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# FUNCTIONAL SERVICING REPORT

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## INFRASTRUCTURE ONTARIO

PROVINCIAL LANDS WEST OF TRAFALGAR ROAD,  
TOWN OF OAKVILLE

Project No.: 2022-0019-10

February 2, 2026

**WALTERFEDY**

# INFRASTRUCTURE ONTARIO

## FUNCTIONAL SERVICING REPORT

Provincial Lands West of Trafalgar Road, Town of Oakville

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## 1.0 INTRODUCTION

WalterFedy was retained by Infrastructure Ontario (IO) to prepare the following Functional Servicing Report to review potential servicing constraints and opportunities for a parcel of land located on the western side of Trafalgar Road, south of Highway 407. This report has been prepared in support of a proposed Official Plan Amendment application to add Residential land uses to the mix of uses permitted in the Trafalgar Urban Core Area 1 land use designation in the North Oakville East Secondary Plan applicable to the portions of the Provincial Lands proximate to Trafalgar Road. The subject lands have an area of approximately 18.96 ha and are currently vacant land used for agricultural purposes. See Figure 1.0 for a Site Location Plan.

An illustrated development concept was prepared by GSP Group Inc. The scenario would see the Trafalgar Corridor Lands developed with a mix of residential and commercial developments. No Site Plans or Draft Plan of Subdivision applications have been developed at this time, only conceptual sketches and estimated population/employment densities. See Appendix A for a conceptual figure showing the built-out form of the Subject lands as presented in the GSP documents.

The purpose of this report is to review the existing background information, as well as information that is currently in the design process, and to provide a general overview of the servicing requirements for the subject lands to support the requested Official Plan Amendment to the North Oakville East Secondary Plan. The report has also been updated to coordinate the preliminary servicing and SWM design with the Argo Trafalgar development located west and south of the IO lands. Also, the Region of Halton is currently undertaking a Water, Wastewater, and Transportation Integrated Master Plan to review Regional infrastructure for anticipated future growth targets to the year 2051. It is anticipated that information related to the proposed development concept (population, flow rates) will be taken into consideration by the Region as part of their Master Plan review and assessment.

### 1.1 Reference Reports

In the preparation of this functional servicing report, the following reports/drawings were referenced:

1. JC7 Subcatchment – Environmental Implementation Report and Functional Servicing Study – North Oakville East, Urbantech Consulting et.al, January 2026.
2. North Oakville Creeks Subwatershed Study (NOCSS), Town of Oakville, August 2006.
3. North Oakville Creeks Subwatershed Study Addendum, Town of Oakville, September 5, 2007.
4. Official Plan Amendment Number 272, North Oakville East Secondary Plan, February 2008.
5. North Oakville East Secondary Plan – Area Servicing Plan, Oakville Ontario, MMM Group Limited, April 2011.
6. Trafalgar Road Corridor Improvements EA, Cornwall Road to Highway 407 – Stormwater Management Report, AECOM, April 2015.
7. IO Lands West and East of Trafalgar – Illustrative Concept Dwg. A2, GSP Group, July 2024.
8. Technical Memorandum – Trafalgar Road (Phase 2) – Hays Boulevard to William Halton Parkway Sanitary Sewer Design, R.V. Anderson Associates Limited, November 8, 2021.
9. 600mm Sanitary Sewer – Trafalgar Road (Reg. Rd. 3) – Plan Profile Dwgs. 36-42 (Rev.1, 60% Review), R.V. Anderson Associates Limited, November 8, 2021.
10. Green Ginger Subdivision – Stages 1 & 2 – Plan Profile Dwgs for Wheat Boom Drive and Ernest Appelbe Boulevard (As-Constructed), DSEL, various dates.
11. Correspondence from DSEL regarding Sanitary Sewer Population, DSEL (late 2021).

12. *Water and Wastewater Linear Design Manual*, Regional Municipality of Halton, April 2019.

## 2.0 EXISTING SITE CONDITIONS

The subject lands are located on western side of Trafalgar Road, south of Highway 407. The property is bisected by William Halton Parkway and bound by an existing commuter parking lot to the north, Trafalgar Road to the east, agricultural lands to the west, and a Region of Halton water tower to the south. Refer to Figure 1.0 for a Site Location Plan.

### 2.1 Topography, Soils, and Hydrogeology

The subject lands are in the northwestern headwaters of the Joshua's Creek subwatershed and are predominantly used for agricultural row crops. The property drains in a southeasterly direction at a slope of 1.5% to 2.0% towards roadside ditches on the western side of the Trafalgar Road right-of-way. Four existing culvert crossings convey surface runoff to the eastern side of Trafalgar Road.

A site-specific geotechnical investigation will be completed during the future re-zoning or detailed design stage. However, based on the Ministry of Agriculture, Food and Rural Affairs AgMaps website and the AECOM Trafalgar Road stormwater management (SWM) report, the subsurface soils generally consist of Chinguacousy clay loam and Oneida clay loam. These soils are characteristic of Hydrologic Soil Groups C and D, respectively.

The subject lands fall within the jurisdiction of Conservation Halton, but it does not appear that the lands are located within the authority's regulation limit. Moreover, the site is not located in a source water protection area. There are no significant natural heritage features within the subject lands.

### 2.2 Water, Sanitary, and Storm Servicing

Servicing infrastructure information was provided by the Region of Halton, the Town of Oakville, and Conservation Halton. Utilities information was obtained from utility drawings prepared as part of the Trafalgar Road study.

#### 2.2.1 Sanitary Servicing

There is no sanitary sewer infrastructure on Trafalgar Road or William Halton Parkway adjacent to the subject lands.

#### 2.2.2 Water Servicing

A 750-mm-diameter watermain is located on Trafalgar Road that runs between Dundas Street and the elevated water tower located south of the western property. A 1200 mm transmission watermain is located on Burnhamthorpe Road, west of Trafalgar Road. See Appendix C for the Area Servicing Plan Report. The subject lands are located wholly within Halton Pressure Zone 4.

#### 2.2.3 Storm Servicing

There are no storm sewers available to service the subject lands. Trafalgar Road is a mix of urbanized and unimproved/rural road cross-sections. Trafalgar Road drains to roadside ditches from Burnhamthorpe Road to south of William Halton Parkway, where it turns into an urbanized cross-section for approximately 230 m north, at which point the road section reverts back to an unimproved/rural cross-section at the commuter parking lot entrance. Within the urbanized cross-section areas, localized storm sewers drain the right-of-way and outlet flows to the eastern side of Trafalgar Road where surface runoff is collected by tributaries of Joshua's Creek. Within the unimproved sections, Trafalgar Road drains southerly in roadside ditches to culvert crossings under Trafalgar Road.

#### 2.2.4 Hydro, Gas, and Other Utilities

Overhead hydro lines are located on the eastern side of Trafalgar Road. Subsurface utility location drawings prepared for the Trafalgar Road study indicate a buried Bell Canada service on the western side of Trafalgar Road, north of Burnhamthorpe Road. No information related to natural gas or other telecommunications is available at this time. The availability of services/utilities in proximity to the subject lands will be confirmed as part of future engineering design works.

### 3.0 REVIEW AGENCIES

#### 3.1 Town of Oakville

The Town of Oakville will be responsible for the review and approval of development applications associated with the site.

#### 3.2 Region of Halton

The Region of Halton will also provide review services associated with any development applications for the subject lands related to sanitary and water servicing. In addition, both Trafalgar Road and William Halton Parkway are Regional Roads. All associated road works or service connections will require review, approval, and permitting by the Region of Halton.

#### 3.3 Conservation Halton

The subject Land is located within the jurisdiction of Conservation Halton. It does not appear that the land is located within the authority's regulated area, but any future storm runoff will be directed to tributaries of Joshua's Creek, which is regulated by Conservation Halton.

#### 3.4 Ministry of Transportation Ontario (MTO)

The subject Land is located within MTO's Permit Control Area to Highway 407 and will require MTO approval.

### 4.0 SITE SERVICING AND GRADING

The Town and Region reviewed and provided comments on preliminary reporting for the IO lands (eastern and western sides) as well as the Argo Trafalgar development located on the eastern side of Trafalgar Road between William Halton Parkway and Burnhamthorpe Road, abutting the southern side of the IO property. The Town indicated that the servicing and SWM design for both the IO and Argo developments should be coordinated to ensure consistency with grading, servicing and SWM approach. As such, the reporting for the IO lands was updated to provide consistency with the conceptual design prepared for the Argo development. Information provided by Urbantech is provided

#### 4.1 Sanitary Services

Within the subject lands, a local sanitary sewer system will be constructed to service the proposed development area. The Block areas proposed for development are approximately 13.3 ha. The preliminary sanitary sewer layout has been coordinated with the downstream Argo development sanitary requirements as well as the future Trafalgar Road sanitary trunk sewer. Sanitary flows from the subject lands will outlet to a future sanitary sewer on Burnhamthorpe Road and then to the future 750-mm-diameter sanitary trunk sewer at the intersection of Burnhamthorpe and Trafalgar Road, carrying the sanitary flows south to Dundas Street. See Figure 1C in Appendix B showing the overall sanitary servicing plan.

The following design criteria, taken from the Halton Water Wastewater Linear Design Manual and the Development Charges Update Water/Wastewater Technical Report (2022), were used to determine the sanitary flows from the proposed development:

- Per capita sewage flow of 0.215 m<sup>3</sup>/persons/day for residential and 0.185 m<sup>3</sup>/emp/day for employment lands
- Residential and employment population based on Concept Plan prepared by GSP.
- Harmon peaking formula to be applied to residential and employment flows.
- Infiltration rate of 0.286 L/ha/s

The proposed land use breakdown for the proposed development, including block areas and population counts, is shown on the Illustrative Concept Plan prepared by GSP, included in Appendix A.

The estimated population within the IO lands on the west side of Trafalgar Road are summarized in Table 1 and the proposed sewage flows from the IO lands are summarized in Table 2. Sanitary flows will outlet via a proposed 525mm sanitary sewer from an internal road to a new sanitary sewer on Burnhamthorpe Road that will convey flows east to the 750 mm sanitary sewer on Trafalgar Road.

As shown in Table 1, the Urbantech Wastewater Drainage and Servicing Plan (Dwg. 9.1 in Appendix B), indicated an estimated population within the IO lands of approximately 20,000 people, which is greater than the anticipated population of 12,720 based on the current concept plan.

**Table 1 - IO Lands Population Estimate - West Parcel**

Location	Residential Population	# Jobs/Employment	Total IO Lands	IO Population from JC7 EIS Report <sup>A</sup>
IO West Parcel	11240	1480	<b>12720</b>	20000

<sup>A</sup> From Dwg. 9.1 - Wastewater Drainage and Servicing Plan - *JC7 Subcatchment - Environmental Implementation Report and Functional Servicing Study (January 2026)*

**Table 2 - Proposed Sanitary Sewage Flows**

Flow Type	Flow (m <sup>3</sup> /day)	Flow (L/s)
Peaked Residential and Commercial	9623.19	111.38
Infiltration Flow	384.49	4.45
Design Flow	10007.69	115.83

Future local sanitary sewers will be designed such that maximum capacity utilized does not exceed 70%, with pipe flow velocities ranging from 0.6 m/s for self-cleansing to a maximum of 3.0 m/s.

The Region of Halton is currently undertaking a Water, Wastewater, and Transportation Integrated Master Plan to review Regional infrastructure for anticipated future growth targets to 2051 that will include a review of wastewater conveyance system requirements and pump station capacities.

## 4.2 Municipal Water

The 2011 ASP notes that there will be adequate flow and pressure at all Pressure Zone 4 nodes during the maximum day and peak hour demand scenarios. The report determined that maximum day pressures at nodes within the subject lands could range between 58 psi and 72 psi, which is consistent with the pressures estimated above based on the anticipated TWL elevations. Additionally, the ASP undertook maximum day +

fire flow modelling to confirm that the water distribution system could meet the Region's requirements of 5,000 l/min (92 l/s) for residential development and 15,000 l/min (250 l/s) for commercial, industrial, and institutional land uses. The analysis was performed targeting a minimum allowable pressure of 30 psi (versus the typical 20 psi) to account for additional system head losses that may occur when smaller-diameter watermains infill within the final Site Plans and development blocks. In order to adequately determine the impacts that the implementation of the proposed development will have on the surrounding water system, the proposed water distribution system was added to the Region of Halton's InfoWater model for the Town of Oakville. It should be noted that 3 separate modelling scenarios were received, and subsequently used for the purposes of this analysis: an existing condition (2021) modelling scenario, interim conditions (2026) modelling scenario, and future conditions (2031) modelling scenario.

As per information received from the Region of Halton, the interim phase (2026) model implements the operation of a new Zone 4 (Ashgrove) Reservoir as well as new pressure release valves in northern Oakville. The Ashgrove reservoir operates at a top water level (TWL) of approximately 250 m within this modelling scenario, and is set to service all of the existing Milton zone M4L and a small portion of Oakville zone O4. Under the existing conditions (2021) model, Milton zone M4L and Oakville zone O4 both operate under a TWL of 236 m. Under the interim condition modelling, M4L was set to operate at a TWL of 250, and only the northern portion of O4 was transferred to a TWL of 250 m – with the remainder of the zone still operating with a TWL of 236.

Under the future condition model (2031), several proposed infrastructure projects from the 2020 Allocation Program were integrated into the model. The key changes within this modelling scenario are as follows:

- Milton zone M5L (TWL of 267 m) is reduced in size, with a significant portion of the zone transferred to a TWL of 250 m. This includes lands within the Halton Hills/401 Corridor area.
- Oakville zone O4 (TWL of 236 m) transitions to a TWL of 223.5 m.
- The southeastern corner of Milton (along Tremaine Road) transitions to a TWL of 223.5 m from the previous TWL of 250 m.
- The boundary of Oakville zone O3 (TWL of 198 m) is adjusted.

Under the changes summarized above, it is known that the IO Trafalgar Lands are currently within Oakville Pressure Zone 4 (Zone TWL 236 m). The service pressure for this zone will change in the 2025 ± population projection to a TWL of 224 m as part of the Region's Pressure Boundary Re-alignment project.

The western portion of the IO East Lands will have finished ground elevations ranging between 184 and 186 m. Based on the noted TWL elevations of 236 m and 224 m, the resulting pressure across the western portion of the IO East Lands is 71 psi – 74 psi, and 54 psi – 57 psi, respectively.

The proposed development will require the future 300 mm watermain extension on William Halton Parkway as well as the proposed 400 mm watermain on Burnhamthorpe Road. Future watermains will extend north into the IO East Lands. Depending on the timing of the IO development on the western side of Trafalgar Road, the extension of local watermain from the western side of Trafalgar Road may also provide another water source.

#### 4.2.1 Domestic Demands

An estimate of the domestic water demand for the proposed development scenario is provided in Appendix C and is summarized in Table 1 below. Demands from any of the scenarios will be distributed throughout the proposed development area and if the future water system is sufficiently looped, the additional domestic demand would not be expected to adversely impact the water distribution system.

**Table 1 – Summary of Domestic Water Demands**

Flow Type	Flow (L/s)
Average Day Demand	38.3
Maximum Day Demand	86.2
Peak Hourly Demand	146.6

#### 4.2.2 Fire Flow Demands

Fire flow demands for any future developments will be subject to the methodology outlined in the Water Supply for Public Fire Protection document published by Fire Underwriters Survey (FUS, 2020). During the detailed design stage, the Site Plan(s) and architectural building plans will be used to calculate the required FUS fire flows for each building. If the system is able to supply 15,000 l/min (250 l/s) as indicated in the Area Servicing Plan report, then sufficient flow will be available to satisfy the fire flow requirements regardless of the development scenario and ultimate residential/employment land split as the building forms will be similar.

The Region of Halton is currently undertaking a Water, Wastewater, and Transportation Integrated Master Plan to review Regional infrastructure for anticipated future growth targets to 2051. This will include a review of water distribution system capacities and level of service.

#### 4.2.3 Service Design and Modelling

As per the Region of Halton’s Water and Wastewater Linear Design Manual, water distribution networks within the Region of Halton shall be able to convey the combination of the Maximum Day Demand (MDD) and Fire Demand within the pressure and velocity ranges as specified. In order to verify that the proposed development will not negatively impact the existing, and future states of the nearby water distribution systems, the proposed water distribution system was imported into the InfoWater models of the Town of Oakville’s water distribution system under the existing 2021 and proposed 2026 and 2031 network scenarios as received from the Region of Halton.

Modelling of the proposed network was completed to better understand hydraulic losses, pressures, and velocities in the proposed development. Models and results are provided in Appendix C.

In order to create the Maximum Day and Peak Hourly demand models, the demands noted within Appendix C were divided by the total number of nodes within the proposed development, the resulting products were then assigned to the system nodes within the models.

For this system in particular, there were 39 nodes attributed to the proposed development. Therefore, the Maximum Day demands for each node was set to a value of approximately 1.778 L/s (the product of the overall Maximum Day demand divided by the 39 nodes within system). This method was replicated for modelling conducted for the Peak Hourly demand scenario.

Within the fire flow analysis tool, hydrant nodes were assigned the appropriate fire flows as described under Section 4.2.2. Additionally, a minimum pressure constraint of 14.1 m (20 psi) was assigned to all nodes within the system. A specified target pressure analysis was then performed on the system. Under this analysis, the program computes the maximum available fire flow such that no nodes within the system drop below the minimum pressure constraint assigned to them. In order to illustrate proposed network’s ability to convey the maximum day demand and fire demand within the pressure and velocity ranges specified, the fire flow was placed at the northwestern most node of the system to simulate the worst case fire flow scenario – with the fire flow required at the furthest point away from the system’s connection with the existing municipal system. The results of this scenario are provided in a Figure within Appendix C. It should be noted that this figure was produced using the 2031 maximum day demand scenario base received from the Region of Halton as it

produced the lowest residual pressure head value at the specified node, thereby representing the worst case scenario.

It is noted that the fire flow analysis conducted considers the previously-assigned Maximum Day demand values that were assigned to the non-hydrant nodes in the model when determining the available fire flow at the hydrant nodes. The fire flow analysis tool utilized within the fire flow scenarios simulates a situation in which a hydrant within the system is required to provide the prescribed fire flow for a duration of 3-hours, under the prescribed system pressure constraints, within the modelled system. The fire flow analysis tool does not override the previously-prescribed demands assigned to the nodes within the system, instead it takes them into account when determining the maximum available fire flow at each hydrant node.

Based on the modelling results provided within Appendix C, the proposed network configuration provides adequate servicing for both the Maximum Day demand plus fire flow and Peak Hourly demand scenarios under all received water models. The modelling results confirm that the subdivision can be serviced in compliance with all requirements of the Region of Waterloo and the MECP, with sufficient water supply available to the proposed development.

### 4.3 Storm

There is no storm sewer infrastructure to service the subject lands. A proposed storm sewer network for the subject lands is shown on Dwg. C301 and C302 (Appendix E). The storm sewer alignment and overall drainage areas have been coordinated with the adjacent Argo development storm sewer and SWM design. The proposed storm sewer captures runoff south of William Halton Parkway and outlets to the proposed SWM Pond 60 located within the IO development. Preliminary storm sewer sizing within the development was provided by Urbantech (see Dwg. 2 - Preliminary Storm Servicing In Appendix D). Portions of the drainage area tributary to the SWM facility will be collected by storm sewer system sized to capture and convey the major storm event. Other areas will drain via a minor (5-yr) storm system with major flows conveyed overland via the internal roadway. Controlled outflow will be conveyed east towards Trafalgar Road. Conveyance of storm flows under Trafalgar Road is still under investigation but will be achieved by either a siphon system at Loyalist Drive or a traditional gravity culvert south of Loyalist Drive. Flows will be conveyed east and outlet to the proposed creek block.

#### 4.4 Stormwater Management

The NOCSS and the Secondary Plan (see figure in Appendix A) identified areas to be used for potential SWM facilities. A SWM facility is proposed within the west parcel of the IO lands. The SWM facility location, as well as inlet and outlet locations, have been coordinated with the ongoing design by Urbantech.

SWM criteria for the subject lands are taken from the NOCSS report and Addendum and the Ministry of the Environment, Conservation and Parks (MECP) guidelines. The SWM requirements are as follows:

- Water Quality Control
  - Total phosphorus (TP) loadings must not increase after development.
  - A Normal (70% TSS removal) level of water quality protection is stipulated for Joshua's Creek; in order to achieve the TP removal criterion, an Enhanced (80% TSS removal) level of protection should be implemented.
  - A dissolved oxygen level of 6 mg/L is required for Joshua's Creek.
  - Chlorides - The Town of Oakville adopted a Salt Management Plan. The requirement for salt management should be reviewed during the detailed design stage.
- Peak Flow Control
  - Post-development peak flows for the 2-year to 100-year storm events and the Regional Storm are to be controlled based on target unit flow rates (m<sup>3</sup>/s/ha) as outlined in Table 7.4.1 in the NOCSS Addendum (Appendix D). These targets are based on maintaining existing condition flow rates.
  - Provide infiltration if possible.

The subject lands are located within subcatchments JC7 and JC8 as identified in Figure 7.4.7 of the NOCSS. Surface drainage crosses under Burnhamthorpe Road at culverts JC-B10 and JC-B9, respectively. Drainage from both subcatchments ultimately drains to culvert JC-D1 at Dundas Street. The proposed SWM Facility will service a drainage area of approximately 35.6 ha. Table 4 summarizes the unit area target flow rates and the resulting allowable discharge based on the NOCSS criteria.

**Table 2 - Target Unit Flow Rates and Total Allowable Discharge**

Storm Event	Target Unit Flow (m <sup>3</sup> /s/ha)	Target Flow (m <sup>3</sup> /s)
2-year	0.007	0.237
5-year	0.011	0.372
10-year	0.013	0.440
25-year	0.017	0.575
50-year	0.019	0.643
100-year	0.021	0.711
Regional	0.048 <sup>A</sup>	1.625

<sup>A</sup> Regional unit flow target reduced from 0.052 m<sup>3</sup>/s/ha to 0.048 m<sup>3</sup>/s/ha based on updated GAWSER modeling prepared as part of the EIS.

Based on the criteria outlined above and the ultimate drainage areas, the proposed SWM facility will be designed as an MECP wet pond complete with a permanent pool and forebay for quality control. The pond will include an active storage component to provide erosion and quantity (peak flow) control via an outlet control structure.

Controlled outflow from SWM Pond 60 will be conveyed east towards Trafalgar Road. Conveyance of storm flows under Trafalgar Road is still under investigation but will be achieved by either a siphon system at Loyalist Drive or a traditional gravity culvert south of Loyalist Drive. Flows will be conveyed east and outlet to the proposed creek block. Although a SWM Facility was not indicated on Figure 7.4.6 in the NOCSS, the implementation of a wet pond is required to meet the SWM criteria stipulated in the NOCSS. The detailed design of the SWM pond and outlet storm sewer will take place during the EIR/FSS stage with water balance made a priority. A SWM facility design for Pond 60 was undertaken as part of the JC7 Subcatchment EIS which utilized the GAWSER model to confirm the storage capacity of facility and to confirm that the outlet target flows are satisfied. Excerpts from the EIS reporting detailing the SWM facility design is provided in Appendix D as well as hydrologic modeling and facility details based on a SWMHYMO event based analysis.

The design of infiltration controls and low impact development measures should be incorporated into the future detailed design of individual site plans. The design of interim ponds and other stormwater management features required to meet water balance and erosion control requirements, are beyond the scope of this assessment for the Official Plan Amendment. However, the design and implementation of these stormwater management features should be considered during the detailed design and construction phasing.

#### **4.5 Other Services**

Gas servicing for the site would need to be coordinated with Enbridge during detailed design. Oakville Hydro lines surround the site and could readily provide service. Coordination would be required during detailed design. Coordination with Bell Canada and other telecommunications services would be required during detailed design.

#### **4.6 Surface Grading and Drainage**

As indicated previously, the lands drain in a southeasterly direction towards Trafalgar Road. Preliminary road centreline grades indicate runoff north of William Halton Parkway will flow northeast through a proposed storm sewer towards the future SWM facility on the eastern side of Trafalgar Road. Runoff and overland flow south of William Halton Parkway will be conveyed southeast through the proposed storm sewer and outlet into the SWM Pond 60 on the western side of Trafalgar Road.

#### **4.7 Erosion and Sediment Control**

Erosion and sediment controls must be implemented during construction. Mud mats should be provided at any construction entrances and any sediment that is tracked onto the roadway during the course of construction will be cleaned by the Contractor at the end of each day. Temporary siltation protection in the form of silt sacks will be installed on all existing and new catchbasins on the Site and within the immediately-adjacent rights-of-way. A sediment control fence will be required around the perimeter of the active work area and to protect the interior wetland. In addition, depending on the size of area stripped for any future works, temporary sediment and erosion control ponds will be constructed.

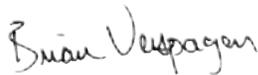
## 5.0 CONCLUSIONS

Based on a review of the background information and coordination with the Argo Trafalgar background study, the IO lands on Trafalgar Road can be serviced as follows:

- Sanitary servicing from the property will be provided via a sanitary sewer system and connection to the future sanitary trunk sewer at the intersection of Burnhamthorpe and Trafalgar Road that will convey effluent south along Trafalgar Road.
- A future water distribution system will need to be extended from the watermain on Trafalgar Road and looped through the subject lands to provide domestic and fire water supply for the future developments.
- The NOCSS will require that future developments drain to SWM facilities that will provide the requisite controls. A storm sewer system will service the site, conveying flows from the area south of William Halton Parkway towards the proposed SWM Pond 60.
- It is anticipated that future development applications will require detailed servicing studies/plans to identify existing and necessary infrastructure to support future development of the subject lands. These would be subject to review and approval by the Town of Oakville, Region of Halton, and other circulated review agencies.
- The ultimate servicing design for the subject lands will need to be coordinated with the Water, Wastewater, and Transportation Integrated Master Plan that is currently being undertaken by the Region of Halton.

All of which is respectfully submitted,

**WALTERFEDY**



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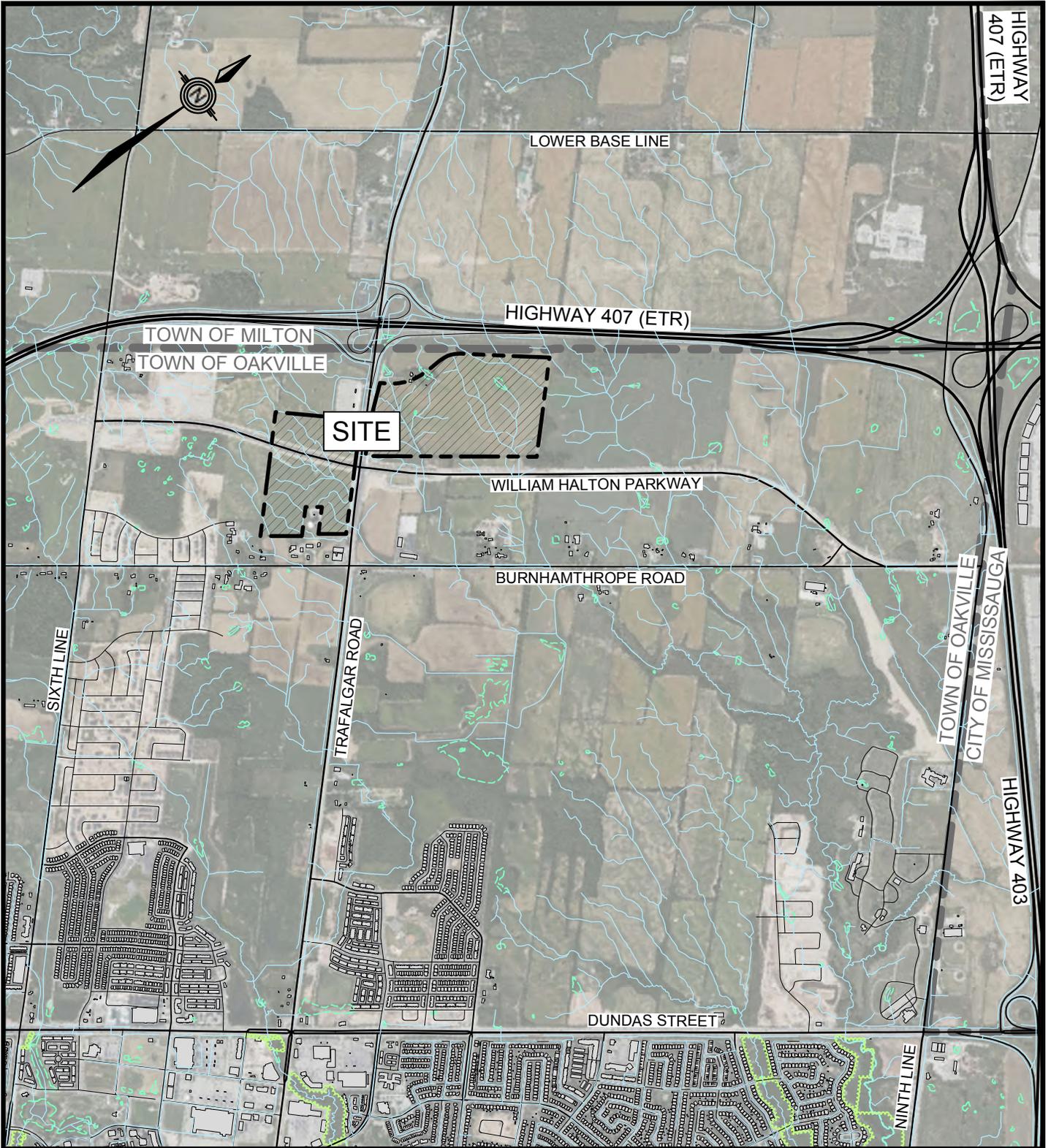
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## FIGURES

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 Jennifer Jantzen; 3/4/2022 9:09:17 AM



PROJECT:  
**TRAFALGAR CORRIDOR  
 FUNCTIONAL SERVICING REPORT  
 OAKVILLE, ONTRIO**

TITLE:  
**SITE LOCATION**

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SCALE: 1:25000	DATE: 2022-03-03
DRAWN BY: JJ	PROJECT NO.: 2022-0019-10
CHECKED BY: JO	FILE: 2022-0019-10 SITE LOCATION
SHEET NO.:	

**fig 1.0**

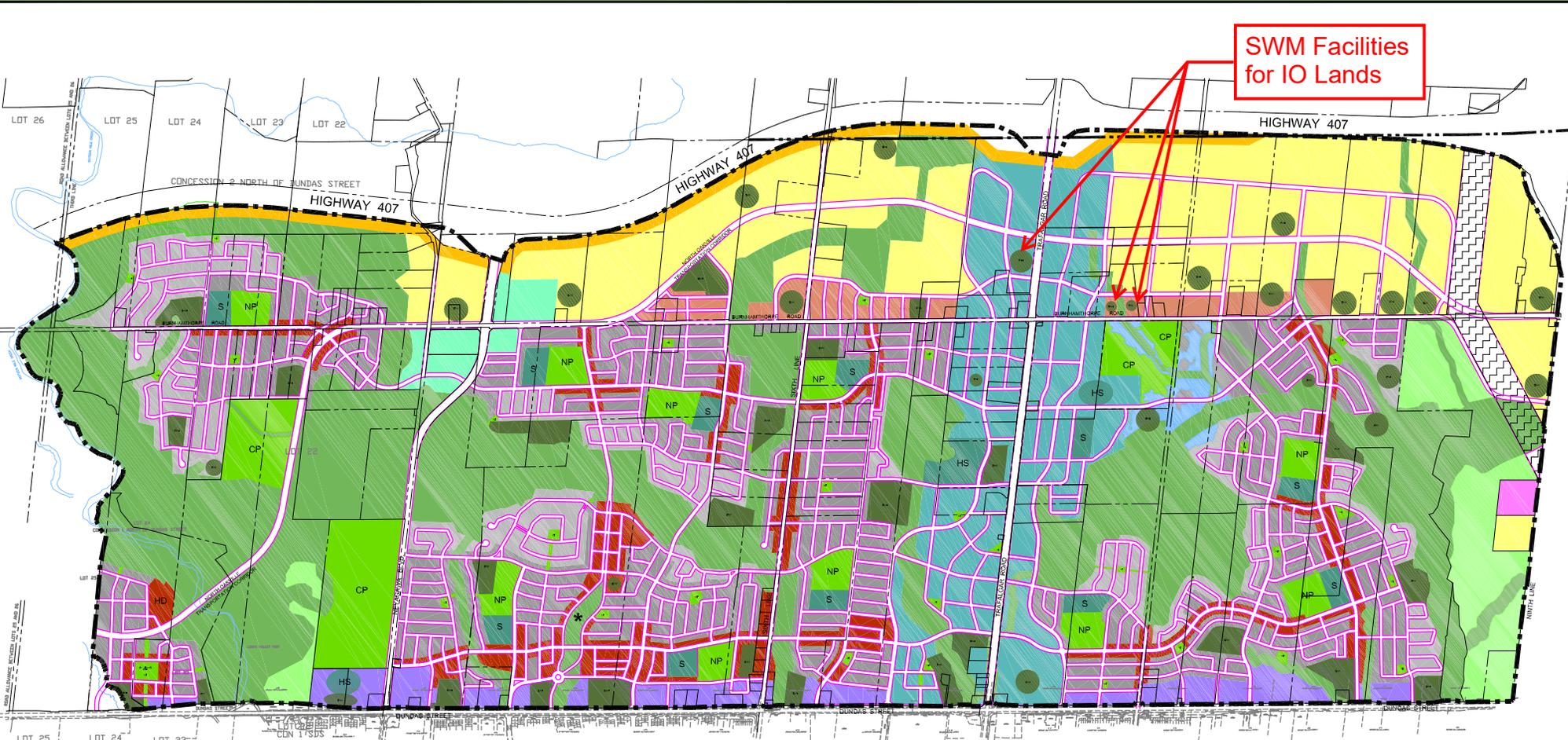
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# **APPENDIX A**

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## **General Background Information**

**SWM Facilities  
for IO Lands**



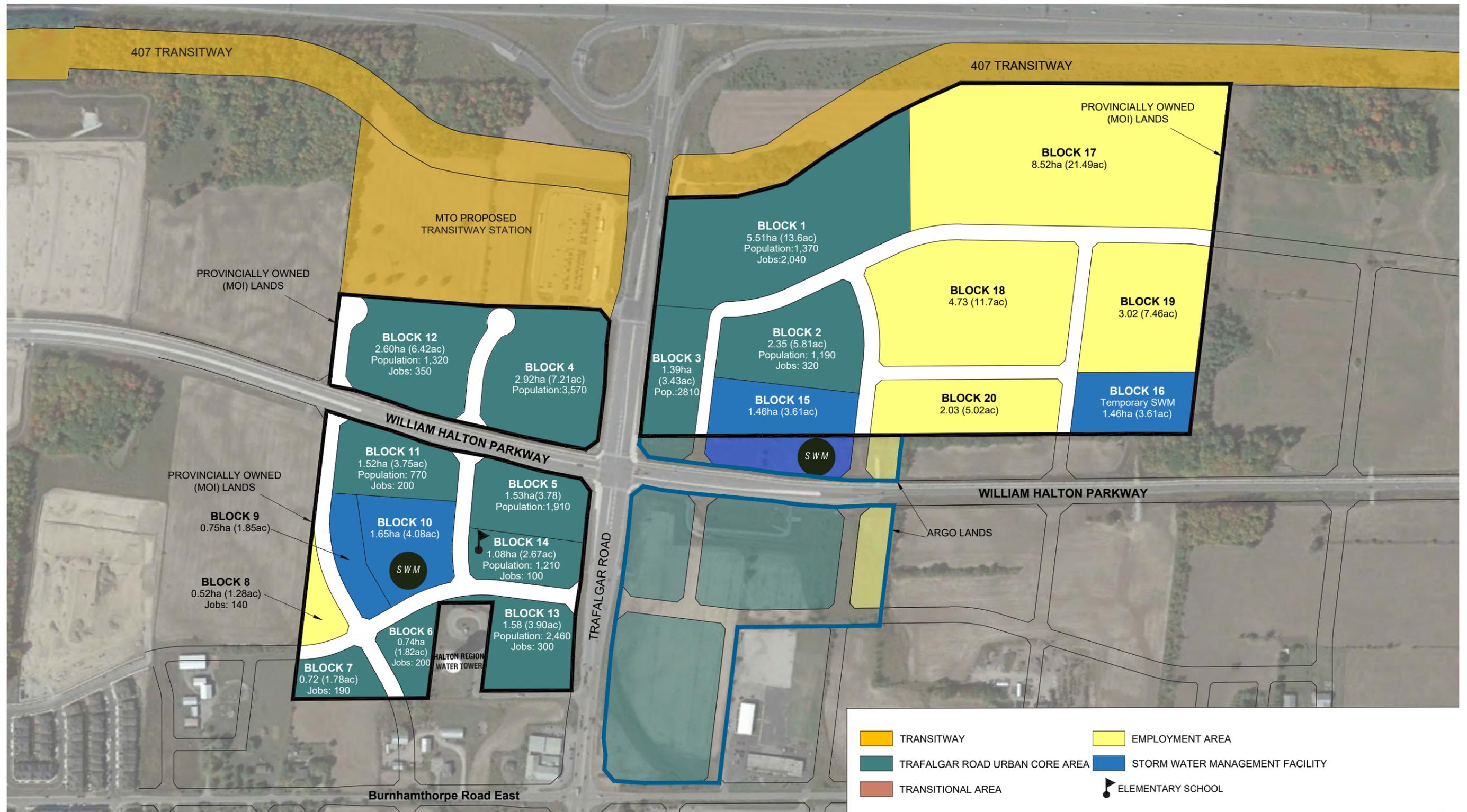
SOURCE: BASEPLAN FROM NORTH OAKVILLE MASTER PLAN APPENDIX 7.3 BY THE TOWN OF OAKVILLE ON AUGUST 13, 2007

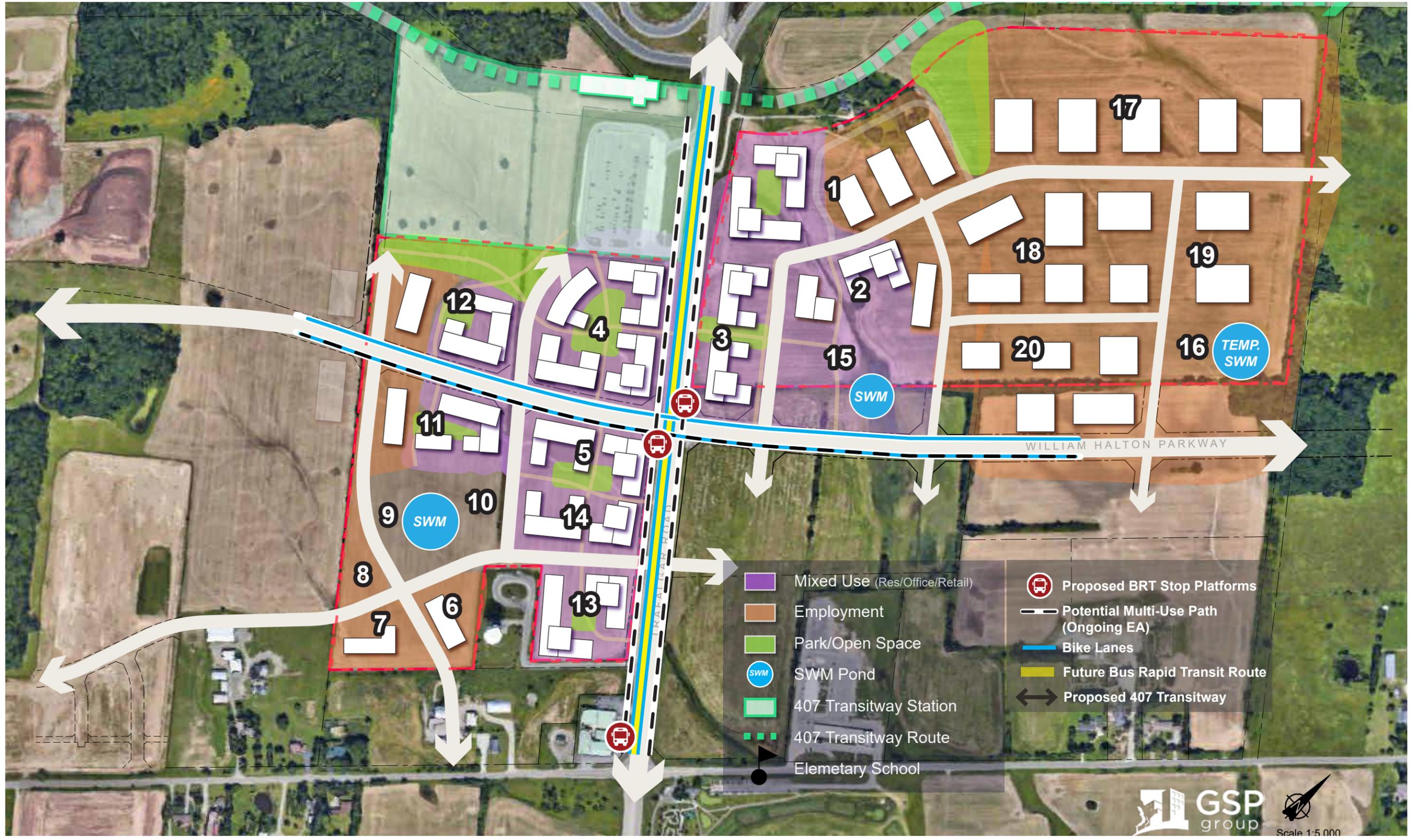


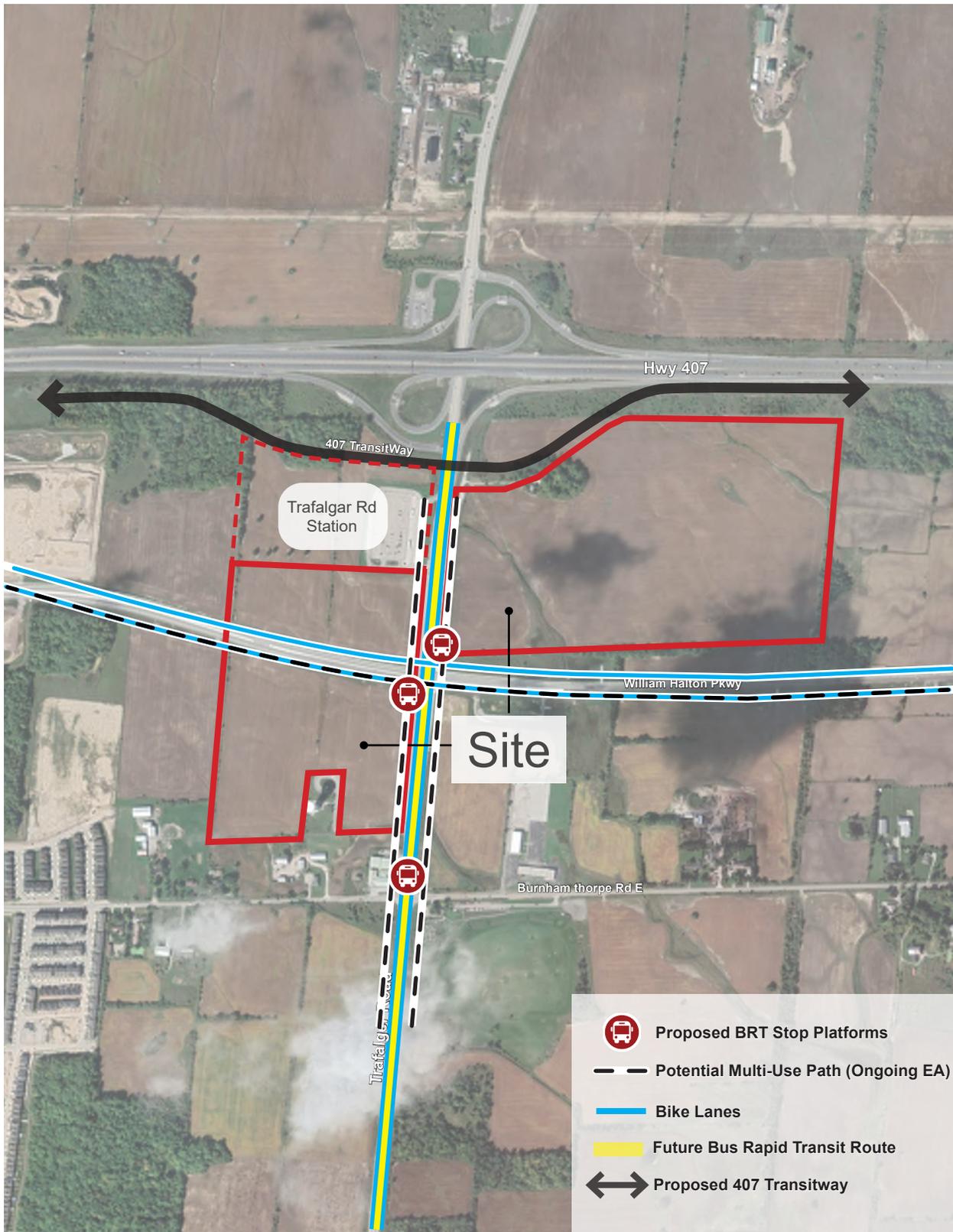
**LEGEND**

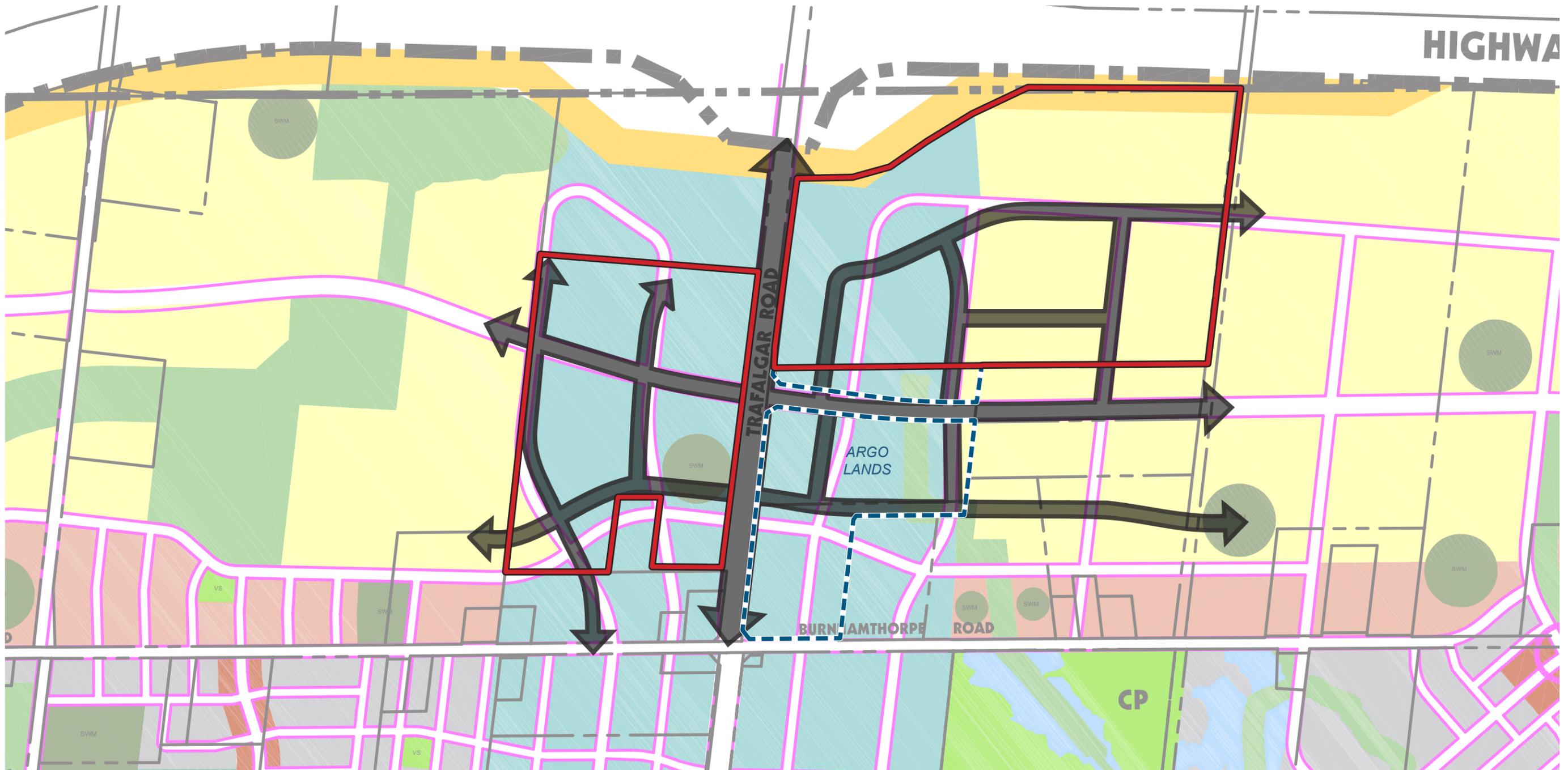
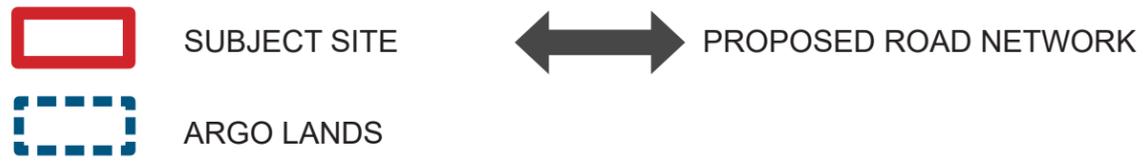
- |  |                                      |  |   |  |   |
|--|--------------------------------------|--|---|--|---|
|  | SECONDARY PLAN AREA BOUNDARY         |  | INSTITUTIONAL AREA                                  |  | UTILITY CORRIDOR                              |
|  | OAKVILLE / MILTON MUNICIPAL BOUNDARY |  | STORMWATER MANAGEMENT FACILITY (final location tbd) |  | NEIGHBOURHOOD ACTIVITY NODE                   |
|  | TRANSITWAY                           |  | COMMUNITY PARK AREA                                 |  | CEMETERY AREA                                 |
|  | DUNDAS STREET URBAN CORE AREA        |  | NEIGHBOURHOOD PARK AREA                             |  | NEIGHBOURHOOD CENTRE AREA                     |
|  | NEYAGAWA BLVD. URBAN CORE AREA       |  | VILLAGE SQUARE/URBAN SQUARE                         |  | GENERAL URBAN AREA                            |
|  | TRAFALGAR ROAD URBAN CORE AREA       |  | ELEMENTARY SCHOOL SITE                              |  | SUB URBAN AREA                                |
|  | TRANSITIONAL AREA                    |  | SECONDARY SCHOOL SITE                               |  | HIGH DENSITY RESIDENTIAL AREA                 |
|  | EMPLOYMENT AREA                      |  | JOSHUA CREEK FLOODPLAIN AREA                        |  | POLICY REFERENCE - SEE POLICY SECTION 7.4.7.2 |
|  | NATURAL HERITAGE SYSTEM AREA         |  |   |  |   |

PROJECT		NORTH OAKVILLE COMMUNITY BUILDERS INC.			
TITLE		SECONDARY PLAN - LAND USE			
Checked	A.W.	Drawn			
Date	MARCH 2008	Proj. No.	10-02076		
Scale	NTS	Exhibit No.	1.1		









**DEVELOPMENT POPULATION STATISTICS**  
**BASED ON GSP CONCEPT**

IO TRAFALGAR WEST

---

Block	Site Area	Residential Population	Job/Employee Population	Total Population
4	2.87	3570		3570
5	1.53	1910		1910
6	0.74		200	200
7	0.72		190	190
8	0.52		140	140
9	0.75	n/a - SWM	n/a - SWM	
10	1.65	n/a - SWM	n/a - SWM	
11	1.52	770	200	970
12	2.60	1320	350	1670
13	1.58	2460	300	2760
14	1.08	1210	100	1310
<b>Total</b>	<b>15.56</b>	<b>11240</b>	<b>1480</b>	<b>12720</b>

- Population estimates per GSP Concept Plans

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## **APPENDIX B**

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### **Sanitary Sewer Information**

**DEVELOPMENT POPULATION STATISTICS BASED ON GSP CONCEPT AND ESTIMATED PEAK SANITARY FLOW**

**IO TRAFALGAR WEST**

Block	Site Area	Residential Population	Job/Employee Population	Total Population	Residential Average Flow (m <sup>3</sup> /day)	Residential Peaking Factor	Residential Peak Flow (m <sup>3</sup> /day)	Employment Average Flow (m <sup>3</sup> /day)	Employment Peaking Factor	Employment Peak Flow (m <sup>3</sup> /day)	Total Residential + Employment Peak Flow	Infiltration Flow (m <sup>3</sup> /day)	TOTAL PEAK FLOW (m <sup>3</sup> /day)
4	2.87	3570		3570	778.26	3.377	2628.29				2628.29	70.92	2699.21
5	1.53	1910		1910	416.38	3.601	1499.49				1499.49	37.81	1537.30
6	0.74		200	200	0			37.00	3.318	122.78	122.78	18.29	141.07
7	0.72		190	190	0			35.15	3.325	116.87	116.87	17.79	134.66
8	0.52		140	140	0			25.90	3.360	87.04	87.04	12.85	99.89
9	0.75	n/a - SWM	n/a - SWM									18.53	18.53
10	1.65	n/a - SWM	n/a - SWM									40.77	40.77
11	1.52	770	200	970	167.86	3.870	649.67	37.00	3.318	122.78	772.45	37.56	810.01
12	2.60	1320	350	1670	287.76	3.719	1070.19	64.75	3.239	209.74	1279.93	64.25	1344.17
13	1.58	2460	300	2760	536.28	3.514	1884.58	55.50	3.263	181.08	2065.66	39.04	2104.71
14	1.08	1210	100	1310	263.78	3.745	987.88	18.50	3.395	62.80	1050.69	26.69	1077.37
<b>Total</b>	<b>15.56</b>	<b>11240</b>	<b>1480</b>	<b>12720</b>	<b>2450.32</b>		<b>8720.10</b>	<b>273.80</b>		<b>903.10</b>	<b>9623.19</b>	<b>384.49</b>	<b>10007.69</b>
<b>Flow (L/s) =</b>											<b>111.38</b>	<b>4.45</b>	<b>115.83</b>

- Population estimates per GSP Concept Plans

- Average per capita residential sanitary flow (m<sup>3</sup>/capita/day) =

0.215

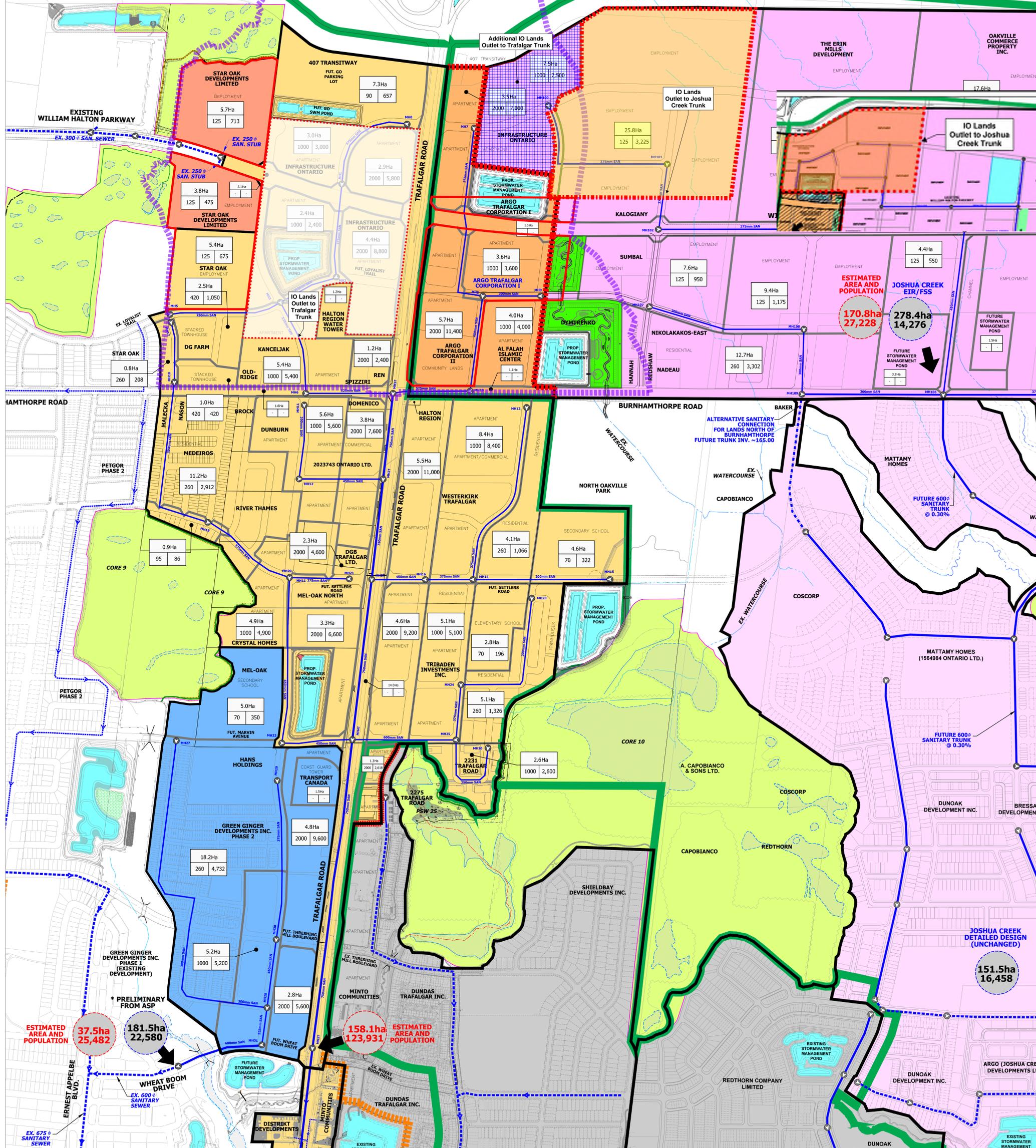
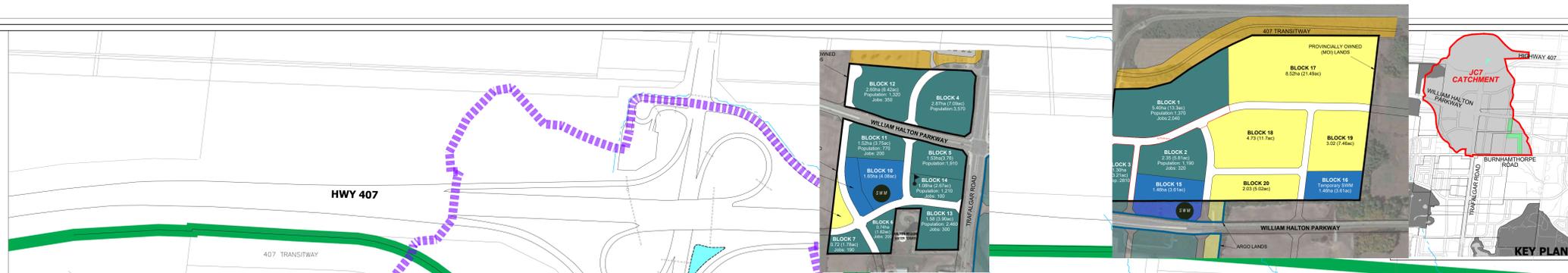
per Development Charges Update Water/Wastewater Technical Report (2022)

- Average per capita employment sanitary flow (m<sup>3</sup>/capita/day) =

0.185

per Development Charges Update Water/Wastewater Technical Report (2022)

- Infiltration rate (L/s/ha) = 0.286



Urbantech Consulting  
Stonybrook Consulting Inc.  
Beacon Environmental  
GEO Morphix Ltd.  
R.J. Burnside & Associates Limited

**LEGEND:**

- SUBJECT LANDS
- JC7 FSS STUDY AREA
- CORE AREA
- PROPOSED NHS
- PROPOSED SWM POND
- EXISTING SANITARY SEWER, MANHOLE AND FLOW DIRECTION
- PROPOSED SANITARY SEWER, MANHOLE AND FLOW DIRECTION
- ORIGINAL ASP BOUNDARY
- PROPOSED REVISION TO ASP BOUNDARY
- WASTEWATER DRAINAGE AREA BOUNDARY
- SUB-DRAINAGE AREA BOUNDARY
- WASTEWATER DRAINAGE AREA (HECTARES) AND POPULATION (PERSONS)
- PROPOSED SWM POND

