore this option during the preliminary design.

The east connection can be completed while the existing trunk remains active (live connection), thereby eliminating the need for by-pass pumping at this location. A live connection requires additional safety measures and increases risk to the construction crew. Following completion of the east connection, a by-pass can be implemented which will divert flow into the newly constructed trunk which eliminates the need to complete a live connection at the west end.

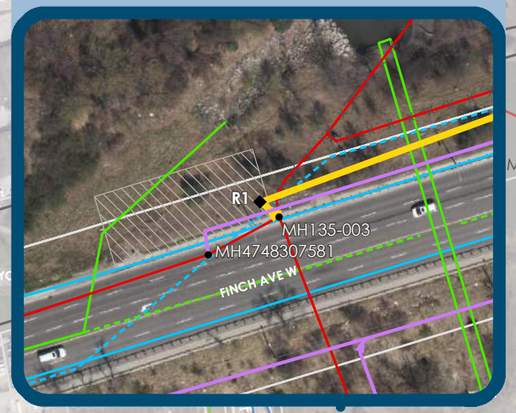
The local 250 mm sewer which collects flows from the neighbourhood south of Finch Avenue West is in conflict with the proposed trunk sewer location. Therefore, the local sewer will be relocated as part of the work for this option, and the flows will be diverted into jacking shaft J1. In addition, the local 300 mm sewer which collects flows from the neigbourhood west of Dufferin Street will require a separate bypass line, which will run along the north side of Finch Avenue and discharge into jacking shaft J1.

It is anticipated that Alternative 3b using microtunnelling would require approximately nine (9) months of construction. The works could be completed in parallel with the potential works in the South Area.

6.2.2.2 Alternative 3d MT: Sewer Realignment

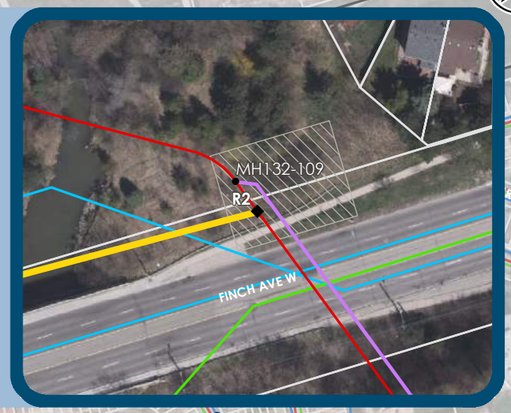
Alternative 3d using Microtunnelling includes the installation of a new section of trunk sewer. The proposed trunk sewer alignment will connect to the existing system adjacent to MH135-003 at the upstream end, and MH132-109 at the downstream end. The proposed alignment for Alternative 3d using Microtunnelling is depicted in **Figure 6-2**.

West Tie-in and Receiving Shaft
- Existing utilities such as the storm culvert crossing Finch Ave W and existing local sanitary sewer.
- Consider installing shaft immediately northwest of MH135-003 for recovery of tunnelling shield and tie-in to existing sewer.
- Extend existing access road coming from Dufferin St eastward to staging area.



East Shaft and MH
- Pedestrian pathway/ sidewalk impacts.

East Tie-in
- 1070 mm dia. sanitary sewer, installed 1959.
- Requires limited tree clearing and temp. access road.
- Requires crossing of existing 900 mm dia. watermain.
- Exit shaft to be constructed on top of existing trunk. Trunk to be supported during shaft construction.
- Watercourse crossing.



Jacking Shaft/Bypass Crossing
- Boring machine and jacks are installed into shaft. Sewer pipe is lowered into shaft and jacked behind tunnelling shield.
- 750 mm pipe to be installed via trenchless method across Finch Ave W. to facilitate bypass plan.
- Access to staging area via existing Park access road. Park access impacts to be confirmed during detailed design.

Jacking Shaft
- Boring machine and jacks are installed into shaft. Sewer pipe is lowered into shaft and jacked behind tunnelling shield.
- Due to low-lying area, a temporary granular base may be installed in the staging area during construction.

Stantec

Legend
- Selected Existing Sanitary Manhole
- Sanitary Sewer - Active
- Sanitary Sewer - Abandoned
- Storm Sewer - Active
- Storm Sewer - Abandoned
- Culvert
- Watermain - Active
- Watermain - Abandoned
- Oil Pipeline

Proposed Sanitary Sewer Works
- New Sanitary Manhole
- Temporary Forcemain
- Reconstruction - Microtunnelling (1200 mm)
- Reconstruction - Trenchless Crossing Method (750 mm)
- Reconstruction - Open Cut (750 mm)
- x x Abandon

Construction Details
- Staging Area

0 100 200 metres
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Figure No.
6-2

Title
Construction Staging Requirements for the North Area Alternative 3d - Microtunnelling

The total drive length for the installation is approximately 805 m, and is to be completed in three sections. A total of four shafts will be required for the installation of the proposed trunk sewer, including two jacking shafts and two receiving shafts. An 1,800 mm diameter MH will be installed at each shaft location. Rehabilitation of the existing MH135-003 is recommended as part of this work.

As with Alternative 3b Microtunnelling, a minimum internal diameter of 1,050 mm (~1,300 mm external diameter) is recommended to ensure that the pipe is rigid enough to withstand the forces and stresses applied to the pipe during the installation process. However, due to available boring equipment, it is anticipated that an internal pipe diameter of 1200 mm may be selected.

The jacking shaft J1 will be accessible from the existing parking lot and access roads within the G. Ross Lord Park adjacent to Finch Avenue West. Jacking shaft J2 will be accessed from Finch Avenue West and a new access road will be required. The west connection will include hand-tunneling from the microtunnelling shaft to the existing MH135-003.

As with Alternative 3b MT, the east connection can be completed while the existing trunk remains active (live connection), thereby eliminating the need for by-pass pumping at this location. A live connection requires additional safety measures and increases risk to the construction crew. Following completion of the east connection, a by-pass can be implemented which will divert flow into the newly constructed trunk which eliminates the need to complete a live connection at the west end.

The installation method requires a new MH to be placed adjacent to MH135-003 and MH132-109. The methodology calls to driving a new shaft adjacent to the wall of the existing MH, and connect them by coring the connecting wall. However, from an operational perspective, it is preferred to avoid placing two MHs adjacent to each other where possible. We will explore this option during the preliminary design.

This alternative includes disturbance to significant valleyland, significant woodland, and requires two creek crossings. It should be noted that both creek crossings are adjacent to Finch Avenue West, and is within an existing utility corridor. There may be impact to traffic along Finch Avenue West during construction. The alignment also crosses through some areas of archaeological potential, and therefore a Stage 2 assessment will be required prior to construction.

As with Alternative 3b MT, the local 250 mm sewer which collects flows from the neighbourhood south of Finch Avenue West is in conflict with the proposed trunk sewer location. Therefore, the local sewer will be relocated as part of the work for this option, and the flows will be diverted into jacking shaft J1. In addition, the local 300 mm sewer which collects flows from the neigbourhood west of Dufferin Street will require a separate bypass line, which will run along the north side of Finch Avenue and discharge into jacking shaft J1.

It is anticipated that Alternative 3d using microtunnelling would require approximately nine (9) months of construction. The works could be completed in parallel with the potential works in the South Area.

6.2.2.3 Alternative 3d HDD: Sewer Realignment

Alternative 3d using Horizontal Directional Drilling includes the installation of a new section of trunk sewer. The proposed trunk sewer alignment will connect to the existing system adjacent to MH135-003 at the upstream end, and MH132-109 at the downstream end. The proposed alignment for Alternative 3d using HDD is depicted in **Figure 6-3**.

This alternative requires two drilling locations and two pipe lay-down areas to be used for the storage of the prepared pipe prior to pulling into place. The works will also include the installation of three (3) access shafts along the proposed sewer alignment. An access shaft will be located at the east and west tie-in locations, while a third access shaft will be located just west of the access road to the reservoir from Finch Avenue West, approximately half way through the sanitary trunk sewer re-routing alignment.

