



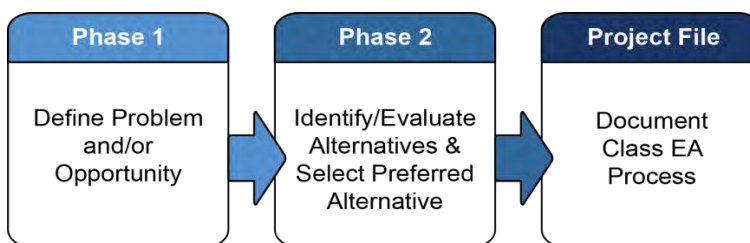
The Regional Municipality of Peel
Burnhamthorpe Road Watermain Class Environmental Assessment
Project File Report

September 2015

Executive Summary

The Regional Municipality of Peel ('Region of Peel') conducted a Class Environmental Assessment (EA) for the Burnhamthorpe Road Watermain Project ('Project') in accordance with Schedule B of the Municipal Class EA as approved under the Ontario *Environmental Assessment Act*.¹ The Project aims to improve water supply through water infrastructure upgrades in support of approved growth in the Mississauga City Centre (MCC) area.

A Schedule B Class EA requires that the first two phases of the five-phase Municipal Class EA planning and design process be carried out, followed by the preparation of a Project File for review.



Phase 1 – Problem/Opportunity

The provincial Growth Plan established a 2031 population forecast of 1.64 million and employment forecast of 870,000 for the Region of Peel. Since the Region of Peel's population in 2011 was 1.29 million, the forecasted growth is significant. In response, the Region of Peel has prepared a long-term Official Plan to assist in managing growth and development to 2031. In concert with the Region of Peel, the City of Mississauga (City) has established their own official plan, as required by Ontario's *Planning Act*, to guide its growth and development to the year 2031.

It is anticipated that much of the City's new population and employment growth will be located in the Downtown, which includes the MCC. In keeping with the City's Downtown intensification plans, there are a significant number of residential, retail and office developments anticipated to be built within the MCC. An additional 25,000 residents and over 20,000 employees are expected to be residing and working within the MCC by 2031. However, the existing water supply for the MCC area is currently incapable of meeting the forecasted growth.

The Region of Peel identified a preferred Water Servicing Strategy to satisfy approved growth to 2031 as detailed in their 2013 Water and Wastewater Master Plan. This strategy has also been encapsulated within their Official Plan and the City's Downtown21 Master Plan. The preferred Water Servicing Strategy recommended that a new 1500 mm diameter watermain along Burnhamthorpe Road from Cawthra Road to Confederation Parkway be implemented for improving water supply to the MCC. This recommendation was confirmed through a feasibility study completed in 2013 by the Region of Peel. The feasibility study also confirmed the need for a number of water service connections to further bolster water supply to the MCC.

Problem/Opportunity Statement

The purpose of the Burnhamthorpe Road Watermain Class EA is to provide the additional water supply required in the MCC area to accommodate identified growth and development in an environmentally-sensitive and stakeholder-responsive manner.

¹ *Municipal Engineers Association, October 2000 (as amended in 2007 and 2011)*

Consultation Undertaken during Phase 1

Although considered discretionary during Phase 1 of the Class EA process, the Region of Peel elected to carry out consultation with review agencies, First Nations, Métis organizations and the public (**Appendix A**) to aid in defining the Project's problem/opportunity statement. Consultation was initiated through newspaper advertisements, email, direct mail, general mail delivery to those living in adjacent areas (**Appendix 1B**) and posting on the Region's website of a Notice of Study Commencement (**Appendix 1C**).

In response to these consultation activities, approximately 15 comments were received (**Appendix 1D**). Five review agencies responded by outlining their specific areas of interest and expectations for the Project, which were considered/fulfilled as part of the Municipal Class EA process carried out. One utility provider offered information on their existing facilities along Burnhamthorpe Road. Two First Nations responded noting the need to consult with them if any evidence of a native burial sites or archaeological findings were uncovered as part of the Project.

In terms of the public, three local residents, two consultant representatives and the project coordinator for a local non-profit organization responded by requesting future Project notifications, citing the need for Region of Peel and City to closely coordinate infrastructure projects and seeking clarification on potential adverse effects to transit/traffic in the MCC.

Phase 2 – Alternative Solutions

Following completion of Phase 1, six alternatives were identified including, the 'Do Nothing' alternative plus five horizontal alignments for the new watermain along Burnhamthorpe Road.

In response to feedback from public consultation and the Region of Peel's longer term water supply plans for the broader area, the westward end of the horizontal alignment of the new watermain was extended from Confederation Parkway to Grand Park Drive.

A number of investigative studies were carried out as part of generating a detailed understanding and description of the environment associated with the alternatives (*Section 4.2*) as defined in the *EA Act*. The Burnhamthorpe Road watermain project is situated within a largely built up area of Mississauga undergoing urban intensification, especially within the MCC. As a result, there are limited natural features and low archaeological potential.

The potential adverse effects of implementing any one of the alternatives were identified along with proposed impact management measures, where appropriate, to mitigate or compensate for the severity or significance of those effects. The resulting net effects for each alternative were comparatively evaluated in order to identify advantages/disadvantages amongst the alternatives and rank them. Overall, Alternative 5 was identified as the recommended alternative for the Burnhamthorpe Road Watermain Class EA by offering the greatest number of advantages with the fewest disadvantages.

Consultation Undertaken during Phase 2

As part of Phase 2 of the Municipal Class EA process, the Region of Peel carried out a number of consultation activities with review agencies, First Nations, Métis organizations and the public to proactively involve them in developing the alternatives, comparatively evaluating them and identifying the preferred alternative. The Region of Peel held individual meetings with potentially affected stakeholders including the City of Mississauga, Credit Valley Conservation authority, utility providers and adjacent property owners.

In addition, the Region of Peel elected to carry out two rounds of Public Information Centres (PICs) instead of just one to provide an additional opportunity for the public to be involved, gain a good understanding of the project and provide comments).

No opposition to the recommended alternative (Alternative 5) was received through consultation, with most of the comments relating to the following:

- Need to coordinate the delivery of infrastructure projects in the MCC between the City and Region of Peel
- Preference for tunnelling of the new watermain versus open cut to reduce surface disruption
- Location of the new watermain alignment and shaft sites in relation to adjacent properties and any potential implications
- Anticipated schedule for constructing the new watermain
- Requests for either the PIC displays or Project-related information (e.g. reports, drawings, etc.) for review/consideration.

Alternative 5 was confirmed as the preferred alternative for the Burnhamthorpe Road Watermain Class EA through these consultation activities in light of no specific concerns or issues being raised.

Description of the Preferred Alternative

The new 1500 mm diameter watermain (**Figure ES 1**) will be installed by construction of a tunnel beneath Burnhamthorpe Road, between Grand Park Drive and Cawthra Road, in three tunnel sections ('drives') using traditional rock tunnel boring machines, microtunnelling, or a combination of the two. The tunnel will be located in the slightly weathered to fresh Georgian Bay shale bedrock.

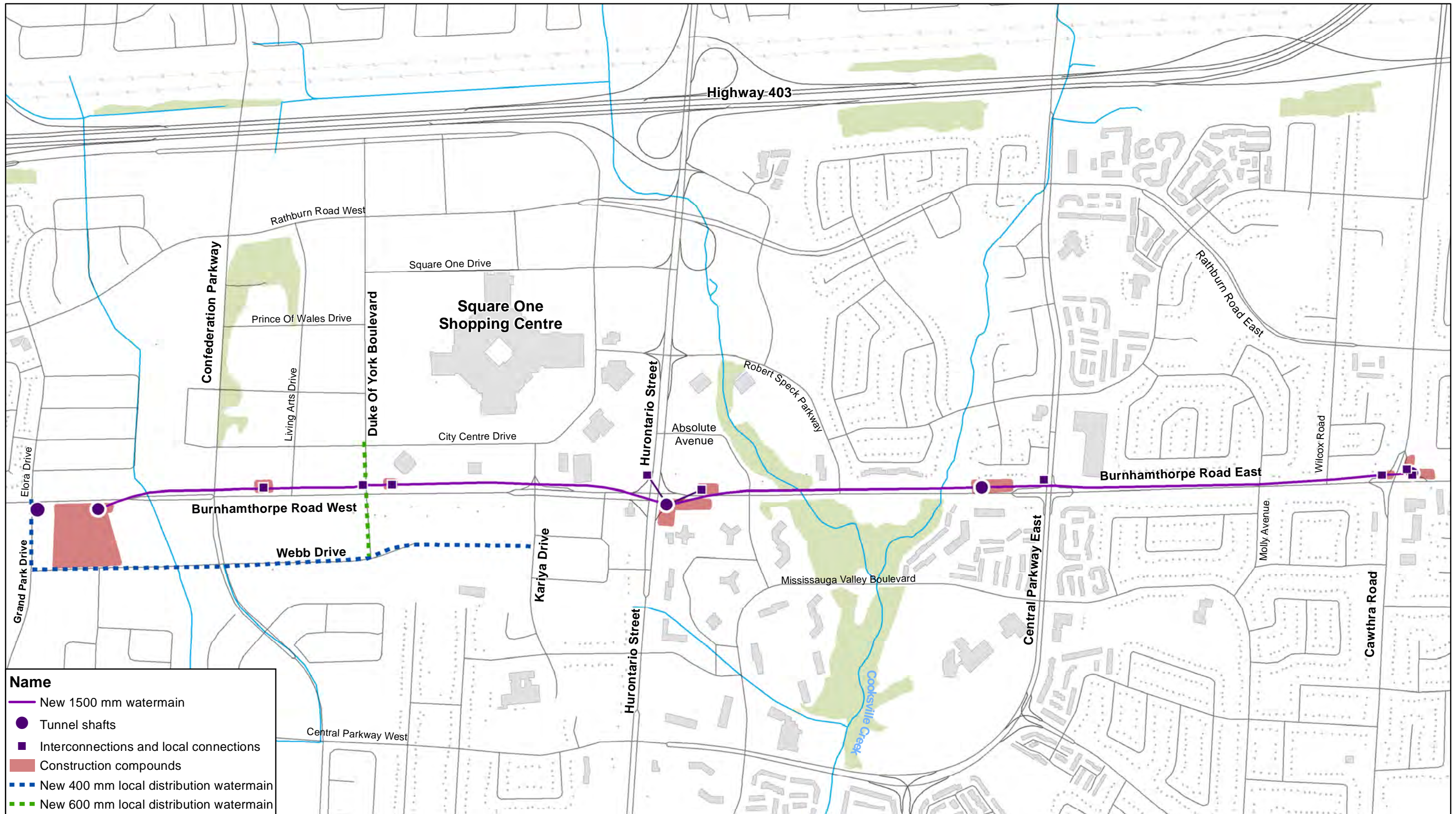
In addition to constructing the new 1500 mm diameter watermain, the Region of Peel is planning on undertaking a number of complementary water infrastructure improvements at the same time. The improvements include six interconnections between the existing 600/750 mm diameter and 1050 mm diameter watermains and the new 1500 mm diameter watermain to maintain pressure in the water system within acceptable limits. In addition, three local connections are required to improve the pressure in the local distribution system and ensure adequate service in the MCC area.

In conjunction with the new 1500 mm diameter watermain, construction of the following local distribution watermains is proposed in order to bolster water supply to the MCC area:

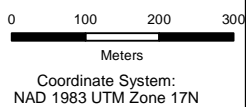
- A new 600 mm diameter local distribution watermain along Duke of York Boulevard from Webb Drive to City Centre Drive
- A new 400 mm diameter local distribution watermain from Kariya Drive, running west along Webb Drive and north up Grand Park Drive to Burnhamthorpe Road West

The new Burnhamthorpe Road watermain will be a 1500 mm diameter concrete pressure pipe with varying sizes of interconnections and local connections. The local distribution watermains will be either concrete pressure pipes and/or polyvinyl chloride (PVC) pipes.

The Region of Peel is proposing to have the new water infrastructure in service by 2019 subject to *EA Act* approval and obtaining all post-EA permits and approvals.



Source: MNR NRVIS, 2013. Produced by GHD under licence from Ontario Ministry of Natural Resources, © Queen's Printer 2015



Region of Peel
Working for you

THE REGIONAL MUNICIPALITY OF PEEL
BURNHAMTHORPE ROAD WATERMAIN CLASS ENVIRONMENTAL ASSESSMENT

13-1125
Sep 2, 2015

PREFERRED ALTERNATIVE

FIGURE ES-1

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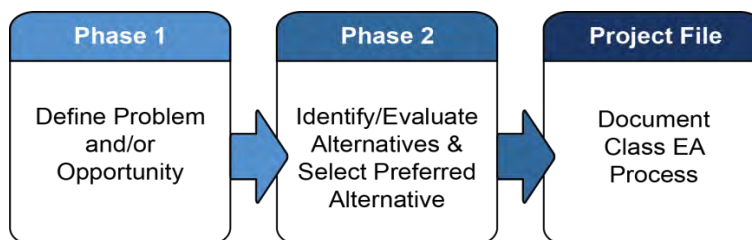
Abbreviations and Acronyms

AEI	Areas of environmental impairment
CA	Conservation Authority
CVC	Credit Valley Conservation
DWWP	Drinking water works permit
EA	Environmental Assessment
GHD	GHD Limited
LOS	Level-of-Service
LRT	Light Rapid Transit
MAA	Ministry of Aboriginal Affairs
MCC	Mississauga City Centre
MEA	Municipal Engineers Association
MNCFN	Mississaugas of the Credit First Nation
MNRF	Ministry of Natural Resources
MOECC	Ministry of the Environment and Climate Change
MTCS	Ministry of Tourism, Culture, and Sport
O.Reg	Ontario Regulation
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyls
PIC	Public Information Centre
PTTW	Permit to take water
ROP	Region Official Plan
TBM	Tunnel Boring Machine
v/c	Volume-to-capacity
VOC	Volatile organic compounds
Vphpl	Vehicles per hour per lane

1. Introduction

The Regional Municipality of Peel ('Region of Peel') conducted a Class Environmental Assessment (EA) for the Burnhamthorpe Road Watermain Project ('Project') in accordance with Schedule B of the Municipal Class EA as approved under the Ontario *Environmental Assessment Act*.² The Project aims to improve water supply through water infrastructure upgrades in support of approved growth in the Mississauga City Centre (MCC) area.

A Schedule B Class EA requires that the first two phases of the five-phase Municipal Class EA planning and design process be carried out, followed by the preparation of a Project File for review (Phase 5). The Schedule B Class EA process is elaborated upon in *Section 2*.



The Region of Peel has initiated the Project to improve water supply and provide water infrastructure upgrades to support approved growth in the Mississauga City Centre (MCC) area. *Section 3* documents Phase 1 of the Municipal Class EA process including the required problem/opportunity statement for the Project.

In response to the problem opportunity statement, six alternatives were identified, comparatively evaluated and consulted on as part of Phase 2 of the Municipal Class EA process leading to a preferred alternative (*Section 4*).

As part of this preferred alternative, a new 1500 mm diameter watermain (**Figure 1**) will be installed by construction of a tunnel beneath Burnhamthorpe Road, between Grand Park Drive and Cawthra Road, in three tunnel sections ('drives') using traditional rock tunnel boring machines (TBMs), microtunnelling, or a combination of the two. The tunnel will be located in the slightly weathered to fresh Georgian Bay shale bedrock.

In addition to constructing the new 1500 mm diameter watermain, the Region of Peel is planning on undertaking a number of complementary water infrastructure improvements at the same time. The improvements include six interconnections between the existing 600/750 mm diameter and 1050 mm diameter watermains and the new 1500 mm diameter watermain to maintain pressure in the water system within acceptable limits. In addition, three local connections are required to improve the pressure in the local distribution system and ensure adequate service in the MCC area.

In conjunction with the new 1500 mm diameter watermain, construction of the following local distribution watermains is proposed in order to bolster water supply to the MCC area:

- A new 600 mm diameter local distribution watermain along Duke of York Boulevard from Webb Drive to City Centre Drive
- A new 400 mm diameter local distribution watermain from Kariya Drive, running west along Webb Drive and north up Grand Park Drive to Burnhamthorpe Road West

² *Municipal Engineers Association, October 2000 (as amended in 2007 and 2011)*

The new Burnhamthorpe Road watermain will be a 1500 mm diameter concrete pressure pipe with varying sizes of interconnections and local connections. The local distribution watermains will be either concrete pressure pipes and/or polyvinyl chloride (PVC) pipes.

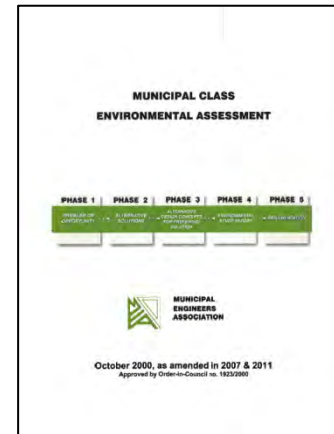
The Region of Peel is proposing to have the new water infrastructure in service by 2019 subject to *EA Act* approval and obtaining all post-EA permits and approvals.

2. The Municipal Class EA Process

2.1 Overview

The Burnhamthorpe Road Watermain project was carried out in accordance with the Municipal Class EA.³ In Ontario, municipalities like the Region of Peel are subject to the *Environmental Assessment Act*, which identifies two types of environmental assessment and approval processes for projects to follow prior to being implemented:

- Individual Environmental Assessments (Part II of the EA Act) – those projects for which a Terms of Reference and an individual environmental assessment are carried out and submitted to the Minister of the Environment and Climate Change (Minister) for review and approval
- Class Environmental Assessments (Part II.1 of the EA Act) - those projects which are approved subject to compliance with an approved class environmental assessment process with respect to a class of undertakings. Providing the approved process is followed, a proponent has complied with Section 13 (3)(a) of the *EA Act*.



Thus, the Municipal Class EA provides an approved process whereby specified municipal infrastructure projects can be planned, designed, constructed, operated, maintained, rehabilitated and retired without having to obtain project-specific approval under the *EA Act*.

Five Phase Municipal Class EA Process

The approved Municipal Class EA process consists of five planning and design phases. The five phases are briefly summarized as follows:

- **Phase 1** – Identify the problem or opportunity
- **Phase 2** – Identify alternative solutions to address the problem or opportunity and establish the preferred alternative taking into account the existing environment and review agency and public input
- **Phase 3** – examine alternative methods for implementing the preferred alternative and determine the preferred method, taking into account the existing environment and additional review agency and public input
- **Phase 4** – document the preceding phases in an Environmental Study Report or Project File Report and make it available for scrutiny by review agencies and the public
- **Phase 5** – complete contract drawings and documents and proceed to construct the preferred method for implementing the preferred alternative

³ Municipal Engineers Association (MEA), October 2000, as amended in 2007 and 2011

Four Project Classifications

Since projects undertaken by municipalities vary in their adverse environmental effects, the Municipal Class EA classifies them in terms of four schedules. The four schedules are briefly summarized as follows:

Table 1: Municipal Class EA Schedules

Municipal Class EA Schedule	Project Description	Municipal Class EA Requirements
Schedule A projects	Limited in scale Minimal adverse environmental effects Primarily municipal maintenance and operational activities	None, pre-approved Can be implemented without following the Municipal Class EA process
Schedule A+ projects	Similar to Schedule A projects	Same as Schedule A projects, but the public must be notified prior to construction
Schedule B projects	Potential for some adverse environmental effects Primarily improvements and minor expansions to existing facilities	Phases 1 and 2 Consult with review agencies and the public Project File Report
Schedule C projects	Potential for significant adverse environmental effects Construction of new facilities and major expansions to existing facilities	Phases 1 to 4 Consult with review agencies and the public Environmental Study Report

Figure 2 illustrates the five phases of the Municipal Class EA planning and design process within the context of the preceding four project classifications or schedules.

Project Implementation

A proponent is able to implement both Schedule A and A+ projects immediately upon completion of the Municipal Class EA process requirements. However, unlike Schedule A and A+ classified projects, a review agency or public member involved in either a Schedule B and C project can make a request to the Minister that it be elevated to an Individual EA (referred to as 'Part II Order' request) if they feel that their raised concerns remain unresolved by the proponent at the end of the Municipal Class EA process. Therefore, Schedule B and C projects can only be implemented by a proponent if there are no outstanding 'Part II Order' requests.

2.2 Burnhamthorpe Road Watermain Class EA Project Classifications

The Project fulfilled the Municipal Class EA Schedule B process requirements. The Municipal Class EA process is a self-assessment process. It is the proponent's responsibility to identify the appropriate project schedule and meet the associated Class EA process requirements. Failure to do so, places the proponent in contravention of the *EA Act*, which is an offence subject to penalties.

The preferred alternative is composed of a number of components that were dealt together as a single project in accordance with the Municipal Class EA process. The project components and associated Municipal Class EA schedules are summarized in **Table 2**.

Table 2: Project Components and Municipal Class EA Schedules Classification

Project Component	Municipal Class EA Schedule
1500 mm diameter watermain along Burnhamthorpe Road in a tunnel between Grand Park Drive and Cawthra Road	Schedule B (ID #1, Page 1-17 of Appendix 1 – Project Schedules of the Municipal Class EA (MEA, October 2000, as amended in 2007 and 2011).
600 mm diameter local distribution watermain within the existing Duke of York Boulevard road allowance from City Centre Drive to Webb Drive	Schedule A+ (ID #1, Page 1-14 of Appendix 1 – Project Schedules of the Municipal Class EA (MEA, October 2000, as amended in 2007 and 2011).
400 mm diameter local distribution watermain within the existing Webb Drive/Grand Park Drive road allowance from Burnhamthorpe Road to Kariya Drive	Schedule A+ (ID #1, Page 1-14 of Appendix 1 – Project Schedules of the Municipal Class EA (MEA, October 2000, as amended in 2007 and 2011).
Installing interconnections between the new 1500 mm diameter watermain and the existing Burnhamthorpe Road watermain and local distribution watermains	Schedule A+ (ID #1, Page 1-14 of Appendix 1 – Project Schedules of the Municipal Class EA (MEA, October 2000, as amended in 2007 and 2011).

The various components making up the preferred alternative are classified as Schedules A+ or B activities. In accordance with the Municipal Class EA, all of the project components were carried out via the more rigorous Schedule B process.

2.3 Burnhamthorpe Road Watermain Class EA Process Followed

The following summarizes the specific steps identified in the Municipal Class EA carried out for the Project and where they are documented in this Project File:

- Phase 1: Problem/Opportunity (**Section 3**)
 - Step 1: Identify and describe the problem or opportunity leading to a clear problem/opportunity statement
 - Step 2: Carry out discretionary consultation to aid in formulating the problem/opportunity statement
- Phase 2: Alternative Solutions (**Section 4**)
 - Step 1: Identify and describe reasonable/feasible alternatives to address the problem/opportunity statement
 - Step 2: Prepare a general inventory of the environment
 - Step 3: Identify the net positive and negative effects of each alternative
 - Step 4: Evaluate the alternatives based on their net effects to identify a recommended alternative
 - Step 5: Carry out mandatory consultation to solicit comments
 - Step 6: Establish a preferred alternative taking into account comments received
- Once Phase 2 is completed, a proponent is required to prepare a Project File documenting the preceding steps and make it available for a mandatory 30 calendar day review period. In order to initiate the review period, a proponent needs to issue a Notice of Completion to those consulted as part of the Project.

3. Phase 1 – Problem / Opportunity

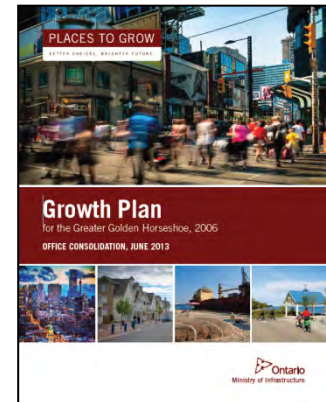
The Burnhamthorpe Road Watermain Class EA involved undertaking the following steps identified in the Municipal Class EA for Phase 1:

- Step 1: Identification and description of the problem or opportunity (**Section 3.1**)
- Step 2: Discretionary public consultation (**Section 3.2**)

3.1 Identification and Description of the Problem / Opportunity

3.1.1 Approved Growth for Mississauga City Centre

In response to municipal and stakeholder interest for provincial leadership to encourage managed population growth, the Government of Ontario enacted the *Places To Grow Act*, 2005 and released the 'Final Growth Plan for the Greater Golden Horseshoe' in 2006 (the Growth Plan). The Growth Plan established a 2031 population forecast of 11.5 million for the municipalities making up the Greater Golden Horseshoe, including the Region of Peel. As of 2001, the existing population within the Greater Golden Horseshoe was 7.79 million. The Growth Plan requires that a minimum 40 percent of this growth be accommodated through intensification in existing built up areas.



For the Region of Peel, the Growth Plan established a 2031 population forecast of 1.64 million and an employment forecast of 870,000. As of the 2011 census, the Region of Peel had a population of 1.29 million which makes it the second-largest municipality in Ontario after the City of Toronto.

Region of Peel's Official Plan

In light of this anticipated high level of population and employment growth, the Region of Peel has prepared a long-term plan to assist it in managing growth and development to 2031. The long-term Region Official Plan (ROP)⁴, required by the provincial *Planning Act*, provides Regional Council with a long-term regional strategic policy framework for guiding growth and development in Peel while:

- Having regard for protecting the environment
- Managing renewable and non-renewable resources
- Outlining a regional structure that manages this growth within Peel in the most efficient manner.



As part of the long-term plan, ROP provides forecasts based on the Growth Plan as an indication of how population, household and employment growth are expected to proceed for each of its three area municipalities of Mississauga, Brampton and Caledon. As of the 2011 census, the City of Mississauga had a population of 713,443 and was Canada's sixth-most populous municipality. The City is expected to have a population of 805,000 and employment of 510,000 by 2031.

⁴ Region Official Plan (office consolidation, October 2014) (www.peelregion.ca/planning/officialplan)

Consequently, one out of every two persons living in the Region of Peel by 2031 is anticipated to be residing in the City of Mississauga. In terms of employment, the City is expected to have nearly 60% of all jobs in the Region of Peel by 2031.

The ROP also provides a Regional Structure describing the Region of Peel's role within the Greater Toronto Area and Hamilton (GTHA) and its relationship to the surrounding municipalities. Specifically, the Regional Structure designates all of the City of Mississauga as part of its urban system with a Conceptual Urban Growth Centre in the vicinity of the Burnhamthorpe Road and Hurontario Street intersection. The Urban Growth Centre extends from this intersection westward along Burnhamthorpe Road towards Mavis Road and northward and southward along Hurontario Road to Highway 403 and the Queen Elizabeth Way respectively. This Urban Growth Centre is connected via a Regional Intensification Corridor to one situated in the City of Brampton.

The Urban Growth Centres and the Regional Intensification Corridor are major locations of intensification that include compact forms of urban development and redevelopment providing a range and mix of housing, employment, recreation, entertainment, civic, cultural and other activities for Region of Peel residents and workers. The Urban Growth Centres and the Regional Intensification Corridor are also focal areas for investment in region-wide public services and infrastructure, including major transit infrastructure.

City of Mississauga's Official Plan

In concert with the Region of Peel, the City of Mississauga has established their own Official Plan required by the provincial Planning Act to guide its growth and development to the year 2031.⁵ The Urban Growth Centre designated by ROP forms the City's Downtown. The Downtown will be the focus for the City as a whole with the highest density, tallest buildings and greatest mix of uses representing the centre of civic, cultural, commercial and recreational facilities.

With this in mind, it is anticipated that much of the City's new population and employment growth will be located in the Downtown. As such, major infrastructure investments including higher order transit and community and cultural facilities will be encouraged in the Downtown in order to support this planned growth. To facilitate this, the City's Official Plan sub-divides the Downtown into four Character Areas with each having their own specific policies. The area around and to the west of the Burnhamthorpe Road and Hurontario Street intersection is designated as the 'Downtown Core' Character Area.

Specific to the 'Downtown Core' Character Area, the City developed the Downtown21 Master Plan (April 2010).⁶ With over 30,000 residents and 20,000 jobs within walking distance of the major centre of civic government, cultural amenities and an established regional retail facility, Downtown21 is designed to promote the continued evolution of a liveable,



⁵ Mississauga Official Plan, office consolidation to July 30, 2014. (www.mississauga.ca/portal/residents/mississaugaofficialplan)

⁶ Mississauga, Downtown21 Master Plan (www.mississauga.ca/portal/residents/downtown-21-masterplan)

compact, accessible, sustainable downtown centre for the entire city which will enhance Mississauga’s competitive advantage and reputation as a forward looking community.

Mississauga City Centre

Forming part of the City’s ‘Downtown Core’ Character Area is the Mississauga City Centre (MCC). The MCC is generally bounded by Confederation Parkway to the west, Highway 403 to the north, Cawthra Road to the east and Burnhamthorpe Road to the south (**Figure 3**). It includes the Square One Shopping Centre, which is Canada’s second largest mall. In addition, it includes a number of public attractions like the Art Gallery, Square One Living Arts Centre, Sheridan College, the Central Library and Mississauga Civic Centre. There a number of existing condominium developments situated in and around the Mall and public buildings/spaces associated with the MCC.

In keeping with the City’s intensification plans for its Downtown, there are a significant number of residential, retail and office developments anticipated to be built within the MCC. **Table 3** lists each of the developments illustrated in **Figure 3**, indicating their type and related details (residential population, square metres of retail space, square metres of office space and employees). Prior to 2031, an additional population of nearly 25,000 residents along with over 20,000 new employees are expected to be residing and working within the MCC respectively.

Table 3: Anticipated Development in the Mississauga City Centre Area

Block Identification	# of residential units	Population	Retail (Square metres)	Office (Square metres)	Employees
1	726	1,594	0	0	0
3	4,348	9,545	8,226	10,183	666
5	259	568	800	0	22
7	405	889	800	0	22
14	0	0	0	38,000	400
20,21	1,900	4,171	4,000	0	108
29	329	722	0	0	0
32	2,085	4,577	10,613	0	286
33	621	1,363	1,700	0	46
36	52	114	1,100	1,200	52
42	263	577	2,230	0	60
43	224	492	2,880	0	78
46	0	0	4,552	26,013	1,259
48	93	204	6,466	5,523	281
56	0	0	560	96,634	4,240
57/86	0	0	5,860	22,575	1,144
61	0	0	2,380	85,656	3,809
62	0	0	0	49,215	2,152
64,67	0	0	11,480	60,996	2,976
69	0	0	10,289	0	277
73	0	0	0	53,053	2,320
90	0	0	6,680	0	180
Total	11,305	24,816	80,616	449,048	20,378

Source: City of Mississauga, Estimates made by Planning and Building Department based upon approvals issued, discussions with developers and estimates from the Downtown21 Master Plan.

3.1.2 Existing and Planned Water Supply for the Mississauga City Centre

The existing water supply for the MCC is currently incapable of meeting the additional residential and employment growth forecasted to 2031 for the area. At present, the water supply for the MCC is based primarily on flow from the Hanlan Reservoir and Pumping Station to the north and the Silverthorne Pumping Station to the south, via major sub-transmission mains; the 1050 mm diameter Silverthorne Watermain, the 750 mm/600 mm watermains on Burnhamthorpe Road and the 600mm watermain on Rathburn Road (**Figure 3** and **Figure 4**). Water supply from the Zone 3 Streetsville Reservoir and Pumping Station via the 750 mm diameter Eglinton Avenue watermain east of Erin Mills Parkway provides limited supply to MCC because the system valve closures are designed to maintain adequate service pressure to Zone 3 west customers.

The Region of Peel is currently upgrading the local water infrastructure to bolster supply to the MCC. This includes a realignment strategy in Zone 3 west areas designed to maximize the east-west transfer capability through the re-alignment of pressure boundaries. A new 1500 mm diameter watermain from the Hanlan Reservoir and Pump Station facility, south to the Cawthra Road and Burnhamthorpe Road intersection is also under construction.

The Region of Peel is also planning to carry out complementary water infrastructure upgrades to further bolster water supply to the MCC. The following watermains are proposed within the MCC area for localized water improvements:

- A new 600 mm local distribution watermain along Duke of York Boulevard from Webb Drive to City Centre Drive
- A new 400 mm local distribution watermain from Kariya Drive, running west along Webb Drive and north up Grand Park Drive to Burnhamthorpe Road West.

3.1.3 Region of Peel's Preferred Water Servicing Strategy

The Region of Peel has identified a preferred Water Servicing Strategy to satisfy approved growth to 2031 as established by the Growth Plan and encapsulated within ROP and the City of Mississauga's Official Plan and Downtown21 Master Plan. The Region of Peel has been evaluating the ability of its existing and planned water and wastewater infrastructure to efficiently and effectively service anticipated growth since 1999 with the first water and wastewater master plan.

The Region of Peel has continued to build on that initial planning through the 2002 Master Plan Addendum, 2007 Master Plan Update and the current 2013 Water and Wastewater Master Plan for Lake-based Systems ('2013 Master Plan').⁷ Through this process (**Figure 5**), the Region of Peel has proactively planned for approved growth; establishing a visionary framework for the water and wastewater servicing needs of the Region to 2031 and beyond.

Municipal Class EA Master Planning Process Followed

The Region of Peel followed Approach 2 of the Municipal Class EA master planning process for developing its 2013 Master Plan. Approach 2 involves preparing a master plan document at the conclusion of Phases 1 and 2 the Municipal Class EA process. This approach allowed for all Schedule A, Schedule A+ and specific Schedule B projects identified in the 2013 Master Plan to move directly forward to implementation with *EA Act* approval. As part of moving forward, a systematic evaluation of alternatives and documentation (i.e. Project File) to support the identified

⁷ *Region of Peel, 2013 Water and Wastewater Master Plan for the Lake-Based Systems, Final Report, March 31, 2014*

Schedule B Class EA requirements along with any applicable review agency commitments are needed prior to implementation.

Steps Leading to a Preferred Water Servicing Strategy

In terms of satisfying Phases 1 and 2 of the Municipal Class EA process, the 2013 Master Plan first defined a problem/opportunity statement acting as the principal starting point for carrying out the master planning process. Next, the 2013 Master Plan assessed existing and future water infrastructure (e.g. water treatment plants, transmission mains, pumping stations and storage facilities) to determine opportunities for developing and expanding the water system to meet growing demands as well as identifying existing constraints.

Six high level servicing concepts to address existing and future servicing issues were first developed and evaluated leading to a combination of the concepts being carried forward, which formed more detailed servicing strategies (**Figure 5**). In total, seven strategies were developed and evaluated leading to a preferred Water Servicing Strategy. The preferred Water Servicing Strategy was Alternative 2, which

- Builds on the previous water servicing strategy
- Is based on existing water transmission and treatment infrastructure
- Minimizes environmental disruption
- Ensures no construction of expensive new water treatment plants is necessary until at least 2031

Capital Program for the Preferred Water Servicing Strategy

Following the selection of the preferred Water Servicing Strategy, a detailed capital program of associated water infrastructure upgrade and/or installation projects required to deliver the Strategy was established as part of the 2013 Master Plan. With regards to improving water supply to support approved growth in the MCC, the capital program included provisions for a new 1500 mm watermain along Burnhamthorpe Road from Cawthra Road to Confederation Parkway (Master Plan ID: W-T-128)

Further, the 2013 Master Plan recommended that the new 1500 mm watermain move forward to implementation as either a Schedule A+ or Schedule B Municipal Class EA with in service anticipated for 2016. To achieve this objective, the 2013 Master Plan stated that a systematic evaluation of alternatives and documentation of such would be needed to support the Schedule B Municipal Class EA requirements along with any applicable review agency commitments prior to implementation.

3.1.4 Confirmation of the New Watermain's Feasibility

The requirement for the new 1500 mm Burnhamthorpe Road watermain was further confirmed through a feasibility study completed in 2013 by the Region of Peel.⁸ The purpose of the study was to obtain updated population projections and review Zone 3 system-wide hydraulics to confirm the watermain diameter and interconnection requirements to properly service the MCC area. The study provided a number of conclusions:

- The MCC area requires additional water supply to accommodate identified growth and development. Modelling the likely additional water demands resulting from the forecasted

⁸ Region of Peel, Feasibility Study for Burnhamthorpe Road Watermain Twinning, July 29, 2013.

growth indicates maximum day demands for the MCC in 2031 of 106 MLD from residents and 55.3 MLD from employment.

- The additional water supply should be delivered through a new 1500 mm watermain.
- The watermain should be installed in a tunnel to reduce disruption to surface users along Burnhamthorpe Road.
- Interconnections of the new 1500 mm watermain within the Zone 3 distribution network are required at six locations, including to the existing 750 mm MCC watermain, the new 900 mm watermain along Cawthra Road and the existing Silverthorne watermain (1050 mm).
- The direct service connections to the new watermain should match those presently connected to the existing MCC watermain.

3.1.5 Interconnections to Secure Adequate Water Supply Service

A total of six interconnections between the existing 600/750 mm diameter watermain, the existing Silverthorne watermain (1050 mm) and the proposed 1500 mm diameter watermain are required to maintain hydraulic conditions and ensure service requirements to the MCC are achieved. A summary of the interconnections is presented in **Table 4**.

Table 4: Description of the Required Interconnections

Location	Connection / mm		
	From	To	Size
Confederation Parkway	1500	600	600
Duke of York Boulevard	1500	600	900
Hurontario Street	1500	750	750
Cawthra Road	1500	1050	400
Cawthra Road	1500	1500	1500
Cawthra Road	1500	900	900

3.1.6 Local Connections to Improve Water System Pressure

Additional connections to the local distribution system are required at Hurontario Street, Duke of York Boulevard and Central Parkway East to maintain pressure in the water system within acceptable limits. **Table 5** presents the local connections.

Table 5: Description of the Required Local Connections

Location	Connection / mm		
	From	To	Size
Duke of York Boulevard	1500	600	600
Hurontario Street	1500	750	750
Central Parkway East	1500	300	300

3.1.7 Problem / Opportunity Statement

The purpose of the Project is to provide the additional water supply required in the MCC area to accommodate future growth and development in an environmentally-sensitive and community-responsive manner.

3.2 Consultation with Agencies, First Nations, Métis Organizations and Public

Although consultation is discretionary during Phase 1 of the Municipal Class EA process, the Region of Peel voluntarily elected to carry it out as part of the Project. Consultation with review agencies, First Nations, Métis organizations and the public was carried out to proactively involve them in defining and formulating the problem / opportunity statement. With this in mind, a comprehensive stakeholder list was developed prior to carrying out various consultation activities to obtain comments.

3.2.1 Establishment of the Stakeholder List

The comprehensive stakeholder contact list was established based on the Municipal Class EA, other EAs and the Region of Peel's consultation experience. First, Schedule 3 – Screening Criteria of the Municipal Class EA was reviewed as a guideline to identify those stakeholders who would most likely be interested in the Burnhamthorpe Road Watermain Class EA based on the following:

- The type of project being proposed (e.g. tunnelled watermain with surface work sites)
- The project's area environment (e.g. existing urban built up area, two creek crossings, etc.)
- The type and likelihood of anticipated adverse environmental effects (e.g. traffic disruption, utility conflicts, etc.)

Next, this preliminary list was augmented with additional stakeholders relevant to the project based on other recent and on-going Municipal Class EAs in the area (e.g. Downtown Mississauga Road Improvements Class EA Study). Following this, the stakeholder list was updated to reflect the Region of Peel's consultation experience.

Appendix 1A presents the stakeholder list utilized for the Project, including the following:

- 20 review agencies (e.g. Ministry of Environment and Climate Change; Ministry of Tourism, Culture and Sport; Credit Valley Conservation; Peel District School Board; Dufferin-Peel Catholic School Board; City of Mississauga, etc.)
- 6 utilities (i.e. Bell Canada, Enbridge, Rogers, etc.)
- 8 First Nations (e.g. Mississaugas of the New Credit; Curve Lake First Nation; etc.)
- 2 Métis organizations (e.g. Métis Nation of Ontario)
- 3 City of Mississauga Councillors (representing Wards 3, 4 and 7)
- 27 miscellaneous interested parties (e.g. Suncor, Mississauga Board of Trade, etc.)
- Residents and property/business owners in the general vicinity of the proposed project (**Appendix 1B**)

3.2.2 Description of Consultation Activities Carried Out

A range of consultation activities were carried out with the objective of identifying issues and opportunities, enhancing public access to project information, building community awareness and providing multiple avenues of engagement.

Specifically, the following activities were undertaken during Phase 1 of the Project:

- Establishing a Project-specific website⁹
- Publishing the 'Notice of Commencement' (**Appendix 1C**) in two editions of 'Mississauga this Week' (November 20 and December 4, 2014) and 'The Mississauga News' (November 27 and December 4, 2014)
- Issuing the 'Notice of Commencement' through direct mailing to residents and property/business owners in the general vicinity of the proposed water supply upgrades (**Appendix 1B**).
- Issuing a letter with the formal 'Notice of Commencement' included via email and/or direct mailing to review agencies, utilities, Councillors, interested parties, First Nations and Métis organizations on November 20, 2014.
- Undertaking follow-up telephone calls to unresponsive review agencies and First Nations following the issuance of the 'Notice of Study Commencement' to ensure it was correctly received and allow for immediate questions and clarifications.
- Holding individual stakeholder meetings (e.g. City of Mississauga).

3.2.3 Consideration of Comments Received

Through the preceding consultation activities, approximately 15 comments/requests for more information were received by the Region of Peel and recorded in the Project's communications record database. Most of the comments/information requests were received via email. An overview is provided by stakeholder group as follows with **Table 6** summarizing the specific comments received and how they were considered as part of Phase 1 of the Project. **Appendix 1D** provides the full record of stakeholder correspondence received and the Region of Peel's responses.

Review Agencies

Five of the seven notified review agencies responded to the Notice. The review agencies who responded included the Ministry of the Environment and Climate Change's (MOECC's) Halton-Peel District Office, Ministry of Natural Resources and Forestry (MNRF), Ministry of Tourism, Culture and Sport (MTCS), Credit Valley Conservation (CVC) and the Peel District School Board.

Utilities

Only one (Hydro One Networks Inc.) of the six notified utilities responded to the Notice.

First Nations and Métis Organizations

Only two of the eight notified First Nations responded to the Notice of Study Commencement; Alderville First Nation and Curve Lake First Nation. No Métis organizations responded.

Interested Parties, Residents and Property/Business Owners

Five individuals responded to the Notice, including three local residents, two consultant representatives and the project coordinator for a local non-profit organization.

⁹ www.peelregion.ca/pw/water/enviro-assess/burnhamthorpe-rd-watermain.htm

Table 6: Summary of comments from Phase 1 of the Class EA

COMMENTS RECEIVED	CONSIDERATION OF COMMENTS
REVIEW AGENCIES	
<p>Ministry of Environment & Climate Change - Halton-Peel District Office December 2, 2014: Identified 8 areas of interest (ecosystem protection and restoration, surface water, groundwater, air quality, dust and noise, servicing and facilities, contaminated soils, mitigation and monitoring, planning and policy, Class EA process and aboriginal consultation), along with general comments on how each of them could be effectively addressed as part of the Burnhamthorpe Road Watermain Class EA. The MOECC also requested that they be provided with the draft Project File for their review prior to finalizing it for the public review.</p>	<p>The comments associated with the 8 areas of interest will be addressed as part of the Burnhamthorpe Road Watermain Class EA (Project) (e.g. included as part of the planned environmental investigations, considered as part of alternative generation, evaluation and selection process, reflected in the Project File, etc.). The draft Project File will be provided to MOECC for their review prior to finalizing it for the mandatory public review period.</p>
<p>Credit Valley Conservation Authority November 27, 2014: Provided preliminary comments on the study area including its site characteristics, areas of potential concern, anticipated permit approval requirements and investigation / documentation expectations. The CVC also requested that they be kept informed of the Class EA study and be provided with documentation for their review.</p>	<p>The preliminary comments on the study area will be reflected in the Project (e.g. included as part of the planned environmental investigations, considered as part of alternative generation, evaluation and selection process, reflected in the Project File, etc.). The draft Project File will be provided to CVC for their review prior to finalizing it for the mandatory public review period.</p>
<p>Ministry of Natural Resources & Forestry - Aurora (Southern Region) December 5, 2014: No concerns with the project at this time, but contact us if any species at risk are uncovered and send all future notifications electronically.</p>	<p>No species at risk were identified in the vicinity of the project area based on natural environmental investigations. Future notifications of the Project were sent electronically.</p>
<p>Ministry of Tourism, Culture and Sport (MTCS) December 29, 2014: Suggest engaging Aboriginal communities to discuss known or potential cultural heritage resources of value to them. An archaeological assessment and Heritage Impact Assessment should be undertaken and submitted to MTCS for review. Continue to contact MTCS as part of the Burnhamthorpe Road Watermain Class EA.</p>	<p>Aboriginal communities were notified throughout the Project. Both a Stage One Archaeological Assessment and a Cultural Heritage Study were carried as part of the Project and submitted to MTCS for their review.</p>
MUNICIPAL	
<p>Peel District School Board December 9, 2014: Interested in knowing if there are any potential adverse effects to</p>	<p>No potential adverse effects to area schools are anticipated from the watermain project; however, there could be short-term disruption effects on student bussing</p>

area schools.	during watermain construction depending upon bus routes. Those potential effects would be minimized through the method of construction (e.g. tunnelling) and the location of construction work sites (e.g. shaft siting).
UTILITIES	
<p>Hydro One Networks Inc. December 2, 2014: No Hydro One Transmission (above 115 kV) Facilities in the area associated with the Burnhamthorpe Road Watermain Class EA; however, there may be Hydro One Distribution Facilities (below 115 kV) potentially affected. Therefore, send notifications of the Burnhamthorpe Road Watermain Class EA to Zone2Scheduling@HydroOne.com for their comments. However, if no changes are made to the current information, then no further consultation is required.</p>	Notice of Study Commencement was forwarded onto Zone2Scheduling@HydroOne.com.
FIRST NATIONS	
<p>Alderville First Nation December 1, 2014: Continue to keep us apprised of any further project related activities.</p>	The Alderville First Nation continued to receive future notifications of the Project.
<p>Curve Lake First Nation December 11, 2014: We strongly suggest that the Williams Treaty First Nations Claims Coordinator be notified of the Burnhamthorpe Road Watermain Class EA. We are not currently aware of any issues that would cause concern with respect to our Traditional, Aboriginal and Treaty rights. However, contact us immediately should excavation unearth bones, remains, or other such evidence of a native burial site or any Archaeological findings. In addition, notify us if there is any potential for anticipated negative impacts on our Treaty and Aboriginal rights because of any new or unforeseen issues.</p>	The Notice of Study Commencement was provided to Karry Sandy-Mackenzie and the Williams Treaty First Nation was notified throughout the Project. A commitment to notify the Curve Lake First Nation as well as all other involved First Nations without delay should excavation unearth any evidence of a native burial site or archaeological findings was included in the Project File for future reference when construction actually proceeds.
PUBLIC	
<p>Completing the Circle - The Career Foundation December 10, 2014: Are there any adverse environmental effects anticipated to transit/traffic in the area both during the Burnhamthorpe Road Watermain Class EA as well as when construction commences?</p>	No potential adverse effects to transit/traffic are anticipated during the Project; however, there could be short-term disruption of transit/traffic in the area during watermain construction, but those potential effects would be minimized through the method of construction (e.g. tunnelling) and the location of construction work sites (e.g. shaft siting).
<p>Resident December 10, 2014: There has been inadequate infrastructure planning given</p>	As part of the Region of Peel's 2013 water and wastewater master planning process, extensive inter-

<p>that the road was recently improved in the vicinity of the project.</p>	<p>departmental and inter-agency consultation took place to identify relevant ongoing and planned infrastructure works in the project area. As an outcome of this process, the required water infrastructure upgrades along Burnhamthorpe Road will be implemented using tunnelling technology in order to minimize surface disruption to roads, transit/traffic, residents and businesses in the study area.</p>
<p>Resident December 12, 2014: Interested in attending the proposed Public Information Centre. January 19, 2015: Keep me informed of the Burnhamthorpe Road Watermain Class EA.</p>	<p>Was added to the distribution list and received future notifications of the Project.</p>
<p>Consultant November 27, 2014: Add my email / mailing address to the distribution list for the Burnhamthorpe Road Watermain Class EA.</p>	<p>Consultant was added to the distribution list and received future notifications of the Project.</p>
<p>Consultant November 27, 2014: Add my email / mailing address to the distribution list for the Burnhamthorpe Road Watermain Class EA.</p>	<p>Consultant was added to the distribution list and received future notifications of the Project.</p>

4. Phase 2 – Alternative Solutions

The six steps specified in the Municipal Class EA for Phase 2 were carried out (**Figure 6**).