PROPOSED DRAINAGE AREA TO TRAFALGAR ROAD SUB-TRUNK SEWER

PROPOSED DRAINAGE AREA TO WILLIAM HALTON PKWY / SIXTH LINE SUB-TRUNK SEWER

PROPOSED DRAINAGE AREA TO JOSHUA CREEK SUB-TRUNK SEWER

PROPOSED DRAINAGE AREA TO WHEAT BOOM DRIVE SUB-TRUNK SEWER

PROPOSED DRAINAGE AREA TO NINTH LINE SUB-TRUNK SEWER

PROPOSED ASP DIVERSION TO TRAFALGAR ROAD SUB-TRUNK SEWER

WASTEWATER DRAINAGE AREA (HECTARES) PER APPROVED STUDIES

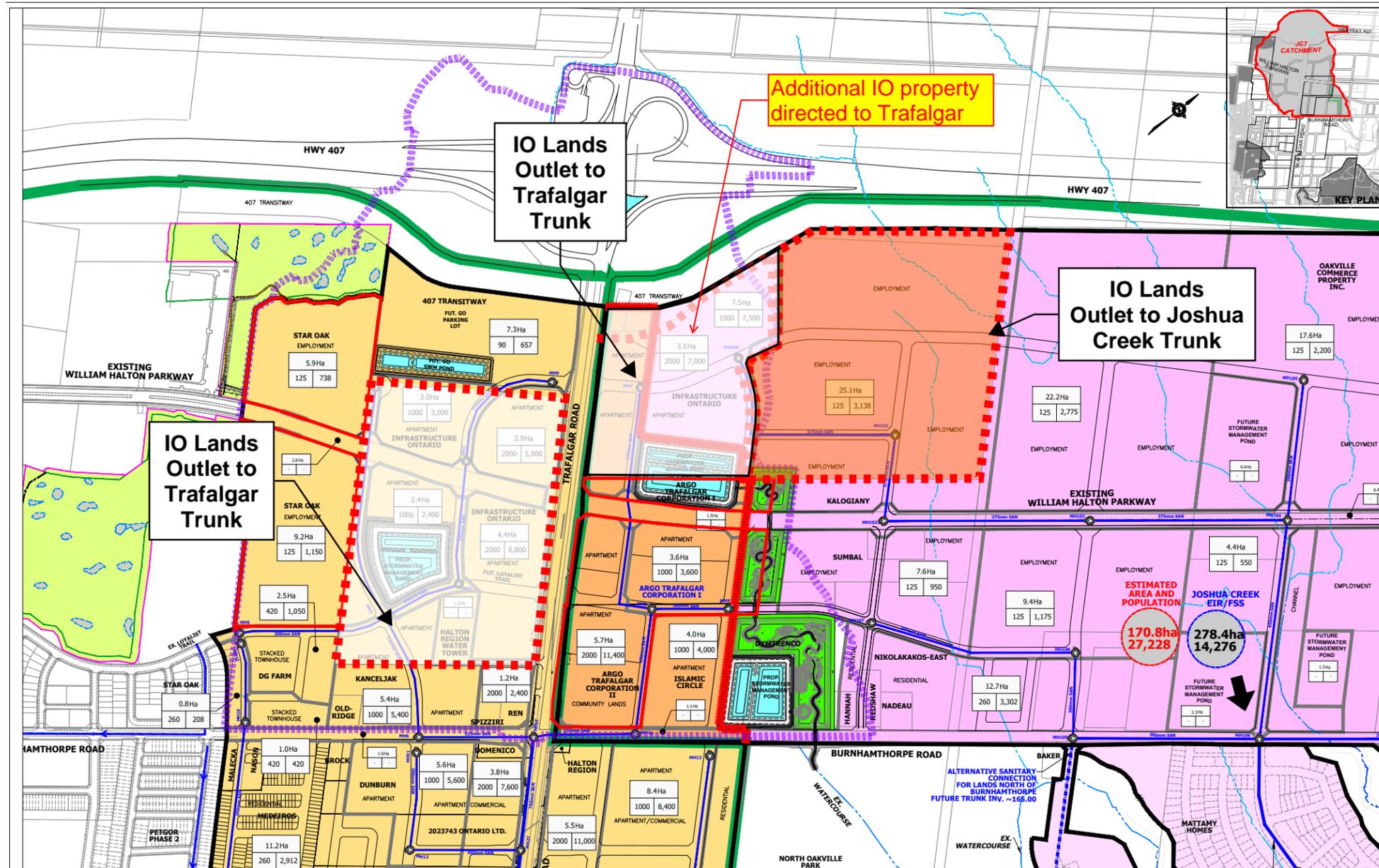
POPULATION (PERSONS)

PROPOSED WASTEWATER DRAINAGE AREA (HECTARES)

POPULATION (PERSONS)

JOSHUA CREEK SUBCATCHMENT JC7 EIR/FSS

**DRAWING 9.1**  
**WASTEWATER DRAINAGE & SERVICING PLAN**  
PROJECT No. 23-744 DATE: DEC. 2025 SCALE: 1:3000



- Total population to Trafalgar Road sanitary sewer from IO lands per Urbantech Wastewater Dwg. 9.1 from the C7 Subcatchment EIS report (see previous page):

West Side = 20,000

East Side = 6,200

Total = 26,200

- Estimated population based on GSP Concept draining to Trafalgar Road sanitary sewer from IO lands (with additional lands on east side included):

West Side = 12,720

East Side = 7,730 (Blocks 1, 2 and 3)

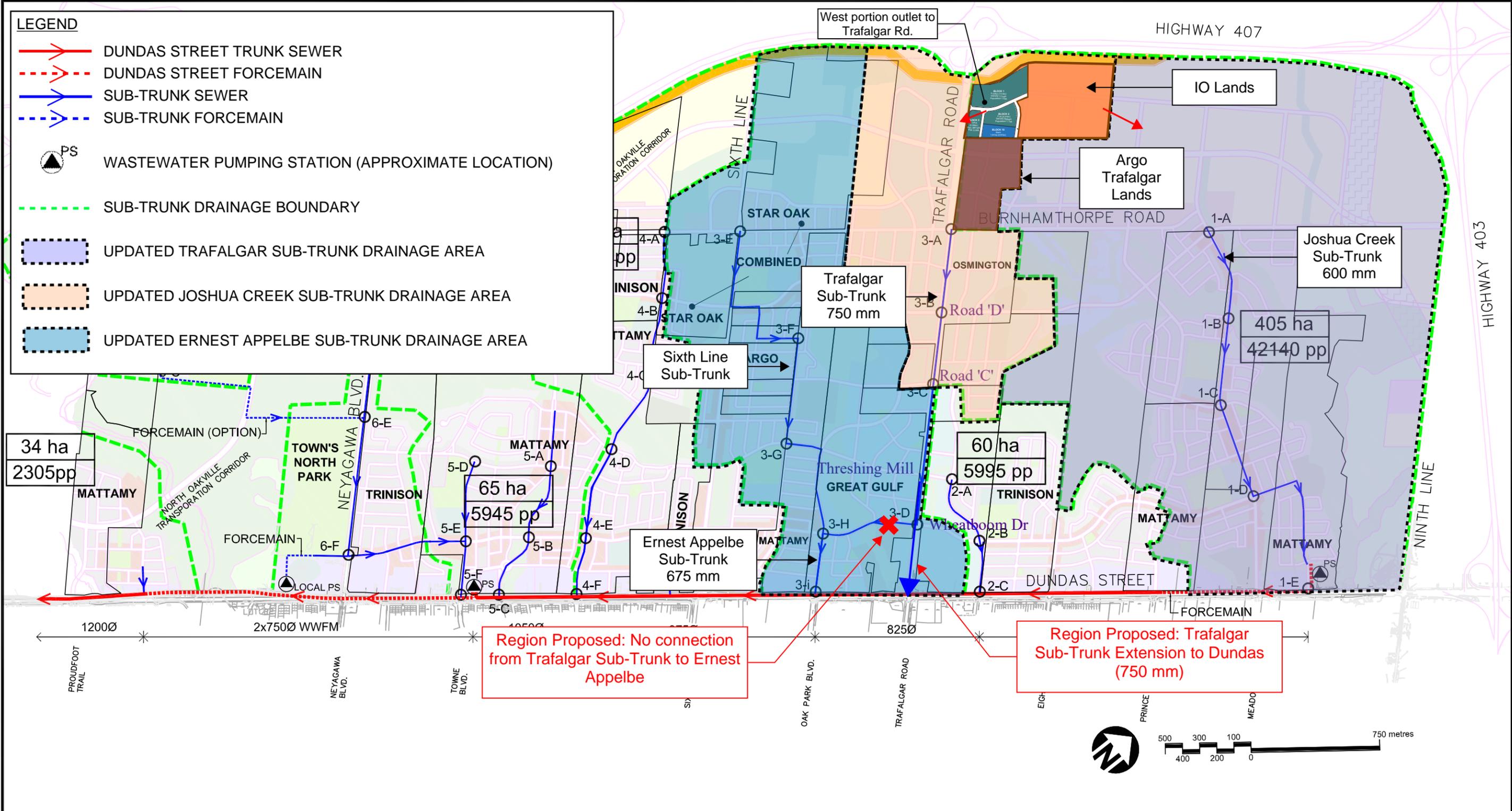
Total = 20,450

Total population to to Trafalgar Road trunk sewer will be less than accounted for in the C7 Subcatchment EIS report.



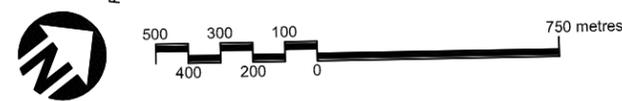
<b>PRELIMINARY SANITARY SEWER DESIGN SHEET</b>  <b>Trafalgar Road Sub-Trunk</b>  Region of Halton	<b>PROJECT DETAILS</b>  Project No: # Date: Dec 2025 Designed by: sr Checked by: dz	<b>DESIGN CRITERIA</b>  Min Diameter = 200 mm Mannings 'n' = 0.013 Avg. Domestic Flow = 215.0 l/c/d Infiltration = 0.286 l/s/ha Min. Velocity = 0.6 m/s Max. Velocity = 3.0 m/s Max. Peaking Factor = 4.50 Min. Peaking Factor = 2.00 Factor of Safety = 30 %
<b>NOMINAL PIPE SIZE USED</b>		

STREET	FROM MH	TO MH	RESIDENTIAL							COMMERCIAL/INDUSTRIAL/INSTITUTIONAL							FLOW CALCULATIONS					PIPE DATA								
			AREA (ha)	ACC. AREA (ha)	UNITS (#)	DENISTY (P/ha)	DENSITY (P/unit)	POP	ACCUM. RES. POP.	AREA (ha)	ACC. AREA (ha)	EQUIV. POP. (p/ha)	FLOW RATE (l/s/ha)	EQUIV. POP.	ACCUM. EQUIV. POP.	INFILTRATION (l/s)	TOTAL ACCUM. POP.	PEAKING FACTOR	RES. FLOW (l/s)	COMM. FLOW (l/s)	ACCUM. COMM. FLOW (l/s)	TOTAL FLOW (l/s)	SLOPE (%)	PIPE DIAMETER (mm)	FULL FLOW CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	ACTUAL VELOCITY (m/s)	PERCENT FULL (%)		
<b>Joshua Creek Sub-Trunk</b>																														
	100	101	7.50	7.50		1000		7500	7500								2.1	7500	3.08	57.4			59.6	0.50	375	124.0	1.1	1.1	48%	
	101	102	25.10	32.60		125		3138	10638								9.3	10638	2.93	77.5			86.8	0.50	375	124.0	1.1	1.2	70%	
	102	103	22.20	54.80		125		2775	13413								15.7	13413	2.83	94.4			110.0	0.50	450	201.6	1.3	1.3	55%	
	103	104	4.40	59.20					13413								16.9	13413	2.83	94.4			111.3	0.50	450	201.6	1.3	1.3	55%	
	105	104	17.60	17.60		125		2200	2200								5.0	2200	3.55	19.5			24.5		200					
		104	6.40	6.40													1.8						1.8							
	104	106	4.40	87.60		125		550	16163								25.1	16163	2.75	110.4			135.5	0.50	450	201.6	1.3	1.3	67%	
	107	108	7.60	7.60		125		950	950								2.2	950	3.81	9.0			11.2	0.50	200	23.2	0.7	0.7	48%	
	108	109	9.40	17.00		125		1175	2125								4.9	2125	3.57	18.9			23.7	0.50	250	42.0	0.9	0.9	56%	
	109	106	12.70	29.70		260		3302	5427								8.5	5427	3.21	43.4			51.9	0.50	300	68.4	1.0	1.1	76%	
		106	3.30	3.30													0.9						0.9							
	110	111	17.40	17.40		125		2175	2175								5.0	2175	3.56	19.3			24.2	0.50	250	42.0	0.9	0.9	58%	
		111	1.80	1.80													0.5						0.5							
	111	112	20.50	39.70		125		2563	4738								11.4	4738	3.27	38.5			49.9	0.50	300	68.4	1.0	1.0	73%	
	113	112	9.00	9.00		100		900	900								2.6	900	3.83	8.6			11.1	0.50	200	23.2	0.7	0.7	48%	
	112	106	1.50	50.20					5638								14.4	5638	3.20	44.8			59.2	0.50	375	124.0	1.1	1.1	48%	
	106	JC		170.80					27228								48.8	27228	2.52	170.7			219.5	0.30	600	336.3	1.2	1.3	65%	
	JC	ds	151.50	322.30				16458	43686								92.2	43686	2.32	252.2			344.3	0.45	600	411.9	1.5	1.6	84%	
<b>Ninth Line Sub-Trunk</b>																														
	201	202	19.40	19.40		125		2425	2425								5.5	2425	3.52	21.2			26.8	0.50	300	68.4	1.0	0.9	39%	
	202	203	13.10	32.50					2425								9.3	2425	3.52	21.2			30.5	0.50	300	68.4	1.0	0.9	45%	
	203	204	31.90	64.40		125		3988	6413								18.4	6413	3.14	50.2			68.6	0.50	375	124.0	1.1	1.1	55%	
	204	205	10.80	75.20		125		1350	7763								21.5	7763	3.06	59.2			80.7	0.50	375	124.0	1.1	1.2	65%	
	205	206	7.90	83.10		70		553	8316								23.8	8316	3.03	62.8			86.5	0.50	375	124.0	1.1	1.2	70%	
	206	207	12.70	95.80		40		508	8824								27.4	8824	3.01	66.1			93.5	0.50	375	124.0	1.1	1.2	75%	
	207	208		95.80					8824								27.4	8824	3.01	66.1			93.5	0.50	375	124.0	1.1	1.2	75%	
	208	ps		95.80					8824								27.4	8824	3.01	66.1			93.5	0.50	375	124.0	1.1	1.2	75%	
<b>Wheat Boom Drive St</b>																														
		27	5.00	5.00		70		350	350								1.4	350	4.05	3.5			5.0							
	27	28	18.20	23.20		260		4732	5082								6.6	5082	3.24	41.0			47.6	0.50	300	68.4	1.0	1.0	70%	
		29	1.50	1.50													0.4						0.4							
	29	30	4.80	6.30		2000		9600	9600								1.8	9600	2.97	71.0			72.8	0.50	375	124.0	1.1	1.1	59%	
	30	28	2.80	9.10		2000		5600	15200								2.6	15200	2.77	104.9			107.5	0.50	450	201.6	1.3	1.3	53%	
	28	31	5.20	37.50		1000		5200	25482								10.7	25482	2.55	161.5			172.3	0.50	525	304.1	1.4	1.4	57%	
	31	ex		37.50					25482								10.7	25482	2.55	161.5			172.3	0.50	600	434.2	1.5	1.4	40%	



Region Proposed: No connection from Trafalgar Sub-Trunk to Ernest Appelbe

Region Proposed: Trafalgar Sub-Trunk Extension to Dundas (750 mm)



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PROJECT		NORTH OAKVILLE COMMUNITY BUILDERS INC.	
TITLE		ULTIMATE WASTEWATER DRAINAGE PLAN	
Checked	M.A.E.	Drawn	T.Y.
Date	AUGUST 2010	Proj. No.	10-02076
Scale	NTS	Exhibit No.	



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## **APPENDIX C**

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### **Water Servicing Information**

## Estimate of Domestic Water Demand for IO Trafalgar Lands, West

Total Area 18.96 ha  
 Per capita Flow 275 l/c/d

### Population Densities

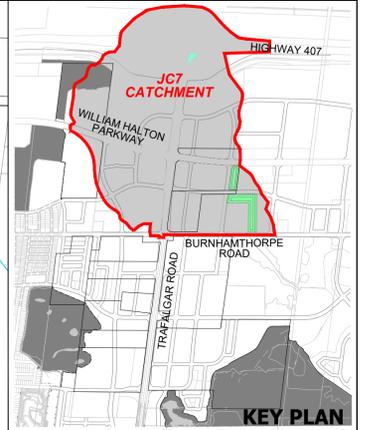
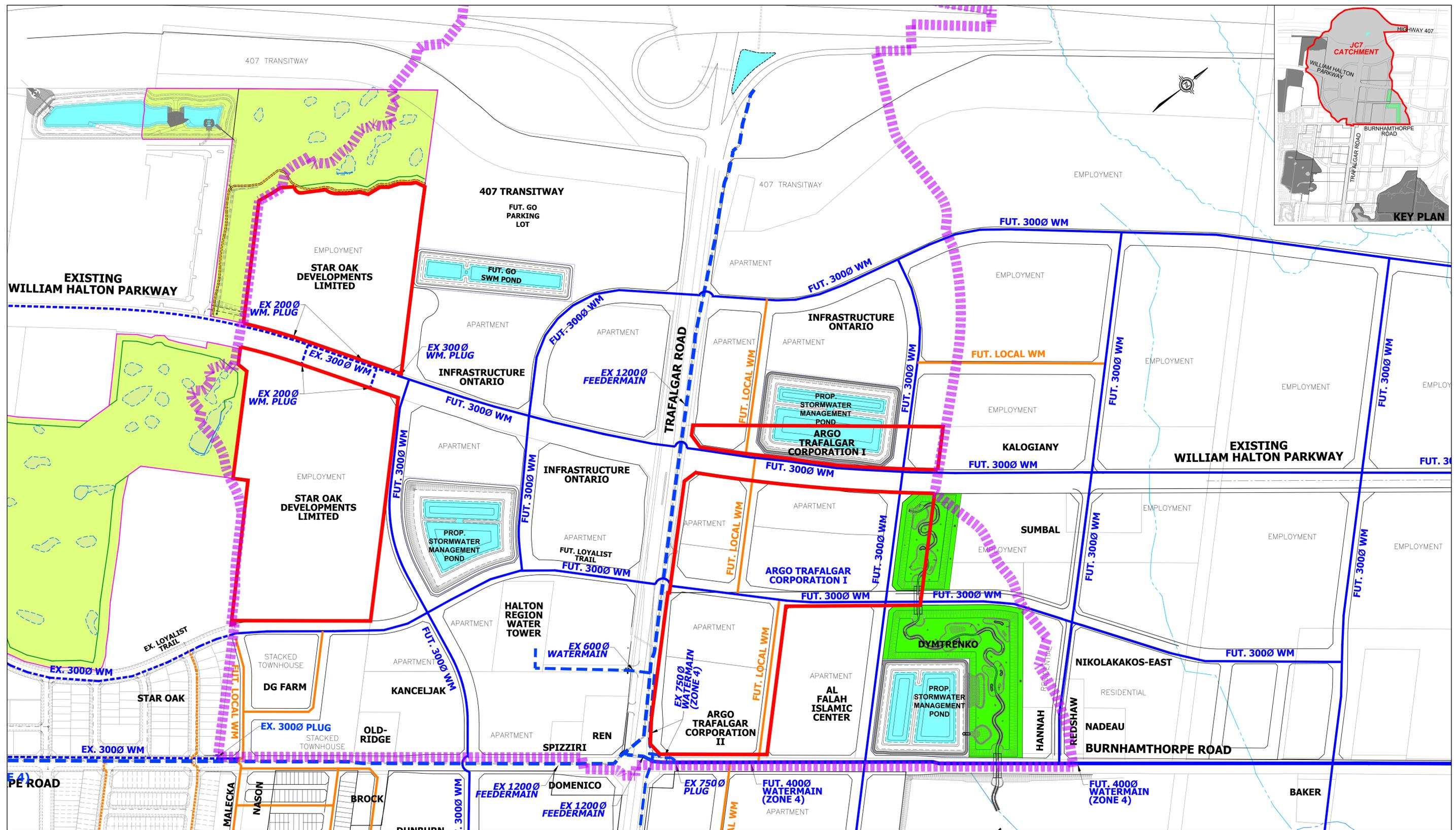
Residential (apartment) 1.703 people/unit (assume all residential is apartment/condo style)  
 Employment 400 ft<sup>2</sup>/employee  
 Institutional (block 10) 450 ft<sup>2</sup>/employee

### Peaking Factors

Max. Day = 2.25  
 Peak Hr. (Res.) 4.00  
 Peak Hr. (Comm.) 2.25

Development Scenario	Units			Population				Avg. Day Flow (l/s)	Max. Day Flow (l/s)	Peak Hr. Flow (l/s)
	Residential	Institutional	Employment	Residential	Institutional	Employment	Total			
	5634	0.37	8.53	9595	88	2294	9683	<b>30.8</b>	<b>69.3</b>	<b>122.8</b>

Note: Design criteria per *Regional Municipality of Halton Version 5 Water and Wastewater Linear Design Manual, October 2019*



Urbantech Consulting  
 Stonybrook Consulting Inc.  
 Beacon Environmental.  
 GEO Morphix Ltd.  
 R.J. Burnside & Associates Limited

**LEGEND:**

	SUBJECT LANDS		EXISTING TRUNK WATERMAIN
	JC7 FSS STUDY AREA		EXISTING 300Ø WATERMAIN
	CORE AREA		EXISTING LOCAL WATERMAIN
	PROPOSED NHS		PROPOSED 300Ø WATERMAIN
	PROPOSED SWM POND		PROPOSED LOCAL WATERMAIN

**NOTES:**

- ALL PROPOSED WATERMAIN SIZES AND ZONE BOUNDARIES SHALL BE CONFIRMED THROUGH DETAILED HYDRAULIC ANALYSIS / MODELING AND IN COORDINATION WITH THE REGION OF HALTON TO DETERMINE PROJECTED AVAILABLE FLOWS AND OPERATING PRESSURES.
- FIRE PROTECTION FOR LARGE APARTMENT BLOCKS FRONTING ARTERIAL ROADS WITH NO LOCAL WATERMAIN TO BE PROVIDED FROM ADJACENT LOCAL ROADS OR WITH APPROPRIATE INTERNAL F.D. CONNECTIONS. ALTERNATIVELY, SPACE TO BE ALLOTTED IN ROADS FOR LOCAL WATERMAINS AND HYDRANTS.

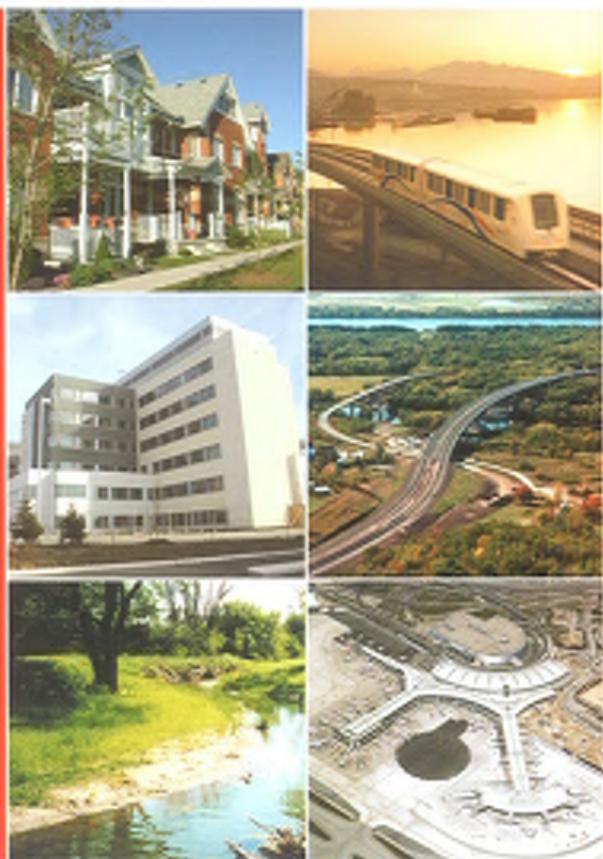
JOSHUA CREEK  
 SUBCATCHMENT JC7 EIR/FSS

**DRAWING 9.2**

**WATER SERVICING PLAN**

PROJECT No. 23-744    DATE: DEC. 2025    SCALE: 1:2500

MMM Group Limited



North Oakville East Secondary  
Plan - Area Servicing Plan  
Oakville, Ontario

Prepared For North Oakville Community  
Builders Inc.

COMMUNITIES  
TRANSPORTATION  
BUILDINGS  
INFRASTRUCTURE



April 2011

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## **1.0 Introduction**

This Area Servicing Plan (ASP) has been prepared for the North Oakville Community Builders Inc. (NOCBI). NOCBI is a group of landowners who own the majority of the lands in North Oakville East, which is the area bounded by Dundas Street on the south, the valley of the Sixteen Mile Creek on the west, Highway 407 ETR on the north and Ninth Line on the east in Oakville. This is an area identified for future urban development by the Regional Municipality of Halton in Regional Official Plan Amendment 8 (ROPA 8) and by the Town of Oakville in Official Plan Amendment 198 (OPA 198). The Secondary Plan for the area was approved by the OMB on January 11, 2008. The approved Secondary Plan requires the completion of the Master Servicing Plan to confirm infrastructure requirements.

This report has been prepared as a component of the North Oakville East Secondary Plan (NOESP). This report is primarily the work of MMM Group Limited (MMM) in co-ordination with other members of the consulting team and, in certain instances as referenced in the report, utilizes research and input from other consultants retained by NOCBI and/or from other available sources. This report is intended to satisfy the Secondary Plan requirement for a Master Servicing Plan. Subsequent to the approval of the North Oakville Secondary Plan the Region has asked that the name Master Servicing Plan be replaced with Area Servicing Plan to avoid confusion with the Regional Water and Wastewater Master Plan. The Report has therefore been prepared to address the requirements of the Secondary Plan (Master Servicing Plan) and the Area Servicing Plan (ASP).

This report addresses the servicing issues by providing conceptual frameworks for the extension and development of water and wastewater systems. To facilitate orderly development of its infrastructure, the Region of Halton recently prepared an update to its Halton Water and Wastewater Master Plan. The Region's report entitled "Water and Wastewater Master Plan Review" – October 2002, has served as a starting point for the review of the Secondary Plan servicing requirements. In 2007 the Region undertook an update to the Master Plan from which elements have been presented and incorporated.

The purpose of this ASP is to apply the Region's proposed servicing concept to the specific Secondary Plan land use proposal and to suggest refinements that are required to each to facilitate orderly development. As noted above, this report satisfies the requirements in OPA 198 and the approved Secondary Plan. It satisfies the requirements of terms of reference prepared by the Region of Halton.

The specific purposes of this report are to provide:

- Detailed information on proposed land uses.
- Detailed information on system demands (water) and flows (wastewater).
- A specific plan for implementing the Region's Master Plan in and around the North Oakville East Secondary Plan (NOESP).
- A discussion of the impact that the proposed development will have on planned Regional Infrastructure in terms of proposed capacity and timing.
- Identify new infrastructure required to service the proposed land use beyond the Water and Wastewater Master Plan.

### 1.1 Proposed Development

During the preparation of the Secondary Plan and servicing strategy for the communities, MMM worked as an integral member of the NOCBI Secondary Plan consulting team, and has worked in consultation with the NOCBI sub-watershed consulting team.

The Secondary Plan contains varying densities of residential land use, commercial and employment lands, community amenity lands as well as a significant amount of Open Space and Natural Area lands. The land use plan that forms part of the Secondary Plan is included as Exhibit 1.1. The total site area of the development lands excluding natural areas is approximately 1616 ha (3993 ac).

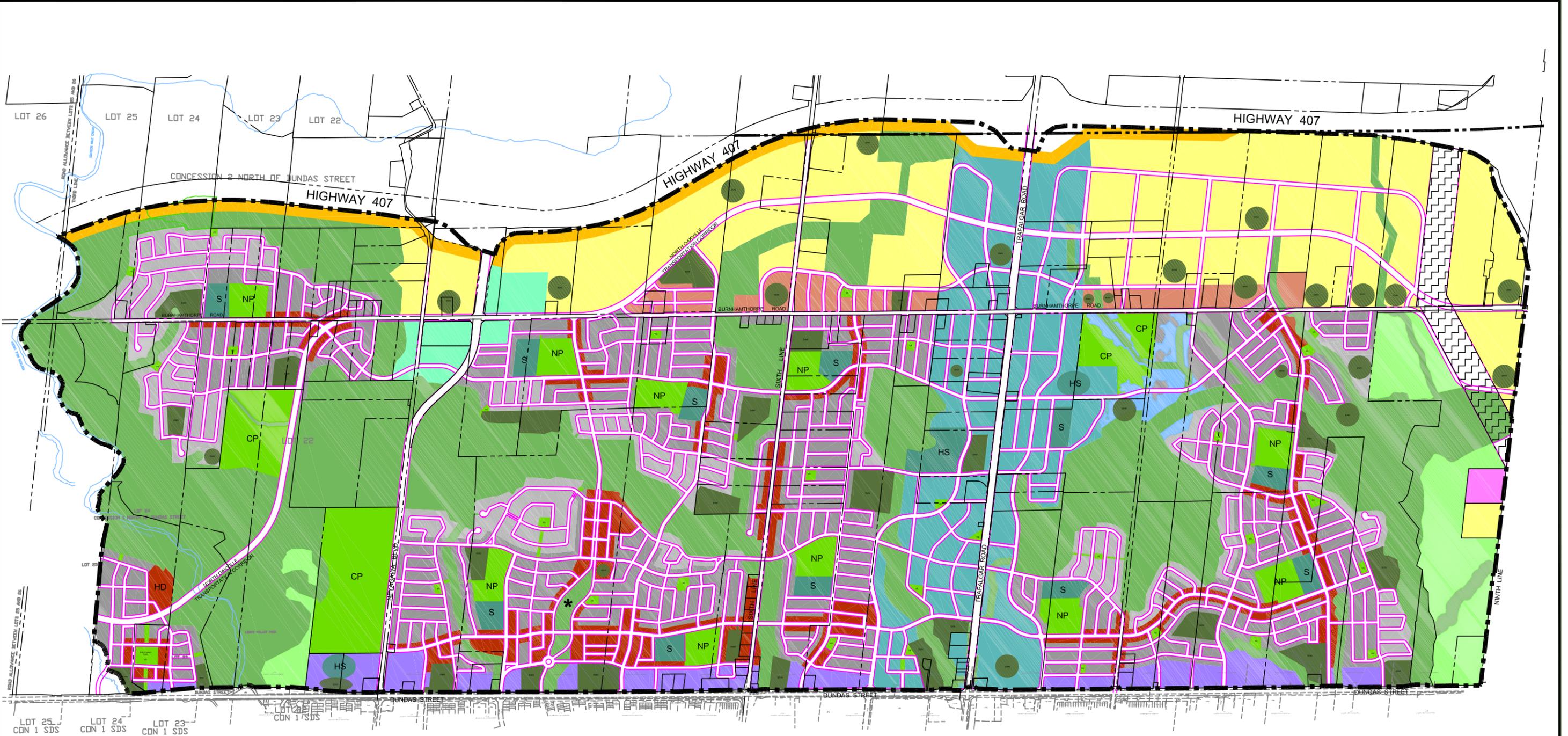
In order to evaluate vertical infrastructure (pumping stations, reservoirs, treatment plants) the anticipated density values were considered. However, given the flexibility with the density values within the approved Secondary Plan the linear infrastructure has been evaluated based on higher density values. This will also allow flexibility within the plan for portions of the plan to be developed at a denser form than other areas. There is no intent to change the population of the community, only to allow flexibility in the design of the linear infrastructure.

### 1.2 NOCBI Timing and Phasing

It is NOCBI's objective that the development of the NOESP will commence in 2010 with occupancies beginning in 2011.

Absorption rates have been estimated by IBI Group. Based upon these growth rates the residential build-out for the entire community will occur in 10 to 12 years. The commercial and employment lands will take longer to develop with the last of the employment lands to be completed in about 20 years.

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SOURCE: BASEPLAN FROM NORTH OAKVILLE MASTER PLAN APPENDIX 7.3 BY THE TOWN OF OAKVILLE ON AUGUST 13, 2007



**LEGEND**

- |  |                                      |  |   |  |   |
|--|--------------------------------------|--|---|--|---|
|  | SECONDARY PLAN AREA BOUNDARY         |  | INSTITUTIONAL AREA                                  |  | UTILITY CORRIDOR                              |
|  | OAKVILLE / MILTON MUNICIPAL BOUNDARY |  | STORMWATER MANAGEMENT FACILITY (final location tbd) |  | NEIGHBOURHOOD ACTIVITY NODE                   |
|  | TRANSITWAY                           |  | COMMUNITY PARK AREA                                 |  | CEMETERY AREA                                 |
|  | DUNDAS STREET URBAN CORE AREA        |  | NEIGHBOURHOOD PARK AREA                             |  | NEIGHBOURHOOD CENTRE AREA                     |
|  | NEYAGAWA BLVD. URBAN CORE AREA       |  | VILLAGE SQUARE/URBAN SQUARE                         |  | GENERAL URBAN AREA                            |
|  | TRAFALGAR ROAD URBAN CORE AREA       |  | ELEMENTARY SCHOOL SITE                              |  | SUB URBAN AREA                                |
|  | TRANSITIONAL AREA                    |  | SECONDARY SCHOOL SITE                               |  | HIGH DENSITY RESIDENTIAL AREA                 |
|  | EMPLOYMENT AREA                      |  | JOSHUA CREEK FLOODPLAIN AREA                        |  | POLICY REFERENCE - SEE POLICY SECTION 7.4.7.2 |
|  | NATURAL HERITAGE SYSTEM AREA         |  |   |  |   |

PROJECT	NORTH OAKVILLE COMMUNITY BUILDERS INC.	
TITLE	SECONDARY PLAN - LAND USE	

Checked	A.W.
Date	MARCH 2008
Scale	NTS
Drawn	Proj. No. 10-02076
	Exhibit No. 1.1

The initial allocation (Phase 1A) as approved by the Region’s 2008/09 program includes approximately 700 Single Detached Equivalents (SDE’s) for lands generally located in the southwest quadrant of the NOESP development lands owned by participating members of NOCBI. Development lands for Phase 1A and lands beyond Phase 1A are illustrated in Exhibit 1.1A.

### 1.3 Comparison of Proposed Development and Timing

In this section of the Report, NOCBI’s proposed development and timing is compared to that expected by the Region when it prepared its “Master Plan Review”. Exhibit 1.2 compares the timing of the residential populations generated by NOESP’s proposed development to the Region’s OPA population estimates at build-out.

For comparison purposes the commercial, industrial and institutional land areas projected for NOCBI’s plan have also been used as the Region’s projections.

<b>EXHIBIT 1.2 – NOCBI VS REGION RESIDENTIAL POPULATION PROJECTIONS</b>			
<b>NOCBI</b>		<b>Region – ROPA 8</b>	
<b>Approved Secondary Plan</b>	<b>Linear Infrastructure</b>		
2021 (Build-Out)	2021 (Build-Out)	2021	Build-Out
50,000	60,000*	40,868	55,000

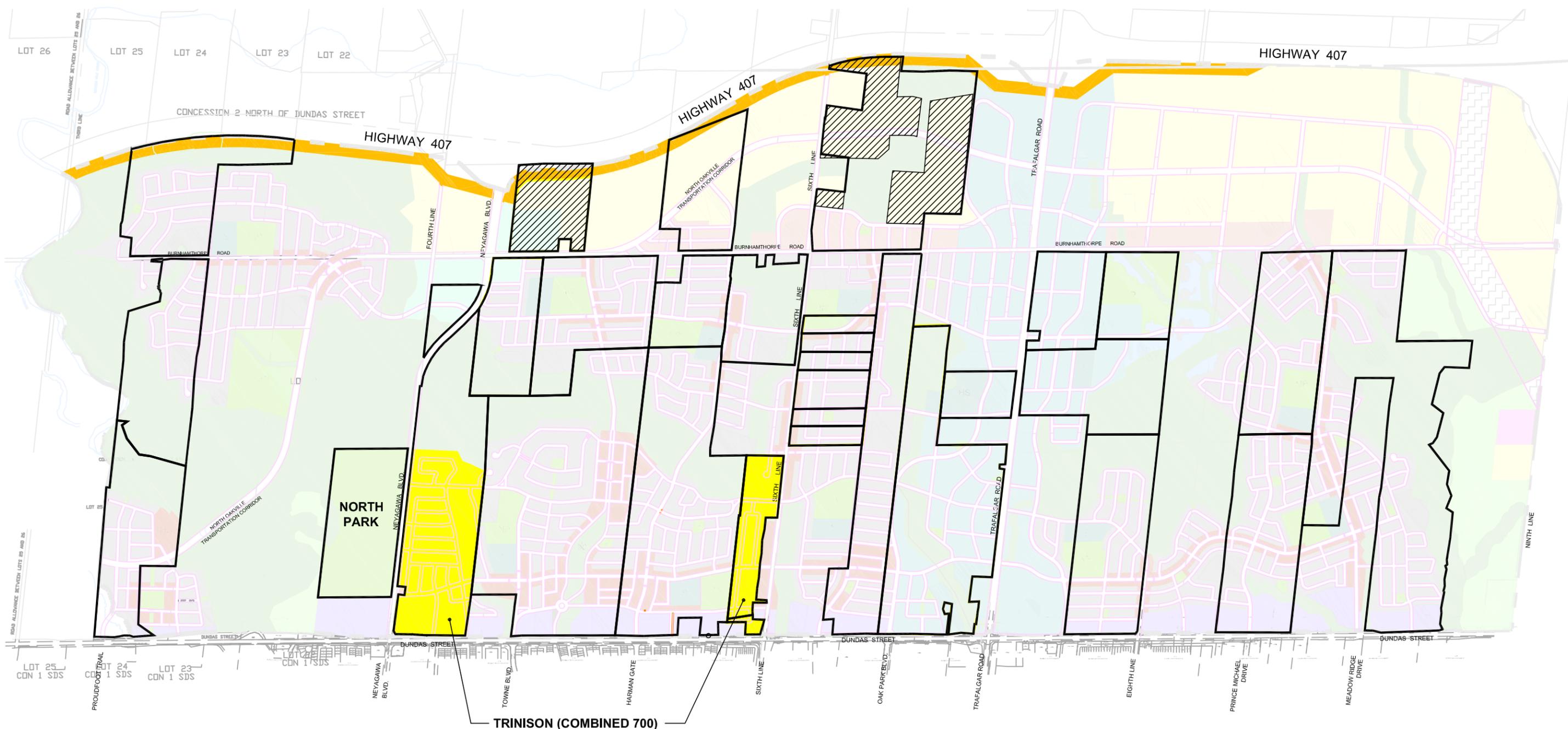
\* - For Design Purposes Only

A population of 55,000 was included in ROPA 8, while 50,000 is the approved secondary plan population that was agreed upon with the Town of Oakville. In order to be conservative in the sizing of linear infrastructure a population of 60,000 was utilized. This assists in accounting for possible scenarios for the distribution of the population in the North Oakville East Secondary Plan area.

From the information presented it can be concluded that the nature of the proposed development is similar to that anticipated by the Region. It can also be concluded that the Region’s overall servicing concepts are still appropriate. The minor variation in population from values projected by the Region will not ultimately impact the sizing of the water and wastewater plants, reservoirs and pumping stations. It also will not impact the conclusions of the Region’s Master Plan.

It is anticipated that the population will not surpass the Region’s estimate until 2020 and can be monitored and adjustments made to the plant size during future Master Plan updates.

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**LEGEND**

- PHASE 1A
- PARTICIPATING NOCBI MEMBERS BEYOND PHASE 1A
- POTENTIAL DEVELOPMENT BEYOND PHASE 1A DOES NOT REQUIRE ALLOCATION



<p>PROJECT</p> <p><b>NORTH OAKVILLE COMMUNITY BUILDERS INC.</b></p>	<p>100 Commerce Valley Dr. West, Thornhill, ON Canada L3T 0A1 t: 905.882.1100 f: 905.882.0055 www.mmm.ca</p>												
<p>TITLE</p> <p style="text-align: center;"><b>LAND USE - PHASE 1</b></p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">Checked</td> <td style="width: 25%;">M.E.O</td> <td style="width: 25%;">Drawn</td> <td style="width: 25%;">A.W</td> </tr> <tr> <td>Date</td> <td>MARCH 2010</td> <td>Proj. No.</td> <td>10-02076</td> </tr> <tr> <td>Scale</td> <td>NTS</td> <td>Exhibit No.</td> <td><b>1.1A</b></td> </tr> </table>	Checked	M.E.O	Drawn	A.W	Date	MARCH 2010	Proj. No.	10-02076	Scale	NTS	Exhibit No.	<b>1.1A</b>
Checked	M.E.O	Drawn	A.W										
Date	MARCH 2010	Proj. No.	10-02076										
Scale	NTS	Exhibit No.	<b>1.1A</b>										

It should also be noted that the Town has planned for a population of 50,000 people in OPA 272 for the approved Secondary Plan.

#### 1.4 Consultation with the Region of Halton

At the outset of this study, the Region of Halton was consulted with respect to its proposed infrastructure plans as generally set out in its report “Water and Wastewater Master Plan Review” and its forthcoming update. Input was also provided to the Region with respect to the timing of infrastructure and the critical need to expedite certain projects.

#### 1.5 Interim Servicing

This Report has been prepared to provide the Region of Halton with a plan for the overall servicing of the Community in a comprehensive fashion. In early discussions with the Region it was agreed that this overall report would be completed first. The Region’s Master Plan and investigations by the Study Team identify that there may be opportunities to service early stages of the Community through interim measures, particularly the utilization of capacities in existing systems to the south.

The Region has indicated in their Infrastructure Stage Plan and Allocation Program (September 19, 2008) that there is existing water and wastewater capacity to accommodate approximately 1500 SDE’s from the NOESP.

A Technical Memorandum (provided in Appendix A) was prepared by AECOM dated September 24, 2009 and was approved by the Region to outline interim servicing opportunities by utilizing available capacity of the existing water and wastewater systems south of Dundas Street. The Region has established that approximately 900 SDE’s are currently available which would accommodate Phase 1A.

If necessary, to accommodate seamless development, additional interim capacity should be investigated.

#### 1.6 Report Organization

This Report has been organized as follows:

##### 1. Introduction

This chapter defines the purpose of the report and describes the subject lands and the development proposed thereon. It also reviews the population projections and timing and compares it to the Region’s projections.

2. Water

This chapter reviews the proposed water infrastructure required to service the subject lands. The review applies the Halton Master Plan Concept to the Secondary Plan and recommends refinements to the servicing plan.

3. Wastewater

This chapter reviews the proposed wastewater infrastructure required for the subject lands. The review applies the Halton Master Plan Concept to the Secondary Plan and recommends refinements to the servicing plan.

## **2.0 Water**

### **2.1 Region's Water & Wastewater Master Plan Update – June 2008**

The Region's Water and Wastewater Master Plan in 2002 set out a strategy for the long term and orderly development of the Region's infrastructure. The Region's 'South Halton Water and Wastewater Master Plan Update' dated June 2008 updated the strategy for the water supply and distribution system. In the case of water, this report addressed supply, pressure districts, storage and distribution. This report also addresses timing. It provides conceptual information on the location of proposed infrastructure; however, this is of course subject to more detailed review when considering the servicing corridors available through the road network that is proposed as part of the Secondary Plan.

This ASP report has been prepared to develop on and complement the Region's plans by providing more specific information on how it can be implemented in the context of the specific plans for the NOESP. Therefore, to provide appropriate context, the Region's Plan as it relates to the NOESP is summarized in this section.

#### *2.1.1 Supply*

Historically water supply for South Halton has come from three main sources, the Burlington Water Purification Plant, The Oakville Water Purification Plant, and wells within Milton (to service specific areas of Milton).

The 2002 Master Plan concluded that the long-term growth of Halton would require the construction in stages of a new water treatment plant that will have an ultimate capacity of 220 ML/d. The first stage of this new plant (Burloak) has been recently completed.

This new supply is critical to meet the Region's medium and long-term growth projections for both the NOESP and the Region as a whole. For the purpose of the remainder of this report it is assumed that the first stage of this plant is on-line.

### *2.1.2 Pressure Districts*

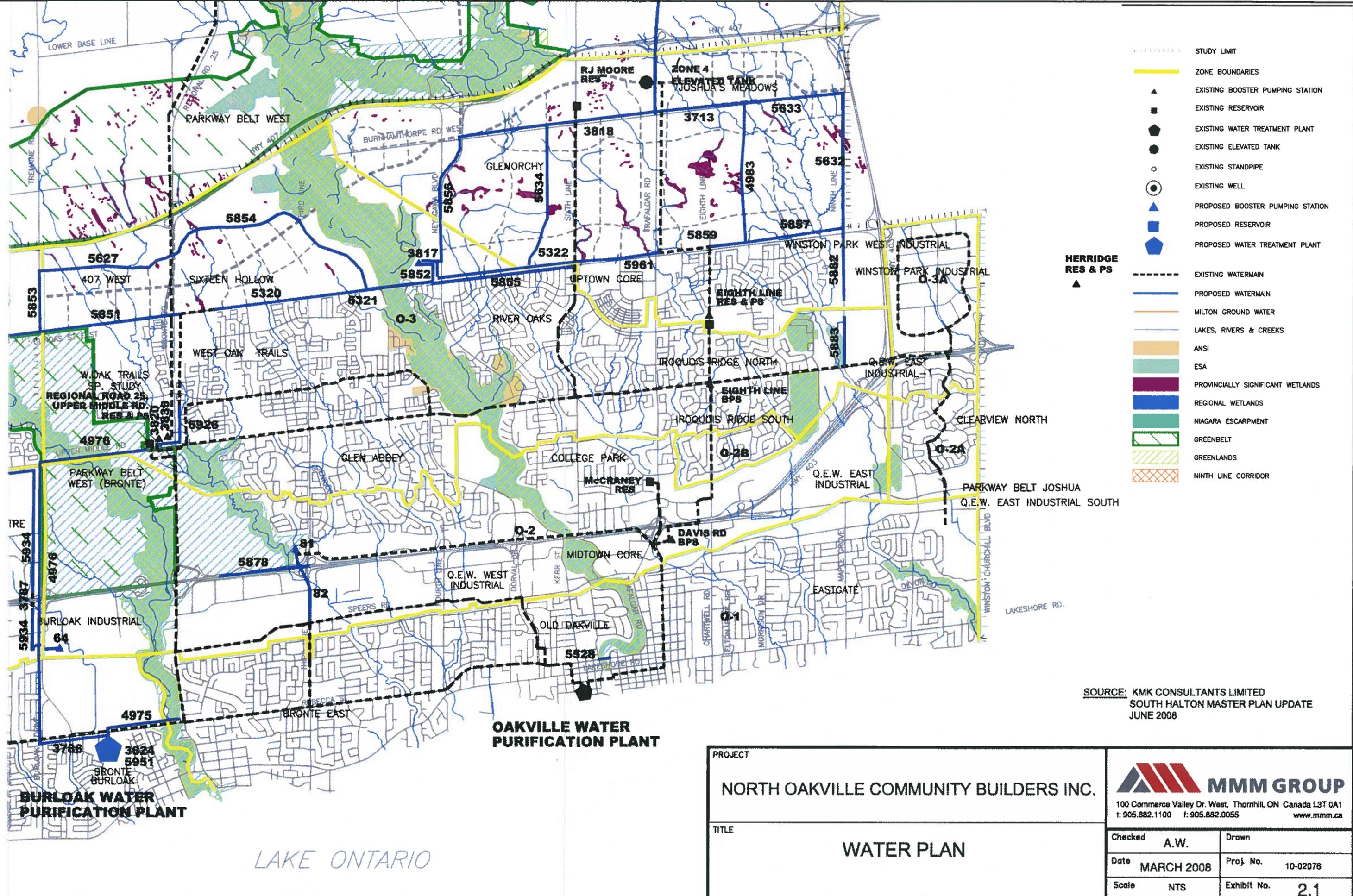
The subject lands are located within two Oakville pressure districts identified as Zone 3 and Zone 4. Zone 3 in Oakville includes all lands with an elevation of 128 to 166m. Zone 4 includes lands between the elevations of 166 to 210m. The majority of the subject lands are within Zone 4, the zone boundary generally parallels Sixteen Mile Creek as shown on Exhibit 2.1.

Supply for Zone 3 is currently via a booster pumping station at Eighth Line and Upper Middle Road and the Kitchen Reservoir and Pump Station at Regional Road 25 and Upper Middle Road. Storage is provided at the Moore Reservoir on Sixth Line north of Burnhamthorpe Road (north of Dundas Street). The Zone 4 supply is via the Eighth Line pumping station and equalization storage is provided at the Trafalgar Road elevated tank (north of Burnhamthorpe Road).

The existing water supply to and within the North Oakville East Secondary Plan area and the storage available is uncharacteristically strong given that it is a geographic expansion to the service area.

In the future, the supply to Zone 3 will be augmented via a 1200mm watermain connection on Dundas Street from 400m east of Bronte Road to Neyagawa Boulevard. This supply will be connected to the existing Zone 3 water supply (Moore Reservoir on Sixth Line) via the existing 600mm watermain on Dundas Street connecting to the existing Sixth Line main which links the Eight Line WBPS with the Moore reservoir. The Zone 4 supply will be augmented with a new Zone 3 to Zone 4 Pumping Station (North Park) on Neyagawa Boulevard. A new Zone 4 1200mm watermain on Neyagawa Boulevard from the pumping station to Burnhamthorpe Road and on Burnhamthorpe Road from Neyagawa Boulevard to Trafalgar Road will connect the new Zone 4 system with the existing Zone 4 system and the elevated tank on Trafalgar Road. This new pumping station and 1200mm watermain will also provide a portion of the second water supply link to Milton.

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- STUDY LIMIT
- ZONE BOUNDARIES
- ▲ EXISTING BOOSTER PUMPING STATION
- EXISTING RESERVOIR
- ⬢ EXISTING WATER TREATMENT PLANT
- EXISTING ELEVATED TANK
- EXISTING STANDPIPE
- ⊙ EXISTING WELL
- ▲ PROPOSED BOOSTER PUMPING STATION
- PROPOSED RESERVOIR
- ⬢ PROPOSED WATER TREATMENT PLANT
- EXISTING WATERMAIN
- PROPOSED WATERMAIN
- MILTON GROUND WATER
- LAKES, RIVERS & CREEKS
- ANSI
- ESA
- PROVINCIAL SIGNIFICANT WETLANDS
- REGIONAL WETLANDS
- NIAGARA ESCARPMENT
- GREENBELT
- GREENLANDS
- NINTH LINE CORRIDOR

SOURCE: KMK CONSULTANTS LIMITED  
SOUTH HALTON MASTER PLAN UPDATE  
JUNE 2008

PROJECT  
**NORTH OAKVILLE COMMUNITY BUILDERS INC.**

**MMM GROUP**  
100 Commerce Valley Dr. West, Thornhill, ON Canada L3T 0A1  
t: 905.882.1100 f: 905.882.0055 www.mmm.ca

TITLE  
**WATER PLAN**

Checked	A.W.	Drawn	
Date	MARCH 2008	Proj. No.	10-02076
Scale	NTS	Exhibit No.	2.1

LAKE ONTARIO

*2.1.3 Storage*

Storage for Oakville Zone 3 is currently provided at the R.J. Moore Reservoir on Sixth Line. Until 2002, there was no storage provided in Zone 4, rather it was provided in Zone 3 and pumped to Zone 4 on an as required basis. In 2002, an elevated storage tank was constructed in Zone 4 on Trafalgar Road north of Burnhamthorpe Road.

To address increased demands in Oakville and Milton, the Region will also be constructing a new 30ML Zone 4 reservoir in Milton to service the NOESP and existing Zone 4 lands.

The existing and planned storage requirement to accommodate the full build-out of the Halton Urban Structure Plan, which includes the NOESP, is illustrated on Exhibit 2.2.

<b>EXHIBIT 2.2 EXISTING AND PROPOSED RESERVOIR STORAGE VOLUME</b>			
<b>(ML)</b>			
<b>Zone 3</b>		<b>Zone 4</b>	
<b>Existing</b>	<b>Proposed (Total)</b>	<b>Existing</b>	<b>Proposed (Total)</b>
32.0	32.0	5.7	35.7

*2.1.4 Distribution*

Development in Oakville is currently serviced via a series of trunk watermains that connect sources of supply, pumping, and storage to a local distribution network.

To support growth, the Region proposes a series of new mains that interconnect with and expand the existing system and connect to the new proposed sources of supply, pumping and storage described above. The Zone 4 distribution system will be supplied from the proposed Zone 4 pumping station at Neyagawa Boulevard north of Dundas Street and it will continue to be supplied by the Eighth Line Pumping Station. The existing 750mm watermain from the Eighth Line pumping station to the Zone 4 elevated tank on Trafalgar Road and the new 1200mm Zone 4 watermain on Neyagawa Boulevard and Burnhamthorpe Road will form the backbone for the Zone 4 water distribution system and feed the Zone 4 to 5 WBPS servicing Milton.

*2.1.5 Region's Timing and Development Charge Projects*

Exhibit 2.3 summarizes the Region's proposed projects and costs (from the MPU Report) for the completion of the water system construction required to service the NOESP and other interconnected areas such as North Oakville west of Sixteen

Mile Creek and other areas of Oakville and Milton based from the Halton Region Council Report No. CS-49-09/PW-20-09/LPS80-09 - Financial and Implementation Plan for the 2008/2009 Allocation Program.

<b>EXHIBIT 2.3 – REGION’S WATER PROJECTS</b>			
<b>Project</b>	<b>Revised Project Cost</b>	<b>Region’s Project #’s</b>	
		<b>Per 2008 MPU</b>	<b>Per ISP</b>
<b>Supply</b>			
Burloak WPP Ph 2 Exp. to between 110 and 165ML/d	\$1,200,000	3824	3824
Burloak WPP Ph 2 Exp. to between 110 and 165ML/d	\$21,019,000	3824	5951
Burloak WPP Ph 2 Exp. to between 110 and 165ML/d	\$114,495,000	3824	6372
<b>Sub-Total</b>	<b>\$136,714,000</b>		
<b>Transmission</b>			
1500/600mm on Rebecca Street - Burloak WPP to Bronte Road	\$ 6,870,000	4975	4975
1500mm from Burloak WTP to Burloak PS (Zone 2)	\$ 1,736,000	3786	3786
1500mm from Burloak WTP to Burloak PS (Zone 2)	\$ 10,659,000	3786	6365
Burloak PS (Zone 2)	\$ 1,476,000	64	64
Burloak PS (Zone 2)	\$ 10,327,000	64	6367
1350mm on Burloak and Upper Middle Road - Burloak PS to Kitchen Reservoir	\$ 1,419,000	4976	4976
1350mm on Burloak and Upper Middle Road - Burloak PS to Kitchen Reservoir	\$ 3,413,000	4976	6363
1350mm on Burloak and Upper Middle Road - Burloak PS to Kitchen Reservoir	\$ 29,675,000	4976	6364
Add Pump Capacity Zone 3 Kitchen PS	\$ 2,025,000	3820	3820
Add Pump Capacity Zone 3 Kitchen PS	\$ 6,610,000	3820	6371
1200mm from Zone 3 Kitchen PS on Bronte to Ex. 1200mm	\$ 6,625,000	5926	5926
1200mm on Dundas - 400m East of Bronte to Proudfoot Trail	\$ 10,686,000	5320	5320
1200mm on Dundas - Proudfoot Trail to Neyagawa Boulevard	\$ 11,500,000	5321	5321
1200mm on Neyagawa - Dundas to new Zone 4PS (ID #3817)	\$ 3,500,000	5852	5852
1200mm on Burnhamthorpe from Neyagawa to Trafalgar	\$ 10,899,000	3818	3818
1200mm Zone 4 WM on Neyagawa from Zone 4 Booster PS to Burnhamthorpe	\$ 4,500,000	5856	5856
750mm Zone 3 WM on Dundas – Neyagawa to Sixth Line	\$300,000	5855	5855
750mm Zone 3 WM on Dundas – Neyagawa to Sixth Line	\$ 3,099,000	5855	6370
Additional Zone 3 Pump at Washburn	\$ 1,216,000	6113	6113
600mm WM on Appleby Line from Proposed Street A to Appleby Line Reservoir (BUR) (A-W14)	\$ 960,000	5534	5534
600mm WM on Appleby Line from existing 600mm WM on Appleby Line from Harrison Court to Dundas Street (BUR)	\$ 705,000	5319	5319
900mm WM on Dundas Street from Appleby Line to Tremaine Road (BUR)	\$ 910,000	3812	3812
900mm WM on Dundas Street from Appleby Line to Tremaine Road (BUR)	\$ 9,714,000	3812	6360
1200mm WM on Dundas Street from Tremaine Road to Bronte Road (OAK)	\$ 679,000	5851	5851
1200mm WM on Dundas Street from Tremaine Road to Bronte Road (OAK)	\$ 6,115,000	5851	6366
New 30 ML Zone 4 Reservoir (HHS)	\$15,111,000	5061	5061
1200mm WM on Trafalgar Rd from Britannia Rd to new Zone 4 Reservoir (HHS)	\$ 29,670,000	4985	4985
900mm WM on Derry Road from Trafalgar Road to Fifth Line (MIL)	\$ 6,031,000	5875	5875
750mm WM on Burloak Drive from Burloak Zone 2 PS to Upper Middle Road (OAK)	\$ 698,000	5934	5934
750mm WM on Burloak Drive from Burloak Zone 2 PS to Upper Middle Road (OAK)	\$ 4,887,000	5934	6368

<b>EXHIBIT 2.3 – REGION’S WATER PROJECTS</b>			
750mm WM on Upper Middle Road from Burloak Drive to Appleby Line (OAK)	\$ 3,422,000	5850	5850
New Zone 3 Pumping Station at Appleby Line Reservoir (BUR)	\$ 6,826,000	54	54
<b>Sub-Total</b>	<b>\$212,264,000</b>		
<b>Local</b>			
New 100 ML/d Zone 4 Booster PS	\$9,044,000	3817	3817
600mm on Dundas from Oak Park Blvd to Sixth Line	\$2,203,000	5322	5322
600mm on New Street (through Development Lands) from Zone 4 BPS (Neyagawa) to Sixth Line	\$7,518,000	5322	6374
600mm on Dundas from Oak Park Blvd to Trafalgar	\$1,038,000	5961	5961
600mm on Sixth Line from Dundas to New Street	\$3,421,000	5634	5634
600mm on Sixth Line from Dundas to Burnhamthorpe	\$3,421,000	5634	6362
750mm on Dundas from Trafalgar to new North Oakville road	\$ 500,000	5859	5859
750mm on Dundas from Eighth Line to new North Oakville road	\$1,960,000	5859	6376
750mm on Dundas from new North Oakville road to Ninth Line	\$500,000	5857	5857
750mm on Dundas from new North Oakville road to Ninth Line	\$2,337,000	5857	6375
750mm on Burnhamthorpe from Trafalgar to new North Oakville road	\$ 696,000	3713	3713
750mm on Burnhamthorpe from Trafalgar to new North Oakville road	\$ 2,087,000	3713	6443
750mm on Burnhamthorpe from new North Oakville road to Ninth Line	\$3,050,000	5633	5633
750mm on Ninth Line from Dundas to Burnhamthorpe	\$ 3,902,000	5632	5632
400mm on new North Oakville road from Dundas to Burnhamthorpe	\$ 640,000	4983	4983
400mm on new North Oakville road from Dundas to Burnhamthorpe	\$1,919,000	4983	6444
<b>Sub-Total</b>	<b>\$44,236,000</b>		
<b>TOTAL</b>	<b>\$393,214,000</b>		

Projects and costs shown in Exhibit 2.3 have been taken from the Region of Halton – 2008 Water and Wastewater Master Plan Update dated June 2008. Some of the works described will also provide service to other areas of Halton.

The infrastructure described above will be constructed on an as-required basis for each phase of development. For example, the 400mm watermain on the Joshua’s Creek road from Dundas Street to Burnhamthorpe Road will not be constructed until the proposed development plan proceeds. In many instances works such as the treatment plants, storage, and pumping stations will be constructed incrementally. In the case of linear infrastructure, it will be extended incrementally to provide local service connectivity and looping.