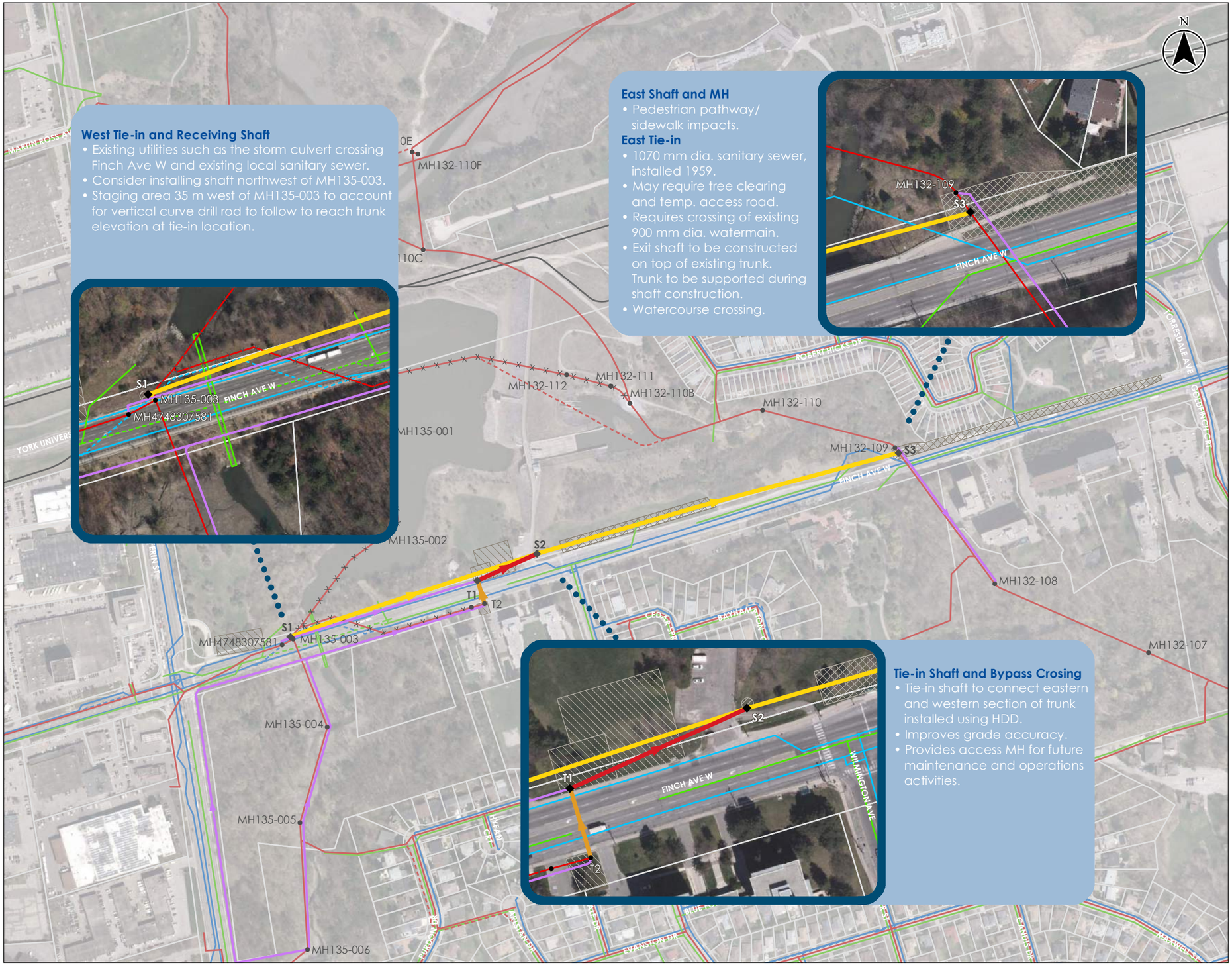
The total proposed sewer length for the installation is approximately 805 m, and is to be completed in two (2) sections. The pipe product is expected to have a minimum internal diameter of 675 mm to provide the required hydraulic capacity. Although the HDD methodology can typically span the anticipated realignment length in one drive, installing the proposed trunk in two drives increases accuracy of grade and alignment due to the low required slope (0.6%) as well as providing access for future maintenance activities through the additional maintenance hole to be installed.

As with Alternative 3b MT, the east connection can be completed while the existing trunk remains active (live connection), thereby eliminating the need for by-pass pumping at this location. A live connection requires additional safety measures and increases risk to the construction crew. Following completion of the east connection, a by-pass can be implemented which will divert from into the newly construction trunk which eliminates the need for a live connection at the west end.

As with Alternative 3b MT, the local 250 mm sewer which collects flows from the neighbourhood south of Finch Avenue West is in conflict with the proposed trunk sewer location. Therefore, the local sewer will be relocated as part of the work for this option, and the flows will be diverted into intermediate shaft (S2). In addition, the local 300 mm sewer which collects flows from the neigbourhood west of Dufferin Street will require a separate bypass line, which will run along the north side of Finch Avenue and discharge into jacking shaft J1.

The shafts/MHs at the east and west tie-in locations will be accessible directly from Finch Avenue West, and the central shaft will be accessible from the existing parking lot and access road through the G. Ross Lord Park, adjacent to Finch Avenue West.

This alternative includes disturbance to significant valleyland, significant woodland, and requires two (2) creek crossings. There may be impacts to vehicular and pedestrian traffic along Finch Avenue West during construction. The alignment crosses through some areas of archaeological potential, and therefore a Stage 2 Assessment will be required prior to construction.



Stantec

Legend

- Selected Existing Sanitary Manhole
- Sanitary Sewer - Active
- Sanitary Sewer - Abandoned
- Storm Sewer - Active
- Storm Sewer - Abandoned
- Culvert
- Watermain - Active
- Watermain - Abandoned
- Oil Pipeline

Proposed Sanitary Sewer Works

- New Sanitary Manhole
- Temporary Forcemain
- Reconstruction - HDD (675 mm)
- Reconstruction - Trenchless Crossing Method (750 mm)
- Reconstruction - Open Cut (750 mm)
- x x Abandon

Construction Details

- Shaft
- Staging Area
- Staging Laydown Area

0 100 200 metres

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Figure No.
6-3

Title
Construction Staging Requirements for the North Area Alternative 3d – Horizontal Directional Drilling (HDD)

It is anticipated that Alternative 3d using HDD would require approximately eight months of construction. The works could be completed in parallel with the potential works in the South Area.

6.2.2.4 Alternative 3f MT: Sewer Realignment

Alternative 3f using Microtunnelling includes the installation of a new section of trunk sewer. The proposed trunk sewer alignment will connect to the existing system adjacent to MH135-003 at the upstream end, and will connect to a new MH to be located between MH132-110 and MH132-109 at the downstream end. The proposed alignment for Alternative 3f using Microtunnelling is depicted in **Figure 6-4**. An access shaft will be located at the east and west tie-in locations, while the third access shaft will be located east of the west tie-in and the fourth access shaft will be located along Finch Avenue West, where the trunk sewer includes a 45-degree change in direction at jacking shaft 2 (J2), then connects to the existing trunk sewer at receiving shaft 2 (R2) at the east tie-in.

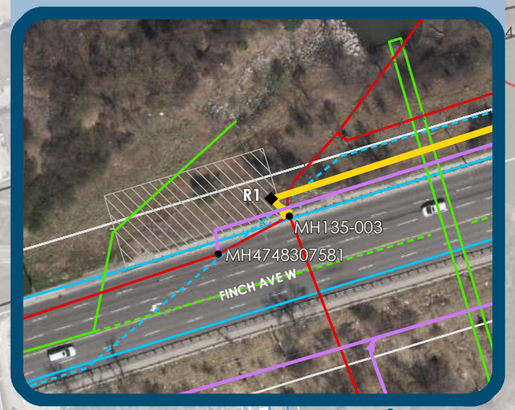
The total proposed sewer length for the installation is approximately 766 m, and is to be completed in three (3) sections. As with Alternative 3b-MT and 3d-MT a minimum internal diameter of 1,050 mm (~1,300 mm external diameter) is recommended to ensure that the pipe is rigid enough to withstand the forces and stresses applied to the pipe during the installation process. However, due to available boring equipment, it is anticipated that an internal pipe diameter of 1200 mm may be selected.

As with Alternative 3b-MT and 3d-MT, the east connection can be completed while the existing trunk remains active (live connection), thereby eliminating the need for by-pass pumping at this location. A live connection requires additional safety measures and increases risk to the construction crew. Following completion of the east connection, a by-pass can be implemented which will divert flow into the newly constructed trunk which eliminates the need to complete a live connection at the west end.

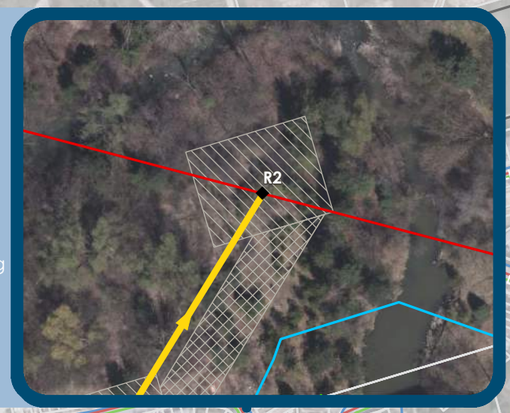
The installation method requires a new MH to be placed adjacent to MH135-003. The methodology calls to driving a new shaft adjacent to the wall of the existing MH, and connect them by coring the connecting wall. However, from an operational perspective, it is preferred to avoid placing two MHs adjacent to each other where possible. We will explore this option during the preliminary design.

As with Alternative 3b-MT and 3d-MT, the local 250 mm sewer which collects flows from the neighbourhood south of Finch Avenue West is in conflict with the proposed trunk sewer location. Therefore, the local sewer will be relocated as part of the work for this option, and the flows will be diverted into intermediate jacking shaft (J1). In addition, the local 300 mm sewer which collects flows from the neigbourhood west of Dufferin Street will require a separate bypass line, which will run along the north side of Finch Avenue and discharge into jacking shaft J1.

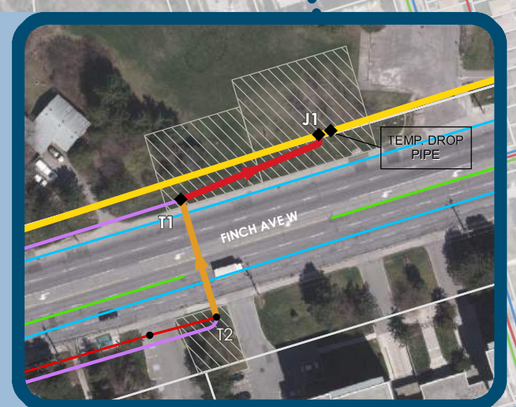
West Tie-in and Receiving Shaft
- Existing utilities such as the storm culvert crossing Finch Ave W and existing local sanitary sewer.
- Consider installing shaft immediately northwest of MH135-003 for recovery of tunnelling shield and tie-in to existing sewer.
- Extend existing access road coming from Dufferin St eastward to staging area.