- Step 1: Identify and describe reasonable/feasible alternative solutions to address the problem/opportunity statement (*Section 4.1*)
- Step 2: Prepare a general inventory of the environment (*Section 4.2*)
- Step 3: Identify net positive and negative effects of each alternative solution (*Section 4.3*)
- Step 4: Evaluate the alternative solutions based on their net effects to identify a recommended solution (*Section 4.4*)
- Step 5: Carry out mandatory consultation to solicit comments (*Section 4.5*)
- Step 6: Establish a preferred solution taking into account comments received (*Section 4.6*)

4.1 Identification and Description of the Alternatives

In accordance with the Municipal Class EA, a reasonable range of feasible alternatives were considered as part of the Project in response to the defined problem/opportunity statement. As previously mentioned, the Region of Peel’s 2013 Water and Wastewater Master Plan followed the planning process detailed in the Municipal Class EA to arrive at a preferred water servicing strategy and capital plan including the proposed new 1500mm diameter Burnhamthorpe Road watermain.

Further, the Region of Peel decided to install the new watermain via a tunnel underneath Burnhamthorpe Road versus open cutting Burnhamthorpe Road to reduce surface disruption to users during construction based on the recommendation in the Feasibility Study.

Following the Municipal Class EA process and based on a set of principles (**Table 7**), five alternative alignments were generated for the new watermain, plus the ‘Do Nothing’ alternative.

Table 7: Principles for Generating Alternative Watermain Alignments

Consideration	Generation Principles for Alternative Alignments
Horizontal Alignment	<p><i>To the extent possible, the alignment should</i></p> <ul style="list-style-type: none"> • Avoid obstructions (e.g. contaminated land, existing utilities, etc.) • Minimize adverse environmental effects (e.g. natural features, traffic disruption, land acquisition, etc.) • Maximize water servicing area and integration with existing infrastructure • Minimize the number of shaft sites • Maximize the suitability of shaft sites
Synergy	<p><i>To the extent possible, the alignment should</i></p> <ul style="list-style-type: none"> • Maximize the degree of synergy with existing and planned transportation and infrastructure improvements (Region of Peel, City of Mississauga, private sector, etc.) • Maximize opportunities for co-location of tunnel shafts with interconnection shafts at key sites: Confederation Parkway, Duke of York Boulevard, Hurontario Street and Cawthra Road

4.1.1 Potential Shaft Sites for the New Watermain

Since the Region of Peel decided to install the new watermain via a tunnel, shafts are required for launching/retrieving the tunneling machines. As a result, five potential shaft sites were identified, as summarized in **Table 8**.

Table 8: Description of the Potential Tunnel Shaft Sites

Shaft Number	Location on Burnhamthorpe Road	Shaft Description
S1b	South side, east of Grand Park Drive	Launch/retrieval shaft site in the boulevard and extending into the Rogers Telecommunication property (currently undeveloped). A temporary and permanent easement would be required.
S3	Southeast corner of intersection with Hurontario Street	Launch/retrieval shaft site in a large open boulevard on City of Mississauga property near residential high rise. An easement would be required.
S4	South side, west of Central Parkway East	Launch/retrieval shaft site in the boulevard extending into private playground. An easement would be required.
S4b	North side, west of Central Parkway East	Launch/retrieval shaft in in the boulevard.
S5	Northeast corner of intersection with Cawthra Road	Retrieval shaft site in the boulevard on City of Mississauga property. An easement would be required.

4.1.2 Required Interconnections and Local Connections

As mentioned, six interconnections between the existing 600/750 mm diameter watermain, the 1050 mm diameter watermain and the new 1500 mm diameter watermain are required to maintain pressure in the water system within acceptable limits. In addition, three local connections are required to improve the pressure in the local distribution system and ensure service requirements to the MCC area are achieved. As well, valve chambers are required to complete these interconnections and local connections.

Table 9 describes the required interconnections and local connections. All of these required interconnections and connections are accounted for in each of the five alternative alignments so that they are all provided for with each alternative.

Figure 7 provides an overview of all connection locations and potential tunnel shaft sites, including the proposed construction compounds associated with each.

Table 9: Descriptions of the Required Interconnections and Local Connections

Connection Site	Location on Burnhamthorpe Road	Connection Type (diameter watermain)
C1A	Southeast corner of intersection with Grand Park Drive	Local connection 400 mm
C1	North side, bet. Confederation Pkwy and Living Arts Drive	Interconnection to 600 mm
C2	North side, intersection of Duke of York Boulevard	Local connection to 600 mm
C3	North side, east of Duke of York Boulevard	Interconnection to 600 mm
C4	Northwest corner of intersection with Hurontario Street	Local connection to 750 mm
C5	North side, between Hurontario Street and Absolute Ave.	Interconnection to 750 mm
C6	Northwest corner of intersection with Central Parkway East	Local connection to 400 mm
C7	Northwest corner of intersection with Cawthra Road	Interconnection to 900 mm
C8	Northeast corner of intersection with Cawthra Road	Interconnection to 1050 mm
C9	Northeast corner of intersection with Cawthra Road	Interconnection to 1500 mm

4.1.3 Description of the Identified Alternatives

4.1.3.1 Do Nothing Alternative

In accordance with the Municipal Class EA (MEA, 2011) and the Code of Practice for Preparing and Reviewing EAs in Ontario (MOECC, 2014), the ‘Do Nothing’ alternative should be considered by a proponent, like the Region of Peel, in all projects because it provides a benchmark against which the benefits/consequences of the other alternatives can be measured.

In the case of this Project, the Region of Peel would not undertake any improvements or changes to its existing water servicing system to support the approved growth in the MCC including the construction of the new 1500mm diameter watermain.

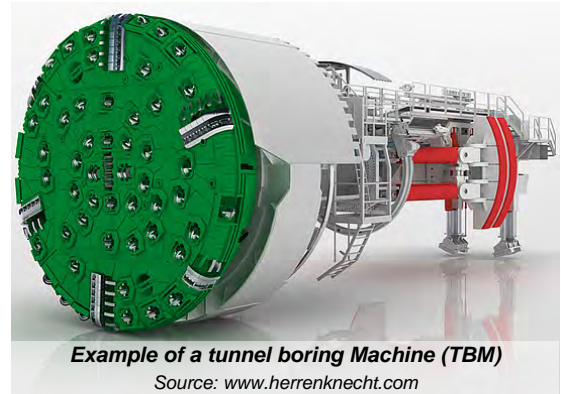
4.1.3.2 Alternative 1: Two-Drive South

In Alternative 1, the horizontal alignment for the new watermain would be constructed entirely on the south side of Burnhamthorpe Road (**Figure 8**), in two drives via traditional tunnelling using a tunnel boring machine (TBM). The first drive would either begin at Hurontario Street (southeast corner, S3) and go west towards the Grand Park Drive retrieval shaft (southeast corner, S1b) or would begin at the Grand Park Drive retrieval shaft (southeast corner, S1b) and go east towards the Hurontario Street (southeast corner, S3) shaft.

The other drive would go east along the south side of Burnhamthorpe Road, curving north to the shaft site at Cawthra Road (northeast corner, S5) where the TBM would be retrieved once tunnelling was complete. The following provides the tunnel drive lengths between launch and retrieval shafts associated with Alternative 1:

Shaft Number	Shaft Type	Shaft Intersection Location	Tunnel Drive Length	
S1b	Launch/Retrieval	Southeast corner of Grand Park Drive and Burnhamthorpe Road	S3↔S1b 1600 m	S3→S5 2000 m
S3	Launch/Retrieval	Southeast corner of Hurontario Street and Burnhamthorpe Road		
S5	Retrieval	Northeast corner of Cawthra Road and Burnhamthorpe Road		

Alternative 1 would require six construction areas along Burnhamthorpe Road to facilitate the installation of the new watermain, construction of the interconnections between the new and existing Burnhamthorpe Road watermains and connections to local watermains. The arrangement of each construction area is described as follows:



- S1b near Grand Park Drive would be used to construct a TBM launch/retrieval shaft as well as construction of a valve chamber with a stub ending to facilitate future connection to the Grand Park Drive local distribution (400 mm) watermain. A large construction compound would be used for material storage, tunneling equipment, temporary contractor offices and site sheds.
- C1, east of Confederation Parkway would require construction of a shaft on the south side of Burnhamthorpe Road and an open-cut crossing to enable construction of an interconnection and a local connection on the north side of Burnhamthorpe Road.
- C2 and C3 near the Duke of York Boulevard intersection would require a construction site for a shaft on the south side of Burnhamthorpe Road, an open cut crossing to the north side of the road and construction of two shafts with valve chambers on either side of Duke of York Boulevard for a local connection (C2) and interconnection (C3).
- S3 at Hurontario Street would be used to construct a TBM launch/retrieval shaft on the south side of Burnhamthorpe Road which would also house a valve chamber. A trenchless crossing would be made to the north side of the road to construct two shafts with valve chambers for a stub-ending for a future local connection (C4) and interconnection (C5).
- C6 near the intersection of Burnhamthorpe and Central Parkway East would require a construction site for a shaft on the south side of Burnhamthorpe Road and an open cut crossing to the north side for a local connection shaft (C6) and valve chamber.
- The intersection with Cawthra Road would be used to construct a TBM retrieval shaft (S5) at the northeast corner which would also house a valve chamber for two interconnections (C8 and C9). A small construction site at the northwest corner would be used for an interconnection shaft (C7) to connect the new watermain to a stub connection left by previous construction works.

4.1.3.3 Alternative 2: Three-Drive South

Similar to Alternative 1, the horizontal alignment for the new 1500mm diameter watermain would be constructed entirely on the south side of Burnhamthorpe Road with Alternative 2 (**Figure 9**)

However, three drives would be used in Alternative 2, using traditional tunnelling, microtunnelling or a combination of the two. The first drive would travel westwards from the launch shaft at Hurontario Street (southeast corner, S3) to the Grand Park Drive (southeast corner, S1b) retrieval shaft or eastwards from a launch shaft at Grand Park Drive (southeast corner, S1b) to the Hurontario Street (southeast corner, S3) shaft.

The second drive from S3 would proceed eastwards to Central Parkway East (southwest corner, S4) which would double as a retrieval shaft and launch shaft for the third drive eastwards, curving

north to the shaft site at Cawthra Road (northeast corner, S5) where the TBM would be retrieved once tunnelling was complete. The following table identifies the tunnel drive lengths between launch and retrieval shafts associated with Alternative 2:

Shaft Number	Shaft Type	Shaft Intersection Location	Tunnel Drive Length		
S1b	Launch/ Retrieval	Southeast corner of Grand Park Drive and Burnhamthorpe Road	S3↔S1b 1600 m	S3→S4 900 m	S4→S5 1100 m
S3	Launch/ Retrieval	Southeast corner of Hurontario Street and Burnhamthorpe Road			
S4	Launch/ Retrieval	Southwest corner of Central Parkway and Burnhamthorpe Road			
S5	Retrieval	Northeast corner of Cawthra Road and Burnhamthorpe Road			

Alternative 2 would require six construction areas along Burnhamthorpe Road to facilitate the installation of the new watermain, construction of the interconnections between the new and existing Burnhamthorpe Road watermains and construction of the connections to local watermains. The arrangement of each construction area is described as follows:

- S1b near Grand Park Drive would be used to construct a TBM launch/retrieval shaft as well as construction of a valve chamber with a stub ending to facilitate a future connection to the Grand Park Drive local watermain. A large construction compound would be used for material storage, tunneling equipment, temporary contractor offices and site sheds.
- C1, east of Confederation Parkway would require construction of a shaft on the south side of Burnhamthorpe Road and an open-cut crossing to enable construction of an interconnection and a local connection on the north side of Burnhamthorpe Road.
- C2 and C3 near the Duke of York Boulevard intersection would require a construction site for a shaft on the south side of Burnhamthorpe Road, an open cut crossing to the north side of the road and construction of two shafts with valve chambers on either side of Duke of York Boulevard for a local connection (C2) and interconnection (C3).
- S3 at Hurontario Street would be used to construct a TBM launch/retrieval shaft on the south side of Burnhamthorpe Road which would also house a valve chamber. A trenchless crossing would be made to the north side of the road to construct two shafts with valve chambers for a stub-ending for a future local connection (C4) and interconnection (C5).
- S4 near the intersection of Burnhamthorpe and Central Parkway East would be used to construct a TBM retrieval and launch shaft as well as construction of a valve chamber for local connection C6. S4 is located on the south side of Burnhamthorpe Road. The local connection C6 would require an open cut crossing to the north side of Burnhamthorpe Road.
- The intersection with Cawthra Road would be used to construct a TBM retrieval shaft (S5) at the northeast corner which would also house a valve chamber for two interconnections (C8 and C9). A small construction site at the northwest corner would be used for an



interconnection shaft (C7) to connect the new watermain to a stub connection left by previous construction works.

4.1.3.4 Alternative 3: Two-Drive North-South-North

In contrast to Alternatives 1 and 2, the horizontal alignment for the 1500mm diameter watermain would be constructed on both sides of Burnhamthorpe Road in Alternative 3 (**Figure 10**). The tunnel would be constructed in two drives using traditional tunnelling via a TBM. The first drive would either begin at Hurontario Street (southeast corner, S3) and go west towards the Grand Park Drive retrieval shaft (southeast corner, S1b) or would begin at the Grand Park Drive retrieval shaft (southeast corner, S1b) and go east towards the Hurontario Street (southeast corner, S3).

The second drive would proceed along the south side of Burnhamthorpe Road to the east of Cooksville Creek and then curve back to the north side of Burnhamthorpe Road for the remainder of the drive to Cawthra Road (northeast corner, S5) where the TBM would be retrieved once tunnelling was complete. The following table outlines the tunnel drive lengths between launch and retrieval shafts associated with Alternative 3:

Shaft Number	Shaft Type	Shaft Intersection Location	Tunnel Drive Length	
S1b	Launch/ Retrieval	Southeast corner of Grand Park Drive and Burnhamthorpe Road	S3↔S1b 1600 m	S3→S5 2000 m
S3	Launch/ Retrieval	Southeast corner of Hurontario Street and Burnhamthorpe Road		
S5	Retrieval	Northeast corner of Cawthra Road and Burnhamthorpe Road		

Alternative 3 would require six construction sites along Burnhamthorpe Road to facilitate the installation of the new watermain, construction of the interconnections between the new and existing watermains and construction of the connections to local watermains. The arrangement of each construction area is described as follows:

- S1b near Grand Park Drive would be used to construct a TBM launch/retrieval shaft as well as construction of a valve chamber with a stub ending to facilitate future connection to the Grand Park Drive local distribution (400 mm) watermain. A large construction compound would be used for material storage, tunneling equipment, temporary contractor offices and site sheds.
- C1, east of Confederation Parkway would be located on the north side of the road resulting in no open-cut road crossing at this location. A shaft and valve chamber would be constructed on the north side for an interconnection and a local connection.
- C2 and C3 near the Duke of York Boulevard would be located on the north side of the road resulting in no open-cut road crossing at this location. Two shafts with valve chambers would be constructed on either side of Duke of York Boulevard for an interconnection and a the local connection (C2) and interconnection (C3).
- S3 at Hurontario Street would be used to construct a TBM launch/retrieval shaft on the south side of Burnhamthorpe Road which would also house a valve chamber. A trenchless crossing would be made to the north side of the road to construct two shafts with valve chambers for a stub-ending for a future local connection (C4) and interconnection (C5).
- C6 near the intersection of Burnhamthorpe and Central Parkway East would require a construction site for a shaft on the north side of Burnhamthorpe Road. An open cut

excavation to the corner of Central Parkway East and Burnhamthorpe would lead to a second shaft and valve chamber for the local connection C6.

- The intersection with Cawthra Road would be used to construct a TBM retrieval shaft (S5) at the northeast corner which would also house a valve chamber for two interconnections (C8 and C9). A small construction site at the northwest corner would be used for an interconnection shaft (C7) to connect the new watermain to a stub connection left by previous construction works.

4.1.3.5 Alternative 4: Three-Drive North-South-North

In Alternative 4, the horizontal alignment for the 1500mm diameter watermain would be the same as Alternative 3, but the tunnel would be constructed in three drives instead of two (**Figure 11**). Using traditional tunnelling, microtunnelling or a combination, the first drive would proceed from the launch shaft at Hurontario Street (southeast corner, S3), curving to the north side of Burnhamthorpe Road, going west towards the Grand Park Drive (southeast corner, S1b) retrieval shaft. Alternatively, the first drive would proceed from the launch shaft at Grand Park Drive (southeast corner, S1b), curving to the north side of Burnhamthorpe Road, going east towards the Hurontario Street (southeast corner, S3) shaft.

The second drive from S3 would go along the south side of Burnhamthorpe Road to Central Parkway East (southwest corner, S4) which would double as a retrieval shaft for the second drive and launch shaft for the third drive. The third drive would curve from the south to the north side of Burnhamthorpe Road and go eastwards to Cawthra Road (northeast corner, S5) where the TBM would be retrieved once tunnelling was complete. The following table provides the tunnel drive lengths between launch and retrieval shafts associated with Alternative 4:

Shaft Number	Shaft Type	Shaft Intersection Location	Tunnel Drive Length		
S1b	Launch/ Retrieval	Southeast corner of Grand Park Drive and Burnhamthorpe Road	S3↔S1b 1600 m		
S3	Launch/ Retrieval	Southeast corner of Hurontario Street and Burnhamthorpe Road		S3→S4 900 m	
S4	Launch/ Retrieval	Southwest corner of Central Parkway and Burnhamthorpe Road			S4→S5 1100 m
S5	Retrieval	Northwest corner of Cawthra Road and Burnhamthorpe Road			

Alternative 4 would require six construction areas along Burnhamthorpe Road to facilitate the installation of the new watermain, construction of the interconnections between the new and existing Burnhamthorpe watermains and construction of the connections to local watermains. The arrangement of each construction area is described as follows:

- S1b near Grand Park Drive would be used to construct a TBM launch/retrieval shaft as well as construction of a valve chamber with a stub ending to facilitate future connection to the Grand Park Drive local distribution (400 mm) watermain. A large construction compound would be used for material storage, tunneling equipment, temporary contractor offices and site sheds.
- C1, east of Confederation Parkway would be located on the north side of the road resulting in no open-cut road crossing at this location. A shaft and valve chamber would be constructed on the north side for an interconnection and a local connection.

- C2 and C3 near the Duke of York Boulevard would be located on the north side of the road resulting in no open-cut road crossing at this location. Two shafts with valve chambers would be constructed on either side of Duke of York Boulevard for an interconnection and a the local connection (C2) and interconnection (C3).
- S3 at Hurontario Street would be used to construct a TBM launch/retrieval shaft on the south side of Burnhamthorpe Road which would also house a valve chamber. A trenchless crossing would be made to the north side of the road to construct two shafts with valve chambers for a stub-ending for a future local connection (C4) and interconnection (C5).
- S4 near the intersection of Burnhamthorpe and Central Parkway East would be used to construct a TBM retrieval and launch shaft as well as construction of a valve chamber for local connection C6. S4 is located on the south side of Burnhamthorpe Road. The local connection C6 would require an open cut crossing to the north side of Burnhamthorpe Road.
- The intersection with Cawthra Road would be used to construct a TBM retrieval shaft (S5) at the northeast corner which would also house a valve chamber for two interconnections (C8 and C9). A small construction site at the northwest corner would be used for an interconnection shaft (C7) to connect the new watermain to a stub connection left by previous construction works.

4.1.3.6 Alternative 5: Three-Drive North-South-North

In response to the stakeholder feedback received, a new alignment (Alternative 5) was identified and developed according to the same generation principles and considerations as Alternatives 1-4.

In Alternative 5, the horizontal alignment for the 1500mm diameter watermain would be constructed in three drives using traditional tunnelling, microtunnelling or a combination (**Figure 12**). The first drive would travel from the launch shaft at Hurontario Street (southeast corner, S3), curving to the north side of Burnhamthorpe Road, going west towards the Grand Park Drive (southeast corner, S1b) retrieval shaft. Alternatively, the first drive would proceed from the launch shaft at Grand Park Drive (southeast corner, S1b), curving to the north side of Burnhamthorpe Road, going east towards the Hurontario Street (southeast corner, S3) shaft.

The second drive from S3 would immediately curve to the north side of Burnhamthorpe Road and proceed east to shaft site S4b between Cooksville Creek and Central Parkway East, which would double as a retrieval shaft for the second drive and launch shaft for the third drive. The third drive would travel along the north side of Burnhamthorpe Road eastwards to Cawthra Road (northeast corner, S5) where the TBM would be retrieved once tunnelling was complete. The following table outlines the tunnel drive lengths between launch and retrieval shafts associated with Alternative 5:

Shaft Number	Shaft Type	Shaft Intersection Location	Tunnel Drive Length		
S1b	Launch/ Retrieval	Southeast corner of Grand Park Drive and Burnhamthorpe Road	S3↔S1b 1600 m	S3→S4b 900 m	S4b→S5 1100 m
S3	Launch/ Retrieval	Southeast corner of Hurontario Street and Burnhamthorpe Road			
S4b	Launch / Retrieval	Northwest corner of Central Parkway East and Burnhamthorpe Road			
S5	Retrieval	Northwest corner of Cawthra Road and Burnhamthorpe Road			

Alternative 5 would require six construction areas along Burnhamthorpe Road to facilitate the installation of the new watermain, construction of the interconnections between the new and existing Burnhamthorpe watermains and construction of the connections to local watermains. The arrangement of each construction area is described as follows:

- S1b near Grand Park Drive would be used to construct a TBM launch/retrieval shaft as well as construction of a valve chamber with a stub ending to facilitate future connection to the Grand Park Drive local distribution (400 mm) watermain. A large construction compound would be used for material storage, tunneling equipment, temporary contractor offices and site sheds.
- C1, east of Confederation Parkway would be located on the north side of the road resulting in no open-cut road crossing at this location. A shaft and valve chamber would be constructed on the north side for an interconnection and a local connection.
- C2 and C3 near the Duke of York Boulevard would be located on the north side of the road resulting in no open-cut road crossing at this location. Two shafts with valve chambers would be constructed on either side of Duke of York Boulevard for an interconnection and a the local connection (C2) and interconnection (C3).
- S3 at Hurontario Street would be used to construct a TBM launch/retrieval shaft on the south side of Burnhamthorpe Road which would also house a valve chamber. A trenchless crossing would be made to the north side of the road to construct two shafts with valve chambers for a stub-ending for a future local connection (C4) and interconnection (C5).
- S4b near the intersection of Burnhamthorpe and Central Parkway East would be used to construct a TBM launch and retrieval shaft. The shaft is on the north side of Burnhamthorpe Road. An open cut excavation to the corner of Central Parkway East and Burnhamthorpe would lead to a second shaft and valve chamber for the local connection C6.
- The intersection with Cawthra Road would be used to construct a TBM retrieval shaft (S5) at the northeast corner which would also house a valve chamber for two interconnections (C8 and C9). A small construction site at the northwest corner would be used for an interconnection shaft (C7) to connect the new watermain to a stub connection left by previous construction works.

4.1.4 Confirmation of the Identified Alternatives

Although not mandatory following Step 1 of Phase 2 of the Municipal Class EA process, the Region of Peel elected to carry out additional consultation with review agencies, First Nations, Métis organizations and the public as part of the Project to proactively involve them in the development of the alternatives being considered. Rather than just consulting on a recommended alternative as per Step 5, the Region of Peel first presented the 'Do Nothing' Alternative along with Alternatives 1-4 at Public Information Centre (PIC) 1 for comment. In response to the feedback received from the additional consultation, a new alignment (Alternative 5) was identified and developed according to the same generation principles and considerations as Alternatives 1 to 4.

Section 4.5 summarizes the consultation activities carried out and feedback received as part of Phase 2 of the Municipal Class EA process.

4.2 Description of the Potentially Affected Environment

All of the preceding alternative alignments are located along a portion of Burnhamthorpe Road that is situated within a largely built up area of City of Mississauga undergoing urban intensification, especially within the MCC. The potentially affected environment associated with the alternative alignments was described as defined in the *EA Act* based on existing information sources and field investigations:

- Natural Environment – includes air, land, water, plant and animal life
- Built Environment – includes any building or structure or thing made by humans
- Social Environment – includes the social conditions that influence the life of humans or a community
- Economic Environment – includes the economic conditions that influence the life of humans or a community
- Cultural Environment – includes the cultural conditions that influence the life of humans or a community

4.2.1 Natural Environment

Since the alternatives are all situated within an existing built-up area, natural features are mostly limited to landscaping associated with urban development (manicured lawns and specimen landscape trees) and the Cooksville Creek corridor (**Appendix 2A**).

Cooksville Creek

Cooksville Creek is a permanent watercourse regulated by the Credit Valley Conservation (CVC) Authority that is made up of two branches (**Figure 13**). The west and east branches join together just south of Burnhamthorpe Road as a single watercourse flowing in a southeast direction towards Lake Ontario. According to the CVC, riparian vegetation for most of the length of Cooksville Creek is poor to moderate, with numerous non-native species.

Cooksville Creek is classified by the Ministry of Natural Resources and Forestry (MNR) as a warmwater fish community. However, fish presence in Cooksville Creek is compromised by the presence of many in-stream barriers which prevent recolonization of fish. Similarly, the benthic community within Cooksville Creek is considered impaired based on benthic invertebrate information collected by CVC. No aquatic *Species at Risk* have been identified.

There are no wetlands, *Areas of Natural Concern*, *Areas of Natural and Scientific Interest*, *Significant Ecological Areas* or other provincially-significant natural heritage features within the vicinity of the alternative alignments (**Appendix 2A**). However, parts of the Cooksville Creek corridor are classified as *Natural Areas* or *Significant Natural Areas* by the City of Mississauga and a portion of corridor located downstream of Burnhamthorpe Road is classified as a *Core Area of the Greenlands System* by the Region of Peel.

Species of Concern

The *federally and provincially endangered* Butternut tree is reportedly present in the area surrounding the West Branch of the Cooksville Creek corridor. Terrestrial *Species at Risk* present in the vicinity of the alternative alignments include the Barn Swallow (*Threatened*) and a nesting Peregrine Falcon (*Special Concern*) high in one of the office buildings along Burnhamthorpe Road.

Hydrogeology

Regional surficial geology mapping indicates the area is underlain by fine-textured clay to silt till on a till plain and shale bedrock with limestone interbeds within the Cooksville Creek valley (**Figure 14** and **Figure 15**). The overburden ranges from less than 1 m up to approximately 10 m thick and bedrock outcrops are locally exposed along the Cooksville Creek valley (**Appendix 2B**). The till overburden forms an aquitard, which overlies a shale bedrock aquitard. The area is underlain with potentially 'marginal' aquifer conditions within the shallow fill and weathered till but is primarily comprised of a relatively thick overburden aquitard. Marginal aquifer conditions may also exist at the overburden and weathered shale bedrock contact.

Unconfined aquifer conditions may exist locally, where the clay till overlying the weathered bedrock is thin, such as in the Cooksville Creek valley and other areas. Coarse textured sediments (sand, or sand and gravel) were not encountered at the overburden / bedrock contact; however, these deposits are common on the contact and within bedrock channels in some areas and if encountered would significantly increase the aquifer groundwater flow conditions (**Appendix 2B**).

4.2.2 Built Environment

Burnhamthorpe Road

The City of Mississauga Official Plan classifies Burnhamthorpe Road as an east-west major arterial road divided into two sections through Mississauga; west of Hurontario Street with a six-lane urban cross section, and; east of Hurontario Street where it becomes a four-lane urban cross section. There are turn lanes at major intersections. The speed limit is posted at 60 km/h within the study area and the right-of-way is approximately 50 m wide.

Peak traffic flows occur in the eastbound direction during the am peak hour with a significant volume of traffic headed into Toronto. In the pm peak hour the reverse is true and the westbound flow is higher as residents return home.

West of Hurontario Street the peak volume is 2,033 in the eastbound direction during the am peak and 2,291 in the westbound direction during the pm peak. Using an average lane capacity of 850 vehicles per hour per lane (vphpl), the section of Burnhamthorpe Road west of Hurontario Street is currently operating with a volume-to-capacity (v/c) ratio of 0.80 during the am peak hour and 0.90 during the pm peak hour. East of Hurontario Street, the peak volume is 2,595 in the eastbound direction during the am peak and 1,632 westbound during the pm peak. The resulting v/c ratios are 1.53 in the am peak and 0.96 in the pm peak.

An analysis of existing 2015 volumes at the study intersections along Burnhamthorpe Road confirmed they are operating with overall level-of-service (LOS) of 'D' or better with the exception of Hurontario Street and Central Parkway which are operating at LOS 'E' and 'F' during the pm peak.

Existing Land Uses

Land use along the portion of Burnhamthorpe Road to the west of Hurontario Street consists predominantly of commercial and downtown mixed use (**Figure 16**). The land uses include the Square One Shopping Centre, Mississauga Civic Centre, City Hall, Celebration Square, Mississauga Central Library and Enterprise Centre, a YMCA centre, offices and gas stations. A number of educational institutions are present as well including Sheridan College near the junction of Duke of York Boulevard and Square One Drive.

To the west of Hurontario Street are various high-rise condominiums including Grand Ovation, Ultra Ovation and Pinnacle Grand Park 1 which are primarily situated on the south side of

Burnhamthorpe Road. These high-rise condominiums have associated underground garage structures which are typical for high-rise buildings along this stretch of Burnhamthorpe Road, but especially in the section along the south-side of Burnhamthorpe Road between Confederation Parkway and Kariya Drive where structural support anchors encroach under the right-of-way.

To the east of Hurontario Street, low to high density residential neighbourhoods back onto Burnhamthorpe Road, interspersed with condominiums such as Absolute Towers and Compass Creek. Security checkpoints at the entrance of Absolute Towers produce noticeable traffic during peak hours. Commercial properties are mostly located at major intersections, including a convenience store and mall at Central Parkway East and a pharmacy at Cawthra Road.

Transit

There are 11 bus stops on Burnhamthorpe Road between Hurontario Street and Cawthra Road, serviced by MiWay bus routes 26, 76 and 353. Route 26 continues along Burnhamthorpe Road west of Hurontario Street, servicing 4 bus stops and linking to routes 3, 8 and 352 at the junction with Kariya Drive and routes 6 and 28 at Confederation Parkway. There are shelters at a number of these bus stop locations including

- Northwest corner of Cawthra Road and Burnhamthorpe Road
- Hurontario Street (southbound), approximately 50 m north of Burnhamthorpe Road
- Hurontario Street (northbound), east-side, 50 m south of Burnhamthorpe Road
- Burnhamthorpe Road, south-side, 75 m east of Hurontario Street

Recreational Trails

The multi-use Burnhamthorpe Trail is situated along the north side of Burnhamthorpe Road for the entire length of the new watermain alignment, blending with the sidewalk for short sections. The sidewalk is situated along both sides of Burnhamthorpe Road from just east of Cawthra Road to Grand Park Drive, with the exception of the south side from Hurontario Street to west of Kariya Park where there is no sidewalk.

A protected bicycle path runs along some sections of Burnhamthorpe Road, separated from the street in mid-block locations between on-street parking and the adjacent sidewalk.

An asphalt multi-use trail is being constructed (spring/summer 2017) along the west side of Cawthra Road, from Meadows Boulevard to Burnhamthorpe Road as part of the Hanlan Water Project.

Water and Wastewater Infrastructure

Existing water servicing infrastructure is predominantly situated on the north side of Burnhamthorpe Road at a depth of less than 5 m. At the two branches of Cooksville Creek between Hurontario Street and Central Parkway East, the water infrastructure passes below the creek at a depth of up to 10 m. A 1200mm diameter sanitary sewer, within a 2400mm diameter tunnel liner, passes below Cooksville Creek along the north side of Burnhamthorpe Road at a depth of up to 23 m.

Utilities

There are a number of above and below ground utilities situated along Burnhamthorpe Road and in the vicinity of the proposed project, including: Enersource (above/below ground power lines); Enbridge (gas); Bell, Rogers and Telus (telecommunication lines), and; street lights operated by the City of Mississauga. These utilities may be temporarily affected during the construction of tunnelling

and connection shafts and any open cut construction of local watermain. Formal notification and consent would be required from the authorities responsible for these utilities prior to construction.

Potentially Contaminated Areas

Significant past fuel spills and current / former gasoline service stations, dry cleaners and other heavy industry along Burnhamthorpe Road are a potential source of contamination that could impact soil and groundwater quality in the vicinity of the proposed Project (**Appendix 2C**). The locations of actual or potential areas of environmental impairment (AEI) due to underground contamination of one type or another are indicated in **Figure 16**, including but not limited to the following:

- Shell operates an activated carbon treatment system at the southeast corner of Hurontario Street and Burnhamthorpe Road East (3650 Kaneff Crescent), suggesting that there is a groundwater quality concern on that site.
- A gasoline service station was historically located at the southwest corner of Burnhamthorpe Road East and Cawthra Road (3670 Cawthra Road). Previous groundwater sampling has confirmed groundwater impact in the area of the property, which may be related to the former gasoline service station.
- Former gasoline station at northwest corner of Cawthra Road.
- A current Petro-Canada gasoline service station is located at 3680 Hurontario Street. Information provided by the Region of Peel indicates that soil and groundwater investigations have been completed beneath Hurontario Street, suggesting that there have been releases from this station that have migrated beneath Hurontario Street.
- Historic gasoline station at northeast corner on Hurontario Street.
- Dry cleaners at 82 Burnhamthorpe Road West.

In addition, salt is applied to Burnhamthorpe Road and other roads in the vicinity for de-icing purposes and could result in elevated electrical conductivity and sodium absorption ratio in soils along them.

4.2.3 Social Environment

The City of Mississauga has an estimated population of 713,443, representing an increase of approximately 6.7 percent from 2006 (Statistics Canada, 2011). The Project is located in the MCC, which is the fastest growing district in the City of Mississauga. The majority of residents live in older apartments and semi-detached houses with a mix of owners (80 percent) and renters (20 percent). 25 percent of MCC households have 1 resident, 30 percent have 2 people living in them and 45 percent have 3 or more people (Metrolinx, 2012).

In the City of Mississauga, approximately 47 percent of the population reported English as their mother tongue, 1 percent reported French and 47 percent reported a non-official language. The average household income in the MCC is \$65,352, where the majority of households (46 percent) have incomes between \$30,000 and \$70,000 (Metrolinx, 2012). In the MCC there is an average of 1.42 cars per household whilst 7 percent of MCC households do not own a vehicle.

Traffic

Over 13,500 people commute to the MCC every morning (88 percent by car and 11 percent via transit) and 4,790 residents commute from the MCC (79 percent by car and 14 percent via transit) (Metrolinx, 2012).

Noise and Vibration

Burnhamthorpe Road is an arterial road in the City of Mississauga, connecting it to adjacent communities as well as industrial, commercial and residential zones within the city to major transportation routes, such as Highway 427 and 403. Road traffic is the major contributor of noise and vibration along Burnhamthorpe Road. Ambient noise and vibration is dominated by road and air traffic at all times of the day, although some commercial and industrial activities are also present (**Appendix 2D**).

4.2.4 Economic Environment

The existing urban area in the vicinity of Burnhamthorpe Road is undergoing intensification efforts especially to the west of Hurontario Street associated with the MCC. As illustrated in **Figure 3** and listed in **Table 3**, there is a significant number of residential, retail and office developments anticipated to be built within the MCC in keeping with the City's Downtown intensification plans. As a result, an additional 25,000 residents and over 20,000 new employees are expected to be residing and working within the MCC prior to 2031.

In order to accommodate these developments, a number of infrastructure projects are proposed along and in the vicinity of Burnhamthorpe Road in addition to the new 1500mm diameter watermain. **Figure 17** illustrates the presently known infrastructure projects proposed along and in the vicinity of Burnhamthorpe Road as well as some of the adjacent development proposals. Corresponding project numbers and project names can be found in **Appendix 2E**. Green indicates projects anticipated to be the focus of coordination efforts during the Burnhamthorpe Road watermain detailed design. Yellow indicates the project should be monitored for potential future coordination opportunities. This indicator is for projects that lie within the Burnhamthorpe project area and have construction timelines that could be adjusted to coordinate with the construction of the Burnhamthorpe Road watermain. Red indicates there was little opportunity for coordination identified since the corresponding projects do not currently fall within the Burnhamthorpe project area or timeline. Red can also indicate that after consultation it was determined that the site should be avoided due to similar construction timelines but limited potential for coordination.

The Region of Peel has reviewed these presently known infrastructure projects and adjacent development proposals with the intent of coordinating the planned construction of the new 1500mm diameter watermain along Burnhamthorpe Road with their implementation as much as possible so as to minimize disruption to the area community and take advantage of project efficiencies.

One, in particular, worth noting is the Hurontario-Main Light Rapid Transit (LRT) project scheduled for construction in 2018 as a public-private partnership initiative involving the City of Mississauga and Metrolinx. The proposed LRT route encompasses a section of the planned Burnhamthorpe Road 1500 mm watermain alignment, west of Hurontario Street to Duke of York Boulevard.

4.2.5 Cultural Environment

For the most part, the underground tunnel alignments, shaft sites, interconnections and local connections associated with all of the alternatives are located within or beneath the existing Burnhamthorpe Road right of way. This land is considered disturbed due to prior urban development and thus is not considered to retain archaeological potential. A Stage One Archaeological Assessment (**Appendix 2F**) completed by the Region of Peel considered an area on the south side of Burnhamthorpe Road, just to the east of Grand Park Drive (shaft compound S1b, **Figure 7**), to retain archaeological potential. No archaeological resources were encountered during the subsequent Stage Two Archaeological Assessment (report available on request).

City Hall and Clock Tower



Based on a Cultural Heritage Resource Assessment (**Appendix 2G**) completed by the Region of Peel, three cultural heritage resources are situated in the vicinity of the alternatives (**Figure 13**):

- City Hall (Cultural Heritage Landscape 1)
- Clock Tower (Built Heritage Resource 1)
- Square One Shopping Centre (Built Heritage Resource 2)

The cultural landscape of the MCC is reflected in the City Hall's clock tower and building, with considerable importance as a civic landmark. These built heritage resources are included in the City of Mississauga's Cultural Landscape Inventory.

4.3 Evaluation of the Alternatives

The alternatives identified in *Section 4.1* were assessed via a 'net effects analysis' to identify a recommended alternative through a comparative evaluation process. A 'net effects analysis' is composed of the following activities reflecting the process specified in the Municipal Class EA:

- **Activity 1:** Identify potential effects on the environment (both positive and negative)
- **Activity 2:** Develop appropriate impact management measures
- **Activity 3:** Apply the impact management measures to the identified potential environmental effects to identify net effects on the environment (both positive and negative)

4.3.1 Development of the Preliminary Evaluation Criteria

In order to identify the potential effects of the alternatives on the environment in a traceable, logical, understandable and reproducible manner, preliminary evaluation criteria were developed based on the problem / opportunity statement, existing environmental conditions and the range of alternatives being considered. The preliminary evaluation criteria were linked to each aspect of the environment (natural, built, social, economic and cultural) as defined in the *EA Act* because the description of the effects of each alternative on the environment is required by the EA process. In addition, technical and financial criteria were included to account for these aspects associated with the alternatives. In total, the following seven categories of criteria were proposed:

- Technical
- Natural Environment
- Built Environment
- Social Environment
- Economic Environment
- Cultural Environment
- Financial

Confirmation of the Evaluation Criteria

The proposed approach for evaluating the alternatives along with the preliminary evaluation criteria were presented at PIC 1 for feedback from interested stakeholders. No specific comments were received on either the proposed approach or the preliminary evaluation criteria. However, minor adjustments were made to remove criteria:

- where no potential effects were identified during investigative studies (e.g. since the alternatives were proposed to be constructed via tunnelling, there were no potential effects on aquatic habitat or species identified because the tunnel would be deep underground when crossing the only identified aquatic habitat (Cooksville Creek)
- where potential effects were found to be consistent between the alternatives (i.e. not contributing to the process of comparative evaluation by identifying differences between alternatives)

The evaluation criteria were finalized and one or more indicators developed for each of them to identify how the potential environmental effects were measured. **Table 10** lists the final evaluation criteria and their respective indicators by category.

Table 10: Final Evaluation Criteria and Indicators

Category	Evaluation Criteria	Indicators
Technical	Ability to address the problem / opportunity	<ul style="list-style-type: none"> • Does the alternative address the problem or opportunity?
	Integration with existing water infrastructure	<ul style="list-style-type: none"> • Degree of integration
	Construction site requirements	<ul style="list-style-type: none"> • Number of tunnel shaft sites • Number of construction sites required to facilitate construction of the interconnections and local connections
	Presence of existing underground structures impacting tunnelling	<ul style="list-style-type: none"> • Degree of conflict between known underground obstructions (e.g. parking garages) and technical approach to tunnelling
	Constructability of tunnelling and pipe installation	<ul style="list-style-type: none"> • Number / length of tunnel drives • Horizontal curvature
	Future operation and maintenance	<ul style="list-style-type: none"> • Ease of access for future operations and maintenance e.g. depth of vertical alignment
Natural	Effect on groundwater	<ul style="list-style-type: none"> • Short- or long-term change in groundwater

Environment		quality or quantity
	Effect on surface water	<ul style="list-style-type: none"> Short- or long-term change in surface water quality or quantity
	Effect on street trees	<ul style="list-style-type: none"> Number and type of street trees removed
Built Environment	Effect on property	<ul style="list-style-type: none"> Property requirements
	Effect on existing residences, businesses and/or community, institutional and recreational facilities	<ul style="list-style-type: none"> Nature of temporary local disruption to residents, businesses and community, institutional or recreational facilities?
	Effect of vibration on existing buildings	<ul style="list-style-type: none"> Degree of adverse vibration effects on buildings
	Effect on existing road infrastructure	<ul style="list-style-type: none"> Nature of adverse effects on roadways
	Effect on existing utility infrastructure	<ul style="list-style-type: none"> Nature and significance of above and/or below ground utilities affected
	Effect of environmental impairment areas	<ul style="list-style-type: none"> Degree of adverse effects on or from areas of environmental impairment
Social Environment	Effect on traffic	<ul style="list-style-type: none"> Temporary disruption (extent and duration) to traffic and public transport operations (GO stations, MiWay bus routes, etc.)
	Effect of noise and perceptible vibration on sensitive receptors ¹⁰	<ul style="list-style-type: none"> Nature of adverse effects on identified sensitive receptors
	Effect of dust on sensitive receptors	<ul style="list-style-type: none"> Nature of adverse effects on identified sensitive receptors
Economic Environment	Synergy with approved or planned projects	<ul style="list-style-type: none"> Degree of synergy
Cultural Environment	Effect on archaeological resources and areas of archaeological potential ¹¹	<ul style="list-style-type: none"> Number and type of known archaeological sites affected Area (ha) of archaeological potential (i.e. lands with potential for the presence of significant archaeological resources) affected
	Effects on significant cultural heritage resources ¹²	<ul style="list-style-type: none"> Number and type of built heritage resources and cultural heritage landscapes displaced or disrupted
Financial	Capital costs	<ul style="list-style-type: none"> Estimated capital cost, including property easements, temporary works and permanent works.

¹⁰ Based on MoECC Noise Limits in Environmental and Land Use Planning Guidelines; Regional and Municipal Noise Limits in By-Laws; MoECC Vibration Limits in NPC-207

¹¹ ASI, 2015. Stage 1 Archaeological Assessment Report; ASI, 2015. Stage 2 Archaeological Assessment Report

¹² ASI, 2015. Cultural Heritage Resource Assessment Report

4.3.2 Application of the Net Effects Analysis

Identify Potential Effects on the Environment

The potential effects on the environment (both positive and negative) were identified for the alternatives by applying the final evaluation criteria and indicators to each of them. The application was done within the context of the description for each alternative and the environment generated through the various investigative studies carried out. The identified potential effects were documented in the '*Potential Effects*' column of the net effects analysis tables for each alternative (**Appendix A**).

Develop and Apply Impact Management Measures

Next, impact management measures were developed as necessary and applied to avoid, mitigate and or compensate for potential negative environmental effects for each alternative. More specifically, the intent of these measures is:

- **Avoidance:** The first priority is to prevent the occurrence of negative (adverse) environmental effects associated with implementing an alternative. Avoidance-by-design.
- **Mitigation:** Where negative environmental effects cannot be avoided, appropriate measures to remove or alleviate, to some degree, the negative effects associated with implementing an alternative should be sought
- **Compensation:** In situations where appropriate mitigation measures are not available, or significant net negative effects will remain following their application, compensation measures may be required to counterbalance these negative effects through replacement in kind, substitution, reimbursement or other agreed compensation.

The impact management measures were developed based on professional expertise, reflecting on current procedures, historical performance and existing environmental conditions. These measures were recorded in the '*Impact management Measures*' column of the net effects tables for each alternative.

Determine Net Effects on the Environment

Once the appropriate impact management measures were developed and applied to the potential environmental effects of each alternative, the remaining net effect(s) were determined and documented in the '*Net Effects*' column of the net effects analysis tables for each alternative. In cases where the net effect could not be improved through the application of avoidance, mitigation and / or compensation measures, the potential net effect remained unchanged. Upon completion of this step, the net effects associated with each alternative were determined and carried forward to comparative evaluation.

4.4 Comparative Evaluation of the Alternatives

The net effects identified for the alternatives were compared in order to identify a recommended alternative using a reasoned argument or '*trade-off*' approach.¹³ In a trade-off approach, the differences in the net effects associated with the alternatives are highlighted first. Next, these differences are considered within the context of one another so that the relative advantages and disadvantages of each alternative can be identified.

¹³ The term 'trade-offs' is defined as '*things of value given up in order to gain different things of value*'.

Finally, a recommended alternative is selected based on its relative advantages and disadvantages compared to other alternatives considered, whereby 'trade-offs' are made - typically the greatest number of advantages or overall benefits with the fewest disadvantages.

The six alternatives were ranked according to their advantages and disadvantages as follows:

1. Alternative 5: Three-Drive North-South-North
2. Alternative 3: Two-Drive North-South-North
3. Alternative 4: Three-Drive North-South-North
4. Alternative 1: Two-Drive South
5. Alternative 2: Three-Drive South
6. Do Nothing

The results of the comparative evaluation are summarized in **Table 11** with the reasons for the preceding ranking highlighted as follows beginning with the first placed alternative.

1st Place – Alternative 5: Three-Drive North-South-North

Although all five alternative alignments would address the problem/opportunity statement by providing the additional water supply required in the MCC area to accommodate identified growth, Alternative 5 is technically preferred and generally minimizes adverse net effects on the environment.

Technical

The predominantly northern alignment of Alternative 5 would mean only two (south-north) road crossings would be required, compared to three or more for the other alternatives, translating into significantly less surface construction work required to connect with existing water servicing infrastructure, mostly on the north side of Burnhamthorpe Road. The alignment on the north side increases the separation distance to the numerous underground structures (e.g. parking garages, basements, etc.) on the south-side of Burnhamthorpe Road West.

In total, Alternative 5 required the fewest road crossings, and the second fewest number of construction sites (ten), whilst offering greater flexibility in tunnelling options (traditional rock tunnel or micro-tunnelling) than some alternatives due to the shorter tunnel drives possible with the inclusion of shaft S4b at Central Parkway East. S4b also supports the tunnel crossing under Cooksville Creek with a shallower alignment to the east and enables a local connection with the 300 mm watermain without the need for a separate construction site.

Natural Environment

Despite ranking sixth overall due to slightly increased *potential* effects, the anticipated actual effects of Alternative 5 on the natural environment would be very similar to the other alternatives being considered.

Although shaft site S4b is situated closer (approximately 75 m) to the east branch of Cooksville Creek than the proposed shafts sites of the other alternatives, the potential for adverse surface water effects would be proactively managed through the implementation of an Erosion and Sediment Control Plan. Therefore, no short-term surface water effects are actually anticipated.