## 2.2 Expected Water Demand

In this section, water demands under various conditions have been assessed and compared to the demands estimated by the Region in the DC Update Technical Report. The design criteria that the Region has utilized in the DC Update report are used in this analysis. The difference in demand is simply a function of a different development scenario. To develop the estimated demands, the system design criteria is first set out and then applied to the proposed development statistics.

Exhibit 2.4 sets out the system unit demands. Exhibit 2.5 summarizes the Water System Design Criteria.

<b>EXHIBIT 2.4 – SYSTEM UNIT DEMANDS</b>				
	<b>Residential L/cap.d</b>	<b>Commercial L/employee.d</b>	<b>Industrial L/employee.d</b>	<b>Institutional L/employee.d</b>
<b>Average Day Demand</b>	330	302	213	74
<b>Maximum Day Peaking Factor</b>	1.9	1.9	1.9	1.9
<b>Peak Hour Peaking Factor</b>	3.00	3.00	3.00	3.00

<b>EXHIBIT 2.5 WATER SYSTEM DESIGN CRITERIA</b>		
<b>Component</b>	<b>Condition/Description</b>	<b>Criteria</b>
Pumping Stations	With adequate zone storage available	Maximum day flow to zone and all subsequent zones
	Without adequate storage available	The greater of peak hour flow or maximum day plus fire to the zone and the maximum day flow to all subsequent higher zones
Storage	Balancing storage	25% of maximum day demand
	Fire storage	Largest expected fire zone (based on land use)
	Total	125% of Balancing + Fire (allows for 25% Emergency Storage)
Fire flow	Minimum flow (single family residential)	5,500 L/min for 2 hours @ minimum 140 kPa (20 psi)
	Minimum flow (industrial/commercial/institutional)	15,000 L/min for 3 hours @ minimum 140 Pa (20 psi)
System pressure	Normal operating conditions	280 kPa (40 psi) to 700 kPa (100 psi)

Exhibit 2.6 summarizes the projected demands under various conditions for the NOESP at build-out by applying the above criteria to the development statistics described in Exhibit 1.2. The calculations for Exhibits 2.6, 2.7, and 2.9 are included in Appendix D.

<b>EXHIBIT 2.6 – FLOW DEMANDS – LINEAR INFRASTRUCTURE (NORTH OAKVILLE EAST SECONDARY PLAN POPUATION PROJECTIONS)</b>					
	<b>Residential (ML/d)</b>	<b>Commercial (ML/d)</b>	<b>Industrial (ML/d)</b>	<b>Institutional (ML/d)</b>	<b>Total (ML/d)</b>
<b>Average Day Demand</b>	19.8	1.5	3.2	0.2	24.8
<b>Maximum Day</b>	37.6	2.9	6.1	0.5	47.1
<b>Peak Hour</b>	59.4	4.5	9.7	0.7	74.3

Exhibit 2.7 is a summary of the projected demands from the development scenario that the Region assumed in preparing the Master Plan as set out on Exhibit 2.1.

<b>EXHIBIT 2.7 – FLOW DEMANDS – LINEAR INFRASTRUCTURE (REGION POPULATION PROJECTIONS)</b>					
	<b>Residential (ML/d)</b>	<b>Commercial (ML/d)</b>	<b>Industrial (ML/d)</b>	<b>Institutional (ML/d)</b>	<b>Total (ML/d)</b>
<b>Average Day Demand</b>	18.1	1.1	3.2	0.2	22.7
<b>Maximum Day</b>	34.5	2.1	6.1	0.3	43.1
<b>Peak Hour</b>	54.4	3.4	9.7	0.5	68.0

A comparison of Exhibit 2.6 and Exhibit 2.7 shows that the projected demand based on North Oakville East Secondary Plan population projections are similar, but with a slightly higher demand for the Secondary Plan population projection. This is a linear function of the increased residential population.

With respect to the Community component of system storage, only the population component needs to be reassessed as it is assumed that fire storage will remain unchanged. Incremental estimated storage requirements are illustrated on Exhibit 2.8. (Incremental represents the storage/pumping required for the NOESP)

<b>EXHIBIT 2.8 INCREMENTAL STORAGE VOLUMES</b>		
	<b>Region (ML)</b>	<b>Secondary Plan (ML)</b>
<b>Zone 3 + Zone 4</b>	13.5	13.6

A majority of this storage shown in Exhibit 2.8 is ultimately required for Zone 4. The updated Master Plan reflects that the Region is proposing all new storage for this area to be constructed within Zone 4.

In reviewing the pumping station requirements for the Secondary Plan, it has been assumed that adequate zone storage is available. As noted above, this is expected to ultimately be the case, but it will not always be as system and population growth is occurring. Exhibit 2.9 shows the incremental total pumping station capacity required for the Region and Secondary Plan population projections.

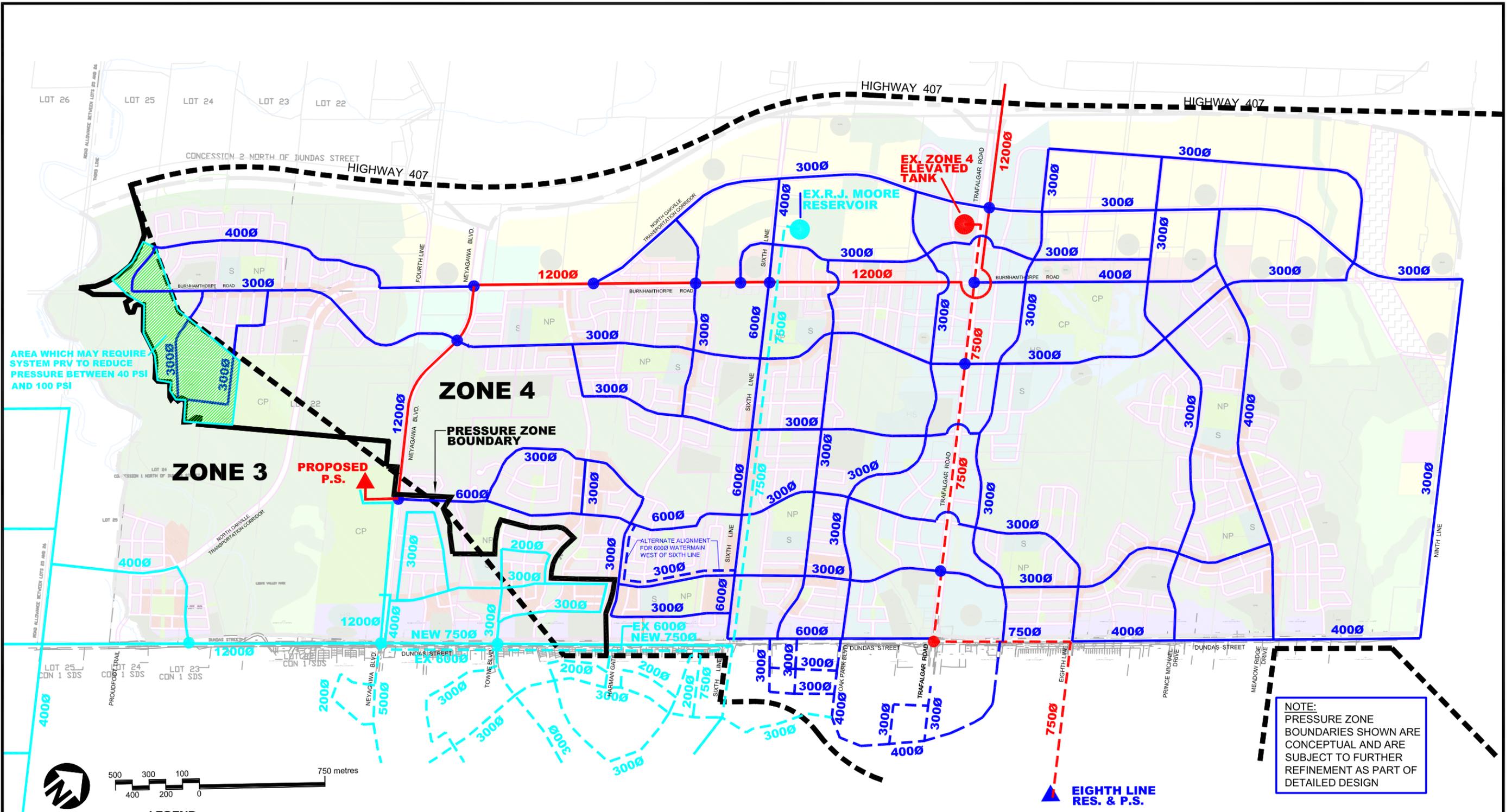
<b>EXHIBIT 2.9 INCREMENTAL TOTAL PUMPING STATION CAPACITIES</b>		
	<b>Region (L/s)</b>	<b>Secondary Plan (L/s)</b>
<b>Zone 3 + Zone 4</b>	498	535

### 2.3 Region’s Concept Plan Applied to North Oakville Secondary Plan

One of the important purposes of this Report is to apply the Region’s Master Plan Update water distribution concept to the approved Secondary Plan for the NOESP. As stated at the outset of this Report, the Report’s purpose is to adapt the Region’s servicing concept to the approved Secondary Plan, not to modify it. As a result of this principle, and because the estimated demand based upon the approved Secondary Plan is similar to the demand assumed by the Region, no changes are recommended to the Region’s proposed supply, pumping, or storage system network, save and except of course for addressing changed demands as described in Section 2.2.

The development of a community plan has however created the opportunity, and in fact the need, for a ‘plan specific’ trunk water main distribution network to be developed to replace the generic one that the Region applied in the absence of a Secondary Plan.

The proposed ASP water distribution network is illustrated in Exhibit 2.10. To address environmental sensitivities and minimize impact, all mains are proposed to be located on existing or proposed roads.



**LEGEND**

- ZONE BOUNDARIES
- PROPOSED ZONE BOUNDARIES
- REGIONAL BOUNDARIES
- ▲ EX. BOOSTER PUMPING STATION
- EXISTING RESERVOIR
- ◼ EX. WATER TREATMENT PLAN
- - - - - EXISTING WATERMAIN
- PROP. CONNECTIONS TO REGIONAL WATERMAINS ON BOUNDARY ROADS
- ▲ PROP. BOOSTER PUMPING STATION
- PROPOSED RESERVOIR
- ◼ PROPOSED WATER TREATMENT PLAN
- PROP. ZONE 3 WATERMAIN
- PROP. ZONE 4 WATERMAIN

PROJECT		 100 Commerce Valley Dr. West, Thornhill, ON Canada L3T 0A1 t: 905.882.1100 f: 905.882.0055 www.mmm.ca	
NORTH OAKVILLE COMMUNITY BUILDERS INC.			
TITLE		Checked	Drawn
ULTIMATE WATER SUPPLY AND DISTRIBUTION SYSTEM PLAN		Date NOVEMBER 2010	Proj. No. 10-02076
		Scale NTS	Exhibit No. 2.10

The proposed ASP water distribution system is essentially the same as the distribution from the Region's MPU with minor changes based on the outcome of land uses proposed by the final secondary plan. The following key elements of the proposed distribution network that are the same as the Region's MPU water system include:

- The 1200mm PD3 supply main on Dundas Street from 400m east of Bronte Road to the Neyagawa Boulevard Pumping Station (Region's Project # 5320, 5321 & 5852)
- The 1200mm PD4 watermain on Neyagawa Boulevard from the Pumping Station to Burnhamthorpe Road (Region's Project # 5856)
- The 1200mm PD4 watermain on Burnhamthorpe Road from Neyagawa Boulevard to Trafalgar Road (Region's Project # 3818)
- The 600mm PD4 watermain on Dundas Street from Sixth Line to Trafalgar Road (Region Project #5322/5961)
- The 750mm PD3 watermain on Dundas Street from Neyagawa Boulevard to Sixth Line (Region Project #5855).
- The 400mm PD4 watermain from Dundas Street to Burnhamthorpe Road on the new Oakville Road (Region's Project # 4983)

Changes to the network to respond to the proposed secondary plan and road pattern include the following minor changes to the Region's MPU.

- Relocation of the north-south local trunk watermain that was located west of Sixth Line (Region Project # 5634) to a 600mm watermain within the Sixth Line right-of-way.
- Relocation of the eastern transmission loop from Ninth Line (Region's Project # 5857, 5632 and 5633) to the internal North Oakville Street. There is very limited development proposed adjacent to Ninth Line due to environmental constraints and the existence of the Glen Oak Memorial Gardens Cemetery and accordingly this does not warrant a transmission watermain on Ninth Line. It is recommended that only a local watermain be provided (and only if a watermain is required) along Ninth Line. The distribution modelling (refer to Section 2.4) has also demonstrated that a 400mm watermain loop on Dundas Street from Eighth Line to the New Oakville Road, north on the new North Oakville Road to Burnhamthorpe Road and then west on Burnhamthorpe to Eighth Line is satisfactory to meet the distribution requirements.

- Relocation of the Zone 4 watermain on Dundas Street between Neyagawa Boulevard and Sixth Line (Project 5322) to the east-west mid-block road between Neyagawa Boulevard and Sixth Line. This watermain was relocated north from Dundas Street as the development on the north side of Dundas Street will be located within Pressure Zone 3

Finally, to ensure integration of the water system for the lands north and south of Dundas Street, the two systems should be interconnected at key locations. This will provide increased security for the existing system and will provide for flexibility with respect to completing the new system on a staged basis.

The updated list of DC related projects is shown in Exhibit 2.3A below.

<b>EXHIBIT 2.3A – REGION’S WATER D.C. PROJECTS – UPDATED PLAN</b>			
<b>Project</b>	<b>Revised Project Cost</b>	<b>Region’s Project #'s</b>	
		<b>Per 2008 MPU</b>	<b>Per ISP</b>
<b>Supply</b>			
Burloak WPP Ph 2 Exp. to between 110 and 165ML/d	\$1,200,000	3824	3824
Burloak WPP Ph 2 Exp. to between 110 and 165ML/d	\$21,019,000	3824	5951
Burloak WPP Ph 2 Exp. to between 110 and 165ML/d	\$114,495,000	3824	6372
<b>Sub-Total</b>	<b>\$136,714,000</b>		
<b>Transmission</b>			
1500/600mm on Rebecca Street - Burloak WPP to Bronte Road	\$ 6,870,000	4975	4975
1500mm from Burloak WTP to Burloak PS (Zone 2)	\$ 1,736,000	3786	3786
1500mm from Burloak WTP to Burloak PS (Zone 2)	\$ 10,659,000	3786	6365
Burloak PS (Zone 2)	\$ 1,476,000	64	64
Burloak PS (Zone 2)	\$ 10,327,000	64	6367
1350mm on Burloak and Upper Middle Road - Burloak PS to Kitchen Reservoir	\$ 1,419,000	4976	4976
1350mm on Burloak and Upper Middle Road - Burloak PS to Kitchen Reservoir	\$ 3,413,000	4976	6363
1350mm on Burloak and Upper Middle Road - Burloak PS to Kitchen Reservoir	\$ 29,675,000	4976	6364
Add Pump Capacity Zone 3 Kitchen PS	\$ 2,025,000	3820	3820
Add Pump Capacity Zone 3 Kitchen PS	\$ 6,610,000	3820	6371
1200mm from Zone 3 Kitchen PS on Bronte to Ex. 1200mm	\$ 6,625,000	5926	5926
1200mm on Dundas - 400m East of Bronte to Proudfoot Trail	\$ 10,686,000	5320	5320
1200mm on Dundas - Proudfoot Trail to Neyagawa Boulevard	\$ 11,500,000	5321	5321
1200mm on Neyagawa - Dundas to new Zone 4PS (ID #3817)	\$ 3,500,000	5852	5852
1200mm on Burnhamthorpe from Neyagawa to Trafalgar	\$ 10,899,000	3818	3818
1200mm Zone 4 WM on Neyagawa from Zone 4 Booster PS to Burnhamthorpe	\$ 4,500,000	5856	5856
750mm Zone 3 WM on Dundas – Neyagawa to Sixth Line	\$300,000	5855	5855
750mm Zone 3 WM on Dundas – Neyagawa to Sixth Line	\$ 3,099,000	5855	6370
Additional Zone 3 Pump at Washburn	\$ 1,216,000	6113	6113
600mm WM on Appleby Line from Proposed Street A to Appleby Line Reservoir (BUR) (A-W14)	\$ 960,000	5534	5534

<b>EXHIBIT 2.3A – REGION’S WATER D.C. PROJECTS – UPDATED PLAN</b>			
600mm WM on Appleby Line from existing 600mm WM on Appleby Line from Harrison Court to Dundas Street (BUR)	\$ 705,000	5319	5319
900mm WM on Dundas Street from Appleby Line to Tremaine Road (BUR)	\$ 910,000	3812	3812
900mm WM on Dundas Street from Appleby Line to Tremaine Road (BUR)	\$ 9,714,000	3812	6360
1200mm WM on Dundas Street from Tremaine Road to Bronte Road (OAK)	\$ 679,000	5851	5851
1200mm WM on Dundas Street from Tremaine Road to Bronte Road (OAK)	\$ 6,115,000	5851	6366
New 30 ML Zone 4 Reservoir (HHS)	\$15,111,000	5061	5061
1200mm WM on Trafalgar Rd from Britannia Rd to new Zone 4 Reservoir (HHS)	\$ 29,670,000	4985	4985
900mm WM on Derry Road from Trafalgar Road to Fifth Line (MIL)	\$ 6,031,000	5875	5875
750mm WM on Burloak Drive from Burloak Zone 2 PS to Upper Middle Road (OAK)	\$ 698,000	5934	5934
750mm WM on Burloak Drive from Burloak Zone 2 PS to Upper Middle Road (OAK)	\$ 4,887,000	5934	6368
750mm WM on Upper Middle Road from Burloak Drive to Appleby Line (OAK)	\$ 3,422,000	5850	5850
New Zone 3 Pumping Station at Appleby Line Reservoir (BUR)	\$ 6,826,000	54	54
<b>Sub-Total</b>	<b>\$212,264,000</b>		
<b>Local</b>			
New 100 ML/d Zone 4 Booster PS	\$9,044,000	3817	3817
600mm on Dundas from Oak Park Blvd to Sixth Line	\$2,203,000	5322	5322
600mm on New Street (through Development Lands) from Zone 4 BPS (Neyagawa) to Sixth Line	\$7,518,000	5322	6374
600mm on Dundas from Oak Park Blvd to Trafalgar	\$1,038,000	5961	5961
600mm on Sixth Line from Dundas to New Street	\$3,421,000	5634	5634
600mm on Sixth Line from Dundas to Burnhamthorpe	\$3,421,000	5634	6362
400mm on Dundas from Trafalgar to new North Oakville road	\$ 500,000	5859	5859
400mm on Dundas from Eighth Line to new North Oakville road	\$1,290,000	5859	6376
400mm on Dundas from new North Oakville road to Ninth Line	\$500,000	5857	5857
400mm on Dundas from new North Oakville road to Ninth Line	\$1,750,000	5857	6375
400mm on Burnhamthorpe from Trafalgar to new North Oakville road	\$ 696,000	3713	3713
400mm on Burnhamthorpe from Trafalgar to new North Oakville road	\$ 1,891,000	3713	6443
300mm on Burnhamthorpe from new North Oakville road to Ninth Line	\$ 2,305,000	5633	5633
300mm on Ninth Line from Dundas to Burnhamthorpe	\$2,218,000	5632	5632
400mm on new North Oakville road from Dundas to Burnhamthorpe	\$ 640,000	4983	4983
400mm on new North Oakville road from Dundas to Burnhamthorpe	\$1,919,000	4983	6444
<b>Sub-Total</b>	<b>\$40,354,000</b>		
<b>TOTAL</b>	<b>\$389,332,000</b>		

#### 2.4 Water Distribution Modelling Analysis

The Region of Halton provided a copy of the Region’s Water Distribution Model dated August 12, 2008 to assist NOCBI’s engineers in modelling the proposed Area Servicing Plan watermain system. The following recommendations are based on the update of the Region’s model to include the proposed ASP watermain system shown in Exhibit 2.10.

*2.4.1 Water Distribution Modelling Results for Peak Hour and Maximum Day*

The proposed ASP system was incorporated into the Region of Halton’s Water Distribution Model to determine if the proposed ASP water system would be adequate to service North Oakville (Please refer to Figure W-1: 2021 Peak Hour Demand Node and Pipe Map in Appendix E). Exhibit 2.11 summarizes the results of the distribution modelling. Copies of the Peak Hour and Maximum Day model results have been included in Appendix E.

<b>EXHIBIT 2.11 – RESULTS OF WATER DISTRIBUTION MODELLING FOR PROPOSED ASP WATER SYSTEM</b>				
	Peak Hour		Maximum Day	
	Pressure Zone 3	Pressure Zone 4	Pressure Zone 3	Pressure Zone 4
Minimum HGL	195.7 m	227.0 m	197.80 m	230.0 m
Node for Minimum HGL	NO 226	NO221	NO115	NO221
Maximum HGL	196.2 m	231.0 m	198.0 m	232.1 m
Node for Maximum HGL	NO111	NO-223	NO111	NO-223
Minimum System Pressure (psi)	40.3 psi	51.1 psi	43.1 psi	52.9 psi
Node for Minimum System Pressure	NO 233	NO 181	NO 233	NO 181
Maximum System Pressure (psi)	52.6 psi	96.5 psi	55.3 psi	99.5 psi
Node for Maximum System Pressure	NO 110	NO 189	NO 110	NO 189

The results of the distribution modelling show that the proposed ASP water system will provide adequate flow and pressure to all locations in Zone 3 during a maximum day and peak hour demand provided the ground elevation is below the elevation of 167.5 m. During the detailed design stage, the design engineers will need to establish the boundary between Zone 3 and Zone 4 based on the proposed grades within each development and the maximum elevation in Zone 3 of 167.5m.

In Zone 4, there will be adequate flow and pressure during both maximum day and peak hour demands for all nodes within Zone 4. The model has

included pressure reducing valves on the 300mm watermains south of Burnhamthorpe Road in the Northwest corner of the NOCBI study area to reduce the pressures for this localized area to maintain pressures between 40 psi and 100 psi.

It should be noted that the maximum headloss in the proposed Zone 3 system is only 0.2 m during a maximum day demand and 0.5 m during a peak hour demand. The low headloss in the overall system indicates that the watermains are adequately sized and that increasing the watermain sizes above the 200mm and 300mm watermains proposed in Zone 3 is not required. Similarly, the maximum headloss in the proposed Zone 4 system is only 2.1 m during a maximum day demand and 4.0 m during a peak hour demand. The low headloss in the Zone 4 system indicates that the proposed 300mm watermains provide a good level of service to meet the required domestic demands.

#### *2.4.2 Water Distribution Modelling Results for Maximum Day plus Fire*

The proposed ASP system was also modelled to determine if the proposed water distribution system could meet the Region's fire requirements of 5,500 l/minute for residential development and 15,000 L/minute for commercial/institutional/industrial development. Since the distribution model was only a skeltonized version of the water system and did not include all the local water distribution watermains, the fire flow analysis was carried out to determine the fire flow available at 30 psi on all the 300mm and larger watermain (rather than the Region's criteria of 20 psi). This criteria was selected to allow for additional headloss in the local watermains that have not been included in the distribution model. In Zone 3 where the model included the 200mm local watermains, the available fire flow was calculated based on the Region's criteria of 20 psi.

The results of the maximum day plus fire modelling indicates that the fire flow of 15,000 L/minute at a residual pressure of 30 psi is available at all nodes in Zone 4. In Zone 3 all the nodes could provide a fire flow of at least 15,000 l/minute at a residual pressure of 20 psi with the exception of nodes NO-226, NO-225, NO-229, NO-231 and NO-228. For these nodes, the available fire flow at 20 psi ranged from 7,680 l/minute to 12,980 l/minute. All these nodes are located within proposed residential developments and the available fire flows all exceeded the Region's criteria of 5,500 l/minute for residential developments.

Based on the modelling, it can be concluded that the propose ASP water system is adequately sized to meet the Region's criteria for a maximum day plus fire demand.

## 2.5 Additional Design Considerations

### 2.5.1 *Local Service Watermains*

The North Oakville Secondary Plan proposes developments that front onto external roads such as Neyagawa Boulevard, Burnhamthorpe Road, Sixth Line and Dundas Street where Regional DC watermains are proposed. These proposed developments will require water services and in some cases may require local watermains to service these developments. The ASP only addresses the watermain sizes for the transmission and major distribution watermains. Local distribution will be addressed in the Functional Servicing Reports supporting the various Draft Plans of Subdivision and will be in accordance with the Region's published standards for water connections.

As local residential lot service connections are not permitted to 400mm and larger watermains, it will be necessary to provide smaller local watermains within several of the planned right-of-way conditions to provide individual connections as per land uses approved by the NOESP. Preliminary analysis at anticipated locations such as Sixth Line and Burnhamthorpe Road (amongst others) supports this as a feasible solution.

### 2.5.2 *Mitigation Measures for Single Feed Watermain Supplies*

The ultimate water distribution is a well designed network of interconnected watermains with multiple loops to ensure security and flexibility in servicing the full build out of the proposed secondary plan area. While it is a priority to loop systems where possible and as soon as the opportunity is available, it will be necessary to service development areas with single feed watermains during various phases of development until the future watermain loops can be constructed.

## 2.6 Staged Servicing

The September 24, 2009 Technical Memorandum prepared by AECOM quantifies the capacity of the existing water distribution system to support growth within North Oakville. This memorandum notes that 3.00MLD or 1,500 SDE'S of water system capacity is available within pressure Zone 4. As further clarified in AECOM's March 11, 2010 Technical Memorandum, implementation of the Second Rebecca Street Crossing (ID 4975) and Additional Zone 3 Pumping Capacity at Kitchener Reservoir (ID 3820) will provide up to 2,000 SDEs of capacity to Oakville Zone 3. Additional infrastructure is required to gain more capacity in the Oakville Zone 3 and 4 systems.

### **3.0 Wastewater**

#### **3.1 Region's Water & Wastewater Master Plan**

In developing its water and wastewater Master Plan and subsequent update, the Region considered a wide variety of possible strategies to service the expected growth with respect to both treatment and conveyance. The conclusions of the Region's work with respect to treatment and conveyance (including conveyance options) as it affects the NOESP are summarized in the following sections.

##### *3.1.1 Treatment*

Wastewater treatment for Oakville is provided at three Wastewater Treatment plants (WWTP). These plants are Mid-Halton, Oakville South East, and Oakville South West. The recommended alternative in the Master Plan proposed that all wastewater treatment for growth in Oakville and Milton be at the Mid-Halton WWTP.

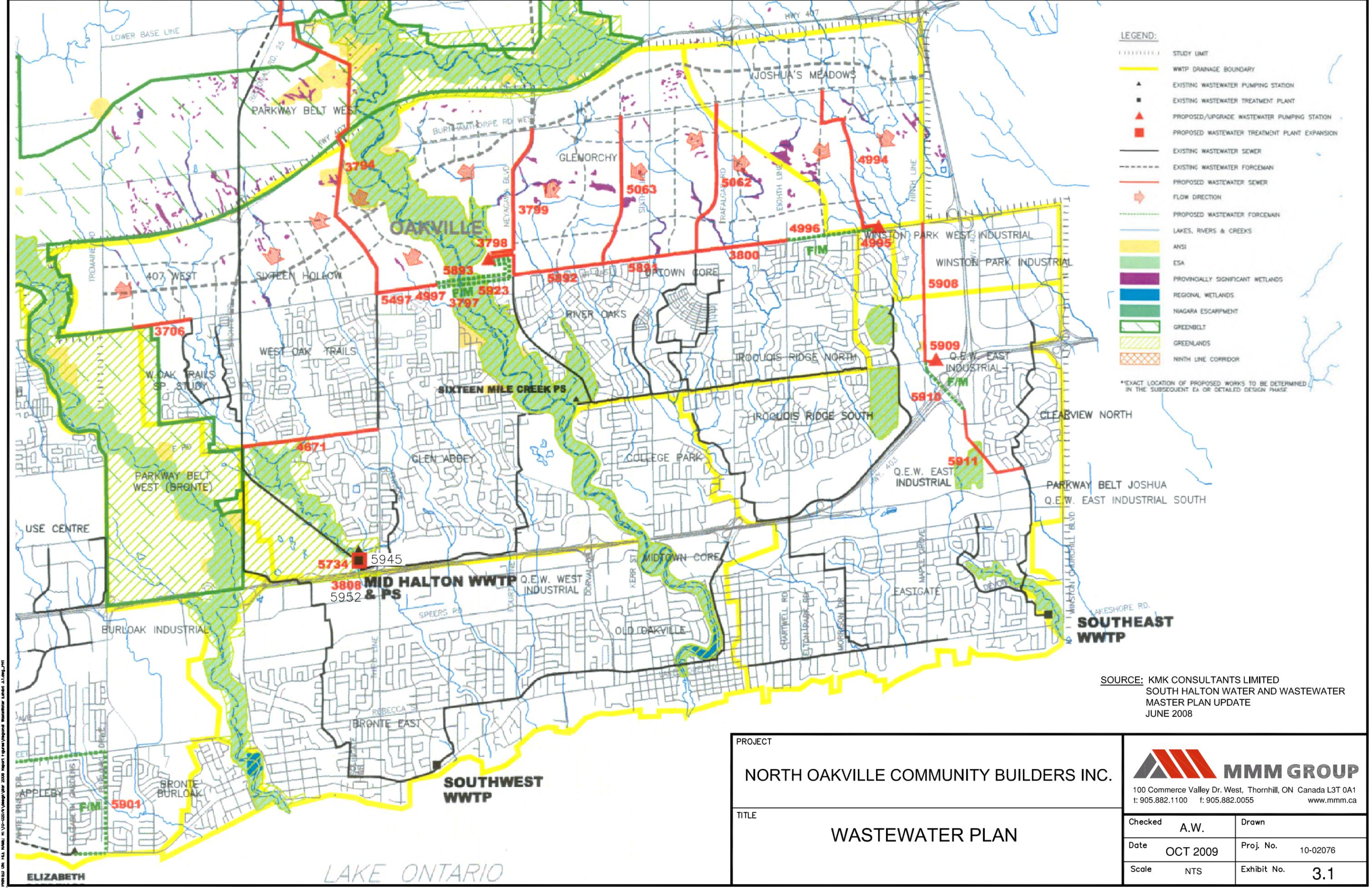
The first phase of Mid-Halton WWTP was constructed in 1991 with a rated capacity of 20,000 m<sup>3</sup>/d. It was subsequently re-rated to 25,000m<sup>3</sup>/d. The Region completed an expansion of the plant to 50,000 m<sup>3</sup>/d in 2003, and has subsequently completed the next expansion to 75,000 m<sup>3</sup>/d in order to service anticipated growth within Milton and Oakville.

The Region has planned the Mid-Halton Wastewater plant and has sufficient land to allow it to be expanded in an orderly and predictable fashion. These expansions would be timed so that the capacity is available when required. Expansion of capacity will trigger the need for various other changes or improvements such as biosolids handling and a new outfall (not required until growth beyond HUSP).

##### *3.1.2 Collection System*

Exhibit 3.1 is a representation of the portion of the Region's proposed wastewater collection and pumping system that are intended to service NOESP, the lands to their west and a portion of the expected growth in Milton.

NOESP (and the lands south) generally slope from north to south and from east to west. The Master Plan provides for a series of sub-trunk sewers that will drain from north to south connecting to a new Trunk Sewer System on Dundas Street. The Region showed the sewers within the



- LEGEND:**
- STUDY LIMIT
  - WWTP DRAINAGE BOUNDARY
  - ▲ EXISTING WASTEWATER PUMPING STATION
  - EXISTING WASTEWATER TREATMENT PLANT
  - ▲ PROPOSED/UPGRADE WASTEWATER PUMPING STATION
  - PROPOSED WASTEWATER TREATMENT PLANT EXPANSION
  - EXISTING WASTEWATER SEWER
  - EXISTING WASTEWATER FORCEMAIN
  - PROPOSED WASTEWATER SEWER
  - FLOW DIRECTION
  - PROPOSED WASTEWATER FORCEMAIN
  - LAKES, RIVERS & CREEKS
  - ANSI
  - ESA
  - PROVINCIAL SIGNIFICANT WETLANDS
  - REGIONAL WETLANDS
  - NIAGARA ESCARPMENT
  - GREENBELT
  - GREENLANDS
  - NINTH LINE CORRIDOR

\*EXACT LOCATION OF PROPOSED WORKS TO BE DETERMINED IN THE SUBSEQUENT EA OR DETAILED DESIGN PHASE

SOURCE: KMK CONSULTANTS LIMITED  
 SOUTH HALTON WATER AND WASTEWATER  
 MASTER PLAN UPDATE  
 JUNE 2008

PROJECT	NORTH OAKVILLE COMMUNITY BUILDERS INC.		
TITLE	WASTEWATER PLAN		
			
		100 Commerce Valley Dr. West, Thornhill, ON Canada L3T 0A1 t: 905.882.1100 f: 905.882.0055 www.mmm.ca	
		Checked	A.W.
Date	OCT 2009	Proj. No.	10-02076
Scale	NTS	Exhibit No.	3.1

PROJECT NO. 10-02076; DATE: OCT 2009; REPORT: WASTEWATER MASTER PLAN UPDATE; DRAWN: A.W.; CHECKED: A.W.; DATE: OCT 2009; SCALE: NTS; EXHIBIT NO. 3.1

Community schematically based on the basic land use plan. One of the purposes of this report is to apply the Master Plan concept to the approved Secondary Plan road and development scheme and recommend a specific plan for the sewer system. At Dundas Street, an east to west trunk sewer system (with pumping) is proposed. This system will intercept flow and divert it west towards the Mid-Halton Plant in a manner that minimizes impact to the existing residents of the Town of Oakville.

More specifically, the lands generally east of Prince Michael Drive will be conveyed east by an internal collection system to a pumping station located approximately at Joshua's Creek and Dundas Street. This proposed Regional pumping station (Joshua's Creek PS) would pump wastewater west via a Dundas Street forcemain to a proposed gravity sewer at Eighth Line and Dundas Street. The gravity sewer will flow west along Dundas Street to a proposed pumping station on the north side of Dundas Street east of Neyagawa Boulevard (North Oakville PS).

The location of the North Oakville PS was revised by an amendment to the Master Plan. The relocation was proposed as it decreases the total amount of sewer and forcemain resulting in a cost savings. Additionally, it reduces pipe congestion on Neyagawa Boulevard and simplifies construction and operation of the proposed North Park Community Centre. Emergency overflow will be determined during the preliminary design stage for the pumping station; however it is expected that the adjacent creek(s) and stormwater management pond will be considered. A preliminary site layout for the North Oakville PS is provided in Appendix C.

The ultimate route from the North Oakville PS is via forcemains constructed on the new Dundas Street Bridge crossing of Sixteen Mile Creek. The forcemains then will discharge to a proposed gravity sewer that extends west to the existing, recently constructed sewer on Third Line. The Third Line sewer, which will also service growth in North Oakville west of Sixteen Mile Creek and Milton, has been constructed to Upper Middle Road. A section of sewer along Upper Middle Road to Bronte Road is also still to be constructed in order to connect the Third Line sewer to the existing trunk sewer at Bronte Road and Upper Middle Road. Existing sewers extend from Upper Middle Road and Bronte Road to the Mid-Halton WWTP.

*3.1.3 Region's Timing and Development Charge Projects*

Exhibit 3.2 summarizes the Region's proposed wastewater projects related to the subject lands and in many cases also for other development areas, particularly areas in Oakville west of Sixteen Mile Creek and Milton.

<b>EXHIBIT 3.2 – REGIONS WASTEWATER PROJECTS</b>			
<b>Type</b>	<b>ID per Financial Plan</b>	<b>Description</b>	<b>Total (\$ 000's)</b>
<b>TREATMENT</b>			
Mid Halton WWTP Expansion			
S	3808	Mid Halton WWTP expansion to 125,000 m3/d (Ph IV and V)	100,740
S	5734	Mid Halton North Pumping Station Expansion	4,055
Mid Halton WWTP New Effluent Outfall			
S	5945	Mid-Halton Outfall/Equalization Upgrade	44,685
			Subtotal
<b>DUNDAS TRUNK SYSTEM</b>			
S	3798	New Wastewater Pumping Station on North Park Property (OAK)	9,788
S	4995	New wastewater Pumping Station on Dundas Street East approximately 550m west of Ninth Line	6,767
S	4996	2x400 mm WW Forcemain on Dundas Street from new PS (IPFS #4995) to Eighth Line	5,782
S	3800	750 mm WWM on Dundas Street from Eighth Line to Oak Park Blvd.	3,161
S	5891	900 mm WWM on Dundas Street from Oak Park Blvd. to Harman Gate	8,000
S	5892	900 mm WWM on Dundas Street from Harman Gate to new PS (IPFS #3798)	9,718
S	5923	2x750 mm Forcemain east of the bridge from Neyagawa Blvd. to PS on North Park Property (IPFS #3798)	3,414
S	3797	750 mm Forcemain from Neyagawa Blvd. hung from the bridge (over 16 Mile Creek to just west of the bridge (old Fourth Line)	306
S	5893	2nd 750 mm Forcemain from Neyagawa Blvd. hung from the Bridge (over 16 Mile Creek) to just west of the bridge (old Fourth Line)	5,252
S	4997	900 mm WWM on Dundas Street from just west of bridge (old Fourth Line) to Proudfoot Trail	224
S	5497	900 mm WWM on Dundas Street from Proudfoot Trail to Third Line	696
			Subtotal
<b>SECONDARY PLAN TRUNKS</b>			
S	3799	600 mm WWM from Burnhamthorpe Rd. West on new North Oakville HUSP Road to Neyagawa Blvd to SPS (ID 3798) (OAK)	1,683
S	4994	600 mm WWM on new North Oakville HUSP road from Burnhamthorpe Rd. West to Dundas Street	2,163
S	5062	600 mm WWM from Burnhamthorpe Rd. West on new North Oakville HUSP road to Dundas Street	1,922
S	5063	525 mm WWM from Burnhamthorpe Rd. West on new North Oakville HUSP road to Dundas Street	1,550
			Subtotal
			<b>TOTAL</b>
			<b>209,906</b>

\* Incremental amount: varies from MPU as balance included in prior approved capital budgets.

Projects and costs shown in Exhibit 3.2 have been taken from the Infrastructure Staging Plan (CS-73-08/PWE-31-08) dated October 2008.

### 3.2 Expected Sewage Generation

In this section sewage generated in the NOESP has been assessed and compared to the Master Plan. The design criteria that the Region has utilized in the Master Plan are used in this analysis. To develop the estimated sewage generation, the system design criteria is first set out and then applied to the proposed development statistics.

The Region of Halton wastewater system criteria is as follows:

<b>EXHIBIT 3.3 AVERAGE DAY WASTEWATER FLOW</b>			
<b>Land Use</b>	<b>Unit</b>	<b>Collection System</b>	<b>Treatment</b>
Residential	L/cap/d	275	365
Commercial	m <sup>3</sup> /ha/d	26.0	26.0
Industrial	m <sup>3</sup> /ha/d	17.6	17.6
Institutional	m <sup>3</sup> /ha/d	11.0	11.0

The modified Harmon Peaking Factor equation is used to determine the peak flows for the collection system. The average day wastewater flow criteria for wastewater treatment includes an allowance for infiltration. An infiltration allowance of 0.286 L/s/ha is added to the peak system flows for designing the collection system.

The treatment capacity flow generated by NOESP is:

<b>EXHIBIT 3.4 – GENERATED WWTP FLOWS – NORTH OAKVILLE EAST SECONDARY PLAN PROJECTIONS</b>					
	<b>Residential ML/d</b>	<b>Commercial ML/d</b>	<b>Industrial ML/d</b>	<b>Institutional ML/d</b>	<b>Total ML/d</b>
<b>Average Daily Flow</b>	21.95	4.13	6.43	0.53	33.03

The above values are calculated using the flow criteria from Exhibit 3.3. Population and area values are as per the wastewater design sheet, included in Appendix B.

By comparison the Region’s predicted treatment plant capacity flow is shown on Exhibit 3.5:

<b>EXHIBIT 3.5 – GENERATED WWTP FLOWS – REGION POPULATION PROJECTIONS</b>					
	<b>Residential ML/d</b>	<b>Commercial ML/d</b>	<b>Industrial ML/d</b>	<b>Institutional ML/d</b>	<b>Total ML/d</b>
<b>Average Daily Flow</b>	20.07	4.13	6.43	0.53	31.16

The above values are calculated using the flow criteria from Exhibit 3.3. Area values are as per the wastewater design sheet, included in Appendix B. Population is as per the Region’s estimate.

As discussed in the water section, it is not possible to discern in the Master Plan the land areas (and therefore expected building areas) that have been assigned to the various non-residential land uses.

A comparison of Exhibits 3.4 and 3.5 demonstrates that the estimated flow to the Mid-Halton WWTP from the area will be similar to that estimated flow by the Region. While it is recommended that the Region begin to utilize this information in its modeling, the decrease in flows will only be realized as full build out is approached per the Region’s timelines. Ultimately this decreased flow could impact the timing of improvements to the Treatment Plant; however, it is not expected to impact the overall development plans for the Plant as it is expected to continue to be expanded in 25,000 m<sup>3</sup>/d increments (or greater if the plant is re-rated).

Pumping stations and sewers are designed based upon peak flows. Flows will increase from east to west as various sub-catchment areas are connected to the Trunk Sewer. Exhibits 3.6 and 3.7, which follow, estimate the peak flow to the Dundas/Neyagawa Pumping Station. This is the full flow from the NOESP. Exhibit 3.6 estimates the peak flows from the NOESP. Exhibit 3.7 estimates flow from the Region’s projected population. Again the non-residential flows from this latter case have been estimated using the corresponding NOESP figures. This approach has also been used to estimate infiltration.

The difference in the peak flows between the Region’s projections and from those generated from the NOESP combined with the proposed decrease in pipe slope in some instances will impact the sizing of the Dundas Street trunk sewer by one pipe size in some locations.

<b>EXHIBIT 3.6 – PEAK GENERATED COLLECTION SYSTEM FLOWS @ DUNDAS/NEYEGAWA P.S – NOESP POPULATION PROJECTIONS</b>					
	<b>Residential L/S</b>	<b>Commercial L/S</b>	<b>Industrial L/S</b>	<b>Institutional L/S</b>	<b>Total L/S</b>
<b>Average Flow</b>	191.4	47.8	74.4	6.1	319.7
<b>Peaking Factor</b>	2.016	2.016	2.016	2.016	2.016
<b>K</b>	0.9166	0.9166	0.9166	0.9166	0.9166
<b>Infiltration</b>	209.4	45.4	104.3	13.7	372.8
<b>Total</b>	563.2	133.7	241.8	25.0	963.7

The above values are calculated using the flow criteria from Exhibit 3.3. Population and area values are as per the wastewater design sheet, included in Appendix B.

By comparison the Region predicted peak flow to the Neyagawa P.S. at build-out is:

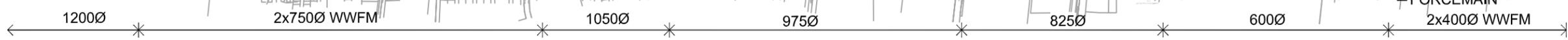
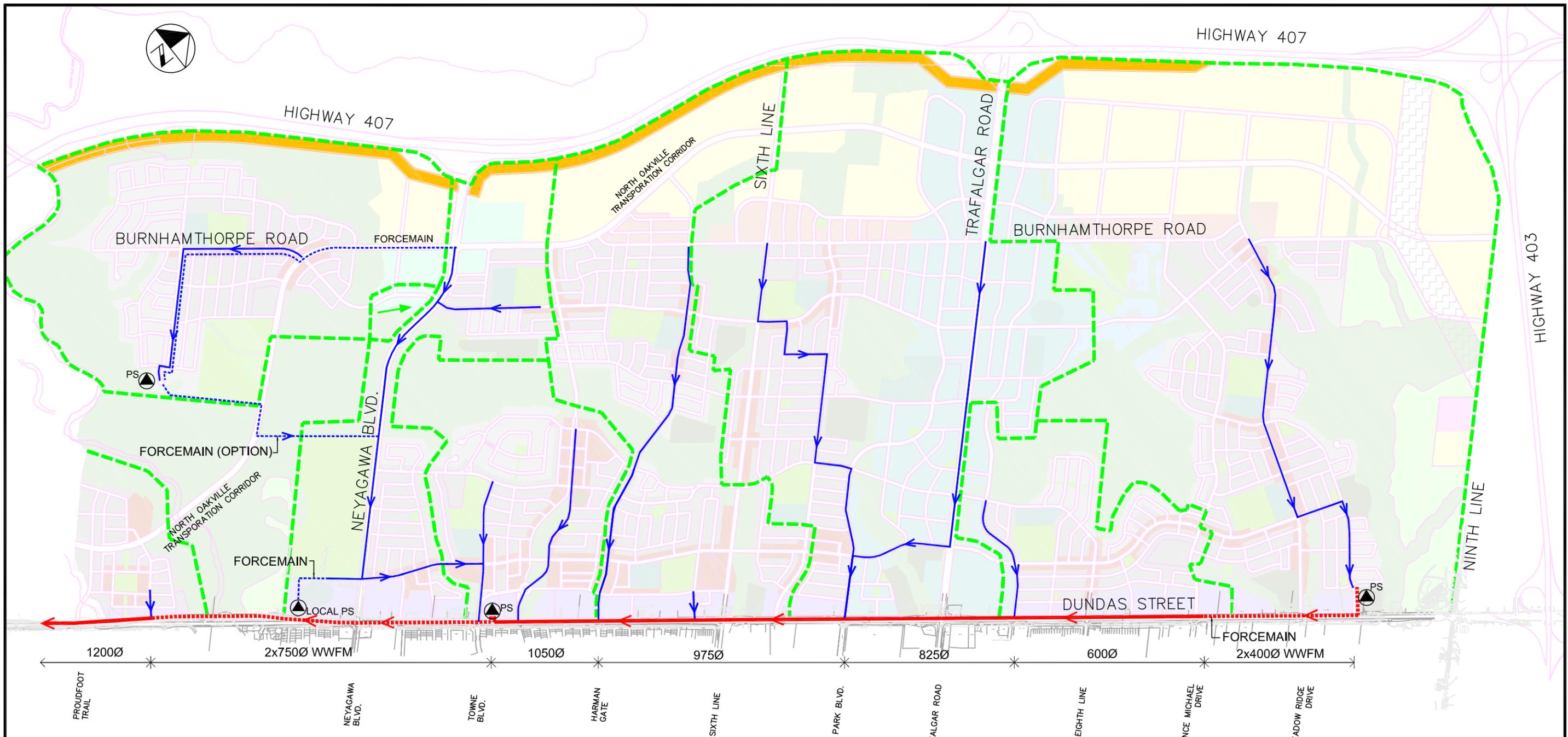
<b>EXHIBIT 3.7 – PEAK GENERATED COLLECTION SYSTEM FLOWS @ DUNDAS/NEYEGAWA P.S. – REGION POPULATION PROJECTIONS</b>					
	<b>Residential L/S</b>	<b>Commercial L/S</b>	<b>Industrial L/S</b>	<b>Institutional L/S</b>	<b>Total L/S</b>
<b>Average Flow</b>	175.1	47.8	74.4	6.1	303.3
<b>Peaking Factor</b>	2.036	2.036	2.036	2.036	2.036
<b>K</b>	0.9166	0.9166	0.9166	0.9166	0.9166
<b>Infiltration</b>	209.4	45.4	104.3	13.7	372.8
<b>Total</b>	536.2	134.6	243.1	25.1	939.0

The above values are calculated using the flow criteria from Exhibit 3.3. Area values are as per the wastewater design sheet, included in Appendix B. Population is as per the Region's estimate.

### 3.3 Region's Concept Plan Applied to North Oakville Secondary Plan

The proposed sewer system to service the NOESP is described in this section and as well as the proposed drainage boundaries is illustrated on Exhibit 3.8.

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**LEGEND**

- DUNDAS STREET TRUNK SEWER
- DUNDAS STREET FORCEMAIN
- SUB-TRUNK SEWER
- SUB-TRUNK FORCEMAIN
- WASTEWATER PUMPING STATION (APPROXIMATE LOCATION)
- SUB-TRUNK DRAINAGE BOUNDARY

NOTE: SUB-TRUNK SEWER AND DRAINAGE BOUNDARY LOCATIONS ARE IN GENERAL CONFORMANCE TO HALTON REGION'S PROPOSED LOCATION AND SHALL BE FURTHER REFINED IN THE DEVELOPMENT SPECIFIC FUNCTIONAL SERVICING REPORTS.



PROJECT		NORTH OAKVILLE COMMUNITY BUILDERS INC.		
TITLE		ULTIMATE WASTEWATER DRAINAGE PLAN		
Checked	M.A.E.	Drawn	T.Y.	
Date	AUGUST 2010	Proj. No.	10-02076	
Scale	NTS	Exhibit No.	3.8	

### Dundas Street Sewer

As discussed in Section 3.1, the Region proposes that all wastewater flows from the NOESP drain to a trunk sewer system along Dundas Street. As plans were being developed for the NOESP, alternative locations for this sewer were considered. At this stage it has been determined that Dundas Street would be a feasible alignment for the sewer.

During the conceptual design stage it was determined that the Dundas Street gravity sewer can begin at a high point near Prince Michael Drive. East of this point will drain to the Joshua's Creek Pumping Station and flows from the west will drain to the Dundas Street gravity sewer, and ultimately the North Oakville Pumping Station. This study generally supports that conclusion.

A preliminary design has been undertaken for the trunk sewer on Dundas Street, which is presented on the enclosed compact disk in Adobe Acrobat format. Hard copies are available upon request.

### Internal Collection Systems

In order to convey wastewater drainage from the subject lands to the Dundas sewer collection system, various alternative system layouts were evaluated. The common elements of the system layouts were:

- All, or virtually all, sewers are located on proposed road alignments.
- All crossings of watercourses or natural features follow proposed road alignments.
- Due to the relatively constant grade from north to south and the generally minimal grade from east to west, there is a high degree of flexibility with respect to sewer routing tributary areas etc.

A number of factors were considered that would influence the proposed alternatives. The factors include environmental features, existing topography, proposed road patterns, stormwater management facilities, and relative ease of sewer construction.

While Exhibit 3.8 shows the preferred alignment for the sub-trunks there is flexibility in the location of the sub-trunks and the corresponding drainage boundaries. The sizing of the Dundas Street sewer has considered this flexibility and as such will allow the plan to evolve as it moves forward over time.

An additional pumping station will likely be required for the lands west of Neyagawa Boulevard south of Burnhamthorpe Road. The lands generally

fall away from Neyagawa Boulevard towards Sixteen Mile Creek. The preferred route for the forcemain would be along Burnhamthorpe Road. A gravity sewer along this same alignment would result in the Neyagawa Boulevard sub-trunk sewer being approximately 26m deep at Burnhamthorpe Road.

An alternate location for this forcemain would be easterly on the north side of the Community Park, along the North Oakville Transportation Corridor, across a portion of the Natural Heritage System Area and then along the boundary between the Town's North Park and the Region's landfill property before emptying into the Neyagawa Boulevard sub-trunk sewer. The depth of a gravity sewer outlet at Neyagawa Boulevard if a pumping station is not used would be approximately 15-16m if routed to the south of the Region's landfill. Both Halton Conservation and the Town of Oakville have expressed concerns with this alternate alignment, regardless of whether a forcemain or gravity sewer is proposed. Therefore the Region of Halton has accepted that a pumping station with forcemain flowing north to Burnhamthorpe Road and east to Neyagawa Boulevard is the preferred alternative. The proposed pumping station would be located at the south limit of the developable lands. The proposed pumping station and forcemain would be DC recoverable by the Region of Halton's criteria as the incoming gravity sewer has been preliminarily sized as 450mm diameter. It is recommended that the Region of Halton include this infrastructure in their next Water & Wastewater Master Plan Update.

A local pumping station will be required for the Secondary School Block located on the north side of Dundas Street west of Neyagawa Boulevard. The need for this local pumping station is due to the low existing ground elevation on the proposed site (lowest elevation  $\pm 147$  MASL). Therefore, a gravity connection from this block to the Neyagawa Road sub-trunk would lower the sub-trunk through the adjacent developments by an additional 13m. The forcemain from this pumping station will be directed to a gravity sewer system within the Town Park and ultimately draining to the sub-trunk on Neyagawa Boulevard. It will be a local pumping station and shall be designed, constructed and financed by the Developer. Alternatively, connection of the Secondary School Block forcemain to the proposed Dundas Street forcemain may be feasible but will require more detailed analysis.

The drainage area plan and corresponding design sheets are included in Appendix B. Proposed profiles for the proposed sub-trunks are included on the CD at the back of Appendix B. A description of each sub-trunk is included below.

### *Joshua's Creek Sub-trunk*

The sub-trunk is designed to service approximately 405 hectares of developable land with an estimated equivalent population of 42140. Tributary areas include the employment and industrial lands between Highway 407 and Burnhamthorpe Road and the employment lands east of the utility corridor. However the employment and institutional areas immediately west of Ninth Line are excluded.

Factors that determine the depth of the Joshua's Creek sub-trunk are the local wastewater sewers from the east and west on Burnhamthorpe Road and the Joshua's Creek crossing (500m south of Burnhamthorpe Road). The entire Joshua's Creek sub-trunk, as shown in Figure SUB-1, is DC recoverable (preliminary sizing at 525mm-600mm). The sub-trunk will drain to a Regional pumping station north of Dundas Street, west of Joshua's Creek. The forcemain from this pumping station will discharge to the Dundas Street trunk sewer at approximately Prince Michael Drive.

### *Trafalgar Sub-trunk*

The tributary area for the Trafalgar sub-trunk has a natural divide and therefore the analysis is split into two tributary areas (Trafalgar A and Trafalgar B. See figures SUB-3a and SUB-3b), which join prior to connecting to the Dundas Street trunk sewer. The subtrunk is designed to service approximately 360 hectares of developable land with an estimated equivalent population of 41,850. Most of this area is made up of the Trafalgar core with higher densities than the other areas of the sub-trunks tributary areas. Employment and industrial areas between Highway 407 and Burnhamthorpe Road are included in the design.

Trafalgar A runs along Trafalgar road while Trafalgar B is expected to run along the major proposed north-south roads and the two will meet and outlet to the Dundas Street trunk sewer at Oak Park Boulevard. Approximately 1730m of the Trafalgar sub-trunk A is DC recoverable with anticipated sizes ranging from 450mm to 675mm. Two factors determine Trafalgar subtrunk A's depth: a) the servicing of Osmington lands, which lies in a naturally low area, and b) the crossing of East Morrison Creek. In order to meet the invert of the Dundas Street trunk sewer, the lower 915m of the sub-trunk will run at 0.30% slope. Trafalgar sub-trunk B can run at nominal depth and grade until it joins with A.

### *Sixth Line Sub-trunk*

The Sixth Line sub-trunk (figure SUB-4) is designed to service approximately 176 hectares of developable land and an estimated equivalent population of 16,965. This includes the employment and

industrial lands between Highway 407 and Burnhamthorpe Road, with an option of it draining to the east limit or to the west limit, depending on the timing of development. The north-west corner of the tributary area determines the depth of the sub-trunk, driving it to approximately 7.0m depth relative to existing ground at the midway point. The sub-trunk returns to nominal depth where it connects to the Dundas Street trunk.

#### *Neyagawa Subtrunk*

The Neyagawa sub-trunk running along Neyagawa Boulevard is designed to service approximately 240 hectares of developable land with an estimated equivalent population of 17,825. The employment and urban core areas between Highway 407 and Burnhamthorpe Road are included in the design.

While the area to the east of Neyagawa Boulevard can enter the subtrunk directly, the area west of Neyagawa Boulevard and south of Highway 407 naturally drains southwest. A pumping station (see figure SUB-6) is required at the southwest corner of the drainage area to bring sewage to the Neyagawa sub-trunk. The forcemain from this pumping station is proposed to discharge to a gravity sewer along Burnhamthorpe Road to the west of Neyagawa Boulevard. The forcemain and the subtrunk may be DC recoverable at preliminary sizes of 450mm. The Region of Halton has noted that this infrastructure is not identified in their 2008 Water and Wastewater Servicing Master Plan Update. The sub-trunk is expected to run along Neyagawa Boulevard at nominal depth then at 0.20% slope along local roads in order to reach the proposed pumping station along Dundas Street.

#### *Other Wastewater Connections to Dundas Street Trunk Sewer*

Three other tributary areas will connect to the Dundas Street trunk sewer at various locations. Due to their shorter lengths and smaller tributary areas they are considered to be local sewers. Together they service an approximate area of 125 hectares of developable lands with an estimated equivalent population of 11,940 people. These local sewers allow the subtrunks and the Dundas Street trunk to be kept at a nominal depth. The costs for these local sewers are not considered to be DC recoverable.

The proposed changes to the collection system would impact the development charge projects. The updated list DC related projects is shown in Exhibit 3.2A on the following page.

### 3.4 Sewer Sizing and Technical Analysis

Flows and then sewer sizes were developed using Regional design criteria. Detailed design sheets are provided in Appendix B.

The sewers were sized utilizing the modified Harmon Peaking Factor equation with offsetting peaks for residential and commercial.

<b>EXHIBIT 3.2A –WASTEWATER PROJECTS SCHEDULE – UPDATED PLAN</b>				
<b>Type</b>	<b>ID per Financial Plan</b>	<b>New ID per Allocation Phase</b>	<b>Description</b>	<b>ISP (\$ 000's)</b>
<b>TREATMENT</b>				
Mid Halton WWTP Expansion				
S	3808 (EA/D)	6383 (C)	Mid Halton WWTP expansion to 125,000 m3/d (Ph IV and V)	100,740
S	5734 (EA/D)	6384 (C)	Mid Halton North Pumping Station Expansion	4,055
Mid Halton WWTP New Effluent Outfall				
S	5945		Mid-Halton Outfall/Equalization Upgrade	44,685
Subtotal				149,480
<b>DUNDAS TRUNK SYSTEM</b>				
S	3798		North Oakville Sewage Pumping Station just north of Dundas east of Neyagawa Blvd. (OAK)	9,788
S	4995		New wastewater Pumping Station on Dundas Street East approximately 550m west of Ninth Line	6,767
S	4996 (D)	6379 (C)	2x400 mm WW Forcemain on Dundas Street from new PS (IPFS #4995) to Eighth Line	5,782
S	3800 (D)	6378 (C)	750 mm WWM on Dundas Street from Eighth Line to Oak Park Blvd.	3,161
S	5891		900 mm WWM on Dundas Street from Oak Park Blvd. to Harman Gate	8,000
S	5892		900 mm WWM on Dundas Street from Harman Gate to new PS (IPFS #3798)	9,718
S	5923		2x750 mm Forcemain east of the bridge from Neyagawa Blvd. to PS on North Park Property (IPFS #3798)	3,414
S	3797		750 mm Forcemain from Neyagawa Blvd. hung from the bridge (over 16 Mile Creek to just west of the bridge (old Fourth Line)	306
S	5893		2nd 750 mm Forcemain from Neyagawa Blvd. hung from the Bridge (over 16 Mile Creek) to just west of the bridge (old Fourth Line)	5,252
S	4997		1200 mm WWM on Dundas Street from just west of bridge (old Fourth Line) to Proudfoot Trail	224
S	5497		1200 mm WWM on Dundas Street from Proudfoot Trail to Third Line	696
Subtotal				53,108
<b>SECONDARY PLAN TRUNKS</b>				
S	3799	3799 (D&C)	600 mm WWM on new North Oakville Road from Neyagawa Blvd. to a new North Oakville SPS (ID3798)	840
S	3799	6215 (D&C)	600 mm WWM on Neyagawa from new North Oakville road to Burnhamthorpe (OAK)	843
S	4994		600mm WWM on new North Oakville HUSP road from Burnhamthorpe Rd. West to Dundas Street	2,163
S	5062 (D)	6426 (C)	600mm WWM from Burnhamthorpe Rd. West on new North Oakville HUSP road to Dundas Street	1,922

S	5063		525mm WWM from Burnhamthorpe Rd. West on new North Oakville HUSP road to Dundas Street	1,550	
				Subtotal	7,318
				<b>TOTAL</b>	<b>209,906</b>

### 3.5 Staged Servicing

In order to accommodate the initial stages of the NOESP development, it will be necessary to implement a “Staged Wastewater Servicing” that could be utilized in advance of the commissioning of the North Oakville Wastewater Pumping Station. AECOM’s recommendations were presented in a Technical Memorandum to the Region’s Zahir Najak dated September 24, 2009 (see Appendix A). In the memorandum, AECOM noted that there is surplus capacity for 900 SDE’s in the existing wastewater sewers to the south of Dundas Street. It was also noted that a minimum of 900 SDE’s are required for the North Oakville pumping station to function. The 900 SDE’s that can connect to the existing wastewater sewers south of Dundas Street may need to be pumped via temporary forcemains or drain by gravity at several locations. Details of the temporary pumping stations and forcemains will be dependant upon location, timing and the number of SDE’s tributary to each connection point. This will be finalized in the Functional Servicing Reports for the affected developments.