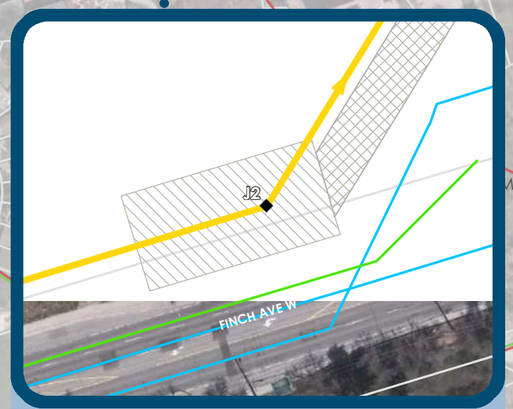


East Tie-in and Receiving Shaft
- 1070 mm dia. sanitary sewer, installed 1959.
- Tree clearing and new access road required from Finch Ave.
- Exit shaft to be constructed on top of existing trunk. Trunk to be supported during shaft construction.
- Low-lying area, minor grading may be required



Jacking Shaft/Bypass Crossing
- Boring machine and jacks are installed into shaft. Sewer pipe is lowered into shaft and jacked behind tunnelling shield.
- 750 mm pipe to be installed via trenchless method across Finch Ave W. to facilitate bypass plan.
- Access to staging area via existing Park access road. Park access impacts to be confirmed during detailed design.





Jacking Shaft
- Boring machine and jacks are installed into shaft. Sewer pipe is lowered into shaft and jacked behind tunnelling shield.
- Tree removal, natural area disturbance required.
- Due to low-lying area, a temporary granular base may be installed in the staging area during construction.

Stantec

Legend
- Selected Existing Sanitary Manhole
- Sanitary Sewer - Active
- Sanitary Sewer - Abandoned
- Storm Sewer - Active
- Storm Sewer - Abandoned
- Culvert
- Watermain - Active
- Watermain - Abandoned
- Oil Pipeline

Proposed Sanitary Sewer Works
- New Sanitary Manhole
- Temporary Forcemain
- Reconstruction - Microtunnelling (1200 mm)
- Reconstruction - Trenchless Crossing Method (750 mm)
- Reconstruction - Open Cut (750 mm)
- x x Abandon

Construction Details
- Staging Area
- Access Path for Long-term Operation and Maintenance

0 100 200 metres
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Figure No.
6-4

Title
Construction Staging Requirements for the North Area Alternative 3f - Microtunnelling

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The shafts/MHs at the east and west tie-in locations will be accessible directly from Finch Avenue West, and the central shaft will be accessible from the existing parking lot and access road through the G. Ross Lord Park, adjacent to Finch Avenue West.

This alternative includes disturbance to significant valleyland and significant woodland. There may be impacts to vehicular and pedestrian traffic along Finch Avenue West during construction. The alignment crosses through some areas of archaeological potential, and therefore a Stage 2 Archaeological Assessment will be required prior to construction.

It is anticipated that Alternative 3f using MT would require approximately eight months of construction. The works could be completed in parallel with the potential works in the South Area.

6.2.2.5 Abandonment of Existing Trunk Sewer and Maintenance Holes

As part of the work required for the trunk sewer realignment alternatives, the existing sewer and MH structures that are diverted will be decommissioned and abandoned in place.

Decommissioning the MH structures typically involves filling the chamber with low-density concrete and/or flowable grout and removing the MH riser and lid to remove all aboveground features. For significant lengths of sewer, it is common practice to grout the first six (6) meters of sewer only, creating a 'plug' capable of preventing inflow or outflow to the abandoned sewer, to reduce abandonment costs. For inaccessible manholes, the MH riser and lid may be permitted to remain in place due to the accessibility challenges.

Based on the realignment alternatives reviewed, the sewer segments between MH135-003 and MH132-111 would require decommissioning. This results in a decommissioned length of approximately 700 m. Due to the significant length of sewer to be decommissioned, it is recommended that only the first 6 m on either side of the sewer pipe section to be abandoned will be filled with grout or concrete, to reduce cost. The abandonment procedure will also be implemented at connection locations with tributaries, unless the tie-in location was addressed by a separate project. The length and location of the sewer plugs will be confirmed during the Preliminary Design phase.

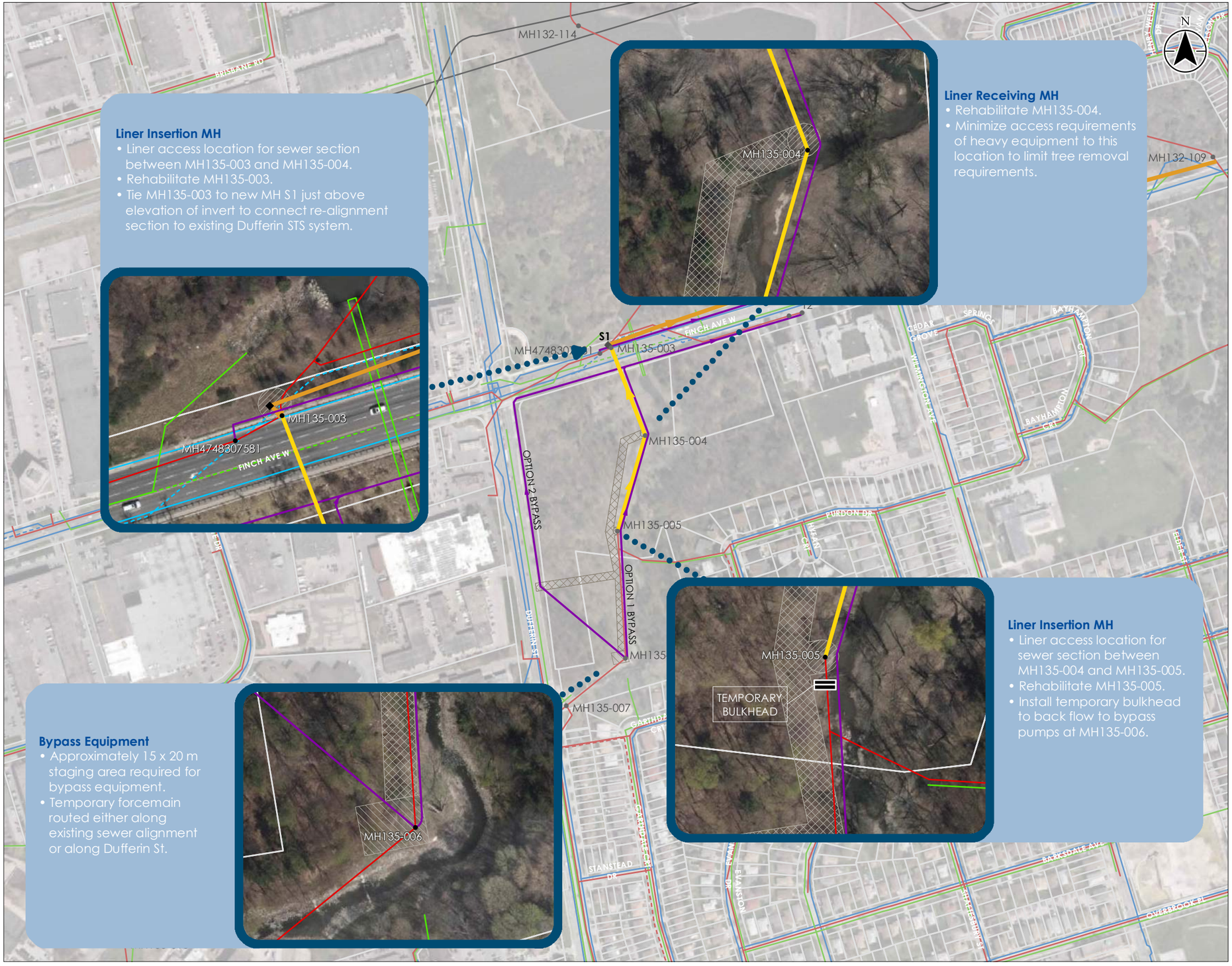
6.3 SHORTLISTED ALTERNATIVE SOLUTIONS IN THE SOUTH AREA

A short list of alternative solutions has been compiled for the South Area. The shortlisted alternatives include the following:

1. Do Nothing
2. Alternative 2a – Cure-in-place-pipe (CIPP)
3. Alternative 2b – Spiral wound (SRP PE)

The proposed rehabilitation alternatives consist of relining the sewer segments between MH135-005 and MH135-003. A concept plan and profile view of the sewer to be rehabilitated is

provided in **Figure 6-5.** Each of the alternative solutions has been reviewed with regards to details such as constructability, hydraulic performance, and conflicts with existing utilities. A full evaluation of the alternatives is provided in **Section 8.0**.



Liner Insertion MH
- Liner access location for sewer section between MH135-003 and MH135-004.
- Rehabilitate MH135-003.
- Tie MH135-003 to new MH S1 just above elevation of invert to connect re-alignment section to existing Dufferin STS system.

Liner Receiving MH
- Rehabilitate MH135-004.
- Minimize access requirements of heavy equipment to this location to limit tree removal requirements.

Liner Insertion MH
- Liner access location for sewer section between MH135-004 and MH135-005.
- Rehabilitate MH135-005.
- Install temporary bulkhead to back flow to bypass pumps at MH135-006.

Bypass Equipment
- Approximately 15 x 20 m staging area required for bypass equipment.
- Temporary forcemain routed either along existing sewer alignment or along Dufferin St.

Stantec

Legend
- Selected Existing Sanitary Manhole
- Sanitary Sewer - Active
- Sanitary Sewer - Abandoned
- Storm Sewer - Active
- Storm Sewer - Abandoned
- Watermain - Active
- Watermain - Abandoned
- Oil Pipeline

Proposed Sanitary Sewer Works
- New Sanitary Manhole

Proposed Sanitary Sewer Works
- Temporary Forcemain
- Rehabilitation
- New Trunk (North Area)

Construction Details
- Insertion Shaft
- Staging Area
- Access Path for Long-term Operation and Maintenance

ALTERNATIVE REHABILITATION METHODS

Alternative 2a	Cast-in-Place Pipe (Preferred Method)
Alternative 2b	Steel Reinforced Pipe PE

0 100 200 metres
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Figure No.
6-5

Title
Construction Staging Requirements for the South Area Alternative 2 - Rehabilitation

6.3.1 Alternative 1: Do Nothing

The "Do Nothing" alternative involves no improvements or upgrades to the existing system. Under this alternative, it is anticipated that maintenance and repairs would continue on a reactive, as-needed basis. As a requirement for the EA process, the "Do Nothing" alternative is being carried forward as a baseline against which the other alternatives can be assessed.