Table 11: Comparative Evaluation Summary of the Alternatives

In comparison to the other alternatives: + relatively favourable ↔ neutral / average - relatively unfavourable

Category / Criteria	Ranking of the Alternatives					
	Do Nothing	Alternative 1: Two-Drive S	Alternative 2: Three-Drive S	Alternative 3: Two-Drive NSN	Alternative 4: Three-Drive NSN	Alternative 5: Three-Drive NSN
Technical	6th	5th	4th	3rd	2nd	1st
<ul style="list-style-type: none"> Ability to address the problem / opportunity Integration with existing infrastructure Construction site requirements Constructability 	~ Does not address the problem / opportunity	+ Addresses the problem / opportunity	+ Addresses the problem / opportunity	+ Addresses the problem / opportunity	+ Addresses the problem / opportunity	+ Addresses the problem / opportunity
		~ 5 road crossings ~ Significant work required to integrate with existing infrastructure	~ 5 road crossings ~ Significant work required to integrate with existing infrastructure	↔ 3 road crossings ↔ Moderate work required to integrate with existing infrastructure	↔ 3 road crossings ↔ Moderate work required to integrate with existing infrastructure	+ 2 road crossings + Least work required to integrate with existing infrastructure
		~ 12 construction sites	~ 13 construction sites	+ 9 construction sites	↔ 10 construction sites	↔ 10 construction sites
		~ Deeper vertical alignment necessary to avoid sanitary sewer at Central Parkway ~ Less flexibility in tunnelling options (traditional rock tunnel only)	+ Generally shallower vertical alignment possible; additional shaft near Central Parkway assists crossing of sanitary sewer + More flexibility in tunnelling options (traditional rock tunnel or micro-tunnelling)	~ Deeper vertical alignment necessary to avoid sanitary sewer at Central Parkway ~ Less flexibility in tunnelling options (traditional rock tunnel only)	+ Generally shallower vertical alignment possible; additional shaft near Central Parkway assists crossing of sanitary sewer + More flexibility in tunnelling options (traditional rock tunnel or micro-tunnelling)	+ Generally shallower vertical alignment possible; additional shaft near Central Parkway assists crossing of sanitary sewer + More flexibility in tunnelling options (traditional rock tunnel or micro-tunnelling)
Natural Environment	1st	2nd	4th	2nd	4th	6th
<ul style="list-style-type: none"> Groundwater 	+ No potential effects	↔ No net adverse effects anticipated	↔ No net adverse effects anticipated	↔ No net adverse effects anticipated	↔ No net adverse effects anticipated	↔ No net adverse effects anticipated

Category / Criteria	Ranking of the Alternatives					
	Do Nothing	Alternative 1: <i>Two-Drive S</i>	Alternative 2: <i>Three-Drive S</i>	Alternative 3: <i>Two-Drive NSN</i>	Alternative 4: <i>Three-Drive NSN</i>	Alternative 5: <i>Three-Drive NSN</i>
<ul style="list-style-type: none"> Surface water 	+ No potential effects	↔ Short-term surface water impacts would be avoided through an Erosion and Sediment Control Plan + No site within 500 m of Cooksville Creek	↔ Short-term surface water impacts would be avoided through an Erosion and Sediment Control Plan ~ Site S4 is less than 250 m from Cooksville Creek	↔ Short-term surface water impacts would be avoided through an Erosion and Sediment Control Plan + No site within 500 m of Cooksville Creek	↔ Short-term surface water impacts would be avoided through an Erosion and Sediment Control Plan ~ Site S4 is less than 250 m from Cooksville Creek	↔ Short-term surface water impacts would be avoided through an Erosion and Sediment Control Plan ~ Site S4b is less than 250 m from Cooksville Creek
<ul style="list-style-type: none"> Street trees and vegetation 	+ No potential effects	+ Removal of 32+ trees would be mitigated via a Tree Preservation and Restoration Plan	↔ Removal of 33+ trees would be mitigated via a Tree Preservation and Restoration Plan	+ Removal of 32+ trees would be mitigated via a Tree Preservation and Restoration Plan	↔ Removal of 33+ trees would be mitigated via a Tree Preservation and Restoration Plan	~ Removal of 37+ trees would be mitigated via a Tree Preservation and Restoration Plan
Built Environment	1st	4th	6th	3rd	5th	2nd
<ul style="list-style-type: none"> Property requirements 	+ No potential effects	~ 10 temporary; 2 permanent easements	~ 11 temporary; 3 permanent easements	↔ 7 temporary; 2 permanent easements	↔ 8 temporary; 3 permanent easements	+ 6 temporary; 2 permanent easements
<ul style="list-style-type: none"> Homes, businesses and/or community, institutional and recreational facilities 	+ No potential effects	↔ No net adverse effects anticipated	~ Site S4 would impact playground and access to plaza	↔ No net adverse effects anticipated	~ Site S4 would impact playground and access to plaza	↔ No net adverse effects anticipated
<ul style="list-style-type: none"> Vibration 	+ No potential effects	↔ Short-term vibration effects at sites will be managed through a monitoring program	~ Short-term vibration effects at sites will be managed through a monitoring program; potential impacts on condo buildings/plaza in close proximity to site S4	↔ Short-term vibration effects at sites will be managed through a monitoring program	~ Short-term vibration effects at sites will be managed through a monitoring program; potential for impacts on condo buildings/plaza in close proximity to site S4	~ Short-term vibration effects at sites will be managed through a monitoring program; potential impacts on condo buildings/plaza in close proximity to site S4b

Category / Criteria	Ranking of the Alternatives					
	Do Nothing	Alternative 1: <i>Two-Drive S</i>	Alternative 2: <i>Three-Drive S</i>	Alternative 3: <i>Two-Drive NSN</i>	Alternative 4: <i>Three-Drive NSN</i>	Alternative 5: <i>Three-Drive NSN</i>
<ul style="list-style-type: none"> Road infrastructure 	+ No potential effects	~ 5 road crossings will require additional short-term excavations and reconstruction ~ Approximately 70% of the alignment under travelled portion of road; increased risk of adverse effects on roadway	~ 5 road crossings will require additional short-term excavations and reconstruction ~ Approximately 70% of the alignment under travelled portion of road; increased risk of adverse effects on roadway	↔ 3 road crossings will require additional short-term excavations and reconstruction + Approximately 15% of the alignment under travelled portion of road; reduced risk of adverse effects on roadway	↔ 3 road crossings will require additional short-term excavations and reconstruction + Approximately 15% of the alignment under travelled portion of road; reduced risk of adverse effects on roadway	+ 2 road crossings will require additional short-term excavations and reconstruction + Approximately 15% of the alignment under travelled portion of road; reduced risk of adverse effects on roadway
<ul style="list-style-type: none"> Contaminated areas 	+ No potential effects	↔ 4 construction sites in proximity to historically contaminated areas	~ 5 construction sites in proximity to historically contaminated areas	↔ 4 construction sites in proximity to historically contaminated areas	~ 5 construction sites in proximity to historically contaminated areas	↔ 4 construction sites in proximity to historically contaminated areas
Social Environment	1st	4th	5th	2nd	5th	3rd
<ul style="list-style-type: none"> Traffic 	+ No potential effects	~ Traffic impacts would be minimized by a Traffic Management Plan; single lane reduction on Burnhamthorpe at multiple locations (short to medium term)	~ Traffic impacts would be minimized by a Traffic Management Plan; single lane reduction on Burnhamthorpe at multiple locations (short to long term)	↔ Traffic impacts would be minimized by a Traffic Management Plan; single lane reduction on Burnhamthorpe at fewer locations (short to medium term)	↔ Traffic impacts would be minimized by a Traffic Management Plan; single lane reduction on Burnhamthorpe at multiple locations (short to long term)	+ Traffic impacts would be minimized by a Traffic Management Plan; single lane reduction on Burnhamthorpe at fewest locations (short term)
<ul style="list-style-type: none"> Noise; Vibration; Dust, etc. 	+ No potential effects	+ Short-term noise and vibration effects at sites will be managed through a	~ Short-term noise and vibration effects at sites will be managed through a	+ Short-term noise and vibration effects at sites will be managed through a	~ Short-term noise and vibration effects at sites will be managed through a	~ Short-term noise and vibration effects at sites will be managed through a

Category / Criteria	Ranking of the Alternatives					
	Do Nothing	Alternative 1: <i>Two-Drive S</i>	Alternative 2: <i>Three-Drive S</i>	Alternative 3: <i>Two-Drive NSN</i>	Alternative 4: <i>Three-Drive NSN</i>	Alternative 5: <i>Three-Drive NSN</i>
		monitoring program	monitoring program; potential impacts on condo buildings/plaza in close proximity to site S4	monitoring program	monitoring program; potential impacts on condo buildings/plaza in close proximity to site S4	monitoring program; potential impacts on houses in close proximity to site S4b
Economic Environment	1st	2nd				
<ul style="list-style-type: none"> Synergy with planned or approved projects 	+ No potential conflicts	All of the alternatives will be designed to maximize synergy with planned or approved projects				
Cultural Environment	1st	2nd				
<ul style="list-style-type: none"> Archaeological / cultural resources 	+ No potential effects	No net adverse effects on identified archaeological or cultural heritage resources				
Financial	1st	2nd				
	+ No capital costs	Capital cost estimates for the alternatives are all within approximately 10% each other				
OVERALL RANKING¹⁴	6th*	4th	5th	2nd	3rd	1st

* Although there would be no adverse environmental effects and no capital costs, the 'Do Nothing' alternative was ranked last because it does not address the problem / opportunity statement.

¹⁴ In comparison to the other alternatives:

+ relatively favourable

↔ neutral / average

~ relatively unfavourable

Likewise, the anticipated removal of approximately 37 street trees - slightly more than the other alternatives - would be compensated for through the design and implementation of a *Tree Preservation and Restoration Plan*. The lower relative ranking simply reflects the fact that in general, avoiding effects is preferable to application of mitigation and/or compensation measures.

As with all the alternatives, the extent of temporary dewatering required during construction of Alternative 5 would be minimized through standard impact management measures (e.g. excavations below the water table would be avoided where possible and sealed shafts / temporary groundwater cut-off structures would be used where appropriate, etc.). In addition, a groundwater monitoring and impact management program will be developed during detailed design, which will include contingency measures.

Built and Social Environments

In terms of the Built and Social Environments, Alternative 5 ranked second and third respectively because the potential for adverse environmental effects is generally less overall or can be minimized through the application of standard construction mitigation measures. The fewest number of easements (eight; six temporary and two permanent) would be required with Alternative 5 compared to between nine and thirteen easements needed for the other alternatives.

Alternative 5 minimizes the extent of tunnelling under the travelled portion of the roadways (approximately 15%) relative to approximately 70% with Alternatives 1 and 2, thereby reducing the risk of potential adverse effects to the travelled portion of Burnhamthorpe Road from future surface settlement after the new watermain is built. Alternative 5 would require the fewest road crossings (two) compared to the other alternatives, reducing the potential need for short-term excavations and road reconstruction on Burnhamthorpe Road if open-cut crossings are required.

Four of the construction sites (shafts and/or connections) associated with Alternatives 1, 3 and 5 are in proximity to areas of actual or potential environmental impairment; less than Alternative 2 and 4 (five sites).

As part of the preliminary geotechnical investigation, soil and water analyses found the presence of metals/inorganics, volatile organic compounds (VOCs) and petroleum hydrocarbons at multiple borehole sample sites. At one borehole location the presence of polycyclic aromatic hydrocarbons (PAHs) was detected in the water sample and at another location the presence of Polychlorinated Biphenyls (PCBs) was detected in the soil sample. Potentially-affected soils will be further assessed as part of the geotechnical investigation carried out during detailed design. Consideration should be given to collecting and sampling bedrock during excavation as there is potential for PHC and VOC concentrations to be in excess of acceptable limits. A Soil Management Plan (consistent with Part XV.1 of the Environmental Protection Act and O.Reg. 153/04, Records of Site Condition) will be developed during detailed design to govern how any contaminated soil/water encountered will be managed. Appropriate measures to accommodate disposal of impacted groundwater during excavation/dewatering activities will also be required. A Qualified Person (as defined under Ontario Reg. 511/09) will direct the appropriate management of potentially contaminated soil / water during construction.

Alternative 5 would result in the fewest locations for single lane reductions on Burnhamthorpe Road compared to the other alternatives (**Appendix 2H**). In addition, the lane reductions would generally be required over a shorter duration (estimated 2-4 months) in comparison to the alternatives requiring a long-term shaft site at S4 (Alternatives 2 and 4). A *Traffic Management Plan* would be implemented during construction to minimize potential short-term adverse effects on traffic from these single lane reductions as well as other disruptions.

The potential for short term adverse noise and vibration effects from the construction of Alternative 5 would be similar to those of the other alternatives and would be proactively managed through the implementation of a *Noise and Vibration Management Program* during construction.

Notwithstanding this, shaft site S4b would be in close proximity to residences located along King Andrew Drive (four houses are within the anticipated 30 m zone of direct influence) and the condo building at 1300 Mississauga Valley Boulevard, located 60 m away on the south-side of Burnhamthorpe Road East. Despite mitigation measures, these residences may be susceptible to potential short-term adverse noise and vibration effects and would be consulted with during development of the *Noise and Vibration Management Program*.

Economic Environment

Alternative 5 offered equal potential for synergy with planned or approved projects in the MCC as the other alternatives. The specific basis for collaboration and coordination will be determined and updated as the proposed projects progress through their respective detailed design phases.

Cultural Environment

From a Cultural Environment perspective, Alternative 5, similar to the other alternatives, would not result in any potential adverse environmental effects to known archaeological resources or cultural heritage resources based on the investigative studies carried out as part of the Project.

Financial

Finally, there are no significant capital cost differences between the alternatives, with Alternatives 2, 4 and 5 projected to cost approximately \$117 million and Alternatives 1 and 3 projections of approximately \$111 million; all within 10% of each other.

2nd Place – Alternative 3: Two-Drive North-South-North

Alternative 3 was ranked second overall since it would, relative to Alternative 5:

- Require one additional road crossing (three in total), equivalent to Alternative 4
- Require more surface construction work to connect the new 1500 mm watermain with existing water servicing infrastructure
- Require a deeper vertical alignment when crossing under Cooksville Creek
- Require a separate construction site to enable the local connection with 300 mm watermain at Central Parkway East, though one less construction site than Alternative 4
- Offer less flexibility in tunnelling options, with only traditional rock tunnelling able to complete the longer tunnel drives required
- Require one additional temporary easement (nine in total) compared to Alternative 5, but one less than Alternative 4
- Have more locations of single lane restrictions on Burnhamthorpe Road and for a longer duration (short to medium term)

3rd Place – Alternative 4: Three-Drive North-South-North

Alternative 4 was ranked third overall since it would:

- Offer the possibility of a shallower vertical alignment, relative to Alternative 1
- Require one additional construction site (ten) than Alternative 3 (equal with Alternative 5)

- Offer greater flexibility in tunnelling options (traditional rock tunnel or micro-tunnelling) than Alternative 1
- Require one more temporary easement (eight) and one more permanent easement (three) than Alternative 3
- Include shaft site S4 near Central Parkway East, which would:
 - assist in a shallower vertical alignment when crossing under Cooksville Creek
 - be situated only approximately 175 m from the East Branch of Cooksville Creek
 - be in close proximity to the condo buildings at 1250 and 1300 Mississauga Valley Boulevard (less than 20 m) and a commercial plaza (dental clinic, convenience store and yoga studio) making them more susceptible to potential short-term adverse noise and vibration effects.
 - be in close proximity to five areas of (potential) environmental impairment, one more than Alternatives 3 and 5
 - adversely affect a private playground and one of two accesses to the commercial plaza (via Burnhamthorpe Road East)
 - have more locations of single lane restrictions on Burnhamthorpe Road and for a longer duration (short to long term)

4th Place – Alternative 1: Two-Drive South

Alternative 1 was ranked fourth overall since it would:

- Require a higher number of road crossings (five in total) than Alternatives 3, 4 and 5
- Require significantly more surface construction work to connect the new 1500 mm diameter watermain with existing water servicing infrastructure
- Require three additional construction sites (twelve) than Alternative 3
- Require a deeper vertical alignment relative to Alternatives 3, 4 and 5 to avoid the underground structures on the south-side of Burnhamthorpe Road West and facilitate crossing under Cooksville Creek
- Offer less flexibility in tunnelling options, with only traditional rock tunnelling able to complete the longer tunnel drives required
- Require more temporary easements (ten) than Alternatives 3 and 5
- Require approximately 70% of the alignment to be under the travelled portion of Burnhamthorpe Road, increasing the risk of potential adverse effects from future surface settlement.

5th Place – Alternative 2: Three-Drive South

Alternative 2 was ranked slightly better technically compared to Alternative 1, but ranked fifth overall since it would:

- Require one additional construction site (13) than Alternative 1
- Require one more temporary easement (eleven) and one more permanent easement (three) than Alternative 1
- Include shaft site S4 near Central Parkway East, which would:

- assist in a shallower vertical alignment when crossing under Cooksville Creek
- be situated only approximately 175 m from the East Branch of Cooksville Creek
- be in close proximity to the condo buildings at 1250 and 1300 Mississauga Valley Boulevard (less than 20 m) and a commercial plaza (dental clinic, convenience store and yoga studio) making them more susceptible to potential short-term adverse noise and vibration effects.
- be in close proximity to five areas of (potential) environmental impairment, one more than Alternatives 3 and 5
- adversely affect a private playground and one of two accesses to the commercial plaza (via Burnhamthorpe Road East)
- have more locations of single lane restrictions on Burnhamthorpe Road and for a longer duration (short to long term)

6th Place – Do Nothing Alternative

Although there would be no adverse environmental effects and no capital costs, the 'Do Nothing' alternative was ranked last because it does not address the problem / opportunity statement. Consequently, the additional water supply required in the MCC area would not be provided and the additional residential and employment growth forecasted to 2031 for the area could not be accommodated.

4.4.1 Identification of the Recommended Alternative

Alternative 5 was ranked first overall among the six alternatives considered in the Project due to:

- Fewest easements (six temporary and two permanent) required
- Minimal extent of tunnelling under the travelled portion of the roadways thereby limiting risks
- The fewest road crossings , reducing the need for short-term excavations
- Slightly fewer construction sites (shafts and/or connections) in proximity to areas of actual or potential environmental impairment than Alternatives 2 and 4
- The fewest locations for lane reductions on Burnhamthorpe Road required over a shorter duration (estimated 2-4 months)
- Approximately equivalent capital cost compared to the other alternative alignments

Alternative 5 (**Figure 12**) was therefore taken forward as the '*Recommended Alternative*' in accordance with Step 4 of Phase 2 of the Municipal Class EA process.

4.5 Consultation with Agencies, First Nations, Métis Organizations and Public

4.5.1 Description of the Consultation Activities Carried Out

As part of Phase 2 of the Municipal Class EA process, the Region of Peel carried out a number of consultation activities with review agencies, First Nations, Métis organizations and the public to proactively involve them in identifying and evaluating the alternatives to determine the recommended alternative.

Specifically, the following activities were undertaken during Phase 2 of the Project:

- Updating the Project website.
- Issuing the 'Notice of Public Information Centre (PIC) 1' (**Appendix 1E**) on February 12, 2015 through direct mailing to residents and property/business owners in the general vicinity of the proposed water supply upgrades (**Appendix 1B**)
- Issuing a letter with the 'Notice of PIC 1' via email and/or direct mailing to review agencies, utilities, councillors, interested parties, First Nations and Métis organizations between February 9 and February 13, 2015
- Publishing the 'Notice of PIC 1' in two editions of 'The Mississauga News' (February 12 and 19, 2015)
- Undertaking follow-up telephone calls to unresponsive review agencies and First Nations following the issuance of the 'Notice of PIC 1' to ensure it was correctly received and allow for immediate questions and clarifications.
- Holding PIC 1 on February 25, 2015 (**Appendix 1E**)
- Issuing the 'Notice of PIC 2' on June 3, 2015 through direct mailing to residents and property/business owners in the general vicinity of the proposed water supply upgrades (**Appendix 1B**).
- Issuing a letter with the 'Notice of PIC 2' (**Appendix 1F**) via email and/or direct mailing to review agencies, utilities, councillors, interested parties, First Nations and Métis organizations on June 8, 2015
- Publishing the 'Notice of PIC 2' in two editions of 'The Mississauga News' (June 4 and June 11, 2015)
- Holding PIC 2 on June 17, 2015 (**Appendix 1F**)
- Holding individual stakeholder meetings (e.g. City of Mississauga, Credit Valley Conservation, YMCA, Rogers).
- Circulating a draft copy of the Project File Report to the MOECC and CVC for initial comments, as per the commitments made during Phase 1 consultation.

Public Information Centre 1 and 2

The Region of Peel elected to carry out two PICs during Phase 2 of the Municipal Class EA process, instead of just a single PIC, which is typically the case for a Schedule B project, to provide an additional opportunity for those interested in the Project to be meaningfully involved. Both PICs were held at the Mississauga Civic Centre (Great Hall), just to the north of Burnhamthorpe Road. This venue was selected because it is accessible by public transit, highly visible and familiar to the public as well as being compliant with the requirements of the *Accessibility for Ontarians with Disabilities Act*.

Both PICs were held as open house/drop-in sessions allowing the attending public to view the display panels at their leisure, ask questions or provide input through one-on-one discussions with attending Region of Peel staff and Project Team members. Comment forms were provided to attending public at both PICs for receiving written input.

Table 12 summarizes the two PICs while **Appendices 1E** and **1F** provide further information and copies of the display boards presented at each respectively.

Table 12: Overview of Public Information Centres

	Public Information Centre 1	Public Information Centre 2
Date/Time	February 25, 2015, 6 to 8:30 p.m.	June 17, 2015, 6 to 8:00 p.m.
Purpose	<p>To obtain input on the following:</p> <ul style="list-style-type: none"> • The draft problem/opportunity statement • The proposed alternative alignments and shaft sites • The environmental conditions associated with the alternatives including potential issues/concerns • The proposed evaluation methodology and preliminary evaluation criteria for assessing the alternatives 	<p>To obtain input on the following:</p> <ul style="list-style-type: none"> • The evaluation of the alternative alignments and shaft sites • The recommended alignment and shaft sites • The potential environmental effects • The proposed avoidance, mitigation and compensation measures developed • The plan and related details for implementing the preferred alignment and shaft sites
Information Displayed	<ul style="list-style-type: none"> • Welcome and PIC Purpose • Planning Context • Municipal Class EA Process • Draft Problem/Opportunity Statement • Environmental Conditions • Proposed Alternatives • Tunnelling Shaft Sites • Proposed Evaluation Methodology/Preliminary Criteria • Tunnelling Methodologies • Complimentary Water System Upgrades • Next Steps 	<ul style="list-style-type: none"> • Welcome and PIC Purpose • Planning Context • Municipal Class EA Process • Stakeholder Comments • Problem/Opportunity Statement • Environmental Conditions and Avoidance/Mitigation Measures • Alternatives • Evaluation Methodology/Final Criteria • Comparative Evaluation of Alternatives • Recommended Alternative (Horizontal and Vertical Alignments) • Tunnelling Methodologies and Mitigation Measures • Traffic Management Plan • Complementary Water System Upgrades • Coordination and Collaboration with Other Infrastructure Projects • Next Steps
Number of Attendees	23	23
Comment Forms Submitted	2	2

Individual Stakeholder Meetings

As mentioned, the Region of Peel held a number of meetings with various individual stakeholders in advance of and following PIC 1 and 2. **Table 13** summarizes the meetings held including the name of the stakeholder, date of the meeting and purpose of the meeting.

Table 13: Summary of Individual Stakeholder Meetings Held

Stakeholder	Meeting Date	Meeting Purpose
Credit Valley Conversation (CVC)	April 13, 2015	To provide a project overview and status, review the preliminary horizontal alignment, discuss the highlights from the baseline natural features assessment and discuss CVC's specific interests related to the Project.
AMACON	April 8, 2015	To discuss the Project and property requirements for the Amacon property located at the north west corner of Confederation Parkway and Burnhamthorpe Road.
Morguard	May 6, 2015	To provide a project overview and status, review the preliminary horizontal alignment, discuss the need to construct specific interconnections at strategic locations and discuss two potential temporary work zones located on the Morguard property.
Rogers	April 9, 2015	To discuss the Project and property requirements for the Rogers property located at the south west corner of Confederation Parkway and Burnhamthorpe Road.
YMCA	April 24, 2015	To provide a project overview and status, review the preliminary horizontal alignment, discuss the need to construct specific interconnections at strategic locations and discuss two potential temporary work zones located on YMCA property.
City of Mississauga	June 4, 2015 and August 18, 2015	To provide updates on the project status, present the preferred alignment for the 1500 mm diameter Burnhamthorpe watermain and local distribution works and to discuss coordination with the Hurontario-Main LRT and other planned City projects.

4.5.2 Consideration of Comments Received

Through the preceding consultation activities, over 40 comments/requests for more information were received by the Region of Peel and recorded in the Project's communications record database. Most of the comments/information requests were received via email. An overview is provided by stakeholder group as follows with **Table 14** summarizing the specific comments received and how they were considered as part of Phase 2 of the Project. **Appendix 1D** provides the full record of stakeholder correspondence received and the Region of Peel's responses.

Review Agencies

Comments were received from six review agencies during Phase 2 of the Project: the Ministry of Aboriginal Affairs, Peel Regional Paramedic Services, CVC, MOECC, MiWay Transit and City of Mississauga.

Utilities

A number of information exchanges took place with Enersource during Phase 2 of the Project, including attendance at PIC 2.

First Nations and Métis Organizations

Two of the First Nations contacted during Phase 2 of the Project responded; Alderville First Nation and the Mississauga of the New Credit First Nation. Neither of the two Métis organizations responded to the notices issued to them.

Interested Parties, Residents and Property/Business Owners

The majority of comments and information exchanges that took place during Phase 2 of the Project were with property/business owners, developers, consultants and residents.

Table 14: Summary of Comments from Phase 2 of the Class EA

COMMENTS RECEIVED	CONSIDERATION OF COMMENTS
REVIEW AGENCIES	
<p>Ministry of Aboriginal Affairs (MAA) March 31, 2015: Provided contact information for the following First Nations that may have existing or asserted rights or claims in Ontario's land claims process or litigation, which could be affected by the Project: Six Nations of the Grand River Territory, Haudenosaunee Confederacy and Mississaugas of the New Credit First Nation. Remove MAA from the distribution list.</p>	<p>The identified First Nations were all contacted as part of the Project. MAA was removed from the Project's distribution list for receiving future notifications.</p>
<p>Credit Valley Conservation Authority April 13, 2014 (meeting): Review a previous 'Scour Report' prepared for a crossing of Cooksville Creek and confirm its applicability to the new watermain via a Geomorphologist. The design will need to accommodate the 100-year scour elevation as Cooksville Creek is a very 'flashy' watercourse. Standard warmwater fishery requirements / limits for water crossing will apply (i.e. crossing limited to between 1 July to 31 March). Would like to review the draft Project File prior to it being issuing as final for the 30 calendar day review period.</p>	<p>The previous 'Scour Report' was reviewed by a Geomorphologist who confirmed its applicability to the new watermain. The review was submitted to the Conservation Authority (CA) via a signed letter. The 100-year scour elevation will be incorporated into the new watermain design. The standard warmwater fishery requirements / limits for water crossing (i.e. crossing limited to 1 July to 31 March) were applied to the Project. The draft Project File was provided to the CVC for comment on July 29, 2015. No comments were received.</p>
<p>Ministry of the Environment and Climate Change August 19, 2015 (letter): The MOECC</p>	

<p>responded to the Region of Peel's dissemination and invitation to provide comments on the draft Project File (July 29) with a number of points relating to:</p> <ul style="list-style-type: none"> • applying best management practices to mitigate any air quality impacts caused by construction dust • Disposal of contaminated soil, consistent with Part XV.1 of the Environmental Protection Act and O.Reg. 153/04 • Private domestic wells, pursuant to O.Reg. 903, Wells (Ontario Water Resources Act). • Consultation with the MOECC Central Region PTTW Coordinator prior to detailed design to confirm any approval requirements for water takings during construction or operation. 	<p>The Region of Peel replied by letter on August 31, 2015 with specific responses to the MOECC's comments, referencing associated revisions to the draft Project File Report, including to Table 16 (Net Effects and Proposed Monitoring Programs) and Table 17 (EA Commitments).</p>
<p>MUNICIPAL</p>	
<p>Peel Regional Paramedic Services February 17, 2015: Requested information on the Project to determine if there are any implications on paramedic services during construction (i.e. road closures, traffic redirection, access restrictions).</p>	<p>The requested information was provided via the Project's website.</p>
<p>MiWay Transit February 18, 2015: Concerned about the potential impact on MiWay's existing bus routes and Project timing. Add another MiWay representative to the distribution list.</p> <p>July 28, 2015: Responding to an update from the Region of Peel regarding anticipated requirement for relocation of bus shelters. Confirming costs and payment arrangements.</p>	<p>A Traffic Management Plan will be prepared as part of detail design of the new watermain, which will include minimizing potential adverse effects on bus routes through on-going discussions with MiWay.</p> <p>The anticipated start of construction is 2017.</p> <p>The Project's distribution list was updated with provided contact information.</p>
<p>City of Mississauga, Community Services June 9, 2015: Provided specifications for Project drawings and clarifications on tree loss compensation and easement requirements.</p>	<p>Provided information was considered as part of the Project.</p>
<p>City of Mississauga, Environmental Services June 9, 2015: Identified downstream</p>	<p>Comment noted.</p>

erosion control project along Cooksville Creek and requested to be circulated on applicable report/drawings in the event the Project impacts the City's storm sewer or watercourse network.	The Project is not anticipated to impact either the City's storm sewer or watercourse network at present; however, the City will continued to be consulted as part of preliminary and detailed design for their input.
UTILITIES	
<p>Enersource</p> <p>February 27, April 14 and May 14, 2015: Send Project information for review. Provided an overview of their existing area facilities as well as potential implications of the Project and clearance requirements. May request a meeting with the Region of Peel as follow up to information received/reviewed. Provided minimum clearance requirements for construction equipment. They currently do not have any plans to any projects along Burnhamthorpe Road between 2017 and 2019.</p>	<p>The requested information was provided via the Project's website.</p> <p>Information provided was appropriately considered as part of the Project.</p>
FIRST NATIONS	
<p>Alderville First Nation</p> <p>February 12 and June 25, 2015: The Project is not within our Traditional or Treaty area, but appreciates the Region of Peel's consultation efforts.</p>	<p>Commented noted. They were notified of future consultation related activities for the Project.</p>
<p>Mississaugas of the New Credit First Nation (MNCFN)</p> <p>July 3, 2015: The MNCFN has a low level of concern regarding the Project. Contact the MNCFN if any environmental / archaeological fieldwork is planned to arrange MNCFN's participation.</p> <p>August 15, 2015: Agreement signed with the Region of Peel to cover field liaison officer participation in Stage Two Archaeological Assessment.</p>	<p>MNCFM was contacted to coordinate their participation in the Stage Two Archaeological Assessment undertaken for the Project. No archaeological resources were encountered.</p>
PUBLIC	
<p>Amacon Development</p> <p>February 11 and 14 and April 14, 2015: Requested information on the Project to determine if there are any implications on their area developments and if a meeting with the Region of Peel is warranted. Please update the Project's distribution list with provided contact information. Provided information on their area developments (e.g. access, anticipated occupancy, etc.).</p>	<p>The requested information was provided via the Project's website.</p> <p>A meeting was held as requested.</p> <p>The Project's distribution list was updated with provided contact information.</p> <p>The provided information on their area developments was considered as part of the Project.</p>
<p>Resident</p> <p>February 15 and 16, 2015: Questioned as to why the Project was not installed in</p>	<p>The new watermain will be tunnelled.</p>

advance of Burnhamthorpe Road being repaved 2 years ago for more cost effective implementation of infrastructure. The new watermain should be tunnelled instead of an open trench to avoid surface disruption to traffic, pedestrians, area residents, etc.	
Colliers International February 17, 2015: PIC timing, anticipated Project timelines and extent of short-term construction related effects.	The date/time of PIC 1 was provided. The anticipated start of construction is 2017. The new watermain will be tunnelled to minimize surface disruption during construction.
Resident February 20, 2015: Questioned as to why the Project was being installed after Burnhamthorpe Road was recently repaved.	The new watermain will be tunnelled to minimize surface disruption during construction resulting in the recently repaved road being largely unaffected.
Hillmond Investments Ltd. / Central Parkway Mall February 24, 2015: Which side of Burnhamthorpe Road will the new watermain be constructed on?	At the time of the comment, the recommended alignment had not been identified, but was for PIC 2. Once identified, the alignment was communicated via PIC 2 and the Project's website.
Resident February 24 and 25 2015 (PIC Comment Form): Which side of Burnhamthorpe Road will the new watermain be constructed on because of potential property implications?	At the time of the comment, the recommended alignment had not been identified, but was for PIC 2. Once identified, the alignment was communicated via PIC 2 and the Project's website.
Resident February 25, 2015 (PIC Comment Form): Potential implications of the Project on the Cooksville Creek and area wildlife and the need for protection during construction.	Tunnelling of the new watermain underneath Cooksville Creek will avoid potential adverse effects to the natural environment including area wildlife.
Resident March 2, 2015: Why the Project was being installed after Burnhamthorpe Road was recently repaved – indicates a lack of coordination between the City and Region?	The new watermain will be tunnelled to minimize surface disruption during construction resulting in the recently repaved road being largely unaffected. The Region of Peel and City of Mississauga have been coordinating their respective infrastructure projects to more efficiently implement their combined projects including holding regular project meetings with each other.
CityTowers Property Management Inc. March 4, 2015: Anticipated time of construction and will water supply be affected to their property?	The anticipated start of construction is 2017. The water supply to their development will not be adversely affected.
First Avenue Properties Inc. March 16, 2015: Requested a meeting with the Region of Peel.	A meeting would be held at the appropriate time depending upon the recommended alignment of the new watermain and potential implications on First Avenue Properties Inc.
Consultant April 17, 2015: Requested drawings on the Project for inclusion in their development's	The requested drawings will be provided when available (preliminary design drawings are anticipated for October

application.	2015).
Resident April 27, 2015: Potential implications of the Project on the bike path located on the north side of Burnhamthorpe Road west of Cawthra Road. The City and Region of Peel need to improve on overall project coordination in the area.	The new watermain will be tunnelled to minimize surface disruption during construction including potential adverse effects on the bike path, but there still may be some localized impacts (e.g. at shaft sites). The Region of Peel and City of Mississauga have been coordinating their respective infrastructure projects to more efficiently implement their combined projects including holding regular project meetings with each other.
Resident May 31, 2015: Appreciated the Region of Peel keeping them informed of the Project. The new watermain should be tunnelled instead of an open trench to avoid surface disruption to traffic, pedestrians, area residents, etc.	The new watermain will be tunnelled to minimize surface disruption during construction including potential adverse effects on the bike path, but there still may be some localized impacts (e.g. at shaft sites). The Region of Peel and City of Mississauga have been coordinating their respective infrastructure projects to more efficiently implement their combined projects including holding regular project meetings with each other.
Consultant June 1, 2015: Requested information on the Project in relation to their development's proposed watermain connection.	Clarified that the proposed development's watermain connection will not be to the new 1500 mm diameter watermain, but most likely the existing 600 mm diameter watermain.
Brookfield Condominium Services Ltd. June 16 and 19, 2015: Anticipated time of new watermain construction? Proximity of the new watermain on their property and potential implications to their planned landscaping modifications.	The anticipated start of construction is 2017. The watermain proposed on Webb Drive will be constructed entirely within the road's right-of-way.
Resident June 17, 2015 (PIC Comment Form): Supportive of the Project and provided alternate financing options.	Comment noted.
Resident June 17, 2015 (PIC Comment Form): Identified existing concerns with the development being built at the northeast corner of Grand Park Drive and Webb Drive (e.g. traffic congestion, safety, noise, dust, etc.). Construction of the new local distribution watermain needs to take this into account so concerns are exasperated.	A Traffic Management Plan will be prepared as part of detail design for the Project, which will include minimizing potential adverse effects on area roads/traffic including Grand Park Drive and Webb Drive. A Noise and Vibration Management Program will be prepared as part of detail design for the Project, which will include minimizing potential adverse effects (e.g. noise, vibration, dust, etc.) on area residents/businesses.
Consultant June 18, 2015: Requested the PIC 2 displays for the Project.	The requested information was provided via the Project's website.
Consultant June 18, 2015: Requested the PIC 2 displays for the Project.	The requested information was provided via the Project's website.
Resident	

June 19, 2015: Provided alternate financing options for the Project.	Comment noted.
Resident June 19, 2015: Felt PIC 2 was well done and informative, but suggested a number of improvements for the Region of Peel to consider in future public events.	Comment noted for consideration as part of future Region of Peel consultation events.
Resident June 19, 2015: Lack of infrastructure coordination between the City and Region of Peel?	The Region of Peel and City of Mississauga have been coordinating their respective infrastructure projects to more efficiently implement their combined projects including holding regular project meetings with each other.
Consulate Development Group July 7, 2015: Is our property receiving a new shut-off box because of the new watermain and which side of Burnhamthorpe Road is it to be located on?	Since the new watermain is for water supply purposes vs water distribution purposes, no new shut-off box is proposed as part of the Project. The recommended watermain alignment is proposed on the north side of Burnhamthorpe Road between Absolute Avenue and Cawthra Road.

4.6 Identification of the Preferred Alternative

The recommended alternative (Alternative 5) was confirmed as the preferred alternative for the Project based on the process outlined in the Municipal Class EA, namely:

- Identify a recommended alternative (Step 4 of Phase 2)
- Consult review agencies, First Nations and Métis organizations and the public on the recommended alternative (Step 5 of Phase 2)
- Confirm or select the preferred alternative based on comments received (Step 6 of Phase 2)

Identification of a Recommended Alternative

Alternative 5 was identified as the recommended alternative based on the results of applying the finalized evaluation criteria and indicators through a 'net effects analysis' followed by a comparative evaluation of the net effects. Alternative 5 addresses the Project's problem/opportunity statement, has a number of technical advantages over the other alternative alignments considered and minimizes potential adverse environmental effects through impact management measures.

Consultation on the Recommended Alternative

In accordance with the Municipal Class EA Planning and Design Process, Alternative 5 was presented as the recommended alternative to review agencies, First Nations and Métis organizations and the public for their input. A range of consultation activities were carried out to solicit input from review agencies, First Nations, Métis organizations and the public including project website updates, notifications, PICs and individual meetings.

No opposition to Alternative 5 was received through the consultation activities carried out. Instead, most of the comments received were related to the following:

- The need to closely coordinate the delivery of infrastructure projects in the area between the City of Mississauga and Region of Peel
- The need to tunnel the new watermain versus open cut to reduce surface disruption
- The location of the new watermain in relation to adjacent properties and any potential implications

- The anticipated timing for constructing the new watermain
- The requests received for either the PIC 2 displays or Project related information (e.g. reports, drawings) for review/consideration

Confirmation of the Preferred Alternative

Following a review and consideration of comments received, the recommended alternative (Alternative 5) was confirmed as the Preferred Alternative (**Figure 18**).

5. Description of the Preferred Alternative

5.1 Detailed Description of the Preferred Alternative

5.1.1 New 1500 mm Diameter Watermain

Preferred Horizontal Alignment of the New Watermain

The new 1500 mm diameter watermain will be installed along Burnhamthorpe Road in the City of Mississauga, from Grand Park Drive to Cawthra Road (**Figure 18**). The watermain will be constructed in three drives using traditional rock TBMs, microtunnelling, or a combination of both.

The first drive will travel from the launch shaft at Hurontario Street (southeast corner, S3), curving to the north side of Burnhamthorpe Road, going west towards the Grand Park Drive (southeast corner, S1b) retrieval shaft. Alternatively, the first drive would proceed from the launch shaft at Grand Park Drive (southeast corner, S1b), curving to the north side of Burnhamthorpe Road, going east towards the Hurontario Street (southeast corner, S3) shaft.

The second drive from S3 will immediately curve to the north side of Burnhamthorpe Road and proceed east to shaft site S4b between Cooksville Creek and Central Parkway East, which will double as a retrieval shaft for the second drive and launch shaft for the third drive. The third drive will travel along the north side of Burnhamthorpe Road eastwards to Cawthra Road (northeast corner, S5) where the TBM will be retrieved once tunnelling was complete. The following table provides the tunnel drive lengths between launch and retrieval shafts for the preferred alternative:

Shaft Number	Shaft Type	Shaft Intersection Location	Tunnel Drive Length		
S1b	Launch / Retrieval	Southeast corner of Grand Park Drive and Burnhamthorpe Road	S3↔S1b 1600 m	S3→S4b 900 m	S4b→S5 1100 m
S3	Launch / Retrieval	Southeast corner of Hurontario Street and Burnhamthorpe Road			
S4b	Launch / Retrieval	Northwest corner of Central Parkway East and Burnhamthorpe Road			
S5	Retrieval	Northwest corner of Cawthra Road and Burnhamthorpe Road			

Vertical Alignment of the New Watermain

The watermain tunnel will be constructed using a rock TBM to pass through the slightly weathered to fresh Georgian Bay shale bedrock beneath Burnhamthorpe Road, between Grand Park Drive and Cawthra Road. The vertical alignment is constrained by the need to avoid the deep sanitary sewer between Kariya Drive and Central Parkway East and the depth of Cooksville Creek. The scour depth of the Creek was verified by a geomorphologist review of an existing scour report (**Appendix 2A**). The crown of the tunnel must pass a minimum of two tunnel diameters below the existing sewer and scour depth of the creek.

The vertical alignment of the tunnel will begin at a depth of approximately 13 m at Hurontario Street and slope downwards in the westerly drive to a depth of 16 m at Grand Park Drive (**Figure 18**). The easterly drive will pass beneath the two branches of the Cooksville Creek and the sanitary sewer, sloping downwards from Hurontario Street to Central Parkway East to a depth of 22 m. At Central Parkway East, the drive will continue with an upwards slope to a depth of 17 m at Cawthra Road.

In addition to constructing the new 1500 mm diameter watermain, the Region of Peel is planning on undertaking a number of complementary water infrastructure improvements at the same time including a number of interconnections, local connections and local distribution watermains.

5.1.2 Required Interconnections and Local Connections

Six interconnections between the existing 600/750 mm and 1050 mm diameter watermains and the new 1500 mm diameter watermain are required to maintain pressure in the water system within acceptable limits. In addition, three local connections are required to improve the pressure in the local distribution system and ensure service requirements to the MCC area are achieved. **Table 15** describes the required interconnections and local connections, as illustrated in **Figure 7**.

Table 15: Descriptions of the Required Interconnections and Local Connections

Connection Site	Location on Burnhamthorpe Road	Connection Type (diameter watermain)
C1A	Southeast corner of intersection with Grand Park Drive	Local connection 400 mm
C1	North side, bet. Confederation Pkwy and Living Arts Drive	Interconnection to 600 mm
C2	North side, intersection of Duke of York Boulevard	Local connection to 600 mm
C3	North side, east of Duke of York Boulevard	Interconnection to 600 mm
C4	Northwest corner of intersection with Hurontario Street	Local connection to 750 mm
C5	North side, between Hurontario Street and Absolute Ave.	Interconnection to 750 mm
C6	Northwest corner of intersection with Central Parkway East	Local connection to 400 mm
C7	Northwest corner of intersection with Cawthra Road	Interconnection to 900 mm
C8	Northeast corner of intersection with Cawthra Road	Interconnection to 1050 mm
C9	Northeast corner of intersection with Cawthra Road	Interconnection to 1500 mm

5.1.3 Construction of the New Watermain

Shaft S3 / Connection Site C4 and C5

A primary construction site will be located on the south east corner of Hurontario Street and Burnhamthorpe Road within an open green space owned by the City of Mississauga (City). A temporary easement (0.74 acre) and permanent easement (0.14 acre) are required for constructing the new watermain and locating a permanent valve chamber at the area. The City has agreed to both easements during consultation with them as part of the Project. A 19 m diameter shaft will be used to launch the TBM for the easterly tunnel drive towards S4b at Central Parkway East and westerly tunnel drive towards S1b near Grand Park Drive.

For the westerly drive, the TBM will travel from shaft site S3 in a northwest direction and curve to align under the boulevard at the north side of Burnhamthorpe Road. For the easterly drive, the TBM will travel from shaft site S3 in a northeast direction and curve to align under the boulevard at the north side of Burnhamthorpe Road. After tunnelling is completed and the new watermain has been installed, a valve chamber will be constructed within the shaft to allow for installation of a connection from the new watermain to the existing 750 mm diameter Burnhamthorpe watermain and for a stub-end for connection to a planned future local distribution watermain.

To achieve these connections, the connecting pipes must pass below Burnhamthorpe Road to the north east corner at Hurontario Street to connect to the existing watermain and to the northwest

corner at Hurontario Street for a planned future local watermain. At these locations, a shaft will be extended to the existing or planned watermain depth (~25m) and a chamber will be built to allow for installation of the required connection and valving. A trenchless method will be used to extend the pipes below Burnhamthorpe Road so traffic disruption is avoided.

Connection Site C2 and C3

The westerly tunnel drive will then continue on the north side of Burnhamthorpe Road towards Duke of York Boulevard. At this location an interconnection (C3) between the new and existing Burnhamthorpe watermain is required, along with a local connection (C2) to the planned local distribution watermain on Duke of York Boulevard. A construction area within the boulevard and extending into a temporary easement on the Morguard property to the east of Duke of York Boulevard will be used to construct a shaft extending to the depth of the new watermain.

A chamber will be constructed to allow for the installation of the two required connections and necessary valving. A second shaft will extend to the depth of the existing watermain and chamber constructed to complete the connection between the new and existing watermains. A staged open cut trench will cross Duke of York Boulevard, where a third shaft will extend to the depth of the planned Duke of York Boulevard local distribution watermain (which will be constructed concurrently with the new Burnhamthorpe watermain). A chamber will be constructed to complete the connection to the planned local distribution watermain with the necessary valving.

Connection Site C1

The westerly tunnel drive will then continue on the north side of Burnhamthorpe Road towards an open boulevard area approximately 150 m east of Confederation Parkway, next to the YMCA building (C1). Consultation with YMCA has allowed for a temporary easement for use of this portion of land for construction purposes. The construction footprint extends into the boulevard and into a lane of traffic to facilitate the construction. A shaft will be constructed extending to the depth of the new watermain.

A chamber will be constructed within the shaft to allow for the installation of an interconnection between the existing and new Burnhamthorpe watermains as well as necessary valving. A second shaft will be constructed extending to the depth of the existing Burnhamthorpe watermain. A chamber will be constructed within the shaft to allow for installation of a local connection to the existing watermain. An additional stub-end will be installed within this chamber to facilitate a local connection to a future planned local distribution watermain on Confederation Parkway.

Shaft 1b / Connection Site C1A

The westerly tunnel drive will then continue on the north side of Burnhamthorpe Road before curving to the south side of Burnhamthorpe Road, approximately 100 m east of Grand Park Drive. The currently undeveloped land parcel between Confederation Parkway and Grand Park Drive south of Burnhamthorpe Road is owned by Rogers Telecommunications Investments Ltd. Rogers has plans to develop the land parcel from east to west.

To avoid interfering with Rogers' development plans, a temporary easement for the far west side of the land parcel will be acquired and the new watermain constructed before the Rogers development begins. Within the construction footprint, the tunnel drive will end in a 17 m diameter shaft where the TBM will be retrieved. A chamber will be constructed within the shaft to allow for the installation of a stub-end and necessary valving and facilitate future connections to watermains in the area.

A permanent easement here is critical for the watermain connection through the property and the valve chamber. If portions of this land are dedicated to public roadway in the future it would eliminate the need for this permanent easement.

Shaft 4b / Connection Site C6

The easterly tunnel drive will be on the north side of Burnhamthorpe Road towards Central Parkway East. At this location a local connection is required between the new watermain and an existing local watermain on Central Parkway East. An area within the boulevard and extending into a temporary easement on City owned land approximately 100 m west of Central Parkway East will be used to construct a shaft extending to the depth of the new watermain.

This shaft will be used to retrieve and relaunch the TBM. A chamber will be constructed to allow for the installation of a local connection and necessary valving. An open cut trench will be extended from the shaft to a second shaft at the west side of Central Parkway East. The second shaft will extend to the depth of the existing watermain and a chamber constructed to complete the connection between the new watermain and the local distribution watermain.