In the event that the 900 SDE of allocation is exhausted there may be a period of time where allocation is required and the North Oakville Pumping Stations are not operational. There may be a number of potential solutions, one of which may include investigation of additional downstream capacity in the wastewater system south of Dundas Street or implementing a temporary pump connection if sufficient downstream capacity is not available. Costs associated with any planning approvals required, design, construction or operation and maintenance of the temporary pump connection and its appurtenances will be borne by the Developer(s) and not the Region, including the costs to revert back to the approved permanent connection as per the ASP. All proposed temporary pump connections will need to be coordinated with and approved by the Region. If additional surplus capacity is discovered in the south system above the 900 SDE flow equivalent, utilization of this capacity must be approved by Halton Region.

## 4.0 Timing

### 4.1 General

For major long-term growth, effective timing and phasing of infrastructure construction is key in providing cost effectiveness, while ensuring that adequate capacity exists as it is required.

Fixed infrastructure such as plants and pumping stations may be constructed incrementally, typically in a modular format. By contrast, linear infrastructure such as pipes and manholes must be completed from point A to B, where B outlets to the treatment system or A connects to the supply system.

### 4.2 Water

In this section, information is provided with respect to the water demands to assist the Region in timing the staging of its infrastructure construction. As noted earlier, for most elements, this information must be combined with similar information from other communities in the Region.

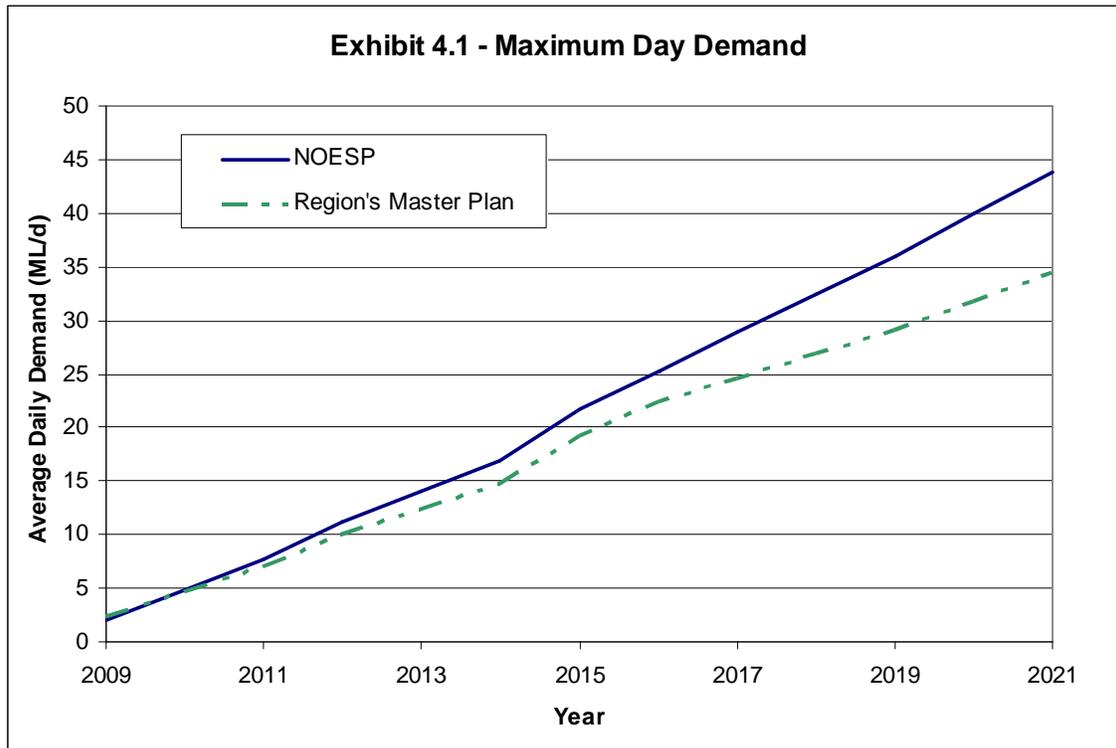
#### 4.2.1 Demand

The water demand created by the Secondary Plan requires various elements of infrastructure to be in place. These elements are:

- Water Treatment
- Pumping Station
- Storage
- Distribution

The capacity requirements of the water treatment and pumping systems are determined based on the maximum daily flow. Exhibit 4.1 shows how the maximum daily flow increases through to build-out to approximately 2021.

Maximum day demands based upon the growth rates assumed in the Region's Master Plan update and DC study are also illustrated. While the total demand (described in Section 2.2) is similar, the rate of growth, and thus demand at different points in time varies.



#### 4.2.2 Timing of Infrastructure Elements

In this section of the ASP, the timing of the various elements of the water system is generally discussed. In the case of many of the elements of the water infrastructure such as storage, pumping, and major distribution, it will be necessary for the Region to run its water model and to understand the timing of the development of other areas of the Region.

##### Treatment

- As the Region has identified there is a need for a greater supply of water to Halton as soon as possible.

##### Water Distribution (mains and pumping)

- It is anticipated that with the addition of storage in Zone 4 in 2002, the supply to the NOESP is adequate to meet the first stages of growth.
- While detailed Regional modeling will be necessary to assess requirements, experience and generally accepted engineering practices would suggest that by adding system storage the service population could be approximately twice what it could be without storage.

- The water system in the NOESP is already well established for Zone 3 and 4. Zone 4 will need to be expanded incrementally as development proceeds. Appropriate major loops will form the backbone of an incrementally growing distribution system.

#### Storage

- Storage has been added in Oakville Zone 4 via an elevated storage tank located on Trafalgar Road. Notwithstanding that the level of storage provided by this elevated storage tank is not sufficient to be considered system storage from the MOE perspective, based on preliminary analysis the existing pumping system has capacity to accommodate considerable growth without the full storage requirement being provided. Therefore, it is anticipated that additional storage is not required in the short-term.
- The need for storage is a function of the rate of development in the overall service area.
- The timing of storage system expansion must be determined in conjunction with the timing of distribution and pumping system capacity expansion. These elements can be implemented on a 'stepped' basis.

### 4.3 Wastewater

In this section, information is provided with respect to wastewater generation to assist the Region in timing the staging of its infrastructure construction. For some infrastructure such as expansion to the Mid-Halton Plant, the need is a function of growth in all areas of Halton, including the NOESP. For other areas, it is a function of the timing of other major elements of infrastructure such as the new Dundas Street Bridge over Sixteen Mile Creek. For the others such as the Dundas Street sewer and pumping stations and upstream sewers, it is a function exclusively of the timing of the development of the NOESP.

#### *4.3.1 System Flows*

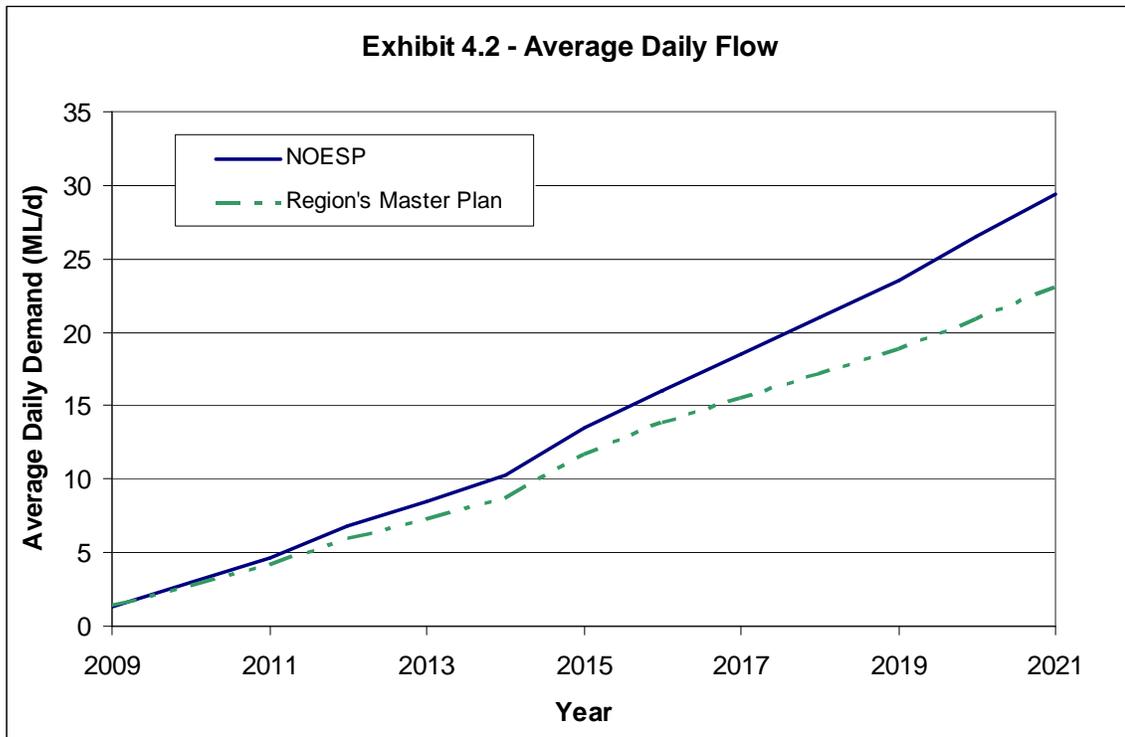
The wastewater generation developed by the Secondary Plan similarly requires various elements of infrastructure to be in place. These elements are:

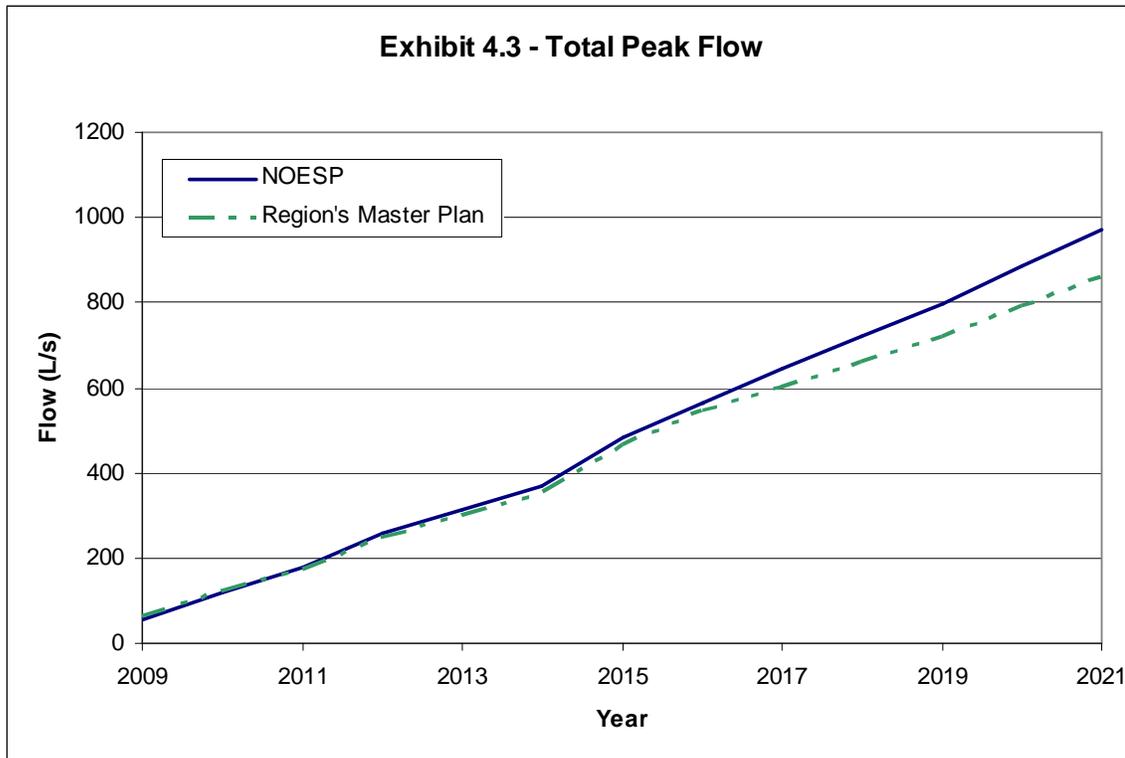
- Wastewater Treatment
- Pumping
- Collection

The capacity requirements of the WWTP are determined based on the Average Daily Flow (including inflow and infiltration) while the pumping

stations and collection systems are determined from the peak flow plus inflow and infiltration. Exhibits 4.2 and 4.3 show how the average daily flow and peak flow increase through to build-out by about 2021.

Flow rates based upon the growth rates assumed in the Region's Master Plan are also illustrated. While the total demand is similar, the rate of growth and these flows at different points in time vary.





#### 4.3.2 *Timing of Infrastructure Elements*

In this section of the ASP, the timing of the various elements of the wastewater system are discussed. Unlike the water system, it is generally possible to predict infrastructure requirements based upon expected flows and the location of development.

The various elements and comments with respect to their timing are discussed here.

##### Treatment

- The Region has already identified a need for increased wastewater treatment capacity.
- The Region is proceeding with an EA for the next expansion of the wastewater plant.
- The actual expansion of the WWTP and the advancement of future expansions should continue to be a priority.

Collection and Pumping

- The wastewater collection and pumping system can be considered in two parts.
- The Dundas Street trunk sewer and the North Oakville Pumping Station are required early to facilitate the development of the NOESP along Dundas Street.
- The pumping station will likely be developed in stages. The logical steps in the development of the pumping station will be determined at the time that the pre-design of the pumping station is undertaken.
- The timing of the sub-trunk sewer system north from Dundas Street will be driven by the timing of development of the NOESP, approved allocation programs and executed agreements.
- Connection of the early stages of the NOESP to the existing systems south of Dundas Street and/or the construction of a staged pumping station and forcemains will allow flexibility in the timing for the completion of the North Oakville Pumping Station and the Dundas Street trunk sewer.

## **5.0 Conclusions**

### **General**

- The proposed development is of a form and quantity similar to what was anticipated by The Region of Halton while completing its “Water and Wastewater Master Plan Review” and “Master Plan Update”.
- This report provides the Region data to assist it in determining the sizing of modules for the Water Treatment Plant and Wastewater Treatment Plant.
- The Financial Plan for NOCBI shall include the necessary provisions to include the internal 400mm diameter watermains as development charge projects.
- The conclusions reached for servicing NOCBI’s approved Secondary Plan in this report are consistent with the Region’s Master Plan.

### **Water**

- There currently exists a strong network of PD3 and PD4 mains in the area of the Community.
- The local major water distribution system can be expanded incrementally.
- The development can occur on an incremental basis.
- The Region’s conceptual plan has been modified to suit the road pattern, but the concept still meets the objective and intent of the Region’s Master Plan.

### **Wastewater**

- The wastewater system requires major upfront infrastructure to be constructed.
- Beyond the initial infrastructure, the linear infrastructure can be constructed on an incremental basis.
- To address the development of the early stages of the NOESP, interim connections may be made to the existing system south of Dundas Street where capacity is proven.

**APPENDIX A**  
**AECOM Technical Memorandum re: North Oakville Servicing**  
**(September 24, 2009)**

**AECOM**

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T 905.886.7022 F 905.886.9494 www.aecom.com

## Technical Memorandum

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**Date:** September 24, 2009  
**To:** Zahir Najak, Halton  
**From:** Miriam Polga  
**Project Number:** 286113301  
**Subject:** **North Oakville Servicing**

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**Distribution:** Stan Holiday, Region of Halton  
Chris Hamel, AECOM

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Please find a summary of our findings regarding the available capacity for allocation in the water and wastewater systems of the North Oakville area.

### Water :

- A significant portion of North Oakville generally east of Neyagawa Blvd will be serviced by Zone 4.
- There is limited existing capacity in the Zone 4 system to support growth. The existing 8th Line infrastructure, including the 8th Line Pumping Station (PS), and the Zone 4 Elevated Tank are the current water supply facilities to the Zone 4 system. Ultimately, the new North Oakville Zone 4 Pumping Station (PS) and the Zone 4 reservoir will provide the additional supply capacity to the area.
- The west areas of North Oakville will be serviced by Zone 3.
- There are existing watermains at the Dundas/Neyagawa area to support extension into new Zone 3 service areas.
- Additional capacity to the Zone 3 system will be provided by the new Zone 3 feedermain to the new North Oakville Zone 4 PS as well as the connecting feedermain along Dundas to the Moore Reservoir feedermain.
- The analysis was undertaken using the 2008 full pipe model which was calibrated with 2007 water usage data.
- Available capacities shown on map are based on 2007 demands and could decrease if any allocation was released after this date.
- SDE calculation is based on the following criteria:
  - Population: 3.2 people/SDE
  - Residential Design Criteria: 330 L/cap/d
  - Max Day PF : 1.9

Wastewater :

- The long term strategy for the North Oakville area is to convey flows generally south to Dundas and westerly along Dundas to the North Oakville East Sewage Pumping Station (NOE SPS) which will pump flows across the Sixteen Mile Creek bridge to gravity sewer system which ultimately outlets to the Mid-Halton Wastewater Treatment Plant.
- Available surplus capacity in the downstream sewer system was evaluated when considering interim servicing requirements
- Review of the development's gravity catchment area was completed to evaluate the possibility of connecting to the sewers south of Dundas Street, based on the potential sewer elevations and topography in the area
- To review the available capacity within the existing sewers south of Dundas, the available skeletonized Master Plan model and recently developed full pipe model was utilized
- Available capacities shown on map are based on most recent available information (2007 flows) and could decrease if any allocation was released after this date
- In order to consider any potential additional flows, flow monitoring of the sewer system was undertaken.
- SDE calculation is based on the following criteria:
  - Population: 3.2 people/SDE
  - Residential Design Criteria: 275 L/cap/d
  - Area: 20 SDEs/ha
  - Peak Extraneous Flow: 0.286 L/s/ha
  - Peaking Factor: Harmon Formula

Attached are two maps depicting the approximate available capacities in the existing Zone 3 and Zone 4 water system and in the existing sewer system south of Dundas Street.

The maximum allowable SDEs under interim water servicing in Oakville Zone 4 is approximately 1500 SDEs. The maximum allowable SDEs under interim wastewater servicing to the south of Dundas St. is approximately 900 SDEs. Approximately 900 SDEs are also required to establish minimum flows for the NOE sewage pumping station operation.



HWY 407

Potential PRVs to create sub-zone 4A

BURNHAMTHORPE RD WEST

ELM GAWA BLVD

STEELES AVE

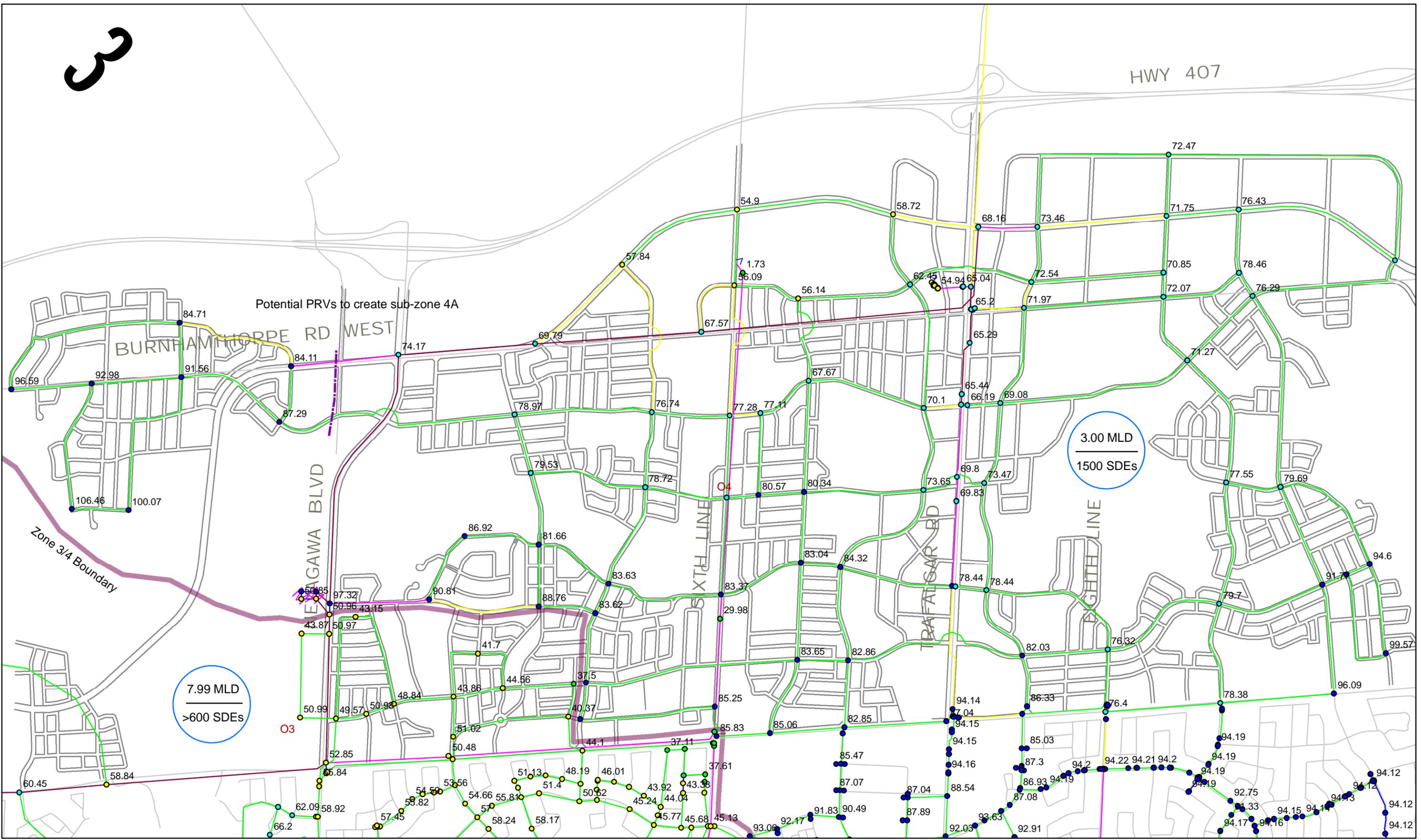
TRAFALGAR RD

WILLOW LINE

Zone 3/4 Boundary

3.00 MLD  
1500 SDEs

7.99 MLD  
>600 SDEs

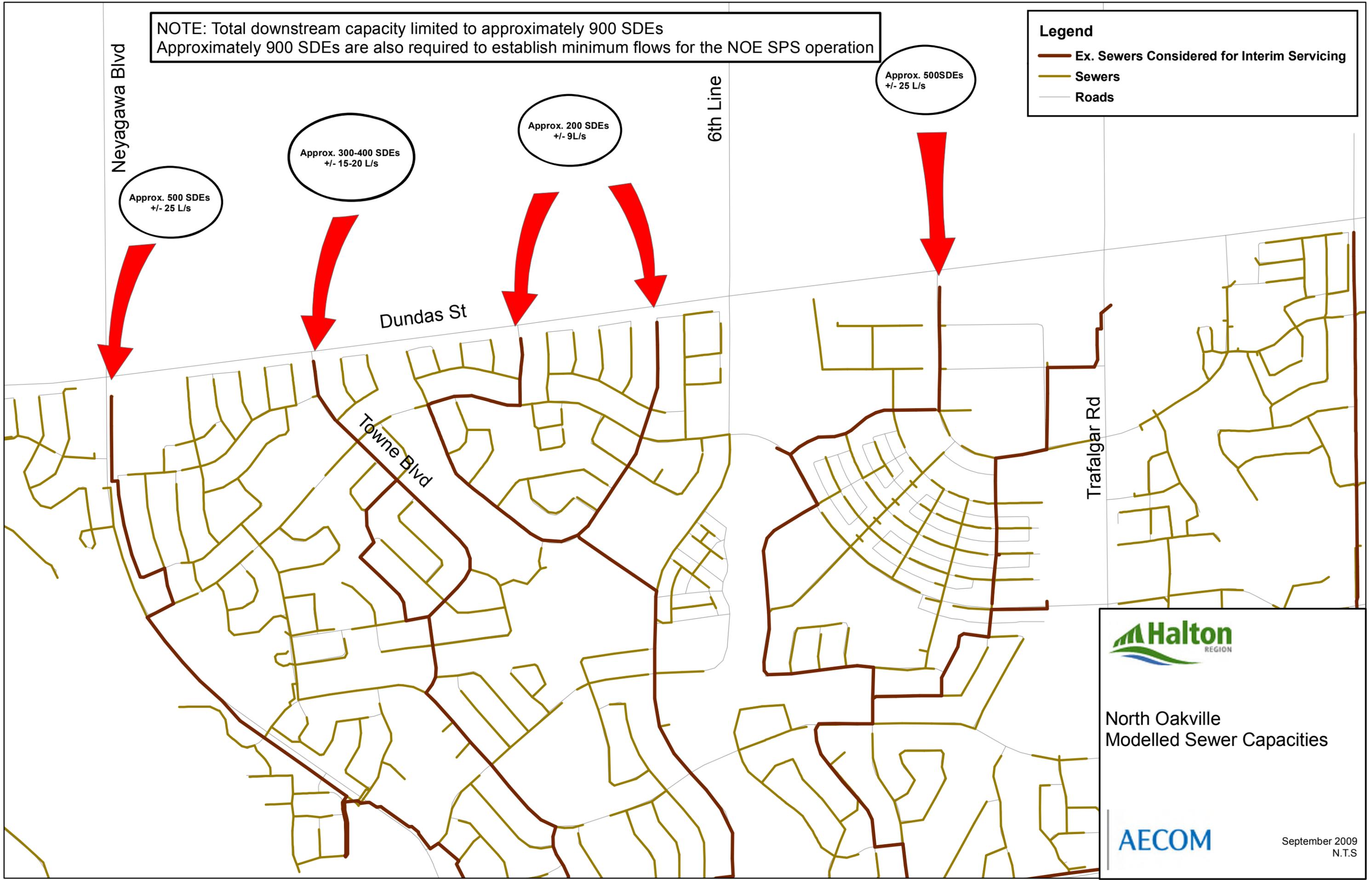


North Oakville Development Plan  
Max Day Pressures (psi) and System Capacities

NOTE: Total downstream capacity limited to approximately 900 SDEs  
Approximately 900 SDEs are also required to establish minimum flows for the NOE SPS operation

**Legend**

- Ex. Sewers Considered for Interim Servicing
- Sewers
- Roads



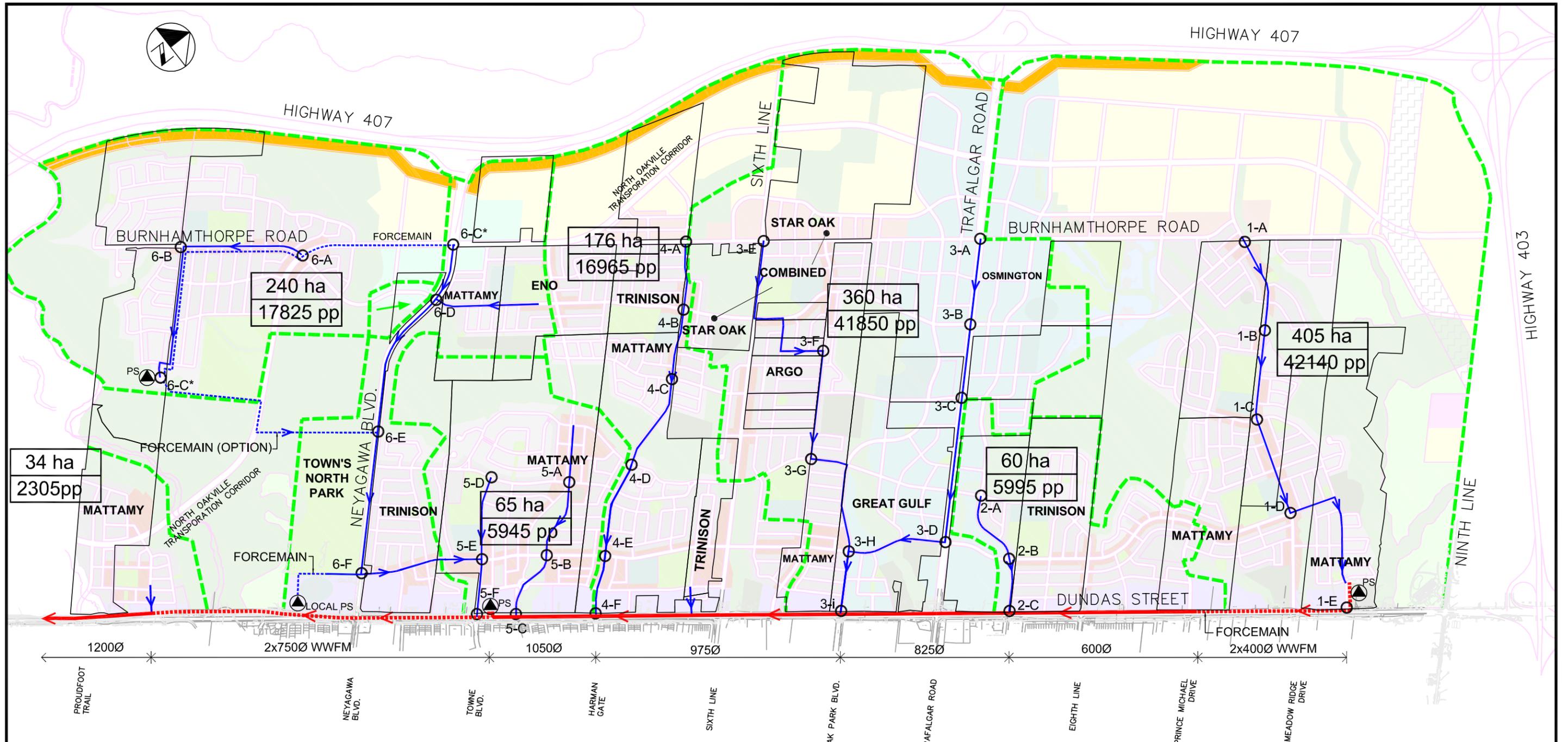
North Oakville  
Modelled Sewer Capacities



September 2009  
N.T.S.

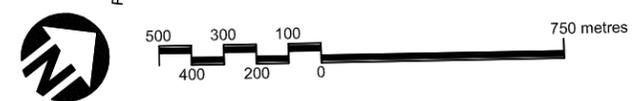
**APPENDIX B**  
**Wastewater Drainage Plans, Design Sheets & Sub-Trunk Information**

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**LEGEND**

- DUNDAS STREET TRUNK SEWER
- DUNDAS STREET FORCEMAIN
- SUB-TRUNK SEWER
- SUB-TRUNK FORCEMAIN
- WASTEWATER PUMPING STATION (APPROXIMATE LOCATION)
- SUB-TRUNK DRAINAGE BOUNDARY
- DEVELOPABLE AREA POPULATION



PROJECT					
NORTH OAKVILLE COMMUNITY BUILDERS INC.					
TITLE		Checked	M.A.E.	Drawn	T.Y.
ULTIMATE WASTEWATER DRAINAGE PLAN		Date	AUGUST 2010	Proj. No.	10-02076
		Scale	NTS	Exhibit No.	







**APPENDIX C**  
**Wastewater – Neyagawa / Dundas Pumping Station**



LIMIT OF MATTAMY SUBDIVISION  
( PENDING )

STORM OUTLET TO SWM  
POND (BY OTHERS)

POTENTIAL 6M WIDE  
SERVICE LANE

WASTEWATER PUMPING STATION  
WET WELL & DIESEL GEN SET  
WITHIN BUILDING FOOTPRINT  
( 1 STORY BUILDING )

SWM POND

EMERGENCY OVERFLOW  
OUTLET TO BY-PASS SWM POND

STREET 'E'

KALIRAJ, AVTAR

DWELLING

EX. GRAVEL DRIVEWAY

MHI

600Ø SAN

MH

1050Ø SAN

TWIN 750Ø FORCEMAIN

EX. DITCH

EX. EDGE OF SHOULDER

EX. EDGE OF PAVEMENT

DUNDAS STREET EAST

TOWNE  
BLVD.

CLIENT  
NORTH OAKVILLE COMMUNITY BUILDERS INC.

TITLE  
**PUMPING STATION  
ON DUNDAS STREET EAST  
( MATTAMY SWM POND )**



100 Commerce Valley Dr. West, Thornhill, ON Canada L3T 0A1  
t: 905.882.1100 f: 905.882.0055 www.mmm.ca

Checked	M.A.E.	Drawn	10/12 Cad
Date	OCT 2009	Proj. No.	10-02076
Scale	1: 500	Exhibit No.	A.2

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**APPENDIX D**  
**Water Demand Calculations**

**Calculation for Table 2.6 - Linear Infrastructure - NOESP Population Projections**

	<b>Residential</b>	<b>Commercial</b>	<b>Industrial</b>	<b>Institutional</b>	<b>Total</b>
Secondary Plan Area (ha)	498.2	70.8	248.0	41.7	
Equivalent Population Factor	41.0 (units/ha)	100.0 (ppl/ha)	43.0 (ppl/ha)	81.0 (ppl/ha)	
Equivalent Population	60,000	7,080	10,664	3,378	
Average Day Demand Rate (l/cap/day)	330.0	213.0	302.0	74.0	
Average Day Demand (ML/day)	19.8	1.5	3.2	0.2	24.8
Maximum Day Peaking Factor	1.9	1.9	1.9	1.9	
Maximum Day Demand (ML/day)	37.6	2.9	6.1	0.5	47.1
Peak Hour Peaking Factor	3.0	3.0	3.0	3.0	
Peak Hour Demand (ML/day)	59.4	4.5	9.7	0.7	74.3

**Calculation for Table 2.7 - Flow Demands - Linear Infrastructure (Region Population Projections)**

	<b>Residential</b>	<b>Commercial</b>	<b>Industrial</b>	<b>Institutional</b>	<b>Total</b>
Secondary Plan Area (ha)	498.2	70.8	248.0	41.7	
Equivalent Population Factor (units/ha)	37.6 (units/ha)	100.0 (ppl/ha)	43.0 (ppl/ha)	81.0 (ppl/ha)	
Equivalent Population	55,000	7,080	10,664	3,378	
Average Day Demand Rate (l/cap/day)	330.0	213.0	302.0	74.0	
Average Day Demand (ML/day)	18.2	1.5	3.2	0.2	23.1
Maximum Day Peaking Factor	1.9	1.9	1.9	1.9	
Maximum Day Demand (ML/day)	34.5	2.9	6.1	0.5	43.9
Peak Hour Peaking Factor	3.0	3.0	3.0	3.0	
Peak Hour Demand (ML/day)	54.5	4.5	9.7	0.7	69.4

**Calculation for Table 2.9 -Incremental Total Pumping Station Capacities**

Maximum Day Demand from Region Populations	43.9	ML/day or	509	l/s
Maximum Day Demand from Secondary Plan Populations	47.1	ML/day or	545	l/s

**APPENDIX E**  
**Results of Water Distribution Modelling**

Node Table for Maximum Day Demand

ID	Demand (ML/d)	Elevation (m)	Head (m)	Pressure (psi)
NO-233	0	167.5	197.9	43.1
NO-191	0.32	167.5	197.9	43.2
NO-226	0.36	167.1	197.8	43.6
NO-228	0.16	167.1	197.8	43.7
NO-229	0.15	167.1	197.8	43.7
NO-190	0.32	167.1	197.9	43.7
NO-120	0.3	167.1	197.9	43.7
NO-231	0.21	167.0	197.8	43.9
NO-232	0	167.0	197.9	43.9
NO-225	0.47	166.5	197.8	44.5
NO-224	0.29	166.5	197.9	44.7
NO-222	0	166.0	197.9	45.4
NO-117	0.66	165.5	197.9	46.1
NO-114	0.71	165.0	197.9	46.7
NO-115	1.29	164.5	197.8	47.4
NO-113	0.32	161.5	197.9	51.8
NO-217	0	161.0	198.0	52.6
NO-111	0.14	161.0	198.0	52.6
NO-181	2.59	194.0	231.2	52.9
NO-192	0.65	160.0	197.9	53.9
NO-112	0.23	160.0	197.9	53.9
NO-179	0.6	193.0	231.3	54.5
NO-109	0.45	159.5	198.0	54.7
NO-188	0.1	192.5	231.3	55.1
NO-110	0.34	159.0	197.9	55.3
NO-182	1.19	191.5	230.8	55.9
NO-180	1.26	192.0	231.4	56.1
NO-178	1.53	188.0	230.9	61.0
NO-183	1.32	185.5	230.6	64.1
NO-171	0.68	186.0	231.4	64.5
NO-156	1.43	184.0	231.3	67.2
NO-200	0	182.5	230.7	68.5
NO-153	1.03	182.5	231.2	69.2
NO-176	0.81	181.5	230.6	69.8
NO-155	0.8	182.0	231.3	70.0
NO-185	1.26	181.0	230.4	70.2
NO-187	3.96	180.5	230.2	70.6
NO-152	0.49	181.0	230.7	70.6
NO-184	0.84	180.5	230.5	71.1
NO-174	0.4	180.5	230.7	71.3
NO-177	0.38	180.5	230.8	71.5
NO-173	0.38	180.5	231.0	71.8
NO-203	0	180.5	231.6	72.6
NO-149	0.96	179.5	231.3	73.7
NO-148	0.9	179.5	231.4	73.7
NO-163	0.3	162.5	214.9	74.6
NO-221	1.74	177.5	230.0	74.6
NO-150	1.74	177.5	230.2	74.9
NO-186	1.27	177.5	230.4	75.2
NO-151	0.75	177.5	230.6	75.5
NO-159	0.85	178.0	231.5	76.0
NO-194	0	178.0	231.5	76.1
NO-157	0.31	177.5	231.4	76.6
NO-124	1.47	177.5	231.4	76.6
NO-158	0.23	177.5	231.5	76.7
NO-130	1.4	176.5	230.7	77.1
NO-175	0.43	176.0	230.6	77.6
NO-199	0	175.8	230.7	78.1
NO-144	0.93	176.5	231.5	78.1
NO-160	1.54	176.5	231.5	78.2
NO-102	0.43	176.0	231.3	78.6
NO-210	0	176.0	231.4	78.7
NO-131	0.7	176.0	231.4	78.8
NO-143	0.43	176.0	231.5	78.9

Node Table for Maximum Day Demand

ID	Demand (ML/d)	Elevation (m)	Head (m)	Pressure (psi)
NO-129	1.49	175.0	230.7	79.2
NO-197	0	175.5	231.4	79.5
NO-145	0.53	175.5	231.5	79.6
NO-125	1.5	175.0	231.0	79.6
NO-209	0	175.0	231.4	80.1
NO-147	0.41	175.0	231.4	80.2
NO-146	0.35	175.0	231.4	80.2
NO-168	0.72	174.5	231.0	80.4
NO-164	0.46	158.0	214.9	80.9
NO-142	0.87	174.5	231.6	81.2
NO-167	1.33	173.5	230.7	81.3
NO-198	0	174.0	231.5	81.7
NO-215	0	173.0	230.6	81.8
NO-123	0.61	173.5	231.5	82.4
NO-134	0.44	173.0	231.4	83.1
NO-122	0.81	173.0	231.5	83.1
NO-208	0.65	173.0	231.5	83.1
NO-235	0	173.0	231.5	83.1
NO-135	0.35	173.0	231.5	83.2
NO-106	0.29	173.0	231.5	83.2
NO-213	0.17	173.0	231.5	83.2
NO-234	0.47	173.0	231.5	83.2
NO-136	0.56	173.0	231.6	83.3
NO-137	0.58	173.0	231.6	83.3
NO-204	0	173.0	231.7	83.4
NO-193	0	172.3	231.2	83.8
NO-121	1.06	172.5	231.5	83.8
NO-195	0	172.5	231.5	83.9
NO-133	0.58	172.0	231.4	84.5
NO-196	0	172.0	231.5	84.6
NO-220	0	172.0	231.5	84.6
NO-219	0	172.0	231.5	84.6
NO-206	0	172.0	231.5	84.6
NO-212	0	172.0	231.5	84.6
NO-218	0	172.0	231.5	84.6
NO-237	0	172.0	231.5	84.6
NO-161	0.46	171.5	231.2	84.9
NO-119	0.34	171.5	231.5	85.3
NO-107	0.19	171.5	231.5	85.3
NO-108	0.43	171.0	231.5	86.0
NO-211	0	171.0	231.6	86.1
NO-141	0.54	171.0	231.7	86.3
NO-214	0	169.0	231.0	88.2
NO-162	1.65	168.5	230.6	88.3
NO-138	1.08	169.5	231.7	88.4
NO-227	0	169.0	231.6	89.0
NO-165	0.92	167.5	230.6	89.6
NO-139	0.85	168.5	231.8	90.0
NO-127	0.48	166.5	230.9	91.5
NO-126	0.71	166.5	230.9	91.5
NO-118	0.08	166.5	231.5	92.5
NO-116	1	166.5	231.8	92.8
NO-205	0	166.5	232.0	93.1
NO-166	0.51	165.0	230.6	93.2
NO-223	0	166.0	232.1	93.9
NO-128	0.44	164.5	230.9	94.3
NO-230	0	165.0	231.6	94.6
NO-238	0	163.5	231.0	95.9
NO-101	0.16	163.5	231.0	96.0
NO-189	0.28	161.0	231.0	99.5

Pipe Table for Maximum Day Demand

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (ML/d)	Velocity (m/s)	Headloss (m)	HL/1000 (m/km)	Status
NO-1000	NO-101	NO-102	588.76	400	130	-4.31	0.40	0.26	0.44	Open
NO-1001	NO-102	WJ-3106-O	19.41	400	130	-0.24	0.02	0.00	0.00	Open
NO-1002	NO-102	NO-103	600.28	400	130	-6.11	0.56	0.50	0.83	Open
NO-1011	NO-105	NO-106	541.87	600	130	4.06	0.17	0.03	0.05	Open
NO-1013	NO-106	NO-107	374.65	600	130	2.76	0.11	0.01	0.03	Open
NO-1014	NO-107	NO-196	150.1	300	120	0.96	0.16	0.02	0.13	Open
NO-1015	NO-106	NO-195	70.9	300	120	1.35	0.22	0.02	0.24	Open
NO-1016	NO-196	NO-195	350.61	200	110	-0.15	0.05	0.01	0.03	Open
NO-1017	NO-107	NO-108	294.17	600	130	1.62	0.07	0.00	0.01	Open
NO-1018	NO-119	NO-220	374.63	600	130	-1.59	0.07	0.00	0.01	Open
NO-1019	NO-119	NO-121	152.67	300	120	1.30	0.21	0.03	0.22	Open
NO-1020	NO-121	NO-196	317.36	200	110	-0.22	0.08	0.02	0.07	Open
NO-1021	NO-121	NO-235	278.11	300	120	0.35	0.06	0.01	0.02	Open
NO-1022	NO-122	NO-195	254.27	300	120	-1.21	0.20	0.05	0.19	Open
NO-1023	NO-122	NO-123	937.39	300	120	0.19	0.03	0.01	0.01	Open
NO-1024	NO-237	NO-194	413.5	200	110	0.06	0.02	0.00	0.01	Open
NO-1025	NO-103	NO-194	172.05	300	120	3.39	0.56	0.23	1.32	Open
NO-1026	NO-123	NO-124	440.4	300	120	0.88	0.14	0.05	0.11	Open
NO-1027	NO-124	NO-194	143.83	300	120	-2.77	0.45	0.13	0.91	Open
NO-1028	NO-194	NO-193	592.36	200	110	0.68	0.25	0.33	0.56	Open
NO-1029	NO-102	NO-193	181.64	300	120	1.61	0.26	0.06	0.33	Open
NO-1030	NO-124	NO-125	675.85	300	120	2.26	0.37	0.42	0.62	Open
NO-1031	NO-193	NO-125	344.35	300	120	2.28	0.37	0.22	0.63	Open
NO-1032	NO-125	NO-126	569.99	300	120	1.22	0.20	0.11	0.20	Open
NO-1033	NO-126	NO-101	564.84	400	130	-3.11	0.29	0.13	0.24	Open
NO-1034	NO-126	NO-127	133.76	300	130	0.55	0.09	0.01	0.04	Open
NO-1035	NO-127	NO-128	134.04	300	120	0.43	0.07	0.00	0.03	Open
NO-1036	NO-128	NO-189	477.58	200	110	-0.40	0.15	0.10	0.21	Open
NO-1037	NO-189	NO-127	589.45	200	110	0.35	0.13	0.10	0.17	Open
NO-1038	NO-128	NO-129	685.96	200	110	0.39	0.14	0.14	0.20	Open
NO-1039	NO-129	NO-126	554.38	400	120	-3.06	0.28	0.15	0.27	Open
NO-1040	NO-129	NO-130	283.5	200	110	0.13	0.05	0.01	0.02	Open
NO-1041	NO-125	NO-130	639.59	300	120	1.83	0.30	0.27	0.42	Open
NO-1042	NO-132	NO-131	168.58	300	120	1.01	0.17	0.02	0.14	Open
NO-1043	NO-131	NO-123	423.46	300	120	-0.89	0.15	0.05	0.11	Open
NO-1044	NO-131	NO-124	811.06	300	120	0.08	0.01	0.00	0.00	Open
NO-1045	NO-132	NO-133	603.53	300	120	0.25	0.04	0.01	0.01	Open
NO-1046	NO-133	NO-122	489.02	300	120	-0.71	0.12	0.04	0.07	Open
NO-1047	NO-119	NO-135	356.67	600	130	0.74	0.03	0.00	0.00	Open
NO-1048	NO-135	NO-208	140.61	300	120	1.47	0.24	0.04	0.28	Open
NO-1049	NO-121	NO-208	392.8	200	110	0.10	0.04	0.01	0.02	Open
NO-1050	NO-208	NO-134	315.71	300	120	0.92	0.15	0.04	0.12	Open
NO-1051	NO-134	NO-133	206.99	300	120	0.49	0.08	0.01	0.04	Open
NO-1052	NO-133	NO-209	410.83	300	120	0.87	0.14	0.04	0.11	Open
NO-1053	NO-209	NO-148	237.11	300	120	0.92	0.15	0.03	0.12	Open
NO-1054	NO-209	NO-210	505.86	200	110	-0.04	0.02	0.00	0.00	Open
NO-1055	NO-210	NO-131	147.35	300	120	-1.12	0.18	0.02	0.17	Open
NO-1056	NO-210	NO-149	412.62	300	120	1.08	0.18	0.06	0.16	Open
NO-1057	NO-216	NO-149	129.96	300	120	1.61	0.26	0.04	0.33	Open
NO-1058	NO-135	NO-198	264.42	600	130	5.29	0.22	0.02	0.09	Open
NO-1059	NO-198	NO-197	410.08	200	110	0.34	0.12	0.06	0.16	Open
NO-1060	NO-197	NO-134	138.92	300	120	-0.74	0.12	0.01	0.08	Open
NO-1061	NO-198	NO-145	239.55	600	130	4.95	0.20	0.02	0.08	Open
NO-1062	NO-145	NO-146	167.95	300	120	1.51	0.25	0.05	0.30	Open
NO-1063	NO-146	NO-147	238.24	300	120	0.99	0.16	0.03	0.14	Open
NO-1064	NO-147	NO-197	233.88	300	120	-1.07	0.18	0.04	0.16	Open
NO-1065	NO-147	NO-148	619.95	300	120	0.59	0.10	0.03	0.05	Open
NO-1066	NO-143	NO-144	610.25	300	120	0.45	0.07	0.02	0.03	Open
NO-1067	NO-144	NO-145	423.73	300	120	-0.20	0.03	0.00	0.01	Open
NO-1068	NO-160	NO-143	312.63	300	120	0.88	0.14	0.03	0.11	Open
NO-1069	NO-144	NO-159	395.51	300	120	-0.29	0.05	0.01	0.01	Open
NO-1071	NO-211	NO-230	145.31	300	120	-1.12	0.18	0.02	0.17	Open
NO-1078	NO-202	NO-160	681.37	300	120	1.95	0.32	0.32	0.47	Open
NO-1079	NO-160	NO-159	715.31	300	120	0.67	0.11	0.05	0.07	Open
NO-1080	NO-159	NO-158	406.15	300	120	0.46	0.08	0.01	0.03	Open
NO-1081	NO-160	NO-170	550.01	300	120	-1.14	0.19	0.10	0.18	Open
NO-1082	NO-170	NO-180	601.7	300	120	1.52	0.25	0.18	0.30	Open
NO-1083	NO-180	NO-236	427.47	300	120	-1.19	0.19	0.08	0.19	Open
NO-1084	NO-180	NO-181	682.16	300	120	1.45	0.24	0.19	0.27	Open
NO-1085	NO-181	NO-179	383.79	400	130	-3.16	0.29	0.09	0.25	Open

Pipe Table for Maximum Day Demand

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (ML/d)	Velocity (m/s)	Headloss (m)	HL/1000 (m/km)	Status
NO-1086	NO-171	NO-179	356.09	300	120	0.99	0.16	0.05	0.14	Open
NO-1087	NO-201	NO-179	235.71	400	120	4.13	0.38	0.11	0.47	Open
NO-1088	NO-179	NO-188	358.54	300	120	1.37	0.22	0.09	0.25	Open
NO-1089	NO-188	NO-156	432.15	300	120	-0.82	0.13	0.04	0.10	Open
NO-1090	NO-158	NO-157	153.07	300	120	1.74	0.28	0.06	0.38	Open
NO-1091	NO-157	NO-146	420.54	200	110	-0.17	0.06	0.02	0.05	Open
NO-1092	NO-158	NO-145	418.46	600	130	-2.71	0.11	0.01	0.03	Open
NO-1093	NO-157	NO-156	312.3	300	120	1.60	0.26	0.10	0.33	Open
NO-1094	NO-156	NO-147	567.36	300	120	-1.07	0.18	0.09	0.16	Open
NO-1095	NO-156	NO-155	619.39	300	120	0.42	0.07	0.02	0.03	Open
NO-1096	NO-155	NO-148	432.73	300	120	-1.13	0.19	0.07	0.17	Open
NO-1097	NO-188	NO-178	589.94	300	120	2.10	0.34	0.32	0.54	Open
NO-1098	NO-178	NO-155	667.28	300	120	-2.04	0.33	0.34	0.51	Open
NO-1099	NO-155	NO-154	202.49	300	120	-1.28	0.21	0.04	0.22	Open
NO-1100	NO-154	NO-153	198.25	300	120	2.66	0.44	0.17	0.84	Open
NO-1101	NO-149	NO-153	430.88	300	120	1.72	0.28	0.16	0.38	Open
NO-1102	WJ-1450-M	NO-173	266.72	400	120	6.58	0.61	0.30	1.11	Open
NO-1103	NO-173	NO-153	526.34	300	120	-1.45	0.24	0.14	0.27	Open
NO-1104	NO-153	NO-152	1,015.81	300	120	1.91	0.31	0.46	0.46	Open
NO-1105	NO-173	NO-174	720.75	400	120	4.13	0.38	0.34	0.47	Open
NO-1106	NO-174	NO-152	382.11	300	120	-0.57	0.09	0.02	0.05	Open
NO-1107	NO-174	NO-175	435.78	400	120	2.38	0.22	0.07	0.17	Open
NO-1108	NO-152	NO-151	476.4	300	120	1.20	0.20	0.09	0.19	Open
NO-1109	NO-152	NO-200	354.4	300	120	-0.35	0.06	0.01	0.02	Open
NO-1110	NO-200	NO-130	365.82	300	120	-0.56	0.09	0.02	0.05	Open
NO-1111	NO-200	NO-199	250.92	200	110	0.21	0.08	0.02	0.06	Open
NO-1112	NO-129	NO-199	381.25	400	120	1.84	0.17	0.04	0.10	Open
NO-1113	NO-151	NO-199	648.51	400	120	-2.05	0.19	0.08	0.13	Open
NO-1114	NO-151	NO-175	137.27	400	120	0.42	0.04	0.00	0.01	Open
NO-1115	NO-151	NO-150	820.77	300	120	2.07	0.34	0.43	0.53	Open
NO-1116	NO-175	NO-186	326.72	300	120	2.38	0.39	0.22	0.68	Open
NO-1117	NO-174	NO-176	130.83	300	120	1.92	0.31	0.06	0.46	Open
NO-1118	NO-176	NO-177	686.39	300	120	-1.48	0.24	0.19	0.28	Open
NO-1119	NO-173	NO-177	143.81	300	120	3.52	0.58	0.20	1.41	Open
NO-1120	NO-177	NO-178	661.23	300	120	-1.20	0.20	0.13	0.19	Open
NO-1121	NO-178	NO-182	388.73	300	120	1.41	0.23	0.10	0.26	Open
NO-1122	NO-181	NO-182	823.02	300	120	2.02	0.33	0.41	0.50	Open
NO-1123	NO-182	NO-183	439.42	300	120	2.23	0.37	0.27	0.61	Open
NO-1124	NO-183	NO-184	312.07	300	120	0.92	0.15	0.04	0.12	Open
NO-1125	NO-177	NO-184	287	300	120	2.86	0.47	0.28	0.96	Open
NO-1126	NO-184	NO-185	672.36	300	120	1.30	0.21	0.15	0.22	Open
NO-1127	NO-184	NO-187	1,048.72	300	120	1.65	0.27	0.36	0.35	Open
NO-1128	NO-185	NO-187	310.75	300	120	2.38	0.39	0.21	0.68	Open
NO-1129	NO-185	NO-176	292.44	300	120	-2.58	0.42	0.23	0.80	Open
NO-1130	NO-185	NO-186	373.49	300	120	0.24	0.04	0.00	0.01	Open
NO-1131	NO-186	NO-150	886.19	300	120	1.34	0.22	0.21	0.24	Open
NO-1132	NO-187	NO-150	1,656.68	300	120	0.06	0.01	0.00	0.00	Open
NO-1133	NO-158	NO-201	441.36	600	130	1.22	0.05	0.00	0.01	Open
NO-1135	NO-148	NO-216	188.35	300	120	-0.53	0.09	0.01	0.04	Open
NO-1136	NO-167	NO-168	678.08	300	120	-2.10	0.34	0.37	0.54	Open
NO-1137	NO-150	NO-221	421.41	300	120	1.74	0.28	0.16	0.38	Open
NO-1138	NO-171	NO-201	175.84	300	120	-1.67	0.27	0.06	0.35	Open
NO-1140	NO-220	NO-108	149.01	600	130	-1.18	0.05	0.00	0.01	Open
NO-2002	NO-111	NO-112	161.86	300	120	1.84	0.30	0.07	0.42	Open
NO-2003	NO-112	NO-110	239.87	300	120	0.34	0.06	0.00	0.02	Open
NO-2004	NO-112	NO-113	152.61	300	120	1.27	0.21	0.03	0.21	Open
NO-2005	NO-113	NO-114	311.45	300	120	0.86	0.14	0.03	0.10	Open
NO-2006	NO-114	NO-192	154.14	300	120	-1.30	0.21	0.03	0.22	Open
NO-2007	NO-192	NO-109	143.59	300	120	-2.23	0.36	0.09	0.61	Open
NO-2008	NO-192	NO-191	458.6	300	120	0.27	0.04	0.01	0.01	Open
NO-2009	NO-191	NO-232	218.24	300	120	-0.52	0.09	0.01	0.04	Open
NO-2010	NO-118	NO-212	526.69	300	120	0.48	0.08	0.02	0.03	Open
NO-2011	NO-212	NO-206	225.03	300	120	0.07	0.01	0.00	0.00	Open
NO-2012	NO-211	NO-206	561.13	300	120	0.57	0.09	0.03	0.05	Open
NO-2013	NO-118	NO-211	188.67	300	120	-0.55	0.09	0.01	0.05	Open
NO-2014	NO-190	NO-120	209.33	300	120	-0.68	0.11	0.01	0.07	Open
NO-2015	NO-190	NO-191	158.36	200	110	-0.47	0.17	0.05	0.29	Open
NO-2016	NO-115	NO-233	173.18	300	120	-0.66	0.11	0.01	0.06	Open
NO-2017	NO-115	NO-114	258.59	300	120	-1.01	0.16	0.04	0.14	Open
NO-2018	NO-217	NO-222	678.5	300	120	0.87	0.14	0.07	0.11	Open

Pipe Table for Maximum Day Demand

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (ML/d)	Velocity (m/s)	Headloss (m)	HL/1000 (m/km)	Status
NO-2019	NO-117	NO-113	472.4	300	120	-0.09	0.01	0.00	0.00	Open
NO-2020	NO-114	NO-225	399.88	200	110	0.45	0.16	0.10	0.26	Open
NO-2021	NO-115	NO-226	349.93	200	110	0.38	0.14	0.07	0.19	Open
NO-2022	NO-230	NO-137	219.37	300	120	-0.81	0.13	0.02	0.09	Open
NO-2025	NO-224	NO-117	66.95	300	120	0.57	0.09	0.00	0.05	Open
NO-2026	NO-205	NO-139	310.57	600	130	13.76	0.56	0.16	0.52	Open
NO-2027	NO-139	NO-116	150.12	600	130	11.23	0.46	0.05	0.36	Open
NO-2028	NO-116	NO-138	443.99	600	130	10.23	0.42	0.13	0.30	Open
NO-2029	NO-138	NO-137	278.11	600	130	8.21	0.34	0.06	0.20	Open
NO-2030	NO-137	NO-136	172.97	300	120	0.55	0.09	0.01	0.05	Open
NO-2031	NO-139	NO-141	348.06	300	120	1.68	0.28	0.12	0.36	Open
NO-2032	NO-141	NO-142	457.99	300	120	1.14	0.19	0.08	0.18	Open
NO-2033	NO-142	NO-138	320.27	300	120	-0.63	0.10	0.02	0.06	Open
NO-2034	NO-142	NO-136	397.91	300	120	0.90	0.15	0.04	0.11	Open
NO-2035	NO-136	NO-234	467.74	300	120	0.89	0.15	0.05	0.11	Open
NO-2036	NO-213	NO-206	398.51	300	120	0.15	0.02	0.00	0.00	Open
NO-2037	NO-169	NO-203	153.94	300	120	3.38	0.55	0.20	1.31	Open
NO-2038	NO-162	NO-8004	8.59	300	120	0.59	0.10	0.00	0.05	Open
NO-2039	NO-203	NO-168	401.68	300	120	3.38	0.55	0.53	1.31	Open
NO-2040	NO-168	NO-214	300.93	300	120	0.56	0.09	0.01	0.05	Open
NO-2041	NO-215	NO-167	1,057.50	300	120	-0.77	0.13	0.09	0.08	Open
NO-2042	NO-215	NO-165	365.07	300	120	0.43	0.07	0.01	0.03	Open
NO-2043	NO-165	NO-162	379.31	300	120	-0.82	0.13	0.04	0.10	Open
NO-2044	NO-162	NO-214	380.2	300	120	-3.07	0.50	0.42	1.10	Open
NO-2045	NO-214	NO-161	309.38	300	120	-2.51	0.41	0.23	0.76	Open
NO-2046	NO-161	NO-204	424.54	300	120	-2.97	0.49	0.44	1.03	Open
NO-2047	NO-165	NO-8006	16.11	300	120	0.17	0.03	0.00	0.00	Open
NO-2048	NO-8006	NO-164	675.49	300	120	0.17	0.03	0.00	0.01	Open
NO-2049	NO-215	NO-166	694.29	300	120	0.34	0.06	0.01	0.02	Open
NO-2050	NO-166	NO-165	418.64	300	120	-0.17	0.03	0.00	0.01	Open
NO-2052	NO-164	NO-163	288.84	300	120	-0.29	0.05	0.00	0.01	Open
NO-2053	NO-8004	NO-163	819.64	300	120	0.59	0.10	0.04	0.05	Open
NO-2054	NO-217	NO-111	391.36	300	120	-0.43	0.07	0.01	0.03	Open
NO-2060	NO-217	NO-111	391.36	300	120	-0.43	0.07	0.01	0.03	Open
NO-2061	NO-219	NO-220	92.41	300	120	0.41	0.07	0.00	0.03	Open
NO-2062	NO-218	NO-212	58.02	300	120	-0.41	0.07	0.00	0.03	Open
NO-2063	NO-101	NO-238	307.24	400	120	1.04	0.10	0.01	0.04	Open
NO-2064	NO-222	NO-224	145.1	300	120	0.87	0.14	0.02	0.11	Open
NO-2066	NO-223	NO-205	146.23	600	120	13.76	0.56	0.09	0.60	Open
NO-2067	NO-225	NO-226	392.34	200	110	-0.02	0.01	0.00	0.00	Open
NO-2068	NO-233	NO-228	72.65	200	110	0.17	0.06	0.00	0.04	Open
NO-2069	NO-228	NO-229	268.88	200	110	0.01	0.01	0.00	0.00	Open
NO-2070	NO-233	NO-190	74.58	300	120	-0.83	0.14	0.01	0.10	Open
NO-2071	NO-229	NO-231	71.51	200	110	-0.14	0.05	0.00	0.03	Open
NO-2072	NO-231	NO-120	136.70	200	110	-0.35	0.13	0.02	0.17	Open
NO-2073	NO-227	NO-230	296.46	200	110	0.31	0.11	0.04	0.13	Open
NO-2074	NO-227	NO-138	270.86	200	110	-0.31	0.11	0.04	0.13	Open
NO-2075	NO-120	NO-232	176.82	300	120	-1.33	0.22	0.04	0.23	Open
NO-2076	NO-206	NO-119	177.67	300	120	0.79	0.13	0.02	0.09	Open
NO-2077	NO-137	NO-234	496.43	600	130	6.27	0.26	0.06	0.12	Open
NO-2078	NO-234	NO-213	78.28	600	130	6.69	0.27	0.01	0.14	Open
NO-2079	NO-134	NO-235	493.92	300	120	-0.73	0.12	0.04	0.08	Open
NO-2080	NO-235	NO-122	252.44	300	120	0.51	0.08	0.01	0.04	Open
NO-2081	NO-235	NO-196	251.6	300	120	-0.89	0.15	0.03	0.11	Open
NO-2082	NO-202	NO-204	149.23	300	120	2.97	0.49	0.15	1.03	Open
NO-2083	NO-236	NO-159	383.64	300	120	0.93	0.15	0.05	0.12	Open
NO-2084	NO-123	NO-237	144.28	300	120	-2.19	0.36	0.08	0.59	Open
NO-2085	NO-237	NO-104	180.53	300	120	-2.25	0.37	0.11	0.62	Open
NO-2087	NO-238	NO-189	204.36	300	120	1.04	0.17	0.03	0.15	Open
NO-3000	NO-135	NO-213	147.4	600	130	-6.36	0.26	0.02	0.12	Open
NO-3001	NO-218	NO-219	334.39	300	120	0.41	0.07	0.01	0.03	Open
NO-3002	2929	NO-109	106.28	300	120	2.67	0.44	0.09	0.85	Open
NO-3003	NO-232	2702	428.26	300	120	-1.85	0.30	0.18	0.43	Open
NO-3004	3173	NO-111	395.02	400	130	2.85	0.26	0.08	0.20	Open