A concern with the "Do Nothing" alternative is the risk of failure. In the unlikely event of a failure of the Dufferin STS, large amount of wastewater would be released into the environment with a high risk of entering the watercourse, and subsequently contaminate the natural drainage system in its vicinity, potentially triggering a very costly remediation project. The "Do Nothing" alternative does not reduce this risk to the natural environment.

Failure of the Dufferin STS could affect wastewater collections for the upstream catchment. The impacts could include sewer back-ups and basement flooding, and potential release to the environment. Emergency bypass and repair work can be costly to the City.

6.3.2 Alternative 2: Sewer Rehabilitation

6.3.2.1 Cured-In-Place Pipe (CIPP) - Dry Rehabilitation

Alternative 2a involves the use of CIPP to rehabilitate the existing Dufferin STS between MH135-005 and MH135-003. This method provides a lining to the existing pipe with a flexible tube impregnated with thermosetting resin. This rehabilitation method requires bypass pumping to divert all sewage flows which allows for a dry installation.

The staging area required for CIPP rehabilitation is approximately 20 m x 15 m for each MH access. Access will be required at MH135-006 for bypass installation, and access to MH135-005, MH135-004, and MH135-003 for the liner installation. Access to the existing sewer requires the removal of the cone and risers of the MH, but the MH structure may remain intact. The CIPP liner material is flexible and can be inserted directly from the supply spool.

An access road will be required to allow access to MH135-006, MH135-005, and MH135-004. The construction of the access road will require tree clearing and grading within the TRCA owned valleylands. A permanent access road will remain to allow continued access for maintenance activities following completion of the construction works.

It is anticipated that the construction works associated with Alternative 2a will take approximately four months. There is an opportunity to combine the flow bypass work in the south area with that of the north area, which would allow the work in the north and south area to be completed in parallel.

CIPP is a well-established rehabilitation method, and extensive knowledge exists within the industry regarding appropriate design and installation practices. There are multiple contractors in the GTA area that offer CIPP rehabilitation services, and thus competitive pricing is expected.

6.3.2.2 Steel Reinforced Pipe (SPR) PE – Dry or Controlled Flow Rehabilitation

Alternative 2b involves the use of a spiral wound liner named SPR PE (provided by Contec) as the rehabilitation method, to rehabilitate the existing Dufferin STS between MH135-005 and MH135-003. The SPR PE will be designed to provide a full structural solution for the existing sewer pipe.

The SRP PE rehabilitation method consists of the installation of steel-reinforced corrugated polyethylene strips with smooth inner wall that are spiral wound by a machine into the existing pipe and then grouted in place with low strength grout, which transfers externally applied loads to the structure of the liner.

The SRP PE rehabilitation method can be installed using the existing MH structure. The cone and riser will be removed from the top of the MH structure to allow adequate access for the equipment. The existing MH structure would be removed and reinstated following construction. A staging area of approximately 15 m x 20 m will be required to house a side boom, back-hoe, or crane is required to facilitate the installation of the SRP PE lining material.

It is anticipated that the construction works associated with Alternative 2b will take approximately four months. There is an opportunity to combine the flow bypass work in the south area with that of the north area, which would allow the work in the north and south area to be completed in parallel. SRP PE is a newer technology when compared to CIPP, and there are few contractors that are capable of completing this work. Therefore, there is an additional level of risk associated with the SRP PE technology.

6.3.3 Maintenance Hole Rehabilitation

Based on the MH inspections completed by Capital Sewer, MHs MH135-003, MH135-004, and MH135-005 should be cleared of debris and roots, and rehabilitated with mortar cement lining and coated with epoxy, and have their top sections, grade rings, frames, and covers replaced.

7.0 OPINION OF PROBABLE COST

The following Opinion of Probable Costs (OPC) have been prepared based on material quotations, discussions with contractors, current market labour rates, and unit rates within Stantec's costing database. Concept engineering OPC's (Class D) are in 2016 dollars (excluding taxes) and considered accurate within -30%/+50%. OPCs have been completed for each of the two considered installation methods: Microtunnelling and Horizontal Directional Drilling (HDD) and two considered rehabilitation methods: CIPP and SRP PE. **Table 7-1** presents a summary of OPCs for each alternative. Additional information on the Levels of Cost Opinions is provided in **Appendix F**.

Table 7-1: Opinion of Probable Cost Summary

OPTION	METHODOLOGY	COST
NORTH AREA		
1	Do Nothing	$ 0
3b	Microtunnelling	$ 9,770,000
3d	Microtunnelling	$ 10,770,000
	HDD	$ 7,300,000
3f	Microtunnelling	$ 10,175,000
SOUTH AREA		
1	Do Nothing	$ 0
2a	CIPP	$ 980,000
2b	SRP PE	$ 2,130,000

Note: Taxes are excluded from the opinion of probable cost.

Based on the opinions of probable cost for the realignment alternatives, Alternative 3d using HDD is anticipated to present the lowest cost alternative for the North Area, with the exception of the Do-Nothing Alternative. Alternative 3d using Microtunnelling offers the highest cost alternative.

Within the South Area, Alternative 2a using CIPP presents the lowest cost alternative for the south area, with the exception of the Do-Nothing Alternative. Alternative 2b using SRP PE presents the highest cost alternative.

8.0 EVALUATION OF ALTERNATIVES

8.1 EVALUATION PROCESS

The sanitary sewer servicing alternatives are to be evaluated and ranked based on a set of evaluation criteria. The evaluation criteria are intended to guide the assessment of servicing alternatives based on their impacts to the natural, social, technical, and economic environments. The evaluation criteria are presented in the following section. The alternatives solutions have been reviewed qualitatively for each criterion and the alternatives have been ranked based on a comprehensive review of all components.

8.2 ENVIRONMENTAL COMPONENTS

The environmental components outlined below represent a broad definition of the Environment as described in the EA Act.

Table 8-1: Environmental Component Definitions

Environmental Component	Description
Natural Environment	Component having regard for protecting significant natural and physical elements of the environment (i.e., air, land, water and biota) including natural heritage and environmental features and functions such as receiving water sensitivities.
Social/Cultural	Component that evaluates potential effects on residents, neighbourhoods, businesses, community character, social cohesion, community features, and historical/archaeological and heritage components.
Technical	Component that considers technical suitability and other engineering aspects of the servicing options.
Economic/Financial	Component that addresses the potential effect on servicing costs.

A qualitative evaluation was used to consider the suitability of alternatives and to identify significant advantages and disadvantages of each alternative with respect to a specific set of evaluation criteria identified for each environment component. A detailed set of evaluation criteria is provided in **Table 8-2**.

Table 8-2: Evaluation Criteria

CRITERIA
Social/Cultural
Public Health and Safety
Impacts to recreational/open space uses
Overall safety and movement of pedestrians and vehicle traffic during construction
Property Impacts
Impacts to land use and/or planned developments
Property acquisition required
Construction Impacts
Impacts to surrounding properties during construction and operation
Impacts to traffic operations during construction
Aesthetics
Impacts to streetscape/ parkland with or without mitigation
Utilities
Existing/future utility corridors
Utility relocations
Cultural Heritage Resources
Impacts to build heritage, archaeological resources, burial sites, etc.
Natural Environment
Floodplain/Regulation Limit
Terrestrial Wildlife and Vegetation
Aquatic Wildlife/Vegetation
Water Quality
Planning/Technical
Meets Applicable Planning/Policy Objectives
Connection to Adjacent Infrastructure Elements
Operations
Performance under normal/non-standard conditions
Ability to undertake maintenance/general accessibility
Ability to accept flows from identified service area

CRITERIA
Required Infrastructure
Length of sewer Need for a Bypass Effectiveness in addressing infiltration issues Hydraulic performance
Constructability Required Site Size Staging requirements
Complexity of Construction Level of construction risk Compatibility with anticipated geotechnical and hydrogeological conditions Risk of undermining existing infrastructure elements Risk Associated with Bypass/tie-ins Availability of mitigation measures
Availability of local expertise in GTA Availability of technical knowledge and competition
Anticipated Construction Period
Economic Initial capital cost Property acquisition costs Operation and maintenance costs

8.3 EVALUATION OF ALTERNATIVES

All alternatives were reviewed against each of the evaluation criteria.

8.3.1 North Area

Five (5) alternatives have been reviewed for the North Area:

1. Do Nothing,
2. Alternative 3b – Realignment using MT,
3. Alternative 3d – Realignment using MT,
4. Alternative 3d – Realignment using HDD, and
5. Alternative 3f – Realignment using MT.

Each alternative has been reviewed against the evaluation criteria. An evaluation matrix is provided in **Appendix G**, which includes a brief qualitative discussion for each criterion. The recommended solution is Alternative 3f using Microtunnelling. A summary of the key benefits of this alternative is provided below.

Property Impacts: The Etobicoke-Finch West Light Rail Transit Line is proposed to be constructed along Finch Avenue West, directly adjacent to the Dufferin STS EA Study Area. A transit station has been proposed at the intersection of Finch Avenue West and Wilmington Avenue. The preliminary plans for the transit station were reviewed, and the proposed jacking shafts have been positioned accordingly to avoid utility conflicts. Continued coordination between the Dufferin STS realignment north of Finch Avenue West and the Etobicoke-Finch West Light Rail Transit Line is recommended throughout the detailed design and construction to ensure that any changes to the projects are captured.