Shaft S5 / Connection Site C7, C8 and C9

The easterly tunnel drive will then continue on the north side of Burnhamthorpe Road towards Cawthra Road. Two construction sites at Cawthra Road will facilitate three interconnections between the new Burnhamthorpe Road watermain and the existing Burnhamthorpe and MCC watermains and the retrieval of the TBM. The construction site within the boulevard at the north east corner at Cawthra Road (S5) and extending into the turning lane on Burnhamthorpe Road will be used for the construction of a shaft extending to the depth of the new watermain.

A chamber will be constructed within the shaft to allow for the installation of an interconnection between the new watermain and the existing Burnhamthorpe (C9) and MCC watermains (C8) as well as all necessary valving. The construction site within the boulevard at the northwest corner at Cawthra Road will be used for the construction of a shaft extending to the depth of the new watermain. A chamber will be constructed to complete the connection (C7) between the new watermain and the stub-end connection from the MCC watermain and necessary valving.

5.1.4 Local Distribution Watermains to Further Bolster Water Supply

In conjunction with the new 1500 mm diameter watermain, the Region of Peel is planning to carry out complementary water infrastructure upgrades to bolster water supply to the MCC, including:

- A new 600 mm diameter local distribution watermain along Duke of York Boulevard from Webb Drive to City Centre Drive
- A new 400 mm diameter local distribution watermain from Kariya Drive, running west along Webb Drive and north up Grand Park Drive to Burnhamthorpe Road West

The Region of Peel is planning to build the Webb Drive local distribution watermain by open-cut construction whereby a trench is dug and the watermain is placed in the trench followed by backfilling, compaction and restoration to previous conditions. The Duke of York Boulevard and Grand Park Drive local distribution watermains will be mostly constructed by trenchless methods to minimize surface disturbance.

Both watermains will be constructed predominantly within the existing road right-of-ways, resulting in limited property requirements (i.e. acquisition or temporary or permanent easements) associated with either proposed watermain. The exception is for the land east of Webb Drive to Kariya Drive

which is currently privately owned. The Region of Peel would not be able to construct the watermain unless this land was dedicated to the City of Mississauga as part of the future extended Webb Drive right-of-way, or the Region acquired the land from the private owner. Alternatively, construction of this section of watermain may be deferred until such time as the land ownership status is resolved.

5.1.5 Construction Materials

The new Burnhamthorpe Road watermain will be a 1500 mm diameter concrete pressure pipe with varying sizes of interconnection and local connection concrete pressure pipes. Valve chambers will be required for appropriate valving and connections and will be constructed as cast-in-place reinforced concrete structures. The local distribution watermains will be either concrete pressure pipes and/or polyvinyl chloride (PVC) pipes.

5.2 Commitments and Monitoring for the Preferred Alternative

The net effects associated with the Preferred Alternative were confirmed based on the more detailed analysis of the preferred alternative. The Region of Peel's intention is to undertake a number of complementary water infrastructure improvements at the same time as constructing the new 1500 mm diameter watermain. The potential effects, proposed impact management measures and resultant net effects associated with these improvements were identified and included along with those confirmed for Alternative 5 (**Table 16**). The confirmation of the net effects has been presented in the same order as the environment is described in *Section 4.2*.

Table 16 summarizes the proposed impact management measures and required pre-construction, construction and/or post-construction environmental monitoring associated with implementation of the preferred alternative. These will be further developed during detailed design.

The Region of Peel has made a number of commitments regarding the proposed impact management and compensation measures, monitoring requirements and in response to consultation activities carried out during the Burnhamthorpe Road Watermain Class EA. **Table 17** summarizes the commitments made for the Project under the following headings:

- Brief commitment description
- Project File section where the commitment is mentioned
- Commitment timing (when the commitment will be implemented)
- How the commitment will be monitored for compliance (i.e. fulfilled)

The commitments have been further grouped into one of the following categories:

- General (not specific to a particular environmental category or the result of consultation)
- Environment (Natural, Built, Social Environment, etc.)
- Consultation (in response to a particular issue raised during Class EA consultation)

The Region of Peel is committed to ensuring that the preferred alternative and complementary water infrastructure improvements are constructed and operated in accordance with the Municipal Class EA planning and design process followed and conclusions reached.

Table 16: Summary of Net Effects and Proposed Monitoring Programs for Preferred Alternative

Category	Criteria	Potential Effects	Impact management Measures	Net Effects	Proposed Monitoring Programs
Natural Environment	Effect on groundwater	<ul style="list-style-type: none"> Short-term effect on groundwater quality/quantity of shafts and tunneling intersecting the water table and bedrock groundwater at some sites. As contaminated soil / groundwater is located in areas of proposed tunneling/excavation, potential long-term effect on groundwater quality/quantity from mobilization of contaminated water from environmentally-impaired sites nearby due to construction-related groundwater takings. 	<ul style="list-style-type: none"> Develop and implement a groundwater monitoring and impact management program during detailed design, including contingency measures. Apply standard construction management measures to minimize the extent of temporary dewatering required during construction (e.g. excavations below the water table would be avoided where possible; use of sealed shafts and temporary groundwater cut-off structures where appropriate; storage and refuelling of equipment will be conducted exclusively in designated spill protection areas, etc.). Engage a Qualified Person (as defined under Ontario Reg. 511/09) to direct the appropriate management of potentially contaminated soil / water, consistent with Part XV.1 of the Environmental Protection Act and O.Reg. 153/04, Records of Site Condition). 	<ul style="list-style-type: none"> No short-term or long-term groundwater quality and quantity impacts would occur provided standard construction impact management measures are applied and potentially contaminated soil / water is appropriately managed. 	<ul style="list-style-type: none"> Conduct pre-construction activities to establish baseline conditions Consultation with the MOECC Central Region will take place as part of detailed design to confirm any approval requirements for water takings (e.g. a Permit to Take Water) during construction or operation, along with associated discharge water quality and quantity monitoring and mitigation programs. If any private domestic wells are discovered, affected well owners will be engaged and continue to have water of appropriate quality and in adequate quantities supplied for the duration of construction. Any work done on affected wells or any replacement wells will be completed pursuant to O.Reg. 903, Wells (Ontario Water Resources Act). Conduct construction phase activities to verify the amount of the anticipated water takings and groundwater level changes at active construction water taking locations. Conduct post-construction monitoring (verify aquifer recovery (80 percent) subsequent to the proposed active construction water takings).
	Effect on surface water	<ul style="list-style-type: none"> Short-term effects on surface water quantity as a result of construction-related dewatering activities at shaft site 4b (less than 250 m from Cooksville Creek). Short-term effects on water quality from surface water-borne sediment and contaminants via stormwater discharge from shaft site 4b. 	<ul style="list-style-type: none"> Develop and implement a Stormwater Management Plan (consistent with the MOECC Stormwater Management Planning and Design Manual (2003), incorporating erosion and sediment control measures – in consultation with CVC and consistent with the Erosion and Sediment Control Guidelines for Urban Construction (2006), during construction Develop and implement a Spill Response Plan and train construction staff on associated procedures. Apply standard construction management measures to minimize short-term effects on surface water quality during construction Establish protective fencing to demarcate a 10 m buffer from the top of Cooksville Creek valley slope to prevent construction at S4b from affecting the CVC Regulated Area. 	<ul style="list-style-type: none"> Short-term effects on surface water quality and quantity as a result of construction activities would be managed through the use of appropriate construction methods, including the development and implementation of an Erosion and Sediment Control Plan. 	<ul style="list-style-type: none"> Daily construction phase monitoring to ensure the adequacy and efficacy of Erosion and Sediment Control measures. A construction phase surface water monitoring program will be developed during detailed design, with the purpose of ensuring mitigation measures are effective/adequate.

Category	Criteria	Potential Effects	Impact management Measures	Net Effects	Proposed Monitoring Programs
	Effect on street trees and vegetation	<ul style="list-style-type: none"> Removal of approximately 37 trees along with herbaceous and woody vegetation associated with the following construction sites: <ul style="list-style-type: none"> S1b: 2+ successional trees S3: 8+ mature trees S4b: 4+ street trees and vegetation S5: 4+ trees C1: 4+ trees C3: 5+ trees C5: 4+ trees C7: 5+ trees 	<ul style="list-style-type: none"> Avoid the removal of street trees and vegetation where possible as part of detailed design and construction site planning Develop and implement a Tree Preservation and Restoration Plan, including: identifying trees to be protected, removed and/or transplanted; standard root zone protections and; tree replacement at a ratio of 1:1, with a focus on native, non-invasive, salt-tolerant species to the extent possible. Install and maintain protective fencing to delineate the construction areas immediately adjacent to natural areas so the temporary disturbance of natural vegetation during construction would be avoided. 	<ul style="list-style-type: none"> Removal of approximately 37 trees and vegetation would be minimized where possible and compensated for by implementing a Tree Preservation and Restoration Plan 	<ul style="list-style-type: none"> Undertake post-construction monitoring to confirm the survival of new- / trans-plantings under the Tree Preservation and Restoration Plan and monitor the presence of invasive species in the re-planted / re-vegetated areas (once per growing season for two years following initial planting).
Built Environment	Effect on property	<ul style="list-style-type: none"> 6 temporary easements and 2 permanent easement would be required from property owners for construction sites outside of the Burnhamthorpe Road right-of-way as follows: <ul style="list-style-type: none"> S1b: Private land owned by Rogers. One temporary and one permanent easement required. C3: Private land owned by Morguard Corporation. A temporary easement is critical for use of the land as a construction site for a connection shaft. S3: Public land owned by the City of Mississauga. One small permanent easement required. One temporary easement required. S4b: Public land owned by the City of Mississauga. Temporary easement required. S5: Land owned by private owner. Temporary easement may be required. C1: Private land owned by the YMCA. Temporary easement required. 	<ul style="list-style-type: none"> Provide market value compensation to affected private property owners and as per agreements with the City of Mississauga, in accordance with Region of Peel protocols. 	<ul style="list-style-type: none"> The property owners associated with the 6 temporary easements and 2 permanent easements required for construction sites outside of Burnhamthorpe Road right-of-way would be compensated for in accordance with Region of Peel protocols. 	<ul style="list-style-type: none"> No specific monitoring program is proposed.
	Effect on existing residences, businesses and/or community, institutional and recreational facilities	<ul style="list-style-type: none"> Short term construction related effects (e.g. loss of access to sidewalks, disruption to bus stops, interruption of the multi-use trail, aesthetic effects on nearby residents and businesses, etc.), associated with following surface construction sites: <ul style="list-style-type: none"> S1b: Aesthetic effects on nearby condo residents. 	<ul style="list-style-type: none"> Develop and implement a Traffic Management Plan, including sign-posted pedestrian / trail detours; relocated bus stops; etc. Shroud construction sites to mitigate adverse aesthetic effects at street level and up to third-floor Establish a complaints management protocol prior to the start of construction and implement 	<ul style="list-style-type: none"> Temporary adverse effects from surface construction sites would be avoided where possible and minimized through the development and implementation of a Traffic Management Plan and shrouding of construction sites, but there would still be short-term inconveniences to pedestrians, transit users, etc. and adverse aesthetic effects for occupants above the third-floor level in close 	<ul style="list-style-type: none"> No specific monitoring program is proposed.

Category	Criteria	Potential Effects	Impact management Measures	Net Effects	Proposed Monitoring Programs
		<ul style="list-style-type: none"> - S3: Disruptive effects on sidewalk and bus stop. Aesthetic effects on nearby condo residents. - S4b: Disruptive effects on multi-use trail and sidewalk. Aesthetic effects on nearby houses. - S5: Disruptive effects on multi-use trail. Aesthetic effects on nearby houses. - C1: Disruptive effects on sidewalk. Aesthetic effects on nearby businesses. - Local Connection: Limited access to Central Library parking ramp during construction. - C3: Disruptive effects on sidewalk and pedestrian crossing. Aesthetic effects on nearby office/Civic Centre/Council offices. Access to local businesses and shopping area. - C7: Disruptive effects on multi-use trail, sidewalk, pedestrian crossing and street art installation. - C9: Disruptive effects on bus stop, multi-use trail, sidewalk and pedestrian crossing. 	<p>for the duration of the construction contract to address complaints arising from disruptive or aesthetic effects.</p>	<p>proximity to the surface construction sites.</p>	
	Effect of vibration on existing buildings	<ul style="list-style-type: none"> • Short-term construction related vibration effects at the following construction sites if vibrations exceed 5 mm/sec: <ul style="list-style-type: none"> - S1b: High potential of effects on residences along Wallenberg Crescent and adjacent condo building. - S3: Low to moderate potential of effects on condo building located southeast of site and low potential of effects on condo buildings located along south-side of Burnhamthorpe Road. - S4b: Moderate to high potential of effects on residences located along King Andrew Drive and low to moderate potential of effects on condo building located on south-side of Burnhamthorpe Road. - S5: Moderate potential of effects on residences located along Greycedar Crescent - C1: Low potential of effects on condo building located on the south-side of Burnhamthorpe Road. Moderate potential of effects on YMCA building. - C3: Low potential of effects on condo buildings located on the south-side of Burnhamthorpe Road and office building on 	<ul style="list-style-type: none"> • Develop and implement a Vibration Management Program during construction (e.g. undertake pre-construction property surveys of all properties within 30 m of surface construction sites (zone of direct influence), consult with affected property owners, apply good management practices for noise and vibration reduction, etc.). • Circulate special notifications to the surrounding property owners within the zone of influence prior to the start of construction to advise them of the construction activity and to offer a pre-construction inspection of their property/building. • Establish a complaints management protocol prior to the start of construction and implement for the duration of the construction contract to address complaints arising from vibration. • Adhere to MoECC vibration limits in NPC-207 	<ul style="list-style-type: none"> • Short-term construction related vibration effects would be minimized by the development and implementation of a Vibration Management Program during construction and adherence to NPC-207 limits, but residual effects on the condo building and residences in close proximity to site S4b would potentially remain. 	<ul style="list-style-type: none"> • Undertake pre-construction (e.g. surveys and video records of the four residences located along King Andrew Drive within the anticipated 30 m zone of direct influence associated with site S4b) and construction vibration monitoring. • Monitoring arrays should be installed prior to the commencement of construction past the Amacon development, the YMCA, and the Central Library buildings as well as past the two Cooksville Creek sanitary pipelines (750 and 1200DN). • Additional arrays may be considered at key shaft sites however this will be subject to their proximity to any potentially sensitive structures and an assessment of whether it will be practical to ensure that damage to the installations by construction traffic can be avoided. • Furthermore, vibration monitoring should be installed in and adjacent to the basements of the Amacon development, the YMCA, and the Central Library buildings.

Category	Criteria	Potential Effects	Impact management Measures	Net Effects	Proposed Monitoring Programs
		<p>north.</p> <ul style="list-style-type: none"> - C5: Low potential of effects on condo buildings located on the south-side of Burnhamthorpe Road - C7: Moderate potential of effects on townhouses and condo building located to the north of the site. 			
	Effect on existing road infrastructure	<ul style="list-style-type: none"> • Short-term excavation of portions of Burnhamthorpe Road at surface construction sites and for 2 road crossings and longer term pavement settlement where the preferred horizontal alignment is situated under the travelled portion of Burnhamthorpe Road (approximately 15% of the alignment). 	<ul style="list-style-type: none"> • Reconstruct excavated portions of Burnhamthorpe Road at surface construction sites and for 2 road crossings to meet City of Mississauga road design standards. • Complete additional geotechnical investigations during detailed design to better characterize geotechnical conditions and specify appropriate tunnelling and shaft construction methodologies. • Minimize the portion of the new watermain's horizontal alignment under the travelled portion of Burnhamthorpe Road as much as possible during detailed design. 	<ul style="list-style-type: none"> • The short-term excavated portions of Burnhamthorpe Road would be reconstructed to City of Mississauga road design standards and the longer term settlement of pavement on Burnhamthorpe Road would be minimized. 	<ul style="list-style-type: none"> • Undertake pavement settlement monitoring during construction of the new watermain where the alignment is under the travelled portion of Burnhamthorpe Road
	Effect on existing utility infrastructure	<ul style="list-style-type: none"> • Conflicts with existing utility infrastructure at surface construction sites as follows: <ul style="list-style-type: none"> - S1b: Overhead utility lines and poles along the north side of the shaft compound - S3: Substantial overhead utility lines, poles and anchor points, streetlight poles surrounding site and electrical/telephone box - S4b: Sub-surface sanitary sewer; single overhead utility line/pole and anchor points; streetlight poles; trail light poles. - S5: Single streetlight pole and trail light pole. - C1: Single streetlight pole - C3: Single streetlight pole, 2 traffic lights, overhead lines/poles/anchor points and electrical/telephone box - C5: Single streetlight pole and overhead lines/poles. - C7: Overhead utility lines, poles and anchor points; 2 streetlight poles; and a single traffic light pole. 	<ul style="list-style-type: none"> • Confirm in consultation with utility providers locations of all above and/or below ground utility infrastructure prior to construction • Revise the design of the new watermain to minimize conflicts with existing utility infrastructure as much as possible during detailed design • Relocate utility infrastructure as required as part of pre-construction activities. 	<ul style="list-style-type: none"> • Conflicts with above and/or below ground utility infrastructure during construction would be minimized by consulting with utility providers, revising the design of the new watermain and relocating affected utility infrastructure as required. 	<ul style="list-style-type: none"> • No specific monitoring program is proposed.
	Effect of environmental impairment areas	<ul style="list-style-type: none"> • Encountering of contaminants at the following 4 construction sites due to their proximity to areas of (potential) environmental impairment: 	<ul style="list-style-type: none"> • Undertake additional investigations of potential areas of environmental impairment to determine actual degree of contamination 	<ul style="list-style-type: none"> • The encountering of contaminants at 4 construction sites due to their proximity to areas of (potential) environmental impairment 	<ul style="list-style-type: none"> • Undertake pre-construction baseline soil sampling and construction phase soil management consistent with Part XV.1 of the

Category	Criteria	Potential Effects	Impact management Measures	Net Effects	Proposed Monitoring Programs
		<ul style="list-style-type: none"> - S3: AEI 1 (via groundwater) - S5: AEI 3 - C5: PAEI 1 (via groundwater) - C7: AEI 3 	<p>during detailed design</p> <ul style="list-style-type: none"> • Revise the design of the new watermain to minimize the potential for encountering contaminants during construction as much as possible during detailed design • Minimize the amount of temporary dewatering required during construction by specifying sealed (undrained) shaft construction in the overburden and temporary groundwater cutoff structures where appropriate. • Use good management practices for construction in the vicinity of areas of environmental impairment, including: <ul style="list-style-type: none"> - Development and implementation of contingency measures and spill response plans - Use of appropriate personal protective equipment • Engage a Qualified Person (as defined under Ontario Reg. 511/09) to direct appropriate management of potentially contaminated soil and/or water. • Develop a Soil Management Plan (consistent with Part XV.1 of the Environmental Protection Act and O.Reg. 153/04, Records of Site Condition) to govern how any contaminated soil/water encountered will be handled and disposed of. 	<p>would be minimized by determining the actual degree of contamination and redesigning the new watermain accordingly where possible prior to construction, limiting dewatering, using good construction management practices and engaging a Qualified Person.</p>	<p>Environmental Protection Act and O.Reg. 153/04, Records of Site Condition) to govern how any contaminated soil/water encountered will be handled and disposed of.</p>
Social Environment	Effect on traffic	<ul style="list-style-type: none"> • Short-term increase in construction related truck traffic associated with surface construction sites (S1b, S3, S4b and S5) • Temporary closure of traffic lanes to accommodate surface construction sites at: <ul style="list-style-type: none"> - C1: Burnhamthorpe Road - westbound travel direction reduced to 2 lanes between Confederation and Duke of York. - C7: Cawthra Road – southbound right turn lane and westbound Burnhamthorpe Road bus lane to be closed during construction. Intersection expected to operate over capacity with 2 minute delay during afternoon peak. • Short-term removal of 12 on-street parking spaces at C3. 	<ul style="list-style-type: none"> • Develop and implement a Traffic Management Plan during construction in accordance with the Region of Peel's protocols and consultation with the City of Mississauga, transit providers (MiWay, MetroLinx, etc.). 	<ul style="list-style-type: none"> • The short-term adverse effects associated with an increase in construction related truck traffic and temporary closure of traffic lanes would be minimized by developing and implementing a <i>Traffic Management Plan</i>; however, 12 on-street parking spaces would be removed for the period of construction at C3. 	<ul style="list-style-type: none"> • No specific monitoring program is proposed.
	Effect of noise	<ul style="list-style-type: none"> • Short-term construction related noise and 	<ul style="list-style-type: none"> • Develop and implement a Noise and Vibration 	<ul style="list-style-type: none"> • Short-term construction related noise and 	<ul style="list-style-type: none"> • Undertake reactive noise monitoring in

Category	Criteria	Potential Effects	Impact management Measures	Net Effects	Proposed Monitoring Programs
	and perceptible vibration on sensitive receptors	<p>vibration effects are anticipated in proximity to surface construction sites as follows:</p> <ul style="list-style-type: none"> - S1b: High potential of effects on residences along Wallenberg Crescent and adjacent condo building. Customers of the adjacent commercial plaza to the west of Grand Park Drive. - S3: Low to moderate potential of effects on condo building located southeast of site and low potential of effects on condo buildings located along south-side of Burnhamthorpe Road. - S4b: Moderate to high potential of effects on residences located along King Andrew Drive and low to moderate potential of effects on condo building located on south-side of Burnhamthorpe Road. - S5: Moderate potential of effects on residences located along Greycedar Crescent. Existing concrete noise wall will provide some noise protection to nearby residents at ground level; higher potential to second storey windows. - C1: Moderate potential of effects on YMCA building. Low potential of effects on condo building located on the south-side of Burnhamthorpe Road and receptors located north of City Centre Drive. - C3: Low potential of effects on condo buildings located on the south-side of Burnhamthorpe Road and office building on north. - C5: Low potential of effects on condo buildings located on the south-side of Burnhamthorpe Road - C7: Moderate to high potential of effects on townhouses located to the north of the site. Low potential of effects on surrounding condo buildings. 	<p>Management Program during construction (e.g. consult with affected property owners, apply good management practices for noise and vibration reduction, etc.).</p> <ul style="list-style-type: none"> • Adhere to MOECC NPC-115; MOECC Noise Limits in Environmental and Land Use Planning Guidelines; applicable regional / municipal by-laws, including City of Mississauga 'Noise Control By-law 360-79' • Circulate special notifications to the surrounding property owners within the zone of influence prior to the start of construction to advise them of the construction activity. • Establish a complaints management protocol prior to the start of construction and implement for the duration of the construction contract to address complaints arising from noise and/or vibration. 	<p>vibration effects would be minimized by the development and implementation of a Noise and Vibration Management Program during construction and adherence to MOECC NPC-115; MOECC Noise Limits in Environmental and Land Use Planning Guidelines and applicable regional / municipal by-laws, including City of Mississauga 'Noise Control By-law 360-79', but residual effects on the condo building and residences in close proximity to site S4b would potentially remain.</p>	<p>response to complaints if warranted.</p>
	Effect of dust on sensitive receptors	<ul style="list-style-type: none"> • Short-term increase in dust in proximity to all surface construction sites 	<ul style="list-style-type: none"> • Apply good management practices to mitigate any air quality impacts caused by construction dust, consistent with Cheminfo Services Inc. <i>Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities (2005)</i> (e.g. install a mud mat (asphalt, concrete, gravel) at each surface construction site, employ regular road sweeping, undertake dust suppression, etc.) 	<ul style="list-style-type: none"> • Short-term construction-related effects of dust would be minimized by applying standard construction mitigation measures. 	<ul style="list-style-type: none"> • No specific monitoring program is proposed.

Category	Criteria	Potential Effects	Impact management Measures	Net Effects	Proposed Monitoring Programs
Economic Environment	Synergy with approved or planned projects	<ul style="list-style-type: none"> Numerous approved / planned projects identified with good potential for coordination during detailed design and construction, including: Planned development of the site between Burnhamthorpe Road and Webb drive, with S1b on the west portion of the property (rather than east) which is not due for construction until 2018-20, after the 1500 mm diameter watermain. Good synergy with the planned Hurontario-Main LRT. 	<ul style="list-style-type: none"> No mitigation measures required. 	<ul style="list-style-type: none"> Numerous approved / planned projects identified with good potential for coordination during detailed design and construction, including: Planned development of the site between Burnhamthorpe Road and Webb drive, with S1b on the west portion of the property (rather than east) which is not due for construction until 2018-20, after the 1500 mm diameter watermain. Good synergy with the planned Hurontario-Main LRT.. 	<ul style="list-style-type: none"> No specific monitoring program is proposed.
Cultural Environment	Effect on archaeological resources and areas of archaeological potential	<ul style="list-style-type: none"> Uncovering of archaeological resources 	<ul style="list-style-type: none"> If archaeological sites are discovered during construction of the Project, appropriate action will be taken, including a cessation of construction work on the affected site, consultation with aboriginal communities and adherence to Ministry of Tourism, Culture and Sport guidelines. 	<ul style="list-style-type: none"> No known archaeological sites or resources would be adversely affected. However, if deeply buried archaeological sites are discovered during construction of the Project, then appropriate action will be taken, including a cessation of construction work on the affected site, consultation with aboriginal communities and adherence to Ministry of Tourism, Culture and Sport guidelines. 	<ul style="list-style-type: none"> No specific monitoring program is proposed.
	Effects on significant cultural heritage resources	<ul style="list-style-type: none"> No displacement or disruption of built heritage resources or cultural heritage landscapes. 	<ul style="list-style-type: none"> No mitigation measures required 	<ul style="list-style-type: none"> No built heritage resources or cultural heritage landscapes would be displaced or disrupted. 	<ul style="list-style-type: none"> No specific monitoring program is proposed.

Table 17: Class EA Commitments and Compliance Monitoring

Category	ID #	Commitment Description	Project File Report Section(s) and/or Supporting Document	Commitment Timing
General	1.	Required permits and approvals will be obtained for the Preferred Alternative	Section 5	Pre-Construction, Construction
	2.	Any unforeseen change to the Preferred Alternative will be reviewed by the Region of Peel to determine if it should follow the Municipal Class EA addendum process	Not specified	Pre-Construction, Construction
	3.	The impact management measures and proposed monitoring programs associated with the Preferred Alternative will be implemented unless they are determined and documented to be no longer applicable or required.	Section 5	Pre-Construction, Construction
Natural Environment	4.	Develop and implement a groundwater monitoring and impact management program	Section 5	Pre-Construction, Construction
	5.	Consult with the MOECC Central Region as part of detailed design to confirm any approval requirements for water takings (e.g. a Permit to Take Water) during construction or operation, along with associated discharge water quality and quantity monitoring and mitigation programs.	Section 5	Pre-Construction, Construction
	6.	If any private domestic wells are discovered, affected well owners will be engaged and continue to have water of appropriate quality and in adequate quantities supplied for the duration of construction. Any work done on affected wells or any replacement wells will be completed pursuant to O.Reg. 903, Wells (Ontario Water Resources Act).	Section 5	Pre-Construction, Construction
	7.	Develop and implement a Stormwater Management Plan (consistent with the MOECC <i>Stormwater Management Planning and Design Manual (2003)</i>), including erosion and sediment control measures	Section 5	Pre-Construction, Construction
	8.	Develop and implement a Spill Response Plan	Section 5	Pre-Construction, Construction
	9.	Develop and implement a Tree Preservation and Restoration Plan	Section 5	Pre-Construction, Construction
Built Environment	10.	Pre-construction surveys and video records of the four buildings within 30 m of the proposed shaft site S4b will be completed.	Noise and Vibration Impact Assessment Report	Pre-Construction
	11.	Develop and implement a Vibration Management Program	Noise and Vibration Impact Assessment Report	Pre-Construction, Construction
	12.	Conduct additional investigations to determine the nature of identified underground storage tanks and/or potential areas of environmental impairment and develop a Soil Management Plan (consistent with Part XV.1 of the Environmental Protection Act and O.Reg. 153/04, Records of Site Condition) to govern how any contaminated soil/water encountered will be handled and disposed of.	Section 5	Pre-Construction, Construction
Social Environment	13.	A complaint protocol will be developed prior to construction and implemented during construction of the proposed project for responding to potential dust, noise and vibration related complaints from area residents.	Section 5	Pre-Construction, Construction
	14.	Develop and implement a Traffic Management Plan, including measures to manage impacts to sidewalks, the multi-use Burnhamthorpe Trail and bus shelters through consultation with the City of Mississauga and MiWay.	Section 5	Pre-Construction, Construction
	15.	Develop and implement a Noise and Vibration Management Program	Noise and Vibration Impact Assessment Report	Pre-Construction, Construction
Consultation	16.	Affected residents and business owners immediately adjacent to construction will be notified of construction activities (i.e. road/lane closures, municipal service/utility disruptions, driveway access) a minimum of 24 hours prior to construction in their immediate area.	Section 5	Construction
	17.	Review agencies (e.g. provincial ministries, agencies, City of Mississauga, utilities, etc.) and developers will be consulted through meetings and correspondence on an as-needed basis during design and construction to coordinate the construction of their infrastructure/development projects with the Preferred Alternative.	Section 5	Pre-Construction, Construction
	18.	All property easement requirements will be confirmed and agreements obtained with the affected property owners prior to construction.	Section 5	Pre-Construction

5.3 Approvals Required for the Preferred Alternative

In addition to requiring *EA Act* approval, there are a number of municipal, regional and other provincial approvals as well as property agreements anticipated to implement the preferred alternative. With this in mind, **Table 18** lists the anticipated post-EA permits and approvals by approval authority: municipal and regional approvals, provincial approvals and property owners.

Table 18: Anticipated Permits and Approvals Required for the Preferred Alternative

Approval Authority	Anticipated Post-EA Permits and Approvals Required	Legislation or By-Law Reference
Municipal and Regional		
City of Mississauga	Road Occupancy Permits	
	Noise By-Law	By-Law 360-79
Region of Peel	Road Occupancy Permit	
Utility Authorities	Consent from the following utility authorities: Enersource Enbridge Inc. Hydro One Hydro One Networks Bell Canada Rogers Cable Telus MTS-Allstream Trans-Northern Pipeline TransCanadaPipeLines Limited	Not subject to legislation or by-law
Credit Valley Conservation	Permit for Development, Interference with Wetlands and Alterations to Shorelines and Watercourses	Ontario Regulation 160/06 under the Conservation Authorities Act
	Erosion and Sediment Control Plan and Surface Water Management Plan	Conservation Authorities Act
Provincial		
Ministry of the Environment and Climate Change	Drinking Water Works Permit	Environmental Protection Act
	Permit to Take Water	Ontario Water Resources Act
Ministry of Tourism, Culture and Sport	Compliance letter	Ontario Heritage Act
Property Agreements		
Property owners	Permanent and temporary easements	Not subject to legislation or by-law

Each of the anticipated permits and approvals listed in **Table 18** are discussed in further detail in the following sub-sections.

5.3.1 Municipal and Regional Approvals

City of Mississauga

The following permits and approvals may be required from the City of Mississauga (City) prior to constructing the preferred alternative:

- **Road Occupancy Permits** – Road occupancy permits would be required for any construction within local road allowances including Burnhamthorpe Road, Grand Park Drive, Webb Drive, Confederation Parkway, Duke of York Boulevard and Central Parkway East.
- **Noise By-Law 360-79** – If necessary, the Region of Peel would require exemptions to the municipal noise control by-law from the City. Exceptions would include requirements to operate beyond the hours of 7:00 am to 7:00 pm Mondays to Saturdays, anytime on Sundays or Statutory Holidays in designated Quiet Zones and beyond the hours of 9:00 am to 7:00 pm on Sundays in all other areas.
- Since there is no City of Mississauga permit for removing street trees, it is expected that tree removal permission will be obtained through review of the development application by the City's Planning and Building Department.

Region of Peel

The following permits and approvals may be required from the Region of Peel prior to constructing the preferred alternative:

- **Road Occupancy Permits** – Road occupancy permits may be required for any construction within Regional road allowances including Cawthra Road.

Utility Authorities

The following utilities are located on Burnhamthorpe Road and may be temporarily affected during construction:

- Region of Peel – Water and Sanitary
- Bell Canada
- Enersource
- Enbridge
- MTS Allstream
- Rogers Cable

In addition, the following utilities are located on Duke of York Boulevard and Webb Drive/Grand Park Drive and may be temporarily affected during construction:

- Region of Peel – Water and Sanitary
- Bell Canada
- City of Mississauga – Storm Sewers
- Enersource
- Enbridge
- MTS Allstream

- Rogers Cable
- Telus

Formal notification and consent would be required from the authorities responsible for the preceding utilities prior to construction.

Credit Valley Conservation

The following permits and approvals may be required from Credit Valley Conservation (CVC) prior to implementing the preferred alternative:

- **Permit for Development, Interference with Wetlands and Alterations to Shorelines and Watercourses** - Any works involving development, interference with a wetland and/or alterations to a watercourse or shoreline would require review and approval from the CVC under Ontario Regulation 160/06 (Development, Interference with Wetlands and Alteration to Shoreline and Watercourse Regulation). As such, CVC would be consulted during detail design of the new watermain in relation to the two crossings of the East and West Branches of Cooksville Creek.
- Specifically, the Region of Peel may require a permit under Ontario Regulation 160/06 for the two watercourse crossings where a waterway would be interfered with, which would include a description of the purpose of the preferred alternative, methods and alterations to be carried out, timeframe for the work to be carried out and additional studies or documentation as required by CVC. This would apply to works within the CVC Regulated Area.
- **Erosion and Sediment Control Plan and Surface Water Management Plan** - An Erosion and Sediment Control Plan and a Surface Water Management Plan would be prepared in accordance with the CVC Technical Guidelines for Stormwater Management Submissions (CVC, 2013) and submitted to CVC for approval in order to protect surface water quantity and quality as a result of construction of the preferred alternative.

5.3.2 Provincial Approvals

Ministry of the Environment and Climate Change

The following permits and approvals may be required from the Ministry of the Environment and Climate Change (MOECC) prior to implementing the preferred alternative:

- **Drinking Water Works Permit (DWWP)** – A Municipal Drinking Water Licence and DWWP is issued for an overall system and further alterations must be authorized through specific DWWP amendments.
- **Permit to Take Water (PTTW)** - A PTTW is required under Section 34 of the OWRA for temporary water taking from groundwater which exceeds 50,000 L/day (or 7.5 Imperial gallons per minute). The water taking for the Preferred Alternative would be temporary. Consultation with the MOECC Central Region will take place as part of detailed design to confirm any approval requirements for water takings during construction or operation. A Category 3 Permit to Take Water application requires the completion of a hydrogeological study. The hydrogeological field work and data analysis completed as part of the Class EA was undertaken to the level typically required for a PTTW application. Supporting documentation to the PTTW would include a detailed monitoring plan outlining the number and frequency of groundwater monitoring wells, streamflow measurements, stream piezometer measurements and water chemistry data collection.

Ministry of Tourism, Culture and Sport

The Ministry of Tourism, Culture and Sport (MTCS) must review the archaeological reports prepared as part of the Project to ensure that their fieldwork and reporting requirements are met in accordance to Standards and Guidelines for Consultant Archaeologists (Ministry of Tourism, Culture and Sport, 2011).

If the licence report meets MTCS's requirements, then a compliance letter is issued to the archaeologist and copied to the project proponent and it is filed into the Ontario Public Register of Archaeological Reports. No construction can take place until the compliance letters from the MTCS for the Stage One and Stage Two Archaeological Assessments carried out as part of the Burnhamthorpe Road Watermain Class EA have been received.

5.3.3 Property Requirements

Property easements required for constructing and maintaining the new 1500 mm diameter watermain have been identified and property owners were informed as part of consultation undertaken during the Class EA through the Region of Peel's Real Estate Section. Specifically, the Region of Peel would obtain six temporary easements and two permanent easements to facilitate the tunnelled construction of the new watermain as follows (**Appendix 2I**):

- **Grand Park Drive** - The staging area is within the open space parcel south of Burnhamthorpe Road and east of Grand Park Drive that is currently under development by Rogers Telecommunications (PLAN 43R-24091). A *temporary easement* is required for use of the land as a construction site and a *permanent easement* is required for the watermain connection through the property and the valve chamber. If portions of this land are dedicated to public roadway in the future it would eliminate the need for a permanent easement.
- **Confederation Parkway** - The staging area extends into the Commercial parcel north of Burnhamthorpe Road and east of Confederation Parkway belonging to YMCA (PIN 13141-0205). A *temporary easement* is required for use of the land as a construction site.
- **Duke of York Boulevard** - The staging area extends into the Commercial parcel north of Burnhamthorpe Road and east of Duke of York Boulevard belonging to Morguard Corporation (PIN 13142-0005). A *temporary easement* is required for use of the land as a construction site.
- **Hurontario Street** - The staging area is within the Open Space parcel south of Burnhamthorpe Road and east of Hurontario Street belonging to the City of Mississauga (PIN 13164-0001 and 13164-0002). A *temporary easement* is required for use of the land as a construction site. Portions of this land could be dedicated to public highway in the future therefore reducing the size of the temporary easement. A *permanent easement* is required for the valve chamber and watermain within the property. Portions of this land could be dedicated to public highway in the future therefore reducing the size of the permanent easement required.
- **Central Parkway East** - The staging area is within the Open Space parcel north of Burnhamthorpe Road and west of Central Parkway East belonging to the City of Mississauga (PIN 13174-0177). A *temporary easement* is required for use of the land as a construction site. The parcel could be dedicated as public highway in the future therefore eliminating the need for a temporary easement.

- **Cawthra Road** - The staging area is within the Commercial parcel north of Burnhamthorpe Road and west of Cawthra Road belonging to Victor and Eduarda Amaral (PIN 13170-0241). A *temporary easement* may be required for use of the land as a construction staging area.

All property easement requirements would be confirmed by the Region of Peel during detailed design and agreements obtained with the affected property owners prior to construction.

5.4 Implementation of the Preferred Alternative

As mentioned in *Section 2.0*, following confirmation of the preferred alternative being classified as a Schedule B activity, the Region of Peel, as the proponent, is required to prepare a Project File documenting the first two phases of the Class EA process followed and conclusions reached and make it available for a 30 calendar day review period.

5.4.1 Notice of Completion

As part of the process of making the Project File available for review, the Region of Peel issued a formal 'Notice of Completion' (**Appendix 1G**) for the Burnhamthorpe Road Watermain Class EA on **September 17, 2015**, including the following activities:

- Issuing a letter with the 'Notice of Completion' via email and/or direct mailing to review agencies, utilities, councillors, interested parties, First Nations and Métis organizations.
- Issuing the Notice through direct mailing to residents and property/business owners in the general vicinity of the proposed project (**Appendix 1B**).
- Publishing the Notice in two consecutive editions of 'Mississauga this Week' News' (September 10 and 17, 2015) and 'The Mississauga News' (September 10 and 17, 2015).
- Posting the Notice on the Project-specific website on September 17, 2015

30 Day Review Period

The Region of Peel established the 30 calendar day review period starting on **September 17, 2015** and ending on **October 18, 2015** whereby any interested person can inspect the Project File and provide comments. The comments, including any issues or concerns, should be sent first to the Region of Peel for potential resolution before they are escalated to the Minister of the Environment and Climate Change (Minister) as a Part II Order request.

5.4.2 Class EA Phase 5

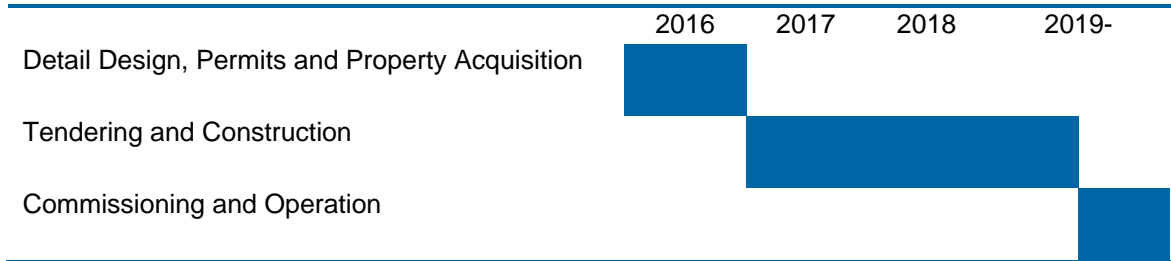
If no Part II Order requests are received during the 30 calendar day review period or those that are received are satisfactorily resolved, then a proponent is able to proceed to Phase 5 of the Municipal Class EA process and implement the preferred alternative according to their schedule. Specifically, this entails essentially three steps:

- Complete the detailed design, embodying the preferred alternative and associated pre-construction environmental provisions and commitments as specified in the Project File, including acquiring all necessary post-EA permits, approvals and property.
- Proceed to tendering and construction of the preferred alternative, monitoring to ensure fulfilment of construction-related environmental provisions and commitments as specified in the Project File.

- Commission the preferred alternative, monitoring to ensure fulfilment of infrastructure operations-related environmental provisions and commitments as specified in the Project File.

Anticipate Implementation Schedule for the Preferred Alternative

The Region of Peel’s current anticipated implementation timeline for the preferred alternative is shown below, with a view to having the new water infrastructure in service by 2019.



6. Summary

As required by the Municipal Class EA (MEA, 2011), the planning and design process carried out for the Burnhamthorpe Road Watermain Class EA (Project) is documented in this report. In recognition of the preferred alternative being classified as a Schedule B activity, the Region of Peel carried out Phases 1 and 2 of the Municipal Class EA planning and design process.

In Phase 1, the problem / opportunity of the Project was confirmed as the need to provide additional water supply in the MCC to accommodate identified growth and development in an environmentally-sensitive and stakeholder-responsive manner. Although considered discretionary during Phase 1 of the Class EA process, the Region of Peel elected to carry out consultation to aid in defining the Project's problem/opportunity statement. Consultation was initiated via a Notice of Commencement being issued to review agencies, First Nations, Métis organizations and the public through newspaper advertisements, email, direct mail, general mail delivery to those living in adjacent areas and posting on the Region's website.

Following completion of Phase 1, six alternatives were identified including, the 'Do Nothing' alternative and five horizontal alignments for the new watermain along Burnhamthorpe Road between Grand Park Drive and Cawthra Road in the City of Mississauga.

A number of investigative studies were carried out as part of generating a detailed understanding and description of the environment associated with the alternatives as defined in the *Environmental Assessment Act*. The section of Burnhamthorpe Road associated with the alternative alignments is situated within a largely built up area of Mississauga undergoing urban intensification, especially within the MCC. As a result, there are limited natural features and low archaeological potential.

The potential adverse effects of implementing any of the alternatives were identified along with proposed impact management measures, where appropriate, to mitigate their severity or significance. The net effects for each alternative were comparatively evaluated in order to identify their relative advantages/disadvantages and rank them. Although all five alternatives would address the problem / opportunity, Alternative 5 has a number of technical advantages over the other alternatives and minimizes potential adverse environmental effects through avoidance and impact management measures.

As part of Phase 2 of the Municipal Class EA process, the Region of Peel carried out a number of consultation activities with review agencies, First Nations, Métis organizations and the public to proactively involve them in developing the alternatives, comparatively evaluating them and identifying the recommended alternative. The Region of Peel held individual meetings with potentially affected stakeholders including the City of Mississauga, Credit Valley Conservation authority, utility providers and adjacent property owners. The Region of Peel elected to carry out two rounds of Public Information Centres instead of just one to provide an additional opportunity for the public to be involved, gain a good understanding of the project and provide comments. Alternative 5 was confirmed as the preferred alternative for the Project through these consultation activities in light of no specific concerns or issues being raised.

In addition to constructing a new 1500 mm diameter watermain, the preferred alternative includes complementary and concurrent water infrastructure improvements, including a number of interconnections, local connections and local distribution watermains.

The Region of Peel is proposing to have the new water infrastructure in service by 2019 subject to *EA Act* approval and obtaining all post-EA permits and approvals.