Node Table for Peak Hour Demand

ID	Demand (ML/d)	Elevation (m)	Head (m)	Pressure (psi)
NO-101	0.26	163.5	229.0	93.1
NO-102	0.69	176.0	229.4	75.9
NO-106	0.46	173.0	230.4	81.6
NO-107	0.30	171.5	230.4	83.7
NO-108	0.69	171.0	230.4	84.4
NO-109	0.71	159.5	196.2	52.2
NO-110	0.54	159.0	196.0	52.6
NO-111	0.22	161.0	196.2	50.0
NO-112	0.36	160.0	196.0	51.2
NO-113	0.51	161.5	196.0	49.0
NO-114	1.11	165.0	195.9	43.9
NO-115	2.04	164.5	195.8	44.5
NO-116	1.58	166.5	230.6	91.1
NO-117	1.04	165.5	196.0	43.3
NO-118	0.12	166.5	230.4	90.8
NO-119	0.54	171.5	230.4	83.7
NO-120	0.47	167.1	195.9	41.0
NO-121	1.68	172.5	230.3	82.2
NO-122	1.28	173.0	230.3	81.4
NO-123	0.96	173.5	230.2	80.6
NO-124	2.33	177.5	230.1	74.7
NO-125	2.36	175.0	229.0	76.8
NO-126	1.11	166.5	228.8	88.5
NO-127	0.75	166.5	228.8	88.5
NO-128	0.69	164.5	228.7	91.3
NO-129	2.35	175.0	228.5	76.1
NO-130	2.20	176.5	228.6	74.0
NO-131	1.11	176.0	230.2	77.1
NO-133	0.91	172.0	230.3	82.8
NO-134	0.69	173.0	230.3	81.4
NO-135	0.55	173.0	230.4	81.6
NO-136	0.88	173.0	230.4	81.6
NO-137	0.91	173.0	230.4	81.6
NO-138	1.71	169.5	230.5	86.7
NO-139	1.34	168.5	230.7	88.4
NO-141	0.85	171.0	230.5	84.6
NO-142	1.38	174.5	230.4	79.5
NO-143	0.67	176.0	230.4	77.3
NO-144	1.48	176.5	230.4	76.6
NO-145	0.84	175.5	230.4	78.0
NO-146	0.55	175.0	230.3	78.6
NO-147	0.64	175.0	230.3	78.5
NO-148	1.42	179.5	230.2	72.1
NO-149	1.51	179.5	230.2	72.1
NO-150	2.74	177.5	227.4	70.9
NO-151	1.18	177.5	228.4	72.3
NO-152	0.78	181.0	228.6	67.6
NO-153	1.62	182.5	229.9	67.4
NO-155	1.26	182.0	230.1	68.4
NO-156	2.25	184.0	230.1	65.6
NO-157	0.50	177.5	230.3	75.0
NO-158	0.36	177.5	230.4	75.2
NO-159	1.34	178.0	230.4	74.5
NO-160	2.44	176.5	230.4	76.6
NO-161	0.72	171.5	229.4	82.3
NO-162	2.61	168.5	227.9	84.5
NO-163	0.48	162.5	214.9	74.5
NO-164	0.73	158.0	214.9	80.9
NO-165	1.45	167.5	227.8	85.7
NO-166	0.80	165.0	227.8	89.3
NO-167	2.10	173.5	228.1	77.6
NO-168	1.14	174.5	228.9	77.4
NO-171	1.07	186.0	230.3	63.0
NO-173	0.60	180.5	229.6	69.8

Node Table for Peak Hour Demand

ID	Demand (ML/d)	Elevation (m)	Head (m)	Pressure (psi)
NO-174	0.64	180.5	228.6	68.3
NO-175	0.68	176.0	228.4	74.4
NO-176	1.28	181.5	228.5	66.8
NO-177	0.60	180.5	229.0	69.0
NO-178	2.41	188.0	229.3	58.7
NO-179	0.94	193.0	230.2	52.9
NO-180	1.99	192.0	230.3	54.4
NO-181	4.08	194.0	230.0	51.1
NO-182	1.89	191.5	229.0	53.4
NO-183	2.08	185.5	228.4	61.0
NO-184	1.32	180.5	228.3	68.0
NO-185	1.99	181.0	227.9	66.7
NO-186	2.01	177.5	227.9	71.6
NO-187	6.26	180.5	227.4	66.7
NO-188	0.16	192.5	230.0	53.3
NO-189	0.45	161.0	228.9	96.5
NO-190	0.51	167.1	195.9	40.9
NO-191	0.51	167.5	196.0	40.5
NO-192	1.03	160.0	196.0	51.2
NO-193	0.00	172.3	229.3	81.2
NO-194	0.00	178.0	230.2	74.2
NO-195	0.00	172.5	230.3	82.2
NO-196	0.00	172.0	230.3	82.9
NO-197	0.00	175.5	230.3	77.9
NO-198	0.00	174.0	230.4	80.1
NO-199	0.00	175.8	228.5	75.0
NO-200	0.00	182.5	228.6	65.5
NO-203	0.00	180.5	230.2	70.6
NO-204	0.00	173.0	230.4	81.6
NO-205	0.00	166.5	230.9	91.5
NO-206	0.00	172.0	230.4	83.0
NO-208	1.02	173.0	230.3	81.5
NO-209	0.00	175.0	230.3	78.5
NO-210	0.00	176.0	230.2	77.1
NO-211	0.00	171.0	230.4	84.4
NO-212	0.00	172.0	230.4	83.0
NO-213	0.27	173.0	230.4	81.6
NO-214	0.00	169.0	228.9	85.1
NO-215	0.00	173.0	227.8	78.0
NO-217	0.00	161.0	196.2	50.0
NO-218	0.00	172.0	230.4	83.0
NO-219	0.00	172.0	230.4	83.0
NO-220	0.00	172.0	230.4	83.0
NO-221	2.74	177.5	227.0	70.4
NO-222	0.00	166.0	196.0	42.7
NO-223	0.00	166.0	231.0	92.4
NO-224	0.46	166.5	196.0	41.9
NO-225	0.74	166.5	195.7	41.5
NO-226	0.57	167.1	195.7	40.6
NO-227	0.00	169.0	230.4	87.4
NO-228	0.25	167.1	195.9	40.9
NO-229	0.24	167.1	195.9	40.9
NO-230	0.00	165.0	230.4	93.0
NO-231	0.33	167.0	195.9	41.0
NO-232	0.00	167.0	196.0	41.2
NO-233	0.00	167.5	195.9	40.3
NO-234	0.75	173.0	230.4	81.6
NO-235	0.00	173.0	230.3	81.5
NO-237	0.00	172.0	230.3	82.9
NO-238	0.00	163.5	229.0	93.1

Pipe Table for Peak Hour Demand

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (ML/d)	Velocity (m/s)	Headloss (m)	HL/1000 (m/km)	Status
NO-1000	NO-101	NO-102	588.76	400	130	-5.67	0.52	0.43	0.73	Open
NO-1001	NO-102	WJ-3106-O	19.41	400	130	1.15	0.11	0.00	0.04	Open
NO-1002	NO-102	NO-103	600.28	400	130	-9.24	0.85	1.08	1.79	Open
NO-1011	NO-105	NO-106	541.87	600	130	3.92	0.16	0.03	0.05	Open
NO-1013	NO-106	NO-107	374.65	600	130	0.86	0.04	0.00	0.00	Open
NO-1014	NO-107	NO-196	150.1	300	120	1.14	0.19	0.03	0.18	Open
NO-1015	NO-106	NO-195	70.9	300	120	1.50	0.24	0.02	0.29	Open
NO-1016	NO-196	NO-195	350.61	200	110	-0.11	0.04	0.01	0.02	Open
NO-1017	NO-107	NO-108	294.17	600	130	-0.58	0.02	0.00	0.00	Open
NO-1018	NO-119	NO-220	374.63	600	130	0.86	0.04	0.00	0.00	Open
NO-1019	NO-119	NO-121	152.67	300	120	1.73	0.28	0.06	0.38	Open
NO-1020	NO-121	NO-196	317.36	200	110	-0.25	0.09	0.03	0.09	Open
NO-1021	NO-121	NO-235	278.11	300	120	0.35	0.06	0.01	0.02	Open
NO-1022	NO-122	NO-195	254.27	300	120	-1.38	0.23	0.06	0.25	Open
NO-1023	NO-122	NO-123	937.39	300	120	0.66	0.11	0.06	0.06	Open
NO-1024	NO-237	NO-194	413.5	200	110	0.41	0.15	0.09	0.22	Open
NO-1025	NO-103	NO-194	172.05	300	120	3.75	0.61	0.27	1.59	Open
NO-1026	NO-123	NO-124	440.4	300	120	1.75	0.29	0.17	0.39	Open
NO-1027	NO-124	NO-194	143.83	300	120	-3.03	0.50	0.15	1.07	Open
NO-1028	NO-194	NO-193	592.36	200	110	1.13	0.42	0.87	1.47	Open
NO-1029	NO-102	NO-193	181.64	300	120	1.73	0.28	0.07	0.38	Open
NO-1030	NO-124	NO-125	675.85	300	120	3.70	0.61	1.05	1.55	Open
NO-1031	NO-193	NO-125	344.35	300	120	2.87	0.47	0.33	0.97	Open
NO-1032	NO-125	NO-126	569.99	300	120	1.83	0.30	0.24	0.42	Open
NO-1033	NO-126	NO-101	564.84	400	130	-4.00	0.37	0.21	0.38	Open
NO-1034	NO-126	NO-127	133.76	300	130	0.95	0.16	0.01	0.11	Open
NO-1035	NO-127	NO-128	134.04	300	120	0.64	0.11	0.01	0.06	Open
NO-1036	NO-128	NO-189	477.58	200	110	-0.52	0.19	0.16	0.34	Open
NO-1037	NO-189	NO-127	589.45	200	110	0.45	0.17	0.16	0.26	Open
NO-1038	NO-128	NO-129	685.96	200	110	0.47	0.17	0.20	0.29	Open
NO-1039	NO-129	NO-126	554.38	400	120	-3.76	0.35	0.22	0.39	Open
NO-1040	NO-129	NO-130	283.5	200	110	-0.22	0.08	0.02	0.07	Open
NO-1041	NO-125	NO-130	639.59	300	120	2.38	0.39	0.44	0.68	Open
NO-1042	NO-132	NO-131	168.58	300	120	2.71	0.44	0.15	0.87	Open
NO-1043	NO-131	NO-123	423.46	300	120	-0.02	0.00	0.00	0.00	Open
NO-1044	NO-131	NO-124	811.06	300	120	1.26	0.21	0.17	0.21	Open
NO-1045	NO-132	NO-133	603.53	300	120	1.05	0.17	0.09	0.15	Open
NO-1046	NO-133	NO-122	489.02	300	120	-0.23	0.04	0.00	0.01	Open
NO-1047	NO-119	NO-135	356.67	600	130	-2.45	0.10	0.01	0.02	Open
NO-1048	NO-135	NO-208	140.61	300	120	1.91	0.31	0.06	0.45	Open
NO-1049	NO-121	NO-208	392.8	200	110	-0.05	0.02	0.00	0.00	Open
NO-1050	NO-208	NO-134	315.71	300	120	0.84	0.14	0.03	0.10	Open
NO-1051	NO-134	NO-133	206.99	300	120	0.27	0.04	0.00	0.01	Open
NO-1052	NO-133	NO-209	410.83	300	120	0.63	0.10	0.02	0.06	Open
NO-1053	NO-209	NO-148	237.11	300	120	0.42	0.07	0.01	0.03	Open
NO-1054	NO-209	NO-210	505.86	200	110	0.22	0.08	0.03	0.07	Open
NO-1055	NO-210	NO-131	147.35	300	120	-0.36	0.06	0.00	0.02	Open
NO-1056	NO-210	NO-149	412.62	300	120	0.58	0.10	0.02	0.05	Open
NO-1057	NO-216	NO-149	129.96	300	120	3.37	0.55	0.17	1.31	Open
NO-1058	NO-135	NO-198	264.42	600	130	-0.65	0.03	0.00	0.00	Open
NO-1059	NO-198	NO-197	410.08	200	110	0.43	0.16	0.10	0.24	Open
NO-1060	NO-197	NO-134	138.92	300	120	-0.45	0.07	0.00	0.03	Open
NO-1061	NO-198	NO-145	239.55	600	130	-1.08	0.04	0.00	0.00	Open
NO-1062	NO-145	NO-146	167.95	300	120	1.92	0.31	0.08	0.46	Open
NO-1063	NO-146	NO-147	238.24	300	120	1.25	0.20	0.05	0.21	Open
NO-1064	NO-147	NO-197	233.88	300	120	-0.88	0.14	0.03	0.11	Open
NO-1065	NO-147	NO-148	619.95	300	120	0.18	0.03	0.00	0.01	Open
NO-1066	NO-143	NO-144	610.25	300	120	0.22	0.04	0.01	0.01	Open
NO-1067	NO-144	NO-145	423.73	300	120	-0.49	0.08	0.02	0.04	Open
NO-1068	NO-160	NO-143	312.63	300	120	0.89	0.15	0.03	0.11	Open
NO-1069	NO-144	NO-159	395.51	300	120	-0.77	0.13	0.03	0.08	Open
NO-1071	NO-211	NO-230	145.31	300	120	-0.94	0.15	0.02	0.12	Open
NO-1078	NO-202	NO-160	681.37	300	120	2.02	0.33	0.34	0.50	Open
NO-1079	NO-160	NO-159	715.31	300	120	0.24	0.04	0.01	0.01	Open
NO-1080	NO-159	NO-158	406.15	300	120	-0.34	0.06	0.01	0.02	Open
NO-1081	NO-160	NO-170	550.01	300	120	-1.55	0.25	0.17	0.31	Open
NO-1082	NO-170	NO-180	601.7	300	120	1.92	0.31	0.28	0.46	Open
NO-1083	NO-180	NO-236	427.47	300	120	-2.02	0.33	0.22	0.51	Open
NO-1084	NO-180	NO-181	682.16	300	120	1.96	0.32	0.33	0.48	Open
NO-1085	NO-181	NO-179	383.79	400	130	-5.25	0.48	0.24	0.63	Open

Pipe Table for Peak Hour Demand

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (ML/d)	Velocity (m/s)	Headloss (m)	HL/1000 (m/km)	Status
NO-1086	NO-171	NO-179	356.09	300	120	1.61	0.26	0.12	0.33	Open
NO-1087	NO-201	NO-179	235.71	400	120	6.66	0.61	0.27	1.13	Open
NO-1088	NO-179	NO-188	358.54	300	120	2.08	0.34	0.19	0.53	Open
NO-1089	NO-188	NO-156	432.15	300	120	-1.35	0.22	0.10	0.24	Open
NO-1090	NO-158	NO-157	153.07	300	120	2.47	0.40	0.11	0.73	Open
NO-1091	NO-157	NO-146	420.54	200	110	-0.12	0.04	0.01	0.02	Open
NO-1092	NO-158	NO-145	418.46	600	130	4.33	0.18	0.03	0.06	Open
NO-1093	NO-157	NO-156	312.3	300	120	2.09	0.34	0.17	0.54	Open
NO-1094	NO-156	NO-147	567.36	300	120	-1.31	0.21	0.13	0.23	Open
NO-1095	NO-156	NO-155	619.39	300	120	-0.20	0.03	0.00	0.01	Open
NO-1096	NO-155	NO-148	432.73	300	120	-1.47	0.24	0.12	0.28	Open
NO-1097	NO-188	NO-178	589.94	300	120	3.27	0.54	0.73	1.23	Open
NO-1098	NO-178	NO-155	667.28	300	120	-3.30	0.54	0.84	1.25	Open
NO-1099	NO-155	NO-154	202.49	300	120	-3.29	0.54	0.25	1.24	Open
NO-1100	NO-154	NO-153	198.25	300	120	4.76	0.78	0.49	2.47	Open
NO-1101	NO-149	NO-153	430.88	300	120	2.44	0.40	0.31	0.72	Open
NO-1102	WJ-1450-M	NO-173	266.72	400	120	11.87	1.09	0.88	3.31	Open
NO-1103	NO-173	NO-153	526.34	300	120	-2.22	0.36	0.32	0.60	Open
NO-1104	NO-153	NO-152	1015.81	300	120	3.35	0.55	1.31	1.29	Open
NO-1105	NO-173	NO-174	720.75	400	120	7.41	0.68	0.99	1.38	Open
NO-1106	NO-174	NO-152	382.11	300	120	-0.19	0.03	0.00	0.01	Open
NO-1107	NO-174	NO-175	435.78	400	120	4.18	0.38	0.21	0.48	Open
NO-1108	NO-152	NO-151	476.4	300	120	1.88	0.31	0.21	0.44	Open
NO-1109	NO-152	NO-200	354.4	300	120	0.51	0.08	0.01	0.04	Open
NO-1110	NO-200	NO-130	365.82	300	120	0.04	0.01	0.00	0.00	Open
NO-1111	NO-200	NO-199	250.92	200	110	0.47	0.17	0.07	0.28	Open
NO-1112	NO-129	NO-199	381.25	400	120	2.10	0.19	0.05	0.13	Open
NO-1113	NO-151	NO-199	648.51	400	120	-2.57	0.24	0.13	0.19	Open
NO-1114	NO-151	NO-175	137.27	400	120	0.08	0.01	0.00	0.00	Open
NO-1115	NO-151	NO-150	820.77	300	120	3.19	0.52	0.96	1.17	Open
NO-1116	NO-175	NO-186	326.72	300	120	3.58	0.59	0.48	1.45	Open
NO-1117	NO-174	NO-176	130.83	300	120	2.78	0.46	0.12	0.91	Open
NO-1118	NO-176	NO-177	686.39	300	120	-2.60	0.43	0.55	0.81	Open
NO-1119	NO-173	NO-177	143.81	300	120	6.09	1.00	0.56	3.90	Open
NO-1120	NO-177	NO-178	661.23	300	120	-1.84	0.30	0.28	0.42	Open
NO-1121	NO-178	NO-182	388.73	300	120	2.33	0.38	0.25	0.66	Open
NO-1122	NO-181	NO-182	823.02	300	120	3.13	0.51	0.93	1.13	Open
NO-1123	NO-182	NO-183	439.42	300	120	3.56	0.58	0.64	1.45	Open
NO-1124	NO-183	NO-184	312.07	300	120	1.49	0.24	0.09	0.29	Open
NO-1125	NO-177	NO-184	287	300	120	4.73	0.77	0.70	2.44	Open
NO-1126	NO-184	NO-185	672.36	300	120	2.21	0.36	0.40	0.60	Open
NO-1127	NO-184	NO-187	1048.72	300	120	2.68	0.44	0.90	0.85	Open
NO-1128	NO-185	NO-187	310.75	300	120	3.76	0.62	0.50	1.60	Open
NO-1129	NO-185	NO-176	292.44	300	120	-4.10	0.67	0.55	1.87	Open
NO-1130	NO-185	NO-186	373.49	300	120	0.55	0.09	0.02	0.05	Open
NO-1131	NO-186	NO-150	886.19	300	120	2.12	0.35	0.49	0.55	Open
NO-1132	NO-187	NO-150	1656.68	300	120	0.18	0.03	0.01	0.01	Open
NO-1133	NO-158	NO-201	441.36	600	130	-7.49	0.31	0.07	0.17	Open
NO-1135	NO-148	NO-216	188.35	300	120	-2.30	0.38	0.12	0.64	Open
NO-1136	NO-167	NO-168	678.08	300	120	-3.34	0.55	0.87	1.28	Open
NO-1137	NO-150	NO-221	421.41	300	120	2.74	0.45	0.37	0.89	Open
NO-1138	NO-171	NO-201	175.84	300	120	-2.68	0.44	0.15	0.85	Open
NO-1140	NO-220	NO-108	149.01	600	130	1.26	0.05	0.00	0.01	Open
NO-2002	NO-111	NO-112	161.86	300	120	2.83	0.46	0.15	0.94	Open
NO-2003	NO-112	NO-110	239.87	300	120	0.54	0.09	0.01	0.04	Open
NO-2004	NO-112	NO-113	152.61	300	120	1.93	0.32	0.07	0.46	Open
NO-2005	NO-113	NO-114	311.45	300	120	1.25	0.20	0.06	0.21	Open
NO-2006	NO-114	NO-192	154.14	300	120	-2.10	0.34	0.08	0.54	Open
NO-2007	NO-192	NO-109	143.59	300	120	-3.42	0.56	0.19	1.34	Open
NO-2008	NO-192	NO-191	458.6	300	120	0.29	0.05	0.01	0.01	Open
NO-2009	NO-191	NO-232	218.24	300	120	-0.97	0.16	0.03	0.13	Open
NO-2010	NO-118	NO-212	526.69	300	120	0.36	0.06	0.01	0.02	Open
NO-2011	NO-212	NO-206	225.03	300	120	-0.04	0.01	0.00	0.00	Open
NO-2012	NO-211	NO-206	561.13	300	120	0.45	0.07	0.02	0.03	Open
NO-2013	NO-118	NO-211	188.67	300	120	-0.48	0.08	0.01	0.04	Open
NO-2014	NO-190	NO-120	209.33	300	120	-1.12	0.18	0.04	0.17	Open
NO-2015	NO-190	NO-191	158.36	200	110	-0.75	0.28	0.11	0.68	Open
NO-2016	NO-115	NO-233	173.18	300	120	-1.11	0.18	0.03	0.17	Open
NO-2017	NO-115	NO-114	258.59	300	120	-1.53	0.25	0.08	0.30	Open
NO-2018	NO-217	NO-222	678.5	300	120	1.33	0.22	0.16	0.23	Open

Pipe Table for Peak Hour Demand

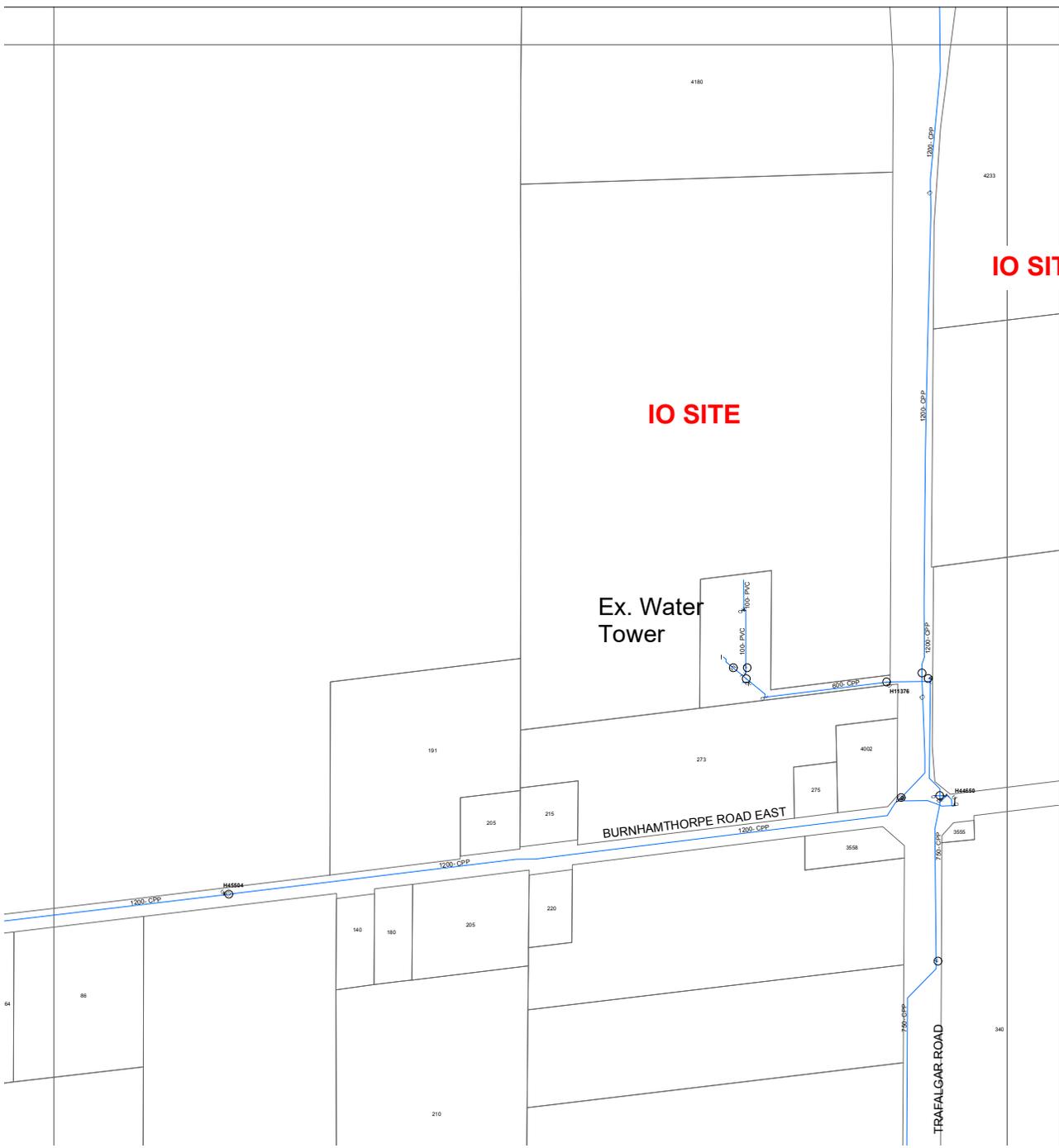
ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (ML/d)	Velocity (m/s)	Headloss (m)	HL/1000 (m/km)	Status
NO-2019	NO-117	NO-113	472.4	300	120	-0.17	0.03	0.00	0.01	Open
NO-2020	NO-114	NO-225	399.88	200	110	0.70	0.26	0.24	0.60	Open
NO-2021	NO-115	NO-226	349.93	200	110	0.61	0.22	0.16	0.46	Open
NO-2022	NO-230	NO-137	219.37	300	120	-0.66	0.11	0.01	0.06	Open
NO-2025	NO-224	NO-117	66.95	300	120	0.87	0.14	0.01	0.11	Open
NO-2026	NO-205	NO-139	310.57	600	130	15.12	0.62	0.19	0.62	Open
NO-2027	NO-139	NO-116	150.12	600	130	11.86	0.49	0.06	0.39	Open
NO-2028	NO-116	NO-138	443.99	600	130	10.27	0.42	0.13	0.30	Open
NO-2029	NO-138	NO-137	278.11	600	130	7.36	0.30	0.05	0.16	Open
NO-2030	NO-137	NO-136	172.97	300	120	0.82	0.13	0.02	0.09	Open
NO-2031	NO-139	NO-141	348.06	300	120	1.92	0.31	0.16	0.46	Open
NO-2032	NO-141	NO-142	457.99	300	120	1.07	0.18	0.07	0.16	Open
NO-2033	NO-142	NO-138	320.27	300	120	-0.93	0.15	0.04	0.12	Open
NO-2034	NO-142	NO-136	397.91	300	120	0.63	0.10	0.02	0.06	Open
NO-2035	NO-136	NO-234	467.74	300	120	0.57	0.09	0.02	0.05	Open
NO-2036	NO-213	NO-206	398.51	300	120	0.26	0.04	0.00	0.01	Open
NO-2037	NO-169	NO-203	153.94	300	120	5.43	0.89	0.48	3.15	Open
NO-2038	NO-162	NO-8004	8.59	300	120	0.73	0.12	0.00	0.08	Open
NO-2039	NO-203	NO-168	401.68	300	120	5.43	0.89	1.26	3.15	Open
NO-2040	NO-168	NO-214	300.93	300	120	0.95	0.15	0.04	0.12	Open
NO-2041	NO-215	NO-167	1057.5	300	120	-1.24	0.20	0.22	0.20	Open
NO-2042	NO-215	NO-165	365.07	300	120	0.70	0.11	0.03	0.07	Open
NO-2043	NO-165	NO-162	379.31	300	120	-1.48	0.24	0.11	0.29	Open
NO-2044	NO-162	NO-214	380.2	300	120	-4.83	0.79	0.96	2.54	Open
NO-2045	NO-214	NO-161	309.38	300	120	-3.88	0.64	0.52	1.69	Open
NO-2046	NO-161	NO-204	424.54	300	120	-4.60	0.75	0.99	2.32	Open
NO-2047	NO-165	NO-8006	16.11	300	120	0.47	0.08	0.00	0.03	Open
NO-2048	NO-8006	NO-164	675.49	300	120	0.47	0.08	0.02	0.03	Open
NO-2049	NO-215	NO-166	694.29	300	120	0.54	0.09	0.03	0.04	Open
NO-2050	NO-166	NO-165	418.64	300	120	-0.26	0.04	0.00	0.01	Open
NO-2052	NO-164	NO-163	288.84	300	120	-0.26	0.04	0.00	0.01	Open
NO-2053	NO-8004	NO-163	819.64	300	120	0.73	0.12	0.06	0.08	Open
NO-2054	NO-217	NO-111	391.36	300	120	-0.67	0.11	0.03	0.06	Open
NO-2060	NO-217	NO-111	391.36	300	120	-0.67	0.11	0.03	0.06	Open
NO-2061	NO-219	NO-220	92.41	300	120	0.41	0.07	0.00	0.03	Open
NO-2062	NO-218	NO-212	58.02	300	120	-0.41	0.07	0.00	0.03	Open
NO-2063	NO-101	NO-238	307.24	400	120	1.41	0.13	0.02	0.06	Open
NO-2064	NO-222	NO-224	145.1	300	120	1.33	0.22	0.03	0.23	Open
NO-2066	NO-223	NO-205	146.23	600	120	15.12	0.62	0.10	0.72	Open
NO-2067	NO-225	NO-226	392.34	200	110	-0.04	0.01	0.00	0.00	Open
NO-2068	NO-233	NO-228	72.65	200	110	0.25	0.09	0.01	0.09	Open
NO-2069	NO-228	NO-229	268.88	200	110	0.01	0.00	0.00	0.00	Open
NO-2070	NO-233	NO-190	74.58	300	120	-1.37	0.22	0.02	0.24	Open
NO-2071	NO-229	NO-231	71.51	200	110	-0.23	0.08	0.01	0.08	Open
NO-2072	NO-231	NO-120	136.70	200	110	-0.56	0.21	0.06	0.40	Open
NO-2073	NO-227	NO-230	296.46	200	110	0.27	0.10	0.03	0.10	Open
NO-2074	NO-227	NO-138	270.86	200	110	-0.27	0.10	0.03	0.10	Open
NO-2075	NO-120	NO-232	176.82	300	120	-2.16	0.35	0.10	0.57	Open
NO-2076	NO-206	NO-119	177.67	300	120	0.67	0.11	0.01	0.07	Open
NO-2077	NO-137	NO-234	496.43	600	130	4.97	0.20	0.04	0.08	Open
NO-2078	NO-234	NO-213	78.28	600	130	4.79	0.20	0.01	0.07	Open
NO-2079	NO-134	NO-235	493.92	300	120	-0.57	0.09	0.02	0.05	Open
NO-2080	NO-235	NO-122	252.44	300	120	0.79	0.13	0.02	0.09	Open
NO-2081	NO-235	NO-196	251.6	300	120	-1.00	0.16	0.03	0.14	Open
NO-2082	NO-202	NO-204	149.23	300	120	4.60	0.75	0.35	2.32	Open
NO-2083	NO-236	NO-159	383.64	300	120	1.53	0.25	0.12	0.30	Open
NO-2084	NO-123	NO-237	144.28	300	120	-2.06	0.34	0.08	0.52	Open
NO-2085	NO-237	NO-104	180.53	300	120	-2.47	0.40	0.13	0.73	Open
NO-2087	NO-238	NO-189	204.36	300	120	1.41	0.23	0.05	0.26	Open
NO-3000	NO-135	NO-213	147.4	600	130	-4.25	0.17	0.01	0.06	Open
NO-3001	NO-218	NO-219	334.39	300	120	0.41	0.07	0.01	0.03	Open
NO-3002	2929	NO-109	106.28	300	120	4.13	0.68	0.20	1.90	Open
NO-3003	NO-232	2702	428.26	300	120	-3.13	0.51	0.49	1.13	Open
NO-3004	3173	NO-111	395.02	400	130	4.38	0.40	0.18	0.45	Open

Available Fire Flow during a Maximum Day plus Fire Demand

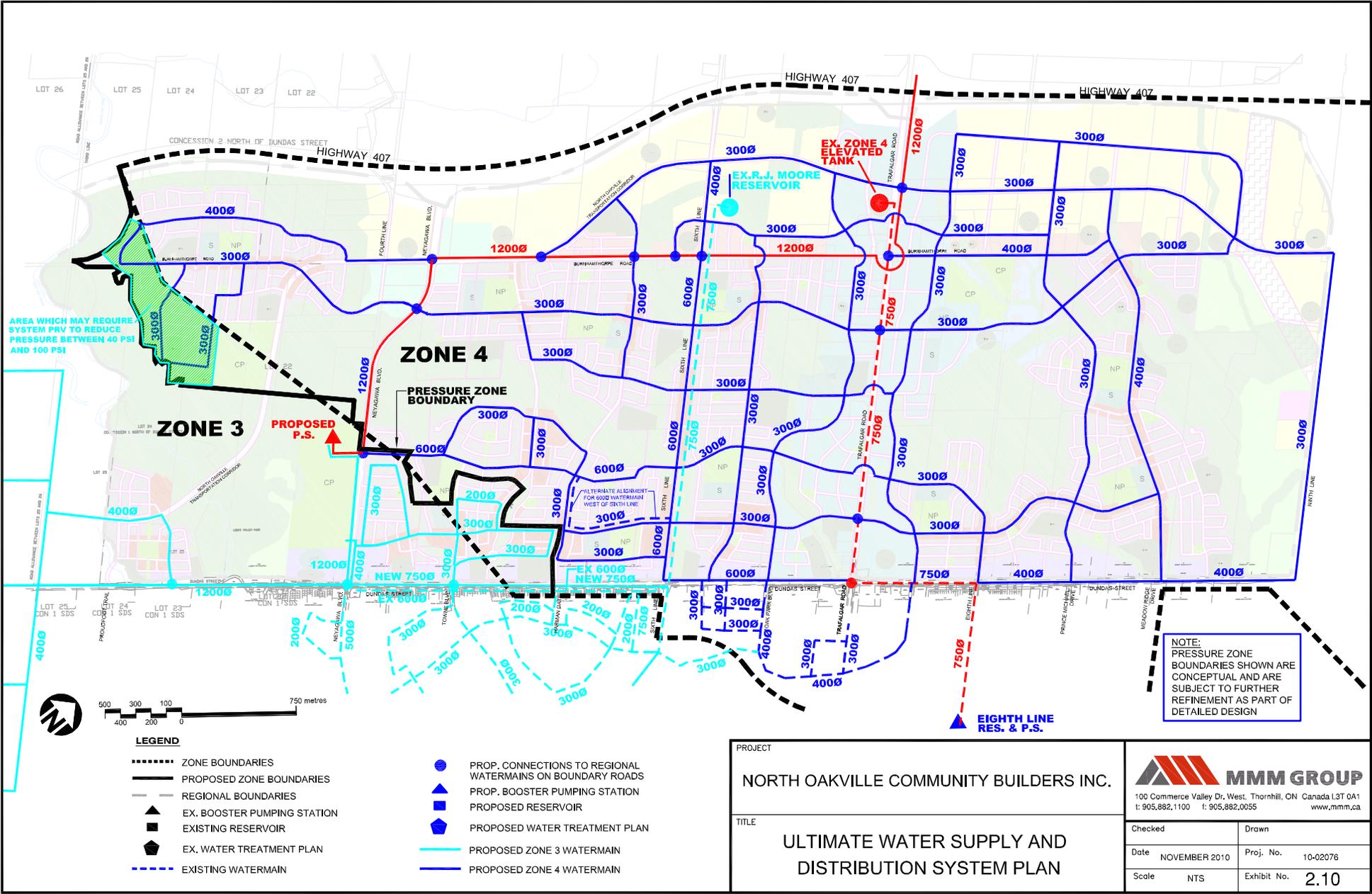
ID	Total Demand (ML/d)	Critical Node 2 Pressure (psi)	Design Flow (ML/d)	Design Flow (L/minute)	Design Flow (L/second)
NO-226	8.28	20.0	11.1	7,681	128
NO-225	8.39	20.0	11.1	7,722	129
NO-229	8.07	20.0	14.8	10,306	172
NO-231	8.13	20.0	16.1	11,188	186
NO-228	8.08	20.0	18.7	12,979	216
NO-222	7.92	20.0	26.1	18,125	302
NO-224	8.21	20.0	26.2	18,215	304
NO-117	8.58	20.0	27.7	19,222	320
NO-110	8.26	30.0	23.2	16,104	268
NO-233	7.92	30.0	23.4	16,250	271
NO-221	9.66	30.0	23.8	16,500	275
NO-190	8.24	30.0	24.6	17,056	284
NO-120	8.22	30.0	24.6	17,069	284
NO-215	7.92	30.0	24.8	17,215	287
NO-191	8.24	30.0	25.5	17,729	295
NO-166	8.43	30.0	25.9	18,007	300
NO-115	9.21	30.0	26.5	18,410	307
NO-163	8.22	30.0	26.6	18,438	307
NO-227	7.92	30.0	26.7	18,556	309
NO-165	8.84	30.0	27.0	18,722	312
NO-167	9.25	30.0	27.4	19,021	317
NO-164	8.38	30.0	28.2	19,569	326
NO-232	7.92	30.0	28.7	19,896	332
NO-162	9.57	30.0	31.7	22,028	367
NO-114	8.63	30.0	31.8	22,097	368
NO-217	7.92	30.0	32.2	22,354	373
NO-113	8.24	30.0	33.2	23,063	384
NO-112	8.15	30.0	36.4	25,278	421
NO-192	8.58	30.0	37.7	26,146	436
NO-111	8.06	30.0	39.9	27,694	462
NO-214	7.92	30.0	41.2	28,604	477
NO-168	8.65	30.0	41.9	29,111	485
NO-183	9.24	30.0	43.4	30,132	502
NO-150	9.66	30.0	44.1	30,611	510
NO-161	8.38	30.0	44.7	31,049	517
NO-182	9.12	30.0	46.5	32,285	538
NO-109	8.37	30.0	47.2	32,806	547
NO-187	11.89	30.0	49.4	34,271	571
NO-200	7.92	30.0	51.5	35,736	596
NO-143	8.35	30.0	53.4	37,104	618
NO-130	9.32	30.0	54.5	37,813	630
NO-180	9.18	30.0	55.3	38,431	641
NO-189	8.2	30.0	56.1	38,972	650
NO-188	8.02	30.0	56.3	39,111	652
NO-128	8.36	30.0	56.8	39,424	657.06
NO-203	7.92	30.0	59.7	41,451	691
NO-186	9.19	30.0	60.6	42,104	702
NO-141	8.46	30.0	63.7	44,264	738
NO-185	9.18	30.0	67.1	46,583	776
NO-181	10.51	30.0	67.4	46,799	780
NO-171	8.6	30.0	67.4	46,833	781
NO-118	8	30.0	67.7	46,979	783.0
NO-184	8.76	30.0	68.2	47,354	789
NO-178	9.45	30.0	68.3	47,444	791
NO-127	8.4	30.0	69.1	47,965	799
NO-204	7.92	30.0	69.9	48,514	809
NO-176	8.73	30.0	73.5	51,042	851
NO-152	8.41	30.0	74.3	51,597	860
NO-144	8.86	30.0	75.5	52,396	873
NO-209	7.92	30.0	75.7	52,563	876
NO-193	7.92	30.0	79.0	54,875	915
NO-218	7.92	30.0	79.5	55,174	920
NO-199	7.92	30.0	80.2	55,708	928
NO-210	7.92	30.0	81.8	56,799	947

Available Fire Flow during a Maximum Day plus Fire Demand

ID	Total Demand (ML/d)	Critical Node 2 Pressure (psi)	Design Flow (ML/d)	Design Flow (L/minute)	Design Flow (L/second)
NO-129	9.41	30.0	83.3	57,833	964
NO-142	8.79	30.0	83.9	58,285	971
NO-211	7.92	30.0	84.0	58,313	972
NO-125	9.42	30.0	84.7	58,840	981
NO-212	7.92	30.0	86.8	60,243	1,004
NO-160	9.47	30.0	87.1	60,472	1,008
NO-156	9.35	30.0	87.5	60,736	1,012
NO-157	8.23	30.0	89.4	62,083	1,035
NO-151	8.67	30.0	90.9	63,090	1,052
NO-197	7.92	30.0	91.5	63,535	1,059
NO-177	8.3	30.0	92.5	64,222	1,070
NO-175	8.35	30.0	92.5	64,257	1,071
NO-146	8.27	30.0	94.6	65,708	1,095
NO-230	7.92	30.0	95.2	66,118	1,102
NO-219	7.92	30.0	96.3	66,854	1,114
NO-174	8.32	30.0	97.2	67,507	1,125
NO-194	7.92	30.0	97.9	67,979	1,133
NO-208	8.57	30.0	99.1	68,819	1,147
NO-153	8.95	30.0	100.1	69,514	1,159
NO-126	8.63	30.0	100.2	69,563	1,159
NO-124	9.4	30.0	100.7	69,896	1,165
NO-159	8.77	30.0	101.1	70,236	1,171
NO-101	8.08	30.0	101.5	70,493	1,175
NO-149	8.88	30.0	101.9	70,778	1,180
NO-136	8.48	30.0	102.4	71,132	1,186
NO-155	8.72	30.0	102.6	71,250	1,188
NO-121	8.98	30.0	107.4	74,549	1,242
NO-196	7.92	30.0	109.6	76,097	1,268
NO-123	8.53	30.0	110.1	76,444	1,274
NO-147	8.33	30.0	111.1	77,125	1,285
NO-179	8.52	30.0	111.1	77,174	1,286
NO-148	8.82	30.0	113.3	78,674	1,311
NO-122	8.73	30.0	116.1	80,597	1,343
NO-133	8.5	30.0	117.3	81,472	1,358
NO-131	8.62	30.0	118.9	82,563	1,376
NO-195	7.92	30.0	121.3	84,208	1,403
NO-206	7.92	30.0	122.5	85,049	1,417
NO-235	7.92	30.0	122.7	85,208	1,420
NO-134	8.36	30.0	126.7	87,972	1,466
NO-102	8.35	30.0	128.1	88,931	1,482
NO-173	8.3	30.0	139.5	96,896	1,615
NO-137	8.5	30.0	237.1	164,653	2,744
NO-220	7.92	30.0	240.8	167,194	2,787
NO-108	8.35	30.0	241.3	167,576	2,793
NO-138	9	30.0	244.4	169,701	2,828
NO-107	8.11	30.0	246.0	170,799	2,847
NO-234	8.39	30.0	256.0	177,771	2,963
NO-106	8.21	30.0	256.8	178,299	2,972
NO-116	8.92	30.0	259.5	180,194	3,003
NO-119	8.26	30.0	262.2	182,104	3,035
NO-213	8.09	30.0	265.1	184,063	3,068
NO-139	8.77	30.0	265.8	184,556	3,076
NO-198	7.92	30.0	270.6	187,944	3,132
NO-145	8.45	30.0	272.8	189,451	3,158
NO-158	8.15	30.0	284.3	197,451	3,291
NO-135	8.27	30.0	287.3	199,528	3,325
NO-205	7.92	30.0	316.8	219,965	3,666
NO-223	7.92	30.0	318.0	220,847	3,681



Existing Watermain  
Halton Region Operations Plans  
(Waterworks)



AREA WHICH MAY REQUIRE SYSTEM PRV TO REDUCE PRESSURE BETWEEN 40 PSI AND 100 PSI

NOTE: PRESSURE ZONE BOUNDARIES SHOWN ARE CONCEPTUAL AND ARE SUBJECT TO FURTHER REFINEMENT AS PART OF DETAILED DESIGN

**LEGEND**

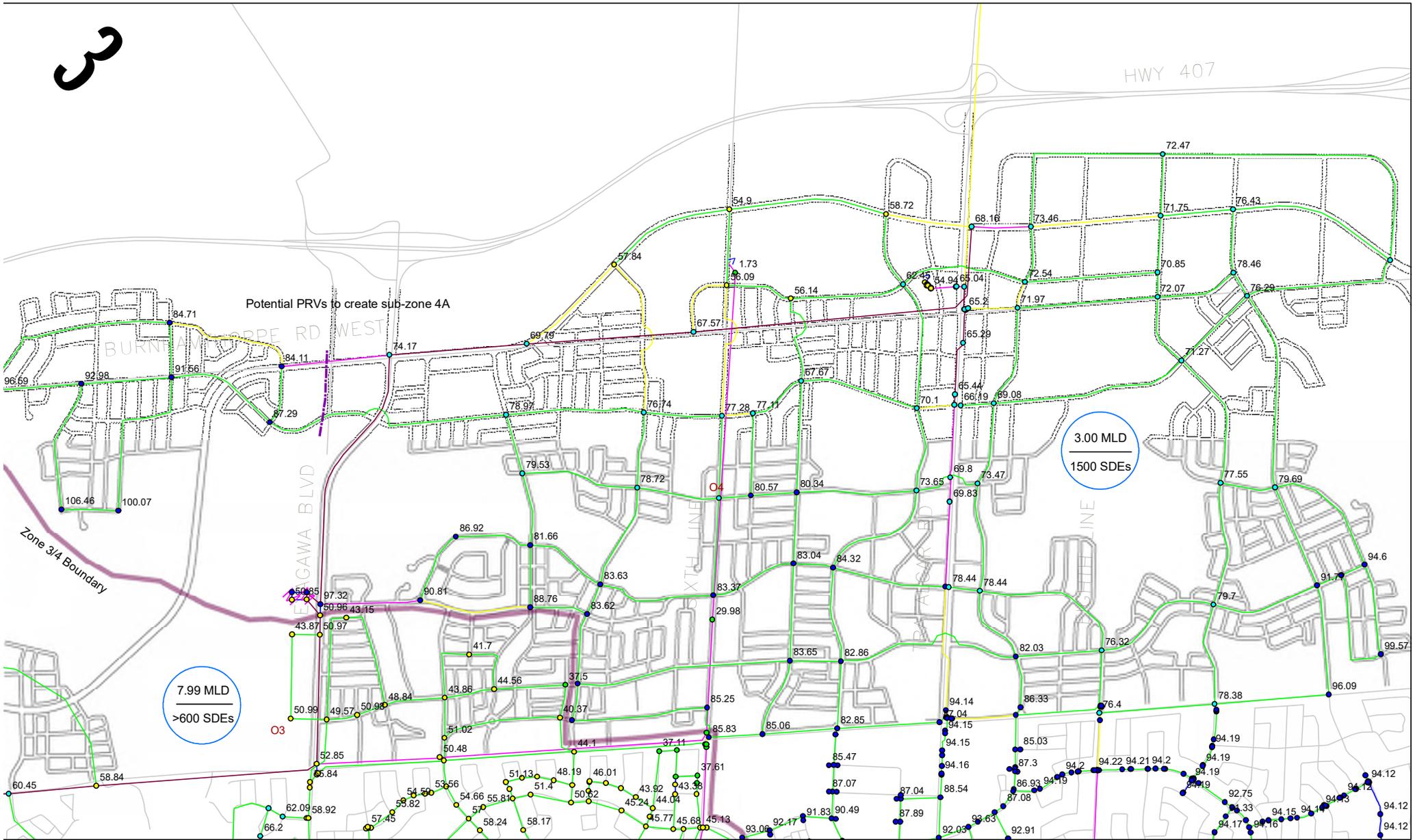
- ZONE BOUNDARIES
- PROPOSED ZONE BOUNDARIES
- REGIONAL BOUNDARIES
- ▲ EX. BOOSTER PUMPING STATION
- EXISTING RESERVOIR
- EX. WATER TREATMENT PLAN
- - - - - EXISTING WATERMAIN
- PROP. CONNECTIONS TO REGIONAL WATERMANS ON BOUNDARY ROADS
- ▲ PROP. BOOSTER PUMPING STATION
- PROP. RESERVOIR
- PROP. WATER TREATMENT PLAN
- PROP. ZONE 3 WATERMAIN
- PROP. ZONE 4 WATERMAIN

PROJECT  
**NORTH OAKVILLE COMMUNITY BUILDERS INC.**

TITLE  
**ULTIMATE WATER SUPPLY AND DISTRIBUTION SYSTEM PLAN**

**MMM GROUP**  
 100 Commerce Valley Dr. West, Thornhill, ON Canada L3T 0A1  
 t: 905.882.1100 f: 905.882.0055 www.mmm.ca

Checked	Drawn
Date NOVEMBER 2010	Proj. No. 10-02076
Scale NTS	Exhibit No. 2.10



North Oakville Development Plan  
Max Day Pressures (psi) and System Capacities



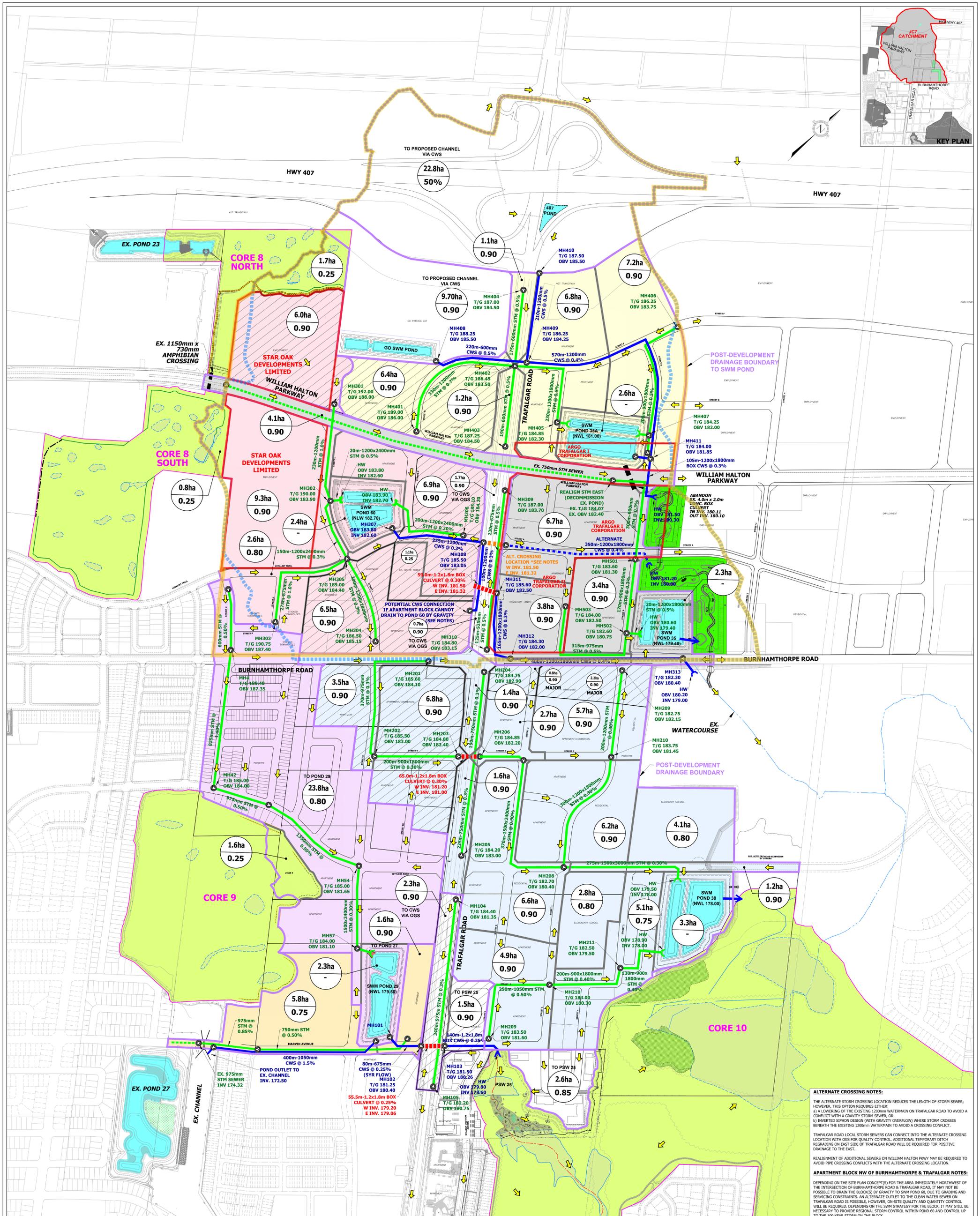
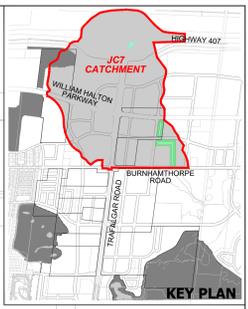
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September 2009  
Source: Infowater

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## **APPENDIX D**

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### **Storm Drainage and SWM Information**



Urbantech Consulting  
 Stonybrook Consulting Inc.  
 Beacon Environmental  
 GEO Morphix Ltd.  
 R.J. Burnside & Associates Limited

LEGEND:	
	SUBJECT LANDS
	JCT FSS STUDY AREA
	JCT EIR SUBCATCHMENT AREA
	CORE AREA
	PROPOSED SWM POND
	PROPOSED CHANNEL
	PRELIMINARY CLEAN WATER SEWER ALIGNMENT AND FLOW DIRECTION (ANY STORM SEWERS DISCHARGING DIRECTLY INTO CLEAN SEWERS REQUIRE OGS)
	PRELIMINARY STORM SEWER ALIGNMENT AND FLOW DIRECTION (SHOWN FOR MAIN SERVICING ROUTES ONLY)
	TRAFALGAR ROAD CROSSING (TO BE INSTALLED BY REGION)
	ALTERNATE CROSSING - SEE NOTES
	MAJOR SYSTEM / OVERLAND FLOW DIRECTION & DIRECTION OF LOCAL STORM SEWERS
	MINOR SYSTEM STORM DRAINAGE AREA (A)
	RUNOFF COEFFICIENT
	POST-DEVELOPMENT STORM DRAINAGE BOUNDARY
	STORM DRAINAGE SUB-BOUNDARY
	MAJOR SYSTEM CAPTURE AREA (100 MINUS 5 YEAR FLOW ADDED TO MINOR SYSTEM)
	DRAINAGE TO POND 29 (EM4)
	DRAINAGE TO POND 60 (JCT)
	DRAINAGE TO POND 35A (JCT)
	DRAINAGE TO POND 35 (JCT)
	DRAINAGE TO POND 38 (JCT)
	CLEAN DRAINAGE AREAS AS NOTED (OGS OR OTHER TO BE PROVIDED)

**ALTERNATE CROSSING NOTES:**  
 THE ALTERNATE STORM CROSSING LOCATION REDUCES THE LENGTH OF STORM SEWER; HOWEVER, THIS OPTION REQUIRES EITHER:  
 a) A LOWERING OF THE EXISTING 1200mm WATERMAIN ON TRAFALGAR ROAD TO AVOID A CONFLICT WITH A GRAVITY STORM SEWER, OR  
 b) INVERTED SUMP DESIGN (WITH GRAVITY OVERFLOW) WHERE STORM CROSSES BENEATH THE EXISTING 1200mm WATERMAIN TO AVOID A CROSSING CONFLICT.  
 TRAFALGAR ROAD LOCAL STORM SEWERS CAN CONNECT INTO THE ALTERNATE CROSSING LOCATION WITH OGS FOR QUALITY CONTROL. ADDITIONAL TEMPORARY DITCH REGRADING ON EAST SIDE OF TRAFALGAR ROAD WILL BE REQUIRED FOR POSITIVE DRAINAGE TO THE EAST.  
 REALIGNMENT OF ADDITIONAL SEWERS ON WILLIAM HALTON PKWY MAY BE REQUIRED TO AVOID PIPE CROSSING CONFLICTS WITH THE ALTERNATE CROSSING LOCATION.

**APARTMENT BLOCK NW OF BURNHAMTHORPE & TRAFALGAR NOTES:**  
 DEPENDING ON THE SITE PLAN CONCEPTS FOR THE AREA IMMEDIATELY NORTHWEST OF THE INTERSECTION OF BURNHAMTHORPE ROAD & TRAFALGAR ROAD, IT MAY NOT BE POSSIBLE TO DRAIN THE BLOCKS BY GRAVITY TO SWM POND 60, DUE TO GRADING AND SERVICING CONSTRAINTS. AN ALTERNATE OUTLET TO THE CLEAN WATER SEWER ON TRAFALGAR ROAD IS POSSIBLE, HOWEVER, ON-SITE QUALITY AND QUANTITY CONTROL WILL BE REQUIRED. DEPENDING ON THE SWM STRATEGY FOR THE BLOCK, IT MAY STILL BE NECESSARY TO PROVIDE REGIONAL STORM CONTROL WITHIN POND 60 AND CONTROL UP TO THE 100-YEAR STORM ON THE BLOCK.