Impacts to the Natural Environment: The impacts to the watercourse are lower for Alternative 3f due to the elimination of the need for a second river crossing at the east end of the site. Alternatives 3b and 3d would pose a risk to the river bed, and therefore to aquatic life, due to the insufficient depth of cover between the top of pipe and the riverbed.

Construction Risks: Alternative 3f poses the lowest risk during construction due to the elimination of the second crossing of the watercourse at the east end of the study area.

In contrast, Alternative 3d HDD poses the lowest cost and the shortest construction duration, however HDD poses additional risks throughout construction depending on the subsurface geology. The required slope for the proposed Alternative 3d HDD alternative is approximately 0.6%, which can typically be achieved only in favourable subsurface conditions. Therefore, depending on subsurface geology, the HDD method may not provide the required slope. For these reasons, MT is the preferred construction method.

The alignment for Alternative 3b and 3d both show that there is insufficient depth of cover between the top of pipe and the riverbed. Therefore, there is a high risk of impact to the riverbed during construction which reduce the likelihood of a successful installation.

8.3.2 South Area

Three alternatives have been reviewed for the South Area:

1. Do Nothing,
2. Alternative 2a – Rehabilitation using CIPP, and
3. Alternative 2b – Rehabilitation using SRP PE.

Each alternative has been reviewed against the evaluation criteria. An evaluation matrix is provided in **Appendix G**, which includes a brief qualitative discussion for each criterion.

Impacts to the natural environment are expected to be similar between Alternatives 2a and 2b due to the similar staging and access requirements. Similarly, impacts to traffic will be minimal for both alternatives. The project location is distant from most developed lands, the nearby residential properties are separated by tree cover and grade differences which would help to reduce visual or noise impacts.

Although the impacts to the natural and social environments will be similar for both alternatives, the recommended solution is Alternative 2a Rehabilitation using CIPP. A summary of the key benefits is provided in the section below.

Hydraulic Performance: The hydraulic analysis completed as part of the Pre-Design Report indicated that the reduction in capacity was significantly greater for Alternative 2b SRP PE than for Alternative 2a CIPP.

Economic Impacts: Alternative 2b SRP PE poses a significantly greater installation cost than that of Alternative 2a CIPP. For this reason, the preferred rehabilitation solution is Alternative 2a CIPP.

Below in **Table 8-3**, is a qualitative evaluation matrix for each alternative for both the north and south area. A table is provided in **Appendix G** which includes a qualitative discussion describing the rationale behind the scoring process. The preferred alternatives are outlined in red. A description of each symbol is below:

- - Poor
- - Fair
- - Good
- - Excellent

Table 8-3: Quantitative Evaluation Matrix

	North Area Alternatives					South Area Alternatives		
Criteria	Alt 1: Do Nothing	Alt 3b - MT: New Alignment	Alt 3d - MT: New Alignment	Alt 3d - HDD: New Alignment	Alt 3f - MT: New Alignment	Alt 1: Do Nothing	Alt 2a – CIPP: Rehabilitate Dry	Alt 2b – SRP PE: Rehabilitate Controlled Flow
Social/Cultural								
Public health and safety impacts								
Property impacts	n/a					n/a		
Impacts of construction activities on surrounding neighbourhoods	n/a					n/a		
Aesthetic impacts								
Utility impacts	n/a					n/a		
Impacts to cultural heritage resources								
Natural Environment								
Impacts to floodplain/TRCA regulation limit								
Impacts to Terrestrial wildlife and vegetation								
Impacts to aquatic wildlife/vegetation								
Water quality impacts								
Technical and Planning Considerations								
Meets policy and connectivity requirements								
Meets operational standards								
Infrastructure performance and effectiveness								
Constructability	n/a					n/a		
Construction complexity and availability of local expertise	n/a					n/a		
Economic								
Capital cost								
Property acquisition cost								
Operation and maintenance cost								
Overall Evaluation								

9.0 RECOMMENDED SOLUTION

Within the North Area, the recommended servicing strategy is the Alternative 3f MT solution. This servicing solution includes the installation of a 1200 mm ID sewer through the use of the microtunnelling methodology. The solution includes the installation of a new sewer segment which will connect to the existing trunk adjacent to existing MH135-003 and discharge to a new MH to be installed between MH132-109 and MH132-110. The existing sewer between MH155-003 and MH132-111 will be decommissioned as part of this work.

Within the South Area, the recommended servicing strategy is the Alternative 2a CIPP solution. This solution involves the installation of a lining into the existing pipe with a flexible tube impregnated with thermosetting resin. The rehabilitation work will span the sewers from MH135-005 to MH135-003.

9.1 CONSTRUCTION STAGING AND TIMELINES

The recommended solutions for the North and South Area have been reviewed to establish the construction staging requirements and timelines for each. A summary of the anticipated staging requirements is discussed in the following text.

A total of four (4) construction shafts will be required for the construction of Alternative 3f MT within the North Area: two receiving shafts, and two jacking shafts as shown previously in **Figure 6-4**. Within the South Area, access will be required to MH135-004, MH135-005, and MH135-006 as shown previously in **Figure 6-5**. Tree clearing and the construction of a permanent access road are to be completed at the beginning of the construction period to facilitate further works.

Within the North Area, the west receiving shaft adjacent to MH135-003 is accessible via Finch Avenue West. Tree clearing and the construction of a permanent access road will be required to access the east receiving shaft from Finch Avenue West. The east shaft location will require tree removals and potential grading adjustments to prepare the work area. The central jacking shafts are accessible through the park access road and parking lot, adjacent to Finch Avenue West. An access road will be constructed from the Finch Ave or from the TRCA parking lot to the proposed location for the eastern-most jacking shaft (J2).

The work within the South Area will require access to MH135-003, MH135-004, and MH135-005 for the rehabilitation work, and access to MH135-006 will be required to facilitate the temporary bypass pumping system. Although MH135-003 is accessible from Finch Avenue West, the remaining MHs will require significant tree clearing, grading adjustments, and the construction of an access road through the valley lands to permit access. The existing MH structures can be maintained throughout construction; however, the MHs cone, riser, and lid will be removed to allow construction works, and will be replacement upon completion.

It is anticipated that the works within the North Area will be constructed beginning at the east end of the study area and working west. This will allow the eastern portion of proposed sewer to be commissioned during the construction work, and a temporary bypass can be implemented which will discharge into the newly commissioned sewer.

A bypass is required for the work within the South Area, as well as for the west connection within the North Area (adjacent to MH135-003). Therefore, there is an opportunity for one bypass to be implemented to accommodate the works in the north and south areas concurrently. It is recommended that the bypass be implemented from MH135-006, and discharge to the Proposed Jacking Shaft J1, following the construction and commissioning of the eastern portion of the proposed trunk sewer within the North Area. In addition, the local 300 mm sewer which collects flows from the neigbourhood west of Dufferin Street will require a separate bypass line, which will run along the north side of Finch Avenue and discharge into jacking shaft J1.

The local sewer south of Finch Avenue West is to be relocated to avoid conflicts with the proposed trunk sewer. A crossing of Finch Avenue West will be required for the installation of the local sewer. It is recommended that this crossing be oversized to allow it to be used as the crossing for the bypass pumping of the Dufferin Trunk Sewer. It is anticipated that the local sewer relocation will utilize open-cut methodology along the boulevards, and auger-boring methodology for the crossing of Finch Avenue West. This will eliminate the need for a second crossing of Finch Avenue West.

Following the completion of the proposed works, a portion of the existing Dufferin STS will be decommissioned by filling with grout. Typically, all surface features are removed (i.e. MH lids, covers, and risers), however, the infrastructure may be left in place in locations where the infrastructure is not accessible, such as within the reservoir. The site will be restored to the pre-existing conditions, wherever possible. The permanent access roads will be maintained following construction to ensure that the infrastructure is accessible and maintainable for future works.

9.2 OPINION OF PROBABLE COST

As noted in Section 7.0, an Opinion of Probable Costs (OPC) have been prepared for the recommended alternative solution. The OPC has been developed based on material quotations, discussions with contractors, current market labour rates, and unit rates within Stantec's costing database. Concept engineering OPC's are in 2016 dollars (excluding taxes) and considered accurate within ±50%. **Table 9-1** presents a summary of OPCs for each alternative.

Table 9-1: Opinion of Probable Cost Summary

OPTION	METHODOLOGY	COST
North Area		
3f	Microtunnelling	$10,175,000
South Area		

OPTION	METHODOLOGY	COST
2a	CIPP	$980,000
	Total	**$11,055,000**

Note: Taxes are excluded from the opinion of probable cost.

10.0 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Based on the features identified within the desktop review and field reconnaissance, preliminary mitigation measures have been identified to offset the potential for environmental impacts to identified features during and after construction. During preliminary and detailed design, site-specific mitigation measures may be required based on the results of the Stage 2 Archaeological Assessment and detailed ecological field investigations. It is also anticipated that permits and approvals obtained from federal and provincial agencies (see Section 12) will contain mitigation measures (including timing, site-specific mitigation, protection measures, and compensation) that will need to be implemented during and after construction. All mitigation measures should be incorporated into contract documentation and specifications.

10.1 SOCIO-ECONOMIC ENVIRONMENT

10.1.1 Cultural Heritage

The Cultural Heritage Assessment has been completed. The assessment concluded that adverse impacts on cultural heritage features are not anticipated; therefore, no mitigation measures are required.