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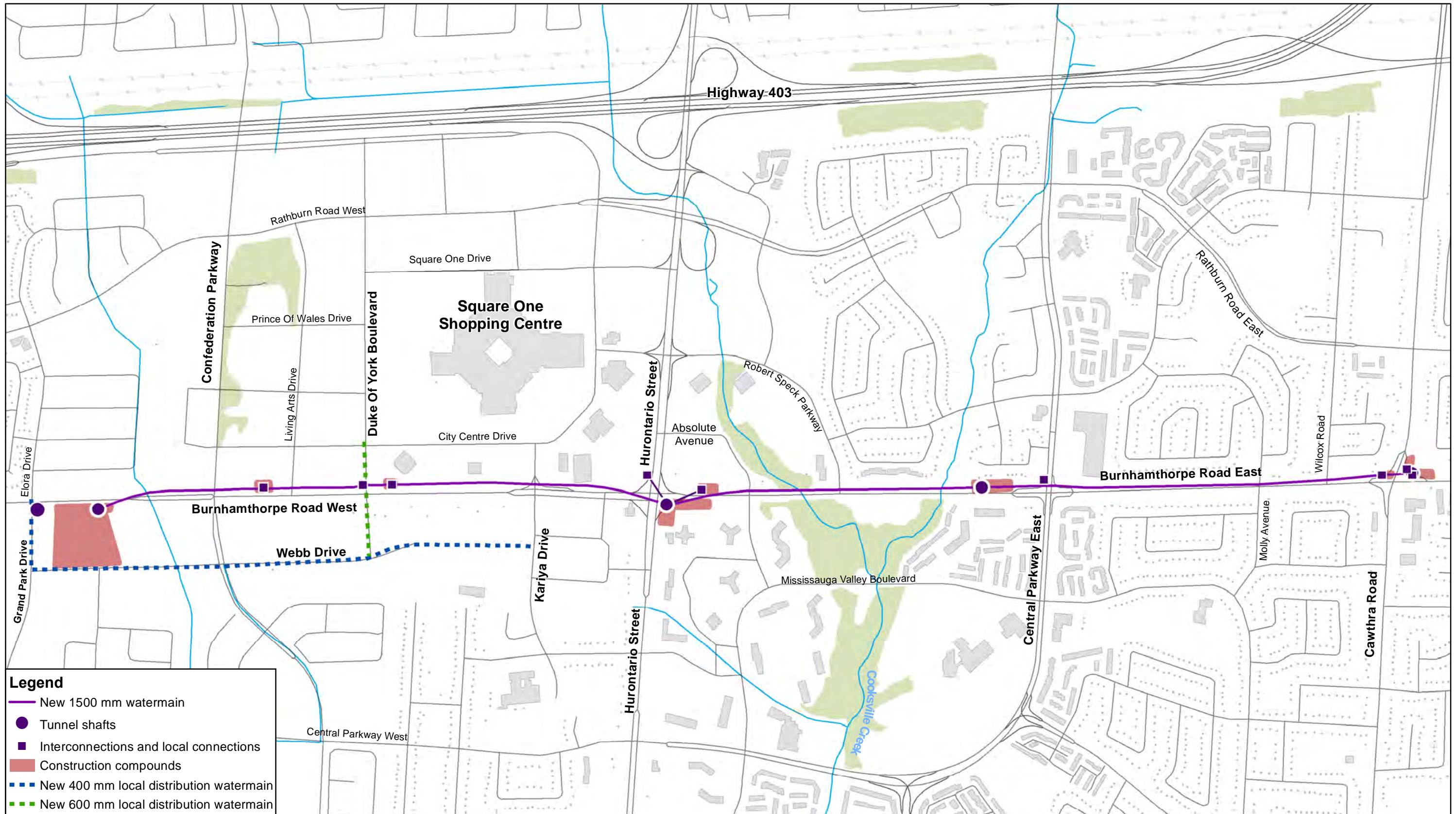
Senior Environmental Planner
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ian.Dobrindt@ghd.com



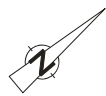
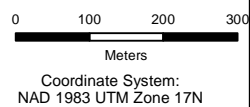
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Figures



Source: MNR NRVIS, 2013. Produced by GHD under licence from Ontario Ministry of Natural Resources, © Queen's Printer 2015



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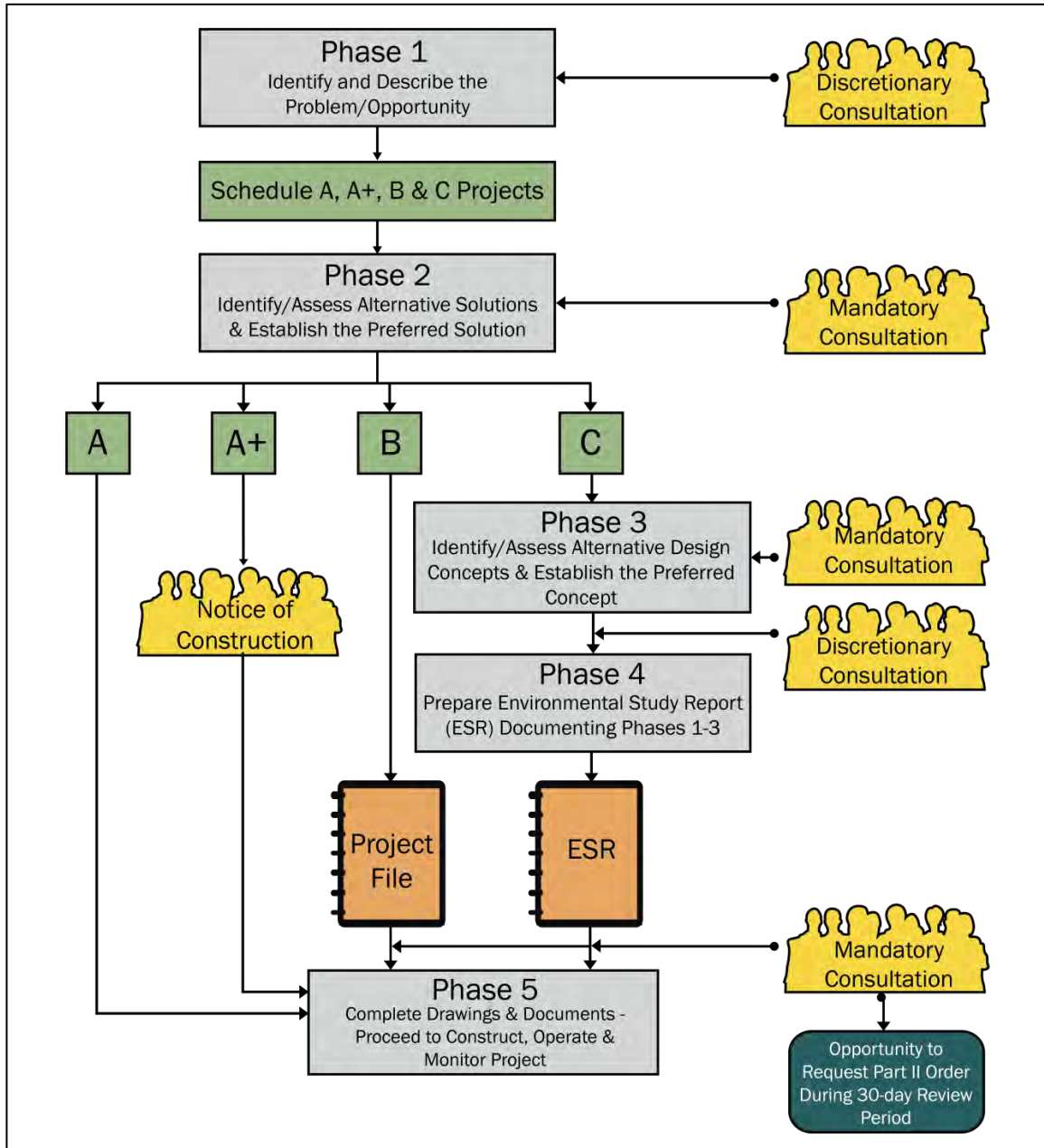
THE REGIONAL MUNICIPALITY OF PEEL
BURNHAMTHORPE ROAD WATERMAIN CLASS ENVIRONMENTAL ASSESSMENT

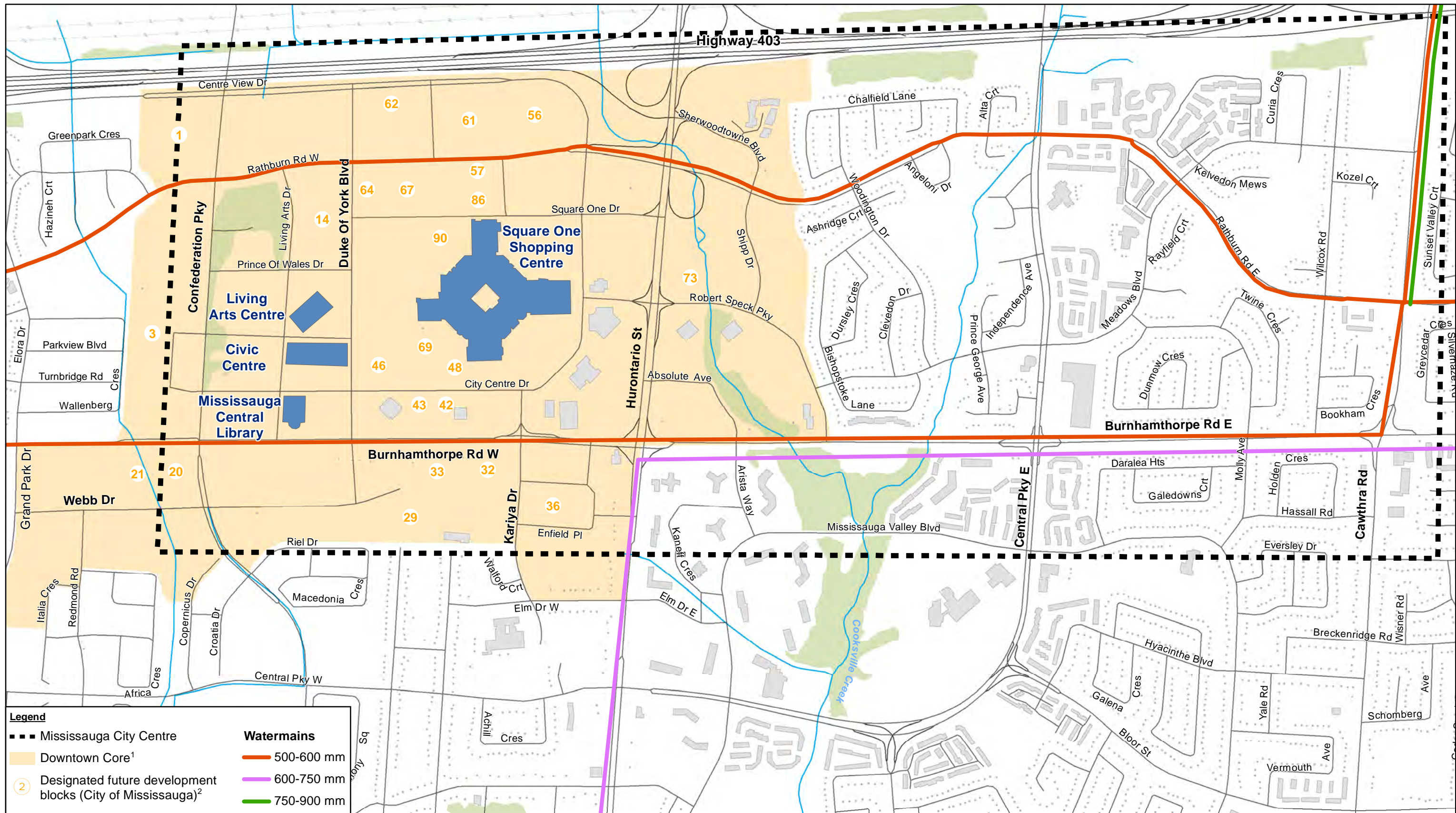
13-1125
Sep 2, 2015

PREFERRED ALTERNATIVE

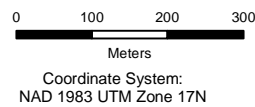
FIGURE 1

Figure 2: Overview of the Municipal Class Environmental Assessment Process





Source: MNR NRVIS, 2013. Produced by GHD under licence from Ontario Ministry of Natural Resources, © Queen's Printer 2015



Notes:
 1. City of Mississauga, 2010. Downtown 21 Master Plan
 2. See Table 3 in Class EA Project File Report, GHD 2015



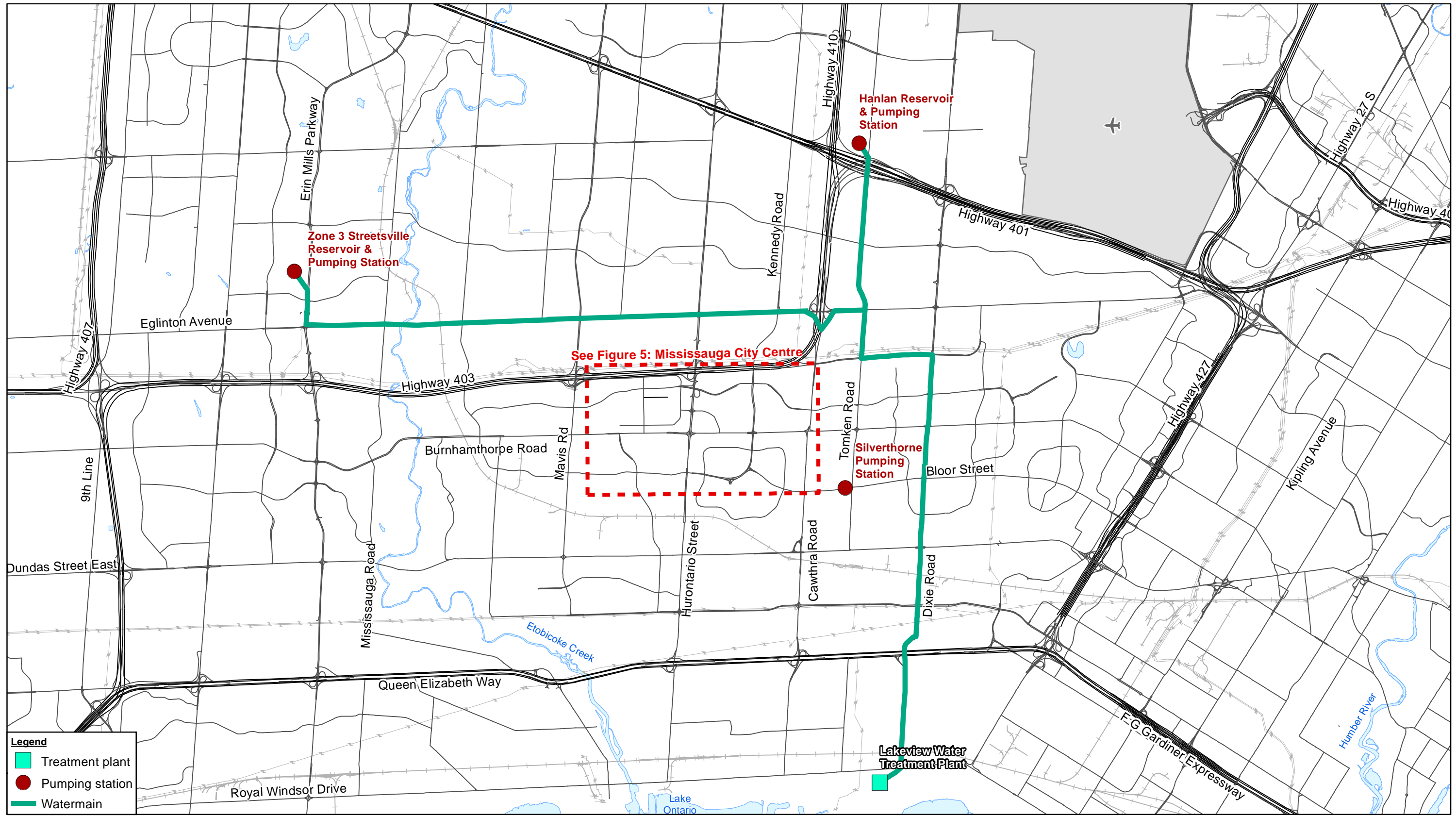
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MISSISSAUGA CITY CENTRE AND
 MAJOR WATER SUPPLY INFRASTRUCTURE

FIGURE 3



Legend

- █ Treatment plant
- Pumping station
- Watermain

Source: MNR NRVIS, 2013. Produced by GHD under licence from Ontario Ministry of Natural Resources, © Queen's Printer 2015

0 500 1,000 1,500
Meters

Coordinate System:
NAD 1983 UTM Zone 17N

THE REGIONAL MUNICIPALITY OF PEEL
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**SELECT FEATURES OF EXISTING
REGIONAL WATER SUPPLY SYSTEM**

13-1125
Sep 8, 2015

FIGURE 4

GIS File: Q:\GIS\PROJECTS\8000000s\8811966\Layouts\EA013\8811966-03(EA013)GIS-WA010.mxd

Figure 5: Overview of Region of Peel 2013 Water and Wastewater Master Planning Process

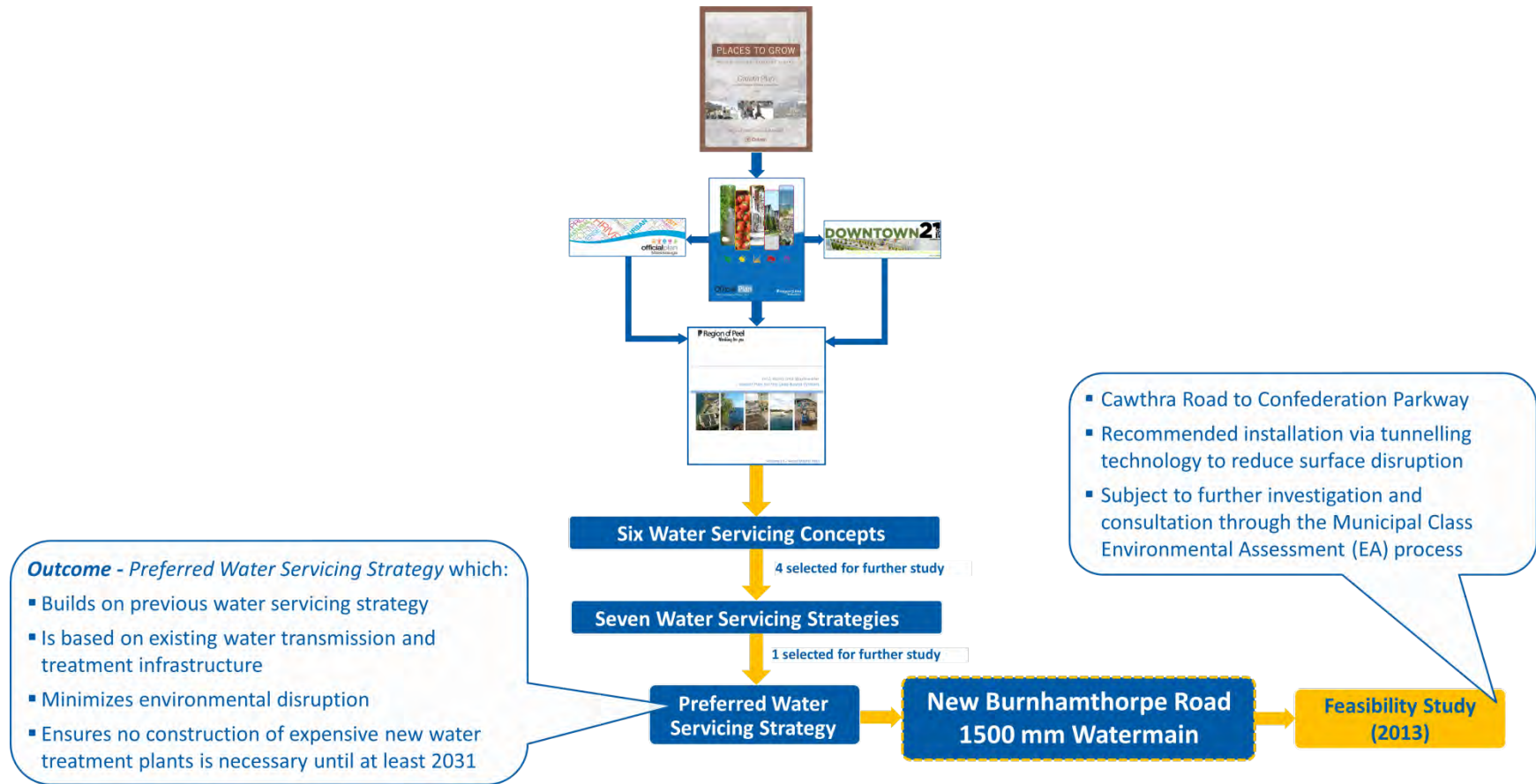
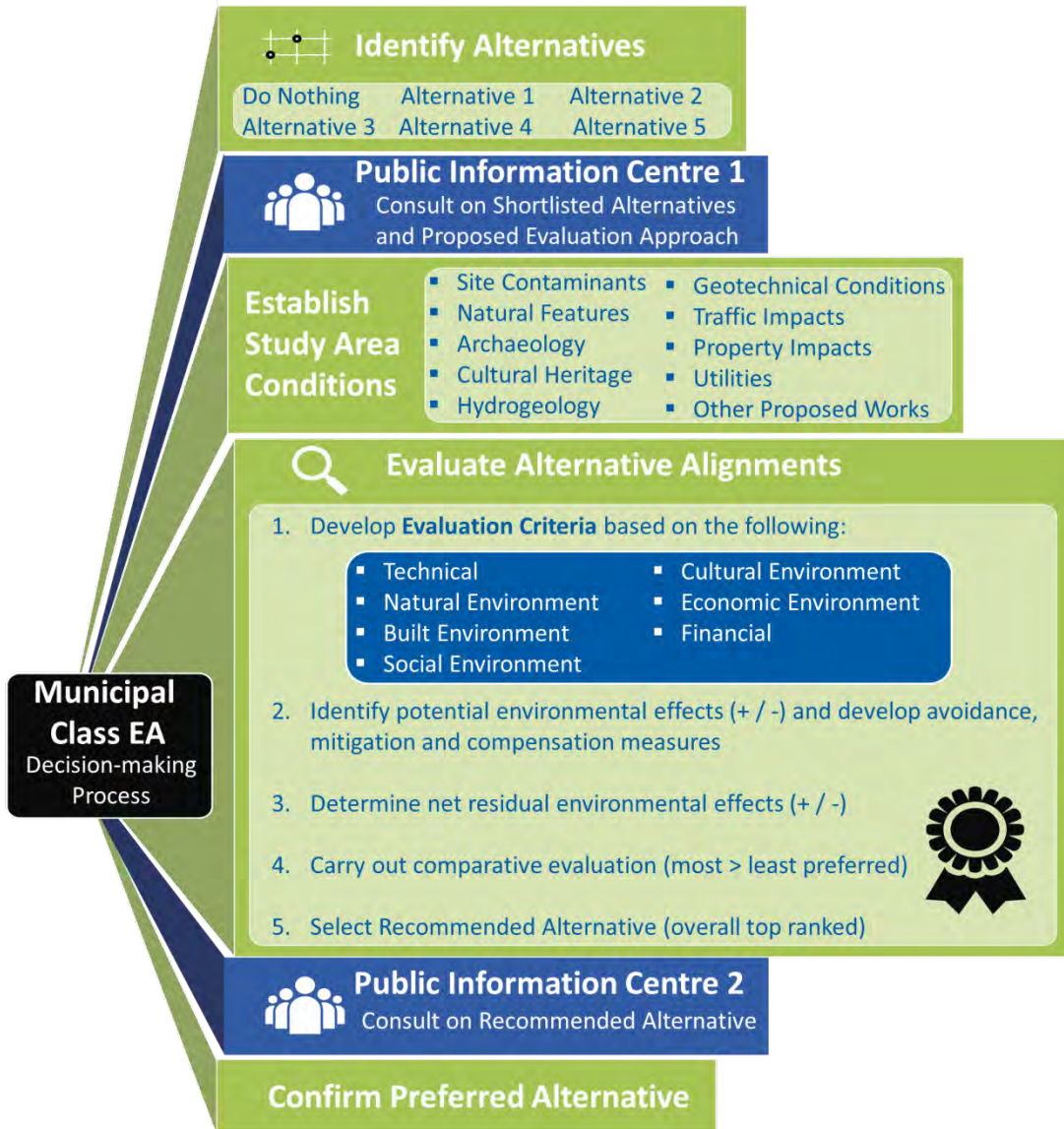
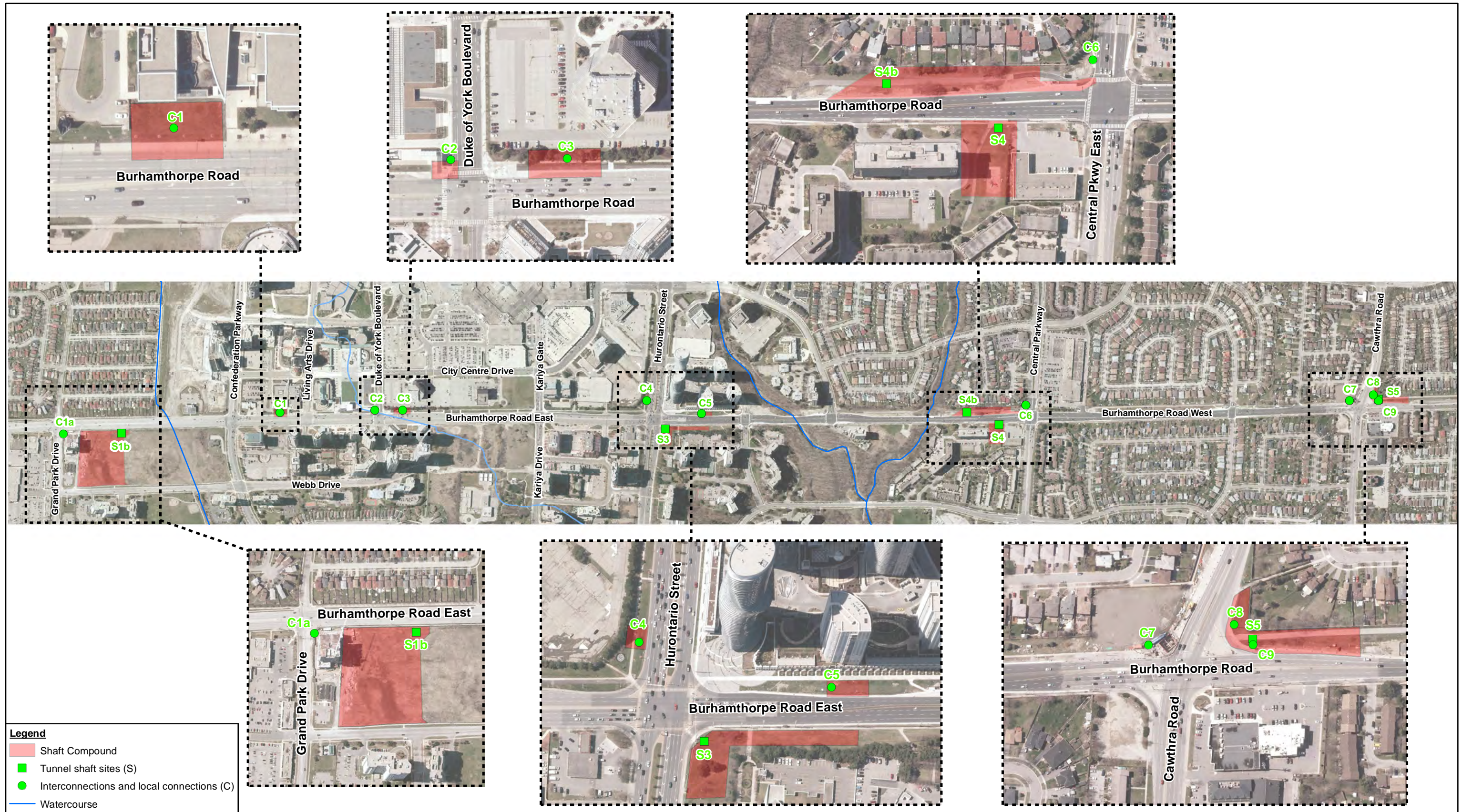
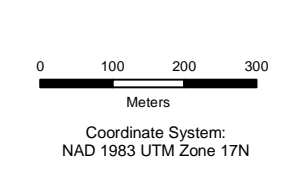


Figure 6: Process of Identification, Consultation and Evaluation of Alternatives





Source: MNR NRVIS, 2013. Imagery provided by City of Mississauga. Produced by GHD under licence from Ontario Ministry of Natural Resources, © Queen's Printer 2015



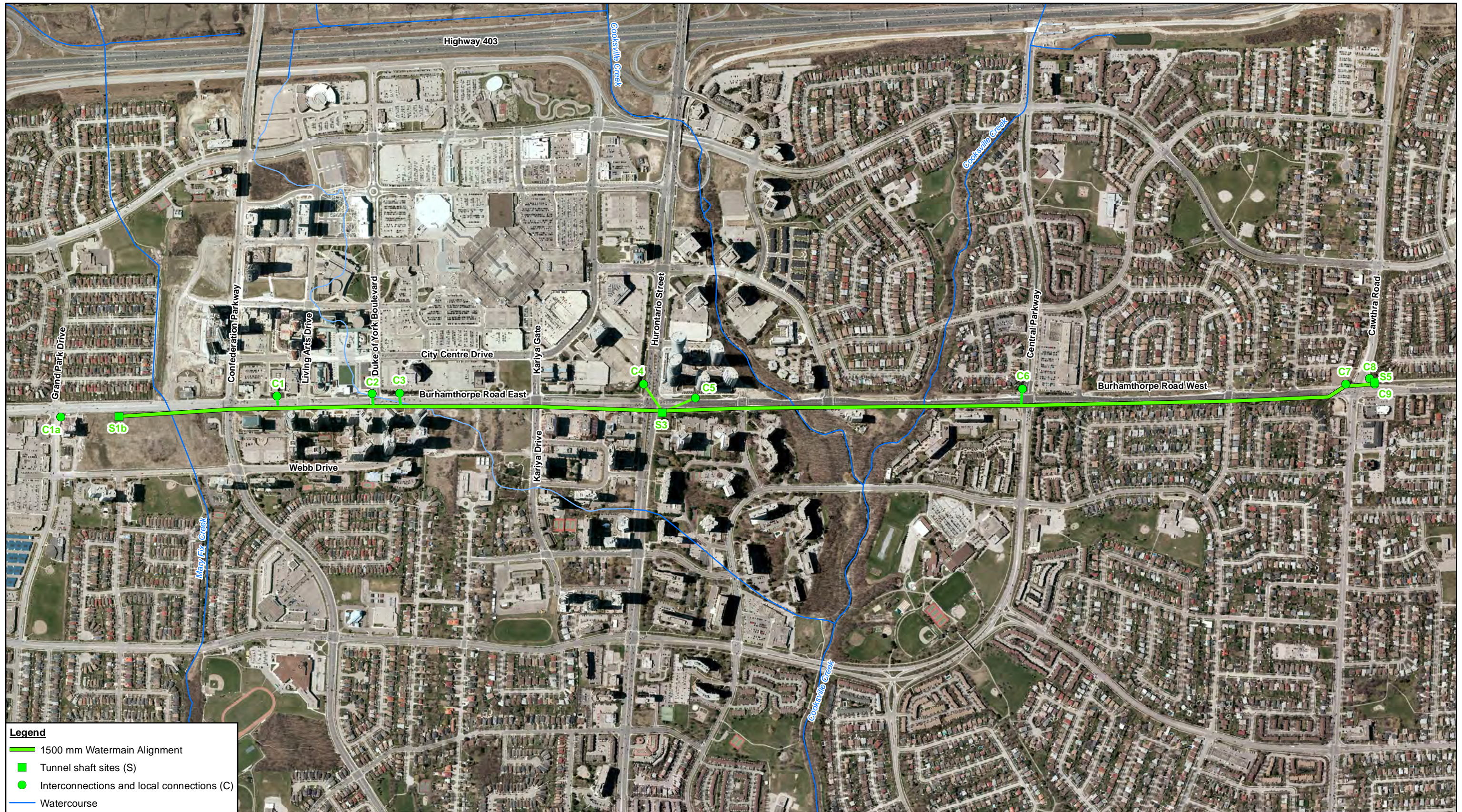
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BURNHAMTHORPE ROAD WATERMAIN CLASS ENVIRONMENTAL ASSESSMENT

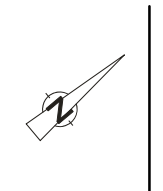
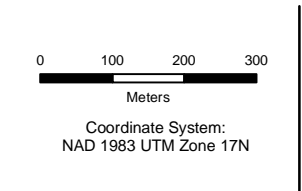
OVERVIEW OF POTENTIAL TUNNEL SHAFT SITES AND
CONNECTION LOCATIONS

13-1125
Jul 23, 2015

FIGURE 7



Source: MNR NRVIS, 2013. Imagery provided by City of Mississauga. Produced by GHD under licence from Ontario Ministry of Natural Resources, © Queen's Printer 2015



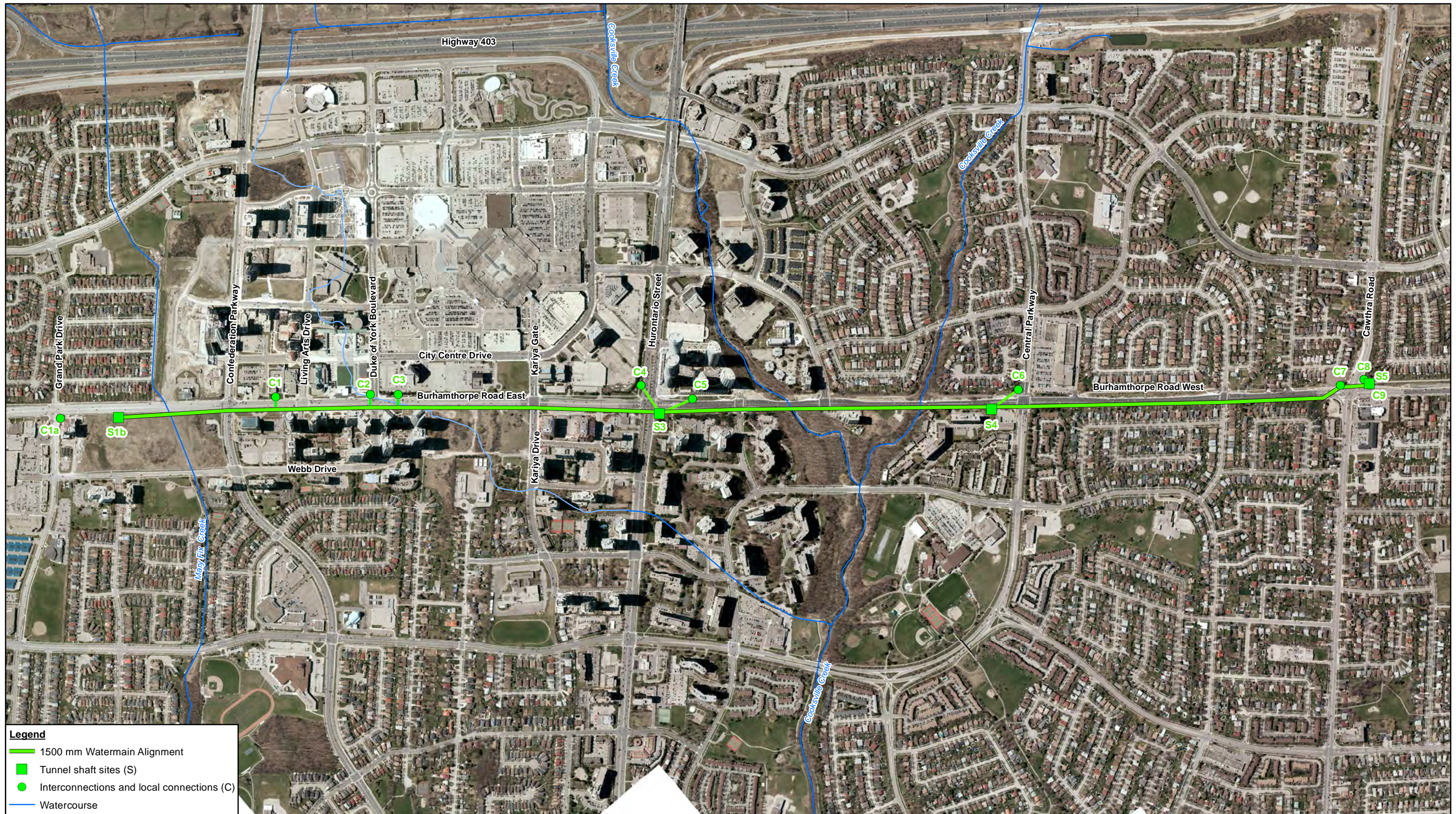
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ALTERNATIVE 1: TWO-DRIVE, SOUTH

FIGURE 8



Legend

- 1500 mm Watermain Alignment
- Tunnel shaft sites (S)
- Interconnections and local connections (C)
- Watercourse

Source: MNR NRVIS, 2013. Imagery provided by City of Mississauga. Produced by GHD under licence from Ontario Ministry of Natural Resources, © Queen's Printer 2015

0 100 200 300
Meters

Coordinate System:
NAD 1983 UTM Zone 17N

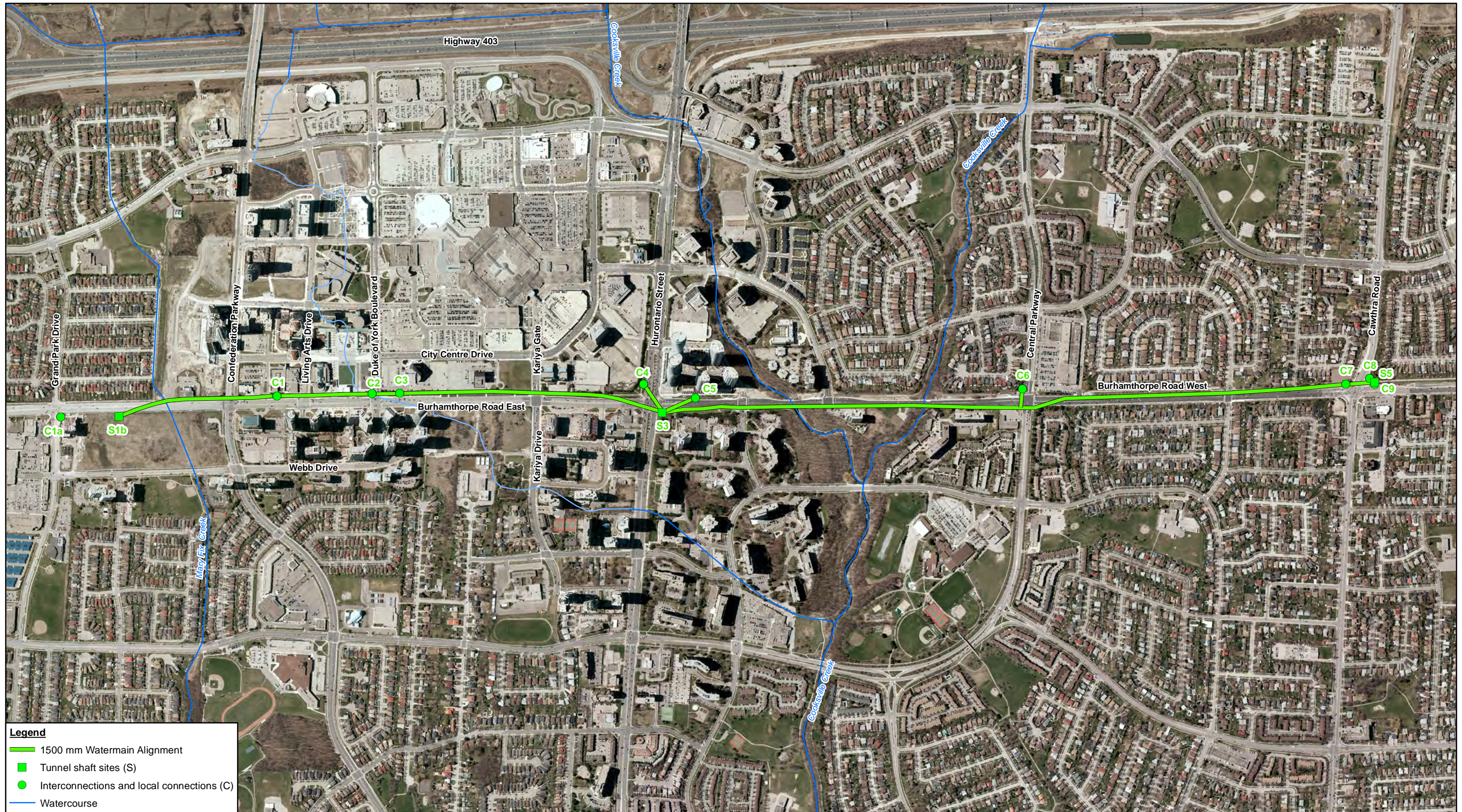
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ALTERNATIVE 2: THREE-DRIVE, SOUTH

FIGURE 9



Legend

- 1500 mm Watermain Alignment
- Tunnel shaft sites (S)
- Interconnections and local connections (C)
- Watercourse

Source: MNR NRVIS, 2013. Imagery provided by City of Mississauga. Produced by GHD under licence from Ontario Ministry of Natural Resources, © Queen's Printer 2015

0 100 200 300
Meters

Coordinate System:
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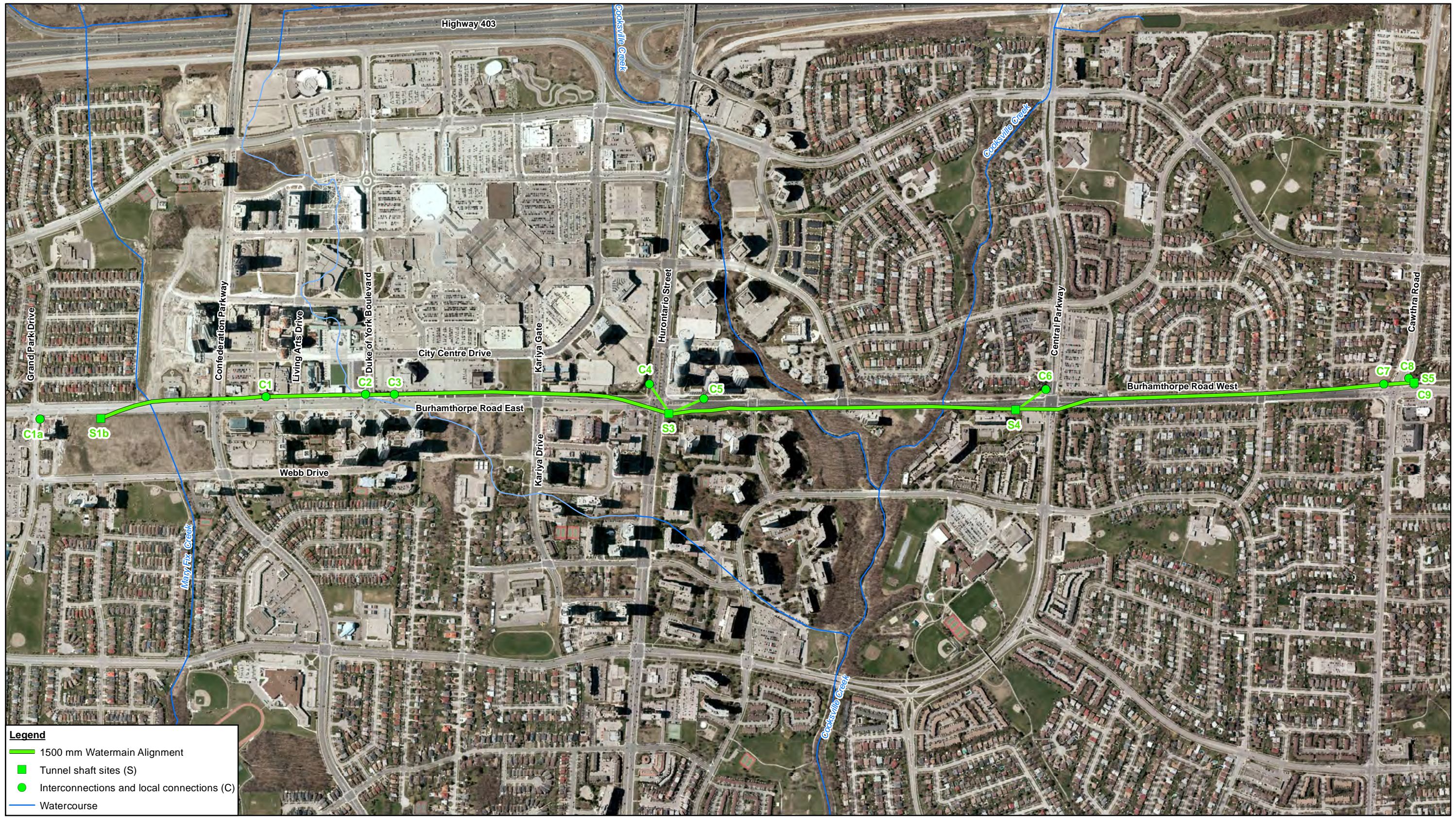
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BURNHAMTHORPE ROAD WATERMAIN CLASS ENVIRONMENTAL ASSESSMENT

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ALTERNATIVE 3: TWO-DRIVE, NORTH-SOUTH-NORTH

FIGURE 10

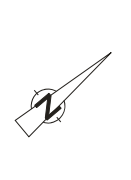
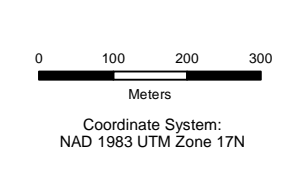
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Legend

- 1500 mm Watermain Alignment
- Tunnel shaft sites (S)
- Interconnections and local connections (C)
- Watercourse

Source: MNR NRVIS, 2013. Imagery provided by City of Mississauga. Produced by GHD under licence from Ontario Ministry of Natural Resources, © Queen's Printer 2015



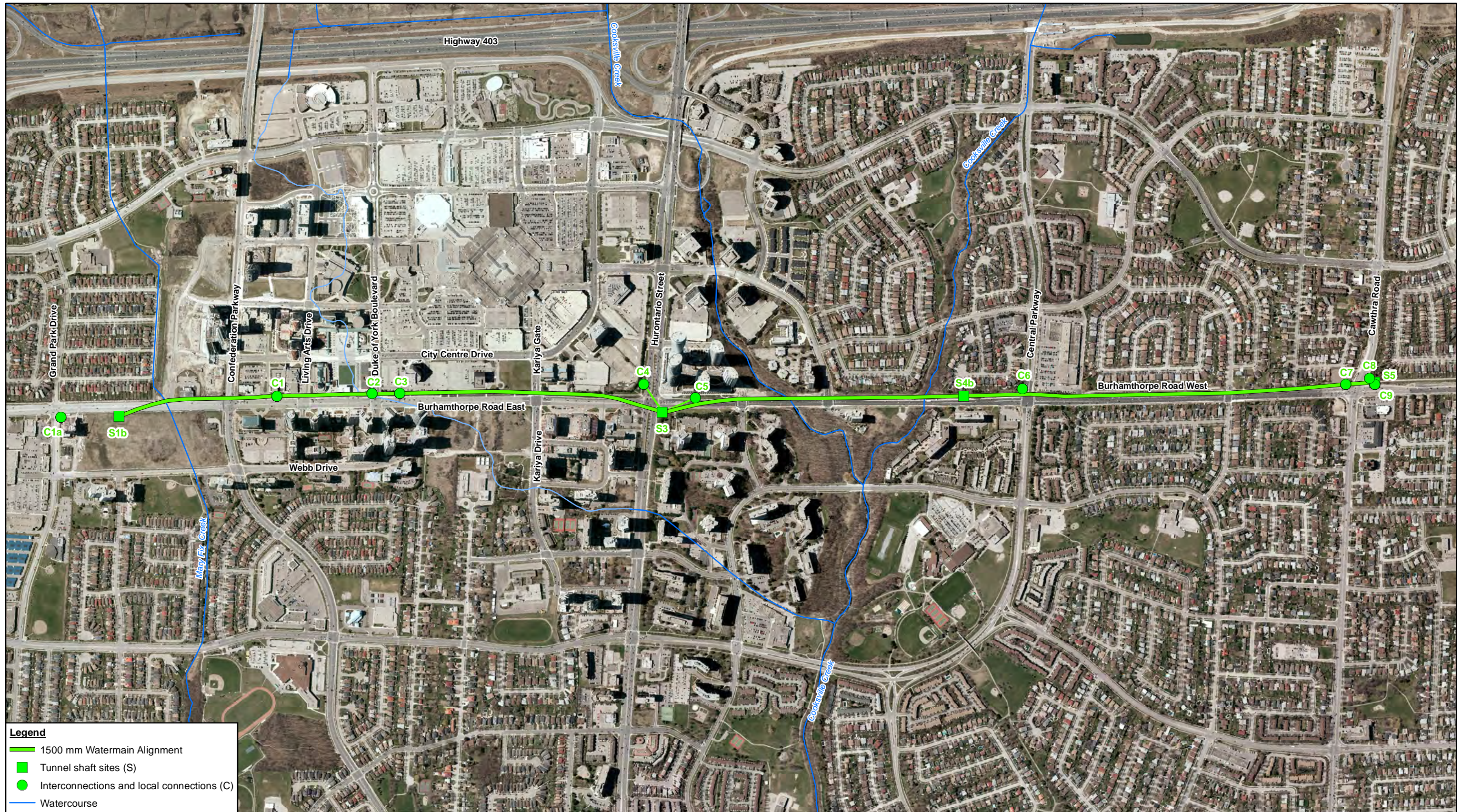
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ALTERNATIVE 4: THREE-DRIVE, NORTH-SOUTH-NORTH

FIGURE 11



Legend

- 1500 mm Watermain Alignment
- Tunnel shaft sites (S)
- Interconnections and local connections (C)
- Watercourse

Source: MNR NRVIS, 2013. Imagery provided by City of Mississauga. Produced by GHD under licence from Ontario Ministry of Natural Resources, © Queen's Printer 2015

0 100 200 300
Meters

Coordinate System:
NAD 1983 UTM Zone 17N

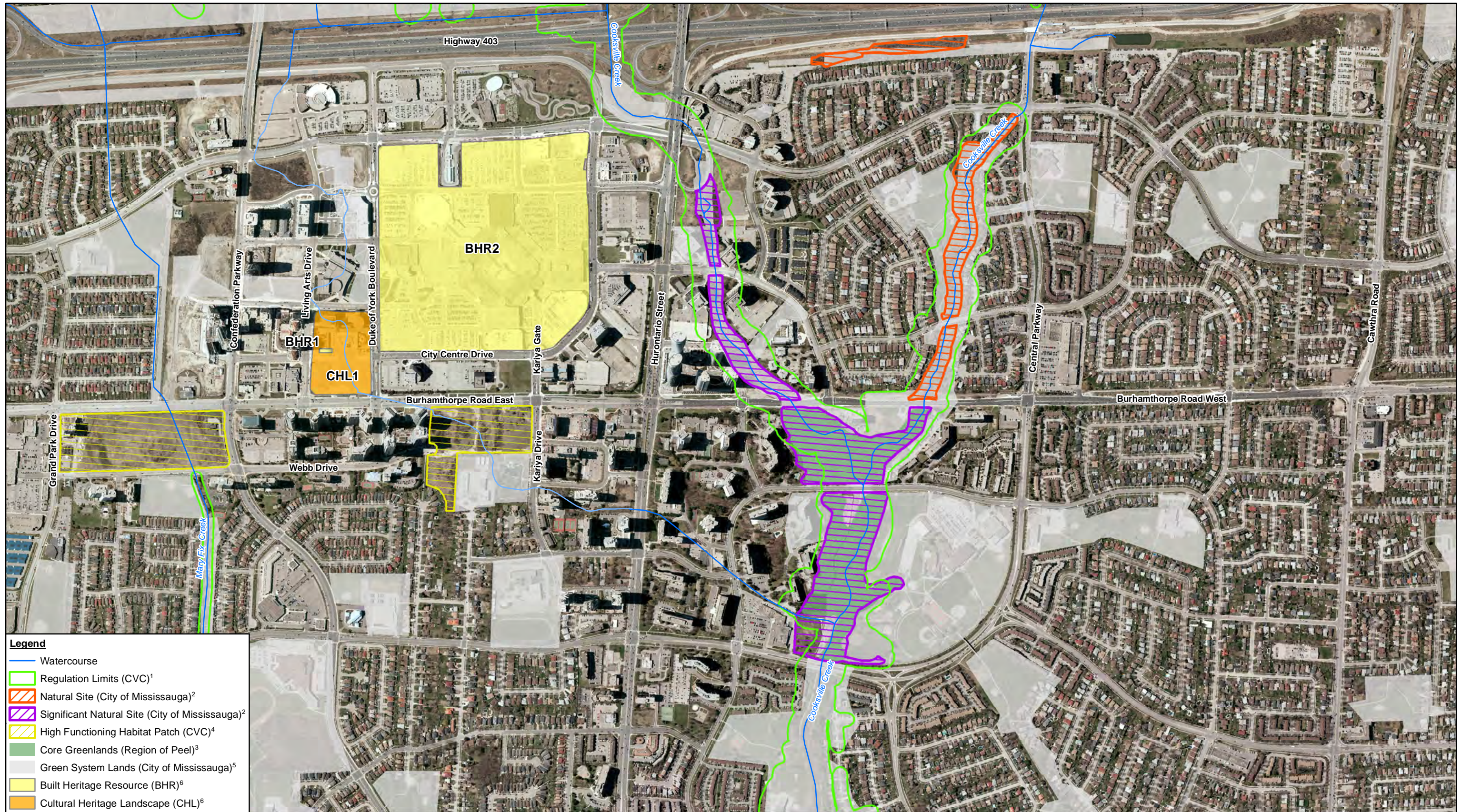
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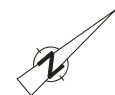
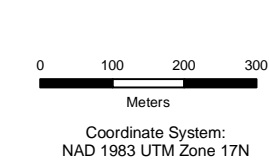
13-1125
Jul 23, 2015