JOSHUA CREEK  
 SUBCATCHMENT JCT7 EIR/FSS

**DRAWING 7.8**  
**STORM DRAINAGE & SERVICING PLAN**  
 PROJECT No. DATE: SCALE:  
 23-744 DEC. 2025 1:2500



**URBANTECH®**

**STORM SEWER DESIGN SHEET**

**5 Year Storm (+ Constant Flow)**

**Trafalgar Road Corridor**

**Town of Oakville**

**PROJECT DETAILS**

**Project No: 23-744/23-745**

**Date: Dec 2025**

**Designed by: sr**

**Checked by: DZ**

**DESIGN CRITERIA**

**Min. Diameter = 300 mm**

**Mannings 'n' = 0.013**

**Starting Tc = 10 min**

**Factor of Safety = 20 %**

$$\text{Rainfall Intensity} = \frac{A}{(Tc+B)^c}$$

**A = 1170**

**B = 5.8**

**c = 0.843**

Shading indicates pipes carrying 100yr flow

**NOMINAL PIPE SIZE USED**

STREET	FROM MH	TO MH	AREA (ha)	RUNOFF COEFFICIENT "R"	'AR'	ACCUM. 'AR'	RAINFALL INTENSITY (mm/hr)	FLOW (m3/s)	CONSTANT FLOW (m3/s)	ACCUM. CONSTANT FLOW (m3/s)	TOTAL FLOW (m3/s)	LENGTH (m)	SLOPE (%)	PIPE DIAMETER (mm)	FULL FLOW CAPACITY (m3/s)	FULL FLOW VELOCITY (m/s)	INITIAL Tc (min)	TIME OF CONCENTRATION (min)	ACC. TIME OF CONCENTRATION (min)	PERCENT FULL (%)
<b>DRAINAGE TO PSW25</b>																				
POND 29	101	102	0.00	0.00	0.00	0.00	114.2	0.000	0.242	0.242	0.242	80.0	0.30	600	0.336	1.19	10.00	1.12	11.12	72%
TRAFALGAR RD	104	102	2.30	0.90	2.07	2.07	114.2	0.657	0.411	0.411	1.068	340.0	0.30	975	1.227	1.64	10.00	3.45	13.45	87%
CROSSING 1	102	103	0.00	0.00	0.00	2.07	96.7	0.556	0.000	0.653	1.209	55.5	0.25	1200x1800 (BOX)	4.204	1.95	13.45	0.48	13.92	29%
TO PSW25	103	HW1	1.50	0.90	1.35	3.42	94.7	0.900	0.325	0.978	1.878	140.0	0.25	1200x1800 (BOX)	4.204	1.95	13.92	1.20	15.12	45%
<b>DRAINAGE TO POND D</b>																				
BURNHAMTHORPE RD	201	202	3.50	0.90	3.15	3.15	114.2	0.999			0.999	370.0	0.30	975	1.227	1.64	10.00	3.75	13.75	81%
STREET 9	202	203	6.80	0.90	6.12	9.27	95.4	2.458			2.458	200.0	0.30	900x1800 (BOX)	3.059	1.89	13.75	1.77	15.52	80%
TRAFALGAR RD	204	203	1.40	0.90	1.26	1.26	114.2	0.400			0.400	190.0	0.30	750	0.610	1.38	10.00	2.29	12.29	66%
TRAFALGAR RD	205	203	1.60	0.90	1.44	1.44	114.2	0.457			0.457	225.0	0.30	750	0.610	1.38	10.00	2.72	12.72	75%
CROSSING 2	203	206	0.00	0.00	0.00	11.97	88.7	2.950	1.616	1.616	4.566	65.0	0.30	1200x1800 (BOX)	4.643	2.15	15.52	0.50	16.02	98%
STREET 3	206	207	1.40	0.90	1.26	13.23	87.0	3.197	0.000	1.616	4.813	105.0	0.30	1200x2400 (BOX)	6.587	2.29	16.02	0.77	16.79	73%
STREET 1	207	208	6.60	0.90	5.94	19.17	84.5	4.500	0.173	1.789	6.289	370.0	0.30	1500x2400 (BOX)	9.059	2.52	16.79	2.45	19.24	69%
STREET 7	209	210	5.70	0.90	5.13	5.13	103.3	1.472	0.476	0.476	1.948	200.0	0.30	1200	2.135	1.89	12.00	1.77	13.77	91%
0	210	208	6.20	0.90	5.58	10.71	95.4	2.838	0.000	0.476	3.314	300.0	0.30	1200x1800 (BOX)	4.605	2.13	13.77	2.35	16.11	72%
TO POND D	208	HW2	1.20	0.90	1.08	30.96	77.5	6.663	0.000	2.265	8.928	275.0	0.30	1500x3000 (BOX)	11.944	2.65	19.24	1.73	20.96	75%
STREET 3	211	212	4.90	0.90	4.41	4.41	114.2	1.399			1.399	250.0	0.50	1050	1.931	2.23	10.00	1.87	11.87	72%
STREET 2	212	213	2.80	0.80	2.24	6.65	103.9	1.920			1.920	160.0	0.40	900x1800 (BOX)	3.532	2.18	11.87	1.22	13.09	54%
TO POND D	213	HW3	5.10	0.75	3.83	10.48	98.2	2.859			2.859	130.0	0.40	900x1800 (BOX)	3.532	2.18	13.09	0.99	14.09	81%



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**5 Year Storm (+ Constant Flow)**

**Trafalgar Road Corridor**

**Town of Oakville**

**PROJECT DETAILS**

**Project No: 23-744/23-745**

**Date: Dec 2025**

**Designed by: sr**

**Checked by: DZ**

**DESIGN CRITERIA**

**Min. Diameter = 300 mm**

**Mannings 'n' = 0.013**

**Starting Tc = 10 min**

**Factor of Safety = 20 %**

**Rainfall Intensity =  $\frac{A}{(Tc+B)^c}$**

**A = 1170**

**B = 5.8**

**c = 0.843**

Shading indicates pipes carrying 100yr flow

**NOMINAL PIPE SIZE USED**

STREET	FROM MH	TO MH	AREA (ha)	RUNOFF COEFFICIENT "R"	'AR'	ACCUM. 'AR'	RAINFALL INTENSITY (mm/hr)	FLOW (m3/s)	CONSTANT FLOW (m3/s)	ACCUM. CONSTANT FLOW (m3/s)	TOTAL FLOW (m3/s)	LENGTH (m)	SLOPE (%)	PIPE DIAMETER (mm)	FULL FLOW CAPACITY (m3/s)	FULL FLOW VELOCITY (m/s)	INITIAL Tc (min)	TIME OF CONCENTRATION (min)	ACC. TIME OF CONCENTRATION (min)	PERCENT FULL (%)
<b>DRAINAGE TO POND A POND 60 (IO WEST OF TRAFALGAR)</b>																				
N OF WHP	301	302	6.00	0.90	5.40	5.40	114.2	1.713	1.094	1.094	2.807	230.0	1.00	1200	3.899	3.45	10.00	1.11	11.11	72%
STREET P	303	305	2.60	0.80	2.08	2.08	114.2	0.660			0.660	275.0	1.00	675	0.841	2.35	10.00	1.95	11.95	79%
STREET L	304	305	6.50	0.90	5.85	5.85	114.2	1.856	1.233	1.233	3.089	200.0	0.30	1200x1800 (BOX)	4.605	2.13	10.00	1.56	11.56	67%
STREET L	305	302	8.80	0.90	7.92	15.85	103.5	4.558	0.000	1.233	5.791	150.0	0.30	1200x2400 (BOX)	6.587	2.29	11.95	1.09	13.04	88%
TO POND A	302	HW4	0.00	0.00	0.00	21.25	98.4	5.811	0.000	2.327	8.138	20.0	0.50	1200x2400 (BOX)	8.504	2.95	13.04	0.11	13.16	96%
WATER TOWER		306	1.10	0.25	0.28	0.28														
LOYALIST TRAIL	306	HW5	7.10	0.90	6.39	6.67	114.2	2.115	0.992	0.992	3.107	200.0	0.20	1200x2400 (BOX)	5.379	1.87	10.00	1.78	11.78	58%
POND A OUTLET	307	308	0.00	0.00	0.00	0.00	114.2	0.000	1.750	1.750	1.750	235.0	0.30	1200	2.135	1.89	10.00	2.07	12.07	82%
TRAFALGAR RD	308	X3	0.00	0.00	0.00	0.00	102.9	0.000	0.000	1.750	1.750	100.0	0.30	1200	2.135	1.89	12.07	0.88	12.96	82%
TRAFALGAR RD	309	X3	1.70	0.90	1.53	1.53	114.2	0.485			0.485	230.0	0.50	675	0.594	1.66	10.00	2.31	12.31	82%
TRAFALGAR RD	310	X3	0.70	0.90	0.63	0.63	114.2	0.200			0.200	125.0	0.50	525	0.304	1.40	10.00	1.48	11.48	66%
CROSSING 3	X3	311	0.00	0.00	0.00	2.16	98.8	0.593	0.000	1.750	2.343	59.0	0.30	1200x1800 (BOX)	4.643	2.15	12.96	0.46	13.41	50%
EASEMENT	311	312	0.00	0.00	0.00	2.16	96.8	0.581	0.000	1.750	2.331	150.0	0.30	1200x1800 (BOX)	4.605	2.13	13.41	1.17	14.59	51%
BURNHAMTHORPE RD	312	HW6	0.00	0.00	0.00	2.16	92.1	0.553	0.000	1.750	2.303	415.0	0.40	1200x1800 (BOX)	5.318	2.46	14.59	2.81	17.40	43%
<b>DRAINAGE TO POND B POND 35A (IO EAST OF TRAFALGAR)</b>																				
STREET K	401	402	6.40	0.90	5.76	5.76	114.2	1.827	1.123	1.123	2.950	330.0	0.70	1200	3.262	2.88	10.00	1.91	11.91	90%
TRAFALGAR RD	403	402	1.20	0.90	1.08	1.08	114.2	0.343			0.343	190.0	0.50	600	0.434	1.54	10.00	2.06	12.06	79%
TRAFALGAR RD	404	402	1.10	0.90	0.99	0.99	114.2	0.314			0.314	175.0	0.50	600	0.434	1.54	10.00	1.90	11.90	72%
TO POND B	402	405	6.90	0.90	6.21	14.04	103.0	4.017	0.000	1.123	5.140	230.0	0.50	1200x1800 (BOX)	5.946	2.75	12.06	1.39	13.45	86%
TO POND B	406	407	8.50	0.90	7.65	7.65	114.2	2.427			2.427	300.0	0.50	900x1800 (BOX)	3.949	2.44	10.00	2.05	12.05	61%
<b>DRAINAGE TO POND C</b>																				
WHP		EX.POND	4.10	0.90	3.69	3.69						925.0	0.53	750	0.810	1.83	10.00	8.40	18.40	
WHP	EX.POND	501				3.69	79.7	0.817			0.817	250.0	0.30	900	0.992	1.56	18.40	2.67	21.08	82%
STREET B	501	502	6.70	0.90	6.03	9.72	73.0	1.971			1.971	170.0	0.30	1350	2.923	2.04	21.08	1.39	22.46	67%
BURNHAMTHORPE RD	503	502	3.80	0.90	3.42	3.42	114.2	1.085			1.085	390.0	0.50	975	1.585	2.12	10.00	3.06	13.06	68%
POND C	502	POND C	3.40	0.90	3.06	16.20	70.0	3.148			3.148	10.0	0.50	1200x1800 (BOX)	5.946	2.75	22.46	0.06	22.52	53%

**Urbantech Consulting, A Division of Leighton-Zec Ltd.**

3760 14th Avenue, Suite 301 Markham, Ontario L3R 3T7

TEL: 905.946.9461 FAX: 905.946.9595

[www.urbantech.com](http://www.urbantech.com)

## **SWM Pond 60**

SWM Pond 60 will service a drainage area of approximately 35.6 ha with an imperviousness of 89%. Table D1 summarizes the operating levels and storage volumes that can be achieved within the SWM block shown on the current drawings. The facility operating levels were based on information provided by Urbantech. A detailed stage-storage-discharge worksheet is attached.

Stage	Elevation (m)	Active Volume (m <sup>3</sup> )	Cumulative Volume (m <sup>3</sup> )
Bottom of Pond	180.70	0	0
Permanent Pool	182.70	0	9168
Extended Detention (25mm)	183.45	7713	22556
Max. Water Level	186.70	51906	66154
Top of Pond/Spill	187.00	57306	71553
Outlet Controls:	One - 250-mm-diameter low flow orifice (quality) at elev. 182.70 m		
	Two - 325-mm-diameter orifices (quantity) at elev. 183.45 m		
	Two - 300-mm-diameter orifices at elev. 184.60 m		

Table D2 summarizes the MECP water quality requirements for the proposed wet pond facility.

Component	Required	Provided
Protection Level	'Enhanced' (80% long-term TSS removal)	
Drainage Area for Quality Control	35.6 ha	
Percent Impervious	89%	
Req'd MECP Water Quality Unit Volume	262 m <sup>3</sup> /ha	
<b>Permanent Pool Volume</b>		
Permanent Pool (Required unit volume = 210 m <sup>3</sup> /ha) <sup>A</sup>	7903 m <sup>3</sup>	9168 m <sup>3</sup>
Permanent Pool Depth	1.0 - 2.0 m	2.0 m
<b>Extended Detention Volume/Control</b>		
Extended Detention Volume (Based on 25mm storm)	6371 m <sup>3</sup>	7713 m <sup>3</sup> (elev. 183.45 m)
Drawdown time for Erosion Control	24 - 48 hours	34 hours
Orifice Diameter (Water Quality)	---	250 mm dia. (invert 182.70 m)

<sup>A</sup> Permanent Pool Volume = Total required volume, less 40 m<sup>3</sup>/s/ha

SWM facility performance was assessed with the SWMHYMO hydrologic modeling program using a single catchment to represent the drainage area and the detailed stage-storage-discharge characteristics with a Route Reservoir command. The analysis was performed with the 24-hour Town of Oakville Chicago Storm IDF. Table D3 shows the target flow values established by the NOCSS along with the controlled discharge from the SWM facility and volume requirements. The analysis shows that the 2-year to 100-year and Regional Storm SWM facility discharge rates are less than or equal to the target flows.

Storm Event	Target Unit Flow (m <sup>3</sup> /s/ha)	Target Flow (m <sup>3</sup> /s) <sup>A</sup>	SWM Facility Discharge (m <sup>3</sup> /s)	Required Storage Volume (m <sup>3</sup> )
2-year	0.007	0.237	0.180	10110
5-year	0.011	0.372	0.355	12880
10-year	0.013	0.440	0.438	14950
25-year	0.017	0.575	0.526	17780
50-year	0.019	0.643	0.575	19710
100-year	0.021	0.711	0.630	21780
Regional	0.048	1.625	1.589	<b>51530</b>

<sup>A</sup> Per JC7 Subwatershed EIS (Jan 2026)

**SWM FACILITY 60 (WEST SIDE) - STAGE-STORAGE-DISCHARGE CALCULATIONS**

Outlet Device No. 1 (Quality & Erosion)		Outlet Device No. 2 (Quantity)		Outlet Device No. 3		Outlet No. 4 (Quantity)	
Type:	Circular Orifice	Type:	Circular Orifice	Type:	Circular Orifice	Type:	Broad crested overflow weir
Diameter (mm)	250	Diameter (mm)	325	Diameter (mm)	300	Sill Elevation (m)	186.80
Area (m <sup>2</sup> )	0.04909	Area (m <sup>2</sup> )	0.08296	Area (m <sup>2</sup> )	0.07069	Length (m)	15.0
Invert Elev. (m)	182.60	Invert Elev. (m)	183.45	Invert Elev. (m)	184.60	Discharge (Q) =	1.67 L H <sup>1.5</sup>
C/L Elev. (m)	182.73	C/L Elev. (m)	183.61	C/L Elev. (m)	184.75		
Disch. Coeff. (C <sub>d</sub> )	0.62	Disch. Coeff. (C <sub>d</sub> )	0.62	Disch. Coeff. (C <sub>d</sub> )	0.62		
Discharge (Q) =	C <sub>d</sub> A ( 2 g H ) <sup>0.5</sup>	Discharge (Q) =	C <sub>d</sub> A ( 2 g H ) <sup>0.5</sup>	Discharge (Q) =	C <sub>d</sub> A ( 2 g H ) <sup>0.5</sup>		
Number of Orifices:	1	Number of Orifices:	2	Number of Orifices:	2		
		Spill into pipe elev. (m)	0.00	Spill into pipe elev. (m)	0.00		

	Elevation m	SWM Pond Volumes				Outlet No. 1		Outlet No. 2		Outlet No. 3		Outlet No. 4		Total Discharge m <sup>3</sup> /s	
		Area Main Pond m <sup>2</sup>	Incremental Volume m <sup>3</sup>	Cumulative Volume m <sup>3</sup>	Active Storage Volume m <sup>3</sup>	H m	Discharge m <sup>3</sup> /s								
Bottom Pond	180.70	4340.0	0	0	0										
	181.70	7570.0	5955	5955	0										
Top Perm. Pool	182.70	9015.0	8293	14248	0	0.00	0.000							0.0000	
Ext. Det. - 25mm = 183.45	182.90	9700.0	1871	16119	1871	0.30	0.049							0.0492	
	183.10	10400.0	2010	18129	3881	0.50	0.078							0.0778	
	183.30	11200.0	2160	20289	6041	0.70	0.098							0.0984	
	183.50	11475.0	2267	22556	8309	0.90	0.115	0.00	0.000					0.1154	
	183.70	11735.0	2321	24877	10630	1.10	0.130	0.25	0.068					0.1985	
	183.90	11995.0	2373	27250	13003	1.30	0.144	0.45	0.220					0.3636	
	184.10	12250.0	2424	29675	15427	1.50	0.156	0.65	0.300					0.4556	
	184.30	12520.0	2477	32152	17904	1.70	0.167	0.85	0.363					0.5295	
	Orifice #3 elev 184.95	184.50	12780.0	2530	34682	20434	1.90	0.177	1.05	0.416					0.5934
		184.70	13050.0	2583	37265	23017	2.10	0.187	1.25	0.463	0.10	0.012			0.6630
		184.90	13320.0	2637	39902	25654	2.30	0.197	1.45	0.506	0.30	0.087			0.7898
		185.10	13600.0	2692	42594	28346	2.50	0.206	1.65	0.545	0.50	0.213			0.9640
		185.30	13870.0	2747	45341	31093	2.70	0.215	1.85	0.582	0.70	0.275			1.0714
		185.50	14150.0	2802	48143	33895	2.90	0.223	2.05	0.617	0.90	0.325			1.1646
		185.70	14430.0	2858	51001	36753	3.10	0.231	2.25	0.650	1.10	0.368			1.2489
185.90		14710.0	2914	53915	39667	3.30	0.239	2.45	0.681	1.30	0.407			1.3267	
186.10		15000.0	2971	56886	42638	3.500	0.2461	2.65	0.711	1.50	0.443			1.3995	
186.30		15280.0	3028	59914	45666	3.7000	0.2534	2.85	0.739	1.70	0.475			1.4683	
Max. Water Level	186.50	15570.0	3085	62999	48751	3.9000	0.2605	3.05	0.767	1.90	0.506			1.5336	
	186.70	15980.0	3155	66154	51906	4.1000	0.2674	3.25	0.794	2.10	0.535			1.5961	
	186.80	18000.0	1699	67853	53606	4.2000	0.2707	3.35	0.807	2.20	0.549	0.000	0.0000	1.6263	
Weir/Spill - 0.10m above Max.	187.00	19000.0	3700	71553	57306	4.4000	0.2774	3.55	0.832	2.40	0.576	0.200	2.2405	3.9256	

**SWMF 60 - Wet Pond - Drawdown Calculations**

Pond drawdown time can be estimated using Equation 4.10 (MOEE SWMP Planning & Design Manual)

$$t = \frac{2A_p}{CA_o(2g)^{0.5}} (h_1^{0.5} - h_2^{0.5})$$

t = drawdown time in seconds	=	to be calculated
Ap = surface area of the pond (m <sup>2</sup> )	=	<b>10250</b> (Avg. Surface Area between h <sub>1</sub> & h <sub>2</sub> )
C = discharge coefficient	=	0.62
D = diameter of controlling orifice (m)	=	<b>0.250</b>
Ao = cross-sectional area of orifice (m <sup>2</sup> )	=	0.04909
g = acceleration due to gravity (m/s <sup>2</sup> )	=	9.81
Orifice invert elevation (m)	=	<b>182.700</b> (Permanent Pool Elev.)
Orifice centreline elevation (m)	=	<b>182.825</b>
Extended detention elevation (m)	=	<b>183.450</b> (Runoff volume for 25 mm event.)
h <sub>1</sub> = starting water level above orifice (m)	=	0.6250
h <sub>2</sub> = ending water level above orifice (m)	=	0.00

t = 120221.7 seconds =

<b>33.4 hours</b>
-------------------

## STORMWATER MANAGEMENT WATER QUALITY CALCULATIONS

### SWMF 60 - WET POND

#### Areas Contributing to SWM Pond for Water Quality

Sub-Catchment ID	Area (ha)	Percent Impervious (%)
Future Development Area	35.6	89.0
<b>TOTAL</b>	<b>35.6</b>	<b>89.0</b>

#### SWM Pond

Required protection level:	Enhanced
Contributing drainage area:	35.60 ha
Impervious level:	89.0 %
Total required water quality storage volume per hectare:	256.7 m <sup>3</sup> /ha
Required permanent pool volume per hectare:	217 m <sup>3</sup> /ha
Required extended detention storage volume per hectare:	40.0 m <sup>3</sup> /ha
Required permanent pool volume:	7,903 m <sup>3</sup>
Provided permanent pool volume:	9,168 m <sup>3</sup>
Required MOE extended detention storage volume:	1,424 m <sup>3</sup>
Provided extended detention volume during water quality event:	1,490 m <sup>3</sup>
25mm Storm - Required storage volume:	6,371 m <sup>3</sup>
25mm Storm - Provided Volume:	<b>7,713 m<sup>3</sup></b> (elev. 183.45m)
Total pond storage volume during water quality event:	16,881 m <sup>3</sup>

#### MECP SWM Design Manual Table 3.2

Protection Level	SWMP Type	Storage Volume (m <sup>3</sup> /ha) for Impervious Level			
		35%	55%	70%	85%
<i>Enhanced</i> (80% long-term S.S. removal)	Infiltration	25	30	35	40
	Wetlands	80	105	120	140
	Hybrid Wet Pond/Wetland	110	150	175	195
	<b>Wet Pond</b>	140	190	225	<b>250</b>
<i>Normal</i> (70% long-term S.S. removal)	Infiltration	20	20	25	30
	Wetlands	60	70	80	90
	Hybrid Wet Pond/Wetland	75	90	105	120
	Wet Pond	90	110	130	150
<i>Basic</i> (60% long-term S.S. removal)	Infiltration	20	20	20	20
	Wetlands	60	60	60	60
	Hybrid Wet Pond/Wetland	60	70	75	80
	Wet Pond	60	75	85	95
	Dry Pond (Continuous Flow)	90	150	200	240

```

2 Metric units
*****
*# Project Name: TRAFALGAR IO
*# OAKVILLE, ONTARIO
*# JOB NUMBER : 2022-0019-10
*# Date : OCTOBER 2023
*# Revised : JANUARY 2026
*# Company : WALTER FEDY
*# File : IO-TRAFE.DAT - PRELIMINARY SWM FACILITY SIZING
*****
START TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN=[002]
OK24-002.STM
*
READ STORM STORM_FILENAME "STORM.001"
*
*#-----|-----
*# POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#-----|-----
*# SWM FACILITY 60 - WEST SIDE OF IO LANDS
*
CALIB STANDHYD ID=[2], NHYD=["AREA-A"], DT=[1](min), AREA=[35.6](ha),
XIMP=[0.79], TIMP=[0.89], DWF=[0](cms), LOSS=[2],
SCS curve number CN=[75],
Pervious surfaces: IAPER=[4.0](mm), SLPP=[2.0](%),
LGP=[30](m), MNP=[0.250], SCP=[0](min),
Impervious surfaces: IAImp=[1.0](mm), SLPI=[1.0](%),
LGI=[495](m), MNI=[0.015], SCI=[0](min)
RAINFALL=[ , , , ](mm/hr) , END=-1
*#-----|-----
*# ROUTE FLOWS THROUGH SWM FACILITY 60
*#
ROUTE RESERVOIR IDout=[1], NHYD=["SWM-60"], IDin=[2],
RDT=[1](min),
TABLE of ( OUTFLOW-STORAGE ) values
(cms) - (ha-m)
0.0000 0.0000
0.0492 0.1871
0.0778 0.3881
0.0984 0.6041
0.1154 0.8309
0.1985 1.0630
0.3636 1.3003
0.4556 1.5427
0.5295 1.7904
0.5934 2.0434
0.6630 2.3017
0.7898 2.5654
0.9640 2.8346
1.2489 3.6753
1.3267 3.9667
1.4683 4.5666
1.5336 4.8751
1.5961 5.1906
-1 -1 (max twenty pts)
IDovf=[3], NHYDovf=["OFL-60"]
*#-----|-----
*# SWM FACILITY 35A - EAST SIDE OF IO LANDS
*
CALIB STANDHYD ID=[7], NHYD=["AREA-B"], DT=[1](min), AREA=[25.3](ha),
XIMP=[0.84], TIMP=[0.94], DWF=[0](cms), LOSS=[2],
SCS curve number CN=[75],
Pervious surfaces: IAPER=[4.0](mm), SLPP=[2.0](%),
LGP=[30](m), MNP=[0.250], SCP=[0](min),
Impervious surfaces: IAImp=[1.0](mm), SLPI=[1.0](%),
LGI=[410](m), MNI=[0.015], SCI=[0](min)
RAINFALL=[ , , , ](mm/hr) , END=-1
*#-----|-----
*# ROUTE FLOWS THROUGH SWM FACILITY 35A
*# NOTE: LAST OUTFLOW-STORAGE DATA PAIR IS AT WEIR SILL.
*#
ROUTE RESERVOIR IDout=[8], NHYD=["SWM35A"], IDin=[7],
RDT=[1](min),
TABLE of ( OUTFLOW-STORAGE ) values
(cms) - (ha-m)
0.0000 0.0000
0.0189 0.2402
0.0651 0.4944
0.0801 0.6255
0.1181 0.7621
0.1709 0.9047
0.2877 1.0500
0.4204 1.3466
0.5168 1.6512
0.5970 1.9637
0.6673 2.2842
0.7686 2.6127
0.9191 2.9492
1.0205 3.2937
1.1084 3.6461
1.1880 4.0065
1.2254 4.1897
-1 -1 (max twenty pts)
IDovf=[9], NHYDovf=["OFL-35"]
*#-----|-----
*#
*# RUN REMAINING DESIGN STORMS (5 TO 100-YR - OAKVILLE 24HR CHICAGO STORM
+ HURRICANE HAZEL + 25mm)
*
START TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN=[005]
OK24-005.STM
*
START TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN=[010]
OK24-010.STM
*

```

```

START TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN=[025]
OK24-025.STM
*
START TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN=[050]
OK24-050.STM
*
START TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN=[100]
OK24-100.STM
*
START TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN=[250]
hazel48.STM
*
START TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN=[325]
25mm.STM
*
*#-----|-----
FINISH

```

SSSSS W W M M H H Y Y M M OOO 999 999 =====
S W W W M M M H H Y Y M M M O O 9 9 9 9
SSSSS W W W M M M H H H H Y Y M M M O O ## 9 9 9 9 Ver 4.05
S W W M M M H H Y M M O O 9999 9999 Sept 2011
SSSSS W W M M H H Y M M OOO 9 9 9 =====
StormWater Management HYdrologic Model 999 999 =====

\*\*\*\*\* SWMHYMO Ver/4.05 \*\*\*\*\*
\*\*\*\*\* A single event and continuous hydrologic simulation model \*\*\*\*\*
\*\*\*\*\* based on the principles of HYMO and its successors \*\*\*\*\*
\*\*\*\*\* OTTHYMO-83 and OTTHYMO-89. \*\*\*\*\*
\*\*\*\*\* Distributed by: J.F. Sabourin and Associates Inc. \*\*\*\*\*
\*\*\*\*\* Ottawa, Ontario: (613) 836-3884 \*\*\*\*\*
\*\*\*\*\* Gatineau, Quebec: (819) 243-6858 \*\*\*\*\*
\*\*\*\*\* E-Mail: swmhymo@jfsa.Com \*\*\*\*\*

\*\*\*\*\* Licensed user: WalterFedy \*\*\*\*\*
\*\*\*\*\* Kitchener SERIAL#:2018430 \*\*\*\*\*

\*\*\*\*\* PROGRAM ARRAY DIMENSIONS \*\*\*\*\*
\*\*\*\*\* Maximum value for ID numbers : 10 \*\*\*\*\*
\*\*\*\*\* Max. number of rainfall points: 105408 \*\*\*\*\*
\*\*\*\*\* Max. number of flow points : 105408 \*\*\*\*\*

\*\*\*\*\* DETAILED OUTPUT \*\*\*\*\*
\*\*\*\*\* DATE: 2026-02-05 TIME: 14:11:52 RUN COUNTER: 001610 \*\*\*\*\*
\* Input filename: C:\USERS\JORESK-1\Desktop\JOHNOW-1\TRAFAL-1\IO-TraFE.dat \*
\* Output filename: C:\USERS\JORESK-1\Desktop\JOHNOW-1\TRAFAL-1\IO-TraFE.out \*
\* Summary filename: C:\USERS\JORESK-1\Desktop\JOHNOW-1\IO-TraFE.sum \*
\* User comments:
\* 1:
\* 2:
\* 3:

001:0001-----
\* Project Name: TRAFALGAR IO
\* OAKVILLE, ONTARIO
\* JOB NUMBER : 2022-0019-10
\* Date : OCTOBER 2023
\* Revised : JANUARY 2026
\* Company : WALTER FEDY
\* File : IO-TRAFE.DAT - PRELIMINARY SWM FACILITY SIZING
\*\* END OF RUN : 1

002:0002-----
\* Project Name: TRAFALGAR IO
\* OAKVILLE, ONTARIO
\* JOB NUMBER : 2022-0019-10
\* Date : OCTOBER 2023
\* Revised : JANUARY 2026
\* Company : WALTER FEDY
\* File : IO-TRAFE.DAT - PRELIMINARY SWM FACILITY SIZING

002:0002-----
\* Project Name: TRAFALGAR IO
\* OAKVILLE, ONTARIO
\* JOB NUMBER : 2022-0019-10
\* Date : OCTOBER 2023
\* Revised : JANUARY 2026
\* Company : WALTER FEDY
\* File : IO-TRAFE.DAT - PRELIMINARY SWM FACILITY SIZING

002:0002-----
\* Project Name: TRAFALGAR IO
\* OAKVILLE, ONTARIO
\* JOB NUMBER : 2022-0019-10
\* Date : OCTOBER 2023
\* Revised : JANUARY 2026
\* Company : WALTER FEDY
\* File : IO-TRAFE.DAT - PRELIMINARY SWM FACILITY SIZING

Table with 8 columns: TIME, RAIN, TIME, RAIN, TIME, RAIN, TIME, RAIN. Rows show rainfall data at various time intervals from 0.17 to 2.00 hours.

Table with 8 columns: TIME, RAIN, TIME, RAIN, TIME, RAIN, TIME, RAIN. Rows show rainfall data at various time intervals from 2.17 to 6.00 hours.

002:0003-----
\* CALIB STANDHYD
\* 02:AREA-A DT= 1.00
Area (ha)= 35.60
Total Imp(%)= 89.00 Dir. Conn.(%)= 79.00

Table with 4 columns: IMPERVIOUS, PERVIOUS (i), PEAK FLOW (cms), TIME TO PEAK (hrs). Includes routing results and totals for Area A.

002:0004-----
\* ROUTE FLOWS THROUGH SWM FACILITY 60
\* ROUTE RESERVOIR
\* IN>02: (AREA-A)
\* OUT<01: (SWM-60)

Table with 4 columns: ROUTING RESULTS, AREA, QPEAK, TPEAK, R.V. Rows show routing results for Area A and B.

TOTAL NUMBER OF SIMULATED OVERFLOWS = 0
CUMULATIVE TIME OF OVERFLOWS (hours)= .00
PERCENTAGE OF TIME OVERFLOWING (%)= .00

PEAK FLOW REDUCTION [Qout/Qin](%)= 3.862
TIME SHIFT OF PEAK FLOW (min)= 145.00
MAXIMUM STORAGE USED (ha.m.)= 1011E+01

Table with 4 columns: IMPERVIOUS, PERVIOUS (i), Surface Area (ha), Dep. Storage (mm). Includes routing results for Area B.

Length (m) = 410.00 30.00
Mannings n = .015 .250
Max. eff. Inten. (mm/hr) = 82.18 106.58
Storage Coeff. (min) = 7.00 13.00
Unit Hyd. Tpeak (min) = 7.02 (ii) 12.81 (ii)
Unit Hyd. peak (cms) = 7.00 13.00
PEAK FLOW (cms) = 3.51 .28
TIME TO PEAK (hrs) = 8.55 8.67
RUNOFF VOLUME (mm) = 47.68 28.20
TOTAL RAINFALL (mm) = 48.69 48.69
RUNOFF COEFFICIENT = .98 .58

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN\* = 75.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

002:0006-----
\*# ROUTE FLOWS THROUGH SWM FACILITY 35A
\*# NOTE: LAST OUTFLOW-STORAGE DATA PAIR IS AT WEIR SILL.

ROUTE RESERVOIR IN>07: (AREA-B) OUT<08: (SWM35A) Requested routing time step = 1.0 min.
Table with columns: OUTFLOW STORAGE, STORAGE, OUTFLOW STORAGE, STORAGE. Values include .000, .019, .065, .080, .118, .171, .288, .420, .517.

ROUTING RESULTS AREA OPEAK TPEAK R.V.
Table with columns: AREA (ha), OPEAK (cms), TPEAK (hrs), R.V. (mm). Values: 25.30, 3.718, 8.550, 44.572.

TOTAL NUMBER OF SIMULATED OVERFLOWS = 0
CUMULATIVE TIME OF OVERFLOWS (hours) = .00
PERCENTAGE OF TIME OVERFLOWING (%) = .00

PEAK FLOW REDUCTION [Qout/Qin] (%) = 3.353
TIME SHIFT OF PEAK FLOW (min) = 153.00
MAXIMUM STORAGE USED (ha.m.) = .7798E+00

002:0007-----
\*#
\*# RUN REMAINING DESIGN STORMS (5 TO 100-YR - OAKVILLE 24HR CHICAGO STORM + HURRICANE HAZEL + 25mm)
\*\* END OF RUN : 4

START Project dir.: C:\USERS\JORESK-1\Desktop\JOHNOW-1\TRAFAL-1
Rainfall dir.: C:\USERS\JORESK-1\Desktop\JOHNOW-1\TRAFAL-1
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 005
NSTORM= 1
# 1=OK24-005.STM

005:0002-----
\*# Project Name: TRAFALGAR IO
\*# OAKVILLE, ONTARIO
\*# JOB NUMBER : 2022-0019-10
\*# Date : OCTOBER 2023
\*# Revised : JANUARY 2026
\*# Company : WALTER FEDY
\*# File : IO-TRAFE.DAT - PRELIMINARY SWM FACILITY SIZING

005:0002-----
\*#
\*# READ STORM Ptotal= 60.87 mm
\*# Filename: OAKVILLE 5-YR, 24-HR CHICAGO STORM
\*# Comments: OAKVILLE 5-YR, 24-HR CHICAGO STORM

Table with columns: TIME, RAIN, TIME, RAIN, TIME, RAIN, TIME, RAIN. Values include .17, .33, .50, .67, .83, 1.00, 1.17, 1.33.

Table with multiple columns of numerical data. Values include 1.50, 1.67, 1.83, 2.00, 2.17, 2.33, 2.50, 2.67, 2.83, 3.00, 3.17, 3.33, 3.50, 3.67, 3.83, 4.00, 4.17, 4.33, 4.50, 4.67, 4.83, 5.00, 5.17, 5.33, 5.50, 5.67, 5.83, 6.00.

005:0003-----
\*#
\*# POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
\*# SWM FACILITY 60 - WEST SIDE OF IO LANDS

CALIB STANDHYD Area (ha) = 35.60
02:AREA-A DT= 1.00 Total Imp(%) = 89.00 Dir. Conn.(%) = 79.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha) = 31.68 3.92
Dep. Storage (mm) = 1.00 4.00
Average Slope (%) = 1.00 2.00
Length (m) = 495.00 30.00
Mannings n = .015 .250
Max. eff. Inten. (mm/hr) = 114.21 100.15
over (min) = 7.00 13.00
Storage Coeff. (min) = 6.89 (ii) 12.83 (ii)
Unit Hyd. Tpeak (min) = 7.00 13.00
Unit Hyd. peak (cms) = .16 .09

PEAK FLOW (cms) = 6.49 .68 6.982 (iii)
TIME TO PEAK (hrs) = 8.55 8.67 8.550
RUNOFF VOLUME (mm) = 59.86 33.49 54.335
TOTAL RAINFALL (mm) = 60.87 60.87 60.873
RUNOFF COEFFICIENT = .98 .55 .893

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN\* = 75.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

005:0004-----
\*# ROUTE FLOWS THROUGH SWM FACILITY 60
\*#

ROUTE RESERVOIR IN>02: (AREA-A) OUT<01: (SWM-60) Requested routing time step = 1.0 min.
Table with columns: OUTFLOW STORAGE, STORAGE, OUTFLOW STORAGE, STORAGE. Values include .000, .049, .078, .098, .115, .199, .364, .456, .530.

ROUTING RESULTS AREA OPEAK TPEAK R.V.
Table with columns: AREA (ha), OPEAK (cms), TPEAK (hrs), R.V. (mm). Values: 35.60, 6.982, 8.550, 54.335.

TOTAL NUMBER OF SIMULATED OVERFLOWS = 0
CUMULATIVE TIME OF OVERFLOWS (hours) = .00
PERCENTAGE OF TIME OVERFLOWING (%) = .00

PEAK FLOW REDUCTION [Qout/Qin] (%) = 5.081
TIME SHIFT OF PEAK FLOW (min) = 85.00
MAXIMUM STORAGE USED (ha.m.) = .1288E+01

005:0005-----
\*#
\*# SWM FACILITY 35A - EAST SIDE OF IO LANDS

CALIB STANDHYD Area (ha) = 25.30
07:AREA-B DT= 1.00 Total Imp(%) = 94.00 Dir. Conn.(%) = 84.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	23.78	1.52	
Dep. Storage (mm)=	1.00	4.00	
Average Slope (%)=	1.00	2.00	
Length (m)=	410.00	30.00	
Mannings n =	.015	.250	
Max.eff.Inten.(mm/hr)=	114.21	184.18	
over (min)	6.00	11.00	
Storage Coeff. (min)=	6.15 (ii)	10.81 (ii)	
Unit Hyd. Tpeak (min)=	6.00	11.00	
Unit Hyd. peak (cms)=	.19	.10	
PEAK FLOW (cms)=	5.18	.48	5.558 (iii)
TIME TO PEAK (hrs)=	8.53	8.63	8.533
RUNOFF VOLUME (mm)=	59.87	38.68	56.483
TOTAL RAINFALL (mm)=	60.87	60.87	60.873
RUNOFF COEFFICIENT =	.98	.64	.928

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
 CN\* = 75.0 Ia = Dep. Storage (Above)  
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
 THAN THE STORAGE COEFFICIENT.  
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

005:0006-----  
 \*# ROUTE FLOWS THROUGH SWM FACILITY 35A  
 \*# NOTE: LAST OUTFLOW-STORAGE DATA PAIR IS AT WEIR SILL.  
 \*#

ROUTE RESERVOIR IN>07:(AREA-B) OUT<08:(SWM35A)	Requested routing time step = 1.0 min.
===== OUTFLOW STORAGE TABLE =====	
OUTFLOW STORAGE	OUTFLOW STORAGE
(cms) (ha.m.)	(cms) (ha.m.)
.000 .0000E+00	.597 .1964E+01
.019 .2402E+00	.667 .2284E+01
.065 .4944E+00	.769 .2613E+01
.080 .6255E+00	.919 .2949E+01
.118 .7621E+00	1.020 .3294E+01
.171 .9047E+00	1.108 .3646E+01
.288 .1050E+01	1.188 .4006E+01
.420 .1347E+01	1.225 .4190E+01
.517 .1651E+01	.000 .0000E+00

ROUTING RESULTS	AREA	QPEAK	TPEAK	R.V.
-----	(ha)	(cms)	(hrs)	(mm)
INFLOW >07: (AREA-B)	25.30	5.558	8.533	56.483
OUTFLOW<08: (SWM35A)	25.30	.239	10.050	56.478
OVERFLOW<09: (OFL-35)	.00	.000	.000	.000

TOTAL NUMBER OF SIMULATED OVERFLOWS = 0  
 CUMULATIVE TIME OF OVERFLOWS (hours)= .00  
 PERCENTAGE OF TIME OVERFLOWING (%)= .00

PEAK FLOW REDUCTION [Qout/Qin](%)= 4.295  
 TIME SHIFT OF PEAK FLOW (min)= 91.00  
 MAXIMUM STORAGE USED (ha.m.)=.9891E+00

005:0007-----  
 \*#  
 \*#  
 \*# RUN REMAINING DESIGN STORMS (5 TO 100-YR - OAKVILLE 24HR CHICAGO STORM  
 + HURRICANE HAZEL + 25mm)  
 \*#

005:0002-----  
 \*#  
 \*# \*\* END OF RUN : 9

-----  
 | START | Project dir.: C:\USERS\JORESK-1\Desktop\JOHNOW-1\TRAFAL-1  
 |-----| Rainfall dir.: C:\USERS\JORESK-1\Desktop\JOHNOW-1\TRAFAL-1  
 TZERO = .00 hrs on 0  
 METOUT= 2 (output = METRIC)  
 NRUN = 010  
 NSTORM= 1  
 # 1=OK24-010.STM

010:0002-----  
 \*# \*\*\*\*\*  
 \*# Project Name: TRAFALGAR IO  
 \*# OAKVILLE, ONTARIO  
 \*# JOB NUMBER : 2022-0019-10  
 \*# Date : OCTOBER 2023  
 \*# Revised : JANUARY 2026  
 \*# Company : WALTER FEDY  
 \*# File : IO-TRAFE.DAT - PRELIMINARY SWM FACILITY SIZING  
 \*# \*\*\*\*\*

010:0002-----  
 \*#  
 \*# READ STORM | Filename: OAKVILLE 10-YR, 24-HR CHICAGO STORM  
 Ptotal= 70.24 mm | Comments: OAKVILLE 10-YR, 24-HR CHICAGO STORM

TIME RAIN	TIME RAIN	TIME RAIN	TIME RAIN
hrs mm/hr	hrs mm/hr	hrs mm/hr	hrs mm/hr
.17 .459	6.17 1.420	12.17 1.637	18.17 .689

.33	.467	6.33	1.521	12.33	1.572	18.33	.679
.50	.475	6.50	1.637	12.50	1.512	18.50	.669
.67	.484	6.67	1.775	12.67	1.457	18.67	.659
.83	.493	6.83	1.941	12.83	1.406	18.83	.650
1.00	.503	7.00	2.144	13.00	1.359	19.00	.641
1.17	.513	7.17	2.400	13.17	1.315	19.17	.632
1.33	.523	7.33	2.731	13.33	1.274	19.33	.624
1.50	.534	7.50	3.178	13.50	1.236	19.50	.616
1.67	.545	7.67	3.817	13.67	1.200	19.67	.607
1.83	.557	7.83	4.807	13.83	1.166	19.83	.600
2.00	.570	8.00	6.551	14.00	1.135	20.00	.592
2.17	.583	8.17	10.442	14.17	1.105	20.17	.585
2.33	.596	8.33	26.431	14.33	1.076	20.33	.578
2.50	.611	8.50	134.793	14.50	1.050	20.50	.571
2.67	.626	8.67	39.070	14.67	1.024	20.67	.564
2.83	.642	8.83	18.369	14.83	1.000	20.83	.557
3.00	.659	9.00	11.812	15.00	.978	21.00	.551
3.17	.677	9.17	8.690	15.17	.956	21.17	.544
3.33	.697	9.33	6.883	15.33	.935	21.33	.538
3.50	.717	9.50	5.708	15.50	.915	21.50	.532
3.67	.739	9.67	4.885	15.67	.897	21.67	.526
3.83	.762	9.83	4.276	15.83	.879	21.83	.521
4.00	.787	10.00	3.807	16.00	.861	22.00	.515
4.17	.814	10.17	3.435	16.17	.845	22.17	.510
4.33	.843	10.33	3.133	16.33	.829	22.33	.504
4.50	.874	10.50	2.882	16.50	.814	22.50	.499
4.67	.907	10.67	2.671	16.67	.799	22.67	.494
4.83	.944	10.83	2.490	16.83	.785	22.83	.489
5.00	.984	11.00	2.333	17.00	.771	23.00	.484
5.17	1.028	11.17	2.196	17.17	.758	23.17	.479
5.33	1.077	11.33	2.076	17.33	.746	23.33	.475
5.50	1.130	11.50	1.969	17.50	.734	23.50	.470
5.67	1.190	11.67	1.873	17.67	.722	23.67	.466
5.83	1.258	11.83	1.786	17.83	.711	23.83	.461
6.00	1.334	12.00	1.708	18.00	.700	24.00	.457

010:0003-----  
 \*#  
 \*# POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING  
 \*# \*\*\*\*\*  
 \*# SWM FACILITY 60 - WEST SIDE OF IO LANDS  
 \*#

CALIB STANDHYD	Area (ha)=	35.60
02:AREA-A DT= 1.00	Total Imp(%)=	89.00 Dir. Conn.(%)= 79.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	31.68	3.92
Dep. Storage (mm)=	1.00	4.00
Average Slope (%)=	1.00	2.00
Length (m)=	495.00	30.00
Mannings n =	.015	.250
Max.eff.Inten.(mm/hr)=	134.79	134.12
over (min)	6.00	12.00
Storage Coeff. (min)=	6.45 (ii)	11.73 (ii)
Unit Hyd. Tpeak (min)=	6.00	12.00
Unit Hyd. peak (cms)=	.18	.10
PEAK FLOW (cms)=	7.96	.91
TIME TO PEAK (hrs)=	8.53	8.65
RUNOFF VOLUME (mm)=	69.23	41.27
TOTAL RAINFALL (mm)=	70.24	70.24
RUNOFF COEFFICIENT =	.99	.59

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
 CN\* = 75.0 Ia = Dep. Storage (Above)  
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
 THAN THE STORAGE COEFFICIENT.  
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

010:0004-----  
 \*# ROUTE FLOWS THROUGH SWM FACILITY 60  
 \*#

ROUTE RESERVOIR IN>02:(AREA-A) OUT<01:(SWM-60)	Requested routing time step = 1.0 min.
===== OUTFLOW STORAGE TABLE =====	
OUTFLOW STORAGE	OUTFLOW STORAGE
(cms) (ha.m.)	(cms) (ha.m.)
.000 .0000E+00	.593 .2043E+01
.049 .1871E+00	.663 .2302E+01
.078 .3881E+00	.790 .2565E+01
.098 .6041E+00	.964 .2835E+01
.115 .8309E+00	1.249 .3675E+01
.199 .1063E+01	1.327 .3967E+01
.364 .1300E+01	1.468 .4567E+01
.456 .1543E+01	1.534 .4875E+01
.530 .1790E+01	1.596 .5191E+01

ROUTING RESULTS	AREA	QPEAK	TPEAK	R.V.
-----	(ha)	(cms)	(hrs)	(mm)
INFLOW >02: (AREA-A)	35.60	8.608	8.533	63.367
OUTFLOW<01: (SWM-60)	35.60	.438	9.867	63.366
OVERFLOW<03: (OFL-60)	.00	.000	.000	.000

TOTAL NUMBER OF SIMULATED OVERFLOWS = 0  
 CUMULATIVE TIME OF OVERFLOWS (hours)= .00  
 PERCENTAGE OF TIME OVERFLOWING (%)= .00

PEAK FLOW REDUCTION [Qout/Qin](%)= 5.083  
 TIME SHIFT OF PEAK FLOW (min)= 80.00  
 MAXIMUM STORAGE USED (ha.m.)=.1495E+01

010:0005-----

```

*
*# SWM FACILITY 35A - EAST SIDE OF IO LANDS
*
-----
| CALIB STANDHYD | Area (ha)= 25.30
| 07:AREA-B DT= 1.00 | Total Imp(%)= 94.00 Dir. Conn.(%)= 84.00
-----
IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 23.78 1.52
Dep. Storage (mm)= 1.00 4.00
Average Slope (%)= 1.00 2.00
Length (m)= 410.00 30.00
Mannings n = .015 .250
Max.eff.Inten.(mm/hr)= 134.79 246.39
over (min) 6.00 10.00
Storage Coeff. (min)= 5.76 (ii) 9.90 (ii)
Unit Hyd. Tpeak (min)= 6.00 10.00
Unit Hyd. peak (cms)= .19 .11
*TOTALS*
PEAK FLOW (cms)= 6.24 .63 6.772 (iii)
TIME TO PEAK (hrs)= 8.53 8.62 8.533
RUNOFF VOLUME (mm)= 69.23 47.01 65.683
TOTAL RAINFALL (mm)= 70.24 70.24 70.238
RUNOFF COEFFICIENT = .99 .67 .935
(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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010:0006-----
*# ROUTE FLOWS THROUGH SWM FACILITY 35A
*# NOTE: LAST OUTFLOW-STORAGE DATA PAIR IS AT WEIR SILL.
*#
-----
| ROUTE RESERVOIR | Requested routing time step = 1.0 min.
| IN>07:(AREA-B) |
| OUT<08:(SWM35A) |
-----
===== OUTFLOW STORAGE TABLE =====
OUTFLOW STORAGE OUTFLOW STORAGE
(cms) (ha.m.) (cms) (ha.m.)
.000 .0000E+00 .597 .1964E+01
.019 .2402E+00 .667 .2284E+01
.065 .4944E+00 .769 .2613E+01
.080 .6255E+00 .919 .2949E+01
.118 .7621E+00 1.020 .3294E+01
.171 .9047E+00 1.108 .3646E+01
.288 .1050E+01 1.188 .4006E+01
.420 .1347E+01 1.225 .4190E+01
.517 .1651E+01 .000 .0000E+00

ROUTING RESULTS AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW >07: (AREA-B) 25.30 6.772 8.533 65.683
OUTFLOW<08: (SWM35A) 25.30 .325 9.800 65.679
OVERFLOW<09: (OFL-35) .00 .000 .000 .000

TOTAL NUMBER OF SIMULATED OVERFLOWS = 0
CUMULATIVE TIME OF OVERFLOWS (hours)= .00
PERCENTAGE OF TIME OVERFLOWING (%)= .00

PEAK FLOW REDUCTION [Qout/Qin] (%)= 4.795
TIME SHIFT OF PEAK FLOW (min)= 76.00
MAXIMUM STORAGE USED (ha.m.)=.1133E+01

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```

010:0007-----
*#
*#-----
*# RUN REMAINING DESIGN STORMS (5 TO 100-YR - OAKVILLE 24HR CHICAGO STORM
*# + HURRICANE HAZEL + 25mm)
*#
010:0002-----
010:0002-----
*#
** END OF RUN : 24

```

```

025:0002-----
*#
*#-----
*# Project Name: TRAFALGAR IO
*# OAKVILLE, ONTARIO
*# JOB NUMBER : 2022-0019-10
*# Date : OCTOBER 2023
*# Revised : JANUARY 2026
*# Company : WALTER FEDY
*# File : IO-TRAFE.DAT - PRELIMINARY SWM FACILITY SIZING
*#
-----
| START | Project dir.: C:\USERS\JORESK-1\Desktop\JOHNOW-1\TRAFAL-1
| | Rainfall dir.: C:\USERS\JORESK-1\Desktop\JOHNOW-1\TRAFAL-1
| |
| TZERO = .00 hrs on 0
| METOUT= 2 (output = METRIC)
| NRUN = 025
| NSTORM= 1
| # 1=OK24-025.STM
-----
025:0002-----
*#
*#-----
*# Project Name: TRAFALGAR IO
*# OAKVILLE, ONTARIO
*# JOB NUMBER : 2022-0019-10
*# Date : OCTOBER 2023
*# Revised : JANUARY 2026
*# Company : WALTER FEDY
*# File : IO-TRAFE.DAT - PRELIMINARY SWM FACILITY SIZING
*#
-----
| ROUTE RESERVOIR | Requested routing time step = 1.0 min.
| IN>02:(AREA-A) |
| OUT<01:(SWM-60) |
-----
===== OUTFLOW STORAGE TABLE =====
OUTFLOW STORAGE OUTFLOW STORAGE
(cms) (ha.m.) (cms) (ha.m.)
.000 .0000E+00 .593 .2043E+01
.049 .1871E+00 .663 .2302E+01
.078 .3881E+00 .790 .2565E+01
.098 .6041E+00 .964 .2835E+01
.115 .8309E+00 1.249 .3675E+01
.199 .1063E+01 1.327 .3967E+01
.364 .1300E+01 1.468 .4567E+01
.456 .1543E+01 1.534 .4875E+01
.530 .1790E+01 1.596 .5191E+01

ROUTING RESULTS AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW >02: (AREA-A) 35.60 10.764 8.533 75.243
OUTFLOW<01: (SWM-60) 35.60 .526 9.800 75.242
OVERFLOW<03: (OFL-60) .00 .000 .000 .000

```

```

025:0002-----
*#
*#-----
*# READ STORM | Filename: OAKVILLE 25-YR, 24-HR CHICAGO STORM
*# Ptotal= 82.47 mm | Comments: OAKVILLE 25-YR, 24-HR CHICAGO STORM
-----
TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
.17 .528 6.17 1.640 12.17 1.891 18.17 .794
.33 .537 6.33 1.756 12.33 1.816 18.33 .782
.50 .547 6.50 1.892 12.50 1.746 18.50 .771
.67 .557 6.67 2.052 12.67 1.683 18.67 .760
.83 .568 6.83 2.244 12.83 1.624 18.83 .749
1.00 .579 7.00 2.479 13.00 1.569 19.00 .738
1.17 .590 7.17 2.776 13.17 1.518 19.17 .728
1.33 .602 7.33 3.160 13.33 1.471 19.33 .719
1.50 .615 7.50 3.679 13.50 1.427 19.50 .709
1.67 .628 7.67 4.420 13.67 1.385 19.67 .700
1.83 .642 7.83 5.570 13.83 1.346 19.83 .691
2.00 .656 8.00 7.599 14.00 1.309 20.00 .682
2.17 .671 8.17 12.135 14.17 1.275 20.17 .673
2.33 .687 8.33 30.924 14.33 1.242 20.33 .665
2.50 .704 8.50 162.166 14.50 1.211 20.50 .657
2.67 .721 8.67 45.867 14.67 1.182 20.67 .649
2.83 .740 8.83 21.413 14.83 1.154 20.83 .642
3.00 .760 9.00 13.734 15.00 1.128 21.00 .634
3.17 .781 9.17 10.091 15.17 1.103 21.17 .627
3.33 .803 9.33 7.985 15.33 1.079 21.33 .620
3.50 .826 9.50 6.618 15.50 1.056 21.50 .613
3.67 .852 9.67 5.661 15.67 1.034 21.67 .606
3.83 .878 9.83 4.953 15.83 1.013 21.83 .599
4.00 .907 10.00 4.409 16.00 .993 22.00 .593
4.17 .938 10.17 3.977 16.17 .974 22.17 .587
4.33 .971 10.33 3.626 16.33 .956 22.33 .580
4.50 1.007 10.50 3.335 16.50 .938 22.50 .574
4.67 1.047 10.67 3.090 16.67 .921 22.67 .569
4.83 1.089 10.83 2.880 16.83 .905 22.83 .563
5.00 1.135 11.00 2.698 17.00 .889 23.00 .557
5.17 1.186 11.17 2.540 17.17 .874 23.17 .552
5.33 1.242 11.33 2.400 17.33 .860 23.33 .546
5.50 1.305 11.50 2.276 17.50 .846 23.50 .541
5.67 1.374 11.67 2.164 17.67 .832 23.67 .536
5.83 1.452 11.83 2.064 17.83 .819 23.83 .531
6.00 1.540 12.00 1.973 18.00 .806 24.00 .526

```

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025:0003-----
*#
*#-----
*# POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#
*#-----
*# SWM FACILITY 60 - WEST SIDE OF IO LANDS
*#
-----
| CALIB STANDHYD | Area (ha)= 35.60
| 02:AREA-A DT= 1.00 | Total Imp(%)= 89.00 Dir. Conn.(%)= 79.00
-----
IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 31.68 3.92
Dep. Storage (mm)= 1.00 4.00
Average Slope (%)= 1.00 2.00
Length (m)= 495.00 30.00
Mannings n = .015 .250
Max.eff.Inten.(mm/hr)= 162.17 184.56
over (min) 6.00 11.00
Storage Coeff. (min)= 5.99 (ii) 10.64 (ii)
Unit Hyd. Tpeak (min)= 6.00 11.00
Unit Hyd. peak (cms)= .19 .11
*TOTALS*
PEAK FLOW (cms)= 9.80 1.24 10.764 (iii)
TIME TO PEAK (hrs)= 8.53 8.63 8.533
RUNOFF VOLUME (mm)= 81.46 51.79 75.243
TOTAL RAINFALL (mm)= 82.47 82.47 82.475
RUNOFF COEFFICIENT = .99 .63 .912
(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

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025:0004-----
*#
*#-----
*# ROUTE FLOWS THROUGH SWM FACILITY 60
*#
-----
| ROUTE RESERVOIR | Requested routing time step = 1.0 min.
| IN>02:(AREA-A) |
| OUT<01:(SWM-60) |
-----
===== OUTFLOW STORAGE TABLE =====
OUTFLOW STORAGE OUTFLOW STORAGE
(cms) (ha.m.) (cms) (ha.m.)
.000 .0000E+00 .593 .2043E+01
.049 .1871E+00 .663 .2302E+01
.078 .3881E+00 .790 .2565E+01
.098 .6041E+00 .964 .2835E+01
.115 .8309E+00 1.249 .3675E+01
.199 .1063E+01 1.327 .3967E+01
.364 .1300E+01 1.468 .4567E+01
.456 .1543E+01 1.534 .4875E+01
.530 .1790E+01 1.596 .5191E+01