10.1.2 Archaeological Resources

A Stage 2 Archaeological Assessment will be undertaken and will be submitted to the MTCS for their review and comment. Based on the findings of the Stage 2 Archaeological Assessment, and any further necessary stages of archaeological assessment, recommendations for archaeological resources will be implemented. Wherever possible archaeological sites that are determined to have cultural heritage value and interest should be mitigated in whole or in part by avoidance and preservation. If it should evolve that avoidance and preservation is not feasible, the site or sites should be mitigated by the implementation of Stage 4 salvage excavations. For any sensitive First Nations sites that could be subject to impact by the project, Stage 3 and Stage 4 options will be evaluated in discussions with the appropriate First Nations.

Should previously unknown archaeological or heritage resources be uncovered or suspected of being uncovered during construction, ground disturbance in the find location should cease immediately. The Ministry of Tourism, Culture and Sport and an archaeologist licensed in the Province of Ontario should be notified immediately. A site-specific response plan should then be employed following further investigation of the specific find. The response plan would indicate under which conditions the ground disturbance activity in the find location may resume.

In the event that human remains are uncovered or suspected of being uncovered during ground disturbance, the above measures should be implemented along with notifying local

police, the coroner's office, and the Cemeteries Regulation Unit of the Ontario Ministry Consumer Services.

10.1.3 Current Land Uses and Land Users

During construction, mitigation measures should be implemented to minimize noise to nearby residents. Recommended mitigation measures are summarized below:

- Motorized construction equipment should be equipped with mufflers and silencers.
- Company and construction personnel should avoid idling of vehicles; vehicles or equipment should be turned off when not in use, unless required.
- Activities that create noise should be restricted to daylight hours when possible, and adhere to local noise by-laws; sources of continuous noise, such as portable generators, should be shielded or located so as to reduce disturbance to residents and businesses.
- Where installation will take an extended time period to complete, an assessment should be undertaken to determine the suitability and effectiveness of temporary noise barriers adjacent to residential properties.
- The contractor should implement site practices during construction that are in line with the Environment Canada document 'Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities' (Environment Canada, 2005), which may include:
    - maintaining equipment in compliance with regulatory requirements
    - protecting stockpiles of friable material with a barrier or windscreen in the event of dry conditions and dust
    - dust suppression of source areas
    - covering loads of friable materials during transport
- Safety fencing and signs should be implemented to separate the construction work site from recreational users of the Reservoir lands.

10.1.4 Transportation

The contractor should implement a traffic management plan for all roads affected by construction, which at a minimum outlines measures to:

- Control the movement of materials and personnel to and from the construction site;
- Post signs to warn oncoming motorists of construction activity;

- Reduce on-road disturbance and lane closures; and
- Store equipment as far from the edge of the road as practical.

10.1.5 Ongoing Planning Studies and Future Development

The Project Team has reviewed the recommended solution against the City's Cycling Network and Trails Plan, as developed in 2016. There is an existing cycling network through the G. Ross Lord Park which extends from Finch Avenue West to the northeast of the study area. Although there are pedestrian and bike trails along Finch Avenue West, and through the G. Ross Lord Park, it is anticipated that the impacts to these trails will be minor. Short term interferences to the trails are anticipated throughout the course of construction, however full closures or detours of these trails is not anticipated.

The City of Toronto and Metrolinx have undertaken the Transit Project Assessment Process (TPAP) study for the 17 km long Etobicoke-Finch West Light Rail Transit (EFWLRT) corridor. In conjunction with this work, the City has schedule Finch Avenue West for a widening, including the widening of the bridge crossing the West Don River. The proposed alignment for the Etobicoke-Finch West Light Rail Transit includes rail lines along Finch Avenue West, with a stop to be located at the intersection of Wilmington Avenue. The proposed shafts for the Dufferin STS realignment have been positioned outside of the existing right-of-way, and sufficient space has been maintained for the light-rail transit stop and the anticipated road widening, as per the details for the proposed stop, as currently available. Throughout the preliminary and detailed design phases, the engineering teams are to continue to consider the proposed light-rail work and coordinate as required to ensure that conflicts are avoided.

Future development has been identified within and adjacent to the study area, as identified in Section 5.1.5.7. To accommodate the proposed development within the area, projected future design flows were used in the preliminary design of the sewer. These flows have been used to confirm the size and capacity of the proposed sewer rehabilitation and realignment work. Additional details can be found within the Pre-Design Report (**Appendix D**).

10.2 NATURAL ENVIRONMENT

10.2.1 Natural Areas – Wetlands, Woodlands, and Valleylands

Protection of Natural Areas:

- Avoid encroachment into features to the extent possible.
- Clearly delineate/demarcate work areas to avoid accidental encroachment and incidental damage to native trees and areas of natural vegetation.
- Educate workers on the requirements for and importance of avoiding entrance to the demarcated area.

- Inspectors should ensure construction vehicles and personnel stay within the work area, thereby limiting the disturbance of natural vegetation.
- All maintenance activities, vehicle refueling or washing, as well as the storage of chemical and construction equipment should be located >30m from natural areas, if possible. In the event of an accidental spill, the MOECC Spills Action Centre should be contacted and emergency spill procedures implemented immediately.
- Accidental damage to trees, or unexpected vegetation removal, should be replaced / restored with native species.
- Install, monitor and maintain proper muffling and maintenance of machinery and equipment to mitigate noise impacts to wildlife.

Erosion and Sediment Control:

- Use appropriate erosion and sediment control measures such as sediment fencing or filter logs (i.e., SiltSoxx™) around work areas and access roads.
- Erosion and sediment control structures (i.e., silt fencing) should be installed, monitored and maintained regularly to ensure that they are fully functional.
- Additional silt fence should be available on site, prior to grading operations, to provide a contingency supply in the event of an emergency.
- Steep slopes (>3:1) should have erosion blankets.
- Where evidence of sedimentation or erosion exists, corrective action should be taken as soon as conditions permit.
- Controls are to be removed only after the soils of the construction area have been stabilized and adequately protected or until vegetation cover is re-established.

Post-construction Restoration:

- Disturbed areas should be restored using only native species where appropriate, including areas disturbed during construction.
- Seed mixes and other planting lists should be designed to include only native species adapted to the site conditions, including soil type, moisture and sun exposure. Seed and other material should be from local sources where possible. Exceptions may include plantings in harsh urban environments. In these areas, invasive non-native species should not be used to prevent introduction into adjacent natural areas.
- Seed mixes should include fast-growing, short-lived perennial cover crop to stabilize soil and reduce competition from weeding exotics.

- Newly created forest edges should be planted with a mix of large woody stock, including trees and shrubs to protect the forest interior from exposure to the sun, wind and invasive species.

10.2.2 Wildlife and Wildlife Habitat

Timing of vegetation clearing should occur outside of periods of active bird breeding (April 1 to August 15). If vegetation clearing must proceed during the restricted period, a biologist may be able to search the area and establish activity setbacks around active nests.

Pre-construction surveys are recommended to survey for potential bat maternity habitat (snag trees) in all areas of vegetation removal. Surveys should be completed during leaf-off (November to May), with sufficient lead time to allow for authorization under the Endangered Species Act, 2007, if necessary.

Contractors should be trained to locate and avoid potential wildlife, including turtles and snakes. Visual searches should occur before work is initiated each day, including inspection of machinery and equipment, prior to starting equipment, particularly during the peak reptile activity period (April 1 to September 30).

TRCA had a record of one Butternut within the Study Area; however, it is not in the proposed development footprint. Therefore, the tree will not be impacted by the proposed construction.

Due to the potential for swallows within the study area, vertical slopes on soil stockpiles are to be avoided to deter Bank Swallows from nesting. Slopes should be reduced to 70 degrees or less to be effective. Exclusion methods such as tarping are recommended for areas where slope angles cannot be altered (excavated tunnels). Mitigation measures should be implemented prior to the Bank Swallow breeding season (April 15) and continue to be implemented for the duration of the breeding season (until at least July 15, or longer if required by the MNRF).

Work must stop immediately in the area if Bank Swallows have managed to nest despite efforts to deter them from nesting and protection measures must then be implemented. Mitigation measures listed above for Bank Swallow would also be applicable to Northern Rough-winged Swallows which are protected under the MBCA.

10.2.3 Aquatic Habitat

For Dufferin Creek, mitigation measures are as follows:

- Complete construction activities within the creek valley and floodplain during the warmwater timing window for Dufferin Creek that allows work to be completed from July 1 to March 31 of any given year.
- Use appropriate erosion and sediment control measures such as sediment fencing or filter logs (i.e., SiltSoxx™) around work areas and access roads.

- Install a waterproof coffer dam to isolate the work area during in-water/near water works at MH135-004 and MH135-005.
- Before isolation and dewatering works commence, retain a qualified environmental professional to ensure applicable permits for relocating fish are obtained, and to capture fish trapped within an isolated/enclosed area at the work site and safely relocate them to an appropriate location in the same waters.
- Equip intakes of pumping hoses with an appropriate device to avoid entraining and impinging fish (see DFO's Measures to Avoid Causing Serious Harm (http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/index-eng.html).
- Manage water from dewatering operations to reduce the risk of erosion and/or release of sediment laden or contaminated water to the waterbody by discharging to a settling basin, filter bag, or other energy dispersion measure at least 30 m from the channel, where feasible.
- Reduce the access and temporary work space to the extent possible to limit destabilization of soils near the work area.
- Following construction, restore disturbed bed and banks to pre-construction conditions to the extent possible.