ALTERNATIVE 5: THREE-DRIVE, NORTH-SOUTH-NORTH

FIGURE 12



Source: MNR NRVIS, 2013. Imagery provided by City of Mississauga. Produced by GHD under licence from Ontario Ministry of Natural Resources, © Queen's Printer 2015



- Notes:
1. Credit Valley Conservation Regulation Limit under O.Reg 160/06, as obtained December 2014
 2. City of Mississauga (NAS). 2013. Natural Areas Survey. Mississauga, Ontario
 3. Region of Peel, 2014. Region of Peel Official Plan, Office Consolidation 2014. Region of Peel, Ontario
 4. CVC. 2012. Landscape Scale Analysis of the City of Mississauga: Natural and Semi-natural habitats and Opportunities for Enhancement. Credit Valley Conservation. Final Technical Report. x + 90 p plus appendices.
 5. City of Mississauga, Official Plan (2010), Schedule 1
 6. Project File Appendix 2G: Cultural Heritage Resource Assessment Report, GHD 2015



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THE REGIONAL MUNICIPALITY OF PEEL
BURNHAMTHORPE ROAD WATERMAIN CLASS ENVIRONMENTAL ASSESSMENT

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NATURAL AND CULTURAL ENVIRONMENT

FIGURE 13

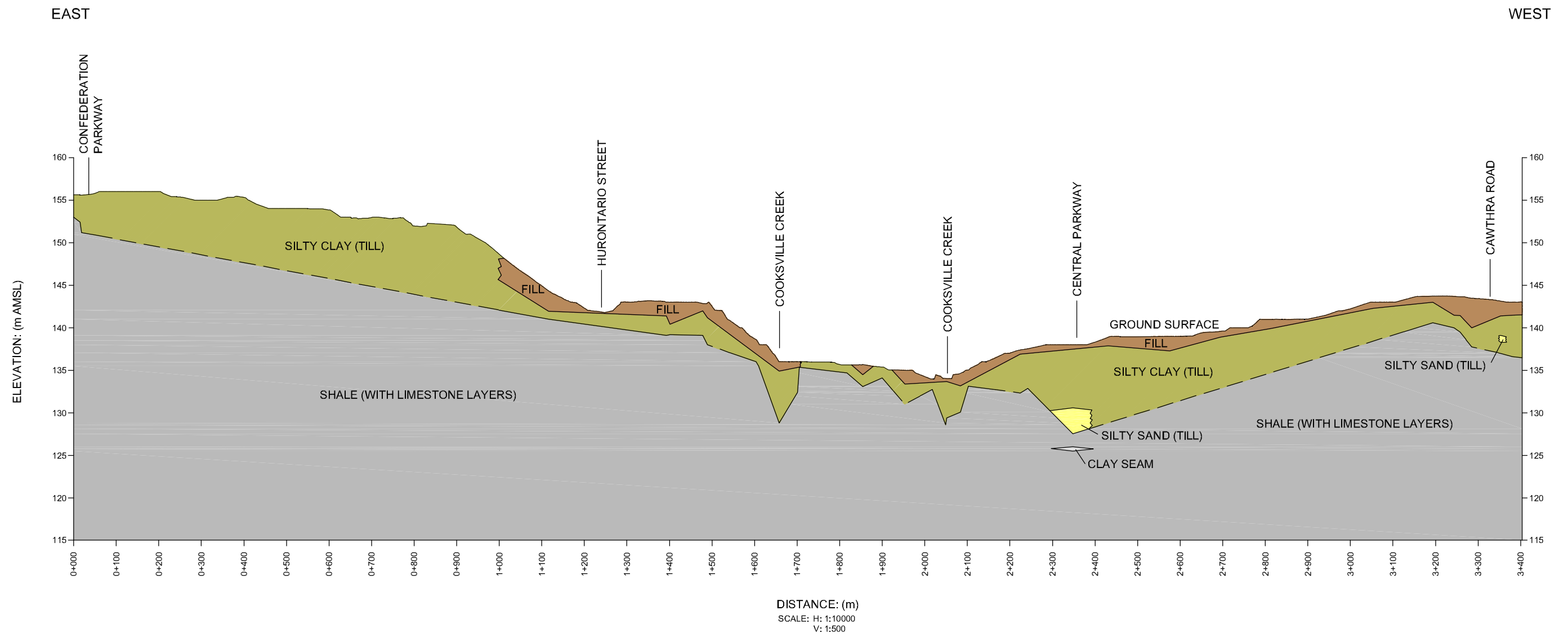
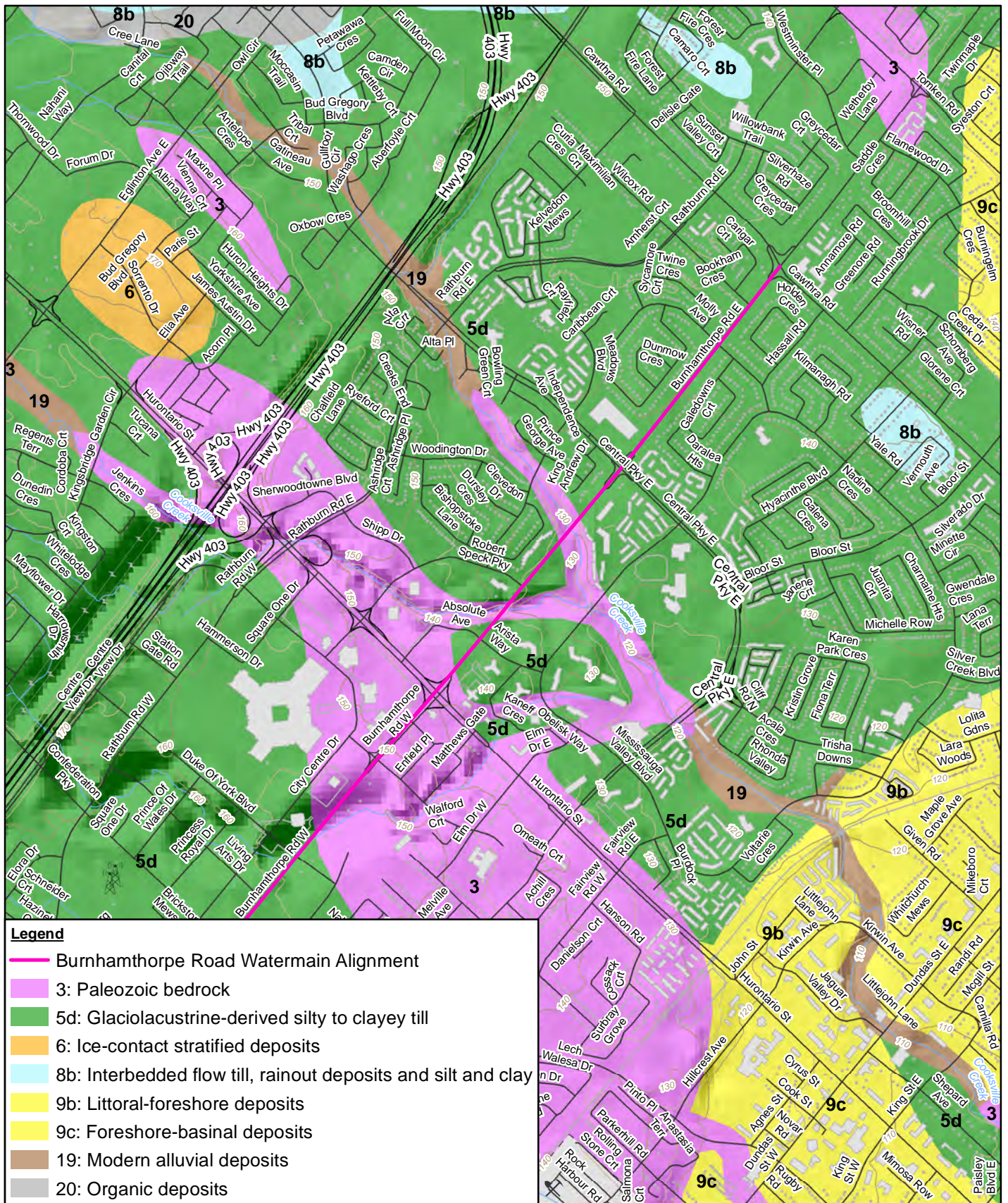


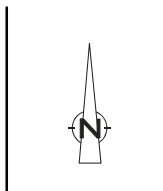
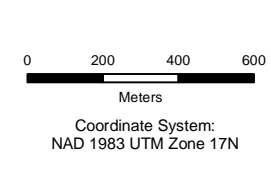
Figure 14

GENERALIZED GEOLOGIC PROFILE
 BURNHAMTHORPE ROAD WATERMAIN CLASS EA
 MISSISSAUGA, ONTARIO
Regional Municipality of Peel





Source: MNRF NRVIS, 2015. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2015; Ontario Geological Survey 2003. Surficial geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release---Data 128.



REGIONAL MUNICIPALITY OF PEEL
 BURNHAMTHORPE ROAD WATERMAIN
 CLASS ENVIRONMENTAL ASSESSMENT
 DESKTOP STUDY
 SURFICIAL GEOLOGY

086943-03
 Jul 22, 2015

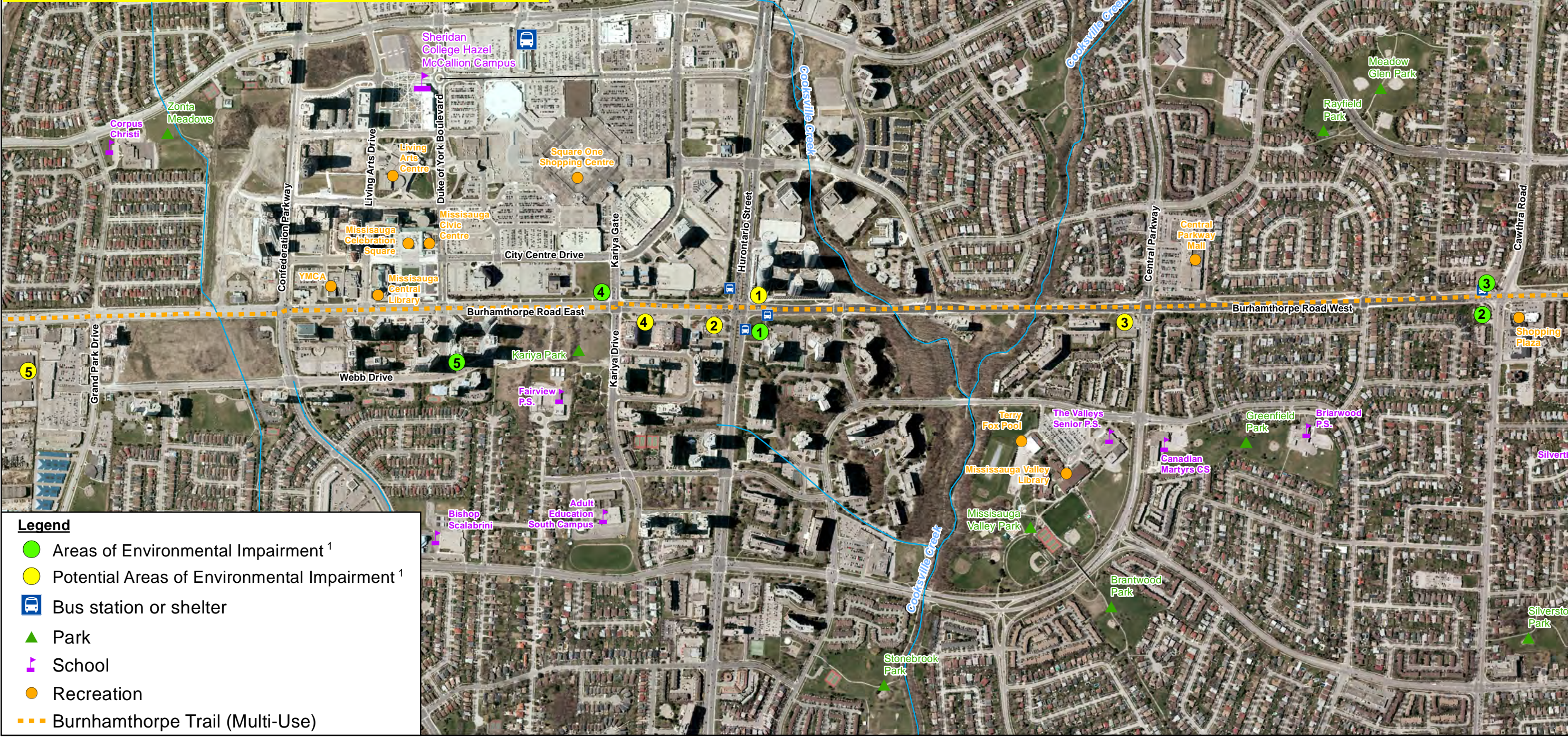
FIGURE 15

POTENTIAL AREAS OF ENVIRONMENTAL IMPAIRMENT (PAEI)

- PAEI 1: Former Gasoline Service Station (4003 Hurontario St.)
- PAEI 2: Gasoline Service Station (3680 Hurontario St.)
- PAEI 3: Former Gasoline Service Station (350 Burnhamthorpe Rd. E.)
- PAEI 4: Dry Cleaner (82 Burnhamthorpe Rd. W)
- PAEI 5: Dry Cleaner (3663 Mavis Road)
- PAEI 6: Application of Road Salt on Municipal Roads (Entire Site)

AREAS OF ENVIRONMENTAL IMPAIRMENT (AEI)

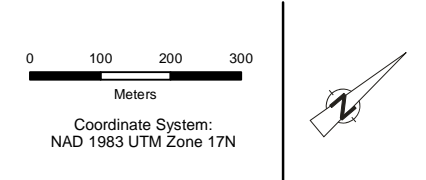
- AEI 1: Groundwater Treatment System (3650 Kaneff Cres.)
- AEI 2: Groundwater Impact (3670 Cawthra Road)
- AEI 3: Groundwater Impact (691 Burnhamthorpe Rd E.)
- AEI 4: 900 Litre Mineral Oil Spill (Burnhamthorpe Rd W. & Kariya Gate)
- AEI 5: Diesel Fuel Spill (225 Webb Drive)



Legend

- Areas of Environmental Impairment ¹
- Potential Areas of Environmental Impairment ¹
- Bus station or shelter
- ▲ Park
- ▲ School
- Recreation
- Burnhamthorpe Trail (Multi-Use)

Source: MNR NRVIS, 2013. Imagery provided by City of Mississauga. Produced by GHD under licence from Ontario Ministry of Natural Resources, © Queen's Printer 2015



Notes:
1. Project File Appendix 2C: Phase I Environmental Site Assessment Report, GHD 2015

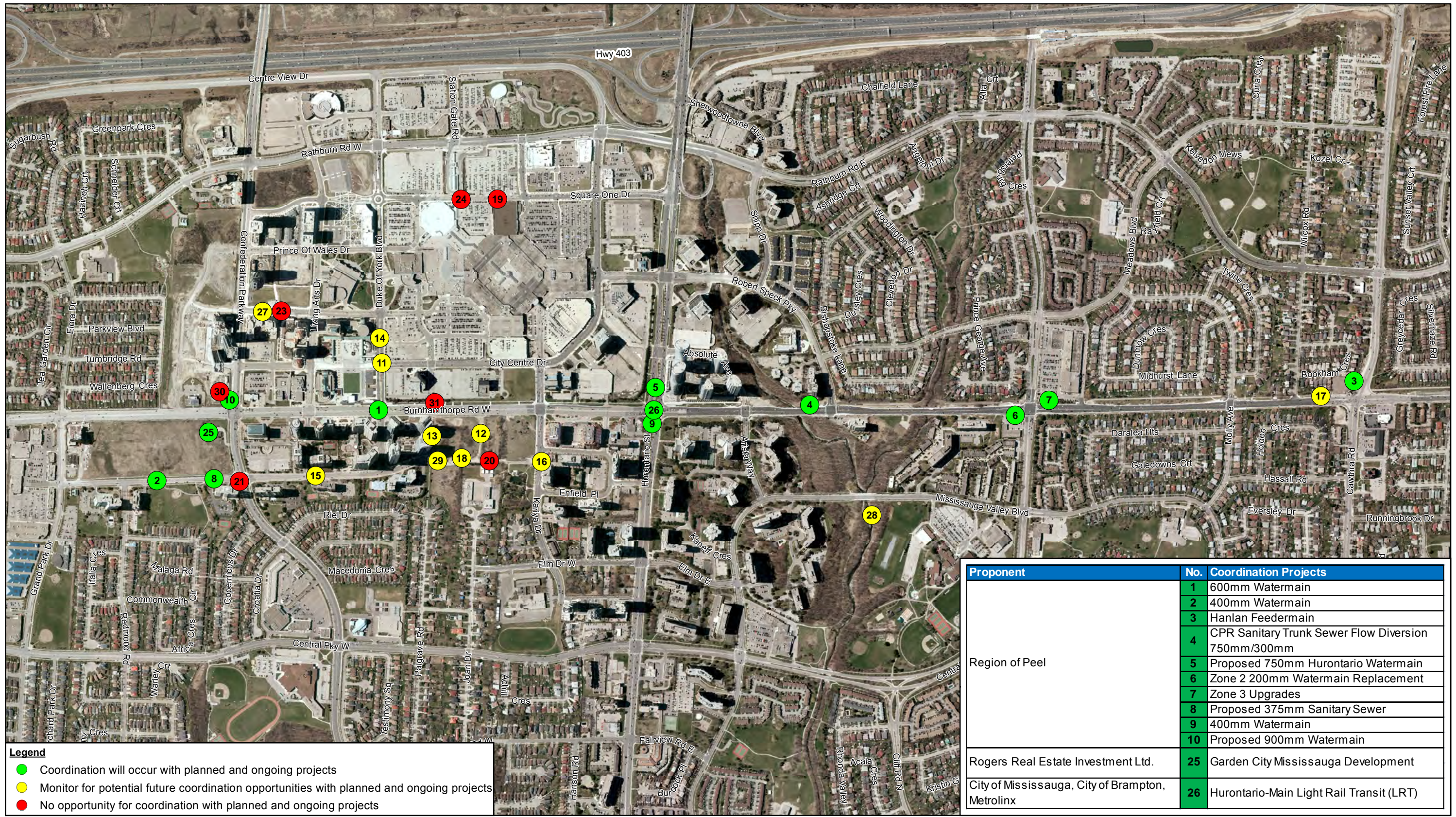


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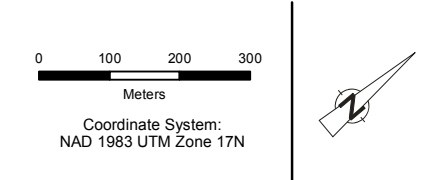
13-1125
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BUILT AND SOCIAL ENVIRONMENT

FIGURE 16



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Notes:
Please refer to Volume 2, Appendix 2E – Project Synergies Report, 'Table 1: Summary of Project Synergies' for additional project numbers and description of each synergy project.

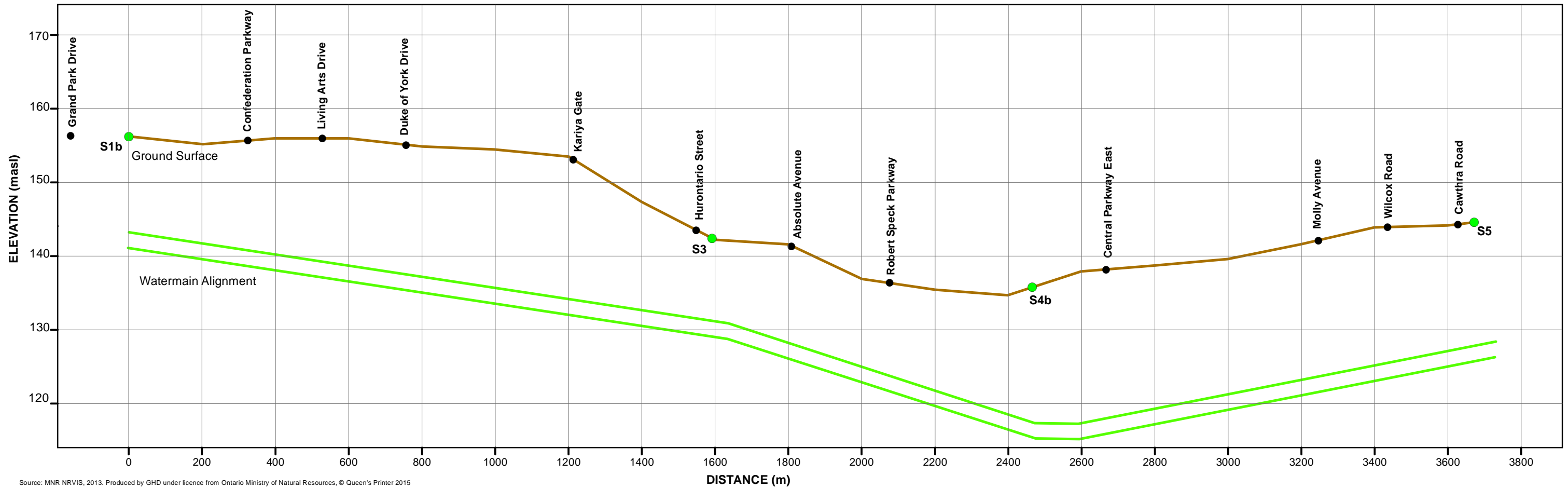
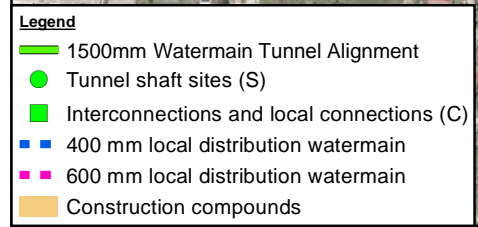
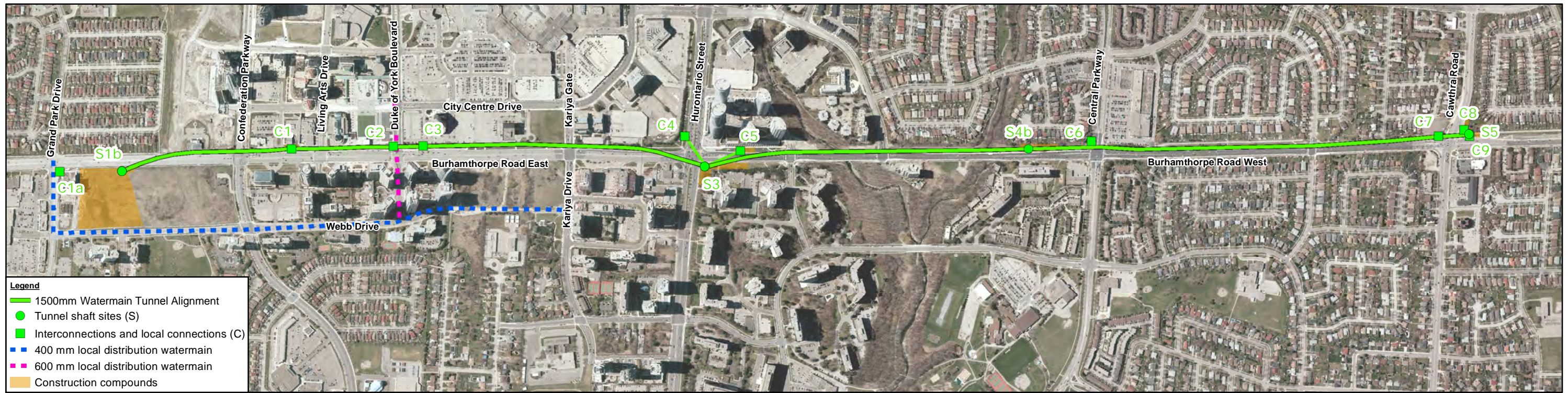


THE REGIONAL MUNICIPALITY OF PEEL
BURNHAMTHORPE ROAD WATERMAIN CLASS ENVIRONMENTAL ASSESSMENT

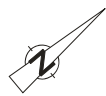
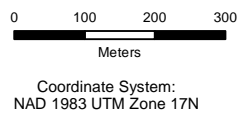
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PLANNED AND PROPOSED PROJECTS

FIGURE 17



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BURNHAMTHORPE ROAD WATERMAIN CLASS ENVIRONMENTAL ASSESSMENT

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PREFERRED HORIZONTAL AND VERTICAL ALIGNMENT

FIGURE 18

Appendices

Appendix A – Net Effects Analysis of the Alternatives

Table 1: Net Effects Analysis – Do Nothing Alternative

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
Technical	Ability to address the problem / opportunity	<ul style="list-style-type: none"> Does the alternative address the problem or opportunity? 	<ul style="list-style-type: none"> No. The alternative would not address the problem/opportunity 	<ul style="list-style-type: none"> None available. 	<ul style="list-style-type: none"> The alternative would not address the problem/opportunity
	Integration with existing water infrastructure	<ul style="list-style-type: none"> Degree of integration 	<ul style="list-style-type: none"> There would be no integration with existing water infrastructure 	<ul style="list-style-type: none"> None available. 	<ul style="list-style-type: none"> . There would be no integration with existing water infrastructure
	Construction site requirements	<ul style="list-style-type: none"> Number of tunnel shaft sites Number of connections 	<ul style="list-style-type: none"> There would be no construction site requirements. 	<ul style="list-style-type: none"> None required. 	<ul style="list-style-type: none"> There would be no construction site requirements.
	Presence of existing underground structures impacting tunnelling	<ul style="list-style-type: none"> Degree of conflicts between known underground obstructions (e.g. parking garages) and technical approach to tunnelling 	<ul style="list-style-type: none"> There would be no conflicts with underground structures. 	<ul style="list-style-type: none"> None required. 	<ul style="list-style-type: none"> There would be no conflicts with underground structures.
	Constructability of tunnelling and pipe installation	<ul style="list-style-type: none"> Number / length of tunnel drives Horizontal curvature 	<ul style="list-style-type: none"> There would be no issues of constructability. 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> There would be no issues of constructability.
	Future operation and maintenance	<ul style="list-style-type: none"> Ease of future maintenance (e.g. depth of vertical alignment) 	<ul style="list-style-type: none"> There would be no future maintenance requirements 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> There would be no future maintenance requirements.
Natural Environment <small>1 2</small>	Effect on groundwater	<ul style="list-style-type: none"> Short- or long-term change in groundwater quality or quantity 	<ul style="list-style-type: none"> No short-term or long-term change in groundwater quality/quantity. 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> Groundwater quality/quantity would remain unchanged.
	Effect on surface water	<ul style="list-style-type: none"> Short- or long-term change in surface water quality or quantity 	<ul style="list-style-type: none"> No short-term or long-term change in surface water quality/quantity. 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> Surface water quality/quantity would remain unchanged.
	Effect on street trees and vegetation	<ul style="list-style-type: none"> Number of street trees and extent of vegetation removed 	<ul style="list-style-type: none"> No removal of street trees or vegetation. 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> All existing street trees and vegetation would remain unchanged.
Built Environment	Effect on property	<ul style="list-style-type: none"> Property requirements 	<ul style="list-style-type: none"> No property requirements. 	<ul style="list-style-type: none"> None required. 	<ul style="list-style-type: none"> There would be no property requirements.
	Effect on existing residences, businesses and/or community, institutional and recreational facilities	<ul style="list-style-type: none"> Nature of temporary local disruption to residents, businesses and community, institutional or recreational facilities 	<ul style="list-style-type: none"> No residents, businesses and community, institutional or recreational facilities would be temporarily disrupted. 	<ul style="list-style-type: none"> None required. 	<ul style="list-style-type: none"> There would be temporary local disruption to residents, businesses and community, institutional or recreational facilities
	Effect of vibration on existing buildings	<ul style="list-style-type: none"> Degree of risk of short-term adverse vibration effects on buildings 	<ul style="list-style-type: none"> No short-term vibration effects on buildings. 	<ul style="list-style-type: none"> None required. 	<ul style="list-style-type: none"> There would be no short-term vibration effects on buildings.
	Effect on existing road infrastructure	<ul style="list-style-type: none"> Nature of adverse effects on roadways 	<ul style="list-style-type: none"> No adverse effects on roadways. 	<ul style="list-style-type: none"> None required. 	<ul style="list-style-type: none"> There would be no adverse effects on roadways.

¹ GHD, 2015. Baseline Natural Features Assessment Report (EA6)

² GHD, 2015. Desktop Geotechnical Study Report (EA9)

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
	Effect on existing utility infrastructure	<ul style="list-style-type: none"> Nature and significance of above and/or below ground utilities affected 	<ul style="list-style-type: none"> No adverse effects to above and/or below ground utilities. 	<ul style="list-style-type: none"> None required. 	<ul style="list-style-type: none"> There would be no adverse effects to above and/or below ground utilities.
	Effect of environmental impairment areas	<ul style="list-style-type: none"> Proximity to areas of environmental impairment (AEI) 	<ul style="list-style-type: none"> No areas of environmental impairment (AEI) would be adversely affected. 	<ul style="list-style-type: none"> None required. 	<ul style="list-style-type: none"> There would be no adverse effects to areas of environmental impairment (AEI).
Social Environment	Effect on traffic	<ul style="list-style-type: none"> Short-term disruption (extent and duration) to traffic and public transport operations (GO stations, MiWay bus routes, etc.) 	<ul style="list-style-type: none"> No short-term disruption effects to traffic. 	<ul style="list-style-type: none"> None required. 	<ul style="list-style-type: none"> There would be no short-term disruption effects to traffic.
	Effect of noise and perceptible vibration on sensitive receptors ³	<ul style="list-style-type: none"> Degree of risk of short-term adverse noise and vibration effects on sensitive receptors 	<ul style="list-style-type: none"> No short-term noise and vibration effects on sensitive receptors. 	<ul style="list-style-type: none"> None required. 	<ul style="list-style-type: none"> There would be no short-term noise and vibration effects on sensitive receptors.
	Effect of dust on sensitive receptors ⁴	<ul style="list-style-type: none"> Nature of short-term adverse dust effects on identified sensitive receptors 	<ul style="list-style-type: none"> Short-term increase in dust levels in proximity to all surface construction sites 	<ul style="list-style-type: none"> None required. 	<ul style="list-style-type: none"> Short-term construction-related effects of dust will be avoided and
Economic Environment	Synergy with approved or planned projects	<ul style="list-style-type: none"> Degree of synergy 	<ul style="list-style-type: none"> No opportunities for synergy with approved or planned projects. 	<ul style="list-style-type: none"> None available. 	<ul style="list-style-type: none"> There would be no opportunities for synergy with approved or planned projects.
Cultural Environment	Effect on archaeological resources and areas of archaeological potential ⁵	<ul style="list-style-type: none"> Number and type of known archaeological sites affected Area (ha) of archaeological potential (i.e. lands with potential for the presence of significant archaeological resources) affected 	<ul style="list-style-type: none"> No adverse effects to known archaeological resources or areas of archaeological potential 	<ul style="list-style-type: none"> None required. 	<ul style="list-style-type: none"> There would be no adverse effects to known archaeological sites areas of archaeological potential.
	Effects on significant cultural heritage resources ⁶	<ul style="list-style-type: none"> Number and type of built heritage resources and cultural heritage landscapes displaced or disrupted 	<ul style="list-style-type: none"> No displacement or disruption of built heritage resources or cultural heritage landscapes. 	<ul style="list-style-type: none"> None required. 	<ul style="list-style-type: none"> No built heritage resources or cultural heritage landscapes would be displaced or disrupted.
Financial	Capital costs	<ul style="list-style-type: none"> Estimated capital cost, including property easements, temporary works and permanent works (Level D \$)? 	<ul style="list-style-type: none"> ~\$111 million 	<ul style="list-style-type: none"> Not applicable 	<ul style="list-style-type: none"> ~\$111 million

³ Based on MoECC Noise Limits in Environmental and Land Use Planning Guidelines; Regional and Municipal Noise Limits in By-Laws; MoECC Vibration Limits in NPC-207

⁴ Reference any relevant regs

⁵ ASI, 2015. Stage 1 Archaeological Assessment Report

⁶ ASI, 2015. Cultural Heritage Resource Assessment Report

Table 2: Net Effects Analysis - Alternative 1: Two-Drive South

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
Technical	Ability to address the problem / opportunity	<ul style="list-style-type: none"> Does the alternative address the problem or opportunity? 	<ul style="list-style-type: none"> Yes. The alternative addresses the problem/opportunity 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> The alternative addresses the problem/opportunity
	Integration with existing water infrastructure	<ul style="list-style-type: none"> Degree of integration 	<ul style="list-style-type: none"> Since the alignment is almost exclusively on the south side of Burnhamthorpe Road, 5 road crossings and significant work is required to facilitate interconnections with existing water infrastructure 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> Low degree of integration with existing water infrastructure, since the alignment is predominantly on the south side of Burnhamthorpe Road, requiring 5 road crossings.
	Construction site requirements	<ul style="list-style-type: none"> Number of tunnel shaft sites Number of connections 	<ul style="list-style-type: none"> 3 tunnel shaft sites 9 connections 	<ul style="list-style-type: none"> Limit the total number of surface works sites to a total 12 by co-locating tunnelling and connections works. 	<ul style="list-style-type: none"> 12 total surface works sites would be required.
	Presence of existing underground structures impacting tunnelling	<ul style="list-style-type: none"> Degree of conflicts between known underground obstructions (e.g. parking garages) and technical approach to tunnelling 	<ul style="list-style-type: none"> There are a number of underground structures on the south side of Burnhamthorpe Road between Duke of York and Confederation 	<ul style="list-style-type: none"> Avoid numerous known underground structures by adjusting the vertical alignment of the tunnel accordingly. 	<ul style="list-style-type: none"> Conflicts with underground structures would be avoided but the tunnel vertical alignment would be deeper
	Constructability of tunnelling and pipe installation	<ul style="list-style-type: none"> Number / length of tunnel drives Horizontal curvature 	<ul style="list-style-type: none"> 2 tunnel drives (1600 m, 2000 m) decreases the degree of flexibility for construction e.g. tunnelling technologies (traditional rock tunnel only) 1 horizontal curve required 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> 2 tunnel drives (1600 m, 2000 m) decreases the degree of flexibility for construction e.g. tunnelling technologies (traditional rock tunnel only) 1 horizontal curve required
	Future operation and maintenance	<ul style="list-style-type: none"> Ease of future maintenance e.g. depth of vertical alignment 	<ul style="list-style-type: none"> More complex maintenance likely due to deeper vertical alignment necessary to avoid sanitary sewer at Central Parkway 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> More complex maintenance likely due to deeper vertical alignment necessary to avoid sanitary sewer at Central Parkway
Natural Environment <small>7 8</small>	Effect on groundwater	<ul style="list-style-type: none"> Short- or long-term change in groundwater quality or quantity 	<ul style="list-style-type: none"> Short-term effect on groundwater quality/quantity of shafts and tunneling intersecting the water table and bedrock groundwater at some sites. As contaminated soil / groundwater is potentially located in areas of proposed tunneling/excavation, long-term effect on groundwater quality/quantity of mobilization of contaminated water from environmentally-impaired sites nearby due to construction-related groundwater takings. 	<ul style="list-style-type: none"> Develop and implement a groundwater monitoring and impact management program during detailed design, including contingency measures. Apply standard construction management measures to minimize the extent of temporary dewatering required during construction (e.g., excavations below the water table would be avoided where possible; use of sealed shafts and temporary groundwater cutoff structures where appropriate; storage and refuelling of equipment will be conducted exclusively in designated spill protection areas, etc.). Engage a Qualified Person (as defined under Ontario Reg. 511/09) to direct the appropriate management of potentially contaminated soil / water, consistent with Part XV.1 of the Environmental Protection Act and O.Reg. 153/04, Records of Site Condition). 	<ul style="list-style-type: none"> No short-term or long-term groundwater quality and quantity impacts would occur provided standard construction impact management measures are applied and potentially contaminated soil / water is appropriately managed.
	Effect on surface water	<ul style="list-style-type: none"> Short- or long-term change in surface water quality or quantity 	<ul style="list-style-type: none"> No potential effects anticipated since there are no construction sites within 500 m of Cooksville Creek 	<ul style="list-style-type: none"> Develop and implement a Stormwater Management Plan (consistent with the MOECC Stormwater Management Planning and Design Manual (2003), incorporating erosion and sediment control measures – in consultation with CVC and consistent 	<ul style="list-style-type: none"> Short-term effects on surface water quality and quantity as a result of construction activities would be managed through the use of appropriate construction methods, including the development and implementation of an <i>Erosion and Sediment</i>

⁷ GHD, 2015. Baseline Natural Features Assessment Report (EA6)

⁸ GHD, 2015. Desktop Geotechnical Study Report (EA9)

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
				<p>with the Erosion and Sediment Control Guidelines for Urban Construction (2006), during construction</p> <ul style="list-style-type: none"> Develop and implement a Spill Response Plan and train construction staff on associated procedures. <p>Apply standard construction management measures to minimize short-term effects on surface water quality during construction</p>	<p><i>Control Plan.</i></p> <ul style="list-style-type: none"> No site within 500 m of Cooksville Creek
	Effect on street trees and vegetation	<ul style="list-style-type: none"> Number of street trees and extent of vegetation removed 	<ul style="list-style-type: none"> Removal of at least 32 trees along with herbaceous and woody vegetation, including: <ul style="list-style-type: none"> S1b: 2+ successional trees S3: 8+ mature trees S5: 4+ trees C1: 4+ trees C3: 5+ trees C5: 4+ trees C7: 5+ trees 	<ul style="list-style-type: none"> Avoid the removal of street trees and vegetation where possible as part of detailed design and construction site planning Develop and implement a <i>Tree Preservation and Restoration Plan</i>, including transplanting, standard root zone protections and tree replacement at a ratio of 1:1, with a focus on native, non-invasive, salt-tolerant species to the extent possible. 	<ul style="list-style-type: none"> Removal of at least 32 trees and vegetation would be minimized as much as possible by implementing a <i>Tree Preservation and Restoration Plan</i>
Built Environment	Effect on property	<ul style="list-style-type: none"> Property requirements 	<ul style="list-style-type: none"> 10 temporary easements and 2 permanent easements required for construction sites outside of Burnhamthorpe Road right-of-way as follows: <ul style="list-style-type: none"> S1b: Private land owned by Rogers. 1 temporary easement and 1 permanent easement required. C1: Private land owned by the YMCA. 1 temporary easement required. C3: Private land owned by Morguard Corporation. A temporary easement is critical for use of the land as a construction site for a connection shaft. S3: Public land owned by the City of Mississauga. 1 small permanent easement required. 1 temporary easement required. S5: Private land owned by private owner. 1 temporary easement required. Estimated 5 small, temporary easements on south side to enable road crossings for connections on north side. 	<ul style="list-style-type: none"> Provide market value compensation to affected private property owners and as per agreements with the City of Mississauga, in accordance with Region of Peel protocols. 	<ul style="list-style-type: none"> 10 temporary easements and 2 permanent easements required for construction sites outside of Burnhamthorpe Road right-of-way would be compensated for in accordance with Region of Peel protocols.
	Effect on existing residences, businesses and/or community, institutional and recreational facilities	<ul style="list-style-type: none"> Nature of temporary local disruption to residents, businesses and community, institutional or recreational facilities 	<ul style="list-style-type: none"> Temporary adverse effects from surface construction sites e.g. loss of access to sidewalks, disruption to bus stops, interruption of the multi-use trail and aesthetic effects on nearby residents and businesses, including the following: <ul style="list-style-type: none"> S1b: Aesthetic effects on nearby condo residents. S3: Disruptive effects on sidewalk and bus stop. Adverse aesthetic effects on nearby condo residents. S5: Disruptive effects on multi-use trail. Aesthetic effects on nearby houses. C1: Disruptive effects on sidewalk. Aesthetic effects on nearby businesses. Local Connection: No access to Central Library parking ramp during construction. C3: Disruptive effects on sidewalk and pedestrian 	<ul style="list-style-type: none"> Develop and implement a <i>Traffic Management Plan</i>, including: sign-posted pedestrian / trail detours; Relocated bus stops/shelters; etc. Shroud construction sites to mitigate adverse aesthetic effects at street level and up to third-floor 	<ul style="list-style-type: none"> Temporary adverse effects from surface construction sites would be avoided where possible and minimized through the development and implementation of a <i>Traffic Management Plan</i>, <i>Urban Art Restoration Plan</i> and shrouding of construction sites. However, there would still be short-term inconveniences to pedestrians, transit users, etc. and adverse aesthetic effects for occupants above the third-floor level in close proximity to the surface construction sites.

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
			<p>crossing. Aesthetic effects on nearby office/Civic Centre/Council offices. Access to local businesses and shopping area.</p> <ul style="list-style-type: none"> - C7: Disruptive effects on multi-use trail, sidewalk, pedestrian crossing and street art installation. - C9: Disruptive effects on bus stop, multi-use trail, sidewalk and pedestrian crossing. 		
Effect of vibration on existing buildings	<ul style="list-style-type: none"> ▪ Degree of risk of short-term adverse vibration effects on buildings 		<ul style="list-style-type: none"> ▪ Short-term vibration effects are anticipated from the following sites if vibrations exceed 5 mm/sec: <ul style="list-style-type: none"> - S1b: High risk of effects on residences along Wallenberg Crescent and adjacent condo building. - S3: Low to moderate risk to condo building located southeast of site. Low risk to condo buildings located along south-side of Burnhamthorpe Road. - S5: Moderate risk of effects on residences located along Greycedar Crescent - C1: Low risk of effects on condo building located on the south-side of Burnhamthorpe Road. Moderate risk of effects on YMCA building. - C3: Low risk of effects on condo buildings located on the south-side of Burnhamthorpe Road and office building on north. - C5: Low risk of effects on condo buildings located on the south-side of Burnhamthorpe Road - C7: Moderate risk of effects on townhouses and condo building located to the north of the site. 	<ul style="list-style-type: none"> ▪ Develop and implement a <i>Vibration Management Program</i> during construction, e.g. undertake pre-construction property surveys of all properties within 30 m of surface construction sites (zone of direct influence), consult with affected property owners, apply good management practices for noise and vibration reduction and implement a complaint response protocol. ▪ Adhere to MoECC vibration limits in NPC-207 	<ul style="list-style-type: none"> ▪ Short-term vibration effects will be minimized by the development and implementation of a <i>Vibration Management Program</i> during construction and adherence to NPC-207 limits.
Effect on existing road infrastructure	<ul style="list-style-type: none"> ▪ Nature of adverse effects on roadways 		<ul style="list-style-type: none"> ▪ 5 road crossings will require additional short-term excavations and reconstruction ▪ Approximately 70% of the alignment under travelled portion of road; increased risk of adverse effects on roadway 	<ul style="list-style-type: none"> ▪ Reconstruct excavated portions of Burnhamthorpe Road at surface construction sites and 5 road crossings to meet City of Mississauga road design standards. ▪ Minimize the portion of the alignment under the travelled portion of the road as much as possible. ▪ Complete detailed geotechnical investigations during the design phase of the project to understand the geotechnical conditions and specify appropriate tunnelling and shaft construction methodologies. ▪ Undertake settlement monitoring during construction 	<ul style="list-style-type: none"> ▪ Excavated portions of Burnhamthorpe Road would be reconstructed to City of Mississauga road design standards ▪ Approximately 70% of the alignment under the travelled portion of road would increase risk of adverse effects on roadway
Effect on existing utility infrastructure	<ul style="list-style-type: none"> ▪ Nature and significance of above and/or below ground utilities affected 		<ul style="list-style-type: none"> ▪ Short-term adverse effects on above ground utilities at surface construction sites as follows: <ul style="list-style-type: none"> - S1b: Overhead utility lines and poles along the north side of the shaft compound - S3: Substantial overhead utility lines, poles and anchor points, streetlight poles surrounding site and electrical/telephone box - S5: Single streetlight pole and trail light pole. - C1: Single streetlight pole - C3: Single streetlight pole, 2 traffic lights, 	<ul style="list-style-type: none"> ▪ In consultation with utility providers, locate all above and/or below ground utility infrastructure prior to construction to avoid potential conflicts with tunnel alignment and surface construction sites ▪ Relocate utility infrastructure as required as part of pre-construction activities. 	<ul style="list-style-type: none"> ▪ Short-term adverse effects on above and/or below ground utility infrastructure during construction would be minimized by locating all infrastructure prior to construction, consulting with utility providers and relocation of affected infrastructure as required. However, short-term Interruption of service is possible.