ROUTING RESULTS AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW >02: (AREA-A) 35.60 10.764 8.533 75.243
OUTFLOW<01: (SWM-60) 35.60 .526 9.800 75.242
OVERFLOW<03: (OFL-60) .00 .000 .000 .000

```

CUMULATIVE TIME OF OVERFLOWS (hours)= .00
PERCENTAGE OF TIME OVERFLOWING (%)= .00

PEAK FLOW REDUCTION [Qout/Qin](%)= 4.886
TIME SHIFT OF PEAK FLOW (min)= 76.00
MAXIMUM STORAGE USED (ha.m.)=.1778E+01

025:0005-
\*
\*# SWM FACILITY 35A - EAST SIDE OF IO LANDS
\*

CALIB STANDHYD Area (ha)= 25.30
07:AREA-B DT= 1.00 Total Imp(%)= 94.00 Dir. Conn.(%)= 84.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 23.78 1.52
Dep. Storage (mm)= 1.00 4.00
Average Slope (%)= 1.00 2.00
Length (m)= 410.00 30.00
Mannings n = .015 .250
Max.eff.Inten.(mm/hr)= 162.17 321.84
over (min)= 5.00 9.00
Storage Coeff.(min)= 5.35 (ii) 9.07 (ii)
Unit Hyd. Tpeak (min)= 5.00 9.00
Unit Hyd. peak (cms)= .22 .13
\*TOTALS\*
PEAK FLOW (cms)= 7.80 .84 8.504 (iii)
TIME TO PEAK (hrs)= 8.52 8.60 8.517
RUNOFF VOLUME (mm)= 81.46 58.15 77.745
TOTAL RAINFALL (mm)= 82.47 82.47 82.475
RUNOFF COEFFICIENT = .99 .71 .943

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN\* = 75.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

025:0006-
\*# ROUTE FLOWS THROUGH SWM FACILITY 35A
\*# NOTE: LAST OUTFLOW-STORAGE DATA PAIR IS AT WEIR SILL.
\*#

ROUTE RESERVOIR Requested routing time step = 1.0 min.
IN>07: (AREA-B)
OUT<08: (SWM35A)

Table with 4 columns: OUTFLOW (cms), STORAGE (ha.m.), OUTFLOW (cms), STORAGE (ha.m.). Rows show various flow and storage values.

ROUTING RESULTS table with 5 columns: AREA (ha), QPEAK (cms), TPEAK (hrs), R.V. (mm). Rows show inflow, outflow, and overflow data.

TOTAL NUMBER OF SIMULATED OVERFLOWS = 0
CUMULATIVE TIME OF OVERFLOWS (hours)= .00
PERCENTAGE OF TIME OVERFLOWING (%)= .00

PEAK FLOW REDUCTION [Qout/Qin](%)= 4.868
TIME SHIFT OF PEAK FLOW (min)= 70.00
MAXIMUM STORAGE USED (ha.m.)=.1332E+01

025:0007-
\*#
\*#
\*#
\*#
\*# RUN REMAINING DESIGN STORMS (5 TO 100-YR - OAKVILLE 24HR CHICAGO STORM
+ HURRICANE HAZEL + 25mm)

025:0002-

025:0002-

025:0002-

\*\* END OF RUN : 49

\*\*\*\*\*

START Project dir.: C:\USERS\JORESK-1\Desktop\JOHNOW-1\TRAFAL-1
Rainfall dir.: C:\USERS\JORESK-1\Desktop\JOHNOW-1\TRAFAL-1

TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 050
NSTORM= 1
# 1=OK24-050.STM

050:0002-
\*#
\*# Project Name: TRAFALGAR IO
\*# OAKVILLE, ONTARIO
\*# JOB NUMBER : 2022-0019-10
\*# Date : OCTOBER 2023
\*# Revised : JANUARY 2026
\*# Company : WALTER FEDY
\*# File : IO-TRAFE.DAT - PRELIMINARY SWM FACILITY SIZING
\*#
\*#
\*#

050:0002-
\*#
\*# READ STORM Filename: OAKVILLE 50-YR, 24-HR CHICAGO STORM
Ptotal= 89.46 mm Comments: OAKVILLE 50-YR, 24-HR CHICAGO STORM

Table with 8 columns: TIME (hrs), RAIN (mm/hr), TIME (hrs), RAIN (mm/hr), TIME (hrs), RAIN (mm/hr), TIME (hrs), RAIN (mm/hr). Rows show hourly rainfall and time data.

050:0003-
\*#
\*# POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
\*#
\*#
\*# SWM FACILITY 60 - WEST SIDE OF IO LANDS
\*#

CALIB STANDHYD Area (ha)= 35.60
02:AREA-A DT= 1.00 Total Imp(%)= 89.00 Dir. Conn.(%)= 79.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 31.68 3.92
Dep. Storage (mm)= 1.00 4.00
Average Slope (%)= 1.00 2.00
Length (m)= 495.00 30.00
Mannings n = .015 .250
Max.eff.Inten.(mm/hr)= 182.06 229.12
over (min)= 6.00 10.00
Storage Coeff.(min)= 5.72 (ii) 9.98 (ii)
Unit Hyd. Tpeak (min)= 6.00 10.00
Unit Hyd. peak (cms)= .19 .11
\*TOTALS\*
PEAK FLOW (cms)= 11.15 1.50 12.404 (iii)
TIME TO PEAK (hrs)= 8.53 8.62 8.533
RUNOFF VOLUME (mm)= 88.45 57.93 82.050
TOTAL RAINFALL (mm)= 89.46 89.46 89.457
RUNOFF COEFFICIENT = .99 .65 .917

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN\* = 75.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

050:0004-
\*# ROUTE FLOWS THROUGH SWM FACILITY 60
\*#

ROUTE RESERVOIR Requested routing time step = 1.0 min.
IN>02: (AREA-A)
OUT<01: (SWM-60)

Table with 4 columns: OUTFLOW (cms), STORAGE (ha.m.), OUTFLOW (cms), STORAGE (ha.m.). Rows show various flow and storage values.

.115 .8309E+00 | 1.249 .3675E+01
.199 .1063E+01 | 1.327 .3967E+01
.364 .1300E+01 | 1.468 .4567E+01
.456 .1543E+01 | 1.534 .4875E+01
.530 .1790E+01 | 1.596 .5191E+01

ROUTING RESULTS AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW >02: (AREA-A) 35.60 12.404 8.533 82.050
OUTFLOW<01: (SWM-60) 35.60 .575 9.767 82.048
OVERFLOW<03: (OFL-60) .00 .000 .000 .000

TOTAL NUMBER OF SIMULATED OVERFLOWS = 0
CUMULATIVE TIME OF OVERFLOWS (hours) = .00
PERCENTAGE OF TIME OVERFLOWING (%) = .00

PEAK FLOW REDUCTION [Qout/Qin] (%) = 4.637
TIME SHIFT OF PEAK FLOW (min) = 74.00
MAXIMUM STORAGE USED (ha.m.) = .1971E+01

050:0005-
\*# SWM FACILITY 35A - EAST SIDE OF IO LANDS
\*

CALIB STANDHYD Area (ha) = 25.30
07:AREA-B DT= 1.00 Total Imp(%) = 94.00 Dir. Conn.(%) = 84.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha) = 23.78 1.52
Dep. Storage (mm) = 1.00 4.00
Average Slope (%) = 1.00 2.00
Length (m) = 410.00 30.00
Mannings n = .015 .250
Max.eff.Inten.(mm/hr) = 182.06 371.68
over (min) = 5.00 9.00
Storage Coeff. (min) = 5.11 (ii) 8.62 (iii)
Unit Hyd. Tpeak (min) = 5.00 9.00
Unit Hyd. peak (cms) = .22 .13
\*TOTALS\*
PEAK FLOW (cms) = 8.88 .99 9.712 (iii)
TIME TO PEAK (hrs) = 8.52 8.58 8.517
RUNOFF VOLUME (mm) = 88.44 64.61 84.645
TOTAL RAINFALL (mm) = 89.46 89.46 89.457
RUNOFF COEFFICIENT = .99 .72 .946

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN\* = 75.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

050:0006-
\*# ROUTE FLOWS THROUGH SWM FACILITY 35A
\*# NOTE: LAST OUTFLOW-STORAGE DATA PAIR IS AT WEIR SILL.
\*#

ROUTE RESERVOIR Requested routing time step = 1.0 min.
IN>07: (AREA-B)
OUT<08: (SWM35A)
===== OUTFLOW STORAGE TABLE =====
OUTFLOW STORAGE OUTFLOW STORAGE
(cms) (ha.m.) (cms) (ha.m.)
.000 .0000E+00 .597 .1964E+01
.019 .2402E+00 .667 .2284E+01
.065 .4944E+00 .769 .2613E+01
.080 .6255E+00 .919 .2949E+01
.118 .7621E+00 1.020 .3294E+01
.171 .9047E+00 1.108 .3646E+01
.288 .1050E+01 1.188 .4006E+01
.420 .1347E+01 1.225 .4190E+01
.517 .1651E+01 .000 .0000E+00

ROUTING RESULTS AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW >07: (AREA-B) 25.30 9.712 8.517 84.645
OUTFLOW<08: (SWM35A) 25.30 .459 9.633 84.640
OVERFLOW<09: (OFL-35) .00 .000 .000 .000

TOTAL NUMBER OF SIMULATED OVERFLOWS = 0
CUMULATIVE TIME OF OVERFLOWS (hours) = .00
PERCENTAGE OF TIME OVERFLOWING (%) = .00

PEAK FLOW REDUCTION [Qout/Qin] (%) = 4.724
TIME SHIFT OF PEAK FLOW (min) = 67.00
MAXIMUM STORAGE USED (ha.m.) = .1468E+01

050:0007-
\*#-----|-----|
\*#-----|-----|
\*#-----|-----|
\*# RUN REMAINING DESIGN STORMS (5 TO 100-YR - OAKVILLE 24HR CHICAGO STORM
+ HURRICANE HAZEL + 25mm)

050:0002-
\*#-----|-----|
\*#-----|-----|

050:0002-
\*#-----|-----|
\*#-----|-----|

050:0002-
\*#-----|-----|
\*#-----|-----|

050:0002-
\*#-----|-----|
\*#-----|-----|

\*\* END OF RUN : 99
\*\*\*\*\*

START Project dir.: C:\USERS\JOESK-1\Desktop\JOHNOW-1\TRAFAL-1
Rainfall dir.: C:\USERS\JOESK-1\Desktop\JOHNOW-1\TRAFAL-1
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 100
NSTORM= 1
# 1=OK24-100.STM

100:0002-----|-----|
\*#-----|-----|
\*# Project Name: TRAFALGAR IO
\*# OAKVILLE, ONTARIO
\*# JOB NUMBER : 2022-0019-10
\*# Date : OCTOBER 2023
\*# Revised : JANUARY 2026
\*# Company : WALTER FEDY
\*# File : IO-TRAFE.DAT - PRELIMINARY SWM FACILITY SIZING
\*\*\*\*\*

100:0002-----|-----|
\*#-----|-----|
READ STORM Filename: OAKVILLE 100-YR, 24-HR CHICAGO STORM
Ptotal= 98.13 mm Comments: OAKVILLE 100-YR, 24-HR CHICAGO STORM

Table with 8 columns: TIME, RAIN, TIME, RAIN, TIME, RAIN, TIME, RAIN. Rows show hourly data for rain intensity and cumulative totals.

100:0003-----|-----|
\*#-----|-----|
\*# POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
\*#-----|-----|
\*# SWM FACILITY 60 - WEST SIDE OF IO LANDS
\*\*\*\*\*

CALIB STANDHYD Area (ha) = 35.60
02:AREA-A DT= 1.00 Total Imp(%) = 89.00 Dir. Conn.(%) = 79.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha) = 31.68 3.92
Dep. Storage (mm) = 1.00 4.00
Average Slope (%) = 1.00 2.00
Length (m) = 495.00 30.00
Mannings n = .015 .250
Max.eff.Inten.(mm/hr) = 200.80 263.04
over (min) = 5.00 10.00
Storage Coeff. (min) = 5.50 (ii) 9.53 (ii)
Unit Hyd. Tpeak (min) = 5.00 10.00
Unit Hyd. peak (cms) = .21 .12
\*TOTALS\*
PEAK FLOW (cms) = 12.66 1.75 14.030 (iii)
TIME TO PEAK (hrs) = 8.52 8.62 8.533
RUNOFF VOLUME (mm) = 97.12 65.68 90.532
TOTAL RAINFALL (mm) = 98.13 98.13 98.133
RUNOFF COEFFICIENT = .99 .67 .923

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN\* = 75.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

100:0004
\*# ROUTE FLOWS THROUGH SWM FACILITY 60
\*#

Table with columns: ROUTE RESERVOIR, Requested routing time step = 1.0 min., OUTFLOW STORAGE TABLE, OUTFLOW STORAGE, OUTFLOW STORAGE

ROUTING RESULTS table with columns: AREA, QPEAK, TPEAK, R.V.

TOTAL NUMBER OF SIMULATED OVERFLOWS = 0
CUMULATIVE TIME OF OVERFLOWS (hours) = .00
PERCENTAGE OF TIME OVERFLOWING (%) = .00

PEAK FLOW REDUCTION [Qout/Qin] (%) = 4.488
TIME SHIFT OF PEAK FLOW (min) = 73.00
MAXIMUM STORAGE USED (ha.m.) = .2178E+01

100:0005
\*# SWM FACILITY 35A - EAST SIDE OF IO LANDS
\*#

Table with columns: CALIB STANDHYD, Area, Total Imp, Dir. Conn.

Table with columns: IMPERVIOUS, PERVIOUS, Surface Area, Dep. Storage, Average Slope, Length, Mannings n, Max. eff. Inten., Storage Coeff., Unit Hyd. Tpeak, Unit Hyd. peak, PEAK FLOW, TIME TO PEAK, RUNOFF VOLUME, TOTAL RAINFALL, RUNOFF COEFFICIENT

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN\* = 75.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

100:0006
\*# ROUTE FLOWS THROUGH SWM FACILITY 35A
\*# NOTE: LAST OUTFLOW-STORAGE DATA PAIR IS AT WEIR SILL.
\*#

Table with columns: ROUTE RESERVOIR, Requested routing time step = 1.0 min., OUTFLOW STORAGE TABLE, OUTFLOW STORAGE, OUTFLOW STORAGE

ROUTING RESULTS table with columns: AREA, QPEAK, TPEAK, R.V.

TOTAL NUMBER OF SIMULATED OVERFLOWS = 0
CUMULATIVE TIME OF OVERFLOWS (hours) = .00
PERCENTAGE OF TIME OVERFLOWING (%) = .00

PEAK FLOW REDUCTION [Qout/Qin] (%) = 4.623
TIME SHIFT OF PEAK FLOW (min) = 66.00
MAXIMUM STORAGE USED (ha.m.) = .1616E+01

100:0007
\*#
\*#

\*# RUN REMAINING DESIGN STORMS (5 TO 100-YR - OAKVILLE 24HR CHICAGO STORM + HURRICANE HAZEL + 25mm)

100:0002
100:0002
100:0002
100:0002
100:0002
\*\* END OF RUN : 249

START Project dir.: C:\USERS\JORESK-1\Desktop\JOHNOW-1\TRAFAL-1
Rainfall dir.: C:\USERS\JORESK-1\Desktop\JOHNOW-1\TRAFAL-1
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 250
NSTORM= 1
# 1=hazel48.STM

250:0002
\*# Project Name: TRAFALGAR IO
\*# OAKVILLE, ONTARIO
\*# JOB NUMBER : 2022-0019-10
\*# Date : OCTOBER 2023
\*# Revised : JANUARY 2026
\*# Company : WALTER FEDY
\*# File : IO-TRAFE.DAT - PRELIMINARY SWM FACILITY SIZING

Table with columns: TIME, RAIN, TIME, RAIN, TIME, RAIN, TIME, RAIN

250:0003
\*#
\*# POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
\*#
\*# SWM FACILITY 60 - WEST SIDE OF IO LANDS

Table with columns: CALIB STANDHYD, Area, Total Imp, Dir. Conn.

Table with columns: IMPERVIOUS, PERVIOUS, Surface Area, Dep. Storage, Average Slope, Length, Mannings n, Max. eff. Inten., Storage Coeff., Unit Hyd. Tpeak, Unit Hyd. peak, PEAK FLOW, TIME TO PEAK, RUNOFF VOLUME, TOTAL RAINFALL, RUNOFF COEFFICIENT

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN\* = 75.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

250:0004
\*# ROUTE FLOWS THROUGH SWM FACILITY 60

```

*#
-----
ROUTE RESERVOIR      Requested routing time step = 1.0 min.
IN>02:(AREA-A)
OUT<01:(SWM-60)
-----
===== OUTFLOW STORAGE TABLE =====
OUTFLOW STORAGE      OUTFLOW STORAGE
(cms) (ha.m.)         (cms) (ha.m.)
.000 .0000E+00         .593 .2043E+01
.049 .1871E+00         .663 .2302E+01
.078 .3881E+00         .790 .2565E+01
.098 .6041E+00         .964 .2835E+01
.115 .8309E+00         1.249 .3675E+01
.199 .1063E+01         1.327 .3967E+01
.364 .1300E+01         1.468 .4567E+01
.456 .1543E+01         1.534 .4875E+01
.530 .1790E+01         1.596 .5191E+01
-----
ROUTING RESULTS      AREA      QPEAK      TPEAK      R.V.
                   (ha)      (cms)      (hrs)      (mm)
INFLOW >02: (AREA-A) 35.60    5.172     46.000    275.692
OUTFLOW<01: (SWM-60) 35.60    1.589     47.467    275.688
OVERFLOW<03: (OFL-60) .00      .000      .000      .000
-----
TOTAL NUMBER OF SIMULATED OVERFLOWS = 0
CUMULATIVE TIME OF OVERFLOWS (hours)= .00
PERCENTAGE OF TIME OVERFLOWING (%) = .00
-----
PEAK FLOW REDUCTION [Qout/Qin](%) = 30.717
TIME SHIFT OF PEAK FLOW (min) = 88.00
MAXIMUM STORAGE USED (ha.m.) = .5153E+01
-----

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250:0005-----
*
*# SWM FACILITY 35A - EAST SIDE OF IO LANDS
*
-----
CALIB STANDHYD      Area (ha)= 25.30
07:AREA-B DT= 1.00 Total Imp(%)= 94.00 Dir. Conn.(%)= 84.00
-----
IMPERVIOUS      PERVIOUS (i)
Surface Area (ha)= 23.78      1.52
Dep. Storage (mm)= 1.00      4.00
Average Slope (%) = 1.00      2.00
Length (m) = 410.00      30.00
Mannings n = .015      .250
-----
Max.eff.Inten.(mm/hr)= 53.00      139.19
over (min) = 8.00      14.00
Storage Coeff. (min)= 8.37 (ii) 13.57 (iii)
Unit Hyd. Tpeak (min)= 8.00      14.00
Unit Hyd. peak (cms)= .14      .08
-----
*TOTALS*
PEAK FLOW (cms) = 3.13      .58      3.702 (iii)
TIME TO PEAK (hrs) = 46.00      46.02      46.000
RUNOFF VOLUME (mm) = 283.93      254.87      279.325
TOTAL RAINFALL (mm) = 284.97      284.97      284.973
RUNOFF COEFFICIENT = 1.00      .89
-----
(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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250:0006-----
*# ROUTE FLOWS THROUGH SWM FACILITY 35A
*# NOTE: LAST OUTFLOW-STORAGE DATA PAIR IS AT WEIR SILL.
*#
-----
ROUTE RESERVOIR      Requested routing time step = 1.0 min.
IN>07:(AREA-B)
OUT<08:(SWM35A)
-----
===== OUTFLOW STORAGE TABLE =====
OUTFLOW STORAGE      OUTFLOW STORAGE
(cms) (ha.m.)         (cms) (ha.m.)
.000 .0000E+00         .597 .1964E+01
.019 .2402E+00         .667 .2284E+01
.065 .4944E+00         .769 .2613E+01
.080 .6255E+00         .919 .2949E+01
.118 .7621E+00         1.020 .3294E+01
.171 .9047E+00         1.108 .3646E+01
.288 .1050E+01         1.188 .4006E+01
.420 .1347E+01         1.225 .4190E+01
.517 .1651E+01         .000 .0000E+00
-----
ROUTING RESULTS      AREA      QPEAK      TPEAK      R.V.
                   (ha)      (cms)      (hrs)      (mm)
INFLOW >07: (AREA-B) 25.30    3.702     46.000    279.325
OUTFLOW<08: (SWM35A) 25.30    1.141     47.400    279.306
OVERFLOW<09: (OFL-35) .00      .000      .000      .000
-----
TOTAL NUMBER OF SIMULATED OVERFLOWS = 0
CUMULATIVE TIME OF OVERFLOWS (hours)= .00
PERCENTAGE OF TIME OVERFLOWING (%) = .00
-----
PEAK FLOW REDUCTION [Qout/Qin](%) = 30.821
TIME SHIFT OF PEAK FLOW (min) = 84.00
MAXIMUM STORAGE USED (ha.m.) = .3794E+01
-----

```

```

250:0007-----
*#
*#
*# RUN REMAINING DESIGN STORMS (5 TO 100-YR - OAKVILLE 24HR CHICAGO STORM
*# + HURRICANE HAZEL + 25mm)
*#
-----

```

```

250:0002-----
*
250:0002-----
*
250:0002-----
*
250:0002-----
*
250:0002-----
*
250:0002-----
*
250:0002-----
*
** END OF RUN : 324
-----

```

```

START | Project dir.: C:\USERS\JORESK-1\Desktop\JOHNOW-1\TRAFAL-1
Rainfall dir.: C:\USERS\JORESK-1\Desktop\JOHNOW-1\TRAFAL-1
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 325
NSTORM= 1
# 1=25mm.STM
-----

```

```

325:0002-----
*#*****
*# Project Name: TRAFALGAR IO
*# OAKVILLE, ONTARIO
*# JOB NUMBER : 2022-0019-10
*# Date : OCTOBER 2023
*# Revised : JANUARY 2026
*# Company : WALTER FEDY
*# File : IO-TRAFE.DAT - PRELIMINARY SWM FACILITY SIZING
*#*****
-----

```

```

325:0002-----
*
READ STORM      Filename: LONDON 25mm, 4-HR CHICAGO STORM
Ptotal= 25.04 mm Comments: LONDON 25mm, 4-HR CHICAGO STORM
-----
TIME RAIN      TIME RAIN      TIME RAIN      TIME RAIN
hrs mm/hr      hrs mm/hr      hrs mm/hr      hrs mm/hr
.17 1.512      1.17 6.037      2.17 4.411      3.17 1.875
.33 1.709      1.33 14.332     2.33 3.562      3.33 1.721
.50 1.972      1.50 56.252     2.50 2.999      3.50 1.593
.67 2.344      1.67 17.399     2.67 2.597      3.67 1.484
.83 2.913      1.83 8.728      2.83 2.297      3.83 1.390
1.00 3.898      2.00 5.839      3.00 2.063      4.00 1.308
-----

```

```

325:0003-----
*#
*# POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#*****
*# SWM FACILITY 60 - WEST SIDE OF IO LANDS
*#
-----

```

```

CALIB STANDHYD      Area (ha)= 35.60
02:AREA-A DT= 1.00 Total Imp(%)= 89.00 Dir. Conn.(%)= 79.00
-----
IMPERVIOUS      PERVIOUS (i)
Surface Area (ha)= 31.68      3.92
Dep. Storage (mm)= 1.00      4.00
Average Slope (%) = 1.00      2.00
Length (m) = 495.00      30.00
Mannings n = .015      .250
-----
Max.eff.Inten.(mm/hr)= 56.25      22.58
over (min) = 9.00      20.00
Storage Coeff. (min)= 9.15 (ii) 19.92 (iii)
Unit Hyd. Tpeak (min)= 9.00      20.00
Unit Hyd. peak (cms)= .12      .06
-----
*TOTALS*
PEAK FLOW (cms) = 2.87      .14      2.936 (iii)
TIME TO PEAK (hrs) = 1.58      1.82      1.583
RUNOFF VOLUME (mm) = 24.04      7.82      20.634
TOTAL RAINFALL (mm) = 25.04      25.04      25.039
RUNOFF COEFFICIENT = .96      .31      .824
-----
(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
-----

```

```

325:0004-----
*# ROUTE FLOWS THROUGH SWM FACILITY 60
*#
-----
ROUTE RESERVOIR      Requested routing time step = 1.0 min.
IN>02:(AREA-A)
OUT<01:(SWM-60)
-----
===== OUTFLOW STORAGE TABLE =====
OUTFLOW STORAGE      OUTFLOW STORAGE
(cms) (ha.m.)         (cms) (ha.m.)
.000 .0000E+00         .593 .2043E+01
-----

```

.049	.1871E+00	.663	.2302E+01
.078	.3881E+00	.790	.2565E+01
.098	.6041E+00	.964	.2835E+01
.115	.8309E+00	1.249	.3675E+01
.199	.1063E+01	1.327	.3967E+01
.364	.1300E+01	1.468	.4567E+01
.456	.1543E+01	1.534	.4875E+01
.530	.1790E+01	1.596	.5191E+01

ROUTING RESULTS				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW >02: (AREA-A)	35.60	2.936	1.583	20.634
OUTFLOW<01: (SWM-60)	35.60	.101	4.117	20.633
OVERFLOW<03: (OFL-60)	.00	.000	.000	.000

TOTAL NUMBER OF SIMULATED OVERFLOWS = 0  
 CUMULATIVE TIME OF OVERFLOWS (hours)= .00  
 PERCENTAGE OF TIME OVERFLOWING (%)= .00

PEAK FLOW REDUCTION [Qout/Qin] (%)= 3.435  
 TIME SHIFT OF PEAK FLOW (min)= 152.00  
 MAXIMUM STORAGE USED (ha.m.)=.6371E+00

325:0005-----

\*# SWM FACILITY 35A - EAST SIDE OF IO LANDS

CALIB STANDHYD	Area (ha)=	25.30
07:AREA-B DT= 1.00	Total Imp(%)=	94.00 Dir. Conn.(%)= 84.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		23.78	1.52
Dep. Storage (mm)=		1.00	4.00
Average Slope (%)=		1.00	2.00
Length (m)=		410.00	30.00
Mannings n =		.015	.250
Max.eff.Inten.(mm/hr)=		56.25	45.21
over (min)		8.00	16.00
Storage Coeff. (min)=		8.17 (ii)	16.33 (ii)
Unit Hyd. Tpeak (min)=		8.00	16.00
Unit Hyd. peak (cms)=		.14	.07
PEAK FLOW (cms)=		2.29	.12
TIME TO PEAK (hrs)=		1.57	1.73
RUNOFF VOLUME (mm)=		24.04	10.02
TOTAL RAINFALL (mm)=		25.04	25.04
RUNOFF COEFFICIENT =		.96	.40

\*TOTALS\*  
2.358 (iii)

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 75.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

325:0006-----

\*# ROUTE FLOWS THROUGH SWM FACILITY 35A  
\*# NOTE: LAST OUTFLOW-STORAGE DATA PAIR IS AT WEIR SILL.  
\*#

ROUTE RESERVOIR	Requested routing time step = 1.0 min.
IN>07: (AREA-B)	
OUT<08: (SWM35A)	

===== OUTFLOW STORAGE TABLE =====			
OUTFLOW	STORAGE	OUTFLOW	STORAGE
(cms)	(ha.m.)	(cms)	(ha.m.)
.000	.0000E+00	.597	.1964E+01
.019	.2402E+00	.667	.2284E+01
.065	.4944E+00	.769	.2613E+01
.080	.6255E+00	.919	.2949E+01
.118	.7621E+00	1.020	.3294E+01
.171	.9047E+00	1.108	.3646E+01
.288	.1050E+01	1.188	.4006E+01
.420	.1347E+01	1.225	.4190E+01
.517	.1651E+01	.000	.0000E+00

ROUTING RESULTS				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW >07: (AREA-B)	25.30	2.358	1.567	21.796
OUTFLOW<08: (SWM35A)	25.30	.065	4.117	21.795
OVERFLOW<09: (OFL-35)	.00	.000	.000	.000

TOTAL NUMBER OF SIMULATED OVERFLOWS = 0  
 CUMULATIVE TIME OF OVERFLOWS (hours)= .00  
 PERCENTAGE OF TIME OVERFLOWING (%)= .00

PEAK FLOW REDUCTION [Qout/Qin] (%)= 2.767  
 TIME SHIFT OF PEAK FLOW (min)= 153.00  
 MAXIMUM STORAGE USED (ha.m.)=.4956E+00

325:0007-----

\*#-----  
\*#-----  
\*# RUN REMAINING DESIGN STORMS (5 TO 100-YR - OAKVILLE 24HR CHICAGO STORM  
+ HURRICANE HAZEL + 25mm)  
\*#-----

325:0002-----

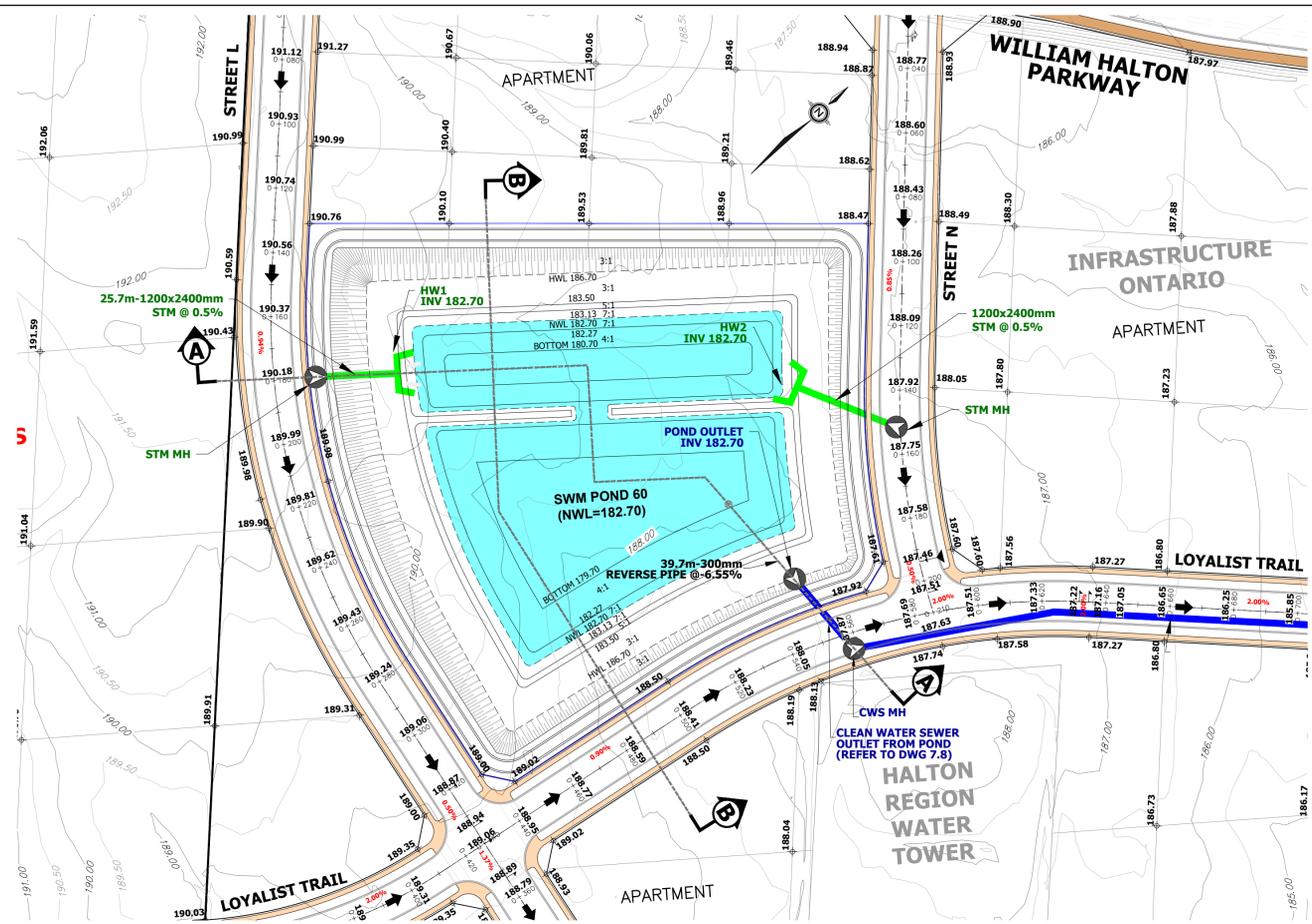
325:0002-----

325:0002-----

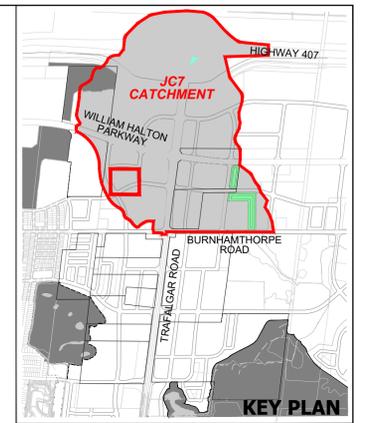
```

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325:0002-----
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325:0002-----
*
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325:0002-----
*
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325:0002-----
*
FINISH
*****
WARNINGS / ERRORS / NOTES
-----
Simulation ended on 2026-02-05 at 14:11:58
=====