For the Don River West Branch, mitigation measures are as follows:

- Complete tunneling activities within the warmwater timing window for the Don River West Branch that allows work to be completed from July 1 to March 31 of any given year.
- Standard erosion and sediment control measures should be implemented around tie-in, jacking, and receiving shaft staging areas.
- Prior to initiating microtunelling, appropriate geotechnical data should be obtained to assist in determining the tunnel path.
- Tunneling equipment (e.g., rigs, support equipment, sump) should be set up a minimum of 30 m from the edge of watercourses, as feasible.
- Clearing of vegetation or grading of watercourse banks should not occur immediately adjacent to the edge of watercourses, as determined through consultation with the TRCA.
- A bentonite mud release contingency plan should be prepared and kept on-site.
- Monitor the watercourse for accidental mud release during tunneling activities.

- Bentonite mud should be used without the use of additives (except with approval from appropriate regulatory authorities).
- Suitable bentonite mud tanks or sumps should be installed to prevent contamination of the watercourse.
- Install berms and/or check dams, silt fencing, and secondary containment measures (i.e., plastic tarp) downslope from tie-in, jacking and receiving shafts to contain the release of drilling mud.
- Dispose drilling mud in accordance with the appropriate regulatory authority requirements.
- Clean up operational spills on a daily basis to prevent mobilization of drilling mud off site during rain events.
- Reduce slurry viscosity through appropriate filtering of drilled material to reduce the pressure gradient along the tunnel path due to frictional effects.
- Immediately contain any drilling mud that escapes onto land and transfer it into an on-site containment system.
- Maintain the following materials during tunneling operations and be prepared to employ them in the event of a bentonite mud spill:
    - Sand bags
    - Straw bales
    - Sediment fencing
    - Hydrovac truck

10.3 PHYSICAL ENVIRONMENT

10.3.1 Physiography and Bedrock Geology

A geotechnical investigation was previously undertaken by SPL Consultants Limited[1] (SPL) in September 2013 for the trenchless installation north of the G. Ross Lord Reservoir, which was used as a basis for assumed conditions along the shortlisted Dufferin STS realignment options. Based on a preliminary review of the available geotechnical information, the following considerations have been made:

1. The native fine grain silty and sandy soil is identified within the area. This material is prone to flowing at the face of the excavation below the groundwater table, therefore shorter tunnelling lengths are recommended. A close-face tunnelling methodology (such as microtunnelling) is best suited for this environment.

2. The potential presence of cobbles and/or boulders must be considered during the design and construction of the proposed installation. The presence of these materials could halt progress of the trenchless operation. No information is currently available as to the diameter or unconfined strength of the cobbles/boulders that might reside within the till soils.

A geotechnical and hydrogeological investigation will be completed within the proposed study area as part of the preliminary design stage of the project. These studies will provide site specific information which will aid in the design of the preferred solution. The subsurface information available to date has been used to inform design decisions such as the selection of pipe material and installation methods which are suited to the subsurface conditions.

10.3.2 Hydrogeology

Genivar Inc. completed the West Don Sanitary Trunk Sewer Rehabilitation Hydrogeological Investigation[2] in September 2013 as part of the Maple Trunk diversion which took place just north of the study area. Based on the understanding of existing conditions, mitigation measures to be implemented during the construction phase have been provided below:

- To reduce the potential for erosion and scouring at dewatering points, energy dissipation techniques should be used. At dewatering points, discharge piping should be free of leaks and properly anchored to prevent bouncing or snaking during surging. Discharge should be monitored to make sure that no erosion or flooding occurs.

[1] Report on Preliminary Geotechnical Investigation, West Don Trunk Sewer Replacement, G. Ross Lord Reservoir, Toronto. SPL Consultants Ltd. February 28, 2012, Reissued September 27, 2013
[2]Hydrogeological Investigation in Support of a Category 3 Permit to Take Water Application, West Don Sanitary Trunk Sewer Rehabilitation, for the City of Toronto, Genivar. September 2013.

- Protective measures may include dewatering at low velocities, dissipating water energy by discharging into a filter bag or equivalent, and utilizing protective riprap or equivalent.
- If energy dissipation measures are found to be inadequate, the rate of dewatering should be reduced or dewatering discontinued until satisfactory mitigation measures are in place.
- Prior to construction, a hydrogeologist should assess the need for, and develop if necessary, a well monitoring program.

10.3.3 Source Water Protection

The Study Area is located within a highly vulnerable aquifer, and a significant groundwater recharge area (when applying Rule 44 (1) and Threshold by Toronto and Region Source Protection Area jurisdiction). Genivar Inc. completed the West Don Sanitary Trunk Sewer Rehabilitation Hydrogeological Investigation[3] in September 2013. This report included a summary of the hydrogeological assessment and included recommendations on dewatering requirements.

The previously completed Hydrogeological Investigation recommended a Category 3 Permit to Take Water Application for the previously completed Maple Trunk STS diversion work adjacent to the study area. The maximum daily dewatering rates were expected to range between 730,000 to 1,245,000 L/day, and the construction was expected to be completed within 6 months. Further hydrogeological investigations will be completed as part of the Preliminary Design phase to confirm dewatering requirements for the preferred solution. It should be noted that the use of sheet piling may be incorporated into the design, which may reduce the groundwater seepage into the excavations and may provide additional vertical stability.

[3]Hydrogeological Investigation in Support of a Category 3 Permit to Take Water Application, West Don Sanitary Trunk Sewer Rehabilitation, for the City of Toronto, Genivar. September 2013.

11.0 CONSULTATION AND OUTREACH ACTIVITIES

11.1 OVERVIEW

Consultation is an essential requirement of the Municipal Class EA process. Consultation is the process of identifying interested and potentially affected parties and informing them about the project, soliciting information about their values and local environmental and socio-economic circumstances, and receiving advice about key project decisions before those decisions are finalized. Consultation and outreach activities have included providing project information to, and requesting comments/feedback from members of the public, public agencies, Indigenous communities, and other stakeholders. These activities are summarized below.

11.2 PROJECT CONTACT LIST

The City of Toronto Public Consultation Unit developed the initial contact list for the project which included surrounding landowners and relevant agencies, utilities, and municipal departments. The initial contact list has been updated as the Municipal Class EA process unfolded because of changes in personnel, correspondence received, and attendees at meetings and the consultation event.

Key project contacts included:

- Local BIA: DUKE Heights BIA
- Councillor James Pasternak, Ward 10, York Centre
- Indigenous Groups including:
  - Mississaugas of the New Credit First Nation
  - Alderville First Nation
  - Curve Lake First Nation
  - Hiawatha First Nation
  - Kawartha Nishnawbe First Nation
  - Mississaugas of Scugog Island First Nation
- Hydro One Networks Inc., Enbridge Gas Distribution Inc., Bell Canada, Rogers Cable
- Toronto Region and Conservation Authority
- York Region
- Metrolinx
- Toronto District School Board

11.3 PROJECT NOTICES

A Notice of Study Commencement was issued on November 24, 2016 and was circulated to the project contact list and published in the North York Mirror Newspaper. In addition, a copy of the notice was circulated to the local Councillor. The notice was also distributed via Canada Post to

2000 residents in the project's study area on November 24, 2016.The Notice described the project and the Municipal Class EA and consultation process, provided a map, and listed project contact information.

The City of Toronto provided the Notice of Commencement to the following Indigenous groups on October 17, 2017:

- Mississaugas of the New Credit First Nation
- Alderville First Nation
- Curve Lake First Nation
- Hiawatha First Nation
- Kawartha Nishnawbe First Nation
- Mississaugas of Scugog Island First Nation

A Notice of Public Information Event was issued on November 17, 2017 prior to the Event and circulated to the contact list on November 15, 2017 and published in the North York Mirror Newspaper on November 24, 2017. The Notice described the project, provided a map and information on the format, time and location of the Event, and listed project contact information. The Notice was circulated to the contact list and local Councillor via email on November 23rd, 2017, published in the North York Mirror newspaper on November 24, 2017, and was distributed via Canada Post to 2000 residents in the study area on November 17, 2017.

The City of Toronto also informed the following Indigenous groups about the Archeological Report and the Design Recommendations presented at the Public Drop-in Event:

- Mississaugas of the New Credit First Nation
- Alderville First Nation
- Curve Lake First Nation
- Hiawatha First Nation
- Kawartha Nishnawbe First Nation
- Mississaugas of Scugog Island First Nation

11.4 STAKEHOLDER MEETINGS

Meetings have been held with various stakeholders including the TRCA (March 23, 2017 and July 12, 2017), the City of Toronto Transportation and Parks, Forestry & Recreation departments (April 20, 2017) and Metrolinx (May 8, 2017). At the meetings Stantec provided an overview of the project, environmental investigation, evaluation of alternatives and next steps. Additional meetings will be held with agency and municipal personnel as the project progresses towards detailed design and construction.

11.5 COMMUNICATION AND CONSULTATION EVENT

The Public Information Event (PIE) was held on December 7, 2017 from 6:00 PM to 8:00 PM at the T Herbert H. Carnegie Centennial Centre (580 Finch Avenue West, Toronto, ON M9M 3A3). Members of the public who attended the Event have also been added to the contact list.

A total of 22 display boards were presented during the PIE which provided the project background and a review of the study area. The boards included a review of the social, cultural, and natural environment within the study area, and an overview of the Municipal Class EA process. The boards included a review of the alternative solutions and presented a summary of the evaluation process used to select the recommended solution. The boards also included information on the mitigation measures for the recommended solution.

One member of the public attended the PIE and a feedback form was completed. A copy of the feedback form is provided in Appendix H. The comment period was open to the public for two weeks - from December 7, 2017 to December 22, 2017.

The City and project team staff in attendance at the meeting included:

- Bashir Ahmed, City of Toronto
- Mae Lee, City of Toronto
- Khatija Sahib, City of Toronto
- Adam Zietara, City of Toronto
- Tony Petrucci, Stantec Consulting Ltd.
- Jennifer Hale, Stantec Consulting Ltd.
- Nelson Oliveira, Stantec Consulting Ltd.