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
			<p>overhead lines/poles/anchor points and electrical/telephone box</p> <ul style="list-style-type: none"> - C5: Single streetlight pole and overhead lines/poles. - C7: Substantial overhead utility lines, poles and anchor points; 2 streetlight poles; Single traffic light pole; numerous utility covers and a drainage grates. 		
	Effect of environmental impairment areas	<ul style="list-style-type: none"> Proximity to areas of environmental impairment (AEI) 	<ul style="list-style-type: none"> Horizontal tunnel alignment is in proximity to the following 8 sites of (potential) environmental impairment: AEI 1, AEI 2, AEI 3, AEI 4, PAEI 1, PAEI 2, PAEI 3, PAEI 4 4 construction sites in proximity to areas of (potential) environmental impairment: <ul style="list-style-type: none"> - S3: AEI 1 (via groundwater) - S5: AEI 3 - C5: PAEI 1 (via groundwater) - C7: AEI 3 	<ul style="list-style-type: none"> Undertake additional investigations of potential areas of environmental impairment to determine actual degree of contamination Minimize the amount of temporary dewatering required during construction by specifying sealed (undrained) shaft construction in the overburden and temporary groundwater cutoff structures where appropriate. Use good management practices for construction in areas of environmental impairment, including: <ul style="list-style-type: none"> - Development and implementation of contingency measures and spill response plans - Use of appropriate personal protective equipment Engage a Qualified Person (as defined under Ontario Reg. 511/09) to direct appropriate management of potentially contaminated soil and/or water. Develop a Soil Management Plan (consistent with Part XV.1 of the Environmental Protection Act and O.Reg. 153/04, Records of Site Condition) to govern how any contaminated soil/water encountered will be handled and disposed of. 	<ul style="list-style-type: none"> Proximity and interaction of surface and tunnelling construction with 12 known areas of environmental impairment would be avoided as much as possible Adverse impacts would be minimized through limiting dewatering, use of good construction management practices and engagement of a Qualified Person.
Social Environment	Effect on traffic	<ul style="list-style-type: none"> Short-term disruption (extent and duration) to traffic and public transport operations (GO stations, MiWay bus routes, etc.) 	<ul style="list-style-type: none"> Short-term effects from increased truck traffic associated with surface construction sites (S1b, S3 and S5) Short-term effects from temporary closure of traffic lanes to accommodate surface construction sites at: <ul style="list-style-type: none"> - C1: Westbound travel reduced to 2 lanes between Confederation and Living Arts Drive. - C7: Cawthra Road – southbound right turn lane and westbound Burnhamthorpe Road bus lane to be closed during construction. Intersection expected to operate over capacity with 2 minute delay during afternoon peak. - Numerous small sites to facilitate road crossings from south side to north. Short-term removal of 12 on-street parking spaces at C3. 	<ul style="list-style-type: none"> Develop and implement a <i>Traffic Management Plan</i> during construction in accordance with the Region of Peel's protocols and consultation with the City of Mississauga, transit providers (MiWay, MetroLinx, etc.). 	<ul style="list-style-type: none"> Short-term effects would be minimized by developing and implementing a <i>Traffic Management Plan</i>. However, 12 on-street parking spaces would be removed for the period of construction at C3 (2-4 months).
	Effect of noise and perceptible vibration on	<ul style="list-style-type: none"> Degree of risk of short-term adverse noise and vibration effects on sensitive receptors 	<ul style="list-style-type: none"> Short-term noise and vibration effects are anticipated in proximity to surface construction sites as follows: 	<ul style="list-style-type: none"> Develop and implement a <i>Noise and Vibration Management Program</i> during construction, e.g. undertake pre-construction property surveys of all 	<ul style="list-style-type: none"> Short-term noise and vibration effects will be minimized by the development and implementation of a <i>Noise and Vibration Management Program</i>

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
	sensitive receptors ⁹		<ul style="list-style-type: none"> - S1b: High risk of effects on residences along Wallenberg Crescent and adjacent condo building. Customers of the adjacent commercial plaza to the west of Grand Park Drive. - S3: All immediate receptors surrounding this shaft site may experience adverse effects. The lower levels will be more impacted than the upper levels. - S5: Moderate risk of effects on residences located along Greycedar Crescent. Existing concrete noise wall will provide some noise protection to nearby residents at ground level; higher risk to second storey windows. - C1: Moderate risk of effects on YMCA building. Low risk of effects on condo building located on the south-side of Burnhamthorpe Road and receptors located north of City Centre Drive. - C3: Low risk of effects on condo buildings located on the south-side of Burnhamthorpe Road and office building on north. - C5: Low risk of effects on condo buildings located on the south-side of Burnhamthorpe Road - C7: Moderate to high risk of effects on townhouses located to the north of the site. Low risk of effects on surrounding condo buildings. 	<p>properties within 30 m of surface construction sites (zone of direct influence), consult with affected property owners, apply good management practices for noise and vibration reduction and implement a complaint response protocol.</p> <ul style="list-style-type: none"> ▪ Adhering to MOECC NPC-115; MOECC Noise Limits in Environmental and Land Use Planning Guidelines; applicable regional / municipal by-laws, including City of Mississauga 'Noise Control By-law 360-79' 	during construction and adherence to MOECC NPC-115; MOECC Noise Limits in Environmental and Land Use Planning Guidelines and applicable regional / municipal by-laws, including City of Mississauga 'Noise Control By-law 360-79'
	Effect of dust on sensitive receptors ¹⁰	<ul style="list-style-type: none"> ▪ Nature of short-term adverse dust effects on identified sensitive receptors 	<ul style="list-style-type: none"> ▪ Short-term increase in dust levels in proximity to all surface construction sites 	<ul style="list-style-type: none"> ▪ Apply good management practices to mitigate any air quality impacts caused by construction dust, consistent with Cheminfo Services Inc. <i>Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities (2005)</i> (e.g., install a mud mat (asphalt, concrete, gravel) at each surface construction site, employ regular road sweeping, undertake dust suppression, etc.) ▪ A complaint protocol will be developed and implemented for responding to potential dust-related complaints from area residents. 	<ul style="list-style-type: none"> ▪ Short-term construction-related effects of dust will be avoided and/or mitigated through the application of good management practices such as dust suppression and development of a complaint response protocol.
Economic Environment	Synergy with approved or planned projects	<ul style="list-style-type: none"> ▪ Degree of synergy 	<ul style="list-style-type: none"> ▪ Numerous approved / planned projects identified with good potential for coordination during detailed design and construction, including: <ul style="list-style-type: none"> - Planned development of the site between Burnhamthorpe Road and Webb drive, with S1b on the west portion of the property (rather than east) which is not due for construction until 2018-20, after the 1500 mm diameter watermain. - Good synergy with the planned Hurontario-Main LRT 	<ul style="list-style-type: none"> ▪ None required 	<ul style="list-style-type: none"> ▪ Numerous approved / planned projects identified with good potential for coordination during detailed design and construction, including: <ul style="list-style-type: none"> - Planned development of the site between Burnhamthorpe Road and Webb drive, with S1b on the west portion of the property (rather than east) which is not due for construction until 2018-20, after the 1500 mm diameter watermain. - Good synergy with the planned Hurontario-Main LRT

⁹ Based on MoECC Noise Limits in Environmental and Land Use Planning Guidelines; Regional and Municipal Noise Limits in By-Laws; MoECC Vibration Limits in NPC-207

¹⁰ Reference any relevant regs

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
Cultural Environment	Effect on archaeological resources and areas of archaeological potential ¹¹	<ul style="list-style-type: none"> Number and type of known archaeological sites affected Area (ha) of archaeological potential (i.e. lands with potential for the presence of significant archaeological resources) affected 	<ul style="list-style-type: none"> There are no known archaeological sites in the vicinity of the majority of the surface construction sites. However, there is archaeological potential at construction site S1b (2.5 ha) 	<ul style="list-style-type: none"> Undertake a Stage 2 Archaeological Assessment by a qualified archaeologist at S1b to determine the presence of archaeological resources. If warranted based on the results of the Stage 2 Archaeological Assessment, Stage 3 and Stage 4 Archaeological Assessments will be conducted. If and when archaeological sites are discovered, appropriate action will be taken, including a cessation of construction work on the affected site, consultation with aboriginal communities and adherence to Ministry of Tourism, Culture and Sport guidelines. 	<ul style="list-style-type: none"> No known archaeological sites or resources would be adversely affected. However, if deeply buried archaeological sites are discovered, appropriate action will be taken, including a cessation of construction work on the affected site, consultation with aboriginal communities and adherence to Ministry of Tourism, Culture and Sport guidelines.
	Effects on significant cultural heritage resources ¹²	<ul style="list-style-type: none"> Number and type of built heritage resources and cultural heritage landscapes displaced or disrupted 	<ul style="list-style-type: none"> No built heritage resources or cultural heritage landscapes would be displaced or disrupted. 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> No built heritage resources or cultural heritage landscapes would be displaced or disrupted.
Financial	Capital costs	<ul style="list-style-type: none"> Estimated capital cost, including property easements, temporary works and permanent works (Level D \$)? 	<ul style="list-style-type: none"> ~\$111 million 	<ul style="list-style-type: none"> Not applicable 	<ul style="list-style-type: none"> ~\$111 million

¹¹ ASI, 2015. Stage 1 Archaeological Assessment Report

¹² ASI, 2015. Cultural Heritage Resource Assessment Report

Table3: Net Effects Analysis - Alternative 2: Three-Drive South

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
Technical	Ability to address the problem / opportunity	<ul style="list-style-type: none"> Does the alternative address the problem or opportunity? 	<ul style="list-style-type: none"> Yes. The alternative addresses the problem/opportunity 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> The alternative addresses the problem/opportunity
	Integration with existing water infrastructure	<ul style="list-style-type: none"> Degree of integration 	<ul style="list-style-type: none"> Since the alignment is almost exclusively on the south side of Burnhamthorpe Road, 5 road crossings and significant work is required to facilitate interconnections with existing water infrastructure 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> Low degree of integration with existing water infrastructure, since the alignment is predominantly on the south side of Burnhamthorpe Road, requiring 5 road crossings.
	Construction site requirements	<ul style="list-style-type: none"> Number of tunnel shaft sites Number of connections 	<ul style="list-style-type: none"> 4 tunnel shaft sites 9 connections 	<ul style="list-style-type: none"> Limit the total number of surface works sites to a total 13 by co-locating tunnelling and connections works. 	<ul style="list-style-type: none"> 13 total surface works sites would be required.
	Presence of existing underground structures impacting tunnelling	<ul style="list-style-type: none"> Degree of conflicts between known underground obstructions (e.g. parking garages) and technical approach to tunnelling 	<ul style="list-style-type: none"> There are a number of underground structures on the south side of Burnhamthorpe Road between Duke of York and Confederation 	<ul style="list-style-type: none"> Avoid numerous known underground structures by adjusting the vertical alignment of the tunnel accordingly. 	<ul style="list-style-type: none"> Conflicts with underground structures would be avoided but the tunnel vertical alignment would be deeper
	Constructability of tunnelling and pipe installation	<ul style="list-style-type: none"> Number / length of tunnel drives Horizontal curvature 	<ul style="list-style-type: none"> 3 tunnel drives (1600 m, 900 m and 1100 m) increases the degree of flexibility for construction e.g. tunnelling technologies (traditional rock tunnel or micro-tunnelling) 1 horizontal curve required 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> 3 tunnel drives (1600 m, 900 m and 1100 m) increases the degree of flexibility for construction e.g. tunnelling technologies (traditional rock tunnel or micro-tunnelling) 1 horizontal curve required
	Future operation and maintenance	<ul style="list-style-type: none"> Ease of future maintenance e.g. depth of vertical alignment 	<ul style="list-style-type: none"> More complex maintenance likely due to deeper vertical alignment necessary to avoid sanitary sewer at Central Parkway 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> More complex maintenance likely due to deeper vertical alignment necessary to avoid sanitary sewer at Central Parkway
Natural Environment <small>13 14</small>	Effect on groundwater	Short- or long-term change in groundwater quality or quantity	<ul style="list-style-type: none"> Short-term effect on groundwater quality/quantity of shafts and tunneling intersecting the water table and bedrock groundwater at some sites. As contaminated soil / groundwater is potentially located in areas of proposed tunneling/excavation, long-term effect on groundwater quality/quantity of mobilization of contaminated water from environmentally-impaired sites nearby due to construction-related groundwater takings. 	<ul style="list-style-type: none"> Develop and implement a groundwater monitoring and impact management program during detailed design, including contingency measures. Apply standard construction management measures to minimize the extent of temporary dewatering required during construction (e.g., excavations below the water table would be avoided where possible; use of sealed shafts and temporary groundwater cutoff structures where appropriate; storage and refuelling of equipment will be conducted exclusively in designated spill protection areas, etc.). Engage a Qualified Person (as defined under Ontario Reg. 511/09) to direct the appropriate management of potentially contaminated soil / water, consistent with Part XV.1 of the Environmental Protection Act and O.Reg. 153/04, Records of Site Condition). 	No short-term or long-term groundwater quality and quantity impacts would occur provided standard construction impact management measures are applied and potentially contaminated soil / water is appropriately managed.
	Effect on surface water	Short- or long-term change in surface water quality or quantity	<ul style="list-style-type: none"> Short-term effects on surface water quantity as a result of construction-related dewatering activities at shaft site 4 (less than 250 m from Cooksville 	<ul style="list-style-type: none"> Develop and implement a Stormwater Management Plan (consistent with the MOECC Stormwater Management Planning and Design Manual (2003), incorporating erosion and sediment control 	<ul style="list-style-type: none"> Short-term effects on surface water quality and quantity as a result of construction activities would be managed through the use of appropriate construction methods, including the development

¹³ GHD, 2015. Baseline Natural Features Assessment Report (EA6)

¹⁴ GHD, 2015. Desktop Geotechnical Study Report (EA9)

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
			<p>Creek)</p> <ul style="list-style-type: none"> Short-term effects on water quality from surface water-borne sediment and contaminants via stormwater discharge from shaft site 4b. 	<ul style="list-style-type: none"> measures – in consultation with CVC and consistent with the Erosion and Sediment Control Guidelines for Urban Construction (2006), during construction Develop and implement a Spill Response Plan and train construction staff on associated procedures. Apply standard construction management measures to minimize short-term effects on surface water quality during construction 	<ul style="list-style-type: none"> and implementation of an Erosion and Sediment Control Plan. Site S4 is less than 250 m from Cooksville Creek
	Effect on street trees and vegetation	<ul style="list-style-type: none"> Number of street trees and extent of vegetation removed 	<ul style="list-style-type: none"> Removal of at least 33 trees along with herbaceous and woody vegetation, including: <ul style="list-style-type: none"> S1b: 2+ successional trees S3: 8+ mature trees S4b: 4+ street trees and vegetation S5: 4+ trees C1: 4+ trees C3: 5+ trees C5: 4+ trees C7: 5+ trees 	<ul style="list-style-type: none"> Avoid the removal of street trees and vegetation where possible as part of detailed design and construction site planning Develop and implement a <i>Tree Preservation and Restoration Plan</i>, including transplanting, standard root zone protections and tree replacement at a ratio of 1:1, with a focus on native, non-invasive, salt-tolerant species to the extent possible. 	<ul style="list-style-type: none"> Removal of approximately 33 trees and vegetation would be minimized as much as possible by implementing a <i>Tree Preservation and Restoration Plan</i>
Built Environment	Effect on property	<ul style="list-style-type: none"> Property requirements 	<ul style="list-style-type: none"> 11 temporary easements and 3 permanent easements required for construction sites outside of Burnhamthorpe Road right-of-way as follows: <ul style="list-style-type: none"> S1b: Private land owned by Rogers. 1 temporary easement and 1 permanent easement required. C1: Private land owned by the YMCA. 1 temporary easement required. C3: Private land owned by Morguard Corporation. A temporary easement is critical for use of the land as a construction site for a connection shaft. S3: Public land owned by the City of Mississauga. 1 small permanent easement required. 1 temporary easement required. S4: Private land owned by 1371048 Ontario Inc. (First Avenue Properties Inc.). 1 permanent easement required. 1 temporary easement required. S5: Private land owned by private owner. 1 temporary easement required. Estimated 5 small, temporary easements on south side to enable road crossings for connections on north side. 	<ul style="list-style-type: none"> Provide market value compensation to affected private property owners and as per agreements with the City of Mississauga, in accordance with Region of Peel protocols. 	<ul style="list-style-type: none"> 11 temporary easements and 3 permanent easements required for construction sites outside of Burnhamthorpe Road right-of-way would be compensated for in accordance with Region of Peel protocols.
	Effect on existing residences, businesses and/or community, institutional and recreational facilities	<ul style="list-style-type: none"> Nature of temporary local disruption to residents, businesses and community, institutional or recreational facilities 	<ul style="list-style-type: none"> Temporary adverse effects from surface construction sites e.g. loss of access to sidewalks, disruption to bus stops, interruption of the multi-use trail and aesthetic effects on nearby residents and businesses, including the following: <ul style="list-style-type: none"> S1b: Aesthetic effects on nearby condo residents. S3: Disruptive effects on sidewalk and bus stop. Adverse aesthetic effects on nearby condo residents. S4: Highly disruptive effects on sidewalk, private 	<ul style="list-style-type: none"> Develop and implement a <i>Traffic Management Plan</i>, including: sign-posted pedestrian / trail detours; Relocated bus stops/shelters; etc. Shroud construction sites to mitigate adverse aesthetic effects at street level and up to third-floor 	<ul style="list-style-type: none"> Temporary adverse effects from surface construction sites would be avoided where possible and minimized through the development and implementation of a <i>Traffic Management Plan</i>, <i>Urban Art Restoration Plan</i> and shrouding of construction sites. However, there would still be short-term inconveniences to pedestrians, transit users, etc. and adverse aesthetic effects for occupants above the third-floor level in close proximity to the surface

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
			<p>children's play area and closure/limited access to shopping plaza. Adverse aesthetic effects on nearby condo residents.</p> <ul style="list-style-type: none"> - S5: Disruptive effects on multi-use trail. Aesthetic effects on nearby houses. - C1: Disruptive effects on sidewalk. Aesthetic effects on nearby businesses. - Local Connection: No access to Central Library parking ramp during construction. - C3: Disruptive effects on sidewalk and pedestrian crossing. Aesthetic effects on nearby office/Civic Centre/Council offices. Access to local businesses and shopping area. - C7: Disruptive effects on multi-use trail, sidewalk, pedestrian crossing and street art installation. - C9: Disruptive effects on bus stop, multi-use trail, sidewalk and pedestrian crossing. 		<p>construction sites.</p> <ul style="list-style-type: none"> Site S4 would impact playground and access to plaza via Burnhamthorpe Road
Effect of vibration on existing buildings	<ul style="list-style-type: none"> Degree of risk of short-term adverse vibration effects on buildings 	<ul style="list-style-type: none"> Degree of risk of short-term adverse vibration effects on buildings 	<ul style="list-style-type: none"> Short-term vibration effects are anticipated from the following sites if vibrations exceed 5 mm/sec: <ul style="list-style-type: none"> - S1b: High risk of effects on residences along Wallenberg Crescent and adjacent condo building. - S3: Low to moderate risk to condo building located southeast of site. Low risk to condo buildings located along south-side of Burnhamthorpe Road. - S4: High risk for directly adjacent condo building (1300 Mississauga Valley Blvd), housing estate, shops and business. - S5: Moderate risk of effects on residences located along Greycedar Crescent - C1: Low risk of effects on condo building located on the south-side of Burnhamthorpe Road. Moderate risk of effects on YMCA building. - C3: Low risk of effects on condo buildings located on the south-side of Burnhamthorpe Road and office building on north. - C5: Low risk of effects on condo buildings located on the south-side of Burnhamthorpe Road - C7: Moderate risk of effects on townhouses and condo building located to the north of the site. 	<ul style="list-style-type: none"> Develop and implement a <i>Vibration Management Program</i> during construction, e.g. undertake pre-construction property surveys of all properties within 30 m of surface construction sites (zone of direct influence), consult with affected property owners, apply good management practices for noise and vibration reduction and implement a complaint response protocol. Adhere to MoECC vibration limits in NPC-207 	<ul style="list-style-type: none"> Short-term vibration effects will be minimized by the development and implementation of a <i>Vibration Management Program</i> during construction and adherence to NPC-207 limits. Potential for residual impacts on the condo buildings and plaza in close proximity to site S4
Effect on existing road infrastructure	<ul style="list-style-type: none"> Nature of adverse effects on roadways 	<ul style="list-style-type: none"> Nature of adverse effects on roadways 	<ul style="list-style-type: none"> 5 road crossings will require additional short-term excavations and reconstruction Approximately 70% of the alignment under travelled portion of road; increased risk of adverse effects on roadway 	<ul style="list-style-type: none"> Reconstruct excavated portions of Burnhamthorpe Road at surface construction sites and 5 road crossings to meet City of Mississauga road design standards. Minimize the portion of the alignment under the travelled portion of the road as much as possible. Complete detailed geotechnical investigations during the design phase of the project to understand the geotechnical conditions and specify appropriate tunnelling and shaft construction methodologies. 	<ul style="list-style-type: none"> Excavated portions of Burnhamthorpe Road would be reconstructed to City of Mississauga road design standards Approximately 70% of the alignment under the travelled portion of road would increase risk of adverse effects on roadway

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
				<ul style="list-style-type: none"> Undertake settlement monitoring during construction 	
	Effect on existing utility infrastructure	<ul style="list-style-type: none"> Nature and significance of above and/or below ground utilities affected 	<ul style="list-style-type: none"> Short-term adverse effects on above ground utilities at surface construction sites as follows: <ul style="list-style-type: none"> S1b: Overhead utility lines and poles along the north side of the shaft compound S3: Substantial overhead utility lines, poles and anchor points, streetlight poles surrounding site and electrical/telephone box S4: Overhead utility lines and single pole. Electrical/telephone box. S5: Single streetlight pole and trail light pole. C1: Single streetlight pole C3: Single streetlight pole, 2 traffic lights, overhead lines/poles/anchor points and electrical/telephone box C5: Single streetlight pole and overhead lines/poles. C7: Substantial overhead utility lines, poles and anchor points; 2 streetlight poles; Single traffic light pole; numerous utility covers and a drainage grates. 	<ul style="list-style-type: none"> In consultation with utility providers, locate all above and/or below ground utility infrastructure prior to construction to avoid potential conflicts with tunnel alignment and surface construction sites Relocate utility infrastructure as required as part of pre-construction activities. 	<ul style="list-style-type: none"> Short-term adverse effects on above and/or below ground utility infrastructure during construction would be minimized by locating all infrastructure prior to construction, consulting with utility providers and relocation of affected infrastructure as required. However, short-term Interruption of service is possible.
	Effect of environmental impairment areas	<ul style="list-style-type: none"> Proximity to areas of environmental impairment (AEI) 	<ul style="list-style-type: none"> Horizontal tunnel alignment is in proximity to the following 8 sites of (potential) environmental impairment: AEI 1, AEI 2, AEI 3, AEI 4, PAEI 1, PAEI 2, PAEI 3, PAEI 4 5 construction sites in proximity to areas of (potential) environmental impairment: <ul style="list-style-type: none"> S3: AEI 1 (via groundwater) S4: PAEI 3 S5: AEI 3 C5: PAEI 1 (via groundwater) C7: AEI 3 	<ul style="list-style-type: none"> Undertake additional investigations of potential areas of environmental impairment to determine actual degree of contamination Minimize the amount of temporary dewatering required during construction by specifying sealed (undrained) shaft construction in the overburden and temporary groundwater cutoff structures where appropriate. Use good management practices for construction in areas of environmental impairment, including: <ul style="list-style-type: none"> Development and implementation of contingency measures and spill response plans Use of appropriate personal protective equipment Engage a Qualified Person (as defined under Ontario Reg. 511/09) to direct appropriate management of potentially contaminated soil and/or water. Develop a Soil Management Plan (consistent with Part XV.1 of the Environmental Protection Act and O.Reg. 153/04, Records of Site Condition) to govern how any contaminated soil/water encountered will be handled and disposed of. 	<ul style="list-style-type: none"> Proximity and interaction of surface and tunnelling construction with 13 known areas of environmental impairment would be avoided as much as possible Adverse impacts would be minimized through limiting dewatering, use of good construction management practices and engagement of a Qualified Person.
Social Environment	Effect on traffic	<ul style="list-style-type: none"> Short-term disruption (extent and duration) to traffic and public transport operations (GO stations, MiWay bus routes, etc.) 	<ul style="list-style-type: none"> Short-term effects from increased truck traffic associated with surface construction sites (S1b, S3, S4 and S5) Short-term effects from temporary closure of traffic lanes to accommodate surface construction sites at: <ul style="list-style-type: none"> S4: Eastbound travel reduced to 2 lanes west of 	<ul style="list-style-type: none"> Develop and implement a <i>Traffic Management Plan</i> during construction in accordance with the Region of Peel's protocols and consultation with the City of Mississauga, transit providers (MiWay, MetroLinx, etc.). 	<ul style="list-style-type: none"> Short-term effects would be minimized by developing and implementing a <i>Traffic Management Plan</i>. However, 12 on-street parking spaces would be removed for the period of construction at C3 (2-4 months) and eastbound travel reduced to 2 lanes on Burnhamthorpe Road, west of Central Parkway at S4 (up to 2 years).

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
			<p>Central Parkway</p> <ul style="list-style-type: none"> - C1: Westbound travel reduced to 2 lanes between Confederation and Living Arts Drive. - C7: Cawthra Road – southbound right turn lane and westbound Burnhamthorpe Road bus lane to be closed during construction. Intersection expected to operate over capacity with 2 minute delay during afternoon peak. - Numerous small sites to facilitate road crossings from south side to north. <ul style="list-style-type: none"> ▪ Short-term removal of 12 on-street parking spaces at C3. 		
	Effect of noise and perceptible vibration on sensitive receptors ¹⁵	<ul style="list-style-type: none"> ▪ Degree of risk of short-term adverse noise and vibration effects on sensitive receptors 	<ul style="list-style-type: none"> ▪ Short-term noise and vibration effects are anticipated in proximity to surface construction sites as follows: <ul style="list-style-type: none"> - S1b: High risk of effects on residences along Wallenberg Crescent and adjacent condo building. Customers of the adjacent commercial plaza to the west of Grand Park Drive. - S3: All immediate receptors surrounding this shaft site may experience adverse effects. The lower levels will be more impacted than the upper levels. - S4: Significant effects likely for directly adjacent condo building (1300 Mississauga Valley Blvd), housing estate, shops and business. - S5: Moderate risk of effects on residences located along Greycedar Crescent. Existing concrete noise wall will provide some noise protection to nearby residents at ground level; higher risk to second storey windows. - C1: Moderate risk of effects on YMCA building. Low risk of effects on condo building located on the south-side of Burnhamthorpe Road and receptors located north of City Centre Drive. - C3: Low risk of effects on condo buildings located on the south-side of Burnhamthorpe Road and office building on north. - C5: Low risk of effects on condo buildings located on the south-side of Burnhamthorpe Road - C7: Moderate to high risk of effects on townhouses located to the north of the site. Low risk of effects on surrounding condo buildings. 	<ul style="list-style-type: none"> ▪ Develop and implement a <i>Noise and Vibration Management Program</i> during construction, e.g. undertake pre-construction property surveys of all properties within 30 m of surface construction sites (zone of direct influence), consult with affected property owners, apply good management practices for noise and vibration reduction and implement a complaint response protocol. ▪ Adhering to MOECC NPC-115; MOECC Noise Limits in Environmental and Land Use Planning Guidelines; applicable regional / municipal by-laws, including City of Mississauga 'Noise Control By-law 360-79' 	<ul style="list-style-type: none"> ▪ Short-term noise and vibration effects will be minimized by the development and implementation of a <i>Noise and Vibration Management Program</i> during construction and adherence to MOECC NPC-115; MOECC Noise Limits in Environmental and Land Use Planning Guidelines and applicable regional / municipal by-laws, including City of Mississauga 'Noise Control By-law 360-79'. ▪ Potential for residual impacts on the condo buildings and plaza in close proximity to site S4.
	Effect of dust on sensitive receptors ¹⁶	<ul style="list-style-type: none"> ▪ Nature of short-term adverse dust effects on identified sensitive receptors 	<ul style="list-style-type: none"> ▪ Short-term increase in dust levels in proximity to all surface construction sites 	<ul style="list-style-type: none"> ▪ Apply good management practices to mitigate any air quality impacts caused by construction dust, consistent with Cheminfo Services Inc. <i>Best Practices for the Reduction of Air Emissions from Construction</i> 	<ul style="list-style-type: none"> ▪ Short-term construction-related effects of dust will be avoided and/or mitigated through the application of good management practices such as dust suppression and development of a complaint

¹⁵ Based on MoECC Noise Limits in Environmental and Land Use Planning Guidelines; Regional and Municipal Noise Limits in By-Laws; MoECC Vibration Limits in NPC-207

¹⁶ Reference any relevant regs

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
				<p><i>and Demolition Activities (2005)</i> (e.g., install a mud mat (asphalt, concrete, gravel) at each surface construction site, employ regular road sweeping, undertake dust suppression, etc.)</p> <p>A complaint protocol will be developed and implemented for responding to potential dust-related complaints from area residents.</p>	response protocol.
Economic Environment	Synergy with approved or planned projects	<ul style="list-style-type: none"> Degree of synergy 	<ul style="list-style-type: none"> Numerous approved / planned projects identified with good potential for coordination during detailed design and construction, including: <ul style="list-style-type: none"> Planned development of the site between Burnhamthorpe Road and Webb drive, with S1b on the west portion of the property (rather than east) which is not due for construction until 2018-20, after the 1500 mm diameter watermain. Good synergy with the planned Hurontario-Main LRT 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> Numerous approved / planned projects identified with good potential for coordination during detailed design and construction, including: <ul style="list-style-type: none"> Planned development of the site between Burnhamthorpe Road and Webb drive, with S1b on the west portion of the property (rather than east) which is not due for construction until 2018-20, after the 1500 mm diameter watermain. Good synergy with the planned Hurontario-Main LRT
Cultural Environment	Effect on archaeological resources and areas of archaeological potential ¹⁷	<ul style="list-style-type: none"> Number and type of known archaeological sites affected Area (ha) of archaeological potential (i.e. lands with potential for the presence of significant archaeological resources) affected 	<ul style="list-style-type: none"> There are no known archaeological sites in the vicinity of the majority of the surface construction sites. However, there is archaeological potential at construction site S1b (2.5 ha) 	<ul style="list-style-type: none"> Undertake a Stage 2 Archaeological Assessment by a qualified archaeologist at S1b to determine the presence of archaeological resources. If warranted based on the results of the Stage 2 Archaeological Assessment, Stage 3 and Stage 4 Archaeological Assessments will be conducted. If and when archaeological sites are discovered, appropriate action will be taken, including a cessation of construction work on the affected site, consultation with aboriginal communities and adherence to Ministry of Tourism, Culture and Sport guidelines. 	<ul style="list-style-type: none"> No known archaeological sites or resources would be adversely affected. However, if deeply buried archaeological sites are discovered, appropriate action will be taken, including a cessation of construction work on the affected site, consultation with aboriginal communities and adherence to Ministry of Tourism, Culture and Sport guidelines.
	Effects on significant cultural heritage resources ¹⁸	<ul style="list-style-type: none"> Number and type of built heritage resources and cultural heritage landscapes displaced or disrupted 	<ul style="list-style-type: none"> No built heritage resources or cultural heritage landscapes would be displaced or disrupted. 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> No built heritage resources or cultural heritage landscapes would be displaced or disrupted.
Financial	Capital costs	<ul style="list-style-type: none"> Estimated capital cost, including property easements, temporary works and permanent works (Level D \$)? 	<ul style="list-style-type: none"> ~\$117 million 	<ul style="list-style-type: none"> Not applicable 	<ul style="list-style-type: none"> ~\$117 million

¹⁷ ASI, 2015. Stage 1 Archaeological Assessment Report

¹⁸ ASI, 2015. Cultural Heritage Resource Assessment Report

Table 4: Net Effects Analysis - Alternative 3: Two-Drive North-South-North

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
Technical	Ability to address the problem / opportunity	<ul style="list-style-type: none"> Does the alternative address the problem or opportunity? 	<ul style="list-style-type: none"> Yes. The alternative addresses the problem/opportunity 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> The alternative addresses the problem/opportunity
	Integration with existing water infrastructure	<ul style="list-style-type: none"> Degree of integration 	<ul style="list-style-type: none"> Since the alignment has sections running along the north side of Burnhamthorpe Road, 3 road crossings and moderate work is required to facilitate interconnections with existing water infrastructure 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> Moderate degree of integration with existing water infrastructure, since the alignment is predominantly on the north side of Burnhamthorpe Road, requiring 3 road crossings.
	Construction site requirements	<ul style="list-style-type: none"> Number of tunnel shaft sites Number of connections 	<ul style="list-style-type: none"> 3 tunnel shaft sites 9 connections 	<ul style="list-style-type: none"> Limit the total number of surface works sites to a total 9 by co-locating tunnelling and connections works. 	<ul style="list-style-type: none"> 9 total surface works sites would be required.
	Presence of existing underground structures impacting tunnelling	<ul style="list-style-type: none"> Degree of conflicts between known underground obstructions (e.g. parking garages) and technical approach to tunnelling 	<ul style="list-style-type: none"> There are 2 underground structures: parking beneath Mississauga Civic Centre/Central Library; at the northwest corner of Confederation Pkwy and Burnhamthorpe Rd 	<ul style="list-style-type: none"> Avoid 2 known underground structures by adjusting the vertical alignment of the tunnel accordingly. 	<ul style="list-style-type: none"> Conflicts with underground structures would be avoided but the tunnel vertical alignment would be deeper
	Constructability of tunnelling and pipe installation	<ul style="list-style-type: none"> Number / length of tunnel drives Horizontal curvature 	<ul style="list-style-type: none"> 2 tunnel drives (1600 m, 2100 m) decreases the degree of flexibility for construction e.g. tunnelling technologies (traditional rock tunnel only) 3 horizontal curves required 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> 2 tunnel drives (1600 m, 2100 m) decreases the degree of flexibility for construction e.g. tunnelling technologies (traditional rock tunnel only) 3 horizontal curves required
	Future operation and maintenance	<ul style="list-style-type: none"> Ease of future maintenance e.g. depth of vertical alignment 	<ul style="list-style-type: none"> More complex maintenance likely due to deeper vertical alignment necessary to avoid sanitary sewer at Central Parkway 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> More complex maintenance likely due to deeper vertical alignment necessary to avoid sanitary sewer at Central Parkway
Natural Environment <small>19 20</small>	Effect on groundwater	Short- or long-term change in groundwater quality or quantity	<ul style="list-style-type: none"> Short-term effect on groundwater quality/quantity of shafts and tunneling intersecting the water table and bedrock groundwater at some sites. As contaminated soil / groundwater is potentially located in areas of proposed tunneling/excavation, long-term effect on groundwater quality/quantity of mobilization of contaminated water from environmentally-impaired sites nearby due to construction-related groundwater takings. 	<ul style="list-style-type: none"> Develop and implement a groundwater monitoring and impact management program during detailed design, including contingency measures. Apply standard construction management measures to minimize the extent of temporary dewatering required during construction (e.g., excavations below the water table would be avoided where possible; use of sealed shafts and temporary groundwater cutoff structures where appropriate; storage and refuelling of equipment will be conducted exclusively in designated spill protection areas, etc.). Engage a Qualified Person (as defined under Ontario Reg. 511/09) to direct the appropriate management of potentially contaminated soil / water, consistent with Part XV.1 of the Environmental Protection Act and O.Reg. 153/04, Records of Site Condition). 	<ul style="list-style-type: none"> No short-term or long-term groundwater quality and quantity impacts would occur provided standard construction impact management measures are applied and potentially contaminated soil / water is appropriately managed.
	Effect on surface water	Short- or long-term change in surface water quality or quantity	<ul style="list-style-type: none"> No potential effects anticipated since there are no construction sites within 500 m of Cooksville Creek 	<ul style="list-style-type: none"> Develop and implement a Stormwater Management Plan (consistent with the MOECC Stormwater Management Planning and Design Manual (2003), incorporating erosion and sediment control measures – in consultation with CVC and consistent 	<ul style="list-style-type: none"> Short-term effects on surface water quality and quantity as a result of construction activities would be managed through the use of appropriate construction methods, including the development and implementation of an <i>Erosion and Sediment</i>

¹⁹ GHD, 2015. Baseline Natural Features Assessment Report (EA6)

²⁰ GHD, 2015. Desktop Geotechnical Study Report (EA9)

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
				<p>with the Erosion and Sediment Control Guidelines for Urban Construction (2006), during construction</p> <ul style="list-style-type: none"> Develop and implement a Spill Response Plan and train construction staff on associated procedures. Apply standard construction management measures to minimize short-term effects on surface water quality during construction 	<p><i>Control Plan.</i></p> <ul style="list-style-type: none"> No site within 500 m of Cooksville Creek
	Effect on street trees and vegetation	<ul style="list-style-type: none"> Number of street trees and extent of vegetation removed 	<ul style="list-style-type: none"> Removal of at least 32 trees along with herbaceous and woody vegetation, including: <ul style="list-style-type: none"> S1b: 2+ successional trees S3: 8+ mature trees S5: 4+ trees C1: 4+ trees C3: 5+ trees C5: 4+ trees C7: 5+ trees 	<ul style="list-style-type: none"> Avoid the removal of street trees and vegetation where possible as part of detailed design and construction site planning Develop and implement a <i>Tree Preservation and Restoration Plan</i>, including transplanting, standard root zone protections and tree replacement at a ratio of 1:1, with a focus on native, non-invasive, salt-tolerant species to the extent possible. 	<ul style="list-style-type: none"> Removal of at least 32 trees and vegetation would be minimized as much as possible by implementing a <i>Tree Preservation and Restoration Plan</i>
Built Environment	Effect on property	<ul style="list-style-type: none"> Property requirements 	<ul style="list-style-type: none"> 7 temporary easements and 2 permanent easements required for construction sites outside of Burnhamthorpe Road right-of-way as follows: <ul style="list-style-type: none"> S1b: Private land owned by Rogers. 1 temporary easement and 1 permanent easement required. C1: Private land owned by the YMCA. 1 temporary easement required. C3: Private land owned by Morguard Corporation. A temporary easement is critical for use of the land as a construction site for a connection shaft. S3: Public land owned by the City of Mississauga. 1 small permanent easement required. 1 temporary easement required. S5: Private land owned by private owner. 1 temporary easement required. Estimated 2 small, temporary easements on south side to enable road crossings for connections on north side 	<ul style="list-style-type: none"> Provide market value compensation to affected private property owners and as per agreements with the City of Mississauga, in accordance with Region of Peel protocols. 	<ul style="list-style-type: none"> 7 temporary easements and 2 permanent easements required for construction sites outside of Burnhamthorpe Road right-of-way would be compensated for in accordance with Region of Peel protocols.
	Effect on existing residences, businesses and/or community, institutional and recreational facilities	<ul style="list-style-type: none"> Nature of temporary local disruption to residents, businesses and community, institutional or recreational facilities 	<ul style="list-style-type: none"> Temporary adverse effects from surface construction sites e.g. loss of access to sidewalks, disruption to bus stops, interruption of the multi-use trail and aesthetic effects on nearby residents and businesses, including the following: <ul style="list-style-type: none"> S1b: Aesthetic effects on nearby condo residents. S3: Disruptive effects on sidewalk and bus stop. Adverse aesthetic effects on nearby condo residents. S5: Disruptive effects on multi-use trail. Aesthetic effects on nearby houses. C1: Disruptive effects on sidewalk. Aesthetic effects on nearby businesses. Local Connection: No access to Central Library parking ramp during construction. C3: Disruptive effects on sidewalk and pedestrian 	<ul style="list-style-type: none"> Develop and implement a <i>Traffic Management Plan</i>, including: sign-posted pedestrian / trail detours; Relocated bus stops/shelters; etc. Shroud construction sites to mitigate adverse aesthetic effects at street level and up to third-floor 	<ul style="list-style-type: none"> Temporary adverse effects from surface construction sites would be avoided where possible and minimized through the development and implementation of a <i>Traffic Management Plan</i>, <i>Urban Art Restoration Plan</i> and shrouding of construction sites. However, there would still be short-term inconveniences to pedestrians, transit users, etc. and adverse aesthetic effects for occupants above the third-floor level in close proximity to the surface construction sites.

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
			<p>crossing. Aesthetic effects on nearby office/Civic Centre/Council offices. Access to local businesses and shopping area.</p> <ul style="list-style-type: none"> - C7: Disruptive effects on multi-use trail, sidewalk, pedestrian crossing and street art installation. - C9: Disruptive effects on bus stop, multi-use trail, sidewalk and pedestrian crossing. 		
Effect of vibration on existing buildings	<ul style="list-style-type: none"> ▪ Degree of risk of short-term adverse vibration effects on buildings 	<ul style="list-style-type: none"> ▪ Short-term vibration effects are anticipated from the following sites if vibrations exceed 5 mm/sec: <ul style="list-style-type: none"> - S1b: High risk of effects on residences along Wallenberg Crescent and adjacent condo building. - S3: Low to moderate risk to condo building located southeast of site. Low risk to condo buildings located along south-side of Burnhamthorpe Road. - S5: Moderate risk of effects on residences located along Greycedar Crescent - C1: Low risk of effects on condo building located on the south-side of Burnhamthorpe Road. Moderate risk of effects on YMCA building. - C3: Low risk of effects on condo buildings located on the south-side of Burnhamthorpe Road and office building on north. - C5: Low risk of effects on condo buildings located on the south-side of Burnhamthorpe Road - C7: Moderate risk of effects on townhouses and condo building located to the north of the site. 	<ul style="list-style-type: none"> ▪ Develop and implement a <i>Vibration Management Program</i> during construction, e.g. undertake pre-construction property surveys of all properties within 30 m of surface construction sites (zone of direct influence), consult with affected property owners, apply good management practices for noise and vibration reduction and implement a complaint response protocol. ▪ Adhere to MoECC vibration limits in NPC-207 	<ul style="list-style-type: none"> ▪ Short-term vibration effects will be minimized by the development and implementation of a <i>Vibration Management Program</i> during construction and adherence to NPC-207 limits. 	
Effect on existing road infrastructure	<ul style="list-style-type: none"> ▪ Nature of adverse effects on roadways 	<ul style="list-style-type: none"> ▪ 3 road crossings will require additional short-term excavations and reconstruction ▪ Approximately 15% of the alignment under travelled portion of road; reduced risk of adverse effects on roadway 	<ul style="list-style-type: none"> ▪ Reconstruct excavated portions of Burnhamthorpe Road at surface construction sites and 3 road crossings to meet City of Mississauga road design standards. ▪ Minimize the portion of the alignment under the travelled portion of the road as much as possible. ▪ Complete detailed geotechnical investigations during the design phase of the project to understand the geotechnical conditions and specify appropriate tunnelling and shaft construction methodologies. ▪ Undertake settlement monitoring during construction 	<ul style="list-style-type: none"> ▪ Excavated portions of Burnhamthorpe Road would be reconstructed to City of Mississauga road design standards ▪ Approximately 15% of the alignment under the travelled portion of road would increase risk of adverse effects on roadway 	
Effect on existing utility infrastructure	<ul style="list-style-type: none"> ▪ Nature and significance of above and/or below ground utilities affected 	<ul style="list-style-type: none"> ▪ Short-term adverse effects on above ground utilities at surface construction sites as follows: <ul style="list-style-type: none"> - S1b: Overhead utility lines and poles along the north side of the shaft compound - S3: Substantial overhead utility lines, poles and anchor points, streetlight poles surrounding site and electrical/telephone box - S5: Single streetlight pole and trail light pole. - C1: Single streetlight pole - C3: Single streetlight pole, 2 traffic lights, 	<ul style="list-style-type: none"> ▪ In consultation with utility providers, locate all above and/or below ground utility infrastructure prior to construction to avoid potential conflicts with tunnel alignment and surface construction sites ▪ Relocate utility infrastructure as required as part of pre-construction activities. 	<ul style="list-style-type: none"> ▪ Short-term adverse effects on above and/or below ground utility infrastructure during construction would be minimized by locating all infrastructure prior to construction, consulting with utility providers and relocation of affected infrastructure as required. However, short-term Interruption of service is possible. 	