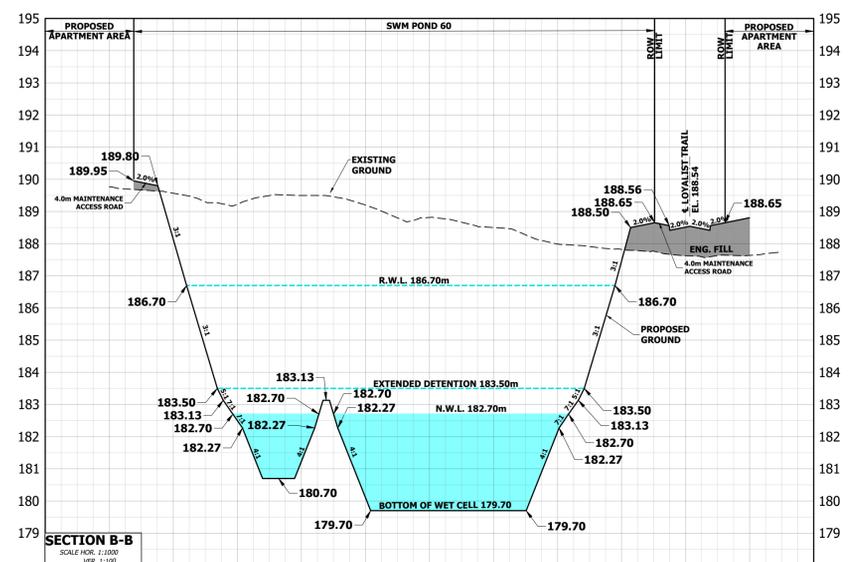
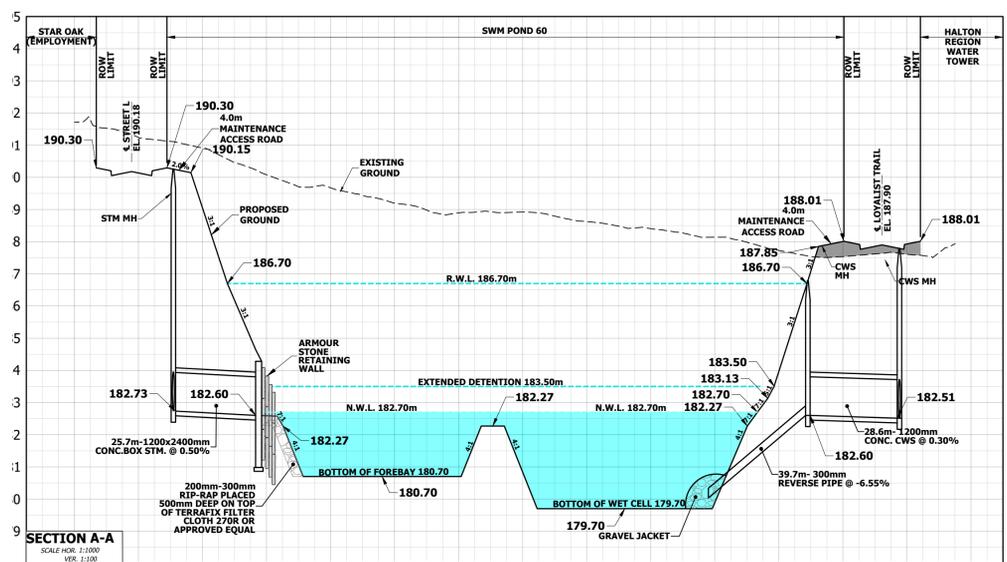
```



**SWM POND 60  
PLAN VIEW SCALE 1:1000**



**KEY PLAN**



Urbantech Consulting  
Stonybrook Consulting Inc.  
Beacon Environmenta.  
GEO Morphix Ltd.  
R.J. Burnside & Associates Limited

**LEGEND:**

	SUBJECT LANDS		PROPOSED CLEAN WATER SEWER AND FLOW DIRECTION
	CORE AREA		PROPOSED STORM SEWER AND FLOW DIRECTION
	PROPOSED NHS		BUS STOP
	EXISTING CONTOURS		ASPHALT MULTI-USE PATH
	PROPOSED GRADE		1.5m CONC. SIDEWALK
	EXISTING GRADE		2.4m TRAIL
	PROPOSED OVERLAND FLOW ROUTE		

JOSHUA CREEK  
SUBCATCHMENT JCT7 EIR/FSS

**DRAWING 7.12A**

**SWM POND 60**

PROJECT No. 23-744 DATE: DEC. 2025 SCALE: 1:1000

## 7.8 Conveyance of Major System Flows

Where feasible, a continuous overland flow routes are proposed through the development lands to safely convey major system flows in excess of the minor system up to the 100 year event to the proposed stormwater ponds. Flows exceeding the capacity of the minor system will be contained within right-of-ways. For all classes of roads, the product of depth of water (m) at the gutter times the velocity of flow (m/s) shall not exceed  $0.65\text{m}^2/\text{s}$ . Should the major system flow exceed the conveyance capacity of any given road, the storm sewer will be sized to accommodate the excess flows such that the road capacity is not exceeded.

Three 100-year capture areas are identified on **Drawing 7.8**. In these locations, 100-year flows will be captured by the minor system through storm inlets at low points in the right-of-way (ROW). Two of the capture areas will be conveyed to Pond 60, while the third will be conveyed to Pond 35A. For development areas north of William Halton Parkway and west of Trafalgar Road, overland flow across these ROWs is not feasible, necessitating 100-year capture. Additionally, for the apartment block draining to Pond 60, continuous overland flow routes are not viable due to grading constraints, further requiring 100-year capture.

## 7.9 SWM Pond Operating Characteristics

### 7.9.1 Contributing Drainage Areas and Imperviousness

As noted in Section 7.1, NOCSS completed a preliminary assessment of the required numbers and locations of SWM ponds to meet the SWM design criteria. It presented preliminary locations for ponds in each subcatchment in North Oakville East. NOCSS Figure 7.4.6 illustrates three potential SWM ponds in the EIR Subcatchment Area. There are currently two private ponds located within their area, one to service the 407 interchange and one for the GO parking lot.

Although only one NOCSS pond was proposed to service the JC7 lands east of Trafalgar Road and west of stream reach JC-10A, due to grading and flow conveyance constraints associated with having uncontrolled major flows crossing Trafalgar Road and William Halton Parkway, three ponds (Pond 60, Pond 35A, and Pond 35) are proposed.

The contributing drainage area to each SWM facility is illustrated on **Drawing 7.8**.

The impervious coverage for each drainage area has been estimated based on the various land uses and their respective areas in the current JC7 Development Concept Plan.

**Pond 60** is located in the south-west portion of the JC7 EIR Subcatchment Area. The drainage area to Pond 60 is 35.6 ha shown on **Drawing 7.8** including 2.4 ha of pond area. Through the construction of Pond 60 and the associated storm sewer system, 0.59 ha will be diverted from subcatchment EM4, 1.16 ha from SM1, and 12.11 ha from JC9 to JC7. Included in the 35.6 ha is

6 ha that will be conveyed south of William Halton Parkway by a 1200 mm storm sewer. Refer to **Drawing 7.9** for the drainage area exchange.

Pond 60 and its contributing drainage area were modelled in GAWSER using a Route Reservoir command for the pond and a StandHYD for the contributing drainage area. The GAWSER results were used to determine the preliminary volume requirements of the pond based on the target outflow rates determined using NOCSS target unit rates as shown in **Table 7.5** below and adjusted for the Regional Storm unit flow rate as discussed in Section 7.9.4. The contributing drainage area to Pond 60 was modelled as 35.6 ha at 89% imperviousness. Pond 60 provides 2 year to 100 year as well as the Regional controls to target flow rates and over-controls flows to account for the drainage area exchange from EM4 (0.59 ha) and SM1 (1.16 ha) into JC7. Flow targets were established for Pond 60 based on the existing JC7 and JC9 drainage areas only. Addition details of the Pond 60 design are provided in Section 7.9.2.

**Table 7.5 – Flow Targets for Pond 60**

Return Period (years)	NOCSS – Dundas JC-D1 Culvert			
	NOCSS Unit Flow Rates (m <sup>3</sup> /s/ha)	Pond 60 Target Flows (m <sup>3</sup> /s)		
		JC7 (21.74 ha)	JC9 (12.11 ha)	Total (33.85 ha)
2	0.007	0.152	0.085	0.237
5	0.011	0.239	0.133	0.372
10	0.013	0.283	0.157	0.440
25	0.017	0.370	0.206	0.575
50	0.019	0.413	0.230	0.643
100	0.021	0.457	0.254	0.711
Regional	0.052	1.130	0.630	1.760
Regional	0.048 <sup>1</sup>	1.044	0.581	1.625

<sup>1</sup> Regional Storm unit flow rate to be adjusted to 0.048 m<sup>3</sup>/s/ha based on updated GAWSER modeling to meet NOCSS target flow at Dundas Street; see Section 7.9.4.

Two ponds are proposed east of Trafalgar Road. Pond 35 is generally proposed in the location shown in NOCSS at the low point of the JC7 Subcatchment Area, west of Stream Reach JC7. Its specific location, as well as the location of the proposed stream realignment, are governed by topography, consideration of location of the current JC-10A stream reach and floodplain, property boundaries, the new north-south road (Street B) north of Burnhamthorpe Road and integration with the proposed grading and SWM concepts. Through consultation with Town on the Development Concept, the new north-south Street B location was determined considering intersection spacing east of Trafalgar Road and the location of the existing uses on the Al Falah Islamic Centre property. The new road is proposed to be located on the Dymtrenko lands, immediately east of the Islamic Centre property. Pond 35 is located to the east of the new road with its outlet to the realigned stream reach JC-10A to the immediate east. The stream reach

abuts the east and north sides of the pond to generally follow the existing stream reach location north of the pond.

Considering the limited space available in this general location based on surrounding uses and ownership, NOCSS Pond 35 has been split into two ponds – Pond 35 and 35A. Pond 35A is located upstream of William Halton Parkway, on lands owned by Argo Trafalgar II and Infrastructure Ontario, and will service the IO lands and the Trafalgar Road right-of-way north of William Halton Parkway. The addition of Pond 35A also provides the realigned JC-10A stream with clean water, and avoids the need to direct uncontrolled minor and major storm drainage from north of William Halton Parkway across the arterial road.

**Pond 35A** is located in the north-east portion of the JC7 EIR Subcatchment Area. The drainage area to Pond 35A is 25.3 ha shown on **Drawing 7.8** including 2.6 ha of pond area. Through the construction of Pond 35A and the associated storm sewer system, 1.91 ha is directed from JC8a to JC7. Refer to **Drawing 7.9** for the drainage area exchange.

Pond 35A and the contributing drainage area were modelled in GAWSER using a Route Reservoir command for the pond and a StandHYD for the contributing drainage area. The GAWSER results were used to determine the preliminary volume requirements of the pond based on the target outflow rates determined using NOCSS target unit rates as shown in **Table 7.6** below and adjusted for the Regional Storm unit flow rate as discussed in **Section 7.9.4**. The contributing drainage area to Pond 35A was modelled as 25.3 ha at 94% imperviousness. Pond 35A provides 2 year to 100 year as well as the Regional controls to target flow rates.

**Table 7.6 – Flow Targets for Pond 35A**

Return Period (years)	NOCSS – Dundas JC-D1 Culvert			
	NOCSS Unit Flow Rates (m <sup>3</sup> /s/ha)	Pond 35A Target Flows (m <sup>3</sup> /s)		
		JC7 (23.39 ha)	JC8a (1.91 ha)	Total (25.3 ha)
2	0.007	0.164	0.013	0.177
5	0.011	0.257	0.021	0.278
10	0.013	0.304	0.025	0.329
25	0.017	0.398	0.032	0.430
50	0.019	0.444	0.036	0.481
100	0.021	0.491	0.040	0.531
Regional	0.052	1.216	0.099	1.316
Regional	0.048 <sup>1</sup>	1.123	0.092	1.214

<sup>1</sup> Regional Storm unit flow rate to be adjusted to 0.048 m<sup>3</sup>/s/ha based on updated GAWSER modeling to meet NOCSS target flow at Dundas Street; see Section 7.9.4.

**Pond 35** is located in the south-east portion of the JC7 EIR Subcatchment Area. The drainage area to Pond 35 is 20.3 ha shown on **Drawing 7.8** including 2.3 ha of pond area. Through the construction of Pond 35 and the associated storm sewer system, 0.02 ha will be diverted from subcatchment JC8, and 0.63 ha from JC9 to JC7. Refer to **Drawing 7.9** for the drainage area exchange.

Pond 35 and the contributing drainage area were modelled in GAWSER using a Route Reservoir command for the pond and a StandHYD for the contributing drainage area. The GAWSER results were used to determine the preliminary volume requirements of the pond based on the target outflow rates determined using NOCSS target unit rates as shown in **Table 7.7** below unit flow rate as discussed in **Section 7.9.4**. The contributing drainage area to Pond 35 was modelled as 20.3 ha at 93% imperviousness. It should be noted, while a portion of the Argo Trafalgar Corporation lands are anticipated to become Community Lands, those lands have conservatively been accounted in the SWM facility design at the higher imperviousness for the Urban Core area per the Master Plan. Pond 35 provides 2 year to 100 year as well as the Regional controls to target flow rates. Additional details of the Pond 35 design are provided in **Section 7.9.2**.

**Table 7.7 – Flow Targets for Pond 35**

Return Period (years)	NOCSS – Dundas JC-D1 Culvert				
	NOCSS Unit Flow Rates (m <sup>3</sup> /s/ha)	Pond 35 Target Flows (m <sup>3</sup> /s)			
		JC9 (0.63 ha)	JC8 (0.02 ha)	JC7 (19.65 ha)	Total (20.3 ha)
2	0.007	0.004	0.000	0.138	0.142
5	0.011	0.007	0.000	0.216	0.223
10	0.013	0.008	0.000	0.255	0.264
25	0.017	0.011	0.000	0.334	0.345
50	0.019	0.012	0.000	0.373	0.386
100	0.021	0.013	0.000	0.413	0.426
Regional	0.052	0.033	0.001	1.022	1.056
Regional	0.048 <sup>1</sup>	0.030	0.001	0.943	0.974

<sup>1</sup> Regional Storm unit flow rate to be adjusted to 0.048 m<sup>3</sup>/s/ha based on updated GAWSER modeling to meet NOCSS target flow at Dundas Street; see Section 7.9.4.

NOCSS Figure 7.4.6 shows an additional SWM Pond (Pond 36) east of stream reach JC-10a. This EIR/FSS does not propose a SWM pond in this location since there is very little drainage to JC-10a within the JC7 Subcatchment.

## 7.9.2 SWM Facility Design

### Design and Operating Characteristics

As identified in Section 7.8 above, three stormwater ponds are proposed to service the JC7 development area (Ponds 60, 35A, and 35). The locations of the above ponds are illustrated in **Drawing 7.8**.

Summaries of the pond characteristics for Ponds 60, 35A and 35, are presented in **Table 7.8** to **Table 7.14**. Sizing calculations are provided in **Appendix E-2**. These tables present inflow, outflow and storage requirements with and without storm stacking.

Conservation Halton and the Town of Oakville require that “storm stacking” be considered for Regional Storm control facilities. Due to long extended detention drawdown times, it is recognized that the active storage in SWM facilities may be reduced during the Regional Storm event. Storm stacking was evaluated for all design events. Due to the long drawdown time, it is recommended (at detailed design) that the SWM facility is designed assuming that the ED storage is unavailable during the 2 year to 100 year and Regional storms. This was tested and the ponds were found to have sufficient active storage above the ED water level to manage the Regional Storm.

The conceptual designs of the ponds are presented in **Drawings 7.12A, 7.12B and 7.12C**. Storage / release rate targets for the facilities north of Burnhamthorpe Road have been provided.

**Table 7.8 – Stormwater Management Facility Drainage Areas and Sizes**

Pond	Drainage Area (ha)	Imp. (%)	SWM Pond Block Area (ha)
Pond 60	35.6	89	2.4
Pond 35A	25.3	94	2.6
Pond 35	20.3	93	2.3

**Table 7.9 – Pond 60 Inflow/Volume Characteristics (With Stacking Conditions)**

Return Period	Area (ha)	Imp. (%)	Peak Inflow (m <sup>3</sup> /s)	Target Release Rate (m <sup>3</sup> /s)	Outflow (m <sup>3</sup> /s)	Storage Requirements (m <sup>3</sup> )
Perm. Pool	35.6	89	-	-	-	7,903
ED			-	-	-	-
2			1.819	0.237	0.237	9,414
5			2.540	0.372	0.372	12,330
10			2.984	0.440	0.440	14,084
25			3.542	0.575	0.575	16,644
50			3.967	0.643	0.643	18,281
100			4.382	0.711	0.711	20,141
Regional			3.861	1.760	1.618	37,786

**Table 7.10 – Pond 60 Inflow/Volume Characteristics**

Return Period	Area (ha)	Imp. (%)	Peak Inflow (m <sup>3</sup> /s)	Target Release Rate (m <sup>3</sup> /s)	Outflow (m <sup>3</sup> /s)	Storage Requirements (m <sup>3</sup> )	Storage Provided (m <sup>3</sup> )	Stage Provided (m)
Perm. Pool	35.6	89	-	-	-	7,903	9,168	182.70
ED			-	0.012	0.011	7,158	7,713	183.45
2			1.819	0.237	0.105	11,805	12,381	183.85
5			2.540	0.372	0.179	14,901	15,406	184.10
10			2.984	0.440	0.226	16,879	17,260	184.25
25			3.542	0.575	0.342	19,615	19,779	184.45
50			3.967	0.643	0.411	21,254	21,705	184.60
100			4.382	0.711	0.498	23,111	23,661	184.75
Regional			3.861	1.625	1.618	45,715	51,209	186.65

**Table 7.11 – Pond 35A Inflow/Volume Characteristics (With Stacking Conditions)**

Return Period	Area (ha)	Imp. (%)	Peak Inflow (m <sup>3</sup> /s)	Target Release Rate (m <sup>3</sup> /s)	Outflow (m <sup>3</sup> /s)	Storage Requirements (m <sup>3</sup> )
Perm. Pool	25.3	94	-	-	-	5,693
ED			-	-	-	-
2			1.327	0.177	0.177	6,759
5			1.848	0.278	0.278	8,825
10			2.170	0.329	0.329	10,065
25			2.574	0.430	0.430	11,875
50			2.882	0.481	0.481	13,033
100			3.182	0.531	0.531	14,350
Regional			2.771	1.316	1.211	26,125

**Table 7.12 – Pond 35A Inflow/Volume Characteristics**

Return Period	Area (ha)	Imp. (%)	Peak Inflow (m <sup>3</sup> /s)	Target Release Rate (m <sup>3</sup> /s)	Outflow (m <sup>3</sup> /s)	Storage Requirements (m <sup>3</sup> )	Storage Provided (m <sup>3</sup> )	Stage Provided (m)
Perm. Pool	25.3	94	-	-	-	5,693	12,646	181.00
ED			-	0.009	0.008	5,236	5,775	181.45
2			1.327	0.177	0.075	8,599	8,709	181.65
5			1.848	0.278	0.130	10,790	10,991	181.80
10			2.170	0.329	0.165	12,196	12,534	181.90
25			2.574	0.430	0.249	14,160	14,877	182.05
50			2.882	0.481	0.301	15,320	15,666	182.10
100			3.182	0.531	0.365	16,643	17,255	182.20
Regional			2.771	1.214	1.211	32,073	42,103	183.65

**Table 7.13 – Pond 35 Inflow/Volume Characteristics (With Stacking Conditions)**

Return Period	Area (ha)	Imp. (%)	Peak Inflow (m <sup>3</sup> /s)	Target Release Rate <sup>1,2</sup> (m <sup>3</sup> /s)	Outflow (m <sup>3</sup> /s)	Storage Requirements (m <sup>3</sup> )
Perm. Pool	20.3	93*	-	-	-	4,527
ED			-	-	-	-
2			1.077	0.142	0.142	5,501
5			1.499	0.223	0.223	7,168
10			1.759	0.264	0.264	8,170
25			2.086	0.345	0.345	9,633
50			2.335	0.386	0.386	10,567
100			2.578	0.426	0.426	11,631
Regional			2.234	0.987	0.922	22,028

\*Note Community Lands within Argo Trafalgar Corp. are conservatively accounted for at higher imperviousness to conform to Town’s Master Plan showing those lands as “Trafalgar Urban Core”

**Table 7.14 – Pond 35 Inflow/ Volume Characteristics**

Return Period	Area (ha)	Imp. (%)	Peak Inflow (m <sup>3</sup> /s)	Target Release Rate <sup>1,2</sup> (m <sup>3</sup> /s)	Outflow (m <sup>3</sup> /s)	Storage Requirements (m <sup>3</sup> )	Storage Provided (m <sup>3</sup> )	Stage Provided (m)
Perm. Pool	20.3	93	-	-	-	4,527	6,481	179.60
ED			-	0.007	0.006	4,228	4,667	180.05
2			1.077	0.142	0.061	6,923	7,018	180.25
5			1.499	0.223	0.104	8,689	8,839	180.40
10			1.759	0.264	0.132	9,822	10,076	180.50
25			2.086	0.345	0.199	11,406	11,957	180.65
50			2.335	0.386	0.241	12,340	12,590	180.70
100			2.578	0.426	0.292	13,405	13,868	180.80
Regional			2.234	0.974	0.922	26,675	34,702	182.30

## **Stormwater Management Pond Design Elements**

The stormwater management ponds have been designed in accordance with directions of the NOCSS, and the MOE SWM Design Manual, and include the following features/functions:

- **Sediment forebay**
  - Improves sediment removal and reduces influent velocities
  - Sized based on MOE forebay settling and dispersion length calculations
  
- **Permanent pool and water quality**
  - Provides water quality and erosion control to satisfy Enhanced Level of protection requirements (i.e., capture of 80 percent Total Suspended Solids) and reduction of Phosphorus levels
  - Sized according to MOE Table 3.2 and corresponding imperviousness or resulting storage based on erosion control requirements
  
- **Erosion Control**
  - Proposed ponds are to provide 250m<sup>3</sup>/imp ha of extended detention storage based on GEO Morphix's erosion analysis for JC-5.
  - The erosion threshold results and drawdown time are sensitive to the depth of storage and release rate. Detailed design of proposed ponds should be accompanied by an update to the GAWSER continuous model and erosion threshold analysis to ensure that the proposed pond outlet design does not increase the frequency or duration of erosive flows downstream.
  
- **Quantity Control**
  - Attenuates post development flows to the unit flow release rates as per the NOCSS for the 2 year through 100 year storms as well as the Regional event.
  - Storage volume requirements for all storms are based on the GAWSER model simulation of post-development drainage areas controlled to the NOCSS return period unit rates. Note that the Regional Storm NOCSS target unit flow rate has been adjusted to 0.048 m<sup>3</sup>/s/ha for all JC7 ponds to ensure that flow rates at Dundas Street are not exceeded. Whether this adjustment is required should be further reviewed and confirmed at detailed design when outlet structures have been designed.

The following discussions provide further detail on various pond design components.

### **Sediment Forebay**

The stormwater management ponds must include a sediment forebay to improve the pollutant removal by trapping larger particles near the inlets of the pond. The forebay for the ponds have been designed to be submerged below the normal water level, has a length to width ratio of approximately 3:1 and does not exceed one third of the permanent pool surface area, as required in the MOE SWMP Design Manual for wet SWM facilities.

## Permanent Pool

The permanent pool has been sized to provide Enhanced Level protection in accordance with the MOE SWMP Design Manual. **Appendix F-3** summarizes the permanent pool requirements and associated calculations.

In accordance with the Town of Oakville SWM facility grading guidelines, 4:1 slopes will be provided below the 7:1 pond shelf down to the pond bottom. Slopes of 7:1 (H:V) have been provided in the safety shelf (4 m wide below permanent pool and 4 m wide up to the extended detention level) on either side of the permanent pool wetted perimeter. These grading requirements are reflected in the pond designs shown on **Drawing 7.11A**.

The permanent pool volume for each facility has been sized to provide Enhanced Level protection in accordance with the MOE SWMP Design Manual. Based on impervious coverage for the wet ponds, the required and provided permanent pool volumes are summarized in the **Table 7.15**.

Slopes of 7:1 (H:V) will be provided for three metres (horizontally) on either side of the permanent pool wetted perimeter. Below this level, slopes will be graded at 3:1 (H:V).

**Table 7.15 – Summary of Permanent Pool Volumes**

Pond I.D.	Imp. (%)	Drainage Area (ha)	Unit Volume <sup>1</sup> (m <sup>3</sup> /ha)	Volume Required (m <sup>3</sup> )	Volume Provided <sup>2</sup> (m <sup>3</sup> )
Pond 60	89	35.6	222	7,903	9,168
Pond 35A	94	25.30	225	5,693	12,646
Pond 35	93	20.30	223	4,527	6,481

<sup>1</sup>SWMP Manual Table 3.2 for wet ponds, less 40m<sup>3</sup>/ha for erosion control.

<sup>2</sup>Volume provided is larger than volume required since the quantity control requirements govern the pond size and the permanent pool is deeper for thermal mitigation.

## Extended Detention Storage

The extended detention storage comprises two components; water quality and erosion control. The water quality requirements are based on Enhanced Level controls (formerly Level 1) as per the MOE SWMP Design Manual. The erosion control volume was determined based on analysis of critical downstream erosion thresholds using the continuous GAWSER model (**Appendix E**) and erosion assessment completed by GEO Morphix (**Appendix D-2**). Based on the results of the continuous model, a target storage volume of 250m<sup>3</sup>/imp ha is required for all facilities.

## **Flood Control Storage**

The quantity control requirements for the 2-year through to 100-year and Regional events will be achieved with active storage depths of less than the 2.0m depth recommended by the MOE SWMP Design Manual for 100-year flood control storage.

Slopes of 7:1 (H:V) will be provided for three metres (horizontally) on either side of the permanent pool wetted perimeter. Above this level, the extended detention and the Regional flood control component will be graded at 4:1 (H:V).

## **Storm Stacking**

Conservation Halton and the Town of Oakville require that “storm stacking” be considered for Regional Storm control facilities. Storm stacking was evaluated for all design events; see **Table 7.9**, **Table 7.11** and **Table 7.13**. Due to the long drawdown time, it is recommended (at detailed design) that the SWM facility is designed assuming that the extended detention storage is unavailable during the 2 year to 100 year and Regional storms.

## **Pond Outlets**

The extended detention volume in ponds will outlet through an orifice. Quantity control will be provided by a combination orifice/notched weir located in the outlet structure. Deep pools along with reverse graded pipes will be provided at the outlet to address thermal mitigation. The ponds have been designed to satisfy the minimum length-to-width ratio of 3:1, with actual L:W ratio of approximately 5:1. The landscape plans should have regard for best management practices, such as the planting recommendations in the report, *Thermal Impacts of Urbanization Including Preventative and Mitigation Techniques* (Credit Valley Conservation, 2011) as well as *Conservation Halton's Guidelines for Landscaping and Rehabilitation Plans* (June 2024).

Details of the proposed pond outlet orifices and outlet weirs will be provided at detailed design. At detailed design, tailwater considerations on outlet structures should be considered in the pond outlet structure design. Tailwater assumptions do not impact the pond block size since outlet structures can be designed to reflect tailwater heights to outfall opening sizes.

## **Access Road**

In accordance with the Town of Oakville standards, 3.0m wide access roads are provided above the active storage elevation. Access roads are provided to facilitate routine inspection and maintenance activities. The maximum slope of access roads is 10:1 (H:V). The access road will extend to the base of the pond and not exceed a maximum slope of 10% which will be included at the detailed design stage.

## Emergency Overflows

To ensure safe conveyance of flows in the event of a blockage of the outlet structure during the Regional Storm event, an emergency overflow weir will be provided above the high water level in the pond. The pond drawings show the extent of the formal spillway that will convey uncontrolled Regional Storm flows from the ponds. The emergency spillway will be sized for the uncontrolled Regional Storm flow and should be set a minimum of 0.10m above the high water level. Appropriate materials and restoration will be addressed at detailed design.

## Thermal Mitigation

Thermal mitigation is required for the proposed ponds, and at detailed design the following measures will be reviewed and where appropriate implemented in the design on the basis that such measures will not impact the pond block sizing:

- 3 m deep pools at the pond outlet
- LID Measures
- Downspout disconnection
- Concrete outlet pipe
- Reversed slope outlet pipe
- Pocket wetlands at the outfall to shade the pond effluent before discharge to Joshua's Creek.

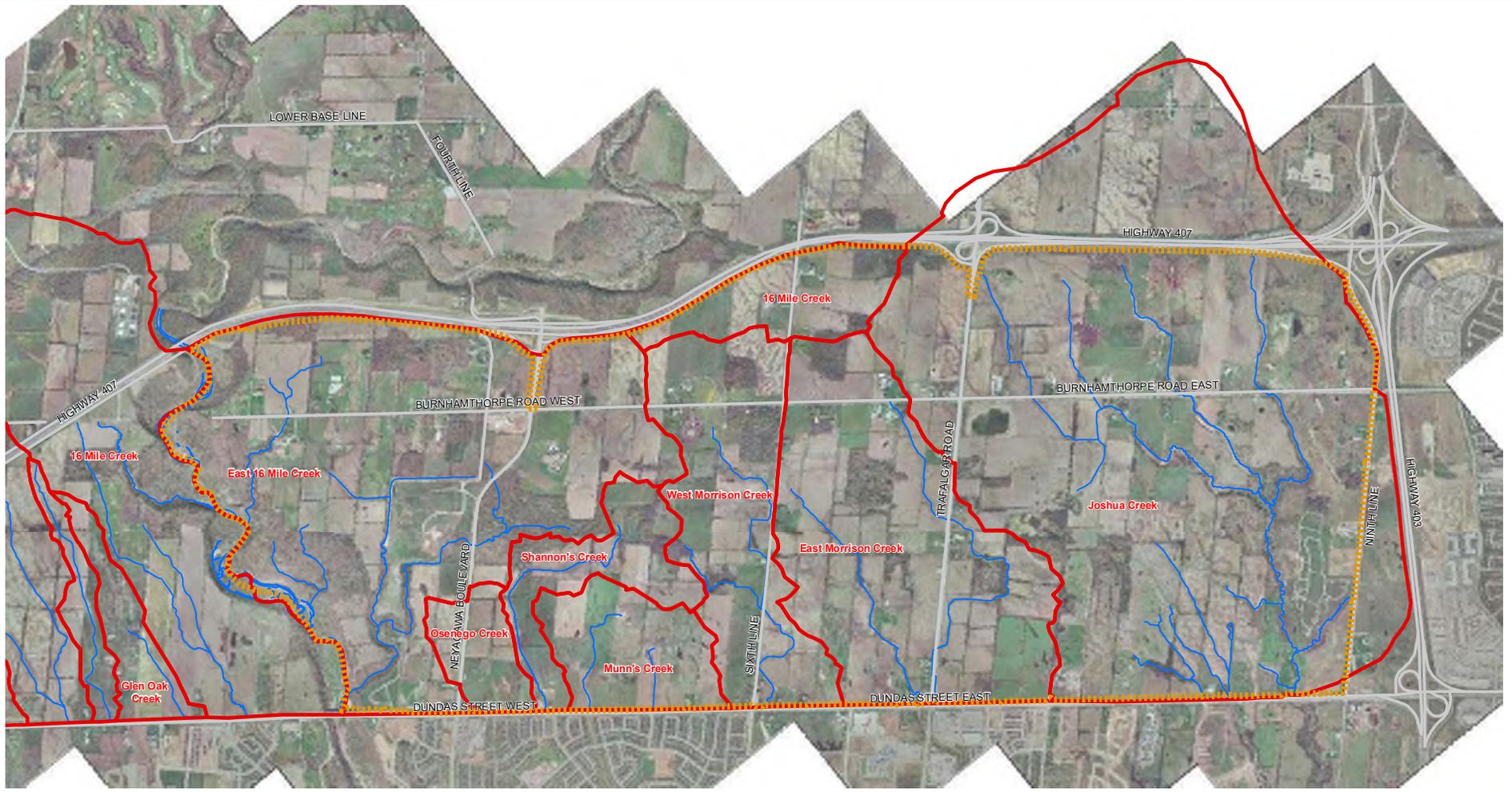
### 7.9.3 SWM Pond Operation and Maintenance

A detailed operations and maintenance manual for stormwater management ponds and related infrastructure should be submitted to the Town at detailed design. The operations and maintenance manual should be prepared in conformance with the Town of Oakville Standards and Specifications, and the MOE SWMP Design Manual.

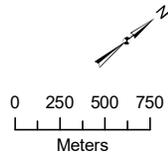
The typical operations and maintenance activities for the stormwater management features and the respective costs are set out in the MOE SWM Design Manual. Refer to Sections 6.0 of the SWMP Design Manual, Operation, Maintenance and Monitoring, and Section 7.0, Capital and Operational Costs for additional details. Additionally, the North Oakville SWM Monitoring Guidelines will be respected to determine operational performance and target adherence.

### 7.9.4 GAWSER Update to Joshua's Creek Hydrology

The Joshua's Creek GAWSER model has been updated for existing, interim and ultimate conditions in JC7 and JC9 subcatchment areas. As discussed in **Section 7.4**, the NOCSS GAWSER model was updated to confirm that the 2 year to 100 year and Regional Storm NOCSS flow targets are met at various locations in the subwatershed and to provide input to the erosion analyses.



NORTH OAKVILLE CREEKS SUBWATERSHED STUDY

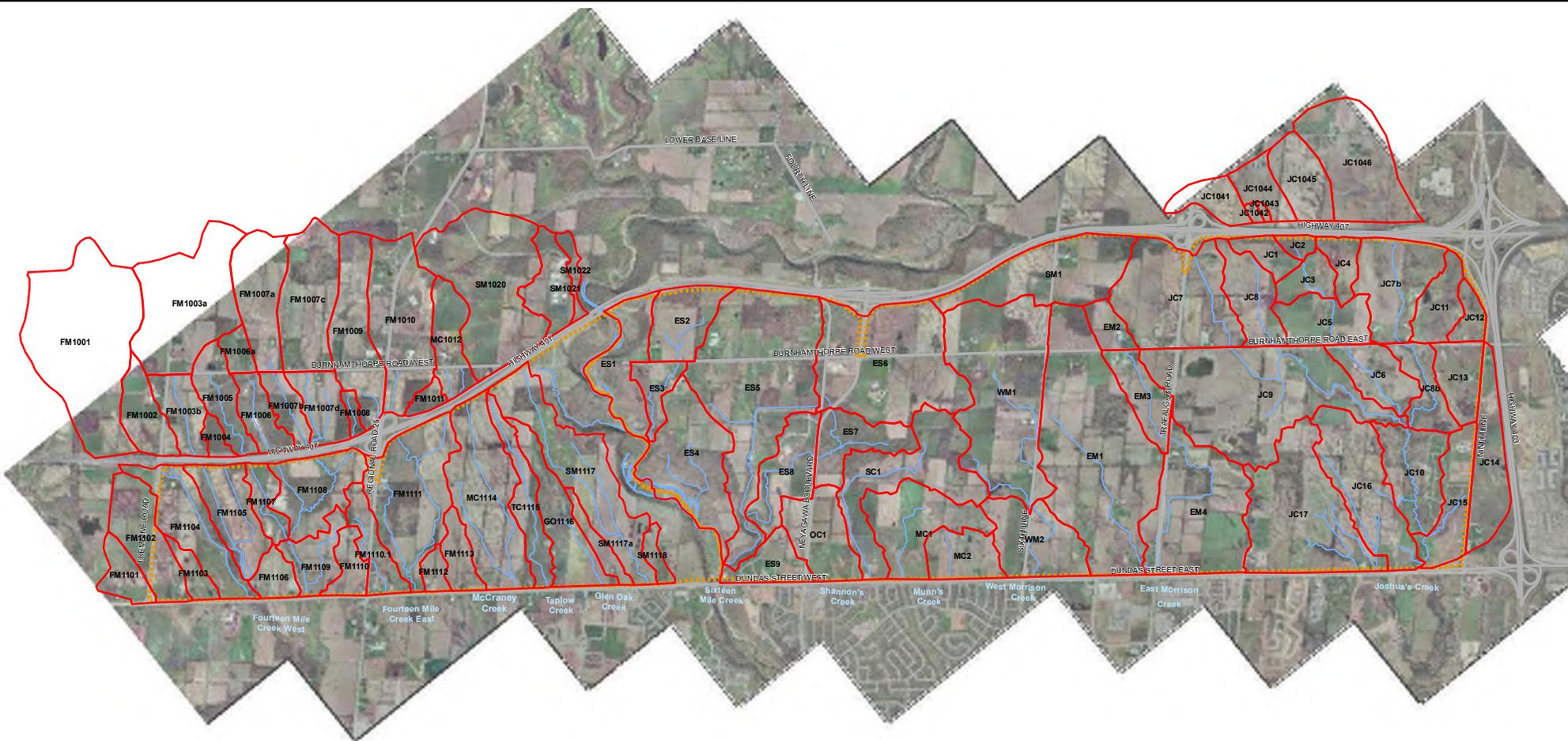


Legend

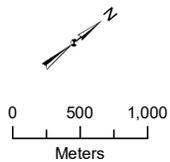
- Road
- Watercourse
- East Study Area
- Watershed

East Study Area  
Watershed Boundaries

Figure 4E.1.1



## NORTH OAKVILLE CREEKS SUBWATERSHED STUDY

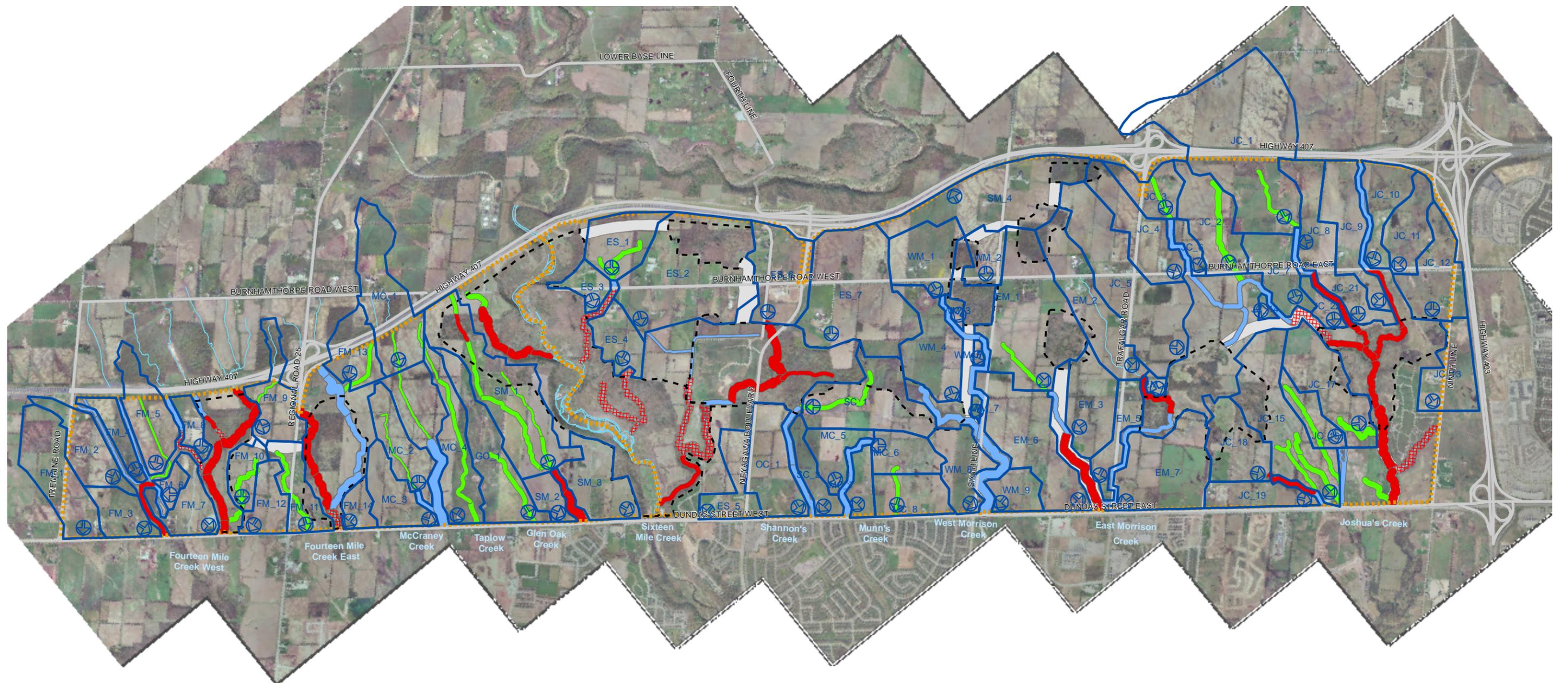


### Legend

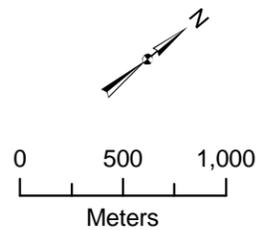
- Study Area
- Road
- Watercourse
- Subcatchments
- OC1** Subcatchment Identification

## Subcatchment Boundaries

Figure 5.1.1



### NORTH OAKVILLE CREEKS SUBWATERSHED STUDY



- Legend**
- Core
  - Secondary Plan Boundary
  - Road
  - Watercourse
  - SWM Pond (Approximate Location)
  - SWM Pond Drainage Area

- Core
- Linkage
- Stream Corridor**
- High Constraint
- High Constraint - Requiring Rehabilitation
- Medium Constraint
- Low Constraint
- SWM Pond Drainage Area
- Approximate SWM Pond Locations

### Approximate Stormwater Facility Locations

Figure 7.4.6

## SWM Targets from NOCSS Addendum

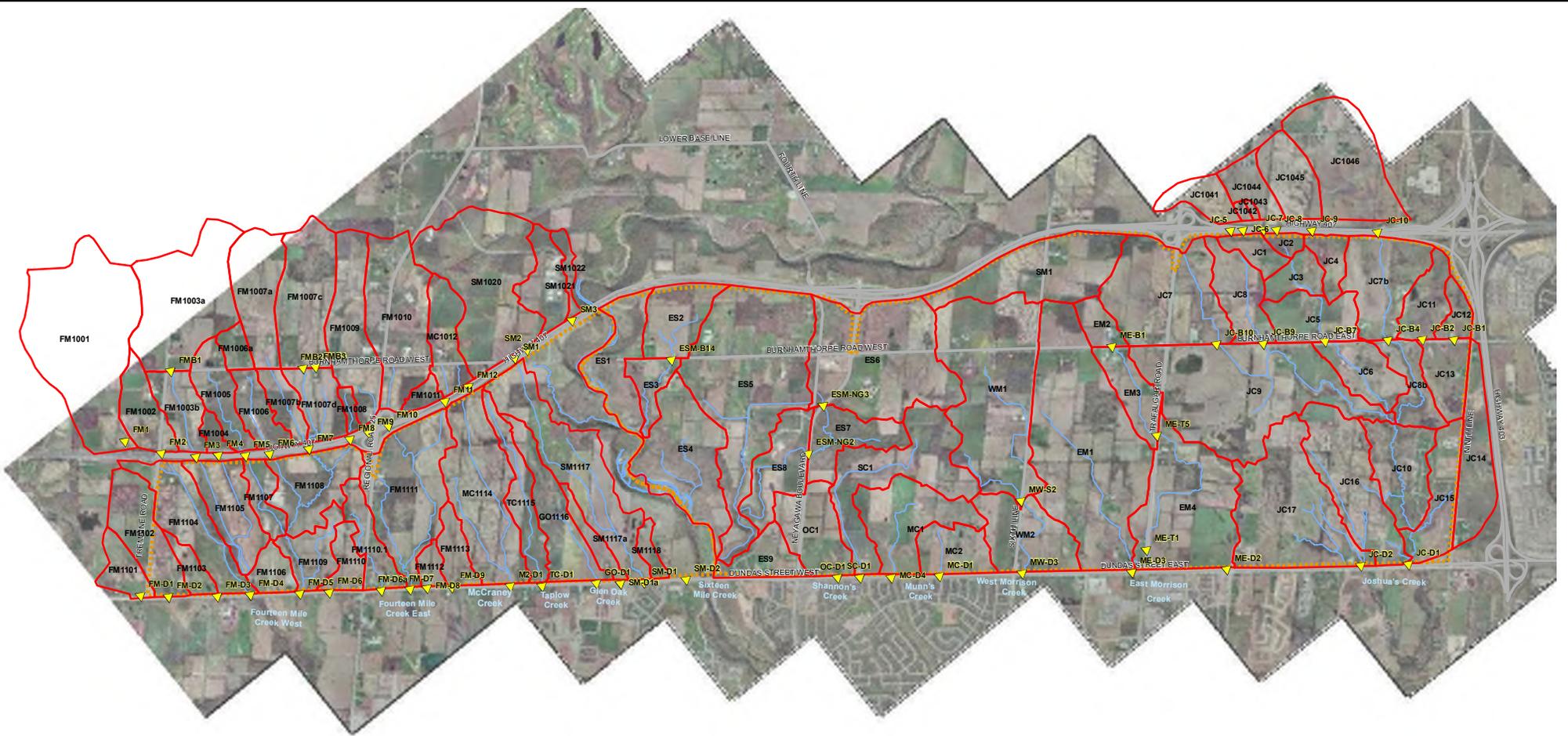
TABLE 7.4.1 TARGET UNIT AREA PEAK FLOW RATES EXISTING LAND USE									
Location	Culvert No.	Drainage Area	Regional Storm	100 year storm	50 year storm	25 year storm	10 year storm	5 year storm	2 year storm
		ha.	m <sup>3</sup> /s						
<b>I4 Mile Creek</b>									
Dundas St. W.	FM-D2	46.56	2.50	1.04	0.92	0.80	0.62	0.51	0.31
	Flow rate / Area (m <sup>3</sup> /s/ha)		0.054	0.022	0.020	0.017	0.013	0.011	0.007
	FM-D3	11.71	0.36	0.36	0.32	0.28	0.23	0.19	0.12
	Flow rate / Area (m <sup>3</sup> /s/ha)		0.005	0.031	0.027	0.024	0.020	0.016	0.010
	FM-D4	423.70	20.96	8.39	7.42	6.49	5.09	4.17	2.62
	Flow rate / Area (m <sup>3</sup> /s/ha)		0.049	0.025	0.018	0.015	0.012	0.010	0.006
	FM-D5	339.99	18.73	7.56	6.80	5.68	4.35	3.43	2.01
	Flow rate / Area (m <sup>3</sup> /s/ha)		0.055	0.022	0.019	0.017	0.013	0.010	0.006
	FM-D6	16.91	0.88	0.36	0.32	0.28	0.23	0.19	0.12
	Flow rate / Area (m <sup>3</sup> /s/ha)		0.052	0.021	0.019	0.017	0.014	0.011	0.007
	FM-D6a	26.23	1.38	0.57	0.50	0.44	0.34	0.28	0.18
	Flow rate / Area (m <sup>3</sup> /s/ha)		0.053	0.022	0.019	0.017	0.013	0.011	0.007
	FM-D7	247.92	11.96	4.63	4.07	3.54	2.75	2.23	1.36
	Flow rate / Area (m <sup>3</sup> /s/ha)		0.048	0.019	0.016	0.014	0.011	0.009	0.005
FM-D8	8.45	0.66	0.37	0.33	0.29	0.23	0.19	0.12	
Flow rate / Area (m <sup>3</sup> /s/ha)		0.078	0.044	0.039	0.034	0.027	0.022	0.014	
FM-D9	18.58	1.47	0.86	0.76	0.67	0.54	0.44	0.28	
Flow rate / Area (m <sup>3</sup> /s/ha)		0.079	0.046	0.041	0.036	0.029	0.024	0.015	
<b>McCraney Creek</b>									
Dundas St. W.	MC-D1	126.46	6.43	2.60	2.31	2.02	1.59	1.31	0.83
Flow rate / Area (m <sup>3</sup> /s/ha)			0.051	0.021	0.018	0.016	0.013	0.010	0.007
<b>Taplow Creek</b>									
Dundas St. W.	TC-D1	33.61	1.64	0.64	0.57	0.50	0.39	0.32	0.21
Flow rate / Area (m <sup>3</sup> /s/ha)			0.049	0.019	0.017	0.015	0.012	0.010	0.006
<b>Glen Oak Creek</b>									
Dundas St. W.	GO-D1	47.16	2.34	0.93	0.83	0.73	0.58	0.48	0.31
Flow rate / Area (m <sup>3</sup> /s/ha)			0.050	0.020	0.018	0.015	0.012	0.010	0.007
<b>West 16 Mile Creek Tribs.</b>									
Dundas St. W.	SM-D1	87.97	3.58	1.24	1.09	0.95	0.73	0.59	0.36
	Flow rate / Area (m <sup>3</sup> /s/ha)		0.041	0.014	0.012	0.011	0.008	0.007	0.004
	SM-D1a	12.53	0.81	0.38	0.34	0.30	0.24	0.20	0.13
	Flow rate / Area (m <sup>3</sup> /s/ha)		0.065	0.030	0.027	0.024	0.019	0.016	0.010
	SM-D2	8.01	0.52	0.24	0.22	0.19	0.15	0.13	0.08
Flow rate / Area (m <sup>3</sup> /s/ha)		0.065	0.030	0.027	0.024	0.019	0.016	0.010	
<b>East 16 Mile Creek Tribs.</b>									
Sixteen Mile Creek	---	383.10	16.86	6.28	5.48	4.70	3.58	2.82	1.64
Flow rate / Area (m <sup>3</sup> /s/ha)			0.044	0.016	0.014	0.012	0.009	0.007	0.004
<b>Osnogo Creek</b>									
Dundas St. W.	OC-D1	43.93	2.03	1.20	1.06	0.94	0.74	0.62	0.40
Flow rate / Area (m <sup>3</sup> /s/ha)			0.060	0.027	0.024	0.021	0.017	0.014	0.009
<b>Shannon's Creek</b>									
Dundas St. W.	SC-D1	84.37	3.81	1.39	1.23	1.06	0.82	0.66	0.40
Flow rate / Area (m <sup>3</sup> /s/ha)			0.045	0.016	0.015	0.013	0.010	0.008	0.005

TABLE 7.4.1 TARGET UNIT AREA PEAK FLOW RATES EXISTING LAND USE									
Location	Culvert No.	Drainage Area	Regional Storm	100 year storm	50 year storm	25 year storm	10 year storm	5 year storm	2 year storm
		ha.	m <sup>3</sup> /s						
<b>Munn's Creek</b>									
Dundas St. W.	MC-D1	29.99	2.01	0.99	0.88	0.77	0.62	0.51	0.33
	Flow rate / Area (m <sup>3</sup> /s/ha)		0.067	0.033	0.029	0.026	0.021	0.017	0.011
	MC-D4	59.61	3.19	1.31	1.16	1.02	0.80	0.67	0.43
Flow rate / Area (m <sup>3</sup> /s/ha)		0.054	0.022	0.019	0.017	0.013	0.011	0.007	
<b>West Morrison Creek</b>									
Dundas St. E.	MW-D3	226.38	10.93	4.26	3.77	3.30	2.59	2.13	1.35
Flow rate / Area (m <sup>3</sup> /s/ha)			0.048	0.019	0.017	0.015	0.011	0.009	0.006
<b>East Morrison Creek</b>									
Dundas St. E.	ME-D2	313.94	13.67	5.18	4.58	4.00	3.14	2.57	1.62
Flow rate / Area (m <sup>3</sup> /s/ha)			0.044	0.016	0.015	0.013	0.010	0.008	0.005
<b>Joshua's Creek</b>									
Dundas St. E.	JC-D1	952.74	50.06	20.58	18.18	16.02	12.57	10.35	6.53
	Flow rate / Area (m <sup>3</sup> /s/ha)		0.052	0.021	0.019	0.017	0.013	0.011	0.007
	JC-D2	111.80	5.68	2.21	1.95	1.69	1.31	1.07	0.65
Flow rate / Area (m <sup>3</sup> /s/ha)		0.051	0.020	0.017	0.015	0.012	0.010	0.006	

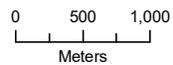
Unit flow rates for upstream subcatchments draining to Dundas Street culvert JC-D1

	A	B	C	D	E	F	G	H	I	J	K
1	TABLE 6.3.6 TARGET UNIT AREA PEAK FLOW RATES										
2	EXISTING LAND USE										
3					Reg.	100	50	25	10	5	2
4	Location	Culvert	GAWSER	Land Use		year	year	year	year	year	year
5		No.	Hyd. No.		m <sup>3</sup> /s						
6											
133	Burnhamthorpe Rd. E.	JC-B7	2215	Existing	11.33	5.50	4.90	4.30	3.40	2.83	1.81
134											
135	Burnhamthorpe Rd. E.	JC-B9	2225	Existing	1.96	0.82	0.72	0.63	0.50	0.42	0.26
136											
137	Burnhamthorpe Rd. E.	JC-B10	2222	Existing	5.33	2.24	1.99	1.75	1.38	1.15	0.73
138											
139	Dundas St. E.	JC-D1	2275	Existing	50.06	20.58	18.18	16.02	12.57	10.35	6.53
140											
141	Dundas St. E.	JC-D2	2278	Existing	5.68	2.21	1.95	1.69	1.31	1.07	0.65

Target peak flows at Burnhamthorpe Road Culvert Crossings (per Trafalgar Road SWM Report, AECOM)



# NORTH OAKVILLE CREEKS SUBWATERSHED STUDY

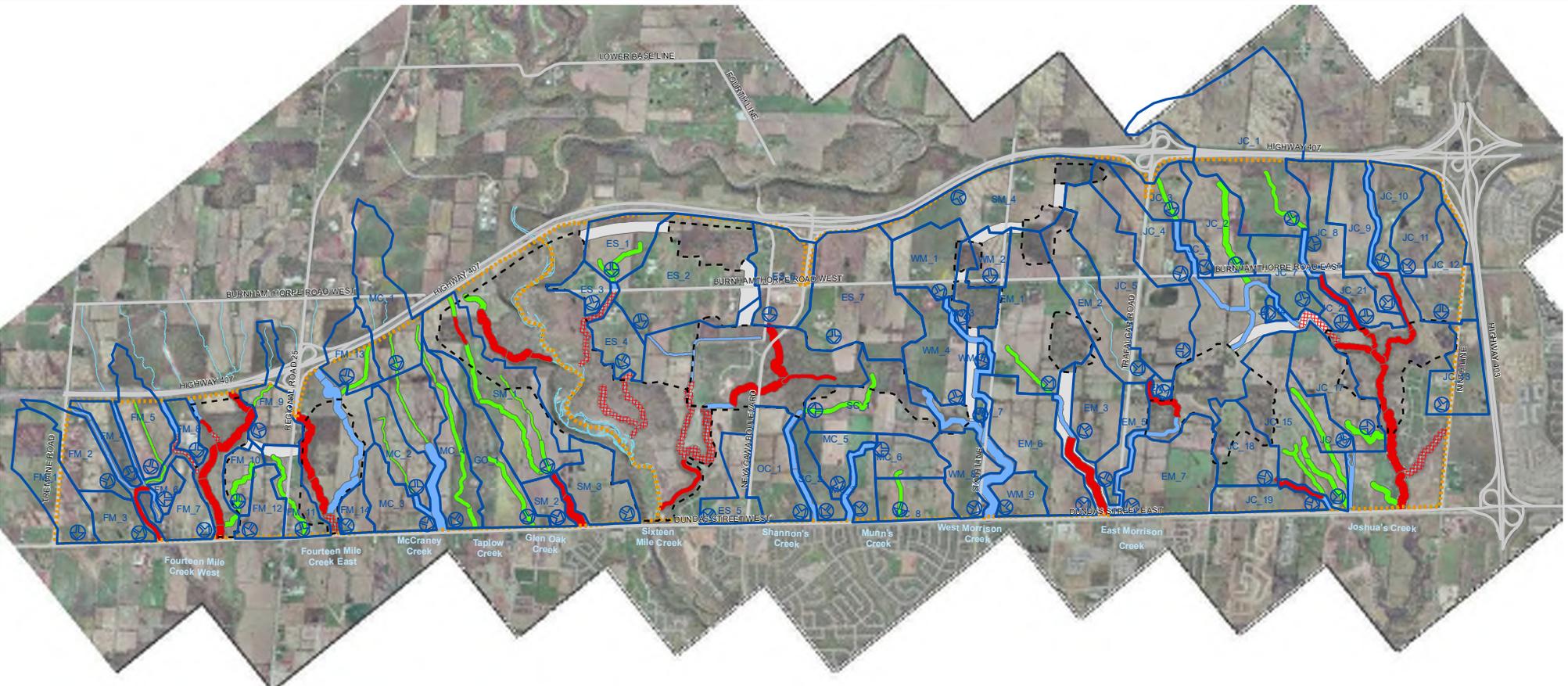


## Legend

- Study Area
- Road
- Watercourse
- Subcatchments
- ▲ Culvert

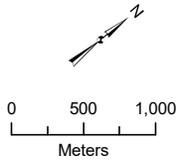
## Unit Flow Rate Target Locations

Figure 7.4.7



**NORTH OAKVILLE CREEKS SUBWATERSHED STUDY**

August 2006



**Legend**

- Core
- Secondary Plan Boundary
- Road
- Watercourse
- SWM Pond (Approximate Location)
- SWM Pond Drainage Area

**Stream Corridor**

- High Constraint
- High Constraint - Requiring Rehabilitation
- Medium Constraint
- Low Constraint
- SWM Pond Drainage Area
- Approximate SWM Pond Locations

Approximate Stormwater Facility Locations

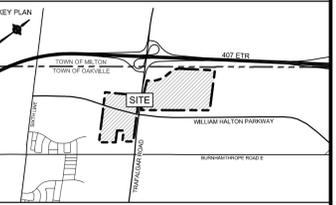
**Figure 7.4.6**

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# APPENDIX E

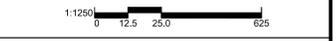
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## Drawings



DATE	ISSUANCE	NO.
2023.11.15	ISSUED FOR SUBMISSION	01

- LEGEND**
- PROPOSED CATCHBASIN
  - PROPOSED STORM MANHOLE
  - PROPOSED SANITARY MANHOLE
  - PROPOSED FIRE HYDRANT
  - PROPOSED WATERMAIN VALVE
  - PROPOSED OVERLAND FLOW ROUTE
  - PROPERTY LINE
  - PROPOSED GRADE
  - EXISTING GRADE



CLIENT  
**INFRASTRUCTURE ONTARIO**

PROJECT  
**TRAFALGAR CORRIDOR FUNCTIONAL SERVICING OAKVILLE, ONTARIO**

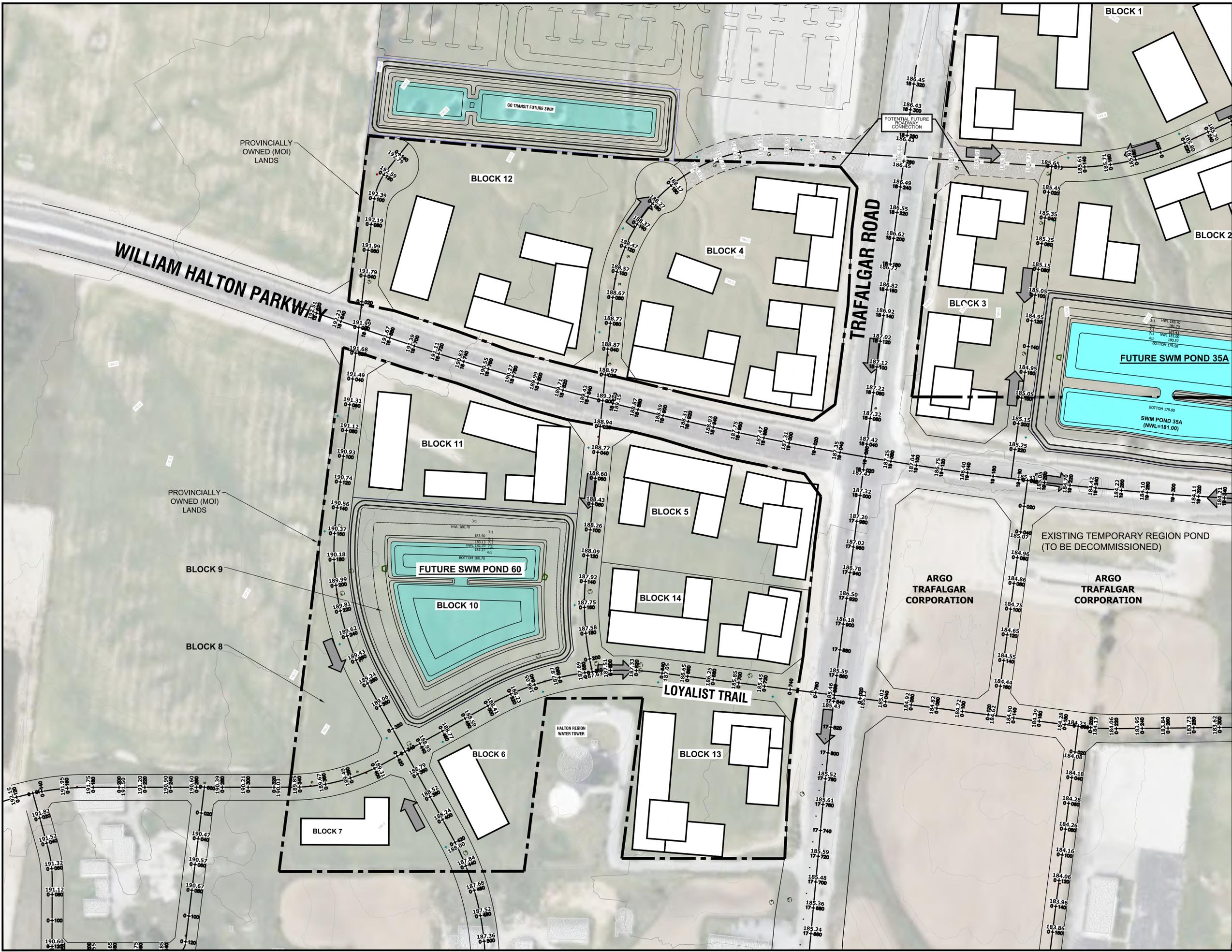
TITLE  
**GRADING PLAN WEST SHEET 1 OF 2**

**WALTERFEDY**  
KITCHENER | HAMILTON | TORONTO | CALGARY  
A PART OF WF GROUP  
800.685.1378 walterfeddy.com

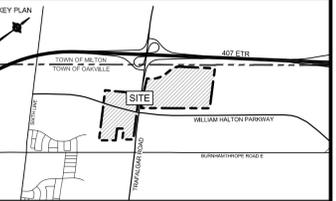
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SCALE: 1:1250	SHEET NO.:
DATE: 2025-11-04	<b>C201</b>
PROJECT NO.: 2022-0019-10	
DRAWN BY: SYK	
CHECKED BY: BV	



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DATE	ISSUANCE	NO.
2023.11.15	ISSUED FOR SUBMISSION	01

- LEGEND**
- CB PROPOSED CATCHBASIN
  - MH PROPOSED STORM MANHOLE
  - MH PROPOSED SANITARY MANHOLE
  - HYD PROPOSED FIRE HYDRANT
  - WW PROPOSED WATERMAIN VALVE
  - PROPOSED OVERLAND FLOW ROUTE
  - PROPERTY LINE
  - [123.45] PROPOSED GRADE
  - [123.45] EXISTING GRADE



CLIENT  
**INFRASTRUCTURE ONTARIO**

PROJECT  
**TRAFALGAR CORRIDOR FUNCTIONAL SERVICING OAKVILLE, ONTARIO**

TITLE  
**GRADING PLAN EAST Sheet 2 of 2**

**WALTERFEDY**  
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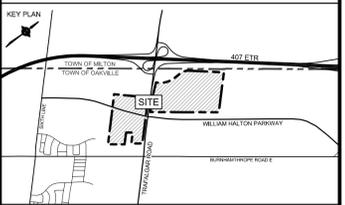
REPRODUCTION OR DISTRIBUTION FOR PURPOSES OTHER THAN AUTHORIZED BY WALTERFEDY, A PART OF WF GROUP, IS FORBIDDEN. CONTRACTORS SHALL VERIFY AND BE RESPONSIBLE FOR ALL DIMENSIONS AND CONDITIONS ON THE JOB AND REPORT ANY VARIATIONS FROM THE DIMENSIONS AND CONDITIONS SHOWN ON DRAWINGS TO WALTERFEDY, A PART OF WF GROUP. - DO NOT SCALE THIS DRAWING -

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SCALE: 1:1250	SHEET NO.:
DATE: 2025-11-04	<b>C202</b>
PROJECT NO.: 2022-0019-10	
DRAWN BY: SYK	
CHECKED BY: BV	



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DATE	ISSUANCE	NO.
2023.11.15	ISSUED FOR SUBMISSION	01

**LEGEND**

	PROPOSED CATCHBASIN
	PROPOSED STORM MANHOLE
	PROPOSED STORM SEWER/SERVICE
	PROPOSED SANITARY MANHOLE
	PROPOSED SANITARY SEWER/SERVICE
	PROPOSED FIRE HYDRANT
	PROPOSED WATERMAIN VALVE
	PROPOSED WATERMAIN/SERVICE
	PROPOSED OVERLAND FLOW ROUTE
	PROPERTY LINE



CLIENT: **INFRASTRUCTURE ONTARIO**

PROJECT: **TRAFALGAR CORRIDOR FUNCTIONAL SERVICING OAKVILLE, ONTARIO**

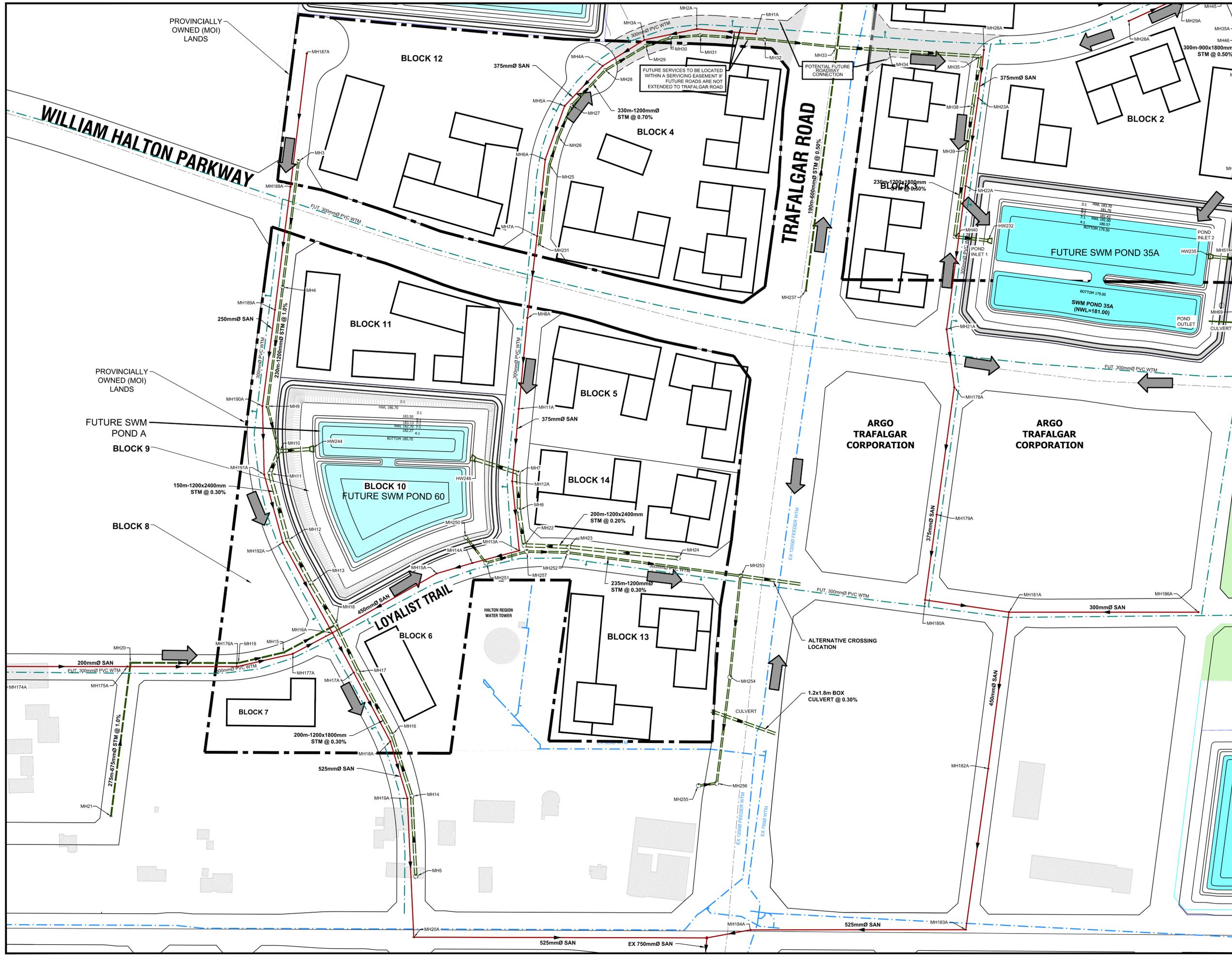
TITLE: **SERVICING PLAN WEST SHEET 1 OF 2**

**WALTERFEDY**  
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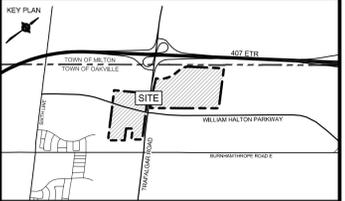
REPRODUCTION OR DISTRIBUTION FOR PURPOSES OTHER THAN AUTHORIZED BY WALTERFEDY, A PART OF WF GROUP, IS FORBIDDEN. CONTRACTORS SHALL VERIFY AND BE RESPONSIBLE FOR ALL DIMENSIONS AND CONDITIONS ON THE JOB AND REPORT ANY VARIATIONS FROM THE DIMENSIONS AND CONDITIONS SHOWN ON DRAWINGS TO WALTERFEDY, A PART OF WF GROUP. - DO NOT SCALE THIS DRAWING -

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SCALE: 1:1250	SHEET NO.:
DATE: 2025-11-04	<b>C301</b>
PROJECT NO.: 2022-0019-10	
DRAWN BY: SYK	
CHECKED BY: BV	



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 Name: Michael Bucci



DATE	ISSUANCE	NO.
2023.11.15	ISSUED FOR SUBMISSION	01

**LEGEND**

	PROPOSED CATCHBASIN
	PROPOSED STORM MANHOLE
	PROPOSED STORM SEWER/SERVICE
	PROPOSED SANITARY MANHOLE
	PROPOSED SANITARY SEWER/SERVICE
	PROPOSED FIRE HYDRANT
	PROPOSED WATERMAIN VALVE
	PROPOSED WATERMAIN/SERVICE
	PROPOSED OVERLAND FLOW ROUTE
	PROPERTY LINE



CLIENT  
**INFRASTRUCTURE ONTARIO**

PROJECT  
**TRAFALGAR CORRIDOR FUNCTIONAL SERVICING OAKVILLE, ONTARIO**

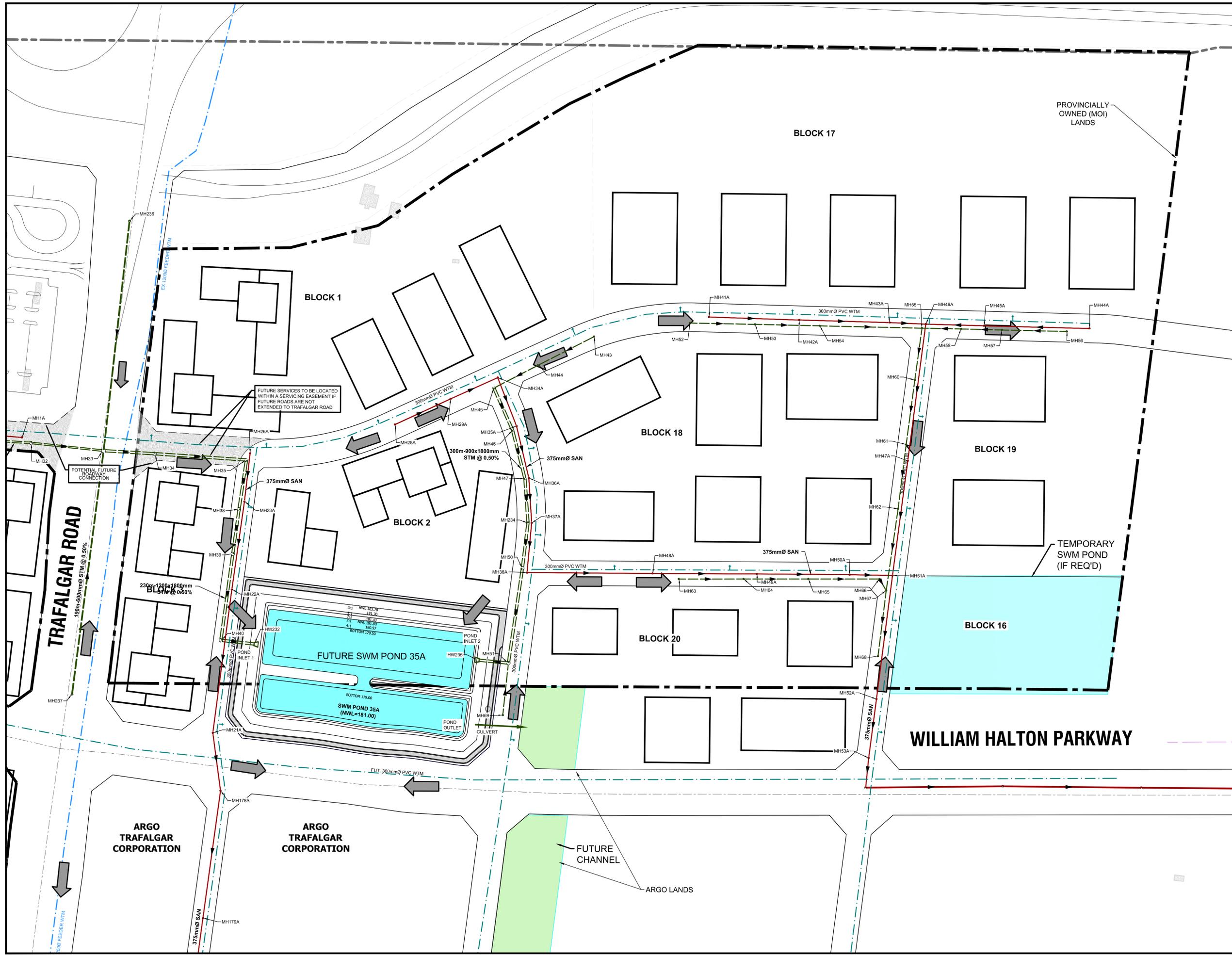
TITLE  
**SERVICING PLAN EAST SHEET 2 OF 2**

**WALTERFEDY**  
KITCHENER | HAMILTON | TORONTO | CALGARY  
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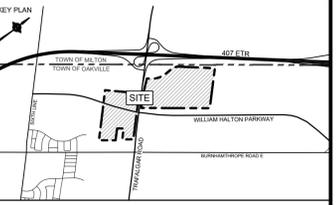
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SCALE: 1:1250	SHEET NO.:
DATE: 2025-11-04	<b>C302</b>
PROJECT NO.: 2022-0019-10	
DRAWN BY: SYK	
CHECKED BY: BV	



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DATE	ISSUANCE	NO.
2023.11.15	ISSUED FOR SUBMISSION	01

**LEGEND**

- CB PROPOSED CATCHBASIN
- MH PROPOSED STORM MANHOLE
- MH PROPOSED STORM SEWER/SERVICE
- MH PROPOSED SANITARY MANHOLE
- MH PROPOSED SANITARY SEWER/SERVICE
- HYD PROPOSED FIRE HYDRANT
- WV PROPOSED WATERMAIN VALVE
- WV PROPOSED WATERMAIN/SERVICE
- PROPOSED OVERLAND FLOW ROUTE
- PROPERTY LINE
- EXISTING/PROPOSED SANITARY DRAINAGE AREA
- 10 CATCHMENT ID
- 0.75 AREA IN HECTARES
- 0.2 POPULATION



CLIENT  
**INFRASTRUCTURE ONTARIO**

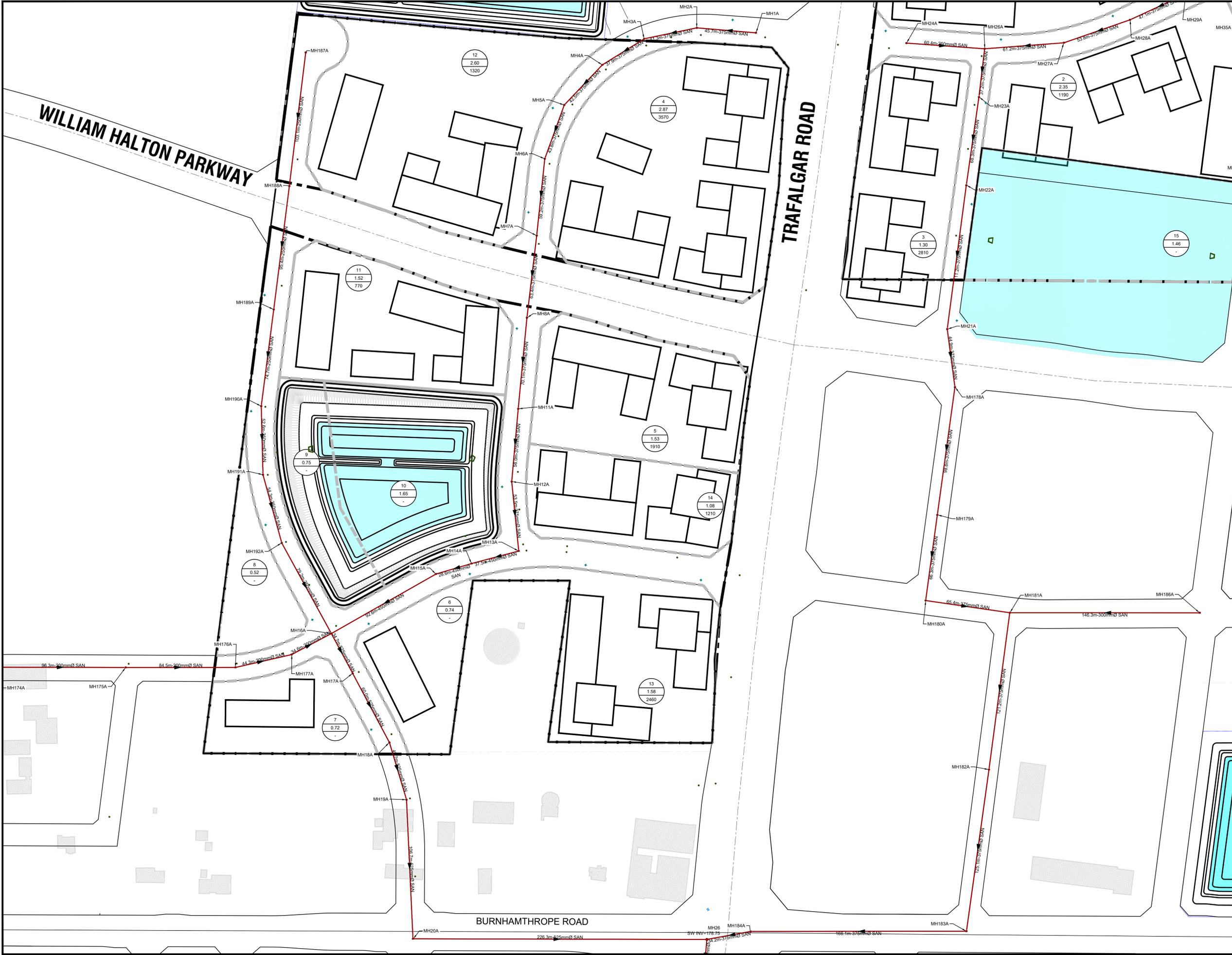
PROJECT  
**TRAFALGAR CORRIDOR  
FUNCTIONAL SERVICING  
OAKVILLE, ONTARIO**

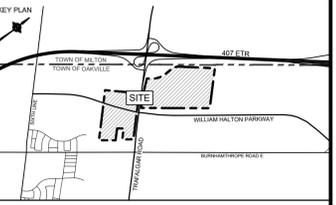
TITLE  
**SANITARY DRAINAGE AREA  
PLAN WEST  
SHEET 1 OF 2**

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SCALE: 1:1250	SHEET NO.:
DATE: 2025-10-31	<b>C303</b>
PROJECT NO.: 2022-0019-10	
DRAWN BY: SYK	
CHECKED BY: BV	





DATE	ISSUANCE	NO.
2023.11.15	ISSUED FOR SUBMISSION	01

**LEGEND**

- PROPOSED CATCHBASIN
- PROPOSED STORM MANHOLE
- PROPOSED STORM SEWER/SERVICE
- PROPOSED SANITARY MANHOLE
- PROPOSED SANITARY SEWER/SERVICE
- HYD
- PROPOSED FIRE HYDRANT
- PROPOSED WATERMAIN VALVE
- PROPOSED WATERMAIN/SERVICE
- PROPOSED OVERLAND FLOW ROUTE
- PROPERTY LINE
- EXISTING/PROPOSED SANITARY DRAINAGE AREA

CATCHMENT ID  
 AREA IN HECTARES  
 POPULATION A  
 POPULATION B



CLIENT  
**INFRASTRUCTURE ONTARIO**

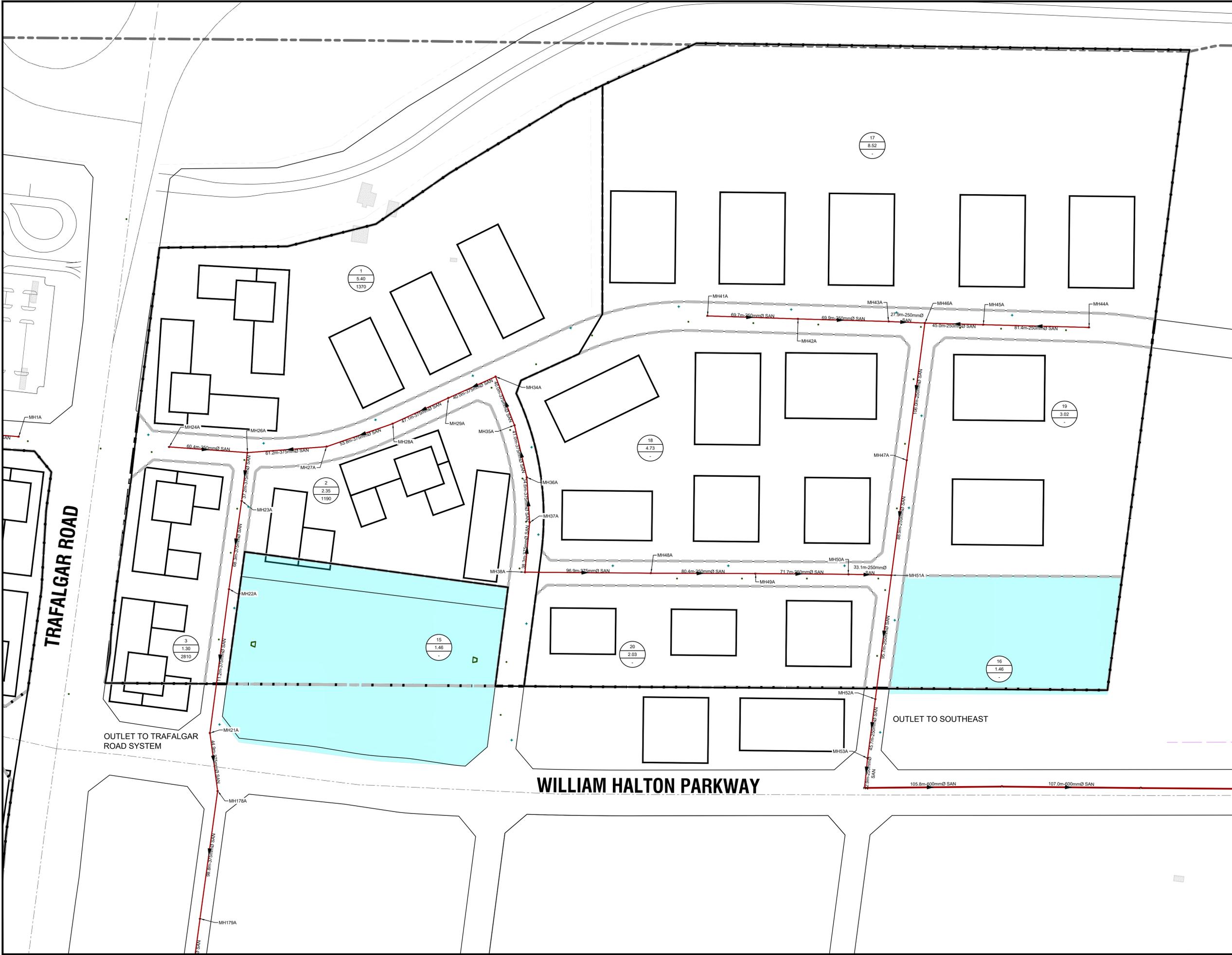
PROJECT  
**TRAFALGAR CORRIDOR  
FUNCTIONAL SERVICING  
OAKVILLE, ONTARIO**

TITLE  
**SANITARY DRAINAGE AREA PLAN  
EAST  
SHEET 2 OF 2**

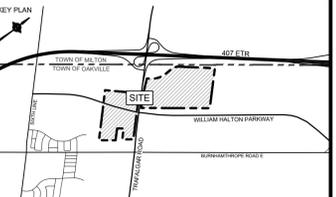
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SCALE	DATE	PROJECT NO.	DRAWN BY	CHECKED BY	SHEET NO.
1:1250	2025-10-31	2022-0019-10	SYK	BV	<b>C304</b>



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DATE	ISSUANCE	NO.
2023.11.15	ISSUED FOR SUBMISSION	01

- LEGEND**
- CB PROPOSED CATCHBASIN
  - MH PROPOSED STORM MANHOLE
  - MH PROPOSED STORM SEWER/SERVICE
  - MH PROPOSED SANITARY MANHOLE
  - MH PROPOSED SANITARY SEWER/SERVICE
  - HYD PROPOSED FIRE HYDRANT
  - WV PROPOSED WATERMAIN VALVE
  - WV PROPOSED WATERMAIN/SERVICE
  - PROPOSED OVERLAND FLOW ROUTE
  - PROPERTY LINE
  - EXISTING/PROPOSED STORM DRAINAGE AREA
  - REACH #
  - AREA IN HECTARES
  - RUN OFF COEFFICIENT



CLIENT  
**INFRASTRUCTURE ONTARIO**

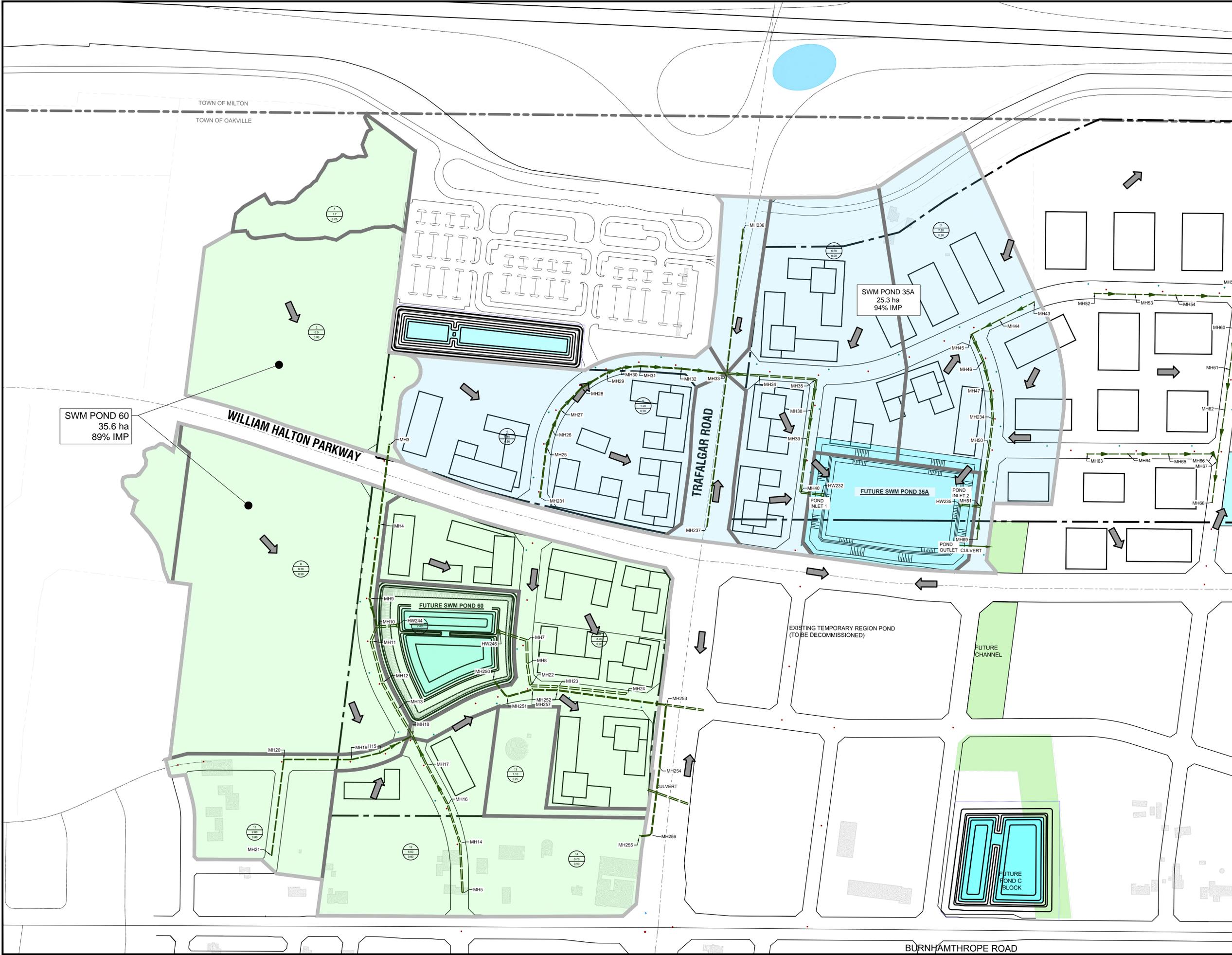
PROJECT  
**TRAFALGAR CORRIDOR  
FUNCTIONAL SERVICING  
OAKVILLE, ONTARIO**

TITLE  
**STORM DRAINAGE AREA PLAN**

**WALTERFEDY**  
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SCALE: 1:2000	SHEET NO.:
DATE: 2025-10-31	<b>C305</b>
PROJECT NO.: 2022-0019-10	
DRAWN BY: SYK	
CHECKED BY: BV	



SWM POND 60  
35.6 ha  
89% IMP

SWM POND 35A  
25.3 ha  
94% IMP

FUTURE SWM POND 35A

FUTURE SWM POND 60

FUTURE POND C BLOCK

EXISTING TEMPORARY REGION POND  
(TO BE DECOMMISSIONED)

FUTURE CHANNEL

BURNHAMTHORPE ROAD

WILLIAM HALTON PARKWAY

TRAFALGAR ROAD