A copy of all presentation material is available on the City of Toronto project website: www.toronto.ca/dufferinsewer. All Public Consultation materials are provided in Appendix H, and all public consultation materials throughout the project were posted on the City's projects designated website: www.toronto.ca/dufferinsewer.

11.6 FEEDBACK RECEIVED TO-DATE

The public consultation program allows interested or potentially affected parties to provide feedback into the project. Feedback has been evaluated and integrated into the project as feasible. To-date, in addition to the above referenced meetings, feedback has been received from two members of the public, Enbridge Pipelines Inc., the MOECC, the TRCA, Metrolinx, the MTCS, and Infrastructure Ontario. Much of the feedback has been in the form of general questions regarding the Municipal Class EA process, the sewer location, agency consultation, and the project contact list.

While all consultation documentation is presented in **Appendix H**, a summary of comments received that have resulted in refinements to the project is presented below:

- The TRCA, in a letter dated February 21, 2017, provided information on policies to consider during selection of alternatives, a description of how detail design commitments should be reflected in the EA (via a pre-design brief), and a list of submissions to be provided to the TRCA. Two (2) meetings were held with the TRCA on March 23, 2017 and July 12, 2017 to review the items of interest to the TRCA.

- The MTCS, in a letter dated March 22, 2017, recommended that a Heritage Impact Assessment be completed and incorporated into the EA. While not originally a component of the project scope, a cultural heritage review was undertaken in relation to a registered heritage property at 685 Finch Avenue West.

- The TRCA, in the meeting on March 23, 2017, expressed two preferences: that they prefer Alternative 3d (connection to MH132-109) as there will be a smaller construction footprint on TRCA lands and in the floodplain, and that they prefer microtunnelling over HDD due to a reduced footprint for the staging area. The above preferences were reviewed and considered during the evaluation of alternatives.

- The City of Toronto Transportation Services, in the meeting on April 20, 2017, requested that the impact of the construction staging area within the City ROW and the impact on traffic for any required land closures or restrictions be included within the evaluation matrix of alternatives. This request was reviewed and considered during the evaluation of alternatives. A suggestion was also made to use the TRCA parking lot at the G. Ross Lord Dam as a construction staging area in exchange for building the TRCA a new temporary parking lot. This suggestion will be reviewed moving forward.

- Metrolinx, in the meeting on May 8, 2017, noted that the City ROW along Finch Ave West will be widened by one lane width in each direction, and where an LRT stop is present, the ROW to be widened by 2 lane widths in each direction including widening of the bridge of the West Don River. LRT stations will be located at Wilmington Ave and Goldfinch Ct. All utilities located in the center of road will be relocated, therefore all infrastructure for the Dufferin STS is to be located outside the existing City ROW to avoid the need for future relocation. Metrolinx also noted that the Finch LRT construction from Highway 27 to Keele Street is scheduled between 2018 and 2021, and future phases have not yet been approved for construction. The Dufferin STS construction work is anticipated to be completed between 2021 and 2022. Continued coordination with the Finch LRT construction works is recommended to ensure that schedule conflicts are avoided.

- Comments received from the Duke Heights Business Improvement Area (BIA) which requested clarification on the study area to confirm that potential growth from the

upstream drainage area was considered within the study. The BIA also requested that the City advise on the 2041 population projections utilized for the population growth within the study area. The BIA indicated that employment related development is anticipated within the area well before 2041. Although the 2041 population information cannot be published at this time, the BIA was directed to City Planning for further information on Planning Projections within and adjacent to the Study Area.

- Input was provided by Hydro One following the Notice of Project Drop-in Event (PIE). Hydro One indicated that, based on the provided sketch, the proposed project affects Hydro One's overhead transmission lines. It is noted that written approval is required from Hydro One/ Infrastructure Ontario prior to any construction on hydro corridor lands. A proposal and drawings are to be submitted for any temporary and permanent rights that the City would like to acquire.

11.7 SUMMARY AND NEXT STEPS

At each stage of the consultation program input received has been compiled, reviewed, and incorporated into the Municipal Class EA process. Responses have been provided, as applicable, to questions and concerns received. On-going consultation will occur with directly-affected and interested parties through detailed design and construction.

This Project File Report must be released for public review for a 30-day period, along with a notice of EA study completion.

During the public review period, any interested party may request further ministerial review of the project from Ontario's Minister of Environment and Climate Change, called a Part II Order Request. A Part II Order request can be made if, in the opinion of the requester, the proponent has neglected to address environmental impacts, or has made a procedural error in the implementation of the Class EA study that cannot be addressed through revision or amendment of the study.

If there are no outstanding concerns raised during the 30-day review period, then the proponent may proceed to Phase 5 of the Municipal Class EA process, implementation of the proposed works.

12.0 PERMITS AND APPROVALS

In additional to completing the Municipal Class EA process, the City will also be required to obtain additional permits and approvals from federal and provincial agencies and provide notifications to stakeholder, as outlined in **Table 12-1** below.

Table 12-1: Summary of Potential Permits/Regulatory Requirements

Permit/Approval Name	Administering Agency	Description
FEDERAL PERMITS AND APPROVALS		
Clearing of Vegetation under the *Migratory Bird Convention Act* (MBCA) (1994)	Environment Canada	No permit is necessary; however, precautions need to be made so that no breeding birds or their nests are harmed or destroyed during the bird nesting season. Nest sweeps will be required at a maximum of 7 days prior to vegetation removal during the bird nesting season (April 1 to August 31), as per the MBCA.
Review and authorization under the *Fisheries* Act (1985)	Fisheries and Oceans Canada (DFO)	To determine if a *Fisheries Act* review is required, Self-Assessment should be completed for all work proposed near water. The Self-Assessment should be submitted to DFO for review.
PROVINCIAL PERMITS AND APPROVALS		
Development Permits under *Ontario Regulations 166/06* (Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses), as per the *Conservation Authorities Act* (1990)	Toronto and Region Conservation Authority (TRCA)	Required for works within TRCA Regulated Areas, including shorelines, watercourses, wetlands and hazardous lands (flooding and erosion hazards, and unstable soils and bedrock).
Permit to Take Water (PTTW) (surface and groundwater) under the *Ontario Water Resources Act* (1990)	Ministry of the Environment and Climate Change (MOECC)	An EASR is required when water will be taken in excess of 50,000 L/d, and less than 400,000 L/d from a lake, stream, river, pond, groundwater, lake, etc. If water will be taken in excess of 400,000 L/d from a lake, stream, river, pond, groundwater, lake, etc., then a PTTW is required.
Environmental Compliance Approval (ECA)	MOECC	Required for facilities that will emit and discharge sewerage. Conditions set out in ECA approval must be met.
Permitting or registration under the *Endangered Species Act* (ESA) (2007)	Ministry of Natural Resources and Forestry (MNRF)	An ESA permit or Registration is required for activities that could impact species protected under the ESA. Consultation will occur with the MNRF to determine ESA permitting requirements.

Permit/Approval Name	Administering Agency	Description
Archaeological clearance under the *Ontario Heritage Act* (OHA)	Ministry of Tourism, Culture, and Sport (MTCS)	As recommended in the Stage 1 archaeological assessment (AA), a Stage 2 AA will be conducted at portions of the Study Area that have archaeological potential. The exact extent for further Stage 2 work will be further confirmed when the limits of proposed project development are delineated. Depending on the results of the Stage 2 AA, Stage 3 and 4 AA's may be required. The completed archaeological assessment reports will be forwarded to the MTCS for review and comment.
Hydro One/ Infrastructure Ontario Clearance	Hydro One/ Infrastructure Ontario	Input was provided by Hydro One following the Notice of Project Drop-in Event (PIE). Hydro One indicated that, based on the provided sketch, the proposed project affects Hydro One's overhead transmission lines. It is noted that written approval is required from Hydro One/ Infrastructure Ontario prior to any construction on hydro corridor lands. A proposal and drawings are to be submitted for any temporary and permanent rights that the City would like to acquire.
MUNICIPAL PERMITS AND APPROVALS		
Road Crossing Agreements	City of Toronto	Required to install infrastructure across City streets via open cut.
Approval to remove trees under the Toronto Municipal Code Parks By-Law (Chapter 608), Ravine and Natural Feature Protection By-law (Chapter 658), and City Street Tree By-law (Chapter 813).	City of Toronto	The City's Tree Protection Policy and Specifications for Construction Near Trees should be followed. Consultation will occur with the City's Parks, Forestry and Recreation Department to allow the removal of City-owned trees. Approval for tree removal requests may be subject to conditions imposed by the City's Parks, Forestry and Recreation Department such as planting replacement trees.
Approval to discharge waste within a City park under the Toronto Municipal Code Parks By-Law (Chapter 608)	City of Toronto	Consultation will occur with the City's Parks, Forestry and Recreation Department to allow the discharge of water within City parks.
Adherence to Noise By-law (Chapter 591), Toronto Municipal Code	City of Toronto	Project activities should adhere to the City's noise by-law, unless otherwise permitted by the City's Urban Development Services Department.

13.0 CLOSING

The preferred solutions have been selected based on an evaluation of the shortlisted alternatives. The recommendations for implementation of the preferred solution are detailed below. A detailed evaluation table can be found in **Appendix G**.

For the North Section of the Study Area, three realignment alternatives were reviewed. Based on the technical review, each of the alternatives were found to be feasible and suitable for further consideration. However, based on the results of the technical review from the Pre-Design Report and of the evaluation matrix, the recommended solution is ***Alternative 3f*** using slurry microtunnelling.

For the South Section of the Study Area, two (2) rehabilitation alternatives were reviewed. Although both of the alternatives are technically feasible, based on the results of the technical review from the Pre-Design Report and of the evaluation matrix, the recommended solution is ***Alternative 2a*** (CIPP rehabilitation).

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