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
			<p>overhead lines/poles/anchor points and electrical/telephone box</p> <ul style="list-style-type: none"> - C5: Single streetlight pole and overhead lines/poles. - C7: Substantial overhead utility lines, poles and anchor points; 2 streetlight poles; Single traffic light pole; numerous utility covers and a drainage grates. 		
	Effect of environmental impairment areas	<ul style="list-style-type: none"> Proximity to areas of environmental impairment (AEI) 	<ul style="list-style-type: none"> Horizontal tunnel alignment is in proximity to the following 8 sites of (potential) environmental impairment: AEI 1, AEI 2, AEI 3, AEI 4, PAEI 1, PAEI 2, PAEI 3, PAEI 4 4 construction sites in proximity to areas of (potential) environmental impairment: <ul style="list-style-type: none"> - S3: AEI 1 (via groundwater) - S5: AEI 3 - C5: PAEI 1 (via groundwater) - C7: AEI 3 	<ul style="list-style-type: none"> Undertake additional investigations of potential areas of environmental impairment to determine actual degree of contamination Minimize the amount of temporary dewatering required during construction by specifying sealed (undrained) shaft construction in the overburden and temporary groundwater cutoff structures where appropriate. Use good management practices for construction in areas of environmental impairment, including: <ul style="list-style-type: none"> - Development and implementation of contingency measures and spill response plans - Use of appropriate personal protective equipment Engage a Qualified Person (as defined under Ontario Reg. 511/09) to direct appropriate management of potentially contaminated soil and/or water. Develop a Soil Management Plan (consistent with Part XV.1 of the Environmental Protection Act and O.Reg. 153/04, Records of Site Condition) to govern how any contaminated soil/water encountered will be handled and disposed of. 	<ul style="list-style-type: none"> Proximity and interaction of surface and tunnelling construction with 12 known areas of environmental impairment would be avoided as much as possible Adverse impacts would be minimized through limiting dewatering, use of good construction management practices and engagement of a Qualified Person.
Social Environment	Effect on traffic	<ul style="list-style-type: none"> Short-term disruption (extent and duration) to traffic and public transport operations (GO stations, MiWay bus routes, etc.) 	<ul style="list-style-type: none"> Short-term effects from increased truck traffic associated with surface construction sites (S1b, S3 and S5) Short-term effects from temporary closure of traffic lanes to accommodate surface construction sites at: <ul style="list-style-type: none"> - C1: Westbound travel reduced to 2 lanes between Confederation and Living Arts Drive. - C7: Cawthra Road – southbound right turn lane and westbound Burnhamthorpe Road bus lane to be closed during construction. Intersection expected to operate over capacity with 2 minute delay during afternoon peak. Short-term removal of 12 on-street parking spaces at C3. 	<ul style="list-style-type: none"> Develop and implement a <i>Traffic Management Plan</i> during construction in accordance with the Region of Peel's protocols and consultation with the City of Mississauga, transit providers (MiWay, MetroLinx, etc.). 	<ul style="list-style-type: none"> Short-term effects would be minimized by developing and implementing a <i>Traffic Management Plan</i>. However, 12 on-street parking spaces would be removed for the period of construction at C3 (2-4 months).
	Effect of noise and perceptible vibration on	<ul style="list-style-type: none"> Degree of risk of short-term adverse noise and vibration effects on sensitive receptors 	<ul style="list-style-type: none"> Short-term noise and vibration effects are anticipated in proximity to surface construction sites as follows: 	<ul style="list-style-type: none"> Develop and implement a <i>Noise and Vibration Management Program</i> during construction, e.g. undertake pre-construction property surveys of all 	<ul style="list-style-type: none"> Short-term noise and vibration effects will be minimized by the development and implementation of a <i>Noise and Vibration Management Program</i>

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
	sensitive receptors ²¹		<ul style="list-style-type: none"> - S1b: High risk of effects on residences along Wallenberg Crescent and adjacent condo building. Customers of the adjacent commercial plaza to the west of Grand Park Drive. - S3: All immediate receptors surrounding this shaft site may experience adverse effects. The lower levels will be more impacted than the upper levels. - S5: Moderate risk of effects on residences located along Greycedar Crescent. Existing concrete noise wall will provide some noise protection to nearby residents at ground level; higher risk to second storey windows. - C1: Moderate risk of effects on YMCA building. Low risk of effects on condo building located on the south-side of Burnhamthorpe Road and receptors located north of City Centre Drive. - C3: Low risk of effects on condo buildings located on the south-side of Burnhamthorpe Road and office building on north. - C5: Low risk of effects on condo buildings located on the south-side of Burnhamthorpe Road - C7: Moderate to high risk of effects on townhouses located to the north of the site. Low risk of effects on surrounding condo buildings. 	<p>properties within 30 m of surface construction sites (zone of direct influence), consult with affected property owners, apply good management practices for noise and vibration reduction and implement a complaint response protocol.</p> <ul style="list-style-type: none"> ▪ Adhering to MOECC NPC-115; MOECC Noise Limits in Environmental and Land Use Planning Guidelines; applicable regional / municipal by-laws, including City of Mississauga 'Noise Control By-law 360-79' 	during construction and adherence to MOECC NPC-115; MOECC Noise Limits in Environmental and Land Use Planning Guidelines and applicable regional / municipal by-laws, including City of Mississauga 'Noise Control By-law 360-79'.
	Effect of dust on sensitive receptors ²²	<ul style="list-style-type: none"> ▪ Nature of short-term adverse dust effects on identified sensitive receptors 	<ul style="list-style-type: none"> ▪ Short-term increase in dust levels in proximity to all surface construction sites 	<ul style="list-style-type: none"> ▪ Apply good management practices to mitigate any air quality impacts caused by construction dust, consistent with Cheminfo Services Inc. <i>Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities (2005)</i> (e.g., install a mud mat (asphalt, concrete, gravel) at each surface construction site, employ regular road sweeping, undertake dust suppression, etc.) <p>A complaint protocol will be developed and implemented for responding to potential dust-related complaints from area residents.</p>	<ul style="list-style-type: none"> ▪ Short-term construction-related effects of dust will be avoided and/or mitigated through the application of good management practices such as dust suppression and development of a complaint response protocol.
Economic Environment	Synergy with approved or planned projects	<ul style="list-style-type: none"> ▪ Degree of synergy 	<ul style="list-style-type: none"> ▪ Numerous approved / planned projects identified with good potential for coordination during detailed design and construction, including: <ul style="list-style-type: none"> - Planned development of the site between Burnhamthorpe Road and Webb drive, with S1b on the west portion of the property (rather than east) which is not due for construction until 2018-20, after the 1500 mm diameter watermain. - Good synergy with the planned Hurontario-Main LRT 	<ul style="list-style-type: none"> ▪ None required 	<ul style="list-style-type: none"> ▪ Numerous approved / planned projects identified with good potential for coordination during detailed design and construction, including: <ul style="list-style-type: none"> - Planned development of the site between Burnhamthorpe Road and Webb drive, with S1b on the west portion of the property (rather than east) which is not due for construction until 2018-20, after the 1500 mm diameter watermain. - Good synergy with the planned Hurontario-Main LRT

²¹ Based on MoECC Noise Limits in Environmental and Land Use Planning Guidelines; Regional and Municipal Noise Limits in By-Laws; MoECC Vibration Limits in NPC-207

²² Reference any relevant regs

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
Cultural Environment	Effect on archaeological resources and areas of archaeological potential ²³	<ul style="list-style-type: none"> Number and type of known archaeological sites affected Area (ha) of archaeological potential (i.e. lands with potential for the presence of significant archaeological resources) affected 	<ul style="list-style-type: none"> There are no known archaeological sites in the vicinity of the majority of the surface construction sites. However, there is archaeological potential at construction site S1b (2.5 ha) 	<ul style="list-style-type: none"> Undertake a Stage 2 Archaeological Assessment by a qualified archaeologist at S1b to determine the presence of archaeological resources. If warranted based on the results of the Stage 2 Archaeological Assessment, Stage 3 and Stage 4 Archaeological Assessments will be conducted. If and when archaeological sites are discovered, appropriate action will be taken, including a cessation of construction work on the affected site, consultation with aboriginal communities and adherence to Ministry of Tourism, Culture and Sport guidelines. 	<ul style="list-style-type: none"> No known archaeological sites or resources would be adversely affected. However, if deeply buried archaeological sites are discovered, appropriate action will be taken, including a cessation of construction work on the affected site, consultation with aboriginal communities and adherence to Ministry of Tourism, Culture and Sport guidelines.
	Effects on significant cultural heritage resources ²⁴	<ul style="list-style-type: none"> Number and type of built heritage resources and cultural heritage landscapes displaced or disrupted 	<ul style="list-style-type: none"> No built heritage resources or cultural heritage landscapes would be displaced or disrupted. 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> No built heritage resources or cultural heritage landscapes would be displaced or disrupted.
Financial	Capital costs	<ul style="list-style-type: none"> Estimated capital cost, including property easements, temporary works and permanent works (Level D \$)? 	<ul style="list-style-type: none"> ~\$111 million 	<ul style="list-style-type: none"> Not applicable 	<ul style="list-style-type: none"> ~\$111 million

²³ ASI, 2015. Stage 1 Archaeological Assessment Report

²⁴ ASI, 2015. Cultural Heritage Resource Assessment Report

Table 5: Net Effects Analysis - Alternative 4: Three-Drive North-South-North

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
Technical	Ability to address the problem / opportunity	<ul style="list-style-type: none"> Does the alternative address the problem or opportunity? 	<ul style="list-style-type: none"> Yes. The alternative addresses the problem/opportunity 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> The alternative addresses the problem/opportunity
	Integration with existing water infrastructure	<ul style="list-style-type: none"> Degree of integration 	<ul style="list-style-type: none"> Since the alignment has sections running along the north side of Burnhamthorpe Road, 3 road crossings and moderate work is required to facilitate interconnections with existing water infrastructure 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> Moderate degree of integration with existing water infrastructure, since the alignment is predominantly on the north side of Burnhamthorpe Road, requiring 3 road crossings.
	Construction site requirements	<ul style="list-style-type: none"> Number of tunnel shaft sites Number of connections 	<ul style="list-style-type: none"> 4 tunnel shaft sites 9 connections 	<ul style="list-style-type: none"> Limit the total number of surface works sites to a total 10 by co-locating tunnelling and connections works. 	<ul style="list-style-type: none"> 10 total surface works sites would be required.
	Presence of existing underground structures impacting tunnelling	<ul style="list-style-type: none"> Degree of conflicts between known underground obstructions (e.g. parking garages) and technical approach to tunnelling 	<ul style="list-style-type: none"> There are 2 underground structures: parking beneath Mississauga Civic Centre/Central Library; at the northwest corner of Confederation Pkwy and Burnhamthorpe Rd 	<ul style="list-style-type: none"> Avoid 2 known underground structures by adjusting the vertical alignment of the tunnel accordingly. 	<ul style="list-style-type: none"> Conflicts with underground structures would be avoided but the tunnel vertical alignment would be deeper
	Constructability of tunnelling and pipe installation	<ul style="list-style-type: none"> Number / length of tunnel drives Horizontal curvature 	<ul style="list-style-type: none"> 3 tunnel drives (1600 m, 900 m, 1100 m) increases the degree of flexibility for construction e.g. tunnelling technologies (traditional rock tunnel or micro-tunnelling) 3 horizontal curves required 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> 3 tunnel drives (1600 m, 900 m, 1100 m) increases the degree of flexibility for construction e.g. tunnelling technologies (traditional rock tunnel or micro-tunnelling) 3 horizontal curves required
	Future operation and maintenance	<ul style="list-style-type: none"> Ease of future maintenance e.g. depth of vertical alignment 	<ul style="list-style-type: none"> More complex maintenance likely due to deeper vertical alignment necessary to avoid sanitary sewer at Central Parkway 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> More complex maintenance likely due to deeper vertical alignment necessary to avoid sanitary sewer at Central Parkway
Natural Environment <small>25 26</small>	Effect on groundwater	Short- or long-term change in groundwater quality or quantity	<ul style="list-style-type: none"> Short-term effect on groundwater quality/quantity of shafts and tunneling intersecting the water table and bedrock groundwater at some sites. As contaminated soil / groundwater is potentially located in areas of proposed tunneling/excavation, long-term effect on groundwater quality/quantity of mobilization of contaminated water from environmentally-impaired sites nearby due to construction-related groundwater takings. 	<ul style="list-style-type: none"> Develop and implement a groundwater monitoring and impact management program during detailed design, including contingency measures. Apply standard construction management measures to minimize the extent of temporary dewatering required during construction (e.g., excavations below the water table would be avoided where possible; use of sealed shafts and temporary groundwater cutoff structures where appropriate; storage and refuelling of equipment will be conducted exclusively in designated spill protection areas, etc.). Engage a Qualified Person (as defined under Ontario Reg. 511/09) to direct the appropriate management of potentially contaminated soil / water, consistent with Part XV.1 of the Environmental Protection Act and O.Reg. 153/04, Records of Site Condition). 	<ul style="list-style-type: none"> No short-term or long-term groundwater quality and quantity impacts would occur provided standard construction impact management measures are applied and potentially contaminated soil / water is appropriately managed.
	Effect on surface water	Short- or long-term change in surface water quality or quantity	<ul style="list-style-type: none"> Short-term effects on surface water quantity as a result of construction-related dewatering activities at shaft site 4 (less than 250 m from Cooksville 	<ul style="list-style-type: none"> Develop and implement a Stormwater Management Plan (consistent with the MOECC Stormwater Management Planning and Design Manual (2003), incorporating erosion and sediment control 	<ul style="list-style-type: none"> Short-term effects on surface water quality and quantity as a result of construction activities would be managed through the use of appropriate construction methods, including the development

²⁵ GHD, 2015. Baseline Natural Features Assessment Report (EA6)

²⁶ GHD, 2015. Desktop Geotechnical Study Report (EA9)

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
			<p>Creek)</p> <ul style="list-style-type: none"> Short-term effects on water quality from surface water-borne sediment and contaminants via stormwater discharge from shaft site 4b. 	<ul style="list-style-type: none"> measures – in consultation with CVC and consistent with the Erosion and Sediment Control Guidelines for Urban Construction (2006), during construction Develop and implement a Spill Response Plan and train construction staff on associated procedures. Apply standard construction management measures to minimize short-term effects on surface water quality during construction 	<ul style="list-style-type: none"> and implementation of an <i>Erosion and Sediment Control Plan</i>. Site S4 is less than 250 m from Cooksville Creek
	Effect on street trees and vegetation	<ul style="list-style-type: none"> Number of street trees and extent of vegetation removed 	<ul style="list-style-type: none"> Removal of at least 33 trees along with herbaceous and woody vegetation, including: <ul style="list-style-type: none"> S1b: 2+ successional trees S3: 8+ mature trees S4: 1 street tree S5: 4+ trees C1: 4+ trees C3: 5+ trees C5: 4+ trees C7: 5+ trees 	<ul style="list-style-type: none"> Avoid the removal of street trees and vegetation where possible as part of detailed design and construction site planning Develop and implement a <i>Tree Preservation and Restoration Plan</i>, including transplanting, standard root zone protections and tree replacement at a ratio of 1:1, with a focus on native, non-invasive, salt-tolerant species to the extent possible. 	<ul style="list-style-type: none"> Removal of approximately 33 trees and vegetation would be minimized as much as possible by implementing a <i>Tree Preservation and Restoration Plan</i>
Built Environment	Effect on property	<ul style="list-style-type: none"> Property requirements 	<ul style="list-style-type: none"> 8 temporary easements and 3 permanent easements required for construction sites outside of Burnhamthorpe Road right-of-way as follows: <ul style="list-style-type: none"> S1b: Private land owned by Rogers. 1 temporary easement and 1 permanent easement required. C1: Private land owned by the YMCA. 1 temporary easement required. C3: Private land owned by Morguard Corporation. A temporary easement is critical for use of the land as a construction site for a connection shaft. S3: Public land owned by the City of Mississauga. 1 small permanent easement required. 1 temporary easement required. S4: Private land owned by 1371048 Ontario Inc. (First Avenue Properties Inc.). 1 permanent easement required. 1 temporary easement required. S5: Private land owned by private owner. 1 temporary easement required. Estimated 2 small, temporary easements on south side to enable road crossings for connections on north side. 	<ul style="list-style-type: none"> Provide market value compensation to affected private property owners and as per agreements with the City of Mississauga, in accordance with Region of Peel protocols. 	<ul style="list-style-type: none"> 8 temporary easements and 3 permanent easements required for construction sites outside of Burnhamthorpe Road right-of-way would be compensated for in accordance with Region of Peel protocols.
	Effect on existing residences, businesses and/or community, institutional and recreational facilities	<ul style="list-style-type: none"> Nature of temporary local disruption to residents, businesses and community, institutional or recreational facilities 	<ul style="list-style-type: none"> Temporary adverse effects from surface construction sites e.g. loss of access to sidewalks, disruption to bus stops, interruption of the multi-use trail and aesthetic effects on nearby residents and businesses, including the following: <ul style="list-style-type: none"> S1b: Aesthetic effects on nearby condo residents. S3: Disruptive effects on sidewalk and bus stop. Adverse aesthetic effects on nearby condo residents. S4: Highly disruptive effects on sidewalk, private 	<ul style="list-style-type: none"> Develop and implement a <i>Traffic Management Plan</i>, including: sign-posted pedestrian / trail detours; Relocated bus stops/shelters; etc. Shroud construction sites to mitigate adverse aesthetic effects at street level and up to third-floor 	<ul style="list-style-type: none"> Temporary adverse effects from surface construction sites would be avoided where possible and minimized through the development and implementation of a <i>Traffic Management Plan</i>, <i>Urban Art Restoration Plan</i> and shrouding of construction sites. However, there would still be short-term inconveniences to pedestrians, transit users, etc. and adverse aesthetic effects for occupants above the third-floor level in close proximity to the surface

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
			<p>children’s play area and closure/limited access to shopping plaza. Adverse aesthetic effects on nearby condo residents.</p> <ul style="list-style-type: none"> - S5: Disruptive effects on multi-use trail. Aesthetic effects on nearby houses. - C1: Disruptive effects on sidewalk. Aesthetic effects on nearby businesses. - Local Connection: No access to Central Library parking ramp during construction. - C3: Disruptive effects on sidewalk and pedestrian crossing. Aesthetic effects on nearby office/Civic Centre/Council offices. Access to local businesses and shopping area. - C7: Disruptive effects on multi-use trail, sidewalk, pedestrian crossing and street art installation. - C9: Disruptive effects on bus stop, multi-use trail, sidewalk and pedestrian crossing. 		<p>construction sites.</p> <ul style="list-style-type: none"> ▪ Site S4 would impact playground and access to plaza via Burnhamthorpe Road
Effect of vibration on existing buildings	<ul style="list-style-type: none"> ▪ Degree of risk of short-term adverse vibration effects on buildings 	<ul style="list-style-type: none"> ▪ Degree of risk of short-term adverse vibration effects on buildings 	<ul style="list-style-type: none"> ▪ Short-term vibration effects are anticipated from the following sites if vibrations exceed 5 mm/sec: <ul style="list-style-type: none"> - S1b: High risk of effects on residences along Wallenberg Crescent and adjacent condo building. - S3: Low to moderate risk to condo building located southeast of site. Low risk to condo buildings located along south-side of Burnhamthorpe Road. - S4: High risk for directly adjacent condo building (1300 Mississauga Valley Blvd), housing estate, shops and business. - S5: Moderate risk of effects on residences located along Greycedar Crescent - C1: Low risk of effects on condo building located on the south-side of Burnhamthorpe Road. Moderate risk of effects on YMCA building. - C3: Low risk of effects on condo buildings located on the south-side of Burnhamthorpe Road and office building on north. - C5: Low risk of effects on condo buildings located on the south-side of Burnhamthorpe Road - C7: Moderate risk of effects on townhouses and condo building located to the north of the site. 	<ul style="list-style-type: none"> ▪ Develop and implement a <i>Vibration Management Program</i> during construction, e.g. undertake pre-construction property surveys of all properties within 30 m of surface construction sites (zone of direct influence), consult with affected property owners, apply good management practices for noise and vibration reduction and implement a complaint response protocol. ▪ Adhere to MoECC vibration limits in NPC-207 	<ul style="list-style-type: none"> ▪ Short-term vibration effects will be minimized by the development and implementation of a <i>Vibration Management Program</i> during construction and adherence to NPC-207 limits. ▪ Potential for residual impacts on the condo buildings and plaza in close proximity to site S4
Effect on existing road infrastructure	<ul style="list-style-type: none"> ▪ Nature of adverse effects on roadways 	<ul style="list-style-type: none"> ▪ Nature of adverse effects on roadways 	<ul style="list-style-type: none"> ▪ 3 road crossings will require additional short-term excavations and reconstruction ▪ Approximately 15% of the alignment under travelled portion of road; reduced risk of adverse effects on roadway 	<ul style="list-style-type: none"> ▪ Reconstruct excavated portions of Burnhamthorpe Road at surface construction sites and 3 road crossings to meet City of Mississauga road design standards. ▪ Minimize the portion of the alignment under the travelled portion of the road as much as possible. ▪ Complete detailed geotechnical investigations during the design phase of the project to understand the geotechnical conditions and specify appropriate tunnelling and shaft construction methodologies. 	<ul style="list-style-type: none"> ▪ Excavated portions of Burnhamthorpe Road would be reconstructed to City of Mississauga road design standards ▪ Approximately 15% of the alignment under the travelled portion of road would increase risk of adverse effects on roadway

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
	Effect on existing utility infrastructure	<ul style="list-style-type: none"> Nature and significance of above and/or below ground utilities affected 	<ul style="list-style-type: none"> Short-term adverse effects on above ground utilities at surface construction sites as follows: <ul style="list-style-type: none"> S1b: Overhead utility lines and poles along the north side of the shaft compound S3: Substantial overhead utility lines, poles and anchor points, streetlight poles surrounding site and electrical/telephone box S4: Overhead utility lines and single pole. Electrical/telephone box. S5: Single streetlight pole and trail light pole. C1: Single streetlight pole C3: Single streetlight pole, 2 traffic lights, overhead lines/poles/anchor points and electrical/telephone box C5: Single streetlight pole and overhead lines/poles. C7: Substantial overhead utility lines, poles and anchor points; 2 streetlight poles; Single traffic light pole; numerous utility covers and a drainage grates. 	<ul style="list-style-type: none"> Undertake settlement monitoring during construction In consultation with utility providers, locate all above and/or below ground utility infrastructure prior to construction to avoid potential conflicts with tunnel alignment and surface construction sites Relocate utility infrastructure as required as part of pre-construction activities. 	<ul style="list-style-type: none"> Short-term adverse effects on above and/or below ground utility infrastructure during construction would be minimized by locating all infrastructure prior to construction, consulting with utility providers and relocation of affected infrastructure as required. However, short-term Interruption of service is possible.
	Effect of environmental impairment areas	<ul style="list-style-type: none"> Proximity to areas of environmental impairment (AEI) 	<ul style="list-style-type: none"> Horizontal tunnel alignment is in proximity to the following 8 sites of (potential) environmental impairment: AEI 1, AEI 2, AEI 3, AEI 4, PAEI 1, PAEI 2, PAEI 3, PAEI 4 5 construction sites in proximity to areas of (potential) environmental impairment: <ul style="list-style-type: none"> S3: AEI 1 (via groundwater) S4: PAEI 3 S5: AEI 3 C5: PAEI 1 (via groundwater) C7: AEI 3 	<ul style="list-style-type: none"> Undertake additional investigations of potential areas of environmental impairment to determine actual degree of contamination Minimize the amount of temporary dewatering required during construction by specifying sealed (undrained) shaft construction in the overburden and temporary groundwater cutoff structures where appropriate. Use good management practices for construction in areas of environmental impairment, including: <ul style="list-style-type: none"> Development and implementation of contingency measures and spill response plans Use of appropriate personal protective equipment Engage a Qualified Person (as defined under Ontario Reg. 511/09) to direct appropriate management of potentially contaminated soil and/or water. Develop a Soil Management Plan (consistent with Part XV.1 of the Environmental Protection Act and O.Reg. 153/04, Records of Site Condition) to govern how any contaminated soil/water encountered will be handled and disposed of. 	<ul style="list-style-type: none"> Proximity and interaction of surface and tunnelling construction with 13 known areas of environmental impairment would be avoided as much as possible Adverse impacts would be minimized through limiting dewatering, use of good construction management practices and engagement of a Qualified Person.
Social Environment	Effect on traffic	<ul style="list-style-type: none"> Short-term disruption (extent and duration) to traffic and public transport operations (GO stations, MiWay bus routes, etc.) 	<ul style="list-style-type: none"> Short-term effects from increased truck traffic associated with surface construction sites (S1b, S3, S4 and S5) Short-term effects from temporary closure of traffic lanes to accommodate surface construction sites at: <ul style="list-style-type: none"> C1: Westbound travel reduced to 2 lanes between 	<ul style="list-style-type: none"> Develop and implement a <i>Traffic Management Plan</i> during construction in accordance with the Region of Peel's protocols and consultation with the City of Mississauga, transit providers (MiWay, MetroLinx, etc.). 	<ul style="list-style-type: none"> Short-term effects would be minimized by developing and implementing a <i>Traffic Management Plan</i>. However, 12 on-street parking spaces would be removed for the period of construction at C3 (2-4 months) and eastbound travel reduced to 2 lanes on Burnhamthorpe Road, west of Central Parkway at S4 (up to 2 years).

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
			<p>Confederation and Living Arts Drive.</p> <ul style="list-style-type: none"> - S4: Eastbound travel reduced to 2 lanes west of Central Parkway - C7: Cawthra Road – southbound right turn lane and westbound Burnhamthorpe Road bus lane to be closed during construction. Intersection expected to operate over capacity with 2 minute delay during afternoon peak. <ul style="list-style-type: none"> ▪ Short-term removal of 12 on-street parking spaces at C3. 		
	Effect of noise and perceptible vibration on sensitive receptors ²⁷	<ul style="list-style-type: none"> ▪ Degree of risk of short-term adverse noise and vibration effects on sensitive receptors 	<ul style="list-style-type: none"> ▪ Short-term noise and vibration effects are anticipated in proximity to surface construction sites as follows: <ul style="list-style-type: none"> - S1b: High risk of effects on residences along Wallenberg Crescent and adjacent condo building. Customers of the adjacent commercial plaza to the west of Grand Park Drive. - S3: All immediate receptors surrounding this shaft site may experience adverse effects. The lower levels will be more impacted than the upper levels. - S4: Significant effects likely for directly adjacent condo building (1300 Mississauga Valley Blvd), housing estate, shops and business. - S5: Moderate risk of effects on residences located along Greycedar Crescent. Existing concrete noise wall will provide some noise protection to nearby residents at ground level; higher risk to second storey windows. - C1: Moderate risk of effects on YMCA building. Low risk of effects on condo building located on the south-side of Burnhamthorpe Road and receptors located north of City Centre Drive. - C3: Low risk of effects on condo buildings located on the south-side of Burnhamthorpe Road and office building on north. - C5: Low risk of effects on condo buildings located on the south-side of Burnhamthorpe Road - C7: Moderate to high risk of effects on townhouses located to the north of the site. Low risk of effects on surrounding condo buildings. 	<ul style="list-style-type: none"> ▪ Develop and implement a <i>Noise and Vibration Management Program</i> during construction, e.g. undertake pre-construction property surveys of all properties within 30 m of surface construction sites (zone of direct influence), consult with affected property owners, apply good management practices for noise and vibration reduction and implement a complaint response protocol. ▪ Adhering to MOECC NPC-115; MOECC Noise Limits in Environmental and Land Use Planning Guidelines; applicable regional / municipal by-laws, including City of Mississauga 'Noise Control By-law 360-79' 	<ul style="list-style-type: none"> ▪ Short-term noise and vibration effects will be minimized by the development and implementation of a <i>Noise and Vibration Management Program</i> during construction and adherence to MOECC NPC-115; MOECC Noise Limits in Environmental and Land Use Planning Guidelines and applicable regional / municipal by-laws, including City of Mississauga 'Noise Control By-law 360-79'. ▪ Potential for residual impacts on the condo buildings and plaza in close proximity to site S4.
	Effect of dust on sensitive receptors ²⁸	<ul style="list-style-type: none"> ▪ Nature of short-term adverse dust effects on identified sensitive receptors 	<ul style="list-style-type: none"> ▪ Short-term increase in dust levels in proximity to all surface construction sites 	<ul style="list-style-type: none"> ▪ Apply good management practices to mitigate any air quality impacts caused by construction dust, consistent with Cheminfo Services Inc. <i>Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities (2005)</i> (e.g., install a mud mat (asphalt, concrete, gravel) at each surface construction site, employ regular road sweeping, 	<ul style="list-style-type: none"> ▪ Short-term construction-related effects of dust will be avoided and/or mitigated through the application of good management practices such as dust suppression and development of a complaint response protocol.

²⁷ Based on MoECC Noise Limits in Environmental and Land Use Planning Guidelines; Regional and Municipal Noise Limits in By-Laws; MoECC Vibration Limits in NPC-207

²⁸ Reference any relevant regs

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
				undertake dust suppression, etc.) <ul style="list-style-type: none"> A complaint protocol will be developed and implemented for responding to potential dust-related complaints from area residents. 	
Economic Environment	Synergy with approved or planned projects	<ul style="list-style-type: none"> Degree of synergy 	<ul style="list-style-type: none"> Numerous approved / planned projects identified with good potential for coordination during detailed design and construction, including: <ul style="list-style-type: none"> Planned development of the site between Burnhamthorpe Road and Webb drive, with S1b on the west portion of the property (rather than east) which is not due for construction until 2018-20, after the 1500 mm diameter watermain. <ul style="list-style-type: none"> Good synergy with the planned Hurontario-Main LRT 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> Numerous approved / planned projects identified with good potential for coordination during detailed design and construction, including: <ul style="list-style-type: none"> Planned development of the site between Burnhamthorpe Road and Webb drive, with S1b on the west portion of the property (rather than east) which is not due for construction until 2018-20, after the 1500 mm diameter watermain. <ul style="list-style-type: none"> Good synergy with the planned Hurontario-Main LRT
Cultural Environment	Effect on archaeological resources and areas of archaeological potential ²⁹	<ul style="list-style-type: none"> Number and type of known archaeological sites affected Area (ha) of archaeological potential (i.e. lands with potential for the presence of significant archaeological resources) affected 	<ul style="list-style-type: none"> There are no known archaeological sites in the vicinity of the majority of the surface construction sites. However, there is archaeological potential at construction site S1b (2.5 ha) 	<ul style="list-style-type: none"> Undertake a Stage 2 Archaeological Assessment by a qualified archaeologist at S1b to determine the presence of archaeological resources. If warranted based on the results of the Stage 2 Archaeological Assessment, Stage 3 and Stage 4 Archaeological Assessments will be conducted. If and when archaeological sites are discovered, appropriate action will be taken, including a cessation of construction work on the affected site, consultation with aboriginal communities and adherence to Ministry of Tourism, Culture and Sport guidelines. 	<ul style="list-style-type: none"> No known archaeological sites or resources would be adversely affected. However, if deeply buried archaeological sites are discovered, appropriate action will be taken, including a cessation of construction work on the affected site, consultation with aboriginal communities and adherence to Ministry of Tourism, Culture and Sport guidelines.
	Effects on significant cultural heritage resources ³⁰	<ul style="list-style-type: none"> Number and type of built heritage resources and cultural heritage landscapes displaced or disrupted 	<ul style="list-style-type: none"> No built heritage resources or cultural heritage landscapes would be displaced or disrupted. 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> No built heritage resources or cultural heritage landscapes would be displaced or disrupted.
Financial	Capital costs	<ul style="list-style-type: none"> Estimated capital cost, including property easements, temporary works and permanent works (Level D \$)? 	<ul style="list-style-type: none"> ~\$117 million 	<ul style="list-style-type: none"> Not applicable 	<ul style="list-style-type: none"> ~\$117 million

²⁹ ASI, 2015. Stage 1 Archaeological Assessment Report

³⁰ ASI, 2015. Cultural Heritage Resource Assessment Report

Table 6: Net Effects Analysis - Alternative 5: Three-Drive North-South-North

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
Technical	Ability to address the problem / opportunity	<ul style="list-style-type: none"> Does the alternative address the problem or opportunity? 	<ul style="list-style-type: none"> Yes. The alternative addresses the problem/opportunity 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> The alternative addresses the problem/opportunity
	Integration with existing water infrastructure	<ul style="list-style-type: none"> Degree of integration 	<ul style="list-style-type: none"> Since the alignment is almost entirely on the north side of Burnhamthorpe Road, only 2 road crossings and less work is required to facilitate interconnections with existing water infrastructure 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> High degree of integration with existing water infrastructure, since the alignment is predominantly on the north side of Burnhamthorpe Road, limiting required road crossings to 2.
	Construction site requirements	<ul style="list-style-type: none"> Number of tunnel shaft sites Number of connections 	<ul style="list-style-type: none"> 4 tunnel shaft sites 9 connections 	<ul style="list-style-type: none"> Limit the total number of surface works sites to a total 10 by co-locating tunnelling and connections works. 	<ul style="list-style-type: none"> 10 total surface works sites would be required.
	Presence of existing underground structures impacting tunnelling	<ul style="list-style-type: none"> Degree of conflicts between known underground obstructions (e.g. parking garages) and technical approach to tunnelling 	<ul style="list-style-type: none"> There are 2 underground structures: parking beneath Mississauga Civic Centre/Central Library; at the northwest corner of Confederation Pkwy and Burnhamthorpe Rd 	<ul style="list-style-type: none"> Avoid 2 known underground structures by adjusting the vertical alignment of the tunnel accordingly. 	<ul style="list-style-type: none"> Conflicts with underground structures would be avoided but the tunnel vertical alignment would be deeper
	Constructability of tunnelling and pipe installation	<ul style="list-style-type: none"> Number / length of tunnel drives Horizontal curvature 	<ul style="list-style-type: none"> 3 tunnel drives (1700 m, 900 m, 1100 m) increases the degree of flexibility for construction e.g. tunnelling technologies (traditional rock tunnel or micro-tunnelling) 3 horizontal curves required 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> 3 tunnel drives (1700 m, 900 m, 1100 m) increases the degree of flexibility for construction e.g. tunnelling technologies (traditional rock tunnel or micro-tunnelling) 3 horizontal curves required
	Future operation and maintenance	<ul style="list-style-type: none"> Ease of future maintenance e.g. depth of vertical alignment 	<ul style="list-style-type: none"> More complex maintenance likely due to deeper vertical alignment necessary to avoid sanitary sewer at Central Parkway 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> More complex maintenance likely due to deeper vertical alignment necessary to avoid sanitary sewer at Central Parkway
Natural Environment <small>31 32</small>	Effect on groundwater	Short- or long-term change in groundwater quality or quantity	<ul style="list-style-type: none"> Short-term effect on groundwater quality/quantity of shafts and tunneling intersecting the water table and bedrock groundwater at some sites. As contaminated soil / groundwater is potentially located in areas of proposed tunneling/excavation, long-term effect on groundwater quality/quantity of mobilization of contaminated water from environmentally-impaired sites nearby due to construction-related groundwater takings. 	<ul style="list-style-type: none"> Develop and implement a groundwater monitoring and impact management program during detailed design, including contingency measures. Apply standard construction management measures to minimize the extent of temporary dewatering required during construction (e.g., excavations below the water table would be avoided where possible; use of sealed shafts and temporary groundwater cutoff structures where appropriate; storage and refuelling of equipment will be conducted exclusively in designated spill protection areas, etc.). Engage a Qualified Person (as defined under Ontario Reg. 511/09) to direct the appropriate management of potentially contaminated soil / water, consistent with Part XV.1 of the Environmental Protection Act and O.Reg. 153/04, Records of Site Condition). 	<ul style="list-style-type: none"> No short-term or long-term groundwater quality and quantity impacts would occur provided standard construction impact management measures are applied and potentially contaminated soil / water is appropriately managed.
	Effect on surface water	Short- or long-term change in surface water quality or quantity	<ul style="list-style-type: none"> Short-term effects on surface water quantity as a result of construction-related dewatering activities at shaft site 4b (less than 250 m from Cooksville 	<ul style="list-style-type: none"> Develop and implement a Stormwater Management Plan (consistent with the MOECC Stormwater Management Planning and Design Manual (2003), incorporating erosion and sediment control 	<ul style="list-style-type: none"> Short-term effects on surface water quality and quantity as a result of construction activities would be managed through the use of appropriate construction methods, including the development

³¹ GHD, 2015. Baseline Natural Features Assessment Report (EA6)

³² GHD, 2015. Desktop Geotechnical Study Report (EA9)

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
			<p>Creek).</p> <ul style="list-style-type: none"> Short-term effects on water quality from surface water-borne sediment and contaminants via stormwater discharge from shaft site 4b. 	<p>measures – in consultation with CVC and consistent with the Erosion and Sediment Control Guidelines for Urban Construction (2006), during construction</p> <ul style="list-style-type: none"> Develop and implement a Spill Response Plan and train construction staff on associated procedures. Apply standard construction management measures to minimize short-term effects on surface water quality during construction Establish protective fencing to demarcate a 10 m buffer from the top of Cooksville Creek valley slope to prevent construction at S4b from affecting the CVC Regulated Area. 	<p>and implementation of an <i>Erosion and Sediment Control Plan</i>.</p> <ul style="list-style-type: none"> Site S4b is less than 250 m from Cooksville Creek
	Effect on street trees and vegetation	<ul style="list-style-type: none"> Number of street trees and extent of vegetation removed 	<ul style="list-style-type: none"> Removal of at least 37 trees along with herbaceous and woody vegetation, including: <ul style="list-style-type: none"> S1b: 2+ successional trees S3: 8+ mature trees S4b: 4+ street trees and vegetation S5: 4+ trees C1: 4+ trees C3: 5+ trees C5: 4+ trees C7: 5+ trees 	<ul style="list-style-type: none"> Avoid the removal of street trees and vegetation where possible as part of detailed design and construction site planning Develop and implement a <i>Tree Preservation and Restoration Plan</i>, including transplanting, standard root zone protections and tree replacement at a ratio of 1:1, with a focus on native, non-invasive, salt-tolerant species to the extent possible. 	<ul style="list-style-type: none"> Removal of approximately 37 trees and vegetation would be minimized as much as possible by implementing a <i>Tree Preservation and Restoration Plan</i>
Built Environment	Effect on property	<ul style="list-style-type: none"> Property requirements 	<ul style="list-style-type: none"> 6 temporary easements and 2 permanent easements required for construction sites outside of Burnhamthorpe Road right-of-way as follows: <ul style="list-style-type: none"> S1b: Private land owned by Rogers. 1 temporary easement and 1 permanent easement required. C1: Private land owned by the YMCA. Temporary easement required. C3: Private land owned by Morguard Corporation. A temporary easement is critical for use of the land as a construction site for a connection shaft. S3: Public land owned by the City of Mississauga. 1 small permanent easement required. 1 temporary easement required. S4b: Public land owned by the City of Mississauga. Temporary easement required. S5: Private land owned by private owner. Temporary easement required. 	<ul style="list-style-type: none"> Provide market value compensation to affected private property owners and as per agreements with the City of Mississauga, in accordance with Region of Peel protocols. 	<ul style="list-style-type: none"> 6 temporary easements and 2 permanent easements required for construction sites outside of Burnhamthorpe Road right-of-way would be compensated for in accordance with Region of Peel protocols.
	Effect on existing residences, businesses and/or community, institutional and recreational facilities	<ul style="list-style-type: none"> Nature of temporary local disruption to residents, businesses and community, institutional or recreational facilities 	<ul style="list-style-type: none"> Temporary adverse effects from surface construction sites e.g. loss of access to sidewalks, disruption to bus stops, interruption of the multi-use trail and aesthetic effects on nearby residents and businesses, including the following: <ul style="list-style-type: none"> S1b: Aesthetic effects on nearby condo residents. S3: Disruptive effects on sidewalk and bus stop. Aesthetic effects on nearby condo residents. S4b: Disruptive effects on multi-use trail and sidewalk. Aesthetic effects on nearby houses. S5: Disruptive effects on multi-use trail. Aesthetic 	<ul style="list-style-type: none"> Develop and implement a <i>Traffic Management Plan</i>, including: sign-posted pedestrian / trail detours; Relocated bus stops/shelters; etc. Shroud construction sites to mitigate adverse aesthetic effects at street level and up to third-floor 	<ul style="list-style-type: none"> Temporary adverse effects from surface construction sites would be avoided where possible and minimized through the development and implementation of a <i>Traffic Management Plan</i>, <i>Urban Art Restoration Plan</i> and shrouding of construction sites. <p>However, there would still be short-term inconveniences to pedestrians, transit users, etc. and adverse aesthetic effects for occupants above the third-floor level in close proximity to the surface construction sites.</p>

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
			<p>effects on nearby houses.</p> <ul style="list-style-type: none"> - C1: Disruptive effects on sidewalk. Aesthetic effects on nearby businesses. - Local Connection: No access to Central Library parking ramp during construction. - C3: Disruptive effects on sidewalk and pedestrian crossing. Aesthetic effects on nearby office/Civic Centre/Council offices. Access to local businesses and shopping area. - C7: Disruptive effects on multi-use trail, sidewalk, pedestrian crossing and street art installation. - C9: Disruptive effects on bus stop, multi-use trail, sidewalk and pedestrian crossing. 		
Effect of vibration on existing buildings	<ul style="list-style-type: none"> ▪ Degree of risk of short-term adverse vibration effects on buildings 	<ul style="list-style-type: none"> ▪ Degree of risk of short-term adverse vibration effects on buildings 	<ul style="list-style-type: none"> ▪ Short-term vibration effects are anticipated from the following sites if vibrations exceed 5 mm/sec: <ul style="list-style-type: none"> - S1b: High risk of effects on residences along Wallenberg Crescent and adjacent condo building. - S3: Low to moderate risk of effects on condo building located southeast of site and low risk of effects on condo buildings located along south-side of Burnhamthorpe Road. - S4b: Moderate to high risk of effects on residences located along King Andrew Drive and low to moderate risk of effects on condo building located on south-side of Burnhamthorpe Road. - S5: Moderate risk of effects on residences located along Greycedar Crescent - C1: Low risk of effects on condo building located on the south-side of Burnhamthorpe Road. Moderate risk of effects on YMCA building. - C3: Low risk of effects on condo buildings located on the south-side of Burnhamthorpe Road and office building on north. - C5: Low risk of effects on condo buildings located on the south-side of Burnhamthorpe Road - C7: Moderate risk of effects on townhouses and condo building located to the north of the site. 	<ul style="list-style-type: none"> ▪ Develop and implement a <i>Vibration Management Program</i> during construction, e.g. undertake pre-construction property surveys of all properties within 30 m of surface construction sites (zone of direct influence), consult with affected property owners, apply good management practices for noise and vibration reduction and implement a complaint response protocol. ▪ Adhere to MoECC vibration limits in NPC-207 	<p>Short-term vibration effects will be minimized by the development and implementation of a <i>Vibration Management Program</i> during construction and adherence to NPC-207 limits.</p> <ul style="list-style-type: none"> ▪ Potential for residual impacts on the condo building and residences in close proximity to site S4b
Effect on existing road infrastructure	<ul style="list-style-type: none"> ▪ Nature of adverse effects on roadways 	<ul style="list-style-type: none"> ▪ Nature of adverse effects on roadways 	<ul style="list-style-type: none"> ▪ 2 road crossings will require additional short-term excavations and reconstruction ▪ Approximately 15% of the alignment under travelled portion of road; reduced risk of adverse effects on roadway 	<ul style="list-style-type: none"> ▪ Reconstruct excavated portions of Burnhamthorpe Road at surface construction sites and 2 road crossings to meet City of Mississauga road design standards. ▪ Minimize the portion of the alignment under the travelled portion of the road as much as possible. ▪ Complete detailed geotechnical investigations during the design phase of the project to understand the geotechnical conditions and specify appropriate tunnelling and shaft construction methodologies. ▪ Undertake settlement monitoring during construction 	<ul style="list-style-type: none"> ▪ Excavated portions of Burnhamthorpe Road would be reconstructed to City of Mississauga road design standards ▪ Approximately 15% of the alignment under the travelled portion of road would increase risk of adverse effects on roadway

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
	Effect on existing utility infrastructure	<ul style="list-style-type: none"> Nature and significance of above and/or below ground utilities affected 	<ul style="list-style-type: none"> Short-term adverse effects on above ground utilities at surface construction sites as follows: <ul style="list-style-type: none"> S1b: Overhead utility lines and poles along the north side of the shaft compound S3: Substantial overhead utility lines, poles and anchor points, streetlight poles surrounding site and electrical/telephone box S4b: Sub-surface sanitary sewer; single overhead utility line/pole and anchor points; streetlight poles; trail light poles. S5: Single streetlight pole and trail light pole. C1: Single streetlight pole C3: Single streetlight pole, 2 traffic lights, overhead lines/poles/anchor points and electrical/telephone box C5: Single streetlight pole and overhead lines/poles. C7: Substantial overhead utility lines, poles and anchor points; 2 streetlight poles; Single traffic light pole; numerous utility covers and a drainage grates. 	<ul style="list-style-type: none"> In consultation with utility providers, locate all above and/or below ground utility infrastructure prior to construction to avoid potential conflicts with tunnel alignment and surface construction sites Relocate utility infrastructure as required as part of pre-construction activities. 	<ul style="list-style-type: none"> Short-term adverse effects on above and/or below ground utility infrastructure during construction would be minimized by locating all infrastructure prior to construction, consulting with utility providers and relocation of affected infrastructure as required. However, short-term Interruption of service is possible.
	Effect of environmental impairment areas	<ul style="list-style-type: none"> Proximity to areas of environmental impairment (AEI) 	<ul style="list-style-type: none"> 8 sites of (potential) environmental impairment: AEI 1, AEI 2, AEI 3, AEI 4, PAEI 1, PAEI 2, PAEI 3, PAEI 4 4 construction sites in proximity to areas of (potential) environmental impairment: <ul style="list-style-type: none"> S3: AEI 1 (via groundwater) S5: AEI 3 C5: PAEI 1 (via groundwater) C7: AEI 3 	<ul style="list-style-type: none"> Undertake additional investigations of potential areas of environmental impairment to determine actual degree of contamination Minimize the amount of temporary dewatering required during construction by specifying sealed (undrained) shaft construction in the overburden and temporary groundwater cutoff structures where appropriate. Use good management practices for construction in areas of environmental impairment, including: <ul style="list-style-type: none"> Development and implementation of contingency measures and spill response plans Use of appropriate personal protective equipment Engage a Qualified Person (as defined under Ontario Reg. 511/09) to direct appropriate management of potentially contaminated soil and/or water. Develop a Soil Management Plan (consistent with Part XV.1 of the Environmental Protection Act and O.Reg. 153/04, Records of Site Condition) to govern how any contaminated soil/water encountered will be handled and disposed of. 	<ul style="list-style-type: none"> Proximity and interaction of surface and tunnelling construction with 12 known areas of environmental impairment would be avoided as much as possible Adverse impacts would be minimized through limiting dewatering, use of good construction management practices and engagement of a Qualified Person.
Social Environment	Effect on traffic	<ul style="list-style-type: none"> Short-term disruption (extent and duration) to traffic and public transport operations (GO stations, MiWay bus routes, etc.) 	<ul style="list-style-type: none"> Short-term effects from increased truck traffic associated with surface construction sites (S1b, S3, S4b and S5) Short-term effects from temporary closure of traffic lanes to accommodate surface construction sites at: <ul style="list-style-type: none"> C1: Burnhamthorpe Road - westbound travel direction reduced to 2 lanes between Confederation and Duke of York. 	<ul style="list-style-type: none"> Develop and implement a <i>Traffic Management Plan</i> during construction in accordance with the Region of Peel's protocols and consultation with the City of Mississauga, transit providers (MiWay, MetroLinx, etc.). 	<ul style="list-style-type: none"> Short-term effects would be minimized by developing and implementing a <i>Traffic Management Plan</i>. However, 12 on-street parking spaces would be removed for the period of construction at C3.

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
			<ul style="list-style-type: none"> - C7: Cawthra Road – southbound right turn lane and westbound Burnhamthorpe Road bus lane to be closed during construction. Intersection expected to operate over capacity with 2 minute delay during afternoon peak. ▪ Short-term removal of 12 on-street parking spaces at C3. 		
	Effect of noise and perceptible vibration on sensitive receptors ³³	<ul style="list-style-type: none"> ▪ Degree of risk of short-term adverse noise and vibration effects on sensitive receptors 	<ul style="list-style-type: none"> ▪ Short-term noise and vibration effects are anticipated in proximity to surface construction sites as follows: <ul style="list-style-type: none"> - S1b: High risk of effects on residences along Wallenberg Crescent and adjacent condo building. Customers of the adjacent commercial plaza to the west of Grand Park Drive. - S3: Low to moderate risk of effects on condo building located southeast of site and low risk of effects on condo buildings located along south-side of Burnhamthorpe Road. - S4b: Moderate to high risk of effects on residences located along King Andrew Drive and low to moderate risk of effects on condo building located on south-side of Burnhamthorpe Road. - S5: Moderate risk of effects on residences located along Greycedar Crescent. Existing concrete noise wall will provide some noise protection to nearby residents at ground level; higher risk to second storey windows. - C1: Moderate risk of effects on YMCA building. Low risk of effects on condo building located on the south-side of Burnhamthorpe Road and receptors located north of City Centre Drive. - C3: Low risk of effects on condo buildings located on the south-side of Burnhamthorpe Road and office building on north. - C5: Low risk of effects on condo buildings located on the south-side of Burnhamthorpe Road - C7: Moderate to high risk of effects on townhouses located to the north of the site. Low risk of effects on surrounding condo buildings. 	<ul style="list-style-type: none"> ▪ Develop and implement a <i>Noise and Vibration Management Program</i> during construction, e.g. undertake pre-construction property surveys of all properties within 30 m of surface construction sites (zone of direct influence), consult with affected property owners, apply good management practices for noise and vibration reduction and implement a complaint response protocol. ▪ Adhering to MOECC NPC-115; MOECC Noise Limits in Environmental and Land Use Planning Guidelines; applicable regional / municipal by-laws, including City of Mississauga 'Noise Control By-law 360-79' 	<ul style="list-style-type: none"> ▪ Short-term noise and vibration effects will be minimized by the development and implementation of a <i>Noise and Vibration Management Program</i> during construction and adherence to MOECC NPC-115; MOECC Noise Limits in Environmental and Land Use Planning Guidelines and applicable regional / municipal by-laws, including City of Mississauga 'Noise Control By-law 360-79'. ▪ Potential for residual impacts on the condo building and residences in close proximity to site S4b
	Effect of dust on sensitive receptors ³⁴	<ul style="list-style-type: none"> ▪ Nature of short-term adverse dust effects on identified sensitive receptors 	<ul style="list-style-type: none"> ▪ Short-term increase in dust levels in proximity to all surface construction sites 	<ul style="list-style-type: none"> ▪ Apply good management practices to mitigate any air quality impacts caused by construction dust, consistent with Cheminfo Services Inc. <i>Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities (2005)</i> (e.g., install a mud mat (asphalt, concrete, gravel) at each surface construction site, employ regular road sweeping, undertake dust suppression, etc.) ▪ A complaint protocol will be developed and 	<ul style="list-style-type: none"> ▪ Short-term construction-related effects of dust will be avoided and/or mitigated through the application of good management practices such as dust suppression and development of a complaint response protocol.

³³ Based on MoECC Noise Limits in Environmental and Land Use Planning Guidelines; Regional and Municipal Noise Limits in By-Laws; MoECC Vibration Limits in NPC-207

³⁴ Reference any relevant regs

Category	Criteria	Indicator	Potential Effects	Impact management Measures	Net Effects
				implemented for responding to potential dust-related complaints from area residents.	
Economic Environment	Synergy with approved or planned projects	<ul style="list-style-type: none"> Degree of synergy 	<ul style="list-style-type: none"> Numerous approved / planned projects identified with good potential for coordination during detailed design and construction, including: <ul style="list-style-type: none"> Planned development of the site between Burnhamthorpe Road and Webb drive, with S1b on the west portion of the property (rather than east) which is not due for construction until 2018-20, after the 1500 mm diameter watermain. <ul style="list-style-type: none"> Good synergy with the planned Hurontario-Main LRT 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> Numerous approved / planned projects identified with good potential for coordination during detailed design and construction, including: <ul style="list-style-type: none"> Planned development of the site between Burnhamthorpe Road and Webb drive, with S1b on the west portion of the property (rather than east) which is not due for construction until 2018-20, after the 1500 mm diameter watermain. <ul style="list-style-type: none"> Good synergy with the planned Hurontario-Main LRT
Cultural Environment	Effect on archaeological resources and areas of archaeological potential ³⁵	<ul style="list-style-type: none"> Number and type of known archaeological sites affected Area (ha) of archaeological potential (i.e. lands with potential for the presence of significant archaeological resources) affected 	<ul style="list-style-type: none"> There are no known archaeological sites in the vicinity of the majority of the surface construction sites. However, there is archaeological potential at construction site S1b (2.5 ha) 	<ul style="list-style-type: none"> Undertake a Stage 2 Archaeological Assessment by a qualified archaeologist at S1b to determine the presence of archaeological resources. If warranted based on the results of the Stage 2 Archaeological Assessment, Stage 3 and Stage 4 Archaeological Assessments will be conducted. If and when archaeological sites are discovered, appropriate action will be taken, including a cessation of construction work on the affected site, consultation with aboriginal communities and adherence to Ministry of Tourism, Culture and Sport guidelines. 	<ul style="list-style-type: none"> No known archaeological sites or resources would be adversely affected. However, if deeply buried archaeological sites are discovered, appropriate action will be taken, including a cessation of construction work on the affected site, consultation with aboriginal communities and adherence to Ministry of Tourism, Culture and Sport guidelines.
	Effects on significant cultural heritage resources ³⁶	<ul style="list-style-type: none"> Number and type of built heritage resources and cultural heritage landscapes displaced or disrupted 	<ul style="list-style-type: none"> No built heritage resources or cultural heritage landscapes would be displaced or disrupted. 	<ul style="list-style-type: none"> None required 	<ul style="list-style-type: none"> No built heritage resources or cultural heritage landscapes would be displaced or disrupted.
Financial	Capital costs	<ul style="list-style-type: none"> Estimated capital cost, including property easements, temporary works and permanent works (Level D \$)? 	<ul style="list-style-type: none"> ~\$117 million 	<ul style="list-style-type: none"> Not applicable 	<ul style="list-style-type: none"> ~\$117 million

³⁵ ASI, 2015. Stage 1 Archaeological Assessment Report

³⁶ ASI, 2015. Cultural Heritage Resource Assessment Report

